Koyo®

JTEKT
Koyo TOYODA

Ball & Roller Bearings

JTEKT

JTEKT CORPORATION

CAT. NO. B2001E-7

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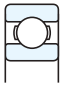
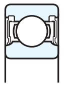
Deep groove ball bearings


Open type ··· B 8
(67, 68, 69, 160, 60
62, 63, 64)


Shielded/sealed type ··· B 20
(Z, RU
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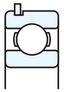
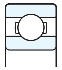
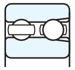

Locating snap ring type ··· B 32
(N
NR)


Extra-small & miniature ··· B 40
(flanged type ··· B 46)


Double-row ······ B 52
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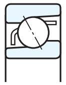
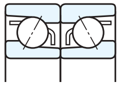
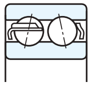
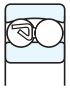
Angular contact ball bearings

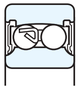

Single-row ··· B 62
(79, 70, 72, 73, 74)

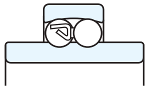

Matched pair ··· B 90
(DB, DF
DT)

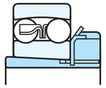

Double-row ··· B 118
(32, 33, 52, 53
52...2RS, 53...2RS)

Self-aligning ball bearings

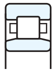

Open type ··· B 126
(12, 22
13, 23)

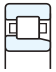

Sealed type ··· B 132
(22...2RS
23...2RS)

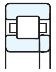

Extended inner ring type ··· B 134
[112, 113]

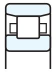

Adapter assemblies ··· B 136

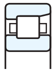
Cylindrical roller bearings


NU

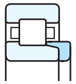

NJ

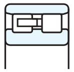

NUP

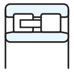

N


NF

Single-row ··· B 142
(NU10, NU2, NU22, NU32
NU3, NU23, NU33, NU4)

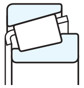

Thrust collars ··· B 168
[HJ]

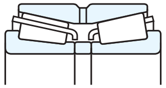

NN

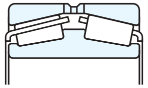

NNU

Double-row ··· B 178
(NN30
NNU49)

Tapered roller bearings


Metric series ··· B 194
Inch series ······ B 224
(329, 320, 330, 331, 302, 322
332, 303, 303D, 313, 323, ISO)


TDO type ······ B 268
(462, 463, 46T302, 46T322
46T303, 46T303D, 46T323)


TDI type ······ B 284
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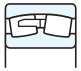
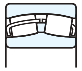
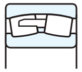
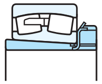
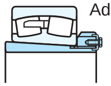
Spherical roller bearings

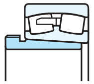

R, RR


RZ

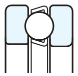

RHA

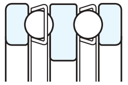
··· B 294
(239, 230, 240, 231, 241
222, 232, 213, 223)

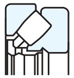


Adapter assemblies ··· B 318


Withdrawal sleeves ··· B 326

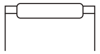
Thrust ball, Spherical thrust roller bearings


Single direction ··· B 338
(511, 512, 513, 514
532, 533, 534
532U, 533U, 534U)

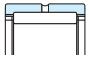

Double direction ··· B 348
(522, 523, 524
542, 543, 544
542U, 543U, 544U)

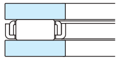

··· B 356
[292, 293, 294]

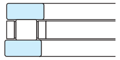
Needle roller bearings

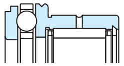
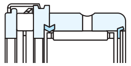
Needle roller and cage ass'y
Metric ··· B 380
Inch ··· B 408


Drawn cup type
Metric ··· B 414
Inch ··· B 424

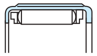

Heavy-duty type
Metric ··· B 432
Inch ··· B 440


Thrust needle roller
Metric ··· B 444
Inch ··· B 452


Thrust cylindlical roller ··· B 448


Combined ··· B 460, B 462
[Ball thrust series]

(Cylindlical roller thrust series)


Inner ring
··· B 466


(Miniature one-way clutches
··· B 482)


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· Bearings for machine tool spindles (for support of axial loading) ································· C 59
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Koyo®

BALL & ROLLER BEARINGS

Koyo

Publication of Rolling Bearing Catalog

Today's technology-based society, in order to utilize the earth's limited resources effectively and protect the environment, must strive to develop new technologies and alternate energy sources, and in that connection it continues to pursue new targets in various fields. To achieve such targets, technically advanced and highly functional rolling bearings with significantly greater compactness, lighter weight, longer life and lower friction as well as higher reliability during use in special environments are sought.

This new-edition catalog is based on the results of wide-ranging technical studies and extensive R&D efforts and will enable the reader to select the optimal bearing for each application.

JTEKT is confident that you will find this new catalog useful in the selection and use of rolling bearings. JTEKT is grateful for your patronage and look forward to continuing to serve you in the future.

★The contents of this catalog are subject to change without prior notice. Every possible effort has been made to ensure that the data herein is correct; however, JTEKT cannot assume responsibility for any errors or omissions.

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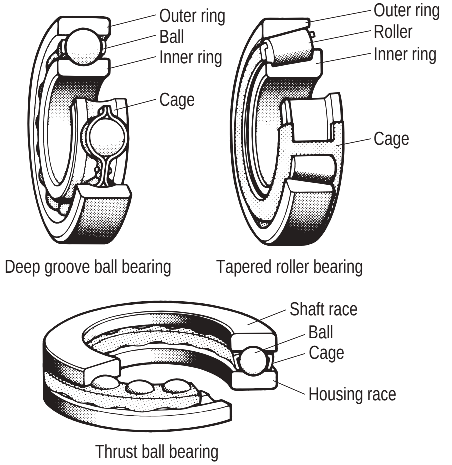
1. Rolling bearing structures and types

1-1 Structure

Rolling bearings (bearings hereinafter) normally comprise bearing rings, rolling elements and a cage. (see Fig. 1-1)

Rolling elements are arranged between inner and outer rings with a cage, which retains the rolling elements in correct relative position, so they do not touch one another. With this structure, a smooth rolling motion is realized during operation.

Bearings are classified as follows, by the number of rows of rolling elements :
single-row, double-row, or multi-row (triple- or four-row) bearings.



Deep groove ball bearing

Tapered roller bearing

Thrust ball bearing

Note) In thrust bearings inner and outer rings and also called “shaft race” and “housing race” respectively. The race indicates the washer specified in JIS.

Fig. 1-1 Bearing structure

1) Bearing rings

The path of the rolling elements is called the raceway; and, the section of the bearing rings where the elements roll is called the raceway surface. In the case of ball bearings, since grooves are provided for the balls, they are also referred to as raceway grooves.

The inner ring is normally engaged with a shaft; and, the outer ring with a housing.

2) Rolling element

Rolling elements may be either balls or rollers. Many types of bearings with various shapes of rollers are available.

- Ball
- Cylindrical roller ($L_W \leqq 3\,D_W$)*
- Long cylindrical roller ($3D_W \leqq L_W \leqq 10D_W$, $D_W > 6$ mm)*
- Needle roller ($3D_W \leqq L_W \leqq 10D_W$, $D_W \leqq 6$ mm)*
- Tapered roller (tapered trapezoid)
- Convex roller (barrel shape)

* (L_W : roller length (mm)
D_W : roller diameter (mm))

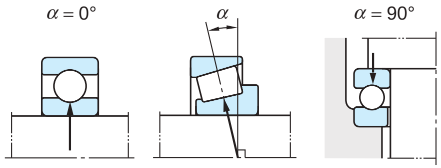
3) Cage

The cage guides the rolling elements along the bearing rings, retaining the rolling elements in correct relative position. There are various types of cages including pressed, machined, molded, and pin type cages.

Due to lower friction resistance than that found in full complement roller and ball bearings, bearings with a cage are more suitable for use under high speed rotation.

1-2 Type

The contact angle (α) is the angle formed by the direction of the load applied to the bearing rings and rolling elements, and a plan perpendicular to the shaft center, when the bearing is loaded.



Bearings are classified into two types in accordance with the contact angle (α).

· Radial bearings ($0° \leqq \alpha \leqq 45°$)
... designed to accommodate mainly radial load.
· Thrust bearings ($45° < \alpha \leqq 90°$)
... designed to accommodate mainly axial load.

Rolling bearings are classified in Fig. 1-2, and characteristics of each bearing type are described in Tables 1-1 to 1-13.

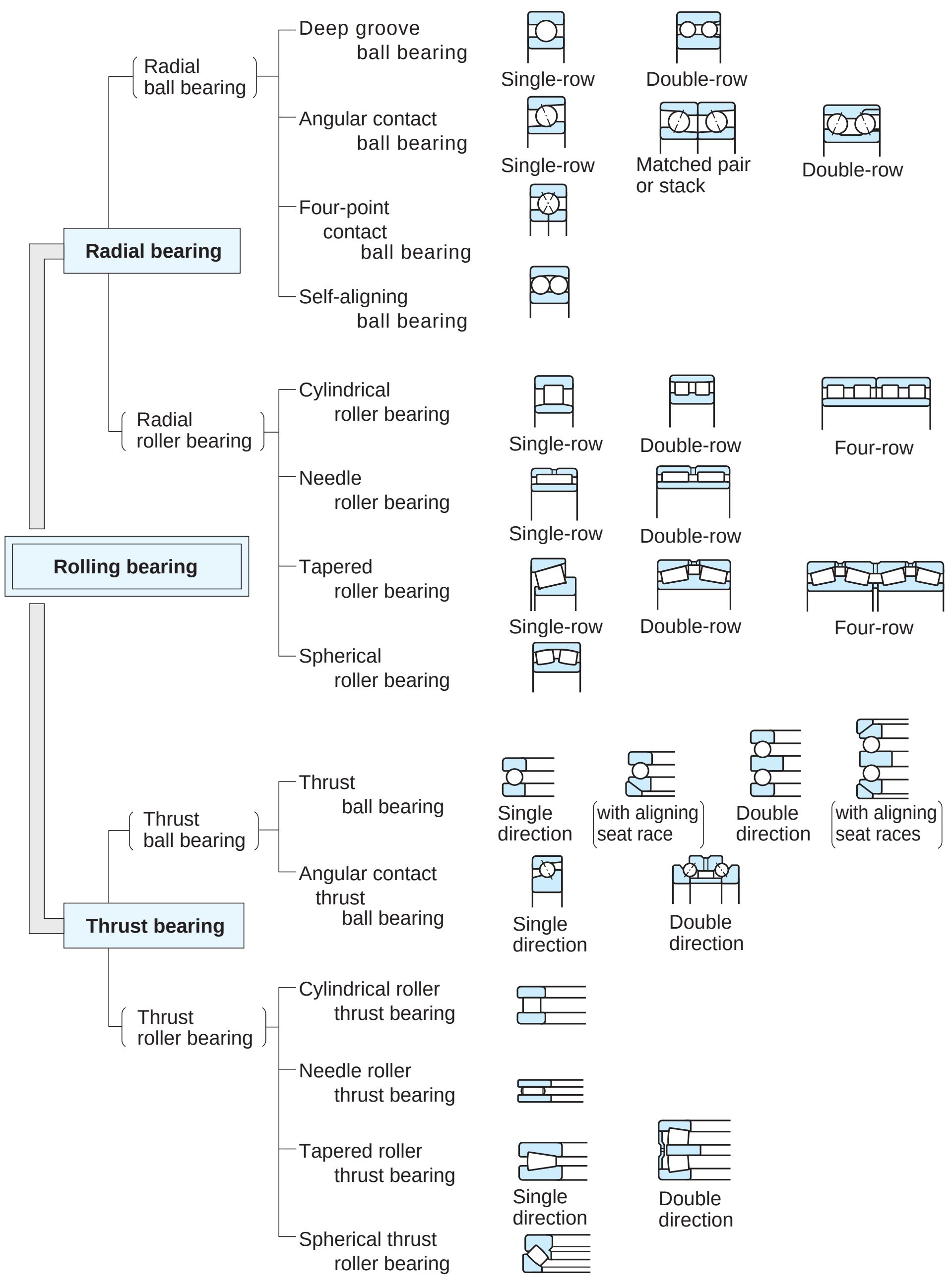


Fig. 1-2(1) Rolling bearings

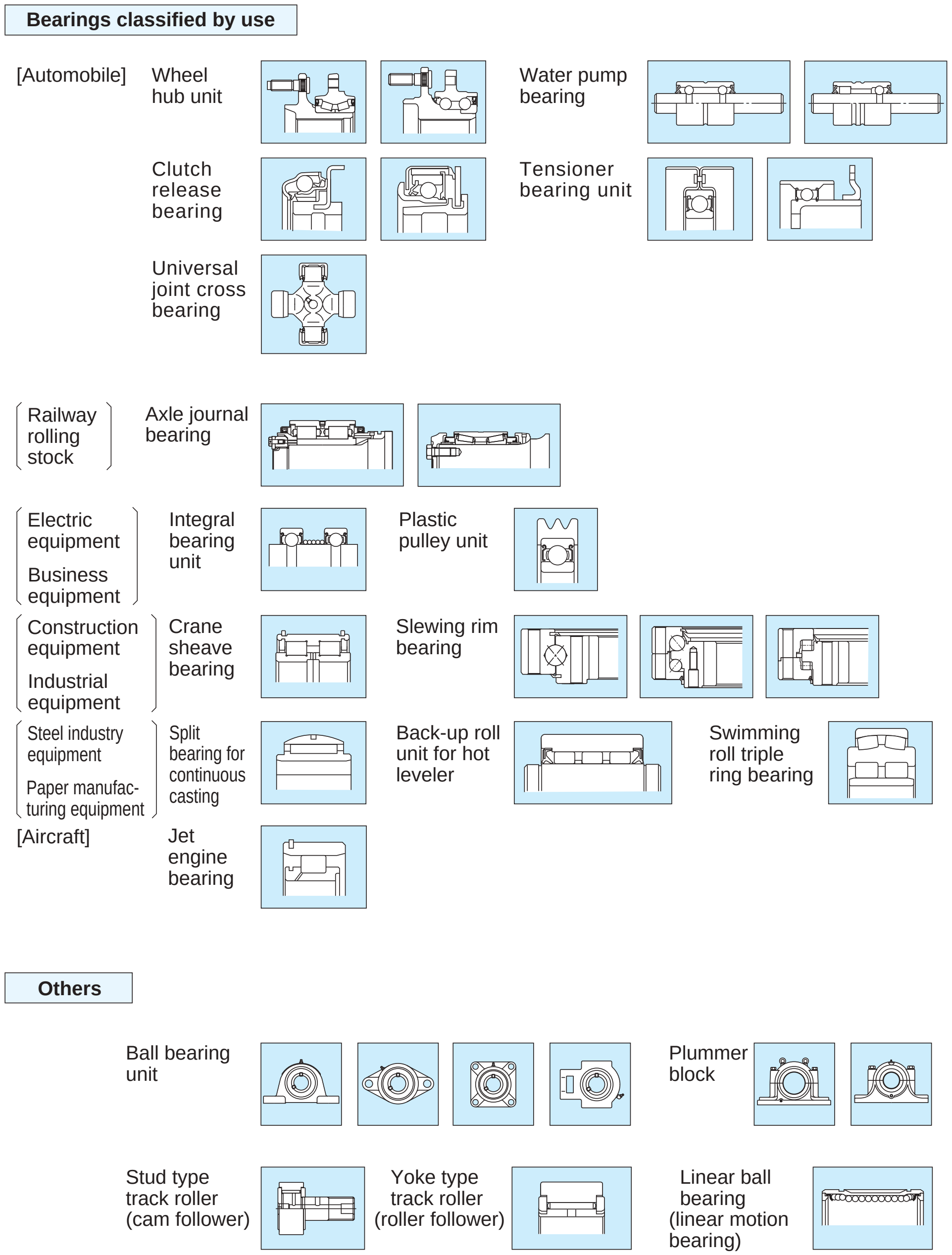
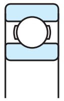
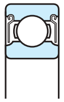
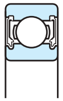
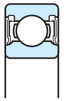
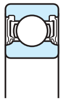
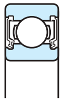
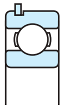
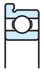
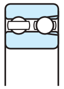


Fig. 1-2(2) Rolling bearings

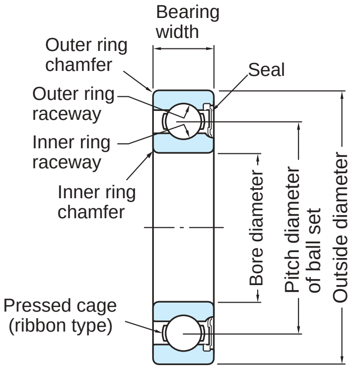
Table 1-1 Deep groove ball bearings

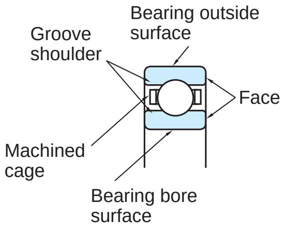
Single-row								Double-row
Open type	Shielded type	Non-contact sealed type	Contact sealed type		Extremely light contact sealed type	With locating snap ring	Flanged type	
								
	ZZ	2RU	2RS	2RK	2RD	NR	(Suitable for extra-small or miniature bearing)	
680, 690, 600, 620, 630, (ML) ···Extra-small, miniature bearing								4200
6700, 6800, 6900, 16000, 6000, 6200, 6300, 6400								4300

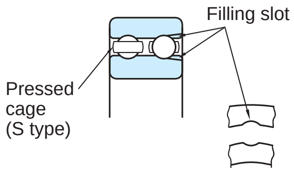
- The most popular types among rolling bearings, widely used in a variety of industries.
- Radial load and axial load in both directions can be accommodated.
- Suitable for operation at high speed, with low noise and low vibration.
- Sealed bearings employing steel shields or rubber seals are filled with the appropriate volume of grease when manufactured.
- Bearings with a flange or locating snap ring attached on the outer ring are easily mounted in housings for simple positioning of housing location.

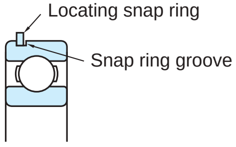
[Recommended cages] Pressed cage (ribbon type, snap type ··· single-row, S type ··· double-row), copper alloy or phenolic resin machined cage, synthetic resin molded cage

[Main applications]
Automobile : front and rear wheels, transmissions, electric devices
Electric equipment : standard motors, electric appliances for domestic use
Others : measuring instruments, internal combustion engines, construction equipment, railway rolling stock, cargo transport equipment, agricultural equipment, equipment for other industrial uses





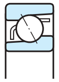
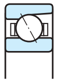
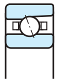
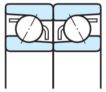
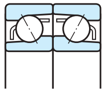
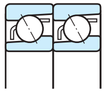
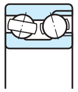
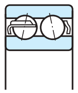




Bearing size (Reference) Unit : mm

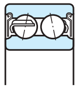
Connotation	Bore diameter	Outside diameter
Miniature	–	Under 9
Extra-small	Under 10	9 or more
Small size	10 or more	80 or less
Medium size	–	80 – 180
Large size	–	180 – 800
Extra-large size	–	Over 800

Table 1-2 Angular contact ball bearings

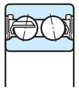
Single-row			Matched pair			Double-row	
		For high-speed use	Back-to-back arrangement	Face-to-face arrangement	Tandem arrangement		
							
(With pressed cage)	(With machined cage)	HAR	DB	DF	DT	(With filling slot)	
7000, 7200, 7300, 7400 ··················· Contact angle 30°						3200	5200
7000B, 7200B, 7300B, 7400B ··················· 40°						3300	5300
7900C, 7000C, 7200C, 7300C HAR900C, HAR000C ··························· 15°						Contact angle 32°	Contact angle 24°

- Bearing rings and balls possess their own contact angle which is normally 15°, 30° or 40°.
  - Larger contact angle ····· higher resistance against axial load
  - Smaller contact angle ··· more advantageous for high-speed rotation
- Single-row bearings can accommodate radial load and axial load in one direction.
- DB and DF matched pair bearings and double-row bearings can accommodate radial load and axial load in both directions.
  DT matched pair bearings are used for applications where axial load in one direction is too large for one bearing to accept.
- HAR type high speed bearings were designed to contain more balls than standard bearings by minimizing the ball diameter, to offer improved performance in machine tools.
- Angular contact ball bearings are used for high accuracy and high-speed operation.

- Axial load in both directions and radial load can be accommodated by adapting a structure pairing two single-row angular contact ball bearings back to back.
- For bearings with no filling slot, the sealed type is available.



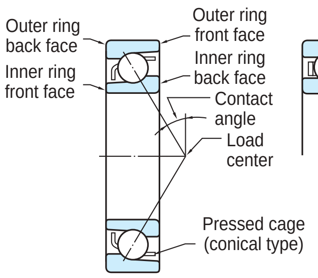
ZZ (Shielded)

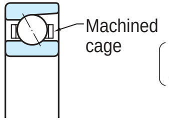


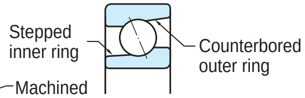
2RS (Sealed)

[Recommended cages] Pressed cage (conical type ··· single-row : S type, snap type ··· double-row), copper alloy or phenolic resin machined cage, synthetic resin molded cage

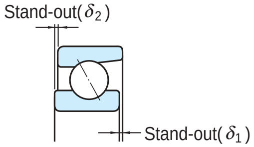
[Main applications]
Single-row : machine tool spindles, high frequency motors, gas turbines, centrifugal separators, front wheels of small size automobiles, differential pinion shafts
Double-row : hydraulic pumps, roots blowers, air-compressors, transmissions, fuel injection pumps, printing equipment







(Ball and bearing ring are not separable.)

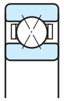
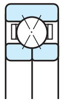
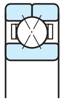


Contact angles (Reference)

Contact angle	Supplementary code
15°	C
20°	CA
25°	AC
30°	A (Omitted)
35°	E
40°	B

"G type" bearings are processed (with flush ground) such that the stand-out turns out to be $\delta_1 = \delta_2$.
The matched pair DB, DF, and DT, or stack are available.

Table 1-3 Four-point contact ball bearings

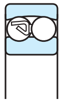
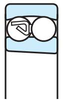
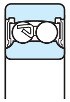
One-piece type	Two-piece inner ring	Two-piece outer ring
		
—	6200BI 6300BI	(6200BO) (6300BO)

- Radial load and axial load in both directions can be accommodated.
- A four-point contact ball bearing can substitute for a face-to-face or back-to-back arrangement of angular contact ball bearings.
- Suitable for use under pure axial load or combined radial and axial load with heavy axial load.
- This type of bearing possesses a contact angle (α) determined in accordance with the axial load direction. This means that the bearing ring and balls contact each other at two points on the lines forming the contact angle.

[Recommended cage] Copper alloy machined cage

[Main applications]
Motorcycle : Transmission, driveshaft pinion-side
Automobile : Steering, transmission

Table 1-4 Self-aligning ball bearings

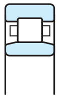
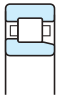
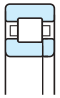
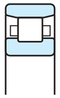
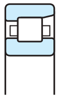
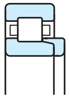
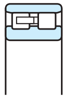
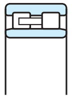
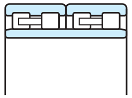
Cylindrical bore	Tapered bore	Sealed
	 K (Taper 1 : 12)	 2RS
120, 130 1200, 1300 2200, 2300	(11200, 11300··· extended inner ring type)	2200 2RS 2300 2RS

- Spherical outer ring raceway allows self-alignment, accommodating shaft or housing deflection and misaligned mounting conditions.
- Tapered bore design can be mounted readily using an adapter.

Pressed cage (staggered type···12, 13,
22...2RS, 23...2RS
snap type ·········22, 23)

Power transmission shaft of wood working and spinning machines, plummer blocks

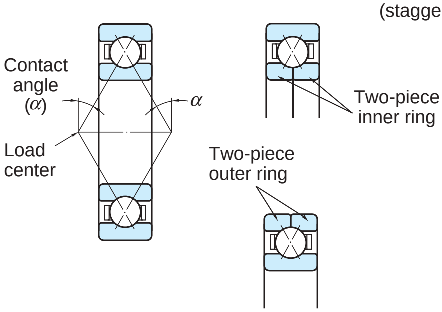
Table 1-5 Cylindrical roller bearings

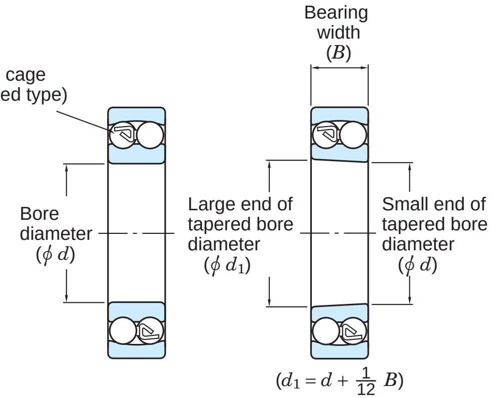
Single-row						Double-row		Four-row
								
NU	NJ	NUP	N	NF	NH	NN	NNU	(Mainly use on rolling mill roll neck)
NU1000, NU200 (R), NU300 (R), NU400 NU2200 (R), NU2300 (R) NU3200, NU3300						Cylindrical bore NNU4900 NN3000	Tapered bore NNU4900K NN3000K	(FC) , (4CR)

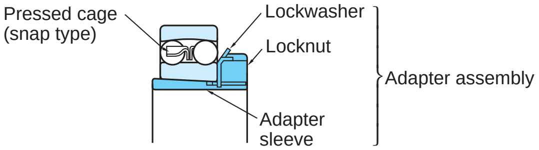
- Since the design allowing linear contact of cylindrical rollers with the raceway provides strong resistance to radial load, this type is suitable for use under heavy radial load and impact load, as well as at high speed.
- N and NU types are ideal for use on the free side: they are movable in the shaft direction in response to changes in bearing position relative to the shaft or housing, which are caused by heat expansion of the shaft or improper mounting.
- NJ and NF types can accommodate axial load in one direction; and NH and NUP types can accommodate partial axial load in both directions.
- With separable inner and outer ring, this type ensures easy mounting.
- Due to their high rigidity, NNU and NN types are widely used in machine tool spindles.

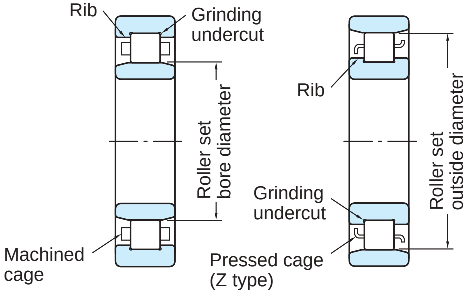
[Recommended cages] Pressed cage (Z type), copper alloy machined cage, pin type cage, synthetic resin molded cage

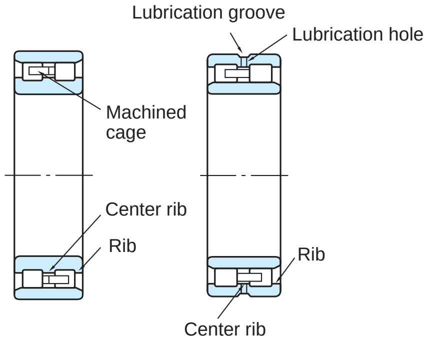
[Main applications] Large and medium size motors, traction motors, generators, internal combustion engines, gas turbines, machine tool spindles, speed reducers, cargo transport equipment, and other industrial equipment











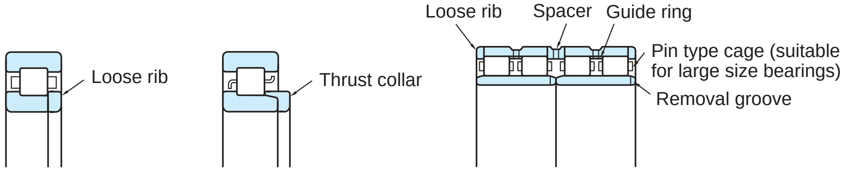
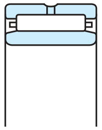
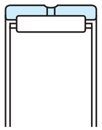
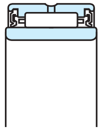
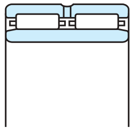
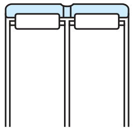


Table 1-6 Machined ring needle roller bearings

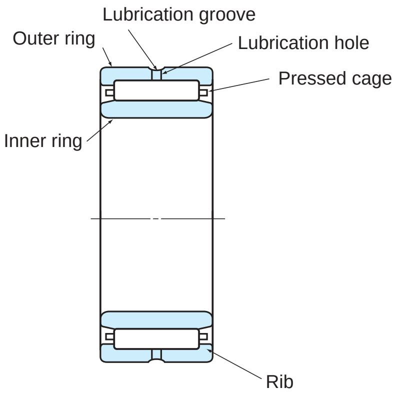
Single-row			Double-row	
 With inner ring	 Without inner ring	 Sealed	 With inner ring	 Without inner ring
NA4800	RNA4800	NA49002RS	NA6900	RNA6900
NA4900	RNA4900	–	(d ≧ 32)	(Fw ≧ 40)
NA6900	RNA6900	(HJ.2RS)		
(NKJ, NKJS)	(NK, NKS, HJ)			

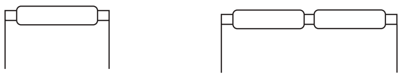
- ■ In spite of their basic structure, which is the same as that of NU type cylindrical roller bearings, bearings with minimum ring sections offer space savings and greater resistance to radial load, by using needle rollers.
- ■ Bearings with no inner rings function using heat treated and ground shafts as their raceway surface.

[Recommended cage] Pressed cage

[Main applications] Automobile engines, transmissions, pumps, power shovel wheel drums, hoists, overhead traveling cranes, compressors

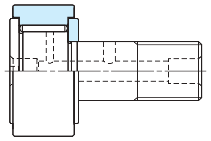
(Reference) Many needle roller bearings other than those with machined ring are available.
For details, refer to the pages for the needle roller bearing specification tables and the dedicated "Needle Roller Bearings" catalog (CAT No. B2020E), published separately.



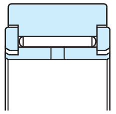


Needle roller and cage assemblies

Drawn cup needle roller bearings

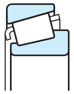
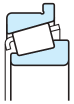
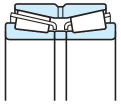
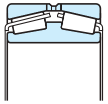
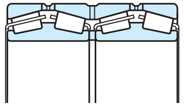


Stud type track roller
(cam follower)



Yoke type track roller
(roller follower)

Table 1-7 Tapered roller bearings

Single-row				Double-row		Four-row
		 Flanged type		 TDO type	 TDI type	 (Mainly used on rolling mill roll necks)
(Standard contact angle)		(Inter mediate contact angle)	(Steep contact angle)	46200	45200	37200
32900JR	30200JR	30200CR	30300DJ	46200A	45300	47200
32000JR	32200JR	32200CR	30300DJR	46300	(45T)	47300
33000JR	33200JR	30300CR	31300JR	46300A		(47T)
33100JR	30300JR	32300CR		(46T)		(4TR)
	32300JR					

- ■ Tapered rollers assembled in the bearings are guided by the inner ring back face rib.
- ■ The raceway surfaces of inner ring and outer ring and the rolling contact surface of rollers are designed so that the respective apexes converge at a point on the bearing center line.
- ■ Single-row bearings can accommodate radial load and axial load in one direction, and double-row bearings can accommodate radial load and axial load in both directions.
- ■ This type of bearing is suitable for use under heavy load or impact load.
- ■ Bearings are classified into standard, intermediate and steep types, in accordance with their contact angle (α).
  The larger the contact angle is, the greater the bearing resistance to axial load.
- ■ Since outer ring and inner ring assembly can be separated from each other, mounting is easy.
- ■ Bearings designated by the suffix "J" and "JR" are interchangeable internationally.
- ■ Items sized in inches are still widely used.

[Recommended cages] Pressed cage, synthetic resin molded cage, pin type cage

[Main applications] Automobile : front and rear wheels, transmissions, differential pinion
Others : machine tool spindles, construction equipment, large size agricultural equipment, railway rolling stock speed reduction gears, rolling mill roll necks and speed reducers, etc

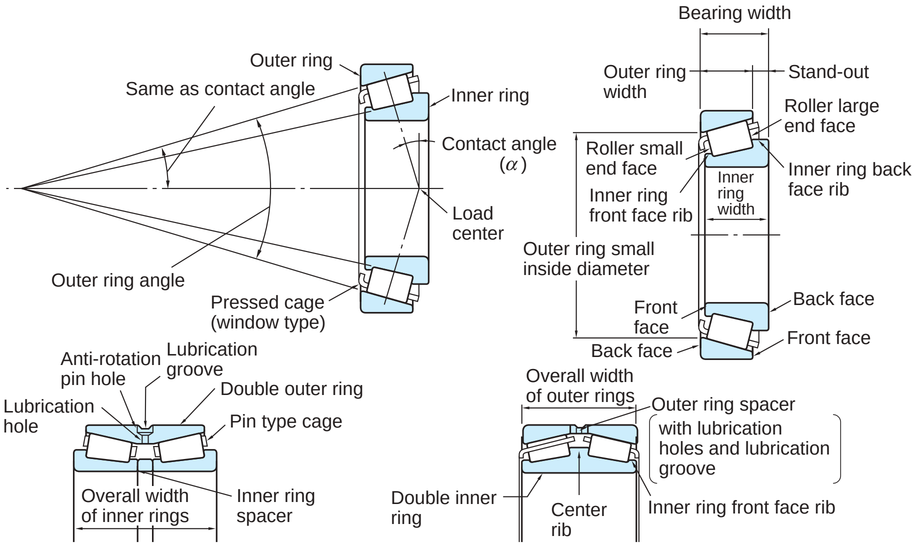
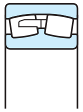
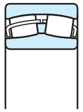
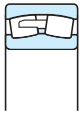
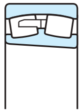


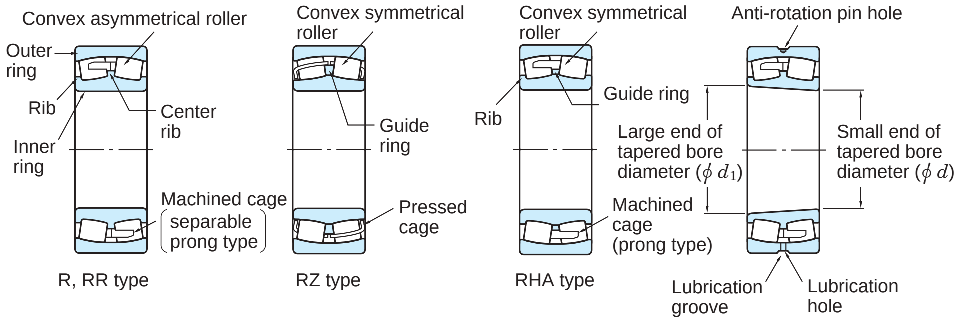
Table 1-8 Spherical roller bearings

Cylindrical bore			Tapered bore
Convex asymmetrical roller type	Convex symmetrical roller type		
 R, RR	 RZ	 RHA	 K or K30
23900R, 23000R (RZ, RHA), 23100R (RZ, RHA), 22200R (RZ, RHA), 21300R (RZ) 24000R (RZ, RHA), 24100R (RZ, RHA), 23200R (RZ, RHA), 22300R (RZ, RHA)			

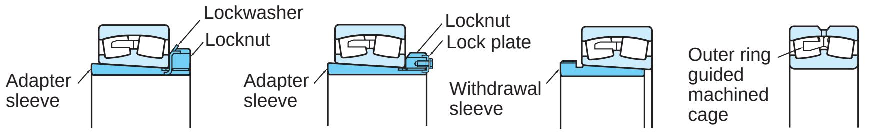
- Spherical roller bearings comprising barrel-shaped convex rollers, double-row inner ring and outer ring are classified into three types : R(RR), RZ and RHA, according to their internal structure.
- With the bearing designed such that the circular arc center of the outer ring raceway matches with the bearing center, the bearing is self-aligning, insensitive to errors of alignment of the shaft relative to the housing, and to shaft bending.
- This type can accommodate radial load and axial load in both directions, which makes it especially suitable for applications in which heavy load or impact load is applied.
- The tapered bore type can be easily mounted/dismounted by using an adapter or withdrawal sleeve.
  There are two types of tapered bores (tapered ratio) :
  - 1 : 30 (supplementary code K30) ··· Suitable for series 240 and 241.
  - 1 : 12 (supplementary code K) ··· Suitable for series other than 240 and 241.
- Lubrication holes, a lubrication groove and anti-rotation pin hole can be provided on the outer ring. Lubrication holes and a lubrication groove can be provided on the inner ring, too.

[Recommended cages] Copper alloy machined cage, pressed cage

[Main applications] Paper manufacturing equipment, speed reducers, railway rolling stock axle journals, rolling mill pinion stands, table rollers, crushers, shaker screens, printing equipment, wood working equipment, speed reducers for various industrial uses, plummer blocks

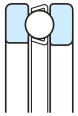
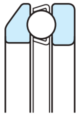
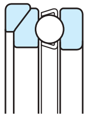
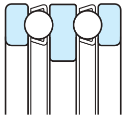
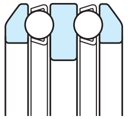
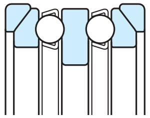


R, RR type RZ type RHA type



(Shaft diameter ≦ 180 mm) (Shaft diameter ≧ 200 mm) (For shaker screen)

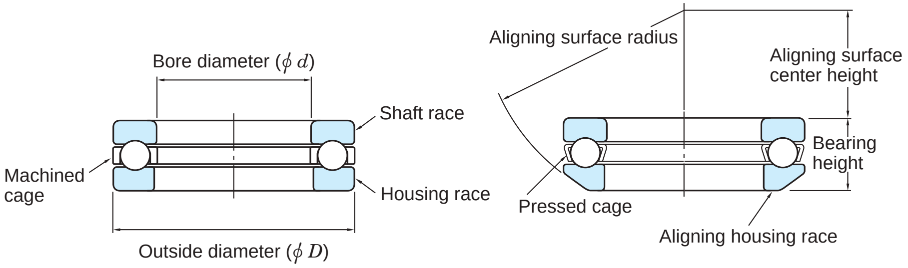
Table 1-9 Thrust ball bearings

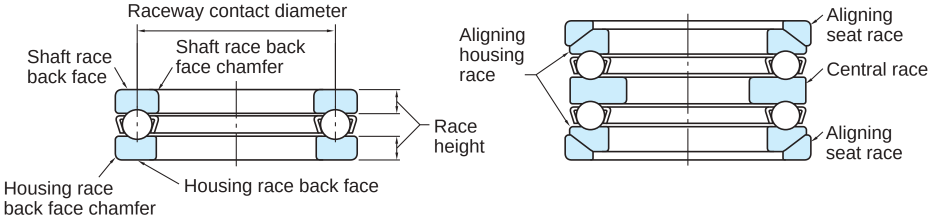
Single direction			Double direction		
With flat back faces	With spherical back face	With aligning seat race	With flat back faces	With spherical back faces	With aligning seat races
					
51100	–	–	–	–	–
51200	53200	53200U	52200	54200	54200U
51300	53300	53300U	52300	54300	54300U
51400	53400	53400U	52400	54400	54400U

- This type of bearing comprises washer-shaped rings with raceway groove and ball and cage assembly.
- Races to be mounted on shafts are called shaft races (or inner rings); and, races to be mounted into housings are housing races (or outer rings).
  Central races of double direction bearings are mounted on the shafts.
- Single direction bearings accommodate axial load in one direction, and double direction bearings accommodate axial load in both directions. (Both of these bearings cannot accommodate radial loads.)
- Since bearings with a spherical back face are self- aligning, it helps to compensate for mounting errors.

[Recommended cages] Pressed cage, copper alloy or phenolic resin machined cage, synthetic resin molded cage

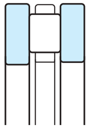
[Main applications] Automobile king pins, machine tool spindles





[Remark] The race indicates the washer specified in JIS.

Table 1-10 Cylindrical roller thrust bearings

Single direction

(811, 812, NTHA)
■ This type of bearing comprises washer-shaped rings (shaft and housing race) and cylindrical roller and cage assembly. Crowned cylindrical rollers produce uniform pressure distribution on roller/raceway contact surface. ■ Axial load can be accommodated in one direction. ■ Great axial load resistance and high axial rigidity are provided.
[Recommended cages] Copper alloy machined cage
[Main applications] Oil excavators, iron and steel equipment

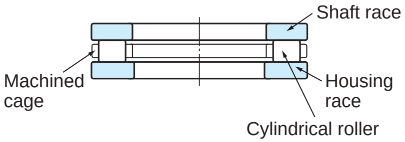
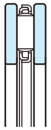
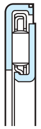
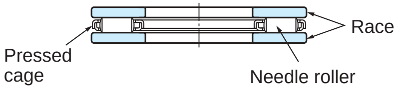
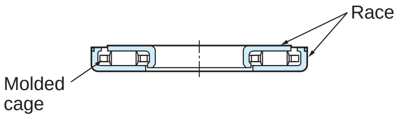


Table 1-11 Needle roller thrust bearings

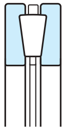
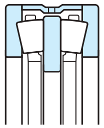
Separable	Non-separable
	
(AXK, FNT, NTA)	(FNTKF)
■ The separable type, comprising needle roller and cage thrust assembly and a race, can be matched with a pressed thin race (AS) or machined thick race (LS, WS.811, GS.811). ■ The non-separable type comprises needle roller and cage thrust assembly and a precision pressed race. ■ Axial load can be accommodated in one direction. ■ Due to the very small installation space required, this type contributes greatly to size reduction of application equipment. ■ In many cases, needle roller and cage thrust assembly function by using the mounting surface of the application equipment, including shafts and housings, as its raceway surface.	
Pressed cage, synthetic resin molded cage	
Transmissions for automobiles, cultivators and machine tools	

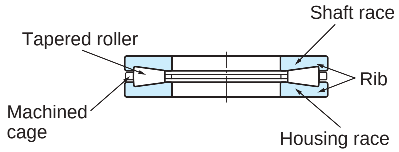


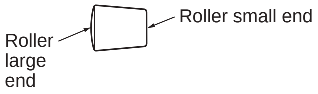


[Remark] The race indicates the thrust washer or washer specified in JIS.

Table 1-12 Tapered roller thrust bearings

Single direction	Double direction
	
(T) (THR)	(2THR)
■ This type of bearing comprises tapered rollers (with spherical large end), which are uniformly guided by ribs of the shaft and housing races. ■ Both shaft and housing races and rollers have tapered surfaces whose apexes converge at a point on the bearing axis. ■ Single direction bearings can accommodate axial load in one direction; and, double direction bearings can accommodate axial load in both directions. ■ Double direction bearings are to be mounted such that their central race is placed on the shaft shoulder. Since this type is treated with a clearance fit, the central race must be fixed with a sleeve, etc.	
[Recommended cages] Copper alloy machined cage	
[Main applications] Single direction : crane hooks, oil excavator swivels Double direction : rolling mill roll necks	





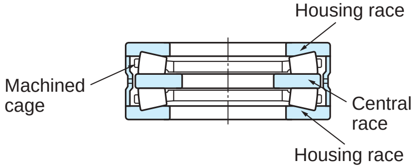
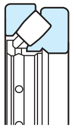
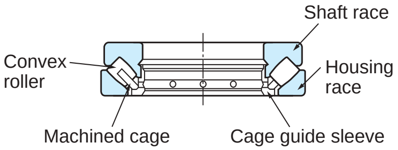


Table 1-13 Spherical thrust roller bearings


29200 29300 29400
■ This type of bearing, comprising barrel-shaped convex rollers arranged at an angle with the axis, is self-aligning due to spherical housing race raceway; therefore, shaft inclination can be compensated for to a certain degree. ■ Great axial load resistance is provided. This type can accommodate a small amount of radial load as well as heavy axial load. ■ Normally, oil lubrication is employed.
Copper alloy machined cage
Hydroelectric generators, vertical motors, propeller shafts for ships, screw down speed reducers, jib cranes, coal mills, pushing machines, molding machines



2. Outline of bearing selection

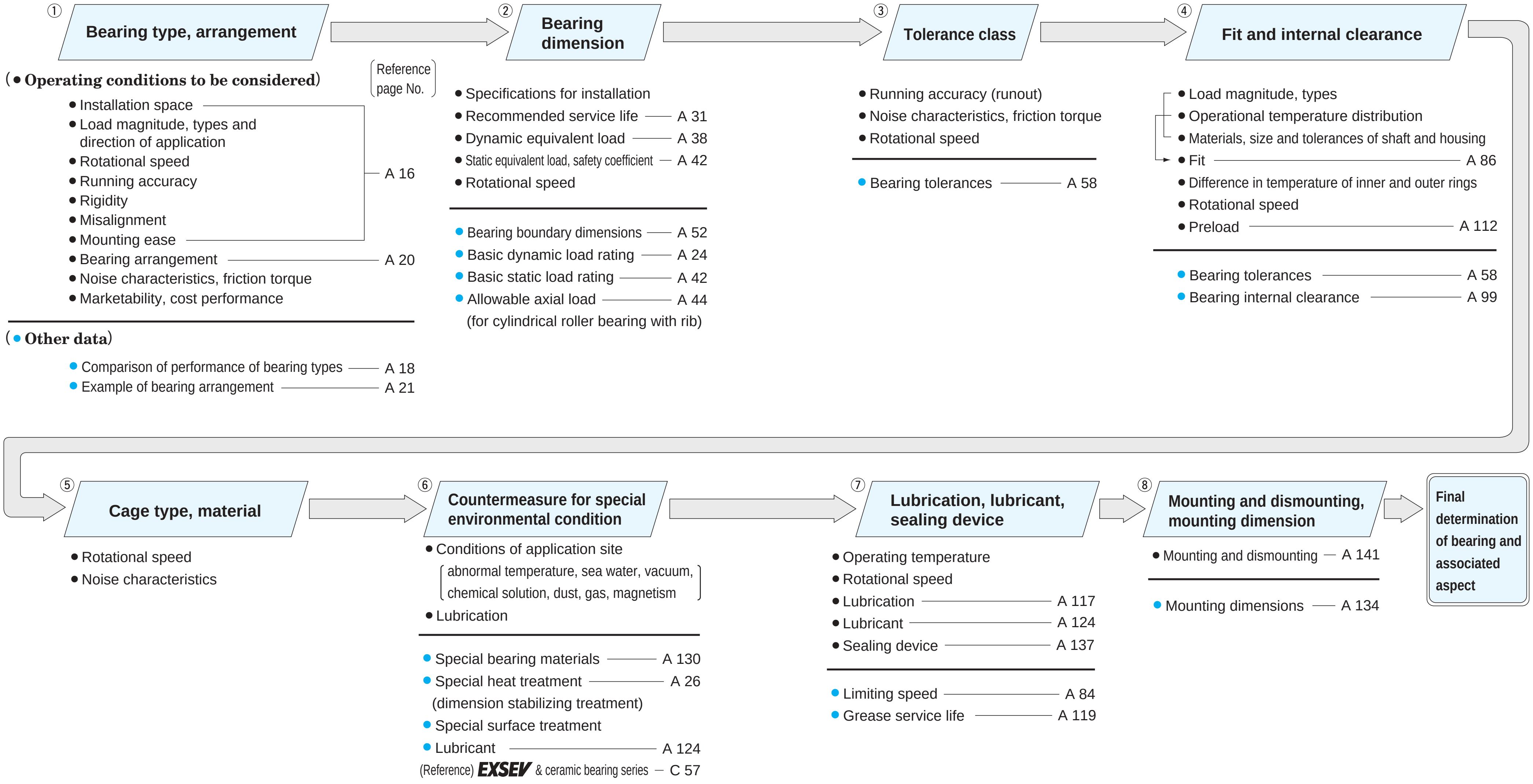
Currently, as bearing design has become diversified, their application range is being increasingly extended. In order to select the most suitable bearings for an application, it is necessary to conduct a comprehensive study on both bearings and the equipment in which the bearings will be installed, including operating conditions, the performance required of the bearings, specifications of the other components to be installed along with the bearings, marketability, and cost performance, etc.

In selecting bearings, since the shaft diameter is usually determined beforehand, the prospective bearing type is chosen based upon installation space, intended arrangement, and according to the bore diameter required.

Next, from the bearing specifications are determined the service life required when compared to that of the equipment in which it is used, along with a calculation of the actual service life from operational loads.

Internal specifications including bearing accuracy, internal clearance, cage, and lubricant are also selected, depending on the application.

For reference, general selection procedure and operating conditions are described in Fig. 2-1. There is no need to follow a specific order, since the goal is to select the right bearing to achieve optimum performance.



① **Bearing type, arrangement**

(Reference page No.)

(● **Operating conditions to be considered**)

- Installation space
- Load magnitude, types and direction of application
- Rotational speed
- Running accuracy
- Rigidity
- Misalignment
- Mounting ease — A 16
- Bearing arrangement — A 20
- Noise characteristics, friction torque
- Marketability, cost performance

(● **Other data**)

- Comparison of performance of bearing types — A 18
- Example of bearing arrangement — A 21

② **Bearing dimension**

- Specifications for installation
- Recommended service life — A 31
- Dynamic equivalent load — A 38
- Static equivalent load, safety coefficient — A 42
- Rotational speed

- Bearing boundary dimensions — A 52
- Basic dynamic load rating — A 24
- Basic static load rating — A 42
- Allowable axial load — A 44
  (for cylindrical roller bearing with rib)

③ **Tolerance class**

- Running accuracy (runout)
- Noise characteristics, friction torque
- Rotational speed

- Bearing tolerances — A 58

④ **Fit and internal clearance**

- Load magnitude, types
- Operational temperature distribution
- Materials, size and tolerances of shaft and housing
- Fit — A 86
- Difference in temperature of inner and outer rings
- Rotational speed
- Preload — A 112

- Bearing tolerances — A 58
- Bearing internal clearance — A 99

⑤ **Cage type, material**

- Rotational speed
- Noise characteristics

⑥ **Countermeasure for special environmental condition**

- Conditions of application site
  (abnormal temperature, sea water, vacuum, chemical solution, dust, gas, magnetism)
- Lubrication

- Special bearing materials — A 130
- Special heat treatment — A 26
  (dimension stabilizing treatment)
- Special surface treatment
- Lubricant — A 124

(Reference) **EXSEV** & ceramic bearing series — C 57

⑦ **Lubrication, lubricant, sealing device**

- Operating temperature
- Rotational speed
- Lubrication — A 117
- Lubricant — A 124
- Sealing device — A 137

- Limiting speed — A 84
- Grease service life — A 119

⑧ **Mounting and dismounting, mounting dimension**

- Mounting and dismounting — A 141

- Mounting dimensions — A 134

Final determination of bearing and associated aspect

Fig. 2-1(1)   Bearing selection procedure

Fig. 2-1(2)   Bearing selection procedure

3. Selection of bearing type

In selecting bearings, the most important thing is to fully understand the operating conditions of the bearings.

The main factors to be considered are listed in Table 3-1, while bearing types are listed in Table 3-2.

Table 3-1 (1) Selection of bearing type

Items to be considered		Selection method	Reference page No.
1) Installation space	Bearing can be installed in target equipment	● When a shaft is designed, its rigidity and strength are considered essential; therefore, the shaft diameter, i.e., bore diameter, is determined at start. For rolling bearings, since wide variety with different dimensions are available, the most suitable bearing type should be selected. (Fig. 3-1)	A 52
2) Load	Load magnitude, type and direction which applied (Load resistance of bearing is specified in terms of the basic load rating, and its value is specified in the bearing specification table.)	● Since various types of load are applied to bearings, load magnitude, types (radial or axial) and direction of application (both directions or single direction in the case of axial load), as well as vibration and impact must be considered in order to select the proper bearing. ● The following is the general order for radial resistance ; (deep groove ball bearings < angular contact ball bearings < cylindrical roller bearings < tapered roller bearings < spherical roller bearings)	A 18 (Table 3-2) A 87
3) Rotational speed	Response to rotational speed of equipment in which bearings will be installed (The limiting speed for bearing is expressed as allowable speed, and this value is specified in the bearing specification table.)	● Since the allowable speed differs greatly depend-ing not only upon bearing type but on bearing size, cage, accuracy, load and lubrication, all factors must be considered in selecting bearings. ● In general, the following bearings are the most widely used for high speed operation. (deep groove ball bearings, angular contact ball bearings, cylindrical roller bearings)	A 18 (Table 3-2) A 84
4) Running accuracy	Accurate rotation delivering required performance (Dimension accuracy and running accuracy of bearings are provided by JIS, etc.)	● Performance required differs depending on equipment in which bearings are installed : for instance, machine tool spindles require high running accuracy, gas turbines require high speed rotation, and control equipment requires low friction. In such cases, bearings of tolerance class 5 or higher are required. ● The following are the most widely used bearings. (deep groove ball bearings, angular contact ball bearings, cylindrical roller bearings)	A 18 (Table 3-2) A 58
5) Rigidity	Rigidity that delivers the bearing performance required (When load is applied to a bearing, elastic deformation occurs at the point where its rolling elements contact the raceway surface. The higher the rigidity that bearings possess, the better they control elastic deformation.)	● In machine tool spindles and automobile final drives, bearing rigidity as well as rigidity of equipment itself must be enhanced. ● Elastic deformation occurs less in roller bearings than in ball bearings. ● Rigidity can be enhanced by providing preload. This method is suitable for use with angular contact ball bearings and tapered roller bearings.	A 18 (Table 3-2) A 112

Table 3-1 (2) Selection of bearing type

Items to be considered		Selection method	Reference page No.
6) Misalignment (aligning capability)	Operating conditions which cause misalignment (shaft deflection caused by load, inaccuracy of shaft and housing, mounting errors) can affect bearing performance (Allowable misalignment (in angle) for each bearing type is described in the section before the bearing specification table, to facilitate determination of the self-aligning capability of bearings.)	● Internal load caused by excessive misalignment damages bearings. Bearings designed to absorb such misalignment should be selected. ● The higher the self-aligning capability that bearings possess, the larger the angular misalignment that can be absorbed. The following is the general order of bearings when comparing allowable angular misalignment : (cylindrical roller bearings < tapered roller bearings < deep groove ball bearings, angular contact ball bearings < spherical roller bearings, self-aligning ball bearings)	A 18 (Table 3-2)
7) Mounting and dismounting	Methods and frequency of mounting and dismounting required for periodic inspection	● Cylindrical roller bearings, needle roller bearings and tapered roller bearings, with separable inner and outer rings, are recommended for applications in which mounting and dismounting is conducted frequently. ● Use of sleeve eases the mounting of self-aligning ball bearings and spherical roller bearings with tapered bore.	A 18 (Table 3-2)

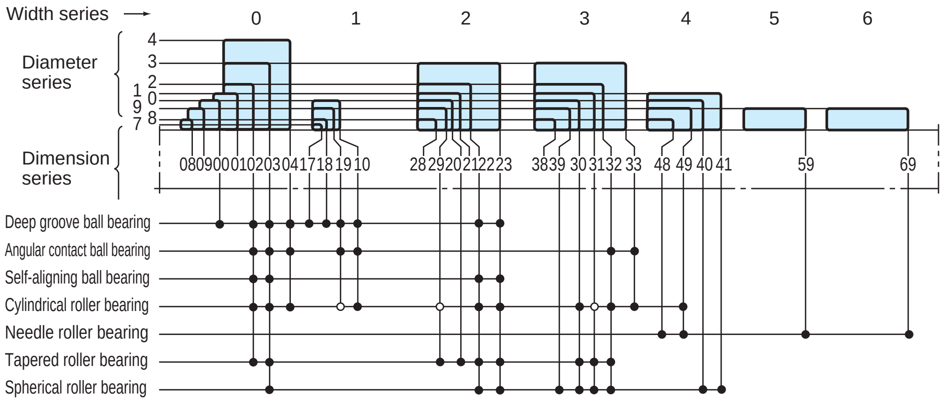
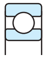
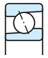
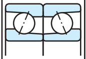
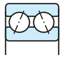
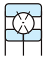
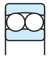
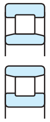
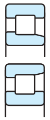
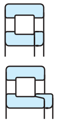
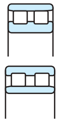
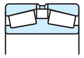
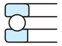
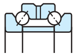
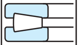
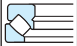


Fig. 3-1 Radial bearing dimension series

Table 3-2 Performance comparison of bearing type

		Deep groove ball bearing	Angular contact ball bearing			Four-point contact ball bearing	Self-aligning ball bearing	Cylindrical roller bearing				Needle roller bearing (machined ring type)	Tapered roller bearing		Spherical roller bearing	Thrust ball bearing		Double direction angular contact thrust ball bearing	Cylindrical roller thrust bearing	Needle roller thrust bearing	Tapered roller thrust bearing	Spherical thrust roller bearing	Reference page No.
			Single-row 	Matched pair or stack 	Double-row 			NU · N 	NJ · NF 	NUP · NH 	NN · NNU 		Single-row 	Double-row, four-row 		With flat back faces 	With aligning seat race 						
Load resistance	Radial load	○	○	◎	◎	○	○	◎	◎	◎	◎	◎	◎	◎	◎	×	×	×	×	×	×	△	—
	Axial load	○ ⟷	◎ ←	◎ ⟷ *	◎ ⟷ *	◎ ⟷	△ ⟷	×	△ ←	△ ⟷	×	×	◎ ←	◎ ⟷	△ ⟷	○ ← *	○ ← *	◎ ⟷	◎ ←	◎ ←	◎ ←	◎ ←	—
	Combined load radial and axial	○	○	◎	◎	○	△	×	△	△	×	×	◎	◎	△	×	×	×	×	×	×	△	—
	Vibration or impact load	△	△	△	△	△	△	◎	◎	◎	◎	○	◎	◎	◎	△	△	△	○	○	◎	◎	—
High speed adaptability		◎	◎	◎	○	◎	△	◎	◎	◎	◎	○	○	○	○	△	△	○	△	△	△	△	A16 A84
High accuracy		◎	◎	◎		◎		◎			◎		○			○		◎					A16, 58 A117
Low noise level/low torque		◎						○															A16
Rigidity				○		○		○	○	○	◎	○	○	◎				○	◎	◎	◎		A16
Misalignment		○	△	×	×	×	◎	△	△	△	△	△	△	△	◎	×	◎	×	×	×	×	◎	A17 Description before specification table
Inner and outer ring separability		×	×	×	×	■ *	×	■	■	■	■	■	■	■	×	■	■	■	■	■ *	■	■	—
Arrangement	Fixed side	■ ⟷	■ ←	■ ⟷	■ ⟷ *	■ ⟷	■ ⟷	×	■ ←	■ ⟷	×	×	■ ←	■ ⟷	■ ⟷								A20
	Free side	□		□	□	□	□	■	□	□	■	■		□	□								A20
Remarks			A pair of bearings mounted facing each other.	*DT arrangement is effective for one direction only.	*Filling slot type is effective for one direction only.	*Non-separable type is also available.							A pair of bearings mounted facing each other.			*Double direction bearings are effective for both directions.				*Non-separable type is also available.			—
Reference page No.		A4 B4	A5 B54			A6 —	A6 B124	A7 B138				A8 B362	A9 B184		A10 B290	A11 B336		— —	A12 B448	A12 B444	A13 —	A13 B354	—

◎ Excellent ○ Good △ Fair × Unacceptable ⟷ Both directions ← One direction only ■ Acceptable □ Acceptable, but shaft shrinkage must be compensated for.

4. Selection of bearing arrangement

As bearing operational conditions vary depending on devices in which bearings are mounted, different performances are demanded of bearings. Normally, two or more bearings are used on one shaft.

In many cases, in order to locate shaft positions in the axial direction, one bearing is mounted on the fixed side first, then the other bearing is mounted on the free side.

Table 4-1 Bearings on fixed and free sides

	Features	Recommended bearing type	Example No.
Fixed side bearing	● This bearing determines shaft axial position. ● This bearing can accommodate both radial and axial loads. ● Since axial load in both directions is imposed on this bearing, strength must be considered in selecting the bearing for this side.	Deep groove ball bearing Matched pair or stack angular contact ball bearing Double-row angular contact ball bearing Self-aligning ball bearing Cylindrical roller bearing with rib (NUP and NH types) Double-row tapered roller bearing Spherical roller bearing	Examples 1–11
Free side bearing	● This bearing is employed to compensate for expansion or shrinkage caused by operating temperature change and to allow ajustment of bearing position. ● Bearings which accommodate radial load only and whose inner and outer rings are separable are recommended as free side bearings. ● In general, if non-separable bearings are used on free side, clearance fit is provided between outer ring and housing to compensate for shaft movement through bearings. In some cases, clearance fit between shaft and inner ring is utilized.	● Separable types Cylindrical roller bearing (NU and N types) Needle roller bearing (NA type, etc.) ● Non-separable types Deep groove ball bearing Matched pair angular contact ball bearing (Back-to-back arrangement) Double-row angular contact ball bearing Self-aligning ball bearing Double-row tapered roller bearing (TDO type) Spherical roller bearing	
When fixed and free sides are not distinguished	● When bearing intervals are short and shaft shrinkage does not greatly affect bearing operation, a pair of angular contact ball bearings or tapered roller bearings is used in paired mounting to accommodate axial load. ● After mounting, the axial clearance is adjusted using nuts or shims.	Deep groove ball bearing Angular contact ball bearing Self-aligning ball bearing Cylindrical roller bearing (NJ and NF types) Tapered roller bearing Spherical roller bearing	Examples 12–16
Bearings for vertical shafts	● Bearings which can accommodate both radial and axial loads should be used on fixed side. Heavy axial load can be accommodated using thrust bearings together with radial bearings. ● Bearings which can accommodate radial load only are used on free side, compensating for shaft movement.	● Fixed side Matched pair angular contact ball bearing (Back-to-back arrangement) Double-row tapered roller bearing (TDO type) Thrust bearing + radial bearing	Examples 17 and 18

Table 4-2 (1) Example bearing arrangements

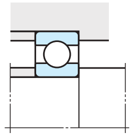
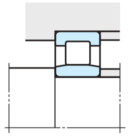
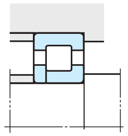
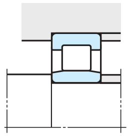
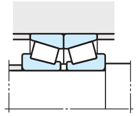
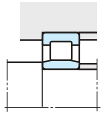
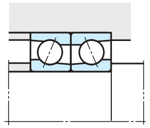
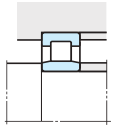
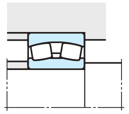
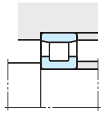
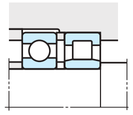
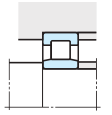
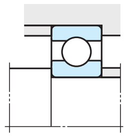
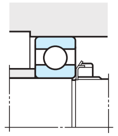
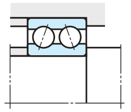
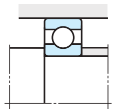
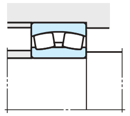
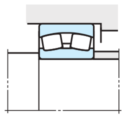
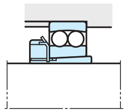
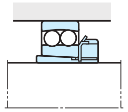
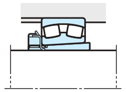
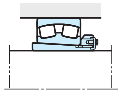
Example	Bearing arrangement		Recommended application	Application example
	Fixed side	Free side		
Ex. 1			○ Suitable for high-speed operation; used for various types of applications. ○ Not recommended for applications that have center displacement between bearings or shaft deflection.	Medium size motors, air blowers
Ex. 2			○ More suitable than Ex. 1 for operation under heavy load or impact load. Suitable also for high-speed operation. ○ Due to separability, suitable for applications requiring interference of both inner and outer rings. ○ Not recommended for applications that have center displacement between bearings or shaft deflection.	Traction motors for railway rolling stock
Ex. 3			○ Recommended for applications under heavier or greater impact load than those in Ex. 2. ○ This arrangement requires high rigidity from fixed side bearings mounted back to back, with preload provided. ○ Shaft and housing of accurate dimensions should be selected and mounted properly.	Steel manufacturing table rollers, lathe spindles
Ex. 4			○ This is recommended for operation at high speed or axial load lighter than in Ex. 3. ○ This is recommended for applications requiring interference of both inner and outer rings. ○ Some applications use double-row angular contact ball bearings on fixed side instead of matched pair angular contact ball bearings.	Motors
Ex. 5			○ This is recommended for operations under relatively small axial load. ○ This is recommended for applications requiring interference of both inner and outer rings.	Paper manufacturing calender rollers, diesel locomotive axle journals
Ex. 6			○ This is recommended for operations at high speed and heavy radial load, as well as normal axial load. ○ When deep groove ball bearings are used, clearance must be provided between outside diameter and housing, to prevent application of radial load.	Diesel locomotive transmissions
Ex. 7			○ This arrangement is most widely employed. ○ This arrangement can accommodate partial axial load as well as radial load.	Pumps, automobile transmissions

Table 4-2 (2) Example bearing arrangements

Example	Bearing arrangement		Recommended application	Application example
	Fixed side	Free side		
Ex. 8			○ This is recommended for operations with relatively heavy axial load in both directions. ○ Some applications use matched pair angular contact ball bearings on fixed side instead of double-row angular contact ball bearings.	Worm gear speed reducers
Ex. 9			○ This is the optimum arrangement for applications with possible mounting errors or shaft deflection. ○ Bearings in this arrangement can accommodate partial axial load, as well as heavy radial load.	Steel manufacturing table roller speed reducers, overhead crane wheels
Ex. 10			○ This is optimum arrangement for applications with possible mounting errors or shaft deflection. ○ Ease of mounting and dismounting, ensured by use of adaptor, makes this arrangement suitable for long shafts which are neither stepped nor threaded. ○ This arrangement is not recommended for applications requiring axial load capability.	General industrial equipment counter shafts
Ex. 11			○ This is the optimum arrangement for applications with possible mounting errors or shaft deflection. ○ This is recommended for operations under impact load or radial load heavier than that in Ex. 10. ○ This arrangement can accommodate partial axial load as well as radial load.	Steel manufacturing table rollers

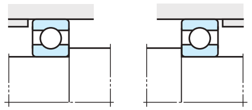
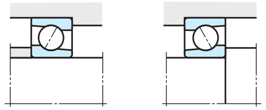
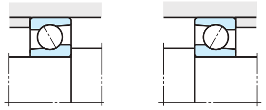
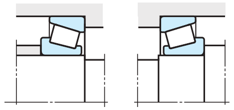
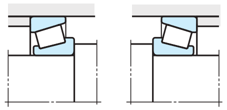
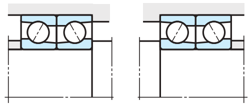
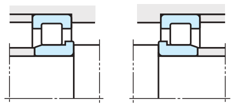
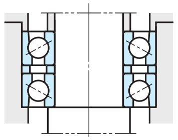
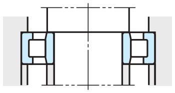
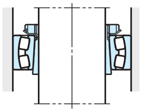
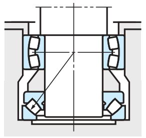
	Arrangement in which fixed and free sides are not distinguished	Recommended application	Application example
Ex. 12		○ This arrangement is most popular when applied to small equipment operating under light load. ○ When used with light preloading, thickness-adjusted shim or spring is mounted on one side of outer ring.	Small motors, small speed reducers, small pumps
Ex. 13	 Back-to-back  Face-to-face	○ This is suitable for applications in which rigidity is enhanced by preloading. This is frequently employed in applications requiring high speed operation under relatively large axial load. ○ Back-to-back arrangement is suitable for applications in which moment load affects operation. ○ When preloading is required, care should be taken in preload adjustment.	Machine tool spindles

Table 4-2 (3) Example bearing arrangements

Example	Arrangement in which fixed and free sides are not distinguished	Recommended application	Application example
Ex. 14	 Back-to-back  Face-to-face	○ This is recommended for operation under impact load or axial load heavier than in Ex. 13. ○ This is suitable for applications in which rigidity is enhanced by preloading. ○ Back-to-back arrangement is suitable for applications in which moment load affects operation. ○ When interference is required between inner ring and shaft, face-to-face arrangement simplifies mounting. This arrangement is effective for applications in which mounting error is possible. ○ When preloading is required, care should be taken in preload adjustment.	Speed reducers, automobile wheels
Ex. 15		○ This is recommended for applications requiring high speed and high accuracy of rotation under light load. ○ This is suitable for applications in which rigidity is enhanced by preloading. ○ Tandem arrangement and face-to-face arrangement are possible, as is back-to-back arrangement.	Machine tool spindles
Ex. 16		○ This arrangement provides resistance against heavy radial and impact loads. ○ This is applicable when both inner and outer rings require interference. ○ Care should be taken not to reduce axial internal clearance a critical amount during operation.	Construction equipment final drive

	Application to vertical shafts	Recommended application	Application example
Ex. 17	 Fixed side  Free side	○ This arrangement, using matched pair angular contact ball bearings on the fixed side and cylindrical roller bearings on the free side, is suitable for high speed operation.	Vertical motors, vertical pumps
Ex. 18	 Free side  Fixed side	○ This is recommended for operation at low speed and heavy load, in which axial load is heavier than radial load. ○ Due to self-aligning capability, this is suitable for applications in which shaft runout or deflection occurs.	Crane center shafts, vertical pumps

5. Selection of bearing dimensions

5-1 Bearing service life

When bearings rotate under load, material flakes from the surfaces of inner and outer rings or rolling elements by fatigue arising from repeated contact stress (ref. A 152).

This phenomenon is called flaking.

The total number of bearing rotations until flaking occurs is regarded as the bearing "(fatigue) service life".

"(Fatigue) service life" differs greatly depending upon bearing structures, dimensions, materials, and processing methods.
Since this phenomenon results from fatigue distribution in bearing materials themselves, differences in bearing service life should be statistically considered.

When a group of identical bearings are rotated under the same conditions, the total number of revolutions until 90 % of the bearings are left without flaking (i.e. a service life of 90 % reliability) is defined as the basic rating life. In operation at a constant speed, the basic rating life can be expressed in terms of time.

In actual operation, a bearing fails not only because of fatigue, but other factors as well, such as wear, seizure, creeping, fretting, brinelling, cracking etc (ref. A 152, 16. Examples of bearing failures).

These bearing failures can be minimized by selecting the proper mounting method and lubricant, as well as the bearing most suitable for the application.

5-2 Calculation of service life

5-2-1 Basic dynamic load rating C

The basic dynamic load rating is either pure radial (for radial bearings) or central axial load (for thrust bearings) of constant magnitude in a constant direction, under which the basic rating life of 1 million revolutions can be obtained, when the inner ring rotates while the outer ring is stationary, or vice versa. The basic dynamic load rating, which represents the capacity of a bearing under rolling fatigue, is specified as the basic dynamic radial load rating (C_r) for radial bearings, and basic dynamic axial load rating (C_a) for thrust bearings. These load ratings are listed in the specification table.

These values are prescribed by ISO 281/1990, and are subject to change by conformance to the latest ISO standards.

5-2-2 Basic rating life L_{10}

The basic rating life L_{10} is a service life of 90 % reliability when used under normal usage conditions for bearings of high manufacturing quality where the inside of the bearing is of a standard design made from bearing steel materials specified in JIS or equivalent materials.

The relationship between the basic dynamic load rating, dynamic equivalent load, and basic rating life of a bearing can be expressed using equation (5-1). This life calculation equation does not apply to bearings that are affected by factors such as plastic deformation of the contact surfaces of raceways and rolling elements due to extremely high load conditions (when P exceeds either the basic static load rating C_0 (refer to p. A 42) or $0.5C$) or, conversely, to bearings that are affected by factors such as the contact surfaces of raceways and rolling elements slipping due to extremely low load conditions.

If conditions like these may be encountered, consult with JTEKT.

It is convenient to express the basic rating life in terms of time, using equation (5-2), when a bearing is used for operation at a constant speed; and, in terms of traveling distance (km), using equation (5-3), when a bearing is used in railway rolling stock or automobiles.

$$\begin{pmatrix}\text{Total}\\\text{revolutions}\end{pmatrix} \quad L_{10} = \left(\frac{C}{P}\right)^p \quad \cdots\cdots\cdots\cdots\cdots (5\text{-}1)$$

$$(\text{Time}) \quad L_{10h} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^p \quad \cdots\cdots\cdots\cdots (5\text{-}2)$$

$$\begin{pmatrix}\text{Running}\\\text{distance}\end{pmatrix} \quad L_{10s} = \pi D L_{10} \quad \cdots\cdots\cdots\cdots\cdots (5\text{-}3)$$

where :

L_{10} : basic rating life 10^6 revolutions
L_{10h} : basic rating life h
L_{10s} : basic rating life km
P : dynamic equivalent load N
·····················(refer to p. A 38.)
C : basic dynamic load rating N
n : rotational speed min^{-1}
p : for ball bearings········· $p = 3$
for roller bearings······ $p = 10/3$
D : wheel or tire diameter mm

Accordingly, where the dynamic equivalent load is P, and rotational speed is n, equation (5-4) can be used to calculate the basic dynamic load rating C; the bearing size most suitable for a specified purpose can then be selected, referring to the bearing specification table.

The recommended bearing service life differs depending on the machines with which the bearing is used, as shown in Table 5-5, p. A 31.

$$C = P\left(L_{10h} \times \frac{60n}{10^6}\right)^{1/p} \quad \cdots\cdots\cdots\cdots\cdots (5\text{-}4)$$

[Reference]
The equations using a service life coefficient (f_h) and rotational speed coefficient (f_n) respectively, based on equation (5-2), are as follows :

$$L_{10h} = 500 f_h^{\,p} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (5\text{-}5)$$

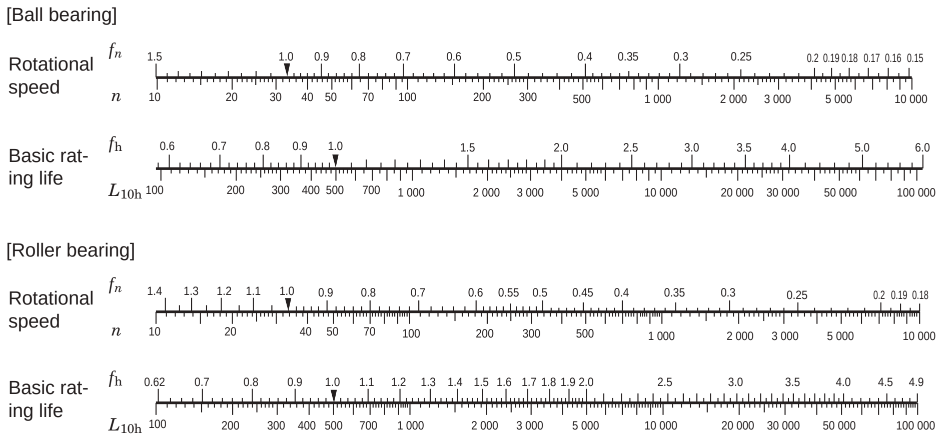
Coefficient of service life :

$$f_h = f_n \frac{C}{P} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (5\text{-}6)$$

Coefficient of rotational speed :

$$f_n = \left(\frac{10^6}{500 \times 60n}\right)^{1/p} = (0.03n)^{-1/p} \quad \cdots\cdots\cdots\cdots\cdots\cdots (5\text{-}7)$$

For reference, the values of f_n, f_h, and L_{10h} can be easily obtained by employing the nomograph attached to this catalog, as an abbreviated method.



[Reference] Rotational speed (n) and its coefficients (f_n), and service life coefficient (f_h) and basic rating life (L_{10h})

5-2-3 Correction of basic dynamic load rating for high temperature use and dimension stabilizing treatment

In high temperature operation, bearing material hardness deteriorates, as material compositions are altered. As a result, the basic dynamic load rating is diminished. Once altered, material composition is not recovered, even if operating temperatures return to normal.

Therefore, for bearings used in high temperature operation, the basic dynamic load rating should be corrected by multiplying the basic dynamic load rating values specified in the bearing specification table by the temperature coefficient values in Table 5-1.

Table 5-1 Temperature coefficient values

Bearing temperature, °C	125	150	175	200	250
Temperature coefficient	1	1	0.95	0.90	0.75

Since normal heat treatment is not effective in maintaining the original bearing size in extended operation at 120 °C or higher, dimension stabilizing treatment is necessary. Dimension stabilizing treatment codes and their effective temperature ranges are described in Table 5-2.

Since dimension stabilizing treatment diminishes material hardness, the basic dynamic load rating may be reduced for some types of bearings.

Table 5-2 Dimension stabilizing treatment

Dimension stabilizing treatment code	Effective temperature range
S0	Over 100°C, up to 150°C
S1	150°C 200°C
S2	200°C 250°C

5-2-4 Modified rating life L_{nm}

The life of rolling bearings was standardized as a basic rating life in the 1960s, but in actual applications, sometimes the actual life and the basic rating life have been quite different due to the lubrication status and the influence of the usage environment. To make the calculated life closer to the actual life, a corrected rating life has been considered since the 1980s. In this corrected rating life, bearing characteristic factor a_2 (a correction factor for the case in which the characteristics related to the life are changed due to the bearing materials, manufacturing process, and design) and usage condition factor a_3 (a correction factor that takes into account usage conditions that have a direct influence on the bearing life, such as the lubrication) or factor a_{23} formed from the interdependence of these two factors, are considered with the basic rating life. These factors were handled differently by each bearing manufacturer, but they have been standardized as a modified rating life in **ISO 281** in 2007. In 2013, **JIS B 1518** (dynamic load ratings and rating life) was amended to conform to the **ISO**.

The basic rating life (L_{10}) shown in equation (5-1) is the (fatigue) life with a dependability of 90 % under normal usage conditions for rolling bearings that have standard factors such as internal design, materials, and manufacturing quality. **JIS B 1518**:2013 specifies a calculation method based on **ISO 281**:2007. To calculate accurate bearing life under a variety of operating conditions, it is necessary to consider elements such as the effect of changes in factors that can be anticipated when using different reliabilities and system approaches, and interactions between factors. Therefore, the specified calculation method considers additional stress due to the lubrication status, lubricant contamination, and fatigue load limit C_u (refer to p. A 29) on the inside of the bearing. The life that uses this life modification factor a_{ISO}, which considers the above factors, is called modified rating life L_{nm} and is calculated with the following equation (5-8).

$$L_{nm} = a_1\, a_{ISO}\, L_{10} \quad\cdots\cdots\cdots\cdots\cdots\cdots \text{(5-8)}$$

In this equation,

L_{nm} : Modified rating life 10^6 rotations
(This rating life has been modified for one of or a combination of the following: reliability of 90 % or higher, fatigue load limit, special bearing characteristics, lubrication contamination, and special operating conditions.)
L_{10} : Basic rating life 10^6 rotations (reliability: 90 %)
a_1 : Life modification factor for reliability ··············· refer to section (1)
a_{ISO} : Life modification factor ··············· refer to section (2)

[Remark]
When bearing dimensions are to be selected given L_{nm} greater than 90 % in reliability, the strength of shaft and housing must be considered.

(1) Life modification factor for reliability a_1

The term "reliability" is defined as "for a group of apparently identical rolling bearings, operating under the same conditions, the percentage of the group that is expected to attain or exceed a specified life" in **ISO 281**:2007. Values of a_1 used to calculate a modified rating life with a reliability of 90 % or higher (a failure probability of 10 % or less) are shown in Table 5-3.

Table 5-3 Life modification factor for reliability a_1

Reliability, %	L_{nm}	a_1
90	L_{10m}	1
95	L_{5m}	0.64
96	L_{4m}	0.55
97	L_{3m}	0.47
98	L_{2m}	0.37
99	L_{1m}	0.25
99.2	$L_{0.8m}$	0.22
99.4	$L_{0.6m}$	0.19
99.6	$L_{0.4m}$	0.16
99.8	$L_{0.2m}$	0.12
99.9	$L_{0.1m}$	0.093
99.92	$L_{0.08m}$	0.087
99.94	$L_{0.06m}$	0.080
99.95	$L_{0.05m}$	0.077

(Citation from **JIS B 1518**:2013)

(2) Life modification factor a_{ISO}

a) System approach

The various influences on bearing life are dependent on each other. The system approach of calculating the modified life has been evaluated as a practical method for determining life modification factor a_{ISO} (ref. Fig. 5-1). Life modification factor a_{ISO} is calculated with the following equation. A diagram is available for each bearing type (radial ball bearings, radial roller bearings, thrust ball bearings, and thrust roller bearings). (Each diagram (Figs. 5-2 to 5-5) is a citation from **JIS B 1518**:2013.)

Note that in practical use, this is set so that life modification factor $a_{ISO} \leqq 50$.

$$a_{ISO} = f\left(\frac{e_c\, C_u}{P},\ \kappa\right) \quad\cdots\cdots\cdots\cdots\cdots\cdots \text{(5-9)}$$

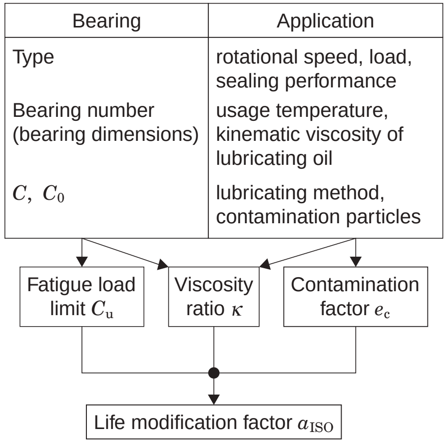


Fig. 5-1 System approach

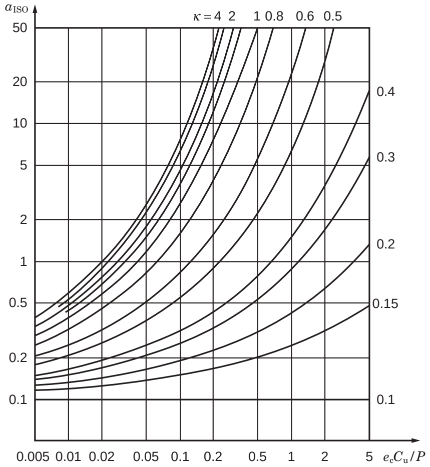


Fig. 5-2 Life modification factor a_{ISO} (Radial ball bearings)

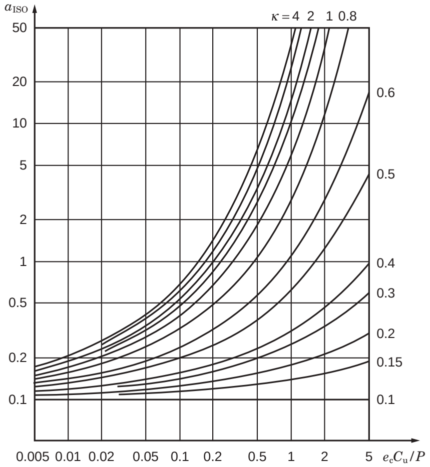


Fig. 5-3 Life modification factor a_{ISO} (Radial roller bearings)

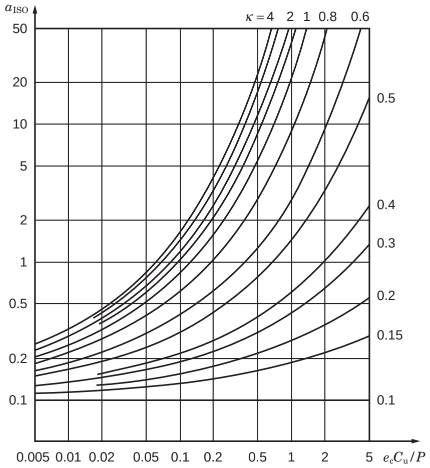


Fig. 5-4 Life modification factor a_{ISO} (Thrust ball bearings)

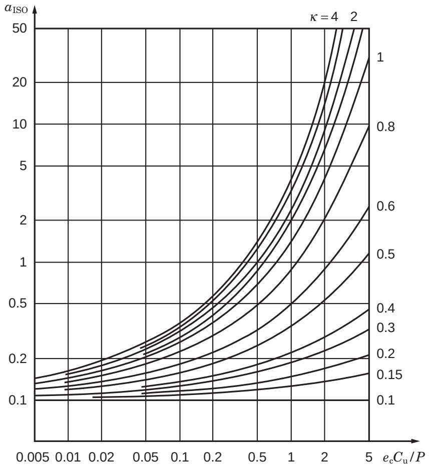


Fig. 5-5 Life modification factor a_{ISO} (Thrust roller bearings)

(Figs. 5-2 to 5-5 Citation from **JIS B 1518**:2013)

b) Fatigue load limit C_u

For regulated steel materials or alloy steel that has equivalent quality, the fatigue life is unlimited so long as the load condition does not exceed a certain value and so long as the lubrication conditions, lubrication cleanliness class, and other operating conditions are favorable. For general high-quality materials and bearings with high manufacturing quality, the fatigue stress limit is reached at a contact stress of approximately 1.5 GPa between the raceway and rolling elements. If one or both of the material quality and manufacturing quality are low, the fatigue stress limit will also be low.

The term "fatigue load limit" C_u is defined as "bearing load under which the fatigue stress limit is just reached in the most heavily loaded raceway contact" in **ISO 281**:2007. and is affected by factors such as the bearing type, size, and material.

For details on the fatigue load limits of special bearings and other bearings not listed in this catalog, contact JTEKT.

c) Contamination factor e_c

If solid particles in the contaminated lubricant are caught between the raceway and the rolling elements, indentations may form on one or both of the raceway and the rolling elements. These indentations will lead to localized increases in stress, which will decrease the life. This decrease in life attributable to the contamination of the lubricant can be calculated from the contamination level as contamination factor e_c.

D_{pw} shown in this table is the pitch diameter of ball/roller set, which is expressed simply as $D_{pw} = (D + d)/2$. (D: Outside diameter, d: Bore diameter)

For information such as details on special lubricating conditions or detailed investigations, contact JTEKT.

Table 5-4 Values of contamination factor e_c

Contamination level	e_c	
	D_{pw} < 100 mm	D_{pw} ≧ 100 mm
Extremely high cleanliness: The size of the particles is approximately equal to the thickness of the lubricant oil film, this is found in laboratory-level environments.	1	1
High cleanliness: The oil has been filtered by an extremely fine filter, this is found with standard grease-packed bearings and sealed bearings.	0.8 to 0.6	0.9 to 0.8
Standard cleanliness: The oil has been filtered by a fine filter, this is found with standard grease-packed bearings and shielded bearings.	0.6 to 0.5	0.8 to 0.6
Minimal contamination: The lubricant is slightly contaminated.	0.5 to 0.3	0.6 to 0.4
Normal contamination: This is found when no seal is used and a coarse filter is used in an environment in which wear debris and particles from the surrounding area penetrate into the lubricant.	0.3 to 0.1	0.4 to 0.2
High contamination: This is found when the surrounding environment is considerably contaminated and the bearing sealing is insufficient.	0.1 to 0	0.1 to 0
Extremely high contamination	0	0

(Table 5-4 Citation from **JIS B 1518**:2013)

d) Viscosity ratio κ

The lubricant forms an oil film on the roller contact surface, which separates the raceway and the rolling elements. The status of the lubricant oil film is expressed by viscosity ratio κ, the actual kinematic viscosity at the operating temperature v divided by the reference kinematic viscosity v_1 as shown in the following equation.

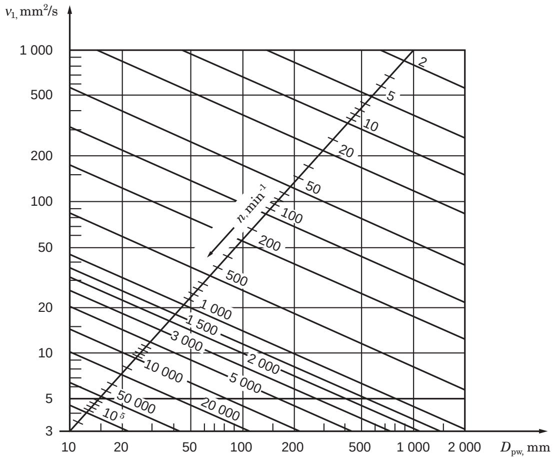
A κ greater than 4, equal to 4, or less than 0.1 is not applicable.

For details on lubricants such as grease and lubricants with extreme pressure additives, contact JTEKT.

$$\kappa = \frac{v}{v_1} \quad \text{(5-10)}$$

v : Actual kinematic viscosity at the operating temperature; the viscosity of the lubricant at the operating temperature (refer to Fig. 12-3, p. A129)

v_1 : Reference kinematic viscosity; determined according to the speed and pitch diameter of ball/roller set D_{pw} of the bearing (ref. Fig. 5-6)



(Fig. 5-6 Citation from **JIS B 1518**:2013)

Fig. 5-6 Reference kinematic viscosity ν_1

5-2-5 Service life of bearing system comprising two or more bearings

Even for systems which comprise two or more bearings, if one bearing is damaged, the entire system malfunctions.

Where all bearings used in an application are regarded as one system, the service life of the bearing system can be calculated using the following equation,

$$\frac{1}{L^e}=\frac{1}{L_1{}^e}+\frac{1}{L_2{}^e}+\frac{1}{L_3{}^e}+\cdots\cdots\cdots\cdots \quad (5\text{-}11)$$

where :

L : rating life of system

L_1, L_2, $L_3\cdots\cdots$: rating life of each bearing

e : constant

e = 10/9······ball bearing
e = 9/8······roller bearing
The mean value is for a system using both ball and roller bearings.

[Example]

When a shaft is supported by two roller bearings whose service lives are 50 000 hours and 30 000 hours respectively, the rating life of the bearing system supporting this shaft is calculated as follows, using equation (5-11) :

$$\frac{1}{L^{9/8}}=\frac{1}{50\ 000^{9/8}}+\frac{1}{30\ 000^{9/8}}$$

$$L \fallingdotseq 20\ 000\ \mathrm{h}$$

The equation suggests that the rating life of these bearings as a system becomes shorter than that of the bearing with the shorter life.

This fact is very important in estimating bearing service life for applications using two or more bearings.

5-2-6 Applications and recommended bearing service life

Since longer service life does not always contribute to economical operation, the most suitable service life for each application and operating conditions should be determined.

For reference, Table 5-5 describes recommended service life in accordance with the application, as empirically determined.

Table 5-5 Recommended bearing service life (reference)

Operating condition	Application	Recommended service life (h)
Short or intermittent operation	Household electric appliance, electric tools, agricultural equipment, heavy cargo hoisting equipment	4 000 – 8 000
Not extended duration, but stable operation required	Household air conditioner motors, construction equipment, conveyers, elevators	8 000 – 12 000
Intermittent but extended operation	Rolling mill roll necks, small motors, cranes	8 000 – 12 000
	Motors used in factories, general gears	12 000 – 20 000
	Machine tools, shaker screens, crushers	20 000 – 30 000
	Compressors, pumps, gears for essential use	40 000 – 60 000
Daily operation more than 8 hr. or continuous extended operation	Escalators	12 000 – 20 000
	Centrifugal separators, air conditioners, air blowers, woodworking equipment, passenger coach axle journals	20 000 – 30 000
	Large motors, mine hoists, locomotive axle journals, railway rolling stock traction motors	40 000 – 60 000
	Paper manufacturing equipment	100 000 – 200 000
24 hr. operation (no failure allowed)	Water supply facilities, power stations, mine water discharge facilities	100 000 – 200 000

5-3 Calculation of loads

Loads affecting bearings includes force exerted by the weight of the object the bearings support, transmission force of devices such as gears and belts, loads generated in equipment during operation etc.

Seldom can these kinds of load be determined by simple calculation, because the load is not always constant.

In many cases, the load fluctuates, and it is difficult to determine the frequency and magnitude of the fluctuation.

Therefore, loads are normally obtained by multiplying theoretical values with various coefficients obtained empirically.

5-3-1 Load coefficient

Even if radial and axial loads are obtained through general dynamic calculation, the actual load becomes greater than the calculated value due to vibration and impact during operation.

In many cases, the load is obtained by multiplying theoretical values by the load coefficient.

Table 5-6 Values of load coefficient f_w

Operating condition	Application example	f_w
Operation with little vibration or impact	Motors Machine tools Measuring instrument	1.0 – 1.2
Normal operation (slight impact)	Railway rolling stock Automobiles Paper manufacturing equipment Air blowers Compressors Agricultural equipment	1.2 – 2.0
Operation with severe vibration or impact	Rolling mills Crushers Construction equipment Shaker screens	2.0 – 3.0

$$F = f_w \cdot F_c \quad \cdots\cdots\cdots\cdots (5\text{-}12)$$

where :
F : measured load N
F_c : calculated load N
f_w : load coefficient (ref. Table 5-6)

5-3-2 Load generated through belt or chain transmission

In the case of belt transmission, the theoretical value of the load affecting the pulley shafts can be determined by obtaining the effective transmission force of the belt.

For actual operation, the load is obtained by multiplying this effective transmission force by the load coefficient (f_w) considering vibration and impact generated during operation, and the belt coefficient (f_b) considering belt tension.

In the case of chain transmission, the load is determined using a coefficient equivalent to the belt coefficient.

This equation (5-13) is as follows ;

$$F_b = \frac{2\,M}{D_p} \cdot f_w \cdot f_b$$

$$= \frac{19.1\times10^6\,W}{D_p n} \cdot f_w \cdot f_b \quad \cdots\cdots\cdots (5\text{-}13)$$

where :
F_b : estimated load affecting pulley shaft or sprocket shaft N
M : torque affecting pulley or sprocket mN · m
W : transmission force kW
D_p : pitch circle diameter of pulley or sprocket mm
n : rotational speed min^{-1}
f_w : load coefficient (ref. Table 5-6)
f_b : belt coefficient (ref. Table 5-7)

Table 5-7 Values of belt coefficient f_b

Belt type	f_b
Timing belt (with teeth)	1.3 – 2.0
V-belt	2.0 – 2.5
Flat belt (with tension pulley)	2.5 – 3.0
Flat belt	4.0 – 5.0
Chain	1.2 – 1.5

5-3-3 Load generated under gear transmission

(1) Loads affecting gear and gear coefficient

In the case of gear transmission, loads transmitted by gearing are theoretically classified into three types: tangential load (K_t), radial load (K_r) and axial load (K_a).

Those loads can be calculated dynamically (using equations ⓐ, ⓑ and ⓒ, described in section (2)).

To determine the actual gear loads, these theoretical loads must be multiplied by coefficients considering vibration and impact during operation (f_w) (ref. Table 5-6) and the gear coefficient (f_g) (ref. Table 5-8) considering the finish treatment of gears.

Table 5-8 Values of gear coefficient f_g

Gear type	f_g
Precision gears (both pitch error and tooth shape error less than 0.02 mm)	1.0 – 1.1
Normal gears (both pitch error and tooth shape error less than 0.1 mm)	1.1 – 1.3

(2) Calculation of load on gears

ⓐ **Tangential load (tangential force) K_t**

(Spur gears, helical gears, double-helical gears, straight bevel gears, spiral bevel gears)

$$K_t = \frac{2\,M}{D_p} = \frac{19.1\times10^6\ W}{D_p n} \quad \cdots\cdots\cdots\cdots (5\text{-}14)$$

ⓐ~ⓒ where :

K_t	: gear tangential load	N
K_r	: gear radial load	N
K_a	: gear axial load	N
M	: torque affecting gears	mN · m
D_p	: gear pitch circle diameter	mm
W	: transmitting force	kW
n	: rotational speed	min^{-1}
α	: gear pressure angle	deg
β	: gear helix (spiral) angle	deg
δ	: bevel gear pitch angle	deg

		ⓑ **Radial load (separating force) K_r**	ⓒ **Axial load (axial force) K_a**
Spur gears		$K_r = K_t \tan\alpha$ ⋯⋯ (5-15)	0
Helical gears		$K_r = K_t \dfrac{\tan\alpha}{\cos\beta}$ ⋯⋯ (5-16)	$K_a = K_t \tan\beta$ ⋯⋯ (5-22)
Double-helical gears		$K_r = K_t \dfrac{\tan\alpha}{\cos\beta}$ ⋯⋯ (5-17)	0
Straight[1)] bevel gears	Drive side	$K_{r1} = K_t \tan\alpha\ \cos\delta_1$ ⋯⋯ (5-18)	$K_{a1} = K_t \tan\alpha\ \sin\delta_1$ ⋯⋯ (5-23)
	Driven side	$K_{r2} = K_t \tan\alpha\ \cos\delta_2$ ⋯⋯ (5-19)	$K_{a2} = K_t \tan\alpha\ \sin\delta_2$ ⋯⋯ (5-24)
Spiral[1), 2)] bevel gears	Drive side	$K_{r1} = \dfrac{K_t}{\cos\beta}\left(\tan\alpha\ \cos\delta_1 \pm \sin\beta \sin\delta_1\right)$ ⋯⋯ (5-20)	$K_{a1} = \dfrac{K_t}{\cos\beta}\left(\tan\alpha\ \sin\delta_1 \mp \sin\beta\ \cos\delta_1\right)$ ⋯⋯ (5-25)
	Driven side	$K_{r2} = \dfrac{K_t}{\cos\beta}\left(\tan\alpha\ \cos\delta_2 \mp \sin\beta \sin\delta_2\right)$ ⋯⋯ (5-21)	$K_{a2} = \dfrac{K_t}{\cos\beta}\left(\tan\alpha\ \sin\delta_2 \pm \sin\beta\ \cos\delta_2\right)$ ⋯⋯ (5-26)

[Notes] 1) Codes with subscript 1 and 2 shown in equations are respectively applicable to drive side gears and driven side gears.

2) Symbols (+) and (–) denote the following ;

Symbols in upper row : clockwise rotation accompanied by right-handed spiral or counterclockwise rotation with left-handed spiral

Symbols in lower row : counterclockwise rotation with right-handed spiral or clockwise rotation with left-handed spiral

[Remark] Rotating directions are described as viewed at the back of the apex of the pitch angle.

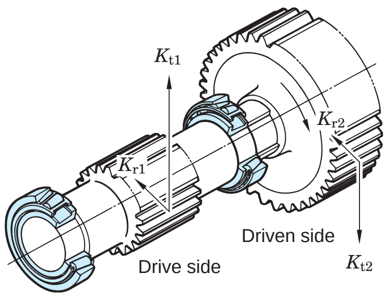


Fig. 5-7 Load on spur gears

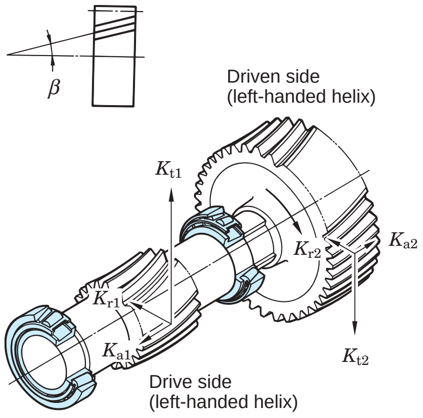


Fig. 5-8 Load on helical gears

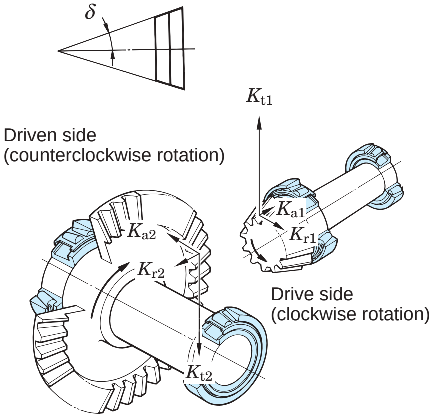


Fig. 5-9 Load on straight bevel gears

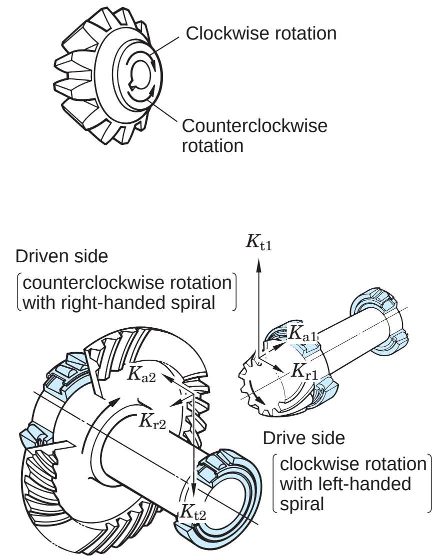


Fig. 5-10 Load on spiral bevel gears

5-3-4 Load distribution on bearings

The load distribution affecting bearings can be calculated as follows: first, radial force components are calculated, then, the sum of vectors of the components is obtained in accordance with the load direction.

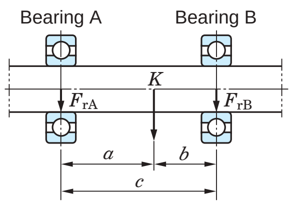
Calculation examples of radial load distribution are described in the following section.

[Remark]

Bearings shown in Exs. 3 to 5 are affected by components of axial force when these bearings accommodate radial load, and axial load (K_a) which is transferred externally, i.e. from gears.

For calculation of the axial load in this case, refer to page A 38.

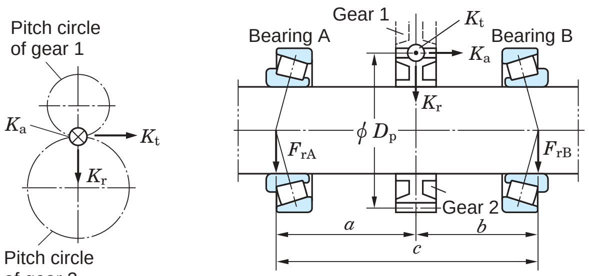
Example 1 Fundamental calculation (1)



$$F_{rA} = \frac{b}{c}K$$

$$F_{rB} = \frac{a}{c}K \quad \cdots\cdots \text{(5-27)}$$

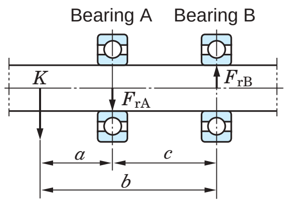
Example 3 Gear load distribution (1)



$$F_{rA} = \sqrt{\left(\frac{b}{c}K_t\right)^2 + \left(\frac{b}{c}K_r - \frac{D_p}{2c}K_a\right)^2}$$

$$F_{rB} = \sqrt{\left(\frac{a}{c}K_t\right)^2 + \left(\frac{a}{c}K_r + \frac{D_p}{2c}K_a\right)^2} \quad \cdots\cdots \text{(5-29)}$$

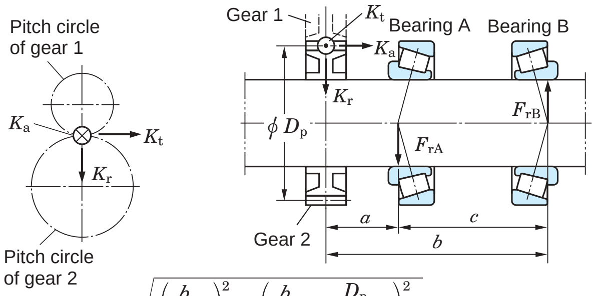
Example 2 Fundamental calculation (2)



$$F_{rA} = \frac{b}{c}K$$

$$F_{rB} = \frac{a}{c}K \quad \cdots\cdots \text{(5-28)}$$

Example 4 Gear load distribution (2)



$$F_{rA} = \sqrt{\left(\frac{b}{c}K_t\right)^2 + \left(\frac{b}{c}K_r - \frac{D_p}{2c}K_a\right)^2}$$

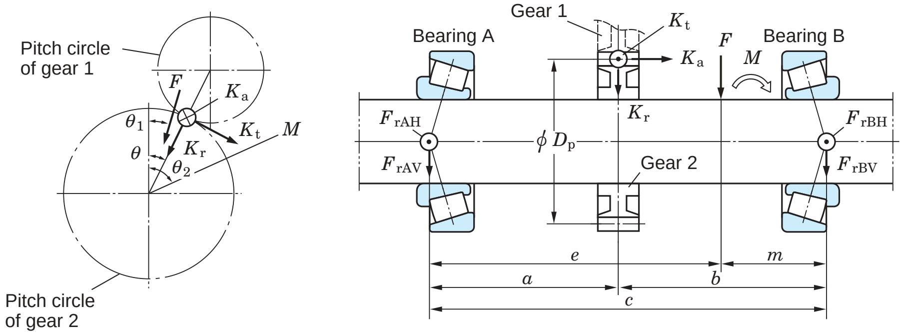
$$F_{rB} = \sqrt{\left(\frac{a}{c}K_t\right)^2 + \left(\frac{a}{c}K_r - \frac{D_p}{2c}K_a\right)^2} \quad \cdots\cdots \text{(5-30)}$$

Description of signs in Examples 1 to 5

F_{rA}: radial load on bearing A N
F_{rB}: radial load on bearing B N
K : shaft load N
K_t, K_r, K_a : gear load N
(ref. A 34)

D_p : gear pitch circle diameter mm
⊙ : denotes load direction (upward perpendicular to paper surface)
⊗ : denotes load direction (downward perpendicular to paper surface)

Example 5 Simultaneous application of gear load and other load



(Gears 1 and 2 are engaged with each other at angle θ. External load F, moment M, are applied to these gears at angles θ_1 and θ_2.)

- Perpendicular radial component force (upward and downward along diagram)

$$F_{rAV} = \frac{b}{c}(K_r\cos\theta + K_t\sin\theta) - \frac{D_p}{2c}K_a\cos\theta + \frac{m}{c}F\cos\theta_1 - \frac{M}{c}\cos\theta_2$$

$$F_{rBV} = \frac{a}{c}(K_r\cos\theta + K_t\sin\theta) + \frac{D_p}{2c}K_a\cos\theta + \frac{e}{c}F\cos\theta_1 + \frac{M}{c}\cos\theta_2$$

- Horizontal radial component force (upward and downward perpendicular to diagram)

$$F_{rAH} = \frac{b}{c}(K_r\sin\theta - K_t\cos\theta) - \frac{D_p}{2c}K_a\sin\theta + \frac{m}{c}F\sin\theta_1 - \frac{M}{c}\sin\theta_2$$

$$F_{rBH} = \frac{a}{c}(K_r\sin\theta - K_t\cos\theta) + \frac{D_p}{2c}K_a\sin\theta + \frac{e}{c}F\sin\theta_1 + \frac{M}{c}\sin\theta_2$$

■ Combined radial force

$$F_{rA} = \sqrt{F_{rAV}{}^2 + F_{rAH}{}^2}$$

$$F_{rB} = \sqrt{F_{rBV}{}^2 + F_{rBH}{}^2} \quad \cdots\cdots\cdots\cdots \text{(5-31)}$$

(When θ, F, and M are zero, the same result as in Ex. 3 is obtained)

5-4 Dynamic equivalent load

Bearings are used under various operating conditions; however, in most cases, bearings receive radial and axial load combined, while the load magnitude fluctuates during operation.

Therefore, it is impossible to directly compare the actual load and basic dynamic load rating.

The two are compared by replacing the loads applied to the shaft center with one of a constant magnitude and in a specific direction, that yields the same bearing service life as under actual load and rotational speed.

This theoretical load is referred to as the dynamic equivalent load (P).

5-4-1 Calculation of dynamic equivalent load

Dynamic equivalent loads for radial bearings and thrust bearings ($\alpha \neq 90°$) which receive a combined load of a constant magnitude in a specific direction can be calculated using the following equation,

$$P = XF_r + YF_a \quad \cdots\cdots\cdots\cdots (5\text{-}32)$$

where :

P : dynamic equivalent load N

for radial bearings,
P_r : dynamic equivalent radial load
for thrust bearings,
P_a : dynamic equivalent axial load

F_r : radial load N
F_a : axial load N
X : radial load factor
Y : axial load factor

(values of X and Y are listed in the bearing specification table.)

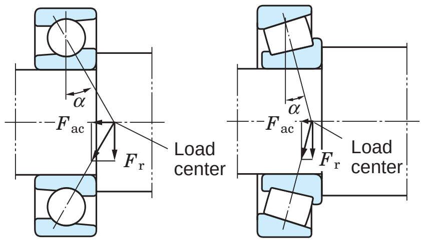
- When $F_a/F_r \leqq e$ for single-row radial bearings, it is taken that $X = 1$, and $Y = 0$. Hence, the dynamic equivalent load rating is $P_r = F_r$.

(Values of e, which designates the limit of F_a/F_r, are listed in the bearing specification table.)

- For single-row angular contact ball bearings and tapered roller bearings, axial component forces (F_{ac}) are generated as shown in Fig. 5-11, therefore a pair of bearings is arranged face-to-face or back-to-back.
  The axial component force can be calculated using the following equation.

$$F_{ac} = \frac{F_r}{2\,Y} \quad \cdots\cdots\cdots\cdots (5\text{-}33)$$

Table 5-9 describes the calculation of the dynamic equivalent load when radial loads and external axial loads (K_a) are applied to bearings.



(Load center position is listed in the bearing specification table.)

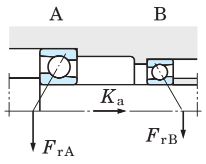
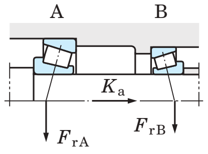
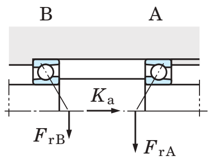
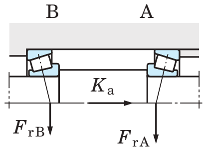
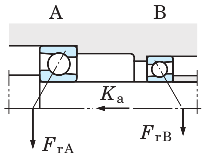
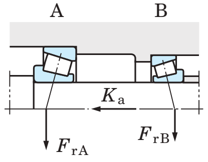
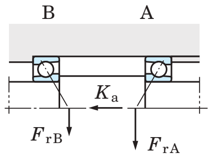
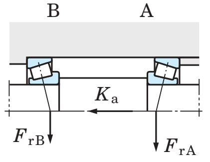
Fig. 5-11 Axial component force

- For thrust ball bearings with contact angle $\alpha = 90°$, to which an axial load is applied, $P_a = F_a$.
- The dynamic equivalent load of spherical thrust roller bearing can be calculated using the following equation.

$$P_a = F_a + 1.2\,F_r \quad \cdots\cdots\cdots\cdots (5\text{-}34)$$

where : $F_r/F_a \leqq 0.55$

Table 5-9 Dynamic equivalent load calculation : when a pair of single-row angular contact ball bearings or tapered roller bearings is arranged face-to-face or back-to-back.

Paired mounting			Loading condition	Bearing	Axial load	Dynamic equivalent load
Back-to-back arrangement	Face-to-face arrangement					
 	 		$\dfrac{F_{rB}}{2Y_B} + K_a \geqq \dfrac{F_{rA}}{2Y_A}$	Bearing A	$\dfrac{F_{rB}}{2Y_B} + K_a$	$P_A = XF_{rA} + Y_A\left(\dfrac{F_{rB}}{2Y_B} + K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
				Bearing B	–	$P_B = F_{rB}$
			$\dfrac{F_{rB}}{2Y_B} + K_a < \dfrac{F_{rA}}{2Y_A}$	Bearing A	–	$P_A = F_{rA}$
				Bearing B	$\dfrac{F_{rA}}{2Y_A} - K_a$	$P_B = XF_{rB} + Y_B\left(\dfrac{F_{rA}}{2Y_A} - K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$
 	 		$\dfrac{F_{rB}}{2Y_B} \leqq \dfrac{F_{rA}}{2Y_A} + K_a$	Bearing A	–	$P_A = F_{rA}$
				Bearing B	$\dfrac{F_{rA}}{2Y_A} + K_a$	$P_B = XF_{rB} + Y_B\left(\dfrac{F_{rA}}{2Y_A} + K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$
			$\dfrac{F_{rB}}{2Y_B} > \dfrac{F_{rA}}{2Y_A} + K_a$	Bearing A	$\dfrac{F_{rB}}{2Y_B} - K_a$	$P_A = XF_{rA} + Y_A\left(\dfrac{F_{rB}}{2Y_B} - K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
				Bearing B	–	$P_B = F_{rB}$

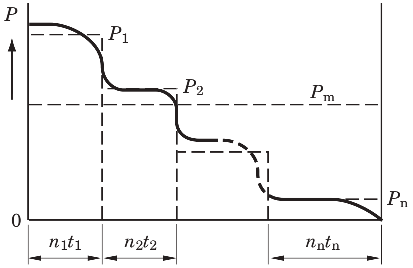
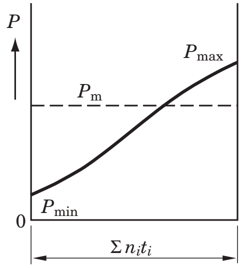
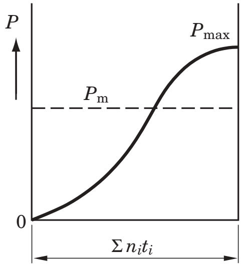
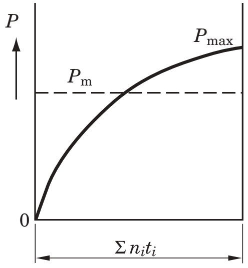
[Remarks] 1. These equations can be used when internal clearance and preload during operation are zero.
2. Radial load is treated as positive in the calculation, if it is applied in a direction opposite that shown in Fig. in Table 5-9.

5-4-2 Mean dynamic equivalent load

When load magnitude or direction varies, it is necessary to calculate the mean dynamic equivalent load, which provides the same length of bearing service life as that under the actual load fluctuation.

The mean dynamic equivalent load (P_m) under different load fluctuations is described using Graphs (1) to (4).

As shown in Graph (5), the mean dynamic equivalent load under stationary and rotating load applied simultaneously, can be obtained using equation (5-39).

(1) Staged fluctuation		(2) Stageless fluctuation	(3) Fluctuation forming sine curve	(4) Fluctuation forming sine curve (upper half of sine curve)
				
$P_m = \sqrt[p]{\dfrac{P_1{}^p n_1t_1 + P_2{}^p n_2t_2 + \cdots\cdots + P_n{}^p n_nt_n}{n_1t_1 + n_2t_2 + \cdots\cdots\cdots + n_nt_n}}$ …… (5-35)		$P_m = \dfrac{P_{min} + 2\,P_{max}}{3}$ ········ (5-36)	$P_m = 0.68\,P_{max}$ ········ (5-37)	$P_m = 0.75\,P_{max}$ ········ (5-38)

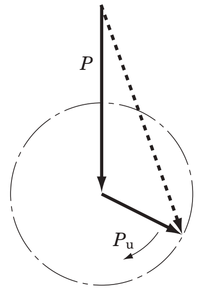
Symbols for Graphs (1) to (4)

P_m : mean dynamic equivalent load N
P_1 : dynamic equivalent load applied for t_1 hours at rotational speed n_1 N
P_2 : dynamic equivalent load applied for t_2 hours at rotational speed n_2 N
⋮ ⋮ ⋮
P_n : dynamic equivalent load applied for t_n hours at rotational speed n_n N
P_{min} : minimum dynamic equivalent load N
P_{max} : maximum dynamic equivalent load N
Σn_it_i : total rotation in (t_1 to t_i) hours
p : for ball bearings, $p = 3$
for roller bearings, $p = 10/3$

[Reference] Mean rotational speed n_m can be calculated using the following equation :

$$n_m = \frac{n_1t_1 + n_2t_2 + \cdots\cdots\cdots + n_nt_n}{t_1 + t_2 + \cdots\cdots\cdots + t_n}$$

(5) Stationary load and rotating load acting simultaneously



$$P_m = f_m\,(P + P_u) \quad \cdots\cdots\cdots \text{(5-39)}$$

where :

P_m : mean dynamic equivalent load N
f_m : coefficient (refer. Fig. 5-12)
P : stationary load N
P_u : rotating load N

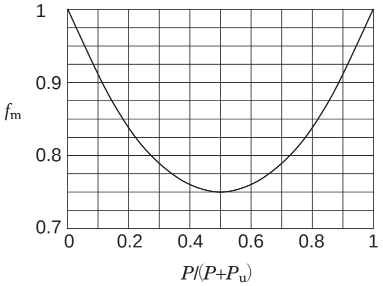


Fig. 5-12 Coefficient f_m

5-5 Basic static load rating and static equivalent load

5-5-1 Basic static load rating

Excessive static load or impact load even at very low rotation causes partial permanent deformation of the rolling element and raceway contacting surfaces. This permanent deformation increases with the load; if it exceeds a certain limit, smooth rotation will be hindered.

The basic static load rating is the static load which responds to the calculated contact stress shown below, at the contact center between the raceway and rolling elements which receive the maximum load.

- Self-aligning ball bearings ··· 4 600 MPa
- Other ball bearings ··············· 4 200 MPa
- Roller bearings ······················ 4 000 MPa

The total extent of contact stress-caused permanent deformation on surfaces of rolling elements and raceway will be approximately 0.000 1 times greater than the rolling element diameter.

The basic static load rating for radial bearings is specified as the basic static radial load rating, and for thrust bearings, as the basic static axial load rating. These load ratings are listed in the bearing specification table, using C_{0r} and C_{0a} respectively.

These values are prescribed by ISO 78/1987 and are subject to change by conformance to the latest ISO standards.

5-5-2 Static equivalent load

The static equivalent load is a theoretical load calculated such that, during rotation at very low speed or when bearings are stationary, the same contact stress as that imposed under actual loading condition is generated at the contact center between raceway and rolling element to which the maximum load is applied.

For radial bearings, radial load passing through the bearing center is used for the calculation; for thrust bearings, axial load in a direction along the bearing axis is used.

The static equivalent load can be calculated using the following equations.

[Radial bearings]

···The greater value obtained by the following two equations is used.

$$P_{0r} = X_0 F_r + Y_0 F_a \quad \cdots\cdots\cdots\cdots \text{(5-40)}$$

$$P_{0r} = F_r \quad \cdots\cdots\cdots\cdots \text{(5-41)}$$

[Thrust bearings]

$(\alpha \neq 90°)$

$$P_{0a} = X_0 F_r + F_a \quad \cdots\cdots\cdots\cdots \text{(5-42)}$$

[When $F_a < X_0 F_r$, the solution becomes less accurate.]

$(\alpha = 90°)$

$$P_{0a} = F_a \quad \cdots\cdots\cdots\cdots \text{(5-43)}$$

---

where :

P_{0r} : static equivalent radial load N

P_{0a} : static equivalent axial load N

F_r : radial load N

F_a : axial load N

X_0 : static radial load factor

Y_0 : static axial load factor (values of X_0 and Y_0 are listed in the bearing specification table.)

5-5-3 Safety coefficient

The allowable static equivalent load for a bearing is determined by the basic static load rating of the bearing; however, bearing service life, which is affected by permanent deformation, differs in accordance with the performance required of the bearing and operating conditions.

Therefore, a safety coefficient is designated, based on empirical data, so as to ensure safety in relation to basic static load rating.

$$f_s = \frac{C_0}{P_0} \quad \cdots\cdots\cdots\cdots \text{(5-44)}$$

where :

f_s : safety coefficient (ref. Table 5-10)

C_0 : basic static load rating N

P_0 : static equivalent load N

Table 5-10 Values of safety coefficient f_s

Operating condition		f_s (min.)	
		Ball bearing	**Roller bearing**
With bearing rotation	When high accuracy is required	2	3
	Normal operation	1	1.5
	When impact load is applied	1.5	3
Without bearing rotation (occasional oscillation)	Normal operation	0.5	1
	When impact load or uneven distribution load is applied	1	2

[Remark] For spherical thrust roller bearings, $f_s \geqq 4$.

5-6 Allowable axial load for cylindrical roller bearings

Bearings whose inner and outer rings comprise either a rib or loose rib can accommodate a certain magnitude of axial load, as well as radial load. In such cases, axial load capacity is controlled by the condition of rollers, load capacity of rib or loose rib, lubrication, rotational speed etc.

For certain special uses, a design is available to accommodate very heavy axial loads. In general, axial loads allowable for cylindrical roller bearings can be calculated using the following equation, which are based on empirical data.

$$F_{ap} = 9.8\, f_a \cdot f_b \cdot f_p \cdot d_m^2 \quad \cdots\cdots\cdots\cdots\cdots\cdots \text{(5-45)}$$

where :

F_{ap} : maximum allowable axial load N

f_a : coefficient determined from loading condition (Table 5-11)

f_b : coefficient determined from bearing diameter series (Table 5-12)

f_p : coefficient for rib surface pressure (Fig. 5-13)

d_m : mean value of bore diameter d and outside diameter D mm

$$\left(\frac{d+D}{2}\right)$$

Table 5-11 Values of coefficient determined from loading condition f_a

Loading condition	f_a
Continuous loading	1
Intermittent loading	2
Instantaneous loading	3

Table 5-12 Values of coefficient determined from bearing diameter series f_b

Diameter series	f_b
9	0.6
0	0.7
2	0.8
3	1.0
4	1.2

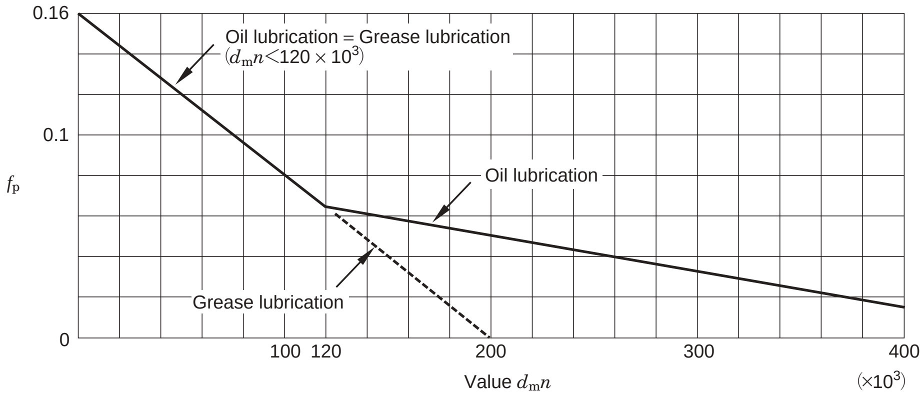


Fig. 5-13 Relationship between coefficient for rib surface pressure f_p and value $d_m n$ (n : rotational speed, min^{-1})

5-7 Applied calculation examples

[Example 1] Bearing service life (time) with 90 % reliability

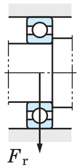
(Conditions)

Deep groove ball bearing : 6308

Radial load $F_r = 3\,500$ N

Axial load not applied ($F_a = 0$)

Rotational speed $n = 800$ min^{-1}



① Basic dynamic load rating (C_r) is obtained from the bearing specification table.

$C_r = 50.9$ kN

② Dynamic equivalent radial load (P_r) is calculated using equation (5-32).

$P_r = F_r = 3\,500$ N

③ Bearing sevice life (L_{10h}) is calculated using equation (5-2).

$$L_{10h} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^p$$

$$= \frac{10^6}{60\times 800}\times\left(\frac{50.9\times 10^3}{3\,500}\right)^3 \fallingdotseq \underline{64\,100\ \text{h}}$$

[Example 2] Bearing service life (time) with 96 % reliability

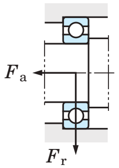
(Conditions)

Deep groove ball bearing : 6308

Radial load $F_r = 3\,500$ N

Axial load $F_a = 1\,000$ N

Rotational speed $n = 800$ min^{-1}



① From the bearing specification table ;

- Basic load rating (C_r, C_{0r}) f_0 factor is obtained.

$C_r = 50.9$ kN

$C_{0r} = 24.0$ kN

$f_0 = 13.2$

- Values X and Y are obtained by comparing value e, calculated from value $f_0 F_a / C_{0r}$ via proportional interpolation, with value $f_0 F_a / F_r$.

$$\frac{f_0 F_a}{C_{0r}} = \frac{13.2\times 1\,000}{24.0\times 10^3} = 0.550$$

$$e = 0.22 + (0.26 - 0.22)\times\frac{(0.550-0.345)}{(0.689-0.345)}$$

$$= 0.24$$

$$\frac{F_a}{F_r} = \frac{1\,000}{3\,500} = 0.29 > e$$

The result is,

$$X = 0.56$$

$$Y = 1.99 - (1.99 - 1.71)\times\frac{(0.550-0.345)}{(0.689-0.345)}$$

$$= 1.82$$

② Dynamic equivalent load (P_r) is obtained using equation (5-32).

$$P_r = XF_r + YF_a$$

$$= (0.56\times 3\,500) + (1.82\times 1\,000) = 3\,780\ \text{N}$$

③ Service life with 90 % reliability (L_{10h}) is obtained using equation (5-2).

$$L_{10h} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^p$$

$$= \frac{10^6}{60\times 800}\times\left(\frac{50.9\times 10^3}{3\,780}\right)^3 \fallingdotseq \underline{50\,900\ \text{h}}$$

[Example 3] Calculation of the a_{ISO} factor with the conditions in Example 2

(Conditions)

Oil lubrication

(Oil that has been filtered by a fine filter)

Operating temperature 70 °C

96 % reliability

④ Lubricating oil selection

From the bearing specification table, the pitch diameter $D_{pw} = (40 + 90)/2 = 65$ is obtained.

$d_{mn} = 65 \times 800 = 52\,000$. Therefore, select VG 68 from Table 12-8, p. A 129.

⑤ Calculating the a_{ISO} factor

The operating temperature is 70 °C, so according to Fig. 12-3, p. A 129, the viscosity when operating is $v = 20$ mm^2/s

According to Fig. A, $v_1 = 21.7$ mm^2/s

$\kappa = v/v_1 = 20/21.7 = 0.92$

The oil has been filtered by a fine filter, so Table 5-4 shows e_c is 0.5 to 0.6.

To stringently estimate the value, $e_c = 0.5$.

$$\frac{e_c \cdot C_u}{P} = \frac{0.5\times 1\,850}{3\,780} = 0.24$$

Therefore, according to Fig. B

$a_{\mathrm{ISO}} = 7.7$

⑥ Service life with 96 % reliability (L_{nm}) is obtained using equation (5-8).

According to Table 5-3, $a_1 = 0.55$.

$$L_{4m} = a_1 a_{\mathrm{ISO}} L_{10} = 0.55\times 7.7\times 50\,900 \fallingdotseq 216\,000\ \text{h}$$

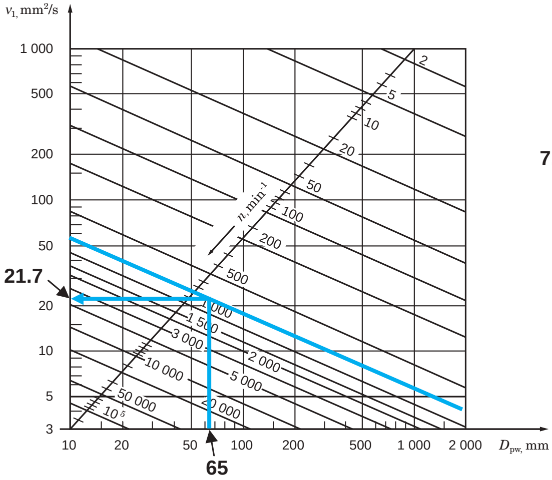


Fig. A

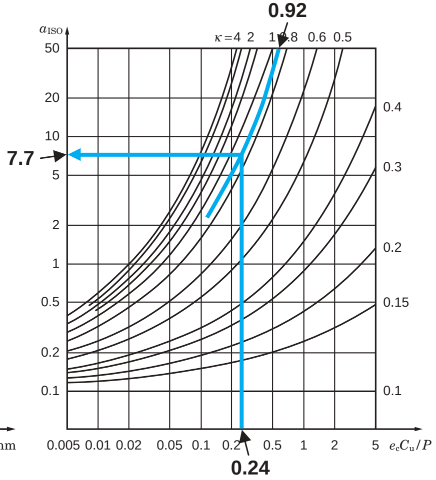


Fig. B

The a_{ISO} factor can also be calculated on our website.

[Example 4] Bearing service life (total revolution)

(Conditions)

Tapered roller bearing

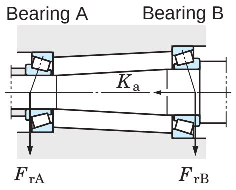
Bearing A : 30207 JR

Bearing B : 30209 JR

Radial load $F_{rA} = 5\,200$ N

$F_{rB} = 6\,800$ N

Axial load $K_a = 1\,600$ N



① From the bearing specification table, the following specifications are obtained.

	Basic dynamic load rating (C_r)	e	$X^{1)}$	$Y^{1)}$
Bearing A	68.8 kN	0.37	0.4	1.60
Bearing B	83.9 kN	0.40	0.4	1.48

[Note] 1) Those values are used, where $F_a / F_r > e$.

Where $F_a / F_r \leq e$, $X = 1$, $Y = 0$.

② Axial load applied to shafts must be calculated, considering the fact that component force in the axial direction is generated when radial load is applied to tapered roller bearings. (ref. equation 5-33, Table 5-9)

$$\frac{F_{rA}}{2\,Y_A} + K_a = \frac{5\,200}{2 \times 1.60} + 1\,600 = 3\,225 \text{ N}$$

$$\frac{F_{rB}}{2\,Y_B} = \frac{6\,800}{2 \times 1.48} = 2\,297 \text{ N}$$

Consequently, axial load $\frac{F_{rA}}{2\,Y_A} + K_a$ is applied to bearing B.

③ Dynamic equivalent load (P_r) is obtained from Table 5-9.

$$P_{rA} = F_{rA} = 5\,200 \text{ N}$$

$$P_{rB} = XF_{rB} + Y_B \left(\frac{F_{rA}}{2\,Y_A} + K_a \right)$$

$$= 0.4 \times 6\,800 + 1.48 \times 3\,225 = 7\,493 \text{N}$$

④ Each bearing service life (L_{10}) is calculated using equation (5-1).

$$L_{10A} = \left(\frac{C_{rA}}{P_{rA}} \right)^{10/3} = \left(\frac{68.8 \times 10^3}{5\,200} \right)^{10/3}$$

$$\fallingdotseq \underline{5\,480 \times 10^6 \text{ revolutions}}$$

$$L_{10B} = \left(\frac{C_{rB}}{P_{rB}} \right)^{10/3} = \left(\frac{83.9 \times 10^3}{7\,493} \right)^{10/3}$$

$$\fallingdotseq \underline{3\,140 \times 10^6 \text{ revolutions}}$$

[Example 5] Bearing size selection

(Conditions)

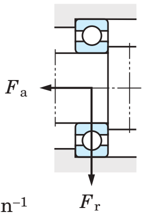
Deep groove ball bearing : 62 series

Required service life : more than 10 000 h

Radial load $F_r = 2\,000$ N

Axial load $F_a = 300$ N

Rotational speed $n = 1\,600$ min^{-1}



① The dynamic equivalent load (P_r) is hypothetically calculated.

The resultant value, $F_a / F_r = 300/2\,000 = 0.15$, is smaller than any other values of e in the bearing specification table.

Hence, JTEKT can consider that $P_r = F_r = 2\,000$ N.

② The required basic dynamic load rating (C_r) is calculated according to equation (5-4).

$$C_r = P_r \left(L_{10h} \times \frac{60n}{10^6} \right)^{1/p}$$

$$= 2\,000 \times \left(10\,000 \times \frac{60 \times 1\,600}{10^6} \right)^{1/3}$$

$$= 19\,730 \text{ N}$$

③ Among those covered by the bearing specification table, the bearing of the 62 series with C_r exceeding 19 730 N is <u>6205 R</u>, with bore diameter for 25 mm.

④ The dynamic equivalent load obtained at step ① is confirmed by obtaining value e for 6205 R.

Where C_{0r} of 6205 R is 9.3 kN, and f_0 is 12.8

$$f_0 \, F_a / C_{0r} = 12.8 \times 300/9\,300 = 0.413$$

Then, value e can be calculated using proportional interpolation.

$$e = 0.22 + (0.26 - 0.22) \times \frac{(0.413 - 0.345)}{(0.689 - 0.345)}$$

$$= 0.23$$

As a result, it can be confirmed that

$F_a / F_r = 0.15 < e$.

Hence, $P_r = F_r$.

[Example 6] Bearing size selection

(Conditions)

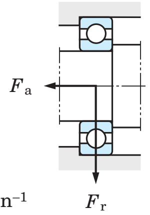
Deep groove ball bearing : 63 series

Required service life : more than 15 000 h

Radial load $F_r = 4\,000$ N

Axial load $F_a = 2\,400$ N

Rotational speed $n = 1\,000$ min^{-1}



① The hypothetic dynamic equivalent load (P_r) is calculated :

Since $F_a / F_r = 2\,400/4\,000 = 0.6$ is much larger than the value e specified in the bearing specification table, it suggests that the axial load affects the dynamic equivalent load.

Hence, assuming that $X = 0.56$, $Y = 1.6$ (approximate mean value of Y), using equation (5-32),

$$P_r = XF_r + XF_a = 0.56 \times 4\,000 + 1.6 \times 2\,400$$

$$= 6\,080 \text{ N}$$

② Using equation (5-4), the required basic dynamic load rating (C_r) is :

$$C_r = P_r \left(L_{10h} \times \frac{60n}{10^6} \right)^{1/p}$$

$$= 6\,080 \times \left(15\,000 \times \frac{60 \times 1\,000}{10^6} \right)^{1/3}$$

$$= 58\,700 \text{ N}$$

③ From the bearing specification table, a 6309 with a bore diameter of 45 mm is selected as a 63 series bearing with C_r exceeding 58 700 N.

④ The dynamic equivalent load and basic rating life are confirmed, by calculating the value e for a 6309.

Values obtained using the proportional interpolation are :

where $f_0 \, F_a / C_{0r} = 13.3 \times 2\,400/29\,500 = 1.082$

$e = 0.283$, $Y = 1.54$.

Thus, $F_a / F_r = 0.6 > e$.

Using the resultant values, the dynamic equivalent load and basic rating life can be calculated as follows :

$$P_r = XF_r + YF_a$$

$$= 0.56 \times 4\,000 + 1.54 \times 2\,400 = 5\,940 \text{N}$$

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C_r}{P_r} \right)^p$$

$$= \frac{10^6}{60 \times 1\,000} \times \left(\frac{61.1 \times 10^3}{5\,940} \right)^3 \fallingdotseq \underline{18\,100 \text{ h}}$$

⑤ The basic rating life of the 6308, using the same steps, is :

$L_{10h} \fallingdotseq 11\,500$ h, which does not satisfy the service life requirement.

[Example 7] Calculation of allowable axial load for cylindrical roller bearings

(Conditions)

Single-row cylindrical roller bearing : NUP 310

Rotational speed $n = 1\,500$ min^{-1}

Oil lubrication

Axial load is intermittently applied.

① Using the bearing specification table, the value d_m for the NUP 310 can be calculated as follows :

$$d_m = \frac{d + D}{2} = \frac{50 + 110}{2} = 80 \text{ mm}$$

② Each coefficient used in equation (5-45).

From values listed in Table 5-11, coefficient f_a related to intermittent load is : $f_a = 2$

From values listed in Table 5-12, coefficient f_b related to diameter series 3 is : $f_b = 1.0$

According to Fig. 5-13, coefficient f_p for allowable rib surface pressure, related to

$d_m n = 80 \times 1\,500 = 12 \times 10^4$, is : $f_p = 0.062$

③ Using equation (5-45), the allowable axial load F_{ap} is :

$$F_{ap} = 9.8 \, f_a \cdot f_b \cdot f_p \cdot d_m^2$$

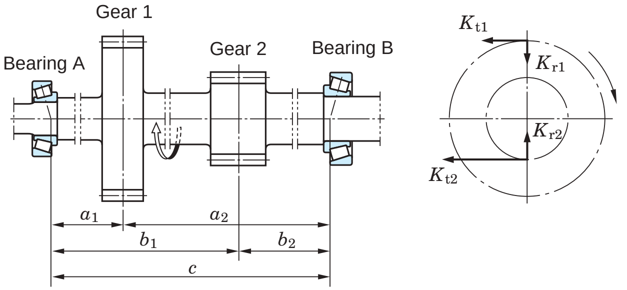
$$= 9.8 \times 2 \times 1.0 \times 0.062 \times 80^2$$

$$\fallingdotseq \underline{7\,780 \text{ N}}$$

[Example 8] Calculation of service life of spur gear shaft bearings

(Conditions)
Tapered roller bearing
Bearing A : 32309 JR
Bearing B : 32310 JR
Gear type : spur gear (normally machined)
Gear pressure angle $\alpha_1 = \alpha_2 = 20°$
Gear pitch circle diameter $D_{p1} = 360$ mm
$D_{p2} = 180$ mm
Transmission power $W = 150$ kW
Rotational speed $n = 1\,000$ min^{-1}

Operating condition: accompanied by impact
Installation locations
$a_1 = 95$ mm, $a_2 = 265$ mm,
$b_1 = 245$ mm, $b_2 = 115$ mm,
$c = 360$ mm



① Using equations (5-14) and (5-15), theoretical loads applied to gears (tangential load, K_t; radial load, K_r) are calculated.

[Gear 1]

$$K_{t1} = \frac{19.1 \times 10^6 W}{D_p n} = \frac{19.1 \times 10^6 \times 150}{360 \times 1\,000}$$

$$= 7\,958 \text{ N}$$

$$K_{r1} = K_{t1} \tan \alpha_1 = 2\,896 \text{ N}$$

[Gear 2]

$$K_{t2} = \frac{19.1 \times 10^6 \times 150}{180 \times 1\,000} = 15\,917 \text{ N}$$

$$K_{r2} = K_{t2} \tan \alpha_2 = 5\,793 \text{ N}$$

② The radial load applied to the bearing is calculated, where the load coefficient is determined as $f_w = 1.5$ from Table 5-6, and the gear coefficient as $f_g = 1.2$ from Table 5-8.

[Bearing A]

- Load consisting of K_{t1} and K_{t2} is :

$$K_{tA} = f_w f_g \left(\frac{a_2}{c} K_{t1} + \frac{b_2}{c} K_{t2} \right)$$

$$= 1.5 \times 1.2 \times \left(\frac{265}{360} \times 7\,958 + \frac{115}{360} \times 15\,917 \right) = 19\,697 \text{ N}$$

- Load consisting of K_{r1} and K_{r2} is :

$$K_{rA} = f_w f_g \left(\frac{a_2}{c} K_{r1} - \frac{b_2}{c} K_{r2} \right)$$

$$= 1.5 \times 1.2 \times \left(\frac{265}{360} \times 2\,896 - \frac{115}{360} \times 5\,793 \right) = 506 \text{ N}$$

- Combining the loads of K_{tA} and K_{rA}, the radial load (F_{rA}) applied to bearing A can be calculated as follows :

$$F_{rA} = \sqrt{K_{tA}^2 + K_{rA}^2}$$

$$= \sqrt{19\,697^2 + 506^2} = 19\,703 \text{ N}$$

[Bearing B]

- Load consisting of K_{t1} and K_{t2} is :

$$K_{tB} = f_w f_g \left(\frac{a_1}{c} K_{t1} + \frac{b_1}{c} K_{t2} \right)$$

$$= 1.5 \times 1.2 \times \left(\frac{95}{360} \times 7\,958 + \frac{245}{360} \times 15\,917 \right) = 23\,278 \text{ N}$$

- Load consisting of K_{r1} and K_{r2} is :

$$K_{rB} = f_w f_g \left(\frac{a_1}{c} K_{r1} - \frac{b_1}{c} K_{r2} \right)$$

$$= 1.5 \times 1.2 \times \left(\frac{95}{360} \times 2\,896 - \frac{245}{360} \times 5\,793 \right) = -5\,721 \text{ N}$$

- The radial load (F_{rB}) applied to bearing B can be calculated using the same steps as with bearing A.

$$F_{rB} = \sqrt{K_{tB}^2 + K_{rB}^2}$$

$$= \sqrt{23\,278^2 + (-5\,721)^2} = 23\,971 \text{ N}$$

③ The following specifications can be obtained from the bearing specification table.

	Basic dynamic load rating (C_r)	e	$X^{1)}$	$Y^{1)}$
Bearing A	183 kN	0.35	0.4	1.74
Bearing B	221 kN			

[Note] 1) Those values are used, where $F_a / F_r > e$.
Where $F_a / F_r \leqq e$, $X = 1$, $Y = 0$.

④ When an axial load is not applied externally, if the radial load is applied to the tapered roller bearing, an axial component force is generated.

Considering this fact, the axial load applied from the shaft and peripheral parts is to be calculated :

(Equation 5-33, Table 5-9)

$$\frac{F_{rB}}{2\,Y_B} = \frac{23\,971}{2 \times 1.74} > \frac{F_{rA}}{2\,Y_A} = \frac{19\,703}{2 \times 1.74}$$

According to the result, it is clear that the axial component force ($F_{rB}/2Y_B$) applied to bearing B is also applied to bearing A as an axial load applied from the shaft and peripheral parts.

⑤ Using the values listed in Table 5-9, the dynamic equivalent load is calculated, where $K_a = 0$:

$$P_{rA} = XF_{rA} + Y_A \frac{F_{rB}}{2\,Y_B}$$

$$= 0.4 \times 19\,703 + 1.74 \times \frac{23\,971}{2 \times 1.74}$$

$$= 19\,867 \text{ N}$$

$$P_{rB} = F_{rB} = 23\,971 \text{ N}$$

⑥ Using equation (5-2), the basic rating life of each bearing is calculated :

[Bearing A]

$$L_{10hA} = \frac{10^6}{60n} \left(\frac{C_{rA}}{P_A} \right)^p$$

$$= \frac{10^6}{60 \times 1\,000} \times \left(\frac{183 \times 10^3}{19\,867} \right)^{10/3}$$

$$\fallingdotseq \underline{27\,300 \text{ h}}$$

[Bearing B]

$$L_{10hB} = \frac{10^6}{60n} \left(\frac{C_{rB}}{P_B} \right)^p$$

$$= \frac{10^6}{60 \times 1\,000} \times \left(\frac{221 \times 10^3}{23\,971} \right)^{10/3}$$

$$\fallingdotseq \underline{27\,400 \text{ h}}$$

Reference

Using equation (5-11), the system service life (L_{10hS}) using a pair of bearings is :

$$L_{10hS} = \frac{1}{\left(\dfrac{1}{{L_{10hA}}^e} + \dfrac{1}{{L_{10hB}}^e} \right)^{1/e}}$$

$$= \frac{1}{\left(\dfrac{1}{27\,300^{9/8}} + \dfrac{1}{27\,400^{9/8}} \right)^{8/9}}$$

$$\fallingdotseq \underline{14\,800 \text{ h}}$$

6. Boundary dimensions and bearing numbers

6-1 Boundary dimensions

Bearing boundary dimensions are dimensions required for bearing installation with shaft or housing, and as described in Fig. 6-1, include the bore diameter, outside diameter, width, height, and chamfer dimension.

These dimensions are standardized by the International Organization for Standardization (ISO 15). JIS B 1512 "rolling bearing boundary dimensions" is based on ISO.

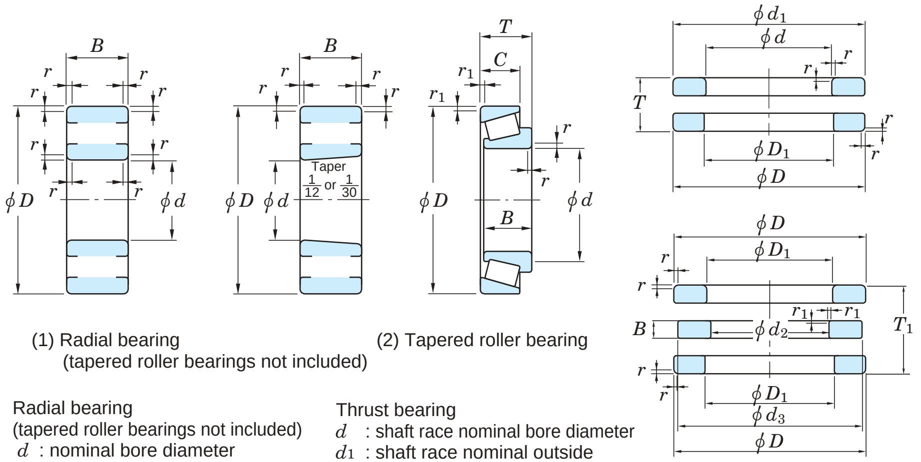
These boundary dimensions are provided, classified into radial bearings (tapered roller bearings are provided in other tables) and thrust bearings.

Boundary dimensions of each bearing are listed in Appendixes at the back of this catalog. In these boundary dimension tables, the outside diameter, width, height, and chamfer dimensions related to bearing bore diameter numbers and bore diameters are listed in diameter series and dimension series.

Reference

1) Diameter series is a series of nominal bearing outside diameters provided for respective ranges of bearing bore diameter; and, a dimension series includes width and height as well as diameters.

2) Tapered roller bearing boundary dimensions listed in the Appendixes are adapted to conventional dimension series (widths and diameters). Tapered roller bearing boundary dimensions provided in JIS B 1512-2000 are new dimension series based on ISO 355 (ref. descriptions before the bearing specification table); for reference, the bearing specification table covers numeric codes used in these dimension series.



(1) Radial bearing
(tapered roller bearings not included)

(2) Tapered roller bearing

(3) Thrust bearing
(single/double direction)

Radial bearing
(tapered roller bearings not included)
d : nominal bore diameter
D : nominal outside diameter
B : nominal assembled bearing width
r : inner/outer ring chamfer dimension1)

Tapered roller bearing
d : nominal bore diameter
D : nominal outside diameter
T : nominal assembled bearing width
B : nominal inner ring width
C : nominal outer ring width
r : inner ring chamfer dimension1)
r_1 : outer ring chamfer dimension1)

Thrust bearing
d : shaft race nominal bore diameter
d_1 : shaft race nominal outside diameter2)
d_2 : central race nominal bore diameter
d_3 : central race nominal outside diameter2)
D : housing race nominal outside diameter
D_1 : housing race nominal bore diameter1)
T : single direction nominal bearing height
T_1 : double direction nominal bearing height
B : central race nominal height
r : shaft/housing race chamfer dimension1)
r_1 : central race chamfer dimension1)

[Notes]
1) The bearing specification table includes the minimum value.
2) The bearing specification table includes the maximum value.

Fig. 6-1 Bearing boundary dimensions

Cross-section dimensions of radial bearings and thrust bearings expressed in dimension series can be compared using Figs. 6-2 and 6-3.

In this way, many dimension series are provided; however, not all dimensions are practically adapted.

Some of them were merely prescribed, given expected future use.

6-2 Dimensions of snap ring grooves and locating snap rings

JIS B 1509 "rolling bearing -radial bearing with locating snap ring-dimensions and tolerances" conforms to the dimensions of snap ring groove for fitting locating snap ring on the outside surface of bearing and the dimensions and tolerances of locating snap ring.

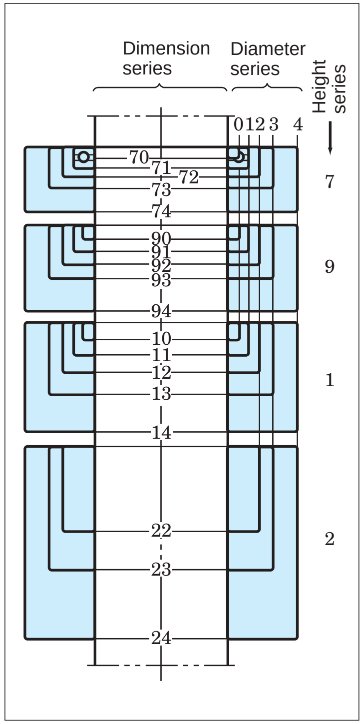


Fig. 6-3 Thrust bearing dimension series diagram (diameter series 5 omitted)

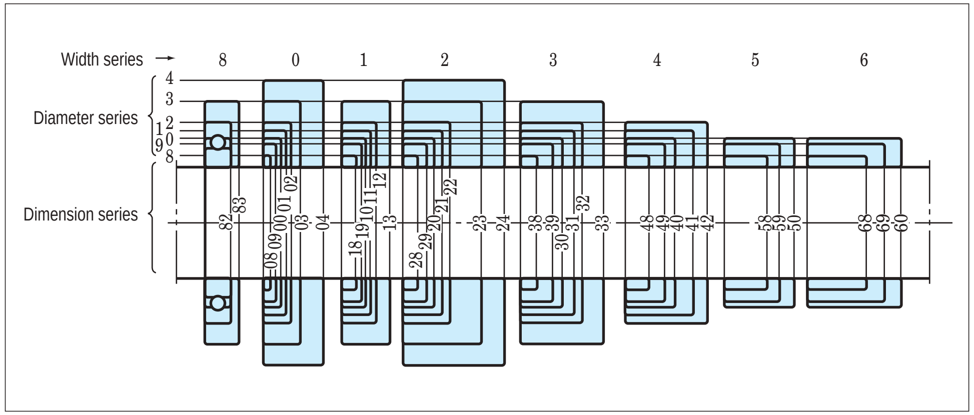


Fig. 6-2 Radial bearing dimension series diagram (diameter series 7 omitted)

6-3 Bearing number

A bearing number is composed of a basic number and a supplementary code, denoting bearing specifications including bearing type, boundary dimensions, running accuracy, and internal clearance.

Bearing numbers of standard bearings corresponding to JIS B 1512 "rolling bearing boundary dimensions" are prescribed in JIS B 1513.

As well as these bearing numbers, JTEKT uses supplementary codes other than those provided by JIS.

Among basic numbers, bearing series codes are listed in Table 6-1, and the composition of bearing numbers is described in Table 6-2, showing the order of arrangement of the parts.

[Examples of bearing numbers]

(Ex. 1)

62 03 ZZ C 2

- C 2: Internal clearance code (clearance C2)
- ZZ: Shield code (both sides shielded)
- 03: Bore diameter number (nominal bore diameter, 17 mm)
- 62: Bearing series code (single-row deep groove ball bearing of dimension series 02)

(Ex. 2)

72 10 C DT P 5

- P 5: Tolerance class code (class 5)
- DT: Matched pair or stack code (tandem arrangement)
- C: Contact angle code (nominal contact angle, 15°)
- 10: Bore diameter number (nominal bore diameter, 50 mm)
- 72: Bearing series code (single-row angular contact ball bearing of dimension series 02)

(Ex. 3)

NU 3 18 C 3 P 6

- P 6: Tolerance class code (class 6)
- C 3: Internal clearance code (clearance C3)
- 18: Bore diameter number (nominal bore diameter, 90 mm)
- NU 3: Bearing series code (single-row cylindrical roller bearing of dimension series 03)

(Ex. 4)

320 05 J R P 6 X

- P 6 X: Tolerance class code (class 6X)
- R: Internal design code (high load capacity)
- J: Code denoting that boundary dimensions and sub unit dimensions are based on ISO standards.
- 05: Bore diameter number (nominal bore diameter, 25 mm)
- 320: Bearing series code (single-row tapered roller bearing of dimension series 20)

(Ex. 5)

232/500 RZ K C 4

- C 4: Internal clearance code (clearance C4)
- K: Bearing ring shape code (inner ring tapered bore (taper 1 : 12))
- RZ: Internal design code (with convex symmetric rollers, pressed cage)
- /500: Bore diameter number (nominal bore diameter, 500 mm)
- 232: Bearing series code (spherical roller bearing of dimension series 32)

(Ex. 6)

512 15

- 15: Bore diameter number (nominal bore diameter, 75 mm)
- 512: Bearing series code (single direction thrust ball bearing of dimension series 12)

Table 6-1 Bearing series code

Bearing type	Bearing series code	Type code	Dimension series code	
			Width series 1)	Diameter series
Single-row deep groove ball bearing	**67**	6	(1)	7
	68	6	(1)	8
	69	6	(1)	9
	160 2)	6	(0)	0
	60	6	(1)	0
	62	6	(0)	2
	63	6	(0)	3
	64	6	(0)	4
Double-row deep groove ball bearing (with filling slot)	**42**	4	(2)	2
	43	4	(2)	3
Single-row angular contact ball bearing	**79**	7	(1)	9
	70	7	(1)	0
	72	7	(0)	2
	73	7	(0)	3
	74	7	(0)	4
Double-row angular contact ball bearing (with filling slot)	**32**	(0)	3	2
	33	(0)	3	3
Double-row angular contact ball bearing	**52**	5	(3)	2
	53	5	(3)	3
Self-aligning ball bearing	**12**	1	(0)	2
	22	2	(2)	2
	13	1	(0)	3
	23	2	(2)	3
	112 2)	1	(0) 3)	2
	113 2)	1	(0) 3)	3
Single-row cylindrical roller bearing	**NU 10**	NU 4)	1	0
	NU 2	NU 4)	(0)	2
	NU 22	NU 4)	2	2
	NU 32	NU 4)	3	2
	NU 3	NU 4)	(0)	3
	NU 23	NU 4)	2	3
	NU 4	NU 4)	(0)	4
Double-row cylindrical roller bearing	**NNU 49**	NNU	4	9
	NN 30	NN	3	0
Single-row needle roller bearing	**NA 48**	NA	4	8
	NA 49	NA	4	9
	NA 59	NA	5	9
Double-row needle roller bearing	**NA 69**	NA	6	9
Tapered roller bearing	**329**	3	2	9
	320	3	2	0
	330	3	3	0
	331	3	3	1
	302	3	0	2
	322	3	2	2
	332	3	3	2
	303	3	0	3
	313	3	1	3
	323	3	2	3
Spherical roller bearing	**239**	2	3	9
	230	2	3	0
	240	2	4	0
	231	2	3	1
	241	2	4	1
	222	2	2	2
	232	2	3	2
	213 2)	2	0	3
	223	2	2	3
Single direction thrust ball bearing	**511**	5	1	1
	512	5	1	2
	513	5	1	3
	514	5	1	4
Single direction thrust ball bearing with spherical back face	**532**	5	3	2
	533	5	3	3
	534	5	3	4
Double direction thrust ball bearing	**522**	5	2	2
	523	5	2	3
	524	5	2	4
Double direction thrust ball bearing with spherical back faces	**542**	5	4	2
	543	5	4	3
	544	5	4	4
Spherical thrust roller bearing	**292**	2	9	2
	293	2	9	3
	294	2	9	4

[Notes]
1) Width series codes in parentheses are omitted in bearing series codes.
2) These are bearing series codes customarily used.
3) Nominal outer ring width series (inner rings only are wide).
4) Besides NU type, NJ, NUP, N, NF, and NH are provided.

Table 6-2 Bearing number configuration

	Basic number			Supplementary code										
Order of arrengement	Bearing series code	Bore diameter No.	Contact angle code	Internal design code, cage guide code	Shield/seal code	Ring shape code, lubrication hole/groove code		Material code, special treatment code	Matched pair or stack code	Internal clearance code, preload code	Spacer code	Cage material/ shape code	Tolerance code	Grease code

(Codes and descriptions)

Bearing series code

68	Deep groove ball bearing
69	⋮
60	⋮
⋮	⋮

(For standard bearing code, refer to Table 6-1)

Bore diameter No.

/0.6	0.6 mm (Bore diameter)	
1	1	
/1.5	1.5	
⋮	⋮	
9	9	
00	10	
01	12	
02	15	
03	17	
04	20	· Bore diameters (mm) of bearing in the bore diameter range 04 to 96 can be obtained by multiplying their bore diameter number by five.
/22	22	
05	25	
⋮	⋮	
96	480	
/500	500	
/2500	2500	

Contact angle code

A	(omitted) 30°	Angular contact ball bearing
AC	25°	
B	40°	
C	15°	
CA	20°	
E	35°	
B	(omitted) Less than 17°	Tapered roller bearing
C	20°	
D	28° 30'	
DJ	28° 48' 39"	

Internal design code

R	High load capacity (Deep groove ball bearing, cylindrical roller bearing, tapered roller bearing)	
G	Equal stand-out is provided on both sides of the ring of angular contact ball bearing (In general, C2 clearance is used)	
GST	Angular contact ball bearing described above with standard internal clearance provided	
J	Tapered roller bearing, whose outer ring width, contact angle and outer ring small inside diameter conform to ISO standards	
R	With convex asymmetric rollers and machined cage	Spherical roller bearings
RZ	With convex symmetric rollers and pressed cage	
RHA	With convex symmetric rollers and one-piece machined cage	
V	Full complement type ball or roller bearing (with no cage)	

Shield/seal code

one side	both sides	
Z	**ZZ**	Fixed shield
ZX	**ZZX**	Removable shield
ZU	**2ZU**	Non-contact seal
RU	**2RU**	
RS	**2RS**	Contact seal
RK	**2RK**	
U	**UU**	
RD	**2RD**	Extremely light contact seal

Ring shape code, lubrication hole/groove code

K	Inner ring tapered bore provided (1 : 12)
K30	Inner ring tapered bore provided (1 : 30)
N	Snap ring groove on outer ring outside surface provided
NR	Snap ring groove and locating snap ring on outer ring outside surface provided

(Codes and descriptions)

NY	Creep prevention synthetic resin ring on outer ring outside surface provided
SG	Spiral groove on inner ring bore surface provided
W	Lubrication hole and lubrication groove on cylindrical roller bearing outer ring outside surface provided
W33	Lubrication hole and lubrication groove on spherical roller bearing outer ring outside surface provided

Material code, special treatment code

Code not given	High carbon chrome bearing steel	
E	Case carburizing steel	
F		
H		
Y		
ST	Stainless steel	
SH	Special heat treatment	
S0	Up to 150 °C	Dimension stabilizing treatment
S1	Up to 200 °C	
S2	Up to 250 °C	

Matched pair or stack code, cage guide code

DB	Back-to-back arrangement	Angular contact ball bearing
DF	Face-to-face arrangement	
DT	Tandem arrangement	
PA	With outer ring guide cage (Ball bearing)	
Q3	With roller guide cage (Roller bearing)	

Internal clearance code, preload code

C1	Smaller than C2	
C2	Smaller than standard clearance	Radial internal clearance for radial bearing
CN	Standard clearance	
C3	Greater than standard clearance	
C4	Greater than C3	
C5	Greater than C4	
M1 to M6	Radial internal clearance for extra-small/ miniature ball bearing	
CD2	Smaller than standard clearance	Radial internal clearance for double-row angular contact ball bearing
CDN	Standard clearance	
CD3	Greater than standard clearance	
CM	Radial internal clearance for electric motor bearing	Deep groove ball bearing
CT		Cylindrical roller bearing
NA	Non-interchangeable cylindrical roller bearing radial internal clearance (C1NA to C5NA)	
S	Slight preload	Preload for angular contact ball bearing
L	Light preload	
M	Medium preload	
H	Heavy preload	

Spacer code

Spacer width (mm) is affixed to the end of each code.

+	Inner and outer ring spacers provided	Deep groove ball bearing
/	Inner and outer ring spacers provided	Angular contact ball bearing
/P	Outer ring spacer provided	
/S	Inner ring spacer provided	
+DP	Inner and outer ring spacers provided	Cylindrical roller bearing, spherical roller bearing
+IDP	Inner ring spacer provided	
+ODP	Outer ring spacer provided	

Cage material/type code

/ /	Steel sheet	Pressed cage
YS	Stainless steel sheet	
FT	Phenol resin	Machined cage
FY	High-tensile brass casting	
FW	High-tensile brass casting (separable type)	
MG	Polyamide	(Molded cage)
FG		
FP	Carbon steel	(Pin type cage)

Tolerance code (JIS)

Omitted	Class 0
P6	Class 6
P6X	Class 6X
P5	Class 5
P4	Class 4
P2	Class 2

Grease code

A2	Alvania 2
AC	Andok C
B5	Beacon 325
SR	Multemp SRL

7. Bearing tolerances

7-1 Tolerances and tolerance classes for bearings

Bearing tolerances and permissible values for the boundary dimensions and running accuracy of bearings are specified.

These tolerances are prescribed in JIS B 1514-1, JIS B 1514-2, and JIS B 1514-3 (roller bearings - bearing tolerances part 1: radial bearings, part 2: thrust bearings, and part 3: permissible values for chamfer dimensions). (These JIS standards are based on ISO standards.)

Bearing tolerances are standardized by classifying bearings into the following six classes (accuracy in tolerances becomes higher in the order described): 0, 6X, 6, 5, 4 and 2.

Class 0 bearings offer adequate performance for general applications; and, bearings of class 5 or higher are required for demanding applications and operating conditions including those described in Table 7-1.

These tolerances follow ISO standards, but some countries use different names for them. Tolerances for each bearing class, and organizations concerning bearings are listed in Table 7-2.

■ Boundary dimension accuracy
(items on shaft and housing mounting dimensions)
- Tolerances for bore diameter, outside diameter, ring width, assembled bearing width
- Tolerances for set bore diameter and set outside diameter of rollers
- Tolerance limits for chamfer dimensions
- Permissible values for width variation
- Tolerance and permissible values for tapered bore

■ Running accuracy
(items on runout of rotating elements)
- Permissible values for radial and axial runout of inner and outer rings
- Permissible values for perpendicularity of inner ring face
- Permissible values for perpendicularity of outer ring outside surface
- Permissible values for thrust bearing raceway thickness

Accuracies for dimensions and running of each bearing type are listed in Tables 7-3 through 7-10; and, tolerances for tapered bore and limit values for chamfer dimensions of radial bearings are in Tables 7-11 and 7-12.

Table 7-1 High precision bearing applications

Required performance	Applications	Tolerance class
High accuracy in runout is required for rolling elements.	Acoustic / visual equipment spindles (VTR, tape recorders)	P 5, P 4
	Radar / parabola antenna slewing shafts	P 4
	Machine tool spindles	P 5, P 4, P 2, ABEC 9
	Computers, magnetic disc spindles	P 5, P 4, P 2, ABEC 9
	Aluminum foil roll necks	P 5
	Multi-stage mill backing bearings	P 4
High speed rotation	Dental spindles	P 2, ABMA 5P, ABMA 7P
	Superchargers	P 5, P 4
	Jet engine spindles and accessories	P 5, P 4
	Centrifugal separators	P 5, P 4
	LNG pumps	P 5
	Turbo molecular pump spindles and touch-down	P 5, P 4
	Machine tool spindles	P 5, P 4, P 2, ABEC 9
	Tension reels	P 5, P 4
Low friction or low friction variation is required.	Control equipment (synchronous motors, servomotors, gyro gimbals)	P 4, ABMA 7P
	Measuring instruments	P 5
	Machine tool spindles	P 5, P 4, P 2, ABEC 9

Table 7-2 Bearing type and tolerance class

Bearing type			Applied standards	Applied tolerance class						Tolerance table
Deep groove ball bearing			JIS B 1514-1	Class 0	–	Class 6	Class 5	Class 4	Class 2	Table 7-3
Angular contact ball bearing				Class 0	–	Class 6	Class 5	Class 4	Class 2	
Self-aligning ball bearing				Class 0	–	–	–	–	–	
Cylindrical roller bearing				Class 0	–	Class 6	Class 5	Class 4	Class 2	
Needle roller bearing (machined ring type)			JIS B 1536-1	Class 0	–	–	–	–	–	
Tapered roller bearing	Metric series (single-row)		JIS B 1514-1	Class 0	Class 6X	(Class 6)	Class 5	Class 4	Class 2	Table 7-5
	Metric series (double or four-row)		BAS 1002	Class 0	–	–	–	–	–	Table 7-6
	Inch series		ANSI/ABMA	Class 4	–	Class 2	Class 3	Class 0	Class 00	Table 7-7
	Metric series (J-series)			Class PK	–	Class PN	Class PC	Class PB	–	Table 7-8
Spherical roller bearing			JIS B 1514-1	Class 0	–	–	–	–	–	Table 7-3
Thrust ball bearing			JIS B 1514-2	Class 0	–	Class 6	Class 5	Class 4	–	Table 7-9
Spherical thrust roller bearing				Class 0	–	–	–	–	–	Table 7-10
Precision ball screw support bearing			JTEKT standards	–	–	–	Class P5Z	Class P4Z	–	–
Double direction angular contact thrust ball bearing				–	–	–	Equivalent to class 5	Equivalent to class 4	–	–
(Reference) Class comparison	ISO	Radial bearing	ISO 492	Normal Class	Class 6X	Class 6	Class 5	Class 4	Class 2	–
		Thrust bearing	ISO 199	Normal Class	–	Class 6	Class 5	Class 4	–	–
	DIN BS NF	Radial and thrust bearings	DIN 620 BS 6107 NF E 22-335	Normal Class	Class 6X	Class 6	Class 5	Class 4	Class 2	–
	ANSI ABMA	Radial bearing	ABMA std. 20	ABEC 1 RBEC 1	– –	ABEC 3 RBEC 3	ABEC 5 RBEC 5	ABEC 7 –	ABEC 9 –	–
		Instrument ball bearing	ABMA std. 12	–	–	Class 3P	Class 5P Class 5T	Class 7P Class 7T	Class 9P	Table 7-4
		Tapered roller bearing	ABMA std. 19	Class 4 Class K	– –	Class 2 Class N	Class 3 Class C	Class 0 Class B	Class 00 Class A	Table 7-7

(Reference) Standards and organizations concerned with bearings

JIS	Japanese Industrial Standard
BAS	The Japan Bearing Industrial Association Standard
ISO	International Organization for Standardization
ANSI	American National Standards Institute, Inc.
ABMA	American Bearing Manufactures Association
DIN	Deutsches Institut für Normung
BS	British Standards Institution
NF	Association Francaise de Normalisation

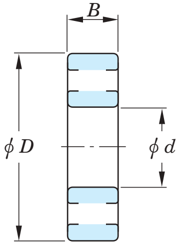
Table 7-3 (1) Radial bearing tolerances (tapered roller bearings excluded)

= JIS B 1514-1 =

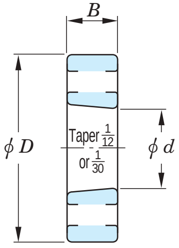
(1) Inner ring (bore diameter)

Unit : μm

Nominal bore diameter d mm		Single plane mean bore diameter deviation Δ_{dmp}										Single bore diameter deviation Δ_{ds} 1)				Single plane bore diameter variation V_{dsp}													Mean bore diameter variation V_{dmp}					Nominal bore diameter d mm	
		class 0		class 6		class 5		class 4		class 2		class 4		class 2		Diameter series 7, 8, 9				Diameter series 0, 1				Diameter series 2, 3, 4				Dia. series 1)							
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4	class 2	class 0	class 6	class 5	class 4	class 2	over	up to
																max.				max.				max.				max.	max.						
–	0.6	0	–8	0	–7	0	–5	0	–4	0	–2.5	0	–4	0	–2.5	10	9	5	4	8	7	4	3	6	5	4	3	2.5	6	5	3	2	1.5	–	0.6
0.6	2.5	0	–8	0	–7	0	–5	0	–4	0	–2.5	0	–4	0	–2.5	10	9	5	4	8	7	4	3	6	5	4	3	2.5	6	5	3	2	1.5	0.6	2.5
2.5	10	0	–8	0	–7	0	–5	0	–4	0	–2.5	0	–4	0	–2.5	10	9	5	4	8	7	4	3	6	5	4	3	2.5	6	5	3	2	1.5	2.5	10
10	18	0	–8	0	–7	0	–5	0	–4	0	–2.5	0	–4	0	–2.5	10	9	5	4	8	7	4	3	6	5	4	3	2.5	6	5	3	2	1.5	10	18
18	30	0	–10	0	–8	0	–6	0	–5	0	–2.5	0	–5	0	–2.5	13	10	6	5	10	8	5	4	8	6	5	4	2.5	8	6	3	2.5	1.5	18	30
30	50	0	–12	0	–10	0	–8	0	–6	0	–2.5	0	–6	0	–2.5	15	13	8	6	12	10	6	5	9	8	6	5	2.5	9	8	4	3	1.5	30	50
50	80	0	–15	0	–12	0	–9	0	–7	0	–4	0	–7	0	–4	19	15	9	7	19	15	7	5	11	9	7	5	4	11	9	5	3.5	2	50	80
80	120	0	–20	0	–15	0	–10	0	–8	0	–5	0	–8	0	–5	25	19	10	8	25	19	8	6	15	11	8	6	5	15	11	5	4	2.5	80	120
120	150	0	–25	0	–18	0	–13	0	–10	0	–7	0	–10	0	–7	31	23	13	10	31	23	10	8	19	14	10	8	7	19	14	7	5	3.5	120	150
150	180	0	–25	0	–18	0	–13	0	–10	0	–7	0	–10	0	–7	31	23	13	10	31	23	10	8	19	14	10	8	7	19	14	7	5	3.5	150	180
180	250	0	–30	0	–22	0	–15	0	–12	0	–8	0	–12	0	–8	38	28	15	12	38	28	12	9	23	17	12	9	8	23	17	8	6	4	180	250
250	315	0	–35	0	–25	0	–18	*0*	*–15*	–	–	*0*	*–15*	–	–	44	31	18	*15*	44	31	14	*11*	26	19	14	*11*	–	26	19	9	*8*	–	250	315
315	400	0	–40	0	–30	0	–23	*0*	*–18*	–	–	*0*	*–18*	–	–	50	38	23	*18*	50	38	18	*14*	30	23	18	*14*	–	30	23	12	*9*	–	315	400
400	500	0	–45	0	–35	*0*	*–28*	*0*	*–23*	–	–	*0*	*–23*	–	–	56	44	*28*	*23*	56	44	*21*	*17*	34	26	*21*	*17*	–	34	26	*14*	*12*	–	400	500
500	630	0	–50	0	–40	*0*	*–35*	–	–	–	–	–	–	–	–	63	50	*35*	–	63	50	*26*	–	38	30	*26*	–	–	38	30	*18*	–	–	500	630
630	800	0	–75	*0*	*–50*	*0*	*–45*	–	–	–	–	–	–	–	–	*94*	*63*	*45*	–	*94*	*63*	*34*	–	*56*	*38*	*34*	–	–	*56*	*38*	*23*	–	–	630	800
800	1 000	0	–100	*0*	*–60*	*0*	*–60*	–	–	–	–	–	–	–	–	*125*	*75*	*60*	–	*125*	*75*	*45*	–	*75*	*45*	*45*	–	–	*75*	*45*	*30*	–	–	800	1 000
1 000	1 250	0	–125	*0*	*–75*	*0*	*–75*	–	–	–	–	–	–	–	–	*156*	*94*	*75*	–	*156*	*94*	*56*	–	*94*	*56*	*56*	–	–	*94*	*56*	*38*	–	–	1 000	1 250
1 250	1 600	0	–160	–	–	–	–	–	–	–	–	–	–	–	–	*200*	–	–	–	*200*	–	–	–	*120*	–	–	–	–	*120*	–	–	–	–	1 250	1 600
1 600	2 000	0	–200	–	–	–	–	–	–	–	–	–	–	–	–	*250*	–	–	–	*250*	–	–	–	*150*	–	–	–	–	*150*	–	–	–	–	1 600	2 000



Cylindrical bore



Tapered bore

(2) Inner ring (running accuracy and width)

Unit : μm

Nominal bore diameter d mm		Radial runout of assembled bearing inner ring K_{ia}					S_d			S_{ia} 2)			Single inner ring width deviation Δ_{Bs}										Single inner ring width deviation Δ_{Bs} 3)								Inner ring width variation V_{Bs}					Nominal bore diameter d mm	
		class 0	class 6	class 5	class 4	class 2	class 5	class 4	class 2	class 5	class 4	class 2	class 0		class 6		class 5		class 4		class 2		class 0 4)		class 6 4)		class 5 4)		classes 4, 2		class 0	class 6	class 5	class 4	class 2		
over	up to	max.					max.			max.			upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.					over	up to
–	0.6	10	5	4	2.5	1.5	7	3	1.5	7	3	1.5	0	–40	0	–40	0	–40	0	–40	0	–40	–	–	–	–	0	–250	0	–250	12	12	5	2.5	1.5	–	0.6
0.6	2.5	10	5	4	2.5	1.5	7	3	1.5	7	3	1.5	0	–40	0	–40	0	–40	0	–40	0	–40	–	–	–	–	0	–250	0	–250	12	12	5	2.5	1.5	0.6	2.5
2.5	10	10	6	4	2.5	1.5	7	3	1.5	7	3	1.5	0	–120	0	–120	0	–40	0	–40	0	–40	0	–250	0	–250	0	–250	0	–250	15	15	5	2.5	1.5	2.5	10
10	18	10	7	4	2.5	1.5	7	3	1.5	7	3	1.5	0	–120	0	–120	0	–80	0	–80	0	–80	0	–250	0	–250	0	–250	0	–250	20	20	5	2.5	1.5	10	18
18	30	13	8	4	3	2.5	8	4	1.5	8	4	2.5	0	–120	0	–120	0	–120	0	–120	0	–120	0	–250	0	–250	0	–250	0	–250	20	20	5	2.5	1.5	18	30
30	50	15	10	5	4	2.5	8	4	1.5	8	4	2.5	0	–120	0	–120	0	–120	0	–120	0	–120	0	–250	0	–250	0	–250	0	–250	20	20	5	3	1.5	30	50
50	80	20	10	5	4	2.5	8	5	1.5	8	5	2.5	0	–150	0	–150	0	–150	0	–150	0	–150	0	–380	0	–380	0	–250	0	–250	25	25	6	4	1.5	50	80
80	120	25	13	6	5	2.5	9	5	2.5	9	5	2.5	0	–200	0	–200	0	–200	0	–200	0	–200	0	–380	0	–380	0	–380	0	–380	25	25	7	4	2.5	80	120
120	150	30	18	8	6	2.5	10	6	2.5	10	7	2.5	0	–250	0	–250	0	–250	0	–250	0	–250	0	–500	0	–500	0	–380	0	–380	30	30	8	5	2.5	120	150
150	180	30	18	8	6	5	10	6	4	10	7	5	0	–250	0	–250	0	–250	0	–250	0	–250	0	–500	0	–500	0	–380	0	–380	30	30	8	5	4	150	180
180	250	40	20	10	8	5	11	7	5	13	8	5	0	–300	0	–300	0	–300	0	–300	0	–300	0	–500	0	–500	0	–500	0	–500	30	30	10	6	5	180	250
250	315	50	25	13	*10*	–	13	*8*	–	15	*9*	–	0	–350	0	–350	0	–350	*0*	*–350*	–	–	0	–500	0	–500	0	–500	–	–	35	35	13	*8*	–	250	315
315	400	60	30	15	*13*	–	15	*9*	–	20	*12*	–	0	–400	0	–400	0	–400	*0*	*–400*	–	–	0	–630	0	–630	0	–630	–	–	40	40	15	*9*	–	315	400
400	500	65	35	*20*	*15*	–	*18*	*11*	–	*25*	*15*	–	0	–450	0	–450	*0*	*–450*	*0*	*–450*	–	–	–	–	–	–	–	–	–	–	50	45	*18*	*11*	–	400	500
500	630	70	40	*25*	–	–	*25*	–	–	*30*	–	–	0	–500	0	–500	*0*	*–500*	–	–	–	–	–	–	–	–	–	–	–	–	60	50	*20*	–	–	500	630
630	800	80	*50*	*30*	–	–	*30*	–	–	*35*	–	–	0	–750	*0*	*–750*	*0*	*–750*	–	–	–	–	–	–	–	–	–	–	–	–	70	*60*	*23*	–	–	630	800
800	1 000	90	*60*	*40*	–	–	*40*	–	–	*45*	–	–	0	–1 000	*0*	*–1 000*	*0*	*–1 000*	–	–	–	–	–	–	–	–	–	–	–	–	80	*60*	*35*	–	–	800	1 000
1 000	1 250	100	*70*	*50*	–	–	*50*	–	–	*60*	–	–	0	–1 250	*0*	*–1 250*	*0*	*–1 250*	–	–	–	–	–	–	–	–	–	–	–	–	100	*60*	*45*	–	–	1 000	1 250
1 250	1 600	120	–	–	–	–	–	–	–	–	–	–	0	–1 600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	120	–	–	–	–	1 250	1 600
1 600	2 000	140	–	–	–	–	–	–	–	–	–	–	0	–2 000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	140	–	–	–	–	1 600	2 000

S_d : perpendicularity of inner ring face with respect to the bore S_{ia} : axial runout of assembled bearing inner ring

[Notes] 1) These shall be applied to bearings of diameter series 0, 1, 2, 3 and 4.
2) These shall be applied to deep groove ball bearings and angular contact ball bearings.
3) These shall be appplied to individual bearing rings manufactured for matched pair or stack bearings.
4) Also applicable to the inner ring with tapered bore of $d \geqq 50$ mm.

[Remark] Values in Italics are prescribed in JTEKT standards.

Table 7-3 (2) Radial bearing tolerances (tapered roller bearings excluded)

(3) Outer ring (outside diameter)

Unit : µm

Nominal outside dia. D mm		Single plane mean outside diameter deviation Δ_{Dmp}										Single outside diameter deviation Δ_{Ds}[1]			
		class 0		class 6		class 5		class 4		class 2		class 4[5]		class 2	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
–	2.5	0	– 8	0	– 7	0	– 5	0	– 4	0	– 2.5	0	– 4	0	– 2.5
2.5	6	0	– 8	0	– 7	0	– 5	0	– 4	0	– 2.5	0	– 4	0	– 2.5
6	18	0	– 8	0	– 7	0	– 5	0	– 4	0	– 2.5	0	– 4	0	– 2.5
18	30	0	– 9	0	– 8	0	– 6	0	– 5	0	– 4	0	– 5	0	– 4
30	50	0	– 11	0	– 9	0	– 7	0	– 6	0	– 4	0	– 6	0	– 4
50	80	0	– 13	0	– 11	0	– 9	0	– 7	0	– 4	0	– 7	0	– 4
80	120	0	– 15	0	– 13	0	– 10	0	– 8	0	– 5	0	– 8	0	– 5
120	150	0	– 18	0	– 15	0	– 11	0	– 9	0	– 5	0	– 9	0	– 5
150	180	0	– 25	0	– 18	0	– 13	0	– 10	0	– 7	0	– 10	0	– 7
180	250	0	– 30	0	– 20	0	– 15	0	– 11	0	– 8	0	– 11	0	– 8
250	315	0	– 35	0	– 25	0	– 18	0	– 13	0	– 8	0	– 13	0	– 8
315	400	0	– 40	0	– 28	0	– 20	0	– 15	0	– 10	0	– 15	0	– 10
400	500	0	– 45	0	– 33	0	– 23	*0*	*– 17*	–	–	*0*	*– 17*	–	–
500	630	0	– 50	0	– 38	0	– 28	*0*	*– 20*	–	–	*0*	*– 20*	–	–
630	800	0	– 75	0	– 45	0	– 35	–	–	–	–	–	–	–	–
800	1 000	0	– 100	0	– 60	*0*	*– 50*	–	–	–	–	–	–	–	–
1 000	1 250	0	– 125	*0*	*– 75*	*0*	*– 63*	–	–	–	–	–	–	–	–
1 250	1 600	0	– 160	*0*	*– 90*	*0*	*– 80*	–	–	–	–	–	–	–	–
1 600	2 000	0	– 200	*0*	*– 120*	–	–	–	–	–	–	–	–	–	–
2 000	2 500	0	– 250	–	–	–	–	–	–	–	–	–	–	–	–

Nominal outside dia. D mm		Single plane outside diameter variation V_{Dsp}															Mean outside diameter variation V_{Dmp}					Nominal outside dia. D mm	
		Diameter series 7, 8, 9				Diameter series 0, 1				Diameter series 2, 3, 4				Dia. series[1]	Shielded/sealed type Diameter series 2, 3, 4	Shielded/sealed type Diameter series 0, 1, 2, 3, 4							
		class 0[2]	class 6[2]	class 5[5]	class 4[5]	class 0[2]	class 6[2]	class 5[5]	class 4[5]	class 0[2]	class 6[2]	class 5[5]	class 4[5]	class 2	class 0[2]	class 6[2]	class 0[2]	class 6[2]	class 5	class 4	class 2		
over	up to	max.				max.				max.				max.	max.		max.					over	up to
–	2.5	10	9	5	4	8	7	4	3	6	5	4	3	2.5	10	9	6	5	3	2	1.5	–	2.5
2.5	6	10	9	5	4	8	7	4	3	6	5	4	3	2.5	10	9	6	5	3	2	1.5	2.5	6
6	18	10	9	5	4	8	7	4	3	6	5	4	3	2.5	10	9	6	5	3	2	1.5	6	18
18	30	12	10	6	5	9	8	5	4	7	6	5	4	4	12	10	7	6	3	2.5	2	18	30
30	50	14	11	7	6	11	9	5	5	8	7	5	5	4	16	13	8	7	4	3	2	30	50
50	80	16	14	9	7	13	11	7	5	10	8	7	5	4	20	16	10	8	5	3.5	2	50	80
80	120	19	16	10	8	19	16	8	6	11	10	8	6	5	26	20	11	10	5	4	2.5	80	120
120	150	23	19	11	9	23	19	8	7	14	11	8	7	5	30	25	14	11	6	5	2.5	120	150
150	180	31	23	13	10	31	23	10	8	19	14	10	8	7	38	30	19	14	7	5	3.5	150	180
180	250	38	25	15	11	38	25	11	8	23	15	11	8	8	–	–	23	15	8	6	4	180	250
250	315	44	31	18	13	44	31	14	10	26	19	14	10	8	–	–	26	19	9	7	4	250	315
315	400	50	35	20	15	50	35	15	11	30	21	15	11	10	–	–	30	21	10	8	5	315	400
400	500	56	41	23	*17*	56	41	17	*13*	34	25	17	*13*	–	–	–	34	25	12	*9*	–	400	500
500	630	63	48	28	*20*	63	48	21	*15*	38	29	21	*15*	–	–	–	38	29	14	*10*	–	500	630
630	800	94	56	35	–	94	56	26	–	55	34	26	–	–	–	–	55	34	18	–	–	630	800
800	1 000	125	75	*50*	–	125	75	*38*	–	75	45	*38*	–	–	–	–	75	45	*25*	–	–	800	1 000
1 000	1 250	*156*	*94*	*63*	–	*156*	*94*	*47*	–	*94*	*56*	*47*	–	–	–	–	*94*	*56*	*31*	–	–	1 000	1 250
1 250	1 600	*200*	*113*	*80*	–	*200*	*113*	*60*	–	*120*	*68*	*60*	–	–	–	–	*120*	*68*	*40*	–	–	1 250	1 600
1 600	2 000	*250*	*150*	–	–	*250*	*150*	–	–	*150*	*90*	–	–	–	–	–	*150*	*90*	–	–	–	1 600	2 000
2 000	2 500	*313*	–	–	–	*313*	–	–	–	*188*	–	–	–	–	–	–	*188*	–	–	–	–	2 000	2 500

(4) Outer ring (running accuracy and width)

Unit : µm

Nominal outside dia. D mm		Radial runout of assembled bearing outer ring K_{ea}					S_D[4]			S_{ea}[3) 4]			Δ_{Cs}[3]		Ring width variation V_{Cs}[3]			
		class 0	class 6	class 5	class 4	class 2	class 5	class 4	class 2	class 5	class 4	class 2	classes 0, 6, 5, 4, 2		classes 0, 6	class 5	class 4	class 2
over	up to	max.					max.			max.			upper	lower	max.			
–	2.5	15	8	5	3	1.5	8	4	1.5	8	5	1.5	Shall conform to the tolerance Δ_{Bs} on d of the same bearing		Shall conform to the tolerance V_{Bs} on d of the same bearing	5	2.5	1.5
2.5	6	15	8	5	3	1.5	8	4	1.5	8	5	1.5				5	2.5	1.5
6	18	15	8	5	3	1.5	8	4	1.5	8	5	1.5				5	2.5	1.5
18	30	15	9	6	4	2.5	8	4	1.5	8	5	2.5				5	2.5	1.5
30	50	20	10	7	5	2.5	8	4	1.5	8	5	2.5				5	2.5	1.5
50	80	25	13	8	5	4	8	4	1.5	10	5	4				6	3	1.5
80	120	35	18	10	6	5	9	5	2.5	11	6	5				8	4	2.5
120	150	40	20	11	7	5	10	5	2.5	13	7	5				8	5	2.5
150	180	45	23	13	8	5	10	5	2.5	14	8	5				8	5	2.5
180	250	50	25	15	10	7	11	7	4	15	10	7				10	7	4
250	315	60	30	18	11	7	13	8	5	18	10	7				11	7	5
315	400	70	35	20	13	8	13	10	7	20	13	8				13	8	7
400	500	80	40	23	*15*	–	15	*12*	–	23	*15*	–				15	*9*	–
500	630	100	50	25	*18*	–	18	*13*	–	25	*18*	–				18	*11*	–
630	800	120	60	30	–	–	20	–	–	30	–	–				20	–	–
800	1 000	140	75	*40*	–	–	*23*	–	–	*40*	–	–				*23*	–	–
1 000	1 250	160	*85*	*45*	–	–	*30*	–	–	*45*	–	–				*30*	–	–
1 250	1 600	190	*95*	*60*	–	–	*45*	–	–	*60*	–	–				*45*	–	–
1 600	2 000	220	*110*	–	–	–	–	–	–	–	–	–				–	–	–
2 000	2 500	250	–	–	–	–	–	–	–	–	–	–				–	–	–

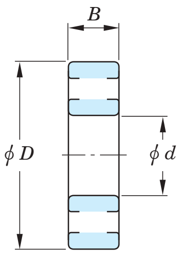
S_D : perpendicularity of outer ring outside surface with respect to the face
S_{ea} : axial runout of assembled bearing outer ring
Δ_{Cs} : deviation of a single outer ring width

[Notes]

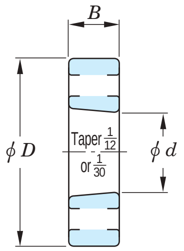
1) These shall be applied to bearings of diameter series 0, 1, 2, 3 and 4.
2) Shall be applied when locating snap ring is not fitted.
3) These shall be applied to deep groove ball bearings and angular contact ball bearings.
4) These shall not be applied to flanged bearings.
5) These shall not be applied to shielded bearings and sealed bearings.

[Remark]

Values in Italics are prescribed in JTEKT standards.



Cylindrical bore



Tapered bore

d : nominal bore diameter
D : nominal outside diameter
B : nominal assembled bearing width

(Refer.) Table 7-4 Tolerances for measuring instrument ball bearings (inch series)

= ANSI/ABMA standards = (reference)

(1) Inner ring and outer ring width

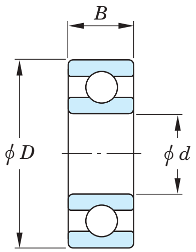
Unit : μm

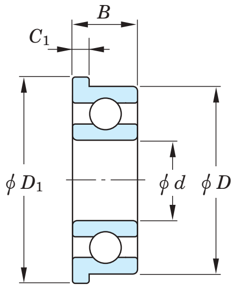
Nominal bore dia. d mm		Single plane mean bore diameter deviation Δ_{dmp}				Single bore diameter deviation Δ_{ds}				Single plane bore diameter variation V_{dsp}		Mean bore diameter variation V_{dmp}		Radial runout of assembled bearing inner ring K_{ia}			Axial runout of assembled bearing inner ring S_{ia}			Perpendicularity of inner ring face with respect to the bore S_d			Single inner or outer ring width deviation Δ_{Bs} , Δ_{Cs}		Inner or outer ring width variation V_{Bs} , V_{Cs}		
		classes 5P, 7P		class 9P		classes 5P, 7P		class 9P		classes 5P, 7P	class 9P	classes 5P, 7P	class 9P	class 5P	class 7P	class 9P	class 5P	class 7P	class 9P	class 5P	class 7P	class 9P	classes 5P, 7P, 9P		class 5P	class 7P	class 9P
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	max.		max.		max.			max.			max.			upper	lower	max.		
–	10	0	− 5.1	0	− 2.5	0	− 5.1	0	− 2.5	2.5	1.3	2.5	1.3	3.8	2.5	1.3	7.6	2.5	1.3	7.6	2.5	1.3	0	− 25.4	5.1	2.5	1.3
10	18	0	− 5.1	0	− 2.5	0	− 5.1	0	− 2.5	2.5	1.3	2.5	1.3	3.8	2.5	1.3	7.6	2.5	1.3	7.6	2.5	1.3	0	− 25.4	5.1	2.5	1.3
18	30	0	− 5.1	0	− 2.5	0	− 5.1	0	− 2.5	2.5	1.3	2.5	1.3	3.8	3.8	2.5	7.6	3.8	1.3	7.6	3.8	1.3	0	− 25.4	5.1	2.5	1.3

(2) Outer ring

Unit : μm

Nominal outside dia. D mm		Single plane mean outside diameter deviation Δ_{Dmp}				Single outside diameter deviation Δ_{Ds}						Single plane outside diameter variation V_{Dsp}			Mean outside diameter variation V_{Dmp}			Radial runout of assembled bearing outer ring K_{ea}			Axial runout of assembled bearing outer ring S_{ea}			Perpendicularity of outer ring outside surface with respect to the face S_D			Single outer ring flange outside diameter deviation Δ_{D1s}		Single outer ring flange width deviation Δ_{C1s}	
		classes 5P, 7P		class 9P		classes 5P, 7P				class 9P		classes 5P, 7P		class 9P	classes 5P, 7P		class 9P	class 5P	class 7P	class 9P	class 5P	class 7P	class 9P	class 5P	class 7P	class 9P	classes 5P, 7P		classes 5P, 7P	
						Open type		Shielded/ sealed type		Open type		Open type	Shielded/ sealed type	Open type	Open type	Shielded/ sealed type	Open type													
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.			max.			max.			max.			max.			upper	lower	upper	lower
–	18	0	− 5.1	0	− 2.5	0	− 5.1	+ 1	− 6.1	0	− 2.5	2.5	5.1	1.3	2.5	5.1	1.3	5.1	3.8	1.3	7.6	5.1	1.3	7.6	3.8	1.3	0	− 25.4	0	− 50.8
18	30	0	− 5.1	0	− 3.8	0	− 5.1	+ 1	− 6.1	0	− 3.8	2.5	5.1	2	2.5	5.1	2	5.1	3.8	2.5	7.6	5.1	2.5	7.6	3.8	1.3	0	− 25.4	0	− 50.8
30	50	0	− 5.1	0	− 3.8	0	− 5.1	+ 1	− 6.1	0	− 3.8	2.5	5.1	2	2.5	5.1	2	5.1	5.1	2.5	7.6	5.1	2.5	7.6	3.8	1.3	0	− 25.4	0	− 50.8





d : nominal bore diameter
D : nominal outside diameter
B : nominal assembled bearing width
D_1 : nominal outer ring flange outside diameter
C_1 : nominal outer ring flange width

Table 7-5 (1) Tolerances for metric series tapered roller bearings

= JIS B 1514-1 =

(1) Inner ring

Unit : µm

Nominal bore diameter d mm		Single plane mean bore diameter deviation $\Delta_{d\mathrm{mp}}$								Single bore diameter deviation $\Delta_{d\mathrm{s}}$				Single plane bore diameter variation $V_{d\mathrm{sp}}$					Mean bore diameter variation $V_{d\mathrm{mp}}$				
		classes 0, 6X		classes 6, 5		class 4		class 2		class 4		class 2		classes 0, 6X	class 6	class 5	class 4	class 2	classes 0, 6X	class 6	class 5	class 4	class 2
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.					max.				
–	10	0	–12	0	–7[1]	0	–5	0	–4	0	–5	0	–4	12	–	5	4	2.5	9	–	5	4	1.5
10	18	0	–12	0	–7	0	–5	0	–4	0	–5	0	–4	12	7	5	4	2.5	9	5	5	4	1.5
18	30	0	–12	0	–8	0	–6	0	–4	0	–6	0	–4	12	8	6	5	2.5	9	6	5	4	1.5
30	50	0	–12	0	–10	0	–8	0	–5	0	–8	0	–5	12	10	8	6	3	9	8	5	5	2
50	80	0	–15	0	–12	0	–9	0	–5	0	–9	0	–5	15	12	9	7	4	11	9	6	5	2
80	120	0	–20	0	–15	0	–10	0	–6	0	–10	0	–6	20	15	11	8	5	15	11	8	5	2.5
120	180	0	–25	0	–18	0	–13	0	–7	0	–13	0	–7	25	18	14	10	7	19	14	9	7	3.5
180	250	0	–30	0	–22	0	–15	0	–8	0	–15	0	–8	30	22	17	11	7	23	16	11	8	4
250	315	0	–35	0	–25[1]	0	–18	0	–8	0	–18	0	–8	35	*25*	19	12	8	26	*19*	13	9	5
315	400	0	–40	0	–30[1]	–	–	–	–	–	–	–	–	40	*30*	23	–	–	30	*23*	15	–	–
400	500	0	–45	0	–35[1]	–	–	–	–	–	–	–	–	45	*35*	28	–	–	34	*26*	17	–	–
500	630	0	–60	0	–40[1]	–	–	–	–	–	–	–	–	60	*40*	35	–	–	40	*30*	20	–	–
630	800	0	–75	0	–50[1]	–	–	–	–	–	–	–	–	75	*50*	45	–	–	45	*38*	25	–	–
800	1 000	0	–100	0	–60[1]	–	–	–	–	–	–	–	–	100	*60*	60	–	–	55	*45*	30	–	–

Radial runout of assembled bearing inner ring K_{ia}					S_{d}			S_{ia}		Single inner ring width deviation $\Delta_{B\mathrm{s}}$										Nominal bore diameter d mm	
classes 0, 6X	class 6	class 5	class 4	class 2	class 5	class 4	class 2	class 4	class 2	class 0		class 6X		class 6		classes 5, 4		class 2			
max.					max.			max.		upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	over	up to
15	–	5	3	2	7	3	1.5	3	2	0	–120	0	–50	–	–	0	–200	0	–200	–	10
15	7	5	3	2	7	3	1.5	3	2	0	–120	0	–50	0	–120	0	–200	0	–200	10	18
18	8	5	3	2.5	8	4	1.5	4	2.5	0	–120	0	–50	0	–120	0	–200	0	–200	18	30
20	10	6	4	2.5	8	4	2	4	2.5	0	–120	0	–50	0	–120	0	–240	0	–240	30	50
25	10	7	4	3	8	5	2	4	3	0	–150	0	–50	0	–150	0	–300	0	–300	50	80
30	13	8	5	3	9	5	2.5	5	3	0	–200	0	–50	0	–200	0	–400	0	–400	80	120
35	18	11	6	4	10	6	3.5	7	4	0	–250	0	–50	0	–250	0	–500	0	–500	120	180
50	20	13	8	5	11	7	5	8	5	0	–300	0	–50	0	–300	0	–600	0	–600	180	250
60	*30*	13	9	6	13	8	5.5	9	6	0	–350	0	–50	*0*	*–350*	0	–700	0	–700	250	315
70	*35*	15	–	–	15	–	–	–	–	0	–400	0	–50	*0*	*–400*	0	–800[2]	–	–	315	400
80	*40*	20	–	–	17	–	–	–	–	0	–450	0	–50	*0*	*–450*	0	–900[2]	–	–	400	500
90	*50*	25	–	–	20	–	–	–	–	0	–500	–	–	*0*	*–500*	0	–1 100[2]	–	–	500	630
100	*60*	30	–	–	25	–	–	–	–	0	–750	–	–	*0*	*–750*	0	–1 600[2]	–	–	630	800
115	*75*	37	–	–	30	–	–	–	–	0	–1 000	–	–	*0*	*–1 000*	0	–2 000[2]	–	–	800	1 000

S_{d} : perpendicularity of inner ring face with respect to the bore
S_{ia} : axial runout of assembled bearing inner ring

(2-1) Outer ring

Unit : µm

Nominal outside diameter D mm		Single plane mean outside diameter deviation $\Delta_{D\mathrm{mp}}$								Single outside diameter deviation $\Delta_{D\mathrm{s}}$				Single plane outside diameter variation $V_{D\mathrm{sp}}$					Mean outside diameter variation $V_{D\mathrm{mp}}$				
		classes 0, 6X		classes 6, 5		class 4		class 2		class 4		class 2		classes 0, 6X	class 6	class 5	class 4	class 2	classes 0, 6X	class 6	class 5	class 4	class 2
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.					max.				
–	18	0	–12	0	–8[1]	0	–6	0	–5	0	–6	0	–5	12	–	6	5	4	9	–	5	4	2.5
18	30	0	–12	0	–8	0	–6	0	–5	0	–6	0	–5	12	8	6	5	4	9	6	5	4	2.5
30	50	0	–14	0	–9	0	–7	0	–5	0	–7	0	–5	14	9	7	5	4	11	7	5	5	2.5
50	80	0	–16	0	–11	0	–9	0	–6	0	–9	0	–6	16	11	8	7	4	12	8	6	5	2.5
80	120	0	–18	0	–13	0	–10	0	–6	0	–10	0	–6	18	13	10	8	5	14	10	7	5	3
120	150	0	–20	0	–15	0	–11	0	–7	0	–11	0	–7	20	15	11	8	5	15	11	8	6	3.5
150	180	0	–25	0	–18	0	–13	0	–7	0	–13	0	–7	25	18	14	10	7	19	14	9	7	4
180	250	0	–30	0	–20	0	–15	0	–8	0	–15	0	–8	30	20	15	11	8	23	15	10	8	5
250	315	0	–35	0	–25	0	–18	0	–9	0	–18	0	–9	35	25	19	14	8	26	19	13	9	5
315	400	0	–40	0	–28	0	–20	0	–10	0	–20	0	–10	40	28	22	15	10	30	21	14	10	6
400	500	0	–45	0	–33[1]	–	–	–	–	–	–	–	–	45	*33*	26	–	–	34	*25*	17	–	–
500	630	0	–50	0	–38[1]	–	–	–	–	–	–	–	–	60	*38*	30	–	–	38	*29*	20	–	–
630	800	0	–75	0	–45[1]	–	–	–	–	–	–	–	–	80	*45*	38	–	–	55	*34*	25	–	–
800	1 000	0	–100	0	–60[1]	–	–	–	–	–	–	–	–	100	*60*	50	–	–	75	*45*	30	–	–
1 000	1 250	0	–125	0	–80[1]	–	–	–	–	–	–	–	–	130	*75*	65	–	–	90	*56*	38	–	–
1 250	1 600	0	–160	0	–100[1]	–	–	–	–	–	–	–	–	170	*90*	90	–	–	100	*68*	50	–	–

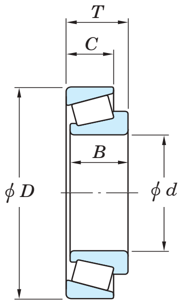
Radial runout of assembled bearing outer ring K_{ea}					S_{D}[3]			S_{ea}[3]		Nominal outside diameter D mm	
classes 0, 6X	class 6	class 5	class 4	class 2	class 5	class 4	class 2	class 4	class 2		
max.					max.			max.		over	up to
18	–	6	4	2.5	8	4	1.5	5	2.5	–	18
18	9	6	4	2.5	8	4	1.5	5	2.5	18	30
20	10	7	5	2.5	8	4	2	5	2.5	30	50
25	13	8	5	4	8	4	2.5	5	4	50	80
35	18	10	6	5	9	5	3	6	5	80	120
40	20	11	7	5	10	5	3.5	7	5	120	150
45	23	13	8	5	10	5	4	8	5	150	180
50	25	15	10	7	11	7	5	10	7	180	250
60	30	18	11	7	13	8	6	10	7	250	315
70	35	20	13	8	13	10	7	13	8	315	400
80	*40*	24	–	–	17	–	–	–	–	400	500
100	*50*	30	–	–	20	–	–	–	–	500	630
120	*60*	36	–	–	25	–	–	–	–	630	800
140	*75*	43	–	–	30	–	–	–	–	800	1 000
160	*85*	52	–	–	38	–	–	–	–	1 000	1 250
180	*95*	62	–	–	50	–	–	–	–	1 250	1 600

S_{D} : perpendicularity of outer ring outside surface with respect to the face
S_{ea} : axial runout of assembled bearing outer ring

(2-2) Outer ring

Unit : µm

Nominal bore diameter d mm		Single outer ring width deviation $\Delta_{C\mathrm{s}}$			
		class 6X		classes 0, 6, 5, 4, 2	
over	up to	upper	lower	upper	lower
–	10	0	–100	Shall comform to the tolerance $\Delta_{B\mathrm{s}}$ on d of the same bearing	
10	18	0	–100		
18	30	0	–100		
30	50	0	–100		
50	80	0	–100		
80	120	0	–100		
120	180	0	–100		
180	250	0	–100		
250	315	0	–100		
315	400	0	–100		
400	500	0	–100		
500	630	–	–		
630	800	–	–		
800	1 000	–	–		



d : nominal bore diameter
D : nominal outside diameter
B : nominal inner ring width
C : nominal outer ring width
T : nominal assembled bearing width

[Notes] 1) Class 6 values are prescribed in JTEKT standards.
2) These shall be applied to bearings of tolerance class 5.
3) These shall not be applied to flanged bearings.

[Remark] Values in Italics are prescribed in JTEKT standards.

Table 7-5 (2) Tolerances for metric series tapered roller bearings

(3) Assembled bearing width and effective width

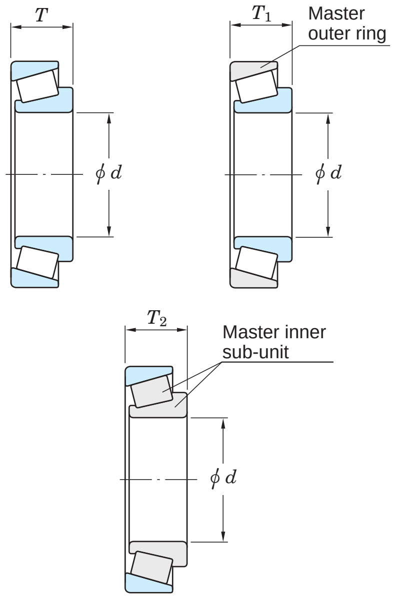
Unit : µm

Nominal bore diameter d mm		Actual bearing width deviation Δ_{Ts}										Actual effective inner sub-unit width deviation Δ_{T1s}							
		class 0		class 6X		class 6		classes 5, 4		class 2		class 0		class 6X		classes 5, 4		class 2	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
–	10	+200	0	+100	0	–	–	+200	–200	+200	–200	+100	0	+50	0	+100	–100	+100	–100
10	18	+200	0	+100	0	+200	0	+200	–200	+200	–200	+100	0	+50	0	+100	–100	+100	–100
18	30	+200	0	+100	0	+200	0	+200	–200	+200	–200	+100	0	+50	0	+100	–100	+100	–100
30	50	+200	0	+100	0	+200	0	+200	–200	+200	–200	+100	0	+50	0	+100	–100	+100	–100
50	80	+200	0	+100	0	+200	0	+200	–200	+200	–200	+100	0	+50	0	+100	–100	+100	–100
80	120	+200	–200	+100	0	+200	–200	+200	–200	+200	–200	+100	–100	+50	0	+100	–100	+100	–100
120	180	+350	–250	+150	0	+350	–250	+350	–250	+200	–250	+150	–150	+50	0	+150	–150	+100	–100
180	250	+350	–250	+150	0	+350	–250	+350	–250	+200	–300	+150	–150	+50	0	+150	–150	+100	–150
250	315	+350	–250	+200	0	*+350*	*–250*	+350	–250	+200	–300	+150	–150	+100	0	+150	–150	+100	–150
315	400	+400	–400	+200	0	*+400*	*–400*	+400	–400[1]	–	–	+200	–200	+100	0	+200	–200[1]	–	–
400	500	+450	–450	+200	0	*+400*	*–400*	+450	–450[1]	–	–	+225	–225	+100	0	+225	–225[1]	–	–
500	630	+500	–500	–	–	*+500*	*–500*	+500	–500[1]	–	–	–	–	–	–	–	–	–	–
630	800	+600	–600	–	–	*+600*	*–600*	+600	–600[1]	–	–	–	–	–	–	–	–	–	–
800	1 000	+750	–750	–	–	*+750*	*–750*	+750	–750[1]	–	–	–	–	–	–	–	–	–	–

Nominal bore diameter d mm		Actual effective outer ring width deviation Δ_{T2s}							
		class 0		class 6X		classes 5, 4		class 2	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower
–	10	+100	0	+50	0	+100	–100	+100	–100
10	18	+100	0	+50	0	+100	–100	+100	–100
18	30	+100	0	+50	0	+100	–100	+100	–100
30	50	+100	0	+50	0	+100	–100	+100	–100
50	80	+100	0	+50	0	+100	–100	+100	–100
80	120	+100	–100	+50	0	+100	–100	+100	–100
120	180	+200	–100	+100	0	+200	–100	+100	–150
180	250	+200	–100	+100	0	+200	–100	+100	–150
250	315	+200	–100	+100	0	+200	–100	+100	–150
315	400	+200	–200	+100	0	+200	–200[1]	–	–
400	500	+225	–225	+100	0	+225	–225[1]	–	–
500	630	–	–	–	–	–	–	–	–
630	800	–	–	–	–	–	–	–	–
800	1 000	–	–	–	–	–	–	–	–

[Note] 1) These shall be applied to bearings of tolerance class 5.

[Remark] Values in Italics are prescribed in JTEKT standards.



d : nominal bore diameter
T : nominal assembled bearing width
T_1 : nominal effective width of inner sub-unit
T_2 : nominal effective width of outer ring

Table 7-6 Tolerances for metric series double-row and four-row tapered roller bearings (class 0)

= BAS 1002 =

(1) Inner ring, outer ring width and overall width

Unit : µm

Nominal bore diameter d mm		Single plane mean bore diameter deviation Δ_{dmp}		Single plane bore diameter variation V_{dsp}	Mean bore diameter variation V_{dmp}	K_{ia}	Single outer ring or inner ring width deviation Δ_{Bs}, Δ_{Cs}		Actual overall inner rings/outer rings width deviation			
									Double-row Δ_{Ts}		Four-row Δ_{Ts}, Δ_{Ws}	
over	up to	upper	lower	max.	max.	max.	upper	lower	upper	lower	upper	lower
30	50	0	–12	12	9	20	0	–120	+240	–240	–	–
50	80	0	–15	15	11	25	0	–150	+300	–300	–	–
80	120	0	–20	20	15	30	0	–200	+400	–400	+500	–500
120	180	0	–25	25	19	35	0	–250	+500	–500	+600	–600
180	250	0	–30	30	23	50	0	–300	+600	–600	+750	–750
250	315	0	–35	35	26	60	0	–350	+700	–700	+900	–900
315	400	0	–40	40	30	70	0	–400	+800	–800	+1 000	–1 000
400	500	0	–45	45	34	80	0	–450	+900	–900	+1 200	–1 200
500	630	0	–60	60	40	90	0	–500	+1 000	–1 000	+1 200	–1 200
630	800	0	–75	75	45	100	0	–750	+1 500	–1 500	–	–
800	1 000	0	–100	100	55	115	0	–1 000	+1 500	–1 500	–	–

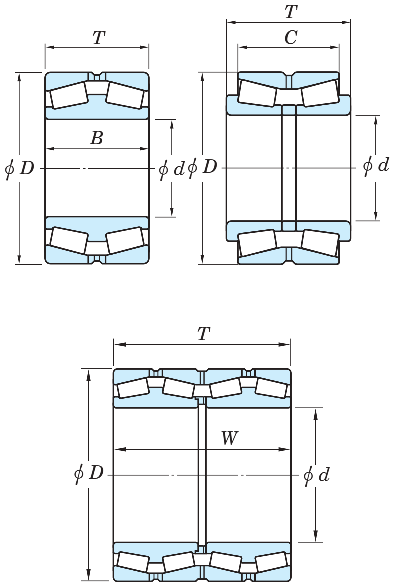
K_{ia} : radial runout of assembled bearing inner ring

(2) Outer ring

Unit : µm

Nominal outside diameter D mm		Single plane mean outside diameter deviation Δ_{Dmp}		Single plane outside diameter variation V_{Dsp}	Mean outside diameter variation V_{Dmp}	K_{ea}
over	up to	upper	lower	max.	max.	max.
50	80	0	–16	16	12	25
80	120	0	–18	18	14	35
120	150	0	–20	20	15	40
150	180	0	–25	25	19	45
180	250	0	–30	30	23	50
250	315	0	–35	35	26	60
315	400	0	–40	40	30	70
400	500	0	–45	45	34	80
500	630	0	–50	60	38	100
630	800	0	–75	80	55	120
800	1 000	0	–100	100	75	140
1 000	1 250	0	–125	130	90	160
1 250	1 600	0	–160	170	100	180

K_{ea} : radial runout of assembled bearing outer ring



d : nominal bore diameter
D : nominal outside diameter
B : nominal double inner ring width
C : nominal double outer ring width
T, W : nominal overall width of outer rings (inner rings)

Table 7-7 Tolerances and permissible values for inch series tapered roller bearings

= ANSI/ABMA 19 =

(1) Inner ring

Unit : µm

Applied bearing type	Nominal bore diameter d, mm (1/25.4)		Deviation of a single bore diameter Δ_{ds}									
			class 4		class 2		class 3		class 0		class 00	
	over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
All types	–	**76.2** (3.0)	+13	0	+13	0	+13	0	+13	0	+8	0
	76.2 (3.0)	**266.7** (10.5)	+25	0	+25	0	+13	0	+13	0	+8	0
	266.7 (10.5)	**304.8** (12.0)	+25	0	+25	0	+13	0	+13	0	+8	0
	304.8 (12.0)	**609.6** (24.0)	+51	0	+51	0	+25	0	–	–	–	–
	609.6 (24.0)	**914.4** (36.0)	+76	0	–	–	+38	0	–	–	–	–
	914.4 (36.0)	**1 219.2** (48.0)	+102	0	–	–	+51	0	–	–	–	–
	1 219.2 (48.0)	–	+127	0	–	–	+76	0	–	–	–	–

(2) Outer ring

Unit : µm

Applied bearing type	Nominal outside diameter D, mm (1/25.4)		Deviation of a single outside diameter Δ_{Ds}									
			class 4		class 2		class 3		class 0		class 00	
	over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
All types	–	**266.7** (10.5)	+25	0	+25	0	+13	0	+13	0	+8	0
	266.7 (10.5)	**304.8** (12.0)	+25	0	+25	0	+13	0	+13	0	+8	0
	304.8 (12.0)	**609.6** (24.0)	+51	0	+51	0	+25	0	–	–	–	–
	609.6 (24.0)	**914.4** (36.0)	+76	0	+76	0	+38	0	–	–	–	–
	914.4 (36.0)	**1 219.2** (48.0)	+102	0	–	–	+51	0	–	–	–	–
	1 219.2 (48.0)	–	+127	0	–	–	+76	0	–	–	–	–

(3) Radial runout of assembled bearing inner ring/outer ring

Unit : µm

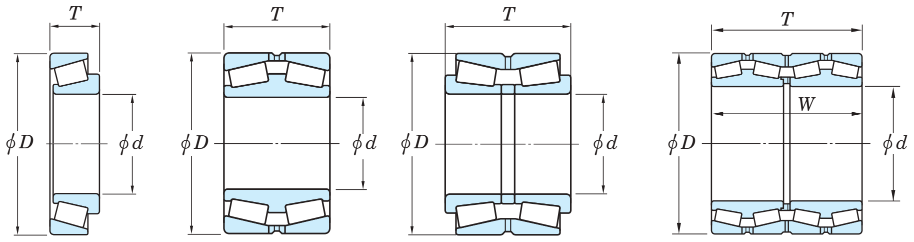
Applied bearing type	Nominal outside diameter D, mm (1/25.4)		Radial runout of inner ring/outer ring K_{ia}, K_{ea}				
			class 4	class 2	class 3	class 0	class 00
	over	up to	max.	max.	max.	max.	max.
All types	–	**266.7** (10.5)	51	38	8	4	2
	266.7 (10.5)	**304.8** (12.0)	51	38	8	4	2
	304.8 (12.0)	**609.6** (24.0)	51	38	18	–	–
	609.6 (24.0)	**914.4** (36.0)	76	51	51	–	–
	914.4 (36.0)	**1 219.2** (48.0)	76	–	76	–	–
	1 219.2 (48.0)	–	76	–	76	–	–

(4) Assembled bearing width and overall width

Unit : µm

Applied bearing type	Nominal bore diameter d, mm (1/25.4)		Nominal outside diameter D, mm (1/25.4)		Deviation of the actual bearing width and overall width of inner rings/outer rings Δ_{Ts}, Δ_{Ws}							
					class 4		class 2		class 3		classes 0,00	
	over	up to	over	up to	upper	lower	upper	lower	upper	lower	upper	lower
Single-row	–	**101.6** (4.0)	–	–	+ 203	0	+ 203	0	+ 203	– 203	+ 203	– 203
	101.6 (4.0)	**266.7** (10.5)			+ 356	– 254	+ 203	0	+ 203	– 203	+ 203	– 203
	266.7 (10.5)	**304.8** (12.0)	–	–	+ 356	– 254	+ 203	0	+ 203	– 203	+ 203	– 203 1)
	304.8 (12.0)	**609.6** (24.0)	–	**508.0** (20.0)	–	–	+ 381	– 381	+ 203	– 203	–	–
	304.8 (12.0)	**609.6** (24.0)	**508.0** (20.0)	–	–	–	+ 381	– 381	+ 381	– 381	–	–
	609.6 (24.0)		–	–	+ 381	– 381	–	–	+ 381	– 381	–	–
Double-row	–	**101.6** (4.0)	–	–	+ 406	0	+ 406	0	+ 406	– 406	+ 406	– 406
	101.6 (4.0)	**266.7** (10.5)	–	–	+ 711	– 508	+ 406	– 203	+ 406	– 406	+ 406	– 406
	266.7 (10.5)	**304.8** (12.0)	–	–	+ 711	– 508	+ 406	– 203	+ 406	– 406	+ 406	– 406 1)
	304.8 (12.0)	**609.6** (24.0)	–	**508.0** (20.0)	–	–	+ 762	– 762	+ 406	– 406	–	–
	304.8 (12.0)	**609.6** (24.0)	**508.0** (20.0)	–	–	–	+ 762	– 762	+ 762	– 762	–	–
	609.6 (24.0)		–	–	+ 762	– 762	–	–	+ 762	– 762	–	–
Double-row (TNA type)	–	**127.0** (5.0)	–	–	–	–	+ 254	0	+ 254	0	–	–
	127.0 (5.0)		–	–	–	–	+ 762	0	+ 762	0	–	–
Four-row	Total dimensional range		–	–	+1 524	–1 524	+1 524	–1 524	+1 524	–1 524	+1 524	–1 524

[Note] 1) These shall be applied to bearings of class 0.



d : nominal bore diameter

D : nominal outside diameter

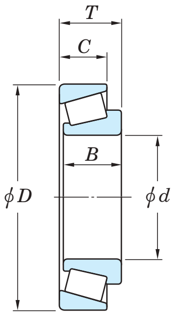
T, W : nominal assembled bearing width and nominal overall width of outer rings (inner rings)

Table 7-8 Tolerances for metric J series tapered roller bearings [1]

(1) Bore diameter and width of inner ring and assembled bearing width

Unit : µm

Nominal bore diameter d mm		Deviation of a single bore diameter Δ_{ds}								Deviation of a single inner ring width Δ_{Bs}								Deviation of the actual bearing width Δ_{Ts}								Nominal bore diameter d mm	
		class PK		class PN		class PC		class PB		class PK		class PN		class PC		class PB		class PK		class PN		class PC		class PB			
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	over	up to
10	**18**	0	– 12	0	– 12	0	– 7	0	– 5	0	– 100	0	– 50	0	– 200	0	– 200	+ 200	0	+ 100	0	+ 200	– 200	+ 200	– 200	**10**	**18**
18	**30**	0	– 12	0	– 12	0	– 8	0	– 6	0	– 100	0	– 50	0	– 200	0	– 200	+ 200	0	+ 100	0	+ 200	– 200	+ 200	– 200	**18**	**30**
30	**50**	0	– 12	0	– 12	0	– 10	0	– 8	0	– 100	0	– 50	0	– 200	0	– 200	+ 200	0	+ 100	0	+ 200	– 200	+ 200	– 200	**30**	**50**
50	**80**	0	– 15	0	– 15	0	– 12	0	– 9	0	– 150	0	– 50	0	– 300	0	– 300	+ 200	0	+ 100	0	+ 200	– 200	+ 200	– 200	**50**	**80**
80	**120**	0	– 20	0	– 20	0	– 15	0	– 10	0	– 150	0	– 50	0	– 300	0	– 300	+ 200	– 200	+ 100	0	+ 200	– 200	+ 200	– 200	**80**	**120**
120	**180**	0	– 25	0	– 25	0	– 18	0	– 13	0	– 200	0	– 50	0	– 300	0	– 300	+ 350	– 250	+ 150	0	+ 350	– 250	+ 200	– 250	**120**	**180**
180	**250**	0	– 30	0	– 30	0	– 22	0	– 15	0	– 200	0	– 50	0	– 350	0	– 350	+ 350	– 250	+ 150	0	+ 350	– 250	+ 200	– 300	**180**	**250**
250	**315**	0	– 35	0	– 35	0	– 22	0	– 15	0	– 200	0	– 50	0	– 350	0	– 350	+ 350	– 250	+ 200	0	+ 350	– 300	+ 200	– 300	**250**	**315**



d : nominal bore diameter
D : nominal outside diameter
B : nominal inner ring width
C : nominal outer ring width
T : nominal assembled bearing width

(2) Outside diameter and width of outer ring and radial runout of assembled bearing inner ring/outer ring

Unit : µm

Nominal outside diameter D mm		Deviation of a single outside diameter Δ_{Ds}								Deviation of a single outer ring width Δ_{Cs}								Radial runout of inner ring/outer ring K_{ia}, K_{ea}				Nominal outside diameter D mm	
		class PK		class PN		class PC		class PB		class PK		class PN		class PC		class PB		class PK	class PN	class PC	class PB		
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.	max.	max.	max.	over	up to
18	**30**	0	– 12	0	– 12	0	– 8	0	– 6	0	– 150	0	– 100	0	– 150	0	– 150	18	18	5	3	**18**	**30**
30	**50**	0	– 14	0	– 14	0	– 9	0	– 7	0	– 150	0	– 100	0	– 150	0	– 150	20	20	6	3	**30**	**50**
50	**80**	0	– 16	0	– 16	0	– 11	0	– 9	0	– 150	0	– 100	0	– 150	0	– 150	25	25	6	4	**50**	**80**
80	**120**	0	– 18	0	– 18	0	– 13	0	– 10	0	– 200	0	– 100	0	– 200	0	– 200	35	35	6	4	**80**	**120**
120	**150**	0	– 20	0	– 20	0	– 15	0	– 11	0	– 200	0	– 100	0	– 200	0	– 200	40	40	7	4	**120**	**150**
150	**180**	0	– 25	0	– 25	0	– 18	0	– 13	0	– 200	0	– 100	0	– 250	0	– 250	45	45	8	4	**150**	**180**
180	**250**	0	– 30	0	– 30	0	– 20	0	– 15	0	– 250	0	– 100	0	– 250	0	– 250	50	50	10	5	**180**	**250**
250	**315**	0	– 35	0	– 35	0	– 25	0	– 18	0	– 250	0	– 100	0	– 300	0	– 300	60	60	11	5	**250**	**315**
315	**400**	0	– 40	0	– 40	0	– 28	–	–	0	– 250	0	– 100	0	– 300	–	–	70	70	13	–	**315**	**400**

[Note] 1) Bearings with supplementary code “J” attached at the front of bearing number
Ex. JHM720249/JHM720210, and the like

Table 7-9 Tolerances for thrust ball bearings = JIS B 1514-2 =

(1) Shaft race and central race

Unit : μm

Nominal bore diameter of shaft or central race d or d_2, mm		Single plane mean bore diameter deviation $\Delta_{d\mathrm{mp}}$ or $\Delta_{d2\mathrm{mp}}$				Single plane bore diameter variation $V_{d\mathrm{sp}}$ or $V_{d2\mathrm{sp}}$		Race raceway to back face thickness variation S_{i} 1) 2)			
		classes 0, 6, 5		class 4		classes 0, 6, 5	class 4	class 0	class 6	class 5	class 4
over	up to	upper	lower	upper	lower	max.		max.			
–	18	0	– 8	0	– 7	6	5	10	5	3	2
18	30	0	– 10	0	– 8	8	6	10	5	3	2
30	50	0	– 12	0	– 10	9	8	10	6	3	2
50	80	0	– 15	0	– 12	11	9	10	7	4	3
80	120	0	– 20	0	– 15	15	11	15	8	4	3
120	180	0	– 25	0	– 18	19	14	15	9	5	4
180	250	0	– 30	0	– 22	23	17	20	10	5	4
250	315	0	– 35	0	– 25	26	19	25	13	7	5
315	400	0	– 40	0	– 30	30	23	30	15	7	5
400	500	0	– 45	0	– 35	34	26	30	18	9	6
500	630	0	– 50	0	– 40	38	30	35	21	11	7
630	800	0	– 75	0	– 50	55	40	40	25	13	8
800	1 000	0	– 100	–	–	75	–	45	30	15	–
1 000	1 250	0	– 125	–	–	95	–	50	35	18	–

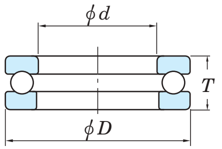
[Notes] 1) Double direction thrust ball bearings shall be included in d of single direction thrust ball bearings of the same diameter series and nominal outside diameter.
2) Applies only to thrust ball bearings and cylindrical roller thrust bearings with 90° contact angle.

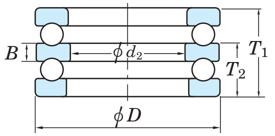
(2) Housing race

Unit : μm

Nominal outside diameter D mm		Single plane mean outside diameter deviation $\Delta_{D\mathrm{mp}}$				Single plane outside diameter variation $V_{D\mathrm{sp}}$		Race raceway to back face thickness variation S_{e} 1) 2)
		classes 0, 6, 5		class 4		classes 0, 6, 5	class 4	classes 0, 6, 5, 4
over	up to	upper	lower	upper	lower	max.		max.
10	18	0	– 11	0	– 7	8	5	Shall conform to the tolerance S_{i} on d or d_2 of the same bearing
18	30	0	– 13	0	– 8	10	6	
30	50	0	– 16	0	– 9	12	7	
50	80	0	– 19	0	– 11	14	8	
80	120	0	– 22	0	– 13	17	10	
120	180	0	– 25	0	– 15	19	11	
180	250	0	– 30	0	– 20	23	15	
250	315	0	– 35	0	– 25	26	19	
315	400	0	– 40	0	– 28	30	21	
400	500	0	– 45	0	– 33	34	25	
500	630	0	– 50	0	– 38	38	29	
630	800	0	– 75	0	– 45	55	34	
800	1 000	0	– 100	0	– 60	75	45	
1 000	1 250	0	– 125	–	–	95	–	
1 250	1 600	0	– 160	–	–	120	–	

[Notes] 1) These shall be applied to race with flat back face only.
2) Applies only to thrust ball bearings and cylindrical roller thrust bearings with 90° contact angle.





d : shaft race nominal bore diameter
d_2 : central race nominal bore diameter
D : housing race nominal outside diameter
B : central race nominal height
T : nominal bearing height (single direction)
T_1, T_2 : nominal bearing height (double direction)

(3) Bearing height and central race height

Unit : μm

Nominal bore diameter d mm		Single direction		Double direction					
		Deviation of the actual bearing height $\Delta_{T\mathrm{s}}$		Deviation of the actual bearing height $\Delta_{T1\mathrm{s}}$ 1)		Deviation of the actual bearing height $\Delta_{T2\mathrm{s}}$ 1)		Deviation of a single central race height B $\Delta_{B\mathrm{s}}$ 1)	
		class 0		class 0		class 0		class 0	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower
–	30	*0*	*– 75*	*+ 50*	*– 150*	*0*	*– 75*	*0*	*– 50*
30	50	*0*	*– 100*	*+ 75*	*– 200*	*0*	*– 100*	*0*	*– 75*
50	80	*0*	*– 125*	*+ 100*	*– 250*	*0*	*– 125*	*0*	*– 100*
80	120	*0*	*– 150*	*+ 125*	*– 300*	*0*	*– 150*	*0*	*– 125*
120	180	*0*	*– 175*	*+ 150*	*– 350*	*0*	*– 175*	*0*	*– 150*
180	250	*0*	*– 200*	*+ 175*	*– 400*	*0*	*– 200*	*0*	*– 175*
250	315	*0*	*– 225*	*+ 200*	*– 450*	*0*	*– 225*	*0*	*– 200*
315	400	*0*	*– 300*	*+ 250*	*– 600*	*0*	*– 300*	*0*	*– 250*

[Note] 1) Double direction thrust ball bearings shall be included in d of single direction thrust ball bearings of the same diameter series and nominal outside diameter.

[Remark] Values in Italics are prescribed in JTEKT standards.

Table 7-10 Tolerances for spherical thrust roller bearings (class 0) = JIS B 1514-2 =

(1) Shaft race

Unit : μm

Nominal bore diameter d mm		Single plane mean bore diameter deviation $\Delta_{d\mathrm{mp}}$		Single plane bore diameter variation $V_{d\mathrm{sp}}$	Refer.		
					S_{d}	Actual bearing height deviation $\Delta_{T\mathrm{s}}$	
over	up to	upper	lower	max.	max.	upper	lower
50	80	0	– 15	11	*25*	*+ 150*	*– 150*
80	120	0	– 20	15	*25*	*+ 200*	*– 200*
120	180	0	– 25	19	*30*	*+ 250*	*– 250*
180	250	0	– 30	23	*30*	*+ 300*	*– 300*
250	315	0	– 35	26	*35*	*+ 350*	*– 350*
315	400	0	– 40	30	*40*	*+ 400*	*– 400*
400	500	0	– 45	34	*45*	*+ 450*	*– 450*

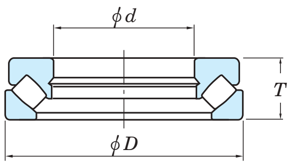
S_{d} : perpendicularity of inner ring face with respect to the bore

[Remark] Values in Italics are prescribed in JTEKT standards.

(2) Housing race

Unit : μm

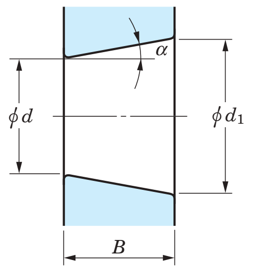
Nominal outside diameter D, mm		Single plane mean outside diameter deviation $\Delta_{D\mathrm{mp}}$	
over	up to	upper	lower
120	180	0	– 25
180	250	0	– 30
250	315	0	– 35
315	400	0	– 40
400	500	0	– 45
500	630	0	– 50
630	800	0	– 75
800	1 000	0	– 100



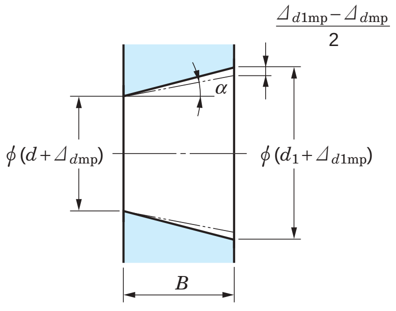
d : shaft race nominal bore diameter
D : housing race nominal outside diameter
T : nominal bearing height

Table 7-11 Tolerances and permissible values for tapered bores of radial bearings

(class 0 ··· JIS B 1514-1)



Theoretical tapered bore



Tapered bore with single plane mean bore diameter deviation

(1) Basically tapered bore (taper 1:12)

Unit : µm

Nominal bore diameter d, mm		$\Delta_{d\mathrm{mp}}$		$\Delta_{d1\mathrm{mp}} - \Delta_{d\mathrm{mp}}$		$V_{d\mathrm{sp}}$ 1)
over	up to	upper	lower	upper	lower	max.
–	10	+ 22	0	+ 15	0	9
10	18	+ 27	0	+ 18	0	11
18	30	+ 33	0	+ 21	0	13
30	50	+ 39	0	+ 25	0	16
50	80	+ 46	0	+ 30	0	19
80	120	+ 54	0	+ 35	0	22
120	180	+ 63	0	+ 40	0	40
180	250	+ 72	0	+ 46	0	46
250	315	+ 81	0	+ 52	0	52
315	400	+ 89	0	+ 57	0	57
400	500	+ 97	0	+ 63	0	63
500	630	+ 110	0	+ 70	0	70
630	800	+ 125	0	+ 80	0	–
800	1 000	+ 140	0	+ 90	0	–
1 000	1 250	+ 165	0	+ 105	0	–
1 250	1 600	+ 195	0	+ 125	0	–

(2) Basically tapered bore (taper 1:30)

Unit : µm

Nominal bore diameter d, mm		$\Delta_{d\mathrm{mp}}$		$\Delta_{d1\mathrm{mp}} - \Delta_{d\mathrm{mp}}$		$V_{d\mathrm{sp}}$ 1)
over	up to	upper	lower	upper	lower	max.
–	50	+ 15	0	+ 30	0	19
50	80	+ 15	0	+ 30	0	19
80	120	+ 20	0	+ 35	0	22
120	180	+ 25	0	+ 40	0	40
180	250	+ 30	0	+ 46	0	46
250	315	+ 35	0	+ 52	0	52
315	400	+ 40	0	+ 57	0	57
400	500	+ 45	0	+ 63	0	63
500	630	+ 50	0	+ 70	0	70

[Note] 1) These shall be applied to all radial planes with tapered bore, not be applied to bearings of diameter series 7, 8.

[Remark] 1) Symbols of quantity

d_1 : reference diameter at theoretical large end of tapered bore

$$d_1 = d + \frac{1}{12}B \quad \text{or} \quad d_1 = d + \frac{1}{30}B$$

$\Delta_{d\mathrm{mp}}$: single plane mean bore diameter deviation at theoretical small end of tapered bore

$\Delta_{d1\mathrm{mp}}$: single plane mean bore diameter deviation at theoretical large end of tapered bore

$V_{d\mathrm{sp}}$: single plane bore diameter variation (a tolerance for the diameter variation given by a maximum value applying in any radial plane of the bore)

B : nominal inner ring width

α : $\frac{1}{2}$ of nominal tapered angle of tapered bore

(tapered ratio 1/12)	(tapered ratio 1/30)
$\alpha = 2°23'9.4''$	$\alpha = 0°57'17.4''$
$= 2.385\ 94°$	$= 0.954\ 84°$
$= 0.041\ 643$ rad	$= 0.016\ 665$ rad

Table 7-12 Tolerances and permissible values for flanged radial ball bearings

(1) Tolerances on flange outside diameters

Unit : µm

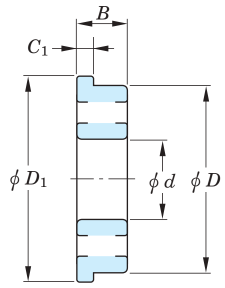
Nominal outer ring flange outside diameter D_1 (mm)		Deviation of single outer ring flange outside diameter, $\Delta_{D1\mathrm{s}}$			
		Locating flange		Non-locating flange	
over	up to	upper	lower	upper	lower
–	6	0	– 36	+ 220	– 36
6	10	0	– 36	+ 220	– 36
10	18	0	– 43	+ 270	– 43
18	30	0	– 52	+ 330	– 52
30	50	0	– 62	+ 390	– 62
50	80	0	– 74	+ 460	– 74

(2) Tolerances and permissible values on flange widths and permissible values of running accuracies relating to flanges

Unit : µm

Nominal outside diameter D (mm)		Deviation of single outer ring flange width $\Delta_{C1\mathrm{s}}$ 1)		Variation of outer ring flange width $V_{C1\mathrm{s}}$ 1)				Perpendicularity of outer ring outside surface with respect to the flange back face S_{D1}						Axial runout of assembled bearing outer ring flange back face S_{ea1}				
								Deep groove ball bearings and angular contact ball bearings			Tapered roller bearings			Deep groove ball bearings and angular contact ball bearings			Tapered roller bearings	
		classes 0, 6, 5, 4, 2		classes 0, 6	class 5	class 4	class 2	class 5	class 4	class 2	class 5	class 4	class 2	class 5	class 4	class 2	class 4	class 2
over	up to	upper	lower	max.				max.			max.			max.			max.	
–	2.5	Shall conform to the tolerance Δ_{Bs} on d of the same class and the bearing		Shall conform to the tolerance V_{Bs} on d of the same class and the bearing	5	2.5	1.5	8	4	1.5	8	4	1.5	11	7	3	7	4
2.5	6				5	2.5	1.5	8	4	1.5	8	4	1.5	11	7	3	7	4
6	18				5	2.5	1.5	8	4	1.5	8	4	1.5	11	7	3	7	4
18	30				5	2.5	1.5	8	4	1.5	8	4	1.5	11	7	4	7	4
30	50				5	2.5	1.5	8	4	1.5	8	4	2	11	7	4	7	4
50	80				6	3	1.5	8	4	1.5	8	4	2.5	14	7	6	7	6

[Note] 1) These shall be applied to groove ball bearings, i.e. deep groove ball bearing and angular contact ball bearing etc.



d : nominal bore diameter

D : nominal outside diameter

B : nominal assembled bearing width

D_1 : nominal outer ring flange outside diameter

C_1 : nominal outer ring flange width

Table 7-13 Permissible values for chamfer dimensions = JIS B 1514-3 =

(1) Radial bearing (tapered roller bearings excluded)

Unit : mm

$r_{\rm min}$ or $r_{1\,\rm min}$	Nominal bore diameter d mm		$r_{\rm max}$ or $r_{1\,\rm max}$	
	over	up to	Radial direction	Axial direction
0.05	–	–	0.1	0.2
0.08	–	–	0.16	0.3
0.1	–	–	0.2	0.4
0.15	–	–	0.3	0.6
0.2	–	–	0.5	0.8
0.3	–	40	0.6	1
	40	–	0.8	1
0.6	–	40	1	2
	40	–	1.3	2
1	–	50	1.5	3
	50	–	1.9	3
1.1	–	120	2	3.5
	120	–	2.5	4
1.5	–	120	2.3	4
	120	–	3	5
2	–	80	3	4.5
	80	220	3.5	5
	220	–	3.8	6
2.1	–	280	4	6.5
	280	–	4.5	7
2.5	–	100	3.8	6
	100	280	4.5	6
	280	–	5	7
3	–	280	5	8
	280	–	5.5	8
4	–	–	6.5	9
5	–	–	8	10
6	–	–	10	13
7.5	–	–	12.5	17
9.5	–	–	15	19
12	–	–	18	24
15	–	–	21	30
19	–	–	25	38

[Remarks]

1. Value of $r_{\rm max}$ or $r_{1\,\rm max}$ in the axial direction of bearings with nominal width lower than 2 mm shall be the same as the value in radial direction.
2. There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{\rm min}$ or $r_{1\,\rm min}$ which contacts the inner ring side face and bore, or the outer ring side face and outside surface.

(2) Radial bearings with locating snap ring (snap ring groove side) and cylindrical roller bearings (separete thrust collar and loose rib side)

Unit : mm

$r_{1\,\rm min}$	Nominal bore dia. or nominal outside dia. d or D		$r_{1\,\rm max}$	
	over	up to	Radial direction	Axial direction
0.2	–	–	0.5	0.5
0.3	–	40	0.6	0.8
	40	–	0.8	0.8
0.5	–	40	1	1.5
	40	–	1.3	1.5
0.6	–	40	1	1.5
	40	–	1.3	1.5
1	–	50	1.5	2.2
	50	–	1.9	2.2
1.1	–	120	2	2.7
	120	–	2.5	2.7
1.5	–	120	2.3	3.5
	120	–	3	3.5
2	–	80	3	4
	80	220	3.5	4
	220	–	3.8	4
2.1	–	280	4	4.5
	280	–	4.5	4.5
2.5	–	100	3.8	5
	100	280	4.5	5
	280	–	5	5
3	–	280	5	5.5
	280	–	5.5	5.5
4	–	–	6.5	6.5
5	–	–	8	8
6	–	–	10	10

[Remark] There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{1\,\rm min}$ which contacts the inner ring side face and bore, or the outer ring side face and outside surface.

(3) Cylindrical roller bearings (non-rib side) and angular contact ball bearings (front face side)

Unit : mm

$r_{1\,\rm min}$	Nominal bore dia. or nominal outside dia. d or D		$r_{1\,\rm max}$	
	over	up to	Radial direction	Axial direction
0.1	–	–	0.2	0.4
0.15	–	–	0.3	0.6
0.2	–	–	0.5	0.8
0.3	–	40	0.6	1
	40	–	0.8	1
0.6	–	40	1	2
	40	–	1.3	2
1	–	50	1.5	3
	50	–	1.9	3
1.1	–	120	2	3.5
	120	–	2.5	4
1.5	–	120	2.3	4
	120	–	3	5
2	–	80	3	4.5
	80	220	3.5	5
	220	–	3.8	6

[Remark] There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{1\,\rm min}$ which contacts the inner ring side face and bore, or the outer ring side face and outside surface.

(4) Metric series tapered roller bearing

Unit : mm

$r_{\rm min}$ or $r_{1\,\rm min}$	Nominal bore dia. or nominal outside dia.$^{1)}$ d or D, mm		$r_{\rm max}$ or $r_{1\,\rm max}$	
	over	up to	Radial direction	Axial direction
0.3	–	40	0.7	1.4
	40	–	0.9	1.6
0.6	–	40	1.1	1.7
	40	–	1.3	2
1	–	50	1.6	2.5
	50	–	1.9	3
1.5	–	120	2.3	3
	120	250	2.8	3.5
	250	–	3.5	4
2	–	120	2.8	4
	120	250	3.5	4.5
	250	–	4	5
2.5	–	120	3.5	5
	120	250	4	5.5
	250	–	4.5	6
3	–	120	4	5.5
	120	250	4.5	6.5
	250	400	5	7
	400	–	5.5	7.5
4	–	120	5	7
	120	250	5.5	7.5
	250	400	6	8
	400	–	6.5	8.5
5	–	180	6.5	8
	180	–	7.5	9
6	–	180	7.5	10
	180	–	9	11
7.5	–	–	*12.5*	*17*
9.5	–	–	*15*	*19*

[Note] 1) Inner ring shall be included in division d, and outer ring, in division D.

[Remarks]

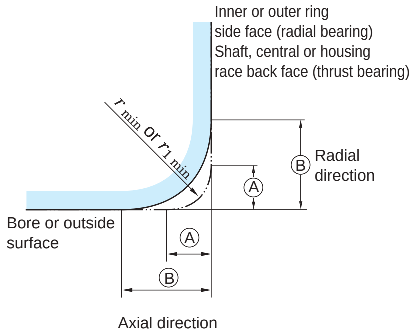
1. There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{\rm min}$ or $r_{1\,\rm min}$ which contacts the inner ring back face and bore, or the outer ring back face and outside surface.
2. Values in Italics are provided in JTEKT standards.

(5) Thrust bearing

Unit : mm

$r_{\rm min}$ or $r_{1\,\rm min}$	$r_{\rm max}$ or $r_{1\,\rm max}$
	Radial and axial direction
0.05	0.1
0.08	0.16
0.1	0.2
0.15	0.3
0.2	0.5
0.3	0.8
0.6	1.5
1	2.2
1.1	2.7
1.5	3.5
2	4
2.1	4.5
3	5.5
4	6.5
5	8
6	10
7.5	12.5
9.5	15
12	18
15	21
19	25

[Remark] There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{\rm min}$ or $r_{1\,\rm min}$ which contacts with the shaft or central race back face and bore, or the housing race back face and outside surface.



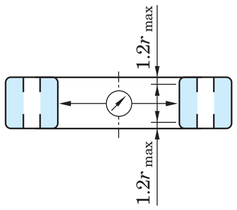
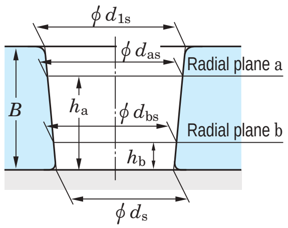
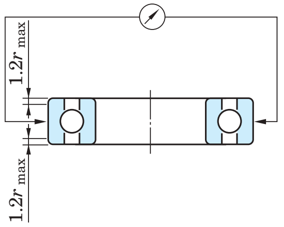
(Ⓐ : $r_{\rm min}$ or $r_{1\,\rm min}$
Ⓑ : $r_{\rm max}$ or $r_{1\,\rm max}$)

7-2 Tolerance measuring method (reference)

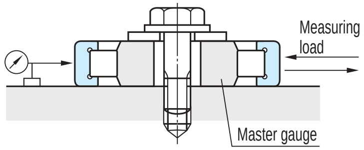
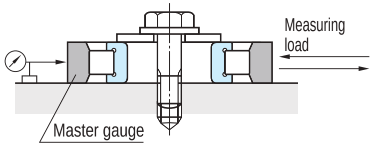
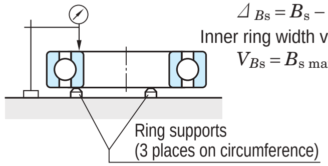
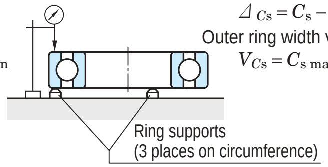
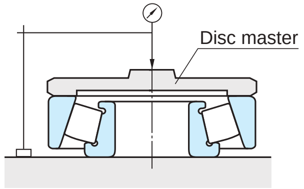
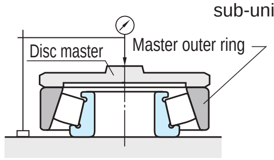
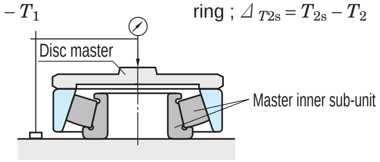
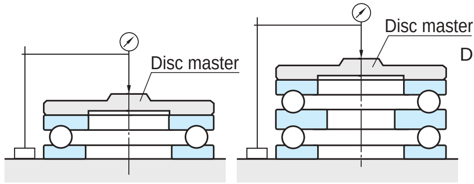
The details on measuring methods for bearings are prescribed in JIS B 1515-2.

This section outlines measuring methods for dimensional and running accuracy.

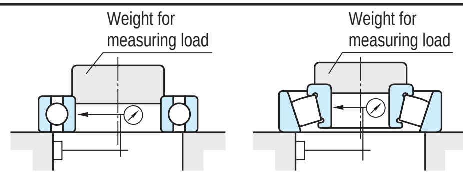
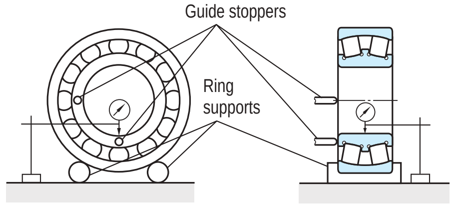
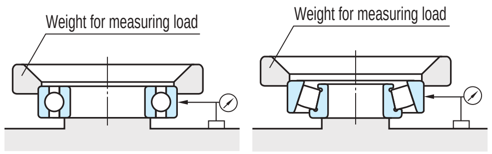
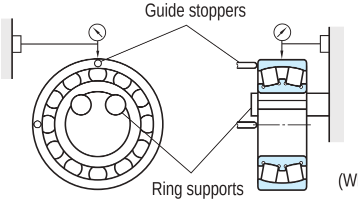
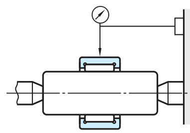
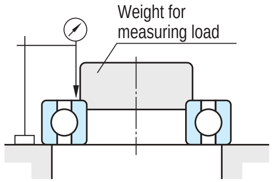
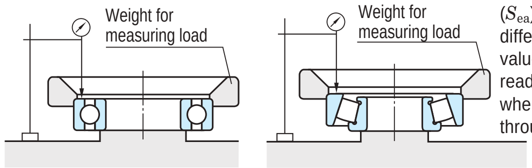
Dimensional accuracy (1)

Bore diameter (d) **Cylindrical bore bearings**	Obtain the maximum value ($d_{\mathrm{sp\,max}}$) and the minimum value ($d_{\mathrm{sp\,min}}$) of the bore diameter (d_{s}) acquired in a single radial plane. Obtain the single plane mean bore diameter (d_{mp}) as the arithmetic mean value of the maximum value ($d_{\mathrm{sp\,max}}$) and minimum values ($d_{\mathrm{sp\,min}}$).  $d_{\mathrm{mp}} = \dfrac{d_{\mathrm{sp\,max}} + d_{\mathrm{sp\,min}}}{2}$ Single plane mean bore diameter deviation ; $\Delta_{d\mathrm{mp}} = d_{\mathrm{mp}} - d$ Bore diameter variation in a single plane ; $V_{d\mathrm{sp}} = d_{\mathrm{sp\,max}} - d_{\mathrm{sp\,min}}$ Mean bore diameter variation ; $V_{d\mathrm{mp}} = d_{\mathrm{mp\,max}} - d_{\mathrm{mp\,min}}$ Deviation of a single bore diameter ; $\Delta_{d\mathrm{s}} = d_{\mathrm{s}} - d$
Bore diameter (d) **Tapered bore bearings**	 Bore diameter at the theoretical small end and bore diameter at the theoretical large end ; $d_{\mathrm{s}} = \dfrac{d_{\mathrm{bs}} \cdot h_{\mathrm{a}} - d_{\mathrm{as}} \cdot h_{\mathrm{b}}}{h_{\mathrm{a}} - h_{\mathrm{b}}}$ $d_{1\mathrm{s}} = \dfrac{d_{\mathrm{as}}\,(B - h_{\mathrm{b}}) - d_{\mathrm{bs}}\,(B - h_{\mathrm{a}})}{h_{\mathrm{a}} - h_{\mathrm{b}}}$ Single plane mean bore diameter deviation at the theoretical small end ; $\Delta_{d\mathrm{mp}} = d_{\mathrm{mp}} - d$ Deviation on taper ; $(\Delta_{d1\mathrm{mp}} - \Delta_{d\mathrm{mp}}) = (d_{1\mathrm{mp}} - d_1) - (d_{\mathrm{mp}} - d)$ Bore diameter variation in a single plane ; $V_{d\mathrm{sp}} = d_{\mathrm{sp\,max}} - d_{\mathrm{sp\,min}}$
Outside diameter (D)	Obtain the single plane mean outside diameter (D_{mp}) as the arithmetical mean value of the maximum value ($D_{\mathrm{sp\,max}}$) and the minimum value ($D_{\mathrm{sp\,min}}$) of the outside diameters (D_{s}) acquired in a single radial plane.  $D_{\mathrm{mp}} = \dfrac{D_{\mathrm{sp\,max}} + D_{\mathrm{sp\,min}}}{2}$ Single plane mean outside diameter deviation ; $\Delta_{D\mathrm{mp}} = D_{\mathrm{mp}} - D$ Outside diameter variation in a single plane ; $V_{D\mathrm{sp}} = D_{\mathrm{sp\,max}} - D_{\mathrm{sp\,min}}$ Mean outside diameter variation ; $V_{D\mathrm{mp}} = D_{\mathrm{mp\,max}} - D_{\mathrm{mp\,min}}$ Deviation of a single outside diameter ; $\Delta_{D\mathrm{s}} = D_{\mathrm{s}} - D$

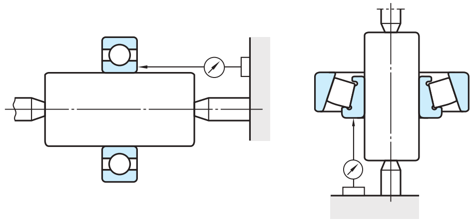
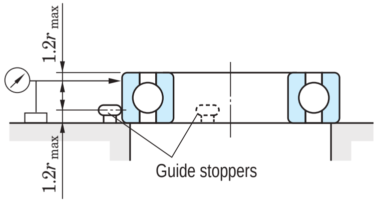
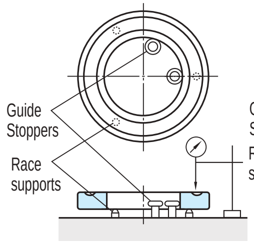
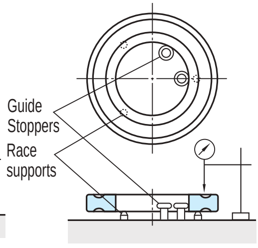
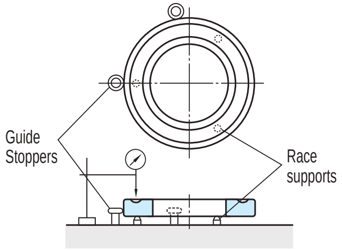
Dimensional accuracy (2)

Roller set bore diameter (F_{w})	 Deviation of the roller set bore diameter ; $\Delta_{F\mathrm{w}} = (d_{\mathrm{G}} + \delta_{1\mathrm{m}}) - F_{\mathrm{w}}$ Deviation of the minimum diameter of the roller set bore diameter ; $\Delta_{F\mathrm{w\,min}} = (d_{\mathrm{G}} + \delta_{1\mathrm{min}}) - F_{\mathrm{w}}$ (d_{G}) outside diameter of the master gauge ($\delta_{1\mathrm{m}}$) arithmetical mean value of the amount of movement of the outer ring ($\delta_{1\mathrm{min}}$) minimum value of the amount of movement of the outer ring
Roller set outside diameter (E_{w})	 Deviation of the roller set outside diameter ; $\Delta_{E\mathrm{w}} = (D_{\mathrm{G}} + \delta_{2\mathrm{m}}) - E_{\mathrm{w}}$ (D_{G}) bore diameter of the master gauge ($\delta_{2\mathrm{m}}$) arithmetical mean value of the amount of movement of the master gauge
Inner ring width (B) **Outer ring width** (C)	Deviation of a single inner ring width ; $\Delta_{B\mathrm{s}} = B_{\mathrm{s}} - B$ Inner ring width variation ; $V_{B\mathrm{s}} = B_{\mathrm{s\,max}} - B_{\mathrm{s\,min}}$  Deviation of a single outer ring width ; $\Delta_{C\mathrm{s}} = C_{\mathrm{s}} - C$ Outer ring width variation ; $V_{C\mathrm{s}} = C_{\mathrm{s\,max}} - C_{\mathrm{s\,min}}$ 
Assembled bearing width of tapered roller bearing (T)	 Deviation of the actual bearing width ; $\Delta_{T\mathrm{s}} = T_{\mathrm{s}} - T$
Nominal effective width of tapered roller bearing (T_1, T_2)	Deviation of the actual effective width of inner sub-unit ; $\Delta_{T1\mathrm{s}} = T_{1\mathrm{s}} - T_1$  Deviation of the actual effective width of outer ring ; $\Delta_{T2\mathrm{s}} = T_{2\mathrm{s}} - T_2$ 
Nominal height of thrust ball bearing with flat back face (T, T_1)	 Deviation of the actual bearing height ; $\Delta_{T\mathrm{s}} = T_{\mathrm{s}} - T$ (single direction) $\Delta_{T1\mathrm{s}} = T_{1\mathrm{s}} - T_1$ (double direction)

Running accuracy (1)

Radial runout of assembled bearing inner ring (K_{ia})		The radial runout of the inner ring (K_{ia}) shall be obtained as the difference between the maximum value and the minimum value of the readings of the measuring instrument, when the inner ring has been rotated through one rotation.
		[Note] The measurement of the radial runout of the inner ring of cylindrical roller bearings, machined ring needle roller bearings, self-aligning ball bearings and spherical roller bearings shall be carried out by fixing the outer ring with ring supports.
Radial runout of assembled bearing outer ring (K_{ea})		The measurement of outer ring runout (K_{ea}) shall be obtained as the difference between the maximum value and the minimum value of the readings of the measuring instrument, when the outer ring has been rotated through one rotation.
	  (When inner ring is not fitted.)	[Note] The measurement of the radial runout of the outer ring of cylindrical roller bearings, machined ring needle roller bearings, self-aligning ball bearings and spherical roller bearings shall be carried out by fixing the inner ring with ring supports.
Axial runout of assembled bearing inner ring (S_{ia})		The axial runout of the inner ring (S_{ia}) shall be obtained as the difference between the maximum value and the minimum value of the readings of the measuring instrument, when the inner ring has been rotated through one rotation.
Axial runout of assembled bearing outer ring (S_{ea})		The axial runout of the outer ring (S_{ea}) shall be obtained as the difference between the maximum value and the minimum value of the readings of the measuring instrument, when the outer ring has been rotated through one rotation.

Running accuracy (2)

Perpendicularity of inner ring face with respect to the bore (S_{d})		Perpendicularity of inner ring face (S_{d}) shall be obtained as the difference between the maximum value and the minimum value of the readings of the measuring instrument, when the inner ring has been rotated through one rotation with the tapered arbor.
Perpendicularity of outer ring outside surface with respect to the face (S_{D})		Perpendicularity of outer ring outside surface (S_{D}) shall be obtained as the difference between the maximum value and the minimum value of the readings of the measuring instrument, when the outer ring has been rotated through one rotation along the guide stopper.
Shaft/central race raceway to back face thickness variation of thrust ball bearing with flat back face (S_{i})	 (Shaft race)  (Central race)	The measurement of the thickness variation (S_{i}) of shaft race raceway track shall be obtained as the difference between the maximum value and the minimum value of the readings of the measuring instrument, when the shaft race has been rotated through one rotation along the guide stopper. For the central race, carry out the same measurement for the two raceway grooves to obtain the thickness variation of the raceway track (S_{i}).
Housing race raceway to back face thickness variation of thrust ball bearing with flat back face (S_{e})		The measurement of the thickness variation (S_{e}) of housing race raceway track shall be obtained as the difference between the maximum value and the minimum value of the readings of the measuring instrument, when the housing race has been rotated through one rotation along the guide stopper.

8. Limiting speed

The rotational speed of a bearing is normally affected by friction heat generated in the bearing. If the heat exceeds a certain amount, seizure or other failures occur, thus causing rotation to be discontinued.

The limiting speed is the highest speed at which a bearing can continuously operate without generating such critical heat.

The limiting speed differs depending on various factors including bearing type, dimensions and their accuracy, lubrication, lubricant type and amount, shapes of cages and materials and load conditions, etc.

The limiting speed determined under grease lubrication and oil lubrication (oil bath) for each bearing type are listed in the bearing specification table.

These speeds are applied when bearings of standard design are rotated under normal load conditions (approximately, $C/P \geqq 16^*$, $F_a/F_r \leqq 0.25$).

Each lubricant has superior performance in use, according to type.

Some are not suitable for high speed ; when bearing rotational speed exceeds 80 % of catalog specification, consult with JTEKT.

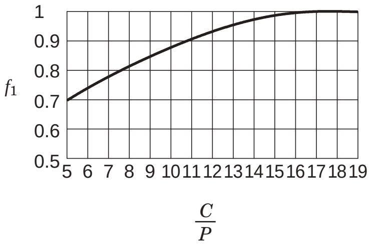


Fig. 8-1a Values of correction coefficient f_1 of load magnitude (Excludes K type bearings and railway rolling stock axle journals)

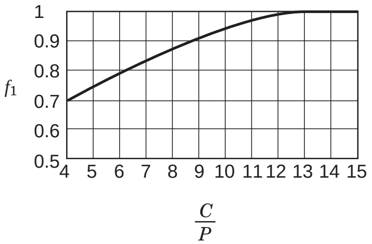


Fig. 8-1b Values of correction coefficient f_1 of load magnitude (K type bearings and railway rolling stock axle journals)

8-1 Correction of limiting speed

When the load condition is $C/P < 16^*$, i.e. the dynamic equivalent load P exceeds approximately 6* % of basic dynamic load rating C, or when a combined load in which the axial load is greater than 25 % of radial load is applied, the limiting speed should be corrected by using equation (8-1) :

$$n_a = f_1 \cdot f_2 \cdot n \quad \text{(8-1)}$$

where :

n_a	: corrected limiting speed	$\min^{-1}$
f_1	: correction coefficient determined from the load magnitude (Fig. 8-1)	
f_2	: correction coefficient determined from combined load (Fig. 8-2)	
n	: limiting speed under normal load condition (values in the bearing specification table)	$\min^{-1}$
C	: basic dynamic load rating	N
P	: dynamic equivalent load	N
F_r	: radial load	N
F_a	: axial load	N

* 13 (8 %) for K type bearings and railway rolling stock axle journals

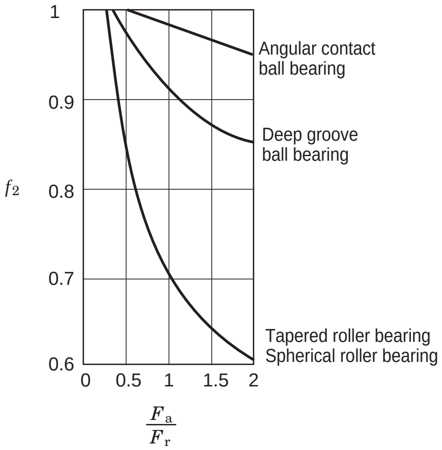


Fig. 8-2 Values of correction coefficient f_2 of combined load

8-2 Limiting speed for sealed ball bearings

The limiting speed of ball bearings with a contact seal (RS, RK type) are determined by the rubbing speed at which the seal contacts the inner ring. These allowable rubbing speeds differ depending on seal rubber materials; and, for ball bearings with the Koyo standard contact type seal (NBR), a rubbing speed of 15 m/s is utilized.

8-3 Considerations for high speed

When bearings are used for high speed, especially when the rotation speed approaches the limiting speed or exceeds it, the following should be considered :
(for further information on high speed, consult with JTEKT)

(1) Use of high precision bearings
(2) Study of proper internal clearance
  Reduction in internal clearance caused by temperature increase should be considered.
(3) Selection of proper cage type and materials
  For high speed, copper alloy or phenolic resin machined cages are suitable. Synthetic resin molded cages for high speed are also available.
(4) Selection of proper lubrication
  Suitable lubrication for high speed should be selected jet lubrication, oil mist lubrication and oil air lubrication, etc.

8-4 Frictional coefficient (reference)

The frictional moment of rolling bearings can be easily compared with that of plain bearings. The frictional moment of rolling bearings can be obtained from their bore diameter, using the following equation :

$$M = \mu P \frac{d}{2} \quad \text{(8-2)}$$

where :

M	: frictional moment	mN · m
μ	: frictional coefficient	
P	: load on the bearing	N
d	: nominal bore diameter	mm

The friction coefficient is greatly dependent on bearing type, bearing load, rotation speed and lubrication, etc.

Reference values for the friction coefficient during stable operation under normal operating conditions are listed in Table 8-1.

For plain bearings, the value is normally 0.01 to 0.02 ; but, for certain cases, it is 0.1 to 0.2.

Table 8-1 Friction coefficient μ

Bearing type	Friction coefficient μ
Deep groove ball bearing	0.001 0 – 0.001 5
Angular contact ball bearing	0.001 2 – 0.002 0
Self-aligning ball bearing	0.000 8 – 0.001 2
Cylindrical roller bearing	0.000 8 – 0.001 2
Full complement type needle roller bearing	0.002 5 – 0.003 5
Needle roller and cage assembly	0.002 0 – 0.003 0
Tapered roller bearing	0.001 7 – 0.002 5
Spherical roller bearing	0.002 0 – 0.002 5
Thrust ball bearing	0.001 0 – 0.001 5
Spherical thrust roller bearing	0.002 0 – 0.002 5

9. Bearing fits

9-1 Purpose of fit

The purpose of fit is to securely fix the inner or outer ring to the shaft or housing, to preclude detrimental circumferential sliding on the fitting surface.

Such detrimental sliding (referred to as "creep") will cause abnormal heat generation, wear of the fitting surface, infiltration of abrasion metal particles into the bearing, vibration, and many other harmful effects, which cause a deterioration of bearing functions.

Therefore, it is necessary to fix the bearing ring which is rotating under load to the shaft or housing with interference.

9-2 Tolerance and fit for shaft & housing

For metric series bearings, tolerances for the shaft diameter and housing bore diameter are standardized in JIS B 0401-1 and 0401-2 "ISO system of limits and fits - Part 1 and Part 2" (based on ISO 286; shown in Appendixes at the back of this catalogue). Bearing fits on the shaft and housing are determined based on the tolerances specified in the above standard.

Fig. 9-1 shows the relationship between tolerances for shaft and housing bore diameters and fits for bearings of class 0 tolerance.

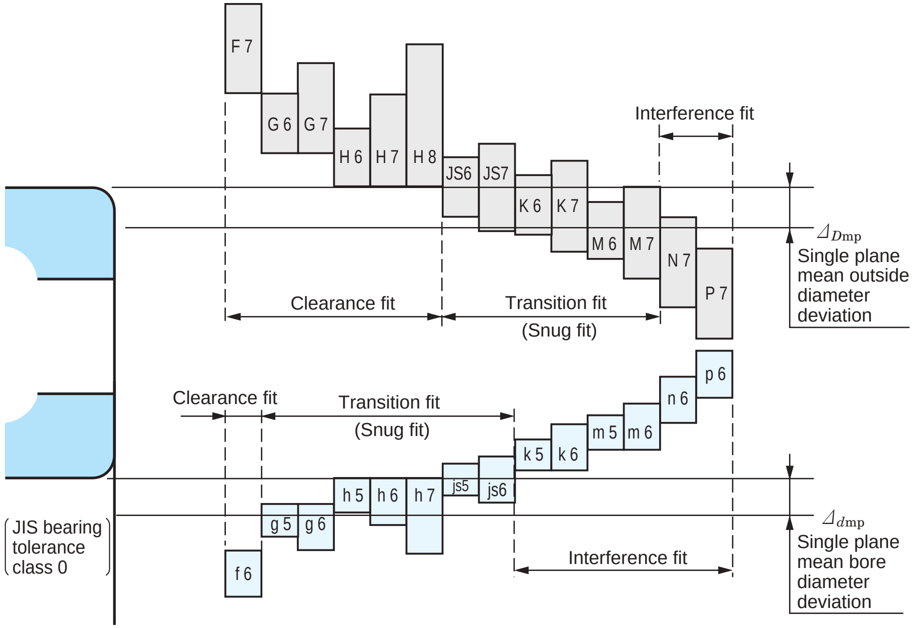


Fig. 9-1 Relationship between tolerances for shaft/housing bore diameters and fits (bearings of class 0 tolerance)

9-3 Fit selection

In selecting the proper fit, careful consideration should be given to bearing operating conditions.

Major specific considerations are :

- Load characteristics and magnitude
- Temperature distribution in operating
- Bearing internal clearance
- Surface finish, material and thickness of shaft and housing
- Mounting and dismounting methods
- Necessity to compensate for shaft thermal expansion at the fitting surface
- Bearing type and size

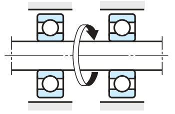
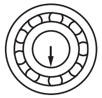
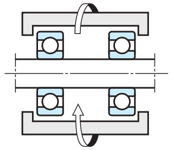
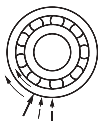
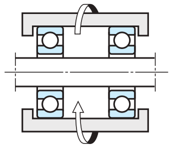
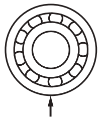
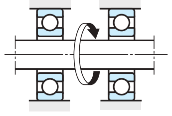
In view of these considerations, the following paragraphs explain the details of the important factors in fit selection.

1) Load characteristics

Load characteristics are classified into three types : rotating inner ring load; rotating outer ring load and indeterminate direction load.

Table 9-1 tabulates the relationship between these characteristics and fit.

Table 9-1 Load characteristics and fits

Rotation pattern	Direction of load	Loading conditions	Fit		Typical application
			Inner ring & shaft	Outer ring & housing	
 Inner ring : rotating Outer ring : stationary	 Stationary	Rotating inner ring load Stationary outer ring load	Interference fit necessary (k, m, n, p, r)	Clearance fit acceptable (F, G, H, JS)	Spur gear boxes, motors
 Inner ring : stationary Outer ring : rotating	 Rotating with outer ring				Greatly unbalanced wheels
 Inner ring : stationary Outer ring : rotating	 Stationary	Stationary inner ring load Rotating outer ring load	Clearance fit acceptable (f, g, h, js)	Interference fit necessary (K, M, N, P)	Running wheels & pulleys with stationary shaft
 Inner ring : rotating Outer ring : stationary	 Rotating with inner ring				Shaker screens (unbalanced vibration)
Indeterminate	Rotating or stationary	Indeterminate direction load	Interference fit	Interference fit	Cranks

2) Effect of load magnitude

When a radial load is applied, the inner ring will expand slightly. Since this expansion enlarges the circumference of the bore minutely, the initial interference is reduced.

The reduction can be calculated by the following equations :

[In the case of $F_r \leqq 0.25\ C_0$]

$$\Delta_{dF} = 0.08\sqrt{\frac{d}{B}\cdot F_r} \times 10^{-3} \cdots\cdots (9\text{-}1)$$

[In the case of $F_r > 0.25\ C_0$]

$$\Delta_{dF} = 0.02\ \frac{F_r}{B} \times 10^{-3} \cdots\cdots (9\text{-}2)$$

where:

Δ_{dF} : reduction of inner ring interference mm
d : nominal bore diameter of bearing mm
B : nominal inner ring width mm
F_r : radial load N
C_0 : basic static load rating N

Consequently, when the radial load, exceeds the C_0 value by more than 25 %, greater interference is needed.

Much greater interference is needed, when impact loads are expected.

3) Effect of fitting surface roughness

The effective interference obtained after fitting differs from calculated interference due to plastic deformation of the ring fitting surface. When the inner ring is fitted, the effective interference, subject to the effect of the fitting surface finish, can be approximated by the following equations :

[In the case of a ground shaft]

$$\Delta_{deff} \fallingdotseq \frac{d}{d+2}\ \Delta_d \cdots\cdots (9\text{-}3)$$

[In the case of a turned shaft]

$$\Delta_{deff} \fallingdotseq \frac{d}{d+3}\ \Delta_d \cdots\cdots (9\text{-}4)$$

where:

Δ_{deff} : effective interference mm
Δ_d : calculated interference mm
d : nominal bore diameter of bearing mm

4) Effect of temperature

A bearing generally has an operating temperature, higher than the ambient temperature. When the inner ring operates under load, its temperature generally becomes higher than that of the shaft and the effective interference decreases due to the greater thermal expansion of the inner ring.

If the assumed temperature difference between the bearing inside and surrounding housing is Δ_t, the temperature difference at the fitting surfaces of the inner ring and shaft will be approximately (0.10 to 0.15) × Δ_t.

The reduction of interference (Δ_{dt}) due to temperature difference is then expressed as follows :

$$\Delta_{dt} = (0.10 \text{ to } 0.15)\ \Delta_t \cdot \alpha \cdot d$$
$$\fallingdotseq 0.001\,5\ \Delta_t \cdot d\ \times 10^{-3} \cdots\cdots (9\text{-}5)$$

where:

Δ_{dt} : reduction of interference due to temperature difference mm
Δ_t : temperature difference between the inside of the bearing and the surrounding housing °C
α : linear expansion coefficient of bearing steel ($\fallingdotseq 12.5 \times 10^{-6}$) 1/°C
d : nominal bore diameter of bearing mm

Consequently, when a bearing is higher in temperature than the shaft, greater interference is required.

However, a difference in temperature or in the coefficient of expansion may sometimes increase the interference between outer ring and housing. Therefore, when clearance is provided to accommodate shaft thermal expansion, care should be taken.

5) Maximum stress due to fit

When a bearing is fitted with interference, the bearing ring will expand or contract, generating internal stress.

Should this stress be excessive, the bearing ring may fracture.

The maximum bearing fitting-generated stress is determined by the equation in Table 9-2.

In general, to avoid fracture, it is best to adjust the maximum interference to less than 1/1 000 of the shaft diameter, or the maximum stress (σ), determined by the equation in Table 9-2, should be less than 120 MPa.

6) Other considerations

When a high degree of accuracy is required, the tolerance of the shaft and housing must be improved. Since the housing is generally less easy to machine precisely than the shaft, it is advisable to use a clearance fit on the outer ring.

With hollow shafts or thin section housings, greater than normal interference is needed.

With split housings, on the other hand, smaller interference with outer ring is needed.

When the housing is made of aluminum or other light metal alloy, relatively greater than normal interference is needed.

In such a case, consult with JTEKT.

Table 9-2 Maximum fitting-generated stress in bearings

Shaft & inner ring	Housing bore & outer ring
(In the case of hollow shaft) $\sigma = \frac{E}{2}\cdot\frac{\Delta_{deff}}{d}\cdot\frac{\left(1-\frac{d_0^2}{d^2}\right)\left(1+\frac{d^2}{D_i^2}\right)}{\left(1-\frac{d_0^2}{D_i^2}\right)}$	(In the case of $D_h \neq \infty$) $\sigma = E\cdot\frac{\Delta_{Deff}}{D}\cdot\frac{\left(1-\frac{D^2}{D_h^2}\right)}{\left(1-\frac{D_e^2}{D_h^2}\right)}$
(In the case of solid shaft) $\sigma = \frac{E}{2}\cdot\frac{\Delta_{deff}}{d}\cdot\left(1+\frac{d^2}{D_i^2}\right)$	(In the case of $D_h = \infty$) $\sigma = E\cdot\frac{\Delta_{Deff}}{D}$

where :

σ : maximum stress MPa
d : nominal bore diameter (shaft diameter) mm
D_i : raceway contact diameter of inner ring mm
  ball bearing ······ $D_i \fallingdotseq 0.2\ (D+4\ d)$
  roller bearing ··· $D_i \fallingdotseq 0.25\ (D+3\ d)$
Δ_{deff} : effective interference of inner ring mm
d_0 : bore diameter of hollow shaft mm

D_e : raceway contact diameter of outer ring mm
  ball bearing ······ $D_e \fallingdotseq 0.2\ (4D+d)$
  roller bearing ··· $D_e \fallingdotseq 0.25\ (3D+d)$
D : nominal outside diameter (bore diameter of housing) mm
Δ_{Deff} : effective interference of outer ring mm
D_h : outside diameter of housing mm
E : young's modulus 2.08×10^5 MPa

[Remark] The above equations are applicable when the shaft and housing are steel. When other materials are used, JTEKT should be consulted.

9-4 Recommended fits

As described in Section 9-3, the characteristics / magnitude of the bearing load, temperature, mounting / dismounting methods and other conditions must be considered to choose proper fits.

Past experience is also valuable.

Table 9-3 shows standard fits for the metric series bearings; Tables 9-4 to 9-8 tabulate the most typical and recommended fits for different bearings types.

Table 9-3 Standard fits for metric series bearings [1]

(1) Fits for bore diameter [2] of radial bearings

Class of bearing	Rotating inner ring load or indeterminate direction load						Stationary inner ring load			
	Class of shaft tolerance range									
Classes 0, 6X, 6	r 6	p 6	n 6	m 6 m 5	k 6 k 5	js 6 js 5	h 5	h 6 h 5	g 6 g 5	f 6
Class 5	–	–	–	m 5	k 4	js 4	h 4	h 5	–	–
Fit	Interference fit					Transition fit				Clearance fit

(2) Fits for outside diameter [2] of radial bearings

Class of bearing	Stationary outer ring load				Indeterminate direction load or rotating outer ring load				
	Class of housing bore tolerance range								
Classes 0, 6X, 6	G 7	H 7 H 6	JS 7 JS 6	–	JS 7 JS 6	K 7 K 6	M 7 M 6	N 7 N 6	P 7
Class 5	–	H 5	JS 5	K 5	–	K 5	M 5	–	–
Fit	Clearance fit		Transition fit						Interference fit

(3) Fits for bore diameter [2] of thrust bearings

Class of bearing	Central axial load (generally for thrust bearings)		Combined load (in the case of spherical thrust roller bearing)			
			Rotating shaft race load or indeterminate direction load			Stationary shaft race load
	Class of shaft tolerance range					
Classes 0, 6	js 6	h 6	n 6	m 6	k 6	js 6
Fit	Transition fit		Interference fit			Transition fit

(4) Fits for outside diameter [2] of thrust bearings

Class of bearing	Central axial load (generally for thrust bearings)		Combined load (in the case of spherical thrust roller bearing)				
			Stationary housing race load or indeterminate direction load			Rotating housing race load	
	Class of housing bore tolerance range						
Classes 0, 6	–	H 8	G 7	H 7	JS 7	K 7	M 7
Fit	Clearance fit				Transition fit		

[Notes] 1) Bearings specified in JIS B 1512
2) Follow JIS B 1514-1 and 1514-2 for tolerance.

Table 9-4 (1) Recommended shaft fits for radial bearings (classes 0, 6X, 6)

Conditions [1]		Ball bearing		Cylindrical roller bearing Tapered roller bearing		Spherical roller bearing		Class of shaft tolerance range	Remarks	Applications (for reference)
		Shaft diameter (mm)								
		over	up to	over	up to	over	up to			
Cylindrical bore bearing (classes 0, 6X, 6)										
Rotating inner ring load or indeterminate direction load	Light load or fluctuating load $\left(\frac{P_r}{C_r} \leqq 0.05\right)$	–	18	–	–	–	–	h 5	For applications requiring high accuracy, js 5,k 5 and m 5 should be used in place of js 6, k 6 and m 6.	Electric appliances, machine tools, pumps, blowers, carriers etc.
		18	100	–	40	–	–	js 6		
		100	200	40	140	–	–	k 6		
		–	–	140	200	–	–	m 6		
	Normal load $\left(0.05 < \frac{P_r}{C_r} \leqq 0.10\right)$	–	18	–	–	–	–	js 5	For single-row tapered roller bearings and angular contact ball bearings, k 5 and m 5 may be replaced by k 6 and m 6, because internal clearance reduction due to fit need not be considered.	Electric motors, turbines, internal combustion engines, woodworking machines etc.
		18	100	–	40	–	40	k 5		
		100	140	40	100	40	65	m 5		
		140	200	100	140	65	100	m 6		
		200	280	140	200	100	140	n 6		
		–	–	200	400	140	280	p 6		
		–	–	–	–	280	500	r 6		
	Heavy load or impact load $\left(\frac{P_r}{C_r} > 0.10\right)$	–	–	50	140	50	100	n 6	Bearings with larger internal clearance than standard are required.	Railway rolling stock axle journals, traction motors
		–	–	140	200	100	140	p 6		
		–	–	200	–	140	200	r 6		
Stationary inner ring load	Inner ring needs to move smoothly on shaft.	All shaft diameters						g 6	For applications requiring high accuracy, g 5 should be used. For large size bearing, f 6 may be used for easier movement.	Stationary shaft wheels
	Inner ring does not need to move smoothly on shaft.	All shaft diameters						h 6	For applications requiring high accuracy, h 5 should be used.	Tension pulleys, rope sheaves etc.
Central axial load only		All shaft diameters						js 6	–	–
Tapered bore bearing (class 0) (with adapter or withdrawal sleeve)										
All loads		All shaft diameters						h 9/IT 5 [2]	For transmission shafts, h 10/IT 7 [2] may be applied.	

[Notes] 1) Light, normal, and heavy loads refer to those with dynamic equivalent radial loads (P_r) of 5 % or lower, over 5 % up to 10 % inclusive, and over 10 % respectively in relation to the basic dynamic radial load rating (C_r) of the bearing concerned.
2) IT 5 and IT 7 mean that shaft roundness tolerance, cylindricity tolerance, and other errors in terms of shape should be within the tolerance range of IT 5 and IT 7, respectively. For numerical values for standard tolerance grades IT 5 and IT 7, refer to supplementary table at end of this catalog.

[Remark] This table is applicable to solid steel shafts.

Table 9-4 (2) Recommended housing fits for radial bearings (classes 0, 6X, 6)

Conditions				Class of housing bore tolerance range	Remarks	Applications (for reference)
Housing	Load type etc. 1)		Outer ring axial displacement 2)			
One-piece or split type	Stationary outer ring load	All load types	Easily displaceable	H 7	G 7 may be applied when a large size bearing is used, or if the temperature difference is large between the outer ring and housing.	Ordinary bearing devices, railway rolling stock axle boxes, power transmission equipment etc.
		Light or normal load		H 8	–	
		High temperature at shaft and inner ring		G 7	F 7 may be applied when a large size bearing is used, or if the temperature difference is large between the outer ring and housing.	Drying cylinders etc.
One-piece type		Light or normal load, requiring high running accuracy	Not displaceable in principle	K 6	Mainly applied to roller bearings.	
			Displaceable	JS 6	Mainly applied to ball bearings.	
		Requiring low-noise rotation	Easily displaceable	H 6	–	
	Indeterminate direction load	Light or normal load	Normally displaceable	JS 7	For applications requiring high accuracy, JS 6 and K 6 should be used in place of JS 7 and K 7.	Electric motors, pumps, crankshaft main bearings etc.
		Normal or heavy load	Not displaceable in principle	K 7		
		High impact load	Not displaceable	M 7	–	Traction motors etc.
	Rotating outer ring load	Light or fluctuating load	Not displaceable	M 7	–	Conveyor rollers, ropeways, tension pulleys etc.
		Normal or heavy load		N 7	Mainly applied to ball bearings.	Wheel hubs with ball bearings etc.
		Thin section housing, heavy or high impact load		P 7	Mainly applied to roller bearings.	Wheel hubs with roller bearings, bearings for large end of connecting rods etc.

[Notes] 1) Loads are classified as stated in Note 1) to Table 9-4 (1).
2) Indicating distinction between applications of non-separable bearings permitting and not permitting axial displacement of the outer rings.

[Remarks] 1. This table is applicable to cast iron or steel housings.
2. If only central axial load is applied to the bearing, select such tolerance range class as to provide clearance in the radial direction for outer ring.

Table 9-5 (1) Recommended shaft fits for precision extra-small/miniature ball bearings ($d < 10$ mm)

Unit : μm

Load type		Bearing tolerance class	Single plane mean bore diameter deviation Δ_{dmp}		Shaft diameter dimensional tolerance		Fit 1)	Applications
			upper	lower	upper	lower		
Rotating inner ring load	Middle/high speed Light or normal load	ABMA 5P JIS class 5	0 0	– 5.1 – 5	+ 2.5	– 2.5	7.6T – 2.5L 7.5T – 2.5L	Gyro rotors, air cleaners, electric tools, encoders
		ABMA 7P JIS class 4	0 0	– 5.1 – 4	+ 2.5	– 2.5	7.6T – 2.5L 6.5T – 2.5L	
	Low speed Light load	ABMA 5P JIS class 5	0 0	– 5.1 – 5	– 2.5	– 7.5	2.6T – 7.5L 2.5T – 7.5L	Gyro gimbals, synchronizers, servomotors, floppy disc spindles
		ABMA 7P JIS class 4	0 0	– 5.1 – 4	– 2.5	– 7.5	2.6T – 7.5L 1.5T – 7.5L	
Rotating outer ring load	Low to high speed Light load	ABMA 5P JIS class 5	0 0	– 5.1 – 5	– 2.5	– 7.5	2.6T – 7.5L 2.5T – 7.5L	Pinch rolls, tape guide rollers, linear actuators
		ABMA 7P JIS class 4	0 0	– 5.1 – 4	– 2.5	– 7.5	2.6T – 7.5L 1.5T – 7.5L	

[Note] 1) Symbols T and L means interference and clearance respectively.

Table 9-5 (2) Recommended housing fits for precision extra-small/miniature ball bearings ($D \leqq 30$ mm)

Unit : μm

Load type		Bearing tolerance class	Single plane mean outside diameter deviation Δ_{Dmp}		Housing bore diameter dimensional tolerance		Fit 1)	Applications
			upper	lower	upper	lower		
Rotating inner ring load	Middle/high speed Light or normal load	ABMA 5P ABMA 7P	0	– 5.1	+ 5	0	0 – 10.1L	Gyro rotors, air cleaners, electric tools, encoders
		JIS class 5 2)	0 0	– 5 – 6	+ 5	0	0 – 10 L 0 – 11 L	
		JIS class 4 2)	0 0	– 4 – 5	+ 5	0	0 – 9 L 0 – 10 L	
	Low speed Light load	ABMA 5P ABMA 7P	0	– 5.1	+ 2.5	– 2.5	2.5T – 7.6L	Gyro gimbals, synchronizers, servomotors, floppy disc spindles
		JIS class 5 2)	0 0	– 5 – 6	+ 2.5	– 2.5	2.5T – 7.5L 2.5T – 8.5L	
		JIS class 4 2)	0 0	– 4 – 5	+ 2.5	– 2.5	2.5T – 6.5L 2.5T – 7.5L	
Rotating outer ring load	Low to high speed Light load	ABMA 5P ABMA 7P	0	– 5.1	+ 2.5	– 2.5	2.5T – 7.6L	Pinch rolls, tape guide rollers
		JIS class 5 2)	0 0	– 5 – 6	+ 2.5	– 2.5	2.5T – 7.5L 2.5T – 8.5L	
		JIS class 4 2)	0 0	– 4 – 5	+ 2.5	– 2.5	2.5T – 6.5L 2.5T – 7.5L	

[Notes] 1) Symbols T and L means interference and clearance respectively.
2) In the columns "single plane mean outside diameter deviation" and "fit" upper row values are applied in the case of $D \leqq 18$ mm, lower row values in the case of $18 < D \leqq 30$ mm.

Table 9-6 (1) Recommended shaft fits for metric J series tapered roller bearings

■ Bearing tolerance : class PK, class PN

Load type		Nominal bore diameter *d* mm		Class of shaft tolerance range	Remarks
		over	up to		
Rotating inner ring load	Normal load	10	120	m 6	
		120	500	n 6	
	Heavy load Impact load High speed rotation	10	120	n 6	Generally, bearing internal clearance should be larger than standard.
		120	180	p 6	
		180	250	r 6	
		250	500	r 7	
Rotating outer ring load	Normal load without impact	80	315	h 6 or g 6	
	Heavy load Impact load High speed rotation	10	120	n 6	Generally, bearing internal clearance should be larger than standard.
		120	180	p 6	
		180	250	r 6	
		250	500	r 7	

■ Bearing tolerance : class PC, class PB

Load type		Nominal bore diameter *d* mm		Class of shaft tolerance range (bearing tolerance class)		Remarks
		over	up to	PC	PB	
Rotating inner ring load	Spindles of precision machine tools	10	315	k 5	k 5	
		315	500	k 5	–	
	Heavy load Impact load High speed rotation	10	18	m 6	m 5	Generally, bearing internal clearance should be larger than standard.
		18	50	m 5	m 5	
		50	80	n 5	n 5	
		80	120	n 5	n 4	
		120	180	p 4	p 4	
		180	250	r 4	r 4	
		250	315	r 5	r 4	
		315	500	r 5	–	
Rotating outer ring load	Spindles of precision machine tools	10	315	k 5	k 5	
		315	500	k 5	–	

Table 9-6 (2) Recommended housing fits for metric J series tapered roller bearings

■ Bearing tolerance : class PK, class PN

Load type		Nominal outside diameter *D* mm		Class of housing bore diameter tolerance range	Remarks
		over	up to		
Rotating inner ring load	Used for free or fixed side	18	315	G 7	Outer ring is easily displaceable in axial direction.
		315	400	F 6	
	Position of outer ring is adjustable (in axial direction)	18	400	J 7	Outer ring is displaceable in axial direction.
	Position of outer ring is not adjustable (in axial direction)	18	400	P 7	Outer ring is fixed in axial direction.
Rotating outer ring load	Position of outer ring is not adjustable (in axial direction)	18	120	R 7	Outer ring is fixed in axial direction.
		120	180		
		180	400		

■ Bearing tolerance : class PC, class PB

Load type		Nominal outside diameter *D* mm		Class of housing bore diameter tolerance range (bearing tolerance class)		Remarks
		over	up to	PC	PB	
Rotating inner ring load	Used for free side	18	315	G 5	G 5	Outer ring is easily displaceable in axial direction.
		315	500	G 5	–	
	Used for fixed side	18	315	H 5	H 4	Outer ring is displaceable in axial direction.
		315	500	H 5	–	
	Position of outer ring is adjustable (in axial direction)	18	120	K 5	K 5	Outer ring is fixed in axial direction.
		120	180	JS 6	JS 6	
		180	250	JS 6	JS 5	
		250	315	K 5	JS 5	
		315	500	K 5	–	
	Position of outer ring is not adjustable (in axial direction)	18	315	N 5	M 5	
		315	500	N 5	–	
Rotating outer ring load	Position of outer ring is not adjustable (in axial direction)	18	250	N 6	N 5	Outer ring is fixed in axial direction.
		250	315	N 5	N 5	
		315	500	N 5	–	

Table 9-7 (1) Recommended shaft fits for inch series tapered roller bearings

■ Bearing tolerance : class 4, class 2

Load type		Nominal bore diameter d mm (1/25.4)		Deviation of a single bore diameter Δ_{ds}, μm		Dimensional tolerance of shaft diameter μm		Remarks
		over	up to	upper	lower	upper	lower	
Rotating inner ring load	Normal load	–	76.2 (3.0)	+13	0	+ 38	+ 25	
		76.2 (3.0)	304.8 (12.0)	+25	0	+ 64	+ 38	
		304.8 (12.0)	609.6 (24.0)	+51	0	+127	+ 76	
		609.6 (24.0)	914.4 (36.0)	+76	0	+190	+114	
	Heavy load Impact load High speed rotation	–	76.2 (3.0)	+13	0	Should be such that average interference stands at 0.000 5 × d (mm)		Generally, bearing internal clearance should be larger than standard.
		76.2 (3.0)	304.8 (12.0)	+25	0			
		304.8 (12.0)	609.6 (24.0)	+51	0			
		609.6 (24.0)	914.4 (36.0)	+76	0			
Rotating outer ring load	Normal load without impact	–	76.2 (3.0)	+13	0	+ 13	0	
		76.2 (3.0)	304.8 (12.0)	+25	0	+ 25	0	
		304.8 (12.0)	609.6 (24.0)	+51	0	+ 51	0	
		609.6 (24.0)	914.4 (36.0)	+76	0	+ 76	0	
	Normal load without impact	–	76.2 (3.0)	+13	0	0	– 13	Inner ring is displaceable in axial direction.
		76.2 (3.0)	304.8 (12.0)	+25	0	0	– 25	
		304.8 (12.0)	609.6 (24.0)	+51	0	0	– 51	
		609.6 (24.0)	914.4 (36.0)	+76	0	0	– 76	
	Heavy load Impact load High speed rotation	–	76.2 (3.0)	+13	0	Should be such that average interference stands at 0.000 5 × d (mm)		Generally, bearing internal clearance should be larger than standard.
		76.2 (3.0)	304.8 (12.0)	+25	0			
		304.8 (12.0)	609.6 (24.0)	+51	0			
		609.6 (24.0)	914.4 (36.0)	+76	0			

■ Bearing tolerance : class 3, class 0[1)]

Load type		Nominal bore diameter d mm (1/25.4)		Deviation of a single bore diameter Δ_{ds}, μm		Dimensional tolerance of shaft diameter μm		Remarks
		over	up to	upper	lower	upper	lower	
Rotating inner ring load	Spindles of precision machine tools	–	76.2 (3.0)	+13	0	+ 30	+ 18	
		76.2 (3.0)	304.8 (12.0)	+13	0	+ 30	+ 18	
		304.8 (12.0)	609.6 (24.0)	+25	0	+ 64	+ 38	
		609.6 (24.0)	914.4 (36.0)	+38	0	+102	+ 64	
	Heavy load Impact load High speed rotation	–	76.2 (3.0)	+13	0	Should be such that average interference stands at 0.000 5 × d (mm)		Generally, bearing internal clearance should be larger than standard.
		76.2 (3.0)	304.8 (12.0)	+13	0			
		304.8 (12.0)	609.6 (24.0)	+25	0			
		609.6 (24.0)	914.4 (36.0)	+38	0			
Rotating outer ring load	Spindles of precision machine tools	–	76.2 (3.0)	+13	0	+ 30	+ 18	
		76.2 (3.0)	304.8 (12.0)	+13	0	+ 30	+ 18	
		304.8 (12.0)	609.6 (24.0)	+25	0	+ 64	+ 38	
		609.6 (24.0)	914.4 (36.0)	+38	0	+102	+ 64	

[Note] 1) Class 0 bearing : $d \leqq 304.8$ mm

Table 9-7 (2) Recommended housing fits for inch series tapered roller bearings

■ Bearing tolerance : class 4, class 2

Load type		Nominal outside diameter D mm (1/25.4)		Deviation of a single outside diameter Δ_{Ds}, μm		Dimensional tolerance of housing bore diameter μm		Remarks
		over	up to	upper	lower	upper	lower	
Rotating inner ring load	Used for free or fixed side.	–	76.2 (3.0)	+ 25	0	+ 76	+ 51	Outer ring is easily displaceable in axial direction.
		76.2 (3.0)	127.0 (5.0)	+ 25	0	+ 76	+ 51	
		127.0 (5.0)	304.8 (12.0)	+ 25	0	+ 76	+ 51	
		304.8 (12.0)	609.6 (24.0)	+ 51	0	+152	+102	
		609.6 (24.0)	914.4 (36.0)	+ 76	0	+229	+152	
	Position of outer ring is adjustable (in axial direction).	–	76.2 (3.0)	+ 25	0	+ 25	0	Outer ring is displaceable in axial direction.
		76.2 (3.0)	127.0 (5.0)	+ 25	0	+ 25	0	
		127.0 (5.0)	304.8 (12.0)	+ 25	0	+ 51	0	
		304.8 (12.0)	609.6 (24.0)	+ 51	0	+ 76	+ 25	
		609.6 (24.0)	914.4 (36.0)	+ 76	0	+127	+ 51	
	Position of outer ring is not adjustable (in axial direction).	–	76.2 (3.0)	+ 25	0	– 13	– 38	Outer ring is fixed in axial direction.
		76.2 (3.0)	127.0 (5.0)	+ 25	0	– 25	– 51	
		127.0 (5.0)	304.8 (12.0)	+ 25	0	– 25	– 51	
		304.8 (12.0)	609.6 (24.0)	+ 51	0	– 25	– 76	
		609.6 (24.0)	914.4 (36.0)	+ 76	0	– 25	–102	
Rotating outer ring load	Position of outer ring is not adjustable (in axial direction).	–	76.2 (3.0)	+ 25	0	– 13	– 38	Outer ring is fixed in axial direction.
		76.2 (3.0)	127.0 (5.0)	+ 25	0	– 25	– 51	
		127.0 (5.0)	304.8 (12.0)	+ 25	0	– 25	– 51	
		304.8 (12.0)	609.6 (24.0)	+ 51	0	– 25	– 76	
		609.6 (24.0)	914.4 (36.0)	+ 76	0	– 25	–102	

■ Bearing tolerance : class 3, class 0[1)]

Load type		Nominal outside diameter D mm (1/25.4)		Deviation of a single outside diameter Δ_{Ds}, μm		Dimensional tolerance of housing bore diameter μm		Remarks
		over	up to	upper	lower	upper	lower	
Rotating inner ring load	Used for free side.	–	152.4 (6.0)	+ 13	0	+ 38	+ 25	Outer ring is easily displaceable in axial direction.
		152.4 (6.0)	304.8 (12.0)	+ 13	0	+ 38	+ 25	
		304.8 (12.0)	609.6 (24.0)	+ 25	0	+ 64	+ 38	
		609.6 (24.0)	914.4 (36.0)	+ 38	0	+ 89	+ 51	
	Used for fixed side.	–	152.4 (6.0)	+ 13	0	+ 25	+ 13	Outer ring is displaceable in axial direction.
		152.4 (6.0)	304.8 (12.0)	+ 13	0	+ 25	+ 13	
		304.8 (12.0)	609.6 (24.0)	+ 25	0	+ 51	+ 25	
		609.6 (24.0)	914.4 (36.0)	+ 38	0	+ 76	+ 38	
	Position of outer ring is adjustable (in axial direction).	–	152.4 (6.0)	+ 13	0	+ 13	0	Outer ring is fixed in axial direction.
		152.4 (6.0)	304.8 (12.0)	+ 13	0	+ 25	0	
		304.8 (12.0)	609.6 (24.0)	+ 25	0	+ 25	0	
		609.6 (24.0)	914.4 (36.0)	+ 38	0	+ 38	0	
	Position of outer ring is not adjustable (in axial direction).	–	152.4 (6.0)	+ 13	0	0	– 13	
		152.4 (6.0)	304.8 (12.0)	+ 13	0	0	– 25	
		304.8 (12.0)	609.6 (24.0)	+ 25	0	0	– 25	
		609.6 (24.0)	914.4 (36.0)	+ 38	0	0	– 38	
Rotating outer ring load	Position of outer ring is not adjustable (in axial direction).	–	152.4 (6.0)	+ 13	0	– 13	– 25	Outer ring is fixed in axial direction.
		152.4 (6.0)	304.8 (12.0)	+ 13	0	– 13	– 38	
		304.8 (12.0)	609.6 (24.0)	+ 25	0	– 13	– 38	
		609.6 (24.0)	914.4 (36.0)	+ 38	0	– 13	– 51	

[Note] 1) Class 0 bearing : $D \leqq 304.8$ mm

Table 9-8 (1) Recommended shaft fits for thrust bearings (classes 0, 6)

Load type		Shaft diameter, mm		Class of shaft tolerance range	Remarks
		over	up to		
Central axial load (generally for thrust bearings)		All shaft diameters		js 6	h 6 may also be used.
Combined load (spherical thrust roller bearing)	Stationary shaft race load	All shaft diameters		js 6	–
	Rotating shaft race load or indeterminate direction load	–	200	k 6	js 6, k 6 and m 6 may be used in place of k 6, m 6 and n 6, respectively.
		200	400	m 6	
		400	–	n 6	

Table 9-8 (2) Recommended housing fits for thrust bearings (classes 0, 6)

Load type		Class of housing bore diameter tolerance range	Remarks
Central axial load (generally for thrust bearings)		–	Select such tolerance range class as provides clearance in the radial direction for housing race.
		H 8	In case of thrust ball bearings requiring high accuracy.
Combined load (spherical thrust roller bearing)	Stationary housing race load	H 7	–
	Indeterminate direction load or rotating housing race load	K 7	In case of application under normal operating conditions.
		M 7	In case of comparably large radial load.

[Remark] This table is applicable to cast iron or steel housings.

10. Bearing internal clearance

Bearing internal clearance is defined as the total distance either inner or outer ring can be moved when the other ring is fixed.

If movement is in the radial direction, it is called radial internal clearance; if in the axial direction, axial internal clearance. (Fig. 10-1)

Bearing performance depends greatly upon internal clearance during operation (also referred to as operating clearance); inappropriate clearance results in short rolling fatigue life and generation of heat, noise or vibration.

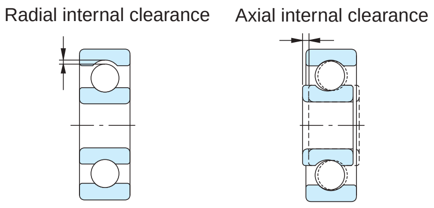


Fig. 10-1 Bearing internal clearance

In measuring internal clearance, a specified load is generally applied in order to obtain stable measurement values.

Consequently, measured clearance values will be larger than the original clearance by the amount of elastic deformation due to the load applied for measurement.

As far as roller bearings are concerned, however, the amount of elastic deformation is negligible.

Clearance prior to mounting is generally defined as the original clearance.

10-1 Selection of internal clearance

The term "residual clearance" is defined as the original clearance decreased owing to expansion or contraction of a raceway due to fitting, when the bearing is mounted in the shaft and housing.

The term "effective clearance" is defined as the residual clearance decreased owing to dimensional change arising from temperature differentials within the bearing.

The term "operating clearance" is defined as the internal clearance present while a bearing mounted in a machine is rotating under a certain load, or, the effective clearance increased due to elastic deformation arising from bearing loads.

As illustrated in Fig. 10-2, bearing fatigue life is longest when the operating clearance is slightly negative.

However, as the operating clearance becomes more negative, the fatigue life shortens remarkably.

Thus it is recommended that bearing internal clearance be selected such that the operating clearance is slightly positive.

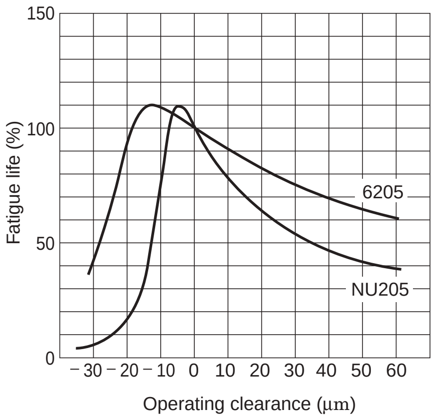


Fig. 10-2 Relationship between operating clearance and fatigue life

It is important to take specific operating conditions into consideration and select a clearance suitable for the conditions.

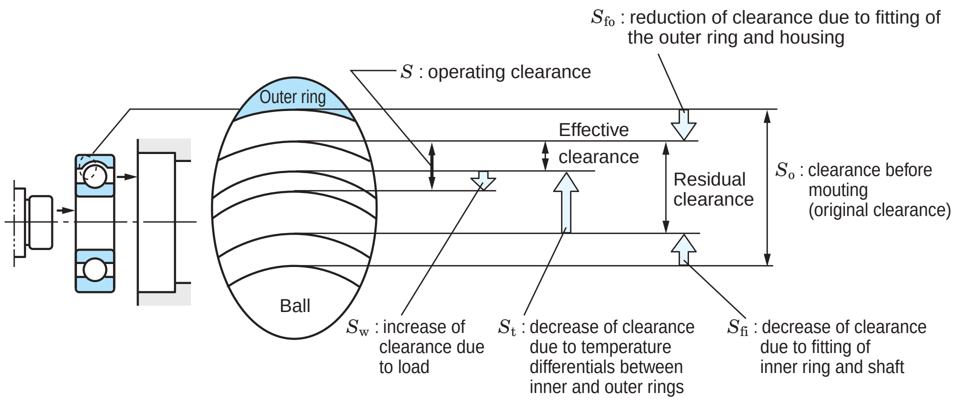
For example, when high rigidity is required, or when the noise must be minimized, the operating clearance must be reduced. On the other hand, when high operating temperature is expected, the operating clearance must be increased.

10-2 Operating clearance

Table 10-1 shows how to determine the operating clearance when the shaft and housing are made of steel.

Tables 10-2 to 10-10 show standard values for bearing internal clearance before mounting.
Table 10-11 shows examples of clearance selection excluding CN clearance.

Table 10-1 How to determine operating clearance



Operating clearance (S)	$S = S_o - (S_f + S_{t1} + S_{t2}) + S_w{}^*$	* S_w (increase of clearance due to load) is generally small, and thus may be ignored, although there is an equation for determining the value.
Decrease of clearance due to fitting (S_f)	(In the case of hollow shaft) $S_{fi} = \varDelta_{deff} \dfrac{d}{D_i} \cdot \dfrac{\left(1 - \dfrac{{d_0}^2}{d^2}\right)}{\left(1 - \dfrac{{d_0}^2}{{D_i}^2}\right)}$ (In the case of solid shaft) $S_{fi} = \varDelta_{deff} \dfrac{d}{D_i}$	(In the case of $D_h \neq \infty$) $S_{fo} = \varDelta_{Deff} \dfrac{D_e}{D} \cdot \dfrac{\left(1 - \dfrac{D^2}{{D_h}^2}\right)}{\left(1 - \dfrac{{D_e}^2}{{D_h}^2}\right)}$ (In the case of $D_h = \infty$) $S_{fo} = \varDelta_{Deff} \dfrac{D_e}{D}$
Decrease of clearance due to temperature differentials between inner and outer rings (S_{t1})	The amount of decrease varies depending on the state of housing; however, generally the amount can be approximated by the following equation on the assumption that the outer ring will not expand : $S_{t1} = \alpha\,(D_i \cdot t_i - D_e \cdot t_e)$	where : $D_e = D_i + 2D_w$ Consequently, $S_{t1} + S_{t2}$ will be determined by the following equation : $S_{t1} + S_{t2} = \alpha \cdot D_i \cdot t_1 + 2\,\alpha \cdot D_w \cdot t_2$ Temperature differential between the inner and outer rings, t_1, can be expressed as follows : $t_1 = t_i - t_e$ Temperature differential between the rolling element and outer ring, t_2, can be expressed as follows : $t_2 = t_w - t_e$
Decrease of clearance due to temperature rise of rolling element (S_{t2})	$S_{t2} = 2\,\alpha \cdot D_w \cdot t_w$	

In Table 10-1,

S	: operating clearance	mm
S_o	: clearance before mounting	mm
S_f	: decrease of clearance due to fitting	mm
S_{fi}	: expansion of inner ring raceway contact diameter	mm
S_{fo}	: contraction of outer ring raceway contact diameter	mm
S_{t1}	: decrease of clearance due to temperature differentials between inner and outer rings	mm
S_{t2}	: decrease of clearance due to temperature rise of the rolling elements	mm
S_w	: increase of clearance due to load	mm
$\varDelta_{deff}$	: effective interference of inner ring	mm
d	: nominal bore diameter (shaft diameter)	mm
d_0	: bore diameter of hollow shaft	mm
D_i	: inner ring raceway contact diameter ball bearing ······ $D_i \fallingdotseq 0.2(D + 4\,d)$ roller bearing ··· $D_i \fallingdotseq 0.25(D + 3\,d)$	mm
$\varDelta_{Deff}$	: effective interference of outer ring	mm
D_h	: outside diameter of housing	mm
D_e	: outer ring raceway contact diameter ball bearing ······ $D_e \fallingdotseq 0.2(4\,D + d)$ roller bearing ··· $D_e \fallingdotseq 0.25(3\,D + d)$	mm
D	: nominal outside diameter	mm
α	: linear expansion coefficient of bearing steel (12.5×10^{-6})	1/°C
D_w	: average diameter of rolling elements ball bearing ······ $D_w \fallingdotseq 0.3(D - d)$ roller bearing ··· $D_w \fallingdotseq 0.25(D - d)$	mm
t_i	: temperature rise of the inner ring	°C
t_e	: temperature rise of the outer ring	°C
t_w	: temperature rise of rolling elements	°C

■ Bearings are sometimes used with a non-steel shaft or housing.
In the automotive industry, a statistical method is often incorporated for selection of clearance.
In these cases, or when other special operating conditions are involved, JTEKT should be consulted.

Table 10-2 Radial internal clearance of deep groove ball bearings (cylindrical bore)

Unit : μm

Nominal bore diameter d, mm		Clearance									
		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2.5	**6**	0	7	2	13	8	23	*14*	*29*	*20*	*37*
6	**10**	0	7	2	13	8	23	14	29	20	37
10	**18**	0	9	3	18	11	25	18	33	25	45
18	**24**	0	10	5	20	13	28	20	36	28	48
24	**30**	1	11	5	20	13	28	23	41	30	53
30	**40**	1	11	6	20	15	33	28	46	40	64
40	**50**	1	11	6	23	18	36	30	51	45	73
50	**65**	1	15	8	28	23	43	38	61	55	90
65	**80**	1	15	10	30	25	51	46	71	65	105
80	**100**	1	18	12	36	30	58	53	84	75	120
100	**120**	2	20	15	41	36	66	61	97	90	140
120	**140**	2	23	18	48	41	81	71	114	105	160
140	**160**	2	23	18	53	46	91	81	130	120	180
160	**180**	2	25	20	61	53	102	91	147	135	200
180	**200**	2	30	25	71	63	117	107	163	150	230
200	**225**	2	35	25	85	75	140	125	195	175	265
225	**250**	2	40	30	95	85	160	145	225	205	300
250	**280**	2	45	35	105	90	170	155	245	225	340
280	**315**	2	55	40	115	100	190	175	270	245	370
315	**355**	3	60	45	125	110	210	195	300	275	410
355	**400**	3	70	55	145	130	240	225	340	315	460

[Remarks] 1. For measured clearance, the increase of radial internal clearance caused by the measurement load should be added to the values in the above table for correction. Amounts for correction are as shown below.
Of the amounts for clearance correction in the C 2 column, the smaller is applied to the minimum clearance, the larger to the maximum clearance.
2. Values in Italics are prescribed in JTEKT standards.

Nominal bore diameter d, mm		Measurement load N	Amounts of clearance correction, μm				
over	up to		C 2	C N	C 3	C 4	C 5
2.5	**18**	24.5	3 – 4	4	4	4	4
18	**50**	49	4 – 5	5	6	6	6
50	**280**	147	6 – 8	8	9	9	9

Table 10-3 Radial internal clearance of extra-small/miniature ball bearings

Unit : μm

Clearance code	M 1		M 2		M 3		M 4		M 5		M 6	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Clearance	0	5	3	8	5	10	8	13	13	20	20	28

[Remark] For measured clearance, the following amounts should be added for correction.

Measurement load, N		Amounts of clearance correction, μm					
Extra-small ball bearing	Miniature ball bearing	M1	M2	M3	M4	M5	M6
2.3		1	1	1	1	1	1

(Extra-small ball bearing : 9 mm or larger in outside diameter and under 10 mm in bore diameter
Miniature ball bearing : under 9 mm in outside diameter)

Table 10-4 Axial internal clearance of matched pair angular contact ball bearings (measurement clearance) 1)

Unit : μm

Nominal bore diameter d, mm		Contact angle : 15°				Contact angle : 30°							
		C 2		C N		C 2		C N		C 3		C 4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
–	**10**	13	33	33	53	3	14	10	30	30	50	50	70
10	**18**	15	35	35	55	3	16	10	30	30	50	50	70
18	**24**	20	40	45	65	3	20	20	40	40	60	60	80
24	**30**	20	40	45	65	3	20	20	40	40	60	60	80
30	**40**	20	40	45	65	3	20	25	45	45	65	70	90
40	**50**	20	40	50	70	3	20	30	50	50	70	75	95
50	**65**	30	55	65	90	9	27	35	60	60	85	90	115
65	**80**	30	55	70	95	10	28	40	65	70	95	110	135
80	**100**	35	60	85	110	10	30	50	75	80	105	130	155
100	**120**	40	65	100	125	12	37	65	90	100	125	150	175
120	**140**	45	75	110	140	15	40	75	105	120	150	180	210
140	**160**	45	75	125	155	15	40	80	110	130	160	210	240
160	**180**	50	80	140	170	15	45	95	125	140	170	235	265
180	**200**	50	80	160	190	20	50	110	140	170	200	275	305

Nominal bore diameter d, mm		Contact angle : 40°							
		C 2		C N		C 3		C 4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.
–	**10**	2	10	6	18	16	30	26	40
10	**18**	2	12	7	21	18	32	28	44
18	**24**	2	12	12	26	20	40	30	50
24	**30**	2	14	12	26	20	40	40	60
30	**40**	2	14	12	26	25	45	45	65
40	**50**	2	14	12	30	30	50	50	70
50	**65**	5	17	17	35	35	60	60	85
65	**80**	6	18	18	40	40	65	70	95
80	**100**	6	20	20	45	55	80	85	110
100	**120**	6	25	25	50	60	85	100	125
120	**140**	7	30	30	60	75	105	125	155
140	**160**	7	30	35	65	85	115	140	170
160	**180**	7	31	45	75	100	130	155	185
180	**200**	7	37	60	90	110	140	170	200

[Note] 1) Including increase of clearance caused by measurement load.

Table 10-5 Radial internal clearance of double-row angular contact ball bearings

Unit : µm

Nominal bore diameter d, mm		Clearance					
		CD2		CDN		CD3	
over	up to	min.	max.	min.	max.	min.	max.
2.5	**10**	0	7	2	10	8	18
10	**18**	0	7	2	11	9	19
18	**24**	0	8	2	11	10	21
24	**30**	0	8	2	13	10	23
30	**40**	0	9	3	14	11	24
40	**50**	0	10	4	16	13	27
50	**65**	0	11	6	20	15	30
65	**80**	0	12	7	22	18	33
80	**100**	0	12	8	24	22	38
100	**120**	0	13	9	25	24	42
120	**140**	0	15	10	26	25	44
140	**160**	0	16	11	28	26	46
160	**180**	0	17	12	30	27	47
180	**200**	0	18	14	32	28	48

[Remark]
Regarding deep groove ball bearings and matched pair and double-row angular contact ball bearings, equations of the relationship between radial internal clearance and axial internal clearance are shown on page A 111.

Table 10-6 Radial internal clearance of self-aligning ball bearings

Unit : µm

Nominal bore diameter d, mm		Cylindrical bore bearing clearance										Tapered bore bearing clearance									
		C 2		C N		C 3		C 4		C 5		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2.5	**6**	1	8	5	15	10	20	15	25	21	33	–	–	–	–	–	–	–	–	–	–
6	**10**	2	9	6	17	12	25	19	33	27	42	–	–	–	–	–	–	–	–	–	–
10	**14**	2	10	6	19	13	26	21	35	30	48	–	–	–	–	–	–	–	–	–	–
14	**18**	3	12	8	21	15	28	23	37	32	50	–	–	–	–	–	–	–	–	–	–
18	**24**	4	14	10	23	17	30	25	39	34	52	7	17	13	26	20	33	28	42	37	55
24	**30**	5	16	11	24	19	35	29	46	40	58	9	20	15	28	23	39	33	50	44	62
30	**40**	6	18	13	29	23	40	34	53	46	66	12	24	19	35	29	46	40	59	52	72
40	**50**	6	19	14	31	25	44	37	57	50	71	14	27	22	39	33	52	45	65	58	79
50	**65**	7	21	16	36	30	50	45	69	62	88	18	32	27	47	41	61	56	80	73	99
65	**80**	8	24	18	40	35	60	54	83	76	108	23	39	35	57	50	75	69	98	91	123
80	**100**	9	27	22	48	42	70	64	96	89	124	29	47	42	68	62	90	84	116	109	144
100	**120**	10	31	25	56	50	83	75	114	105	145	35	56	50	81	75	108	100	139	130	170
120	**140**	10	38	30	68	60	100	90	135	125	175	40	68	60	98	90	130	120	165	155	205
140	**160**	15	44	35	80	70	120	110	161	150	210	45	74	65	110	100	150	140	191	180	240

Table 10-7 Radial internal clearance of electric motor bearings

1) Deep groove ball bearing

Unit : µm

Nominal bore diameter d, mm		Clearance	
		CM	
over	up to	min.	max.
10[1]	**18**	4	11
18	**30**	5	12
30	**50**	9	17
50	**80**	12	22
80	**120**	18	30
120	**160**	24	38

[Note] 1) 10 mm is included.
[Remark] To adjust for change of clearance due to measuring load, use correction values shown in Table 10-2.

2) Cylindrical roller bearing

Unit : µm

Nominal bore diameter d, mm		Clearance			
		Interchangeability CT		Non-interchangeability CM	
over	up to	min.	max.	min.	max.
24	**40**	15	35	15	30
40	**50**	20	40	20	35
50	**65**	25	45	25	40
65	**80**	30	50	30	45
80	**100**	35	60	35	55
100	**120**	35	65	35	60
120	**140**	40	70	40	65
140	**160**	50	85	50	80
160	**180**	60	95	60	90
180	**200**	65	105	65	100

[Note] "Interchangeability" means interchangeable only among products (sub-units) of the same manufacturer ; not with others.

Table 10-8 Radial internal clearance of cylindrical roller bearings and machined ring needle roller bearings

(1) Cylindrical bore bearing

Unit : μm

Nominal bore diameter d, mm		Clearance									
		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
–	10	0	25	20	45	35	60	50	75	–	–
10	24	0	25	20	45	35	60	50	75	65	90
24	30	0	25	20	45	35	60	50	75	70	95
30	40	5	30	25	50	45	70	60	85	80	105
40	50	5	35	30	60	50	80	70	100	95	125
50	65	10	40	40	70	60	90	80	110	110	140
65	80	10	45	40	75	65	100	90	125	130	165
80	100	15	50	50	85	75	110	105	140	155	190
100	120	15	55	50	90	85	125	125	165	180	220
120	140	15	60	60	105	100	145	145	190	200	245
140	160	20	70	70	120	115	165	165	215	225	275
160	180	25	75	75	125	120	170	170	220	250	300
180	200	35	90	90	145	140	195	195	250	275	330
200	225	45	105	105	165	160	220	220	280	305	365
225	250	45	110	110	175	170	235	235	300	330	395
250	280	55	125	125	195	190	260	260	330	370	440
280	315	55	130	130	205	200	275	275	350	410	485
315	355	65	145	145	225	225	305	305	385	455	535
355	400	100	190	190	280	280	370	370	460	510	600
400	450	110	210	210	310	310	410	410	510	565	665
450	500	110	220	220	330	330	440	440	550	625	735

(2) Tapered bore bearing

Unit : μm

Nominal bore diameter d, mm		Non-interchangeable clearance													
		C 9 NA[1]		C 1 NA		C 2 NA		C N NA		C 3 NA		C 4 NA		C 5 NA	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
12	14	5	10	–	–	–	–	–	–	–	–	–	–	–	–
14	24	5	10	10	20	20	30	35	45	45	55	55	65	75	85
24	30	5	10	10	25	25	35	40	50	50	60	60	70	80	95
30	40	5	12	12	25	25	40	45	55	55	70	70	80	95	110
40	50	5	15	15	30	30	45	50	65	65	80	80	95	110	125
50	65	5	15	15	35	35	50	55	75	75	90	90	110	130	150
65	80	10	20	20	40	40	60	70	90	90	110	110	130	150	170
80	100	10	25	25	45	45	70	80	105	105	125	125	150	180	205
100	120	10	25	25	50	50	80	95	120	120	145	145	170	205	230
120	140	15	30	30	60	60	90	105	135	135	160	160	190	230	260
140	160	15	35	35	65	65	100	115	150	150	180	180	215	260	295
160	180	15	35	35	75	75	110	125	165	165	200	200	240	285	320
180	200	20	40	40	80	80	120	140	180	180	220	220	260	315	355
200	225	20	45	45	90	90	135	155	200	200	240	240	285	350	395
225	250	25	50	50	100	100	150	170	215	215	265	265	315	380	430
250	280	25	55	55	110	110	165	185	240	240	295	295	350	420	475
280	315	30	60	60	120	120	180	205	265	265	325	325	385	470	530
315	355	30	65	65	135	135	200	225	295	295	360	360	430	520	585
355	400	35	75	75	150	150	225	255	330	330	405	405	480	585	660
400	450	45	85	85	170	170	255	285	370	370	455	455	540	650	735
450	500	50	95	95	190	190	285	315	410	410	505	505	600	720	815

[Note] 1) Clearance C 9 NA is applied to tapered bore cylindrical roller bearings of JIS tolerance classes 5 and 4.

Table 10-9 Radial internal clearance of spherical roller bearings

(1) Cylindrical bore bearing

Unit : μm

Nominal bore diameter *d*, mm		Clearance									
		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
14	**18**	10	20	20	35	35	45	45	60	60	75
18	**24**	10	20	20	35	35	45	45	60	60	75
24	**30**	15	25	25	40	40	55	55	75	75	95
30	**40**	15	30	30	45	45	60	60	80	80	100
40	**50**	20	35	35	55	55	75	75	100	100	125
50	**65**	20	40	40	65	65	90	90	120	120	150
65	**80**	30	50	50	80	80	110	110	145	145	180
80	**100**	35	60	60	100	100	135	135	180	180	225
100	**120**	40	75	75	120	120	160	160	210	210	260
120	**140**	50	95	95	145	145	190	190	240	240	300
140	**160**	60	110	110	170	170	220	220	280	280	350
160	**180**	65	120	120	180	180	240	240	310	310	390
180	**200**	70	130	130	200	200	260	260	340	340	430
200	**225**	80	140	140	220	220	290	290	380	380	470
225	**250**	90	150	150	240	240	320	320	420	420	520
250	**280**	100	170	170	260	260	350	350	460	460	570
280	**315**	110	190	190	280	280	370	370	500	500	630
315	**355**	120	200	200	310	310	410	410	550	550	690
355	**400**	130	220	220	340	340	450	450	600	600	750
400	**450**	140	240	240	370	370	500	500	660	660	820
450	**500**	140	260	260	410	410	550	550	720	720	900
500	**560**	150	280	280	440	440	600	600	780	780	1 000
560	**630**	170	310	310	480	480	650	650	850	850	1 100
630	**710**	190	350	350	530	530	700	700	920	920	1 190
710	**800**	210	390	390	580	580	770	770	1 010	1 010	1 300
800	**900**	230	430	430	650	650	860	860	1 120	1 120	1 440
900	**1 000**	260	480	480	710	710	930	930	1 220	1 220	1 570

(2) Tapered bore bearing

Unit : μm

Nominal bore diameter *d*, mm		Clearance									
		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
18	**24**	15	25	25	35	35	45	45	60	60	75
24	**30**	20	30	30	40	40	55	55	75	75	95
30	**40**	25	35	35	50	50	65	65	85	85	105
40	**50**	30	45	45	60	60	80	80	100	100	130
50	**65**	40	55	55	75	75	95	95	120	120	160
65	**80**	50	70	70	95	95	120	120	150	150	200
80	**100**	55	80	80	110	110	140	140	180	180	230
100	**120**	65	100	100	135	135	170	170	220	220	280
120	**140**	80	120	120	160	160	200	200	260	260	330
140	**160**	90	130	130	180	180	230	230	300	300	380
160	**180**	100	140	140	200	200	260	260	340	340	430
180	**200**	110	160	160	220	220	290	290	370	370	470
200	**225**	120	180	180	250	250	320	320	410	410	520
225	**250**	140	200	200	270	270	350	350	450	450	570
250	**280**	150	220	220	300	300	390	390	490	490	620
280	**315**	170	240	240	330	330	430	430	540	540	680
315	**355**	190	270	270	360	360	470	470	590	590	740
355	**400**	210	300	300	400	400	520	520	650	650	820
400	**450**	230	330	330	440	440	570	570	720	720	910
450	**500**	260	370	370	490	490	630	630	790	790	1 000
500	**560**	290	410	410	540	540	680	680	870	870	1 100
560	**630**	320	460	460	600	600	760	760	980	980	1 230
630	**710**	350	510	510	670	670	850	850	1 090	1 090	1 360
710	**800**	390	570	570	750	750	960	960	1 220	1 220	1 500
800	**900**	440	640	640	840	840	1 070	1 070	1 370	1 370	1 690
900	**1 000**	490	710	710	930	930	1 190	1 190	1 520	1 520	1 860

Table 10-10 Radial internal clearance of double/four-row and matched pair tapered roller bearings (cylindrical bore)

Unit : μm

Nominal bore diameter d, mm		Clearance									
		C 1		C 2		C N		C 3		C 4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
14	**18**	0	10	10	20	20	30	30	40	40	50
18	**24**	0	10	10	20	20	30	30	40	40	55
24	**30**	0	10	10	20	20	30	30	45	45	60
30	**40**	0	12	12	25	25	40	40	55	55	75
40	**50**	0	15	15	30	30	45	45	60	60	80
50	**65**	0	15	15	30	30	50	50	70	70	90
65	**80**	0	20	20	40	40	60	60	80	80	110
80	**100**	0	20	20	45	45	70	70	100	100	130
100	**120**	0	25	25	50	50	80	80	110	110	150
120	**140**	0	30	30	60	60	90	90	120	120	170
140	**160**	0	30	30	65	65	100	100	140	140	190
160	**180**	0	35	35	70	70	110	110	150	150	210
180	**200**	0	40	40	80	80	120	120	170	170	230
200	**225**	0	40	40	90	90	140	140	190	190	260
225	**250**	0	50	50	100	100	150	150	210	210	290
250	**280**	0	50	50	110	110	170	170	230	230	320
280	**315**	0	60	60	120	120	180	180	250	250	350
315	**355**	0	70	70	140	140	210	210	280	280	390
355	**400**	0	70	70	150	150	230	230	310	310	440
400	**450**	0	80	80	170	170	260	260	350	350	490
450	**500**	0	90	90	190	190	290	290	390	390	540
500	**560**	0	100	100	210	210	320	320	430	430	590
560	**630**	0	110	110	230	230	350	350	480	480	660
630	**710**	0	130	130	260	260	400	400	540	540	740
710	**800**	0	140	140	290	290	450	450	610	610	830
800	**900**	0	160	160	330	330	500	500	670	670	920

Table 10-11 Examples of non-standard clearance selection

Service conditions	Applications	Examples of clearance selection
In the case of heavy/impact load, large interference	Railway rolling stock axle journals	C 3
In the case of vibration/impact load, interference fit both for inner/outer rings	Shaker screens, railway rolling stock traction motors, tractor final reduction gears	C 3, C 4 C 4 C 4
When shaft deflection is large	Automobile rear wheels	C 5
When shaft and inner ring are heated	Dryers of paper making machines, table rollers of rolling mills	C 3, C 4 C 3
When clearance fit both for inner/outer rings	Roll necks of rolling mills	C 2
When noise/vibration during rotation is to be lowered	Micro-motors	C 1, C 2, CM
When clearance after mounting is to be adjusted in order to reduce shaft runout	Lathe spindles	C 9 NA, C 1 NA

[Reference] Relationship between radial internal clearance and axial internal clearance

[Deep groove ball bearing]

$$\varDelta_a = \sqrt{\varDelta_r\,(4m_o - \varDelta_r)} \quad \cdots\cdots (10\text{-}1)$$

[Double-row angular contact ball bearing]

$$\varDelta_a = 2\sqrt{m_o^2 - \left(m_o\cos\alpha - \frac{\varDelta_r}{2}\right)^2} - 2m_o\sin\alpha \quad \cdots\cdots (10\text{-}2)$$

[Matched pair angular contact ball bearing]

$$\varDelta_a = 2m_o\sin\alpha - 2\sqrt{m_o^2 - \left(m_o\cos\alpha + \frac{\varDelta_r}{2}\right)^2} \quad \cdots\cdots (10\text{-}3)$$

[Double/four-row and
matched pair tapered roller bearing]

$$\varDelta_a = \varDelta_r\cot\alpha \fallingdotseq \frac{1.5}{e}\varDelta_r \quad \cdots\cdots (10\text{-}4)$$

where :

$\varDelta_a$: axial internal clearance mm

$\varDelta_r$: radial internal clearance mm

$m_o = r_e + r_i - D_w$

r_e : outer ring raceway groove radius mm

r_i : inner ring raceway groove radius mm

D_w : ball diameter mm

α : nominal contact angle

e : limit value of F_a/F_r

(shown in the bearing specification table.)

11. Preload

Generally, bearings are operated with a certain amount of proper clearance allowed. For some applications, however, bearings are mounted with axial load of such magnitude that the clearance will be negative.

The axial load, referred to as "preload," is often applied to angular contact ball bearings and tapered roller bearings.

11-1 Purpose of preload

- To improve running accuracy by reducing runout of shaft, as well as to heighten position accuracy in radial and axial directions. (Bearings for machine tool spindles and measuring instruments)
- To improve gear engagement accuracy by increasing bearing rigidity. (Bearings for automobile final reduction gears)
- To reduce smearing by eliminating sliding in irregular rotation, self-rotation, and around-the-raceway revolution of rolling elements. (For high rotation-speed angular contact ball bearings)
- To minimize abnormal noise due to vibration or resonance. (For small electric motor bearings)
- To keep rolling elements in the right position relative to the raceway. (For thrust ball bearings and spherical thrust roller bearings used on horizontal shafts)

11-2 Method of preloading

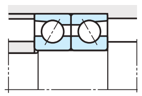
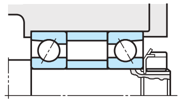
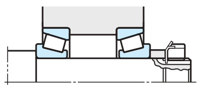
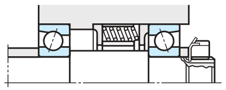
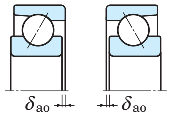
The preload can be done either by the position preloading or the constant pressure preloading; typical examples are given in Table 11-1.

Comparison between position and constant pressure preloadings

- With the same amount of preloading, the position preloading produces smaller displacement in the axial direction, and thus is liable to bring about higher rigidity.
- The constant pressure preloading produces stable preloading, or little fluctuation in the amount of preload, since the spring can absorb the load fluctuation and shaft expansion/contraction caused by temperature difference between the shaft and housing during operation.
- The position preloading can apply a larger preload.

Consequently, the position preloading is more suitable for applications requiring high rigidity, while the constant pressure preloading is more suitable for high rotational speed, vibration prevention in the axial direction, and thrust bearings used on horizontal shafts.

Table 11-1 Method of preloading

Position preloading			Constant pressure preloading
			
• Method using matched pair bearing with standout adjusted for preloading (see below).  	• Method using spacer with dimensions adjusted for preloading.	• Method using nut or bolt capable of adjusting preload in axial direction. In this case, starting friction moment during adjustment should be measured so that proper preload will be applied.	• Method using coil spring or diaphragm spring.

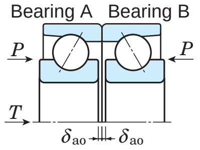
11-3 Preload and rigidity

For angular contact ball bearings and tapered roller bearings, the "back-to-back" arrangement is generally used to apply preload for higher rigidity.

This is because shaft rigidity is improved by the longer distance between load centers in the back-to-back arrangement.

Fig. 11-1 shows the relationship between preload given via position preloading and rigidity expressed by displacement in the axial direction of the back-to-back bearing.

P : amount of preload (load)
T : axial load from outside
T_A : axial load applied to Bearing A
T_B : axial load applied to Bearing B
δ_a : displacement of matched pair bearing
δ_{aA} : displacement of Bearing A
δ_{aB} : displacement of Bearing B
$2\delta_{ao}$: clearance between inner rings before preloading



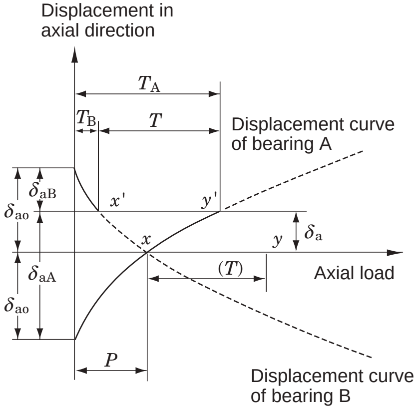


Fig. 11-1 Preloading diagram in position preloading

In Fig. 11-1, when preload P is applied (inner ring is tightened toward the axial direction), bearings A and B are displaced by δ_{ao} respectively, and the clearance between inner rings diminishes from $2\delta_{ao}$ to zero.

The displacement when axial load T is applied to these matched pair bearings from the outside can be determined as δ_a .

[For reference]
How to determine δ_a in Fig. 11-1
①Determine the displacement curve of bearing A.
②Determine the displacement curve of bearing B. ...Symmetrical curve in relation to horizontal axis intersecting vertical line of preload P at point x.
③With the load from outside defined as T, determine line segment $x-y$ on the horizontal line passing through point x. Displace segment $x-y$ in parallel along the displacement curve of bearing B. Determine point y' at which to intersect displacement curve of bearing A.
④δ_a can be determined as the distance between line segments $x'-y'$ and $x-y$.

Fig. 11-2 shows the relationship between preload and rigidity in the constant pressure preloading using the same matched pair bearings as in Fig. 11-1.

In this case, since the spring rigidity can be ignored, the matched pair bearing shows almost the same rigidity as a separate bearing with preload P applied in advance.

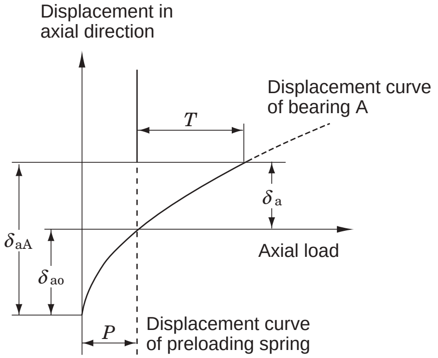


Fig. 11-2 Preloading diagram in constant pressure preloading

11-4 Amount of preload

The amount of preload should be determined, to avoid an adverse effect on bearing life, temperature rise, friction torque, or other performance characteristic, in view of the bearing application.

Decrease of preload due to wear-in, accuracy of the shaft and housing, mounting conditions, and lubrication should also be fully considered in determining preload.

11-4-1 Preload amount of matched pair angular contact ball bearings

Table 11-2 shows recommended preload for matched pair angular contact ball bearings of JIS class 5 or higher used for machine tool spindles or other higher precision applications.

JTEKT offers four types of standard preload: slight preload (S), light preload (L), medium preload (M), and heavy preload (H), so that preload can be selected properly and easily for various applications.

Generally, light or medium preload is recommended for grinder spindles, and medium or heavy preload for spindles of lathes and milling machines.

Table 11-3 shows recommended fits of high-precision matched pair angular contact ball bearings used with light or medium preload applied.

Table 11-3 Recommended fits for high-precision matched pair angular contact ball bearings with preload applied

(1) Dimensional tolerance of shaft Unit : μm

Shaft diameter mm		Inner ring rotation		Outer ring rotation
over	up to	Tolerance of shaft diameter	Interference between shaft and inner ring (matching adjustment)[1]	Tolerance of shaft diameter
6	**10**	− 2 − 6	0 – 2	0 − 4
10	**18**	− 2 − 7	0 – 2	0 − 5
18	**30**	− 2 − 8	0 – 2.5	0 − 6
30	**50**	− 2 − 9	0 – 2.5	0 − 7
50	**80**	− 2 − 10	0 – 3	0 − 8
80	**120**	− 2 − 12	0 – 4	0 − 10
120	**180**	− 2 − 14	0 – 5	0 − 12

[Note] 1) Matching adjustment means to measure of bore diameter the bearing and match it to the measured shaft diameter.

(2) Dimensional tolerance of housing bore Unit : μm

Housing bore diameter mm		Inner ring rotation			Outer ring rotation
		Tolerance of housing bore diameter		Clearance[1] between housing and outer ring	Tolerance of housing bore diameter
over	up to	Fixed-side bearing	Free-side bearing		
18	**30**	± 4.5	+ 9 0	2 – 6	− 6 − 12
30	**50**	± 5.5	+ 11 0	2 – 6	− 6 − 13
50	**80**	± 6.5	+ 13 0	3 – 8	− 8 − 16
80	**120**	± 7.5	+ 15 0	3 – 9	− 9 − 19
120	**180**	± 9	+ 18 0	4 – 12	− 11 − 23
180	**250**	± 10	+ 20 0	5 – 15	− 13 − 27
250	**315**	± 11.5	+ 23 0	6 – 18	− 16 − 32

[Note] 1) Lower value is desirable for fixed side; higher value for free side.

Table 11-2 Standard preload of high-precision matched pair angular contact ball bearings

[S : slight preload, L : light preload, M : medium preload, H : heavy preload] Unit : N

Bore diameter No.	7900 C			7000			7000 C				7200			7200 C				ACT 000		ACT 000 B		Bore diameter No.
	S	L	M	L	M	H	S	L	M	H	L	M	H	S	L	M	H	L	M	L	M	
00	5	15	30	30	80	145	6	20	50	100	50	145	245	10	30	80	145	–	–	–	–	**00**
01	7	20	40	30	80	145	6	20	50	100	60	145	295	15	40	100	195	–	–	–	–	**01**
02	8	25	50	50	145	245	10	30	80	145	80	245	390	15	50	145	245	–	–	–	–	**02**
03	8	25	50	60	145	295	15	40	100	165	100	245	540	25	70	145	345	–	–	–	–	**03**
04	15	40	80	60	145	295	15	40	100	245	145	295	635	25	80	195	390	–	–	–	–	**04**
05	15	50	100	100	245	490	20	60	145	295	145	390	785	35	100	245	490	–	–	–	–	**05**
06	15	50	100	145	295	635	25	80	195	390	145	590	930	35	100	295	590	195	345	295	685	**06**
07	25	70	140	145	390	785	35	100	245	490	245	785	1 270	50	145	390	785	195	390	390	735	**07**
08	25	80	155	145	390	785	35	100	295	590	390	880	1 570	65	195	440	880	245	440	440	835	**08**
09	35	100	195	245	540	980	50	145	345	635	490	1 080	1 770	85	245	540	1 080	245	490	490	930	**09**
10	35	100	195	245	635	1 180	50	145	390	735	540	1 180	2 060	85	245	590	1 180	295	540	540	1 030	**10**
11	40	120	235	295	785	1 370	65	195	440	880	635	1 370	2 450	100	295	735	1 470	390	685	685	1 270	**11**
12	40	120	235	390	880	1 570	65	195	490	980	785	1 470	2 940	115	345	785	1 670	390	735	735	1 420	**12**
13	50	145	295	440	980	1 770	85	245	540	1 090	835	1 670	3 330	130	390	930	1 860	440	835	785	1 520	**13**
14	65	195	390	490	1 080	2 060	85	245	635	1 270	930	1 860	3 720	160	490	980	2 060	590	1 130	1 030	2 010	**14**
15	65	195	390	590	1 180	2 150	100	295	685	1 370	980	2 150	3 920	195	590	1 180	2 350	590	1 130	1 080	2 110	**15**
16	65	195	390	635	1 370	2 350	100	295	735	1 470	1 080	2 450	4 310	225	685	1 370	2 750	685	1 370	1 270	2 500	**16**
17	85	245	490	735	1 570	2 550	130	390	880	1 770	1 270	2 940	4 900	260	785	1 570	2 940	735	1 420	1 320	2 600	**17**
18	100	295	590	785	1 670	2 840	145	440	980	1 960	1 470	3 230	5 390	260	785	1 770	3 430	980	1 860	1 770	3 380	**18**
19	100	295	590	880	1 770	3 140	160	490	1 080	2 060	1 670	3 430	5 880	290	880	1 960	3 920	980	1 960	1 860	3 530	**19**
20	100	345	685	880	1 960	3 530	175	540	1 180	2 150	1 860	3 920	6 370	325	980	2 150	4 410	1 030	2 010	1 910	3 680	**20**
21	100	345	685	980	2 150	3 920	195	590	1 270	2 350	2 060	4 310	7 060	360	1 080	2 350	4 900	1 180	2 250	2 150	3 770	**21**
22	145	390	785	1 080	2 380	4 410	210	635	1 470	2 550	2 250	4 900	7 840	385	1 180	2 450	5 290	1 320	2 600	2 450	4 760	**22**
24	145	490	980	1 180	2 650	4 900	225	685	1 670	2 840	2 450	5 390	8 820	420	1 270	2 840	5 490	1 420	2 800	2 550	5 100	**24**
26	195	590	1 180	1 370	3 140	5 390	245	735	1 770	3 140	2 750	5 880	9 310	485	1 470	3 140	5 880	1 770	3 380	3 230	6 230	**26**
28	195	635	1 270	1 470	3 430	5 880	260	785	1 960	3 920	2 940	6 370	9 800	520	1 570	3 430	6 370	2 010	3 920	3 720	7 210	**28**
30	245	735	1 470	1 770	3 920	6 860	275	835	2 150	4 410	3 330	6 860	10 300	585	1 770	3 720	6 860	2 500	4 850	4 660	8 920	**30**
32	245	785	1 570	2 150	4 410	7 840	290	880	2 350	4 900	3 630	7 350	10 800	645	1 960	4 120	7 840	2 500	4 850	4 660	8 920	**32**
34	345	880	1 810	2 450	4 900	8 820	325	980	2 450	5 390	3 920	7 840	11 800	645	2 150	4 410	8 330	3 090	6 030	5 730	11 100	**34**

11-4-2 Amount of preload for thrust ball bearings

When a thrust ball bearing is rotated at high speed, balls slide on raceway due to centrifugal force and the gyro moment, which often causes the raceway to suffer from smearing or other defects.

To eliminate such sliding, it is necessary to mount the bearing without clearance, and apply an axial load (preload) larger than the minimum necessary axial load determined by the following equation.

When an axial load from the outside is lower than 0.001 3 C_{0a}, there is no adverse effect on the bearing, as long as lubrication is satisfactory.

Generally, deep groove and angular contact ball bearings are recommended for applications when a portion of rotation under axial load is present at high speed.

11-4-3 Amount of preload for spherical thrust roller bearings

Spherical thrust roller bearings sometimes suffer from scuffing, smearing, or other defects due to sliding which occurs between the roller and raceway surface in operation.

To eliminate such sliding, it is necessary to mount the bearing without clearance, and apply an axial load (preload) larger than the minimum necessary axial load.

Of the two values determined by the two equations below, the higher should be defined as the minimum necessary axial load.

- Thrust ball bearing (contact angle : 90°)

$$F_{a\,\min} = 5.1\left(\frac{n}{1\,000}\right)^2 \cdot \left(\frac{C_{0a}}{1\,000}\right)^2 \times 10^{-3} \quad\cdots\cdots\cdots \quad (11\text{-}1)$$

- Spherical thrust roller bearing (the higher value determined by the two equations should be taken.)

$$F_{a\,\min} = \frac{C_{0a}}{2\,000} \quad\cdots\cdots\cdots \quad (11\text{-}2)$$

$$F_{a\,\min} = 1.8F_r + 1.33\left(\frac{n}{1\,000}\right)^2 \cdot \left(\frac{C_{0a}}{1\,000}\right)^2 \times 10^{-4} \quad\cdots\cdots\cdots \quad (11\text{-}3)$$

---

where :

$F_{a\ \min}$:	minimum necessary axial load	N
n :	rotational speed	$\min^{-1}$
C_{0a} :	static axial load rating	N
F_r :	radial load	N

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12. Bearing lubrication

12-1 Purpose and method of lubrication

Lubrication is one of the most important factors determining bearing performance. The suitability of the lubricant and lubrication method have a dominant influence on bearing life.

Functions of lubrication :

- To lubricate each part of the bearing, and to reduce friction and wear
- To carry away heat generated inside bearing due to friction and other causes
- To cover rolling contact surface with the proper oil film in order to prolong bearing fatigue life
- To prevent corrosion and contamination by dirt

Bearing lubrication is classified broadly into two categories: grease lubrication and oil lubrication. Table 12-1 makes a general comparison between the two.

Table 12-1 Comparison between grease and oil lubrication

Item	Grease	Oil
· Sealing device	Easy	Slightly complicated and special care required for maintenance
· Lubricating ability	Good	Excellent
· Rotation speed	Low/medium speed	Applicable at high speed as well
· Replacement of lubricant	Slightly troublesome	Easy
· Life of lubricant	Relatively short	Long
· Cooling effect	No cooling effect	Good (circulation is necessary)
· Filtration of dirt	Difficult	Easy

12-1-1 Grease lubrication

Grease lubrication is widely applied since there is no need for replenishment over a long period once grease is filled, and a relatively simple structure can suffice for the lubricant sealing device.

There are two methods of grease lubrication. One is the closed lubrication method, in which grease is filled in advance into shielded/sealed bearing; the other is the feeding method, in which the bearing and housing are filled with grease in proper quantities at first, and refilled at a regular interval via replenishment or replacement.

Devices with numerous grease inlets sometimes employ the centralized lubricating method, in which the inlets are connected via piping and supplied with grease collectively.

1) Amount of grease

In general, grease should fill approximately one-third to one-half the inside space, though this varies according to structure and inside space of housing.

It must be borne in mind that excessive grease will generate heat when churned, and will consequently alter, deteriorate, or soften.

When the bearing is operated at low speed, however, the inside space is sometimes filled with grease to two-thirds to full, in order to preclude infiltration of contaminants.

2) Replenishment/replacement of grease

The method of replenishing/replacing grease depends largely on the lubrication method. Whichever method may be utilized, care should be taken to use clean grease and to keep dirt or other foreign matter out of the housing.

In addition, it is desirable to refill with grease of the same brand as that filled at the start.

When grease is refilled, new grease must be injected inside bearing.

Fig. 12-1 gives one example of a feeding method.

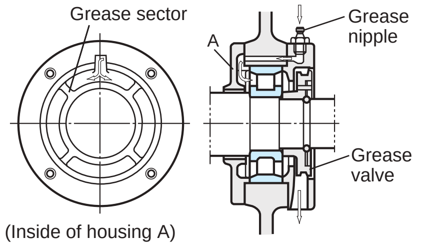


Fig. 12-1 Example of grease feeding method (using grease sector)

In the example, the inside of the housing is divided by grease sectors. Grease fills one sector, then flows into the bearing.

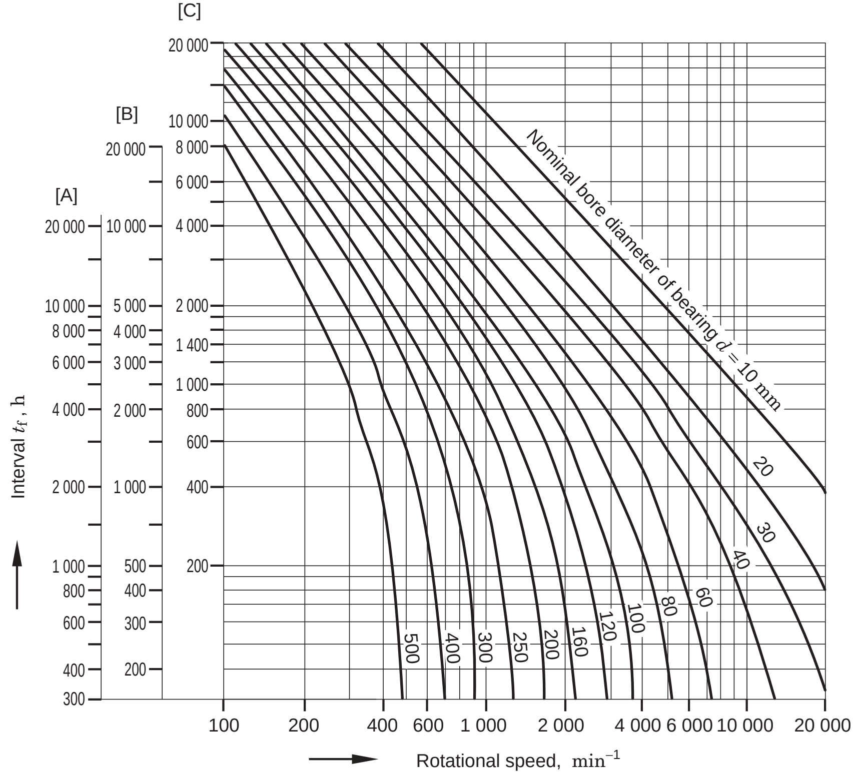
On the other hand, grease flowing back from the inside is forced out of the bearing by the centrifugal force of the grease valve.

When the grease valve is not used, it is necessary to enlarge the housing space on the discharge side to store old grease.

The housing is uncovered and the stored old grease is removed at regular intervals.

3) Grease feeding interval

In normal operation, grease life should be regarded roughly as shown in Fig. 12-2, and replenishment/replacement should be carried out accordingly.



[Notes] 1) [A] : radial ball bearing

[B] : cylindrical roller bearing, needle roller bearing

[C] : tapered roller bearing, spherical roller bearing, thrust ball bearing

2) Temperature correction

When the bearing operating temperature exceeds 70°C, t_f', obtained by multiplying t_f by correction coefficient a, found on the scale below, should be applied as the feeding interval.

$t_f' = t_f \times a$

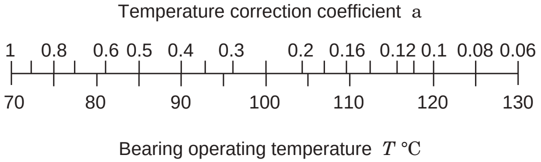


Fig. 12-2 Grease feeding interval

4) Grease life in shielded/sealed ball bearing

Grease life can be estimated by the following equation when a single-row deep groove ball bearing is filled with grease and sealed with shields or seals.

$$\log L = 6.10 - 4.40 \times 10^{-6} d_m n - 3.125 \left(\frac{P_r}{C_r} - 0.04 \right) - (0.021 - 1.80 \times 10^{-8} d_m n)\, T \cdots (12\text{-}1)$$

where :

L	: grease life	h
d_m	$= \dfrac{D+d}{2}$ (D : outside diameter, d : bore diameter)	mm
n	: rotational speed	min^{-1}
P_r	: dynamic equivalent radial load	N
C_r	: basic dynamic radial load rating	N
T	: operating temperature of bearing	°C

The conditions for applying equation (12-1) are as follows :

a) Operating temperature of bearing : T °C

Applicable when $T \leqq 120$

(when $T < 50$, $T = 50$)

When $T > 120$, please contact with JTEKT.

b) Value of $d_m n$

Applicable when $d_m n \leqq 500 \times 10^3$

(when $d_m n < 125 \times 10^3$, $d_m n = 125 \times 10^3$)

When $d_m n > 500 \times 10^3$, please contact with JTEKT.

c) Load condition : $\dfrac{P_r}{C_r}$

Applicable when $\dfrac{P_r}{C_r} \leqq 0.16$

(when $\dfrac{P_r}{C_r} < 0.04$, $\dfrac{P_r}{C_r} = 0.04$)

When $\dfrac{P_r}{C_r} > 0.16$, please contact with JTEKT.

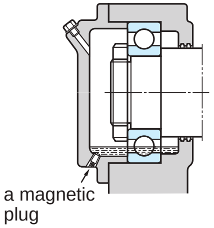
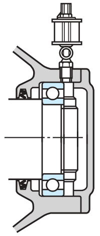
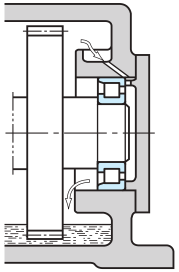
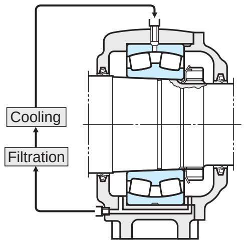
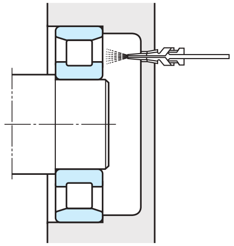
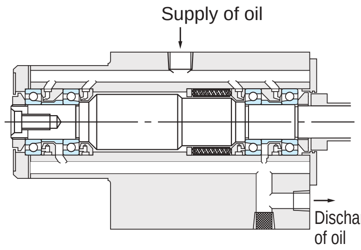
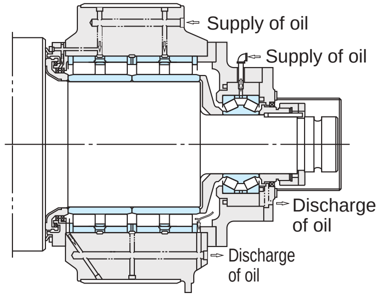
12-1-2 Oil lubrication

Oil lubrication is usable even at high speed rotation and somewhat high temperature, and is effective in reducing bearing vibration and noise.

Thus oil lubrication is used in many cases where grease lubrication does not work.

Table 12-2 shows major types and methods of oil lubrication.

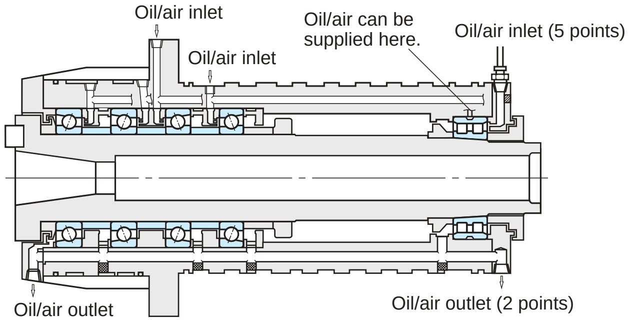
Table 12-2 Type and method of oil lubrication

① **Oil bath**	● Simplest method of bearing immersion in oil for operation. ● Suitable for low/medium speed. ● Oil level gauge should be furnished to adjust the amount of oil. (In the case of horizontal shaft) About 50 % of the lowest rolling element should be immersed. (In the case of vertical shaft) About 70 to 80 % of the bearing should be immersed. ● It is better to use a magnetic plug to prevent wear iron particles from dispersing in oil.	
② **Oil drip**	● Oil is dripped with an oiling device, and the inside of the housing is filled with oil mist by the action of rotating parts. This method has a cooling effect. ● Applicable at relatively high speed and up to medium load. ● In general, 5 to 6 drops of oil are utilized per minute. (It is difficult to adjust the dripping in 1mL/h or smaller amounts.) ● It is necessary to prevent too much oil from being accumulated at the bottom of housing.	
③ **Oil splash**	● This type of lubrication method makes use of a gear or simple flinger attached to shaft in order to splash oil. This method can supply oil for bearings located away from the oil tank. ● Usable up to relatively high speed. ● It is necessary to keep oil level within a certain range. ● It is better to use a magnetic plug to prevent wear iron particles from dispersing in oil. It is also advisable to set up a shield or baffle board to prevent contaminants from entering the bearing.	
④ **Forced oil circulation**	● This method employs a circulation-type oil supply system. Supplied oil lubricates inside of the bearing, is cooled and sent back to the tank through an oil escape pipe. The oil, after filtering and cooling, is pumped back. ● Widely used at high speeds and high temperature conditions. ● It is better to use an oil escape pipe approximately twice as thick as the oil supply pipe in order to prevent too much lubricant from gathering in housing. ● Required amount of oil : see Remark 1.	
⑤ **Oil jet lubrication**	● This method uses a nozzle to jet oil at a constant pressure (0.1 to 0.5MPa), and is highly effective in cooling. ● Suitable for high speed and heavy load. ● Generally, the nozzle (diameter 0.5 to 2 mm) is located 5 to 10 mm from the side of a bearing. When a large amount of heat is generated, 2 to 4 nozzles should be used. ● Since a large amount of oil is supplied in the jet lubrication method, old should be discharged with an oil pump to prevent excessive residual oil. ● Required amount of oil : see Remark 1.	
⑥ **Oil mist lubrication (spray lubrication)**	● This method employs an oil mist generator to produce dry mist (air containing oil in the form of mist). The dry mist is continuously sent to the oil supplier, where the mist is turned into a wet mist (sticky oil drops) by a nozzle set up on the housing or bearing, and is then sprayed onto bearing. ● Required amount of mist : see Remark 2. ● This method provides and sustains the smallest amount of oil film necessary for lubrication, and has the advantages of preventing oil contamination, simplifying bearing maintenance, prolonging bearing fatigue life, reducing oil consumption etc.	(Example of grinding machine)  (Example of rolling mill) 

⑦ Oil/air lubrication

- A proportioning pump sends forth a small quantity of oil, which is mixed with compressed air by a mixing valve. The admixture is supplied continuously and stably to the bearing.
- This method enables quantitative control of oil in extremely small amounts, always supplying new lubricating oil. It is thus suitable for machine tools and other applications requiring high speed.
- Compressed air and lubricating oil are supplied to the spindle, increasing the internal pressure and helping prevent dirt, cutting-liquid, etc. from entering. As well, this method allows the lubricating oil to flow through a feeding pipe, minimizing atmospheric pollution.

■ JTEKT produces an oil/air lubricator and, air cleaner, as well as a spindle unit incorporating the oil/air lubrication system. Please refer to brochure "oil/air lubricator & air clean unit".



(Example of spindle unit incorporating oil/air lubrication system)

Remark 1 Required oil supply in forced oil circulation ; oil jet lubrication methods

$$G = \frac{1.88 \times 10^{-4} \mu \cdot d \cdot n \cdot P}{60 \; c \cdot r \cdot \varDelta_T}$$

where :

G : required oil supply L/min

μ : friction coefficient (see table at right)

d : nominal bore diameter mm

n : rotational speed min^{-1}

P : dynamic equivalent load of bearing N

c : specific heat of oil 1.88-2.09kJ/kg·K

r : density of oil $\mathrm{g/cm^3}$

$\varDelta_T$: temperature rise of oil K

Values of friction coefficient μ

Bearing type	μ
Deep groove ball bearing	0.001 0 – 0.001 5
Angular contact ball bearing	0.001 2 – 0.002 0
Cylindrical roller bearing	0.000 8 – 0.001 2
Tapered roller bearing	0.001 7 – 0.002 5
Spherical roller bearing	0.002 0 – 0.002 5

The values obtained by the above equation show quantities of oil required to carry away all the generated heat, with heat release not taken into consideration.

In reality, the oil supplied is generally half to two-thirds of the calculated value.

Heat release varies widely according to the application and operating conditions.

To determine the optimum oil supply, it is advised to start operating with two-thirds of the calculated value, and then reduce the oil gradually while measuring the operating temperature of bearing, as well as the supplied and discharged oil.

Remark 2 Notes on oil mist lubrication

1) Required amount of mist (mist pressure : 5 kPa)

(In the case of a bearing) $Q = 0.11dR$

(In the case of two oil seals combined) $Q = 0.028d_1$

where :

Q : required amount of mist L/min

d : nominal bore diameter mm

R : number of rolling element rows

d_1 : inside diameter of oil seal mm

In the case of high speed ($d_m n \geqq 400 \times 10^3$), it is necessary to increase the amount of oil and heighten the mist pressure.

2) Piping diameter and design of lubrication hole/groove

When the flow rate of mist in piping exceeds 5 m/s, oil mist suddenly condenses into an oil liquid.

Consequently, the piping diameter and dimensions of the lubrication hole/groove in the housing should be designed to keep the flow rate of mist, obtained by the following equation, from exceeding 5 m/s.

$$V = \frac{0.167Q}{A} \leqq 5$$

where :

V : flow rate of mist m/s

Q : amount of mist L/min

A : sectional area of piping or lubrication groove $\mathrm{cm^2}$

3) Mist oil

Oil used in oil mist lubrication should meet the following requirements.

- ability to turn into mist
- has high extreme pressure resistance
- good heat/oxidation stability
- rust-resistant
- unlikely to generate sludge
- superior demulsifier

Oil mist lubrication has a number of advantages for high speed rotation bearings. Its performance, however, is largely affected by surrounding structures and bearing operating conditions.

If contemplating the use of this method, please contact with JTEKT for advice based on JTEKT long experience with oil mist lubrication.

12-2 Lubricant

12-2-1 Grease

Grease is made by mixing and dispersing a solid of high oil-affinity (called a thickener) with lubricant oil (as a base), and transforming it into a semi-solid state.

As well, a variety of additives can be added to improve specific performance.

(1) Base oil

Mineral oil is usually used as the base oil for grease. When low temperature fluidity, high temperature stability, or other special performance is required, diester oil, silicon oil, polyglycolic oil, fluorinated oil, or other synthetic oil is often used.

Generally, grease with a low viscosity base oil is suitable for applications at low temperature or high rotation speed; grease with high viscosity base oils are suitable for applications at high temperature or under heavy load.

(2) Thickener

Most greases use a metallic soap base such as lithium, sodium, or calcium as thickeners. For some applications, however, non-soap base thickeners (inorganic substances such as bentone, silica gel, and organic substances such as urea compounds, fluorine compounds) are also used.

In general, the mechanical stability, bearing operating temperature range, water resistance, and other characteristics of grease are determined by the thickener.

(Lithium soap base grease)
Superior in heat resistance, water resistance and mechanical stability.

(Calcium soap base grease)
Superior in water resistance; inferior in heat resistance.

(Sodium soap base grease)
Superior in heat resistance; inferior in water resistance.

(Non-soap base grease)
Superior in heat resistance.

(3) Additives

Various additives are selectively used to serve the respective purposes of grease applications.

- Extreme pressure agents
  When bearings must tolerate heavy or impact loads.
- Oxidation inhibitors
  When grease is not refilled for a long period.
  Structure stabilizers, rust preventives, and corrosion inhibitors are also used.

(4) Consistency

Consistency, which indicates grease hardness, is expressed as a figure obtained, in accordance with ASTM (JIS), by multiplication by 10 the depth (in mm) to which the cone-shaped metallic plunger penetrates into the grease at 25°C by deadweight in 5 seconds. The softer the grease, the higher the figure.

Table 12-4 shows the relationships between the NLGI scales and ASTM (JIS) penetration indexes, service conditions of grease.
(NLGI : National Lubricating Grease Institute)

Table 12-4 Grease consistency

NLGI scale	ASTM (JIS) penetration index (25°C, 60 mixing operations)	Service conditions/ applications
0	355 – 385	For centralized lubricating
1	310 – 340	For centralized lubricating, at low temperature
2	265 – 295	For general use
3	220 – 250	For general use, at high temperature
4	175 – 205	For special applications

(5) Mixing of different greases

Since mixing of different greases changes their properties, greases of different brands should not be mixed.

If mixing cannot be avoided, greases containing the same thickener should be used. Even if the mixed greases contain the same thickener, however, mixing may still produce adverse effects, due to difference in additives or other factors.

Thus it is necessary to check the effects of a mixture in advance, through testing or other methods.

Table 12-3 Characteristics of respective greases

	Lithium grease			Calcium grease (cup grease)	Sodium grease (fiber grease)	Complex base grease		Non-soap base grease			
Thickener	Lithium soap			Calcium soap	Sodium soap	Lithium complex soap	Calcium complex soap	Bentone	Urea compounds	Fluorine compounds	Thickener
Base oil	Mineral oil	Synthetic oil (diester oil)	Synthetic oil (silicon oil)	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral/ synthetic oil	Synthetic oil	Base oil
Dropping point (°C)	170 to 190	170 to 230	220 to 260	80 to 100	160 to 180	250 or higher	200 to 280	–	240 or higher	250 or higher	Dropping point (°C)
Operating temperature range (°C)	– 30 to + 120	– 50 to + 130	– 50 to + 180	– 10 to + 70	0 to + 110	– 30 to + 150	– 10 to + 130	– 10 to + 150	– 30 to + 150	– 40 to + 250	Operating temperature range (°C)
Rotation speed range	Medium to high	High	Low to medium	Low to medium	Low to high	Low to high	Low to medium	Medium to high	Low to high	Low to medium	Rotation speed range
Mechanical stability	Excellent	Good to excellent	Good	Fair to good	Good to excellent	Good to excellent	Good	Good	Good to excellent	Good	Mechanical stability
Water resistance	Good	Good	Good	Good	Bad	Good to excellent	Good	Good	Good to excellent	Good	Water resistance
Pressure resistance	Good	Fair	Bad to fair	Fair	Good to excellent	Good	Good	Good to excellent	Good to excellent	Good	Pressure resistance
Remarks	Most widely usable for various rolling bearings.	Superior low temperature and friction characteristics. Suitable for bearings for measuring instruments and extra-small ball bearings for small electric motors.	Superior high and low temperature characteristics.	Suitable for applications at low rotation speed and under light load. Not applicable at high temperature.	Liable to emulsify in the presence of water. Used at relatively high temperature.	Superior mechanical stability and heat resistance. Used at relatively high temperature.	Superior pressure resistance when extreme pressure agent is added. Used in bearings for rolling mills.	Suitable for applications at high temperature and under relatively heavy load.	Superior water resistance, oxidation stability, and heat stability. Suitable for applications at high temperature and high speed.	Superior chemical resistance and solvent resistance. Usable at up to 250 °C.	Remarks

Table 12-5 Typical examples of standard grease for JTEKT bearings

Grease name	Thickener	Base oil	Appearance	Consistency 60W		NLGI scale	Operating temperature range (°C)	Application examples	
				Unworked	Worked				
Alvania 2	Lithium	Mineral oil	Grayish brown	276	275	2	–10 – 100	Automobile	Steering column
Raremax AF-I	Urea	Mineral oil	Pale yellow, viscous	–	300	1 – 2[2]	0 – 150		Wheel (hub unit)
FS841	Fluororesin	Fluorosilicone oil	White	–	290	2	–40 – 220		Fan coupling
Sunlight 2	Lithium	Mineral oil	Yellowish brown	–	280	2	–10 – 100		Universal joint (shell type), steering joint
Unirex N3	Lithium complex	Mineral oil	Green	–	235	3	–10 – 130		Clutch release
W191	Urea	PAO[1], mineral oil	Pale yellow	247	275	2	–30 – 130		Water pump bearing
Darina 2	Microgel	Mineral oil	Amber	–	280	2	0 – 150	Steel production	Conveyor
Emalube L	Urea	Mineral oil	Light brown, viscous	–	350	0 – 1[2]	–10 – 200		Continuous casting machine
Palmax RBG	Special lithium complex	Mineral oil	Yellow, viscous	–	300	1 – 2[2]	–10 – 150		Rolling mill roll neck
4B grease	Carbon black	Ethyl oil	Black	–	260	2 – 3[2]	–30 – 250	Extra-small/miniature ball bearings	Photocopier (high temperature/conductive), printer (high temperature/conductive)
KRYTOX GPL 226	Fluororesin	Fluorinated oil		–	280	2	0 – 250		Photocopier (high temperature), printer (high temperature)
Multemp PSNo.2	Lithium	Mineral oil, ester oil	Pinkish white, viscous	–	275	2	–40 – 100		Motor (for low temperatures)
KVC grease	Urea	PAO[1], ester oil	Milkish pink	–	244	3	–30 – 150		Motor (for high temperatures), rotary encoder, fan motor (for high temperatures)
SR grease	Lithium	Ester oil	Light brown, viscous	–	250	3	–40 – 130	Extra-small/miniature ball bearings, automobile	Motor, stepping motor, fan motor Center bearing (for propeller shafts), steering column
KDL grease	Fluororesin (PTFE)	Fluorinated oil	White	–	260	2 – 3[2]	–30 – 200	Semiconductor manufacturing equipment	For high temperatures, for clean environment, for vacuum environment
KHD	Lithium	PAO[1]	White	–	199	4	–30 – 120		For room temperature, for atmosphere
Nerita 2858	Lithium	Mineral oil (XHVI)	Yellowish brown	–	279	2	–30 – 100	Railway rolling stock	Axle journal (ABU)
Arapen RB 320	Lithium, calcium	Mineral oil	Yellowish brown	–	315	1	–30 – 90		Axle journal (general)
Isoflex NBU 15	Barium complex	Ester oil	Beige	270	280	2	–40 – 100	Machine tool spindle	
Shell Cassida grease RLS2	Aluminum complex	PAO[1]	Transparent	–	280	2	–20 – 100	For food machinery	
Alvania EP2	Lithium	Mineral oil	Brown	282	276	2	–10 – 80	Slewing rim, automobile	Universal joint, king pin thrust bearing
Alvania 3	Lithium	Mineral oil	Brown	240	225	3	–10 – 100	Agricultural machinery	

[Notes] 1) PAO: Polyalphaolefin oil
2) The value is within the range specified by the consistency numbers.

12-2-2 Lubricating oil

For lubrication, bearings usually employ highly refined mineral oils, which have superior oxidation stability, rust-preventive effect, and high film strength.

With bearing diversification, however, various synthetic oils have been put into use.

These synthetic oils contain various additives (oxidation inhibitors, rust preventives, antifoaming agents, etc.) to improve specific properties. Table 12-6 shows the characteristics of lubricating oils.

Mineral lubricating oils are classified by applications in JIS and MIL.

Table 12-6 Characteristics of lubricating oils

Type of lubricating oil	Highly refined mineral oil	Major synthetic oils				
		Diester oil	Silicon oil	Polyglycolic oil	Polyphenyl ether oil	Fluorinated oil
Operating temperature range (°C)	– 40 to + 220	– 55 to + 150	– 70 to + 350	– 30 to + 150	0 to + 330	– 20 to + 300
Lubricity	Excellent	Excellent	Fair	Good	Good	Excellent
Oxidation stability	Good	Good	Fair	Fair	Excellent	Excellent
Radioactivity resistance	Bad	Bad	Bad to fair	Bad	Excellent	–

[Selection of lubricating oil]

The most important criterion in selecting a lubricating oil is whether the oil provides proper viscosity at the bearing operating temperature.

Standard values of proper kinematic viscosity can be obtained through selection by bearing type according to Table 12-7 first, then through selection by bearing operating conditions according to Table 12-8.

When lubricating oil viscosity is too low, the oil film will be insufficient. On the other hand, when the viscosity is too high, heat will be generated due to viscous resistance.

In general, the heavier the load and the higher the operating temperature, the higher the lubricating oil viscosity should be ; whereas, the higher the rotation speed, the lower the viscosity should be.

Fig. 12-3 illustrates the relationship between lubricating oil viscosity and temperature.

Table 12-7 Proper kinematic viscosity by bearing type

Bearing type	Proper kinematic viscosity at operating temperature
Ball bearing Cylindrical roller bearing	13mm²/ s or higher
Tapered roller bearing Spherical roller bearing	20mm²/ s or higher
Spherical thrust roller bearing	32mm²/ s or higher

Table 12-8 Proper kinematic viscosities by bearing operating conditions

Operating temperature	d_mn value	Proper kinematic viscosity (expressed in the ISO viscosity grade or the SAE No.)			
		Light/normal load		Heavy/impact load	
– 30 to 0°C	All rotation speeds	ISO VG 15, 22, 46	(Refrigerating machine oil)	––	
0 to 60°C	300 000 or lower	ISO VG 46	(Bearing oil Turbine oil)	ISO VG 68 SAE 30	(Bearing oil Turbine oil)
	300 000 to 600 000	ISO VG 32	(Bearing oil Turbine oil)	ISO VG 68	(Bearing oil Turbine oil)
	600 000 or higher	ISO VG 7, 10, 22	(Bearing oil)	––	
60 to 100°C	300 000 or lower	ISO VG 68	(Bearing oil)	ISO VG 68, 100 SAE 30	(Bearing oil)
	300 000 to 600 000	ISO VG 32, 46	(Bearing oil Turbine oil)	ISO VG 68	(Bearing oil Turbine oil)
	600 000 or higher	ISO VG 22, 32, 46	(Bearing oil Turbine oil Machine oil)	––	
100 to 150°C	300 000 or lower	ISO VG 68, 100 SAE 30, 40	(Bearing oil)	ISO VG 100 to 460	(Bearing oil Gear oil)
	300 000 to 600 000	ISO VG 68 SAE 30	(Bearing oil Turbine oil)	ISO VG 68, 100 SAE 30, 40	(Bearing oil)

[Remarks] 1. $d_mn = \frac{D+d}{2} \times n \cdots \{D$: nominal outside diameter (mm), d : nominal bore diameter (mm), n : rotational speed (min^{-1})$\}$

2. Refer to refrigerating machine oil (JIS K 2211), turbine oil (JIS K 2213), gear oil (JIS K 2219), machine oil (JIS K 2238) and bearing oil (JIS K 2239).

3. Please contact with JTEKT if the bearing operating temperature is under −30°C or over 150°C .

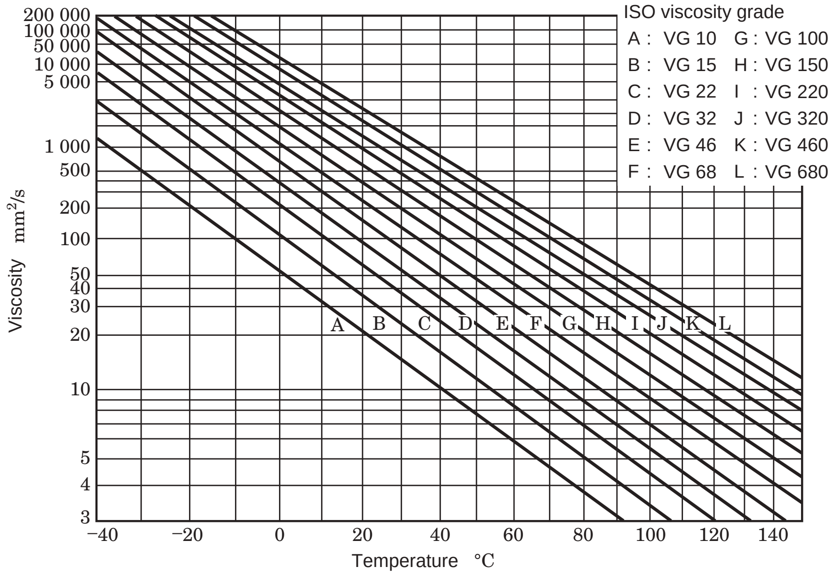


Fig. 12-3 Relationship between lubricating oil viscosity and temperature (viscosity index :100)

13. Bearing materials

Bearing materials include steel for bearing rings and rolling elements, as well as steel sheet, steel, copper alloy and synthetic resins for cages.

These bearing materials should possess the following characteristics :

1) High elasticity, durable under high partial contact stress.
2) High strength against rolling contact fatigue due to large repetitive contact load.

Bearing rings
Rolling elements

3) Strong hardness
4) High abrasion resistance
5) High toughness against impact load
6) Excellent dimensional stability

Bearing rings
Rolling elements
Cages

13-1 Bearing rings and rolling elements materials

1) High carbon chromium bearing steel

High carbon chromium bearing steel specified in JIS is used as a general material in bearing rings (inner rings, outer rings) and rolling elements (balls, rollers).

Their chemical composition classified by steel type is given in Table 13-1.

Among these steel types, SUJ 2 is generally used. SUJ 3, which contains additional Mn and Si, possesses high hardenability and is commonly used for thick section bearings.

SUJ 5 has increased hardenability, because it was developed by adding Mo to SUJ 3.

For small and medium size bearings, SUJ 2 and SUJ 3 are used, and for large size and extra-large size bearings with thick sections, SUJ 5 is widely used.

Generally, these materials are processed into the specified shape and then undergo hardening and annealing treatment until they attain a hardness of 57 to 64 HRC.

2) Case carburizing bearing steel (case hardened steel)

When a bearing receives heavy impact loads, the surface of the bearing should be hard and the inside soft.

Such materials should possess a proper amount of carbon, dense structure, and carburizing case depth on their surface, while having proper hardness and fine structure internally.

For this purpose, chromium steel and nickel-chromium-molybdenum steel are used as materials.

Typical steel materials are shown in Table 13-2.

3) Steel for Standard JTEKT Specification Bearings

In general terms, it is known that the non-metallic inclusions contained in materials are harmful to the rolling contact fatigue life.

At JTEKT, to reduce the amount of non-metallic inclusions, which are harmful to the fatigue life, we set the chemical compounds of the bearing steel in a proprietary manner. As a result, JTEKT standard bearings have a life that is approximately twice as long as the general bearings that are targeted by JIS B 1518 (and ISO 281).

Therefore, the basic dynamic load ratings of JTEKT standard bearings are 1.25 times the dynamic load ratings established in JIS B 1518 (and ISO 281).

This steel for standard JTEKT specification bearings is not applied to the special application bearings in this general catalog. If you require special application bearings with long lives, contact JTEKT.

Table 13-1 Chemical composition of high carbon chromium bearing steel

Standard	Code	Chemical composition (%)						
		C	Si	Mn	P	S	Cr	Mo
JIS G 4805	SUJ 2	0.95 – 1.10	0.15 – 0.35	Not more than 0.50	Not more than 0.025	Not more than 0.025	1.30 – 1.60	Not more than 0.08
	SUJ 3	0.95 – 1.10	0.40 – 0.70	0.90 – 1.15			0.90 – 1.20	Not more than 0.08
	SUJ 5	0.95 – 1.10	0.40 – 0.70	0.90 – 1.15			0.90 – 1.20	0.10 – 0.25
SAE J 404	52100	0.98 – 1.10	0.15 – 0.35	0.25 – 0.45	Not more than 0.025	Not more than 0.025	1.30 – 1.60	Not more than 0.06

[Remark] As for bearings which are induction hardened, carbon steel with a high carbon content of 0.55 to 0.65 % is used in addition to those listed in this table.

4) Other

For special applications, the special heat treatment shown below can be used according to various usage conditions.

[Extremely high reliability]

· SH bearings [1)]

······ By using the heat treatment technology developed by JTEKT to perform special heat treatment on high carbon chromium bearing steel, we have improved the surface hardness of these products and provided them with compressive residual stress, which has led to high reliability especially in terms of resistance to foreign matter.

· KE bearings [2)]

······ By using the heat treatment technology developed by JTEKT to perform special heat treatment on carburized bearing steel, we have improved the surface hardness of these products and adjusted their amount of residual austenite, which has led to high reliability especially in terms of resistance to foreign matter.

[1)] Acronym of Special Heat treatment
[2)] Acronym of Koyo EXTRA-LIFE Bearing

Table 13-2 Chemical composition of case carburizing bearing steel

Standard	Code	Chemical composition (%)							
		C	Si	Mn	P	S	Ni	Cr	Mo
JIS G 4053	SCr 415	0.13 – 0.18	0.15 – 0.35	0.60 – 0.85	Not more than 0.030	Not more than 0.030	–	0.90 – 1.20	–
	SCr 420	0.18 – 0.23	0.15 – 0.35	0.60 – 0.85			–	0.90 – 1.20	–
	SCM 420	0.18 – 0.23	0.15 – 0.35	0.60 – 0.85	Not more than 0.030	Not more than 0.030	–	0.90 – 1.20	0.15 – 0.30
	SNCM 220	0.17 – 0.23	0.15 – 0.35	0.60 – 0.90	Not more than 0.030	Not more than 0.030	0.40 – 0.70	0.40 – 0.65	0.15 – 0.30
	SNCM 420	0.17 – 0.23	0.15 – 0.35	0.40 – 0.70			1.60 – 2.00	0.40 – 0.65	0.15 – 0.30
	SNCM 815	0.12 – 0.18	0.15 – 0.35	0.30 – 0.60	Not more than 0.030	Not more than 0.030	4.00 – 4.50	0.70 – 1.00	0.15 – 0.30
SAE J 404	5120	0.17 – 0.22	0.15 – 0.35	0.70 – 0.90	Not more than 0.035	Not more than 0.040	–	0.70 – 0.90	–
	8620	0.18 – 0.23	0.15 – 0.35	0.70 – 0.90	Not more than 0.035	Not more than 0.040	0.40 – 0.70	0.40 – 0.60	0.15 – 0.25
	4320	0.17 – 0.22	0.15 – 0.30	0.45 – 0.65	Not more than 0.025	Not more than 0.025	1.65 – 2.00	0.40 – 0.60	0.20 – 0.30

13-2 Materials used for cages

Since the characteristics of materials used for cages greatly influence the performance and reliability of rolling bearings, the choice of materials is of great importance.

It is necessary to select cage materials in accordance with required shape, ease of lubrication, strength, and abrasion resistance.

Typical materials used for metallic cages are shown in Tables 13-3 and 13-4.

In addition, phenolic resin machined cages and other synthetic resin molded cages are often used.

Materials typically used for molded cages are polyacetal, polyamide (Nylon 6.6, Nylon 4.6), and polymer containing fluorine, which are strengthened with glass and carbon fibers.

Table 13-3 Chemical compositions of pressed cage steel sheet (A) and machined cage carbon steel (B)

	Standard	Code	Chemical composition (%)						
			C	Si	Mn	P	S	Ni	Cr
(A)	JIS G 3141	SPCC	Not more than 0.12	–	Not more than 0.50	Not more than 0.040	Not more than 0.045	–	–
	JIS G 3131	SPHC	Not more than 0.15	–	Not more than 0.60	Not more than 0.050	Not more than 0.050	–	–
	BAS 361	SPB 2	0.13 – 0.20	Not more than 0.04	0.25 – 0.60	Not more than 0.030	Not more than 0.030	–	–
	JIS G 4305	SUS 304	Not more than 0.08	Not more than 1.00	Not more than 2.00	Not more than 0.045	Not more than 0.030	8.00 – 10.50	18.00 – 20.00
(B)	JIS G 4051	S 25 C	0.22 – 0.28	0.15 – 0.35	0.30 – 0.60	Not more than 0.030	Not more than 0.035	–	–

Table 13-4 Chemical composition of high-tensile brass casting of machined cages (%)

Standard	Code	Cu	Zn	Mn	Fe	Al	Sn	Ni	Impurity	
									Pb	Si
JIS H 5120	CAC 301 (HBsC*)	55 – 60	33 – 42	0.1 – 1.5	0.5 – 1.5	0.5 – 1.5	Not more than 1.0	Not more than 1.0	Not more than 0.4	Not more than 0.1

＊: Material with HBsC is used.

14. Shaft and housing design

In designing the shaft and housing, the following should be taken into consideration.

1) Shafts should be thick and short.
(in order to reduce distortion including bending)

2) Housings should possess sufficient rigidity.
(in order to reduce distortion caused by load)
[Note] · For light alloy housings, rigidity may be provided by inserting a steel bushing.

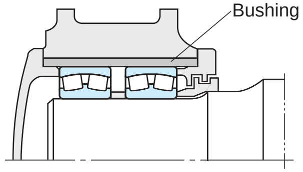


Fig. 14-1 Example of light alloy housing

3) The fitting surface of the shaft and housing should be finished in order to acquire the required accuracy and roughness.
The shoulder end-face should be finished in order to be perpendicular to the shaft center or housing bore surface. (refer to Table 14-1)

4) The fillet radius (r_a) should be smaller than chamfer dimension of the bearing.
(refer to Tables 14-2, 14-3)
[Notes] · Generally it should be finished so as to form a simple circular arc.
(refer to Fig. 14-2)
· When the shaft is given a ground finish, a recess may be provided.
(Fig. 14-3)

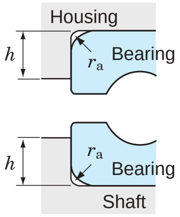


Fig. 14-2 Fillet radius

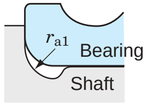


Fig. 14-3 Grinding undercut

5) The shoulder height (h) should be smaller than the outside diameter of inner ring and larger than bore diameter of outer ring so that the bearing is easily dismounted.
(refer to Fig. 14-2 and Table 14-2)

6) If the fillet radius must be larger than the bearing chamfer, or if the shaft/housing shoulder must be low/high, insert a spacer between the inner ring and shaft shoulder as shown in Fig. 14-4, or between the outer ring and the housing shoulder.

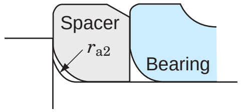


Fig. 14-4 Example of shaft with spacer

7) Screw threads and lock nuts should be completely perpendicular to shaft axis. It is desirable that the tightening direction of threads and lock nuts be opposite to the shaft rotating direction.

8) When split housings are used, the surfaces where the housings meet should be finished smoothly and provided with a recess at the inner ends of the surfaces that meet.

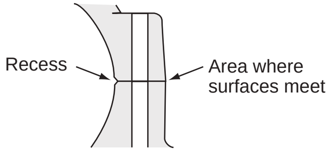


Fig. 14-5 Recesses on meeting surfaces

14-1 Accuracy and roughness of shafts and housings

The fitting surface of the shaft and housing may be finished by turning or fine boring when the bearing is used under general operating conditions. However, if the conditions require minimum vibration and noise, or if the bearing is used under severe operating conditions, a ground finish is required.

Recommended accuracy and roughness of shafts and housings under general conditions are given in Table 14-1.

Table 14-1 Recommended accuracy and roughness of shafts and housings

Item	Bearing class	Shaft	Housing bore
Roundness tolerance	classes 0, 6	IT 3 – IT 4	IT 4 – IT 5
	classes 5, 4	IT 2 – IT 3	IT 2 – IT 3
Cylindrical form tolerance	classes 0, 6	IT 3 – IT 4	IT 4 – IT 5
	classes 5, 4	IT 2 – IT 3	IT 2 – IT 3
Shoulder runout tolerance	classes 0, 6	IT 3	IT 3 – IT 4
	classes 5, 4	IT 3	IT 3
Roughness of fitting surfaces Ra	Small size bearings Large size bearings	0.8 a 1.6 a	1.6 a 3.2 a

[Remark] Refer to the figures listed in the attached table when the basic tolerance IT is required.

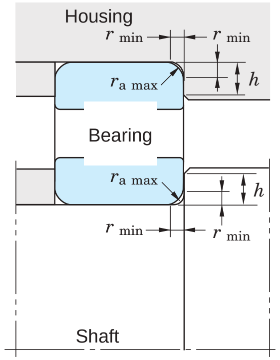
14-2 Mounting dimensions

Mounting dimensions mean the necessary dimensions to mount bearings on shafts or housings, which include the fillet radius or shoulder diameters.

Standard values are shown in Table 14-2. (The mounting related dimensions of each bearing are given in the bearing specification table.)

The grinding undercut dimensions for ground shafts are given in Table 14-3.

Table 14-2 Shaft/housing fillet radius and shoulder height of radial bearings



Unit : mm

Chamfer dimension of inner ring or outer ring r min	Shaft and housing		
	Fillet radius $r_{a\,max}$	Shoulder height h min	
		General cases 1)	Special cases 2)
0.05	0.05	0.3	0.3
0.08	0.08	0.3	0.3
0.1	0.1	0.4	0.4
0.15	0.15	0.6	0.6
0.2	0.2	0.8	0.8
0.3	0.3	1.25	1
0.5	0.5	1.75	1.5
0.6	0.6	2.25	2
0.8	0.8	2.75	2.5
1	1	2.75	2.5
1.1	1	3.5	3.25
1.5	1.5	4.25	4
2	2	5	4.5
2.1	2	6	5.5
2.5	2	6	5.5
3	2.5	7	6.5
4	3	9	8
5	4	11	10
6	5	14	12
7.5	6	18	16
9.5	8	22	20
12	10	27	24
15	12	32	29
19	15	42	38

[Notes]
1) Shoulder heights greater than those specified in the Table are required to accommodate heavy axial loads.
2) Used when an axial load is small.
These values are not recommended for tapered roller bearings, angular contact ball bearings, or spherical roller bearings.

[Remark]
Fillet radius can be applied to thrust bearings.

For thrust bearings, the mounting dimensions should be carefully determined such that bearing race will be perpendicular to the support and the supporting area will be wide enough.

For thrust ball bearings, the shaft shoulder diameter d_a should be larger than pitch diameter of ball set, while the shoulder diameter of housing D_a should be smaller than the pitch diameter of ball set. (Fig. 14-6)

For thrust roller bearings, the housing/shaft diameter D_a/d_a should cover the lengths of both rollers. (Fig. 14-7)

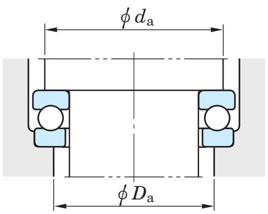


Fig. 14-6 Thrust ball bearings

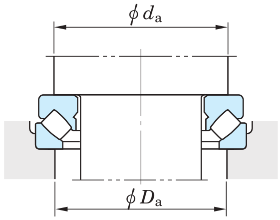
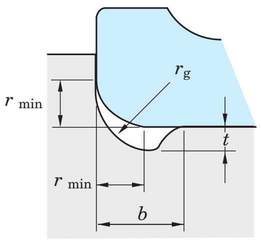


Fig. 14-7 Spherical thrust roller bearings

Table 14-3 Grinding undercut dimensions for ground shafts



Unit : mm

Chamfer dimension of inner ring r min	Grinding undercut dimensions		
	t	r_g	b
1	0.2	1.3	2
1.1	0.3	1.5	2.4
1.5	0.4	2	3.2
2	0.5	2.5	4
2.1	0.5	2.5	4
3	0.5	3	4.7
4	0.5	4	5.9
5	0.6	5	7.4
6	0.6	6	8.6
7.5	0.6	7	10

14-3 Shaft design

When bearings are mounted on shafts, locating method should be carefully determined. Shaft design examples for cylindrical bore bearings are given in Table 14-4, and those for bearings with a tapered bore in Table 14-5.

Table 14-4 Mounting designs for cylindrical bore bearings

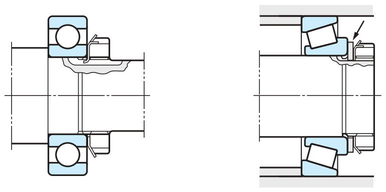
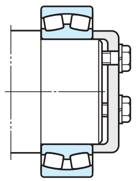
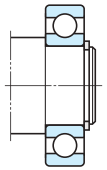
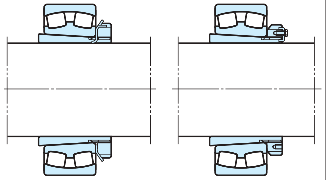
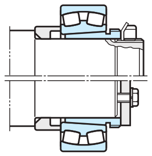
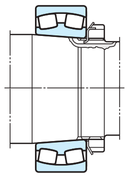
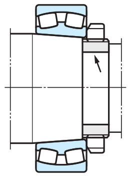
(a) Shaft locknut	(b) End plate	(c) Locating snap ring
		
Lockwashers are used to prevent loosening of locknuts. When tapered roller bearings or angular contact ball bearings are transition-fitted to shafts, plain washers several mm thick as shown above (at right) should be added and tightened with nut.	End of shaft should have bolt holes.	Used when the housing inside is limited, or to simplify shaft machining.

Table 14-5 Mounting designs for bearings with tapered bore

(d) Adapter assembly	(e) Withdrawal sleeve	(f) Shaft locknut	(g) Split ring
			
The simplest method for axial positioning is just to attach an adapter sleeve to the shaft and tighten the locknuts. To prevent locknut loosening, lock-washer (not more than 180 mm in shaft diameter) or lock plate (not less than 200 mm in shaft diameter) are used.	The locknut (above) or end plate (below) fixes the bearing with a withdrawal sleeve, which makes it easy to dismount the bearing.	The shaft is threaded in the same way as shown in Fig. (a). The bearing is located by tightening locknut.	A split ring with threaded outside diameter is inserted into groove on the tapered shaft. A key is often used to prevent the locknut and split ring from loosening.

14-4 Sealing devices

Sealing devices not only prevent foreign matter (dirt, water, metal powder) from entering, but prevent lubricant inside from leaking. If the sealing device fails to function satisfactorily, foreign matter or leakage will cause bearing damage as a result of malfunction or seizure.

Therefore, it is necessary to design or choose the most suitable sealing devices as well as to choose the proper lubricating measures according to operating conditions.

Sealing devices may be divided into non-contact and contact types according to their structure.

They should satisfy the following conditions :

- Free from excessive friction (heat generation)
- Easy maintenance (especially ease of mounting and dismounting)
- As low cost as possible

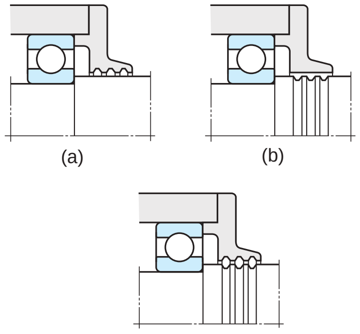
14-4-1 Non-contact type sealing devices

A non-contact type sealing device, which includes oil groove, flinger (slinger), and labyrinth, eliminates friction because it does not have a contact point with the shaft.

These devices utilize narrow clearance and centrifugal force and are especially suitable for operation at high rotation speed and high temperature.

Table 14-6 (1) Non-contact type sealing devices

(1) Oil groove

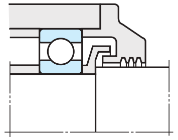


(a) (b) (c)

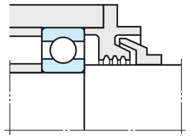
- This kind of seal having more than three grooves at the narrow clearance between the shaft and housing cover, is usually accompanied by other sealing devices except when it is used with grease lubrication at low rotation speed.
- Preventing entrance of contaminants can be improved by filling the groove with calcium grease (cup grease) having a consistency of 150 to 200.
- The clearance between the shaft and housing cover should be as narrow as possible. Recommended clearances are as follows.
  - Shaft diameter of less than 50mm ········ 0.25 – 0.4mm
  - Shaft diameter of over 50mm ········ 0.5 – 1 mm
- Recommended dimensions for the oil groove are as follows.
  - Width ········ 2 – 5mm
  - Depth ········ 4 – 5mm

Table 14-6 (2) Non-contact type sealing devices

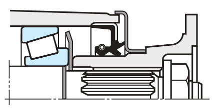
(2) Flinger (slinger)



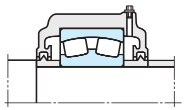
(d) Flinger attached inside



(e) Flinger attached outside



(f) Cover type flinger



(g) Oil thrower

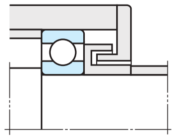
■ A flinger utilizes centrifugal force to splash away the oil and dirt. It produces an air stream which prevents oil leakage and dirt by a pumping action. In many cases, this device is used together with other sealing devices.

■ A flinger installed inside the housing (Fig. d) provides an inward pumping action, preventing lubricant leakage; and, when installed outside (Fig. e), the outward pumping action prevents lubricant contamination.

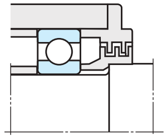
■ A cover type flinger (Fig. f) splashes away dirt and dust by centrifugal force.

■ The oil thrower, shown in (Fig. g), is a kind of flinger. An annular ridge on the shaft or a ring fitted onto the shaft utilizes centrifugal force to prevent the lubricant from flowing out.

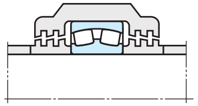
(3) Labyrinth



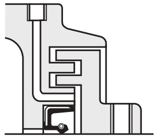
(h) Axial labyrinth



(i) Radial labyrinth



(j) Aligning labyrinth



(k) Axial labyrinth with greasing feature

■ A labyrinth provides clearance in the shape of engagements between the shaft and housing. It is the most suitable for prevention of lubricant leakage at high rotation speed.

■ Though an axial labyrinth, shown in (Fig. h), is popular because of its ease of mounting, the sealing effect is better in a radial labyrinth, shown in (Fig. i).

■ An aligning labyrinth (Fig. j) is used with self-aligning type bearings.

■ In the cases of (Fig. i) and (Fig. j), the housing or the housing cover should be split.

■ Recommended labyrinth clearances are given in the following table.

Shaft diameter	Radial clearance	Axial clearance
50mm or less	0.25 – 0.4mm	1 – 2mm
Over 50mm	0.5 – 1 mm	3 – 5mm

■ To improve sealing effect, fill the labyrinth clearance with grease, shown in (Fig. k).

14-4-2 Contact type sealing devices

This type provides a sealing effect by means of the contact of its end with the shaft and are manufactured from synthetic rubber, synthetic resin, or felt.

The synthetic rubber oil seal is most popular.

1) Oil seals

Many types and sizes of oil seals, as a finished part, have been standardized.

JTEKT produces various oil seals.

The names and functions of each oil seal part are shown in Fig. 14-8 and Table 14-7. Table 14-8 provides a representative example.

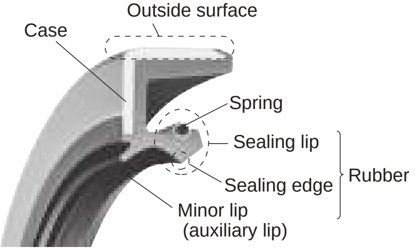


Fig. 14-8 Names of oil seal parts

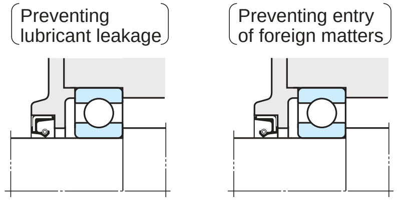
Table 14-7 Complete list of oil seal part functions

Names	Functions
Sealing edge	Prevents fluid leakage by making contact with rotating shaft. (The contact surface of the sealing edge with the shaft should always filled with lubricant, so as to maintain an oil film therein.)
Sealing lip and spring	Provides proper pressure on the sealing edge to maintain stable contact. Spring provides proper pressure on the lip and maintains such pressure for a long time.
Outside surface	Fixes the oil seal to the housing and prevents fluid leakage through the fitting surface. (Comes encased in metal cased type or rubber covered type.)
Case	Strengthens seal.
Minor lip (auxiliary lip)	Prevents entry of contaminants. (In many cases, the space between the sealing lip and minor lip is filled with grease.)

Table 14-8 Typical oil seal types

With case		With inner case	Without case
Without spring	With spring		With spring
 HM (JIS GM)  MH (JIS G)	 HMS (JIS SM)  MHS (JIS S)  CRS	 HMSH (JIS SA)	 MS
 HMA  MHA	 HMSA (JIS DM)  MHSA (JIS D)  CRSA	 HMSAH (JIS DA)	–
● The oil seals shown in the lower row contain the minor lip (auxiliary lip). ● Special types of seals such as the mud resistance seal, pressure resistance seal and outer seal for rotating housings can be provided to serve under various operating conditions.			● By providing a slit on the oil seals, it is possible to attach them from other points than the shaft ends.

Oil seals without minor lips are mounted in different directions according to their operating conditions (shown in Fig. 14-9).



(a) Front facing inside (b) Front facing outside

Fig. 14-9 Direction of sealing lips and their purpose

When the seal is used in a dirty operating environment, or penetration of water is expected, it is advisable to have two oil seals combined or to have the space between the two sealing lips be filled with grease. (shown in Fig. 14-10)

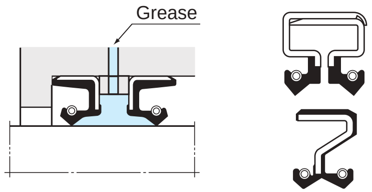


Fig. 14-10 Seals used in a dirty operating environment

Respective seal materials possess different properties. Accordingly, as shown in Table 14-9, allowable lip speed and operating temperature differ depending on the materials. Therefore, by selecting proper materials, oil seals can be used for sealing not only lubricants but also chemicals including alcohol, acids, alkali, etc.

Table 14-9 Allowable lip speed and operating temperature range of oil seals

Seal material	Allowable lip speed (m/s)	Operating temperature range (°C)
NBR	15	– 40 to + 120
Acrylic rubber	25	– 30 to + 150
Silicone rubber	32	– 50 to + 170
Fluoro rubber	32	– 20 to + 180

To ensure the maximum sealing effect of the oil seal, the shaft materials, surface roughness and hardness should be carefully chosen.

Table 14-10 shows the recommended shaft conditions.

Table 14-10 Recommended shaft conditions

Material	Machine structure steel, low alloy steel and stainless steel
Surface hardness	For low speed : harder than 30 HRC For high speed : harder than 50 HRC
Surface roughness (Ra)	0.2 – 0.6a A surface which is excessively rough may cause oil leakage or abrasion ; whereas an excessively fine surface may cause sealing lip seizure, preventing the oil film from forming. Surface must also be free of spiral grinding marks.

2) Felt seals and others

Although felt seals have been used conventionally, it is recommended to replace them with rubber oil seals because the use of felt seals are limited to the following conditions.

- Light dust protection
- Allowable lip speed : not higher than 5m/s

Contact type sealing devices include mechanical seals, O-rings and packings other than those described herein.

JTEKT manufactures various oil seals ranging from those illustrated in Table14-8 to special seals for automobiles, large seals for rolling mills, mud resistance seals, pressure resistance seals, outer seals for rotating housings and O-rings.

For details, refer to JTEKT separate catalog "Oil seals & O-rings" (CAT. NO. R2001E).

15. Handling of bearings

15-1 General instructions

Since rolling bearings are more precisely made than other machine parts, careful handling is absolutely necessary.

1) Keep bearings and the operating environment clean.
2) Handle carefully.
   Bearings can be cracked and brinelled easily by strong impact if handled roughly.
3) Handle using the proper tools.
4) Keep bearings well protected from rust.
   Do not handle bearings in high humidity.
   Operators should wear gloves in order not to soil bearings with perspiration from their hands.
5) Bearings should be handled by experienced or well trained operators.
6) Set bearing operation standards and follow them.
   - Storage of bearings
   - Cleaning of bearings and their adjoining parts.
   - Inspection of dimensions of adjoining parts and finish conditions
   - Mounting
   - Inspection after mounting
   - Dismounting
   - Maintenance and inspection (periodical inspection)
   - Replenishment of lubricants

15-2 Storage of bearings

In shipping bearings, since they are covered with proper anti-corrosion oil and are wrapped in antitarnish paper, the quality of the bearings is guaranteed as long as the wrapping paper is not damaged.

If bearings are to be stored for a long time, it is advisable that the bearings be stored on shelves set higher than 30 cm from the floor, at a humidity less than 65 %, and at a temperature around 20°C.

Avoid storage in places exposed directly to the sun's rays or placing boxes of bearings against cold walls.

15-3 Bearing mounting

15-3-1 Recommended preparation prior to mounting

1) Preparation of bearings

Wait until just before mounting before removing the bearings from their packaging to prevent contamination and rust.

Since the anti-corrosion oil covering bearings is a highly capable lubricant, the oil should not be cleaned off if the bearings are pre-lubricated, or when the bearings are used for normal operation. However, if the bearings are used in measuring instruments or at high rotation speed, the anti-corrosion oil should be removed using a clean detergent oil. After removal of the anti-corrosion oil, bearings should not be left for a long time because they rust easily.

2) Inspection of shafts and housings

Clean up the shaft and housing to check whether it has flaws or burrs as a result of machining.

Be very careful to completely remove lapping agents (SiC, Al_2O_3, etc.), casting sands, and chips from inside the housing.

Next, check that the dimensions, forms, and finish conditions of the shaft and the housing are accurate to those specified on the drawing.

The shaft diameter and housing bore diameter should be measured at the several points as shown in Figs. 15-1 and 15-2.

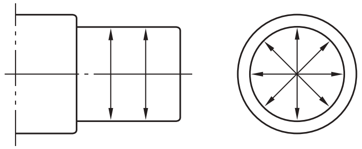


Fig. 15-1 Measuring points on shaft diameter

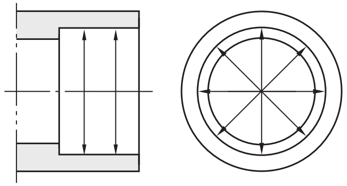


Fig. 15-2 Measuring points on housing bore diameter

Furthermore, fillet radius of shaft and housing, and the squareness of shoulders should be checked.

When using shaft and housing which have passed inspection, it is advisable to apply machine oil to each fitting surface just before mounting.

15-3-2 Bearing mounting

Mounting procedures depend on the type and fitting conditions of bearings.

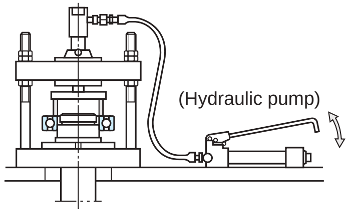
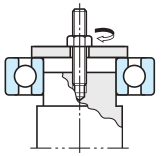
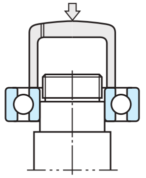
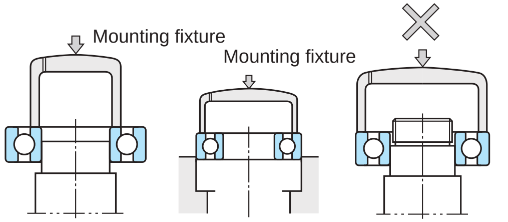
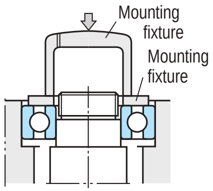
For general bearings in which the shaft rotates, an interference fit is applied to inner rings, while a clearance fit is applied to outer rings.

For bearings in which the outer rings rotate, an interference fit is applied to the outer rings.

Interference fitting is roughly classified as shown here. The detailed mounting processes are described in Tables 15-1 to 15-3.

- **Interference fit of inner rings**
  - **Bearings with cylindrical bore**
    - **Press fit** ··· Applied to small size bearings with restricted interference. (Table 15-1)
    - **Shrink fit** ··· Applied to bearings which allow heavy interference or to large size bearings. (Table 15-2)
  - **Bearings with tapered bore**
    - **Mounting on tapered shafts** ·· (Table 15-3)
    - **Mounting using sleeves** ·· (Table 15-3)
- **Interference fit of outer rings**
  - **Press fit** ··· Most widely used method (Table 15-1)
  - **Cooling fit** ··· Bearings are fit into housings by cooling them with dry ice, etc. In this method, proper rust-preventive treatment is required, since moisture in the atmosphere adheres to bearings.

Table 15-1 Press fit of bearings with cylindrical bores

Mounting methods	Descriptions
 (a) Using press fit (the most widely used method)  (b) Using bolts and nuts (screw hole should be provided at the shaft end)  (c) Using hammers (only when there is no alternative measure)	■ As shown in the Fig., a bearing should be mounted slowly with care, by using a fixture to apply force evenly to the bearing. When mounting the inner ring, apply pressure to the inner ring only. Similarly, in mounting the outer ring, press only the outer ring.  (Inner ring press fit) (Outer ring press fit) (Inner ring press fit) ■ If interference is required on both the inner and outer ring of non-separable bearings, use two kinds of fixtures as shown in the Fig. and apply force carefully, as rolling elements are easily damaged. Be sure never to use a hammer in such cases.  Simultaneous press fit of inner ring and outer ring

Reference **Force is necessary to press fit or remove bearings.**

The force necessary to press fit or remove inner rings of bearings differs depending on the finish of shafts and how much interference the bearings allow.

The standard values can be obtained by using the following equations.

(Solid shafts)

$$K_a = 9.8\, f_k \cdot \Delta_{deff} \cdot B \left(1 - \frac{d^2}{D_i^2}\right) \times 10^3 \quad \cdots\cdots\cdots\cdots \text{(15-1)}$$

(Hollow shafts)

$$K_a = 9.8\, f_k \cdot \Delta_{deff} \cdot B \, \frac{\left(1 - \frac{d^2}{D_i^2}\right)\left(1 - \frac{d_0^2}{d^2}\right)}{\left(1 - \frac{d_0^2}{D_i^2}\right)} \times 10^3 \quad \cdots\cdots \text{(15-2)}$$

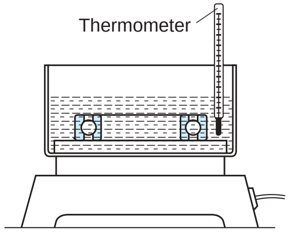
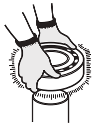
In equations (15-1) and (15-2),

K_a : force necessary for press fit or removal N
Δ_{deff} : effective interference mm
f_k : resistance coefficient
(Coefficient taking into consideration friction between shafts and inner rings ··· refer to the table on the right)
B : nominal inner ring width mm
d : nominal inner ring bore diameter mm
D_i : average outside diameter of inner ring mm
d_0 : hollow shaft bore diameter mm

Value of resistance coefficient f_k

Conditions	f_k
· Press fitting bearings on to cylindrical shafts	4
· Removing bearings from cylindrical shafts	6
· Press fitting bearings on to tapered shafts or tapered sleeves	5.5
· Removing bearings from tapered shafts or tapered sleeves	4.5
· Press fitting tapered sleeves between shafts and bearings	10
· Removing tapered sleeves from the space between shafts and bearings	11

Table 15-2 Shrink fit of cylindrical bore bearings

Shrink fit	Descriptions
 (a) Heating in an oil bath  (b) Induction heater	■ This method, which expands bearings by heating them in oil, has the advantage of not applying too much force to bearings and taking only a short time.  [Notes] ● Oil temperature should not be higher than 100 °C, because bearings heated at higher than 120 °C lose hardness. ● Heating temperature can be determined from the bore diameter of a bearing and the interference by referring to Fig. 15-3. ● Use nets or a lifting device to prevent the bearing from resting directly on the bottom of the oil container. ● Since bearings shrink in the radial direction as well as the axial direction while cooling down, fix the inner ring and shaft shoulder tightly with the shaft nut before shrinking, so that no space is left between them. ■ Shrink fit proves to be clean and effective since, by this method, the ring can be provided with even heat in a short time using neither fire nor oil. When electricity is being conducted, the bearing itself generates heat by its electrical resistance, aided by the built-in exciting coil.

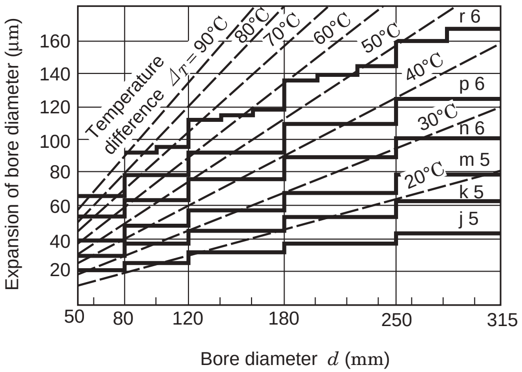


Fig. 15-3 Heating temperature and expansion of inner rings

[Remarks]

1. Thick solid lines show the maximum interference value between bearings (class 0) and shafts (r 6, p 6, n 6, m 5, k 5, j 5) at normal temperature.

2. Therefore, the heating temperature should be selected to gain a larger "expansion of the bore diameter" than the maximum interference values.

When fitting class 0 bearings having a 90 mm bore diameter to m 5 shafts, this figure shows that heating temperature should be 40 °C higher than room temperature to produce expansion larger than the maximum interference value of 48 µm.
However, taking cooling during mounting into consideration, the temperature should be set 20 to 30 °C higher than the temperature initially required.

Table 15-3 Mounting bearings with tapered bores

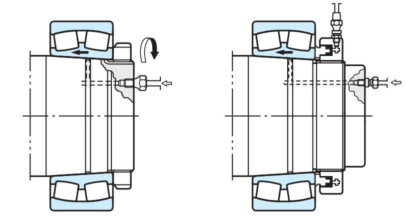
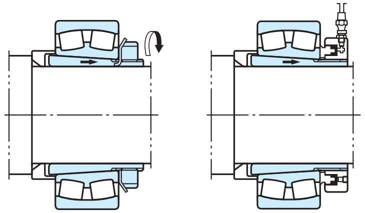
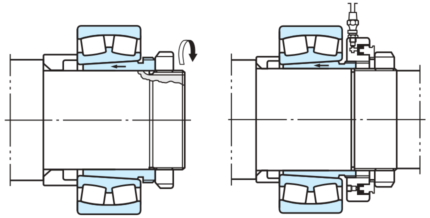
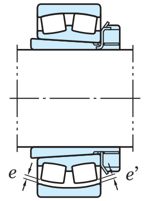
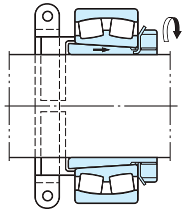
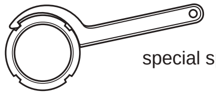
Mounting methods	Descriptions
 ① Locknut ② Hydraulic nut (a) Mounting on tapered shafts  ① Locknut ② Hydraulic nut (b) Mounting by use of an adapter sleeve  ① Locknut ② Hydraulic nut (c) Mounting by use of a withdrawal sleeve  (d) Measuring clearances	■ When mounting bearings directly on tapered shafts, provide oil holes and grooves on the shaft and inject high pressure oil into the space between the fitting surfaces (oil injection). Such oil injection can reduce tightening torque of locknut by lessening friction between the fitting surfaces. ■ When exact positioning is required in mounting a bearing on a shaft with no shoulder, use a clamp to help determine the position of the bearing.  Locating bearing by use of a clamp ■ When mounting bearings on shafts, locknuts are generally used. Special spanners are used to tighten them. Bearings can also be mounted using hydraulic nuts.  ■ When mounting tapered bore spherical roller bearings, the reduction in the radial internal clearance which gradually occurs during operation should be taken into consideration as well as the push-in depth described in Table 15-4. Clearance reduction can be measured by a thickness gage. First, stabilize the roller in the proper position and then insert the gage into the space between the rollers and the outer ring. Be careful that the clearance between both roller rows and the outer rings is roughly the same ($e \doteqdot e'$). Since the clearance may differ at different measuring points, take measurements at several positions. ■ When mounting self-aligning ball bearings, leave enough clearance to allow easy aligning of the outer ring.

Table 15-4 Mounting tapered bore spherical roller bearings

Nominal bore diameter *d* mm		Reduction of radial internal clearance µm		Axial displacement, mm				Minimum required residual clearance, µm		
				1/12 taper		1/30 taper		C N clearance	C 3 clearance	C 4 clearance
over	up to	min.	max.	min.	max.	min.	max.			
24	**30**	**15**	**20**	0.27	0.35	–	–	10	20	35
30	**40**	**20**	**25**	0.32	0.4	–	–	15	25	40
40	**50**	**25**	**35**	0.4	0.5	–	–	20	30	45
50	**65**	**30**	**40**	0.45	0.6	–	–	25	35	55
65	**80**	**35**	**50**	0.55	0.75	–	–	35	40	70
80	**100**	**40**	**55**	0.65	0.85	–	–	40	50	85
100	**120**	**55**	**70**	0.85	1.05	2.15	2.65	45	65	100
120	**140**	**65**	**90**	1.0	1.2	2.5	3.0	55	80	110
140	**160**	**75**	**100**	1.1	1.35	2.75	3.4	55	90	130
160	**180**	**80**	**110**	1.2	1.5	3.0	3.8	60	100	150
180	**200**	**90**	**120**	1.4	1.7	3.5	4.3	70	110	170
200	**225**	**100**	**130**	1.55	1.85	3.85	4.6	80	120	190
225	**250**	**110**	**140**	1.7	2.05	4.25	5.1	90	130	210
250	**280**	**120**	**160**	1.8	2.3	4.5	5.75	100	140	230
280	**315**	**130**	**180**	2.0	2.5	5.0	6.25	110	150	250
315	**355**	**150**	**200**	2.3	2.8	5.75	7.0	120	170	270
355	**400**	**170**	**220**	2.5	3.1	6.25	7.75	130	190	300
400	**450**	**190**	**240**	2.8	3.4	7.0	8.5	140	210	330
450	**500**	**210**	**270**	3.1	3.8	7.75	9.5	160	230	360
500	**560**	**240**	**310**	3.5	4.3	8.75	10.8	170	260	370
560	**630**	**260**	**350**	3.9	4.8	9.75	12.0	200	300	410
630	**710**	**300**	**390**	4.3	5.3	10.8	13.3	210	320	460
710	**800**	**340**	**430**	4.8	6.0	12.0	15.0	230	370	530
800	**900**	**370**	**500**	5.3	6.7	13.3	16.8	270	410	570
900	**1000**	**410**	**550**	5.9	7.4	14.8	18.5	300	450	640

[Remark] The values for reduction of radial internal clearance listed above are values obtained when mounting bearings with CN clearance on solid shafts. In mounting bearings with C 3 clearance, the maximum value listed above should be taken as the standard.

15-4 Test run

A trial operation is conducted to insure that the bearings are properly mounted.

In the case of compact machines, rotation may be checked by manual operation at first.

If no abnormalities, such as those described below, are observed, then further trial operation proceeds using a power source.

- Knocking ···
  due to flaws or insertion of foreign matter on rolling contact surfaces.
- Excessive torque (heavy) ···
  due to friction on sealing devices, too small clearances, and mounting errors.
- Uneven running torque ···
  due to improper mounting and mounting errors.

For machines too large to allow manual operation, idle running is performed by turning off the power source immediately after turning it on. Before starting power operation, it must be confirmed that bearings rotate smoothly without any abnormal vibration and noise.

Power operation should be started under no load and at low speed, then the speed is gradually increased until the designed speed is reached.

During power operation, check the noise, increase in temperature and vibration.

If any of the abnormalities listed in Tables 15-5 and 15-6 are found, operation must be stopped, and inspection for defects immediately conducted.

The bearings should be dismounted if necessary.

Table 15-5 Bearing noises, causes, and countermeasures

Noise types		Causes	Countermeasures
Cyclic	Flaw noise Rust noise (similar to noise when punching a rivet) Brinelling noise (Unclear siren-like noise)	Flaw on raceway Rust on raceway Brinelling on raceway	Improve mounting procedure, cleaning method and rust preventive method. Replace bearing.
	Flaking noise (similar to a large hammering noise)	Flaking on raceway	Replace bearing.
Not cyclic	Dirt noise (an irregular sandy noise.)	Insertion of foreign matter	Improve cleaning method, sealing device. Use clean lubricant. Replace bearing.
	Fitting noise (drumming or hammering noise)	Improper fitting or excessive bearing clearance	Review fitting and clearance conditions. Provide preload. Improve mounting accuracy.
	Flaw noise, rust noise, flaking noise	Flaws, rust and flaking on rolling elements	Replace bearing.
	Squeak noise (often heard in cylindrical roller bearings with grease lubrication, especially in winter or at low temperatures)	If noise is caused by improper lubrication, a proper lubricant should be selected. In general, however, serious damage will not be caused by an improper lubricant if used continuously.	
Others	Abnormally large metallic sound	Abnormal load Incorrect mounting Insufficient amount of or improper lubricant	Review fitting, clearance. Adjust preload. Improve accuracy in processing and mounting shafts and housings. Improve sealing device. Refill lubricant. Select proper lubricant.

Table 15-6 Causes and countermeasures for abnormal temperature rise

Causes	Countermeasures
Too much lubricant	Reduce lubricant amount. Use grease of lower consistency.
Insufficient lubricant	Refill lubricant.
Improper lubricant	Select proper lubricant.
Abnormal load	Review fitting and clearance conditions and adjust preload.
Improper mounting (excessive friction)	Improve accuracy in processing and mounting shaft and housing. Review fitting. Improve sealing device.

Normally, listening rods are employed for bearing noise inspections.

The instrument detecting abnormalities through sound vibration and the Diagnosis System utilizing acoustic emission for abnormality detection are also applicable.

In general, bearing temperature can be estimated from housing temperature, but the most accurate method is to measure the temperature of outer rings directly via lubrication holes.

Normally, bearing temperature begins to rise gradually when operation is just starting; and, unless the bearing has some abnormality, the temperature stabilizes within one or two hours.

Therefore, a rapid rise in temperature or unusually high temperature indicates some abnormality.

15-5 Bearing dismounting

After dismounting bearings, handling of the bearings and the various methods available for this should be considered.

If the bearing is to be disposed of, any simple method such as torch cutting can be employed. If the bearing is to be reused or checked for the causes of its failure, the same amount of care as in mounting should be taken in dismounting so as not to damage the bearing and other parts.

Since bearings with interference fits are easily damaged during dismounting, measures to prevent damage during dismounting must be incorporated into the design.

It is recommended that dismounting devices be designed and manufactured, if necessary.

It is useful for discovering the causes of failures when the conditions of bearings, including mounting direction and location, are recorded prior to dismounting.

Dismounting method

Tables 15-7 to 15-9 describe dismounting methods for interference fit bearings intended for reuse or for failure analysis.

The force necessary to remove bearings can be calculated using the equations given on page A 142.

Table 15-7 Dismounting of cylindrical bore bearings

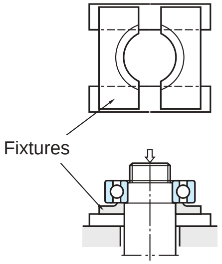
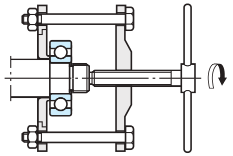
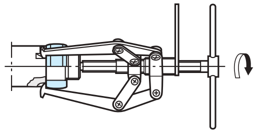
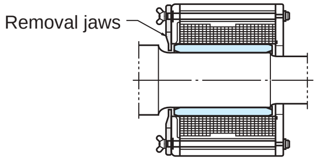
Inner ring dismounting methods	Descriptions
 (a) Dismounting by use of a press  (b) Dismounting by use of special tools  (c) Dismounting by use of special tools  (d) Dismounting using induction heater	● Non-separable bearings should be treated carefully during dismounting so as to minimize external force, which affects their rolling elements. ● The easiest way to remove bearings is by using a press as shown in Fig. (a). It is recommended that the fixture be prepared so that the inner ring can receive the removal force. ● Figs. (b) and (c) show a dismounting method in which special tools are employed. In both cases, the jaws of the tool should firmly hold the side of the inner ring. ● Fig. (d) shows an example of removal by use of an induction heater : this method can be adapted to both mounting and dismounting of the inner rings of NU and NJ type cylindrical roller bearings. The heater can be used for heating and expanding inner rings in a short time.

Table 15-8 Dismounting tapered bore bearings

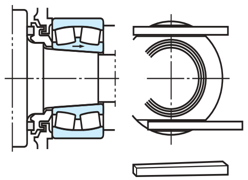
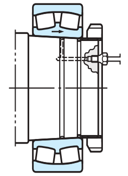
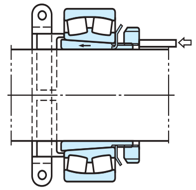
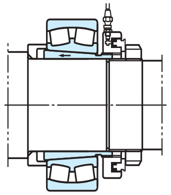
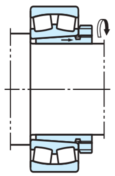
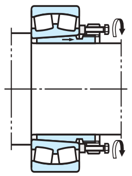
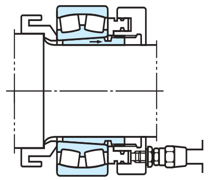
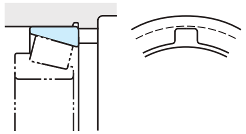
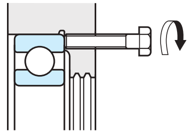
Inner ring dismounting methods	Descriptions
 (a) Dismounting by use of a wedge  (b) Dismounting by use of oil pressure  (c) Dismounting by use of clamps  (d) Dismounting by use of hydraulic nuts  (e) Dismounting by use of locknuts  (f) Dismounting by use of bolts  (g) Dismounting by use of hydraulic nuts	● Fig. (a) shows the dismounting of an inner ring by means of driving wedges into notches at the back of the labyrinth. Fig. (b) shows dismounting by means of feeding high pressure oil to the fitting surfaces. In both cases, it is recommended that a stopper (ex. shaft nuts) be provided to prevent bearings from suddenly dropping out. ● For bearings with an adapter sleeve, the following two methods are suitable. As shown in Fig. (c), fix bearings with clamps, loosen locknuts, then hammer off the adapter sleeve. This method is mainly used for small size bearings. Fig. (d) shows the method using hydraulic nuts. ● Small size bearings with withdrawal sleeves can be removed by tightening locknuts as shown in Fig. (e). For large size bearings, provide several bolt holes on locknuts as shown in Fig. (f), and tighten bolts. The bearings can then be removed as easily as small size bearings. ● Fig. (g) shows the method using hydraulic nuts.

Table 15-9 Dismounting of outer rings

Outer ring dismounting methods	Description
 (a) Notchs for dismounting  (b) Bolt holes and bolts for dismounting	● To dismount outer rings with interference fits, it is recommended that notches or bolt holes be provided on the shoulder of the housings.

15-6 Maintenance and inspection of bearings

Periodic and thorough maintenance and inspection are indispensable to drawing full performance from bearings and lengthening their useful life.

Besides, prevention of accidents and down time by early detection of failures through maintenance and inspection greatly contributes to the enhancement of productivity and profitability.

15-6-1 Cleaning

Before dismounting a bearing for inspection, record the physical condition of the bearing, including taking photographs.

Cleaning should be done after checking the amount of remaining lubricant and collecting lubricant as a sample for examination.

- A dirty bearing should be cleaned using two cleaning processes, such as rough cleaning and finish cleaning.
  It is recommended that a net be set on the bottom of cleaning containers.
- In rough cleaning, use brushes to remove grease and dirt. Bearings should be handled carefully. Note that raceway surfaces may be damaged by foreign matter, if bearings are rotated in cleaning oil.
- During finish cleaning, clean bearings carefully by rotating them slowly in cleaning oil.

In general, neutral water-free light oil or kerosene is used to clean bearings, a warm alkali solution can also be used if necessary. In any case, it is essential to keep oil clean by filtering it prior to cleaning.

Apply anti-corrosion oil or rust preventive grease on bearings immediately after cleaning.

15-6-2 Inspection and analysis

Before determining that dismounted bearings will be reused, the accuracy of their dimensions and running, internal clearance, fitting surfaces, raceways, rolling contact surfaces, cages and seals must be carefully examined, so as to confirm that no abnormality is present.

It is desirable for skilled persons who have sufficient knowledge of bearings to make decisions on the reuse of bearings.

Criteria for reuse differs according to the performance and importance of machines and inspection frequency.

If the following defects are found, replace the bearing with a new one.

- Cracks and chips in bearing components
- Flaking on the raceway surfaces and the rolling contact surfaces
- Other failures of a serious degree described in the following section "16. Examples of bearing failures."

15-7 Methods of analyzing bearing failures

It is important for enhancing productivity and profitability, as well as for accident prevention that abnormalities in bearings are detected during operation.

Representative detection methods are described in the following section.

1) Noise checking

Since the detection of abnormalities in bearings from noises requires ample experience, sufficient training must be given to inspectors. Given this, it is recommended that specific persons be assigned to this work in order to gain this experience.

Attaching hearing aids or listening rods on housings is effective for detecting bearing noise.

2) Checking of operating temperature

Since this method utilizes change in operating temperature, its application is limited to relatively stable operations.

For detection, operating temperatures must be continuously recorded.

If abnormalities occur in bearings, operating temperature not only increase but also change irregularly.

It is recommended that this method be employed together with noise checking.

3) Lubricant checking

This method detects abnormalities from the foreign matter, including dirt and metallic powder, in lubricants collected as samples.

This method is recommended for inspection of bearings which cannot be checked by close visual inspection, and large size bearings.

16. Examples of bearing failures

Table 16-1 (1) Bearing failures, causes and countermeasures

Failures	Characteristics	Damages	Causes	Countermeasures
1 Flaking	(A-6961) (A-6476) Flaking is a phenomenon when material is removed in flakes from a surface layer of the bearing raceways or rolling elements due to rolling fatigue. This phenomenon is generally attributed to the approaching end of bearing service life. However, if flaking occurs at early stages of bearing service life, it is necessary to determine causes and adopt countermeasures. [Reference] Pitting Pitting is another type of failure caused by rolling fatigue, in which minute holes of approx. 0.1 mm in depth are generated on the raceway surface.	Flaking occurring at an incipient stage	· Too small internal clearance · Improper or insufficient lubricant · Too much load · Rust	· Provide proper internal clearance. · Select proper lubricating method or lubricant.
		Flaking on one side of radial bearing raceway	· Extraordinarily large axial load	· Fitting between outer ring on the free side and housing should be changed to clearance fit.
		Symmetrical flaking along circumference of raceway	· Inaccurate housing roundness	· Correct processing accuracy of housing bore. (Especially for split housings, care should be taken to ensure processing accuracy.)
		Slanted flaking on the radial ball bearing raceway	· Improper mounting · Shaft deflection · Inaccuracy of the shaft and housing	· Correct centering. · Widen bearing internal clearance. · Correct squareness of shaft or housing shoulder.
		Flaking occurring near the edge of the raceway or rolling contact surface of roller bearings		
		Flaking on the raceway surface at the same interval as rolling element spacing	· Heavy impact load during mounting · A flaw of cylindrical roller bearings or tapered roller bearings caused when they are mounted. · Rust gathered while out of operation	· Improve mounting procedure. · Provide rust prevention treatment before long cessation of operation.
2 Cracking, chipping	(A-6395)	Cracking in outer ring or inner ring	· Excessive interference · Excessive fillet on shaft or housing · Heavy impact load · Advanced flaking or seizure	· Select proper fit. · Adjust fillet on the shaft or in the housing to smaller than that of the bearing chamfer dimension. · Re-examine load conditions.
		Cracking on rolling elements	· Heavy impact load · Advanced flaking	· Improve mounting and handling procedure. · Re-examine load conditions.
		Cracking on the rib	· Impact on rib during mounting · Excessive axial impact load	· Improve mounting procedure. · Re-examine load conditions.
3 Brinelling, nicks	(A-6617) (Brinelling) · Brinelling is a small surface indentation generated either on the raceway through plastic deformation at the contact point between the raceway and rolling elements, or on the rolling surfaces from insertion of foreign matter, when heavy load is applied while the bearing is stationary or rotating at a low rotation speed. · Nicks are those indentations produced directly by rough handling such as hammering.	Brinelling on the raceway or rolling contact surface	· Entry of foreign matter	· Clean bearing and its peripheral parts. · Improve sealing devices.
		Brinelling on the raceway surface at the same interval as the rolling element spacing	· Impact load during mounting · Excessive load applied while bearing is stationary	· Improve mounting procedure. · Improve machine handling.
		Nicks on the raceway or rolling contact surface	· Careless handling	· Improve mounting and handling procedure.

Table 16-1 (2) Bearing failures, causes and countermeasures

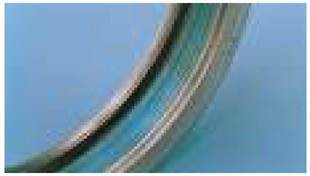
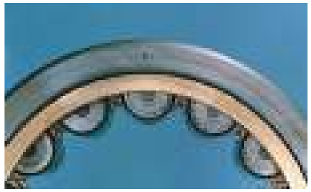
Failures	Characteristics	Damages	Causes	Countermeasures
4 Pear skin, discoloration	 (A-6720) (Discoloration) · Pear skin is a phenomenon in which minute brinell marks cover the entire rolling surface, caused by the insertion of foreign matter. This is characterized by loss of luster and a rolling surface that is rough in appearance. In extreme cases, this is accompanied by discoloration due to heat generation. · Discoloration is a phenomenon in which the surface color changes because of staining or heat generation during rotation. Color change caused by rust and corrosion is generally separate from this phenomenon.	Indentation similar to pear skin on the raceway and rolling contact surface.	· Entry of minute foreign matter	· Clean the bearing and its peripheral parts. · Improve sealing device.
		Discoloration of the raceway, surface rolling contact surface, rib face, and cage riding land.	· Too small bearing internal clearance · Improper or insufficient lubricant · Quality deterioration of lubricant due to aging, etc.	· Provide proper internal clearance. · Select proper lubricating method or lubricant.
5 Scratches, scuffing	 (A-6459) (Scuffing) · Scratches are relatively shallow marks generated by sliding contact, in the same direction as the sliding. This is not accompanied by apparent melting of material. · Scuffing refers to marks, the surface of which are partially melted due to higher contact pressure and therefore a greater heat effect. · Generally, scuffing may be regarded as a serious case of scratches.	Scratches on raceway or rolling contact surface	· Insufficient lubricant at initial operation · Careless handling	· Apply lubricant to the raceway and rolling contact surface when mounting. · Improve mounting procedure.
		Scuffing on rib face and roller end face	· Improper or insufficient lubricant · Improper mounting · Excessive axial load	· Select proper lubricating method or lubricant. · Correct centering of axial direction.
6 Smearing	 (A-6640) Smearing is a phenomenon in which a cluster of minute seizures cover the rolling contact surface. Since smearing is caused by high temperature due to friction, the surface of the material usually melts partially ; and, the smeared surfaces appear very rough in many cases.	Smearing on raceway or rolling contact surface	· Improper or insufficient lubricant · Slipping of the rolling elements (This occurs due to the break down of lubricant film when an abnormal self rotation causes slip of the rolling elements on the raceway.)	· Select proper lubricating method or lubricant. · Provide proper preload.
7 Rust, corrosion	 (A-7130) · Rust is a film of oxides, or hydroxides, or carbonates formed on a metal surface due to chemical reaction. · Corrosion is a phenomenon in which a metal surface is eroded by acid or alkali solutions through chemical reaction (electrochemical reaction such as chemical combination and battery formation) ; resulting in oxidation or dissolution. (It often occurs when sulfur or chloride contained in the lubricant additives is dissolved at high temperature.)	Rust partially or completely covering the bearing surface.	· Improper storage condition · Dew formation in atmosphere	· Improve bearing storage conditions. · Improve sealing devices. · Provide rust preventive treatment before long cessation of operation.
		Rust and corrosion at the same interval as rolling element spacing	· Contamination by water or corrosive matter	· Improve sealing devices.
8 Electric pitting	 (A-6652) When an electric current passes through a bearing while in operation, it can generate sparks between the raceway and rolling elements through a very thin oil film, resulting in melting of the surface metal in this area. This phenomenon appears to be pitting at first sight. (The resultant flaw is referred to as a pit.) When the pit is magnified, it appears as a hole like a crater, indicating that the material melted when it was sparking. In some cases, the rolling surface becomes corrugated by pitting.	Pitting or a corrugated surface failure on raceway and rolling contact surface (The bearings must be replaced, if the corrugated texture is found by scratching the surface with a fingernail or if pitting can be observed by visual inspection.)	· Sparks generated when electric current passes through bearings	· Providing a bypass which prevents current from passing through bearings. · Insulation of bearings.

Table 16-1 (3) Bearing failures, causes and countermeasures

Failures	Characteristics	Damages	Causes	Countermeasures
9 Wear	 (A-4719) Normally, wear of bearing is observed on sliding contact surfaces such as roller end faces and rib faces, cage pockets, the guide surface of cages and cage riding lands. Wear is not directly related to material fatigue. Wear caused by foreign matter and corrosion can affect not only sliding surfaces but rolling surfaces.	Wear on the contact surfaces (roller end faces, rib faces, cage pockets)	Improper or insufficient lubricant	· Select proper lubricating method or lubricant. · Improve sealing device. · Clean the bearing and its peripheral parts.
		Wear on raceways and rolling contact surfaces	· Entry of foreign matter · Improper or insufficient lubricant	
10 Fretting	 (A-6649) Fretting occurs to bearings which are subject to vibration while in stationary condition or which are exposed to minute vibration. It is characterized by rust-colored wear particles. Since fretting on the raceways often appears similar to brinelling, it is sometimes called "falsebrinelling".	Rust-colored wear particles generated on the fitting surface (fretting corrosion)	· Insufficient interference	· Provide greater interference · Apply lubricant to the fitting surface
		Brinelling on the raceway surface at the same interval as rolling element spacing (false brinelling)	· Vibration and oscillation when bearings are stationary.	· Improve fixing method of the shaft and housing. · Provide preload to bearing.
11 Creeping	 (A-6647) Creeping is a phenomenon in which bearing rings move relative to the shaft or housing during operation.	Wear, discoloration and scuffing, caused by slipping on the fitting surfaces	· Insufficient interference · Insufficient tightening of sleeve	· Provide greater interference. · Proper tightening of sleeve.
12 Damage to cages	 (A-6455) Since cages are made of low hardness materials, external pressure and contact with other parts can easily produce flaws and distortion. In some cases, these are aggravated and become chipping and cracks. Large chipping and cracks are often accompanied by deformation, which may reduce the accuracy of the cage itself and may hinder the smooth movement of rolling elements.	Flaws, distortion, chipping, cracking and excessive wear in cages. Loose or damaged rivets.	· Extraordinary vibration, impact, moment · Improper or insufficient lubricant · Improper mounting (misalignment) · Dents made during mounting	· Re-examine load conditions. · Select proper lubricating method or lubricant. · Minimize mounting deviation. · Re-examine cage types. · Improve mounting.
13 Seizure	 (A-6679) A phenomenon caused by abnormal heating in bearings.	Discoloration, distortion and melting together	· Too small internal clearance · Improper or insufficient lubricant · Excessive load · Aggravated by other bearing flaws	· Provide proper internal clearance. · Select proper lubricating method or lubricant. · Re-examine bearing type. · Earlier discovery of bearing flaws.

Bearing specification tables

Contents

Standard bearings

[Introduction]

Special purpose bearings

[Introduction]

Deep groove ball bearings

Deep groove ball bearings are available in a variety of sizes, and are the most popular of all rolling bearings. This type of bearing supports radial load and a certain degree of axial load in both directions simultaneously.

■ Shielded / sealed type

- Simplifies sealing structure of applications.
- Greasing is not necessary because bearings are pre-lubricated.
- Table 1 on the next page lists major shielded and sealed bearing types and compares their performance.

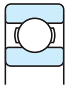
■ With locating snap ring

- Bearings with a locating snap ring can be fit to the housing easily, as the locating snap ring facilitates axial positioning.

■ Extra-small ball bearings and miniature ball bearings

- The open type is widely used. Also available are the shielded/sealed type and the flanged type; the latter is easily positioned in the axial direction.

Single-row deep groove ball bearings



Open type

Bore diameter **10** – **500** mm

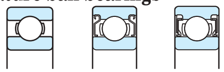
Shielded/sealed type

Bore diameter **10** – **220** mm

With snap ring groove　With locating snap ring

Bore diameter **10** – **130** mm

Extra-small ball bearings and miniature ball bearings

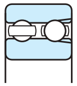


Bore diameter **1** – **9** mm

Flanged type

Bore diameter **1** – **9** mm

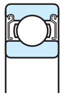
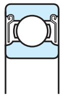
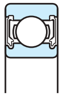
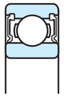
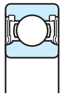
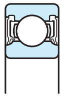
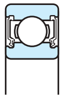
Double-row deep groove ball bearings



(with filling slot)

Bore diameter **10** – **75** mm

Table 1　Comparison of shielded and sealed bearing performance

Type / Characteristics	Shielded	Sealed			
	Non-contact type	Non-contact type	Contact type		Extremely light contact type
	ZZ type	2RU type	2RS type	2RK type	2RD type
	 (a) [1]  (b)	 (c)	 (d) [2]  (e)	 (f)	 (g)
Friction torque	Small	Small	Large	Large	Small
High speed performance	Good	Good	Limited because of contact		Good
Grease sealing property	Good	Better than ZZ type	Better than 2RU type for low-speed applications	Excellent	Excellent
Dirt resistance	Good	Better than ZZ type	Better than 2RU type	Excellent	Excellent
Water resistance	Economical	Better than ZZ type but inferior to 2RS, 2RK and 2RD types	Good	Excellent	Better than ZZ and 2RU types
Operating temperature [3]	– 30 to +110°C		– 30 to +100°C		– 30 to +110°C

[Notes] 1) Illustration (a) of the ZZ type shows the relatively small size bearing.
2) Illustration (d) of the 2RS type shows the relatively small size bearing.
3) The operating temperature range listed is for the standard type. It can be widened by using a different type of grease or sealing material. Consult with JTEKT for details.

■ Handling instructions

1) The shielded/sealed type deep groove ball bearing and the deep groove ball bearing with a locating snap ring are designed for use with the inner ring rotating.
Consult with JTEKT on use with the outer ring rotating.
2) When the axial load is large, make the shaft shoulder and housing shoulder larger than usual.
(Referring to the specification table, make the mounting dimension d_a larger and make D_a smaller.)

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512. For extra-small and miniature ball bearings, special series (ML) are specified together with those described above.
Tolerances	As specified in JIS B 1514-1. (refer to Table 7-3 on pp. A 60 – A 63.)
Radial internal clearance	■ Deep groove ball bearings (except extra-small ball bearings and miniature ball bearings) .... as specified in JIS B 1520 (refer to Table 10-2 on p. A 102.) ■ Extra-small ball bearings and miniature ball bearings .... (refer to Table 10-3 on p. A 102.) ■ Deep groove ball bearings for motors .... (refer to Table 10-6 on p. A 105.)
Recommended fits	■ Bearings of classes 0 and 6 .... (refer to Table 9-4 on pp. A 91, 92.) ■ Precision extra-small ball bearings and miniature ball bearings .... (refer to Table 9-5 on p. A 93.)

Standard cages

- Synthetic resin molded cage (supplementary code : FG, MG)
- Pressed cage (supplementary code : //)
- Copper alloy machined cage (supplementary code : FY)

[Remark]
For certain applications, stainless steel sheet pressed cages (YS) may also be used.

Application of standard cages

Bearing series	Molded cage	Pressed cage	Machined cage
68	683 – 689	–	–
69	693 – 699	–	–
60	603 – 609	–	–
62	623 – 629	–	–
63	633 – 639	–	–
67	–	6700 – 6706	–
68	–	6800 – 6838	6840 – 68/600
69	–	6900 – 6918	6920 – 6980
160	–	16001 – 16028	16030 – 16072
60	6000 – 6009	6010 – 6034	6036 – 6084
62	6200 – 6208	6209 – 6230	6232 – 6248
63	6300 – 6306	6307 – 6328	6330 – 6340
64	–	6403 – 6418	–
42	–	4200 – 4215	–
43	–	4302 – 4315	–

Allowable misalignment

0.002 3 – 0.003 4 rad (8’ – 12’)

Equivalent radial load (Single/double-row)

Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

(refer to the table on the right for values X and Y.)

Static equivalent radial load

$$P_{0r} = 0.6F_r + 0.5F_a$$

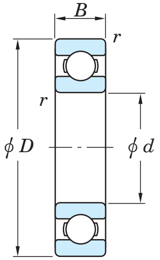
(when the value of $P_{0r} < F_r,\ P_{0r} = F_r$)

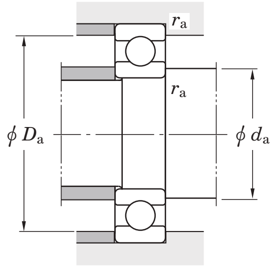
$\frac{if_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Factor f_0 is shown in the bearing dimension table.

Single-row deep groove ball bearings open type

d 10 ~ (17) mm





Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
10	15	3	0.1	1.05	0.430	0.020	15.7	39 000	47 000	**6700**	10.8	14.2	0.1	0.002
	19	5	0.3	2.15	0.840	0.030	14.8	37 000	43 000	**6800**	12	17	0.3	0.005
	22	6	0.3	3.35	1.25	0.070	14.0	34 000	41 000	**6900**	12	20	0.3	0.010
	26	8	0.3	5.70	1.95	0.100	12.3	31 000	36 000	**6000**	12	24	0.3	0.019
	30	9	0.6	6.40	2.40	0.120	13.2	24 000	29 000	**6200**	14	26	0.6	0.032
	35	11	0.6	10.1	3.45	0.270	11.2	22 000	27 000	**6300**	14	31	0.6	0.053
12	18	4	0.2	1.15	0.530	0.023	16.2	34 000	41 000	**6701**	13.6	16.4	0.2	0.003
	21	5	0.3	2.40	1.05	0.040	15.3	33 000	39 000	**6801**	14	19	0.3	0.006
	24	6	0.3	3.60	1.45	0.080	14.5	31 000	36 000	**6901**	14	22	0.3	0.011
	28	7	0.3	6.40	2.40	0.120	13.2	27 000	32 000	**16001**	14	26	0.3	0.024
	28	8	0.3	6.40	2.40	0.120	13.2	27 000	32 000	**6001**	14	26	0.3	0.022
	32	10	0.6	8.50	3.05	0.240	12.3	22 000	27 000	**6201**	16	28	0.6	0.037
	37	12	1	12.1	4.20	0.420	11.1	20 000	25 000	**6301**	17	32	1	0.060
15	21	4	0.2	1.15	0.580	0.024	16.7	29 000	35 000	**6702**	16.6	19.4	0.2	0.004
	24	5	0.3	2.60	1.25	0.050	15.8	28 000	33 000	**6802**	17	22	0.3	0.007
	28	7	0.3	5.40	2.25	0.120	14.3	26 000	30 000	**6902**	17	26	0.3	0.017
	32	8	0.3	7.00	2.85	0.150	13.9	23 000	28 000	**16002**	17	30	0.3	0.025
	32	9	0.3	7.00	2.85	0.150	13.9	23 000	27 000	**6002**	17	30	0.3	0.030
	35	11	0.6	9.55	3.75	0.290	13.2	20 000	24 000	**6202**	19	31	0.6	0.045
	42	13	1	14.3	5.45	0.460	12.3	17 000	20 000	**6302**	20	37	1	0.082
17	23	4	0.2	1.25	0.660	0.027	16.9	27 000	32 000	**6703**	18.6	21.4	0.2	0.005
	26	5	0.3	3.30	1.55	0.060	15.7	26 000	30 000	**6803**	19	24	0.3	0.008
	30	7	0.3	5.75	2.55	0.130	14.7	23 000	28 000	**6903**	19	28	0.3	0.018
	35	8	0.3	7.50	3.25	0.170	14.4	21 000	25 000	**16003**	19	33	0.3	0.032
	35	10	0.3	7.50	3.25	0.170	14.4	21 000	25 000	**6003**	19	33	0.3	0.039
	40	12	0.6	12.0	4.80	0.370	13.2	17 000	21 000	**6203**	21	36	0.6	0.065
	47	14	1	17.0	6.65	0.550	12.4	15 000	18 000	**6303**	22	42	1	0.115
	47	14	1	19.6	7.60	0.680	12.0	15 000	18 000	**6303R**	22	42	1	0.121

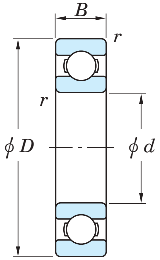
[Remark] Standard cage types used for the above bearings are described earlier in this section.

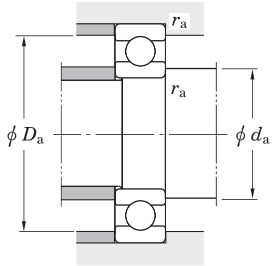
d (17) ~ 28 mm

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
17	62	17	1.1	25.9	9.85	0.920	11.6	13 000	15 000	**6403**	23.5	55.5	1	0.270
20	27	4	0.2	1.30	0.730	0.030	16.1	23 000	27 000	**6704**	21.6	25.4	0.2	0.006
	32	7	0.3	5.00	2.45	0.100	15.5	21 000	25 000	**6804**	22	30	0.3	0.018
	37	9	0.3	7.95	3.70	0.190	14.7	19 000	23 000	**6904**	22	35	0.3	0.036
	42	8	0.3	9.90	4.50	0.290	14.4	17 000	21 000	**16004**	22	40	0.3	0.050
	42	12	0.6	11.7	5.05	0.350	13.9	17 000	21 000	**6004**	24	38	0.6	0.069
	42	12	0.6	14.4	5.85	0.460	13.0	18 000	21 000	**6004R**	24	38	0.6	0.073
	47	14	1	16.0	6.65	0.510	13.2	15 000	17 000	**6204**	25	42	1	0.106
	47	14	1	19.6	7.60	0.680	12.0	15 000	18 000	**6204R**	25	42	1	0.114
	52	15	1.1	19.9	7.85	0.660	12.3	14 000	17 000	**6304**	26.5	45.5	1	0.144
	52	15	1.1	22.6	8.95	0.790	12.0	14 000	16 000	**6304R**	26.5	45.5	1	0.151
	72	19	1.1	38.7	15.2	1.50	11.1	11 000	13 000	**6404**	26.5	65.5	1	0.400
22	44	12	0.6	11.7	5.15	0.350	14.1	17 000	20 000	**60/22**	26	40	0.6	0.073
	50	14	1	16.0	6.65	0.510	13.2	15 000	17 000	**62/22**	27	45	1	0.118
	56	16	1.1	23.1	9.40	0.770	12.6	13 000	15 000	**63/22**	28.5	49.5	1	0.201
25	32	4	0.2	1.35	0.840	0.035	15.8	19 000	22 000	**6705**	26.6	30.4	0.2	0.006
	37	7	0.3	5.40	2.95	0.120	16.0	18 000	21 000	**6805**	27	35	0.3	0.022
	42	9	0.3	8.75	4.55	0.230	15.4	16 000	19 000	**6905**	27	40	0.3	0.041
	47	8	0.3	11.1	5.60	0.340	15.1	15 000	18 000	**16005**	27	45	0.3	0.060
	47	12	0.6	12.6	5.85	0.380	14.5	15 000	18 000	**6005**	29	43	0.6	0.080
	52	15	1	17.5	7.85	0.550	13.9	13 000	15 000	**6205**	30	47	1	0.128
	52	15	1	22.1	9.30	0.740	12.8	13 000	16 000	**6205R**	30	47	1	0.138
	62	17	1.1	25.7	11.3	0.860	13.2	11 000	13 000	**6305**	31.5	55.5	1	0.232
	62	17	1.1	32.7	13.4	1.20	11.9	11 000	14 000	**6305R**	31.5	55.5	1	0.255
	80	21	1.5	45.2	19.4	1.65	12.2	9 100	11 000	**6405**	33	72	1.5	0.530
28	52	12	0.6	15.6	7.40	0.480	14.5	14 000	16 000	**60/28**	32	48	0.6	0.097
	58	16	1	22.4	9.75	0.720	13.4	12 000	14 000	**62/28**	33	53	1	0.173
	68	18	1.1	29.4	13.1	0.990	13.3	10 000	12 000	**63/28**	34.5	61.5	1	0.328

Single-row deep groove ball bearings
open type

d 30 ~ (40) mm





Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	(kg)
30	37	4	0.2	1.45	0.950	0.040	15.7	16 000	19 000	**6706**	31.6	35.4	0.2	0.008
	42	7	0.3	5.65	3.40	0.140	16.4	15 000	18 000	**6806**	32	40	0.3	0.026
	47	9	0.3	9.05	5.00	0.260	15.8	14 000	17 000	**6906**	32	45	0.3	0.045
	55	9	0.3	14.1	7.35	0.440	15.2	13 000	15 000	**16006**	32	53	0.3	0.085
	55	13	1	16.5	8.25	0.530	14.7	13 000	15 000	**6006**	35	50	1	0.116
	62	16	1	24.3	11.3	0.800	13.9	11 000	13 000	**6206**	35	57	1	0.199
	62	16	1	29.2	12.8	1.00	13.0	11 000	13 000	**6206R**	35	57	1	0.212
	72	19	1.1	33.3	15.0	1.15	13.3	9 600	12 000	**6306**	36.5	65.5	1	0.346
	72	19	1.1	41.7	17.7	1.55	12.0	9 800	12 000	**6306R**	36.5	65.5	1	0.379
	90	23	1.5	54.2	23.9	2.05	12.3	8 100	9 700	**6406**	38	82	1.5	0.735
32	58	13	1	18.8	9.15	0.600	14.5	12 000	14 000	**60/32**	37	53	1	0.127
	65	17	1	29.4	13.1	0.990	13.3	10 000	12 000	**62/32**	37	60	1	0.228
	75	20	1.1	37.6	16.2	1.30	12.7	9 300	11 000	**63/32**	38.5	68.5	1	0.437
35	47	7	0.3	5.95	3.85	0.160	16.5	13 000	16 000	**6807**	37	45	0.3	0.030
	55	10	0.6	13.6	7.75	0.440	15.7	12 000	14 000	**6907**	39	51	0.6	0.073
	62	9	0.3	15.3	8.85	0.500	15.7	11 000	13 000	**16007**	37	60	0.3	0.110
	62	14	1	19.9	10.3	0.640	14.9	11 000	13 000	**6007**	40	58	1	0.155
	72	17	1.1	32.1	15.4	1.10	13.9	9 200	11 000	**6207**	41.5	65.5	1	0.288
	72	17	1.1	38.7	17.5	1.40	12.9	9 300	11 000	**6207R**	41.5	65.5	1	0.309
	80	21	1.5	41.7	19.3	1.45	13.2	8 500	10 000	**6307**	43	72	1.5	0.457
	80	21	1.5	50.0	21.7	1.90	12.1	8 700	10 000	**6307R**	43	72	1.5	0.494
	100	25	1.5	68.8	31.0	2.65	12.2	7 200	8 600	**6407**	43	92	1.5	0.952
40	52	7	0.3	6.15	4.20	0.180	16.3	12 000	14 000	**6808**	42	50	0.3	0.033
	62	12	0.6	17.1	9.95	0.570	15.6	11 000	13 000	**6908**	44	58	0.6	0.112
	68	9	0.3	15.8	9.65	0.530	16.0	9 800	12 000	**16008**	42	66	0.3	0.125
	68	15	1	20.9	11.5	0.690	15.2	10 000	12 000	**6008**	45	63	1	0.192
	80	18	1.1	36.4	17.8	1.25	14.0	8 300	10 000	**6208**	46.5	73.5	1	0.366
	90	23	1.5	50.9	24.0	1.85	13.2	7 700	9 200	**6308**	48	82	1.5	0.633

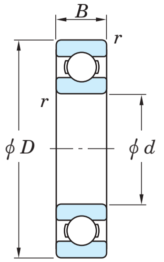
[Remark] Standard cage types used for the above bearings are described earlier in this section.

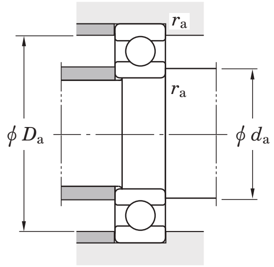
d (40) ~ (60) mm

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	(kg)
40	110	27	2	79.6	36.6	3.15	12.3	6 600	7 900	**6408**	49	101	2	1.23
45	58	7	0.3	7.75	5.40	0.230	16.3	11 000	13 000	**6809**	47	56	0.3	0.040
	68	12	0.6	17.7	10.9	0.600	15.9	9 700	11 000	**6909**	49	64	0.6	0.132
	75	10	0.6	19.4	12.3	0.670	16.0	8 900	10 000	**16009**	49	71	0.6	0.170
	75	16	1	26.2	15.1	0.900	15.3	9 200	11 000	**6009**	50	70	1	0.245
	85	19	1.1	40.9	20.3	1.40	14.0	7 700	9 200	**6209**	51.5	78.5	1	0.407
	100	25	1.5	61.1	29.5	2.25	13.3	6 800	8 100	**6309**	53	92	1.5	0.833
	120	29	2	96.5	45.1	3.90	12.2	6 000	7 200	**6409**	54	111	2	1.53
50	65	7	0.3	8.20	6.10	0.260	16.1	9 600	11 000	**6810**	52	63	0.3	0.052
	72	12	0.6	18.2	11.7	0.640	16.1	9 000	11 000	**6910**	54	68	0.6	0.133
	80	10	0.6	20.0	13.3	0.710	16.2	8 200	9 700	**16010**	54	76	0.6	0.180
	80	16	1	27.3	16.6	0.960	15.6	8 400	9 900	**6010**	55	75	1	0.261
	90	20	1.1	43.9	23.3	1.55	14.4	7 100	8 500	**6210**	56.5	83.5	1	0.463
	90	20	1.1	50.5	25.5	1.80	13.9	7 100	8 600	**6210R**	56.5	83.5	1	0.487
	110	27	2	77.5	38.3	2.90	13.2	6 100	7 300	**6310**	59	101	2	1.07
	130	31	2.1	104	49.5	4.10	12.5	5 500	6 600	**6410**	61	119	2	1.88
55	72	9	0.3	11.0	8.10	0.420	16.2	8 700	10 000	**6811**	57	70	0.3	0.083
	80	13	1	20.8	14.1	0.760	16.2	8 100	9 600	**6911**	60	75	1	0.185
	90	11	0.6	24.2	16.3	0.880	16.2	7 400	8 800	**16011**	59	86	0.6	0.260
	90	18	1.1	35.3	21.2	1.25	15.3	7 600	8 900	**6011**	61.5	83.5	1	0.385
	100	21	1.5	54.2	29.4	1.95	14.4	6 300	7 600	**6211**	63	92	1.5	0.607
	120	29	2	89.5	45.0	3.45	13.2	5 600	6 700	**6311**	64	111	2	1.37
	140	33	2.1	126	62.3	5.35	12.2	5 000	6 000	**6411**	66	129	2	2.29
60	78	10	0.3	14.3	10.6	0.550	16.3	8 000	9 400	**6812**	62	76	0.3	0.104
	85	13	1	25.2	17.3	0.940	16.2	7 500	8 900	**6912**	65	80	1	0.192
	95	11	0.6	24.8	17.6	0.930	16.4	6 900	8 100	**16012**	64	91	0.6	0.280
	95	18	1.1	36.8	23.2	1.35	15.6	7 100	8 400	**6012**	66.5	88.5	1	0.415

Single-row deep groove ball bearings
open type

d (60) ~ (80) mm





Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
60	110	22	1.5	65.6	36.2	2.40	14.4	5 700	6 900	**6212**	68	102	1.5	0.783
	130	31	2.1	102	52.2	3.95	13.2	5 200	6 200	**6312**	71	119	2	1.70
	150	35	2.1	137	70.8	5.75	12.4	4 600	5 500	**6412**	71	139	2	2.77
65	85	10	0.6	14.9	11.5	0.590	16.2	7 300	8 600	**6813**	69	81	0.6	0.126
	90	13	1	21.7	16.1	0.830	16.6	7 100	8 400	**6913**	70	85	1	0.211
	100	11	0.6	21.4	16.0	0.830	16.5	6 600	7 800	**16013**	69	96	0.6	0.300
	100	18	1.1	38.1	25.2	1.40	15.8	6 600	7 800	**6013**	71.5	93.5	1	0.435
	120	23	1.5	71.5	40.1	2.65	14.4	5 400	6 400	**6213**	73	112	1.5	0.990
	140	33	2.1	116	59.9	4.50	13.2	4 800	5 800	**6313**	76	129	2	2.08
	160	37	2.1	148	79.2	6.20	12.4	4 300	5 200	**6413**	76	149	2	3.30
70	90	10	0.6	15.1	11.9	0.620	16.1	6 800	8 100	**6814**	74	86	0.6	0.134
	100	16	1	29.7	21.2	1.10	16.3	6 400	7 600	**6914**	75	95	1	0.342
	110	13	0.6	37.6	25.6	1.40	16.0	6 100	7 200	**16014**	74	106	0.6	0.433
	110	20	1.1	47.6	30.9	1.80	15.6	6 100	7 200	**6014**	76.5	103.5	1	0.602
	125	24	1.5	77.8	44.1	2.90	14.5	5 100	6 100	**6214**	78	117	1.5	1.07
	150	35	2.1	130	68.2	4.95	13.2	4 500	5 400	**6314**	81	139	2	2.52
	180	42	3	181	104	10.2	12.2	3 900	4 600	**6414**	83	167	2.5	4.83
75	95	10	0.6	15.7	12.9	0.660	16.0	6 400	7 600	**6815**	79	91	0.6	0.142
	105	16	1	30.5	22.6	1.20	16.5	6 100	7 200	**6915**	80	100	1	0.363
	115	13	0.6	34.4	25.3	1.35	16.4	5 700	6 700	**16015**	79	111	0.6	0.457
	115	20	1.1	49.4	33.5	1.90	15.8	5 700	6 800	**6015**	81.5	108.5	1	0.638
	130	25	1.5	84.3	48.3	3.10	14.5	4 800	5 800	**6215**	83	122	1.5	1.18
	160	37	2.1	142	77.2	5.40	13.2	4 200	5 000	**6315**	86	149	2	3.02
	190	45	3	192	115	10.9	12.3	3 600	4 400	**6415**	88	177	2.5	5.87
80	100	10	0.6	15.9	13.3	0.690	16.0	6 100	7 200	**6816**	84	96	0.6	0.150
	110	16	1	31.2	24.0	1.25	16.6	5 700	6 800	**6916**	85	105	1	0.382
	125	14	0.6	39.7	29.7	1.50	16.4	5 200	6 100	**16016**	84	121	0.6	0.597

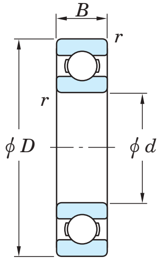
[Remark] Standard cage types used for the above bearings are described earlier in this section.

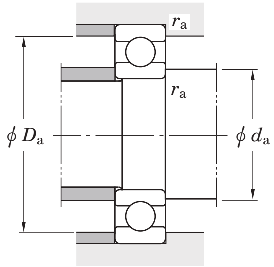
d (80) ~ (100) mm

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
80	125	22	1.1	59.5	39.8	2.25	15.6	5 300	6 300	**6016**	86.5	118.5	1	0.850
	140	26	2	90.9	53.0	3.25	14.6	4 500	5 400	**6216**	89	131	2	1.40
	170	39	2.1	154	86.7	5.85	13.3	3 900	4 700	**6316**	91	159	2	3.59
	200	48	3	205	125	11.5	12.3	3 400	4 100	**6416**	93	187	2.5	6.84
85	110	13	1	23.4	19.0	0.980	16.2	5 600	6 600	**6817**	90	105	1	0.266
	120	18	1.1	39.9	29.6	1.55	16.4	5 300	6 300	**6917**	91.5	113.5	1	0.535
	130	14	0.6	40.8	31.7	1.55	16.5	4 900	5 800	**16017**	89	126	0.6	0.626
	130	22	1.1	61.8	43.1	2.35	15.8	5 000	5 900	**6017**	91.5	123.5	1	0.890
	150	28	2	105	61.9	3.70	14.5	4 200	5 000	**6217**	94	141	2	1.79
	180	41	3	166	96.8	6.35	13.3	3 700	4 400	**6317**	98	167	2.5	4.23
	210	52	4	217	136	12.2	12.3	3 300	3 900	**6417**	101	194	3	8.07
90	115	13	1	23.8	19.7	1.00	16.1	5 300	6 300	**6818**	95	110	1	0.279
	125	18	1.1	41.0	31.6	1.60	16.5	5 100	6 000	**6918**	96.5	118.5	1	0.565
	140	16	1	49.9	37.0	1.85	16.3	4 700	5 600	**16018**	95	135	1	0.848
	140	24	1.5	72.8	49.7	2.65	15.6	4 700	5 600	**6018**	98	132	1.5	1.16
	160	30	2	120	71.5	4.20	14.5	3 900	4 700	**6218**	99	151	2	2.15
	190	43	3	178	107	8.80	13.3	3 500	4 200	**6318**	103	177	2.5	4.91
	225	54	4	230	149	12.7	12.5	3 100	3 700	**6418**	106	209	3	9.78
95	130	18	1.1	42.1	33.5	1.65	16.6	4 800	5 700	**6919**	101.5	123.5	1	0.705
	145	16	1	51.5	39.6	1.90	16.4	4 500	5 300	**16019**	100	140	1	0.885
	145	24	1.5	75.5	53.9	2.75	15.8	4 400	5 200	**6019**	103	137	1.5	1.21
	170	32	2.1	136	81.9	4.65	14.4	3 700	4 400	**6219**	106	159	2	2.62
	200	45	3	191	119	9.45	13.3	3 300	4 000	**6319**	108	187	2.5	5.67
100	125	13	1	24.5	21.2	1.05	16.0	4 800	5 700	**6820**	105	120	1	0.309
	140	20	1.1	56.2	41.9	2.05	16.2	4 500	5 300	**6920**	106.5	133.5	1	0.960
	150	16	1	53.0	42.1	1.95	16.5	4 300	5 100	**16020**	105	145	1	0.910
	150	24	1.5	75.2	54.2	2.70	15.9	4 300	5 100	**6020**	108	142	1.5	1.25

Single-row deep groove ball bearings open type

d (100) ~ (140) mm





Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
100	180	34	2.1	153	93.1	5.15	14.4	3 500	4 200	**6220**	111	169	2	3.14
	215	47	3	216	141	10.9	13.2	3 000	3 600	**6320**	113	202	2.5	7.00
105	145	20	1.1	58.1	44.8	2.10	16.4	4 300	5 100	**6921**	111.5	138.5	1	1.00
	160	18	1	52.3	42.2	1.90	16.5	4 100	4 800	**16021**	110	155	1	1.20
	160	26	2	90.4	65.8	3.20	15.8	4 000	4 700	**6021**	114	151	2	1.59
	190	36	2.1	166	105	5.70	14.4	3 300	3 900	**6221**	116	179	2	3.70
	225	49	3	230	153	11.7	13.2	2 900	3 500	**6321**	118	212	2.5	8.05
110	140	16	1	35.1	30.7	1.40	16.1	4 300	5 100	**6822**	115	135	1	0.606
	150	20	1.1	59.9	47.8	2.20	16.4	4 100	4 900	**6922**	116.5	143.5	1	1.04
	170	19	1	71.8	56.7	2.55	16.3	3 800	4 500	**16022**	115	165	1	1.46
	170	28	2	103	73.0	3.55	15.6	3 800	4 500	**6022**	119	161	2	1.96
	200	38	2.1	180	117	6.20	14.4	3 100	3 700	**6222**	121	189	2	4.36
	240	50	3	257	180	13.3	13.2	2 700	3 200	**6322**	123	227	2.5	9.54
120	150	16	1	36.2	33.0	1.45	16.0	4 000	4 700	**6824**	125	145	1	0.655
	165	22	1.1	71.6	56.9	2.50	16.4	3 800	4 400	**6924**	126.5	158.5	1	1.41
	180	19	1	79.0	63.3	2.75	16.4	3 600	4 200	**16024**	125	175	1	1.80
	180	28	2	106	79.3	3.60	15.9	3 600	4 200	**6024**	129	171	2	2.07
	215	40	2.1	194	131	6.65	14.4	2 900	3 400	**6224**	131	204	2	5.15
	260	55	3	258	185	12.6	13.5	2 500	3 000	**6324**	133	247	2.5	12.5
130	165	18	1.1	46.1	41.2	1.75	16.1	3 600	4 300	**6826**	136.5	158.5	1	0.939
	180	24	1.5	86.9	67.4	3.00	16.3	3 400	4 100	**6926**	138	172	1.5	1.86
	200	22	1.1	89.1	74.8	3.05	11.2	3 000	3 600	**16026**	136.5	193.5	1	2.69
	200	33	2	133	101	4.45	15.8	3 200	3 800	**6026**	139	191	2	3.16
	230	40	3	209	146	9.15	14.5	2 700	3 200	**6226**	143	217	2.5	5.82
	280	58	4	287	214	14.1	13.6	2 300	2 700	**6326**	146	264	3	15.1
140	175	18	1.1	47.8	44.4	1.85	16.0	3 400	4 000	**6828**	146.5	168.5	1	1.00
	190	24	1.5	89.1	74.8	3.05	16.5	3 200	3 800	**6928**	148	182	1.5	1.98
	210	22	1.1	82.2	71.1	2.80	16.5	2 900	3 400	**16028**	146.5	203.5	1	2.86

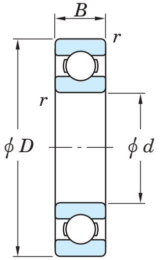
[Remark] Standard cage types used for the above bearings are described earlier in this section.

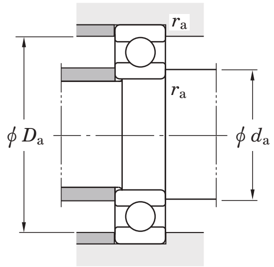
d (140) ~ (190) mm

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
140	210	33	2	137	109	4.55	15.9	3 000	3 600	**6028**	149	201	2	3.55
	250	42	3	208	150	8.65	14.8	2 400	2 900	**6228**	153	237	2.5	7.45
	300	62	4	316	246	15.6	13.6	2 100	2 500	**6328**	156	284	3	19.4
150	190	20	1.1	59.7	54.9	2.20	16.1	3 100	3 700	**6830**	156.5	183.5	1	1.40
	210	28	2	117	94.3	3.75	16.2	2 900	3 400	**6930**	159	201	2	3.05
	225	24	1.1	114	99.3	3.70	16.6	2 700	3 100	**16030**	156.5	218.5	1	3.58
	225	35	2.1	157	126	5.10	16.0	2 800	3 300	**6030**	161	214	2	4.22
	270	45	3	220	168	9.05	15.1	2 200	2 700	**6230**	163	257	2.5	9.41
	320	65	4	343	284	16.6	13.9	1 900	2 300	**6330**	166	304	3	26.2
160	200	20	1.1	60.5	56.9	2.20	16.1	2 900	3 400	**6832**	166.5	193.5	1	1.45
	220	28	2	120	101	3.85	16.4	2 700	3 200	**6932**	169	211	2	3.20
	240	25	1.5	124	108	3.95	16.5	2 600	3 100	**16032**	168	232	1.5	4.25
	240	38	2.1	171	135	5.30	15.9	2 600	3 000	**6032**	171	229	2	5.22
	290	48	3	231	186	9.45	15.4	2 100	2 500	**6232**	173	277	2.5	14.3
	340	68	4	347	286	16.4	13.9	1 800	2 200	**6332**	176	324	3	29.0
170	215	22	1.1	74.8	70.5	2.60	16.1	2 700	3 200	**6834**	176.5	208.5	1	1.90
	230	28	2	124	108	3.95	16.5	2 600	3 100	**6934**	179	221	2	3.35
	260	28	1.5	142	127	4.45	16.5	2 300	2 700	**16034**	178	252	1.5	5.75
	260	42	2.1	201	161	6.20	15.8	2 400	2 800	**6034**	181	249	2	6.80
	310	52	4	265	223	11.1	15.3	1 900	2 300	**6234**	186	294	3	17.5
	360	72	4	408	355	20.5	13.6	1 700	2 000	**6334**	186	344	3	38.6
180	225	22	1.1	75.8	73.1	2.65	16.1	2 600	3 000	**6836**	186.5	218.5	1	2.00
	250	33	2	153	129	4.70	16.3	2 400	2 800	**6936**	189	241	2	4.90
	280	31	2	169	148	5.15	16.4	2 100	2 500	**16036**	189	271	2	7.55
	280	46	2.1	227	194	7.15	15.8	2 200	2 600	**6036**	191	269	2	10.3
	320	52	4	284	241	12.0	15.1	1 800	2 200	**6236**	196	304	3	18.3
	380	75	4	443	407	22.1	13.9	1 600	1 900	**6336**	196	364	3	44.7
190	240	24	1.5	91.4	88.1	3.10	16.1	2 400	2 800	**6838**	198	232	1.5	2.60

Single-row deep groove ball bearings open type

d (190) ~ (260) mm





Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
190	260	33	2	158	138	4.85	16.4	2 300	2 700	6938	199	251	2	5.20
	290	31	2	173	158	5.20	16.6	2 000	2 400	16038	199	281	2	7.85
	290	46	2.1	235	201	7.35	15.8	2 100	2 500	6038	201	279	2	10.8
	340	55	4	319	281	13.7	15.0	1 700	2 000	6238	206	324	3	23.0
	400	78	5	443	415	21.3	14.1	1 500	1 800	6338	210	380	4	51.5
200	250	24	1.5	97.6	93.6	3.20	16.1	2 300	2 700	6840	208	242	1.5	2.70
	280	38	2.1	196	168	5.80	16.2	2 100	2 500	6940	211	269	2	7.30
	310	34	2	201	180	5.95	16.4	1 900	2 300	16040	209	301	2	10.1
	310	51	2.1	272	243	11.3	15.6	1 900	2 300	6040	211	299	2	14.0
	360	58	4	336	311	14.4	15.2	1 600	1 900	6240	216	344	3	28.2
	420	80	5	513	506	25.5	14.0	1 300	1 600	6340	220	400	4	58.0
220	270	24	1.5	101	101	3.35	16.0	2 000	2 400	6844	228	262	1.5	3.00
	300	38	2.1	201	180	5.85	16.4	1 900	2 200	6944	231	289	2	7.90
	340	37	2.1	225	217	6.65	16.5	1 700	2 000	16044	231	329	2	13.2
	340	56	3	294	271	12.0	15.6	1 700	2 000	6044	233	327	2.5	18.3
	400	65	4	389	376	16.8	15.1	1 400	1 700	6244	236	384	3	37.0
	460	88	5	542	539	26.7	13.8	1 200	1 500	6344	240	440	4	71.6
240	300	28	2	135	135	4.25	16.1	1 800	2 100	6848	249	291	2	4.50
	320	38	2.1	205	192	5.95	16.5	1 700	2 000	6948	251	309	2	8.50
	360	37	2.1	230	228	6.75	16.5	1 600	1 800	16048	251	349	2	14.1
	360	56	3	305	296	12.3	15.9	1 600	1 900	6048	253	347	2.5	19.7
	440	72	4	424	431	18.2	15.2	1 200	1 500	6248	256	424	3	51.0
	500	95	5	587	624	28.2	14.2	1 100	1 300	6348	260	480	4	93.3
260	320	28	2	141	146	4.40	16.0	1 700	2 000	6852	269	311	2	4.80
	360	46	2.1	266	263	10.2	16.3	1 500	1 800	6952	271	349	2	14.4
	400	44	3	295	310	11.5	16.4	1 400	1 600	16052	273	387	2.5	21.6
	400	65	4	364	377	15.0	15.8	1 400	1 700	6052	276	384	3	29.3
	480	80	5	502	541	22.2	15.1	1 100	1 300	6252	280	460	4	68.2

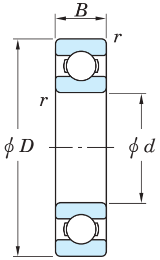
[Remark]　Standard cage types used for the above bearings are described earlier in this section.

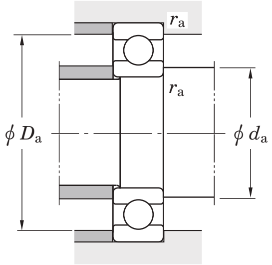
d (260) ~ (360) mm

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
260	540	102	6	663	741	32.4	14.2	990	1 200	6352	284	516	5	116
280	350	33	2	179	183	5.35	16.1	1 500	1 800	6856	289	341	2	7.40
	380	46	2.1	273	283	10.5	16.5	1 400	1 700	6956	291	369	2	15.1
	420	44	3	302	331	11.7	14.7	1 300	1 500	16056	293	407	2.5	22.9
	420	65	4	377	408	15.5	16.0	1 300	1 500	6056	296	404	3	31.0
	500	80	5	529	599	23.2	15.3	1 000	1 200	6256	300	480	4	71.8
	580	108	6	711	845	33.9	14.5	880	1 100	6356	304	556	5	145
300	380	38	2.1	224	230	6.45	16.2	1 400	1 600	6860	311	369	2	10.5
	420	56	3	345	377	13.7	16.2	1 300	1 500	6960	313	407	2.5	24.1
	460	50	4	355	405	14.0	16.4	1 100	1 400	16060	316	447	3	32.2
	460	74	4	444	482	18.4	15.6	1 200	1 400	6060	316	444	3	44.0
	540	85	5	551	663	23.5	15.6	880	1 100	6260	320	520	4	89.5
	620	109	7.5	741	886	35.0	14.4	810	970	6360	332	588	6	169
320	400	38	2.1	227	239	6.50	16.1	1 300	1 500	6864	331	389	2	11.0
	440	56	3	356	404	14.1	16.4	1 200	1 400	6964	333	427	2.5	25.5
	480	50	4	364	432	14.3	16.5	1 100	1 300	16064	336	467	3	33.9
	480	74	4	441	487	17.8	15.7	1 100	1 300	6064	336	464	3	46.0
	580	92	5	612	745	26.7	15.4	840	1 000	6264	340	560	4	113
	670	112	7.5	793	1 010	36.9	14.8	720	870	6364	352	638	6	207
340	420	38	2.1	231	249	6.60	16.1	1 200	1 400	6868	351	409	2	11.5
	460	56	3	352	407	13.7	16.5	1 100	1 300	6968	353	447	2.5	26.8
	520	57	4	419	512	16.8	16.4	980	1 200	16068	356	507	3	46.8
	520	82	5	552	661	23.7	15.6	980	1 200	6068	360	500	4	61.8
	620	92	6	639	817	27.7	15.6	760	910	6268	364	596	5	131
	710	118	7.5	880	1 160	41.7	14.7	660	790	6368	372	678	6	238
360	440	38	2.1	240	268	6.95	16.0	1 100	1 300	6872	371	429	2	12.0
	480	56	3	362	432	14.0	16.5	1 000	1 200	6972	373	467	2.5	28.2
	540	57	4	431	546	17.2	16.5	900	1 100	16072	376	527	3	49.0

Single-row deep groove ball bearings open type

d (360) ~ (500) mm





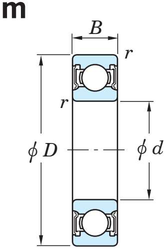
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
360	540	82	5	548	668	23.0	15.7	920	1 100	**6072**	380	520	4	64.7
	650	95	6	696	904	30.4	15.4	700	840	**6272**	384	626	5	144
380	480	46	2.1	305	359	8.95	16.2	980	1 200	**6876**	391	469	2	20.0
	520	65	4	440	552	17.6	16.4	920	1 100	**6976**	396	504	3	40.8
	560	82	5	572	725	24.1	15.9	860	1 000	**6076**	400	540	4	67.6
	680	95	6	730	990	31.9	15.6	650	780	**6276**	404	656	5	162
400	500	46	2.1	311	374	9.10	16.1	920	1 100	**6880**	411	489	2	20.5
	540	65	4	453	588	18.1	16.5	860	1 000	**6980**	416	524	3	42.7
	600	63	5	447	587	17.5	16.5	780	920	**16080**	420	580	4	65.0
	600	90	5	635	824	27.0	15.7	780	920	**6080**	420	580	4	87.7
	720	103	6	785	1 080	34.2	15.5	590	710	**6280**	424	696	5	197
420	520	46	2.1	316	389	9.25	16.1	860	1 000	**6884**	431	509	2	21.5
	560	65	4	449	588	17.7	16.5	810	950	**6984**	436	544	3	43.5
	620	63	5	459	617	18.0	16.4	740	870	**16084**	440	600	4	69.9
	620	90	5	663	894	28.3	15.8	740	870	**6084**	440	600	4	91.2
440	540	46	2.1	321	404	9.40	16.0	810	950	**6888**	451	529	2	22.5
	600	74	4	529	676	21.4	16.4	740	870	**6988**	456	584	3	61.3
	650	67	5	508	710	20.2	16.5	680	810	**16088**	460	630	4	81.7
460	580	56	3	393	517	11.7	16.2	740	870	**6892**	473	567	2.5	35.0
	620	74	4	509	711	20.3	16.5	690	820	**6992**	476	604	3	61.7
	680	71	5	539	767	21.4	16.5	630	750	**16092**	480	660	4	91.2
480	600	56	3	401	539	12.0	16.1	690	820	**6896**	493	587	2.5	36.5
	650	78	5	540	768	21.5	16.5	640	760	**6996**	500	630	4	72.5
	700	71	5	554	807	22.1	16.5	600	710	**16096**	500	680	4	98.5
500	620	56	3	409	561	12.2	16.1	650	770	**68/500**	513	607	2.5	37.5
	670	78	5	556	807	22.2	16.5	610	720	**69/500**	520	650	4	75.2

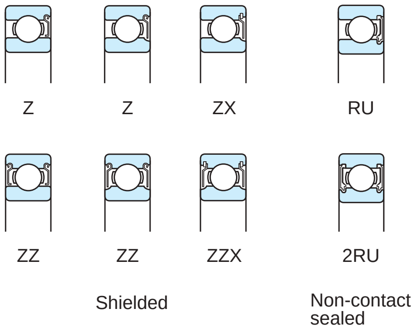
[Remark] Standard cage types used for the above bearings are described earlier in this section.

d (500) mm

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
500	720	71	5	568	846	22.7	16.4	560	660	**160/500**	520	700	4	102
	720	100	6	749	1 100	31.3	16.0	570	670	**60/500**	524	696	5	128

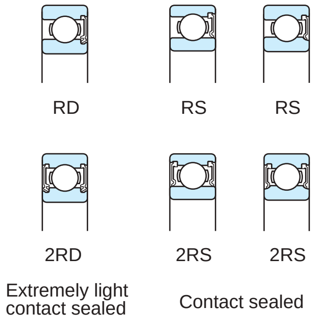
Single-row deep groove ball bearings
shielded type
sealed type
d 10 ~ (20) mm





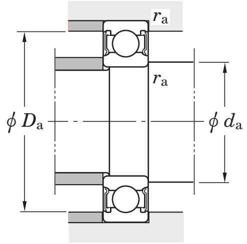
Shielded

Non-contact sealed



Extremely light contact sealed

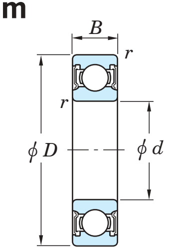
Contact sealed

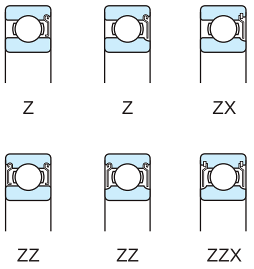


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})				Bearing No.				Mounting dimensions. (mm)				(Refer.) Mass
								Grease lub.			Oil lub.									
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	(Z, ZZ RU, 2RU)	(RD, 2RD)	(RS, 2RS)	(Z)	Shielded	Non-contact sealed	Extremely light contact sealed	Contact sealed	d_a min.	d_a max.	D_a max.	r_a max.	Open type (kg)
10	19	5	0.3	2.15	0.840	0.030	14.8	37 000	—	22 000	43 000	**6800 ZZ**	**6800 2RU**	—	**6800 2RS**	12	12	17	0.3	0.005
	22	6	0.3	3.35	1.25	0.070	14.0	34 000	—	21 000	41 000	**6900 ZZ**	**6900 2RU**	—	**6900 2RS**	12	12.5	20	0.3	0.010
	26	8	0.3	5.70	1.95	0.100	12.3	31 000	28 000	19 000	36 000	**6000 ZZ**	**6000 2RU**	**6000 2RD**	**6000 2RS**	12	13	24	0.3	0.019
	30	9	0.6	6.40	2.40	0.120	13.2	24 000	22 000	16 000	29 000	**6200 ZZ**	**6200 2RU**	**6200 2RD**	**6200 2RS**	14	15	26	0.6	0.032
	35	11	0.6	10.1	3.45	0.270	11.2	22 000	20 000	16 000	27 000	**6300 ZZ**	**6300 2RU**	**6300 2RD**	**6300 2RS**	14	16	31	0.6	0.053
12	18	4	0.2	1.15	0.530	0.023	16.2	34 000	—	20 000	41 000	**6701 ZZX**	**6701 2RU**	—	**6701 2RS**	13.6	—	16.4	0.2	0.003
	21	5	0.3	2.40	1.05	0.040	15.3	33 000	30 000	20 000	39 000	**6801 ZZ**	**6801 2RU**	**6801 2RD**	**6801 2RS**	14	14	19	0.3	0.006
	24	6	0.3	3.60	1.45	0.080	14.5	31 000	28 000	18 000	36 000	**6901 ZZ**	**6901 2RU**	**6901 2RD**	**6901 2RS**	14	14	22	0.3	0.011
	28	8	0.3	6.40	2.40	0.120	13.2	27 000	24 000	17 000	32 000	**6001 ZZ**	**6001 2RU**	**6001 2RD**	**6001 2RS**	14	15	26	0.3	0.022
	32	10	0.6	8.50	3.05	0.240	12.3	22 000	20 000	15 000	27 000	**6201 ZZ**	**6201 2RU**	**6201 2RD**	**6201 2RS**	16	16.5	28	0.6	0.037
	37	12	1	12.1	4.20	0.420	11.1	20 000	18 000	15 000	25 000	**6301 ZZ**	**6301 2RU**	**6301 2RD**	**6301 2RS**	17	17.5	32	1	0.060
15	21	4	0.2	1.15	0.580	0.024	16.7	29 000	—	16 000	35 000	**6702 ZZX**	**6702 2RU**	—	**6702 2RS**	16.6	—	19.4	0.2	0.004
	24	5	0.3	2.60	1.25	0.050	15.8	28 000	—	16 000	33 000	**6802 ZZ**	**6802 2RU**	—	**6802 2RS**	17	17	22	0.3	0.007
	28	7	0.3	5.40	2.25	0.120	14.3	26 000	23 000	15 000	30 000	**6902 ZZ**	**6902 2RU**	**6902 2RD**	**6902 2RS**	17	18	26	0.3	0.017
	32	9	0.3	7.00	2.85	0.150	13.9	23 000	21 000	14 000	27 000	**6002 ZZ**	**6002 2RU**	**6002 2RD**	**6002 2RS**	17	18.5	30	0.3	0.030
	35	11	0.6	9.55	3.75	0.290	13.2	20 000	18 000	13 000	24 000	**6202 ZZ**	**6202 2RU**	**6202 2RD**	**6202 2RS**	19	19.5	31	0.6	0.045
	42	13	1	14.3	5.45	0.460	12.3	17 000	15 000	12 000	20 000	**6302 ZZ**	**6302 2RU**	**6302 2RD**	**6302 2RS**	20	21.5	37	1	0.082
17	23	4	0.2	1.25	0.660	0.027	16.9	27 000	—	15 000	32 000	**6703 ZZ**	**6703 2RU**	—	**6703 2RS**	18.6	—	21.4	0.2	0.005
	26	5	0.3	3.30	1.55	0.060	15.7	26 000	—	14 000	30 000	**6803 ZZ**	**6803 2RU**	—	**6803 2RS**	19	19	24	0.3	0.008
	30	7	0.3	5.75	2.55	0.130	14.7	23 000	21 000	13 000	28 000	**6903 ZZ**	**6903 2RU**	**6903 2RD**	**6903 2RS**	19	19.5	28	0.3	0.018
	35	10	0.3	7.50	3.25	0.170	14.4	21 000	19 000	12 000	25 000	**6003 ZZ**	**6003 2RU**	**6003 2RD**	**6003 2RS**	19	21	33	0.3	0.039
	40	12	0.6	12.0	4.80	0.370	13.2	17 000	15 000	12 000	21 000	**6203 ZZ**	**6203 2RU**	**6203 2RD**	**6203 2RS**	21	22	36	0.6	0.065
	47	14	1	17.0	6.65	0.550	12.4	15 000	14 000	10 000	18 000	**6303 ZZ**	**6303 2RU**	**6303 2RD**	**6303 2RS**	22	24.3	42	1	0.115
20	27	4	0.2	1.30	0.730	0.030	16.1	23 000	—	12 000	27 000	**6704 ZZ**	**6704 2RU**	—	**6704 2RS**	21.6	—	25.4	0.2	0.006
	32	7	0.3	5.00	2.45	0.100	15.5	21 000	—	12 000	25 000	**6804 ZZ**	**6804 2RU**	—	**6804 2RS**	22	22.5	30	0.3	0.018
	37	9	0.3	7.95	3.70	0.190	14.7	19 000	17 000	11 000	23 000	**6904 ZZ**	**6904 2RU**	**6904 2RD**	**6904 2RS**	22	23.5	35	0.3	0.036
	42	12	0.6	11.7	5.05	0.350	13.9	17 000	15 000	10 000	21 000	**6004 ZZ**	**6004 2RU**	**6004 2RD**	**6004 2RS**	24	25	38	0.6	0.069
	47	14	1	16.0	6.65	0.510	13.2	15 000	14 000	9 700	17 000	**6204 ZZ**	**6204 2RU**	**6204 2RD**	**6204 2RS**	25	26.5	42	1	0.106

[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings
shielded type
sealed type
d (20) ~ 35 mm

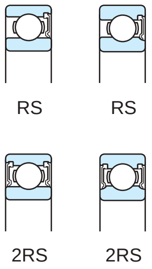




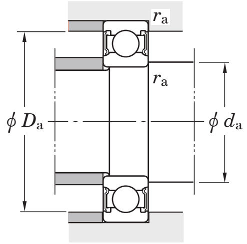
Shielded

Non-contact sealed

Extremely light contact sealed



Contact sealed

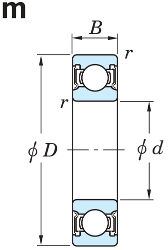


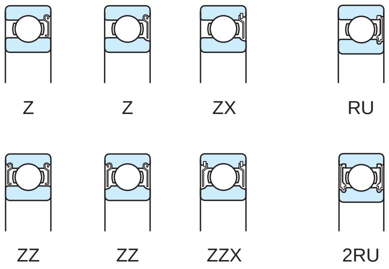
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds ($\min^{-1}$) Grease lub.			Oil lub.	Bearing No.				Mounting dimensions. (mm)				(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	(Z, ZZ RU, 2RU)	(RD, 2RD)	(RS, 2RS)	(Z)	Shielded	Non-contact sealed	Extremely light contact sealed	Contact sealed	d_a min.	d_a max.	D_a max.	r_a max.	Open type (kg)
20	52	15	1.1	19.9	7.85	0.660	12.3	14 000	13 000	9 500	17 000	**6304 ZZ**	**6304 2RU**	**6304 2RD**	**6304 2RS**	26.5	27	45.5	1	0.144
22	44	12	0.6	11.7	5.15	0.350	14.1	17 000	15 000	9 900	20 000	**60/22 ZZ**	**60/22 2RU**	**60/22 2RD**	**60/22 2RS**	26	26.5	40	0.6	0.073
	50	14	1	16.0	6.65	0.510	13.2	15 000	14 000	9 700	17 000	**62/22 ZZ**	**62/22 2RU**	**62/22 2RD**	**62/22 2RS**	27	27	45	1	0.118
	56	16	1.1	23.1	9.40	0.770	12.6	13 000	12 000	8 600	15 000	**63/22 ZZ**	**63/22 2RU**	**63/22 2RD**	**63/22 2RS**	28.5	29	49.5	1	0.201
25	32	4	0.2	1.35	0.840	0.035	15.8	19 000	—	10 000	22 000	**6705 ZZ**	**6705 2RU**	—	**6705 2RS**	26.6	—	30.4	0.2	0.006
	37	7	0.3	5.40	2.95	0.120	16.0	18 000	—	10 000	21 000	**6805 ZZ**	**6805 2RU**	—	**6805 2RS**	27	27.5	35	0.3	0.022
	42	9	0.3	8.75	4.55	0.230	15.4	16 000	14 000	9 300	19 000	**6905 ZZ**	**6905 2RU**	**6905 2RD**	**6905 2RS**	27	29	40	0.3	0.041
	47	12	0.6	12.6	5.85	0.380	14.5	15 000	14 000	9 000	18 000	**6005 ZZ**	**6005 2RU**	**6005 2RD**	**6005 2RS**	29	29.5	43	0.6	0.080
	52	15	1	17.5	7.85	0.550	13.9	13 000	12 000	8 400	15 000	**6205 ZZ**	**6205 2RU**	**6205 2RD**	**6205 2RS**	30	31.5	47	1	0.128
	62	17	1.1	25.7	11.3	0.860	13.2	11 000	9 900	7 500	13 000	**6305 ZZ**	**6305 2RU**	**6305 2RD**	**6305 2RS**	31.5	34	55.5	1	0.232
28	52	12	0.6	15.6	7.40	0.480	14.5	14 000	13 000	8 100	16 000	**60/28 ZZ**	**60/28 2RU**	**60/28 2RD**	**60/28 2RS1**	32	33	48	0.6	0.097
	58	16	1	22.4	9.75	0.720	13.4	12 000	11 000	7 600	14 000	**62/28 ZZ**	**62/28 2RU**	**62/28 2RD**	**62/28 2RS**	33	35	53	1	0.173
	68	18	1.1	29.4	13.1	0.990	13.3	10 000	9 000	6 900	12 000	**63/28 ZZ**	**63/28 2RU**	**63/28 2RD**	**63/28 2RS**	34.5	37.5	61.5	1	0.328
30	37	4	0.2	1.45	0.950	0.040	15.7	16 000	—	8 800	19 000	**6706 ZZ**	**6706 2RU**	—	**6706 2RS**	31.6	—	35.4	0.2	0.008
	42	7	0.3	5.65	3.40	0.140	16.4	15 000	—	8 600	18 000	**6806 ZZ**	**6806 2RU**	—	**6806 2RS**	32	32.5	40	0.3	0.026
	47	9	0.3	9.05	5.00	0.260	15.8	14 000	13 000	8 200	17 000	**6906 ZZ**	**6906 2RU**	**6906 2RD**	**6906 2RS**	32	33	45	0.3	0.045
	55	13	1	16.5	8.25	0.530	14.7	13 000	12 000	7 500	15 000	**6006 ZZ**	**6006 2RU**	**6006 2RD**	**6006 2RS**	35	36	50	1	0.116
	62	16	1	24.3	11.3	0.800	13.9	11 000	9 900	7 000	13 000	**6206 ZZ**	**6206 2RU**	**6206 2RD**	**6206 2RS**	35	37.5	57	1	0.199
	72	19	1.1	33.3	15.0	1.15	13.3	9 600	8 600	6 400	12 000	**6306 ZZ**	**6306 2RU**	**6306 2RD**	**6306 2RS**	36.5	40	65.5	1	0.346
32	58	13	1	18.8	9.15	0.600	14.5	12 000	11 000	7 200	14 000	**60/32 ZZ**	**60/32 2RU**	**60/32 2RD**	**60/32 2RS**	37	38	53	1	0.127
	65	17	1	29.4	13.1	0.990	13.3	10 000	9 000	6 900	12 000	**62/32 ZZ**	**62/32 2RU**	**62/32 2RD**	**62/32 2RS**	37	38.5	60	1	0.228
	75	20	1.1	37.6	16.2	1.30	12.7	9 300	8 400	6 400	11 000	**63/32 ZZ**	**63/32 2RU**	**63/32 2RD**	**63/32 2RS**	38.5	41	68.5	1	0.437
35	47	7	0.3	5.95	3.85	0.160	16.5	13 000	—	7 400	16 000	**6807 ZZ**	**6807 2RU**	—	**6807 2RS**	37	37.5	45	0.3	0.030
	55	10	0.6	13.6	7.75	0.440	15.7	12 000	11 000	6 800	14 000	**6907 ZZ**	**6907 2RU**	**6907 2RD**	**6907 2RS**	39	40	51	0.6	0.073
	62	14	1	19.9	10.3	0.640	14.9	11 000	9 900	6 500	13 000	**6007 ZZ**	**6007 2RU**	**6007 2RD**	**6007 2RS**	40	42	58	1	0.155
	72	17	1.1	32.1	15.4	1.10	13.9	9 200	8 300	6 000	11 000	**6207 ZZ**	**6207 2RU**	**6207 2RD**	**6207 2RS**	41.5	43.5	65.5	1	0.288
	80	21	1.5	41.7	19.3	1.45	13.2	8 500	7 700	5 700	10 000	**6307 ZZ**	**6307 2RU**	**6307 2RD**	**6307 2RS**	43	46	72	1.5	0.457

[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings shielded type sealed type

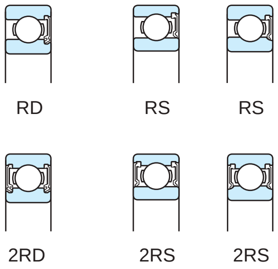
d 40 ~ (65) mm





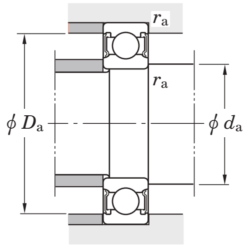
Shielded

Non-contact sealed



Extremely light contact sealed

Contact sealed

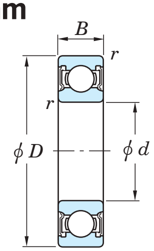


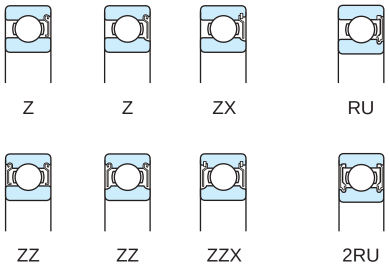
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1}) Grease lub.			Oil lub.	Bearing No.				Mounting dimensions. (mm)				(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	(Z, ZZ RU, 2RU)	(RD, 2RD)	(RS, 2RS)	(Z)	Shielded	Non-contact sealed	Extremely light contact sealed	Contact sealed	d_a min.	d_a max.	D_a max.	r_a max.	Open type (kg)
40	52	7	0.3	6.15	4.20	0.180	16.3	12 000	11 000	6 700	14 000	**6808 ZZ**	**6808 2RU**	**6808 2RD**	**6808 2RS**	42	42	50	0.3	0.033
	62	12	0.6	17.1	9.95	0.570	15.6	11 000	9 900	6 100	13 000	**6908 ZZ**	**6908 2RU**	**6908 2RD**	**6908 2RS**	44	44.5	58	0.6	0.112
	68	15	1	20.9	11.5	0.690	15.2	10 000	9 000	5 800	12 000	**6008 ZZ**	**6008 2RU**	**6008 2RD**	**6008 2RS**	45	46.5	63	1	0.192
	80	18	1.1	36.4	17.8	1.25	14.0	8 300	7 500	5 400	10 000	**6208 ZZ**	**6208 2RU**	**6208 2RD**	**6208 2RS**	46.5	49	73.5	1	0.366
	90	23	1.5	50.9	24.0	1.85	13.2	7 700	6 900	5 100	9 200	**6308 ZZ**	**6308 2RU**	**6308 2RD**	**6308 2RS**	48	51.5	82	1.5	0.633
45	58	7	0.3	7.75	5.40	0.230	16.3	11 000	9 900	5 900	13 000	**6809 ZZ**	**6809 2RU**	**6809 2RD**	**6809 2RS**	47	47	56	0.3	0.040
	68	12	0.6	17.7	10.9	0.600	15.9	9 700	8 700	5 500	11 000	**6909 ZZ**	**6909 2RU**	**6909 2RD**	**6909 2RS**	49	50	64	0.6	0.132
	75	16	1	26.2	15.1	0.900	15.3	9 200	8 300	5 300	11 000	**6009 ZZ**	**6009 2RU**	**6009 2RD**	**6009 2RS**	50	51.5	70	1	0.245
	85	19	1.1	40.9	20.3	1.40	14.0	7 700	6 900	5 100	9 200	**6209 ZZ**	**6209 2RU**	**6209 2RD**	**6209 2RS**	51.5	53.5	78.5	1	0.407
	100	25	1.5	61.1	29.5	2.25	13.3	6 800	6 100	4 500	8 100	**6309 ZZ**	**6309 2RU**	**6309 2RD**	**6309 2RS**	53	59.5	92	1.5	0.833
50	65	7	0.3	8.20	6.10	0.260	16.1	9 600	8 600	5 200	11 000	**6810 ZZ**	**6810 2RU**	**6810 2RD**	**6810 2RS**	52	53	63	0.3	0.052
	72	12	0.6	18.2	11.7	0.640	16.1	9 000	—	5 000	11 000	**6910 ZZ**	**6910 2RU**	—	—	54	55.5	68	0.6	0.133
	80	16	1	27.3	16.6	0.960	15.6	8 400	7 600	4 800	9 900	**6010 ZZ**	**6010 2RU**	**6010 2RD**	**6010 2RS**	55	57	75	1	0.261
	90	20	1.1	43.9	23.3	1.55	14.4	7 100	6 400	4 600	8 500	**6210 ZZ**	**6210 2RU**	**6210 2RD**	**6210 2RS**	56.5	59	83.5	1	0.463
	110	27	2	77.5	38.3	2.90	13.2	6 100	5 500	4 100	7 300	**6310 ZZ**	**6310 2RU**	**6310 2RD**	**6310 2RS**	59	66.5	101	2	1.07
55	72	9	0.3	11.0	8.10	0.420	16.2	8 700	7 800	—	10 000	**6811 ZZ**	**6811 2RU**	**6811 2RD**	—	57	58.5	70	0.3	0.083
	80	13	1	20.8	14.1	0.760	16.2	8 100	7 300	4 500	9 600	**6911 ZZ**	**6911 2RU**	**6911 2RD**	**6911 2RS**	60	60.5	75	1	0.185
	90	18	1.1	35.3	21.2	1.25	15.3	7 600	6 800	4 300	8 900	**6011 ZZ**	**6011 2RU**	**6011 2RD**	**6011 2RS**	61.5	62	83.5	1	0.385
	100	21	1.5	54.2	29.4	1.95	14.4	6 300	5 700	4 100	7 600	**6211 ZZ**	**6211 2RU**	**6211 2RD**	**6211 2RS**	63	66	92	1.5	0.607
	120	29	2	89.5	45.0	3.45	13.2	5 600	—	3 700	6 700	**6311 ZZ**	**6311 2RU**	—	**6311 2RS**	64	74.5	111	2	1.37
60	78	10	0.3	14.3	10.6	0.550	16.3	8 000	7 200	—	9 400	**6812 ZZ**	**6812 2RU**	**6812 2RD**	—	62	63	76	0.3	0.104
	85	13	1	25.2	17.3	0.940	16.2	7 500	—	—	8 900	**6912 ZZ**	**6912 2RU**	—	—	65	66	80	1	0.192
	95	18	1.1	36.8	23.2	1.35	15.6	7 100	—	4 000	8 400	**6012 ZZ**	**6012 2RU**	—	**6012 2RS**	66.5	68.5	88.5	1	0.415
	110	22	1.5	65.6	36.2	2.40	14.4	5 700	5 100	3 700	6 900	**6212 ZZ**	**6212 2RU**	**6212 2RD**	**6212 2RS**	68	72.5	102	1.5	0.783
	130	31	2.1	102	52.2	3.95	13.2	5 200	—	3 500	6 200	**6312 ZZ**	**6312 2RU**	—	**6312 2RS**	71	80	119	2	1.70
65	85	10	0.6	14.9	11.5	0.590	16.2	7 300	6 600	—	8 600	**6813 ZZ**	**6813 2RU**	**6813 2RD**	—	69	69	81	0.6	0.126
	90	13	1	21.7	16.1	0.830	16.6	7 100	6 400	3 900	8 400	**6913 ZZ**	**6913 2RU**	**6913 2RD**	**6913 2RS**	70	71	85	1	0.211

[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings shielded type sealed type

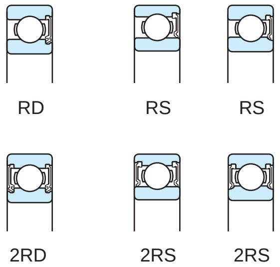
d (65) ~ (90) mm





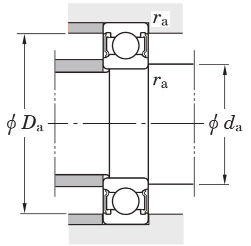
Shielded

Non-contact sealed



Extremely light contact sealed

Contact sealed

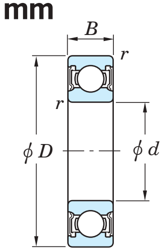


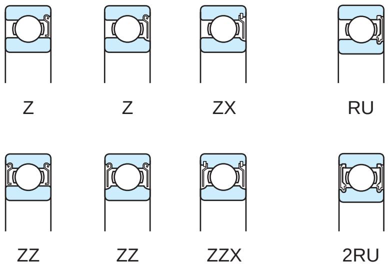
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1}) Grease lub.			Oil lub.	Bearing No.				Mounting dimensions. (mm)				(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	(Z, ZZ RU, 2RU)	(RD, 2RD)	(RS, 2RS)	(Z)	Shielded	Non-contact sealed	Extremely light contact sealed	Contact sealed	d_a min.	d_a max.	D_a max.	r_a max.	Open type (kg)
65	100	18	1.1	38.1	25.2	1.40	15.8	6 600	—	3 700	7 800	**6013 ZZ**	**6013 2RU**	—	**6013 2RS**	71.5	74.5	93.5	1	0.435
	120	23	1.5	71.5	40.1	2.65	14.4	5 400	—	3 500	6 400	**6213 ZZ**	**6213 2RU**	—	**6213 2RS**	73	79	112	1.5	0.990
	140	33	2.1	116	59.9	4.50	13.2	4 800	—	3 200	5 800	**6313 ZZ**	**6313 2RU**	—	**6313 2RS**	76	86	129	2	2.08
70	90	10	0.6	15.1	11.9	0.620	16.1	6 800	6 100	—	8 100	**6814 ZZ**	**6814 2RU**	**6814 2RD**	—	74	74	86	0.6	0.134
	100	16	1	29.7	21.2	1.10	16.3	6 400	5 800	3 600	7 600	**6914 ZZ**	**6914 2RU**	**6914 2RD**	**6914 2RS**	75	76.5	95	1	0.342
	110	20	1.1	47.6	30.9	1.80	15.6	6 100	—	3 500	7 200	**6014 ZZ**	**6014 2RU**	—	**6014 2RS**	76.5	79.5	103.5	1	0.602
	125	24	1.5	77.8	44.1	2.90	14.5	5 100	—	3 300	6 100	**6214 ZZ**	**6214 2RU**	—	**6214 2RS**	78	84	117	1.5	1.07
	150	35	2.1	130	68.2	4.95	13.2	4 500	—	3 000	5 400	**6314 ZZ**	**6314 2RU**	—	**6314 2RS**	81	92	139	2	2.52
75	95	10	0.6	15.7	12.9	0.660	16.0	6 400	5 800	—	7 600	**6815 ZZ**	**6815 2RU**	**6815 2RD**	—	79	79	91	0.6	0.142
	105	16	1	30.5	22.6	1.20	16.5	6 100	—	—	7 200	**6915 ZZ**	**6915 2RU**	—	—	80	82.5	100	1	0.363
	115	20	1.1	49.4	33.5	1.90	15.8	5 700	—	3 300	6 800	**6015 ZZ**	**6015 2RU**	—	**6015 2RS**	81.5	84.5	108.5	1	0.638
	130	25	1.5	84.3	48.3	3.10	14.5	4 800	—	3 100	5 800	**6215 ZZ**	**6215 2RU**	—	**6215 2RS**	83	88.5	122	1.5	1.18
	160	37	2.1	142	77.2	5.40	13.2	4 200	—	2 800	5 000	**6315 ZZ**	**6315 2RU**	—	**6315 2RS**	86	97.5	149	2	3.02
80	100	10	0.6	15.9	13.3	0.690	16.0	6 100	5 500	—	7 200	**6816 ZZ**	**6816 2RU**	**6816 2RD**	—	84	84	96	0.6	0.150
	110	16	1	31.2	24.0	1.25	16.6	5 700	5 100	3 200	6 800	**6916 ZZ**	**6916 2RU**	**6916 2RD**	**6916 2RS**	85	86.5	105	1	0.382
	125	22	1.1	59.5	39.8	2.25	15.6	5 300	—	3 100	6 300	**6016 ZZ**	**6016 2RU**	—	**6016 2RS**	86.5	90	118.5	1	0.850
	140	26	2	90.9	53.0	3.25	14.6	4 500	—	2 900	5 400	**6216 ZZ**	**6216 2RU**	—	**6216 2RS**	89	93	131	2	1.40
	170	39	2.1	154	86.7	5.85	13.3	3 900	—	2 700	4 700	**6316 ZZ**	**6316 2RU**	—	**6316 2RS**	91	105	159	2	3.59
85	110	13	1	23.4	19.0	0.980	16.2	5 600	5 000	—	6 600	**6817 ZZ**	**6817 2RU**	**6817 2RD**	—	90	90.5	105	1	0.266
	120	18	1.1	39.9	29.6	1.55	16.4	5 300	4 800	3 000	6 300	**6917 ZZ**	**6917 2RU**	**6917 2RD**	**6917 2RS**	91.5	92.5	113.5	1	0.535
	130	22	1.1	61.8	43.1	2.35	15.8	5 000	—	2 900	5 900	**6017 ZZ**	**6017 2RU**	—	**6017 2RS**	91.5	96.5	123.5	1	0.890
	150	28	2	105	61.9	3.70	14.5	4 200	—	2 700	5 000	**6217 ZZ**	**6217 2RU**	—	**6217 2RS**	94	102	141	2	1.79
	180	41	3	166	96.8	6.35	13.3	3 700	—	2 500	4 400	**6317 ZZX**	**6317 2RU**	—	**6317 2RS**	98	111	167	2.5	4.23
90	115	13	1	23.8	19.7	1.00	16.1	5 300	4 800	—	6 300	**6818 ZZ**	**6818 2RU**	**6818 2RD**	—	95	95.5	110	1	0.279
	125	18	1.1	41.0	31.6	1.60	16.5	5 100	4 600	2 800	6 000	**6918 ZZ**	**6918 2RU**	**6918 2RD**	**6918 2RS**	96.5	97.5	118.5	1	0.565
	140	24	1.5	72.8	49.7	2.65	15.6	4 700	—	2 700	5 600	**6018 ZZ**	**6018 2RU**	—	**6018 2RS**	98	100.5	132	1.5	1.16
	160	30	2	120	71.5	4.20	14.5	3 900	—	2 600	4 700	**6218 ZZ**	**6218 2RU**	—	**6218 2RS**	99	108.5	151	2	2.15

[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings
shielded type
sealed type

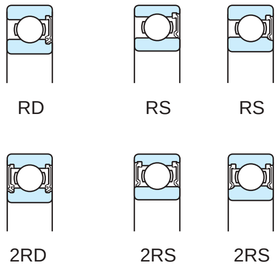
d (90) ~ (130) mm





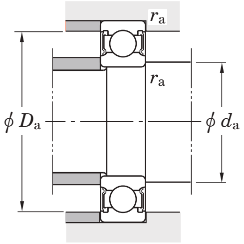
Shielded

Non-contact sealed



Extremely light contact sealed

Contact sealed

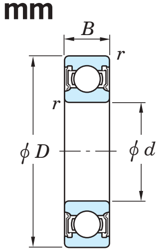


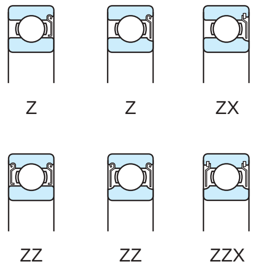
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1}) Grease lub.			Oil lub.	Bearing No.				Mounting dimensions. (mm)				(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	(Z, ZZ RU, 2RU)	(RD, 2RD)	(RS, 2RS)	(Z)	Shielded	Non-contact sealed	Extremely light contact sealed	Contact sealed	d_a min.	d_a max.	D_a max.	r_a max.	Open type (kg)
90	190	43	3	178	107	8.80	13.3	3 500	—	2 400	4 200	**6318 ZZX**	**6318 2RU**	—	**6318 2RS**	103	117	177	2.5	4.91
95	130	18	1.1	42.1	33.5	1.65	16.6	4 800	4 300	2 700	5 700	**6919 ZZ**	**6919 2RU**	**6919 2RD**	**6919 2RS**	101.5	102	123.5	1	0.705
	145	24	1.5	75.5	53.9	2.75	15.8	4 400	—	2 500	5 200	**6019 ZZX**	**6019 2RU**	—	**6019 2RS**	103	107.5	137	1.5	1.21
	170	32	2.1	136	81.9	4.65	14.4	3 700	—	2 400	4 400	**6219 ZZX**	**6219 2RU**	—	**6219 2RS**	106	113	159	2	2.62
	200	45	3	191	119	9.45	13.3	3 300	—	2 200	4 000	**6319 ZZX**	**6319 2RU**	—	**6319 2RS**	108	122	187	2.5	5.67
100	125	13	1	24.5	21.2	1.05	16.0	4 800	4 300	—	5 700	**6820 ZZ**	**6820 2RU**	**6820 2RD**	—	105	105.5	120	1	0.309
	140	20	1.1	51.5	39.6	1.90	16.2	4 500	—	—	5 300	**6920-1 ZZ**	**6920-1 2RU**	—	—	106.5	110.5	133.5	1	0.960
	150	24	1.5	75.2	54.2	2.70	15.9	4 300	—	2 500	5 100	**6020 ZZ**	**6020 2RU**	—	**6020 2RS**	108	112	142	1.5	1.25
	180	34	2.1	153	93.1	5.15	14.4	3 500	—	2 300	4 200	**6220 ZZX**	**6220 2RU**	—	**6220 2RS**	111	122	169	2	3.14
	215	47	3	216	141	10.9	13.2	3 000	—	2 100	3 600	**6320 ZZX**	**6320 2RU**	—	**6320 2RS**	113	131	202	2.5	7.00
105	145	20	1.1	53.0	42.1	1.95	16.4	4 300	—	2 400	5 100	**6921-1 ZZ**	**6921-1 2RU**	—	**6921-1 2RS**	111.5	115	138.5	1	1.00
	160	26	2	90.4	65.8	3.20	15.8	4 000	—	2 300	4 700	**6021 ZZX**	**6021 2RU**	—	**6021 2RS**	114	119	151	2	1.59
	190	36	2.1	166	105	5.70	14.4	3 300	—	2 200	3 900	**6221 ZZX**	**6221 2RU**	—	**6221 2RS**	116	127	179	2	3.70
	225	49	3	230	153	11.7	13.2	2 900	—	2 000	3 500	**6321 ZZX**	**6321 2RU**	—	**6321 2RS**	118	136	212	2.5	8.05
110	140	16	1	35.1	30.7	1.40	16.1	4 300	3 900	—	5 100	**6822 ZZ**	**6822 2RU**	**6822 2RD**	—	115	116.5	135	1	0.606
	150	20	1.1	59.9	47.8	2.20	16.4	4 100	—	—	4 900	**6922 ZZ**	**6922 2RU**	—	—	116.5	119.5	143.5	1	1.04
	170	28	2	103	73.0	3.55	15.6	3 800	—	2 200	4 500	**6022 ZZX**	**6022 2RU**	—	**6022 2RS**	119	123	161	2	1.96
	200	38	2.1	180	117	6.20	14.4	3 100	—	2 000	3 700	**6222 ZZX**	**6222 2RU**	—	**6222 2RS**	121	136.5	189	2	4.36
	240	50	3	257	180	13.3	13.2	2 700	—	1 900	3 200	**6322 ZZX**	**6322 2RU**	—	**6322 2RS**	123	146.5	227	2.5	9.54
120	150	16	1	36.2	33.0	1.45	16.0	4 000	—	—	4 700	**6824 ZZ**	**6824 2RU**	—	—	125	128.5	145	1	0.655
	165	22	1.1	71.6	56.9	2.50	16.4	3 800	—	—	4 400	**6924 ZZ**	**6924 2RU**	—	—	126.5	131.5	158.5	1	1.41
	180	28	2	106	79.3	3.60	15.9	3 600	—	2 100	4 200	**6024 ZZX**	**6024 2RU**	—	**6024 2RS**	129	136	171	2	2.07
	215	40	2.1	194	131	6.65	14.4	2 900	—	1 900	3 400	**6224 ZZX**	**6224 2RU**	—	**6224 2RS**	131	144	204	2	5.15
	260	55	3	258	185	12.6	13.5	2 500	—	—	3 000	**6324 ZZX**	—	—	—	133	158	247	2.5	12.5
130	165	18	1.1	46.1	41.2	1.75	16.1	3 600	—	—	4 300	**6826 ZZ**	**6826 2RU**	—	—	136.5	139.5	158.5	1	0.939
	180	24	1.5	81.5	67.4	2.85	16.3	3 400	—	—	4 100	**6926-1 ZZ**	**6926-1 2RU**	—	—	138	144	172	1.5	1.86

[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings
shielded type
sealed type

d (130) ~ 220 mm

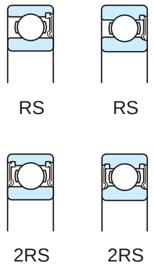




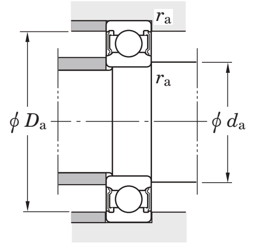
Shielded

Non-contact sealed

Extremely light contact sealed



Contact sealed

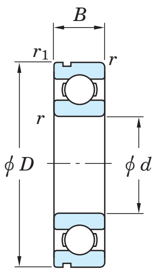


Boundary dimensions (mm) *d*	*D*	*B*	*r* min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min^{-1}) Grease lub. [Z, ZZ RU, 2RU]	(RD, 2RD)	(RS, 2RS)	Oil lub. (Z)	Bearing No. Shielded	Non-contact sealed	Extremely light contact sealed	Contact sealed	Mounting dimensions. (mm) d_a min.	d_a max.	D_a max.	r_a max.	(Refer.) Mass Open type (kg)
130	200	33	2	133	101	4.45	15.8	3 200	—	1 900	3 800	**6026 ZZX**	**6026 2RU**	—	**6026 2RS**	139	146.5	191	2	3.16
	230	40	3	209	146	9.15	14.5	2 700	—	1 800	3 200	**6226 ZZX**	**6226 2RU**	—	**6226 2RS**	143	157	217	2.5	5.82
	280	58	4	287	214	14.1	13.6	2 300	—	—	2 700	**6326 ZZX**	—	—	—	146	171	264	3	15.1
140	175	18	1.1	47.8	44.4	1.85	16.0	3 400	3 100	—	4 000	**6828 ZZ**	—	**6828 2RD**	—	146.5	148	168.5	1	1.00
	190	24	1.5	83.3	71.6	2.90	16.5	3 200	—	—	3 800	**6928-1 ZZ**	**6928-1 2RU**	—	—	148	153	182	1.5	1.98
	210	33	2	137	109	4.55	15.9	3 000	—	1 800	3 600	**6028 ZZX**	**6028 2RU**	—	**6028 2RS**	149	158.5	201	2	3.55
	250	42	3	208	150	8.65	14.8	2 400	—	1 600	2 900	**6228 ZZX**	**6228 2RU**	—	**6228 2RS**	153	169	237	2.5	7.45
	300	62	4	316	246	15.6	13.6	2 100	—	—	2 500	**6328 ZZX**	—	—	—	156	184	284	3	19.4
150	210	28	2	117	94.3	3.75	16.2	2 900	—	1 700	3 400	**6930 ZZ**	**6930 2RU**	—	**6930 2RS**	159	165.5	201	2	3.05
	225	35	2.1	157	126	5.10	16.0	2 800	—	1 600	3 300	**6030 ZZX**	**6030 2RU**	—	**6030 2RS**	161	168.5	214	2	4.22
	270	45	3	220	168	9.05	15.1	2 200	—	—	2 700	**6230 ZZX**	—	—	—	163	183.5	257	2.5	9.41
160	200	20	1.1	60.5	56.9	2.20	16.1	2 900	2 600	—	3 400	**6832 ZZ**	—	**6832 2RD**	—	166.5	168.5	193.5	1	1.45
	240	38	2.1	171	135	5.30	15.9	2 600	—	1 500	3 000	**6032 ZZX**	**6032 2RU**	—	**6032 2RS**	171	178.5	229	2	5.22
	290	48	3	231	186	9.45	15.4	2 100	—	—	2 500	**6232 ZZX**	—	—	—	173	198	277	2.5	14.3
170	215	22	1.1	74.8	70.5	2.60	16.1	2 700	—	—	3 200	**6834 ZZ**	—	—	—	176.5	182.5	208.5	1	1.90
	260	42	2.1	201	161	6.20	15.8	2 400	—	—	2 800	**6034 ZZX**	**6034 2RU**	—	—	181	194	249	2	6.80
	310	52	4	265	223	11.1	15.3	1 900	—	—	2 300	**6234 ZZX**	—	—	—	186	210.5	294	3	17.5
180	225	22	1.1	75.8	73.1	2.65	16.1	2 600	2 300	—	3 000	**6836 ZZ**	—	**6836 2RD**	—	186.5	189.5	218.5	1	2.00
	280	46	2.1	227	194	7.15	15.8	2 200	—	—	2 600	**6036 ZZX**	**6036 2RU**	—	—	191	209.5	269	2	10.3
	320	52	4	264	226	10.8	15.1	1 800	—	—	2 200	**6236-1 ZZX**	—	—	—	196	220.5	304	3	18.3
190	240	24	1.5	91.4	88.1	3.10	16.1	2 400	—	—	2 800	**6838 ZZ**	—	—	—	198	202	232	1.5	2.60
	290	46	2.1	235	201	7.35	15.8	2 100	—	—	2 500	**6038 ZZX**	—	—	—	201	215	279	2	10.8
200	310	51	2.1	272	243	11.3	15.6	1 900	—	—	2 300	**6040 ZZX**	—	—	—	211	228	299	2	14.0
	360	58	4	314	293	13.1	15.2	1 600	—	—	1 900	**6240-1 ZZX**	—	—	—	216	250	344	3	28.2
220	340	56	3	294	271	12.0	15.6	1 700	—	—	2 000	**6044 ZZX**	—	—	—	233	251	327	2.5	18.3

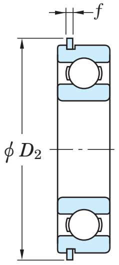
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings
snap ring groove type
locating snap ring type

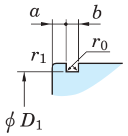
d 10 ~ (28) mm



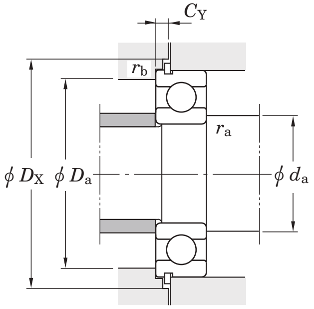
N
With snap ring groove

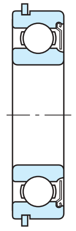


NR
With locating snap ring



Snap ring groove details





With locating snap ring and one shield

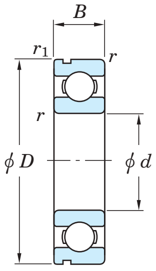
Boundary dimensions (mm)					Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.		Dimensions of snap ring groove (mm)				Dimensions of locating snap ring (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)	(Refer.) Bearing No.
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.	With snap ring groove	With locating snap ring	D_1 max.	a max.	b ±0.15	r_0 max.	D_2 max.	f ±0.05	d_a min.	D_a max.	D_X min.	C_Y max.	r_a max.	r_b max.		
10	22	6	0.3	0.3	3.35	1.25	0.070	14.0	34 000	41 000	**6900N**	**6900NR**	20.8	1.05	0.925 1)	0.2	24.8	0.65	12	20	25.5	1.5	0.3	0.3	0.010	**6900N**
	30	9	0.6	0.3	6.40	2.40	0.120	13.2	24 000	29 000	**6200N**	**6200NR**	28.17	2.06	1.5	0.4	34.7	1.07	14	26	35.5	2.92	0.6	0.3	0.032	**6200N**
	35	11	0.6	0.5	10.1	3.45	0.270	11.2	22 000	27 000	**6300N**	**6300NR**	33.17	2.06	1.5	0.4	39.7	1.07	14	31	40.5	2.92	0.6	0.5	0.053	**6300N**
12	24	6	0.3	0.3	3.60	1.45	0.080	14.5	31 000	36 000	**6901N**	**6901NR**	22.8	1.05	0.925 1)	0.2	26.8	0.65	14	22	27.5	1.5	0.3	0.3	0.011	**6901N**
	32	10	0.6	0.3	8.50	3.05	0.240	12.3	22 000	27 000	**6201N**	**6201NR**	30.15	2.06	1.5	0.4	36.7	1.07	16	28	37.5	2.92	0.6	0.3	0.037	**6201N**
	37	12	1	0.5	12.1	4.20	0.420	11.1	20 000	25 000	**6301N**	**6301NR**	34.77	2.06	1.5	0.4	41.3	1.07	17	32	42	2.92	1	0.5	0.060	**6301N**
15	28	7	0.3	0.3	5.40	2.25	0.120	14.3	26 000	30 000	**6902N**	**6902NR**	26.7	1.3	1.075 1)	0.25	30.8	0.8	17	26	31.5	1.9	0.3	0.3	0.017	**6902N**
	35	11	0.6	0.5	9.55	3.75	0.290	13.2	20 000	24 000	**6202N**	**6202NR**	33.17	2.06	1.5	0.4	39.7	1.07	19	31	40.5	2.92	0.6	0.5	0.045	**6202N**
	42	13	1	0.5	14.3	5.45	0.460	12.3	17 000	20 000	**6302N**	**6302NR**	39.75	2.06	1.5	0.4	46.3	1.07	20	37	47	2.92	1	0.5	0.082	**6302N**
17	30	7	0.3	0.3	5.75	2.55	0.130	14.7	23 000	28 000	**6903N**	**6903NR**	28.7	1.3	1.075 1)	0.25	32.8	0.8	19	28	33.5	1.9	0.3	0.3	0.018	**6903N**
	40	12	0.6	0.5	12.0	4.80	0.370	13.2	17 000	21 000	**6203N**	**6203NR**	38.1	2.06	1.5	0.4	44.6	1.07	21	36	45.5	2.92	0.6	0.5	0.065	**6203N**
	47	14	1	0.5	17.0	6.65	0.550	12.4	15 000	18 000	**6303N**	**6303NR**	44.6	2.46	1.5	0.4	52.7	1.07	22	42	53.5	3.33	1	0.5	0.115	**6303N**
20	32	7	0.3	0.3	5.00	2.45	0.100	15.5	21 000	25 000	**6804N**	**6804NR**	30.7	1.3	1.075 1)	0.25	34.8	0.8	22	30	35.5	1.9	0.3	0.3	0.018	**6804N**
	37	9	0.3	0.3	7.95	3.70	0.190	14.7	19 000	23 000	**6904N**	**6904NR**	35.7	1.7	1.075 1)	0.25	39.8	0.8	22	35	40.5	2.3	0.3	0.3	0.036	**6904N**
	42	12	0.6	0.5	11.7	5.05	0.350	13.9	17 000	21 000	**6004N**	**6004NR**	39.75	2.06	1.5	0.4	46.3	1.07	24	38	47	2.92	0.6	0.5	0.069	**6004N**
	47	14	1	0.5	16.0	6.65	0.510	13.2	15 000	17 000	**6204N**	**6204NR**	44.6	2.46	1.5	0.4	52.7	1.07	25	42	53.5	3.33	1	0.5	0.106	**6204N**
	52	15	1.1	0.5	19.9	7.85	0.660	12.3	14 000	17 000	**6304N**	**6304NR**	49.73	2.46	1.5	0.4	57.9	1.07	26.5	45.5	58.5	3.33	1	0.5	0.144	**6304N**
22	44	12	0.6	0.5	11.7	5.15	0.350	14.1	17 000	20 000	**60/22N**	**60/22NR**	41.75	2.06	1.5	0.4	48.3	1.07	26	40	49	2.92	0.6	0.5	0.073	**60/22N**
	50	14	1	0.5	16.0	6.65	0.510	13.2	15 000	17 000	**62/22N**	**62/22NR**	47.6	2.46	1.5	0.4	55.7	1.07	27	45	56.5	3.33	1	0.5	0.118	**62/22N**
	56	16	1.1	0.5	23.1	9.40	0.770	12.6	13 000	15 000	**63/22N**	**63/22NR**	53.6	2.46	1.5	0.4	61.7	1.07	28.5	49.5	62.5	3.33	1	0.5	0.201	**63/22N**
25	37	7	0.3	0.3	5.40	2.95	0.120	16.0	18 000	21 000	**6805N**	**6805NR**	35.7	1.3	1.075 1)	0.25	39.8	0.8	27	35	40.5	1.9	0.3	0.3	0.022	**6805N**
	42	9	0.3	0.3	8.75	4.55	0.230	15.4	16 000	19 000	**6905N**	**6905NR**	40.7	1.7	1.075 1)	0.25	44.8	0.8	27	40	45.5	2.3	0.3	0.3	0.041	**6905N**
	47	12	0.6	0.5	12.6	5.85	0.380	14.5	15 000	18 000	**6005N**	**6005NR**	44.6	2.06	1.5	0.4	52.7	1.07	29	43	53.5	2.92	0.6	0.5	0.080	**6005N**
	52	15	1	0.5	17.5	7.85	0.550	13.9	13 000	15 000	**6205N**	**6205NR**	49.73	2.46	1.5	0.4	57.9	1.07	30	47	58.5	3.33	1	0.5	0.128	**6205N**
	62	17	1.1	0.5	25.7	11.3	0.860	13.2	11 000	13 000	**6305N**	**6305NR**	59.61	3.28	2.05	0.6	67.7	1.65	31.5	55.5	68.5	4.67	1	0.5	0.232	**6305N**
28	52	12	0.6	0.5	15.6	7.40	0.480	14.5	14 000	16 000	**60/28N**	**60/28NR**	49.73	2.06	1.5	0.4	57.9	1.07	32	48	58.5	2.92	0.6	0.5	0.097	**60/28N**
	58	16	1	0.5	22.4	9.75	0.720	13.4	12 000	14 000	**62/28N**	**62/28NR**	55.6	2.46	1.5	0.4	63.7	1.07	33	53	64.5	3.33	1	0.5	0.173	**62/28N**

[Note] 1) The tolerance of the ring groove width is ±0.125.

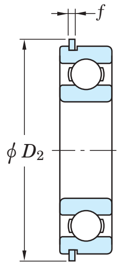
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings
snap ring groove type
locating snap ring type

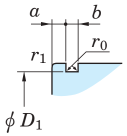
d (28) ~ (50) mm



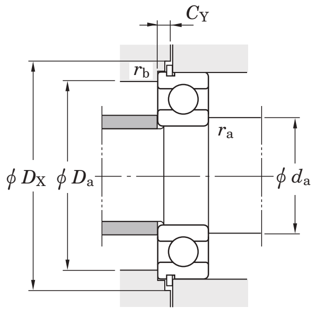
N
With snap ring groove

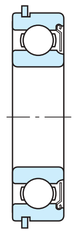


NR
With locating snap ring



Snap ring groove details





With locating snap ring and one shield

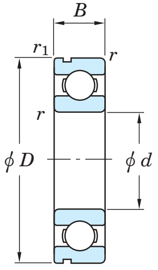
Boundary dimensions (mm) d	D	B	r min.	r_1 min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Bearing No. With snap ring groove	With locating snap ring	Dimensions of snap ring groove (mm) D_1 max.	a max.	b ±0.15	r_0 max.	Dimensions of locating snap ring (mm) D_2 max.	f ±0.05	Mounting dimensions (mm) d_a min.	D_a max.	D_X min.	C_Y max.	r_a max.	r_b max.	(Refer.) Mass (kg)	(Refer.) Bearing No.
28	68	18	1.1	0.5	29.4	13.1	0.990	13.3	10 000	12 000	**63/28N**	**63/28NR**	64.82	3.28	2.05	0.6	74.6	1.65	34.5	61.5	76	4.67	1	0.5	0.328	**63/28N**
30	42	7	0.3	0.3	5.65	3.40	0.140	16.4	15 000	18 000	**6806N**	**6806NR**	40.7	1.3	1.075 1)	0.25	44.8	0.8	32	40	45.5	1.9	0.3	0.3	0.026	**6806N**
	47	9	0.3	0.3	9.05	5.00	0.260	15.8	14 000	17 000	**6906N**	**6906NR**	45.7	1.7	1.075 1)	0.25	49.8	0.8	32	45	50.5	2.3	0.3	0.3	0.045	**6906N**
	55	13	1	0.5	16.5	8.25	0.530	14.7	13 000	15 000	**6006N**	**6006NR**	52.6	2.08	1.5	0.4	60.7	1.07	35	50	61.5	2.9	1	0.5	0.116	**6006N**
	62	16	1	0.5	24.3	11.3	0.800	13.9	11 000	13 000	**6206N**	**6206NR**	59.61	3.28	2.05	0.6	67.7	1.65	35	57	68.5	4.67	1	0.5	0.199	**6206N**
	72	19	1.1	0.5	33.3	15.0	1.15	13.3	9 600	12 000	**6306N**	**6306NR**	68.81	3.28	2.05	0.6	78.6	1.65	36.5	65.5	80	4.67	1	0.5	0.346	**6306N**
32	58	13	1	0.5	18.8	9.15	0.600	14.5	12 000	14 000	**60/32N**	**60/32NR**	55.6	2.08	1.5	0.4	63.7	1.07	37	53	64.5	2.9	1	0.5	0.127	**60/32N**
	65	17	1	0.5	29.4	13.1	0.990	13.3	10 000	12 000	**62/32N**	**62/32NR**	62.6	3.28	2.05	0.6	70.7	1.65	37	60	71.5	4.67	1	0.5	0.228	**62/32N**
	75	20	1.1	0.5	37.6	16.2	1.30	12.7	9 300	11 000	**63/32N**	**63/32NR**	71.83	3.28	2.05	0.6	81.6	1.65	38.5	68.5	83	4.67	1	0.5	0.437	**63/32N**
35	47	7	0.3	0.3	5.95	3.85	0.160	16.5	13 000	16 000	**6807N**	**6807NR**	45.7	1.3	1.075 1)	0.25	49.8	0.8	37	45	50.5	1.9	0.3	0.3	0.030	**6807N**
	55	10	0.6	0.6	13.6	7.75	0.440	15.7	12 000	14 000	**6907N**	**6907NR**	53.7	1.7	1.075 1)	0.25	57.8	0.8	39	51	58.5	2.3	0.6	0.6	0.073	**6907N**
	62	14	1	0.5	19.9	10.3	0.640	14.9	11 000	13 000	**6007N**	**6007NR**	59.61	2.08	2.05	0.6	67.7	1.65	40	58	68.5	3.48	1	0.5	0.155	**6007N**
	72	17	1.1	0.5	32.1	15.4	1.10	13.9	9 200	11 000	**6207N**	**6207NR**	68.81	3.28	2.05	0.6	78.6	1.65	41.5	65.5	80	4.67	1	0.5	0.288	**6207N**
	80	21	1.5	0.5	41.7	19.3	1.45	13.2	8 500	10 000	**6307N**	**6307NR**	76.81	3.28	2.05	0.6	86.6	1.65	43	72	88	4.67	1.5	0.5	0.457	**6307N**
40	52	7	0.3	0.3	6.15	4.20	0.180	16.3	12 000	14 000	**6808N**	**6808NR**	50.7	1.3	1.075 1)	0.25	54.8	0.8	42	50	55.5	1.9	0.3	0.3	0.033	**6808N**
	62	12	0.6	0.6	17.1	9.95	0.570	15.6	11 000	13 000	**6908N**	**6908NR**	60.7	1.7	1.075 1)	0.25	64.8	0.8	44	58	65.5	2.3	0.6	0.6	0.112	**6908N**
	68	15	1	0.5	20.9	11.5	0.690	15.2	10 000	12 000	**6008N**	**6008NR**	64.82	2.49	2.05	0.6	74.6	1.65	45	63	76	3.89	1	0.5	0.192	**6008N**
	80	18	1.1	0.5	36.4	17.8	1.25	14.0	8 300	10 000	**6208N**	**6208NR**	76.81	3.28	2.05	0.6	86.6	1.65	46.5	73.5	88	4.67	1	0.5	0.366	**6208N**
	90	23	1.5	0.5	50.9	24.0	1.85	13.2	7 700	9 200	**6308N**	**6308NR**	86.79	3.28	2.85	0.6	96.5	2.41	48	82	98	5.43	1.5	0.5	0.633	**6308N**
45	58	7	0.3	0.3	7.75	5.40	0.230	16.3	11 000	13 000	**6809N**	**6809NR**	56.7	1.3	1.075 1)	0.25	60.8	0.8	47	56	61.5	1.9	0.3	0.3	0.040	**6809N**
	68	12	0.6	0.6	17.7	10.9	0.600	15.9	9 700	11 000	**6909N**	**6909NR**	66.7	1.7	1.075 1)	0.25	70.8	0.8	49	64	72	2.3	0.6	0.6	0.132	**6909N**
	75	16	1	0.5	26.2	15.1	0.900	15.3	9 200	11 000	**6009N**	**6009NR**	71.83	2.49	2.05	0.6	81.6	1.65	50	70	83	3.89	1	0.5	0.245	**6009N**
	85	19	1.1	0.5	40.9	20.3	1.40	14.0	7 700	9 200	**6209N**	**6209NR**	81.81	3.28	2.05	0.6	91.6	1.65	51.5	78.5	93	4.67	1	0.5	0.407	**6209N**
	100	25	1.5	0.5	61.1	29.5	2.25	13.3	6 800	8 100	**6309N**	**6309NR**	96.8	3.28	2.85	0.6	106.5	2.41	53	92	108	5.43	1.5	0.5	0.833	**6309N**
50	65	7	0.3	0.3	8.20	6.10	0.260	16.1	9 600	11 000	**6810N**	**6810NR**	63.7	1.3	1.075 1)	0.25	67.8	0.8	52	63	68.5	1.9	0.3	0.3	0.052	**6810N**
	72	12	0.6	0.6	18.2	11.7	0.640	16.1	9 000	11 000	**6910N**	**6910NR**	70.7	1.7	1.075 1)	0.25	74.8	0.8	54	68	76	2.3	0.6	0.6	0.133	**6910N**
	80	16	1	0.5	27.3	16.6	0.960	15.6	8 400	9 900	**6010N**	**6010NR**	76.81	2.49	2.05	0.6	86.6	1.65	55	75	88	3.89	1	0.5	0.261	**6010N**

[Note] 1) The tolerance of the ring groove width is ±0.125.

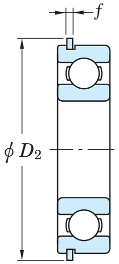
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings
snap ring groove type
locating snap ring type

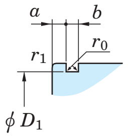
d (50) ~ 90 mm



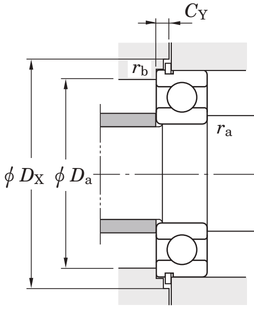
N
With snap ring groove

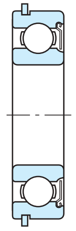


NR
With locating snap ring



Snap ring groove details





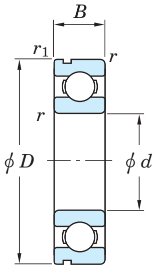
With locating snap ring and one shield

Boundary dimensions (mm)					Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.		Dimensions of snap ring groove (mm)				Dimensions of locating snap ring (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)	(Refer.) Bearing No.
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.	With snap ring groove	With locating snap ring	D_1 max.	a max.	b ±0.15	r_0 max.	D_2 max.	f ±0.05	d_a min.	D_a max.	D_X min.	C_Y max.	r_a max.	r_b max.		
50	90	20	1.1	0.5	43.9	23.3	1.55	14.4	7 100	8 500	**6210N**	**6210NR**	86.79	3.28	2.85	0.6	96.5	2.41	56.5	83.5	98	5.43	1	0.5	0.463	**6210N**
	110	27	2	0.5	77.5	38.3	2.90	13.2	6 100	7 300	**6310N**	**6310NR**	106.81	3.28	2.85	0.6	116.6	2.41	59	101	118	5.43	2	0.5	1.07	**6310N**
55	90	18	1.1	0.5	35.3	21.2	1.25	15.3	7 600	8 900	**6011N**	**6011NR**	86.79	2.87	2.85	0.6	96.5	2.41	61.5	83.5	98	5.03	1	0.5	0.385	**6011N**
	100	21	1.5	0.5	54.2	29.4	1.95	14.4	6 300	7 600	**6211N**	**6211NR**	96.8	3.28	2.85	0.6	106.5	2.41	63	92	108	5.43	1.5	0.5	0.607	**6211N**
	120	29	2	0.5	89.5	45.0	3.45	13.2	5 600	6 700	**6311N**	**6311NR**	115.21	4.06	3.25	0.6	129.7	2.77	64	111	131.5	6.58	2	0.5	1.37	**6311N**
60	95	18	1.1	0.5	36.8	23.2	1.35	15.6	7 100	8 400	**6012N**	**6012NR**	91.82	2.87	2.85	0.6	101.6	2.41	66.5	88.5	103	5.03	1	0.5	0.415	**6012N**
	110	22	1.5	0.5	65.6	36.2	2.40	14.4	5 700	6 900	**6212N**	**6212NR**	106.81	3.28	2.85	0.6	116.6	2.41	68	102	118	5.43	1.5	0.5	0.783	**6212N**
	130	31	2.1	0.5	102	52.2	3.95	13.2	5 200	6 200	**6312N**	**6312NR**	125.22	4.06	3.25	0.6	139.7	2.77	71	119	141.5	6.58	2	0.5	1.70	**6312N**
65	100	18	1.1	0.5	38.1	25.2	1.40	15.8	6 600	7 800	**6013N**	**6013NR**	96.8	2.87	2.85	0.6	106.5	2.41	71.5	93.5	108	5.03	1	0.5	0.435	**6013N**
	120	23	1.5	0.5	71.5	40.1	2.65	14.4	5 400	6 400	**6213N**	**6213NR**	115.21	4.06	3.25	0.6	129.7	2.77	73	112	131.5	6.58	1.5	0.5	0.990	**6213N**
	140	33	2.1	0.5	116	59.9	4.50	13.2	4 800	5 800	**6313N**	**6313NR**	135.23	4.9	3.25	0.6	149.7	2.77	76	129	152	7.37	2	0.5	2.08	**6313N**
70	110	20	1.1	0.5	47.6	30.9	1.80	15.6	6 100	7 200	**6014N**	**6014NR**	106.81	2.87	2.85	0.6	116.6	2.41	76.5	103.5	118	5.03	1	0.5	0.602	**6014N**
	125	24	1.5	0.5	77.8	44.1	2.90	14.5	5 100	6 100	**6214N**	**6214NR**	120.22	4.06	3.25	0.6	134.7	2.77	78	117	136.5	6.58	1.5	0.5	1.07	**6214N**
	150	35	2.1	0.5	130	68.2	4.95	13.2	4 500	5 400	**6314N**	**6314NR**	145.24	4.9	3.25	0.6	159.7	2.77	81	139	162	7.37	2	0.5	2.52	**6314N**
75	115	20	1.1	0.5	49.4	33.5	1.90	15.8	5 700	6 800	**6015N**	**6015NR**	111.81	2.87	2.85	0.6	121.6	2.41	81.5	108.5	123	5.03	1	0.5	0.638	**6015N**
	130	25	1.5	0.5	84.3	48.3	3.10	14.5	4 800	5 800	**6215N**	**6215NR**	125.22	4.06	3.25	0.6	139.7	2.77	83	122	141.5	6.58	1.5	0.5	1.18	**6215N**
	160	37	2.1	0.5	142	77.2	5.40	13.2	4 200	5 000	**6315N**	**6315NR**	155.22	4.9	3.25	0.6	169.7	2.77	86	149	172	7.37	2	0.5	3.02	**6315N**
80	125	22	1.1	0.5	59.5	39.8	2.25	15.6	5 300	6 300	**6016N**	**6016NR**	120.22	2.87	3.25	0.6	134.7	2.77	86.5	118.5	136.5	5.39	1	0.5	0.850	**6016N**
	140	26	2	0.5	90.9	53.0	3.25	14.6	4 500	5 400	**6216N**	**6216NR**	135.23	4.9	3.25	0.6	149.7	2.77	89	131	152	7.37	2	0.5	1.40	**6216N**
	170	39	2.1	0.5	154	86.7	5.85	13.3	3 900	4 700	**6316N**	**6316NR**	163.65	5.69	3.65	0.6	182.9	3.05	91	159	185	8.44	2	0.5	3.59	**6316N**
85	130	22	1.1	0.5	61.8	43.1	2.35	15.8	5 000	5 900	**6017N**	**6017NR**	125.22	2.87	3.25	0.6	139.7	2.77	91.5	123.5	141.5	5.39	1	0.5	0.890	**6017N**
	150	28	2	0.5	105	61.9	3.70	14.5	4 200	5 000	**6217N**	**6217NR**	145.24	4.9	3.25	0.6	159.7	2.77	94	141	162	7.37	2	0.5	1.79	**6217N**
	180	41	3	0.5	166	96.8	6.35	13.3	3 700	4 400	**6317N**	**6317NR**	173.66	5.69	3.65	0.6	192.9	3.05	98	167	195	8.44	2.5	0.5	4.23	**6317N**
90	140	24	1.5	0.5	72.8	49.7	2.65	15.6	4 700	5 600	**6018N**	**6018NR**	135.23	3.71	3.25	0.6	149.7	2.77	98	132	152	6.17	1.5	0.5	1.16	**6018N**
	160	30	2	0.5	120	71.5	4.20	14.5	3 900	4 700	**6218N**	**6218NR**	155.22	4.9	3.25	0.6	169.7	2.77	99	151	172	7.37	2	0.5	2.15	**6218N**
	190	43	3	0.5	178	107	8.80	13.3	3 500	4 200	**6318N**	**6318NR**	183.64	5.69	3.65	0.6	202.9	3.05	103	177	205	8.44	2.5	0.5	4.91	**6318N**

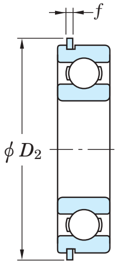
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings
snap ring groove type
locating snap ring type

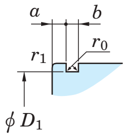
d 95 ~ 130 mm



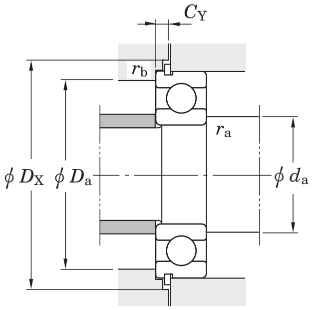
N
With snap
ring groove

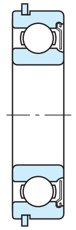


NR
With locating
snap ring



Snap ring
groove details





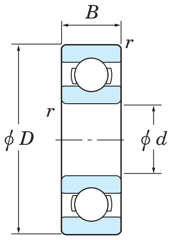
With locating snap
ring and one shield

Boundary dimensions (mm)					Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.		Dimensions of snap ring groove (mm)				Dimensions of locating snap ring (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)	(Refer.) Bearing No.
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.	With snap ring groove	With locating snap ring	D_1 max.	a max.	b ±0.15	r_0 max.	D_2 max.	f ±0.05	d_a min.	D_a max.	D_X min.	C_Y max.	r_a max.	r_b max.		
95	145	24	1.5	0.5	75.5	53.9	2.75	15.8	4 400	5 200	**6019N**	**6019NR**	140.23	3.71	3.25	0.6	154.7	2.77	103	137	157	6.17	1.5	0.5	1.21	**6019N**
	170	32	2.1	0.5	136	81.9	4.65	14.4	3 700	4 400	**6219N**	**6219NR**	163.65	5.69	3.65	0.6	182.9	3.05	106	159	185	8.44	2	0.5	2.62	**6219N**
	200	45	3	0.5	191	119	9.45	13.3	3 300	4 000	**6319N**	**6319NR**	193.65	5.69	3.65	0.6	212.9	3.05	108	187	215	8.44	2.5	0.5	5.67	**6319N**
100	150	24	1.5	0.5	75.2	54.2	2.70	15.9	4 300	5 100	**6020N**	**6020NR**	145.24	3.71	3.25	0.6	159.7	2.77	108	142	162	6.17	1.5	0.5	1.25	**6020N**
	180	34	2.1	0.5	153	93.1	5.15	14.4	3 500	4 200	**6220N**	**6220NR**	173.66	5.69	3.65	0.6	192.9	3.05	111	169	195	8.44	2	0.5	3.14	**6220N**
105	160	26	2	0.5	90.4	65.8	3.20	15.8	4 000	4 700	**6021N**	**6021NR**	155.22	3.71	3.25	0.6	169.7	2.77	114	151	172	6.17	2	0.5	1.59	**6021N**
	190	36	2.1	0.5	166	105	5.70	14.4	3 300	3 900	**6221N**	**6221NR**	183.64	5.69	3.65	0.6	202.9	3.05	116	179	205	8.44	2	0.5	3.70	**6221N**
110	170	28	2	0.5	103	73.0	3.55	15.6	3 800	4 500	**6022N**	**6022NR**	163.65	3.71	3.65	0.6	182.9	3.05	119	161	185	6.45	2	0.5	1.96	**6022N**
	200	38	2.1	0.5	180	117	6.20	14.4	3 100	3 700	**6222N**	**6222NR**	193.65	5.69	3.65	0.6	212.9	3.05	121	189	215	8.44	2	0.5	4.36	**6222N**
120	180	28	2	0.5	106	79.3	3.60	15.9	3 600	4 200	**6024N**	**6024NR**	173.66	3.71	3.65	0.6	192.9	3.05	129	171	195	6.45	2	0.5	2.07	**6024N**
130	200	33	2	0.5	133	101	4.45	15.8	3 200	3 800	**6026N**	**6026NR**	193.65	5.69	3.65	0.6	212.9	3.05	139	191	215	8.44	2	0.5	3.16	**6026N**

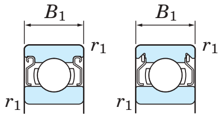
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Extra-small ball bearings, miniature ball bearings

d 1 ~ (4) mm

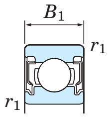


Open



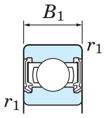
ZZ ZZX

Shielded



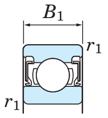
2RU

Non-contact sealed



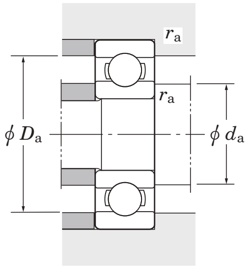
2RD

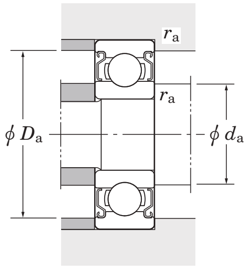
Extremely light contact sealed



2RS

Contact sealed



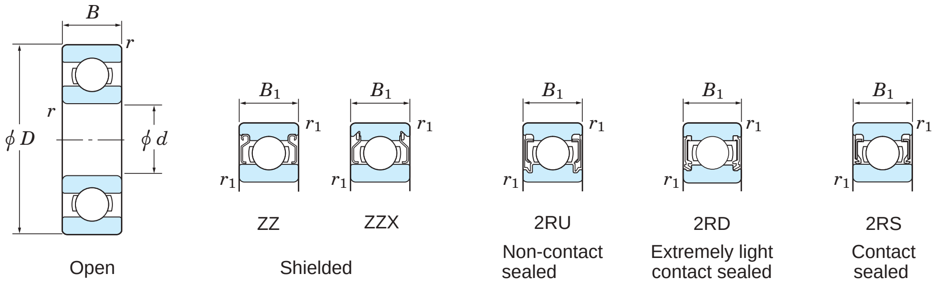


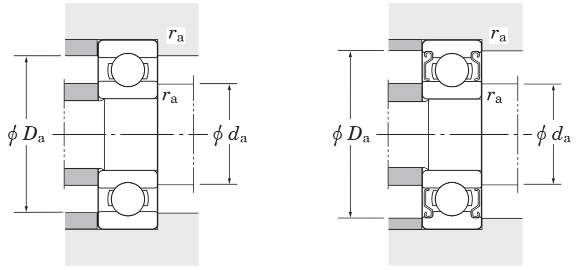
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})				Bearing No.					Mounting dimensions (mm)			(Refer.) Mass (g)
										Grease lub.			Oil lub.									
d	D	B	B_1	r [1] min.	r_1 [1] min.	C_r	C_{0r}	C_u	f_0	(Open ZZ, 2RU)	(2RD)	(2RS)	(Open Z)	Open	Shielded	Non-contact sealed	Extremely light shielded	Contact sealed	d_a min.	D_a max.	r_a max.	
1	3	1	—	0.07	—	0.120	0.03	0.0007	11.6	130 000	—	—	150 000	**681**	—	—	—	—	1.6	2.4	0.05	0.03
	3	1.5	—	0.08	—	0.100	0.02	0.0006	12.8	130 000	—	—	150 000	**ML1003**	—	—	—	—	1.6	2.4	0.07	0.05
	4	1.6	—	0.1	—	0.170	0.04	0.001	11.4	120 000	—	—	140 000	**691**	—	—	—	—	1.8	3.2	0.1	0.1
1.2	4	1.8	—	0.08	—	0.140	0.03	0.0009	11.4	120 000	—	—	140 000	**ML1204**	—	—	—	—	1.8	3.4	0.07	0.1
1.5	4	1.2	2	0.1	0.1	0.140	0.03	0.0009	13.2	120 000	—	—	140 000	**68/1.5**	**W68/1.5 ZZ**	—	—	—	2.3	3.2	0.1	0.1
	5	2	2.6	0.15	0.15	0.300	0.07	0.002	13.3	110 000	—	—	130 000	**69/1.5**	**W69/1.5 ZZX**	—	—	—	2.7	3.8	0.15	0.1
	6	2.5	3	0.1	0.1	0.410	0.10	0.003	11.4	86 000	—	—	100 000	**ML1506**	**WML1506 ZZX**	—	—	—	2.3	5.2	0.1	0.3
2	5	1.5	2.3	0.1	0.1	0.210	0.05	0.001	13.3	98 000	—	—	110 000	**682**	**W682 ZZX**	—	—	—	2.8	4.4	0.1	0.1
	5	2	2.5	0.1	0.08	0.210	0.05	0.001	13.3	98 000	—	—	110 000	**ML2005**	**WML2005 ZZ**	—	—	—	2.6	4.2	0.07	0.1
	6	2.3	3	0.15	0.1	0.410	0.10	0.003	11.4	86 000	—	—	100 000	**692**	**W692 ZZ**	—	—	—	3.2	4.8	0.1	0.2
	6	2.5	3	0.1	0.1	0.410	0.10	0.003	11.4	86 000	—	—	100 000	**ML2006**	**WML2006 ZZX**	—	—	—	2.8	5.2	0.1	0.3
	7	2.5	3	0.15	0.15	0.480	0.13	0.003	12.6	67 000	—	—	79 000	**ML2007**	**WML2007 ZZX**	—	—	—	3.2	5.8	0.15	0.4
	7	2.8	3.5	0.15	0.15	0.480	0.13	0.003	12.6	67 000	—	—	79 000	**602**	**W602 ZZX**	—	—	—	3.2	5.8	0.15	0.5
2.5	6	1.8	2.6	0.1	0.1	0.240	0.06	0.002	14.3	75 000	—	—	89 000	**68/2.5**	**W68/2.5 ZZ**	—	—	—	3.3	5.2	0.1	0.2
	7	2.5	3.5	0.15	0.15	0.390	0.11	0.003	13.7	66 000	—	—	79 000	**69/2.5**	**W69/2.5 ZZ**	—	—	—	3.7	5.8	0.15	0.4
	8	2.5	—	0.1	—	0.540	0.15	0.004	13.4	63 000	—	—	75 000	**ML2508/1B**	—	—	—	—	3.3	7.2	0.1	0.6
	8	2.8	4	0.15	0.1	0.680	0.17	0.005	11.5	64 000	—	—	76 000	**ML2508**	**WML2508 ZZX**	—	—	—	3.7	6.8	0.1	0.6
3	6	2	2.5	0.08	0.05	0.240	0.06	0.002	14.3	75 000	—	—	89 000	**ML3006**	**WML3006 ZZ**	—	—	—	3.6	5.4	0.05	0.2
	7	2	3	(0.15)	(0.15)	0.390	0.11	0.003	13.7	66 000	—	—	79 000	**683**	**W683 ZZ**	—	—	—	4.2	5.8	0.1	0.3
	8	2.5	—	0.1	—	0.490	0.14	0.004	13.4	63 000	—	—	75 000	**ML3008**	—	—	—	—	3.8	7.2	0.1	0.5
	8	3	4	0.15	0.15	0.680	0.17	0.005	11.5	64 000	—	—	76 000	**693**	**W693 ZZ**	—	—	—	4.2	6.8	0.15	0.6
	9	3	5	0.15	0.15	0.540	0.16	0.004	14.0	60 000	—	—	72 000	**603**	**W603 ZZX**	—	—	—	4.2	7.8	0.15	0.9
	10	4	4	0.15	0.15	0.800	0.22	0.006	12.8	52 000	—	44 000	63 000	**623**	**623 ZZ**	—	—	**623 2RS**	4.2	8.8	0.15	1.6
	13	5	5	0.2	0.2	1.65	0.49	0.01	12.3	44 000	—	—	54 000	**633**	**633 ZZ**	—	—	—	4.6	11.4	0.2	3.0
4	7	2	2.5	0.08	0.05	0.320	0.11	0.003	15.1	64 000	—	—	76 000	**ML4007**	**WML4007 ZZ**	—	—	—	4.6	6.4	0.05	0.2
	8	2	3	0.1	0.08	0.490	0.14	0.004	14.6	61 000	—	—	73 000	**ML4008**	**WML4008 ZZ**	—	—	—	4.8	7.2	0.08	0.4
	9	2.5	4	(0.15)	(0.15)	0.800	0.23	0.006	12.8	59 000	—	—	70 000	**684**	**W684 ZZ**	—	—	—	5.2	7.8	0.1	0.6

[Note] 1) Numerical values in ( ) do not conform to JIS B 1521.

Extra-small ball bearings, miniature ball bearings

d (4) ~ (7) mm

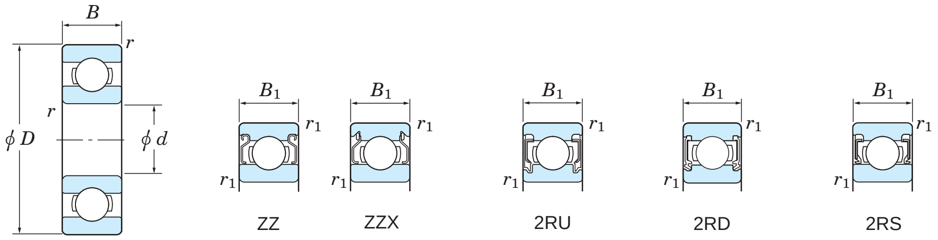




Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min⁻¹) Grease lub.			Oil lub.	Bearing No.					Mounting dimensions (mm)			(Refer.) Mass (g)
d	D	B	B_1	r min.	r_1 min.	C_r	C_{0r}	C_u	f_0	(Open ZZ, 2RU)	(2RD)	(2RS)	(Open Z)	Open	Shielded	Non-contact sealed	Extremely light shielded	Contact sealed	d_a min.	D_a max.	r_a max.	
4	10	3	4	0.15	0.1	0.810	0.23	0.006	13.3	56 000	—	—	67 000	**ML4010**	**WML4010 ZZ**	—	—	—	5.2	8.8	0.1	1.0
	11	4	4	0.15	0.15	1.20	0.35	0.009	12.4	54 000	—	44 000	65 000	**694**	**694 ZZ**	**694 2RU**	—	**694 2RS**	5.2	9.8	0.15	1.8
	12	4	4	0.2	0.2	1.20	0.35	0.009	12.4	53 000	—	—	63 000	**604**	**604 ZZ**	—	—	—	5.6	10.4	0.2	2.1
	13	5	5	0.2	0.2	1.65	0.48	0.010	12.3	44 000	—	39 000	54 000	**624**	**624 ZZ**	**624 2RU**	—	**624 2RS**	5.6	11.4	0.2	2.9
	16	5	5	0.3	0.3	1.70	0.52	0.010	12.4	40 000	—	—	49 000	**634**	**634 ZZ**	—	—	—	6	14	0.3	5.3
5	8	2	2.5	0.08	0.05	0.270	0.09	0.002	15.7	59 000	—	—	70 000	**ML5008**	**WML5008 ZZ**	—	—	—	5.6	7.4	0.05	0.3
	9	2.5	3	0.1	0.08	0.540	0.17	0.004	15.3	56 000	—	—	67 000	**ML5009**	**WML5009 ZZ**	—	—	—	5.8	8.2	0.08	0.5
	10	3	4	0.1	0.1	0.540	0.17	0.005	14.8	55 000	—	—	65 000	**ML5010**	**WML5010 ZZ**	—	—	—	5.8	9	0.1	0.9
	11	3	5	0.15	0.15	0.890	0.28	0.007	12.8	53 000	—	—	63 000	**685**	**W685 ZZ**	—	—	—	6.2	9.8	0.15	1.0
	13	4	4	0.2	0.2	1.35	0.43	0.010	12.3	50 000	45 000	42 000	60 000	**695**	**695 ZZ**	**695 2RU**	**695 2RD**	**695 2RS**	6.6	11.4	0.2	2.2
	14	5	5	0.2	0.2	1.65	0.49	0.010	12.3	50 000	—	—	60 000	**605**	**605 ZZ**	—	—	—	6.6	12.4	0.2	3.5
	16	5	5	0.3	0.3	2.15	0.67	0.030	12.4	40 000	36 000	33 000	49 000	**625**	**625 ZZ**	**625 2RU**	—	**625 2RS**	7	14	0.3	5.0
	19	6	6	0.3	0.3	2.90	0.89	0.040	12.3	35 000	32 000	27 000	43 000	**635**	**635 ZZ**	**635 2RU**	—	**635 2RS**	7	17	0.3	8.5
6	10	2.5	3	0.1	0.08	0.620	0.22	0.006	15.7	53 000	—	—	63 000	**ML6010**	**WML6010 ZZ**	—	—	—	6.8	9.2	0.08	0.6
	12	3	4	0.15	0.1	0.890	0.29	0.008	14.5	49 000	—	37 000	59 000	**ML6012**	**WML6012 ZZ**	—	—	**WML6012 2RS**	7.2	10.8	0.1	1.3
	13	3.5	5	0.15	0.15	1.35	0.44	0.010	13.7	48 000	43 000	36 000	57 000	**686**	**W686 ZZ**	—	—	**W686 2RS**	7.2	11.8	0.15	1.8
	15	5	5	0.2	0.2	1.70	0.52	0.010	12.4	45 000	41 000	32 000	54 000	**696**	**696 ZZ**	**696 2RU**	**696 2RD**	**696 2RS**	7.6	13.4	0.2	3.9
	17	6	6	0.3	0.3	2.45	0.74	0.030	12.2	43 000	39 000	—	51 000	**606**	**606 ZZ**	**606 2RU**	**606 2RD**	—	8	15	0.3	5.8
	19	6	6	0.3	0.3	2.90	0.89	0.040	12.3	35 000	32 000	27 000	43 000	**626**	**626 ZZ**	**626 2RU**	**626 2RD**	**626 2RS**	8	17	0.3	8.1
	19	8	8	0.3	0.3	3.25	1.05	0.04	12.3	40 000	—	—	47 000	**ML6019**	**ML6019 ZZ**	—	—	—	7	18	0.3	9.0
	22	7	7	0.3	0.3	4.10	1.35	0.060	12.4	31 000	—	23 000	37 000	**636**	**636 ZZ**	—	—	**636 2RS**	8	20	0.3	13
7	11	2.5	3	0.1	0.08	0.540	0.23	0.006	16.1	49 000	—	—	59 000	**ML7011**	**WML7011 ZZX**	—	—	—	7.8	10.2	0.08	0.7
	13	3	4	0.15	0.15	0.680	0.28	0.007	14.9	47 000	—	—	55 000	**ML7013**	**WML7013 ZZ**	—	—	—	8.2	11.8	0.15	1.4
	14	3.5	5	0.15	0.15	1.45	0.51	0.010	14.2	45 000	—	—	54 000	**687**	**W687 ZZ**	—	—	—	8.2	12.8	0.15	2.0
	17	5	5	0.3	0.3	2.00	0.71	0.02	14.0	42 000	—	28 000	50 000	**697**	**697 ZZ**	—	—	**697 2RS**	9	15	0.3	5.3
	19	6	6	0.3	0.3	2.95	0.89	0.040	12.3	40 000	36 000	27 000	47 000	**607**	**607 ZZ**	**607 2RU**	**607 2RD**	**607 2RS**	9	17	0.3	7.6
	22	7	7	0.3	0.3	4.10	1.35	0.060	12.4	31 000	28 000	23 000	37 000	**627**	**627 ZZ**	**627 2RU**	**627 2RD**	**627 2RS**	9	20	0.3	13
	22	8	8	0.3	0.3	4.10	1.35	0.06	12.4	34 000	—	—	41 000	**ML7022**	**ML7022 ZZ**	—	—	—	9	20	0.3	14

Extra-small ball bearings, miniature ball bearings

d (7) ~ 9 mm



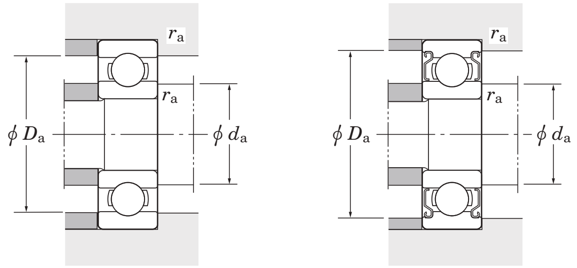
ZZ ZZX

Open Shielded

2RU Non-contact sealed

2RD Extremely light contact sealed

2RS Contact sealed

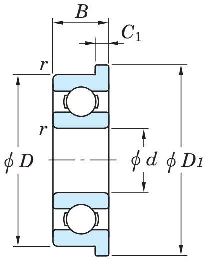


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min⁻¹)				Bearing No.					Mounting dimensions (mm)			(Refer.) Mass (g)
										Grease lub.			Oil lub.									
d	D	B	B_1	r [1] min.	r_1 [1] min.	C_r	C_{0r}	C_u	f_0	(Open ZZ, 2RU)	(2RD)	(2RS)	(Open Z)	Open	Shielded	Non-contact sealed	Extremely light shielded	Contact sealed	d_a min.	D_a max.	r_a max.	
7	26	9	9	0.3	0.3	5.65	1.95	0.100	12.3	26 000	—	—	32 000	**637**	**637 ZZ**	—	—	—	9	24	0.3	24
8	12	2.5	3.5	0.1	0.08	0.680	0.27	0.007	16.4	47 000	—	—	55 000	**ML8012**	**WML8012 ZZ**	—	—	—	8.8	11.2	0.08	0.8
	14	3.5	4	0.15	0.15	1.00	0.39	0.010	15.3	44 000	—	—	52 000	**ML8014**	**WML8014 ZZ**	—	—	—	9.2	12.8	0.15	1.8
	16	4	5	0.2	0.2	1.55	0.59	0.020	14.0	42 000	38 000	28 000	50 000	**688**	**W688 ZZ**	**W688 2RU**	**W688 2RD**	**W688 2RS**	9.6	14.4	0.2	3.2
	19	6	6	0.3	0.3	2.80	0.91	0.040	12.9	39 000	35 000	27 000	46 000	**698**	**698 ZZ**	—	**698 2RD**	**698 2RS**	10	17	0.3	7.2
	22	7	7	0.3	0.3	4.10	1.35	0.060	12.4	34 000	31 000	23 000	41 000	**608**	**608 ZZ**	**608 2RU**	**608 2RD**	**608 2RS**	10	20	0.3	12
	24	8	8	0.3	0.3	4.15	1.40	0.060	12.8	28 000	—	22 000	35 000	**628**	**628 ZZ**	**628 2RU**	—	**628 2RS**	10	22	0.3	18
	28	9	9	0.3	0.3	5.65	1.95	0.100	12.3	26 000	23 000	—	32 000	**638**	**638 ZZ**	—	**638 2RD**	—	10	26	0.3	29
9	17	4	5	0.2	0.2	1.65	0.66	0.020	14.9	39 000	35 000	—	46 000	**689**	**W689 ZZ**	**W689 2RU**	**W689 2RD**	—	10.6	15.4	0.2	3.5
	20	6	6	0.3	0.3	3.10	1.05	0.040	13.3	35 000	32 000	25 000	42 000	**699**	**699 ZZ**	—	**699 2RD**	**699 2RS**	11	18	0.3	7.5
	24	7	7	0.3	0.3	4.15	1.40	0.060	12.8	33 000	30 000	22 000	40 000	**609**	**609 ZZ**	**609 2RU**	**609 2RD**	**609 2RS**	11	22	0.3	15
	26	8	8	(0.6)	(0.6)	5.70	1.95	0.100	12.4	27 000	24 000	19 000	33 000	**629**	**629 ZZ**	**629 2RU**	**629 2RD**	**629 2RS**	12.1	22	0.3	20
	30	10	10	0.6	0.6	7.50	2.65	0.210	12.3	24 000	—	—	29 000	**639**	**639 ZZ**	—	—	—	13	26	0.6	35

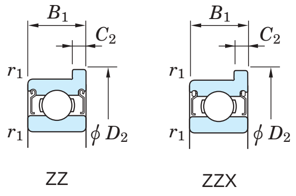
[Note] 1) Numerical values in ( ) do not conform to JIS B 1521.

Extra-small ball bearings, miniature ball bearings flanged type

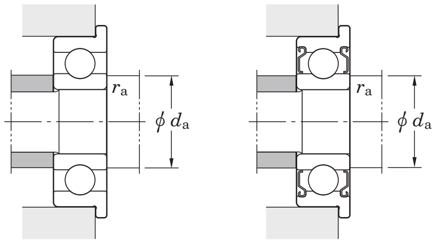
d 1 ~ (4) mm



Open



Shielded

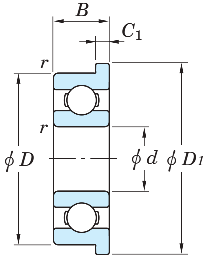


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1}) Grease lub.	Limiting speeds (min^{-1}) Oil lub.	Bearing No.		Dimensions of flange (mm)				Mounting dimensions (mm)		(Refer.) Mass (g)
d	D	B	B_1	r [1] min.	r_1 [1] min.	C_r	C_{0r}	C_u	f_0	[Open ZZ, ZZX]	[Open Z, ZX]	Open	Shielded	D_1	D_2	C_1	C_2	d_a min.	r_a max.	
1	3	1	—	0.07	—	0.120	0.03	0.0007	11.6	130 000	150 000	**F681**	—	3.8	—	0.3	—	1.6	0.05	0.03
	4	1.6	—	0.1	—	0.170	0.04	0.001	11.4	120 000	140 000	**F691**	—	5	—	0.5	—	1.8	0.1	0.1
1.5	4	1.2	2	0.1	0.1	0.140	0.03	0.0009	13.2	120 000	140 000	**F68/1.5**	**WF68/1.5 ZZ**	5	5	0.4	0.6	2.3	0.1	0.1
	5	2	2.6	0.15	0.15	0.300	0.07	0.002	12.9	110 000	120 000	**F69/1.5**	**WF69/1.5 ZZ**	6.5	6.5	0.6	0.8	2.7	0.15	0.2
	6	2.5	3	0.1	0.1	0.410	0.10	0.003	11.4	86 000	100 000	**MLF1506**	**WMLF1506 ZZ**	7.5	7.5	0.6	0.8	2.3	0.1	0.4
2	5	1.5	2.3	0.1	0.1	0.210	0.05	0.001	13.3	99 000	120 000	**F682**	**WF682 ZZ**	6.1	6.1	0.5	0.6	2.8	0.1	0.1
	5	2	2.5	0.1	0.08	0.210	0.05	0.001	12.9	99 000	120 000	**MLF2005**	**WMLF2005 ZZ**	6.2	6.2	0.6	0.6	2.8	0.07	0.2
	6	2.3	3	0.15	0.1	0.410	0.10	0.003	11.4	86 000	100 000	**F692**	**WF692 ZZ**	7.5	7.5	0.6	0.8	3.2	0.1	0.3
	6	2.5	3	0.1	0.1	0.410	0.10	0.003	11.4	86 000	100 000	**MLF2006**	**WMLF2006 ZZ**	7.2	7.2	0.6	0.6	2.8	0.1	0.4
	7	2.5	3	0.15	0.15	0.480	0.13	0.003	12.6	67 000	79 000	**MLF2007**	**WMLF2007 ZZ**	8.2	8.2	0.6	0.6	3.2	0.15	0.5
	7	2.8	3.5	0.15	0.15	0.480	0.13	0.003	12.6	67 000	79 000	**F602**	**WF602 ZZ**	8.5	8.5	0.7	0.9	3.2	0.15	0.6
2.5	6	1.8	2.6	0.1	0.1	0.260	0.07	0.002	14.3	69 000	82 000	**F68/2.5**	**WF68/2.5 ZZ**	7.1	7.1	0.5	0.8	3.3	0.1	0.2
	7	2.5	3.5	0.15	0.15	0.480	0.13	0.003	12.7	66 000	79 000	**F69/2.5**	**WF69/2.5 ZZX**	8.5	8.5	0.7	0.9	3.7	0.15	0.5
	8	2.5	—	0.1	—	0.680	0.17	0.005	11.7	63 000	75 000	**MLF2508/1B**	—	9.2	—	0.6	—	3.5	0.1	0.7
	8	2.8	4	0.15	0.1	0.680	0.17	0.005	11.5	63 000	75 000	**MLF2508**	**WMLF2508 ZZ**	9.5	9.5	0.7	0.9	3.7	0.1	0.7
3	6	2	2.5	0.08	0.05	0.260	0.07	0.002	14.3	69 000	82 000	**MLF3006**	**WMLF3006 ZZ**	7.2	7.2	0.6	0.6	3.6	0.05	0.2
	7	2	3	(0.15)	(0.15)	0.390	0.11	0.003	14.0	65 000	78 000	**F683**	**WF683 ZZ**	8.1	8.1	0.5	0.8	4.2	0.1	0.4
	8	2.5	—	0.1	—	0.490	0.14	0.004	13.4	61 000	72 000	**MLF3008**	—	9.2	—	0.6	—	4.0	0.1	0.6
	8	3	4	0.15	0.15	0.690	0.18	0.005	11.9	63 000	75 000	**F693**	**WF693 ZZ**	9.5	9.5	0.7	0.9	4.2	0.15	0.7
	9	3	5	0.15	0.15	0.710	0.19	0.005	12.4	60 000	72 000	**F603**	**WF603 ZZ**	10.5	10.5	0.7	1	4.2	0.15	1.0
	10	4	4	0.15	0.15	0.800	0.22	0.006	12.4	61 000	72 000	**F623**	**F623 ZZ**	11.5	11.5	1	1	4.2	0.15	1.8
4	7	2	2.5	0.08	0.05	0.320	0.11	0.003	15.1	63 000	75 000	**MLF4007**	**WMLF4007 ZZX**	8.2	8.2	0.6	0.6	4.6	0.05	0.3
	8	2	3	0.1	0.08	0.490	0.14	0.004	13.9	61 000	72 000	**MLF4008**	**WMLF4008 ZZ**	9.2	9.2	0.6	0.6	4.8	0.08	0.5
	9	2.5	4	(0.15)	(0.15)	0.800	0.23	0.006	12.8	59 000	70 000	**F684**	**WF684 ZZ**	10.3	10.3	0.6	1	5.2	0.1	0.7
	10	3	4	0.15	0.1	0.880	0.27	0.007	13.5	56 000	66 000	**MLF4010**	**WMLF4010 ZZ**	11.2	11.6	0.6	0.8	5.2	0.1	1.1
	11	4	4	0.15	0.15	1.20	0.35	0.009	12.4	54 000	65 000	**F694**	**F694 ZZ**	12.5	12.5	1	1	5.2	0.15	2.0
	12	4	4	0.2	0.2	1.20	0.35	0.009	12.4	54 000	65 000	**F604**	**F604 ZZ**	13.5	13.5	1	1	5.6	0.2	2.3

[Note] 1) Numerical values in ( ) do not conform to JIS B 1521.

Extra-small ball bearings, miniature ball bearings flanged type

d (4) ~ 8 mm



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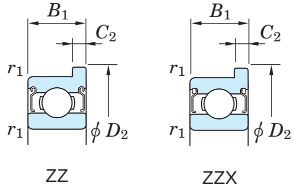
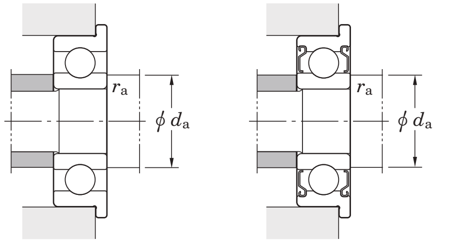


ZZ ZZX

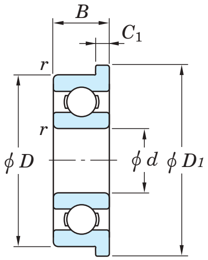
Shielded



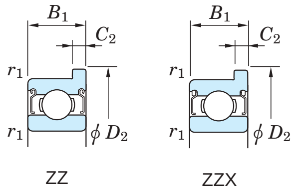
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.		Dimensions of flange (mm)				Mounting dimensions (mm)		(Refer.) Mass (g)
d	D	B	B_1	r min.	r_1 min.	C_r	C_{0r}	C_u	f_0	Grease lub. (Open ZZ, ZZX)	Oil lub. (Open Z, ZX)	Open	Shielded	D_1	D_2	C_1	C_2	d_a min.	r_a max.	
4	13	5	5	0.2	0.2	0.010	0.48	1.65	12.2	50 000	60 000	**F624**	**F624 ZZ**	15	15	1	1	5.6	0.2	3.3
	16	5	5	0.3	0.3	0.010	0.52	1.70	13.0	47 000	55 000	**F634**	**F634 ZZ**	18	18	1	1	6	0.3	5.7
5	8	2	2.5	0.08	0.05	0.270	0.09	0.002	15.8	59 000	70 000	**MLF5008**	**WMLF5008 ZZX**	9.2	9.2	0.6	0.6	5.6	0.05	0.4
	9	2.5	3	0.1	0.08	0.540	0.17	0.004	14.6	57 000	67 000	**MLF5009**	**WMLF5009 ZZX**	10.2	10.2	0.6	0.6	5.8	0.08	0.6
	10	3	4	0.1	0.1	0.540	0.17	0.005	14.8	57 000	67 000	**MLF5010**	**WMLF5010 ZZ**	11.2	11.6	0.6	0.8	5.8	0.1	1.0
	11	3	5	0.15	0.15	0.890	0.28	0.007	14.0	53 000	63 000	**F685**	**WF685 ZZ**	12.5	12.5	0.8	1	6.2	0.15	1.1
	13	4	4	0.2	0.2	1.35	0.43	0.010	13.4	49 000	59 000	**F695**	**F695 ZZ**	15	15	1	1	6.6	0.2	2.5
	14	5	5	0.2	0.2	1.65	0.51	0.01	12.3	48 000	57 000	**F605**	**F605 ZZ**	16	16	1	1	6.6	0.2	3.9
	16	5	5	0.3	0.3	2.15	0.67	0.03	12.4	45 000	54 000	**F625**	**F625 ZZ**	18	18	1	1	7	0.3	5.4
	19	6	6	0.3	0.3	2.90	0.89	0.04	12.3	40 000	47 000	**F635**	**F635 ZZ**	22	22	1.5	1.5	7	0.3	9.7
6	10	2.5	3	0.1	0.08	0.620	0.22	0.006	15.2	53 000	63 000	**MLF6010**	**WMLF6010 ZZX**	11.2	11.2	0.6	0.6	6.8	0.08	0.7
	12	3	4	0.15	0.1	0.890	0.29	0.008	14.5	49 000	59 000	**MLF6012**	**WMLF6012 ZZ**	13.2	13.6	0.6	0.8	7.2	0.1	1.4
	13	3.5	5	0.15	0.15	1.35	0.44	0.010	13.7	48 000	57 000	**F686**	**WF686 ZZ**	15	15	1	1.1	7.2	0.15	2.1
	15	5	5	0.2	0.2	1.70	0.52	0.01	13.0	47 000	55 000	**F696**	**F696 ZZ**	17	17	1.2	1.2	7.6	0.2	4.3
	17	6	6	0.3	0.3	2.85	0.84	0.03	11.4	43 000	52 000	**F606**	**F606 ZZ**	19	19	1.2	1.2	8	0.3	6.3
	19	6	6	0.3	0.3	2.90	0.89	0.04	12.3	40 000	47 000	**F626**	**F626 ZZ**	22	22	1.5	1.5	8	0.3	9.2
	22	7	7	0.3	0.3	4.10	1.35	0.06	12.4	34 000	41 000	**F636**	**F636 ZZ**	25	25	1.5	1.5	8	0.3	14
7	11	2.5	3	0.1	0.08	0.570	0.20	0.005	15.6	49 000	59 000	**MLF7011**	**WMLF7011 ZZX**	12.2	12.2	0.6	0.6	7.8	0.08	0.8
	13	3	4	0.15	0.15	0.680	0.28	0.007	16.0	46 000	55 000	**MLF7013**	**WMLF7013 ZZ**	14.2	14.6	0.6	0.8	8.2	0.15	1.5
	14	3.5	5	0.15	0.15	1.45	0.51	0.010	14.2	45 000	54 000	**F687**	**WF687 ZZ**	16	16	1	1.1	8.2	0.15	2.4
	17	5	5	0.3	0.3	2.00	0.71	0.02	14.0	42 000	50 000	**F697**	**F697 ZZ**	19	19	1.2	1.2	9	0.3	5.8
	19	6	6	0.3	0.3	2.95	0.89	0.04	12.1	40 000	47 000	**F607**	**F607 ZZ**	22	22	1.5	1.5	9	0.3	8.7
	22	7	7	0.3	0.3	4.10	1.35	0.06	12.4	34 000	41 000	**F627**	**F627 ZZ**	25	25	1.5	1.5	9	0.3	14
8	12	2.5	3.5	0.1	0.08	0.680	0.27	0.007	15.9	47 000	55 000	**MLF8012**	**WMLF8012 ZZX**	13.2	13.6	0.6	0.8	8.8	0.08	0.9
	14	3.5	4	0.15	0.15	1.00	0.42	0.01	15.3	44 000	52 000	**MLF8014**	**WMLF8014 ZZ**	15.6	15.6	0.8	0.8	9.2	0.15	2.0
	16	4	5	0.2	0.2	1.55	0.59	0.020	14.8	42 000	50 000	**F688**	**WF688 ZZ**	18	18	1	1.1	9.6	0.2	3.6
	19	6	6	0.3	0.3	2.80	0.91	0.040	12.9	39 000	46 000	**F698**	**F698 ZZ**	22	22	1.5	1.5	10	0.3	8.3
	22	7	7	0.3	0.3	4.10	1.35	0.060	12.4	34 000	41 000	**F608**	**F608 ZZ**	25	25	1.5	1.5	10	0.3	13

Extra-small ball bearings, miniature ball bearings flanged type

d 9 mm

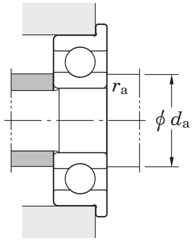


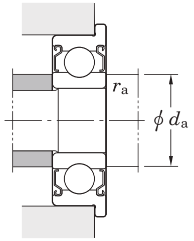
Open



ZZ ZZX

Shielded

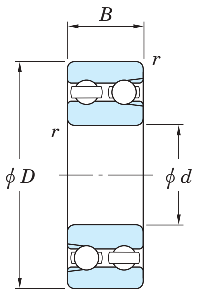




Boundary dimensions (mm) d	D	B	B_1	r min.	r_1 min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min^{-1}) Grease lub. (Open ZZ, ZZX)	Oil lub. (Open Z, ZX)	Bearing No. Open	Shielded	Dimensions of flange (mm) D_1	D_2	C_1	C_2	Mounting dimensions (mm) d_a min.	r_a max.	(Refer.) Mass (g)
9	17	4	5	0.2	0.2	1.65	0.66	0.020	15.1	39 000	46 000	**F689**	**WF689 ZZ**	19	19	1	1.1	10.6	0.2	3.9
	20	6	6	0.3	0.3	3.10	1.05	0.04	13.3	37 000	44 000	**F699**	**F699 ZZ**	23	23	1.5	1.5	11	0.3	8.7
	24	7	7	0.3	0.3	4.15	1.45	0.06	12.8	32 000	38 000	**F609**	**F609 ZZ**	27	27	1.5	1.5	11	0.3	16

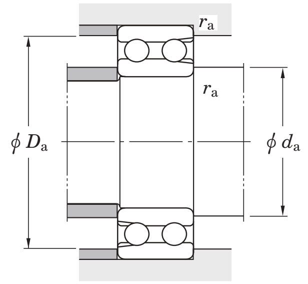
Double-row deep groove ball bearings

d 10 ~ (60) mm



Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
10	30	14	0.6	9.61	5.90	0.300	13.0	15 000	20 000	**4200**	14	26	0.6	0.057
12	32	14	0.6	9.71	6.15	0.320	13.6	14 000	18 000	**4201**	16	28	0.6	0.062
15	35	14	0.6	12.2	9.00	0.460	14.2	12 000	16 000	**4202**	19	31	0.6	0.071
	42	17	1	16.4	11.7	0.830	13.7	11 000	14 000	**4302**	20	37	1	0.123
17	40	16	0.6	14.6	10.4	0.710	14.1	11 000	14 000	**4203**	21	36	0.6	0.106
	47	19	1	20.6	15.0	1.05	13.7	9 400	13 000	**4303**	22	42	1	0.171
20	47	18	1	20.5	16.0	1.10	14.2	9 000	12 000	**4204**	25	42	1	0.165
	52	21	1.1	24.3	17.0	1.25	13.5	8 300	11 000	**4304**	26.5	45.5	1	0.227
25	52	18	1	20.4	16.9	1.05	15.0	7 500	9 900	**4205**	30	47	1	0.189
	62	24	1.1	32.9	25.7	1.75	14.1	6 700	9 000	**4305**	31.5	55.5	1	0.365
30	62	20	1	27.4	24.7	1.50	15.1	6 400	8 500	**4206**	35	57	1	0.298
	72	27	1.1	44.4	35.9	2.45	14.0	5 700	7 600	**4306**	36.5	65.5	1	0.542
35	72	23	1.1	33.0	30.7	1.85	15.2	5 600	7 400	**4207**	41.5	65.5	1	0.460
	80	31	1.5	50.7	41.8	2.85	14.1	5 200	7 000	**4307**	43	72	1.5	0.752
40	80	23	1.1	42.2	42.4	2.50	15.5	4 700	6 300	**4208**	46.5	73.5	1	0.558
	90	33	1.5	57.5	48.8	3.25	14.7	4 600	6 100	**4308**	48	82	1.5	1.01
45	85	23	1.1	39.8	43.9	2.45	15.8	4 600	6 100	**4209**	51.5	78.5	1	0.605
	100	36	1.5	72.0	62.4	4.20	14.3	4 100	5 500	**4309**	53	92	1.5	1.35
50	90	23	1.1	39.2	44.6	2.45	16.1	4 200	5 600	**4210**	56.5	83.5	1	0.651
	110	40	2	88.0	77.7	5.25	14.2	3 700	5 000	**4310**	59	101	2	1.80
55	100	25	1.5	46.5	54.1	2.95	16.1	3 800	5 000	**4211**	63	92	1.5	0.882
	120	43	2	105	94.4	6.40	14.2	3 400	4 600	**4311**	64	111	2	2.29
60	110	28	1.5	59.9	67.6	3.80	15.9	3 500	4 700	**4212**	68	102	1.5	1.20

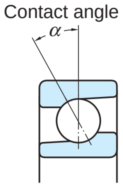
d (60) ~ 75 mm



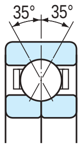
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.		d_a min.	D_a max.	r_a max.	
60	130	46	2.1	124	113	7.70	14.1	3 100	4 200	**4312**	71	119	2	2.87
65	120	31	1.5	68.3	78.5	4.35	15.9	3 200	4 300	**4213**	73	112	1.5	1.59
	140	48	2.1	134	124	8.20	14.3	2 900	3 900	**4313**	76	129	2	3.46
70	125	31	1.5	77.7	89.8	5.05	15.8	3 100	4 100	**4214**	78	117	1.5	1.68
	150	51	2.1	144	136	8.55	14.4	2 700	3 600	**4314**	81	139	2	4.21
75	130	31	1.5	77.0	90.7	4.95	16.0	2 900	3 900	**4215**	83	122	1.5	1.77
	160	55	2.1	166	158	9.70	14.4	2 500	3 400	**4315**	86	149	2	5.15

Angular contact ball bearings

Angular contact ball bearings are suitable for applications which require high accuracy and good high-speed performance. This type of bearing is designed to carry a combined load.

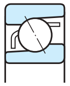


- Single-row angular contact ball bearings and matched pair angular contact ball bearings
  - The standard contact angles are 15°, 30° and 40°. They are identified, respectively, by the supplementary codes "C", "A" (omitted) and "B". Bearings with a smaller contact angle are more suitable for applications involving high-speed rotation. Those with a larger contact angle feature superior axial load resistance.
  - Angular contact ball bearings are often preloaded to enhance their rigidity and rotating performance. (refer to p. A 112.) For high-precision matched pair angular contact ball bearings of class 5 or higher, which are used in machine tools and other precision equipment, the standard preload is specified in three levels: slight (S), light (L), medium (M) and heavy (H). (refer to Table 11-2 on p. A 114.)
  - When this type of bearing is loaded radially, an axial component of force is produced. In this case, two bearings are used together facing one another, or two or more bearings are matched and used. (refer to p. A 38.)
  - Tables 1 and 2 list the different types of single-row and matched pair/stack angular contact ball bearings and describe their characteristics.
- Double-row angular contact ball bearings
  Consist of two single-row angular contact ball bearings matched back-to-back, with inner and outer rings integrated.
  Table 3 shows major types and their characteristics.
- Four-point contact ball bearings
  - Have a contact angle of 35° and an inner ring divided into two annular pieces. They are suitable for applications that involve either axial loading or combined loading, where the axial load makes up the major part of the load.
  - Able to support both axial load and a certain degree of radial load. Each rolling element is in contact with each of the inner and outer rings at a single point, and both contact points lie on the contact angle line. The line runs to either the right or left depending on the direction of the axial load.



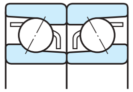
- Consult with JTEKT when using the four-point contact ball bearing because application conditions such as load magnitude should be examined carefully.

Single-row angular contact ball bearings



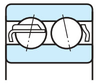
Bore diameter **10** – **380** mm

Matched pair angular contact ball bearings



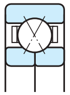
Bore diameter **10** – **380** mm

Double-row angular contact ball bearings



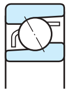
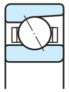
Bore diameter **10** – **110** mm

Four-point contact ball bearings



Bore diameter **20** – **110** mm

Table 1 Single-row angular contact ball bearings

Standard type  (with pressed cage)	● Single-row angular contact ball bearings accommodate radial load and axial load in one direction.
 (with machined cage)	● Bearings with a machined cage are suitable for high-speed applications.

Reference **G-type bearing**

"G-type" bearings have a stand-out between the inner ring and outer ring on both sides that are equal in size.
This arrangement is called "flush ground processing." These bearings can be matched in a variety of ways.

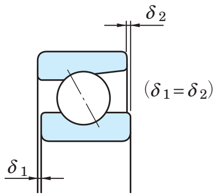
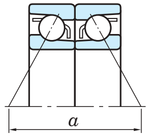
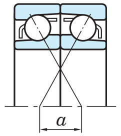
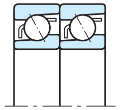


Table 2 Matched pair and stack angular contact ball bearings

Back-to-back arrangement (DB)		● Carries radial load and axial load in both directions. ● Suitable for applications involving moment loading because the distance between the load centers (a) is long. ● As for the preloaded type, the clearance is pre-adjusted so that bearings will be preloaded the proper amount when the inner ring is fixed with a nut.
Face-to-face arrangement (DF)		● Carries radial load and axial load in both directions. ● Has a smaller moment load accommodating capacity than the back-to-back arrangement, because the distance between the load centers (a) is shorter. ● As for the preloaded type, the clearance is pre-adjusted so that bearings will be preloaded the proper amount when the outer rings are pressed together.
Tandem arrangement (DT)		● Carries radial load and axial load in one direction. ● Suitable for applications which involve a high degree of axial loading.

Matched stack

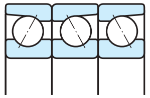
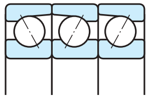
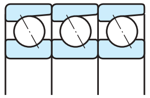
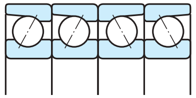
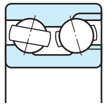
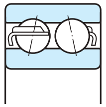
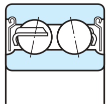
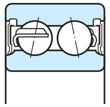
			
(DBD)	(DFD)	(DTD)	(DBB)

Table 3 Double-row angular contact ball bearings

 (with filling slot) 32, 33	 (without filling slot) 52, 53	● Accommodates radial load and axial load in both directions. Also able to accommodate moment load. When installing bearings with filling slot (32 and 33 series), the raceway side without filling slot must accommodate main load. ● The 32 and 33 series are provided with a filling slot, while the 52 and 53 series are not. 32 and 33 series : contact angle 32° 52 and 53 series : contact angle 24°
 Shielded 52...ZZ, 53...ZZ	 Sealed 52...2RS, 53...2RS	● Inferior to single-row and matched pair angular contact ball bearings in terms of high-speed and high accuracy performance. ● Shielded or sealed 52 and 53 series bearings are also available.

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512.
Tolerances	· As specified in JIS B 1514-1. (refer to Table 7-3 on pp. A 60 – A 63.) · JTEKT has established "special tolerances" for bore diameter and outside diameter, as listed in the table to the right, to make it easy to produce high-precision matched stack bearings. Bearings which are produced based on these tolerances are identified by the supplementary code "K5."
Internal clearance	■ Matched pair bearing axial internal clearance............(refer to Table 10-4 on p. A 103.) ■ Double-row bearing radial internal clearance............(refer to Table 10-5 on p. A 104.)
Recommended fits	■ Classes 0 and 6 bearings......................................(refer to Table 9-4 on pp. A 91, 92.) ■ Classes 5 and 4 bearings......................................as listed in the table below. ■ Refer to Table 11-3 on page A 115 for the recommended fits of high-precision matched pair bearings (class 5 and class 4), which are used with light preload (L) or middle preload (M).

Special tolerances (K5) Unit : µm

Nominal bore diameter d (mm)		Single plane mean bore diameter ($\Delta_{d\mathrm{mp}}$) or single plane mean outside diameter deviation ($\Delta_{D\mathrm{mp}}$)			
		class 5		class 4	
over	up to	upper	lower	upper	lower
–	50	– 1	– 4	– 1	– 3
50	80	– 1	– 5	– 1	– 4
80	120	– 1	– 5	– 1	– 4

Fit		class 5	class 4
		Tolerance class	
With shaft	Inner ring rotation	js 5	js 4
	Outer ring rotation	h 5	h 4
With housing	Fixed side	JS 6	JS 5
	Free side	H 6	H 5
	Outer ring rotation	M 5	M 4

Standard cages

- Pressed cage
  (supplementary code : //)
- Copper alloy machined cage
  (supplementary code : FY)

[Note] Machine tools are generally equipped with bearings that have a phenolic resin machined cage (FT). Bearings with a polyamide molded cage can also be used depending on the applications. Four-point contact ball bearings usually use a copper alloy machined cage.

Application of standard cages

Bearing series	Pressed cage	Machined cage
79C 79CPA	— —	7900C – 7932C 7900CPA – 7932CPA
70 70B 70C 70CPA	— — — —	7000 – 7040 7000B – 7040B 7000C – 7040C 7000CPA – 7034CPA
72 72B 72C 72CPA	7200 – 7220 7200B – 7220B 7200C – 7220C —	7200 – 7240 7200B – 7240B 7200C – 7240C 7200CPA – 7230CPA
73 73B 73C	7300 – 7320 7303B – 7320B 7303C – 7320C	7300 – 7340 7303B – 7340B 7303C – 7334C
74 74B	7405 – 7409 7405B – 7409B	7404 – 7418 7404B – 7418B
32 33	3200 – 3215 3302 – 3313	3216 – 3222 3314 – 3322
52 53	5203 – 5214 5304 – 5315	— —

Allowable misalignment Single-row.........0.000 6 rad (2') : Matched pair, double-row......misalignment not allowed

Equivalent radial load

Single-row and matched pair angular contact ball bearings

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	$\frac{if_0F_a{}^*}{C_{0r}}$	e	Single-row and tandem arrangement				Back-to-back and face-to-face arrangement			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
30°	–	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
40°	–	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93

* For i, use 2 for DB&DF and 1 for single&DT.
Factor f_0 is shown in the bearing dimention table.

[Note]
When two single-row angular contact ball bearings are used facing one another, an axial component of force is produced under radial load.
In this case, refer to page A 38 for calculation of the dynamic equivalent radial load.

Static equivalent radial load

$P_{0r} = X_0 F_r + Y_0 F_a$

In reference to single-row and tandem arrangement bearings,

when $P_{0r} < F_r$,
$P_{0r} = F_r$

Contact angle	Single-row and tandem arrangement		Back-to-back and face-to-face arrangement	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

Equivalent radial load

Double-row angular contact ball bearings

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	e	$F_a/F_r \leqq e$		$F_a/F_r > e$		(reference)
		X	Y	X	Y	
24°	0.66	1	0.95	0.68	1.45	52, 53 series
32°	0.86	1	0.73	0.62	1.17	32, 33 series

Static equivalent radial load

$P_{0r} = X_0 F_r + Y_0 F_a$

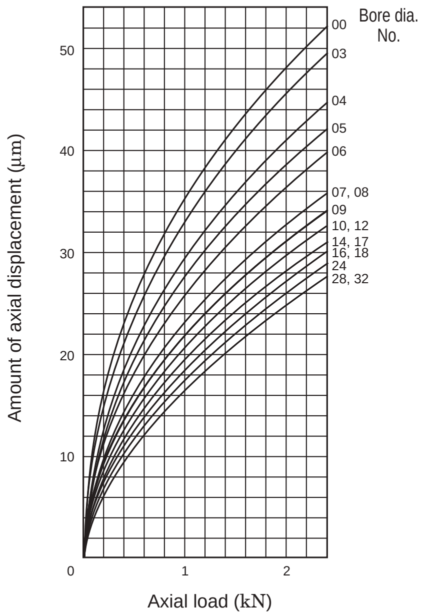
Contact angle	X_0	Y_0	(reference)
24°	1	0.78	52, 53 series
32°	1	0.63	32, 33 series

[Note] In angular contact ball bearings, slippage occurs between the balls and raceways under too small a load, causing smearing to develop.
Matched pair bearings may develop smearing when the ratio of the axial load to the radial load exceeds the value of e ($F_a / F_r > e$), as listed in the specification table. Consult with JTEKT when these bearings are used under the above conditions.

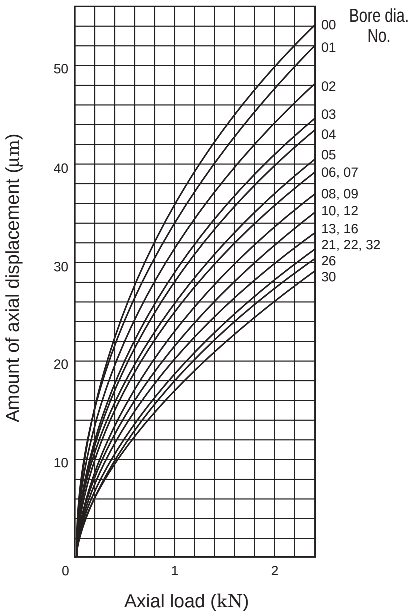
[Reference] Relationship between axial load and axial displacement

Diagrams (1) to (9) illustrate the relationship between axial load and axial displacement.

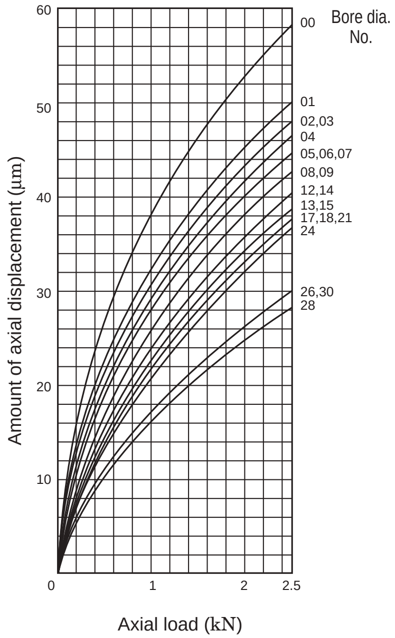
(1) 7900C (contact angle 15°)



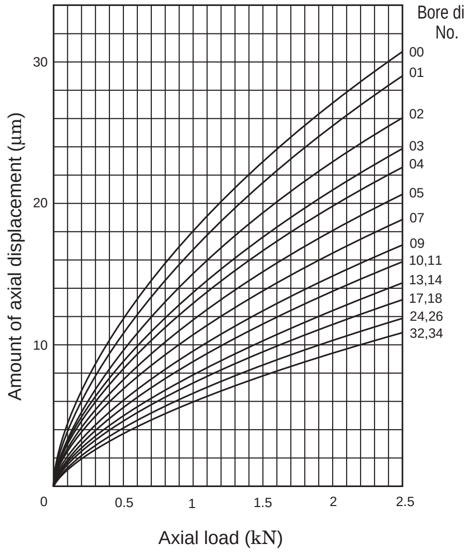
(2) 7000C (contact angle 15°)



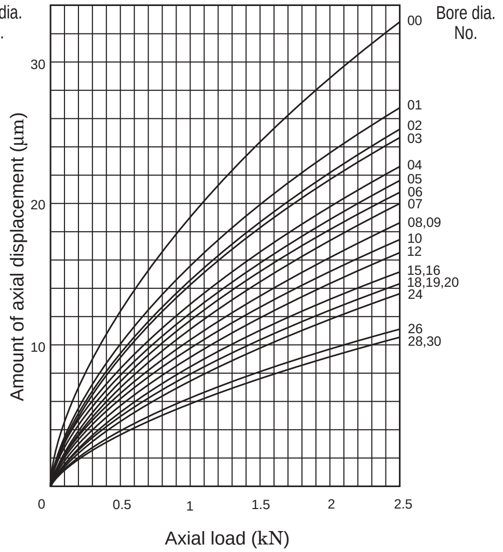
(3) 7200C (contact angle 15°)



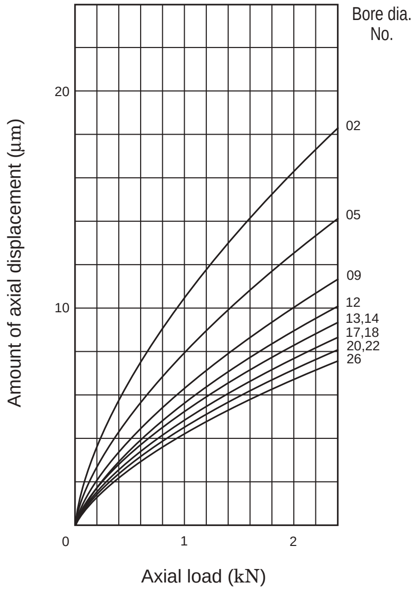
(4) 7000 (contact angle 30°)



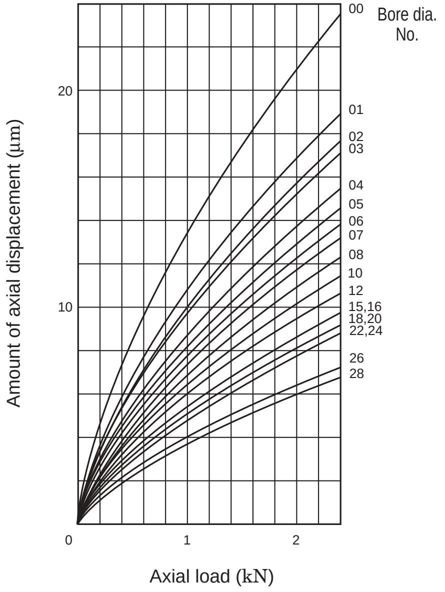
(5) 7200 (contact angle 30°)



(6) 7000B (contact angle 40°)

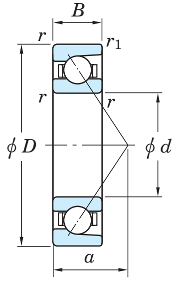


(7) 7200B (contact angle 40°)

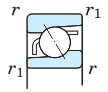


Single-row angular contact ball bearings

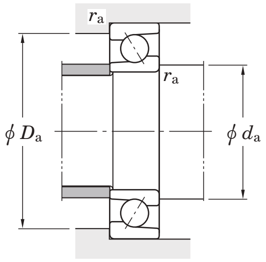
d 10 ~ (17) mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds [1] (min^{-1})		Bearing No. [2]	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
					With machined cage		With pressed cage												
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cage)	(With pressed cage)	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
10	22	6	0.3	0.15	3.75	1.50	—	—	0.060	—	14.2	52 000	69 000	**7900C**	5.1	12.5	19.5	0.3	0.008
	26	8	0.3	0.15	6.25	2.35	—	—	0.120	—	—	34 000	42 000	**7000**	9.1	12.5	23.5	0.3	0.021
	26	8	0.3	0.15	5.80	2.15	—	—	0.110	—	—	25 000	33 000	**7000B**	11.6	12.5	23.5	0.3	0.021
	26	8	0.3	0.15	6.60	2.45	—	—	0.130	—	12.5	47 000	62 000	**7000C**	6.4	12.5	23.5	0.3	0.021
	30	9	0.6	0.3	5.85	2.20	6.75	2.75	0.110	0.140	—	29 000	37 000	**7200**	10.4	14.5	25.5	0.6	0.031
	30	9	0.6	0.3	5.35	2.00	6.20	2.50	0.100	0.130	—	22 000	29 000	**7200B**	13.1	14.5	25.5	0.6	0.031
	30	9	0.6	0.3	6.25	2.35	7.25	2.95	0.120	0.150	13.4	40 000	54 000	**7200C**	7.2	14.5	25.5	0.6	0.031
	35	11	0.6	0.3	10.6	3.75	11.6	4.30	0.300	0.340	—	27 000	33 000	**7300**	12.0	14.5	30.5	0.6	0.054
12	24	6	0.3	0.15	4.00	1.70	—	—	0.070	—	14.7	48 000	62 000	**7901C**	5.4	14.5	21.5	0.3	0.010
	28	8	0.3	0.15	6.75	2.75	—	—	0.140	—	—	29 000	37 000	**7001**	9.9	14.5	25.5	0.3	0.024
	28	8	0.3	0.15	6.20	2.50	—	—	0.130	—	—	22 000	29 000	**7001B**	12.6	14.5	25.5	0.3	0.024
	28	8	0.3	0.15	7.25	2.95	—	—	0.150	—	13.4	40 000	54 000	**7001C**	6.7	14.5	25.5	0.3	0.024
	32	10	0.6	0.3	9.30	3.65	10.0	4.05	0.280	0.310	—	27 000	34 000	**7201**	11.4	16.5	27.5	0.6	0.038
	32	10	0.6	0.3	8.65	3.40	9.30	3.75	0.240	0.270	—	20 000	27 000	**7201B**	14.2	16.5	27.5	0.6	0.038
	32	10	0.6	0.3	9.90	3.85	10.6	4.30	0.300	0.330	12.5	38 000	50 000	**7201C**	7.9	16.5	27.5	0.6	0.038
	37	12	1	0.6	12.8	4.60	14.0	5.25	0.360	0.410	—	24 000	31 000	**7301**	13.1	17.5	31.5	1	0.065
15	28	7	0.3	0.15	5.95	2.65	—	—	0.110	—	14.5	39 000	52 000	**7902C**	6.4	17.5	25.5	0.3	0.015
	32	9	0.3	0.15	7.65	3.45	—	—	0.180	—	—	26 000	32 000	**7002**	11.3	17.5	29.5	0.3	0.035
	32	9	0.3	0.15	6.95	3.15	—	—	0.160	—	—	19 000	25 000	**7002B**	14.6	17.5	29.5	0.3	0.035
	32	9	0.3	0.15	8.25	3.70	—	—	0.190	—	14.1	35 000	47 000	**7002C**	7.6	17.5	29.5	0.3	0.035
	35	11	0.6	0.3	10.1	4.25	10.1	4.25	0.300	0.300	—	24 000	29 000	**7202**	12.9	19.5	30.5	0.6	0.048
	35	11	0.6	0.3	9.30	3.95	9.30	3.95	0.260	0.260	—	18 000	24 000	**7202B**	16.2	19.5	30.5	0.6	0.048
	35	11	0.6	0.3	10.8	4.55	10.8	4.55	0.340	0.340	13.3	33 000	43 000	**7202C**	8.9	19.5	30.5	0.6	0.048
	42	13	1	0.6	15.7	6.45	16.8	7.20	0.490	0.550	—	20 000	25 000	**7302**	15.0	20.5	36.5	1	0.088
17	30	7	0.3	0.15	6.25	2.95	—	—	0.120	—	14.9	36 000	47 000	**7903C**	6.7	19.5	27.5	0.3	0.016
	35	10	0.3	0.15	8.40	4.15	—	—	0.210	—	—	23 000	28 000	**7003**	12.7	19.5	32.5	0.3	0.045

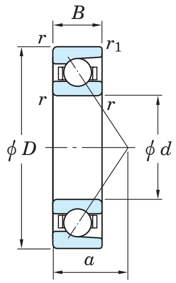
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

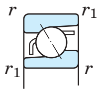
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

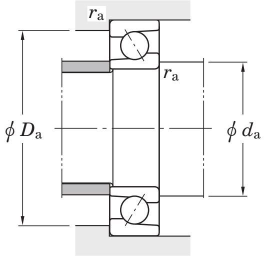
d (17) ~ (25) mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
					With machined cage		With pressed cage												
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cage)	(With pressed cage)	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
17	35	10	0.3	0.15	7.60	3.75	—	—	0.190	—	—	17 000	23 000	**7003B**	16.1	19.5	32.5	0.3	0.045
	35	10	0.3	0.15	9.15	4.45	—	—	0.230	—	14.6	31 000	41 000	**7003C**	8.6	19.5	32.5	0.3	0.045
	40	12	0.6	0.3	12.7	5.50	12.7	5.50	0.380	0.380	—	21 000	26 000	**7203**	14.4	21.5	35.5	0.6	0.070
	40	12	0.6	0.3	11.7	5.05	11.7	5.05	0.330	0.330	—	16 000	21 000	**7203B**	18.2	21.5	35.5	0.6	0.070
	40	12	0.6	0.3	13.6	5.90	13.6	5.90	0.440	0.440	13.4	29 000	38 000	**7203C**	9.9	21.5	35.5	0.6	0.070
	47	14	1	0.6	18.7	7.90	20.0	8.75	0.590	0.660	—	18 000	23 000	**7303**	16.5	22.5	41.5	1	0.120
	47	14	1	0.6	17.3	7.30	18.5	8.10	0.510	0.570	—	14 000	18 000	**7303B**	20.8	22.5	41.5	1	0.120
	47	14	1	0.6	19.8	8.40	19.8	8.40	0.650	0.650	12.6	25 000	33 000	**7303C**	11.4	22.5	41.5	1	0.120
20	37	9	0.3	0.15	9.10	4.55	—	—	0.240	—	14.9	30 000	39 000	**7904C**	8.3	22.5	34.5	0.3	0.035
	42	12	0.6	0.3	12.9	6.10	—	—	0.390	—	—	19 000	24 000	**7004**	15.1	24.5	37.5	0.6	0.079
	42	12	0.6	0.3	11.7	5.55	—	—	0.340	—	—	14 000	19 000	**7004B**	19.2	24.5	37.5	0.6	0.079
	42	12	0.6	0.3	13.9	6.60	—	—	0.450	—	14.1	26 000	35 000	**7004C**	10.2	24.5	37.5	0.6	0.079
	47	14	1	0.6	18.1	8.40	19.2	9.15	0.580	0.640	—	17 000	22 000	**7204**	17.0	25.5	41.5	1	0.112
	47	14	1	0.6	16.6	7.70	17.6	8.40	0.500	0.550	—	13 000	17 000	**7204B**	21.5	25.5	41.5	1	0.112
	47	14	1	0.6	19.4	9.00	20.6	9.80	0.670	0.730	13.4	24 000	32 000	**7204C**	11.6	25.5	41.5	1	0.112
	52	15	1.1	0.6	21.8	9.40	23.4	10.4	0.710	0.790	—	17 000	21 000	**7304**	17.9	27	45	1	0.150
	52	15	1.1	0.6	20.2	8.70	21.7	9.65	0.610	0.680	—	13 000	17 000	**7304B**	22.6	27	45	1	0.150
	52	15	1.1	0.6	23.1	9.95	24.8	11.1	0.780	0.860	12.6	23 000	31 000	**7304C**	12.3	27	45	1	0.150
	72	19	1.1	0.6	44.5	19.1	—	—	1.50	—	—	9 600	13 000	**7404**	23.1	27	65	1	0.395
	72	19	1.1	0.6	41.9	17.9	—	—	1.40	—	—	8 500	12 000	**7404B**	29.2	27	65	1	0.395
25	42	9	0.3	0.15	10.2	5.45	—	—	0.300	—	15.5	25 000	33 000	**7905C**	9.1	27.5	39.5	0.3	0.041
	47	12	0.6	0.3	14.1	7.40	—	—	0.450	—	—	17 000	21 000	**7005**	16.4	29.5	42.5	0.6	0.091
	47	12	0.6	0.3	12.8	6.70	—	—	0.390	—	—	12 000	17 000	**7005B**	21.1	29.5	42.5	0.6	0.091
	47	12	0.6	0.3	15.4	8.00	—	—	0.510	—	14.7	23 000	30 000	**7005C**	10.8	29.5	42.5	0.6	0.091
	52	15	1	0.6	19.2	9.50	20.2	10.3	0.620	0.670	—	15 000	19 000	**7205**	18.8	30.5	46.5	1	0.135
	52	15	1	0.6	17.5	8.70	18.4	9.40	0.530	0.580	—	12 000	15 000	**7205B**	23.9	30.5	46.5	1	0.135

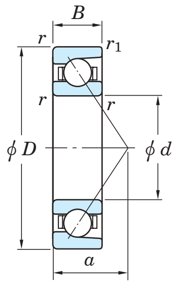
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

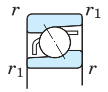
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

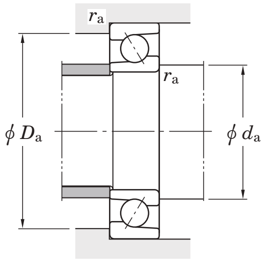
d (25) ~ (35) mm



With machined cage



With pressed cage



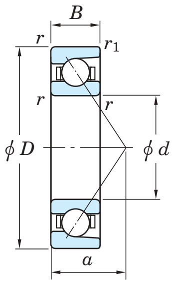
Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		With pressed cage		Fatigue load limits (kN) C_u		Factor	Limiting speeds[1] (min^{-1})		Bearing No.[2]	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cage)	(With pressed cage)	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
25	52	15	1	0.6	20.7	10.2	21.9	11.1	0.710	0.770	14.0	21 000	28 000	**7205C**	12.7	30.5	46.5	1	0.135
	62	17	1.1	0.6	31.0	14.4	33.0	15.8	1.05	1.15	—	14 000	17 000	**7305**	21.1	32	55	1	0.243
	62	17	1.1	0.6	28.6	13.3	30.5	14.6	0.910	1.00	—	10 000	14 000	**7305B**	26.8	32	55	1	0.243
	62	17	1.1	0.6	33.0	15.3	35.1	16.8	1.20	1.30	12.8	19 000	25 000	**7305C**	14.3	32	55	1	0.243
	80	21	1.5	1	49.7	23.2	53.3	25.7	1.80	2.00	—	8 200	11 000	**7405**	26.4	33.5	71.5	1.5	0.527
	80	21	1.5	1	46.1	21.5	49.5	23.9	1.55	1.70	—	7 300	10 000	**7405B**	33.6	33.5	71.5	1.5	0.527
30	47	9	0.3	0.15	10.4	6.25	—	—	0.320	—	15.9	22 000	29 000	**7906C**	9.7	32.5	44.5	0.3	0.046
	55	13	1	0.6	18.2	10.1	—	—	0.610	—	—	14 000	18 000	**7006**	18.8	35.5	49.5	1	0.133
	55	13	1	0.6	16.4	9.20	—	—	0.530	—	—	11 000	14 000	**7006B**	24.3	35.5	49.5	1	0.133
	55	13	1	0.6	19.8	11.0	—	—	0.690	—	14.9	20 000	26 000	**7006C**	12.2	35.5	49.5	1	0.133
	62	16	1	0.6	26.7	13.7	28.1	14.8	0.890	0.970	—	13 000	16 000	**7206**	21.5	35.5	56.5	1	0.208
	62	16	1	0.6	24.3	12.5	25.6	13.6	0.770	0.840	—	9 600	13 000	**7206B**	27.6	35.5	56.5	1	0.208
	62	16	1	0.6	28.8	14.7	30.4	16.0	1.00	1.10	14.0	18 000	24 000	**7206C**	14.3	35.5	56.5	1	0.208
	72	19	1.1	0.6	37.6	18.9	39.9	20.6	1.30	1.45	—	12 000	14 000	**7306**	24.5	37	65	1	0.362
	72	19	1.1	0.6	34.5	17.4	36.6	19.0	1.15	1.25	—	8 700	12 000	**7306B**	31.3	37	65	1	0.362
	72	19	1.1	0.6	40.4	20.3	42.8	22.1	1.50	1.65	13.4	16 000	21 000	**7306C**	16.5	37	65	1	0.362
	90	23	1.5	1	59.5	28.4	63.9	31.6	2.20	2.45	—	7 300	9 700	**7406**	29.3	38.5	81.5	1.5	0.686
	90	23	1.5	1	55.2	26.4	59.3	29.3	1.90	2.10	—	6 500	8 900	**7406B**	37.3	38.5	81.5	1.5	0.686
35	55	10	0.6	0.3	15.7	9.70	—	—	0.550	—	15.7	19 000	25 000	**7907C**	11.0	39.5	50.5	0.6	0.074
	62	14	1	0.6	21.9	12.6	—	—	0.740	—	—	12 000	15 000	**7007**	21.2	40.5	56.5	1	0.170
	62	14	1	0.6	19.7	11.4	—	—	0.640	—	—	9 200	12 000	**7007B**	27.6	40.5	56.5	1	0.170
	62	14	1	0.6	23.9	13.7	—	—	0.840	—	15.0	17 000	22 000	**7007C**	13.5	40.5	56.5	1	0.170
	72	17	1.1	0.6	35.2	18.6	37.1	20.2	1.20	1.30	—	11 000	14 000	**7207**	24.2	42	65	1	0.295
	72	17	1.1	0.6	32.0	17.0	33.8	18.5	1.05	1.15	—	8 300	11 000	**7207B**	31.4	42	65	1	0.295
	72	17	1.1	0.6	38.0	20.1	40.1	21.7	1.40	1.50	14.0	15 000	20 000	**7207C**	15.8	42	65	1	0.295
	80	21	1.5	1	44.2	22.0	49.9	26.4	1.55	1.85	—	10 000	13 000	**7307**	27.4	43.5	71.5	1.5	0.475
	80	21	1.5	1	40.6	20.2	45.8	24.3	1.30	1.60	—	7 700	10 000	**7307B**	35.0	43.5	71.5	1.5	0.475

[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

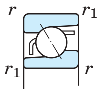
2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

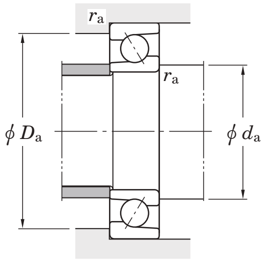
d (35) ~ 45 mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		Basic load ratings (kN) With pressed cage		Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	With machined cage	With pressed cage	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
35	80	21	1.5	1	47.4	23.6	53.5	28.3	1.75	2.10	13.4	14 000	19 000	**7307C**	18.3	43.5	71.5	1.5	0.475
	100	25	1.5	1	75.6	37.0	81.1	41.1	2.85	3.20	—	6 500	8 600	**7407**	32.6	43.5	91.5	1.5	0.950
	100	25	1.5	1	70.2	34.3	75.3	38.1	2.45	2.75	—	5 700	7 900	**7407B**	41.7	43.5	91.5	1.5	0.950
40	62	12	0.6	0.3	19.7	12.4	—	—	0.710	—	15.7	17 000	22 000	**7908C**	12.8	44.5	57.5	0.6	0.107
	68	15	1	0.6	23.4	14.6	—	—	0.830	—	—	11 000	14 000	**7008**	23.2	45.5	62.5	1	0.210
	68	15	1	0.6	21.1	13.2	—	—	0.720	—	—	8 300	11 000	**7008B**	30.2	45.5	62.5	1	0.210
	68	15	1	0.6	25.7	15.9	—	—	0.940	—	15.4	15 000	20 000	**7008C**	14.8	45.5	62.5	1	0.210
	80	18	1.1	0.6	42.0	23.3	44.1	25.1	1.50	1.60	—	10 000	12 000	**7208**	26.3	47	73	1	0.382
	80	18	1.1	0.6	38.2	21.3	40.2	23.0	1.30	1.40	—	7 500	10 000	**7208B**	34.2	47	73	1	0.382
	80	18	1.1	0.6	45.4	25.2	47.7	27.1	1.70	1.85	14.2	14 000	18 000	**7208C**	17.0	47	73	1	0.382
	90	23	1.5	1	54.0	27.4	61.0	32.9	1.90	2.30	—	9 200	12 000	**7308**	30.3	48.5	81.5	1.5	0.657
	90	23	1.5	1	49.6	25.2	56.0	30.3	1.65	2.00	—	6 900	9 200	**7308B**	38.8	48.5	81.5	1.5	0.657
	90	23	1.5	1	57.9	29.4	65.4	35.3	2.20	2.65	13.4	13 000	17 000	**7308C**	20.2	48.5	81.5	1.5	0.657
	110	27	2	1	87.4	43.5	93.8	48.4	3.35	3.70	—	5 900	7 900	**7408**	35.5	50	100	2	1.23
	110	27	2	1	81.1	40.4	87.0	44.9	2.90	3.20	—	5 200	7 200	**7408B**	45.4	50	100	2	1.23
45	68	12	0.6	0.3	20.8	14.1	—	—	0.770	—	16.0	15 000	20 000	**7909C**	13.6	49.5	63.5	0.6	0.127
	75	16	1	0.6	27.8	17.7	—	—	1.00	—	—	10 000	12 000	**7009**	25.3	50.5	69.5	1	0.260
	75	16	1	0.6	25.0	16.0	—	—	0.870	—	—	7 500	10 000	**7009B**	33.2	50.5	69.5	1	0.260
	75	16	1	0.6	30.5	19.3	—	—	1.15	—	15.4	14 000	18 000	**7009C**	16.0	50.5	69.5	1	0.260
	85	19	1.1	0.6	47.2	26.6	49.6	28.6	1.70	1.85	—	9 400	12 000	**7209**	28.0	52	78	1	0.430
	85	19	1.1	0.6	42.9	24.3	45.1	26.1	1.50	1.60	—	7 000	9 400	**7209B**	36.4	52	78	1	0.430
	85	19	1.1	0.6	51.0	28.7	53.6	30.9	1.95	2.10	14.2	13 000	17 000	**7209C**	18.1	52	78	1	0.430
	100	25	1.5	1	68.9	37.1	73.1	40.4	2.55	2.80	—	8 200	10 000	**7309**	33.6	53.5	91.5	1.5	0.875
	100	25	1.5	1	63.2	34.1	67.0	37.2	2.20	2.40	—	6 200	8 200	**7309B**	43.1	53.5	91.5	1.5	0.875
	100	25	1.5	1	74.0	39.7	78.4	43.4	2.95	3.20	13.5	11 000	15 000	**7309C**	22.3	53.5	91.5	1.5	0.875
	120	29	2	1	106	53.8	114	59.8	4.20	4.65	—	5 400	7 100	**7409**	38.6	55	110	2	1.55
	120	29	2	1	98.7	50.0	106	55.5	3.60	4.00	—	4 800	6 600	**7409B**	49.5	55	110	2	1.55

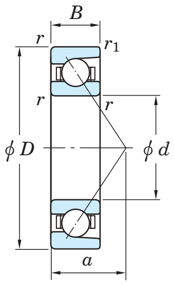
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings. Limiting speeds of pressed cage bearings should be kept to under 80% of this value. For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

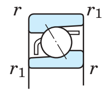
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

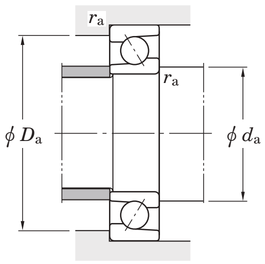
d 50 ~ (60) mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		Basic load ratings (kN) With pressed cage		Fatigue load limits (kN) C_u		Factor	Limiting speeds [1] ($\min^{-1}$)		Bearing No. [2]	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cage)	(With pressed cage)	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
50	72	12	0.6	0.3	21.8	15.7	—	—	0.840	—	16.2	14 000	18 000	**7910C**	14.2	54.5	67.5	0.6	0.128
	80	16	1	0.6	29.5	20.1	—	—	1.10	—	—	9 200	11 000	**7010**	26.9	55.5	74.5	1	0.290
	80	16	1	0.6	26.5	18.1	—	—	0.960	—	—	6 900	9 200	**7010B**	35.3	55.5	74.5	1	0.290
	80	16	1	0.6	32.5	21.9	—	—	1.25	—	15.7	13 000	17 000	**7010C**	16.8	55.5	74.5	1	0.290
	90	20	1.1	0.6	49.2	29.4	51.6	31.5	1.80	1.95	—	8 500	11 000	**7210**	30.4	57	83	1	0.485
	90	20	1.1	0.6	44.6	26.7	46.7	28.6	1.55	1.70	—	6 400	8 500	**7210B**	39.6	57	83	1	0.485
	90	20	1.1	0.6	53.5	31.8	56.0	34.1	2.05	2.20	14.6	12 000	16 000	**7210C**	19.4	57	83	1	0.485
	110	27	2	1	87.6	48.1	92.9	52.5	3.35	3.65	—	7 300	9 100	**7310**	37.2	60	100	2	1.14
	110	27	2	1	80.5	44.3	85.3	48.3	2.90	3.15	—	5 500	7 300	**7310B**	47.9	60	100	2	1.14
	110	27	2	1	93.9	51.6	99.5	56.2	3.85	4.20	13.4	10 000	13 000	**7310C**	24.5	60	100	2	1.14
	130	31	2.1	1.1	122	65.3	—	—	4.90	—	—	4 900	6 600	**7410**	41.6	62	118	2	1.92
	130	31	2.1	1.1	113	60.4	—	—	4.20	—	—	4 400	6 000	**7410B**	53.5	62	118	2	1.92
55	80	13	1	0.6	24.6	18.5	—	—	0.980	—	16.3	13 000	17 000	**7911C**	15.5	60.5	74.5	1	0.178
	90	18	1.1	0.6	38.9	26.3	—	—	1.50	—	—	8 300	10 000	**7011**	29.9	62	83	1	0.420
	90	18	1.1	0.6	34.9	23.7	—	—	1.30	—	—	6 200	8 300	**7011B**	39.4	62	83	1	0.420
	90	18	1.1	0.6	42.6	28.6	—	—	1.65	—	15.5	11 000	15 000	**7011C**	18.7	62	83	1	0.420
	100	21	1.5	1	60.9	37.1	63.7	39.8	2.30	2.45	—	7 600	9 500	**7211**	33.3	63.5	91.5	1.5	0.635
	100	21	1.5	1	55.1	33.8	57.7	36.2	2.00	2.15	—	5 700	7 600	**7211B**	43.6	63.5	91.5	1.5	0.635
	100	21	1.5	1	66.1	40.2	69.2	43.1	2.60	2.80	14.6	11 000	14 000	**7211C**	21.1	63.5	91.5	1.5	0.635
	120	29	2	1	101	56.5	107	61.7	3.95	4.30	—	6 700	8 400	**7311**	40.2	65	110	2	1.45
	120	29	2	1	92.9	52.0	98.4	56.7	3.40	3.70	—	5 000	6 700	**7311B**	51.8	65	110	2	1.45
	120	29	2	1	108	60.6	115	66.1	4.50	4.90	13.4	9 300	12 000	**7311C**	26.4	65	110	2	1.45
	140	33	2.1	1.1	148	82.4	—	—	6.40	—	—	4 500	6 000	**7411**	45.0	67	128	2	2.36
	140	33	2.1	1.1	138	76.5	—	—	5.50	—	—	4 000	5 500	**7411B**	57.8	67	128	2	2.36
60	85	13	1	0.6	29.0	21.8	—	—	1.15	—	16.3	12 000	16 000	**7912C**	16.3	65.5	79.5	1	0.187
	95	18	1.1	0.6	39.9	28.1	—	—	1.55	—	—	7 700	9 700	**7012**	31.4	67	88	1	0.450
	95	18	1.1	0.6	35.7	25.3	—	—	1.35	—	—	5 800	7 700	**7012B**	41.5	67	88	1	0.450

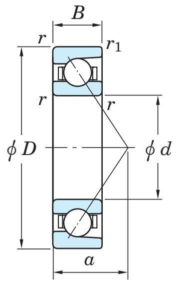
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

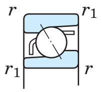
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

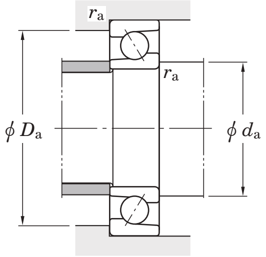
d (60) ~ (70) mm



With machined cage



With pressed cage



Boundary dimensions (mm) d	D	B	r min.	r_1 min.	Basic load ratings (kN) With machined cage C_r	With machined cage C_{0r}	With pressed cage C_r	With pressed cage C_{0r}	Fatigue load limits (kN) C_u (With machined cage)	C_u (With pressed cage)	Factor f_0	Limiting speeds [1)] (min^{-1}) Grease lub.	Oil lub.	Bearing No. [2)]	Load center (mm) a	Mounting dimensions (mm) d_a min.	D_a max.	r_a max.	(Refer.) Mass (kg)
60	95	18	1.1	0.6	43.8	30.6	—	—	1.75	—	15.7	11 000	14 000	**7012C**	19.4	67	88	1	0.450
	110	22	1.5	1	73.7	45.7	77.1	49.0	2.85	3.05	—	6 900	8 600	**7212**	36.1	68.5	101.5	1.5	0.820
	110	22	1.5	1	66.8	41.6	69.9	44.6	2.45	2.60	—	5 100	6 900	**7212B**	47.5	68.5	101.5	1.5	0.820
	110	22	1.5	1	80.0	49.5	83.8	53.0	3.20	3.45	14.5	9 500	13 000	**7212C**	22.7	68.5	101.5	1.5	0.820
	130	31	2.1	1.1	116	65.6	123	71.6	4.55	5.00	—	6 200	7 700	**7312**	43.2	72	118	2	1.81
	130	31	2.1	1.1	106	60.3	113	65.8	3.95	4.30	—	4 600	6 200	**7312B**	55.8	72	118	2	1.81
	130	31	2.1	1.1	124	70.3	131	76.7	5.25	5.70	13.4	8 600	11 000	**7312C**	28.4	72	118	2	1.81
	150	35	2.1	1.1	161	93.6	—	—	6.85	—	—	4 100	5 500	**7412**	48.5	72	138	2	2.85
	150	35	2.1	1.1	149	86.7	—	—	5.90	—	—	3 700	5 100	**7412B**	62.6	72	138	2	2.85
65	90	13	1	0.6	25.9	21.2	—	—	1.10	—	16.5	11 000	15 000	**7913C**	16.9	70.5	84.5	1	0.205
	100	18	1.1	0.6	42.1	31.4	—	—	1.70	—	—	7 200	9 000	**7013**	33.0	72	93	1	0.470
	100	18	1.1	0.6	37.7	28.3	—	—	1.45	—	—	5 400	7 200	**7013B**	43.8	72	93	1	0.470
	100	18	1.1	0.6	46.3	34.3	—	—	1.90	—	15.9	10 000	13 000	**7013C**	20.1	72	93	1	0.470
	120	23	1.5	1	84.1	54.2	87.8	57.8	3.35	3.55	—	6 400	8 000	**7213**	38.2	73.5	111.5	1.5	1.02
	120	23	1.5	1	76.2	49.3	79.5	52.6	2.90	3.10	—	4 800	6 400	**7213B**	50.3	73.5	111.5	1.5	1.02
	120	23	1.5	1	91.4	58.7	95.4	62.6	3.80	4.05	14.6	8 900	12 000	**7213C**	23.9	73.5	111.5	1.5	1.02
	140	33	2.1	1.1	131	75.3	139	82.2	5.15	5.65	—	5 800	7 200	**7313**	46.3	77	128	2	2.22
	140	33	2.1	1.1	120	69.3	127	75.6	4.45	4.85	—	4 300	5 800	**7313B**	59.7	77	128	2	2.22
	140	33	2.1	1.1	140	80.7	149	88.1	5.90	6.45	13.4	8 000	11 000	**7313C**	30.3	77	128	2	2.22
	160	37	2.1	1.1	174	104	—	—	7.40	—	—	3 900	5 200	**7413**	51.4	77	148	2	3.41
	160	37	2.1	1.1	161	96.8	—	—	6.35	—	—	3 500	4 800	**7413B**	66.3	77	148	2	3.41
70	100	16	1	0.6	36.2	29.0	—	—	1.55	—	16.4	10 000	12 000	**7914C**	19.4	75.5	94.5	1	0.332
	110	20	1.1	0.6	53.3	39.4	—	—	2.15	—	—	6 600	8 300	**7014**	36.0	77	103	1	0.660
	110	20	1.1	0.6	47.8	35.5	—	—	1.90	—	—	5 000	6 600	**7014B**	47.8	77	103	1	0.660
	110	20	1.1	0.6	58.6	43.0	—	—	2.45	—	15.7	9 200	12 000	**7014C**	22.1	77	103	1	0.660
	125	24	1.5	1	87.3	55.6	95.4	63.5	3.40	3.90	—	6 100	7 600	**7214**	40.2	78.5	116.5	1.5	1.12
	125	24	1.5	1	79.0	50.6	86.4	57.8	2.95	3.40	—	4 600	6 100	**7214B**	52.9	78.5	116.5	1.5	1.12

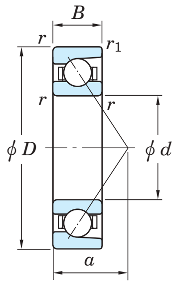
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

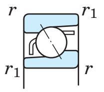
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

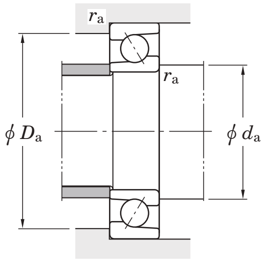
d (70) ~ (80) mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
					With machined cage		With pressed cage												
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	With machined cage	With pressed cage	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
70	125	24	1.5	1	94.9	60.2	104	68.8	3.90	4.45	14.6	8 400	11 000	**7214C**	25.1	78.5	116.5	1.5	1.12
	150	35	2.1	1.1	147	85.8	156	93.6	5.70	6.20	—	5 400	6 700	**7314**	49.3	82	138	2	2.70
	150	35	2.1	1.1	135	78.9	143	86.0	4.90	5.35	—	4 000	5 400	**7314B**	63.7	82	138	2	2.70
	150	35	2.1	1.1	158	91.9	167	100	6.50	7.10	13.4	7 500	9 900	**7314C**	32.2	82	138	2	2.70
	180	42	3	1.1	187	115	—	—	5.30	—	—	3 500	4 600	**7414**	57.6	84	166	2.5	4.99
	180	42	3	1.1	185	119	—	—	5.45	—	—	3 100	4 300	**7414B**	74.2	84	166	2.5	4.99
75	105	16	1	0.6	36.7	30.5	—	—	1.60	—	16.5	9 300	12 000	**7915C**	20.1	80.5	99.5	1	0.350
	115	20	1.1	0.6	54.6	41.7	—	—	2.25	—	—	6 300	7 800	**7015**	37.4	82	108	1	0.690
	115	20	1.1	0.6	48.8	37.6	—	—	1.95	—	—	4 700	6 300	**7015B**	49.9	82	108	1	0.690
	115	20	1.1	0.6	60.1	45.6	—	—	2.55	—	15.9	8 700	11 000	**7015C**	22.7	82	108	1	0.690
	130	25	1.5	1	99.0	65.2	103	69.5	3.95	4.20	—	5 800	7 200	**7215**	42.1	83.5	121.5	1.5	1.23
	130	25	1.5	1	89.6	59.3	93.6	63.3	3.40	3.65	—	4 300	5 800	**7215B**	55.5	83.5	121.5	1.5	1.23
	130	25	1.5	1	108	70.6	112	75.3	4.50	4.80	14.6	8 000	11 000	**7215C**	26.2	83.5	121.5	1.5	1.23
	160	37	2.1	1.1	160	97.0	170	106	6.20	6.75	—	5 000	6 300	**7315**	52.4	87	148	2	3.15
	160	37	2.1	1.1	147	89.2	156	97.3	5.35	5.85	—	3 800	5 000	**7315B**	67.8	87	148	2	3.15
	160	37	2.1	1.1	172	104	182	113	7.10	7.75	13.4	7 000	9 200	**7315C**	34.2	87	148	2	3.15
	190	45	3	1.1	214	141	—	—	6.30	—	—	3 300	4 400	**7415**	61.3	89	176	2.5	5.90
	190	45	3	1.1	198	131	—	—	5.80	—	—	2 900	4 000	**7415B**	78.9	89	176	2.5	5.90
80	110	16	1	0.6	37.3	31.6	—	—	1.65	—	16.5	8 800	11 000	**7916C**	20.7	85.5	104.5	1	0.368
	125	22	1.1	0.6	66.7	50.6	—	—	2.75	—	—	5 800	7 200	**7016**	40.6	87	118	1	0.930
	125	22	1.1	0.6	59.8	45.7	—	—	2.40	—	—	4 300	5 800	**7016B**	54.0	87	118	1	0.930
	125	22	1.1	0.6	73.3	55.3	—	—	3.10	—	15.7	8 000	11 000	**7016C**	24.7	87	118	1	0.930
	140	26	2	1	107	71.5	111	76.2	4.10	4.40	—	5 400	6 700	**7216**	44.8	90	130	2	1.50
	140	26	2	1	96.4	65.0	101	69.3	3.55	3.80	—	4 000	5 400	**7216B**	59.2	90	130	2	1.50
	140	26	2	1	116	77.5	121	82.7	4.70	5.00	14.7	7 500	9 900	**7216C**	27.7	90	130	2	1.50
	170	39	2.1	1.1	174	109	184	119	6.75	7.35	—	4 700	5 900	**7316**	55.6	92	158	2	3.85
	170	39	2.1	1.1	159	100	169	109	5.80	6.35	—	3 500	4 700	**7316B**	71.9	92	158	2	3.85

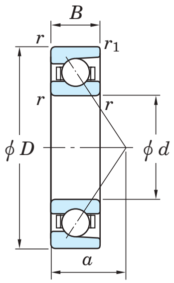
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

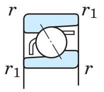
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

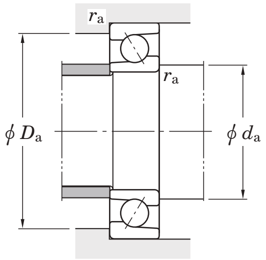
d (80) ~ 90 mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		Basic load ratings (kN) With pressed cage		Fatigue load limits (kN) C_u		Factor	Limiting speeds [1] (min^{-1})		Bearing No. [2]	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cage)	(With pressed cage)	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
80	170	39	2.1	1.1	186	117	197	127	7.70	8.40	13.5	6 500	8 600	**7316C**	36.2	92	158	2	3.85
	200	48	3	1.1	241	166	—	—	7.20	—	—	3 100	4 100	**7416**	65.0	94	186	2.5	6.00
	200	48	3	1.1	223	154	—	—	6.65	—	—	2 700	3 800	**7416B**	83.6	94	186	2.5	6.00
85	120	18	1.1	0.6	48.6	40.6	—	—	2.10	—	16.5	8 100	11 000	**7917C**	22.7	92	113	1	0.523
	130	22	1.1	0.6	68.2	53.7	—	—	2.75	—	—	5 500	6 800	**7017**	42.3	92	123	1	0.970
	130	22	1.1	0.6	61.0	48.4	—	—	2.40	—	—	4 100	5 500	**7017B**	56.5	92	123	1	0.970
	130	22	1.1	0.6	75.1	58.7	—	—	3.15	—	15.9	7 600	10 000	**7017C**	25.5	92	123	1	0.970
	150	28	2	1	123	83.6	129	89.2	4.70	5.00	—	5 000	6 300	**7217**	47.9	95	140	2	1.87
	150	28	2	1	111	76.0	116	81.1	4.05	4.35	—	3 800	5 000	**7217B**	63.3	95	140	2	1.87
	150	28	2	1	134	90.6	140	96.6	5.35	5.70	14.7	7 000	9 200	**7217C**	29.7	95	140	2	1.87
	180	41	3	1.1	187	122	198	133	7.30	7.95	—	4 400	5 500	**7317**	58.8	99	166	2.5	4.53
	180	41	3	1.1	172	112	182	122	6.30	6.85	—	3 300	4 400	**7317B**	76.1	99	166	2.5	4.53
	180	41	3	1.1	201	130	213	142	8.35	9.10	13.5	6 100	8 100	**7317C**	38.3	99	166	2.5	4.53
	210	52	4	1.5	255	180	—	—	7.65	—	—	3 000	3 900	**7417**	68.7	103	192	3	8.54
	210	52	4	1.5	236	167	—	—	7.10	—	—	2 600	3 600	**7417B**	88.1	103	192	3	8.54
90	125	18	1.1	0.6	49.5	42.6	—	—	2.15	—	16.6	7 800	10 000	**7918C**	23.4	97	118	1	0.551
	140	24	1.5	1	81.5	63.3	—	—	3.25	—	—	5 100	6 400	**7018**	45.2	98.5	131.5	1.5	1.26
	140	24	1.5	1	73.0	57.1	—	—	2.80	—	—	3 900	5 100	**7018B**	60.2	98.5	131.5	1.5	1.26
	140	24	1.5	1	89.6	69.1	—	—	3.65	—	15.7	7 100	9 400	**7018C**	27.4	98.5	131.5	1.5	1.26
	160	30	2	1	141	96.7	147	103	5.30	5.65	—	4 700	5 900	**7218**	51.1	100	150	2	2.30
	160	30	2	1	128	88.0	133	93.8	4.60	4.90	—	3 500	4 700	**7218B**	67.4	100	150	2	2.30
	160	30	2	1	153	105	160	112	6.00	6.40	14.6	6 500	8 600	**7218C**	31.7	100	150	2	2.30
	190	43	3	1.1	201	135	213	147	5.90	6.40	—	4 200	5 200	**7318**	61.9	104	176	2.5	5.30
	190	43	3	1.1	184	124	195	135	5.40	5.90	—	3 100	4 200	**7318B**	80.2	104	176	2.5	5.30
	190	43	3	1.1	216	145	229	158	6.30	6.90	13.5	5 800	7 700	**7318C**	40.3	104	176	2.5	5.30
	225	54	4	1.5	270	196	—	—	8.10	—	—	2 800	3 700	**7418**	72.5	108	207	3	11.4
	225	54	4	1.5	250	182	—	—	7.50	—	—	2 500	3 400	**7418B**	93.1	108	207	3	11.4

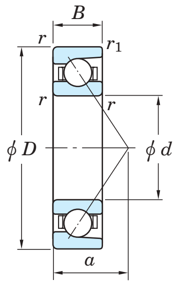
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

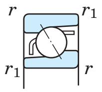
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

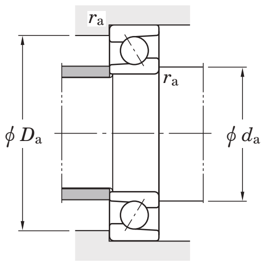
d 95 ~ (105) mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		With pressed cage		Fatigue load limits (kN) C_u		Factor	Limiting speeds [1] (min⁻¹)		Bearing No. [2]	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	With machined cage	With pressed cage	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
95	130	18	1.1	0.6	50.3	44.1	—	—	2.15	—	16.5	7 400	9 800	**7919C**	24.1	102	123	1	0.574
	145	24	1.5	1	83.3	67.1	—	—	3.25	—	—	4 800	6 000	**7019**	47.2	103.5	136.5	1.5	1.32
	145	24	1.5	1	74.5	60.5	—	—	2.85	—	—	3 600	4 800	**7019B**	63.2	103.5	136.5	1.5	1.32
	145	24	1.5	1	91.7	73.4	—	—	3.70	—	15.9	6 700	8 900	**7019C**	28.3	103.5	136.5	1.5	1.32
	170	32	2.1	1.1	153	103	160	111	5.50	5.90	—	4 400	5 500	**7219**	54.3	107	158	2	2.78
	170	32	2.1	1.1	138	94.0	145	101	4.80	5.10	—	3 300	4 400	**7219B**	71.6	107	158	2	2.78
	170	32	2.1	1.1	166	112	174	120	6.30	6.75	14.6	6 100	8 100	**7219C**	33.8	107	158	2	2.78
	200	45	3	1.1	215	149	228	162	6.35	6.90	—	4 000	4 900	**7319**	65.1	109	186	2.5	6.12
	200	45	3	1.1	197	137	209	149	5.80	6.35	—	3 000	4 000	**7319B**	84.4	109	186	2.5	6.12
	200	45	3	1.1	231	160	245	174	6.80	7.40	13.5	5 500	7 300	**7319C**	42.3	109	186	2.5	6.12
100	140	20	1.1	0.6	69.4	58.5	—	—	2.85	—	16.3	7 000	9 200	**7920C**	26.1	107	133	1	0.773
	150	24	1.5	1	85.5	70.6	—	—	3.35	—	—	4 700	5 900	**7020**	48.1	108.5	141.5	1.5	1.37
	150	24	1.5	1	76.5	63.6	—	—	2.95	—	—	3 500	4 700	**7020B**	64.4	108.5	141.5	1.5	1.37
	150	24	1.5	1	94.2	77.2	—	—	3.80	—	16.0	6 500	8 600	**7020C**	28.7	108.5	141.5	1.5	1.37
	180	34	2.1	1.1	171	117	180	126	6.10	6.50	—	4 100	5 200	**7220**	57.7	112	168	2	3.32
	180	34	2.1	1.1	155	107	163	115	5.25	5.65	—	3 100	4 200	**7220B**	76.2	112	168	2	3.32
	180	34	2.1	1.1	186	127	195	136	6.95	7.40	14.6	5 700	7 600	**7220C**	35.9	112	168	2	3.32
	215	47	3	1.1	229	161	259	194	6.60	7.95	—	3 600	4 600	**7320**	69.4	114	201	2.5	7.53
	215	47	3	1.1	210	148	238	178	6.10	7.30	—	2 700	3 600	**7320B**	90.2	114	201	2.5	7.53
	215	47	3	1.1	246	173	278	208	7.10	8.50	13.4	5 000	6 700	**7320C**	44.8	114	201	2.5	7.53
105	145	20	1.1	0.6	70.8	61.5	—	—	2.90	—	16.4	6 700	8 800	**7921C**	26.7	112	138	1	0.810
	160	26	2	1	99.7	81.9	—	—	3.80	—	—	4 400	5 500	**7021**	51.8	115	150	2	1.73
	160	26	2	1	89.2	73.8	—	—	3.30	—	—	3 300	4 400	**7021B**	68.6	115	150	2	1.73
	160	26	2	1	110	89.6	—	—	4.30	—	15.9	6 000	8 000	**7021C**	31.0	115	150	2	1.73
	190	36	2.1	1.1	187	132	—	—	6.70	—	—	3 900	4 900	**7221**	61.0	117	178	2	3.95
	190	36	2.1	1.1	169	121	—	—	5.80	—	—	2 900	3 900	**7221B**	80.5	117	178	2	3.95

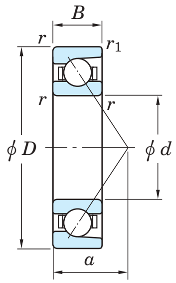
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

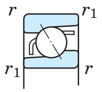
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

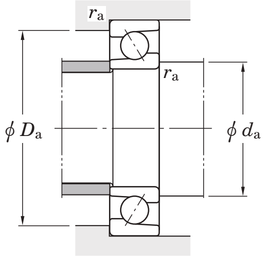
d (105) ~ (130) mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds[1] (min^{-1})		Bearing No.[2]	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
					With machined cage		With pressed cage												
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	With machined cage	With pressed cage	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
105	190	36	2.1	1.1	203	143	—	—	7.60	—	14.6	5 400	7 200	**7221C**	38.0	117	178	2	3.95
	225	49	3	1.1	260	193	—	—	7.75	—	—	3 500	4 400	**7321**	72.1	119	211	2.5	8.62
	225	49	3	1.1	238	177	—	—	7.15	—	—	2 600	3 500	**7321B**	93.7	119	211	2.5	8.62
	225	49	3	1.1	278	207	—	—	8.30	—	13.4	4 800	6 400	**7321C**	46.6	119	211	2.5	8.62
110	150	20	1.1	0.6	72.2	64.4	—	—	2.95	—	16.5	6 400	8 500	**7922C**	27.4	117	143	1	0.840
	170	28	2	1	115	92.8	—	—	4.30	—	—	4 200	5 200	**7022**	54.4	120	160	2	2.14
	170	28	2	1	103	83.7	—	—	3.75	—	—	3 100	4 200	**7022B**	72.7	120	160	2	2.14
	170	28	2	1	126	101	—	—	4.85	—	15.7	5 800	7 700	**7022C**	32.8	120	160	2	2.14
	200	38	2.1	1.1	202	148	—	—	7.30	—	—	3 700	4 600	**7222**	64.3	122	188	2	4.65
	200	38	2.1	1.1	183	135	—	—	6.35	—	—	2 800	3 700	**7222B**	84.9	122	188	2	4.65
	200	38	2.1	1.1	220	160	—	—	8.35	—	14.5	5 100	6 800	**7222C**	40.0	122	188	2	4.65
	240	50	3	1.1	290	226	—	—	8.75	—	—	3 200	4 000	**7322**	76.4	124	226	2.5	10.1
	240	50	3	1.1	266	208	—	—	8.05	—	—	2 400	3 200	**7322B**	99.6	124	226	2.5	10.1
	240	50	3	1.1	311	242	—	—	9.40	—	13.4	4 500	5 900	**7322C**	48.8	124	226	2.5	10.1
120	165	22	1.1	0.6	89.7	81.2	—	—	3.55	—	16.5	5 900	7 800	**7924C**	30.1	127	158	1	1.15
	180	28	2	1	121	103	—	—	4.50	—	—	3 900	4 900	**7024**	57.3	130	170	2	2.27
	180	28	2	1	108	93.0	—	—	3.95	—	—	2 900	3 900	**7024B**	76.9	130	170	2	2.27
	180	28	2	1	133	113	—	—	5.10	—	16.0	5 400	7 100	**7024C**	34.1	130	170	2	2.27
	215	40	2.1	1.1	218	166	—	—	7.85	—	—	3 400	4 300	**7224**	68.5	132	203	2	5.49
	215	40	2.1	1.1	197	151	—	—	6.80	—	—	2 600	3 400	**7224B**	90.3	132	203	2	5.49
	215	40	2.1	1.1	237	180	—	—	8.95	—	14.6	4 800	6 300	**7224C**	42.5	132	203	2	5.49
	260	55	3	1.1	308	252	—	—	9.45	—	—	3 000	3 700	**7324**	82.3	134	246	2.5	12.6
	260	55	3	1.1	282	231	—	—	8.65	—	—	2 200	3 000	**7324B**	107.2	134	246	2.5	12.6
	260	55	3	1.1	331	271	—	—	10.2	—	13.7	4 100	5 500	**7324C**	53.0	134	246	2.5	12.6
130	180	24	1.5	1	109	99.9	—	—	4.20	—	16.4	5 400	7 100	**7926C**	32.8	138.5	171.5	1.5	1.50
	200	33	2	1	147	125	—	—	5.25	—	—	3 500	4 400	**7026**	64.1	140	190	2	3.43

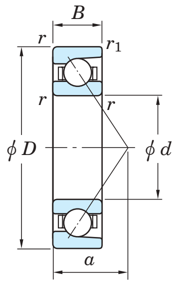
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

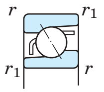
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

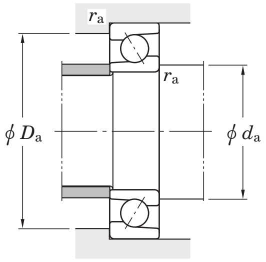
d (130) ~ (150) mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
					With machined cage		With pressed cage												
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	With machined cage	With pressed cage	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
130	200	33	2	1	131	113	—	—	4.60	—	—	2 600	3 500	**7026B**	85.7	140	190	2	3.43
	200	33	2	1	161	137	—	—	5.95	—	15.9	4 800	6 400	**7026C**	38.6	140	190	2	3.43
	230	40	3	1.1	245	198	—	—	7.60	—	—	3 200	4 000	**7226**	72.0	144	216	2.5	6.21
	230	40	3	1.1	222	180	—	—	6.95	—	—	2 400	3 200	**7226B**	95.5	144	216	2.5	6.21
	230	40	3	1.1	266	214	—	—	8.25	—	14.7	4 400	5 800	**7226C**	44.1	144	216	2.5	6.21
	280	58	4	1.5	376	329	—	—	11.8	—	—	2 700	3 400	**7326**	88.8	148	262	3	15.4
	280	58	4	1.5	312	268	—	—	9.70	—	—	2 100	2 700	**7326B**	115.0	148	262	3	15.4
	280	58	4	1.5	368	314	—	—	11.3	—	13.7	3 800	5 000	**7326C**	56.5	148	262	3	15.4
140	190	24	1.5	1	110	105	—	—	4.20	—	16.6	5 100	6 700	**7928C**	34.1	148.5	181.5	1.5	1.59
	210	33	2	1	150	133	—	—	5.30	—	—	3 300	4 100	**7028**	67.0	150	200	2	3.64
	210	33	2	1	134	119	—	—	4.65	—	—	2 500	3 300	**7028B**	89.9	150	200	2	3.64
	210	33	2	1	165	145	—	—	6.00	—	16.0	4 500	6 000	**7028C**	39.9	150	200	2	3.64
	250	42	3	1.1	273	234	—	—	8.65	—	—	2 900	3 600	**7228**	77.3	154	236	2.5	7.76
	250	42	3	1.1	247	213	—	—	7.85	—	—	2 200	2 900	**7228B**	102.8	154	236	2.5	7.76
	250	42	3	1.1	297	254	—	—	9.40	—	14.8	4 000	5 300	**7228C**	47.1	154	236	2.5	7.76
	300	62	4	1.5	411	374	—	—	13.0	—	—	2 500	3 200	**7328**	94.5	158	282	3	18.8
	300	62	4	1.5	378	344	—	—	12.0	—	—	1 900	2 500	**7328B**	123.3	158	282	3	18.8
	300	62	4	1.5	441	401	—	—	14.0	—	13.4	3 500	4 600	**7328C**	60.5	158	282	3	18.8
150	210	28	2	1	148	132	—	—	5.45	—	16.3	4 700	6 200	**7930C**	38.1	160	200	2	2.47
	225	35	2.1	1.1	171	154	—	—	5.95	—	—	3 000	3 800	**7030**	72.1	162	213	2	4.43
	225	35	2.1	1.1	153	138	—	—	5.20	—	—	2 300	3 000	**7030B**	96.2	162	213	2	4.43
	225	35	2.1	1.1	188	169	—	—	6.70	—	16.1	4 200	5 500	**7030C**	42.8	162	213	2	4.43
	270	45	3	1.1	310	280	—	—	9.95	—	—	2 700	3 300	**7230**	83.1	164	256	2.5	9.75
	270	45	3	1.1	281	254	—	—	9.05	—	—	2 000	2 700	**7230B**	110.6	164	256	2.5	9.75
	270	45	3	1.1	338	303	—	—	10.8	—	14.7	3 700	4 900	**7230C**	50.6	164	256	2.5	9.75
	320	65	4	1.5	434	414	—	—	14.0	—	—	2 300	2 900	**7330**	100.3	168	302	3	22.4
	320	65	4	1.5	397	380	—	—	12.8	—	—	1 800	2 300	**7330B**	131.1	168	302	3	22.4

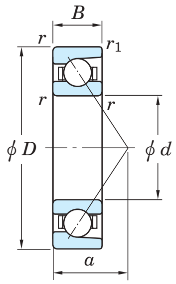
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

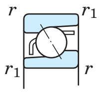
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

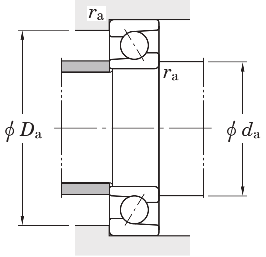
d (150) ~ (180) mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds [1] (min^{-1})		Bearing No. [2]	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
					With machined cage		With pressed cage												
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cage)	(With pressed cage)	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
150	320	65	4	1.5	468	445	—	—	15.0	—	13.7	3 200	4 300	**7330C**	64.0	168	302	3	22.4
160	220	28	2	1	151	144	—	—	5.45	—	16.5	4 400	5 800	**7932C**	39.5	170	210	2	2.60
	240	38	2.1	1.1	194	176	—	—	6.65	—	—	2 800	3 500	**7032**	76.8	172	228	2	5.45
	240	38	2.1	1.1	173	158	—	—	5.80	—	—	2 100	2 800	**7032B**	102.9	172	228	2	5.45
	240	38	2.1	1.1	214	193	—	—	7.50	—	16.0	3 900	5 200	**7032C**	45.8	172	228	2	5.45
	290	48	3	1.1	288	263	—	—	9.05	—	—	2 500	3 100	**7232**	89.0	174	276	2.5	12.1
	290	48	3	1.1	297	279	—	—	9.60	—	—	1 800	2 500	**7232B**	118.4	174	276	2.5	12.1
	290	48	3	1.1	315	333	—	—	9.85	—	15.2	3 400	4 500	**7232C**	54.1	174	276	2.5	12.1
	340	68	4	1.5	456	455	—	—	14.9	—	—	2 200	2 700	**7332**	106.2	178	322	3	26.4
	340	68	4	1.5	415	416	—	—	13.6	—	—	1 600	2 200	**7332B**	138.9	178	322	3	26.4
	340	68	4	1.5	492	490	—	—	16.0	—	14.0	3 000	4 000	**7332C**	67.5	168.5	322	3	26.4
170	230	28	2	1	157	151	—	—	5.75	—	16.6	3 900	5 100	**7934C**	40.8	180	220	2	3.21
	260	42	2.1	1.1	232	214	—	—	7.90	—	—	2 600	3 200	**7034**	83.1	182	248	2	7.58
	260	42	2.1	1.1	208	193	—	—	6.90	—	—	1 900	2 600	**7034B**	111.2	182	248	2	7.77
	260	42	2.1	1.1	256	234	—	—	8.95	—	15.9	3 600	4 800	**7034C**	49.8	182	248	2	7.57
	310	52	4	1.5	340	331	—	—	11.0	—	—	2 300	2 800	**7234**	95.3	188	292	3	15.1
	310	52	4	1.5	306	300	—	—	10.0	—	—	1 700	2 300	**7234B**	126.7	188	292	3	15.1
	310	52	4	1.5	371	359	—	—	12.0	—	15.1	3 100	4 200	**7234C**	58.2	188	292	3	15.1
	360	72	4	1.5	486	485	—	—	15.4	—	—	2 000	2 500	**7334**	112.5	188	342	3	31.2
	360	72	4	1.5	444	444	—	—	14.1	—	—	1 500	2 000	**7334B**	147.2	188	342	3	31.2
	360	72	4	1.5	523	521	—	—	16.5	—	13.8	2 800	3 700	**7334C**	71.5	188	342	3	31.2
180	250	33	2	1	200	188	—	—	7.05	—	16.4	3 600	4 700	**7936C**	45.3	190	240	2	4.68
	280	46	2.1	1.1	265	253	—	—	9.15	—	—	2 400	3 000	**7036**	89.4	192	268	2	10.1
	280	46	2.1	1.1	237	228	—	—	7.95	—	—	1 800	2 400	**7036B**	119.5	192	268	2	10.2
	280	46	2.1	1.1	291	276	—	—	10.4	—	15.7	3 300	4 400	**7036C**	53.8	192	268	2	9.96
	320	52	4	1.5	367	362	—	—	11.8	—	—	2 200	2 700	**7236**	98.2	198	302	3	15.7

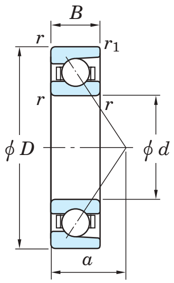
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings. Limiting speeds of pressed cage bearings should be kept to under 80% of this value. For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

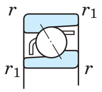
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

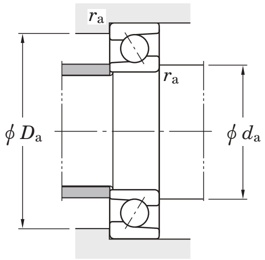
d (180) ~ (240) mm



With machined cage



With pressed cage



d	*D*	*B*	*r* min.	*r*₁ min.	Basic load ratings (kN) With machined cage C_r	C_{0r}	With pressed cage C_r	C_{0r}	Fatigue load limits (kN) C_u (With machined cage)	(With pressed cage)	Factor f_0	Limiting speeds [1)] (min^{-1}) Grease lub.	Oil lub.	Bearing No. [2)]	Load center (mm) *a*	Mounting dimensions (mm) d_a min.	D_a max.	r_a max.	(Refer.) Mass (kg)
180	320	52	4	1.5	331	329	—	—	10.7	—	—	1 600	2 200	**7236B**	130.9	198	302	3	15.7
	320	52	4	1.5	400	393	—	—	12.8	—	14.9	3 000	4 000	**7236C**	59.5	198	302	3	15.7
	380	75	4	1.5	512	534	—	—	16.5	—	—	1 900	2 400	**7336**	118.3	198	362	3	40.0
	380	75	4	1.5	466	488	—	—	15.1	—	—	1 400	1 900	**7336B**	155.0	198	362	3	40.0
190	260	33	2	1	198	197	—	—	6.85	—	16.5	3 300	4 500	**7938C**	46.6	200	250	2	4.83
	290	46	2.1	1.1	271	268	—	—	9.35	—	—	2 300	2 800	**7038**	92.3	202	278	2	10.8
	290	46	2.1	1.1	243	241	—	—	8.15	—	—	1 700	2 300	**7038B**	123.7	202	278	2	10.8
	290	46	2.1	1.1	299	293	—	—	10.6	—	15.9	3 100	4 200	**7038C**	55.2	202	278	2	10.8
	340	55	4	1.5	379	390	—	—	12.4	—	—	2 000	2 500	**7238**	104.0	208	322	3	18.8
	340	55	4	1.5	341	353	—	—	11.2	—	—	1 500	2 000	**7238B**	138.7	208	322	3	18.8
	340	55	4	1.5	414	424	—	—	13.5	—	15.1	2 800	3 700	**7238C**	63.0	208	322	3	18.8
	400	78	5	2	563	598	—	—	18.0	—	—	1 800	2 200	**7338**	124.2	212	378	4	45.5
	400	78	5	2	514	548	—	—	16.5	—	—	1 300	1 800	**7338B**	162.8	212	378	4	45.5
200	280	38	2.1	1.1	256	255	—	—	8.70	—	16.3	3 100	4 100	**7940C**	51.2	212	268	2	6.85
	310	51	2.1	1.1	304	309	—	—	10.0	—	—	2 100	2 600	**7040**	99.1	212	298	2	12.7
	310	51	2.1	1.1	273	279	—	—	9.05	—	—	1 600	2 100	**7040B**	132.5	212	298	2	12.7
	310	51	2.1	1.1	335	338	—	—	10.9	—	15.7	2 900	3 900	**7040C**	59.7	212	298	2	12.7
	360	58	4	1.5	405	423	—	—	13.1	—	—	1 900	2 400	**7240**	109.8	218	342	3	22.4
	360	58	4	1.5	365	384	—	—	11.9	—	—	1 400	1 900	**7240B**	146.5	218	342	3	22.4
	360	58	4	1.5	442	460	—	—	14.2	—	15.1	2 600	3 500	**7240C**	66.5	218	342	3	22.4
	420	80	5	2	593	658	—	—	19.3	—	—	1 700	2 100	**7340**	129.5	222	398	4	52.0
	420	80	5	2	541	602	—	—	17.7	—	—	1 200	1 700	**7340B**	170.1	222	398	4	52.0
220	340	56	3	1.1	334	353	—	—	10.9	—	—	1 900	2 400	**7044**	108.9	234	326	2.5	18.5
	340	56	3	1.1	299	318	—	—	9.80	—	—	1 400	1 900	**7044B**	145.5	234	326	2.5	18.9
240	360	56	3	1.1	364	375	—	—	12.3	—	—	1 700	2 200	**7048**	114.6	254	346	2.5	19.7
	360	56	3	1.1	325	338	—	—	11.1	—	—	1 300	1 700	**7048B**	153.9	254	346	2.5	20.1

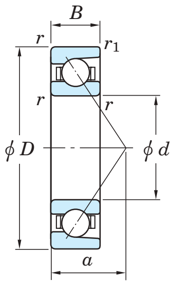
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings. Limiting speeds of pressed cage bearings should be kept to under 80% of this value. For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

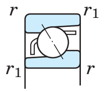
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

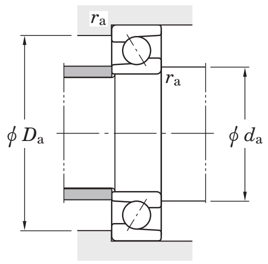
d (240) ~ 380 mm



With machined cage



With pressed cage



Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds [1] (min^{-1})		Bearing No. [2]	Load center (mm)	Mounting dimensions (mm)			(Refer.) Mass (kg)
					With machined cage		With pressed cage												
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cage)	(With pressed cage)	f_0	Grease lub.	Oil lub.		a	d_a min.	D_a max.	r_a max.	
240	440	72	4	1.5	504	595	—	—	16.7	—	—	1 500	1 800	**7248**	134.2	258	422	3	51.8
	440	72	4	1.5	453	539	—	—	15.1	—	—	1 100	1 500	**7248B**	178.6	258	422	3	52.8
260	400	65	4	1.5	407	478	—	—	13.6	—	—	1 500	1 900	**7052**	128.4	278	382	3	28.7
	400	65	4	1.5	364	431	—	—	12.2	—	—	1 100	1 500	**7052B**	171.0	278	382	3	29.3
280	420	65	4	1.5	415	507	—	—	14.0	—	—	1 400	1 800	**7056**	133.5	298	402	3	30.4
	420	65	4	1.5	384	453	—	—	13.1	—	—	1 100	1 400	**7056B**	179.3	298	402	3	31.0
300	460	74	4	1.5	533	680	—	—	18.0	—	—	1 300	1 600	**7060**	146.7	318	442	3	43.7
	460	74	4	1.5	478	613	—	—	16.3	—	—	960	1 300	**7060B**	196.4	318	442	3	44.9
320	480	74	4	1.5	546	722	—	—	18.6	—	—	1 200	1 500	**7064**	152.5	338	462	3	46.0
	480	74	4	1.5	489	651	—	—	16.8	—	—	890	1 200	**7064B**	204.8	338	462	3	47.2
340	520	82	5	2	628	861	—	—	21.4	—	—	1 100	1 300	**7068**	165.1	362	498	4	61.8
	520	82	5	2	563	777	—	—	19.4	—	—	800	1 100	**7068B**	221.4	362	498	4	63.3
360	540	82	5	2	644	913	—	—	22.2	—	—	1 000	1 300	**7072**	170.9	382	518	4	64.6
	540	82	5	2	577	824	—	—	20.1	—	—	750	1 000	**7072B**	229.8	382	518	4	66.2
380	560	82	5	2	660	966	—	—	23.0	—	—	940	1 200	**7076**	176.7	402	538	4	67.2
	560	82	5	2	590	870	—	—	20.7	—	—	700	940	**7076B**	238.2	402	538	4	69.1

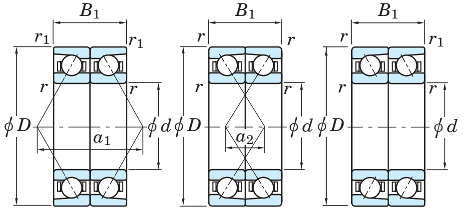
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B or no indication after the bearing number indicates nominal contact angle of 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

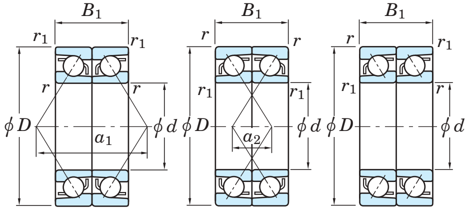
Angular contact ball bearings (matched pair)

d 10 ~ (17) mm



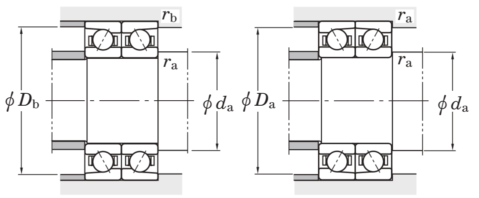
Back-to-back DB　Face-to-face DF　Tandem DT

(With machined cages)

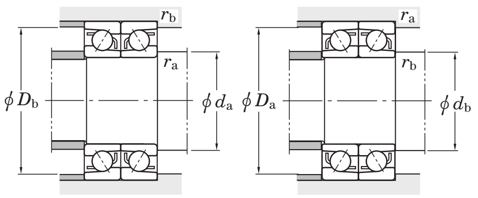


Back-to-back DB　Face-to-face DF　Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
					With machined cages		With pressed cages																		
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	With machined cages	With pressed cages	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
10	22	12	0.3	0.15	6.10	3.05	—	—	0.120	—	14.2	42 000	55 000	**7900CDB**	**7900CDF**	**7900CDT**	10.3	1.7	12.5	—	19.5	20.8	0.3	0.15	0.016
	26	16	0.3	0.15	10.1	4.65	—	—	0.240	—	—	27 000	34 000	**7000DB**	**7000DF**	**7000DT**	18.2	2.2	12.5	—	23.5	24.8	0.3	0.15	0.042
	26	16	0.3	0.15	9.40	4.35	—	—	0.220	—	—	20 000	27 000	**7000BDB**	**7000BDF**	**7000BDT**	23.1	7.1	12.5	—	23.5	24.8	0.3	0.15	0.042
	26	16	0.3	0.15	10.7	4.95	—	—	0.250	—	12.5	37 000	50 000	**7000CDB**	**7000CDF**	**7000CDT**	12.7	3.3	12.5	—	23.5	24.8	0.3	0.15	0.042
	30	18	0.6	0.3	9.50	4.40	11.0	5.45	0.230	0.280	—	23 000	29 000	**7200DB**	**7200DF**	**7200DT**	20.8	2.8	14.5	12.5	25.5	27.5	0.6	0.3	0.062
	30	18	0.6	0.3	8.70	4.05	10.1	5.05	0.210	0.260	—	18 000	23 000	**7200BDB**	**7200BDF**	**7200BDT**	26.2	8.2	14.5	12.5	25.5	27.5	0.6	0.3	0.062
	30	18	0.6	0.3	10.2	4.70	11.8	5.85	0.240	0.300	13.4	32 000	43 000	**7200CDB**	**7200CDF**	**7200CDT**	14.5	3.5	14.5	12.5	25.5	27.5	0.6	0.3	0.062
	35	22	0.6	0.3	17.3	7.55	18.9	8.60	0.590	0.680	—	21 000	27 000	**7300DB**	**7300DF**	**7300DT**	24.0	2.0	14.5	12.5	30.5	32.5	0.6	0.3	0.108
12	24	12	0.3	0.15	6.45	3.45	—	—	0.140	—	14.7	37 000	49 000	**7901CDB**	**7901CDF**	**7901CDT**	10.8	1.2	14.5	—	21.5	22.8	0.3	0.15	0.020
	28	16	0.3	0.15	11.0	5.45	—	—	0.280	—	—	23 000	29 000	**7001DB**	**7001DF**	**7001DT**	19.9	3.9	14.5	—	25.5	26.8	0.3	0.15	0.048
	28	16	0.3	0.15	10.1	5.05	—	—	0.260	—	—	18 000	23 000	**7001BDB**	**7001BDF**	**7001BDT**	25.2	9.2	14.5	—	25.5	26.8	0.3	0.15	0.048
	28	16	0.3	0.15	11.8	5.85	—	—	0.300	—	13.4	32 000	43 000	**7001CDB**	**7001CDF**	**7001CDT**	13.5	2.5	14.5	—	25.5	26.8	0.3	0.15	0.048
	32	20	0.6	0.3	15.1	7.25	16.2	8.05	0.560	0.620	—	22 000	27 000	**7201DB**	**7201DF**	**7201DT**	22.7	2.7	16.5	14.5	27.5	29.5	0.6	0.3	0.076
	32	20	0.6	0.3	14.0	6.80	15.1	7.50	0.480	0.530	—	16 000	22 000	**7201BDB**	**7201BDF**	**7201BDT**	28.5	8.5	16.5	14.5	27.5	29.5	0.6	0.3	0.076
	32	20	0.6	0.3	16.0	7.70	17.2	8.55	0.600	0.670	12.5	30 000	40 000	**7201CDB**	**7201CDF**	**7201CDT**	15.9	4.1	16.5	14.5	27.5	29.5	0.6	0.3	0.076
	37	24	1	0.6	20.7	9.20	22.7	10.5	0.720	0.820	—	20 000	24 000	**7301DB**	**7301DF**	**7301DT**	26.2	2.2	17.5	16.5	31.5	32.5	1	0.6	0.130
15	28	14	0.3	0.15	9.65	5.30	—	—	0.210	—	14.5	31 000	41 000	**7902CDB**	**7902CDF**	**7902CDT**	12.8	1.2	17.5	—	25.5	26.8	0.3	0.15	0.030
	32	18	0.3	0.15	12.4	6.85	—	—	0.350	—	—	20 000	26 000	**7002DB**	**7002DF**	**7002DT**	22.6	4.6	17.5	—	29.5	30.8	0.3	0.15	0.070
	32	18	0.3	0.15	11.3	6.30	—	—	0.320	—	—	15 000	20 000	**7002BDB**	**7002BDF**	**7002BDT**	29.1	11.1	17.5	—	29.5	30.8	0.3	0.15	0.070
	32	18	0.3	0.15	13.4	7.40	—	—	0.380	—	14.1	28 000	37 000	**7002CDB**	**7002CDF**	**7002CDT**	15.3	2.7	17.5	—	29.5	30.8	0.3	0.15	0.070
	35	22	0.6	0.3	16.4	8.55	16.4	8.55	0.600	0.600	—	19 000	24 000	**7202DB**	**7202DF**	**7202DT**	25.7	3.7	19.5	17.5	30.5	32.5	0.6	0.3	0.096
	35	22	0.6	0.3	15.1	7.85	15.1	7.85	0.520	0.520	—	14 000	19 000	**7202BDB**	**7202BDF**	**7202BDT**	32.4	10.4	19.5	17.5	30.5	32.5	0.6	0.3	0.096
	35	22	0.6	0.3	17.6	9.15	17.6	9.15	0.680	0.680	13.3	26 000	35 000	**7202CDB**	**7202CDF**	**7202CDT**	17.8	4.2	19.5	17.5	30.5	32.5	0.6	0.3	0.096
	42	26	1	0.6	25.4	12.9	27.3	14.4	0.990	1.10	—	16 000	20 000	**7302DB**	**7302DF**	**7302DT**	30.0	4.0	20.5	19.5	36.5	37.5	1	0.6	0.176
17	30	14	0.3	0.15	10.1	5.90	—	—	0.240	—	14.9	28 000	38 000	**7903CDB**	**7903CDF**	**7903CDT**	13.4	0.6	19.5	—	27.5	28.8	0.3	0.15	0.032
	35	20	0.3	0.15	13.7	8.25	—	—	0.430	—	—	18 000	23 000	**7003DB**	**7003DF**	**7003DT**	25.3	5.3	19.5	—	32.5	33.8	0.3	0.15	0.090
	35	20	0.3	0.15	12.4	7.50	—	—	0.390	—	—	14 000	18 000	**7003BDB**	**7003BDF**	**7003BDT**	32.2	12.2	19.5	—	32.5	33.8	0.3	0.15	0.090

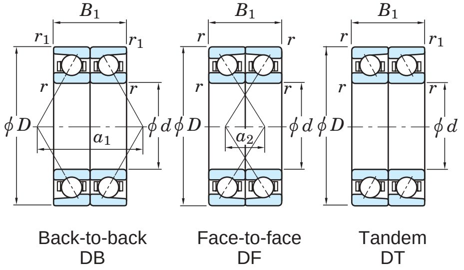
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

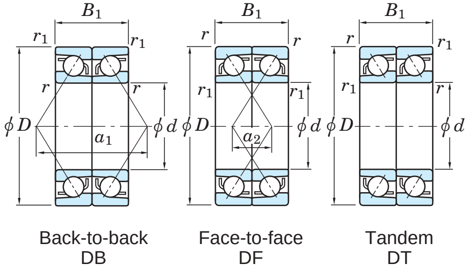
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Angular contact ball bearings (matched pair)

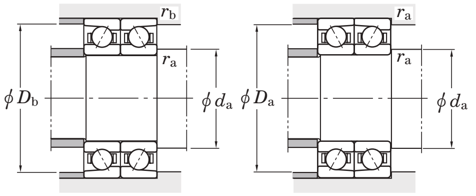
d (17) ~ (25) mm



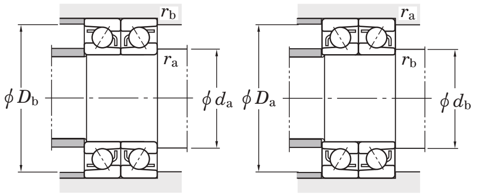
(With machined cages)



(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds[1] (min⁻¹)		Bearing No.[2]			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
					With machined cages		With pressed cages																		
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
17	35	20	0.3	0.15	14.8	8.95	—	—	0.460	—	14.6	25 000	33 000	**7003CDB**	**7003CDF**	**7003CDT**	17.1	2.9	19.5	—	32.5	33.8	0.3	0.15	0.090
	40	24	0.6	0.3	20.6	11.0	20.6	11.0	0.770	0.770	—	17 000	21 000	**7203DB**	**7203DF**	**7203DT**	28.8	4.8	21.5	19.5	35.5	37.5	0.6	0.3	0.140
	40	24	0.6	0.3	19.0	10.1	19.0	10.1	0.660	0.660	—	12 000	17 000	**7203BDB**	**7203BDF**	**7203BDT**	36.3	12.3	21.5	19.5	35.5	37.5	0.6	0.3	0.140
	40	24	0.6	0.3	22.1	11.8	22.1	11.8	0.880	0.880	13.4	23 000	30 000	**7203CDB**	**7203CDF**	**7203CDT**	19.8	4.2	21.5	19.5	35.5	37.5	0.6	0.3	0.140
	47	28	1	0.6	30.3	15.8	32.5	17.5	1.20	1.30	—	15 000	18 000	**7303DB**	**7303DF**	**7303DT**	33.1	5.1	22.5	21.5	41.5	42.5	1	0.6	0.240
	47	28	1	0.6	28.1	14.6	30.1	16.2	1.00	1.15	—	11 000	15 000	**7303BDB**	**7303BDF**	**7303BDT**	41.7	13.7	22.5	21.5	41.5	42.5	1	0.6	0.240
	47	28	1	0.6	32.2	16.8	32.2	16.8	1.30	1.30	12.6	20 000	27 000	**7303CDB**	**7303CDF**	**7303CDT**	22.8	5.2	22.5	21.5	41.5	42.5	1	0.6	0.240
20	37	18	0.3	0.15	14.8	9.15	—	—	0.470	—	14.9	24 000	31 000	**7904CDB**	**7904CDF**	**7904CDT**	16.6	1.4	22.5	—	34.5	35.8	0.3	0.15	0.070
	42	24	0.6	0.3	20.9	12.2	—	—	0.790	—	—	15 000	19 000	**7004DB**	**7004DF**	**7004DT**	30.2	6.2	24.5	—	37.5	39.5	0.6	0.3	0.158
	42	24	0.6	0.3	19.0	11.1	—	—	0.680	—	—	11 000	15 000	**7004BDB**	**7004BDF**	**7004BDT**	38.4	14.4	24.5	—	37.5	39.5	0.6	0.3	0.158
	42	24	0.6	0.3	22.6	13.2	—	—	0.900	—	14.1	21 000	28 000	**7004CDB**	**7004CDF**	**7004CDT**	20.4	3.6	24.5	—	37.5	39.5	0.6	0.3	0.158
	47	28	1	0.6	29.4	16.8	31.2	18.3	1.15	1.25	—	14 000	17 000	**7204DB**	**7204DF**	**7204DT**	33.9	5.9	25.5	24.5	41.5	42.5	1	0.6	0.224
	47	28	1	0.6	27.0	15.4	28.6	16.8	1.00	1.10	—	10 000	14 000	**7204BDB**	**7204BDF**	**7204BDT**	42.9	14.9	25.5	24.5	41.5	42.5	1	0.6	0.224
	47	28	1	0.6	31.5	18.0	33.4	19.6	1.35	1.45	13.4	19 000	26 000	**7204CDB**	**7204CDF**	**7204CDT**	23.2	4.8	25.5	24.5	41.5	42.5	1	0.6	0.224
	52	30	1.1	0.6	35.4	18.8	38.0	20.8	1.40	1.60	—	13 000	17 000	**7304DB**	**7304DF**	**7304DT**	35.8	5.8	27	24.5	45	47.5	1	0.6	0.300
	52	30	1.1	0.6	32.8	17.4	35.2	19.3	1.20	1.35	—	10 000	13 000	**7304BDB**	**7304BDF**	**7304BDT**	45.2	15.2	27	24.5	45	47.5	1	0.6	0.300
	52	30	1.1	0.6	37.6	19.9	40.3	22.2	1.55	1.75	12.6	18 000	24 000	**7304CDB**	**7304CDF**	**7304CDT**	24.6	5.4	27	24.5	45	47.5	1	0.6	0.300
	72	38	1.1	0.6	72.3	38.2	—	—	3.00	—	—	7 400	11 000	**7404DB**	**7404DF**	**7404DT**	46.1	8.1	27	—	65	67.5	1	0.6	0.790
	72	38	1.1	0.6	68.1	35.9	—	—	2.80	—	—	6 400	9 600	**7404BDB**	**7404BDF**	**7404BDT**	58.4	20.4	27	—	65	67.5	1	0.6	0.790
25	42	18	0.3	0.15	16.5	10.9	—	—	0.600	—	15.5	20 000	27 000	**7905CDB**	**7905CDF**	**7905CDT**	18.2	0.2	27.5	—	39.5	40.8	0.3	0.15	0.082
	47	24	0.6	0.3	22.9	14.8	—	—	0.900	—	—	13 000	17 000	**7005DB**	**7005DF**	**7005DT**	32.9	8.9	29.5	—	42.5	44.5	0.6	0.3	0.182
	47	24	0.6	0.3	20.7	13.4	—	—	0.780	—	—	10 000	13 000	**7005BDB**	**7005BDF**	**7005BDT**	42.3	18.3	29.5	—	42.5	44.5	0.6	0.3	0.182
	47	24	0.6	0.3	24.9	16.0	—	—	1.00	—	14.7	18 000	24 000	**7005CDB**	**7005CDF**	**7005CDT**	21.7	2.3	29.5	—	42.5	44.5	0.6	0.3	0.182
	52	30	1	0.6	31.2	19.0	32.9	20.6	1.25	1.35	—	12 000	15 000	**7205DB**	**7205DF**	**7205DT**	37.5	7.5	30.5	29.5	46.5	47.5	1	0.6	0.270
	52	30	1	0.6	28.4	17.4	29.9	18.8	1.05	1.15	—	9 200	12 000	**7205BDB**	**7205BDF**	**7205BDT**	47.7	17.7	30.5	29.5	46.5	47.5	1	0.6	0.270
	52	30	1	0.6	33.7	20.5	35.5	22.2	1.40	1.55	14.0	17 000	23 000	**7205CDB**	**7205CDF**	**7205CDT**	25.5	4.5	30.5	29.5	46.5	47.5	1	0.6	0.270
	62	34	1.1	0.6	50.3	28.8	53.6	31.6	2.10	2.35	—	11 000	14 000	**7305DB**	**7305DF**	**7305DT**	42.1	8.1	32	29.5	55	57.5	1	0.6	0.486

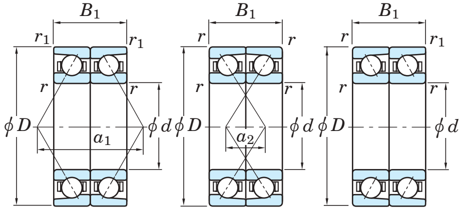
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

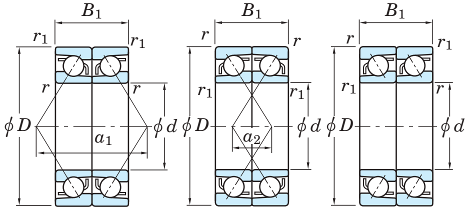
Angular contact ball bearings (matched pair)

d (25) ~ (35) mm



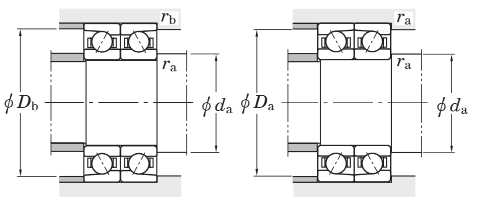
Back-to-back DB | Face-to-face DF | Tandem DT

(With machined cages)

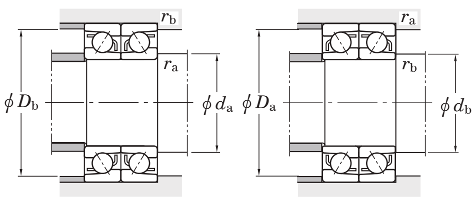


Back-to-back DB | Face-to-face DF | Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
					With machined cages		With pressed cages		(With machined cages)	(With pressed cages)				Back-to-back DB	Face-to-face DF	Tandem DT									
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}			f_0	Grease lub.	Oil lub.				a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
25	62	34	1.1	0.6	46.5	26.6	49.5	29.2	1.85	2.00	—	8 300	11 000	**7305BDB**	**7305BDF**	**7305BDT**	53.5	19.5	32	29.5	55	57.5	1	0.6	0.486
	62	34	1.1	0.6	53.5	30.6	57.0	33.7	2.40	2.65	12.8	15 000	20 000	**7305CDB**	**7305CDF**	**7305CDT**	28.7	5.3	32	29.5	55	57.5	1	0.6	0.486
	80	42	1.5	1	80.7	46.3	86.6	51.5	3.60	4.00	—	6 400	9 100	**7405DB**	**7405DF**	**7405DT**	52.8	10.8	33.5	30.5	71.5	74.5	1.5	1	1.05
	80	42	1.5	1	74.9	43.0	80.4	47.8	3.10	3.40	—	5 500	8 200	**7405BDB**	**7405BDF**	**7405BDT**	67.2	25.2	33.5	30.5	71.5	74.5	1.5	1	1.05
30	47	18	0.3	0.15	16.8	12.5	—	—	0.650	—	15.9	18 000	23 000	**7906CDB**	**7906CDF**	**7906CDT**	19.3	1.3	32.5	—	44.5	45.8	0.3	0.15	0.092
	55	26	1	0.6	29.5	20.2	—	—	1.20	—	—	11 000	14 000	**7006DB**	**7006DF**	**7006DT**	37.5	11.5	35.5	—	49.5	50.5	1	0.6	0.266
	55	26	1	0.6	26.7	18.4	—	—	1.05	—	—	8 500	11 000	**7006BDB**	**7006BDF**	**7006BDT**	48.7	22.7	35.5	—	49.5	50.5	1	0.6	0.266
	55	26	1	0.6	32.2	22.0	—	—	1.40	—	14.9	16 000	21 000	**7006CDB**	**7006CDF**	**7006CDT**	24.4	1.6	35.5	—	49.5	50.5	1	0.6	0.266
	62	32	1	0.6	43.3	27.4	45.7	29.7	1.80	1.95	—	10 000	13 000	**7206DB**	**7206DF**	**7206DT**	43.0	11.0	35.5	34.5	56.5	57.5	1	0.6	0.416
	62	32	1	0.6	39.5	25.0	41.6	27.1	1.55	1.65	—	7 700	10 000	**7206BDB**	**7206BDF**	**7206BDT**	55.2	23.2	35.5	34.5	56.5	57.5	1	0.6	0.416
	62	32	1	0.6	46.8	29.5	49.4	32.0	2.05	2.20	14.0	14 000	19 000	**7206CDB**	**7206CDF**	**7206CDT**	28.5	3.5	35.5	34.5	56.5	57.5	1	0.6	0.416
	72	38	1.1	0.6	61.1	37.8	64.8	41.2	2.60	2.85	—	9 200	12 000	**7306DB**	**7306DF**	**7306DT**	49.0	11.0	37	34.5	65	67.5	1	0.6	0.724
	72	38	1.1	0.6	56.1	34.7	59.4	37.9	2.25	2.45	—	6 900	9 200	**7306BDB**	**7306BDF**	**7306BDT**	62.6	24.6	37	34.5	65	67.5	1	0.6	0.724
	72	38	1.1	0.6	65.6	40.5	69.5	44.2	3.00	3.25	13.4	13 000	17 000	**7306CDB**	**7306CDF**	**7306CDT**	32.9	5.1	37	34.5	65	67.5	1	0.6	0.724
	90	46	1.5	1	96.7	56.9	104	63.2	4.35	4.85	—	5 700	8 100	**7406DB**	**7406DF**	**7406DT**	58.5	12.5	38.5	35.5	81.5	84.5	1.5	1	1.37
	90	46	1.5	1	89.7	52.8	96.3	58.6	3.75	4.15	—	4 900	7 300	**7406BDB**	**7406BDF**	**7406BDT**	74.6	28.6	38.5	35.5	81.5	84.5	1.5	1	1.37
35	55	20	0.6	0.3	25.5	19.4	—	—	1.10	—	15.7	15 000	20 000	**7907CDB**	**7907CDF**	**7907CDT**	22.1	2.1	39.5	—	50.5	52.5	0.6	0.3	0.148
	62	28	1	0.6	35.5	25.2	—	—	1.50	—	—	9 800	12 000	**7007DB**	**7007DF**	**7007DT**	42.3	14.3	40.5	—	56.5	57.5	1	0.6	0.340
	62	28	1	0.6	32.0	22.8	—	—	1.30	—	—	7 300	9 800	**7007BDB**	**7007BDF**	**7007BDT**	55.1	27.1	40.5	—	56.5	57.5	1	0.6	0.340
	62	28	1	0.6	38.8	27.4	—	—	1.70	—	15.0	13 000	18 000	**7007CDB**	**7007CDF**	**7007CDT**	27.0	1.0	40.5	—	56.5	57.5	1	0.6	0.340
	72	34	1.1	0.6	57.1	37.3	60.3	40.4	2.45	2.65	—	8 800	11 000	**7207DB**	**7207DF**	**7207DT**	48.5	14.5	42	39.5	65	67.5	1	0.6	0.590
	72	34	1.1	0.6	52.1	34.1	54.9	36.9	2.10	2.25	—	6 600	8 800	**7207BDB**	**7207BDF**	**7207BDT**	62.7	28.7	42	39.5	65	67.5	1	0.6	0.590
	72	34	1.1	0.6	61.7	40.2	65.1	43.5	2.75	3.00	14.0	12 000	16 000	**7207CDB**	**7207CDF**	**7207CDT**	31.6	2.4	42	39.5	65	67.5	1	0.6	0.590
	80	42	1.5	1	71.8	44.0	81.1	52.8	3.05	3.65	—	8 200	10 000	**7307DB**	**7307DF**	**7307DT**	54.8	12.8	43.5	40.5	71.5	74.5	1.5	1	0.950
	80	42	1.5	1	65.9	40.5	74.4	48.6	2.65	3.15	—	6 200	8 200	**7307BDB**	**7307BDF**	**7307BDT**	70.1	28.1	43.5	40.5	71.5	74.5	1.5	1	0.950
	80	42	1.5	1	77.0	47.2	86.9	56.6	3.50	4.20	13.4	11 000	15 000	**7307CDB**	**7307CDF**	**7307CDT**	36.7	5.3	43.5	40.5	71.5	74.5	1.5	1	0.950
	100	50	1.5	1	123	73.9	132	82.1	5.70	6.35	—	5 000	7 200	**7407DB**	**7407DF**	**7407DT**	65.2	15.2	43.5	40.5	91.5	94.5	1.5	1	1.90

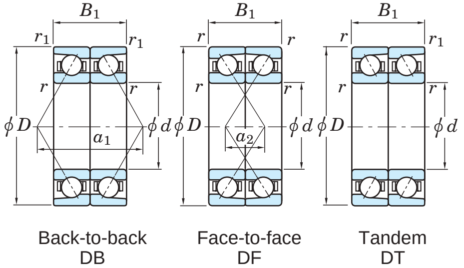
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

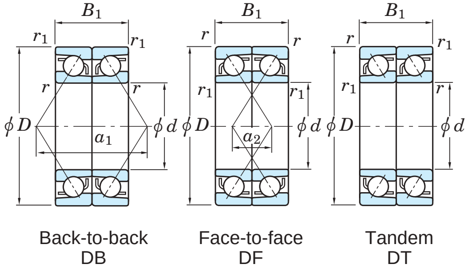
Angular contact ball bearings (matched pair)

d (35) ~ (50) mm



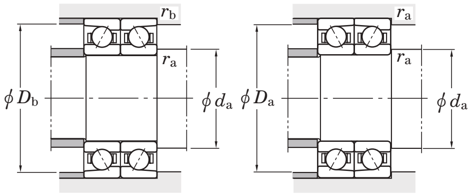
Back-to-back DB   Face-to-face DF   Tandem DT

(With machined cages)

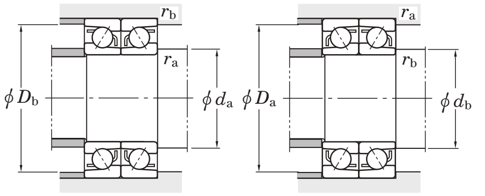


Back-to-back DB   Face-to-face DF   Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN) With machined cages		Basic load ratings (kN) With pressed cages		Fatigue load limits (kN) C_u		Factor	Limiting speeds [1] (min^{-1})		Bearing No. [2]			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
35	100	50	1.5	1	114	68.6	122	76.2	4.90	5.45	—	4 300	6 500	**7407BDB**	**7407BDF**	**7407BDT**	83.3	33.3	43.5	40.5	91.5	94.5	1.5	1	1.90
40	62	24	0.6	0.3	32.0	24.9	—	—	1.40	—	15.7	13 000	18 000	**7908CDB**	**7908CDF**	**7908CDT**	25.7	1.7	44.5	—	57.5	59.5	0.6	0.3	0.214
	68	30	1	0.6	38.1	29.2	—	—	1.65	—	—	8 900	11 000	**7008DB**	**7008DF**	**7008DT**	46.3	16.3	45.5	—	62.5	63.5	1	0.6	0.420
	68	30	1	0.6	34.2	26.4	—	—	1.45	—	—	6 600	8 900	**7008BDB**	**7008BDF**	**7008BDT**	60.5	30.5	45.5	—	62.5	63.5	1	0.6	0.420
	68	30	1	0.6	41.7	31.8	—	—	1.90	—	15.4	12 000	16 000	**7008CDB**	**7008CDF**	**7008CDT**	29.5	0.5	45.5	—	62.5	63.5	1	0.6	0.420
	80	36	1.1	0.6	68.2	46.7	71.7	50.3	3.00	3.25	—	8 000	10 000	**7208DB**	**7208DF**	**7208DT**	52.7	16.7	47	44.5	73	75.5	1	0.6	0.764
	80	36	1.1	0.6	62.1	42.7	65.2	45.9	2.60	2.80	—	6 000	8 000	**7208BDB**	**7208BDF**	**7208BDT**	68.3	32.3	47	44.5	73	75.5	1	0.6	0.764
	80	36	1.1	0.6	73.8	50.4	77.6	54.3	3.45	3.70	14.2	11 000	15 000	**7208CDB**	**7208CDF**	**7208CDT**	34.1	1.9	47	44.5	73	75.5	1	0.6	0.764
	90	46	1.5	1	87.8	54.9	99.1	65.9	3.85	4.60	—	7 400	9 200	**7308DB**	**7308DF**	**7308DT**	60.5	14.5	48.5	45.5	81.5	84.5	1.5	1	1.31
	90	46	1.5	1	80.6	50.5	91.0	60.6	3.30	3.95	—	5 500	7 400	**7308BDB**	**7308BDF**	**7308BDT**	77.5	31.5	48.5	45.5	81.5	84.5	1.5	1	1.31
	90	46	1.5	1	94.1	58.8	106	70.5	4.40	5.25	13.4	10 000	14 000	**7308CDB**	**7308CDF**	**7308CDT**	40.4	5.6	48.5	45.5	81.5	84.5	1.5	1	1.31
	110	54	2	1	142	87.1	152	96.8	6.70	7.45	—	4 600	6 600	**7408DB**	**7408DF**	**7408DT**	70.9	16.9	50	45.5	100	104.5	2	1	2.46
	110	54	2	1	132	80.8	141	89.8	5.75	6.40	—	3 900	5 900	**7408BDB**	**7408BDF**	**7408BDT**	90.8	36.8	50	45.5	100	104.5	2	1	2.46
45	68	24	0.6	0.3	33.7	28.2	—	—	1.55	—	16.0	12 000	16 000	**7909CDB**	**7909CDF**	**7909CDT**	27.1	3.1	49.5	—	63.5	65.5	0.6	0.3	0.254
	75	32	1	0.6	45.2	35.4	—	—	2.00	—	—	8 000	10 000	**7009DB**	**7009DF**	**7009DT**	50.7	18.7	50.5	—	69.5	70.5	1	0.6	0.520
	75	32	1	0.6	40.6	32.0	—	—	1.75	—	—	6 000	8 000	**7009BDB**	**7009BDF**	**7009BDT**	66.3	34.3	50.5	—	69.5	70.5	1	0.6	0.520
	75	32	1	0.6	49.6	38.5	—	—	2.25	—	15.4	11 000	15 000	**7009CDB**	**7009CDF**	**7009CDT**	32.1	0.1	50.5	—	69.5	70.5	1	0.6	0.520
	85	38	1.1	0.6	76.6	53.2	80.5	57.2	3.40	3.70	—	7 500	9 400	**7209DB**	**7209DF**	**7209DT**	56.0	18.0	52	49.5	78	80.5	1	0.6	0.860
	85	38	1.1	0.6	69.7	48.6	73.2	52.3	2.95	3.20	—	5 600	7 500	**7209BDB**	**7209BDF**	**7209BDT**	72.8	34.8	52	49.5	78	80.5	1	0.6	0.860
	85	38	1.1	0.6	82.9	57.4	87.1	61.8	3.90	4.20	14.2	10 000	14 000	**7209CDB**	**7209CDF**	**7209CDT**	36.2	1.8	52	49.5	78	80.5	1	0.6	0.860
	100	50	1.5	1	112	74.2	119	80.9	5.15	5.60	—	6 600	8 200	**7309DB**	**7309DF**	**7309DT**	67.2	17.2	53.5	50.5	91.5	94.5	1.5	1	1.75
	100	50	1.5	1	103	68.2	109	74.3	4.40	4.85	—	4 900	6 600	**7309BDB**	**7309BDF**	**7309BDT**	86.3	36.3	53.5	50.5	91.5	94.5	1.5	1	1.75
	100	50	1.5	1	120	79.5	127	86.7	5.85	6.40	13.5	9 000	12 000	**7309CDB**	**7309CDF**	**7309CDT**	44.6	5.4	53.5	50.5	91.5	94.5	1.5	1	1.75
	120	58	2	1	173	108	185	120	8.35	9.30	—	4 200	6 000	**7409DB**	**7409DF**	**7409DT**	77.2	19.2	55	50.5	110	114.5	2	1	3.10
	120	58	2	1	160	100	172	111	7.20	8.00	—	3 600	5 400	**7409BDB**	**7409BDF**	**7409BDT**	99.1	41.1	55	50.5	110	114.5	2	1	3.10
50	72	24	0.6	0.3	35.4	31.4	—	—	1.70	—	16.2	11 000	15 000	**7910CDB**	**7910CDF**	**7910CDT**	28.3	4.3	54.5	—	67.5	69.5	0.6	0.3	0.256
	80	32	1	0.6	48.0	40.2	—	—	2.20	—	—	7 300	9 200	**7010DB**	**7010DF**	**7010DT**	53.8	21.8	55.5	—	74.5	75.5	1	0.6	0.580

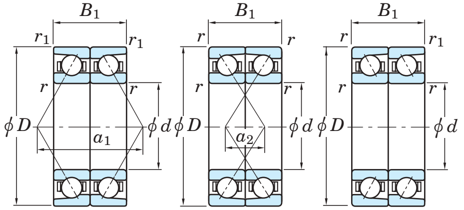
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

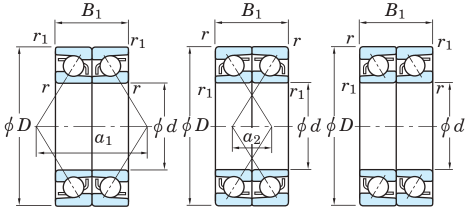
Angular contact ball bearings (matched pair)

d (50) ~ (60) mm



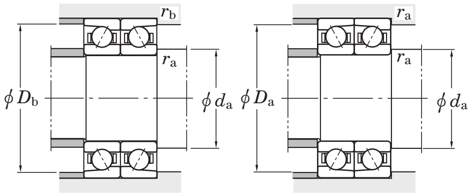
Back-to-back DB　Face-to-face DF　Tandem DT

(With machined cages)

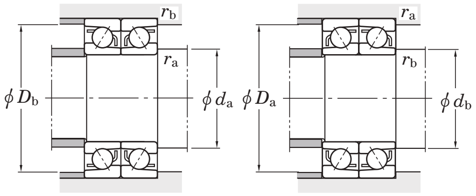


Back-to-back DB　Face-to-face DF　Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

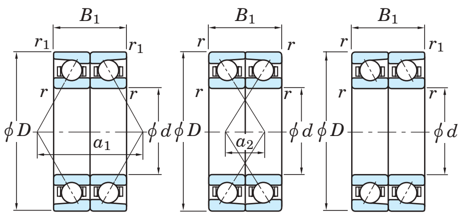
Boundary dimensions (mm)					**Basic load ratings** (kN) With machined cages		With pressed cages		**Fatigue load limits** (kN) C_u		**Factor**	**Limiting speeds** [1] (min^{-1})		**Bearing No.** [2]			**Load center spread** (mm)		**Mounting dimensions** (mm)						(Refer.) **Mass** (kg)
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
50	80	32	1	0.6	43.1	36.2	—	—	1.90	—	—	5 500	7 400	**7010BDB**	**7010BDF**	**7010BDT**	70.5	38.5	55.5	—	74.5	75.5	1	0.6	0.580
	80	32	1	0.6	52.7	43.9	—	—	2.50	—	15.7	10 000	13 000	**7010CDB**	**7010CDF**	**7010CDT**	33.6	1.6	55.5	—	74.5	75.5	1	0.6	0.580
	90	40	1.1	0.6	80.0	58.7	83.8	62.9	3.60	3.85	—	6 800	8 500	**7210DB**	**7210DF**	**7210DT**	60.7	20.7	57	54.5	83	85.5	1	0.6	0.970
	90	40	1.1	0.6	72.5	53.5	75.9	57.3	3.15	3.35	—	5 100	6 800	**7210BDB**	**7210BDF**	**7210BDT**	79.2	39.2	57	54.5	83	85.5	1	0.6	0.970
	90	40	1.1	0.6	86.9	63.6	91.0	68.1	4.10	4.40	14.6	9 400	12 000	**7210CDB**	**7210CDF**	**7210CDT**	38.9	1.1	57	54.5	83	85.5	1	0.6	0.970
	110	54	2	1	142	96.3	151	105	6.70	7.35	—	5 800	7 300	**7310DB**	**7310DF**	**7310DT**	74.4	20.4	60	55.5	100	104.5	2	1	2.28
	110	54	2	1	131	88.6	138	96.6	5.80	6.30	—	4 400	5 800	**7310BDB**	**7310BDF**	**7310BDT**	95.8	41.8	60	55.5	100	104.5	2	1	2.28
	110	54	2	1	153	103	162	112	7.70	8.40	13.4	8 000	11 000	**7310CDB**	**7310CDF**	**7310CDT**	49.0	5.0	60	55.5	100	104.5	2	1	2.28
	130	62	2.1	1.1	198	131	—	—	9.85	—	—	3 800	5 500	**7410DB**	**7410DF**	**7410DT**	83.3	21.3	62	—	118	123	2	1	3.84
	130	62	2.1	1.1	183	121	—	—	8.45	—	—	3 300	4 900	**7410BDB**	**7410BDF**	**7410BDT**	106.9	44.9	62	—	118	123	2	1	3.84
55	80	26	1	0.6	40.0	37.0	—	—	1.95	—	16.3	10 000	14 000	**7911CDB**	**7911CDF**	**7911CDT**	31.1	5.1	60.5	—	74.5	75.5	1	0.6	0.356
	90	36	1.1	0.6	63.2	52.5	—	—	2.95	—	—	6 600	8 300	**7011DB**	**7011DF**	**7011DT**	59.9	23.9	62	—	83	85.5	1	0.6	0.840
	90	36	1.1	0.6	56.7	47.5	—	—	2.55	—	—	5 000	6 600	**7011BDB**	**7011BDF**	**7011BDT**	78.8	42.8	62	—	83	85.5	1	0.6	0.840
	90	36	1.1	0.6	69.3	57.3	—	—	3.35	—	15.5	9 100	12 000	**7011CDB**	**7011CDF**	**7011CDT**	37.4	1.4	62	—	83	85.5	1	0.6	0.840
	100	42	1.5	1	98.9	74.2	104	79.6	4.60	4.90	—	6 100	7 600	**7211DB**	**7211DF**	**7211DT**	66.6	24.6	63.5	60.5	91.5	94.5	1.5	1	1.27
	100	42	1.5	1	89.6	67.6	93.8	72.4	3.95	4.25	—	4 600	6 100	**7211BDB**	**7211BDF**	**7211BDT**	87.3	45.3	63.5	60.5	91.5	94.5	1.5	1	1.27
	100	42	1.5	1	107	80.4	112	86.1	5.20	5.60	14.6	8 400	11 000	**7211CDB**	**7211CDF**	**7211CDT**	42.2	0.2	63.5	60.5	91.5	94.5	1.5	1	1.27
	120	58	2	1	164	113	174	123	7.90	8.60	—	5 400	6 700	**7311DB**	**7311DF**	**7311DT**	80.4	22.4	65	60.5	110	114.5	2	1	2.90
	120	58	2	1	151	104	160	113	6.80	7.40	—	4 000	5 400	**7311BDB**	**7311BDF**	**7311BDT**	103.7	45.7	65	60.5	110	114.5	2	1	2.90
	120	58	2	1	176	121	187	132	9.00	9.85	13.4	7 400	9 800	**7311CDB**	**7311CDF**	**7311CDT**	52.9	5.1	65	60.5	110	114.5	2	1	2.90
	140	66	2.1	1.1	241	165	—	—	12.8	—	—	3 500	5 000	**7411DB**	**7411DF**	**7411DT**	89.9	23.9	67	—	128	133	2	1	4.72
	140	66	2.1	1.1	224	153	—	—	11.0	—	—	3 000	4 500	**7411BDB**	**7411BDF**	**7411BDT**	115.7	49.7	67	—	128	133	2	1	4.72
60	85	26	1	0.6	47.2	43.6	—	—	2.35	—	16.3	9 100	13 000	**7912CDB**	**7912CDF**	**7912CDT**	32.6	6.6	65.5	—	79.5	80.5	1	0.6	0.374
	95	36	1.1	0.6	64.8	56.1	—	—	3.10	—	—	6 200	7 700	**7012DB**	**7012DF**	**7012DT**	62.8	26.8	67	—	88	90.5	1	0.6	0.900
	95	36	1.1	0.6	58.1	50.7	—	—	2.70	—	—	4 600	6 200	**7012BDB**	**7012BDF**	**7012BDT**	83.0	47.0	67	—	88	90.5	1	0.6	0.900
	95	36	1.1	0.6	71.2	61.3	—	—	3.50	—	15.7	8 500	11 000	**7012CDB**	**7012CDF**	**7012CDT**	38.8	2.8	67	—	88	90.5	1	0.6	0.900
	110	44	1.5	1	120	91.5	125	98.0	5.65	6.05	—	5 500	6 900	**7212DB**	**7212DF**	**7212DT**	72.3	28.3	68.5	65.5	101.5	104.5	1.5	1	1.64

[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.
[Remark] Standard cage types used for the above bearings are described earlier in this section.

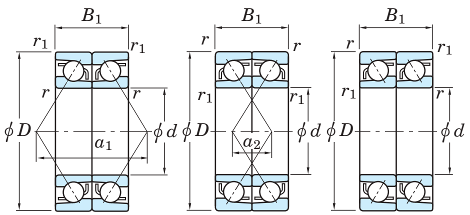
Angular contact ball bearings (matched pair)

d (60) ~ (70) mm



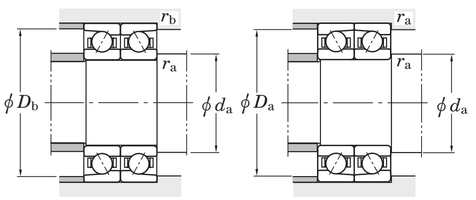
Back-to-back DB · Face-to-face DF · Tandem DT

(With machined cages)

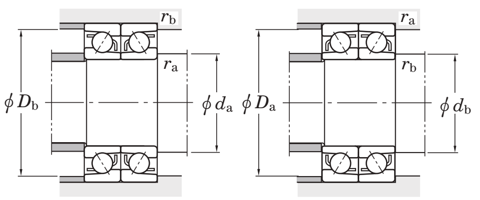


Back-to-back DB · Face-to-face DF · Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

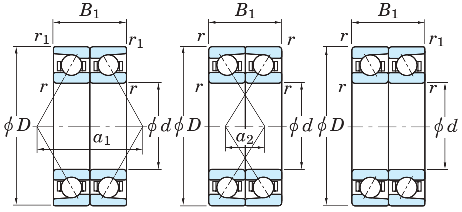
Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
					With machined cages		With pressed cages																		
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
60	110	44	1.5	1	108	83.3	114	89.2	4.90	5.25	—	4 100	5 500	**7212BDB**	**7212BDF**	**7212BDT**	95.0	51.0	68.5	65.5	101.5	104.5	1.5	1	1.64
	110	44	1.5	1	130	99.0	136	106	6.45	6.90	14.5	7 500	10 000	**7212CDB**	**7212CDF**	**7212CDT**	45.3	1.3	68.5	65.5	101.5	104.5	1.5	1	1.64
	130	62	2.1	1.1	188	131	199	143	9.15	10.0	—	5 000	6 200	**7312DB**	**7312DF**	**7312DT**	86.5	24.5	72	67	118	123	2	1	3.62
	130	62	2.1	1.1	172	121	183	132	7.90	8.60	—	3 700	5 000	**7312BDB**	**7312BDF**	**7312BDT**	111.6	49.6	72	67	118	123	2	1	3.62
	130	62	2.1	1.1	201	141	213	153	10.5	11.4	13.4	6 800	9 100	**7312CDB**	**7312CDF**	**7312CDT**	56.7	5.3	72	67	118	123	2	1	3.62
	150	70	2.1	1.1	262	187	—	—	13.7	—	—	3 200	4 600	**7412DB**	**7412DF**	**7412DT**	97.0	27.0	72	—	138	143	2	1	5.70
	150	70	2.1	1.1	243	173	—	—	11.8	—	—	2 800	4 100	**7412BDB**	**7412BDF**	**7412BDT**	125.1	55.1	72	—	138	143	2	1	5.70
65	90	26	1	0.6	42.2	42.3	—	—	2.20	—	16.5	8 600	12 000	**7913CDB**	**7913CDF**	**7913CDT**	33.8	7.8	70.5	—	84.5	85.5	1	0.6	0.410
	100	36	1.1	0.6	68.3	62.8	—	—	3.40	—	—	5 800	7 200	**7013DB**	**7013DF**	**7013DT**	65.9	29.9	72	—	93	95.5	1	0.6	0.940
	100	36	1.1	0.6	61.2	56.6	—	—	2.95	—	—	4 300	5 800	**7013BDB**	**7013BDF**	**7013BDT**	87.6	51.6	72	—	93	95.5	1	0.6	0.940
	100	36	1.1	0.6	75.2	68.7	—	—	3.85	—	15.9	7 900	11 000	**7013CDB**	**7013CDF**	**7013CDT**	40.2	4.2	72	—	93	95.5	1	0.6	0.940
	120	46	1.5	1	137	108	143	116	6.65	7.10	—	5 200	6 400	**7213DB**	**7213DF**	**7213DT**	76.4	30.4	73.5	70.5	111.5	114.5	1.5	1	2.04
	120	46	1.5	1	124	98.7	129	105	5.80	6.15	—	3 900	5 200	**7213BDB**	**7213BDF**	**7213BDT**	100.6	54.6	73.5	70.5	111.5	114.5	1.5	1	2.04
	120	46	1.5	1	148	117	155	125	7.60	8.10	14.6	7 100	9 400	**7213CDB**	**7213CDF**	**7213CDT**	47.8	1.8	73.5	70.5	111.5	114.5	1.5	1	2.04
	140	66	2.1	1.1	213	151	225	164	10.3	11.3	—	4 600	5 800	**7313DB**	**7313DF**	**7313DT**	92.5	26.5	77	72	128	133	2	1	4.44
	140	66	2.1	1.1	195	139	207	151	8.90	9.70	—	3 500	4 600	**7313BDB**	**7313BDF**	**7313BDT**	119.4	53.4	77	72	128	133	2	1	4.44
	140	66	2.1	1.1	228	161	242	176	11.8	12.9	13.4	6 300	8 500	**7313CDB**	**7313CDF**	**7313CDT**	60.6	5.4	77	72	128	133	2	1	4.44
	160	74	2.1	1.1	282	209	—	—	14.8	—	—	3 000	4 300	**7413DB**	**7413DF**	**7413DT**	102.9	28.9	77	—	148	153	2	1	6.82
	160	74	2.1	1.1	262	194	—	—	12.7	—	—	2 600	3 900	**7413BDB**	**7413BDF**	**7413BDT**	132.7	58.7	77	—	148	153	2	1	6.82
70	100	32	1	0.6	58.8	58.0	—	—	3.05	—	16.4	7 800	11 000	**7914CDB**	**7914CDF**	**7914CDT**	38.8	6.8	75.5	—	94.5	95.5	1	0.6	0.664
	110	40	1.1	0.6	86.7	78.7	—	—	4.30	—	—	5 300	6 600	**7014DB**	**7014DF**	**7014DT**	72.0	32.0	77	—	103	105.5	1	0.6	1.32
	110	40	1.1	0.6	77.7	71.1	—	—	3.75	—	—	4 000	5 300	**7014BDB**	**7014BDF**	**7014BDT**	95.5	55.5	77	—	103	105.5	1	0.6	1.32
	110	40	1.1	0.6	95.3	86.0	—	—	4.90	—	15.7	7 300	9 700	**7014CDB**	**7014CDF**	**7014CDT**	44.1	4.1	77	—	103	105.5	1	0.6	1.32
	125	48	1.5	1	142	111	155	127	6.85	7.80	—	4 900	6 100	**7214DB**	**7214DF**	**7214DT**	80.3	32.3	78.5	75.5	116.5	119.5	1.5	1	2.24
	125	48	1.5	1	128	101	140	116	5.90	6.75	—	3 700	4 900	**7214BDB**	**7214BDF**	**7214BDT**	105.8	57.8	78.5	75.5	116.5	119.5	1.5	1	2.24
	125	48	1.5	1	154	120	168	138	7.75	8.90	14.6	6 700	8 900	**7214CDB**	**7214CDF**	**7214CDT**	50.1	2.1	78.5	75.5	116.5	119.5	1.5	1	2.24
	150	70	2.1	1.1	239	172	253	187	11.4	12.4	—	4 300	5 400	**7314DB**	**7314DF**	**7314DT**	98.5	28.5	82	77	138	143	2	1	5.40

[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.
[Remark] Standard cage types used for the above bearings are described earlier in this section.

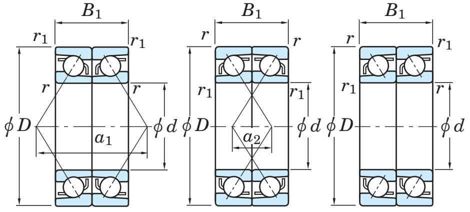
Angular contact ball bearings (matched pair)

d (70) ~ (80) mm



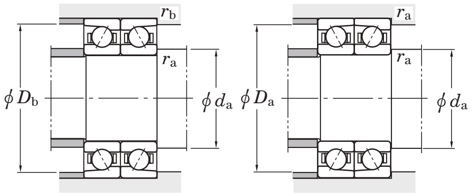
Back-to-back DB | Face-to-face DF | Tandem DT

(With machined cages)

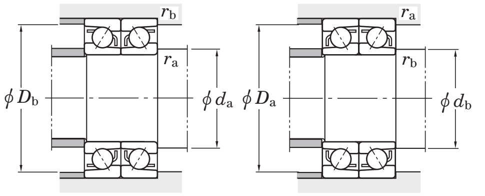


Back-to-back DB | Face-to-face DF | Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

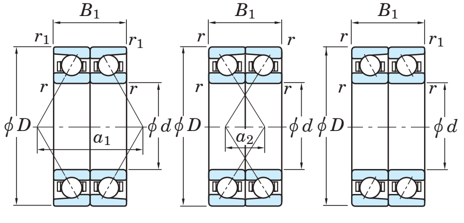
Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds [1] (min^{-1})		Bearing No. [2]			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
					With machined cages		With pressed cages																		
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
70	150	70	2.1	1.1	219	158	232	172	9.80	10.7	—	3 200	4 300	**7314BDB**	**7314BDF**	**7314BDT**	127.3	57.3	82	77	138	143	2	1	5.40
	150	70	2.1	1.1	256	184	272	200	13.0	14.2	13.4	5 900	7 900	**7314CDB**	**7314CDF**	**7314CDT**	64.5	5.5	82	77	138	143	2	1	5.40
	180	84	3	1.1	303	230	—	—	10.6	—	—	2 700	3 900	**7414DB**	**7414DF**	**7414DT**	115.3	31.3	84	—	166	173	2.5	1	9.98
	180	84	3	1.1	301	237	—	—	10.9	—	—	2 300	3 500	**7414BDB**	**7414BDF**	**7414BDT**	148.4	64.4	84	—	166	173	2.5	1	9.98
75	105	32	1	0.6	59.7	60.9	—	—	3.15	—	16.5	7 400	9 800	**7915CDB**	**7915CDF**	**7915CDT**	40.1	8.1	80.5	—	99.5	100.5	1	0.6	0.700
	115	40	1.1	0.6	88.6	83.4	—	—	4.50	—	—	5 000	6 300	**7015DB**	**7015DF**	**7015DT**	74.9	34.9	82	—	108	110.5	1	0.6	1.38
	115	40	1.1	0.6	79.3	75.2	—	—	3.95	—	—	3 800	5 000	**7015BDB**	**7015BDF**	**7015BDT**	99.7	59.7	82	—	108	110.5	1	0.6	1.38
	115	40	1.1	0.6	97.6	91.3	—	—	5.10	—	15.9	6 900	9 200	**7015CDB**	**7015CDF**	**7015CDT**	45.5	5.5	82	—	108	110.5	1	0.6	1.38
	130	50	1.5	1	161	130	168	139	7.90	8.40	—	4 600	5 800	**7215DB**	**7215DF**	**7215DT**	84.2	34.2	83.5	80.5	121.5	124.5	1.5	1	2.46
	130	50	1.5	1	146	119	152	127	6.85	7.30	—	3 500	4 600	**7215BDB**	**7215BDF**	**7215BDT**	111.0	61.0	83.5	80.5	121.5	124.5	1.5	1	2.46
	130	50	1.5	1	175	141	183	151	8.95	9.55	14.6	6 400	8 500	**7215CDB**	**7215CDF**	**7215CDT**	52.5	2.5	83.5	80.5	121.5	124.5	1.5	1	2.46
	160	74	2.1	1.1	260	194	276	212	12.4	13.5	—	4 000	5 000	**7315DB**	**7315DF**	**7315DT**	104.9	30.9	87	82	148	153	2	1	6.30
	160	74	2.1	1.1	239	178	253	195	10.7	11.7	—	3 000	4 000	**7315BDB**	**7315BDF**	**7315BDT**	135.6	61.6	87	82	148	153	2	1	6.30
	160	74	2.1	1.1	279	208	296	227	14.2	15.5	13.4	5 500	7 400	**7315CDB**	**7315CDF**	**7315CDT**	68.5	5.5	87	82	148	153	2	1	6.30
	190	90	3	1.1	348	282	—	—	12.6	—	—	2 500	3 600	**7415DB**	**7415DF**	**7415DT**	122.7	32.7	89	—	176	183	2.5	1	11.8
	190	90	3	1.1	322	261	—	—	11.6	—	—	2 200	3 300	**7415BDB**	**7415BDF**	**7415BDT**	157.9	67.9	89	—	176	183	2.5	1	11.8
80	110	32	1	0.6	60.5	63.2	—	—	3.25	—	16.5	7 000	9 300	**7916CDB**	**7916CDF**	**7916CDT**	41.5	9.5	85.5	—	104.5	105.5	1	0.6	0.736
	125	44	1.1	0.6	108	101	—	—	5.50	—	—	4 600	5 800	**7016DB**	**7016DF**	**7016DT**	81.2	37.2	87	—	118	120.5	1	0.6	1.86
	125	44	1.1	0.6	97.1	91.3	—	—	4.75	—	—	3 500	4 600	**7016BDB**	**7016BDF**	**7016BDT**	108.0	64.0	87	—	118	120.5	1	0.6	1.86
	125	44	1.1	0.6	119	111	—	—	6.20	—	15.7	6 400	8 500	**7016CDB**	**7016CDF**	**7016CDT**	49.5	5.5	87	—	118	120.5	1	0.6	1.86
	140	52	2	1	173	143	181	152	8.25	8.80	—	4 300	5 400	**7216DB**	**7216DF**	**7216DT**	89.5	37.5	90	85.5	130	134.5	2	1	3.00
	140	52	2	1	157	130	163	139	7.15	7.60	—	3 200	4 300	**7216BDB**	**7216BDF**	**7216BDT**	118.3	66.3	90	85.5	130	134.5	2	1	3.00
	140	52	2	1	189	155	197	165	9.40	10.0	14.7	5 900	7 900	**7216CDB**	**7216CDF**	**7216CDT**	55.5	3.5	90	85.5	130	134.5	2	1	3.00
	170	78	2.1	1.1	282	218	299	238	13.5	14.7	—	3 800	4 700	**7316DB**	**7316DF**	**7316DT**	111.2	33.2	92	87	158	163	2	1	7.70
	170	78	2.1	1.1	259	200	274	218	11.6	12.7	—	2 800	3 800	**7316BDB**	**7316BDF**	**7316BDT**	143.9	65.9	92	87	158	163	2	1	7.70
	170	78	2.1	1.1	302	233	321	255	15.4	16.8	13.5	5 200	6 900	**7316CDB**	**7316CDF**	**7316CDT**	72.5	5.5	92	87	158	163	2	1	7.70
	200	96	3	1.1	391	332	—	—	14.4	—	—	2 400	3 400	**7416DB**	**7416DF**	**7416DT**	130.0	34.0	94	—	186	193	2.5	1	12.0

[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.
[Remark] Standard cage types used for the above bearings are described earlier in this section.

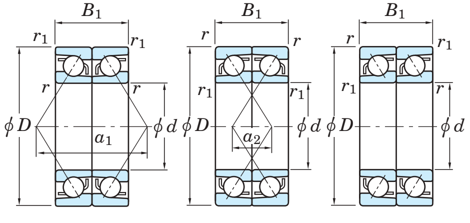
Angular contact ball bearings (matched pair)

d (80) ~ (95) mm



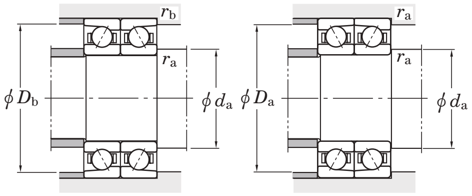
Back-to-back DB　Face-to-face DF　Tandem DT

(With machined cages)

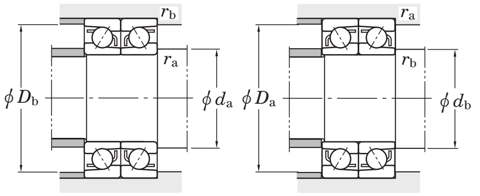


Back-to-back DB　Face-to-face DF　Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
					With machined cages		With pressed cages		With machined cages	With pressed cages		Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT									
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}			f_0						a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
80	200	96	3	1.1	363	307	—	—	13.3	—	—	2 100	3 100	**7416BDB**	**7416BDF**	**7416BDT**	167.2	71.2	94	—	186	193	2.5	1	12.0
85	120	36	1.1	0.6	79.0	81.3	—	—	4.20	—	16.5	6 500	8 600	**7917CDB**	**7917CDF**	**7917CDT**	45.5	9.5	92	—	113	115.5	1	0.6	1.05
	130	44	1.1	0.6	111	107	—	—	5.55	—	—	4 400	5 500	**7017DB**	**7017DF**	**7017DT**	84.7	40.7	92	—	123	125.5	1	0.6	1.94
	130	44	1.1	0.6	99.2	96.7	—	—	4.85	—	—	3 300	4 400	**7017BDB**	**7017BDF**	**7017BDT**	113.0	69.0	92	—	123	125.5	1	0.6	1.94
	130	44	1.1	0.6	122	117	—	—	6.30	—	15.9	6 000	8 000	**7017CDB**	**7017CDF**	**7017CDT**	51.1	7.1	92	—	123	125.5	1	0.6	1.94
	150	56	2	1	200	167	209	178	9.40	10.0	—	4 000	5 000	**7217DB**	**7217DF**	**7217DT**	95.9	39.9	95	90.5	140	144.5	2	1	3.74
	150	56	2	1	181	152	189	162	8.15	8.70	—	3 000	4 000	**7217BDB**	**7217BDF**	**7217BDT**	126.6	70.6	95	90.5	140	144.5	2	1	3.74
	150	56	2	1	218	181	227	193	10.7	11.4	14.7	5 500	7 400	**7217CDB**	**7217CDF**	**7217CDT**	59.5	3.5	95	90.5	140	144.5	2	1	3.74
	180	82	3	1.1	304	243	322	265	14.6	15.9	—	3 500	4 400	**7317DB**	**7317DF**	**7317DT**	117.5	35.5	99	92	166	173	2.5	1	9.06
	180	82	3	1.1	279	223	295	244	12.6	13.7	—	2 700	3 500	**7317BDB**	**7317BDF**	**7317BDT**	152.2	70.2	99	92	166	173	2.5	1	9.06
	180	82	3	1.1	326	261	346	284	16.7	18.2	13.5	4 900	6 500	**7317CDB**	**7317CDF**	**7317CDT**	76.5	5.5	99	92	166	173	2.5	1	9.06
	210	104	4	1.5	414	360	—	—	15.3	—	—	2 300	3 300	**7417DB**	**7417DF**	**7417DT**	137.5	33.5	103	—	192	201.5	3	1.5	17.1
	210	104	4	1.5	384	334	—	—	14.2	—	—	2 000	3 000	**7417BDB**	**7417BDF**	**7417BDT**	176.2	72.2	103	—	192	201.5	3	1.5	17.1
90	125	36	1.1	0.6	80.3	85.2	—	—	4.25	—	16.6	6 200	8 200	**7918CDB**	**7918CDF**	**7918CDT**	46.8	10.8	97	—	118	120.5	1	0.6	1.10
	140	48	1.5	1	132	127	—	—	6.45	—	—	4 100	5 100	**7018DB**	**7018DF**	**7018DT**	90.4	42.4	98.5	—	131.5	134.5	1.5	1	2.52
	140	48	1.5	1	119	114	—	—	5.60	—	—	3 100	4 100	**7018BDB**	**7018BDF**	**7018BDT**	120.5	72.5	98.5	—	131.5	134.5	1.5	1	2.52
	140	48	1.5	1	146	138	—	—	7.30	—	15.7	5 700	7 500	**7018CDB**	**7018CDF**	**7018CDT**	54.8	6.8	98.5	—	131.5	134.5	1.5	1	2.52
	160	60	2	1	229	193	239	206	10.6	11.3	—	3 800	4 700	**7218DB**	**7218DF**	**7218DT**	102.2	42.2	100	95.5	150	154.5	2	1	4.60
	160	60	2	1	207	176	217	188	9.15	9.80	—	2 800	3 800	**7218BDB**	**7218BDF**	**7218BDT**	134.9	74.9	100	95.5	150	154.5	2	1	4.60
	160	60	2	1	249	209	260	223	12.0	12.8	14.6	5 200	6 900	**7218CDB**	**7218CDF**	**7218CDT**	63.5	3.5	100	95.5	150	154.5	2	1	4.60
	190	86	3	1.1	327	270	346	294	11.8	12.8	—	3 300	4 200	**7318DB**	**7318DF**	**7318DT**	123.9	37.9	104	97	176	183	2.5	1	10.6
	190	86	3	1.1	300	248	317	270	10.8	11.8	—	2 500	3 300	**7318BDB**	**7318BDF**	**7318BDT**	160.5	74.5	104	97	176	183	2.5	1	10.6
	190	86	3	1.1	351	289	372	315	12.6	13.8	13.5	4 600	6 100	**7318CDB**	**7318CDF**	**7318CDT**	80.5	5.5	104	97	176	183	2.5	1	10.6
	225	108	4	1.5	439	393	—	—	16.2	—	—	2 100	3 100	**7418DB**	**7418DF**	**7418DT**	145.0	37.0	108	—	207	216.5	3	1.5	22.8
	225	108	4	1.5	406	364	—	—	15.0	—	—	1 800	2 800	**7418BDB**	**7418BDF**	**7418BDT**	186.2	78.2	108	—	207	216.5	3	1.5	22.8
95	130	36	1.1	0.6	81.6	88.3	—	—	4.30	—	16.5	5 900	7 900	**7919CDB**	**7919CDF**	**7919CDT**	48.1	12.1	102	—	123	125.5	1	0.6	1.15
	145	48	1.5	1	135	134	—	—	6.55	—	—	3 900	4 800	**7019DB**	**7019DF**	**7019DT**	94.5	46.5	103.5	—	136.5	139.5	1.5	1	2.64

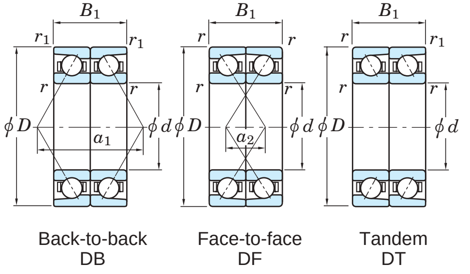
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

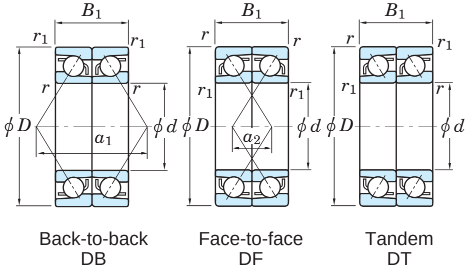
Angular contact ball bearings (matched pair)

d (95) ~ (105) mm



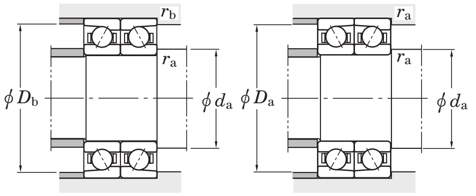
Back-to-back DB — Face-to-face DF — Tandem DT

(With machined cages)

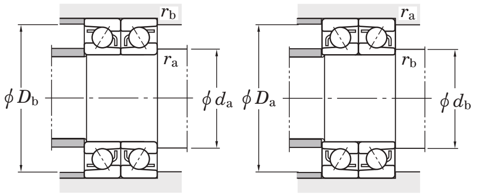


Back-to-back DB — Face-to-face DF — Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
					With machined cages		With pressed cages																		
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
95	145	48	1.5	1	121	121	—	—	5.70	—	—	2 900	3 900	**7019BDB**	**7019BDF**	**7019BDT**	126.4	78.4	103.5	—	136.5	139.5	1.5	1	2.64
	145	48	1.5	1	149	147	—	—	7.40	—	15.9	5 300	7 100	**7019CDB**	**7019CDF**	**7019CDT**	56.7	8.7	103.5	—	136.5	139.5	1.5	1	2.64
	170	64	2.1	1.1	248	207	260	221	11.0	11.8	—	3 500	4 400	**7219DB**	**7219DF**	**7219DT**	108.5	44.5	107	102	158	163	2	1	5.56
	170	64	2.1	1.1	224	188	235	201	9.55	10.2	—	2 700	3 500	**7219BDB**	**7219BDF**	**7219BDT**	143.2	79.2	107	102	158	163	2	1	5.56
	170	64	2.1	1.1	269	224	282	240	12.6	13.5	14.6	4 900	6 500	**7219CDB**	**7219CDF**	**7219CDT**	67.5	3.5	107	102	158	163	2	1	5.56
	200	90	3	1.1	350	298	371	325	12.7	13.8	—	3 200	4 000	**7319DB**	**7319DF**	**7319DT**	130.2	40.2	109	102	186	193	2.5	1	12.2
	200	90	3	1.1	321	273	340	298	11.6	12.7	—	2 400	3 200	**7319BDB**	**7319BDF**	**7319BDT**	168.8	78.8	109	102	186	193	2.5	1	12.2
	200	90	3	1.1	376	319	398	348	13.6	14.8	13.5	4 400	5 800	**7319CDB**	**7319CDF**	**7319CDT**	84.5	5.5	109	102	186	193	2.5	1	12.2
100	140	40	1.1	0.6	113	117	—	—	5.65	—	16.3	5 500	7 400	**7920CDB**	**7920CDF**	**7920CDT**	52.1	12.1	107	—	133	135.5	1	0.6	1.55
	150	48	1.5	1	139	141	—	—	6.75	—	—	3 800	4 700	**7020DB**	**7020DF**	**7020DT**	96.2	48.2	108.5	—	141.5	144.5	1.5	1	2.74
	150	48	1.5	1	124	127	—	—	5.90	—	—	2 800	3 800	**7020BDB**	**7020BDF**	**7020BDT**	128.9	80.9	108.5	—	141.5	144.5	1.5	1	2.74
	150	48	1.5	1	153	154	—	—	7.65	—	16.0	5 200	6 900	**7020CDB**	**7020CDF**	**7020CDT**	57.5	9.5	108.5	—	141.5	144.5	1.5	1	2.74
	180	68	2.1	1.1	279	235	292	252	12.2	13.0	—	3 300	4 100	**7220DB**	**7220DF**	**7220DT**	115.4	47.4	112	—	168	173	2	1	6.64
	180	68	2.1	1.1	252	214	264	229	10.5	11.3	—	2 500	3 300	**7220BDB**	**7220BDF**	**7220BDT**	152.3	84.3	112	—	168	173	2	1	6.64
	180	68	2.1	1.1	303	254	317	273	13.9	14.8	14.6	4 600	6 100	**7220CDB**	**7220CDF**	**7220CDT**	71.8	3.8	112	107	168	173	2	1	6.64
	215	94	3	1.1	373	323	421	387	13.2	15.9	—	2 900	3 600	**7320DB**	**7320DF**	**7320DT**	138.8	44.8	114	—	201	208	2.5	1	15.1
	215	94	3	1.1	342	297	386	356	12.2	14.6	—	2 200	2 900	**7320BDB**	**7320BDF**	**7320BDT**	180.4	86.4	114	—	201	208	2.5	1	15.1
	215	94	3	1.1	400	346	451	415	14.2	17.0	13.4	4 000	5 300	**7320CDB**	**7320CDF**	**7320CDT**	89.6	4.4	114	107	201	208	2.5	1	15.1
105	145	40	1.1	0.6	115	123	—	—	5.75	—	16.4	5 300	7 100	**7921CDB**	**7921CDF**	**7921CDT**	53.5	13.5	112	—	138	140.5	1	0.6	1.62
	160	52	2	1	162	164	—	—	7.60	—	—	3 500	4 400	**7021DB**	**7021DF**	**7021DT**	103.7	51.7	115	—	150	154.5	2	1	3.46
	160	52	2	1	145	148	—	—	6.65	—	—	2 600	3 500	**7021BDB**	**7021BDF**	**7021BDT**	137.2	85.2	115	—	150	154.5	2	1	3.46
	160	52	2	1	178	179	—	—	8.60	—	15.9	4 800	6 400	**7021CDB**	**7021CDF**	**7021CDT**	62.0	10.0	115	—	150	154.5	2	1	3.46
	190	72	2.1	1.1	303	265	—	—	13.4	—	—	3 100	3 900	**7221DB**	**7221DF**	**7221DT**	122.1	50.1	117	—	178	183	2	1	7.90
	190	72	2.1	1.1	275	241	—	—	11.6	—	—	2 300	3 100	**7221BDB**	**7221BDF**	**7221BDT**	161.0	89.0	117	—	178	183	2	1	7.90
	190	72	2.1	1.1	330	287	—	—	15.2	—	14.6	4 300	5 700	**7221CDB**	**7221CDF**	**7221CDT**	75.9	3.9	117	—	178	183	2	1	7.90
	225	98	3	1.1	422	386	—	—	15.5	—	—	2 800	3 500	**7321DB**	**7321DF**	**7321DT**	144.3	46.3	119	—	211	218	2.5	1	17.2
	225	98	3	1.1	387	355	—	—	14.3	—	—	2 100	2 800	**7321BDB**	**7321BDF**	**7321BDT**	187.5	89.5	119	—	211	218	2.5	1	17.2

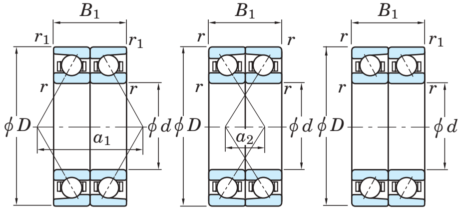
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

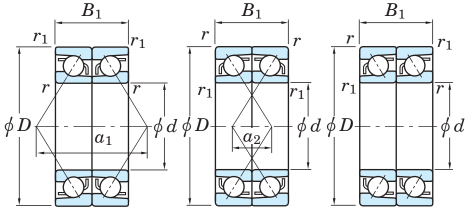
Angular contact ball bearings (matched pair)

d (105) ~ (130) mm



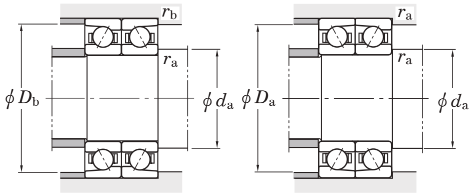
Back-to-back DB | Face-to-face DF | Tandem DT

(With machined cages)

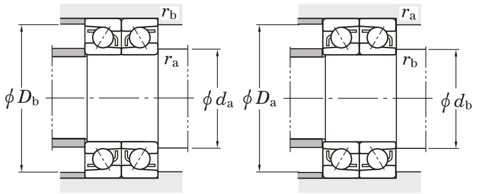


Back-to-back DB | Face-to-face DF | Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

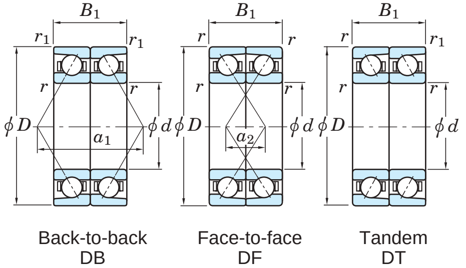
Boundary dimensions (mm) d	D	B_1	r min.	r_1 min.	Basic load ratings (kN) With machined cages C_r	With machined cages C_{0r}	With pressed cages C_r	With pressed cages C_{0r}	Fatigue load limits (kN) C_u (With machined cages)	C_u (With pressed cages)	Factor f_0	Limiting speeds [1] (min^{-1}) Grease lub.	Oil lub.	Bearing No. [2] Back-to-back DB	Face-to-face DF	Tandem DT	Load center spread (mm) a_1	a_2	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	(Refer.) Mass (kg)
105	225	98	3	1.1	452	413	—	—	16.6	—	13.4	3 900	5 100	**7321CDB**	**7321CDF**	**7321CDT**	93.2	4.8	119	—	211	218	2.5	1	17.2
110	150	40	1.1	0.6	117	129	—	—	5.85	—	16.5	5 100	6 800	**7922CDB**	**7922CDF**	**7922CDT**	54.8	14.8	117	—	143	145.5	1	0.6	1.68
	170	56	2	1	187	186	—	—	8.55	—	—	3 300	4 200	**7022DB**	**7022DF**	**7022DT**	108.9	52.9	120	—	160	164.5	2	1	4.28
	170	56	2	1	167	167	—	—	7.45	—	—	2 500	3 300	**7022BDB**	**7022BDF**	**7022BDT**	145.5	89.5	120	—	160	164.5	2	1	4.28
	170	56	2	1	205	203	—	—	9.70	—	15.7	4 600	6 100	**7022CDB**	**7022CDF**	**7022CDT**	65.5	9.5	120	—	160	164.5	2	1	4.28
	200	76	2.1	1.1	329	297	—	—	14.6	—	—	3 000	3 700	**7222DB**	**7222DF**	**7222DT**	128.7	52.7	122	—	188	193	2	1	9.30
	200	76	2.1	1.1	298	270	—	—	12.7	—	—	2 200	3 000	**7222BDB**	**7222BDF**	**7222BDT**	169.7	93.7	122	—	188	193	2	1	9.30
	200	76	2.1	1.1	357	321	—	—	16.7	—	14.5	4 100	5 400	**7222CDB**	**7222CDF**	**7222CDT**	80.1	4.1	122	—	188	193	2	1	9.30
	240	100	3	1.1	472	452	—	—	17.5	—	—	2 600	3 200	**7322DB**	**7322DF**	**7322DT**	152.7	52.7	124	—	226	233	2.5	1	20.2
	240	100	3	1.1	433	416	—	—	16.1	—	—	1 900	2 600	**7322BDB**	**7322BDF**	**7322BDT**	199.3	99.3	124	—	226	233	2.5	1	20.2
	240	100	3	1.1	505	484	—	—	18.8	—	13.4	3 500	4 700	**7322CDB**	**7322CDF**	**7322CDT**	97.7	2.3	124	—	226	233	2.5	1	20.2
120	165	44	1.1	0.6	146	162	—	—	7.10	—	16.5	4 700	6 200	**7924CDB**	**7924CDF**	**7924CDT**	60.2	16.2	127	—	158	160.5	1	0.6	2.30
	180	56	2	1	196	206	—	—	9.00	—	—	3 100	3 900	**7024DB**	**7024DF**	**7024DT**	114.6	58.6	130	—	170	174.5	2	1	4.54
	180	56	2	1	176	186	—	—	7.85	—	—	2 300	3 100	**7024BDB**	**7024BDF**	**7024BDT**	153.9	97.9	130	—	170	174.5	2	1	4.54
	180	56	2	1	216	226	—	—	10.2	—	16.0	4 300	5 700	**7024CDB**	**7024CDF**	**7024CDT**	68.2	12.2	130	—	170	174.5	2	1	4.54
	215	80	2.1	1.1	354	332	—	—	15.7	—	—	2 700	3 400	**7224DB**	**7224DF**	**7224DT**	137.0	57.0	132	—	203	208	2	1	11.0
	215	80	2.1	1.1	321	302	—	—	13.6	—	—	2 100	2 800	**7224BDB**	**7224BDF**	**7224BDT**	180.5	100.5	132	—	203	208	2	1	11.0
	215	80	2.1	1.1	385	359	—	—	17.9	—	14.6	3 800	5 000	**7224CDB**	**7224CDF**	**7224CDT**	85.0	5.0	132	—	203	208	2	1	11.0
	260	110	3	1.1	500	504	—	—	18.9	—	—	2 400	3 000	**7324DB**	**7324DF**	**7324DT**	164.7	54.7	134	—	246	253	2.5	1	25.2
	260	110	3	1.1	457	462	—	—	17.3	—	—	1 800	2 400	**7324BDB**	**7324BDF**	**7324BDT**	214.4	104.4	134	—	246	253	2.5	1	25.2
	260	110	3	1.1	538	542	—	—	20.3	—	13.7	3 300	4 400	**7324CDB**	**7324CDF**	**7324CDT**	105.9	4.1	134	—	246	253	2.5	1	25.2
130	180	48	1.5	1	177	200	—	—	8.45	—	16.4	4 300	5 700	**7926CDB**	**7926CDF**	**7926CDT**	65.5	17.5	138.5	—	171.5	174.5	1.5	1	3.00
	200	66	2	1	238	251	—	—	10.5	—	—	2 800	3 500	**7026DB**	**7026DF**	**7026DT**	128.3	62.3	140	—	190	194.5	2	1	6.86
	200	66	2	1	213	226	—	—	9.20	—	—	2 100	2 800	**7026BDB**	**7026BDF**	**7026BDT**	171.5	105.5	140	—	190	194.5	2	1	6.86
	200	66	2	1	262	274	—	—	11.9	—	15.9	3 900	5 100	**7026CDB**	**7026CDF**	**7026CDT**	77.2	11.2	140	—	190	194.5	2	1	6.86
	230	80	3	1.1	398	395	—	—	15.2	—	—	2 500	3 200	**7226DB**	**7226DF**	**7226DT**	143.9	63.9	144	—	216	223	2.5	1	12.4

[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.
[Remark] Standard cage types used for the above bearings are described earlier in this section.

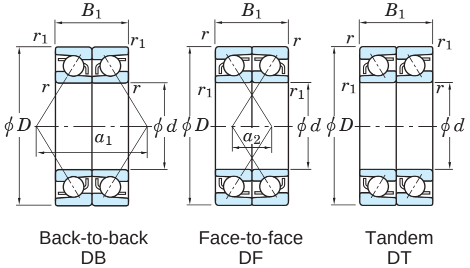
Angular contact ball bearings (matched pair)

d (130) ~ (160) mm



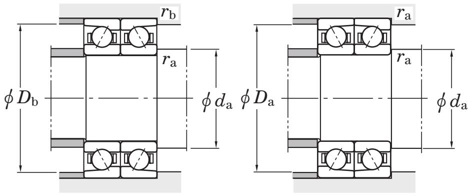
Back-to-back DB Face-to-face DF Tandem DT

(With machined cages)

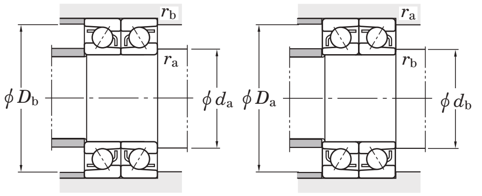


Back-to-back DB Face-to-face DF Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
d	D	B_1	r min.	r_1 min.	With machined cages C_r	With machined cages C_{0r}	With pressed cages C_r	With pressed cages C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
130	230	80	3	1.1	360	360	—	—	13.9	—	—	1 900	2 500	**7226BDB**	**7226BDF**	**7226BDT**	191.0	111.0	144	—	216	223	2.5	1	12.4
	230	80	3	1.1	433	428	—	—	16.5	—	14.7	3 500	4 700	**7226CDB**	**7226CDF**	**7226CDT**	88.2	8.2	144	—	216	223	2.5	1	12.4
	280	116	4	1.5	611	659	—	—	23.7	—	—	2 200	2 700	**7326DB**	**7326DF**	**7326DT**	177.5	61.5	148	—	262	271.5	3	1.5	30.8
	280	116	4	1.5	507	536	—	—	19.4	—	—	1 600	2 200	**7326BDB**	**7326BDF**	**7326BDT**	230.0	114.0	148	—	262	271.5	3	1.5	30.8
	280	116	4	1.5	597	629	—	—	22.7	—	13.7	3 000	4 000	**7326CDB**	**7326CDF**	**7326CDT**	112.9	3.1	148	—	262	271.5	3	1.5	30.8
140	190	48	1.5	1	179	210	—	—	8.45	—	16.6	4 000	5 400	**7928CDB**	**7928CDF**	**7928CDT**	68.2	20.2	148.5	—	181.5	184.5	1.5	1	3.18
	210	66	2	1	243	265	—	—	10.6	—	—	2 600	3 300	**7028DB**	**7028DF**	**7028DT**	134.1	68.1	150	—	200	204.5	2	1	7.28
	210	66	2	1	217	237	—	—	9.25	—	—	2 000	2 600	**7028BDB**	**7028BDF**	**7028BDT**	179.8	113.8	150	—	200	204.5	2	1	7.28
	210	66	2	1	268	290	—	—	12.0	—	16.0	3 600	4 800	**7028CDB**	**7028CDF**	**7028CDT**	79.9	13.9	150	—	200	204.5	2	1	7.28
	250	84	3	1.1	443	468	—	—	17.3	—	—	2 300	2 900	**7228DB**	**7228DF**	**7228DT**	154.6	70.6	154	—	236	243	2.5	1	15.5
	250	84	3	1.1	401	426	—	—	15.7	—	—	1 700	2 300	**7228BDB**	**7228BDF**	**7228BDT**	205.6	121.6	154	—	236	243	2.5	1	15.5
	250	84	3	1.1	483	508	—	—	18.8	—	14.8	3 200	4 300	**7228CDB**	**7228CDF**	**7228CDT**	94.2	10.2	154	—	236	243	2.5	1	15.5
	300	124	4	1.5	668	748	—	—	26.1	—	—	2 000	2 500	**7328DB**	**7328DF**	**7328DT**	189.0	65.0	158	—	282	291.5	3	1.5	37.6
	300	124	4	1.5	613	688	—	—	24.0	—	—	1 500	2 000	**7328BDB**	**7328BDF**	**7328BDT**	246.6	122.6	158	—	282	291.5	3	1.5	37.6
	300	124	4	1.5	717	802	—	—	27.9	—	13.4	2 800	3 700	**7328CDB**	**7328CDF**	**7328CDT**	120.9	3.1	158	—	282	291.5	3	1.5	37.6
150	210	56	2	1	241	263	—	—	10.9	—	16.3	3 700	4 900	**7930CDB**	**7930CDF**	**7930CDT**	76.2	20.2	160	—	200	204.5	2	1	4.94
	225	70	2.1	1.1	278	308	—	—	11.9	—	—	2 400	3 000	**7030DB**	**7030DF**	**7030DT**	144.2	74.2	162	—	213	218	2	1	8.86
	225	70	2.1	1.1	249	275	—	—	10.4	—	—	1 800	2 400	**7030BDB**	**7030BDF**	**7030BDT**	192.3	122.3	162	—	213	218	2	1	8.86
	225	70	2.1	1.1	306	337	—	—	13.4	—	16.1	3 300	4 400	**7030CDB**	**7030CDF**	**7030CDT**	85.6	15.6	162	—	213	218	2	1	8.86
	270	90	3	1.1	504	560	—	—	19.9	—	—	2 100	2 700	**7230DB**	**7230DF**	**7230DT**	166.3	76.3	164	—	256	263	2.5	1	19.5
	270	90	3	1.1	456	509	—	—	18.1	—	—	1 600	2 100	**7230BDB**	**7230BDF**	**7230BDT**	221.2	131.2	164	—	256	263	2.5	1	19.5
	270	90	3	1.1	549	607	—	—	21.6	—	14.7	2 900	3 900	**7230CDB**	**7230CDF**	**7230CDT**	101.3	11.3	164	—	256	263	2.5	1	19.5
	320	130	4	1.5	706	829	—	—	27.9	—	—	1 900	2 300	**7330DB**	**7330DF**	**7330DT**	200.7	70.7	168	—	302	311.5	3	1.5	44.8
	320	130	4	1.5	645	760	—	—	25.6	—	—	1 400	1 900	**7330BDB**	**7330BDF**	**7330BDT**	262.2	132.2	168	—	302	311.5	3	1.5	44.8
	320	130	4	1.5	760	891	—	—	30.0	—	13.7	2 600	3 400	**7330CDB**	**7330CDF**	**7330CDT**	128.0	2.0	168	—	302	311.5	3	1.5	44.8
160	220	56	2	1	245	289	—	—	10.9	—	16.5	3 500	4 700	**7932CDB**	**7932CDF**	**7932CDT**	78.9	22.9	170	—	210	214.5	2	1	5.20

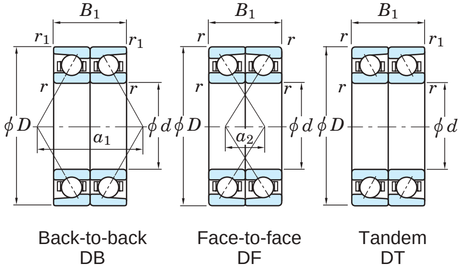
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

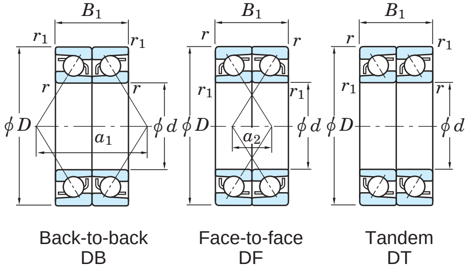
Angular contact ball bearings (matched pair)

d (160) ~ (180) mm



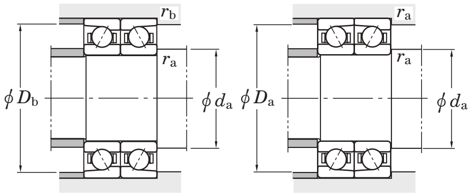
Back-to-back DB Face-to-face DF Tandem DT

(With machined cages)

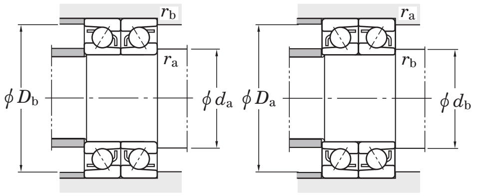


Back-to-back DB Face-to-face DF Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN) With machined cages		Basic load ratings (kN) With pressed cages		Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) ($\min^{-1}$)		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
160	240	76	2.1	1.1	315	353	—	—	13.3	—	—	2 300	2 800	**7032DB**	**7032DF**	**7032DT**	153.5	77.5	172	—	228	233	2	1	10.9
	240	76	2.1	1.1	282	316	—	—	11.6	—	—	1 700	2 300	**7032BDB**	**7032BDF**	**7032BDT**	205.8	129.8	172	—	228	233	2	1	10.9
	240	76	2.1	1.1	347	386	—	—	15.0	—	16.0	3 100	4 100	**7032CDB**	**7032CDF**	**7032CDT**	91.6	15.6	172	—	228	233	2	1	10.9
	290	96	3	1.1	468	525	—	—	18.1	—	—	2 000	2 500	**7232DB**	**7232DF**	**7232DT**	177.9	81.9	174	—	276	283	2.5	1	24.2
	290	96	3	1.1	482	557	—	—	19.2	—	—	1 500	2 000	**7232BDB**	**7232BDF**	**7232BDT**	236.8	140.8	174	—	276	283	2.5	1	24.2
	290	96	3	1.1	511	665	—	—	19.7	—	15.2	2 700	3 600	**7232CDB**	**7232CDF**	**7232CDT**	108.3	12.3	174	—	276	283	2.5	1	24.2
	340	136	4	1.5	741	909	—	—	29.7	—	—	1 700	2 200	**7332DB**	**7332DF**	**7332DT**	212.3	76.3	178	—	322	331.5	3	1.5	52.8
	340	136	4	1.5	675	831	—	—	27.2	—	—	1 300	1 700	**7332BDB**	**7332BDF**	**7332BDT**	277.8	141.8	178	—	322	331.5	3	1.5	52.8
	340	136	4	1.5	800	980	—	—	32.0	—	14.0	2 400	3 200	**7332CDB**	**7332CDF**	**7332CDT**	135.0	1.0	168.5	—	322	331.5	3	1.5	52.8
170	230	56	2	1	255	302	—	—	11.5	—	16.6	3 100	4 100	**7934CDB**	**7934CDF**	**7934CDT**	81.6	25.6	180	—	220	224.5	2	1	6.42
	260	84	2.1	1.1	377	429	—	—	15.8	—	—	2 100	2 600	**7034DB**	**7034DF**	**7034DT**	166.2	82.2	182	—	248	253	2	1	15.2
	260	84	2.1	1.1	338	386	—	—	13.8	—	—	1 600	2 100	**7034BDB**	**7034BDF**	**7034BDT**	222.4	138.4	182	—	248	253	2	1	15.5
	260	84	2.1	1.1	415	469	—	—	17.9	—	15.9	2 900	3 800	**7034CDB**	**7034CDF**	**7034CDT**	99.6	15.6	182	—	248	253	2	1	15.1
	310	104	4	1.5	552	661	—	—	22.0	—	—	1 800	2 300	**7234DB**	**7234DF**	**7234DT**	190.6	86.6	188	—	292	301.5	3	1.5	30.2
	310	104	4	1.5	497	600	—	—	20.0	—	—	1 400	1 800	**7234BDB**	**7234BDF**	**7234BDT**	253.4	149.4	188	—	292	301.5	3	1.5	30.2
	310	104	4	1.5	603	719	—	—	24.0	—	15.1	2 500	3 300	**7234CDB**	**7234CDF**	**7234CDT**	116.3	12.3	188	—	292	301.5	3	1.5	30.2
	360	144	4	1.5	789	969	—	—	30.7	—	—	1 600	2 000	**7334DB**	**7334DF**	**7334DT**	225.0	81.0	188	—	342	351.5	3	1.5	62.4
	360	144	4	1.5	721	888	—	—	28.2	—	—	1 200	1 600	**7334BDB**	**7334BDF**	**7334BDT**	294.4	150.4	188	—	342	351.5	3	1.5	62.4
	360	144	4	1.5	849	1 040	—	—	33.1	—	13.8	2 200	3 000	**7334CDB**	**7334CDF**	**7334CDT**	143.0	1.0	188	—	342	351.5	3	1.5	62.4
180	250	66	2	1	325	375	—	—	14.1	—	16.4	2 800	3 700	**7936CDB**	**7936CDF**	**7936CDT**	90.6	24.6	190	—	240	244.5	2	1	9.36
	280	92	2.1	1.1	430	506	—	—	18.3	—	—	1 900	2 400	**7036DB**	**7036DF**	**7036DT**	178.8	86.8	192	—	268	273	2	1	20.2
	280	92	2.1	1.1	385	457	—	—	15.9	—	—	1 400	1 900	**7036BDB**	**7036BDF**	**7036BDT**	239.0	147.0	192	—	268	273	2	1	20.4
	280	92	2.1	1.1	473	553	—	—	20.7	—	15.7	2 600	3 500	**7036CDB**	**7036CDF**	**7036CDT**	107.6	15.6	192	—	268	273	2	1	19.9
	320	104	4	1.5	596	724	—	—	23.7	—	—	1 700	2 200	**7236DB**	**7236DF**	**7236DT**	196.3	92.3	198	—	302	311.5	3	1.5	31.4
	320	104	4	1.5	538	657	—	—	21.5	—	—	1 300	1 700	**7236BDB**	**7236BDF**	**7236BDT**	261.8	157.8	198	—	302	311.5	3	1.5	31.4
	320	104	4	1.5	650	786	—	—	25.7	—	14.9	2 400	3 200	**7236CDB**	**7236CDF**	**7236CDT**	119.0	15.0	198	—	302	311.5	3	1.5	31.4
	380	150	4	1.5	831	1 070	—	—	33.0	—	—	1 500	1 900	**7336DB**	**7336DF**	**7336DT**	236.7	86.7	198	—	362	371.5	3	1.5	80.0

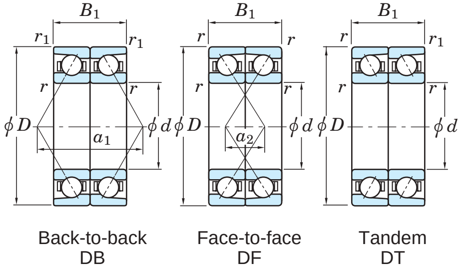
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

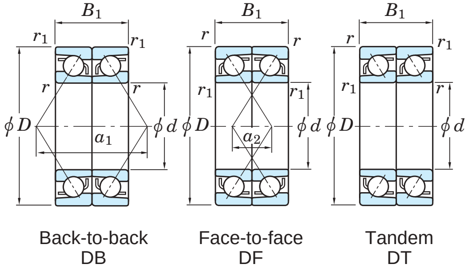
Angular contact ball bearings (matched pair)

d (180) ~ 240 mm



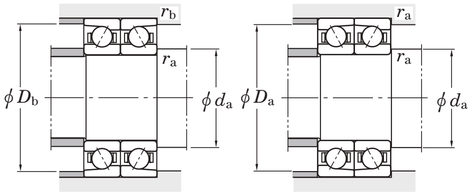
Back-to-back DB Face-to-face DF Tandem DT

(With machined cages)

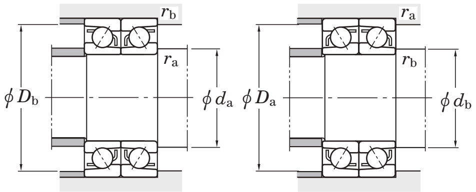


Back-to-back DB Face-to-face DF Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN) With machined cages		Basic load ratings (kN) With pressed cages		Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) (min^{-1})		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
180	380	150	4	1.5	757	976	—	—	30.1	—	—	1 100	1 500	**7336BDB**	**7336BDF**	**7336BDT**	309.9	159.9	198	—	362	371.5	3	1.5	80.0
190	260	66	2	1	322	394	—	—	13.7	—	16.5	2 700	3 600	**7938CDB**	**7938CDF**	**7938CDT**	93.3	27.3	200	—	250	254.5	2	1	9.66
	290	92	2.1	1.1	441	535	—	—	18.7	—	—	1 800	2 300	**7038DB**	**7038DF**	**7038DT**	184.6	92.6	202	—	278	283	2	1	21.6
	290	92	2.1	1.1	395	483	—	—	16.3	—	—	1 400	1 800	**7038BDB**	**7038BDF**	**7038BDT**	247.4	155.4	202	—	278	283	2	1	21.6
	290	92	2.1	1.1	485	585	—	—	21.1	—	15.9	2 500	3 300	**7038CDB**	**7038CDF**	**7038CDT**	110.3	18.3	202	—	278	283	2	1	21.6
	340	110	4	1.5	616	779	—	—	24.7	—	—	1 600	2 000	**7238DB**	**7238DF**	**7238DT**	208.0	98.0	208	—	322	331.5	3	1.5	37.6
	340	110	4	1.5	555	706	—	—	22.4	—	—	1 200	1 600	**7238BDB**	**7238BDF**	**7238BDT**	277.4	167.4	208	—	322	331.5	3	1.5	37.6
	340	110	4	1.5	673	848	—	—	26.9	—	15.1	2 200	3 000	**7238CDB**	**7238CDF**	**7238CDT**	126.0	16.0	208	—	322	331.5	3	1.5	37.6
	400	156	5	2	914	1 200	—	—	36.0	—	—	1 400	1 800	**7338DB**	**7338DF**	**7338DT**	248.3	92.3	212	—	378	390	4	2	91.0
	400	156	5	2	835	1 100	—	—	33.0	—	—	1 100	1 400	**7338BDB**	**7338BDF**	**7338BDT**	325.5	169.5	212	—	378	390	4	2	91.0
200	280	76	2.1	1.1	415	509	—	—	17.4	—	16.3	2 500	3 300	**7940CDB**	**7940CDF**	**7940CDT**	102.3	26.3	212	—	268	273	2	1	13.7
	310	102	2.1	1.1	495	618	—	—	20.0	—	—	1 700	2 100	**7040DB**	**7040DF**	**7040DT**	198.3	96.3	212	—	298	303	2	1	25.4
	310	102	2.1	1.1	443	558	—	—	18.1	—	—	1 300	1 700	**7040BDB**	**7040BDF**	**7040BDT**	265.0	163.0	212	—	298	303	2	1	25.4
	310	102	2.1	1.1	544	676	—	—	21.9	—	15.7	2 300	3 100	**7040CDB**	**7040CDF**	**7040CDT**	119.3	17.3	212	—	298	303	2	1	25.4
	360	116	4	1.5	658	847	—	—	26.2	—	—	1 500	1 900	**7240DB**	**7240DF**	**7240DT**	219.7	103.7	218	—	342	351.5	3	1.5	44.8
	360	116	4	1.5	593	768	—	—	23.7	—	—	1 100	1 500	**7240BDB**	**7240BDF**	**7240BDT**	292.9	176.9	218	—	342	351.5	3	1.5	44.8
	360	116	4	1.5	718	921	—	—	28.4	—	15.1	2 100	2 800	**7240CDB**	**7240CDF**	**7240CDT**	133.0	17.0	218	—	342	351.5	3	1.5	44.8
	420	160	5	2	964	1 320	—	—	38.6	—	—	1 300	1 700	**7340DB**	**7340DF**	**7340DT**	259.0	99.0	222	—	398	410	4	2	104
	420	160	5	2	878	1 200	—	—	35.3	—	—	1 000	1 300	**7340BDB**	**7340BDF**	**7340BDT**	340.1	180.1	222	—	398	410	4	2	104
220	340	112	3	1.1	543	705	—	—	21.8	—	—	1 500	1 900	**7044DB**	**7044DF**	—	217.8	105.8	234	—	326	333	2.5	1	37.0
	340	112	3	1.1	486	636	—	—	19.6	—	—	1 100	1 500	**7044BDB**	**7044BDF**	—	290.9	178.9	234	—	326	333	2.5	1	37.8
240	360	112	3	1.1	591	751	—	—	24.6	—	—	1 400	1 700	**7048DB**	**7048DF**	—	229.2	117.2	254	—	346	353	2.5	1	39.4
	360	112	3	1.1	528	677	—	—	22.2	—	—	1 000	1 400	**7048BDB**	**7048BDF**	—	307.7	195.7	254	—	346	353	2.5	1	40.2
	440	144	4	1.5	819	1 190	—	—	33.4	—	—	1 200	1 500	**7248DB**	**7248DF**	—	268.3	124.3	258	—	422	431.5	3	1.5	104
	440	144	4	1.5	736	1 080	—	—	30.2	—	—	890	1 200	**7248BDB**	**7248BDF**	—	357.3	213.3	258	—	422	431.5	3	1.5	106

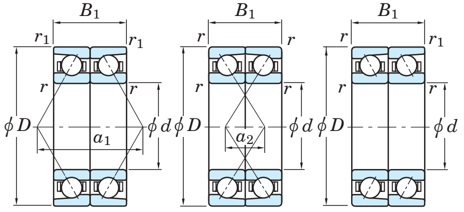
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

[Remark] Standard cage types used for the above bearings are described earlier in this section.

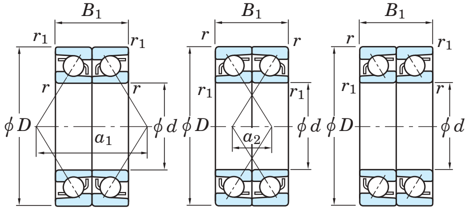
Angular contact ball bearings (matched pair)

d 260 ~ 380 mm



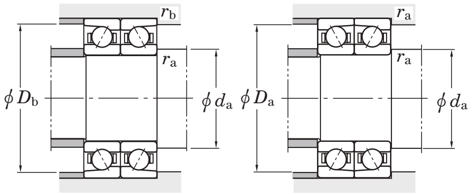
Back-to-back DB | Face-to-face DF | Tandem DT

(With machined cages)

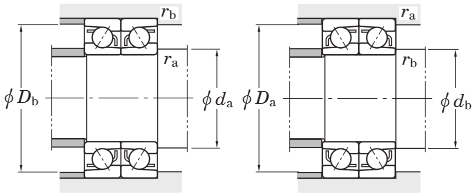


Back-to-back DB | Face-to-face DF | Tandem DT

(With pressed cages)



(With machined cages)



(With pressed cages)

Boundary dimensions (mm)					Basic load ratings (kN)				Fatigue load limits (kN) C_u		Factor	Limiting speeds 1) ($\min^{-1}$)		Bearing No. 2)			Load center spread (mm)		Mounting dimensions (mm)						(Refer.) Mass (kg)
					With machined cages		With pressed cages																		
d	D	B_1	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(With machined cages)	(With pressed cages)	f_0	Grease lub.	Oil lub.	Back-to-back DB	Face-to-face DF	Tandem DT	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
260	400	130	4	1.5	661	956	—	—	27.1	—	—	1 200	1 500	**7052DB**	**7052DF**	—	256.7	126.7	278	—	382	391.5	3	1.5	57.4
	400	130	4	1.5	592	862	—	—	24.4	—	—	910	1 200	**7052BDB**	**7052BDF**	—	341.9	211.9	278	—	382	391.5	3	1.5	58.6
280	420	130	4	1.5	675	1 010	—	—	27.9	—	—	1 100	1 400	**7056DB**	**7056DF**	—	267.1	137.1	298	—	402	411.5	3	1.5	60.8
	420	130	4	1.5	623	906	—	—	26.2	—	—	850	1 100	**7056BDB**	**7056BDF**	—	358.7	228.7	298	—	402	411.5	3	1.5	62.0
300	460	148	4	1.5	866	1 360	—	—	36.0	—	—	1 000	1 300	**7060DB**	**7060DF**	—	293.4	145.4	318	—	442	451.5	3	1.5	87.4
	460	148	4	1.5	776	1 230	—	—	32.5	—	—	770	1 000	**7060BDB**	**7060BDF**	—	392.9	244.9	318	—	442	451.5	3	1.5	89.8
320	480	148	4	1.5	887	1 440	—	—	37.3	—	—	950	1 200	**7064DB**	**7064DF**	—	304.9	156.9	338	—	462	471.5	3	1.5	92.0
	480	148	4	1.5	795	1 300	—	—	33.6	—	—	710	950	**7064BDB**	**7064BDF**	—	409.6	261.6	338	—	462	471.5	3	1.5	94.4
340	520	164	5	2	1 020	1 720	—	—	42.9	—	—	860	1 100	**7068DB**	**7068DF**	—	330.3	166.3	362	—	498	510	4	2	124
	520	164	5	2	914	1 550	—	—	38.7	—	—	640	860	**7068BDB**	**7068BDF**	—	442.8	278.8	362	—	498	510	4	2	127
360	540	164	5	2	1 050	1 830	—	—	44.5	—	—	800	1 000	**7072DB**	**7072DF**	—	341.8	177.8	382	—	518	530	4	2	129
	540	164	5	2	937	1 650	—	—	40.1	—	—	600	800	**7072BDB**	**7072BDF**	—	459.6	295.6	382	—	518	530	4	2	132
380	560	164	5	2	1 070	1 930	—	—	46.0	—	—	750	940	**7076DB**	**7076DF**	—	353.4	189.4	402	—	538	550	4	2	134
	560	164	5	2	959	1 740	—	—	41.5	—	—	560	750	**7076BDB**	**7076BDF**	—	476.4	312.4	402	—	538	550	4	2	138

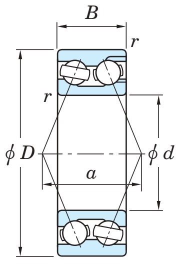
[Notes] 1) Limiting speeds shown above are applicable to machined cage bearings.
Limiting speeds of pressed cage bearings should be kept to under 80% of this value.
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cages or molded cages.

2) B or no indication after the bearing number indicates nominal contact angle of 40° and 30° respectively.

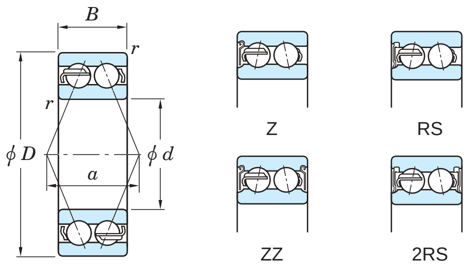
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Double-row angular contact ball bearings

d 10 ~ (40) mm



32, 33 series
(With filling slot)

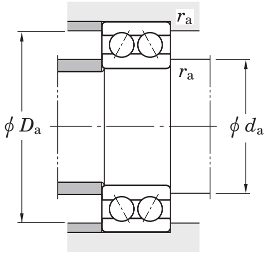


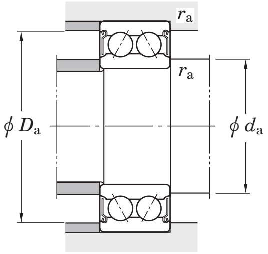
Open

Shielded

Contact sealed

52, 53 series
(Without filling slot)





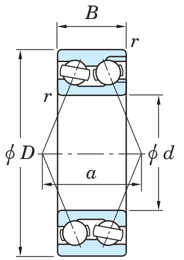
Boundary dimensions (mm)				Basic load ratings (kN) Open		Shielded/sealed		Fatigue load limits (kN) C_u		Limiting speeds (min^{-1}) Grease lub.		Oil lub.	Bearing No.			Load center spread (mm) Open	Mounting dimensions 1) (mm)				(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_r	C_{0r}	(Open)	(Shielded/sealed)	Open Z, ZZ	(RS, 2RS)	Open Z	Open	Shielded	Sealed	a	d_a min.	d_a max.	D_a max.	r_a max.	
10	30	14.3	0.6	9.15	5.35	—	—	0.280	—	15 000	—	20 000	**3200**	—	—	19.5	14.5	—	25.5	0.6	0.052
12	32	15.9	0.6	12.1	7.15	—	—	0.370	—	14 000	—	18 000	**3201**	—	—	21.7	16.5	—	27.5	0.6	0.063
15	35	15.9	0.6	12.1	7.45	—	—	0.390	—	12 000	—	16 000	**3202**	—	—	23.6	19.5	—	30.5	0.6	0.072
	42	19	1	19.0	11.9	—	—	0.610	—	10 000	—	14 000	**3302**	—	—	27.6	20.5	—	36.5	1	0.132
17	40	17.5	0.6	17.2	10.8	—	—	0.560	—	11 000	—	14 000	**3203**	—	—	26.6	21.5	—	35.5	0.6	0.100
	40	17.5	0.6	16.5	8.15	15.9	8.35	0.420	0.430	11 000	11 000	14 000	**5203**	**5203 ZZ**	**5203 2RS**	20.0	21.5	23.5	35.5	0.6	0.091
	47	22.2	1	23.0	17.1	—	—	0.760	—	9 400	—	13 000	**3303**	—	—	31.0	22.5	—	41.5	1	0.192
20	47	20.6	1	21.5	15.0	—	—	0.770	—	9 000	—	12 000	**3204**	—	—	31.5	25.5	—	41.5	1	0.170
	47	20.6	1	24.6	12.5	20.0	10.8	0.640	0.560	8 800	8 800	12 000	**5204**	**5204 ZZ**	**5204 2RS**	23.5	25.5	26.6	41.5	1	0.158
	52	22.2	1.1	26.0	18.4	—	—	0.950	—	8 200	—	11 000	**3304**	—	—	33.8	27	—	45	1	0.230
	52	22.2	1.1	30.9	15.0	24.7	12.8	0.780	0.660	8 300	8 300	11 000	**5304**	**5304 ZZ**	**5304 2RS**	25.9	27	28.3	45	1	0.230
25	52	20.6	1	23.7	18.2	—	—	0.940	—	7 800	—	10 000	**3205**	—	—	34.4	30.5	—	46.5	1	0.190
	52	20.6	1	26.7	14.8	23.6	13.8	0.760	0.710	7 700	7 700	10 000	**5205**	**5205 ZZ**	**5205 2RS**	26.1	30.5	32.3	46.5	1	0.190
	62	25.4	1.1	36.2	26.5	—	—	1.35	—	6 800	—	9 100	**3305**	—	—	40.5	32	—	55	1	0.369
	62	25.4	1.1	40.9	20.8	34.3	18.5	1.05	0.960	6 900	6 900	9 200	**5305**	**5305 ZZ**	**5305 2RS**	31.1	32	33.4	55	1	0.340
30	62	23.8	1	34.1	27.0	—	—	1.40	—	6 500	—	8 700	**3206**	—	—	40.7	35.5	—	56.5	1	0.320
	62	23.8	1	37.2	21.3	31.7	18.3	1.10	0.950	6 400	6 400	8 600	**5206**	**5206 ZZ**	**5206 2RS**	30.8	35.5	38.6	56.5	1	0.290
	72	30.2	1.1	47.7	36.1	—	—	1.85	—	5 800	—	7 800	**3306**	—	—	47.2	37	—	65	1	0.585
	72	30.2	1.1	51.2	28.5	42.9	25.2	1.45	1.30	5 800	5 800	7 700	**5306**	**5306 ZZ**	**5306 2RS**	36.2	37	41.3	65	1	0.510
35	72	27	1.1	46.0	37.5	—	—	1.95	—	5 600	—	7 500	**3207**	—	—	46.9	42	—	65	1	0.480
	72	27	1.1	49.0	29.0	39.7	24.6	1.50	1.25	5 500	5 500	7 300	**5207**	**5207 ZZ**	**5207 2RS**	36.1	42	43.9	65	1	0.430
	80	34.9	1.5	60.7	46.8	—	—	2.40	—	5 200	—	7 000	**3307**	—	—	53.4	43.5	—	71.5	1.5	0.816
	80	34.9	1.5	64.0	36.2	57.6	32.8	1.85	1.70	5 100	5 100	6 800	**5307**	**5307 ZZ**	**5307 2RS**	41.0	43.5	45.5	71.5	1.5	0.790
40	80	30.2	1.1	52.4	43.9	—	—	2.25	—	5 000	—	6 700	**3208**	—	—	52.6	47	—	73	1	0.650
	80	30.2	1.1	55.5	33.6	45.7	29.1	1.75	1.50	5 000	5 000	6 700	**5208**	**5208 ZZ**	**5208 2RS**	39.2	47	49.5	73	1	0.570

[Note] 1) The maximum value of d_a is applied to shielded and sealed type bearings.

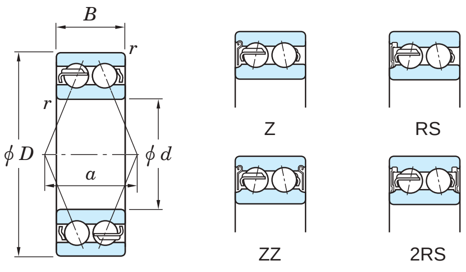
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Double-row angular contact ball bearings

d (40) ~ 70 mm

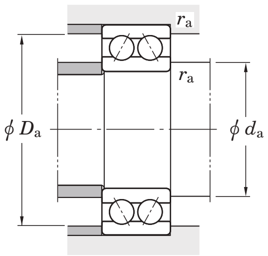


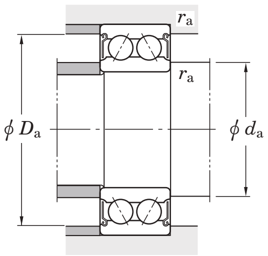
32, 33 series
(With filling slot)



Open
Shielded
Contact sealed

52, 53 series
(Without filling slot)





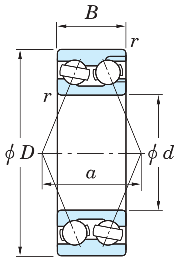
Boundary dimensions (mm)				Basic load ratings (kN)				Fatigue load limits (kN) C_u		Limiting speeds (min^{-1})			Bearing No.			Load center spread (mm)	Mounting dimensions [1] (mm)				(Refer.) Mass (kg)
				Open		Shielded/sealed				Grease lub.		Oil lub.				Open	d_a		D_a	r_a	
d	D	B	r min.	C_r	C_{0r}	C_r	C_{0r}	(Open)	(Shielded/sealed)	(Open Z, ZZ)	(RS, 2RS)	(Open Z)	Open	Shielded	Sealed	a	min.	max.	max.	max.	
40	90	36.5	1.5	67.6	53.8	—	—	2.80	—	4 600	—	6 100	**3308**	—	—	58.9	48.5	—	81.5	1.5	1.07
	90	36.5	1.5	78.3	45.4	64.3	37.8	2.35	1.95	4 600	4 600	6 100	**5308**	**5308 ZZ**	**5308 2RS**	44.9	48.5	52.1	81.5	1.5	1.05
45	85	30.2	1.1	56.8	51.4	—	—	2.65	—	4 600	—	6 100	**3209**	—	—	56.3	52	—	78	1	0.710
	85	30.2	1.1	62.3	38.4	52.1	33.9	2.00	1.75	4 600	4 600	6 100	**5209**	**5209 ZZ**	**5209 2RS**	42.2	52	55.3	78	1	0.620
	100	39.7	1.5	82.6	67.3	—	—	3.50	—	4 100	—	5 500	**3309**	—	—	65.6	53.5	—	91.5	1.5	1.42
	100	39.7	1.5	93.8	55.7	86.1	51.4	2.90	2.65	4 100	4 100	5 500	**5309**	**5309 ZZ**	**5309 2RS**	51.0	53.5	58.2	91.5	1.5	1.42
50	90	30.2	1.1	56.4	52.1	—	—	2.70	—	4 300	—	5 700	**3210**	—	—	58.8	57	—	83	1	0.760
	90	30.2	1.1	66.7	43.6	55.2	37.9	2.25	1.95	4 300	4 300	5 600	**5210**	**5210 ZZ**	**5210 2RS**	44.5	57	58.9	83	1	0.670
	110	44.4	2	108	88.6	—	—	4.60	—	3 800	—	5 000	**3310**	—	—	71.7	60	—	100	2	1.95
	110	44.4	2	111	67.0	102	62.2	3.45	3.20	3 600	3 600	4 800	**5310**	**5310 ZZ**	**5310 2RS**	56.6	60	64.4	100	2	1.93
55	100	33.3	1.5	63.6	60.2	—	—	3.10	—	3 900	—	5 100	**3211**	—	—	65.0	63.5	—	91.5	1.5	1.05
	100	33.3	1.5	82.3	55.2	66.1	44.7	2.85	2.30	3 800	3 800	5 100	**5211**	**5211 ZZ**	**5211 2RS**	50.2	63.5	66.2	91.5	1.5	0.960
	120	49.2	2	126	106	—	—	5.45	—	3 400	—	4 500	**3311**	—	—	79.3	65	—	110	2	2.53
	120	49.2	2	138	85.1	120	74.3	4.40	3.85	3 300	3 300	4 500	**5311**	**5311 ZZ**	**5311 2RS**	61.6	65	71.8	110	2	2.30
60	110	36.5	1.5	80.0	76.8	—	—	3.95	—	3 500	—	4 700	**3212**	—	—	71.3	68.5	—	101.5	1.5	1.40
	110	36.5	1.5	93.0	60.8	78.3	55.9	3.15	2.90	3 500	3 500	4 700	**5212**	**5212 ZZ**	**5212 2RS**	53.8	68.5	74.1	101.5	1.5	1.36
	130	54	2.1	156	132	—	—	6.85	—	3 100	—	4 200	**3312**	—	—	87.4	72	—	118	2	3.24
	130	54	2.1	157	98.7	138	87.1	5.10	4.50	3 100	3 100	4 100	**5312**	**5312 ZZ**	**5312 2RS**	67.2	72	79.2	118	2	3.16
65	120	38.1	1.5	95.5	97.4	—	—	5.05	—	3 200	—	4 300	**3213**	—	—	76.8	73.5	—	111.5	1.5	1.75
	120	38.1	1.5	109	75.3	86.5	63.1	3.90	3.25	3 200	3 200	4 300	**5213**	**5213 ZZ**	**5213 2RS**	58.8	73.5	79.0	111.5	1.5	1.66
	140	58.7	2.1	177	153	—	—	7.80	—	2 900	—	3 900	**3313**	—	—	92.7	77	—	128	2	4.08
	140	58.7	2.1	178	113	178	113	5.75	5.75	2 900	2 900	3 900	**5313**	**5313 ZZ**	**5313 2RS**	70.9	77	85.9	128	2	3.91
70	125	39.7	1.5	97.4	96.4	—	—	5.00	—	3 100	—	4 100	**3214**	—	—	80.7	78.5	—	116.5	1.5	1.92
	125	39.7	1.5	118	82.6	95.4	70.3	4.25	3.65	3 100	3 100	4 100	**5214**	**5214 ZZ**	**5214 2RS**	61.4	78.5	83.5	116.5	1.5	1.81
	150	63.5	2.1	188	160	—	—	7.90	—	2 700	—	3 600	**3314**	—	—	99.7	82	—	138	2	5.04
	150	63.5	2.1	200	129	200	129	6.35	6.35	2 700	2 700	3 600	**5314**	**5314 ZZ**	**5314 2RS**	76.0	82	92.9	138	2	4.89

[Note] 1) The maximum value of d_a is applied to shielded and sealed type bearings.

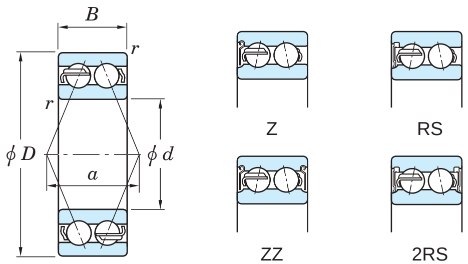
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Double-row angular contact ball bearings

d 75 ~ 110 mm



32, 33 series
(With filling slot)

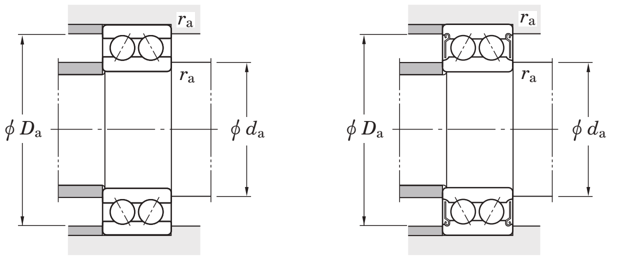


Open

Shielded

Contact sealed

52, 53 series
(Without filling slot)



Boundary dimensions (mm)				Basic load ratings (kN) Open		Shielded/sealed		Fatigue load limits (kN) C_u		Limiting speeds (min^{-1}) Grease lub.		Oil lub.	Bearing No.			Load center spread (mm) Open	Mounting dimensions 1) (mm)				(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_r	C_{0r}	(Open)	(Shielded/sealed)	(Open Z, ZZ)	(RS, 2RS)	(Open Z)	Open	Shielded	Sealed	a	d_a min.	d_a max.	D_a max.	r_a max.	
75	130	41.3	1.5	116	120	—	—	6.15	—	2 900	—	3 900	**3215**	—	—	84.7	83.5	—	121.5	1.5	2.10
	160	68.3	2.1	211	189	—	—	9.00	—	2 500	—	3 300	**3315**	—	—	108.7	87	—	148	2	6.16
	160	68.3	2.1	218	147	218	147	6.95	6.95	2 500	2 500	3 300	**5315**	**5315 ZZ**	**5315 2RS**	81.5	87	99.6	148	2	5.97
80	140	44.4	2	122	121	—	—	5.95	—	2 700	—	3 600	**3216**	—	—	90.7	90	—	130	2	2.64
	170	68.3	2.1	230	213	—	—	9.85	—	2 400	—	3 100	**3316**	—	—	113.1	92	—	158	2	6.93
85	150	49.2	2	143	143	—	—	6.80	—	2 500	—	3 400	**3217**	—	—	98.4	95	—	140	2	3.39
	180	73	3	235	219	—	—	9.80	—	2 200	—	3 000	**3317**	—	—	118.8	99	—	166	2.5	8.30
90	160	52.4	2	165	167	—	—	7.70	—	2 400	—	3 100	**3218**	—	—	104.1	100	—	150	2	4.14
	190	73	3	256	242	—	—	10.6	—	2 100	—	2 800	**3318**	—	—	125.5	104	—	176	2.5	9.23
95	170	55.6	2.1	189	193	—	—	8.65	—	2 200	—	3 000	**3219**	—	—	110.6	107	—	158	2	5.00
	200	77.8	3	273	270	—	—	14.9	—	2 000	—	2 600	**3319**	—	—	132.2	109	—	186	2.5	10.9
100	180	60.3	2.1	215	221	—	—	9.65	—	2 100	—	2 800	**3220**	—	—	116.8	112	—	168	2	6.10
	215	82.6	3	312	324	—	—	17.4	—	1 800	—	2 500	**3320**	—	—	140.4	114	—	201	2.5	13.5
105	190	65.1	2.1	227	237	—	—	11.5	—	2 000	—	2 600	**3221**	—	—	124.2	117	—	178	2	7.37
	225	87.3	3	331	354	—	—	18.5	—	1 800	—	2 300	**3321**	—	—	148.1	119	—	211	2.5	15.6
110	200	69.8	2.1	251	263	—	—	10.9	—	1 900	—	2 500	**3222**	—	—	131.4	122	—	188	2	8.80
	240	92.1	3	352	388	—	—	15.1	—	1 600	—	2 200	**3322**	—	—	156.4	124	—	226	2.5	18.9

[Note] 1) The maximum value of d_a is applied to shielded and sealed type bearings.

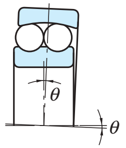
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Self-aligning ball bearings

Self-aligning ball bearings have a spherical outer ring raceway, the center of whose curvature meets that of the bearing itself, so that the inner ring, balls and cage continue to rotate, aligning themselves if they have become misaligned within design limits.

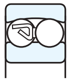
This type of bearing is suitable when the displacement of the centers around which the shaft and housing rotate and shaft deflection are likely to occur.

Bearings with a tapered bore can easily be fit to the shaft with an adapter assembly.

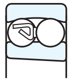


θ : Allowable aligning angle

Self-aligning ball bearings

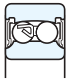


Cylindrical bore



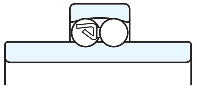
Tapered bore

Bore diameter **10** – **90** mm



Sealed type

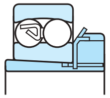
Bore diameter **10** – **55** mm



Extended inner ring type

Bore diameter **20** – **60** mm

Adapter assemblies



Bore diameter **17** – **80** mm

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512.
Tolerances	As specified in JIS B 1514-1, class 0. (refer to Table 7-3 on pp. A 60 – A 63.)
Radial internal clearance	As specified in JIS B 1520. (refer to Table 10-6 on p. A 105.)
Recommended fits	Refer to Table 9-4 on pp. A 91, 92.
Standard cages	● Staggered type pressed steel cage (application : all dimensional range of 12, 13, 112, 113, 22...2RS and 23...2RS series) ● Snap type pressed steel cage (application : all dimensional range of 22 series and those of No. 2300 thru 2316.)
Allowable aligning angle	· 12 and 22 series..........................0.044 rad (2.5°) · 13 and 23 series..........................0.052 rad (3°) · 22...2RS and 23...2RS series......0.026 rad (1.5°)

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_1	0.65	Y_2

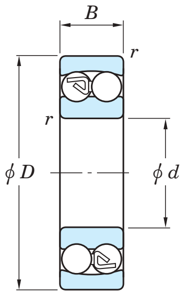
Static equivalent radial load

$P_{0r} = F_r + Y_0F_a$

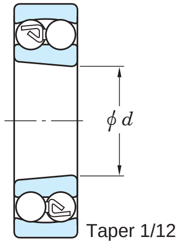
Refer to the bearing specification table for values of e, Y_1, Y_2 and Y_0.

Self-aligning ball bearings
open type

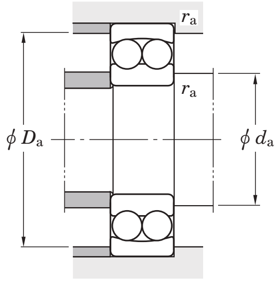
d 10 ~ (35) mm



Cylindrical bore



Tapered bore

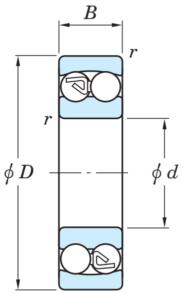


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)			Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
10	30	9	0.6	5.50	1.20	0.08	23 000	28 000	**1200**	—	14	26	0.6	0.33	1.92	2.97	2.01	0.034	—
	30	14	0.6	7.40	1.60	0.10	23 000	29 000	**2200**	—	14	26	0.6	0.59	1.07	1.65	1.12	0.047	—
12	32	10	0.6	5.60	1.25	0.08	21 000	26 000	**1201**	—	16	28	0.6	0.33	1.89	2.93	1.98	0.040	—
	32	14	0.6	7.65	1.75	0.11	21 000	26 000	**2201**	—	16	28	0.6	0.53	1.18	1.83	1.24	0.053	—
15	35	11	0.6	7.45	1.75	0.11	18 000	22 000	**1202**	—	19	31	0.6	0.33	1.90	2.95	2.00	0.049	—
	35	14	0.6	7.70	1.85	0.12	18 000	22 000	**2202**	—	19	31	0.6	0.50	1.27	1.97	1.33	0.060	—
	42	13	1	9.55	2.30	0.14	16 000	20 000	**1302**	—	20	37	1	0.34	1.86	2.88	1.95	0.094	—
	42	17	1	12.1	2.90	0.18	14 000	20 000	**2302**	—	20	37	1	0.50	1.27	1.96	1.33	0.114	—
17	40	12	0.6	7.90	2.05	0.13	16 000	20 000	**1203**	—	21	36	0.6	0.31	2.03	3.14	2.12	0.073	—
	40	16	0.6	9.80	2.40	0.15	16 000	20 000	**2203**	—	21	36	0.6	0.50	1.27	1.96	1.33	0.088	—
	47	14	1	12.5	3.20	0.20	14 000	17 000	**1303**	—	22	42	1	0.33	1.92	2.97	2.01	0.130	—
	47	19	1	14.5	3.60	0.23	13 000	18 000	**2303**	—	22	42	1	0.49	1.28	1.98	1.34	0.158	—
20	47	14	1	9.90	2.65	0.16	14 000	17 000	**1204**	**1204K**	25	42	1	0.29	2.16	3.35	2.27	0.120	0.118
	47	18	1	12.6	3.25	0.21	14 000	17 000	**2204**	**2204K**	25	42	1	0.48	1.31	2.02	1.37	0.140	0.136
	52	15	1.1	12.4	3.35	0.21	13 000	15 000	**1304**	**1304K**	26.5	45.5	1	0.30	2.12	3.28	2.22	0.163	0.161
	52	21	1.1	18.0	4.65	0.30	11 000	15 000	**2304**	**2304K**	26.5	45.5	1	0.49	1.29	2.00	1.35	0.209	0.205
25	52	15	1	12.1	3.30	0.21	12 000	14 000	**1205**	**1205K**	30	47	1	0.28	2.28	3.52	2.39	0.141	0.138
	52	18	1	12.6	3.50	0.22	12 000	15 000	**2205**	**2205K**	30	47	1	0.40	1.58	2.45	1.66	0.163	0.158
	62	17	1.1	18.0	5.05	0.32	9 900	12 000	**1305**	**1305K**	31.5	55.5	1	0.27	2.31	3.57	2.42	0.257	0.252
	62	24	1.1	24.5	6.55	0.42	9 400	13 000	**2305**	**2305K**	31.5	55.5	1	0.46	1.36	2.10	1.42	0.335	0.327
30	62	16	1	15.6	4.70	0.29	9 900	12 000	**1206**	**1206K**	35	57	1	0.25	2.55	3.94	2.67	0.220	0.216
	62	20	1	15.5	4.65	0.29	10 000	12 000	**2206**	**2206K**	35	57	1	0.35	1.79	2.77	1.87	0.260	0.254
	72	19	1.1	21.3	6.30	0.40	8 700	11 000	**1306**	**1306K**	36.5	65.5	1	0.26	2.40	3.72	2.52	0.387	0.381
	72	27	1.1	31.5	8.70	0.55	8 000	11 000	**2306**	**2306K**	36.5	65.5	1	0.44	1.44	2.23	1.51	0.500	0.489
35	72	17	1.1	15.8	5.15	0.32	8 500	10 000	**1207**	**1207K**	41.5	65.5	1	0.23	2.71	4.20	2.84	0.323	0.317

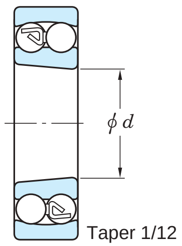
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Self-aligning ball bearings
open type

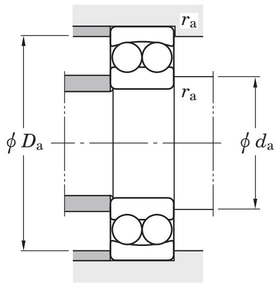
d (35) ~ 65 mm



Cylindrical bore



Tapered bore

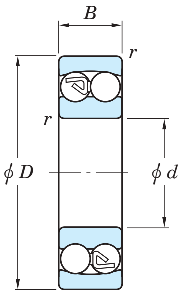


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)			Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
35	72	23	1.1	21.6	6.65	0.42	8 500	10 000	**2207**	**2207K**	41.5	65.5	1	0.37	1.71	2.65	1.79	0.403	0.396
	80	21	1.5	25.1	7.95	0.49	7 600	9 300	**1307**	**1307K**	43	72	1.5	0.25	2.48	3.84	2.60	0.510	0.502
	80	31	1.5	39.5	11.1	0.71	7 100	9 800	**2307**	**2307K**	43	72	1.5	0.45	1.39	2.15	1.46	0.675	0.657
40	80	18	1.1	19.2	6.50	0.41	7 500	9 200	**1208**	**1208K**	46.5	73.5	1	0.22	2.83	4.38	2.97	0.417	0.411
	80	23	1.1	22.4	7.35	0.46	7 600	9 300	**2208**	**2208K**	46.5	73.5	1	0.33	1.92	2.96	2.01	0.505	0.494
	90	23	1.5	29.6	9.80	0.61	6 900	8 400	**1308**	**1308K**	48	82	1.5	0.25	2.57	3.98	2.69	0.715	0.704
	90	33	1.5	44.9	13.4	0.85	6 200	8 600	**2308**	**2308K**	48	82	1.5	0.43	1.47	2.27	1.54	0.925	0.903
45	85	19	1.1	21.8	7.35	0.46	7 000	8 500	**1209**	**1209K**	51.5	78.5	1	0.21	2.94	4.56	3.09	0.465	0.459
	85	23	1.1	23.3	8.15	0.51	7 000	8 500	**2209**	**2209K**	51.5	78.5	1	0.30	2.09	3.23	2.19	0.545	0.533
	100	25	1.5	38.1	12.9	0.80	6 100	7 500	**1309**	**1309K**	53	92	1.5	0.25	2.56	3.95	2.68	0.957	0.942
	100	36	1.5	54.4	16.6	1.05	5 600	7 700	**2309**	**2309K**	53	92	1.5	0.42	1.51	2.33	1.58	1.23	1.20
50	90	20	1.1	22.7	8.10	0.51	6 500	7 900	**1210**	**1210K**	56.5	83.5	1	0.21	3.07	4.76	3.22	0.525	0.515
	90	23	1.1	23.3	8.50	0.53	6 500	7 900	**2210**	**2210K**	56.5	83.5	1	0.27	2.33	3.61	2.45	0.590	0.577
	110	27	2	43.4	14.2	0.89	5 600	6 800	**1310**	**1310K**	59	101	2	0.23	2.70	4.17	2.83	1.21	1.19
	110	40	2	64.6	20.1	1.25	5 100	7 000	**2310**	**2310K**	59	101	2	0.40	1.56	2.41	1.63	1.64	1.60
55	100	21	1.5	26.8	10.0	0.63	5 800	7 100	**1211**	**1211K**	63	92	1.5	0.20	3.19	4.94	3.34	0.705	0.693
	100	25	1.5	26.5	9.95	0.62	5 800	7 100	**2211**	**2211K**	63	92	1.5	0.27	2.35	3.64	2.47	0.810	0.792
	120	29	2	51.3	18.1	1.10	5 000	6 200	**1311**	**1311K**	64	111	2	0.23	2.70	4.18	2.83	1.58	1.56
	120	43	2	75.4	23.8	1.50	4 600	6 400	**2311**	**2311K**	64	111	2	0.41	1.53	2.37	1.60	2.10	2.05
60	110	22	1.5	30.2	11.6	0.73	5 200	6 400	**1212**	**1212K**	68	102	1.5	0.19	3.37	5.22	3.53	0.900	0.885
	110	28	1.5	34.1	12.5	0.80	5 300	6 500	**2212**	**2212K**	68	102	1.5	0.28	2.26	3.49	2.36	1.09	1.07
	130	31	2.1	57.1	20.8	1.30	4 500	5 500	**1312**	**1312K**	71	119	2	0.22	2.91	4.50	3.05	1.96	1.93
	130	46	2.1	87.3	28.1	1.80	4 200	5 800	**2312**	**2312K**	71	119	2	0.39	1.62	2.51	1.70	2.60	2.53
65	120	23	1.5	31.0	12.4	0.79	4 800	5 800	**1213**	**1213K**	73	112	1.5	0.17	3.67	5.68	3.84	1.15	1.13
	120	31	1.5	43.6	16.4	1.05	4 900	5 900	**2213**	**2213K**	73	112	1.5	0.28	2.24	3.47	2.35	1.46	1.43
	140	33	2.1	61.7	22.9	1.40	4 300	5 200	**1313**	**1313K**	76	129	2	0.23	2.73	4.23	2.86	2.45	2.41

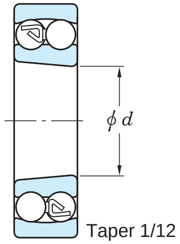
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Self-aligning ball bearings
open type

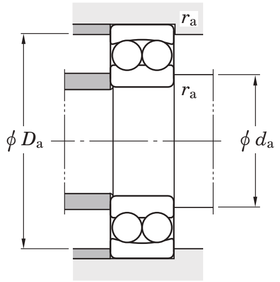
d 70 ~ 90 mm



Cylindrical bore



Tapered bore

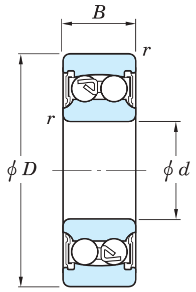


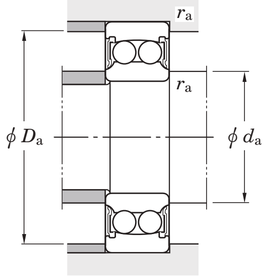
Boundary dimensions (mm)				**Basic load ratings** (kN)		**Fatigue load limit** (kN)	**Limiting speeds** ($\min^{-1}$)		**Bearing No.**		**Mounting dimensions** (mm)			**Constant**	**Axial load factors**			(Refer.) **Mass** (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
70	125	24	1.5	34.7	13.7	0.87	4 600	5 700	**1214**	—	78	117	1.5	0.18	3.48	5.38	3.64	1.26	—
	150	35	2.1	74.0	27.6	1.65	4 000	4 900	**1314**	—	81	139	2	0.22	2.84	4.40	2.98	2.99	—
75	130	25	1.5	38.8	15.5	0.97	4 300	5 300	**1215**	**1215K**	83	122	1.5	0.17	3.60	5.58	3.77	1.36	1.34
	160	37	2.1	78.9	29.9	1.70	4 000	4 900	**1315**	**1315K**	86	149	2	0.23	2.80	4.33	2.93	3.56	3.51
80	140	26	2	39.7	16.9	1.00	4 000	4 900	**1216**	**1216K**	89	131	2	0.16	3.90	6.03	4.08	1.67	1.64
	170	39	2.1	88.1	32.9	1.85	3 500	4 300	**1316**	**1316K**	91	159	2	0.22	2.90	4.49	3.04	4.18	4.12
85	150	28	2	49.2	20.5	1.20	3 800	4 600	**1217**	**1217K**	94	141	2	0.17	3.61	5.59	3.78	2.07	2.04
	180	41	3	97.3	37.8	2.05	3 300	4 000	**1317**	**1317K**	98	167	2.5	0.22	2.93	4.53	3.07	4.98	4.91
90	160	30	2	56.8	23.4	1.30	3 500	4 300	**1218**	**1218K**	99	151	2	0.17	3.69	5.70	3.86	2.52	2.48
	190	43	3	116	44.7	2.35	3 100	3 800	**1318**	**1318K**	103	177	2.5	0.22	2.81	4.35	2.94	5.80	5.71

[Remark] Standard cage types used for the above bearings are described earlier in this section.

Self-aligning ball bearings sealed type

d 10 ~ 55 mm



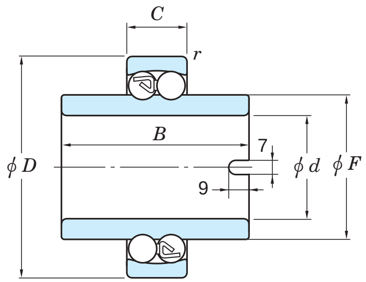


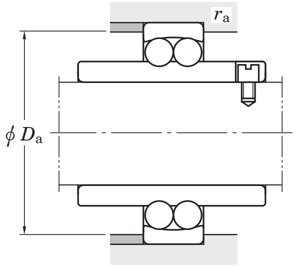
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed (min^{-1})	Bearing No.	Mounting dimensions (mm)				Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.		d_a min.	d_a max.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	
10	30	14	0.6	5.50	1.20	0.08	15 000	**2200 2RS**	13.7	13.7	25	0.6	0.33	1.92	2.97	2.01	0.047
12	32	14	0.6	5.60	1.25	0.08	14 000	**2201 2RS**	15.2	15.2	27	0.6	0.33	1.89	2.93	1.98	0.053
15	35	14	0.6	7.45	1.75	0.11	12 000	**2202 2RS**	18.0	18.0	30	0.6	0.33	1.90	2.95	2.00	0.060
	42	17	1	9.55	2.30	0.14	11 000	**2302 2RS**	20.0	20.0	36	1	0.34	1.86	2.88	1.95	0.114
17	40	16	0.6	7.90	2.05	0.13	11 000	**2203 2RS**	20.2	20.2	35	0.6	0.31	2.03	3.14	2.12	0.088
	47	19	1	12.5	3.20	0.20	9 400	**2303 2RS**	22.1	22.1	41	1	0.33	1.92	2.97	2.01	0.158
20	47	18	1	9.90	2.65	0.16	9 100	**2204 2RS**	24.1	24.1	41	1	0.29	2.16	3.35	2.27	0.140
	52	21	1.1	12.4	3.35	0.21	8 300	**2304 2RS**	26.2	26.2	45	1	0.30	2.12	3.28	2.22	0.209
25	52	18	1	12.1	3.30	0.21	7 900	**2205 2RS**	29.4	29.4	46	1	0.28	2.28	3.52	2.39	0.163
	62	24	1.1	18.0	5.05	0.32	6 600	**2305 2RS**	32	33.9	55	1	0.27	2.31	3.57	2.42	0.335
30	62	20	1	15.6	4.70	0.29	6 600	**2206 2RS**	35.5	35.5	56	1	0.25	2.55	3.94	2.67	0.260
	72	27	1.1	21.3	6.30	0.40	5 800	**2306 2RS**	37	37.8	65	1	0.26	2.40	3.72	2.52	0.500
35	72	23	1.1	15.8	5.15	0.32	5 700	**2207 2RS**	40.9	40.9	65	1	0.23	2.71	4.20	2.84	0.403
	80	31	1.5	25.1	7.95	0.49	5 100	**2307 2RS**	43.5	45.0	71.5	1.5	0.25	2.48	3.84	2.60	0.675
40	80	23	1.1	19.2	6.50	0.41	5 000	**2208 2RS**	47	48.1	73	1	0.22	2.83	4.38	2.97	0.505
	90	33	1.5	29.6	9.80	0.61	4 600	**2308 2RS**	48.5	49.6	81.5	1.5	0.25	2.57	3.98	2.69	0.925
45	85	23	1.1	21.8	7.35	0.46	4 600	**2209 2RS**	52	52.4	78	1	0.21	2.94	4.56	3.09	0.545
	100	36	1.5	38.1	12.9	0.80	4 100	**2309 2RS**	53.5	56.6	91.5	1.5	0.25	2.56	3.95	2.68	1.23
50	90	23	1.1	22.7	8.10	0.51	4 300	**2210 2RS**	56.5	56.5	83	1	0.21	3.07	4.76	3.22	0.590
	110	40	2	43.4	14.2	0.89	3 700	**2310 2RS**	60	62.5	100	2	0.23	2.70	4.17	2.83	1.64
55	100	25	1.5	26.8	10.0	0.63	3 900	**2211 2RS**	63.5	63.5	91.5	1.5	0.20	3.19	4.94	3.34	0.810

[Remark] Standard cage types used for the above bearings are described earlier in this section.

Self-aligning ball bearings extended inner ring type

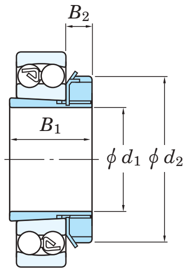
d 20 ~ 60 mm

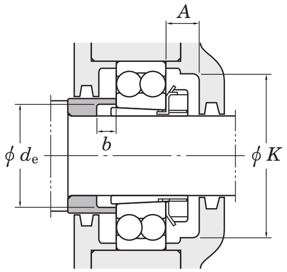




Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)		Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	B	C	F	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		D_a max.	r_a max.	e	Y_1	Y_2	Y_0	
20	47	40	14	29.2	1	9.90	2.65	0.16	14 000	17 000	**11204**	42	1	0.29	2.16	3.35	2.27	0.191
	52	44	15	31.5	1.1	12.4	3.35	0.21	13 000	15 000	**11304**	45.5	1	0.30	2.12	3.28	2.22	0.266
25	52	44	15	33.3	1	12.1	3.30	0.21	12 000	14 000	**11205**	47	1	0.28	2.28	3.52	2.39	0.226
	62	48	17	38	1.1	18.0	5.05	0.32	9 900	12 000	**11305**	55.5	1	0.27	2.31	3.57	2.42	0.445
30	62	48	16	40.1	1	15.6	4.70	0.29	9 900	12 000	**11206**	57	1	0.25	2.55	3.94	2.67	0.360
	72	52	19	45	1.1	21.3	6.30	0.40	8 700	11 000	**11306**	65.5	1	0.26	2.40	3.72	2.52	0.614
35	72	52	17	47.7	1.1	15.8	5.15	0.32	8 500	10 000	**11207**	65.5	1	0.23	2.71	4.20	2.84	0.556
	80	56	21	51.7	1.5	25.1	7.95	0.49	7 600	9 300	**11307**	72	1.5	0.25	2.48	3.84	2.60	0.821
40	80	56	18	54	1.1	19.2	6.50	0.41	7 500	9 200	**11208**	73.5	1	0.22	2.83	4.38	2.97	0.733
	90	58	23	57.7	1.5	29.6	9.80	0.61	6 900	8 400	**11308**	82	1.5	0.25	2.57	3.98	2.69	1.09
45	85	58	19	57.7	1.1	21.8	7.35	0.46	7 000	8 500	**11209**	78.5	1	0.21	2.94	4.56	3.09	0.793
	100	60	25	63.9	1.5	38.1	12.9	0.80	6 100	7 500	**11309**	92	1.5	0.25	2.56	3.95	2.68	1.40
50	90	58	20	62.7	1.1	22.7	8.10	0.51	6 500	7 900	**11210**	83.5	1	0.21	3.07	4.76	3.22	0.875
	110	62	27	70.3	2	43.4	14.2	0.89	5 600	6 800	**11310**	102	2	0.23	2.70	4.17	2.83	1.74
55	100	60	21	70.3	1.5	26.8	10.0	0.63	5 800	7 100	**11211**	93.5	1.5	0.20	3.19	4.94	3.34	1.16
60	110	62	22	78	1.5	30.2	11.6	0.73	5 200	6 400	**11212**	103.5	1.5	0.19	3.37	5.22	3.53	1.52

d_1 17 ~ (45) mm





Boundary dimensions (mm)				Brg. bore d (mm)	Designations Bearing + adapter ass'y	Mounting dimensions (mm)				Mass Brg.+adapter ass'y (kg)	(Refer.)	
d_1	B_1	d_2	B_2			A min.	K min.	d_e min.	b min.		Adapter sleeve No.	Locknut No.
17	24	32	7	20	1204K+**H204X**	—	—	23	5	0.162	A204X	AN04
	28	32	7	20	2204K+**H304X**	—	—	24	5	0.185	A304X	AN04
	28	32	7	20	1304K+**H304X**	—	—	24	8	0.210	A304X	AN04
	31	32	7	20	2304K+**H2304X**	—	—	24	5	0.257	A2304X	AN04
20	26	38	8	25	1205K+**H205X**	15	45	28	5	0.218	A205X	AN05
	29	38	8	25	2205K+**H305X**	15	45	29	5	0.243	A305X	AN05
	29	38	8	25	1305K+**H305X**	15	45	29	6	0.337	A305X	AN05
	35	38	8	25	2305K+**H2305X**	15	45	29	5	0.424	A2305X	AN05
25	27	45	8	30	1206K+**H206X**	15	50	33	5	0.320	A206X	AN06
	31	45	8	30	2206K+**H306X**	15	50	34	5	0.368	A306X	AN06
	31	45	8	30	1306K+**H306X**	15	50	34	6	0.495	A306X	AN06
	38	45	8	30	2306K+**H2306X**	15	50	35	5	0.620	A2306X	AN06
30	29	52	9	35	1207K+**H207X**	17	58	38	5	0.462	A207X	AN07
	35	52	9	35	2207K+**H307X**	17	58	39	5	0.557	A307X	AN07
	35	52	9	35	1307K+**H307X**	17	58	39	7	0.663	A307X	AN07
	43	52	9	35	2307K+**H2307X**	17	58	40	5	0.843	A2307X	AN07
35	31	58	10	40	1208K+**H208X**	17	65	44	5	0.597	A208X	AN08
	36	58	10	40	2208K+**H308X**	17	65	44	5	0.696	A308X	AN08
	36	58	10	40	1308K+**H308X**	17	65	44	5	0.906	A308X	AN08
	46	58	10	40	2308K+**H2308X**	17	65	45	5	1.14	A2308X	AN08
40	33	65	11	45	1209K+**H209X**	17	72	49	5	0.701	A209X	AN09
	39	65	11	45	2209K+**H309X**	17	72	49	8	0.798	A309X	AN09
	39	65	11	45	1309K+**H309X**	17	72	49	5	1.21	A309X	AN09
	50	65	11	45	2309K+**H2309X**	17	72	50	5	1.51	A2309X	AN09
45	35	70	12	50	1210K+**H210X**	19	76	53	5	0.804	A210X	AN10
	42	70	12	50	2210K+**H310X**	19	76	54	10	0.896	A310X	AN10

d_1 (45) ~ 80 mm

Boundary dimensions (mm)				Brg. bore d (mm)	Designations Bearing + adapter ass'y	Mounting dimensions (mm)				Mass Brg.+adapter ass'y (kg)	(Refer.)	
d_1	B_1	d_2	B_2			A min.	K min.	d_e min.	b min.		Adapter sleeve No.	Locknut No.
45	42	70	12	50	1310K+**H310X**	19	76	54	5	1.51	A310X	AN10
	55	70	12	50	2310K+**H2310X**	19	76	56	5	1.98	A2310X	AN10
50	37	75	12	55	1211K+**H211X**	19	85	60	6	1.02	A211X	AN11
	45	75	12	55	2211K+**H311X**	19	85	60	11	1.16	A311X	AN11
	45	75	12	55	1311K+**H311X**	19	85	60	6	1.93	A311X	AN11
	59	75	12	55	2311K+**H2311X**	19	85	61	6	2.50	A2311X	AN11
55	38	80	13	60	1212K+**H212X**	20	90	61	5	1.25	A212X	AN12
	47	80	13	60	2212K+**H312X**	20	90	65	9	1.49	A312X	AN12
	47	80	13	60	1312K+**H312X**	20	90	65	5	2.35	A312X	AN12
	62	80	13	60	2312K+**H2312X**	20	90	66	5	3.04	A2312X	AN12
60	40	85	14	65	1213K+**H213X**	21	96	70	5	1.56	A213X	AN13
	50	85	14	65	2213K+**H313X**	21	96	70	8	1.92	A313X	AN13
	50	85	14	65	1313K+**H313X**	21	96	70	5	2.90	A313X	AN13
65	43	98	15	75	1215K+**H215X**	23	110	80	5	2.09	A215X	AN15
	55	98	15	75	1315K+**H315X**	23	110	80	5	4.40	A315X	AN15
70	46	105	17	80	1216K+**H216X**	25	120	85	5	2.57	A216X	AN16
	59	105	17	80	1316K+**H316X**	25	120	86	5	5.21	A316X	AN16
75	50	110	18	85	1217K+**H217X**	27	128	90	6	3.11	A217X	AN17
	63	110	18	85	1317K+**H317X**	27	128	91	6	6.15	A317X	AN17
80	52	120	18	90	1218K+**H218X**	28	139	95	6	3.75	A218X	AN18
	65	120	18	90	1318K+**H318X**	28	139	96	6	7.16	A318X	AN18

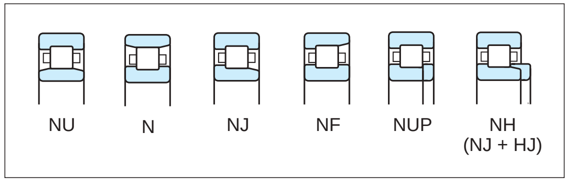
Cylindrical roller bearings

Cylindrical roller bearings feature high radial load capacity because the rollers and raceway are in linear contact. These bearings are suitable for applications that involve heavy radial and impact loading.

They are also appropriate for high-speed applications in that they can be machined very accurately due to their structure.

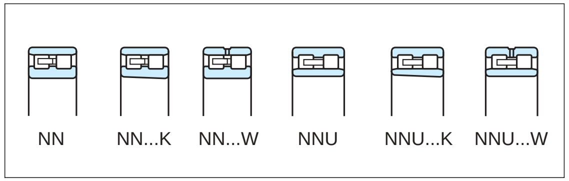
Having a separable inner ring or outer ring, these bearings can be mounted and dismounted easily.

■ Single-row cylindrical roller bearings



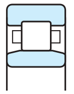
- The NU and N types exhibit their best performance when used as free side bearings since they adjust to the shaft's axial movement, to a certain extent, relative to the housing position.
- The NJ and NF types carry axial load in one direction, while the NUP and NH types can carry a certain degree of axial load in both directions.
- Type R cylindrical roller bearings feature enhanced load rating compared with standard series, though both have equal dimensions.
  This is because type R bearings have different internal design. They are identified by supplementary code "R".

■ Double-row cylindrical roller bearings

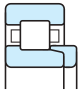


- Double-row cylindrical roller bearings come in two types : with a cylindrical bore, and with a tapered bore. As for those with a tapered bore, the specified amount of clearance can be obtained by adjusting the press-in distance. Some bearings have lubrication holes and lubrication grooves on the outer ring. They are identified by supplementary code "W".
- These bearings can accommodate high radial loads, and are often used on machine tool spindles.

Single-row cylindrical roller bearings



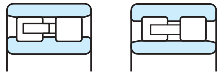
Bore diameter **20** – **460** mm



Thrust collar

Bore diameter **20** – **320** mm

Double-row cylindrical roller bearings



Bore diameter **25** – **480** mm

Boundary dimensions

The dimensions of standard series are as specified in JIS B 1512.

Tolerances

As specified in JIS B 1514-1 (refer to Table 7-3 on pp. A 60 – A 63).

Tolerances of roller set bore diameter F_w and roller set outside diameter E_w of interchangeable bearings are as follows :

Unit : µm

Nominal bore diameter d (mm)		Δ_{Fw} Roller set bore diameter deviation		Δ_{Ew} Roller set outside diameter deviation	
over	up to	upper	lower	upper	lower
–	**20**	+ 10	0	0	– 10
20	**50**	+ 15	0	0	– 15
50	**120**	+ 20	0	0	– 20
120	**200**	+ 25	0	0	– 25
200	**250**	+ 30	0	0	– 30
250	**315**	+ 35	0	0	– 35
315	**400**	+ 40	0	0	– 40
400	**500**	+ 45	0	–	–

[Remark] Interchangeable bearings have an inner ring with rollers that can be matched with the outer ring, or an outer ring with rollers that can be matched with the inner ring, without affecting performance in the bearing that has the same bearing number in one category.

Tapered bore tolerance and allowable values of high precision double-row cylindrical roller bearings (classes 5 and 4) are provided in JTEKT standards (refer to Table 7-11 on p. A 76).

Radial internal clearance

- Cylindrical bore and tapered bore bearings ....(refer to Table 10-8 on pp. A 106, 107.)
- Motor bearings.........(refer to Table 10-7 on p. A 105.)

Recommended fits

Refer to Table 9-4 on pp. A 91, 92.

Standard cages

■ For single-row cylindrical roller bearings :
- Pressed cage (supplementary code : //)
- Synthetic resin molded cage (supplementary code : FG)
- Copper alloy machined cage (supplementary code : FY)

For application range, refer to Table 1.

(Copper alloy machined cages without rivets (LY) are also used for some special purposes.)

■ For double-row cylindrical roller bearings :
- Prong type copper alloy machined cage (supplementary code : FY)
- Separable prong type copper alloy machined cage (supplementary code : FW) ....for class 5 or higher precision bearings

Allowable misalignment

Allowable misalignment of single-row cylindrical roller bearings depends on bearing type and specification.
General values are as follows :
1) When P_r / C_r is approx. 8% under load of normal use ....0.000 6 rad (2′) – 0.000 9 rad (3′)
2) When P_r / C_r is approx. 5% under load lighter than 1) ....0.001 2 rad (4′)

When very large allowable misalignment is required, consult with JTEKT.

Equivalent radial load

Dynamic equivalent radial load $P_r = F_r$
Static equivalent radial load $P_{0r} = F_r$

Allowable axial load

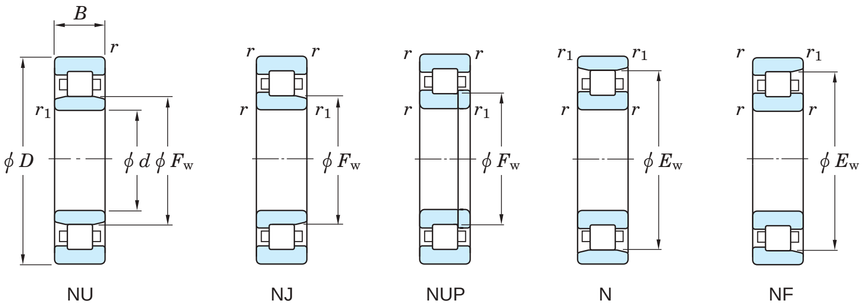
Cylindrical roller bearings with ribs, including loose rib and thrust collar, on both inner and outer rings accommodate axial load to a certain extent.
(NJ and NF types accommodate load applied in one direction :
NUP and NH in both directions.)
For calculation of allowable axial load, refer to p. A 44.

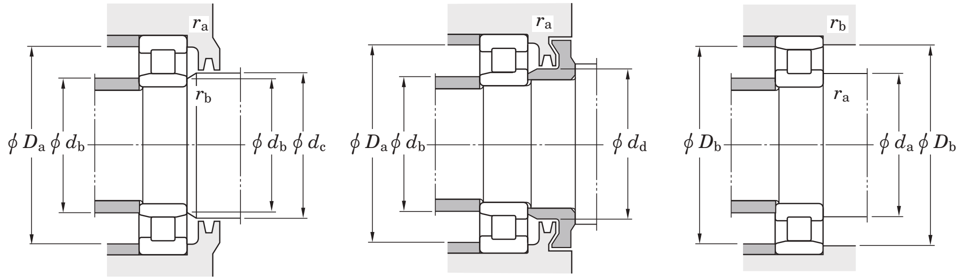
Table 1 Application of standard cages

Bearing series	Pressed cage	Synthetic resin molded cage	Machined cage
NU, NUP 10	—	—	1005 – 1092
N, NF 2	204 – 220	—	204 – 264
NU, NJ, NUP 2	—	—	244 – 264
NU, NJ, NUP 2 R	—	204R – 213R	214R – 240R
NU, NJ, NUP 22	2204 – 2220	—	2204 – 2252
NU, NJ, NUP 22 R	2204R – 2220R	—	2204R – 2240R
NU 32	—	—	3206 – 3252
N, NF 3	304 – 320	—	304 – 348
NU, NJ, NUP 3	—	—	334 – 348
NU, NJ, NUP 3 R	—	304R – 314R	315R – 332R
NU, NJ, NUP 23	2304 – 2320	—	2304 – 2340
NU, NJ, NUP 23 R	2304R – 2320R	—	2304R – 2332R
NU 33	—	—	3306 – 3352
NU, NJ, NUP, NF 4	406 – 420	—	406 – 430

Single-row cylindrical roller bearings

d 20 ~ (30) mm





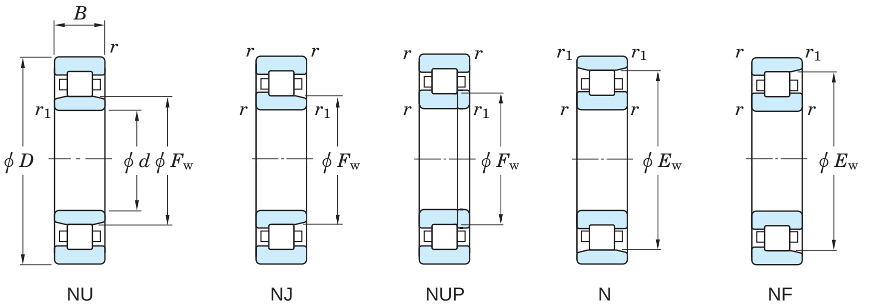
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
20	47	14	1	0.6	—	40	19.3	12.7	1.45	15 000	18 000	—	—	—	**N204**	**NF204**	25	—	—	—	32	42	43	42	1	0.6	(0.108)
	47	14	1	0.6	26.5	—	32.2	22.6	3.05	15 000	18 000	**NU204R**	**NJ204R**	**NUP204R**	—	—	25	24	26	29	32	42	—	—	1	0.6	0.112
	47	18	1	0.6	27	—	27.8	18.4	2.70	13 000	18 000	**NU2204**	**NJ2204**	**NUP2204**	—	—	25	24	26	29	32	42	—	—	1	0.6	0.146
	47	18	1	0.6	26.5	—	38.3	28.3	3.60	13 000	18 000	**NU2204R**	**NJ2204R**	**NUP2204R**	—	—	25	24	26	29	32	42	—	—	1	0.6	0.146
	52	15	1.1	0.6	—	44.5	28.9	19.2	2.50	12 000	16 000	—	—	—	**N304**	**NF304**	26.5	—	—	—	33	45.5	48	45.5	1	0.6	(0.147)
	52	15	1.1	0.6	27.5	—	39.4	26.9	3.75	12 000	16 000	**NU304R**	**NJ304R**	**NUP304R**	—	—	26.5	24	27	30	33	45.5	—	—	1	0.6	0.153
	52	21	1.1	0.6	28.5	—	38.0	30.2	3.60	11 000	16 000	**NU2304**	**NJ2304**	**NUP2304**	—	—	26.5	24	27	30	33	45.5	—	—	1	0.6	0.212
	52	21	1.1	0.6	27.5	—	52.5	38.8	5.40	11 000	16 000	**NU2304R**	**NJ2304R**	**NUP2304R**	—	—	26.5	24	27	30	33	45.5	—	—	1	1	0.215
25	47	12	0.6	0.3	30.5	—	17.8	13.1	2.25	15 000	18 000	**NU1005**	—	**NUP1005**	—	—	29	27	30	32	—	43	—	—	0.6	0.3	0.084
	52	15	1	0.6	—	45	22.1	15.7	1.80	13 000	16 000	—	—	—	**N205**	**NF205**	30	—	—	—	37	47	48	47	1	0.6	(0.132)
	52	15	1	0.6	31.5	—	36.7	27.7	3.75	13 000	15 000	**NU205R**	**NJ205R**	**NUP205R**	—	—	30	29	31	34	37	47	—	—	1	0.6	0.138
	52	18	1	0.6	32	—	29.6	22.8	3.05	12 000	16 000	**NU2205**	**NJ2205**	**NUP2205**	—	—	30	29	31	34	37	47	—	—	1	0.6	0.163
	52	18	1	0.6	31.5	—	43.6	34.6	4.40	12 000	15 000	**NU2205R**	**NJ2205R**	**NUP2205R**	—	—	30	29	31	34	37	47	—	—	1	0.6	0.166
	62	17	1.1	1.1	—	53	36.6	25.2	3.45	10 000	14 000	—	—	—	**N305**	**NF305**	31.5	—	—	—	40	55.5	55.5	55	1	1	(0.235)
	62	17	1.1	1.1	34	—	51.9	37.4	4.85	10 000	14 000	**NU305R**	**NJ305R**	**NUP305R**	—	—	31.5	31.5	33	37	40	55.5	—	—	1	1	0.243
	62	24	1.1	1.1	35	—	53.4	40.9	5.70	9 100	14 000	**NU2305**	**NJ2305**	**NUP2305**	—	—	31.5	31.5	33	37	40	55.5	—	—	1	1	0.340
	62	24	1.1	1.1	34	—	71.2	56.1	7.50	9 100	14 000	**NU2305R**	**NJ2305R**	**NUP2305R**	—	—	31.5	31.5	33	37	40	55.5	—	—	1	1	0.350
30	55	13	1	0.6	36.5	—	23.4	18.4	2.05	13 000	15 000	**NU1006**	—	**NUP1006**	—	—	35	34	35	38	—	50	—	—	1	0.6	0.121
	62	16	1	0.6	—	53.5	31.1	21.5	2.95	11 000	13 000	—	—	—	**N206**	**NF206**	35	—	—	—	44	57	58	56	1	0.6	(0.206)
	62	16	1	0.6	37.5	—	48.9	37.4	5.25	11 000	13 000	**NU206R**	**NJ206R**	**NUP206R**	—	—	35	34	37	40	44	57	—	—	1	0.6	0.209
	62	20	1	0.6	38.5	—	41.0	33.1	4.20	9 800	13 000	**NU2206**	**NJ2206**	**NUP2206**	—	—	35	34	37	40	44	57	—	—	1	0.6	0.262
	62	20	1	0.6	37.5	—	61.2	49.8	6.80	9 700	13 000	**NU2206R**	**NJ2206R**	**NUP2206R**	—	—	35	34	37	40	44	57	—	—	1	0.6	0.262
	62	23.8	1	1	38.5	—	53.3	46.4	5.95	8 700	13 000	**NU3206**	—	—	—	—	35	35	37	40	—	57	—	—	1	0.6	0.343
	72	19	1.1	1.1	—	62	48.3	35.2	5.00	8 700	12 000	—	—	—	**N306**	**NF306**	36.5	—	—	—	48	65.5	65.5	64	1	1	(0.353)
	72	19	1.1	1.1	40.5	—	66.5	50.2	6.80	8 700	12 000	**NU306R**	**NJ306R**	**NUP306R**	—	—	36.5	36.5	40	44	48	65.5	—	—	1	1	0.361
	72	27	1.1	1.1	42	—	64.3	50.8	7.15	7 700	12 000	**NU2306**	**NJ2306**	**NUP2306**	—	—	36.5	36.5	40	44	48	65.5	—	—	1	1	0.500
	72	27	1.1	1.1	40.5	—	93.3	77.6	10.1	7 800	12 000	**NU2306R**	**NJ2306R**	**NUP2306R**	—	—	36.5	36.5	40	44	48	65.5	—	—	1	1	0.534

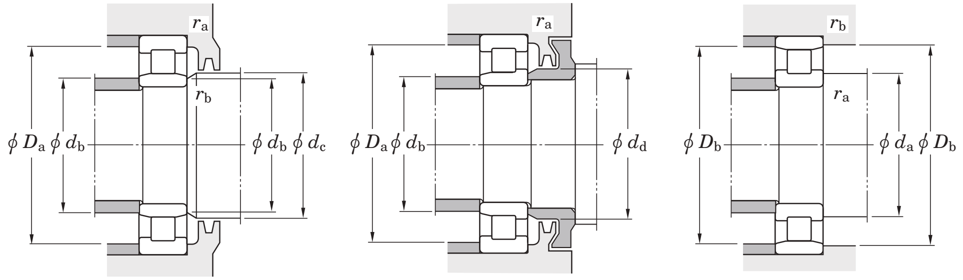
[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (30) ~ (45) mm





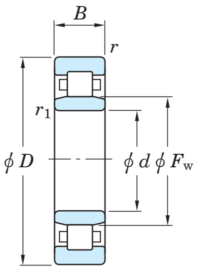
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r	r_1	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a	d_b		d_c	d_d	D_a	D_b		r_a	r_b	
			min.	min.													min.	min.	max.	min.	min.	max.	max.	min.	max.	max.	
30	72	30.2	1.1	1.1	42	—	86.4	74.3	9.95	7 700	12 000	**NU3306**	—	—	—	—	36.5	36.5	40	44	—	65.5	—	—	1	1	0.650
	90	23	1.5	1.5	45	73	78.3	55.0	7.95	7 600	10 000	**NU406**	**NJ406**	**NUP406**	**N406**	**NF406**	38	38	44	47	52	82	82	74	1.5	1.5	0.753
35	62	14	1	0.6	42	—	28.3	23.2	2.65	11 000	13 000	**NU1007**	—	**NUP1007**	—	—	40	39	41	44	—	57	—	—	1	0.5	0.182
	72	17	1.1	0.6	—	61.8	44.6	31.5	4.70	9 500	11 000	—	—	—	**N207**	**NF207**	41.5	—	—	—	50	65.5	68	64	1	0.6	(0.293)
	72	17	1.1	0.6	44	—	62.9	50.2	6.55	9 300	11 000	**NU207R**	**NJ207R**	**NUP207R**	—	—	41.5	39	43	46	50	65.5	—	—	1	0.6	0.306
	72	23	1.1	0.6	43.8	—	61.3	51.2	7.15	8 500	11 000	**NU2207**	**NJ2207**	**NUP2207**	—	—	41.5	39	43	46	50	65.5	—	—	1	0.6	0.402
	72	23	1.1	0.6	44	—	77.1	65.3	9.20	8 300	11 000	**NU2207R**	**NJ2207R**	**NUP2207R**	—	—	41.5	39	43	46	50	65.5	—	—	1	0.6	0.404
	72	27	1.1	1.1	43.8	—	68.5	59.1	7.90	7 600	11 000	**NU3207**	—	—	—	—	41.5	41.5	43	46	—	65.5	—	—	1	0.6	0.524
	80	21	1.5	1.1	—	68.2	62.0	46.9	6.20	7 900	10 000	—	—	—	**N307**	**NF307**	43	—	—	—	53	72	73.5	71	1.5	1	(0.477)
	80	21	1.5	1.1	46.2	—	83.3	65.4	9.35	7 700	10 000	**NU307R**	**NJ307R**	**NUP307R**	—	—	43	41.5	45	48	53	72	—	—	1.5	1	0.482
	80	31	1.5	1.1	46.2	—	75.5	65.7	7.95	7 000	10 000	**NU2307**	**NJ2307**	**NUP2307**	—	—	43	41.5	45	48	53	72	—	—	1.5	1	0.696
	80	31	1.5	1.1	46.2	—	116	101	15.0	6 900	10 000	**NU2307R**	**NJ2307R**	**NUP2307R**	—	—	43	41.5	45	48	53	72	—	—	1.5	1	0.729
	80	34.9	1.5	1.5	46.2	—	102	89.1	12.0	7 000	10 000	**NU3307**	—	—	—	—	43	43	45	48	—	72	—	—	1.5	1	0.908
	100	25	1.5	1.5	53	83	94.1	68.9	9.25	6 600	8 800	**NU407**	**NJ407**	**NUP407**	**N407**	**NF407**	43	43	52	55	61	92	92	84	1.5	1.5	1.02
40	68	15	1	0.6	47	—	31.2	25.7	3.10	10 000	12 000	**NU1008**	—	**NUP1008**	—	—	45	44	46	49	—	63	—	—	1	0.6	0.223
	80	18	1.1	1.1	—	70	54.7	42.9	6.15	8 300	10 000	—	—	—	**N208**	**NF208**	46.5	—	—	—	56	73.5	73.5	72	1	1	(0.374)
	80	18	1.1	1.1	49.5	—	69.6	55.4	7.35	8 300	9 900	**NU208R**	**NJ208R**	**NUP208R**	—	—	46.5	46.5	49	52	56	73.5	—	—	1	1	0.384
	80	23	1.1	1.1	50	—	72.8	62.0	8.75	7 500	10 000	**NU2208**	**NJ2208**	**NUP2208**	—	—	46.5	46.5	49	52	56	73.5	—	—	1	1	0.490
	80	23	1.1	1.1	49.5	—	90.5	77.6	10.3	7 400	9 900	**NU2208R**	**NJ2208R**	**NUP2208R**	—	—	46.5	46.5	49	52	56	73.5	—	—	1	1	0.490
	80	30.2	1.1	1.1	50	—	97.8	90.6	12.2	6 700	10 000	**NU3208**	—	—	—	—	46.5	46.5	49	52	—	73.5	—	—	1	1	0.711
	90	23	1.5	1.5	—	77.5	73.4	56.9	7.85	6 900	9 100	—	—	—	**N308**	**NF308**	48	—	—	—	60	82	82	80	1.5	1.5	(0.646)
	90	23	1.5	1.5	52	—	104	81.5	11.0	6 800	9 100	**NU308R**	**NJ308R**	**NUP308R**	—	—	48	48	51	55	60	82	—	—	1.5	1.5	0.664
	90	33	1.5	1.5	53.5	—	103	88.0	11.6	6 100	9 100	**NU2308**	**NJ2308**	**NUP2308**	—	—	48	48	51	55	60	82	—	—	1.5	1.5	0.956
	90	33	1.5	1.5	52	—	143	122	18.4	6 100	9 100	**NU2308R**	**NJ2308R**	**NUP2308R**	—	—	48	48	51	55	60	82	—	—	1.5	1.5	0.962
	90	36.5	1.5	1.5	53.5	—	130	119	17.6	6 100	9 100	**NU3308**	—	—	—	—	48	48	51	55	—	82	—	—	1.5	1.5	1.19
	110	27	2	2	58	92	120	89.1	12.6	6 000	8 000	**NU408**	**NJ408**	**NUP408**	**N408**	**NF408**	49	49	57	60	67	101	101	93	2	2	1.30
45	75	16	1	0.6	52.5	—	38.9	33.8	4.30	9 200	11 000	**NU1009**	—	**NUP1009**	—	—	50	49	52	54	—	70	—	—	1	0.6	0.289

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

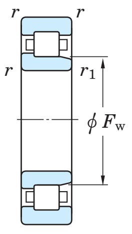
2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

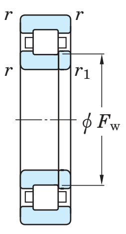
d (45) ~ (55) mm



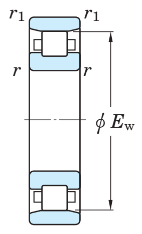
NU



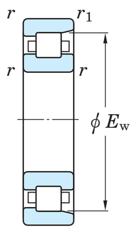
NJ



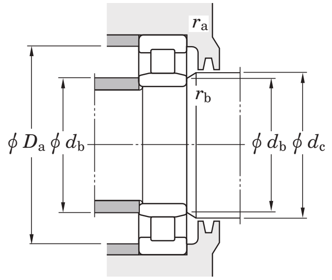
NUP

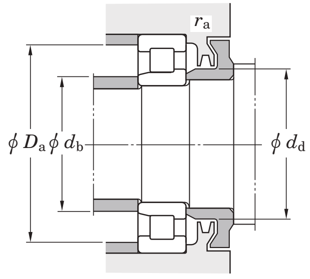


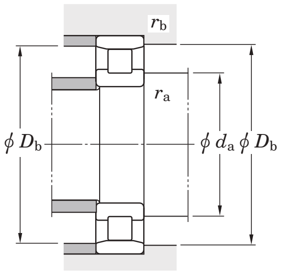
N



NF







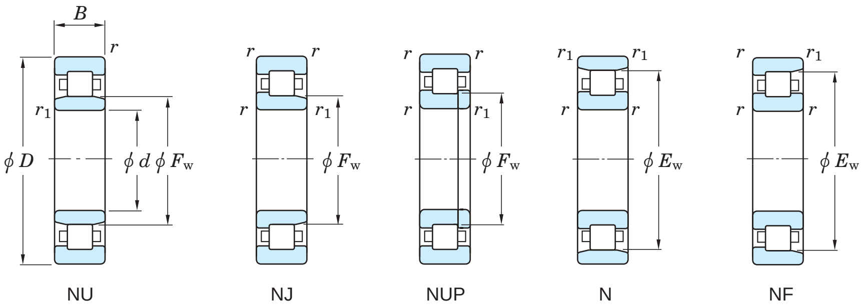
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
45	85	19	1.1	1.1	—	75	57.6	46.9	6.70	7 700	9 200	—	—	—	**N209**	**NF209**	51.5	—	—	—	61	78.5	78.5	77	1	1	(0.427)
	85	19	1.1	1.1	54.5	—	78.9	66.4	9.05	7 600	9 200	**NU209R**	**NJ209R**	**NUP209R**	—	—	51.5	51.5	54	57	61	78.5	—	—	1	1	0.439
	85	23	1.1	1.1	55	—	76.6	67.8	9.60	6 900	9 200	**NU2209**	**NJ2209**	**NUP2209**	—	—	51.5	51.5	54	57	61	78.5	—	—	1	1	0.536
	85	23	1.1	1.1	54.5	—	95.1	84.6	11.2	6 900	9 200	**NU2209R**	**NJ2209R**	**NUP2209R**	—	—	51.5	51.5	54	57	61	78.5	—	—	1	1	0.536
	85	30.2	1.1	1.1	55	—	103	99.0	13.3	6 100	9 200	**NU3209**	—	—	—	—	51.5	51.5	54	57	—	78.5	—	—	1	1	0.770
	100	25	1.5	1.5	—	86.5	98.5	77.5	11.3	6 200	8 300	—	—	—	**N309**	**NF309**	53	—	—	—	66	92	92	89	1.5	1.5	(0.865)
	100	25	1.5	1.5	58.5	—	122	98.3	13.5	6 100	8 200	**NU309R**	**NJ309R**	**NUP309R**	—	—	53	53	57	60	66	92	—	—	1.5	1.5	0.909
	100	36	1.5	1.5	58.5	—	124	113	14.3	5 500	8 300	**NU2309**	**NJ2309**	**NUP2309**	—	—	53	53	57	60	66	92	—	—	1.5	1.5	1.25
	100	36	1.5	1.5	58.5	—	172	153	23.0	5 400	8 200	**NU2309R**	**NJ2309R**	**NUP2309R**	—	—	53	53	57	60	66	92	—	—	1.5	1.5	1.32
	100	39.7	1.5	1.5	58.5	—	164	149	22.6	5 500	8 300	**NU3309**	—	—	—	—	53	53	57	60	—	92	—	—	1.5	1.5	1.59
	120	29	2	2	64.5	100.5	134	112	13.8	5 400	7 200	**NU409**	**NJ409**	**NUP409**	**N409**	**NF409**	54	54	63	66	74	111	111	102	2	2	1.64
50	80	16	1	0.6	57.5	—	42.2	36.8	4.80	8 400	9 900	**NU1010**	—	**NUP1010**	—	—	55	54	57	59	—	75	—	—	1	0.6	0.306
	90	20	1.1	1.1	—	80.4	60.3	51.0	7.30	7 100	8 500	—	—	—	**N210**	**NF210**	56.5	—	—	—	67	83.5	83.5	82	1	1	(0.479)
	90	20	1.1	1.1	59.5	—	82.5	71.9	9.85	7 100	8 500	**NU210R**	**NJ210R**	**NUP210R**	—	—	56.5	56.5	58	62	67	83.5	—	—	1	1	0.497
	90	23	1.1	1.1	60.4	—	80.3	73.6	10.4	6 400	8 500	**NU2210**	**NJ2210**	**NUP2210**	—	—	56.5	56.5	58	62	67	83.5	—	—	1	1	0.580
	90	23	1.1	1.1	59.5	—	99.5	91.5	12.1	6 400	8 500	**NU2210R**	**NJ2210R**	**NUP2210R**	—	—	56.5	56.5	58	62	67	83.5	—	—	1	1	0.580
	90	30.2	1.1	1.1	60.4	—	108	108	14.5	5 700	8 500	**NU3210**	—	—	—	—	56.5	56.5	58	62	—	83.5	—	—	1	1	0.829
	110	27	2	2	—	95	109	93.4	11.7	5 600	7 500	—	—	—	**N310**	**NF310**	59	—	—	—	73	101	101	98	2	2	(1.15)
	110	27	2	2	65	—	138	113	16.0	5 500	7 400	**NU310R**	**NJ310R**	**NUP310R**	—	—	59	59	63	67	73	101	—	—	2	2	1.15
	110	40	2	2	65	—	151	142	20.1	5 000	7 500	**NU2310**	**NJ2310**	**NUP2310**	—	—	59	59	63	67	73	101	—	—	2	2	1.69
	110	40	2	2	65	—	203	187	28.6	4 900	7 400	**NU2310R**	**NJ2310R**	**NUP2310R**	—	—	59	59	63	67	73	101	—	—	2	2	1.76
	110	44.4	2	2	65	—	195	183	27.3	5 000	7 500	**NU3310**	—	—	—	—	59	59	63	67	—	101	—	—	2	2	2.14
	130	31	2.1	2.1	70.8	110.8	161	136	17.4	4 900	6 600	**NU410**	**NJ410**	**NUP410**	**N410**	**NF410**	61	61	69	73	81	119	119	112	2	2	2.01
55	90	18	1.1	1	64.5	—	47.1	43.8	5.75	7 600	8 900	**NU1011**	—	**NUP1011**	—	—	61.5	60	63	66	—	83.5	—	—	1	1	0.445
	100	21	1.5	1.1	—	88.5	72.5	62.3	8.30	6 400	7 700	—	—	—	**N211**	**NF211**	63	—	—	—	73	92	93.5	91	1.5	1	(0.633)
	100	21	1.5	1.1	66	—	108	98.7	14.2	6 400	7 700	**NU211R**	**NJ211R**	**NUP211R**	—	—	63	61.5	65	68	73	92	—	—	1.5	1	0.650
	100	25	1.5	1.1	66.5	—	94.2	87.2	11.6	5 800	7 700	**NU2211**	**NJ2211**	**NUP2211**	—	—	63	61.5	65	68	73	92	—	—	1.5	1	0.780

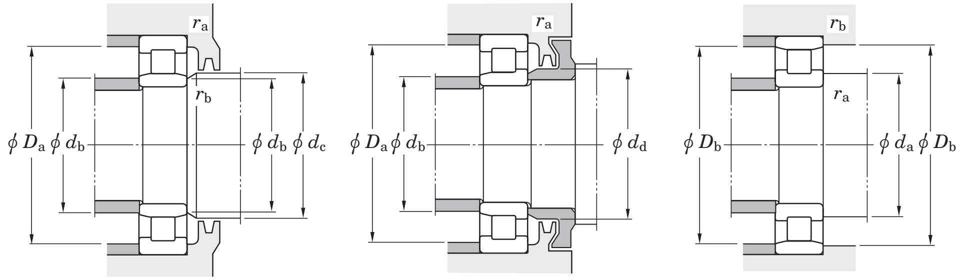
[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (55) ~ (65) mm





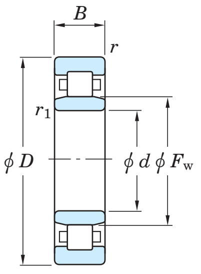
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
55	100	25	1.5	1.1	66	—	127	122	16.9	5 800	7 700	**NU2211R**	**NJ2211R**	**NUP2211R**	—	—	63	61.5	65	68	73	92	—	—	1.5	1	0.806
	100	33.3	1.5	1.5	66.5	—	119	118	16.1	5 100	7 700	**NU3211**	—	—	—	—	63	63	65	68	—	92	—	—	1.5	1	1.14
	120	29	2	2	—	104.5	138	111	15.8	5 100	6 800	—	—	—	**N311**	**NF311**	64	—	—	—	80	111	111	107	2	2	(1.44)
	120	29	2	2	70.5	—	172	143	19.8	5 100	6 700	**NU311R**	**NJ311R**	**NUP311R**	—	—	64	64	69	72	80	111	—	—	2	2	1.50
	120	43	2	2	70.5	—	185	162	24.6	4 500	6 800	**NU2311**	**NJ2311**	**NUP2311**	—	—	64	64	69	72	80	111	—	—	2	2	2.10
	120	43	2	2	70.5	—	251	233	35.3	4 500	6 700	**NU2311R**	**NJ2311R**	**NUP2311R**	—	—	64	64	69	72	80	111	—	—	2	2	2.25
	120	49.2	2	2	70.5	—	235	220	32.8	4 500	6 800	**NU3311**	—	—	—	—	64	64	69	72	—	111	—	—	2	2	2.81
	140	33	2.1	2.1	77.2	117.2	174	138	19.6	4 600	6 100	**NU411**	**NJ411**	**NUP411**	**N411**	**NF411**	66	66	76	79	87	129	129	119	2	2	2.51
60	95	18	1.1	1	69.5	—	53.0	50.0	6.75	7 000	8 300	**NU1012**	—	**NUP1012**	—	—	66.5	65	68	71	—	88.5	—	—	1	1	0.477
	110	22	1.5	1.5	—	97.5	85.7	79.9	10.4	5 800	7 000	—	—	—	**N212**	**NF212**	68	—	—	—	80	102	102	100	1.5	1.5	(0.823)
	110	22	1.5	1.5	72	—	122	107	15.7	5 800	6 900	**NU212R**	**NJ212R**	**NUP212R**	—	—	68	68	71	75	80	102	—	—	1.5	1.5	0.830
	110	28	1.5	1.5	73.5	—	120	123	15.3	5 200	7 000	**NU2212**	**NJ2212**	**NUP2212**	—	—	68	68	71	75	80	102	—	—	1.5	1.5	1.07
	110	28	1.5	1.5	72	—	164	157	21.7	5 200	6 900	**NU2212R**	**NJ2212R**	**NUP2212R**	—	—	68	68	71	75	80	102	—	—	1.5	1.5	1.09
	110	36.5	1.5	1.5	73.5	—	160	167	24.7	4 700	7 000	**NU3212**	—	—	—	—	68	68	71	75	—	102	—	—	1.5	1.5	1.52
	130	31	2.1	2.1	—	113	155	126	17.3	4 700	6 300	—	—	—	**N312**	**NF312**	71	—	—	—	86	119	119	116	2	2	(1.83)
	130	31	2.1	2.1	77	—	187	157	22.1	4 600	6 200	**NU312R**	**NJ312R**	**NUP312R**	—	—	71	71	75	79	86	119	—	—	2	2	1.87
	130	46	2.1	2.1	77	—	211	188	29.4	4 200	6 300	**NU2312**	**NJ2312**	**NUP2312**	—	—	71	71	75	79	86	119	—	—	2	2	2.69
	130	46	2.1	2.1	77	—	278	262	39.6	4 100	6 200	**NU2312R**	**NJ2312R**	**NUP2312R**	—	—	71	71	75	79	86	119	—	—	2	2	2.81
	130	54	2.1	2.1	77	—	275	265	39.9	4 200	6 300	**NU3312**	—	—	—	—	71	71	75	79	—	119	—	—	2	2	3.61
	150	35	2.1	2.1	83	127	209	184	26.1	4 200	5 700	**NU412**	**NJ412**	**NUP412**	**N412**	**NF412**	71	71	82	85	94	139	139	128	2	2	3.02
65	100	18	1.1	1	74.5	—	54.4	52.9	7.15	6 600	7 800	**NU1013**	—	**NUP1013**	—	—	71.5	70	73	76	—	93.5	—	—	1	1	0.506
	120	23	1.5	1.5	—	105.6	105	94.4	13.5	5 400	6 400	—	—	—	**N213**	**NF213**	73	—	—	—	87	112	112	108	1.5	1.5	(1.05)
	120	23	1.5	1.5	78.5	—	134	119	16.1	5 300	6 400	**NU213R**	**NJ213R**	**NUP213R**	—	—	73	73	77	81	87	112	—	—	1.5	1.5	1.05
	120	31	1.5	1.5	79.6	—	150	149	20.6	4 800	6 400	**NU2213**	**NJ2213**	**NUP2213**	—	—	73	73	77	81	87	112	—	—	1.5	1.5	1.43
	120	31	1.5	1.5	78.5	—	186	181	27.7	4 800	6 400	**NU2213R**	**NJ2213R**	**NUP2213R**	—	—	73	73	77	81	87	112	—	—	1.5	1.5	1.45
	120	38.1	1.5	1.5	79.6	—	186	197	29.7	4 300	6 400	**NU3213**	—	—	—	—	73	73	77	81	—	112	—	—	1.5	1.5	1.90
	140	33	2.1	2.1	—	121.5	169	139	19.2	4 300	5 800	—	—	—	**N313**	**NF313**	76	—	—	—	93	129	129	125	2	2	(2.19)

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (65) ~ (75) mm



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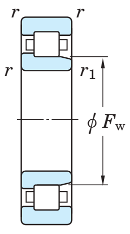
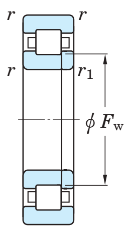


NJ



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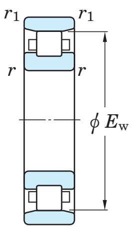

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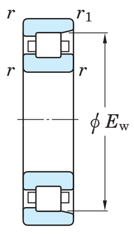
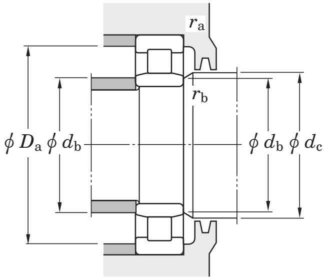
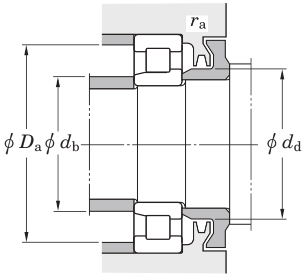
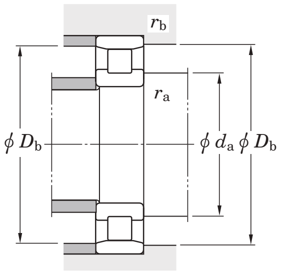


NF







Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
65	140	33	2.1	2.1	82.5	—	226	191	29.8	4 300	5 700	**NU313R**	**NJ313R**	**NUP313R**	—	—	76	76	81	85	93	129	—	—	2	2	2.31
	140	48	2.1	2.1	83.5	—	235	212	32.9	3 900	5 800	**NU2313**	**NJ2313**	**NUP2313**	—	—	76	76	81	85	93	129	—	—	2	2	3.25
	140	48	2.1	2.1	82.5	—	310	287	43.3	3 800	5 700	**NU2313R**	**NJ2313R**	**NUP2313R**	—	—	76	76	81	85	93	129	—	—	2	2	3.36
	140	58.7	2.1	2.1	83.5	—	302	294	43.9	3 900	5 800	**NU3313**	—	—	—	—	76	76	81	85	—	129	—	—	2	2	4.53
	160	37	2.1	2.1	89.3	135.3	228	203	28.2	4 000	5 300	**NU413**	**NJ413**	**NUP413**	**N413**	**NF413**	76	76	88	91	100	149	149	137	2	2	3.58
70	110	20	1.1	1	80	—	72.9	70.4	10.1	6 100	7 200	**NU1014**	—	**NUP1014**	—	—	76.5	75	78	82	—	103.5	—	—	1	1	0.702
	125	24	1.5	1.5	—	110.5	104	95.2	13.6	5 100	6 100	—	—	—	**N214**	**NF214**	78	—	—	—	92	117	117	114	1.5	1.5	(1.15)
	125	24	1.5	1.5	83.5	—	148	137	19.0	5 000	6 000	**NU214R**	**NJ214R**	**NUP214R**	—	—	78	78	82	86	92	117	—	—	1.5	1.5	1.16
	125	31	1.5	1.5	84.5	—	149	151	20.8	4 600	6 100	**NU2214**	**NJ2214**	**NUP2214**	—	—	78	78	82	86	92	117	—	—	1.5	1.5	1.52
	125	31	1.5	1.5	83.5	—	194	194	29.8	4 500	6 000	**NU2214R**	**NJ2214R**	**NUP2214R**	—	—	78	78	82	86	92	117	—	—	1.5	1.5	1.53
	125	39.7	1.5	1.5	84.5	—	185	198	30.0	4 100	6 100	**NU3214**	—	—	—	—	78	78	82	86	—	117	—	—	1.5	1.5	2.09
	150	35	2.1	2.1	—	130	198	168	23.3	4 000	5 400	—	—	—	**N314**	**NF314**	81	—	—	—	100	139	139	134	2	2	(2.73)
	150	35	2.1	2.1	89	—	256	222	33.4	4 000	5 300	**NU314R**	**NJ314R**	**NUP314R**	—	—	81	81	87	92	100	139	—	—	2	2	2.81
	150	51	2.1	2.1	90	—	279	262	39.3	3 600	5 400	**NU2314**	**NJ2314**	**NUP2314**	—	—	81	81	87	92	100	139	—	—	2	2	3.97
	150	51	2.1	2.1	89	—	342	323	47.1	3 600	5 300	**NU2314R**	**NJ2314R**	**NUP2314R**	—	—	81	81	87	92	100	139	—	—	2	2	4.08
	150	63.5	2.1	2.1	90	—	354	356	51.5	3 600	5 400	**NU3314**	—	—	—	—	81	81	87	92	—	139	—	—	2	2	5.62
	180	42	3	3	100	152	285	257	35.2	3 500	4 700	**NU414**	**NJ414**	**NUP414**	**N414**	**NF414**	83	83	99	102	112	167	167	153	2.5	2.5	5.26
75	115	20	1.1	1	85	—	80.0	78.1	10.2	5 700	6 800	**NU1015**	—	**NUP1015**	—	—	81.5	80	83	87	—	108.5	—	—	1	1	0.735
	130	25	1.5	1.5	—	116.5	121	118	16.1	4 800	5 800	—	—	—	**N215**	**NF215**	83	—	—	—	96	122	122	120	1.5	1.5	(1.24)
	130	25	1.5	1.5	88.5	—	163	156	21.9	4 800	5 700	**NU215R**	**NJ215R**	**NUP215R**	—	—	83	83	87	90	96	122	—	—	1.5	1.5	1.29
	130	31	1.5	1.5	88.5	—	162	172	22.3	4 300	5 800	**NU2215**	**NJ2215**	**NUP2215**	—	—	83	83	87	90	96	122	—	—	1.5	1.5	1.57
	130	31	1.5	1.5	88.5	—	202	207	31.5	4 300	5 700	**NU2215R**	**NJ2215R**	**NUP2215R**	—	—	83	83	87	90	96	122	—	—	1.5	1.5	1.61
	130	41.3	1.5	1.5	88.5	—	210	226	34.1	3 900	5 800	**NU3215**	—	—	—	—	83	83	87	90	—	122	—	—	1.5	1.5	2.28
	160	37	2.1	2.1	—	139.5	224	205	28.4	3 800	5 000	—	—	—	**N315**	**NF315**	86	—	—	—	106	149	149	143	2	2	(3.19)
	160	37	2.1	2.1	95	—	300	263	39.9	3 700	5 000	**NU315R**	**NJ315R**	**NUP315R**	—	—	86	86	93	97	106	149	—	—	2	2	3.37
	160	55	2.1	2.1	95.5	—	323	327	43.4	3 400	5 000	**NU2315**	**NJ2315**	**NUP2315**	—	—	86	86	93	97	106	149	—	—	2	2	4.84
	160	55	2.1	2.1	95	—	412	395	57.3	3 300	5 000	**NU2315R**	**NJ2315R**	**NUP2315R**	—	—	86	86	93	97	106	149	—	—	2	2	5.00

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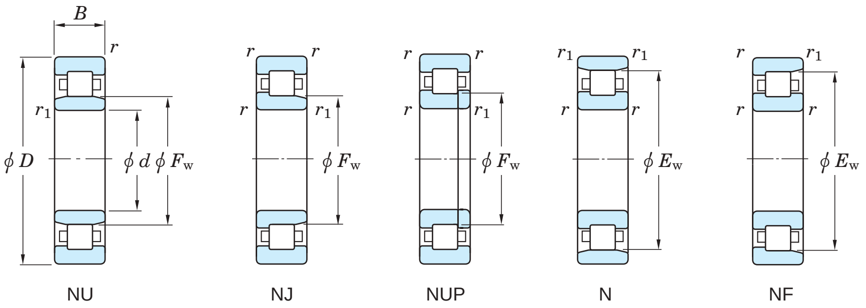
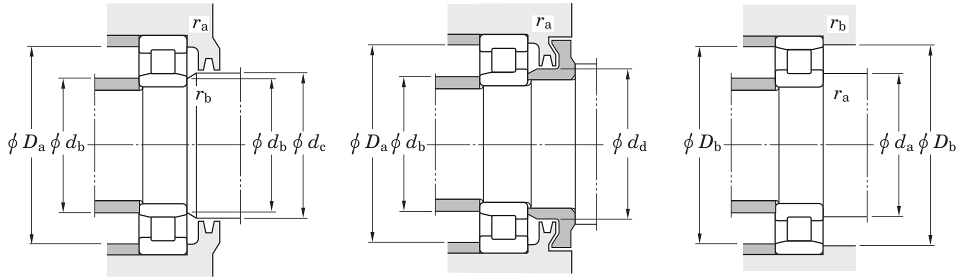
Single-row cylindrical roller bearings

d (75) ~ (90) mm





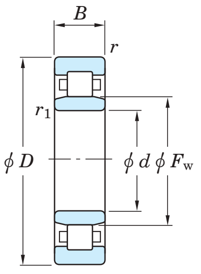
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
75	160	68.3	2.1	2.1	95.5	—	423	430	62.1	3 400	5 000	**NU3315**	—	—	—	—	86	86	93	97	—	149	—	—	2	2	6.86
	190	45	3	3	104.5	160.5	328	274	40.2	3 300	4 400	**NU415**	**NJ415**	**NUP415**	**N415**	**NF415**	88	88	103	107	118	177	177	162	2.5	2.5	6.25
80	125	22	1.1	1	91.5	—	87.2	86.4	11.5	5 300	6 300	**NU1016**	—	**NUP1016**	—	—	86.5	85	90	94	—	118.5	—	—	1	1	0.994
	140	26	2	2	—	125.3	133	122	16.2	4 500	5 400	—	—	—	**N216**	**NF216**	89	—	—	—	104	131	131	128	2	2	(1.51)
	140	26	2	2	95.3	—	174	167	23.0	4 400	5 300	**NU216R**	**NJ216R**	**NUP216R**	—	—	89	89	94	97	104	131	—	—	2	2	1.56
	140	33	2	2	95.3	—	184	186	27.8	4 000	5 400	**NU2216**	**NJ2216**	**NUP2216**	—	—	89	89	94	97	104	131	—	—	2	2	1.96
	140	33	2	2	95.3	—	233	243	35.8	4 000	5 300	**NU2216R**	**NJ2216R**	**NUP2216R**	—	—	89	89	94	97	104	131	—	—	2	2	2.03
	140	44.4	2	2	95.3	—	238	259	37.8	3 600	5 400	**NU3216**	—	—	—	—	89	89	94	97	—	131	—	—	2	2	2.87
	170	39	2.1	2.1	—	147	238	207	30.7	3 500	4 700	—	—	—	**N316**	**NF316**	91	—	—	—	114	159	159	151	2	2	(3.83)
	170	39	2.1	2.1	101	—	320	282	42.1	3 500	4 700	**NU316R**	**NJ316R**	**NUP316R**	—	—	91	91	99	105	114	159	—	—	2	2	4.00
	170	58	2.1	2.1	103	—	343	332	46.9	3 100	4 700	**NU2316**	**NJ2316**	**NUP2316**	—	—	91	91	99	105	114	159	—	—	2	2	5.83
	170	58	2.1	2.1	101	—	445	431	61.1	3 100	4 700	**NU2316R**	**NJ2316R**	**NUP2316R**	—	—	91	91	99	105	114	159	—	—	2	2	5.95
	170	68.3	2.1	2.1	103	—	423	436	61.9	3 100	4 700	**NU3316**	—	—	—	—	91	91	99	105	—	159	—	—	2	2	7.72
	200	48	3	3	110	170	374	315	45.2	3 100	4 200	**NU416**	**NJ416**	**NUP416**	**N416**	**NF416**	93	93	109	112	124	187	187	172	2.5	2.5	7.28
85	130	22	1.1	1	96.5	—	89.8	91.2	12.0	5 100	6 000	**NU1017**	—	**NUP1017**	—	—	91.5	90	95	99	—	123.5	—	—	1	1	1.04
	150	28	2	2	—	133.8	151	140	18.7	4 200	5 000	—	—	—	**N217**	**NF217**	94	—	—	—	110	141	141	137	2	2	(1.90)
	150	28	2	2	100.5	—	209	199	26.3	4 200	5 000	**NU217R**	**NJ217R**	**NUP217R**	—	—	94	94	99	104	110	141	—	—	2	2	1.94
	150	36	2	2	101.8	—	212	218	31.6	3 800	5 000	**NU2217**	**NJ2217**	**NUP2217**	—	—	94	94	99	104	110	141	—	—	2	2	2.50
	150	36	2	2	100.5	—	272	279	41.6	3 700	5 000	**NU2217R**	**NJ2217R**	**NUP2217R**	—	—	94	94	99	104	110	141	—	—	2	2	2.53
	150	49.2	2	2	101.8	—	269	296	42.1	3 300	5 000	**NU3217**	—	—	—	—	94	94	99	104	—	141	—	—	2	2	3.67
	180	41	3	3	—	156	281	247	35.6	3 300	4 500	—	—	—	**N317**	**NF317**	98	—	—	—	119	167	167	160	2.5	2.5	(4.52)
	180	41	3	3	108	—	364	330	48.3	3 300	4 400	**NU317R**	**NJ317R**	**NUP317R**	—	—	98	98	106	110	119	167	—	—	2.5	2.5	4.80
	180	60	3	3	108	—	394	382	54.2	3 000	4 500	**NU2317**	**NJ2317**	**NUP2317**	—	—	98	98	106	110	119	167	—	—	2.5	2.5	6.62
	180	60	3	3	108	—	491	485	67.7	2 900	4 400	**NU2317R**	**NJ2317R**	**NUP2317R**	—	—	98	98	106	110	119	167	—	—	2.5	2.5	6.98
	180	73	3	3	108	—	499	517	71.5	3 000	4 500	**NU3317**	—	—	—	—	98	98	106	110	—	167	—	—	2.5	2.5	9.23
	210	52	4	4	113	177	416	350	49.7	3 000	4 000	**NU417**	**NJ417**	**NUP417**	**N417**	**NF417**	101	101	111	115	128	194	194	179	3	3	8.68
90	140	24	1.5	1.1	103	—	106	109	14.6	4 700	5 600	**NU1018**	—	**NUP1018**	—	—	98	96.5	101	106	—	132	—	—	1.5	1	1.34

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (90) ~ (100) mm



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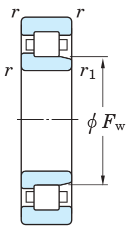

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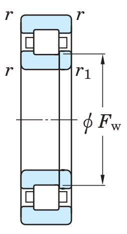

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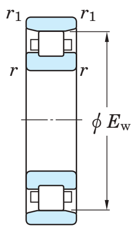

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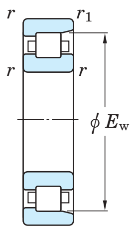

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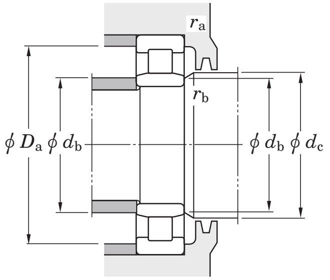
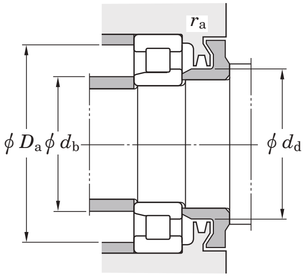
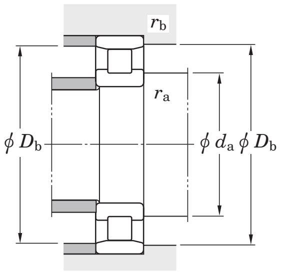






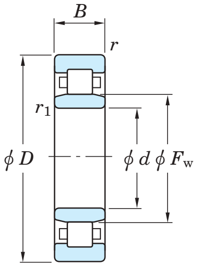
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds ($\min^{-1}$)		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
90	160	30	2	2	—	143	190	178	22.9	3 900	4 700	—	—	—	**N218**	**NF218**	99	—	—	—	116	151	151	146	2	2	(2.32)
	160	30	2	2	107	—	227	217	28.7	3 900	4 700	**NU218R**	**NJ218R**	**NUP218R**	—	—	99	99	105	109	116	151	—	—	2	2	2.38
	160	40	2	2	107	—	259	265	38.9	3 500	4 700	**NU2218**	**NJ2218**	**NUP2218**	—	—	99	99	105	109	116	151	—	—	2	2	3.10
	160	40	2	2	107	—	302	314	45.8	3 500	4 700	**NU2218R**	**NJ2218R**	**NUP2218R**	—	—	99	99	105	109	116	151	—	—	2	2	3.21
	160	52.4	2	2	107	—	338	373	52.8	3 100	4 700	**NU3218**	—	—	—	—	99	99	105	109	—	151	—	—	2	2	4.49
	190	43	3	3	—	165	300	265	38.7	3 100	4 200	—	—	—	**N318**	**NF318**	103	—	—	—	127	177	177	169	2.5	2.5	(5.27)
	190	43	3	3	113.5	—	395	355	50.6	3 100	4 100	**NU318R**	**NJ318R**	**NUP318R**	—	—	103	103	111	117	127	177	—	—	2.5	2.5	5.47
	190	64	3	3	115	—	408	395	55.5	2 800	4 200	**NU2318**	**NJ2318**	**NUP2318**	—	—	103	103	111	117	127	177	—	—	2.5	2.5	7.90
	190	64	3	3	113.5	—	544	534	74.5	2 800	4 100	**NU2318R**	**NJ2318R**	**NUP2318R**	—	—	103	103	111	117	127	177	—	—	2.5	2.5	8.12
	190	73	3	3	115	—	535	559	75.6	2 800	4 200	**NU3318**	—	—	—	—	103	103	111	117	—	177	—	—	2.5	2.5	10.3
	225	54	4	4	123.5	191.5	468	400	55.1	2 800	3 700	**NU418**	**NJ418**	**NUP418**	**N418**	**NF418**	106	106	122	125	139	209	209	194	3	3	10.3
95	145	24	1.5	1.1	108	—	110	115	15.2	4 500	5 300	**NU1019**	—	**NUP1019**	—	—	103	101.5	106	111	—	137	—	—	1.5	1	1.40
	170	32	2.1	2.1	—	151.5	207	195	25.1	3 700	4 400	—	—	—	**N219**	**NF219**	106	—	—	—	123	159	159	155	2	2	(2.80)
	170	32	2.1	2.1	112.5	—	275	265	38.3	3 700	4 400	**NU219R**	**NJ219R**	**NUP219R**	—	—	106	106	111	116	123	159	—	—	2	2	2.92
	170	43	2.1	2.1	113.5	—	288	298	42.9	3 300	4 400	**NU2219**	**NJ2219**	**NUP2219**	—	—	106	106	111	116	123	159	—	—	2	2	3.85
	170	43	2.1	2.1	112.5	—	358	371	52.8	3 300	4 400	**NU2219R**	**NJ2219R**	**NUP2219R**	—	—	106	106	111	116	123	159	—	—	2	2	3.93
	170	55.6	2.1	2.1	113.5	—	371	412	57.2	3 000	4 400	**NU3219**	—	—	—	—	106	106	111	116	—	159	—	—	2	2	5.42
	200	45	3	3	—	173.5	323	311	41.3	3 000	4 000	—	—	—	**N319**	**NF319**	108	—	—	—	134	187	187	178	2.5	2.5	(6.10)
	200	45	3	3	121.5	—	418	387	54.3	2 900	3 900	**NU319R**	**NJ319R**	**NUP319R**	—	—	108	108	119	124	134	187	—	—	2.5	2.5	6.42
	200	67	3	3	121.5	—	465	496	62.6	2 600	4 000	**NU2319**	**NJ2319**	**NUP2319**	—	—	108	108	119	124	134	187	—	—	2.5	2.5	9.39
	200	77.8	3	3	121.5	—	609	654	86.8	2 600	4 000	**NU3319**	—	—	—	—	108	108	119	124	—	187	—	—	2.5	2.5	12.1
	240	55	4	4	133.5	201.5	502	444	60.1	2 600	3 400	**NU419**	**NJ419**	**NUP419**	**N419**	**NF419**	111	111	132	136	149	224	224	204	3	3	13.6
100	150	24	1.5	1.1	113	—	114	120	15.8	4 300	5 100	**NU1020**	—	**NUP1020**	—	—	108	106.5	111	116	—	142	—	—	1.5	1	1.46
	180	34	2.1	2.1	—	160	229	217	28.1	3 500	4 200	—	—	—	**N220**	**NF220**	111	—	—	—	130	169	169	164	2	2	(3.38)
	180	34	2.1	2.1	119	—	312	306	43.0	3 500	4 200	**NU220R**	**NJ220R**	**NUP220R**	—	—	111	111	117	122	130	169	—	—	2	2	3.52
	180	46	2.1	2.1	120	—	322	338	47.3	3 100	4 200	**NU2220**	**NJ2220**	**NUP2220**	—	—	111	111	117	122	130	169	—	—	2	2	4.67
	180	46	2.1	2.1	119	—	417	444	60.7	3 100	4 200	**NU2220R**	**NJ2220R**	**NUP2220R**	—	—	111	111	117	122	130	169	—	—	2	2	4.82

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (100) ~ (120) mm



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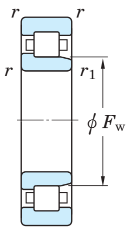

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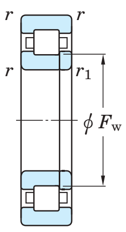

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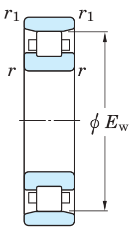

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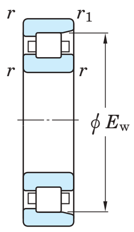

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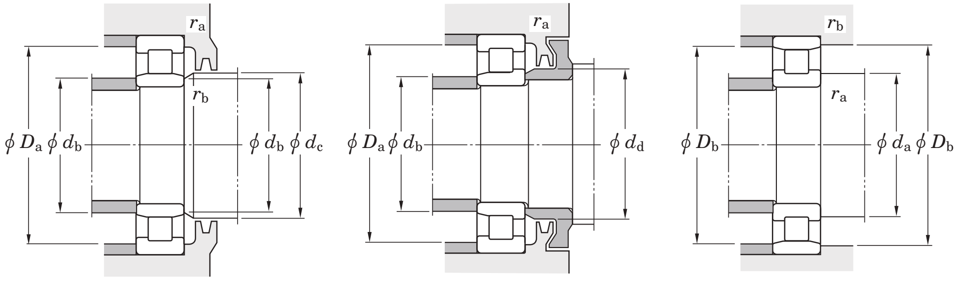


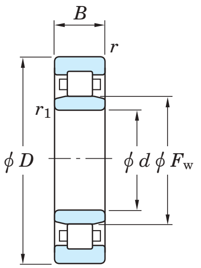
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds ($\min^{-1}$)		Bearing No.					Mounting dimensions (mm)											(Refer.) Mass
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	NU (N) (kg)
100	180	60.3	2.1	2.1	120	—	409	459	61.9	2 800	4 200	**NU3220**	—	—	—	—	111	111	117	122	—	169	—	—	2	2	6.62
	215	47	3	3	—	185.5	373	337	47.2	2 800	3 700	—	—	—	**N320**	**NF320**	113	—	—	—	143	202	202	190	2.5	2.5	(7.59)
	215	47	3	3	127.5	—	474	424	58.7	2 700	3 600	**NU320R**	**NJ320R**	**NUP320R**	—	—	113	113	125	132	143	202	—	—	2.5	2.5	7.75
	215	73	3	3	129.5	—	513	548	68.4	2 500	3 700	**NU2320**	**NJ2320**	**NUP2320**	—	—	113	113	125	132	143	202	—	—	2.5	2.5	11.9
	215	73	3	3	127.5	—	713	717	94.7	2 400	3 600	**NU2320R**	**NJ2320R**	**NUP2320R**	—	—	113	113	125	132	143	202	—	—	2.5	2.5	12.1
	215	82.6	3	3	129.5	—	663	706	93.2	2 500	3 700	**NU3320**	—	—	—	—	113	113	125	132	—	202	—	—	2.5	2.5	15.0
	250	58	4	4	139	211	560	498	67.3	2 500	3 300	**NU420**	**NJ420**	**NUP420**	**N420**	**NF420**	116	116	137	141	156	234	234	213	3	3	14.0
105	160	26	2	1.1	119.5	—	136	149	19.6	4 100	4 800	**NU1021**	—	**NUP1021**	—	—	114	111.5	118	122	—	151	—	—	2	1	1.85
	190	36	2.1	2.1	—	168.8	251	241	34.1	3 300	3 900	—	—	—	**N221**	**NF221**	116	—	—	—	137	179	179	173	2	2	(4.44)
	190	65.1	2.1	2.1	126.8	—	431	482	64.3	2 600	3 900	**NU3221**	—	—	—	—	116	116	124	129	—	179	—	—	2	2	8.00
	225	49	3	3	—	195	426	417	53.1	2 600	3 500	—	—	—	**N321**	**NF321**	118	—	—	—	149	212	212	199	2.5	2.5	(8.68)
	225	77	3	3	135	—	711	750	97.3	2 300	3 500	**NU2321**	—	**NUP2321**	—	—	118	118	131	138	—	212	—	—	2.5	2.5	15.6
	225	87.3	3	3	135	—	799	871	113	2 300	3 500	**NU3321**	—	—	—	—	118	118	132	137	—	212	—	—	2.5	2.5	17.4
	260	60	4	4	144.5	220.5	581	510	67.6	2 400	3 100	**NU421**	**NJ421**	**NUP421**	**N421**	**NF421**	121	121	143	147	162	244	244	223	3	3	19.1
110	170	28	2	1.1	125	—	168	171	21.7	3 800	4 500	**NU1022**	—	**NUP1022**	—	—	119	116.5	124	128	—	161	—	—	2	1	2.31
	200	38	2.1	2.1	—	178.5	300	290	40.1	3 100	3 700	—	—	—	**N222**	**NF222**	121	—	—	—	144	189	189	182	2	2	(5.24)
	200	38	2.1	2.1	132.5	—	366	365	51.1	3 100	3 700	**NU222R**	**NJ222R**	**NUP222R**	—	—	121	121	130	135	144	189	—	—	2	2	4.90
	200	53	2.1	2.1	132.5	—	397	442	55.1	2 800	3 700	**NU2222**	**NJ2222**	**NUP2222**	—	—	121	121	130	135	144	189	—	—	2	2	6.93
	200	53	2.1	2.1	132.5	—	479	517	69.9	2 800	3 700	**NU2222R**	**NJ2222R**	**NUP2222R**	—	—	121	121	130	135	144	189	—	—	2	2	6.93
	200	69.8	2.1	2.1	132.5	—	533	607	80.6	2 500	3 700	**NU3222**	—	—	—	—	121	121	130	135	—	189	—	—	2	2	9.55
	240	50	3	3	—	207	475	467	58.4	2 500	3 300	—	—	—	**N322**	**NF322**	123	—	—	—	158	227	227	211	2.5	2.5	(10.4)
	240	50	3	3	143	—	564	525	70.0	2 400	3 200	**NU322R**	**NJ322R**	**NUP322R**	—	—	123	123	140	145	158	227	—	—	2.5	2.5	10.7
	240	80	3	3	143	—	755	789	102	2 200	3 300	**NU2322**	**NJ2322**	**NUP2322**	—	—	123	123	140	145	158	227	—	—	2.5	2.5	18.8
	240	80	3	3	143	—	843	880	112	2 200	3 200	**NU2322R**	**NJ2322R**	**NUP2322R**	—	—	123	123	140	145	158	227	—	—	2.5	2.5	18.8
	240	92.1	3	3	143	—	849	918	118	2 200	3 300	**NU3322**	—	—	—	—	123	123	140	145	—	227	—	—	2.5	2.5	21.1
	280	65	4	4	155	235	685	621	80.8	2 200	2 900	**NU422**	**NJ422**	**NUP422**	**N422**	**NF422**	126	126	153	157	173	264	264	237	3	3	19.9
120	180	28	2	1.1	135	—	173	181	22.6	3 500	4 200	**NU1024**	—	**NUP1024**	—	—	129	126.5	134	138	—	171	—	—	2	1	2.47

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (120) ~ (140) mm



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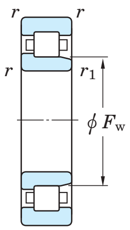

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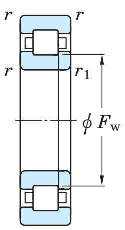

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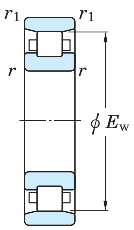

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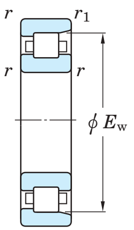

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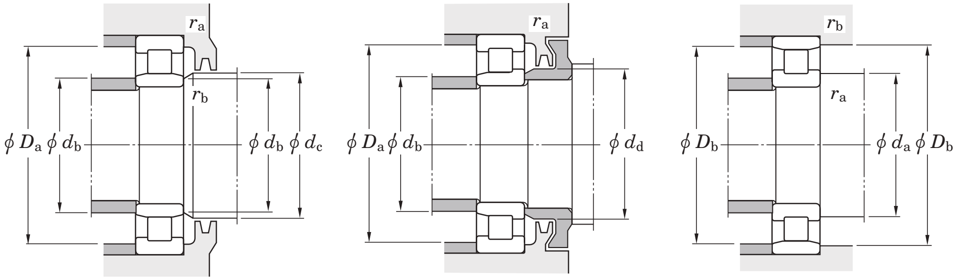


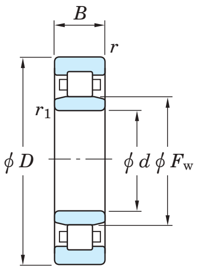
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
120	215	40	2.1	2.1	—	191.5	325	318	42.9	2 900	3 400	—	—	—	**N224**	**NF224**	131	—	—	—	156	204	204	196	2	2	(6.31)
	215	40	2.1	2.1	143.5	—	419	421	57.6	2 800	3 400	**NU224R**	**NJ224R**	**NUP224R**	—	—	131	131	141	146	156	204	—	—	2	2	5.85
	215	58	2.1	2.1	143.5	—	434	492	61.2	2 600	3 400	**NU2224**	**NJ2224**	**NUP2224**	—	—	131	131	141	146	156	204	—	—	2	2	8.56
	215	58	2.1	2.1	143.5	—	565	619	80.9	2 600	3 400	**NU2224R**	**NJ2224R**	**NUP2224R**	—	—	131	131	141	146	156	204	—	—	2	2	8.56
	215	76	2.1	2.1	143.5	—	596	695	89.2	2 300	3 400	**NU3224**	—	—	—	—	131	131	141	146	—	204	—	—	2	2	11.9
	260	55	3	3	—	226	561	551	67.1	2 200	3 000	—	—	—	**N324**	**NF324**	133	—	—	—	171	247	247	230	2.5	2.5	(13.1)
	260	55	3	3	154	—	660	610	79.8	2 200	3 000	**NU324R**	**NJ324R**	**NUP324R**	—	—	133	133	151	156	171	247	—	—	2.5	2.5	13.4
	260	86	3	3	154	—	886	918	116	2 000	3 000	**NU2324**	**NJ2324**	**NUP2324**	—	—	133	133	151	156	171	247	—	—	2.5	2.5	23.1
	260	86	3	3	154	—	991	1 030	129	2 000	3 000	**NU2324R**	**NJ2324R**	**NUP2324R**	—	—	133	133	151	156	172	247	—	—	2.5	2.5	23.1
	260	106	3	3	154	—	1 030	1 120	139	2 000	3 000	**NU3324**	—	—	—	—	133	133	151	156	—	247	—	—	2.5	2.5	28.3
	310	72	5	5	170	260	841	770	98.7	1 900	2 600	**NU424**	**NJ424**	**NUP424**	**N424**	**NF424**	140	140	168	172	190	290	290	262	4	4	28.0
130	200	33	2	1.1	148	—	215	238	29.5	3 200	3 800	**NU1026**	—	**NUP1026**	—	—	139	136.5	146	151	—	191	—	—	2	1	3.77
	230	40	3	3	—	204	338	362	45.2	2 700	3 200	—	—	—	**N226**	**NF226**	143	—	—	—	168	217	217	208	2.5	2.5	(7.21)
	230	40	3	3	153.5	—	454	453	61.0	2 600	3 200	**NU226R**	**NJ226R**	**NUP226R**	—	—	143	143	151	158	168	217	—	—	2.5	2.5	6.60
	230	64	3	3	156	—	474	560	68.7	2 400	3 200	**NU2226**	**NJ2226**	**NUP2226**	—	—	143	143	151	158	168	217	—	—	2.5	2.5	11.2
	230	64	3	3	153.5	—	662	737	95.8	2 400	3 200	**NU2226R**	**NJ2226R**	**NUP2226R**	—	—	143	143	151	158	168	217	—	—	2.5	2.5	11.2
	230	80	3	3	156	—	689	857	107	2 100	3 200	**NU3226**	—	—	—	—	143	143	151	158	—	217	—	—	2.5	2.5	14.1
	280	58	4	4	—	243	699	667	85.7	2 100	2 700	—	—	—	**N326**	**NF326**	146	—	—	—	184	264	264	247	3	3	(16.4)
	280	58	4	4	167	—	771	736	94.1	2 000	2 700	**NU326R**	**NJ326R**	**NUP326R**	—	—	146	146	164	169	184	264	—	—	3	3	16.7
	280	93	4	4	167	—	1 050	1 130	138	1 800	2 700	**NU2326**	**NJ2326**	**NUP2326**	—	—	146	146	164	169	184	264	—	—	3	3	29.1
	280	93	4	4	167	—	1 150	1 230	150	1 800	2 700	**NU2326R**	**NJ2326R**	**NUP2326R**	—	—	146	146	164	169	186	264	—	—	3	3	29.1
	280	112	4	4	167	—	1 170	1 290	158	1 800	2 700	**NU3326**	—	—	—	—	146	146	164	169	—	264	—	—	3	3	34.6
	340	78	5	5	185	285	964	876	108	1 800	2 300	**NU426**	**NJ426**	**NUP426**	**N426**	**NF426**	150	150	183	187	208	320	320	287	4	4	36.1
140	210	33	2	1.1	158	—	220	250	30.5	3 000	3 600	**NU1028**	—	**NUP1028**	—	—	149	146.5	156	161	—	201	—	—	2	1	4.00
	250	42	3	3	—	221	406	421	55.5	2 400	2 900	—	—	—	**N228**	**NF228**	153	—	—	—	182	237	237	228	2.5	2.5	(8.78)
	250	42	3	3	169	—	491	514	67.5	2 400	2 900	**NU228R**	**NJ228R**	**NUP228R**	—	—	153	153	166	171	182	237	—	—	2.5	2.5	8.50
	250	68	3	3	169	—	583	671	84.3	2 200	2 900	**NU2228**	**NJ2228**	**NUP2228**	—	—	153	153	166	171	182	237	—	—	2.5	2.5	14.3
	250	68	3	3	169	—	716	835	106	2 200	2 900	**NU2228R**	**NJ2228R**	**NUP2228R**	—	—	153	153	166	171	182	237	—	—	2.5	2.5	14.3

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (140) ~ (160) mm



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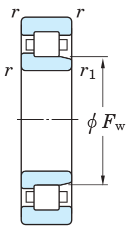

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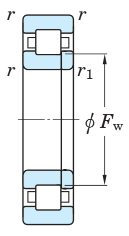

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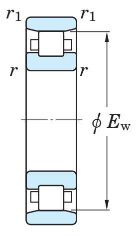

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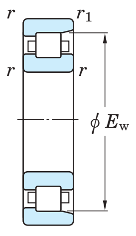

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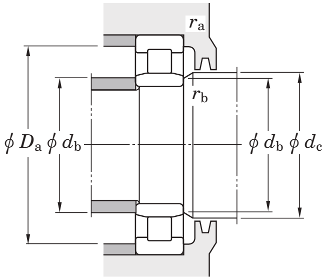
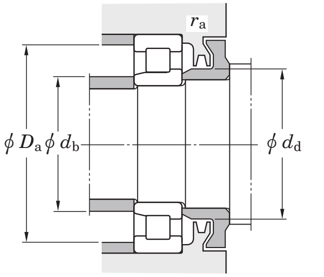
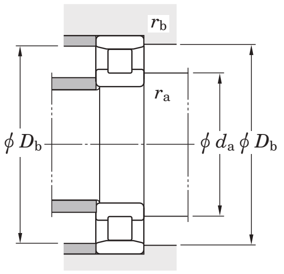






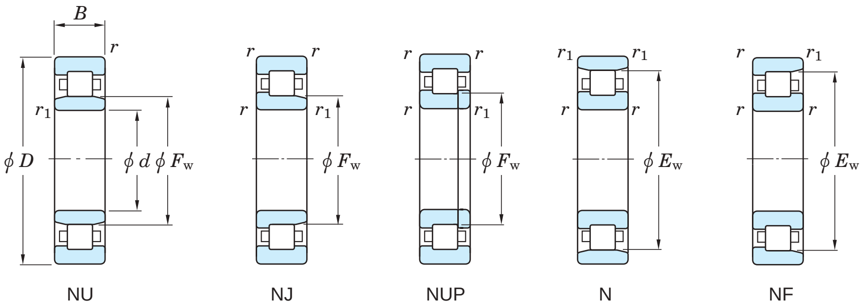
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
140	250	88	3	3	169	—	757	939	114	1 900	2 900	**NU3228**	—	—	—	—	153	153	166	171	—	237	—	—	2.5	2.5	18.5
	300	62	4	4	—	260	771	746	93.8	1 900	2 500	—	—	—	**N328**	**NF328**	156	—	—	—	198	284	284	264	3	3	(21.8)
	300	62	4	4	180	—	829	797	99.4	1 900	2 500	**NU328R**	**NJ328R**	**NUP328R**	—	—	156	156	176	182	198	284	—	—	3	3	21.8
	300	102	4	4	180	—	1 150	1 250	150	1 700	2 500	**NU2328**	**NJ2328**	**NUP2328**	—	—	156	156	176	182	198	284	—	—	3	3	36.8
	300	102	4	4	180	—	1 270	1 380	167	1 700	2 500	**NU2328R**	**NJ2328R**	**NUP2328R**	—	—	156	156	176	182	200	284	—	—	3	3	36.8
	300	118	4	4	180	—	1 360	1 550	185	1 700	2 500	**NU3328**	—	—	—	—	156	156	176	182	—	284	—	—	3	3	41.5
	360	82	5	5	198	302	1 090	1 020	124	1 600	2 200	**NU428**	**NJ428**	**NUP428**	**N428**	**NF428**	160	160	195	200	222	340	340	304	4	4	46.8
150	225	35	2.1	1.5	169.5	—	252	281	32.8	2 800	3 300	**NU1030**	—	**NUP1030**	—	—	161	158	167	173	—	214	—	—	2	1.5	4.83
	270	45	3	3	—	238	468	492	63.4	2 200	2 700	—	—	—	**N230**	**NF230**	163	—	—	—	196	257	257	245	2.5	2.5	(11.1)
	270	45	3	3	182	—	560	594	75.8	2 200	2 600	**NU230R**	**NJ230R**	**NUP230R**	—	—	163	163	179	184	196	257	—	—	2.5	2.5	10.7
	270	73	3	3	182	—	683	800	99.7	2 000	2 700	**NU2230**	**NJ2230**	**NUP2230**	—	—	163	163	179	184	196	257	—	—	2.5	2.5	18.7
	270	73	3	3	182	—	828	982	120	2 000	2 600	**NU2230R**	**NJ2230R**	**NUP2230R**	—	—	163	163	179	184	196	257	—	—	2.5	2.5	18.7
	270	96	3	3	182	—	939	1 200	143	1 800	2 700	**NU3230**	—	—	—	—	163	163	179	184	—	257	—	—	2.5	2.5	23.7
	320	65	4	4	—	277	829	807	99.1	1 800	2 300	—	—	—	**N330**	**NF330**	166	—	—	—	213	304	304	281	3	3	(25.6)
	320	65	4	4	193	—	948	922	115	1 700	2 300	**NU330R**	**NJ330R**	**NUP330R**	—	—	166	166	190	195	213	304	—	—	3	3	27.0
	320	108	4	4	193	—	1 270	1 400	167	1 600	2 300	**NU2330**	**NJ2330**	**NUP2330**	—	—	166	166	190	195	213	304	—	—	3	3	44.7
	320	108	4	4	193	—	1 450	1 600	187	1 500	2 300	**NU2330R**	**NJ2330R**	**NUP2330R**	—	—	166	166	190	195	213	304	—	—	3	3	44.7
	320	128	4	4	193	—	1 610	1 890	217	1 600	2 300	**NU3330**	—	—	—	—	166	166	190	195	—	304	—	—	3	3	51.4
	380	85	5	5	213	317	1 160	1 120	134	1 500	2 000	**NU430**	**NJ430**	**NUP430**	**N430**	**NF430**	170	170	210	216	237	360	360	319	4	4	53.3
160	240	38	2.1	1.5	180	—	297	330	42.8	2 600	3 000	**NU1032**	—	**NUP1032**	—	—	171	168	178	184	—	229	—	—	2	1.5	5.93
	290	48	3	3	—	255	535	568	71.3	2 100	2 500	—	—	—	**N232**	**NF232**	173	—	—	—	210	277	277	262	2.5	2.5	(13.9)
	290	48	3	3	195	—	624	666	83.3	2 000	2 400	**NU232R**	**NJ232R**	**NUP232R**	—	—	173	173	192	197	210	277	—	—	2.5	2.5	14.8
	290	80	3	3	195	—	790	939	113	1 800	2 500	**NU2232**	**NJ2232**	**NUP2232**	—	—	173	173	192	197	210	277	—	—	2.5	2.5	23.6
	290	80	3	3	193	—	1 010	1 190	141	1 800	2 400	**NU2232R**	**NJ2232R**	**NUP2232R**	—	—	173	173	192	197	210	277	—	—	2.5	2.5	23.6
	290	104	3	3	195	—	1 070	1 390	163	1 600	2 500	**NU3232**	—	—	—	—	173	173	192	197	—	277	—	—	2.5	2.5	29.8
	340	68	4	4	—	292	872	876	106	1 600	2 200	—	—	—	**N332**	**NF332**	176	—	—	—	228	324	324	296	3	3	(30.2)
	340	68	4	4	204	—	1 070	1 050	128	1 600	2 100	**NU332R**	**NJ332R**	**NUP332R**	—	—	176	176	200	211	228	324	—	—	3	3	32.0

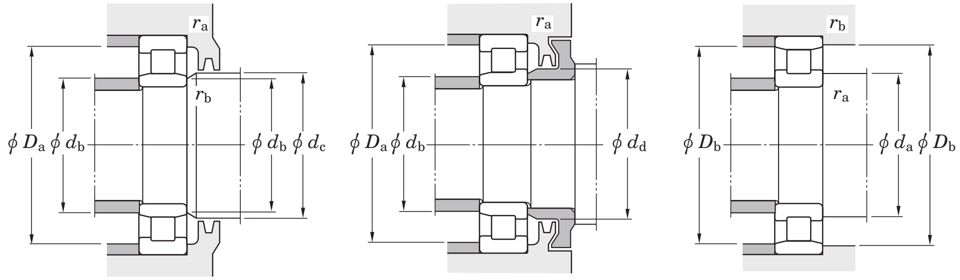
[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (160) ~ (190) mm





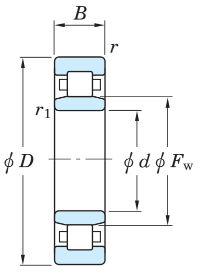
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
160	340	114	4	4	208	—	1 340	1 520	178	1 400	2 200	**NU2332**	**NJ2332**	**NUP2332**	—	—	176	176	200	211	228	324	—	—	3	3	53.1
	340	114	4	4	204	—	1 640	1 820	212	1 400	2 100	**NU2332R**	**NJ2332R**	**NUP2332R**	—	—	176	176	200	211	228	324	—	—	3	3	53.1
	340	136	4	4	208	—	1 590	1 890	216	1 400	2 200	**NU3332**	—	—	—	—	176	176	200	211	—	324	—	—	3	3	61.5
170	260	42	2.1	2.1	193	—	347	400	50.5	2 400	2 800	**NU1034**	—	**NUP1034**	—	—	181	181	190	197	—	249	—	—	2	2	7.90
	310	52	4	4	—	272	596	637	78.4	1 900	2 300	—	—	—	**N234**	**NF234**	186	—	—	—	223	294	294	280	3	3	(17.2)
	310	52	4	4	207	—	754	802	98.7	1 900	2 200	**NU234R**	**NJ234R**	**NUP234R**	—	—	186	186	204	211	223	294	—	—	3	3	18.6
	310	86	4	4	208	—	896	1 080	127	1 700	2 300	**NU2234**	**NJ2234**	**NUP2234**	—	—	186	186	204	211	223	294	—	—	3	3	29.2
	310	86	4	4	205	—	1 210	1 410	166	1 700	2 200	**NU2234R**	**NJ2234R**	**NUP2234R**	—	—	186	186	204	211	223	294	—	—	3	3	29.2
	310	110	4	4	208	—	1 210	1 580	181	1 500	2 300	**NU3234**	—	—	—	—	186	186	204	211	—	294	—	—	3	3	36.2
	360	72	4	4	220	310	997	1 010	122	1 500	2 000	**NU334**	**NJ334**	**NUP334**	**N334**	**NF334**	186	186	216	223	241	344	344	314	3	3	38.6
	360	120	4	4	220	—	1 530	1 750	199	1 300	2 000	**NU2334**	**NJ2334**	**NUP2334**	—	—	186	186	216	223	241	344	—	—	3	3	62.6
	360	140	4	4	220	—	1 770	2 120	240	1 300	2 000	**NU3334**	—	—	—	—	186	186	216	223	—	344	—	—	3	3	70.8
180	280	46	2.1	2.1	205	—	447	503	63.2	2 200	2 600	**NU1036**	—	**NUP1036**	—	—	191	191	203	209	—	269	—	—	2	2	10.5
	320	52	4	4	—	282	618	677	82.2	1 800	2 200	—	—	—	**N236**	**NF236**	196	—	—	—	233	304	304	290	3	3	(18.0)
	320	52	4	4	217	—	783	852	104	1 800	2 100	**NU236R**	**NJ236R**	**NUP236R**	—	—	196	196	214	221	233	304	—	—	3	3	19.3
	320	86	4	4	218	—	929	1 140	133	1 600	2 200	**NU2236**	**NJ2236**	**NUP2236**	—	—	196	196	214	221	233	304	—	—	3	3	30.4
	320	86	4	4	215	—	1 260	1 510	175	1 600	2 100	**NU2236R**	**NJ2236R**	**NUP2236R**	—	—	196	196	214	221	233	304	—	—	3	3	30.4
	320	112	4	4	218	—	1 250	1 680	190	1 400	2 200	**NU3236**	—	—	—	—	196	196	214	221	—	304	—	—	3	3	38.4
	380	75	4	4	232	328	1 130	1 150	136	1 400	1 900	**NU336**	**NJ336**	**NUP336**	**N336**	**NF336**	196	196	227	235	255	364	364	332	3	3	42.6
	380	126	4	4	232	—	1 690	1 940	220	1 300	1 900	**NU2336**	**NJ2336**	**NUP2336**	—	—	196	196	227	235	255	364	—	—	3	3	73.0
	380	150	4	4	232	—	2 070	2 520	276	1 300	1 900	**NU3336**	—	—	—	—	196	196	227	235	—	364	—	—	3	3	84.4
190	290	46	2.1	2.1	215	—	460	530	65.7	2 100	2 500	**NU1038**	—	**NUP1038**	—	—	201	201	213	219	—	279	—	—	2	2	10.9
	340	55	4	4	—	299	694	768	91.3	1 700	2 000	—	—	—	**N238**	**NF238**	206	—	—	—	247	324	324	310	3	3	(21.5)
	340	55	4	4	230	—	869	954	114	1 700	2 000	**NU238R**	**NJ238R**	**NUP238R**	—	—	206	206	227	234	247	324	—	—	3	3	23.3
	340	92	4	4	231	—	1 040	1 290	146	1 500	2 000	**NU2238**	**NJ2238**	**NUP2238**	—	—	206	206	227	234	247	324	—	—	3	3	37.0
	340	92	4	4	228	—	1 380	1 670	189	1 500	2 000	**NU2238R**	**NJ2238R**	**NUP2238R**	—	—	206	206	227	234	247	324	—	—	3	3	37.0
	340	120	4	4	231	—	1 420	1 930	226	1 300	2 000	**NU3238**	—	—	—	—	206	206	227	234	—	324	—	—	3	3	46.8

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d (190) ~ 240 mm



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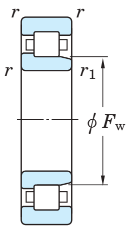
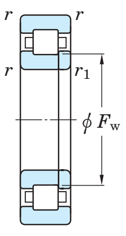
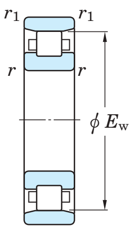


NJ



NUP



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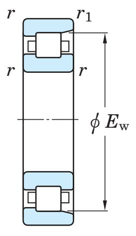

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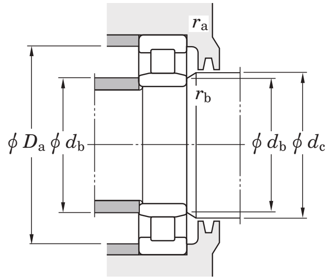
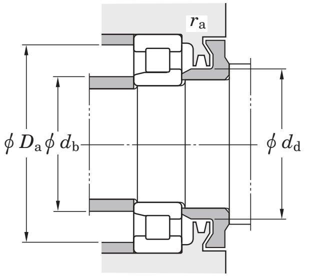
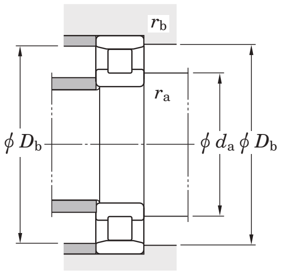






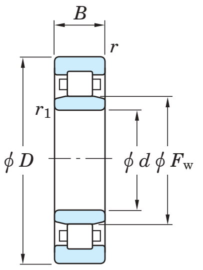
Boundary dimensions (mm) d	D	B	r min.	r_1 min.	F_w	E_w	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Bearing No. NU	NJ	NUP	N	NF	Mounting dimensions (mm) d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	(Refer.) Mass NU (N) (kg)
190	400	78	5	5	245	345	1 220	1 260	146	1 300	1 800	**NU338**	**NJ338**	**NUP338**	**N338**	**NF338**	210	210	240	248	268	380	380	349	4	4	49.9
	400	132	5	5	245	—	1 900	2 220	245	1 200	1 800	**NU2338**	**NJ2338**	**NUP2338**	—	—	210	210	240	248	268	380	—	—	4	4	84.7
	400	155	5	5	245	—	2 340	2 910	316	1 200	1 800	**NU3338**	—	—	—	—	210	210	240	248	—	380	—	—	4	4	96.5
200	310	51	2.1	2.1	229	—	487	582	71.0	1 900	2 300	**NU1040**	—	**NUP1040**	—	—	211	211	226	233	—	299	—	—	2	2	14.1
	360	58	4	4	—	316	775	865	102	1 600	1 900	—	—	—	**N240**	**NF240**	216	—	—	—	261	344	344	328	3	3	(25.7)
	360	58	4	4	243	—	958	1 060	124	1 600	1 900	**NU240R**	**NJ240R**	**NUP240R**	—	—	216	216	240	247	261	344	—	—	3	3	27.2
	360	98	4	4	244	—	1 190	1 490	169	1 400	1 900	**NU2240**	**NJ2240**	**NUP2240**	—	—	216	216	240	247	261	344	—	—	3	3	44.4
	360	98	4	4	241	—	1 530	1 870	211	1 400	1 900	**NU2240R**	**NJ2240R**	**NUP2240R**	—	—	216	216	240	247	261	344	—	—	3	3	44.4
	360	128	4	4	244	—	1 500	2 020	223	1 300	1 900	**NU3240**	—	—	—	—	216	216	240	247	—	344	—	—	3	3	56.2
	420	80	5	5	260	360	1 220	1 270	145	1 200	1 700	**NU340**	**NJ340**	**NUP340**	**N340**	**NF340**	220	220	254	263	283	400	400	364	4	4	56.2
	420	138	5	5	260	—	1 890	2 240	244	1 100	1 700	**NU2340**	**NJ2340**	**NUP2340**	—	—	220	220	254	263	283	400	—	—	4	4	97.4
	420	165	5	5	260	—	2 330	2 930	314	1 100	1 700	**NU3340**	—	—	—	—	220	220	250	258	—	400	—	—	4	4	113
220	340	56	3	3	250	—	637	748	88.1	1 700	2 000	**NU1044**	—	**NUP1044**	—	—	233	233	248	254	—	327	—	—	2.5	2.5	18.5
	400	65	4	4	270	350	949	1 080	123	1 400	1 700	**NU244**	**NJ244**	**NUP244**	**N244**	**NF244**	236	236	266	273	289	384	384	362	3	3	38.5
	400	108	4	4	270	—	1 420	1 810	196	1 200	1 700	**NU2244**	**NJ2244**	—	—	—	236	236	266	273	289	384	—	—	3	3	60.9
	400	144	4	4	270	—	2 040	2 880	319	1 100	1 700	**NU3244**	—	—	—	—	236	236	266	273	—	384	—	—	3	3	78.8
	460	88	5	5	284	396	1 490	1 570	176	1 100	1 500	**NU344**	**NJ344**	**NUP344**	**N344**	**NF344**	240	240	279	287	309	440	440	400	4	4	74.4
	460	145	5	5	284	—	2 260	2 690	287	990	1 500	**NU2344**	—	**NUP2344**	—	—	240	240	276	287	—	440	—	—	4	4	119
	460	180	5	5	284	—	2 660	3 300	347	990	1 500	**NU3344**	—	—	—	—	240	240	279	287	—	440	—	—	4	4	148
240	360	56	3	3	270	—	673	822	95.0	1 600	1 900	**NU1048**	—	**NUP1048**	—	—	253	253	268	275	—	347	—	—	2.5	2.5	20.1
	440	72	4	4	295	385	1 170	1 340	150	1 200	1 500	**NU248**	**NJ248**	**NUP248**	**N248**	**NF248**	256	256	293	298	316	424	424	397	3	3	52.1
	440	120	4	4	295	—	1 790	2 320	246	1 100	1 500	**NU2248**	**NJ2248**	—	—	—	256	256	293	298	316	424	—	—	3	3	82.5
	440	160	4	4	295	—	2 450	3 460	358	990	1 500	**NU3248**	—	—	—	—	256	256	293	298	—	424	—	—	3	3	107
	500	95	5	5	310	430	1 790	1 950	211	990	1 300	**NU348**	**NJ348**	**NUP348**	**N348**	**NF348**	260	260	305	313	337	480	480	434	4	4	94.6
	500	155	5	5	310	—	2 710	3 320	346	880	1 300	**NU2348**	—	**NUP2348**	—	—	260	260	303	313	—	480	—	—	4	4	152
	500	195	5	5	310	—	3 170	4 070	414	880	1 300	**NU3348**	—	—	—	—	260	260	305	313	—	480	—	—	4	4	189

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Single-row cylindrical roller bearings

d 260 ~ 460 mm



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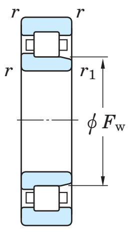
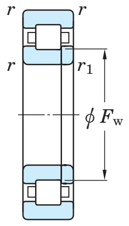


NJ



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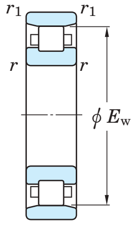

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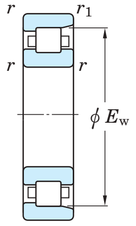

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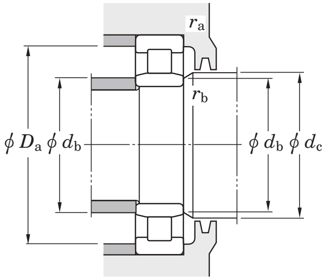
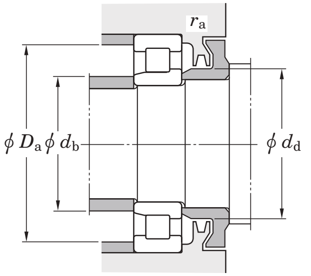
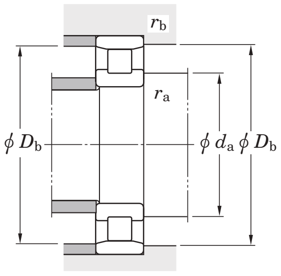






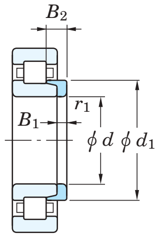
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.					Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
260	400	65	4	4	296	—	819	979	110	1 400	1 700	**NU1052**	—	**NUP1052**	—	—	276	276	292	300	—	384	—	—	3	3	29.2
	480	80	5	5	320	420	1 380	1 580	171	1 100	1 300	**NU252**	**NJ252**	**NUP252**	**N252**	**NF252**	280	280	318	323	343	460	460	432	4	4	69.0
	480	130	5	5	320	—	2 240	2 950	305	990	1 300	**NU2252**	**NJ2252**	—	—	—	280	280	318	323	343	460	—	—	4	4	107
	480	174	5	5	320	—	2 680	3 680	373	880	1 300	**NU3252**	—	—	—	—	280	280	318	323	—	460	—	—	4	4	139
	540	165	6	6	336	—	3 030	3 750	385	790	1 200	**NU2352**	—	**NUP2352**	—	—	284	284	327	339	—	516	—	—	5	5	185
	540	206	6	6	336	—	3 670	4 790	473	790	1 200	**NU3352**	—	—	—	—	284	284	330	339	—	516	—	—	5	5	232
280	420	65	4	4	316	—	841	1 030	114	1 300	1 500	**NU1056**	—	**NUP1056**	—	—	296	296	313	320	—	404	—	—	3	3	35.2
	500	80	5	5	340	440	1 430	1 680	179	1 000	1 200	**NU256**	**NJ256**	**NUP256**	**N256**	**NF256**	300	300	336	343	365	480	480	452	4	4	72.7
300	460	74	4	4	340	—	1 120	1 380	147	1 200	1 400	**NU1060**	—	**NUP1060**	—	—	316	316	337	344	—	444	—	—	3	3	44.1
	540	85	5	5	364	476	1 690	1 960	206	920	1 100	**NU260**	**NJ260**	**NUP260**	**N260**	**NF260**	320	320	361	368	392	520	520	487	4	4	90.7
320	480	74	4	4	360	—	1 150	1 450	152	1 100	1 300	**NU1064**	—	**NUP1064**	—	—	336	336	356	365	—	464	—	—	3	3	48.4
	580	92	5	5	390	510	1 920	2 270	232	840	1 000	**NU264**	**NJ264**	**NUP264**	**N264**	**NF264**	340	340	386	393	419	560	560	522	4	4	114
	670	112	7.5	7.5	425	—	2 460	2 880	287	650	870	**NU364**	—	—	—	—	352	352	419	428	—	638	638	575	6	6	199
340	520	82	5	5	385	—	1 370	1 750	183	980	1 200	**NU1068**	—	**NUP1068**	—	—	360	360	381	390	—	500	—	—	4	4	64.1
360	540	82	5	5	405	—	1 410	1 830	189	920	1 100	**NU1072**	—	**NUP1072**	—	—	380	380	401	410	—	520	—	—	4	4	67.1
380	560	82	5	5	425	—	1 440	1 920	195	860	1 000	**NU1076**	—	**NUP1076**	—	—	400	400	421	430	—	540	—	—	4	4	70.1
400	600	90	5	5	450	—	1 760	2 310	229	780	920	**NU1080**	—	**NUP1080**	—	—	420	420	446	455	—	580	—	—	4	4	91.0
420	620	90	5	5	470	—	1 750	2 320	228	730	860	**NU1084**	—	**NUP1084**	—	—	440	440	466	475	—	600	—	—	4	4	94.6
440	650	94	6	6	493	—	1 880	2 520	242	680	800	**NU1088**	—	**NUP1088**	—	—	464	464	489	498	—	626	—	—	5	5	109
460	680	100	6	6	516	—	2 000	2 730	259	630	750	**NU1092**	—	**NUP1092**	—	—	484	484	512	520	—	656	—	—	5	5	127

[Remarks] 1) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and limiting speeds shown above indicate the value applicable to machined cage. Consult JTEKT about bearings with pressed cage, since they may be different from bearings with machined cage in values above.

2) Bearing numbers of NU and NJ type bearings with mounted thrust collar (refer to specification table shown after this specification table) are NUJ and NH.

Thrust collars for cylindrical roller bearings

d 20 ~ (35) mm



Thrust collar

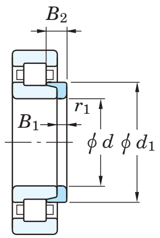
Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
20	29.7	3	6.75	0.6	**HJ204**	0.012	NJ204	NU204
	29.8	3	5.5	0.6	**HJ204R**	0.011	NJ204R	NU204R
	30	3	7.5	0.6	**HJ2204**	0.012	NJ2204	NU2204
	29.8	3	6.5	0.6	**HJ2204R**	0.012	NJ2204R	NU2204R
	31.8	4	7.5	0.6	**HJ304**	0.017	NJ304	NU304
	31.4	4	6.5	0.6	**HJ304R**	0.017	NJ304R	NU304R
	31.8	4	8.5	0.6	**HJ2304**	0.020	NJ2304	NU2304
	31.4	4	7.5	0.6	**HJ2304R**	0.018	NJ2304R	NU2304R
25	34.7	3	7.25	0.6	**HJ205**	0.015	NJ205	NU205
	34.8	3	6	0.6	**HJ205R**	0.014	NJ205R	NU205R
	34.7	3	7.5	0.6	**HJ2205**	0.015	NJ2205	NU2205
	34.8	3	6.5	0.6	**HJ2205R**	0.014	NJ2205R	NU2205R
	39	4	8	1.1	**HJ305**	0.025	NJ305	NU305
	38.2	4	7	1.1	**HJ305R**	0.025	NJ305R	NU305R
	39	4	9	1.1	**HJ2305**	0.025	NJ2305	NU2305
	38.2	4	8	1.1	**HJ2305R**	0.026	NJ2305R	NU2305R
30	41.8	4	8.25	0.6	**HJ206**	0.025	NJ206	NU206
	41.4	4	7	0.6	**HJ206R**	0.025	NJ206R	NU206R
	41.8	4	8.5	0.6	**HJ2206**	0.025	NJ2206	NU2206
	41.4	4	7.5	0.6	**HJ2206R**	0.025	NJ2206R	NU2206R
	45.9	5	9.5	1.1	**HJ306**	0.039	NJ306	NU306
	45.1	5	8.5	1.1	**HJ306R**	0.042	NJ306R	NU306R
	45.9	5	11.5	1.1	**HJ2306**	0.039	NJ2306	NU2306
	45.1	5	9.5	1.1	**HJ2306R**	0.043	NJ2306R	NU2306R
	50.5	7	11.5	1.5	**HJ406**	0.080	NJ406	NU406
35	47.6	4	8	0.6	**HJ207**	0.030	NJ207	NU207
	48.2	4	7	0.6	**HJ207R**	0.033	NJ207R	NU207R
	47.6	4	8.5	0.6	**HJ2207**	0.030	NJ2207	NU2207

d (35) ~ (50) mm

Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
35	48.2	4	8.5	0.6	**HJ2207R**	0.035	NJ2207R	NU2207R
	50.8	6	11	1.1	**HJ307**	0.056	NJ307	NU307
	51.1	6	9.5	1.1	**HJ307R**	0.060	NJ307R	NU307R
	50.8	6	14	1.1	**HJ2307**	0.056	NJ2307	NU2307
	51.1	6	11	1.1	**HJ2307R**	0.062	NJ2307R	NU2307R
	59	8	13	1.5	**HJ407**	0.120	NJ407	NU407
40	54.2	5	9	1.1	**HJ208**	0.046	NJ208	NU208
	54.1	5	8.5	1.1	**HJ208R**	0.049	NJ208R	NU208R
	54.2	5	9.5	1.1	**HJ2208**	0.046	NJ2208	NU2208
	54.1	5	9	1.1	**HJ2208R**	0.050	NJ2208R	NU2208R
	58.4	7	12.5	1.5	**HJ308**	0.083	NJ308	NU308
	57.7	7	11	1.5	**HJ308R**	0.088	NJ308R	NU308R
	58.4	7	14.5	1.5	**HJ2308**	0.083	NJ2308	NU2308
	57.7	7	12.5	1.5	**HJ2308R**	0.091	NJ2308R	NU2308R
	64.8	8	13	2	**HJ408**	0.140	NJ408	NU408
45	59	5	9.5	1.1	**HJ209**	0.053	NJ209	NU209
	59.1	5	8.5	1.1	**HJ209R**	0.055	NJ209R	NU209R
	59	5	9.5	1.1	**HJ2209**	0.053	NJ2209	NU2209
	59.1	5	9	1.1	**HJ2209R**	0.055	NJ2209R	NU2209R
	64	7	12.5	1.5	**HJ309**	0.099	NJ309	NU309
	64.5	7	11.5	1.5	**HJ309R**	0.110	NJ309R	NU309R
	64	7	15	1.5	**HJ2309**	0.099	NJ2309	NU2309
	64.5	7	13	1.5	**HJ2309R**	0.113	NJ2309R	NU2309R
	71.8	8	13.5	2	**HJ409**	0.175	NJ409	NU409
50	64.6	5	10	1.1	**HJ210**	0.063	NJ210	NU210
	64.1	5	9	1.1	**HJ210R**	0.061	NJ210R	NU210R
	64.6	5	9.5	1.1	**HJ2210**	0.063	NJ2210	NU2210
	64.1	5	9	1.1	**HJ2210R**	0.061	NJ2210R	NU2210R
	71	8	14	2	**HJ310**	0.142	NJ310	NU310

Thrust collars for cylindrical roller bearings

d (50) ~ (65) mm



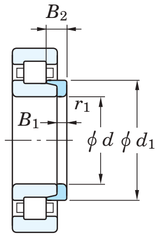
Thrust collar

Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
50	71.4	8	13	2	**HJ310R**	0.151	NJ310R	NU310R
	71	8	17	2	**HJ2310**	0.142	NJ2310	NU2310
	71.4	8	14.5	2	**HJ2310R**	0.155	NJ2310R	NU2310R
	78.8	9	14.5	2.1	**HJ410**	0.230	NJ410	NU410
55	70.8	6	11	1.1	**HJ211**	0.084	NJ211	NU211
	70.9	6	9.5	1.1	**HJ211R**	0.087	NJ211R	NU211R
	70.8	6	11	1.1	**HJ2211**	0.084	NJ2211	NU2211
	70.9	6	10	1.1	**HJ2211R**	0.088	NJ2211R	NU2211R
	77.2	9	15	2	**HJ311**	0.182	NJ311	NU311
	77.6	9	14	2	**HJ311R**	0.195	NJ311R	NU311R
	77.2	9	18.5	2	**HJ2311**	0.182	NJ2311	NU2311
	77.6	9	15.5	2	**HJ2311R**	0.200	NJ2311R	NU2311R
	85.2	10	16.5	2.1	**HJ411**	0.290	NJ411	NU411
60	78.4	6	11	1.5	**HJ212**	0.108	NJ212	NU212
	77.7	6	10	1.5	**HJ212R**	0.108	NJ212R	NU212R
	78.4	6	11	1.5	**HJ2212**	0.108	NJ2212	NU2212
	77.7	6	10	1.5	**HJ2212R**	0.108	NJ2212R	NU2212R
	84.2	9	15.5	2.1	**HJ312**	0.220	NJ312	NU312
	84.5	9	14.5	2.1	**HJ312R**	0.231	NJ312R	NU312R
	84.2	9	19	2.1	**HJ2312**	0.220	NJ2312	NU2312
	84.5	9	16	2.1	**HJ2312R**	0.237	NJ2312R	NU2312R
	91.8	10	16.5	2.1	**HJ412**	0.340	NJ412	NU412
65	84.8	6	11	1.5	**HJ213**	0.123	NJ213	NU213
	84.5	6	10	1.5	**HJ213R**	0.129	NJ213R	NU213R
	84.8	6	11.5	1.5	**HJ2213**	0.123	NJ2213	NU2213
	84.5	6	10.5	1.5	**HJ2213R**	0.131	NJ2213R	NU2213R
	91	10	17	2.1	**HJ313**	0.280	NJ313	NU313
	90.6	10	15.5	2.1	**HJ313R**	0.288	NJ313R	NU313R

d (65) ~ (80) mm

Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
65	91	10	20	2.1	**HJ2313**	0.280	NJ2313	NU2313
	90.6	10	18	2.1	**HJ2313R**	0.298	NJ2313R	NU2313R
	98.5	11	18	2.1	**HJ413**	0.420	NJ413	NU413
70	89.6	7	12.5	1.5	**HJ214**	0.150	NJ214	NU214
	89.5	7	11	1.5	**HJ214R**	0.157	NJ214R	NU214R
	89.6	7	12.5	1.5	**HJ2214**	0.150	NJ2214	NU2214
	89.5	7	11.5	1.5	**HJ2214R**	0.158	NJ2214R	NU2214R
	98	10	17.5	2.1	**HJ314**	0.330	NJ314	NU314
	97.5	10	15.5	2.1	**HJ314R**	0.330	NJ314R	NU314R
	98	10	20.5	2.1	**HJ2314**	0.330	NJ2314	NU2314
	97.5	10	18.5	2.1	**HJ2314R**	0.345	NJ2314R	NU2314R
	110.5	12	20	3	**HJ414**	0.605	NJ414	NU414
75	94	7	12.5	1.5	**HJ215**	0.156	NJ215	NU215
	94.5	7	11	1.5	**HJ215R**	0.166	NJ215R	NU215R
	94	7	12.5	1.5	**HJ2215**	0.156	NJ2215	NU2215
	94.5	7	11.5	1.5	**HJ2215R**	0.167	NJ2215R	NU2215R
	104.2	11	18.5	2.1	**HJ315**	0.400	NJ315	NU315
	104.2	11	16.5	2.1	**HJ315R**	0.410	NJ315R	NU315R
	104.2	11	21.5	2.1	**HJ2315**	0.400	NJ2315	NU2315
	104.2	11	19.5	2.1	**HJ2315R**	0.430	NJ2315R	NU2315R
	116	13	21.5	3	**HJ415**	0.710	NJ415	NU415
80	101.2	8	13.5	2	**HJ216**	0.207	NJ216	NU216
	101.6	8	12.5	2	**HJ216R**	0.222	NJ216R	NU216R
	101.2	8	13.5	2	**HJ2216**	0.207	NJ2216	NU2216
	101.6	8	12.5	2	**HJ2216R**	0.222	NJ2216R	NU2216R
	111.8	11	19.5	2.1	**HJ316**	0.470	NJ316	NU316
	110.6	11	17	2.1	**HJ316R**	0.460	NJ316R	NU316R
	111.8	11	23	2.1	**HJ2316**	0.470	NJ2316	NU2316
	110.6	11	20	2.1	**HJ2316R**	0.480	NJ2316R	NU2316R

d (80) ~ (100) mm



Thrust collar

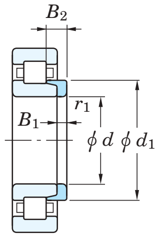
Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
80	122	13	22	3	**HJ416**	0.780	NJ416	NU416
85	108.2	8	14	2	**HJ217**	0.250	NJ217	NU217
	107.6	8	12.5	2	**HJ217R**	0.250	NJ217R	NU217R
	108.2	8	14	2	**HJ2217**	0.250	NJ2217	NU2217
	107.6	8	13	2	**HJ2217R**	0.252	NJ2217R	NU2217R
	117.5	12	20.5	3	**HJ317**	0.560	NJ317	NU317
	117.9	12	18.5	3	**HJ317R**	0.575	NJ317R	NU317R
	117.5	12	24	3	**HJ2317**	0.560	NJ2317	NU2317
	117.9	12	22	3	**HJ2317R**	0.595	NJ2317R	NU2317R
	126	14	24	4	**HJ417**	0.880	NJ417	NU417
90	114.2	9	15	2	**HJ218**	0.305	NJ218	NU218
	114.4	9	14	2	**HJ218R**	0.320	NJ218R	NU218R
	114.2	9	16	2	**HJ2218**	0.305	NJ2218	NU2218
	114.4	9	15	2	**HJ2218R**	0.325	NJ2218R	NU2218R
	125	12	21	3	**HJ318**	0.630	NJ318	NU318
	124.2	12	18.5	3	**HJ318R**	0.630	NJ318R	NU318R
	125	12	26	3	**HJ2318**	0.630	NJ2318	NU2318
	124.2	12	22	3	**HJ2318R**	0.660	NJ2318R	NU2318R
	137	14	24	4	**HJ418**	1.05	NJ418	NU418
95	121	9	15.5	2.1	**HJ219**	0.352	NJ219	NU219
	120.6	9	14	2.1	**HJ219R**	0.355	NJ219R	NU219R
	121	9	16.5	2.1	**HJ2219**	0.352	NJ2219	NU2219
	120.6	9	15.5	2.1	**HJ2219R**	0.365	NJ2219R	NU2219R
	132	13	22.5	3	**HJ319**	0.760	NJ319	NU319
	132.2	13	20.5	3	**HJ319R**	0.785	NJ319R	NU319R
	132	13	26.5	3	**HJ2319**	0.760	NJ2319	NU2319
	147	15	25.5	4	**HJ419**	1.30	NJ419	NU419
100	128	10	17	2.1	**HJ220**	0.444	NJ220	NU220

d (100) ~ 120 mm

Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
100	127.5	10	15	2.1	**HJ220R**	0.435	NJ220R	NU220R
	128	10	18	2.1	**HJ2220**	0.444	NJ2220	NU2220
	127.5	10	16	2.1	**HJ2220R**	0.450	NJ2220R	NU2220R
	140.5	13	22.5	3	**HJ320**	0.895	NJ320	NU320
	139.6	13	20.5	3	**HJ320R**	0.890	NJ320R	NU320R
	140.5	13	27.5	3	**HJ2320**	0.895	NJ2320	NU2320
	139.6	13	23.5	3	**HJ2320R**	0.920	NJ2320R	NU2320R
	153.5	16	27	4	**HJ420**	1.50	NJ420	NU420
105	135	10	17.5	2.1	**HJ221**	0.505	NJ221	NU221
	147	13	22.5	3	**HJ321**	0.970	NJ321	NU321
	159.5	16	27	4	**HJ421**	1.65	NJ421	NU421
110	141.5	11	18.5	2.1	**HJ222**	0.615	NJ222	NU222
	141.7	11	17	2.1	**HJ222R**	0.620	NJ222R	NU222R
	141.5	11	20.5	2.1	**HJ2222**	0.615	NJ2222	NU2222
	141.7	11	19.5	2.1	**HJ2222R**	0.645	NJ2222R	NU2222R
	155.5	14	23	3	**HJ322**	1.17	NJ322	NU322
	155.8	14	22	3	**HJ322R**	1.21	NJ322R	NU322R
	155.5	14	28	3	**HJ2322**	1.17	NJ2322	NU2322
	155.8	14	26.5	3	**HJ2322R**	1.27	NJ2322R	NU2322R
	171	17	29.5	4	**HJ422**	2.10	NJ422	NU422
120	153	11	19	2.1	**HJ224**	0.715	NJ224	NU224
	153.4	11	17	2.1	**HJ224R**	0.710	NJ224R	NU224R
	153	11	22	2.1	**HJ2224**	0.715	NJ2224	NU2224
	153.4	11	20	2.1	**HJ2224R**	0.745	NJ2224R	NU2224R
	168.5	14	23.5	3	**HJ324**	1.40	NJ324	NU324
	168.6	14	22.5	3	**HJ324R**	1.41	NJ324R	NU324R
	168.5	14	28	3	**HJ2324**	1.40	NJ2324	NU2324
	168.6	14	26	3	**HJ2324R**	1.46	NJ2324R	NU2324R
	188	17	30.5	5	**HJ424**	2.60	NJ424	NU424

Thrust collars for cylindrical roller bearings

d 130 ~ (160) mm



Thrust collar

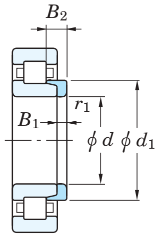
Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
130	165.5	11	19	3	**HJ226**	0.840	NJ226	NU226
	164.2	11	17	3	**HJ226R**	0.790	NJ226R	NU226R
	165.5	11	25	3	**HJ2226**	0.840	NJ2226	NU2226
	164.2	11	21	3	**HJ2226R**	0.840	NJ2226R	NU2226R
	182	14	24	4	**HJ326**	1.62	NJ326	NU326
	182.3	14	23	4	**HJ326R**	1.65	NJ326R	NU326R
	182	14	29.5	4	**HJ2326**	1.62	NJ2326	NU2326
	182.3	14	28	4	**HJ2326R**	1.73	NJ2326R	NU2326R
	205	18	32	5	**HJ426**	3.30	NJ426	NU426
140	179.5	11	19	3	**HJ228**	1.00	NJ228	NU228
	180	11	18	3	**HJ228R**	0.990	NJ228R	NU228R
	179.5	11	25	3	**HJ2228**	1.00	NJ2228	NU2228
	180	11	23	3	**HJ2228R**	1.07	NJ2228R	NU2228R
	196	15	26	4	**HJ328**	1.93	NJ328	NU328
	196	15	25	4	**HJ328R**	2.04	NJ328R	NU328R
	196	15	33.5	4	**HJ2328**	1.98	NJ2328	NU2328
	196	15	31	4	**HJ2328R**	2.14	NJ2328R	NU2328R
	219	18	33	5	**HJ428**	3.75	NJ428	NU428
150	193	12	20.5	3	**HJ230**	1.24	NJ230	NU230
	193.7	12	19.5	3	**HJ230R**	1.26	NJ230R	NU230R
	193	12	26.5	3	**HJ2230**	1.24	NJ2230	NU2230
	193.7	12	24.5	3	**HJ2230R**	1.35	NJ2230R	NU2230R
	210	15	26.5	4	**HJ330**	2.37	NJ330	NU330
	210	15	25	4	**HJ330R**	2.35	NJ330R	NU330R
	210	15	34	4	**HJ2330**	2.37	NJ2330	NU2330
	210	15	31.5	4	**HJ2330R**	2.48	NJ2330R	NU2330R
	234	20	36.5	5	**HJ430**	4.70	NJ430	NU430
160	207	12	21	3	**HJ232**	1.48	NJ232	NU232
	207.3	12	20	3	**HJ232R**	1.48	NJ232R	NU232R

d (160) ~ (200) mm

Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
160	205	12	28	3	**HJ2232**	1.48	NJ2232	NU2232
	206.1	12	24.5	3	**HJ2232R**	1.55	NJ2232R	NU2232R
	225	15	28	4	**HJ332**	2.75	NJ332	NU332
	222.1	15	25	4	**HJ332R**	2.59	NJ332R	NU332R
	225	15	37	4	**HJ2332**	2.75	NJ2332	NU2332
	222.1	15	32	4	**HJ2332R**	2.76	NJ2332R	NU2332R
170	220.5	12	22	4	**HJ234**	1.70	NJ234	NU234
	220.8	12	20	4	**HJ234R**	1.70	NJ234R	NU234R
	219	12	29	4	**HJ2234**	1.70	NJ2234	NU2234
	219.5	12	24	4	**HJ2234R**	1.79	NJ2234R	NU2234R
	238	16	29.5	4	**HJ334**	3.25	NJ334	NU334
	238	16	38.5	4	**HJ2334**	3.25	NJ2334	NU2334
180	230.5	12	22	4	**HJ236**	1.80	NJ236	NU236
	230.8	12	20	4	**HJ236R**	1.79	NJ236R	NU236R
	229	12	29	4	**HJ2236**	1.80	NJ2236	NU2236
	229.5	12	24	4	**HJ2236R**	1.88	NJ2236R	NU2236R
	252	17	30.5	4	**HJ336**	3.85	NJ336	NU336
	252	17	40	4	**HJ2336**	3.85	NJ2336	NU2336
190	244.5	13	23.5	4	**HJ238**	2.20	NJ238	NU238
	244.5	13	21.5	4	**HJ238R**	2.19	NJ238R	NU238R
	243	13	31.5	4	**HJ2238**	2.20	NJ2238	NU2238
	243.2	13	26.5	4	**HJ2238R**	2.31	NJ2238R	NU2238R
	265	18	32	5	**HJ338**	4.45	NJ338	NU338
	265	18	41.5	5	**HJ2338**	4.45	NJ2338	NU2338
200	258	14	25	4	**HJ240**	2.60	NJ240	NU240
	258.2	14	23	4	**HJ240R**	2.65	NJ240R	NU240R
	258	14	34	4	**HJ2240**	2.60	NJ2240	NU2240
	256.9	14	28	4	**HJ2240R**	2.78	NJ2240R	NU2240R
	280	18	33	5	**HJ340**	5.00	NJ340	NU340

Thrust collars for cylindrical roller bearings

d (200) ~ 320 mm



Thrust collar

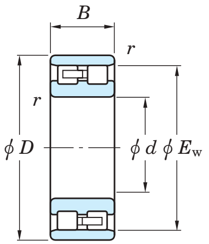
Boundary dimensions (mm)					Thrust collar No.	(Refer.) Mass (kg)	Applicable bearing No.	
d	d_1	B_1	B_2	r_1 min.			NJ	NU
200	280	18	44.5	5	**HJ2340**	5.00	NJ2340	NU2340
220	286	15	27.5	4	**HJ244**	3.55	NJ244	NU244
	286	15	36.5	4	**HJ2244**	3.55	NJ2244	NU2244
	307	20	36	5	**HJ344**	7.05	NJ344	NU344
240	313	16	29.5	4	**HJ248**	4.65	NJ248	NU248
	313	16	38.5	4	**HJ2248**	4.65	NJ2248	NU2248
	335	22	39.5	5	**HJ348**	8.20	NJ348	NU348
260	340	18	33	5	**HJ252**	6.20	NJ252	NU252
	340	18	40.5	5	**HJ2252**	6.20	NJ2252	NU2252
280	360	18	33	5	**HJ256**	7.15	NJ256	NU256
300	387	20	34.5	5	**HJ260**	7.40	NJ260	NU260
320	415	21	37	5	**HJ264**	11.3	NJ264	NU264

Double-row cylindrical roller bearings

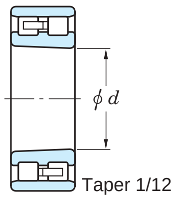
Koyo

d 25 ~ (110) mm

NN

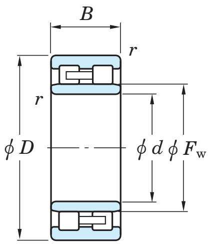


Cylindrical bore

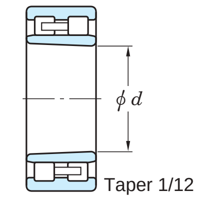


Tapered bore

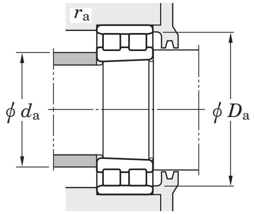
NNU

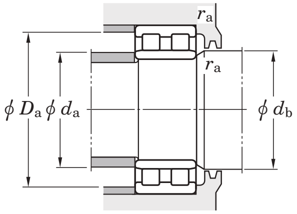


Cylindrical bore



Tapered bore



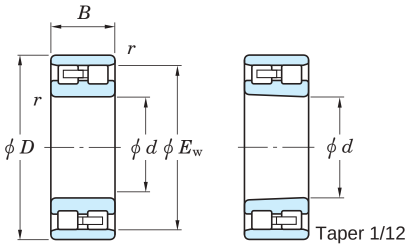


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. NN		Bearing No. NNU		Mounting dimensions (mm)						(Refer.) **Mass** (kg)	
d	D	B	r min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore	d_a min.	d_a max.	d_b min.	D_a max.	D_a min.	r_a max.	Cylindrical bore	Tapered bore
25	47	16	0.6	—	41.3	32.2	30.0	5.20	14 000	17 000	**NN3005**	**NN3005K**	—	—	29	—	—	43	42	0.6	0.127	0.123
30	55	19	1	—	48.5	46.0	44.1	4.95	12 000	14 000	**NN3006**	**NN3006K**	—	—	35	—	—	50	49	1	0.198	0.192
35	62	20	1	—	55	49.1	50.0	5.65	10 000	12 000	**NN3007**	**NN3007K**	—	—	40	—	—	57	56	1	0.253	0.246
40	68	21	1	—	61	52.0	55.9	6.35	9 100	11 000	**NN3008**	**NN3008K**	—	—	45	—	—	63	62	1	0.307	0.298
45	75	23	1	—	67.5	67.1	71.9	8.75	8 300	9 900	**NN3009**	**NN3009K**	—	—	50	—	—	70	69	1	0.404	0.382
50	80	23	1	—	72.5	66.4	72.6	8.85	7 600	9 100	**NN3010**	**NN3010K**	—	—	55	—	—	75	74	1	0.429	0.415
55	90	26	1.1	—	81	89.6	101	13.2	6 800	8 200	**NN3011**	**NN3011K**	—	—	61.5	—	—	83.5	82	1	0.637	0.618
60	95	26	1.1	—	86.1	91.6	106	13.9	6 400	7 700	**NN3012**	**NN3012K**	—	—	66.5	—	—	88.5	87	1	0.685	0.664
65	100	26	1.1	—	91	93.6	111	14.6	6 000	7 200	**NN3013**	**NN3013K**	—	—	71.5	—	—	93.5	92	1	0.728	0.705
70	110	30	1.1	—	100	122	148	20.6	5 500	6 500	**NN3014**	**NN3014K**	—	—	76.5	—	—	103.5	101	1	1.04	1.02
75	115	30	1.1	—	105	124	155	21.5	5 200	6 200	**NN3015**	**NN3015K**	—	—	81.5	—	—	108.5	106	1	1.11	1.08
80	125	34	1.1	—	113	149	186	26.6	4 800	5 800	**NN3016**	**NN3016K**	—	—	86.5	—	—	118.5	114	1	1.55	1.50
85	130	34	1.1	—	118	152	194	27.3	4 600	5 500	**NN3017**	**NN3017K**	—	—	91.5	—	—	123.5	119	1	1.63	1.58
90	140	37	1.5	—	127	179	228	29.3	4 200	5 100	**NN3018**	**NN3018K**	—	—	98	—	—	132	129	1.5	2.07	2.01
95	145	37	1.5	—	132	188	246	31.3	4 100	4 900	**NN3019**	**NN3019K**	—	—	103	—	—	137	134	1.5	2.17	2.10
100	140	40	1.1	113	—	173	258	32.9	4 000	4 800	—	—	**NNU4920**	**NNU4920K**	106.5	111	115	133.5	—	1	1.95	1.87
	150	37	1.5	—	137	196	265	33.3	3 900	4 700	**NN3020**	**NN3020K**	—	—	108	—	—	142	139	1.5	2.28	2.21
105	145	40	1.1	118	—	196	306	40.2	3 900	4 600	—	—	**NNU4921**	**NNU4921K**	111.5	116	120	138.5	—	1	2.00	1.91
	160	41	2	—	146	247	322	42.5	3 700	4 400	**NN3021**	**NN3021K**	—	—	114	—	—	151	148	2	2.88	2.81
110	150	40	1.1	123	—	204	326	42.4	3 700	4 500	—	—	**NNU4922**	**NNU4922K**	116.5	121	125	143.5	—	1	2.10	2.01

Double-row cylindrical roller bearings

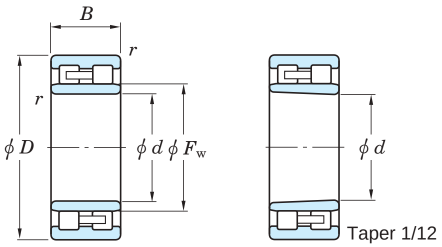
d (110) ~ (260) mm

NN

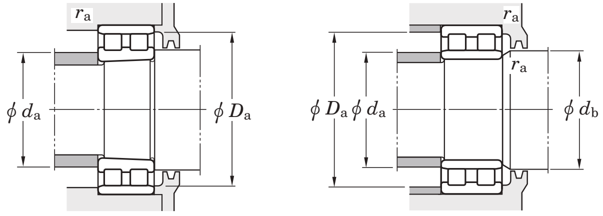


Cylindrical bore Tapered bore

NNU



Cylindrical bore Tapered bore

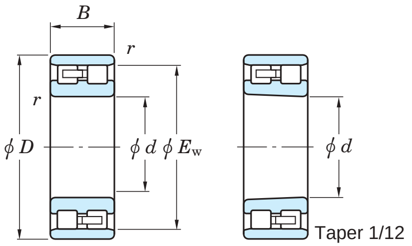


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. NN		NNU		Mounting dimensions (mm)						(Refer.) Mass (kg)	
d	D	B	r min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore	d_a min.	d_a max.	d_b min.	D_a max.	D_a min.	r_a max.	Cylindrical bore	Tapered bore
110	170	45	2	—	155	278	361	47.9	3 500	4 200	**NN3022**	**NN3022K**	—	—	119	—	—	161	157	2	3.65	3.56
120	165	45	1.1	134.5	—	234	373	47.6	3 400	4 000	—	—	**NNU4924**	**NNU4924K**	126.5	132	137	158.5	—	1	2.90	2.77
	180	46	2	—	165	291	392	51.1	3 200	3 900	**NN3024**	**NN3024K**	—	—	129	—	—	171	167	2	4.00	3.87
130	180	50	1.5	146	—	269	428	50.2	3 100	3 700	—	—	**NNU4926**	**NNU4926K**	138	143.5	148	172	—	1.5	3.90	3.73
	200	52	2	—	182	356	476	57.7	2 900	3 500	**NN3026**	**NN3026K**	—	—	139	—	—	191	183	2	5.94	5.76
140	190	50	1.5	156	—	277	456	52.5	2 900	3 500	—	—	**NNU4928**	**NNU4928K**	148	153.5	158	182	—	1.5	4.15	3.97
	210	53	2	—	192	372	516	61.5	2 700	3 300	**NN3028**	**NN3028K**	—	—	149	—	—	201	194	2	6.41	6.21
150	210	60	2	168.5	—	430	692	80.7	2 600	3 100	—	—	**NNU4930**	**NNU4930K**	159	166	171	201	—	2	6.50	6.22
	225	56	2.1	—	206	418	587	70.1	2 500	3 000	**NN3030**	**NN3030K**	—	—	161	—	—	214	208	2	7.74	7.50
160	220	60	2	178.5	—	425	695	79.8	2 500	3 000	—	—	**NNU4932**	**NNU4932K**	169	176	182	211	—	2	6.95	6.65
	240	60	2.1	—	219	499	695	79.6	2 400	2 800	**NN3032**	**NN3032K**	—	—	171	—	—	229	221	2	9.38	9.08
170	230	60	2	188.5	—	451	763	86.4	2 300	2 800	—	—	**NNU4934**	**NNU4934K**	179	186	192	221	—	2	7.20	6.88
	260	67	2.1	—	236	592	824	105	2 200	2 600	**NN3034**	**NN3034K**	—	—	181	—	—	249	238	2	12.8	12.4
180	250	69	2	202	—	572	964	117	2 100	2 600	—	—	**NNU4936**	**NNU4936K**	189	199.5	205	241	—	2	10.5	10.1
	280	74	2.1	—	255	705	958	118	2 000	2 400	**NN3036**	**NN3036K**	—	—	191	—	—	269	257	2	16.8	16.3
190	260	69	2	210	—	581	996	119	2 000	2 400	—	—	**NNU4938**	**NNU4938K**	199	207	215	251	—	2	11.0	10.5
	290	75	2.1	—	265	752	1 020	128	1 900	2 300	**NN3038**	**NN3038K**	—	—	201	—	—	279	267	2	17.6	17.1
200	280	80	2.1	223	—	636	1 050	125	1 900	2 300	—	—	**NNU4940**	**NNU4940K**	211	219.5	228	269	—	2	15.4	14.7
	310	82	2.1	—	282	793	1 120	137	1 700	2 100	**NN3040**	**NN3040K**	—	—	211	—	—	299	285	2	22.5	21.8
220	300	80	2.1	244	—	701	1 220	145	1 700	2 000	—	—	**NNU4944**	**NNU4944K**	231	241	248	289	—	2	16.7	16.0
	340	90	3	—	310	944	1 370	163	1 600	1 900	**NN3044**	**NN3044K**	—	—	233	—	—	327	313	2.5	29.3	28.4
240	320	80	2.1	263	—	736	1 340	155	1 600	1 900	—	—	**NNU4948**	**NNU4948K**	251	260	269	309	—	2	18.0	17.2
	360	92	3	—	330	1 090	1 590	184	1 400	1 700	**NN3048**	**NN3048K**	—	—	253	—	—	347	333	2.5	32.8	31.8
260	360	100	2.1	287	—	1 180	2 050	228	1 400	1 700	—	—	**NNU4952**	**NNU4952K**	271	284	296	349	—	2	31.4	30.0

Double-row cylindrical roller bearings

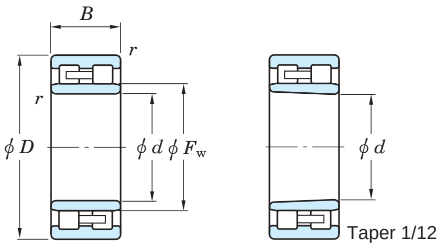
d (260) ~ 460 mm

NN

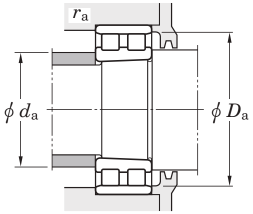


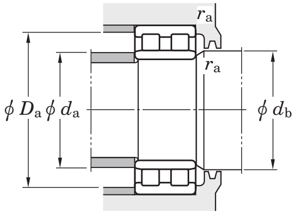
Cylindrical bore   Tapered bore

NNU



Cylindrical bore   Tapered bore





Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. NN		Bearing No. NNU		Mounting dimensions (mm)						(Refer.) Mass (kg)	
d	D	B	r min.	F_w	E_w	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore	d_a min.	d_a max.	d_b min.	D_a max.	D_a min.	r_a max.	Cylindrical bore	Tapered bore
260	400	104	4	—	364	1 290	1 830	204	1 300	1 500	**NN3052**	**NN3052K**	—	—	276	—	—	384	367	3	47.4	46.0
280	380	100	2.1	308	—	1 220	2 200	239	1 300	1 500	—	—	**NNU4956**	**NNU4956K**	291	305	316	369	—	2	33.1	31.6
	420	106	4	—	384	1 370	2 010	220	1 200	1 400	**NN3056**	**NN3056K**	—	—	296	—	—	404	387	3	51.2	49.6
300	420	118	3	339	—	1 470	2 720	285	1 100	1 300	—	—	**NNU4960**	**NNU4960K**	313	335	343	407	—	2.5	51.9	49.7
	460	118	4	—	418	1 610	2 460	266	1 100	1 300	**NN3060**	**NN3060K**	—	—	316	—	—	444	421	3	70.8	68.7
320	440	118	3	352	—	1 530	2 750	286	1 100	1 300	—	—	**NNU4964**	**NNU4964K**	333	348	363	427	—	2.5	53.7	51.4
	480	121	4	—	438	1 690	2 670	283	980	1 200	**NN3064**	**NN3064K**	—	—	336	—	—	464	442	3	76.4	74.0
340	460	118	3	372	—	1 580	2 930	301	990	1 200	—	—	**NNU4968**	**NNU4968K**	353	368	383	447	—	2.5	56.8	54.3
	520	133	5	—	473	2 090	3 090	345	880	1 100	**NN3068**	**NN3068K**	—	—	360	—	—	500	477	4	101	97.8
360	540	134	5	—	493	1 950	3 090	315	830	990	**NN3072**	**NN3072K**	—	—	380	—	—	520	497	4	107	104
380	560	135	5	—	510	2 050	3 350	337	780	940	**NN3076**	**NN3076K**	—	—	400	—	—	540	514	4	113	109
400	600	148	5	—	548	2 550	4 140	414	700	850	**NN3080**	**NN3080K**	—	—	420	—	—	580	552	4	146	141
420	620	150	5	—	570	2 900	4 570	449	670	800	**NN3084**	**NN3084K**	—	—	440	—	—	600	574	4	154	149
440	650	157	6	—	597	3 160	5 060	489	620	740	**NN3088**	**NN3088K**	—	—	464	—	—	626	602	5	177	171
460	680	163	6	—	627	3 390	5 480	521	570	690	**NN3092**	**NN3092K**	—	—	484	—	—	656	632	5	201	195

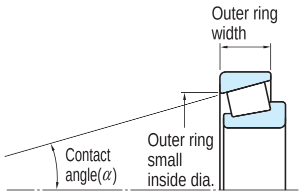
Tapered roller bearings

Tapered roller bearings are designed such that outer ring, inner ring and rollers have tapered surfaces whose apexes converge at a common point on the bearing axis. Along with metric series bearings, inch series bearings are also available.

This type of bearing is suitable for applications that involve heavy or impact loading.

■ Single-row tapered roller bearings

- Able to carry radial and axial load in one direction simultaneously.
  Because an axial component of force is produced when this type of bearing is loaded radially, two bearings are used together facing one another, or two or more bearings are matched and used.
- There are the standard, medium and steep type which are different in contact angle size.
  Medium-tapered metric series bearings are identified by the supplementary code "C" which is added as a suffix to bearing numbers.
- Bearings whose outer ring width, outer ring small inside diameter and contact angle are determined in accordance with ISO 355 specifications are identified by the supplementary code "J" as a suffix.
  Inner ring assemblies and the outer rings of such bearings are interchangeable with those of bearings produced abroad if the bearing numbers are the same.



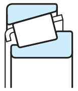
ISO sub-unit specifications

[Note] When supplementary code "J" is added as a prefix (not a suffix) to bearing numbers (e.g. JHM720249/JHM720210), the bearings are not designed according to ISO 355.
Such bearings are called "J series metric tapered roller bearings," and are produced according to special tolerances.

■ Double-row tapered roller bearings

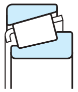
- These bearings are divided into the TDO type which has one double outer ring and two single-row inner rings, and the TDI type which has two single-row outer rings and one double inner ring. Both accommodate radial and axial loading in both directions.
  These two also carry moment loads, however, the TDO type is superior to the TDI type, because the distance between load centers (a) is longer in the TDO type.
- The spacer of the TDO type, or the TDI type, pre-adjusts the internal clearance to provide proper operating clearance after mounting.

Single-row tapered roller bearings



Metric series

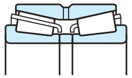
Bore diameter **15** – **360** mm



Inch series
(including J series metric bearing)

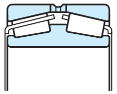
Bore diameter **9.525** – **292.100** mm

Double-row tapered roller bearings



TDO type

Bore diameter **25** – **500** mm



TDI type

Bore diameter **100** – **500** mm

Boundary dimensions

Metric single-row tapered roller bearings : as specified in JIS B 1512.

Reference JIS B 1512 specifies new dimension series which are based on ISO 355, as well as the conventional "3XX" dimension series. These new dimension series are as follows :

New dimension series

(1) Angle series

Angle series	Contact angle α	
	over	up to
2	10°	13° 52’
3	13° 52’	15° 59’
4	15° 59’	18° 55’
5	18° 55’	23°
6	23°	27°
7	27°	30°

(2) Diameter series

Diameter series	$D/(d^{0.77})$	
	over	up to
B	3.40	3.80
C	3.80	4.40
D	4.40	4.70
E	4.70	5.00
F	5.00	5.60
G	5.60	7.00

(3) Width series

Width series	$T/\{(D\text{-}d)^{0.95}\}$	
	over	up to
B	0.50	0.68
C	0.68	0.80
D	0.80	0.88
E	0.88	1.00

[Remarks]
1. Combine these series symbols in the listed order to make the dimension series numbers. (ex. 2BC)
2. Bearing numbers consist of a dimension series number and a bore diameter which is added as a suffix. (ex. 2BC080 : bore diameter 80 mm)

Tolerances

· Metric series single-row tapered roller bearings as specified in JIS B 1514-1. .... (refer to Table 7-5 on pp. A 66 – A 68.)

· Metric series double-row tapered roller bearings as specified in BAS 1002. .... (refer to Table 7-6 on p. A 69.)

· Inch series tapered roller bearings as specified in ABMA Section 19. .... (refer to Table 7-7 on pp. A 70, 71.)

· J series metric tapered roller bearings the tolerance is specified separately. .... (refer to Table 7-8 on pp. A 72, 73.)

Internal clearance

Radial internal clearance of double-row, four-row and matched pair tapered roller bearings .... (refer to Table 10-10 on p. A 110.)

Recommended fits

· Metric series tapered roller bearings (classes 0, 6X and 6) .... (refer to Table 9-4 on pp. A 91, 92.)

· Inch series tapered roller bearings .... (refer to Table 9-7 on pp. A 96, 97.)

· J series metric tapered roller bearings .... (refer to Table 9-6 on pp. A 94, 95.)

Standard cage

Pressed cage (supplementary code : //)

(Some large size bearings have a pin type cage (FP) instead.
They are listed separately in the bearing specification table.)

Allowable misalignment

Single-row tapered roller bearings : 0.000 9 rad (3')
(If the misalignment exceeds this angle size, JTEKT is ready to design special bearings to order.)

Equivalent radial load

[Note]
Refer to the bearing specification table for the values of axial load factors Y_1, Y_2, Y_3 and Y_0 and constant e.

■ Single-row tapered roller bearings

Dynamic equivalent radial load $\left(\text{when } \frac{F_a}{F_r} \leqq e\right)$ $P_r = F_r$

$\left(\text{when } \frac{F_a}{F_r} > e\right)$ $P_r = 0.4F_r + Y_1 F_a$

Static equivalent radial load $P_{0r} = 0.5F_r + Y_0 F_a$

when $P_{0r} < F_r$, $P_{0r} = F_r$

■ Double-row or four-row tapered roller bearings

Dynamic equivalent radial load $\left(\text{when } \frac{F_a}{F_r} \leqq e\right)$ $P_r = F_r + Y_2 F_a$

$\left(\text{when } \frac{F_a}{F_r} > e\right)$ $P_r = 0.67F_r + Y_3 F_a$

Static equivalent radial load $P_{0r} = F_r + Y_0 F_a$

[Remarks]
1. When two single-row tapered roller bearings are used together facing one another, an axial component of force is produced under radial load.
   In this case, refer to pp. A 38, 39 for calculation of the dynamic equivalent radial load.
2. When the load is too small, slippage occurs between the rollers and raceways, causing smearing to develop. This also occurs to matched pair bearings when the ratio of axial load to radial load exceeds the value e shown in the specification table ($F_a/F_r > e$).
   Consult with JTEKT on use of bearings under such conditions.

[Series No. index]

series No.	inner ring	pages	outer ring	pages
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	339	B233		B237
	342	B237		
	344	B235		
	344A	B237		
355	350A	B237	354A	B237,B239,
	355	B239		B241
	355A	B239		
	358	B239		
	359A	B241		
	359S	B241		
365	365	B243	362A	B237,B241,
	365A	B237		B243,B245
	365S	B241		
	366	B243		
	368	B243		
	368A	B243		
	368S	B245		
	369A	B241		
	370A	B243		
375	375	B243	374	B243
385	385	B247	382	B247
	385AX	B243	382A	B241,B243,
	385X	B247		B247
	386A	B241		
	387	B247		
	387A	B247		
	387AS	B247		
	387S	B247		
	388A	B247		
	389	B247		
395	390A	B249	394A	B243,B249,
	392	B249		B251
	395	B249		
	395A	B251		
	395S	B251		
	396	B243		
	397	B249		
	399A	B251		
	399AS	B251		
415	418	B235	414	B235,B237
	419	B237		
	420	B237		
435	438	B239	432	B233
	449	B233	432A	B239
455	456	B245	453X	B241,B245,
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	463	B241		
	466	B245		

series No.	inner ring	pages	outer ring	pages
455	467	B241		
	468	B245		
	469	B247		
475	477	B249	472	B249,B253
	482	B253	472A	B253
			472X	B253
495	495	B257	492A	B255,B257,
	495A	B255		B259
	495AX	B255	493	B255,B259
	496	B257		
	497	B259		
	497A	B259		
	498	B259		
525	525	B235	522	B235,B237,
	526	B237		B239,B241,
	527	B239		B243
	528	B241		
	529	B243		
	529X	B243		
535	535	B239	532A	B239
	537	B245	532X	B237,B245
	539	B245		
	539A	B245		
	543	B237		
555	557S	B245	552A	B245
565	565	B249	563	B249,B251,
	566	B253		B253,B256
	567	B253		
	567A	B253		
	568	B256		
	570	B251		
575R	575R	B255	572	B253,B255,
	575SR	B255		B257
	576R	B253	572X	B257
	577R	B255		
	580R	B257		
	581R	B257		
	582R	B257		
595	594A	B261	592A	B259
	596	B259	592XE	B261
615	615	B239	612	B239,B245,
	619	B245		B247
	621	B245		
	623	B247		
635	641	B251	633	B251
655	655	B253	652	B255
(Continued)	657	B255	653	B253,B255,
	659	B255		B257,B259
	661	B257		

series No.	inner ring	pages	outer ring	pages
655	663	B257		
	665	B259		
	665A	B259		
675	677	B259	672	B259,B261,
	679	B259		B263
	681	B261		
	681A	B261		
	683	B261		
	685	B261		
	687	B263		
745R	740R	B257	742	B253,B255,
	744R	B255		B257,B259
	745AR	B253		
	748SR	B255		
	749AR	B257		
	749R	B259		
	749SR	B259		
	750AR	B257		
755	756A	B257	752	B255,B257,
	757	B257		B259,B261
	758	B259		
	759	B259		
	760	B261		
	762	B255		
	766	B259		
775	778	B261	772	B261,B263
	780	B263		
	782	B263		
	786	B263		
	787	B263		
835R	835R	B253	832	B253,B259
	841R	B259		
855R	855R	B259	854	B259,B261,
	857R	B261		B263
	861R	B263		
	864R	B261		
935	936	B265	932	B263,B265
	938	B265		
	941	B263		
1200	1280	B227	1220	B227
1300	1380	B225	1328	B225
			1329	B225
1700	1755	B227	1729	B227
	1779	B227		
1900R	1986R	B227	1922	B229
	1988R	B229	1932	B227
A2000	A2037	B225	A2126	B225
	A2047	B225		
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series No.	inner ring	pages	outer ring	pages
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	2684	B227		
	2687	B227		
	2688	B229		
	2689	B229		
	2690	B229		
2700R	2788R	B235	2720	B233
	2789R	B235	2729	B235
	2794R	B233	2735X	B233,B235
	2796R	B233		
2900	2984	B241	2924	B241
3100	3192	B229	3120	B229
	3198	B229		
3300	3382	B235	3320	B235
	3386	B235	3328	B235
3400	3478	B233	3420	B233,B235
	3479	B233		
	3490	B235		
3500R	3576R	B237	3520	B239
	3578R	B239	3525	B233,B237
	3581R	B233		
3700	3776	B239	3720	B239,B243
	3780	B243	3730	B243
			3732	B243
3800	3877	B237	3820	B233
	3878	B233	3821	B237
3900	3979	B247	3920	B247
	3984	B251	3925	B251
A4000	A4050	B225	A4138	B225
	A4059	B225		
4300	4375	B235	4335	B235,B237
	4388	B237		
	4395	B237		
4500	4580	B245	4535	B245
	4595	B245		
5500R	5566R	B247	5535	B245,B247,
	5578R	B245		B249,B251
	5583R	B249		
	5584R	B249		
	5595R	B251		
5700	5760	B255	5735	B255
6300	6379	B251	6320	B245,B249,
	6381	B245		B251
	6382	B249		
	6386	B251		
	6389	B251		
6400	6460	B255	6420	B255
	6461	B255		
	6461A	B255		

series No.	inner ring	pages	outer ring	pages
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9100	9185	B251	9121	B251
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	02474	B229		B231
	02475	B231		
	02476	B231		
02800	02872	B229	02820	B229,B231,
	02875	B231		B233
	02876	B231		
	02877	B233		
	02878	B233		
03000	03062	B225	03162	B225
07000	07079	B225	07196	B225,B227
	07097	B227	07204	B227
	07098	B227		
	07100	B227		
	07100S	B227		
08000	08125	B231	08231	B231
09000	09062	B225	09195	B225
	09067	B225	09196	B225
	09078	B225		
11000R	11162R	B237	11300	B237
LM11700R	LM11749R	B225	LM11710	B225
LM11900	LM11949	B225	LM11910	B225
12000	12168	B239	12303	B239
	12175	B239		
12500	12580	B225	12520	B225
M12600	M12648	B225	M12610	B225
	M12649	B225		
LM12700	LM12749	B225	LM12711	B225
13600	13687	B235	13621	B235
13800	13889	B233,B235	13830	B233
			13836	B235
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	15118	B231		
	15119	B231		
	15120	B231		
	15123	B231		
	15125	B231		
15000	15126	B231		
15500	15580	B229	15520	B229
	15590	B229	15523	B229
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	16150	B235	16283	B235
			16284	B233
17000	17098	B227	17244	B227,B229
	17118	B229		
	17119	B229		
17500R	17580R	B225	17520	B225
18000	18200	B243	18337	B243
18500	18587	B235	18520	B235,B237
	18590	B237		
18600	18685	B239	18620	B239,B241
	18690	B241		
18700	18790	B243	18724	B243
19000R	19150R	B235	19281	B235
			19283	B235
21000	21063	B225	21212	B225
L21500	L21549	B225	L21511	B225
23600	23690	B233	23620	B233
24700R	24780R	B237	24720	B237
25500	25572	B235	25520	B235,B239
	25577	B239	25526	B241
	25582	B239		
	25590	B241		
25800R	25877R	B233	25821	B233
	25880R	B233		
26000	26112	B229	26283	B229,B231
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26800R	26877R	B233	26822	B233,B239
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	26884R	B239		
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	27689	B257		
	27690	B259		
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	27881	B235		
28000	28137	B233	28300	B233,B235
	28150	B235	28317	B235
	28158	B235		
28500R	28579R	B243	28521	B243,B245
	28580R	B243		
	28584R	B245		
28600	28678	B243	28622	B243,B247
	28680	B247		
28900	28985	B249	28920	B249
			28921	B249
29500	29580	B249	29520	B249
	29585	B249	29521	B249
	29586	B249		
29600	29675	B253	29620	B253,B255
	29685	B253		
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	LM29749	B235	LM29711	B235
31500	31594	B233	31520	B233
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	33269	B251		
	33275	B253		
	33281	B253		
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	33889	B243	33822	B243,B245
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	34306	B257		
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	37431	B265		
39500	39575	B245	39520	B245,B247,
	39580	B247		B249,B251
	39581	B247	39521	B251
	39585	B249		
	39586	B249		
	39590	B251		
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	41126	B229		
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	42688	B255		
	42690	B257		
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	L44649R	B227		
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	45284	B243	45221	B247
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47600R	47686R	B257		
47800R	47890R	B261	47820	B261
	47896R	B261		
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48600	48684	B267	48620	B267
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	52400	B263		
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	65225	B247		
	65237	B249		
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65300	65390	B241	65320	B241
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66500	66584	B245	66520	B245,B247
	66589	B247		
LM67000	LM67048	B231	LM67010	B231
68000	68450	B265	68712	B265
	68462	B265		
	68463	B265		
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			L68111	B233
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LM72800	LM72849	B227	LM72810	B227
HM81600	HM81649	B225	HM81610	B225
M84200	M84249	B227	M84210	B227
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	M86647R	B229		
	M86649R	B229		
M88000	M88043	B231	M88010	B231
	M88046	B231		
	M88048	B231		

series No.	inner ring	pages	outer ring	pages
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	HM88547	B231	HM88512	B231
HM88600	HM88630	B227	HM88610	B227,B231, B233
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	HM88649	B231		
HM89400	HM89443	B231	HM89410	B231
	HM89449	B233	HM89411	B233
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	98335	B259		
	98350	B261		
	98400	B263		
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LM102900	LM102949	B241	LM102910	B241
LM104900	LM104949	B243	LM104911	B243
HM212000	HM212046	B249	HM212010	B251
	HM212049	B251	HM212011	B249
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	HH221434	B261		
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	HH221442	B261		
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	HH224340	B265		
	HH224346	B265		
	HH224349	B265		
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	HH228349	B265		
LM245800	LM245833	B267	LM245810	B267
	LM245846	B267		
	LM245848	B267		
M246900	M246942	B267	M246910	B267
M249700	M249732	B267	M249710	B267
	M249734	B267		
	M249749	B267		
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series No.	inner ring	pages	outer ring	pages
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			LM501314	B237
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HM516400	HM516448	B257	HM516410	B257
HM518400	HM518445	B259	HM518410	B259
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	LM522548	B265		
	LM522549	B265		
L540000	L540049	B267	L540010	B267
L555200	L555249	B267	L555210	B267
LM603000	LM603049	B241	LM603011	B241
			LM603012	B241
			LM603014	B241
LM613400	LM613449	B253	LM613410	B253
HM617000	HM617049	B259	HM617010	B259
HM624700	HM624749	B265	HM624710	B265
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	HM801349	B237		
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M804000	M804049	B241	M804010	B241
HM804800	HM804840	B237	HM804810	B237,B239, B241
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	HM804848	B241		
	HM804849	B241		
LM806600	LM806649	B245	LM806610	B245
HM807000	HM807035	B237	HM807010	B237,B239, B241,B245
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	HM807049	B245		
HM813800	HM813840	B247	HM813810	B247,B249
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	HM813844	B251		

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LM814800	LM814849	B257	LM814810	B257
HH926700	HH926744	B265	HH926710	B265

Metric J series

series No.	inner ring	pages	outer ring	pages
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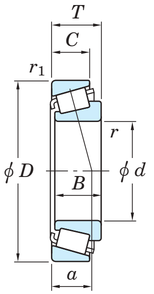
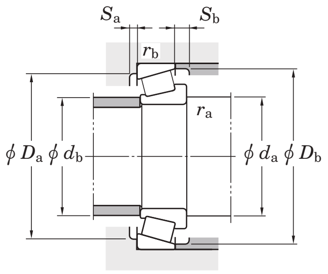
JLM104900	JLM104948	B243	JLM104910	B243
JM205100	JM205149	B243	JM205110	B243
JM207000	JM207049	B247	JM207010	B247
JH211700	JH211749	B251	JH211710	B251
	JH211749A	B251		
JH217200	JH217249	B259	JH217210	B259
JH307700	JH307749	B247	JH307710	B247
JHM318400	JHM318448	B261	JHM318410	B261
JH415600	JH415647	B255	JH415610	B255
JLM506800	JLM506849	B245	JLM506810	B245
JLM508700	JLM508748	B247	JLM508710	B247
JM511900	JM511946	B249	JM511910	B249
JM515600	JM515649	B257	JM515610	B257
JHM516800	JHM516849	B259	JHM516810	B259
JHM522600	JHM522649	B265	JHM522610	B265
JHM534100	JHM534149	B267	JHM534110	B267
JM612900	JM612949	B253	JM612910	B253
JLM710900	JLM710949	B249	JLM710910	B249
JLM714100	JLM714149	B255	JLM714110	B255
JM714200	JM714249	B255	JM714210	B255
JM716600	JM716649	B259	JM716610	B259
JM718100	JM718149	B261	JM718110	B261
JM719100	JM719149	B261	JM719113	B261
JHM720200	JHM720249	B263	JHM720210	B263
JM720200	JM720249	B263	JM720210	B263
JM734400	JM734449	B267	JM734410	B267
JM736100	JM736149	B267	JM736110	B267
JM738200	JM738249	B267	JM738210	B267
JHM807000	JHM807045	B243	JHM807012	B243
JLM813000	JLM813049	B253	JLM813010	B253
JM822000	JM822049	B265	JM822010	B265
JHM840400	JHM840449	B267	JHM840410	B267

Single-row tapered roller bearings metric series

d 15 ~ 22 mm



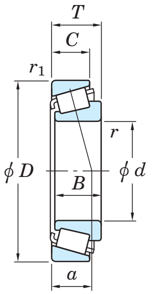


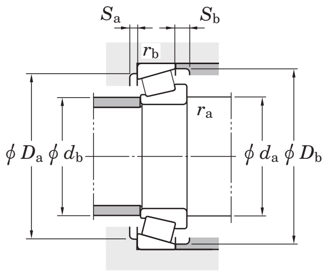
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
15	35	11.75	11	10	0.6	0.6	19.8	14.5	2.00	12 000	16 000	**30202R**	—	8.3	19.5	20	30.5	29	33	2	1.7	0.6	0.6	0.32	1.88	1.04	0.054
	42	14.25	13	11	1	1	27.4	19.2	2.65	10 000	14 000	**30302JR**	2FB	10.0	20.5	22	36.5	35	38	2	3	1	1	0.29	2.11	1.16	0.098
17	40	13.25	12	11	1	1	26.0	20.7	2.85	10 000	14 000	**30203JR**	2DB	10.1	22.5	23	34.5	33	37	2	2	1	1	0.35	1.74	0.96	0.081
	40	17.25	16	14	1	1	34.3	27.5	3.85	10 000	14 000	**32203JR**	2DD	11.4	22.5	23	34.5	33	37	2	3	1	1	0.31	1.92	1.06	0.104
	47	15.25	14	12	1	1	34.2	24.5	3.45	9 200	12 000	**30303JR**	2FB	11.0	22.5	25	41.5	40	42	2	3	1	1	0.29	2.11	1.16	0.133
	47	15.25	14	12	1	1	34.2	24.5	3.45	9 200	12 000	**30303R**	—	10.5	22.5	25	41.5	40	42	2	3	1	1	0.28	2.11	1.16	0.127
	47	20.25	19	16	1	1	39.9	29.9	4.25	9 400	13 000	**32303**	—	12.4	22.5	25	41.5	39	43	2	4	1	1	0.28	2.11	1.16	0.170
	47	20.25	19	16	1	1	45.7	35.9	5.10	9 400	13 000	**32303JR**	2FD	12.2	22.5	25	41.5	39	43	2	4	1	1	0.29	2.11	1.16	0.176
20	42	15	15	12	0.6	0.6	34.1	31.5	4.35	9 700	13 000	**32004JR**	3CC	10.5	24.5	25	37.5	35	39	3	3	0.6	0.6	0.37	1.60	0.88	0.102
	47	15.25	14	12	1	1	34.2	25.5	3.75	9 000	12 000	**57008R**	—	12.9	25.5	26	41.5	37	44	2	3	1	1	0.52	1.16	0.64	0.125
	47	15.25	14	12	1	1	33.8	27.2	3.80	8 700	12 000	**30204JR**	2DB	11.8	25.5	27	41.5	39	44	2	3	1	1	0.35	1.74	0.96	0.127
	47	19.25	18	15	1	1	41.4	34.7	4.90	8 900	12 000	**32204JR**	2DD	12.5	25.5	27	41.5	39	43	2	4	1	1	0.33	1.81	1.00	0.159
	47	19.25	18	16	1	1	41.6	37.0	5.00	9 100	12 000	**32204XR**	—	15.3	25.5	25	41.5	35	45	2	3	1	1	0.55	1.10	0.60	0.170
	52	16.25	16	12	1.5	1.5	43.3	28.4	4.65	8 300	11 000	**30304AC**	—	13.5	28.5	28	43.5	42	49	4	4	1.5	1.5	0.55	1.10	0.60	0.170
	52	16.25	16	13	1.5	1.5	45.3	35.1	5.05	8 300	11 000	**30304AJR**	—	11.1	28.5	28	44	44	47	2	3	1.5	1.5	0.30	2.00	1.10	0.179
	52	22.25	21	18	1.5	1.5	52.3	44.9	6.05	8 600	12 000	**32304CR**	—	16.5	28.5	25	43.5	37	48	3	4	1.5	1.5	0.55	1.10	0.60	0.250
	52	22.25	21	18	1.5	1.5	56.5	46.7	6.70	8 400	11 000	**32304JR**	2FD	14.4	28.5	27	43.5	43	47	3	4	1.5	1.5	0.30	2.00	1.10	0.244
22	44	15	15	11.5	0.6	0.6	35.4	33.6	4.65	9 100	12 000	**320/22JR**	3CC	11.0	26.5	27	39.5	38	41	3	3.5	0.6	0.6	0.40	1.51	0.83	0.108
	47	17	17.5	13.5	1	1	40.9	35.9	5.05	8 700	12 000	**T2CC022**	2CC	11.3	27.5	28	41.5	40	44	4	3.5	1	1	0.33	1.79	0.99	0.138
	50	15.25	14	12	1	1	32.1	25.7	3.50	8 400	11 000	**302/22CR**	—	13.9	27.5	28	44.5	40	47	2	3	1	1	0.55	1.10	0.60	0.140
	50	15.25	14	12	1	1	36.5	30.9	4.30	8 100	11 000	**302/22R**	—	12.2	27.5	30	44.5	41	46	2	3	1	1	0.37	1.60	0.88	0.144
	50	19.25	18	15	1	1	43.8	39.1	5.35	8 400	11 000	**322/22CR**	—	15.5	27.5	28	44.5	38	47	2	4	1	1	0.55	1.10	0.60	0.170
	50	19.25	18	15	1	1	46.0	41.6	5.85	8 100	11 000	**322/22R**	—	14.0	27.5	29	44.5	41	46	2	4	1	1	0.37	1.60	0.88	0.178
	56	17.25	16	13	1.5	1.5	43.0	33.9	4.70	7 700	10 000	**303/22XR**	—	15.7	30.5	31	47.5	44	52	3	4	1.5	1.5	0.59	1.02	0.56	0.210
	56	17.25	16	14	1.5	1.5	52.2	41.1	5.95	7 500	10 000	**303/22R**	—	12.2	30.5	32	47.5	47	51	2	3	1.5	1.5	0.31	1.97	1.08	0.216
	56	22.25	21	17	1.5	1.5	60.4	50.6	7.00	8 000	11 000	**323/22CR**	—	16.9	30.5	28	47.5	41	52	3	5	1.5	1.5	0.55	1.10	0.60	0.290
	56	22.25	21	18	1.5	1.5	63.3	52.7	7.70	7 600	10 000	**323/22R**	—	14.6	30.5	31	47.5	46	51	3	4	1.5	1.5	0.31	1.97	1.08	0.273

[Note] 1) Please consult with JTEKT when using the bearings identified by suffix C. They are medium-tapered types especially designed for special purposes.

Single-row tapered roller bearings metric series

d 25 ~ (30) mm





Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. 1)	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
25	47	15	15	11.5	0.6	0.6	37.8	37.7	5.20	8 300	11 000	**32005JR**	4CC	11.8	29.5	30	42.5	40	44	3	3.5	0.6	0.6	0.43	1.39	0.77	0.118
	47	17	17	14	0.6	0.6	42.0	42.3	5.95	8 300	11 000	**33005JR**	2CE	10.9	29.5	30	42.5	41	44	3	3	0.6	0.6	0.29	2.07	1.14	0.131
	52	16.25	15	12	1	1	38.0	32.4	4.45	7 900	11 000	**30205XR**	—	14.9	30.5	30	46.5	41	49	2	4	1	1	0.58	1.04	0.57	0.155
	52	16.25	15	13	1	1	39.3	33.7	4.75	7 800	10 000	**30205JR**	3CC	12.9	30.5	31	46.5	44	48	2	3	1	1	0.37	1.60	0.88	0.156
	52	19.25	18	16	1	1	45.5	43.2	5.90	7 900	11 000	**32205XR**	—	16.2	30.5	30	46.5	40	50	2	3	1	1	0.55	1.10	0.60	0.200
	52	19.25	18	16	1	1	49.7	44.8	6.35	7 900	11 000	**32205JR**	2CD	13.5	30.5	31	46.5	43	48	2	4	1	1	0.36	1.67	0.92	0.188
	52	22	22	18	1	1	61.1	58.5	8.25	7 900	10 000	**33205JR**	2DE	14.1	30.5	30	46.5	43	49	4	4	1	1	0.35	1.71	0.94	0.225
	62	18.25	17	13	1.5	1.5	49.7	42.5	5.80	5 700	8 000	**30305DJR**	7FB	20.4	33.5	34	53.5	47	58.5	3	5	1.5	1.5	0.83	0.73	0.40	0.269
	62	18.25	17	14	1.5	1.5	56.3	45.8	6.50	6 700	9 000	**TR0506R**	—	16.3	33.5	35	53.5	50	58	3	4	1.5	1.5	0.55	1.10	0.60	0.275
	62	18.25	17	15	1.5	1.5	60.3	46.9	6.90	6 800	9 000	**30305JR**	2FB	12.9	33.5	34	54	54	57	2	3	1.5	1.5	0.30	2.00	1.10	0.273
	62	25.25	24	19	1.5	1.5	71.6	65.8	9.20	7 000	9 300	**32305XR**	—	18.9	33.5	33	53.5	46	58	3	6	1.5	1.5	0.55	1.10	0.60	0.390
	62	25.25	24	20	1.5	1.5	76.6	64.1	9.50	6 900	9 100	**32305JR**	2FD	16.6	33.5	33	53.5	52	57	3	5	1.5	1.5	0.30	2.00	1.10	0.386
28	52	16	16	12	1	1	44.1	44.0	6.10	7 500	10 000	**320/28JR**	4CC	12.7	33.5	33	46.5	45	49	3	4	1	1	0.43	1.39	0.77	0.150
	58	17.25	16	13	1	1	48.5	41.7	5.85	7 000	9 300	**302/28CR**	—	16.0	33.5	34	52.5	47	55	2	4	1	1	0.55	1.10	0.60	0.205
	58	17.25	16	14	1	1	48.5	42.0	6.00	7 000	9 300	**302/28R**	—	13.4	33.5	35	52.5	49	54	2	3	1	1	0.37	1.60	0.88	0.209
	58	20.25	19	16	1	1	56.1	54.1	7.50	7 100	9 400	**322/28CR**	—	17.0	33.5	33	52.5	45	55	3	4	1	1	0.55	1.10	0.60	0.255
	58	20.25	19	16	1	1	61.5	55.2	7.95	6 900	9 100	**322/28R**	—	15.0	33.5	35	52.5	49	54.5	2	4	1	1	0.37	1.60	0.88	0.244
	58	24	24	19	1	1	71.9	69.5	10.0	7 000	9 300	**332/28JR**	2DE	15.4	33.5	34	52.5	49	55	4	5	1	1	0.34	1.77	0.97	0.302
	68	19.75	18	14	1.5	1.5	64.6	50.2	7.25	6 200	8 200	**303/28CR**	—	17.8	36.5	37	59.5	55	64	3	4.5	1.5	1.5	0.55	1.10	0.60	0.332
	68	19.75	18	16	1.5	1.5	66.9	54.0	8.00	6 100	8 200	**303/28R**	—	14.9	36.5	38	59.5	58	63	2	3.5	1.5	1.5	0.32	1.88	1.04	0.345
	68	25.75	24	20	1.5	1.5	83.2	72.9	10.5	6 300	8 500	**323/28CR**	—	20.5	36.5	35	59.5	51	64	3	5.5	1.5	1.5	0.55	1.10	0.60	0.480
	68	25.75	24	21	1.5	1.5	87.0	75.6	11.3	6 100	8 100	**323/28R**	—	17.6	36.5	38	59.5	57	63	3	4.5	1.5	1.5	0.32	1.88	1.04	0.469
30	55	17	17	13	1	1	47.9	48.0	6.75	7 000	9 400	**32006JR**	4CC	13.6	35.5	35	49.5	47	52	3	4	1	1	0.43	1.39	0.77	0.177
	55	20	20	16	1	1	54.1	55.2	7.90	7 000	9 400	**33006JR**	2CE	13.0	35.5	36	49.5	48	52	3	4	1	1	0.29	2.06	1.13	0.203
	62	17.25	16	13	1	1	52.9	45.1	6.35	6 500	8 700	**30206CR**	—	16.5	35.5	36	56.5	51	59	2	4	1	1	0.55	1.10	0.60	0.230
	62	17.25	16	14	1	1	51.8	44.8	6.45	6 500	8 700	**30206JR**	3DB	14.1	35.5	37	56.5	53	57	2	3	1	1	0.37	1.60	0.88	0.236
	62	21.25	20	16	1	1	64.6	59.0	8.30	6 600	8 900	**32206XR**	—	18.0	35.5	36	56.5	49	59	3	5	1	1	0.55	1.10	0.60	0.300
	62	21.25	20	17	1	1	63.3	57.9	8.40	6 500	8 700	**32206JR**	3DC	15.9	35.5	37	56.5	52	58	2	4	1	1	0.37	1.60	0.88	0.292

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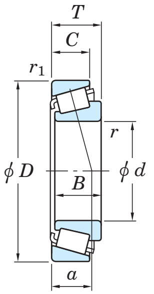
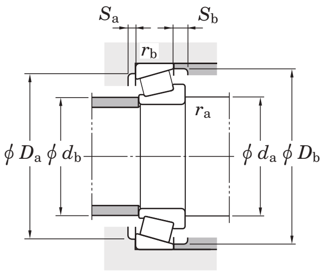
Single-row tapered roller bearings
metric series

d (30) ~ (35) mm



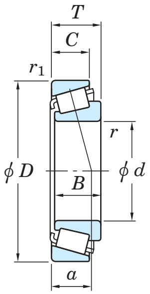


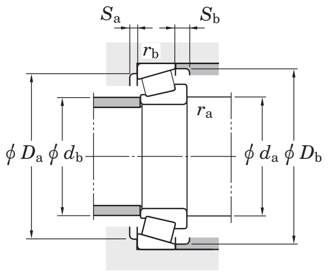
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
30	62	25	25	19.5	1	1	83.1	79.4	11.6	6 500	8 700	**33206JR**	2DE	16.3	35.5	36	56.5	53	59	5	5.5	1	1	0.34	1.76	0.97	0.359
	72	20.75	19	14	1.5	1.5	63.5	54.9	7.70	4 900	6 800	**30306DJR**	7FB	23.7	38.5	40	63.5	55	68	3	6.5	1.5	1.5	0.83	0.73	0.40	0.400
	72	20.75	19	16	1.5	1.5	71.2	55.6	8.10	5 900	7 900	**TRA0607R**	—	18.6	38.5	39	63.5	58	68	3	4.5	1.5	1.5	0.55	1.10	0.60	0.405
	72	20.75	19	16	1.5	1.5	74.4	60.1	9.00	5 800	7 700	**30306JR**	2FB	15.7	38.5	40	63.5	62	66	3	4.5	1.5	1.5	0.31	1.90	1.05	0.411
	72	28.75	27	23	1.5	1.5	100	93.8	13.4	6 000	8 000	**32306CR**	5FD	22.0	38.5	37	63.5	54	68	3	5.5	1.5	1.5	0.55	1.10	0.60	0.610
	72	28.75	27	23	1.5	1.5	103	91.6	13.8	5 900	7 900	**32306JR**	2FD	18.9	38.5	39	63.5	59	66	3	5.5	1.5	1.5	0.31	1.90	1.05	0.588
32	58	17	17	13	1	1	49.2	50.6	7.10	6 700	8 900	**320/32JR**	4CC	14.3	37.5	38	52.5	50	55	3	4	1	1	0.45	1.32	0.73	0.196
	65	18.25	17	14	1	1	59.3	51.5	7.35	6 200	8 300	**302/32CR**	—	17.2	37.5	38	59.5	53	62	3	4	1	1	0.55	1.10	0.60	0.275
	65	18.25	17	15	1	1	60.1	51.4	7.45	6 200	8 200	**302/32R**	—	14.9	37.5	39	59.5	55	61	3	3	1	1	0.37	1.60	0.88	0.266
	65	22.25	21	17	1	1	69.6	65.1	9.20	6 300	8 400	**322/32CR**	—	18.7	37.5	37	59.5	51	62	3	5	1	1	0.55	1.10	0.60	0.340
	65	22.25	21	18	1	1	64.5	57.7	8.45	6 200	8 200	**322/32**	—	16.3	37.5	40	59.5	55	61	2	4	1	1	0.37	1.60	0.88	0.330
	65	26	26	20.5	1	1	89.7	86.9	12.8	6 200	8 300	**332/32JR**	2DE	16.9	37.5	38	59.5	55	62	5	5.5	1	1	0.35	1.73	0.95	0.404
	75	21.75	20	16	1.5	1.5	79.4	66.3	9.70	5 600	7 400	**303/32CR**	—	19.7	40.5	42	66.5	60	70	3	5.5	1.5	1.5	0.55	1.10	0.60	0.465
	75	21.75	20	18	1.5	1.5	80.5	65.6	9.90	5 500	7 300	**303/32R**	—	16.0	40.5	43	66.5	64	70	3	3.5	1.5	1.5	0.32	1.88	1.04	0.461
	75	29.75	28	23	1.5	1.5	93.8	87.1	12.6	5 600	7 400	**TR0608A**	5FD	23.7	40.5	41	66.5	57	71	3	6.5	1.5	1.5	0.55	1.10	0.60	0.649
	75	29.75	28	25	1.5	1.5	112	101	15.3	5 600	7 400	**323/32R**	—	19.6	40.5	42	66.5	63	69	3	4.5	1.5	1.5	0.32	1.88	1.04	0.650
35	55	14	14	11.5	0.6	0.6	32.8	36.5	5.10	6 600	8 800	**32907JR-2**	2BD	10.9	39.5	40	50.5	49	52	2.5	2.5	0.6	0.6	0.29	2.06	1.13	0.120
	62	18	18	14	1	1	57.0	59.4	8.40	6 200	8 200	**32007JR**	4CC	15.1	40.5	40	56.5	54	59	4	4	1	1	0.45	1.32	0.73	0.231
	62	21	20	16	1	1	51.3	53.8	7.70	6 200	8 200	**33007**	—	14.8	40.5	41	56.5	55	59	3	4	1	1	0.33	1.80	0.99	0.250
	62	21	21	17	1	1	64.3	68.0	9.85	6 200	8 200	**33007JR**	2CE	14.2	40.5	41	56.5	55	59	3	4	1	1	0.31	1.97	1.08	0.263
	72	18.25	17	15	1.5	1.5	66.1	56.2	8.10	5 700	7 600	**30207CR**	—	17.9	43.5	43	63.5	59	68	3	3	1.5	1.5	0.55	1.10	0.60	0.350
	72	18.25	17	15	1.5	1.5	68.8	60.9	8.95	5 600	7 400	**30207JR**	3DB	15.3	43.5	44	63.5	62	67	3	3	1.5	1.5	0.37	1.60	0.88	0.344
	72	24.25	23	19	1.5	1.5	86.3	86.6	12.3	5 700	7 600	**32207-1R**	—	21.1	43.5	42	63.5	56	68	3	5	1.5	1.5	0.58	1.04	0.57	0.465
	72	24.25	23	19	1.5	1.5	86.9	82.4	12.2	5 600	7 500	**32207JR**	3DC	18.2	43.5	43	63.5	61	67	3	5	1.5	1.5	0.37	1.60	0.88	0.453
	72	28	28	22	1.5	1.5	110	107	15.8	5 700	7 500	**33207JR**	2DE	18.4	43.5	42	63.5	61	68	5	6	1.5	1.5	0.35	1.70	0.93	0.551
	80	22.75	21	15	2	1.5	78.7	69.1	9.85	4 300	6 000	**30307DJR**	7FB	26.8	45	44	70	66	76.5	3	7.5	2	1.5	0.83	0.73	0.40	0.536
	80	22.75	21	18	2	1.5	87.2	77.8	11.4	5 200	7 000	**30307XR**	—	20.5	45	45	70	63	74	3	4.5	2	1.5	0.55	1.10	0.60	0.560
	80	22.75	21	18	2	1.5	95.2	78.9	12.0	5 200	6 900	**30307JR-1**	2FB	16.9	45	45	70	70	74	3	4.5	2	1.5	0.31	1.90	1.05	0.527

[Note] 1) Please consult with JTEKT when using the bearings identified by suffix C. They are medium-tapered types especially designed for special purposes.

Single-row tapered roller bearings metric series

d (35) ~ (45) mm





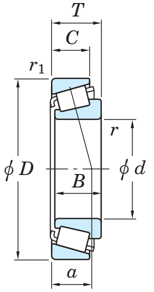
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds ($\min^{-1}$)		Bearing No. [1]	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
35	80	32.75	31	25	2	1.5	121	123	18.0	5 200	7 000	**TR0708-1R**	—	23.8	45	44	70	60	75	3	7.5	2	1.5	0.47	1.27	0.70	0.830
	80	32.75	31	25	2	1.5	126	114	17.3	5 300	7 000	**32307JR**	2FE	20.6	45	44	70	66	74	3	7.5	2	1.5	0.31	1.90	1.05	0.776
40	62	15	15	12	0.6	0.6	42.1	48.5	6.90	5 900	7 800	**32908JR**	2BC	11.9	44.5	45	57.5	55	59	3	3	0.6	0.6	0.29	2.07	1.14	0.164
	68	19	19	14.5	1	1	67.2	71.4	10.3	5 600	7 400	**32008JR**	3CD	15.1	45.5	46	62.5	60	65	4	4.5	1	1	0.38	1.58	0.87	0.282
	68	22	22	18	1	1	75.9	84.6	12.4	5 500	7 400	**33008JR**	2BE	14.7	45.5	46	62.5	60	65	3	4	1	1	0.28	2.12	1.17	0.326
	75	26	26	20.5	1.5	1.5	103	108	16.1	5 200	6 900	**33108JR**	2CE	18.3	48.5	47	66.5	65	71	4	5.5	1.5	1.5	0.36	1.69	0.93	0.508
	80	19.75	18	15	1.5	1.5	76.6	67.4	9.90	5 000	6 700	**30208CR**	—	20.2	48.5	49	71.5	66	76	3	4.5	1.5	1.5	0.55	1.10	0.60	0.445
	80	19.75	18	16	1.5	1.5	78.4	69.2	10.3	5 000	6 700	**30208JR**	3DB	17.0	48.5	49	71.5	69	75	3	3.5	1.5	1.5	0.37	1.60	0.88	0.434
	80	24.75	23	19	1.5	1.5	98.0	93.1	13.7	5 000	6 700	**32208CR**	5DC	22.0	48.5	48	71.5	64	76	3	5.5	1.5	1.5	0.55	1.10	0.60	0.570
	80	24.75	23	19	1.5	1.5	97.0	90.8	13.6	5 000	6 600	**32208JR**	3DC	19.4	48.5	48	71.5	68	75	3	5.5	1.5	1.5	0.37	1.60	0.88	0.554
	80	32	32	25	1.5	1.5	135	139	20.8	5 000	6 700	**33208JR**	2DE	20.7	48.5	47	71.5	67	76	5	7	1.5	1.5	0.36	1.68	0.92	0.758
	85	33	32.5	28	2.5	2	143	143	21.6	4 800	6 400	**T2EE040**	2EE	21.9	52	48	75	70	80	5	5	2	2	0.34	1.74	0.96	0.900
	90	25.25	23	17	2	1.5	100	90.2	13.1	3 800	5 300	**30308DJR**	7FB	29.9	50	51	80	71	86.5	3	8	2	1.5	0.83	0.73	0.40	0.757
	90	25.25	23	20	2	1.5	109	98.5	14.8	4 600	6 100	**30308XR**	—	23.8	50	53	80	72	84	3	5	2	1.5	0.55	1.10	0.60	0.780
	90	25.25	23	20	2	1.5	113	101	15.5	4 500	6 100	**30308JR**	2FB	19.9	50	52	80	77	82	3	5	2	1.5	0.35	1.74	0.96	0.757
	90	35.25	33	26	2	1.5	140	138	20.2	4 700	6 200	**TR0809AR**	—	27.5	50	49	80	67	85	3	9	2	1.5	0.55	1.10	0.60	1.10
	90	35.25	33	27	2	1.5	145	139	21.3	4 600	6 200	**32308JR**	2FD	24.3	50	50	80	73	82	3	8	2	1.5	0.35	1.74	0.96	1.06
45	68	15	15	12	0.6	0.6	43.5	52.4	7.45	5 300	7 100	**32909JR**	2BC	12.5	49.5	50	63.5	61	64	3	3	0.6	0.6	0.32	1.88	1.04	0.190
	75	20	20	15.5	1	1	78.8	86.5	12.6	5 000	6 600	**32009JR**	3CC	16.5	50.5	51	69.5	67	72	4	4.5	1	1	0.39	1.53	0.84	0.354
	75	24	24	19	1	1	87.4	101	14.9	5 000	6 700	**33009JR**	2CE	16.4	50.5	51	69.5	67	71	4	5	1	1	0.29	2.04	1.12	0.416
	80	26	26	20.5	1.5	1.5	110	120	17.9	4 800	6 400	**33109JR**	3CE	19.4	53.5	52	71.5	69	76.5	4	5.5	1.5	1.5	0.38	1.57	0.86	0.563
	85	20.75	19	15	1.5	1.5	83.1	77.0	11.4	4 600	6 100	**30209XR**	—	21.1	53.5	54	76.5	71	80	4	5.5	1.5	1.5	0.55	1.10	0.60	0.500
	85	20.75	19	16	1.5	1.5	83.9	77.4	11.6	4 600	6 100	**30209JR**	3DB	18.9	53.5	54	76.5	74	80	3	4.5	1.5	1.5	0.40	1.48	0.81	0.502
	85	24.75	23	19	1.5	1.5	101	102	15.1	4 600	6 200	**32209CR**	—	23.0	53.5	53	76.5	69	81	3	5.5	1.5	1.5	0.55	1.10	0.60	0.625
	85	24.75	23	19	1.5	1.5	105	104	15.6	4 600	6 100	**32209JR-1**	3DC	20.3	53.5	53	76.5	73	81	3	5.5	1.5	1.5	0.40	1.48	0.81	0.597
	85	32	32	25	1.5	1.5	139	149	22.3	4 600	6 200	**33209JR**	3DE	21.8	53.5	52	76.5	72	81	5	7	1.5	1.5	0.39	1.56	0.86	0.818
	95	29	26.5	20	2.5	2.5	118	118	17.0	3 600	5 100	**T7FC045**	7FC	32.6	57	54	83	71	91	3	9	2	2	0.87	0.69	0.38	0.943
	95	36	35	30	2.5	2.5	175	177	27.2	4 300	5 700	**T2ED045**	2ED	23.8	57	55	83	80	89	6	6	2	2	0.32	1.86	1.02	1.20

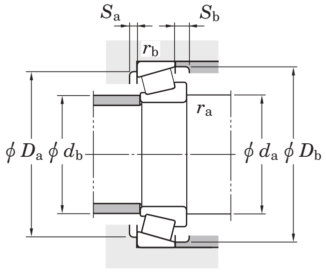
[Note] 1) Please consult with JTEKT when using the bearings identified by suffix C. They are medium-tapered types especially designed for special purposes.

Single-row tapered roller bearings metric series

Koyo

d (45) ~ (55) mm





Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
45	100	27.25	25	18	2	1.5	119	107	15.8	3 400	4 700	**30309DJR**	7FB	32.9	55	56	90	79	96	3	9	2	1.5	0.83	0.73	0.40	0.973
	100	27.25	25	20	2	1.5	136	119	18.1	4 100	5 500	**30309CR**	—	25.7	55	57	90	81	94	4	7	2	1.5	0.55	1.10	0.60	1.00
	100	27.25	25	22	2	1.5	141	128	19.9	4 100	5 400	**30309JR**	2FB	21.3	55	59	90	86	93	3	5	2	1.5	0.35	1.74	0.96	1.01
	100	38.25	36	29	2	1.5	181	182	27.0	4 200	5 600	**32309CR**	—	30.3	55	56	90	76	95	4	9	2	1.5	0.55	1.10	0.60	1.45
	100	38.25	36	30	2	1.5	183	180	27.7	4 100	5 500	**32309JR**	2FD	26.8	55	56	90	82	93	3	8	2	1.5	0.35	1.74	0.96	1.43
50	72	15	15	12	0.6	0.6	45.0	56.3	8.00	4 900	6 600	**32910JR**	2BC	13.7	54.5	55	67.5	65	69	3	3	0.6	0.6	0.34	1.76	0.97	0.195
	80	20	20	15.5	1	1	82.7	94.5	13.8	4 600	6 100	**32010JR**	3CC	17.7	55.5	56	74.5	72	77	4	4.5	1	1	0.42	1.42	0.78	0.389
	80	24	24	19	1	1	91.8	110	16.3	4 600	6 100	**33010JR**	2CE	17.4	55.5	56	74.5	72	76	4	5	1	1	0.32	1.90	1.04	0.451
	85	26	26	20	1.5	1.5	112	127	18.9	4 400	5 900	**33110JR**	3CE	20.6	58.5	56	76.5	74	81.5	4	6	1.5	1.5	0.41	1.46	0.80	0.594
	90	21.75	20	16	1.5	1.5	96.7	95.8	14.3	4 300	5 700	**30210CR**	—	22.7	58.5	58	81.5	76	86	4	5.5	1.5	1.5	0.55	1.10	0.60	0.590
	90	21.75	20	17	1.5	1.5	95.6	91.7	13.8	4 300	5 700	**30210JR**	3DB	20.1	58.5	58	81.5	79	85	3	4.5	1.5	1.5	0.42	1.43	0.79	0.566
	90	24.75	23	19	1.5	1.5	106	113	16.7	4 300	5 700	**32210CR**	—	24.0	58.5	58	81.5	74	86	3	5.5	1.5	1.5	0.55	1.10	0.60	0.675
	90	24.75	23	19	1.5	1.5	106	105	15.9	4 300	5 700	**32210JR**	3DC	20.6	58.5	58	81.5	78	85	3	5.5	1.5	1.5	0.42	1.43	0.79	0.643
	90	32	32	24.5	1.5	1.5	150	167	25.0	4 300	5 700	**33210JR**	3DE	23.1	58.5	57	81.5	77	86.5	5	7.5	1.5	1.5	0.41	1.45	0.80	0.887
	100	36	35	30	2.5	2.5	196	196	30.2	4 100	5 400	**T2ED050**	2ED	24.5	62	58	88	84	94	6	6	2	2	0.34	1.75	0.96	1.28
	105	32	29	22	3	3	141	140	20.3	3 300	4 600	**T7FC050**	7FC	35.9	64	59	91	78	100	4	10	2.5	2.5	0.87	0.69	0.38	1.25
	110	29.25	27	19	2.5	2	144	133	19.8	3 100	4 300	**30310DJR**	7FB	35.0	62	62	98	87	105	3	10	2	2	0.83	0.73	0.40	1.25
	110	29.25	27	20	2.5	2	155	143	21.9	3 700	4 900	**30310CR**	—	27.5	62	64	98	90	103	4	9	2	2	0.55	1.10	0.60	1.25
	110	29.25	27	23	2.5	2	172	152	24.0	3 700	4 900	**30310JR**	2FB	22.9	62	65	98	95	102	3	6	2	2	0.35	1.74	0.96	1.32
	110	42.25	40	33	2.5	2	214	234	34.6	3 800	5 100	**32310CR**	5FD	33.4	62	61	98	81	103	4	9	2	2	0.55	1.10	0.60	2.00
	110	42.25	40	33	2.5	2	221	220	34.2	3 700	5 000	**32310JR**	2FD	29.4	62	62	98	90	102	3	9	2	2	0.35	1.74	0.96	1.89
55	80	17	17	14	1	1	55.8	73.3	10.6	4 400	5 900	**32911JR**	2BC	14.5	61	61	74	72	76	3	3	1	1	0.31	1.94	1.07	0.285
	90	23	23	17.5	1.5	1.5	106	121	18.2	4 100	5 500	**32011JR**	3CC	19.8	63.5	63	81.5	81	86	4	5.5	1.5	1.5	0.41	1.48	0.81	0.569
	90	27	27	21	1.5	1.5	121	149	22.6	4 100	5 400	**33011JR**	2CE	19.3	63.5	63	81.5	81	86	5	6	1.5	1.5	0.31	1.92	1.06	0.672
	95	30	30	23	1.5	1.5	145	161	24.6	4 000	5 300	**33111JR**	3CE	22.5	63.5	62	86.5	83	91	5	7	1.5	1.5	0.37	1.60	0.88	0.868
	100	22.75	21	17	2	1.5	112	108	16.2	3 900	5 200	**30211CR**	—	24.3	65	63	90	84	95	4	5.5	2	1.5	0.55	1.10	0.60	0.750
	100	22.75	21	18	2	1.5	118	113	17.3	3 900	5 200	**30211JR**	3DB	20.7	65	64	90	88	94	4	4.5	2	1.5	0.40	1.48	0.81	0.732
	100	26.75	25	21	2	1.5	134	135	20.4	3 900	5 200	**32211CR**	—	25.9	65	64	90	83	96	4	5.5	2	1.5	0.55	1.10	0.60	0.875

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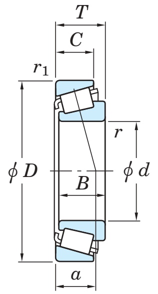
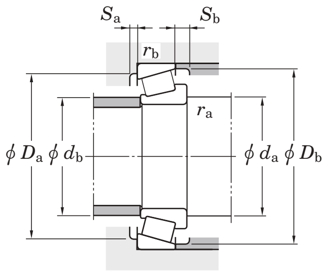
Single-row tapered roller bearings metric series

d (55) ~ (65) mm



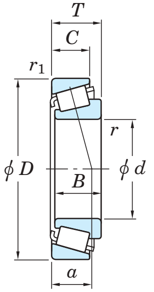


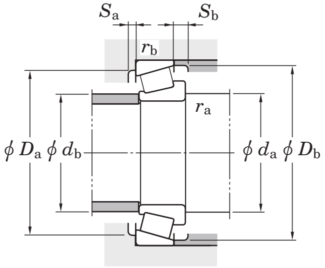
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
55	100	26.75	25	21	2	1.5	134	133	20.5	3 900	5 200	**32211JR-1**	3DC	23.0	65	63	90	87	95	4	5.5	2	1.5	0.40	1.48	0.81	0.863
	100	35	35	27	2	1.5	178	189	28.9	3 900	5 200	**33211JR**	3DE	25.3	65	62	90	85	96	6	8	2	1.5	0.40	1.50	0.83	1.18
	115	34	31	23.5	3	3	161	164	23.9	3 000	4 200	**T7FC055**	7FC	38.6	69	65	101	86	109	4	10.5	2.5	2.5	0.87	0.69	0.38	1.59
	120	31.5	29	21	2.5	2	161	148	22.3	2 900	4 000	**30311DJR**	7FB	38.4	67	68	108	94	113	4	10.5	2	2	0.83	0.73	0.40	1.59
	120	31.5	29	22	2.5	2	180	161	24.8	3 400	4 500	**30311CR**	—	29.8	67	70	108	97	112	4.5	9.5	2	2	0.55	1.10	0.60	1.58
	120	31.5	29	25	2.5	2	187	170	27.0	3 300	4 500	**30311JR**	2FB	25.5	67	71	108	104	111	4	6.5	2	2	0.35	1.74	0.96	1.65
	120	45.5	43	35	2.5	2	230	247	36.9	3 400	4 600	**32311C**	5FD	35.9	67	67	108	90	113	4	10	2	2	0.55	1.10	0.60	2.45
	120	45.5	43	35	2.5	2	214	203	31.8	3 400	4 500	**32311J**	2FD	32.4	67	68	108	99	111	4	10.5	2	2	0.35	1.74	0.96	2.24
	120	45.5	43	35	2.5	2	250	250	39.1	3 400	4 500	**32311JR**	2FD	32.4	67	68	108	99	111	4	10.5	2	2	0.35	1.74	0.96	2.38
60	85	17	17	14	1	1	57.6	78.2	11.3	4 100	5 500	**32912JR**	2BC	15.6	65.5	66	79.5	77	81	3	3	1	1	0.33	1.81	1.00	0.306
	95	23	23	17.5	1.5	1.5	108	127	19.0	3 900	5 200	**32012JR**	4CC	21.0	68.5	67	86.5	85	91	4	5.5	1.5	1.5	0.43	1.39	0.77	0.621
	95	27	27	21	1.5	1.5	127	162	24.5	3 900	5 200	**33012JR**	2CE	20.1	68.5	67	86.5	85	90	5	6	1.5	1.5	0.33	1.83	1.01	0.719
	100	30	30	23	1.5	1.5	149	170	25.9	3 700	5 000	**33112JR**	3CE	23.7	68.5	67	91.5	88	96	5	7	1.5	1.5	0.40	1.51	0.83	0.923
	110	23.75	22	17	2	1.5	127	123	18.8	3 500	4 700	**30212CR**	—	26.2	70	70	100	93	104	4	6.5	2	1.5	0.55	1.10	0.60	0.930
	110	23.75	22	19	2	1.5	133	127	19.7	3 500	4 700	**30212JR**	3EB	21.9	70	70	100	96	103	4	4.5	2	1.5	0.40	1.48	0.81	0.945
	110	29.75	28	22	2	1.5	160	164	25.1	3 600	4 700	**32212CR**	—	28.6	70	68	100	91	105	4	7.5	2	1.5	0.55	1.10	0.60	1.20
	110	29.75	28	24	2	1.5	164	167	25.9	3 500	4 700	**32212JR**	3EC	25.1	70	69	100	95	104	4	5.5	2	1.5	0.40	1.48	0.81	1.19
	110	38	38	29	2	1.5	217	239	36.6	3 600	4 700	**33212JR**	3EE	27.2	70	69	100	93	105	6	9	2	1.5	0.40	1.48	0.82	1.57
	115	39	38	31	4	2.5	198	227	34.0	3 400	4 600	**T5ED060**	5ED	32.4	78	70	103	92	110	5	8	3	2	0.53	1.13	0.62	1.81
	115	40	39	33	2.5	2.5	229	242	37.7	3 400	4 600	**T2EE060**	2EE	27.6	72	70	103	98	109	6	7	2	2	0.33	1.80	0.99	1.80
	125	37	33.5	26	3	3	191	194	28.8	2 800	3 900	**T7FC060**	7FC	40.8	74	71	111	94	119	4	11	2.5	2.5	0.82	0.73	0.40	2.03
	130	33.5	31	22	3	2.5	191	179	27.1	2 600	3 700	**30312DJR**	7FB	40.8	74	73	118	103	124	4	11.5	2.5	2	0.83	0.73	0.40	2.01
	130	33.5	31	23	3	2.5	211	196	30.5	3 100	4 200	**30312CR**	—	31.9	74	75	118	105	121	5	10.5	2.5	2	0.55	1.10	0.60	1.99
	130	33.5	31	26	3	2.5	217	201	31.9	3 100	4 100	**30312JR**	2FB	26.9	74	77	118	112	120	4	7.5	2.5	2	0.35	1.74	0.96	2.08
	130	48.5	46	37	3	2.5	286	310	41.4	3 200	4 300	**32312CR**	5FD	38.3	74	73	118	98	122	5	11	2.5	2	0.55	1.10	0.60	3.15
	130	48.5	46	37	3	2.5	277	275	38.6	3 100	4 200	**32312J**	2FD	32.3	74	74	118	107	120	4	11.5	2.5	2	0.35	1.74	0.96	2.87
	130	48.5	46	37	3	2.5	306	315	44.1	3 100	4 200	**32312JR**	2FD	32.3	74	74	118	107	120	4	11.5	2.5	2	0.35	1.74	0.96	2.99
65	90	17	17	14	1	1	59.2	83.1	12.0	3 900	5 200	**32913JR**	2BC	16.8	70.5	70	84.5	81	86	3	3	1	1	0.35	1.70	0.93	0.327

[Note] 1) Please consult with JTEKT when using the bearings identified by suffix C. They are medium-tapered types especially designed for special purposes.

Single-row tapered roller bearings metric series

d (65) ~ (70) mm



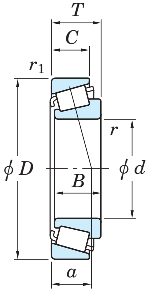


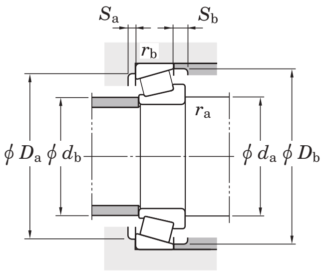
Boundary dimensions (mm) d	D	T	B	C	r min.	r_1 min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Bearing No. [1]	Dimension series to ISO355 (Refer.)	Load center (mm) a	Mounting dimensions (mm) d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	Constant e	Axial load factors Y_1	Y_0	(Refer.) Mass (kg)
65	100	23	23	17.5	1.5	1.5	113	137	20.6	3 600	4 800	**32013JR**	4CC	22.5	73.5	72	91.5	90	97	4	5.5	1.5	1.5	0.46	1.31	0.72	0.664
	100	27	27	21	1.5	1.5	129	169	25.5	3 600	4 800	**33013JR**	2CE	21.1	73.5	72	91.5	89	96	5	6	1.5	1.5	0.35	1.72	0.95	0.762
	110	34	34	26.5	1.5	1.5	191	223	34.3	3 400	4 600	**33113JR**	3DE	25.9	73.5	73	101.5	96	106	6	7.5	1.5	1.5	0.39	1.55	0.85	1.33
	120	24.75	23	18	2	1.5	145	139	21.5	3 200	4 300	**30213CR**	—	28.1	75	77	110	102	114	4	6.5	2	1.5	0.55	1.10	0.60	1.15
	120	24.75	23	20	2	1.5	160	156	24.3	3 200	4 300	**30213JR**	3EB	24.2	75	77	110	106	113	4	4.5	2	1.5	0.40	1.48	0.81	1.18
	120	32.75	31	24	2	1.5	190	198	30.4	3 200	4 300	**32213CR**	—	31.3	75	75	110	99	114	4	8.5	2	1.5	0.55	1.10	0.60	1.55
	120	32.75	31	27	2	1.5	196	203	31.7	3 200	4 300	**32213JR**	3EC	26.6	75	76	110	104	115	4	5.5	2	1.5	0.40	1.48	0.81	1.58
	120	39	38	31	4	2.5	190	232	34.7	3 200	4 300	**T5ED065**	5ED	34.1	83	75	108	96	115	5	8	3	2	0.56	1.07	0.59	1.93
	120	41	41	32	2	1.5	250	277	43.0	3 200	4 300	**33213JR**	3EE	30.0	75	74	110	102	115	7	9	2	1.5	0.39	1.54	0.85	2.02
	130	37	33.5	26	3	3	186	211	31.2	2 600	3 600	**T7FC065**	7FC	44.4	79	78	116	98	124	4	11	2.5	2.5	0.87	0.69	0.38	2.17
	140	36	33	23	3	2.5	220	209	31.4	2 400	3 400	**30313DJR**	7GB	44.3	79	79	128	111	133	4	13	2.5	2	0.83	0.73	0.40	2.44
	140	36	33	25	3	2.5	241	227	35.1	2 900	3 900	**30313CR**	—	34.3	79	81	128	113	130	5	11	2.5	2	0.55	1.10	0.60	2.44
	140	36	33	28	3	2.5	255	239	37.6	2 800	3 800	**30313JR**	2GB	29.3	79	83	128	122	130	4	8	2.5	2	0.35	1.74	0.96	2.56
	140	51	48	39	3	2.5	322	361	49.0	2 900	3 900	**32313CR**	5GD	40.9	79	79	128	106	131	5	12	2.5	2	0.55	1.10	0.60	3.85
	140	51	48	39	3	2.5	313	312	43.4	2 900	3 900	**32313J**	2GD	34.7	79	80	128	117	130	4	12	2.5	2	0.35	1.74	0.96	3.49
	140	51	48	39	3	2.5	346	357	49.6	2 900	3 900	**32313JR**	2GD	34.7	79	80	128	117	130	4	12	2.5	2	0.35	1.74	0.96	3.64
70	100	20	20	16	1	1	89.0	115	17.2	3 500	4 700	**32914JR**	2BC	17.8	75.5	77	94.5	91	96	4	4	1	1	0.32	1.90	1.05	0.496
	110	25	25	19	1.5	1.5	136	163	24.8	3 300	4 400	**32014JR**	4CC	23.6	78.5	78	101.5	98	105	5	6	1.5	1.5	0.43	1.38	0.76	0.884
	110	31	31	25.5	1.5	1.5	168	208	32.3	3 300	4 400	**33014JR**	2CE	22.1	78.5	78	101.5	99	105	5	5.5	1.5	1.5	0.28	2.11	1.16	1.09
	120	37	37	29	2	1.5	227	266	41.2	3 100	4 200	**33114JR**	3DE	28.0	80	79	110	104	115	6	8	2	1.5	0.38	1.58	0.87	1.71
	125	26.25	24	19	2	1.5	158	158	24.5	3 000	4 000	**30214CR**	—	29.9	80	82	116.5	107	119	4	7	2	1.5	0.55	1.10	0.60	1.30
	125	26.25	24	21	2	1.5	173	173	27.1	3 100	4 100	**30214JR**	3EB	25.9	80	81	116.5	110	118	4	5	2	1.5	0.42	1.43	0.79	1.32
	125	33.25	31	24	2	1.5	197	212	32.6	3 100	4 100	**32214CR**	—	32.6	80	80	116.5	104	120	4	9.5	2	1.5	0.55	1.10	0.60	1.65
	125	33.25	31	27	2	1.5	212	225	35.2	3 100	4 100	**32214JR**	3EC	29.2	80	80	116.5	108	119	4	6	2	1.5	0.42	1.43	0.79	1.71
	125	41	41	32	2	1.5	258	294	45.5	3 100	4 100	**33214JR**	3EE	31.2	80	79	116.5	107	120	7	9	2	1.5	0.41	1.47	0.81	2.16
	130	43	42	35	3	2.5	291	319	50.0	3 000	4 000	**T2ED070**	2ED	30.2	84	81	118	111	123	1	1	2.5	2	0.33	1.80	0.99	2.48
	140	39	35.5	27	3	3	222	242	35.8	2 400	3 400	**T7FC070**	7FC	46.5	84	82	126	106	133	5	12	2.5	2.5	0.87	0.69	0.38	2.64
	140	52	51	43	5	3	330	382	51.6	2 900	3 800	**T4FE070**	4FE	37.7	92	82	126	111	133	7	9	4	2.5	0.45	1.34	0.74	3.69

[Note] 1) Please consult with JTEKT when using the bearings identified by suffix C. They are medium-tapered types especially designed for special purposes.

Single-row tapered roller bearings metric series

d (70) ~ (80) mm





Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
70	150	38	35	25	3	2.5	246	235	34.9	2 300	3 200	**30314DJR**	7GB	47.1	84	84	138	118	142	4	13	2.5	2	0.83	0.73	0.40	2.97
	150	38	35	30	3	2.5	280	256	36.0	2 700	3 600	**30314CR**	—	37.0	84	87	138	123	141	6	8	2.5	2	0.55	1.10	0.60	3.10
	150	38	35	30	3	2.5	288	273	42.2	2 600	3 500	**30314JR**	2GB	30.5	84	89	138	130	140	4	8	2.5	2	0.35	1.74	0.96	3.08
	150	54	51	42	3	2.5	321	315	44.1	2 700	3 600	**32314**	—	37.0	84	86	138	125	140	4	12	2.5	2	0.35	1.73	0.95	4.11
	150	54	51	42	3	2.5	371	391	51.4	2 700	3 600	**32314C**	5GD	44.4	84	84	138	115	142	5	12	2.5	2	0.55	1.10	0.60	4.50
	150	54	51	42	3	2.5	396	414	57.2	2 700	3 600	**32314JR**	2GD	37.4	84	86	138	125	140	4	12	2.5	2	0.35	1.74	0.96	4.50
75	105	20	20	16	1	1	92.2	123	18.4	3 300	4 400	**32915JR**	2BC	18.9	80.5	81	99.5	96	101	4	4	1	1	0.33	1.80	0.99	0.526
	115	25	25	19	1.5	1.5	139	169	25.8	3 100	4 200	**32015JR**	4CC	25.1	83.5	83	106.5	103	110	5	6	1.5	1.5	0.46	1.31	0.72	0.930
	115	31	31	25.5	1.5	1.5	177	225	35.0	3 200	4 200	**33015JR**	2CE	22.9	83.5	83	106.5	104	110	6	5.5	1.5	1.5	0.30	2.01	1.11	1.16
	125	37	37	29	2	1.5	234	280	43.4	3 000	4 000	**33115JR**	3DE	29.3	85	84	116.5	109	120	6	8	2	1.5	0.40	1.51	0.83	1.84
	130	27.25	25	20	2	1.5	171	178	27.4	2 900	3 800	**30215CR**	—	31.0	85	87	121.5	111	124	5	7	2	1.5	0.55	1.10	0.60	1.40
	130	27.25	25	22	2	1.5	178	181	28.2	2 900	3 900	**30215JR**	4DB	27.6	85	86	121.5	115	124	4	5	2	1.5	0.44	1.38	0.76	1.42
	130	33.25	31	24	2	1.5	204	225	34.5	2 900	3 900	**32215CR**	—	33.7	85	85	121.5	109	125	4	9	2	1.5	0.55	1.10	0.60	1.75
	130	33.25	31	27	2	1.5	218	234	36.4	2 900	3 900	**32215JR**	4DC	30.2	85	85	121.5	114	125	4	6	2	1.5	0.44	1.38	0.76	1.77
	130	41	41	31	2	1.5	266	310	47.7	2 900	3 900	**33215JR**	3EE	32.5	85	83	121.5	111	125	7	10	2	1.5	0.43	1.40	0.77	2.26
	150	42	38	29	3	3	240	270	39.0	2 200	3 100	**T7FC075**	7FC	50.6	89	89	136	114	143	5	13	2.5	2.5	0.87	0.69	0.38	3.24
	160	40	37	26	3	2.5	266	254	34.2	2 100	2 900	**30315DJR**	7GB	49.9	89	91	148	127	151	6	14	2.5	2	0.83	0.73	0.40	3.45
	160	40	37	26	3	2.5	277	266	36.9	2 100	2 900	**30315DR**	—	48.8	89	91	148	127	151	6	14	2.5	2	0.81	0.74	0.41	3.48
	160	40	37	31	3	2.5	310	296	42.1	2 500	3 400	**30315CR**	—	39.2	89	94	148	130	150	6	9	2.5	2	0.55	1.10	0.60	3.80
	160	40	37	31	3	2.5	325	311	44.9	2 500	3 300	**30315JR**	2GB	32.5	89	95	148	139	149	4	9	2.5	2	0.35	1.74	0.96	3.65
	160	40	37	31	3	2.5	313	298	43.3	2 500	3 300	**30315R**	—	31.9	89	95	148	139	149	4	9	2.5	2	0.35	1.73	0.95	3.52
	160	58	55	43	3	2.5	447	474	61.4	2 500	3 400	**32315CR**	—	46.6	89	90	148	125	154	6	15	2.5	2	0.55	1.10	0.60	5.50
	160	58	55	45	3	2.5	454	481	64.6	2 500	3 300	**32315JR**	2GD	40.0	89	91	148	133	149	4	13	2.5	2	0.35	1.74	0.96	5.41
	160	58	55	45	3	2.5	425	444	60.3	2 500	3 300	**32315R**	—	39.5	89	91	148	133	149	4	13	2.5	2	0.35	1.73	0.95	5.30
80	110	20	20	16	1	1	95.1	131	19.5	3 100	4 200	**32916JR**	2BC	20.1	85.5	86	104.5	101	106	4	4	1	1	0.35	1.71	0.94	0.556
	125	29	29	22	1.5	1.5	185	225	34.6	2 900	3 900	**32016JR**	3CC	26.7	88.5	89	116.5	112	120	6	7	1.5	1.5	0.42	1.42	0.78	1.32
	125	36	36	29.5	1.5	1.5	218	288	44.8	2 900	3 900	**33016JR**	2CE	25.1	88.5	90	116.5	112	119	6	6.5	1.5	1.5	0.28	2.16	1.19	1.63
	130	37	37	29	2	1.5	240	294	44.9	2 800	3 800	**33116JR**	3DE	30.5	90	89	121.5	114	126	6	8	2	1.5	0.42	1.44	0.79	1.93

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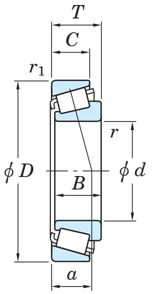
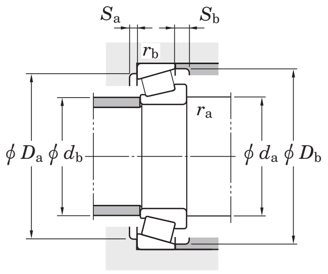
Single-row tapered roller bearings metric series

d (80) ~ (90) mm

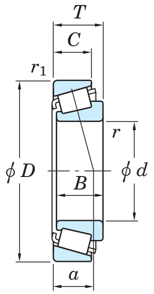


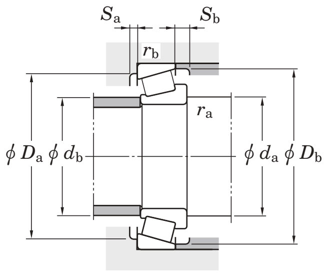


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
80	140	28.25	26	22	2.5	2	202	202	31.2	2 700	3 600	**30216JR**	3EB	28.6	92	91	130	124	132	4	6	2	2	0.42	1.43	0.79	1.72
	140	35.25	33	28	2.5	2	253	271	41.5	2 700	3 600	**32216JR**	3EC	31.7	92	90	130	122	134	4	7	2	2	0.42	1.43	0.79	2.17
	140	46	46	35	2.5	2	313	371	56.1	2 700	3 600	**33216JR**	3EE	35.7	92	89	130	119	135	7	11	2	2	0.43	1.41	0.78	2.99
	145	46	45	38	3	2.5	333	381	52.0	2 600	3 500	**T2ED080**	2ED	32.7	94	92	133	125	137	7	8	2.5	2	0.32	1.88	1.03	3.20
	170	42.5	39	27	3	2.5	294	282	38.7	2 000	2 800	**30316DJR**	7GB	53.5	94	97	158	134	159	6	15.5	2.5	2	0.83	0.73	0.40	4.12
	170	42.5	39	33	3	2.5	368	355	49.9	2 300	3 100	**30316JR**	2GB	34.8	94	102	158	148	159	4	9.5	2.5	2	0.35	1.74	0.96	4.46
	170	42.5	39	33	3	2.5	345	330	47.1	2 300	3 100	**30316R**	—	33.9	94	102	158	148	159	4	9.5	2.5	2	0.35	1.73	0.95	4.26
	170	61.5	58	48	3	2.5	434	440	58.6	2 300	3 100	**32316J**	2GD	43.5	94	98	158	142	159	4	13.5	2.5	2	0.35	1.74	0.96	6.04
	170	61.5	58	48	3	2.5	480	503	67.0	2 300	3 100	**32316JR**	2GD	43.5	94	98	158	142	159	4	13.5	2.5	2	0.35	1.74	0.96	6.31
85	120	23	23	18	1.5	1.5	122	165	25.0	2 900	3 900	**32917JR**	2BC	21.2	93.5	93	111.5	109	115	5	5	1.5	1.5	0.33	1.83	1.01	0.794
	130	29	29	22	1.5	1.5	189	234	35.5	2 800	3 700	**32017JR**	4CC	28.0	93.5	94	121.5	117	125	6	7	1.5	1.5	0.44	1.36	0.75	1.38
	130	36	36	29.5	1.5	1.5	222	300	46.0	2 800	3 700	**33017JR**	2CE	26.3	93.5	94	121.5	118	125	6	6.5	1.5	1.5	0.29	2.06	1.13	1.72
	140	41	41	32	2.5	2	282	346	52.2	2 600	3 500	**33117JR**	3DE	33.2	97	95	130	122	135	7	9	2	2	0.41	1.48	0.81	2.43
	150	30.5	28	24	2.5	2	228	231	35.1	2 500	3 400	**30217JR**	3EB	30.4	97	97	140	132	141	5	6.5	2	2	0.42	1.43	0.79	2.17
	150	38.5	36	30	2.5	2	290	315	47.5	2 500	3 400	**32217JR**	3EC	34.2	97	96	140	130	142	5	8.5	2	2	0.42	1.43	0.79	2.80
	150	49	49	37	2.5	2	368	439	59.1	2 500	3 400	**33217JR**	3EE	37.1	97	95	140	128	144	7	12	2	2	0.42	1.43	0.79	3.63
	180	44.5	41	28	4	3	288	265	36.0	1 900	2 600	**30317D**	—	56.0	103	103	166	143	169	6	16.5	3	2.5	0.81	0.74	0.41	4.54
	180	44.5	41	28	4	3	328	317	42.6	1 900	2 600	**30317DJR**	7GB	56.3	103	103	166	143	169	6	16.5	3	2.5	0.83	0.73	0.40	4.81
	180	44.5	41	34	4	3	396	384	53.0	2 200	2 900	**30317JR**	2GB	36.0	103	107	166	156	167	5	10.5	3	2.5	0.35	1.74	0.96	5.15
	180	44.5	41	34	4	3	381	367	51.1	2 200	2 900	**30317R**	—	35.8	103	107	166	156	167	5	10.5	3	2.5	0.35	1.73	0.95	4.97
	180	63.5	60	49	4	3	549	587	77.6	2 200	3 000	**32317JR**	2GD	43.8	103	103	166	150	167	5	14.5	3	2.5	0.35	1.74	0.96	7.42
90	125	23	23	18	1.5	1.5	126	175	26.2	2 800	3 700	**32918JR**	2BC	22.3	98.5	97	116.5	114	120	5	5	1.5	1.5	0.34	1.75	0.96	0.834
	140	32	32	24	2	1.5	224	276	41.5	2 600	3 500	**32018JR**	3CC	29.8	100	100	131.5	125	134	6	8	2	1.5	0.42	1.42	0.78	1.80
	140	39	39	32.5	2	1.5	278	367	55.6	2 600	3 400	**33018JR**	2CE	27.1	100	100	131.5	127	135	7	6.5	2	1.5	0.27	2.23	1.23	2.22
	150	45	45	35	2.5	2	324	413	61.1	2 500	3 300	**33118JR**	3DE	35.4	102	100	140	130	144	7	10	2	2	0.40	1.51	0.83	3.13
	155	46	46	38	3	3	342	405	54.1	2 400	3 200	**T2ED090**	2ED	33.5	104	102	141	135	147	7	8	2.5	2.5	0.33	1.84	1.01	3.47
	160	32.5	30	26	2.5	2	255	261	39.0	2 400	3 200	**30218JR**	3FB	32.6	102	103	150	140	150	5	6.5	2	2	0.42	1.43	0.79	2.65
	160	42.5	40	34	2.5	2	329	362	53.7	2 400	3 200	**32218JR**	3FC	37.0	102	102	150	138	152	5	8.5	2	2	0.42	1.43	0.79	3.47

Single-row tapered roller bearings
metric series

d (90) ~ (100) mm

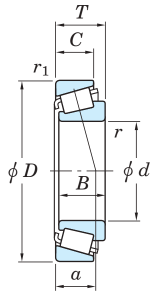


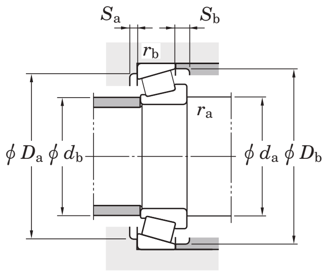


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
90	160	55	55	42	2.5	2	430	527	68.3	2 400	3 200	**33218JR**	3FE	40.8	102	101	150	135	154	9	13	2	2	0.42	1.43	0.78	4.76
	190	46.5	43	30	4	3	359	350	46.2	1 700	2 400	**30318DJR**	7GB	59.6	108	109	176	151	179	6	16.5	3	2.5	0.83	0.73	0.40	5.57
	190	46.5	43	30	4	3	352	336	44.9	1 700	2 400	**30318DR**	—	59.1	108	109	176	151	179	6	16.5	3	2.5	0.81	0.74	0.41	5.60
	190	46.5	43	36	4	3	432	420	57.1	2 100	2 700	**30318JR**	2GB	38.1	108	113	176	165	177	5	10.5	3	2.5	0.35	1.74	0.96	6.04
	190	46.5	43	36	4	3	421	407	55.5	2 100	2 700	**30318R**	—	37.2	108	113	176	165	177	5	10.5	3	2.5	0.35	1.73	0.95	5.78
	190	67.5	64	53	4	3	577	614	78.7	2 100	2 800	**32318JR**	2GD	46.6	108	108	176	157	177	5	14.5	3	2.5	0.35	1.74	0.96	8.61
95	130	23	23	18	1.5	1.5	130	186	27.4	2 600	3 500	**32919JR**	2BC	23.5	103.5	102	121.5	119	125	5	5	1.5	1.5	0.36	1.68	0.92	0.876
	145	32	32	24	2	1.5	229	287	42.6	2 500	3 300	**32019JR**	4CC	31.2	105	105	136.5	130	140	6	8	2	1.5	0.44	1.36	0.75	1.88
	145	39	39	32.5	2	1.5	284	382	57.3	2 500	3 300	**33019JR**	2CE	27.8	105	104	136.5	131	139	7	6.5	2	1.5	0.28	2.16	1.19	2.31
	160	46	46	38	3	3	353	427	56.4	2 300	3 100	**T2ED095**	2ED	34.6	109	107	146	140	152	7	8	2.5	2.5	0.34	1.77	0.97	3.62
	160	49	49	38	2.5	2	381	473	62.5	2 300	3 100	**33119JR**	3EE	37.3	107	106	150	138	154	8	11	2	2	0.39	1.54	0.85	3.89
	170	34.5	32	27	3	2.5	289	299	44.0	2 200	3 000	**30219JR**	3FB	34.9	109	110	158	149	159	5	7.5	2.5	2	0.42	1.43	0.79	3.20
	170	45.5	43	37	3	2.5	389	439	64.1	2 200	3 000	**32219JR**	3FC	38.9	109	108	158	145	161	5	8.5	2.5	2	0.42	1.43	0.79	4.34
	170	58	58	44	3	2.5	468	582	74.0	2 200	2 900	**33219JR**	3FE	42.8	109	107	158	144	163	9	14	2.5	2	0.41	1.47	0.81	5.66
	200	49.5	45	32	4	3	398	391	50.4	1 700	2 300	**30319DJR**	7GB	62.7	113	113	186	157	187	6	17.5	3	2.5	0.83	0.73	0.40	6.68
	200	49.5	45	38	4	3	396	368	49.2	2 000	2 600	**30319**	—	39.8	113	118	186	172	186	5	11.5	3	2.5	0.35	1.73	0.95	6.32
	200	49.5	45	38	4	3	465	455	60.9	2 000	2 600	**30319JR**	2GB	40.8	113	118	186	172	186	5	11.5	3	2.5	0.35	1.74	0.96	6.96
	200	71.5	67	55	4	3	534	544	70.2	2 000	2 600	**32319**	—	49.1	113	115	186	166	186	5	16.5	3	2.5	0.35	1.73	0.95	9.35
	200	71.5	67	55	4	3	646	695	89.2	2 000	2 600	**32319JR**	2GD	49.8	113	115	186	166	186	5	16.5	3	2.5	0.35	1.74	0.96	10.1
100	140	25	25	20	1.5	1.5	158	217	32.0	2 400	3 300	**32920JR**	2CC	24.0	109	108	131	128	135	5	5	1.5	1.5	0.33	1.82	1.00	1.19
	145	24	22.5	17.5	3	3	146	167	24.6	2 400	3 200	**T4CB100**	4CB	29.9	112	109	133	132	140	4	6.5	2.5	2.5	0.47	1.27	0.70	1.12
	150	32	32	24	2	1.5	233	298	43.8	2 400	3 200	**32020JR**	4CC	32.6	110	109	141	134	144	6	8	2	1.5	0.46	1.31	0.72	1.95
	150	39	39	32.5	2	1.5	290	397	59.0	2 400	3 200	**33020JR**	2CE	28.6	110	108	141	135	143	7	6.5	2	1.5	0.29	2.09	1.15	2.40
	165	47	46	39	3	3	368	458	59.5	2 200	3 000	**T2EE100**	2EE	35.1	114	112	151	145	157	7	8	2.5	2.5	0.32	1.88	1.04	3.86
	165	52	52	40	2.5	2	408	523	67.4	2 200	3 000	**33120JR**	3EE	40.1	112	111	155	142	159	8	12	2	2	0.41	1.48	0.81	4.29
	180	37	34	29	3	2.5	323	338	49.1	2 100	2 800	**30220JR**	3FB	36.8	114	116	168	157	168	5	8	2.5	2	0.42	1.43	0.79	3.83
	180	49	46	39	3	2.5	435	495	63.9	2 100	2 800	**32220JR**	3FC	42.1	114	114	168	154	171	5	10	2.5	2	0.42	1.43	0.79	5.21
	180	63	63	48	3	2.5	540	680	85.8	2 100	2 800	**33220JR**	3FE	45.7	114	112	168	151	172	10	15	2.5	2	0.40	1.48	0.82	6.92

Single-row tapered roller bearings metric series

d (100) ~ (110) mm

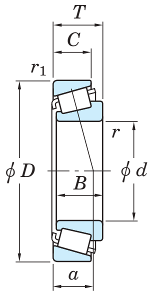


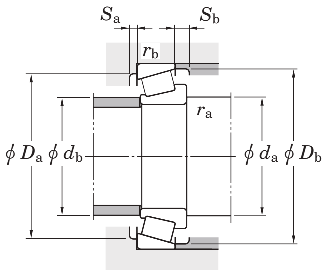


Boundary dimensions (mm) d	D	T	B	C	r min.	r_1 min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Bearing No.	Dimension series to ISO355 (Refer.)	Load center (mm) a	Mounting dimensions (mm) d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	Constant e	Axial load factors Y_1	Y_0	(Refer.) Mass (kg)
100	215	51.5	47	34	4	3	397	374	48.5	1 500	2 100	**30320D**	—	65.9	118	121	201	183	204	5	17	3	2.5	0.81	0.74	0.41	8.02
	215	51.5	47	39	4	3	430	400	52.5	1 800	2 400	**30320**	—	41.4	118	127	201	184	200	6	12.5	3	2.5	0.35	1.73	0.95	7.76
	215	51.5	47	39	4	3	528	521	68.0	1 800	2 400	**30320JR**	2GB	42.7	118	127	201	184	200	6	12.5	3	2.5	0.35	1.74	0.96	8.49
	215	56.5	51	35	4	3	465	459	56.4	1 500	2 200	**31320JR**	7GB	67.7	118	120	201	183	202	6	17.5	3	2.5	0.83	0.73	0.40	8.72
	215	77.5	73	60	4	3	614	637	79.6	1 800	2 400	**32320**	—	52.6	118	123	201	177	200	8	17.5	3	2.5	0.35	1.73	0.95	12.2
	215	77.5	73	60	4	3	725	783	96.9	1 800	2 400	**32320JR**	2GD	53.9	118	123	201	177	200	8	17.5	3	2.5	0.35	1.74	0.96	13.0
105	145	25	25	20	1.5	1.5	160	224	32.6	2 400	3 100	**32921JR**	2CC	25.1	113.5	113	136.5	133	140	5	5	1.5	1.5	0.34	1.75	0.96	1.23
	160	35	35	26	2.5	2	270	344	49.9	2 200	3 000	**32021JR**	4DC	34.5	117	116	150	143	154	6	9	2	2	0.44	1.35	0.74	2.45
	160	43	43	34	2.5	2	335	461	67.4	2 200	3 000	**33021JR**	2DE	30.9	117	116	150	145	153	7	9	2	2	0.28	2.12	1.17	3.08
	175	56	56	44	2.5	2	453	607	76.0	2 100	2 800	**33121JR**	3EE	43.2	117	116	165	150	169	9	12	2	2	0.40	1.48	0.82	5.33
	190	39	36	30	3	2.5	360	380	52.3	2 000	2 600	**30221JR**	3FB	39.0	119	122	178	165	178	6	9	2.5	2	0.42	1.43	0.79	4.49
	190	53	50	43	3	2.5	490	567	73.0	2 000	2 700	**32221JR**	3FC	44.8	119	120	178	161	180	6	10	2.5	2	0.42	1.43	0.79	6.37
	190	68	68	52	3	2.5	622	790	97.4	2 000	2 600	**33221JR**	3FE	48.8	119	117	178	159	182	10	16	2.5	2	0.40	1.49	0.82	8.43
	225	53.5	49	36	4	3	423	396	50.1	1 400	2 000	**30321D**	—	69.1	123	127	211	193	209	6	17	3	2.5	0.81	0.74	0.41	8.76
	225	53.5	49	41	4	3	464	432	56.0	1 700	2 300	**30321**	—	43.1	123	132	211	193	209	7	12.5	3	2.5	0.35	1.73	0.95	8.74
	225	53.5	49	41	4	3	581	578	73.6	1 700	2 300	**30321JR**	2GB	44.1	123	132	211	193	209	7	12.5	3	2.5	0.35	1.74	0.96	9.73
	225	58	53	36	4	3	495	489	59.4	1 500	2 100	**31321JR**	7GB	70.3	123	126	211	193	211	6	18	3	2.5	0.83	0.73	0.40	9.72
	225	81.5	77	63	4	3	679	707	86.7	1 800	2 300	**32321**	—	55.7	123	128	211	185	209	8	18.5	3	2.5	0.35	1.73	0.95	13.9
	225	81.5	77	63	4	3	794	866	107	1 800	2 300	**32321JR**	2GD	56.1	123	128	211	185	209	8	18.5	3	2.5	0.35	1.74	0.96	14.9
110	150	25	25	20	1.5	1.5	162	231	33.3	2 300	3 000	**32922JR**	2CC	26.3	119	118	141	138	145	5	5	1.5	1.5	0.36	1.69	0.93	1.28
	160	27	25.5	19.5	3	3	183	225	32.3	2 200	2 900	**T4CB110**	4CB	31.8	124	120	146	145	154	5	7.5	2.5	2.5	0.44	1.36	0.75	1.63
	170	38	38	29	2.5	2	312	395	56.7	2 100	2 800	**32022JR**	4DC	36.1	122	122	160	152	163	7	9	2	2	0.43	1.39	0.77	3.12
	170	47	47	37	2.5	2	360	502	64.9	2 100	2 800	**33022JR**	2DE	33.4	122	123	160	152	161	7	10	2	2	0.29	2.09	1.15	3.81
	180	56	56	43	2.5	2	464	634	78.6	2 000	2 700	**33122JR**	3EE	44.5	122	121	170	155	174	9	13	2	2	0.42	1.43	0.79	5.52
	200	41	38	32	3	2.5	405	434	58.1	1 900	2 500	**30222JR**	3FB	40.8	124	129	188	174	188	6	9	2.5	2	0.42	1.43	0.79	5.33
	200	56	53	46	3	2.5	547	640	80.4	1 900	2 500	**32222JR**	3FC	46.7	124	126	188	170	190	6	10	2.5	2	0.42	1.43	0.79	7.45
	240	54.5	50	36	4	3	456	429	53.5	1 400	1 900	**30322D**	—	71.5	128	135	226	205	222	6	18	3	2.5	0.81	0.74	0.41	10.2
	240	54.5	50	42	4	3	509	475	60.5	1 600	2 100	**30322**	—	44.8	128	141	226	206	222	8	12.5	3	2.5	0.35	1.73	0.95	10.4

Single-row tapered roller bearings metric series

d (110) ~ 130 mm

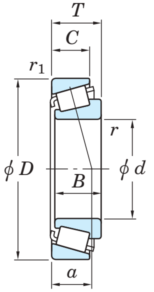


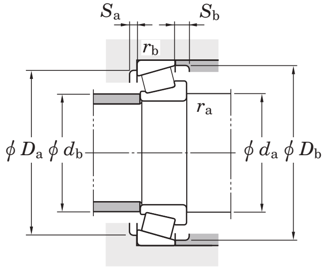


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
110	240	54.5	50	42	4	3	601	590	75.2	1 600	2 100	**30322JR**	2GB	46.3	128	141	226	206	222	8	12.5	3	2.5	0.35	1.74	0.96	11.4
	240	63	57	38	4	3	564	563	68.4	1 400	1 900	**31322JR**	7GB	76.2	128	135	226	205	224	6	21	3	2.5	0.83	0.73	0.40	12.2
	240	84.5	80	65	4	3	759	797	97.4	1 600	2 200	**32322**	—	57.3	128	137	226	198	222	9	19.5	3	2.5	0.35	1.73	0.95	16.6
	240	84.5	80	65	4	3	865	943	115	1 600	2 200	**32322JR**	2GD	59.3	128	137	226	198	222	9	19.5	3	2.5	0.35	1.74	0.96	17.8
120	165	29	29	23	1.5	1.5	215	298	42.5	2 100	2 700	**32924JR**	2CC	29.4	129	128	156	152	160	6	6	1.5	1.5	0.35	1.72	0.95	1.77
	170	27	25	19.5	3	3	206	262	37.0	2 000	2 700	**T4CB120**	4CB	34.6	134	130	156	155	164	4	7.5	2.5	2.5	0.47	1.27	0.70	1.76
	180	38	38	29	2.5	2	325	427	60.0	2 000	2 600	**32024JR**	4DC	38.8	132	131	170	161	173	7	9	2	2	0.46	1.31	0.72	3.34
	180	48	48	38	2.5	2	375	540	68.5	2 000	2 600	**33024JR**	2DE	36.2	132	132	170	160	171	6	10	2	2	0.31	1.97	1.08	4.16
	200	62	62	48	2.5	2	581	785	96.1	1 800	2 400	**33124JR**	3FE	47.8	132	133	190	172	192	9	14	2	2	0.40	1.51	0.83	7.73
	215	43.5	40	34	3	2.5	435	473	61.7	1 700	2 300	**30224JR**	4FB	44.2	134	140	203	187	203	6	9.5	2.5	2	0.44	1.38	0.76	6.36
	215	61.5	58	50	3	2.5	589	691	84.0	1 700	2 300	**32224JR**	4FD	51.6	134	136	203	181	204	7	11.5	2.5	2	0.44	1.38	0.76	9.04
	260	59.5	55	38	4	3	536	512	61.5	1 200	1 700	**30324D**	—	77.8	138	145	246	219	239	6	21	3	2.5	0.81	0.74	0.41	13.0
	260	59.5	55	46	4	3	631	611	76.9	1 500	2 000	**30324**	—	48.9	138	152	246	221	239	10	13.5	3	2.5	0.35	1.73	0.95	13.7
	260	59.5	55	46	4	3	712	714	89.9	1 500	2 000	**30324JR**	2GB	50.2	138	152	246	221	239	10	13.5	3	2.5	0.35	1.74	0.96	14.5
	260	68	62	42	4	3	657	665	77.8	1 300	1 800	**31324JR**	7GB	81.9	138	145	246	221	244	6	21	3	2.5	0.83	0.73	0.40	15.4
	260	90.5	86	69	4	3	1 000	1 110	131	1 500	2 000	**32324JR**	2GD	62.7	138	148	246	213	239	9	21.5	3	2.5	0.35	1.74	0.96	22.2
	260	90.5	86	69	4	3	997	1 110	132	1 500	2 000	**32324R**	—	61.1	138	148	246	213	239	9	21.5	3	2.5	0.35	1.73	0.95	21.8
130	180	32	32	25	2	1.5	251	368	51.2	1 900	2 500	**32926JR**	2CC	31.4	140	141	171	165	174	6	7	2	1.5	0.34	1.77	0.97	2.42
	185	29	27	21	3	3	230	282	39.2	1 800	2 500	**T4CB130**	4CB	37.8	144	141	171	170	179	5	8	2.5	2.5	0.47	1.27	0.70	2.22
	200	45	45	34	2.5	2	428	563	77.4	1 800	2 300	**32026JR**	4EC	42.9	142	144	190	178	192	8	11	2	2	0.43	1.38	0.76	5.04
	200	55	55	43	2.5	2	489	705	85.8	1 700	2 300	**33026JR**	2EE	42.5	142	143	190	178	192	8	12	2	2	0.34	1.76	0.97	6.19
	230	43.75	40	34	4	3	472	511	65.7	1 600	2 100	**30226JR**	4FB	46.2	148	152	216	203	218	7	9.5	3	2.5	0.44	1.38	0.76	7.24
	230	67.75	64	54	4	3	693	830	99.9	1 600	2 200	**32226JR**	4FD	56.0	148	146	216	193	219	7	13.5	3	2.5	0.44	1.38	0.76	11.5
	280	63.75	58	41	5	4	604	582	69.9	1 200	1 600	**30326D**	—	84.0	152	155	262	240	261	7	22	4	3	0.81	0.74	0.41	16.3
	280	63.75	58	49	5	4	823	834	102	1 400	1 800	**30326JR**	2GB	54.0	152	164	262	239	255	8	14.5	4	3	0.35	1.74	0.96	18.1
	280	72	66	44	5	4	734	748	85.7	1 200	1 600	**31326JR**	7GB	87.3	152	155	262	236	261	7	23	4	3	0.83	0.73	0.40	18.9
	280	98.75	93	78	5	4	1 070	1 160	134	1 400	1 800	**32326**	—	69.1	152	163	262	226	259	10	15	4	3	0.35	1.73	0.95	26.5

Single-row tapered roller bearings metric series

d 140 ~ (170) mm

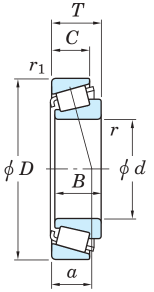


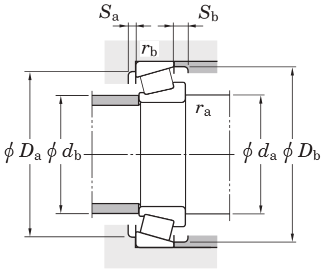


Boundary dimensions (mm) d	D	T	B	C	r min.	r_1 min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Bearing No.	Dimension series to ISO355 (Refer.)	Load center (mm) a	Mounting dimensions (mm) d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	Con-stant e	Axial load factors Y_1	Y_0	(Refer.) Mass (kg)
140	190	32	32	25	2	1.5	258	390	53.2	1 800	2 300	**32928JR**	2CC	33.6	150	150	181	174	184	6	7	2	1.5	0.36	1.67	0.92	2.57
	195	29	27	21	3	3	232	293	39.9	1 700	2 300	**T4CB140**	4CB	40.9	154	151	181	180	189	5	8	2.5	2.5	0.50	1.19	0.66	2.36
	210	45	45	34	2.5	2	435	585	79.2	1 700	2 200	**32028JR**	4DC	45.6	152	153	200	187	202	8	11	2	2	0.46	1.31	0.72	5.28
	210	56	56	44	2.5	2	510	758	90.9	1 600	2 200	**33028JR**	2DE	45.6	152	152	200	186	202	7	12	2	2	0.36	1.67	0.92	6.61
	250	45.75	42	36	4	3	526	570	71.8	1 500	1 900	**30228JR**	4FB	49.4	158	163	236	219	237	9	9.5	3	2.5	0.44	1.38	0.76	8.97
	250	71.75	68	58	4	3	796	961	112	1 500	2 000	**32228JR**	4FD	60.0	158	158	236	210	238	9	13.5	3	2.5	0.44	1.38	0.76	14.7
	300	67.75	62	44	5	4	655	627	74.5	1 100	1 500	**30328D**	—	90.2	162	169	282	254	280	7	23	4	3	0.81	0.74	0.41	20.0
	300	67.75	62	53	5	4	938	962	114	1 300	1 700	**30328JR**	2GB	56.9	162	179	282	254	273	10	14.5	4	3	0.35	1.74	0.96	22.6
	300	77	70	47	5	4	841	865	99.1	1 100	1 500	**31328JR**	7GB	93.8	162	167	282	254	280	8	26	4	3	0.83	0.73	0.40	23.3
	300	107.75	102	85	5	4	1 370	1 570	175	1 300	1 700	**32328R**	—	74.2	162	175	282	246	280	10	17	4	3	0.35	1.74	0.96	35.1
150	210	38	38	30	2.5	2	358	536	72.1	1 600	2 100	**32930JR**	2DC	36.1	162	163	200	194	202	7	8	2	2	0.33	1.83	1.01	3.96
	225	48	48	36	3	2.5	492	668	79.6	1 500	2 000	**32030JR**	4EC	48.8	164	164	213	200	216	8	12	2.5	2	0.46	1.31	0.72	6.41
	225	59	59	46	3	2.5	575	869	101	1 500	2 000	**33030JR**	2EE	47.8	164	164	213	200	217	8	13	2.5	2	0.36	1.65	0.90	8.09
	270	49	45	38	4	3	604	664	80.9	1 300	1 800	**30230JR**	4GB	52.4	168	175	256	234	255	9	11	3	2.5	0.44	1.38	0.76	11.6
	270	77	73	60	4	3	881	1 070	122	1 300	1 800	**32230JR**	4GD	65.2	168	170	256	226	254	8	17	3	2.5	0.44	1.38	0.76	18.2
	320	72	65	46	5	4	768	750	85.7	970	1 400	**30330D**	—	96.0	172	183	302	270	301	9	26	4	3	0.81	0.74	0.41	23.9
	320	72	65	55	5	4	1 050	1 080	129	1 200	1 500	**30330JR**	2GB	60.8	172	193	302	272	292	12	17	4	3	0.35	1.74	0.96	26.6
	320	82	75	50	5	4	952	989	110	980	1 400	**31330JR**	7GB	100.1	172	179	302	272	301	9	27	4	3	0.83	0.73	0.40	28.0
	320	114	108	90	5	4	1 550	1 790	195	1 200	1 600	**32330R**	—	78.4	172	187	302	263	298	10	17	4	3	0.35	1.74	0.96	42.0
160	220	32	30	23	3	3	282	379	50.2	1 500	2 000	**T4DB160**	4DB	44.7	174	172	206	204	213	5	9	2.5	2.5	0.49	1.23	0.68	3.23
	220	38	38	30	2.5	2	368	568	75.2	1 500	2 000	**32932JR**	2DC	38.4	172	173	210	204	212	7	8	2	2	0.35	1.73	0.95	4.19
	240	51	51	38	3	2.5	553	758	90.3	1 400	1 900	**32032JR**	4EC	52.1	174	175	228	213	231	8	13	2.5	2	0.46	1.31	0.72	7.75
	290	52	48	40	4	3	679	750	89.3	1 200	1 600	**30232JR**	4GB	56.3	178	189	276	252	269	8	12	3	2.5	0.44	1.38	0.76	14.1
	290	84	80	67	4	3	994	1 210	137	1 200	1 700	**32232JR**	4GD	70.3	178	182	276	242	274	10	17	3	2.5	0.44	1.38	0.76	23.2
	340	75	68	48	5	4	926	933	104	900	1 300	**30332D**	—	101.8	182	195	322	290	320	9	27	4	3	0.81	0.74	0.41	29.1
	340	75	68	58	5	4	1 170	1 220	142	1 100	1 400	**30332JR**	2GB	63.3	182	205	322	289	310	12	17	4	3	0.35	1.74	0.96	31.8
	340	121	114	95	5	4	1 530	1 720	187	1 100	1 400	**32332**	—	83.0	182	200	322	277	316	10	18	4	3	0.35	1.73	0.95	47.9
170	230	38	38	30	2.5	2	370	606	78.8	1 400	1 900	**32934JR**	3DC	42.0	182	183	220	213	222	7	8	2	2	0.38	1.57	0.86	4.49

Single-row tapered roller bearings metric series

d (170) ~ 200 mm

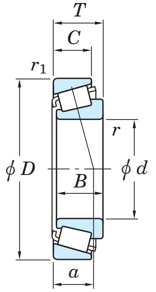


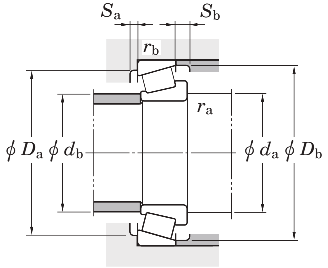


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
170	260	57	57	43	3	2.5	661	905	105	1 300	1 700	**32034JR**	4EC	55.8	184	187	248	230	249	10	14	2.5	2	0.44	1.35	0.74	10.5
	310	57	52	43	5	4	776	867	103	1 100	1 500	**30234JR**	4GB	61.2	192	202	292	269	288	8	14	4	3	0.44	1.38	0.76	17.8
	310	91	86	71	5	4	1 120	1 380	152	1 100	1 500	**32234JR**	4GD	76.2	192	195	292	259	294	10	20	4	3	0.44	1.38	0.76	28.9
	360	80	72	50	5	4	953	1 040	115	830	1 200	**30334D**	—	108.3	192	211	342	310	333	9	30	4	3	0.81	0.74	0.41	34.3
	360	80	72	62	5	4	1 300	1 370	155	1 000	1 300	**30334JR**	2GB	67.9	192	218	342	306	329	13	18	4	3	0.35	1.74	0.96	37.5
	360	127	120	100	5	4	1 640	1 830	193	1 000	1 300	**32334**	—	86.1	192	200	342	295	337	14	26	4	3	0.35	1.73	0.95	56.9
180	250	45	45	34	2.5	2	447	735	93.4	1 300	1 700	**32936JR**	4DC	53.5	192	193	240	225	241	8	11	2	2	0.48	1.25	0.69	6.64
	280	64	64	48	3	2.5	810	1 100	127	1 200	1 600	**32036JR**	3FD	59.5	194	199	268	247	268	10	16	2.5	2	0.42	1.42	0.78	14.1
	320	57	52	43	5	4	771	870	102	1 100	1 400	**30236JR**	4GB	63.6	202	211	302	278	297	9	14	4	3	0.45	1.33	0.73	18.3
	320	91	86	71	5	4	1 200	1 520	164	1 100	1 500	**32236JR**	4GD	77.8	202	204	302	267	303	10	20	4	3	0.45	1.33	0.73	29.9
	380	83	75	52	5	4	1 040	1 150	125	780	1 100	**30336D**	—	112.8	202	225	362	330	351	10	31	4	3	0.81	0.74	0.41	40.1
	380	83	75	64	5	4	1 130	1 110	126	940	1 300	**30336**	—	71.0	202	227	362	318	346	13	19	4	3	0.35	1.73	0.95	39.7
	380	134	126	106	5	4	1 760	1 980	206	960	1 300	**32336**	—	91.8	202	215	362	310	355	14	27	4	3	0.35	1.73	0.95	67.0
190	260	45	45	34	2.5	2	459	789	88.6	1 200	1 600	**32938JR**	4DC	55.0	202	204	250	235	252	8	11	2	2	0.48	1.26	0.69	6.89
	290	64	64	48	3	2.5	823	1 170	131	1 100	1 500	**32038JR**	4FD	62.9	204	209	278	257	279	10	16	2.5	2	0.44	1.36	0.75	14.7
	340	60	55	46	5	4	912	1 030	118	1 000	1 300	**30238JR**	4GB	66.4	212	225	322	298	318	12	13	4	3	0.44	1.38	0.76	21.9
	340	97	92	75	5	4	1 370	1 740	187	1 000	1 300	**32238JR**	4GD	81.9	212	216	322	286	323	12	22	4	3	0.44	1.38	0.76	36.6
	400	86	78	52	6	5	1 190	1 210	131	740	1 000	**30338D**	—	119.2	218	232	378	350	372	11	34	5	4	0.81	0.74	0.41	44.8
	400	86	78	65	6	5	1 260	1 250	139	880	1 200	**30338**	—	73.2	218	241	378	342	370	10	20	5	4	0.35	1.73	0.95	46.2
	400	140	132	109	6	5	1 940	2 190	224	890	1 200	**32338**	—	96.5	218	225	378	330	375	14	30	5	4	0.35	1.73	0.95	76.6
200	280	51	51	39	3	2.5	608	958	109	1 100	1 500	**32940JR**	3EC	53.6	214	216	268	257	271	9	12	2.5	2	0.39	1.52	0.84	9.44
	310	70	70	53	3	2.5	949	1 340	146	1 100	1 400	**32040JR**	4FD	66.9	214	221	298	273	297	11	17	2.5	2	0.43	1.39	0.77	19.1
	360	64	58	48	5	4	991	1 120	126	940	1 200	**30240JR**	4GB	70.3	222	238	342	315	336	12	15	4	3	0.44	1.38	0.76	26.4
	360	104	98	82	5	4	1 550	1 880	200	960	1 300	**32240JR**	3GD	84.6	222	225	342	302	340	11	22	4	3	0.41	1.48	0.81	44.2
	420	89	80	56	6	5	1 130	1 230	132	690	970	**30340D**	—	122.6	228	248	398	365	385	11	33	5	4	0.81	0.74	0.41	50.6
	420	89	80	67	6	5	1 400	1 450	159	820	1 100	**30340**	—	79.8	228	255	398	354	385	11	21	5	4	0.35	1.73	0.95	53.5
	420	146	138	115	6	5	2 240	2 580	260	830	1 100	**32340**	—	102.9	228	240	398	345	395	16	30	5	4	0.35	1.73	0.95	91.0

Single-row tapered roller bearings metric series

d 220 ~ 360 mm

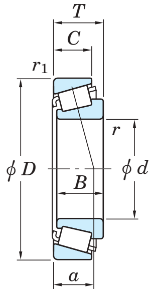


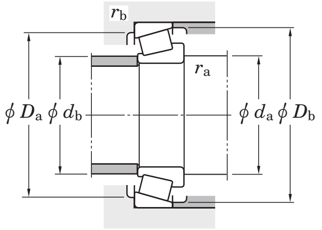


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Dimension series to ISO355 (Refer.)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.			a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
220	300	51	51	39	3	2.5	621	1 010	112	1 000	1 400	**32944JR**	3EC	58.6	234	234	288	275	290	9	12	2.5	2	0.43	1.41	0.78	10.1
	340	76	76	57	4	3	1 120	1 620	175	940	1 300	**32044JR**	4FD	72.8	238	243	326	300	326	12	19	3	2.5	0.43	1.39	0.77	25.2
	400	72	65	54	5	4	1 260	1 440	160	830	1 100	**30244JR**	—	76.5	242	263	382	344	371	14	17	4	3	0.44	1.43	0.79	35.9
	400	114	108	90	5	4	1 500	1 930	198	830	1 100	**32244**	—	95.9	242	260	382	333	377	16	14	4	3	0.43	1.39	0.77	56.8
	460	97	88	73	6	5	1 570	1 680	181	730	980	**30344**	—	84.6	248	282	438	386	420	12	23	5	4	0.35	1.73	0.95	69.0
240	320	51	51	39	3	2.5	645	1 090	119	940	1 300	**32948JR**	4EC	64.5	254	254	308	294	311	9	12	2.5	2	0.46	1.31	0.72	10.9
	360	76	76	57	4	3	1 160	1 720	180	870	1 200	**32048JR**	4FD	78.5	258	261	346	318	346	12	19	3	2.5	0.46	1.31	0.72	26.8
	440	79	72	60	5	4	1 540	1 790	191	730	980	**30248R**	—	82.7	262	287	422	377	409	14	18	4	3	0.42	1.43	0.79	49.5
	440	127	120	100	5	4	1 920	2 480	245	740	980	**32248**	—	106.1	262	282	422	365	415	16	14	4	3	0.43	1.39	0.77	76.4
260	360	63.5	63.5	48	3	2.5	926	1 550	163	830	1 100	**32952JR**	3EC	69.6	274	279	348	328	347	11	15.5	2.5	2	0.41	1.48	0.81	18.9
	400	87	87	65	5	4	1 470	2 170	221	770	1 000	**32052JR**	4FC	85.0	282	287	382	352	383	14	22	4	3	0.43	1.38	0.76	39.5
	480	89	80	67	6	5	1 510	1 860	190	650	870	**30252**	—	93.6	288	310	458	415	450	14	21	5	4	0.42	1.44	0.79	64.9
	480	137	130	106	6	5	2 200	2 870	276	660	880	**32252**	—	115.2	288	300	458	400	455	16	30	5	4	0.43	1.39	0.77	102
280	380	63.5	63.5	48	3	2.5	949	1 630	168	770	1 000	**32956JR**	4EC	75.1	294	298	368	347	368	11	15.5	2.5	2	0.43	1.39	0.76	20.1
	420	87	87	65	5	4	1 510	2 280	230	720	960	**32056JR**	4FC	91.1	302	305	402	370	402	14	22	4	3	0.46	1.31	0.72	41.7
	500	89	80	67	6	5	1 580	1 920	196	610	810	**30256**	—	96.2	308	325	478	440	475	14	21	5	4	0.42	1.44	0.79	67.6
	500	137	130	106	6	5	2 340	3 150	297	610	810	**32256**	—	117.2	308	325	478	420	474	16	30	5	4	0.43	1.39	0.77	108
300	420	76	76	57	4	3	1 320	2 210	223	680	910	**32960JR**	3FD	79.9	318	324	406	383	405	12	19	3	2.5	0.39	1.52	0.84	32.4
	460	100	100	74	5	4	1 800	2 660	263	640	850	**32060JR**	4GD	97.9	322	329	442	404	439	15	26	4	3	0.43	1.38	0.76	57.5
	540	96	85	71	6	5	1 890	2 360	240	550	730	**30260**	—	103.9	328	350	518	475	505	14	24	5	4	0.42	1.44	0.79	84.7
320	440	76	76	57	4	3	1 330	2 270	226	640	850	**32964JR**	3FD	85.0	338	342	426	401	426	12	19	3	2.5	0.42	1.44	0.79	34.0
	480	100	100	74	5	4	1 900	2 810	273	600	800	**32064JR**	4GD	103.0	342	344	462	418	461	16	26	4	3	0.46	1.31	0.72	58.7
	580	104	92	75	6	5	2 190	2 770	273	490	660	**30264**	—	111.9	348	370	558	505	540	14	28	5	4	0.42	1.44	0.79	108
340	460	76	76	57	4	3	1 340	2 340	229	590	790	**32968JR**	4FD	90.5	358	361	446	420	446	12	19	3	2.5	0.44	1.37	0.75	35.6
360	480	76	76	57	4	3	1 350	2 400	231	560	740	**32972JR**	4FD	96.2	378	379	466	438	466	12	19	3	2.5	0.46	1.31	0.72	37.1

Single-row tapered roller bearings
inch series

d 9.525 ~ (22.225) mm



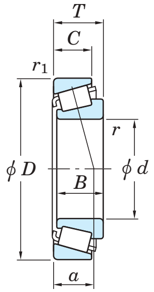


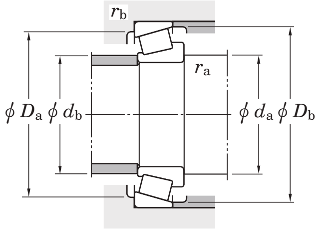
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
9.525	31.991	10.008	10.785	7.938	1.2	1.2	13.4	9.30	1.25	14 000	19 000	**A2037**	**A2126**	7.1	15.0	13.5	26.0	29.0	1.2	1.2	0.40	1.48	0.82	0.029	0.017
11.986	31.991	10.008	10.785	7.938	0.8	1.2	13.4	9.30	1.25	14 000	19 000	**A2047**	**A2126**	7.1	16.5	15.5	26.0	29.0	0.8	1.2	0.40	1.48	0.82	0.023	0.017
12.700	34.988	10.998	10.988	8.730	1.2	1.2	15.7	11.9	1.55	12 000	17 000	**A4050**	**A4138**	8.3	18.5	17.0	29.0	32.0	1.2	1.2	0.45	1.33	0.73	0.033	0.022
14.989	34.988	10.998	10.988	8.730	0.8	1.2	15.7	11.9	1.55	12 000	17 000	**A4059**	**A4138**	8.3	19.5	19.0	29.0	32.0	0.8	1.2	0.45	1.33	0.73	0.029	0.022
15.875	34.988	10.998	10.998	8.712	1.2	1.2	18.1	14.3	1.90	12 000	16 000	**L21549**	**L21511**	7.6	21.5	19.5	29.0	32.5	1.2	1.2	0.32	1.88	1.04	0.031	0.018
	41.275	14.288	14.681	11.112	1.2	2.0	27.3	20.5	2.85	11 000	14 000	**03062**	**03162**	9.3	21.5	20.0	34.0	37.5	1.2	2.0	0.31	1.93	1.06	0.060	0.035
	42.862	16.670	16.670	13.495	1.6	1.6	38.2	29.5	4.15	10 000	14 000	**17580R**	**17520**	10.9	23.0	21.0	36.5	39.0	1.6	1.6	0.33	1.81	1.00	0.078	0.048
	49.225	19.845	21.539	14.288	0.8	1.2	47.2	37.7	5.40	8 900	12 000	**09062**	**09195**	10.6	22.0	21.5	42.0	44.5	0.8	1.2	0.27	2.26	1.24	0.139	0.065
	53.975	22.225	21.839	15.875	0.8	2.4	52.6	41.2	5.65	8 400	11 000	**21063**	**21212**	16.6	29.0	26.5	43.0	50.0	0.8	2.4	0.59	1.02	0.56	0.163	0.097
16.000	47.000	21.000	21.000	16.000	1.0	2.0	45.4	37.7	5.05	9 800	13 000	**HM81649**	**HM81610**	15.0	27.5	23.0	37.5	43.0	1.0	2.0	0.55	1.10	0.60	0.111	0.080
17.462	39.878	13.843	14.605	10.668	1.2	1.2	31.8	26.0	3.60	11 000	14 000	**LM11749R**	**LM11710**	8.6	23.0	21.5	34.0	37.0	1.2	1.2	0.29	2.10	1.15	0.058	0.028
19.050	45.237	15.494	16.637	12.065	1.2	1.2	36.8	30.1	4.25	9 400	13 000	**LM11949**	**LM11910**	10.0	25.0	23.5	39.5	41.5	1.2	1.2	0.30	2.00	1.10	0.081	0.044
	49.225	19.845	21.539	14.288	1.2	1.2	47.2	37.7	5.40	8 900	12 000	**09078**	**09195**	10.6	25.5	24.0	42.0	44.5	1.2	1.2	0.27	2.26	1.24	0.124	0.065
	49.225	21.209	19.050	17.462	1.2	1.6	47.2	37.7	5.40	8 900	12 000	**09067**	**09196**	13.8	25.5	24.0	41.5	44.5	1.2	1.6	0.27	2.26	1.24	0.114	0.084
20.000	50.005	13.495	14.260	9.525	1.6	1.0	33.3	28.8	4.05	7 900	11 000	**07079**	**07196**	10.8	27.5	26.0	44.5	47.0	1.6	1.0	0.40	1.49	0.82	0.104	0.034
20.638	49.225	19.845	19.845	15.875	1.6	1.6	45.5	37.7	5.35	8 600	12 000	**12580**	**12520**	12.7	28.5	26.0	42.5	45.5	1.6	1.6	0.32	1.86	1.02	0.116	0.067
21.430	50.005	17.526	18.288	13.970	1.2	1.2	48.8	40.7	5.80	8 500	11 000	**M12649**	**M12610**	11.1	27.5	25.5	44.0	46.0	1.2	1.2	0.28	2.16	1.19	0.119	0.058
21.987	45.974	15.494	16.637	12.065	1.2	1.2	37.5	34.6	4.85	8 900	12 000	**LM12749**	**LM12711**	10.0	27.5	26.0	40.0	42.5	1.2	1.2	0.31	1.96	1.08	0.078	0.043
22.225	50.005	17.526	18.288	13.970	1.2	1.2	48.8	40.7	5.80	8 500	11 000	**M12648**	**M12610**	11.1	28.5	26.5	44.0	46.0	1.2	1.2	0.28	2.16	1.19	0.115	0.058
	52.388	19.368	20.168	14.288	1.6	1.6	45.9	37.9	5.45	8 000	11 000	**1380**	**1328**	11.6	29.5	29.5	45.0	48.5	1.6	1.6	0.29	2.05	1.13	0.132	0.066
	53.975	19.368	20.168	14.288	1.6	1.6	45.9	37.9	5.45	8 000	11 000	**1380**	**1329**	11.6	29.5	29.5	46.0	49.0	1.6	1.6	0.29	2.05	1.13	0.137	0.082

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (22.225) ~ (26.988) mm



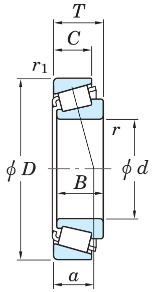


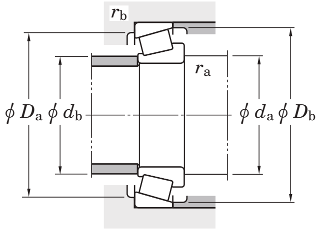
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Load center (mm)	Mounting dimensions (mm)						Constant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
22.225	56.896	19.368	19.837	15.875	1.2	1.2	50.0	43.1	6.20	7 600	10 000	**1755**	**1729**	12.5	29.0	27.5	49.0	51.0	1.2	1.2	0.31	1.95	1.07	0.150	0.100
	57.150	22.225	22.225	17.462	0.8	1.6	65.8	55.7	8.05	7 600	10 000	**1280**	**1220**	15.3	29.5	29.0	49.0	52.0	0.8	1.6	0.35	1.73	0.95	0.189	0.105
	66.421	23.812	25.433	19.050	1.6	1.2	83.8	75.2	11.2	6 500	8 700	**2684**	**2631**	13.9	31.5	29.0	58.0	60.0	1.6	1.2	0.25	2.36	1.30	0.295	0.163
22.606	47.000	15.500	15.500	12.000	1.6	1.0	35.0	32.8	4.45	8 700	12 000	**LM72849**	**LM72810**	12.3	30.0	28.0	40.5	44.0	1.6	1.0	0.47	1.27	0.70	0.076	0.047
23.812	50.292	14.224	14.732	10.668	1.6	1.2	39.1	37.0	5.15	7 800	10 000	**L44640R**	**L44610**	10.8	30.5	28.5	44.5	47.0	1.6	1.2	0.37	1.60	0.88	0.099	0.034
	56.896	19.368	19.837	15.875	0.8	1.2	50.0	43.1	6.20	7 600	10 000	**1779**	**1729**	12.5	29.5	28.5	49.0	51.0	0.8	1.2	0.31	1.95	1.07	0.141	0.100
24.981	50.005	13.495	14.260	9.525	1.6	1.0	33.3	28.8	4.05	7 900	11 000	**07098**	**07196**	10.8	31.0	29.0	44.5	47.0	1.6	1.0	0.40	1.49	0.82	0.084	0.034
	62.000	16.002	16.566	14.288	1.6	1.6	47.4	40.6	5.80	6 700	8 900	**17098**	**17244**	12.7	33.0	30.5	54.0	57.0	1.6	1.6	0.38	1.57	0.86	0.162	0.090
25.000	50.005	13.495	14.260	9.525	1.6	1.0	33.3	28.8	4.05	7 900	11 000	**07097**	**07196**	10.8	31.0	29.0	44.5	47.0	1.6	1.0	0.40	1.49	0.82	0.085	0.035
25.400	50.005	13.495	14.260	9.525	1.0	1.0	33.3	28.8	4.05	7 900	11 000	**07100**	**07196**	10.8	30.5	29.5	44.5	47.0	1.0	1.0	0.40	1.49	0.82	0.084	0.035
	50.005	13.495	14.260	9.525	1.6	1.0	33.3	28.8	4.05	7 900	11 000	**07100S**	**07196**	10.8	31.5	29.5	44.5	47.0	1.6	1.0	0.40	1.49	0.82	0.082	0.035
	50.292	14.224	14.732	10.668	1.2	1.2	39.1	37.0	5.15	7 800	10 000	**L44643R**	**L44610**	10.8	31.5	29.5	44.5	47.0	1.2	1.2	0.37	1.60	0.88	0.092	0.039
	51.994	15.011	14.260	12.700	1.0	1.2	33.3	28.8	4.05	7 900	11 000	**07100**	**07204**	12.3	30.5	29.5	45.0	48.0	1.0	1.2	0.40	1.49	0.82	0.075	0.065
	58.738	19.050	19.355	15.080	1.2	1.2	60.8	57.1	8.25	7 000	9 300	**1986R**	**1932**	13.1	32.5	30.5	52.0	54.0	1.2	1.2	0.33	1.82	1.00	0.179	0.088
	59.530	23.368	23.114	18.288	0.8	1.6	63.0	57.1	7.95	7 200	9 600	**M84249**	**M84210**	18.2	36.0	32.5	49.5	56.0	0.8	1.6	0.55	1.10	0.60	0.194	0.128
	61.912	19.050	20.638	14.288	0.8	2.0	55.7	50.7	7.30	6 400	8 600	**15101**	**15243**	13.2	32.5	31.5	55.0	58.0	0.8	2.0	0.35	1.71	0.94	0.215	0.080
	62.000	19.050	20.638	14.288	3.6	1.2	55.7	50.7	7.30	6 400	8 600	**15100**	**15245**	13.2	38.0	31.5	55.0	58.0	3.6	1.2	0.35	1.71	0.94	0.215	0.081
	63.500	19.050	20.638	14.288	0.8	1.2	55.7	50.7	7.30	6 400	8 600	**15101**	**15250R**	13.2	32.5	31.5	55.0	59.0	0.8	1.2	0.35	1.71	0.94	0.215	0.097
	64.292	21.432	21.432	16.670	1.6	1.6	69.1	70.7	9.90	6 400	8 500	**M86643R**	**M86610**	18.0	38.0	36.5	54.0	61.0	1.6	1.6	0.55	1.10	0.60	0.248	0.127
	66.421	23.812	25.433	19.050	1.2	1.2	83.8	75.2	11.2	6 500	8 700	**2687**	**2631**	13.9	33.5	31.5	58.0	60.0	1.2	1.2	0.25	2.36	1.30	0.272	0.163
	68.262	22.225	22.225	17.462	0.8	1.6	63.7	61.1	8.80	6 000	8 000	**02473**	**02420**	17.1	34.5	33.5	59.0	63.0	0.8	1.6	0.42	1.44	0.79	0.275	0.150
	72.233	25.400	25.400	19.842	0.8	2.4	83.8	87.4	12.4	5 700	7 600	**HM88630**	**HM88610**	20.7	39.5	39.5	60.0	69.0	0.8	2.4	0.55	1.10	0.60	0.391	0.185
26.162	66.421	23.812	25.433	19.050	1.6	1.2	83.8	75.2	11.2	6 500	8 700	**2682**	**2631**	13.9	34.5	32.0	58.0	60.0	1.6	1.2	0.25	2.36	1.30	0.268	0.163
26.988	50.292	14.224	14.732	10.668	3.6	1.2	39.1	37.0	5.15	7 800	10 000	**L44649R**	**L44610**	10.8	37.5	31.0	44.5	47.0	3.6	1.2	0.37	1.60	0.88	0.083	0.039

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (26.988) ~ (30.162) mm



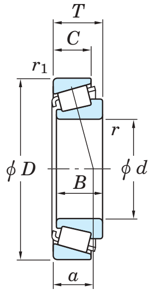


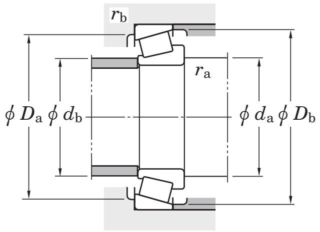
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit	Limiting speeds (min^{-1})		Bearing No.		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	(kN) C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
26.988	60.325	19.842	17.462	15.875	3.6	1.6	47.2	42.7	6.10	7 000	9 400	**15580**	**15523**	15.1	38.5	32.0	51.0	54.0	3.6	1.6	0.35	1.73	0.95	0.140	0.122
	62.000	19.050	20.638	14.288	0.8	1.2	55.7	50.7	7.30	6 400	8 600	**15106**	**15245**	13.2	33.5	33.0	55.0	58.0	0.8	1.2	0.35	1.71	0.94	0.206	0.081
	66.421	23.812	25.433	19.050	1.6	1.2	83.8	75.2	11.2	6 500	8 700	**2688**	**2631**	13.9	35.0	33.0	58.0	60.0	1.6	1.2	0.25	2.36	1.30	0.262	0.163
28.575	57.150	17.462	17.462	13.495	3.6	1.6	47.2	42.7	6.10	7 000	9 400	**15590**	**15520**	12.7	39.0	33.5	51.0	53.0	3.6	1.6	0.35	1.73	0.95	0.131	0.069
	57.150	19.845	19.355	15.875	3.6	1.6	60.8	57.1	8.25	7 000	9 300	**1988R**	**1922**	13.9	39.5	33.5	51.0	53.5	3.6	1.6	0.33	1.82	1.00	0.151	0.076
	62.000	19.050	20.638	14.288	3.6	1.2	55.7	50.7	7.30	6 400	8 600	**15112**	**15245**	13.2	40.0	34.0	55.0	58.0	3.6	1.2	0.35	1.71	0.94	0.193	0.081
	62.000	19.050	20.638	14.288	0.8	1.2	55.7	50.7	7.30	6 400	8 600	**15113**	**15245**	13.2	34.5	34.0	55.0	58.0	0.8	1.2	0.35	1.71	0.94	0.195	0.081
	64.292	21.432	21.432	16.670	1.6	1.6	69.1	70.7	9.90	6 400	8 500	**M86647R**	**M86610**	18.0	40.0	38.0	54.0	61.0	1.6	1.6	0.55	1.10	0.60	0.225	0.127
	66.421	23.812	25.433	19.050	1.2	1.2	83.8	75.2	11.2	6 500	8 700	**2689**	**2631**	13.9	36.0	34.0	58.0	60.0	1.2	1.2	0.25	2.36	1.30	0.249	0.165
	68.262	22.225	22.225	17.462	0.8	1.6	63.7	61.1	8.80	6 000	8 000	**02474**	**02420**	17.1	36.5	36.0	59.0	63.0	0.8	1.6	0.42	1.44	0.79	0.252	0.150
	72.000	19.000	18.923	15.875	1.6	1.6	59.4	49.6	7.25	5 900	7 800	**26112**	**26283**	15.3	37.0	35.0	62.0	65.0	1.6	1.6	0.36	1.67	0.92	0.217	0.163
	72.626	24.608	24.257	17.462	4.8	1.6	77.3	60.5	8.75	6 100	8 100	**41125**	**41286**	20.7	48.0	36.5	61.0	68.0	4.8	1.6	0.60	1.00	0.55	0.292	0.177
	72.626	24.608	24.257	17.462	1.6	1.6	77.3	60.5	8.75	6 100	8 100	**41126**	**41286**	20.7	41.5	36.5	61.0	68.0	1.6	1.6	0.60	1.00	0.55	0.295	0.177
	72.626	30.162	29.997	23.812	3.6	3.2	98.6	89.3	13.3	5 800	7 700	**3192**	**3120**	20.3	42.5	37.0	61.0	67.0	3.6	3.2	0.33	1.80	0.99	0.401	0.222
	72.626	30.162	29.997	23.812	1.2	3.2	98.6	89.3	13.3	5 800	7 700	**3198**	**3120**	20.3	39.0	37.0	61.0	67.0	1.2	3.2	0.33	1.80	0.99	0.410	0.222
	73.025	22.225	22.225	17.462	0.8	3.2	68.8	65.7	9.55	5 500	7 400	**02872**	**02820**	18.4	37.5	37.0	62.0	68.0	0.8	3.2	0.45	1.32	0.73	0.319	0.158
29.000	50.292	14.224	14.732	10.668	3.6	1.2	36.3	37.2	5.15	7 600	10 000	**L45449**	**L45410**	10.9	39.5	33.0	44.5	48.0	3.6	1.2	0.37	1.62	0.89	0.079	0.036
29.367	66.421	23.812	25.433	19.050	3.6	1.2	83.8	75.2	11.2	6 500	8 700	**2690**	**2631**	13.9	41.0	35.0	58.0	60.0	3.6	1.2	0.25	2.36	1.30	0.242	0.165
29.987	62.000	16.002	16.566	14.288	1.6	1.6	47.4	40.6	5.80	6 700	8 900	**17118**	**17244**	12.7	37.0	34.5	54.0	57.0	1.6	1.6	0.38	1.57	0.86	0.135	0.090
	62.000	19.050	20.638	14.288	1.2	1.2	55.7	50.7	7.30	6 400	8 600	**15117**	**15245**	13.2	36.5	35.0	55.0	58.0	1.2	1.2	0.35	1.71	0.94	0.184	0.081
30.000	69.012	19.845	19.583	15.875	3.6	1.2	57.7	55.0	7.95	5 900	7 800	**14117A**	**14276**	15.5	42.5	39.5	60.0	63.0	3.6	1.2	0.38	1.57	0.86	0.225	0.135
30.112	62.000	19.050	20.638	14.288	0.8	1.2	55.7	50.7	7.30	6 400	8 600	**15116**	**15245**	13.2	36.0	35.5	55.0	58.0	0.8	1.2	0.35	1.71	0.94	0.184	0.081
30.162	62.000	16.002	16.566	14.288	1.6	1.6	47.4	40.6	5.80	6 700	8 900	**17119**	**17244**	12.7	37.0	34.5	54.0	57.0	1.6	1.6	0.38	1.57	0.86	0.139	0.091
	64.292	21.432	21.432	16.670	1.6	1.6	69.1	70.7	9.90	6 400	8 500	**M86649R**	**M86610**	18.0	41.0	38.0	54.0	61.0	1.6	1.6	0.55	1.10	0.60	0.213	0.127

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings
inch series

d (30.162) ~ (34.925) mm





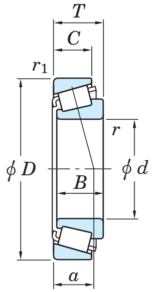
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Bearing No.		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r 1) min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
30.162	68.262	22.225	22.225	17.462	2.4	1.6	70.2	71.1	10.0	6 000	7 900	**M88043**	**M88010**	19.2	43.5	39.5	58.0	65.0	2.4	1.6	0.55	1.10	0.60	0.258	0.144
30.213	62.000	19.050	20.638	14.288	3.6	1.2	55.7	50.7	7.30	6 400	8 600	**15118**	**15245**	13.2	41.5	35.5	55.0	58.0	3.6	1.2	0.35	1.71	0.94	0.181	0.081
	62.000	19.050	20.638	14.288	1.6	1.2	55.7	50.7	7.30	6 400	8 600	**15119**	**15245**	13.2	37.5	35.5	55.0	58.0	1.6	1.2	0.35	1.71	0.94	0.183	0.081
	62.000	19.050	20.638	14.288	0.8	1.2	55.7	50.7	7.30	6 400	8 600	**15120**	**15245**	13.2	36.0	35.5	55.0	58.0	0.8	1.2	0.35	1.71	0.94	0.183	0.081
30.226	69.012	19.845	19.583	15.875	0.8	3.2	57.7	55.0	7.95	5 900	7 800	**14116**	**14274**	15.5	37.0	36.5	59.0	63.0	0.8	3.2	0.38	1.57	0.86	0.226	0.131
31.750	58.738	14.684	15.080	10.716	1.0	1.0	37.0	33.3	4.60	6 600	8 900	**08125**	**08231**	13.5	37.5	36.0	52.0	55.0	1.0	1.0	0.48	1.26	0.69	0.109	0.056
	59.131	15.875	16.764	11.811	SP	1.2	44.8	43.1	6.05	6 600	8 800	**LM67048**	**LM67010**	13.0	42.5	36.0	52.0	56.0	3.5	1.2	0.41	1.46	0.80	0.120	0.062
	62.000	18.161	19.050	14.288	SP	1.2	55.7	50.7	7.30	6 400	8 600	**15123**	**15245**	13.2	42.5	36.5	55.0	58.0	3.5	1.2	0.35	1.71	0.94	0.157	0.081
	62.000	19.050	20.638	14.288	3.6	1.2	55.7	50.7	7.30	6 400	8 600	**15125**	**15245**	13.2	42.5	36.5	55.0	58.0	3.6	1.2	0.35	1.71	0.94	0.169	0.081
	62.000	19.050	20.638	14.288	0.8	1.2	55.7	50.7	7.30	6 400	8 600	**15126**	**15245**	13.2	37.0	36.5	55.0	58.0	0.8	1.2	0.35	1.71	0.94	0.171	0.081
	66.421	25.400	25.357	20.638	0.8	3.2	89.2	85.1	12.7	6 000	8 000	**2580**	**2520**	16.0	38.5	37.5	57.0	62.5	0.8	3.2	0.27	2.19	1.21	0.281	0.123
	68.262	22.225	22.225	17.462	3.6	1.6	63.7	61.1	8.80	6 000	8 000	**02475**	**02420**	17.1	44.5	38.5	59.0	63.0	3.6	1.6	0.42	1.44	0.79	0.224	0.150
	68.262	22.225	22.225	17.462	0.8	1.6	63.7	61.1	8.80	6 000	8 000	**02476**	**02420**	17.1	39.0	38.5	59.0	63.0	0.8	1.6	0.42	1.44	0.79	0.226	0.150
	68.262	22.225	22.225	17.462	1.6	1.6	70.2	71.1	10.0	6 000	7 900	**M88046**	**M88010**	19.2	43.0	40.5	58.0	65.0	1.6	1.6	0.55	1.10	0.60	0.245	0.144
	73.025	22.225	22.225	17.462	3.6	3.2	68.8	65.7	9.55	5 600	7 400	**02875**	**02820**	17.1	45.5	39.5	62.0	68.0	3.6	3.2	0.45	1.32	0.73	0.293	0.158
	73.025	22.225	22.225	17.462	0.8	3.2	68.8	65.7	9.55	5 500	7 400	**02876**	**02820**	17.1	40.0	39.5	62.0	68.0	0.8	3.2	0.45	1.32	0.73	0.293	0.158
	73.025	29.370	27.783	23.020	1.2	3.2	93.0	101	14.2	5 600	7 500	**HM88542**	**HM88510**	23.4	45.5	42.5	59.0	70.0	1.2	3.2	0.55	1.10	0.60	0.377	0.238
	73.812	29.370	27.783	23.020	1.2	3.2	93.0	101	14.2	5 600	7 500	**HM88542**	**HM88512**	23.4	45.5	42.5	59.0	70.0	1.2	3.2	0.55	1.10	0.60	0.377	0.254
33.338	68.262	22.225	22.225	17.462	0.8	1.6	70.2	71.1	10.0	6 000	7 900	**M88048**	**M88010**	19.2	42.5	41.0	58.0	65.0	0.8	1.6	0.55	1.10	0.60	0.231	0.144
	72.000	19.000	18.923	15.875	3.6	1.6	69.8	60.0	8.85	5 900	7 800	**26131**	**26283**	14.3	44.5	38.5	62.0	65.0	3.6	1.6	0.36	1.67	0.92	0.200	0.163
	73.025	29.370	27.783	23.020	0.8	3.2	93.0	101	14.2	5 600	7 500	**HM88547**	**HM88510**	23.4	45.5	42.6	59.0	70.0	0.8	3.2	0.55	1.10	0.60	0.360	0.238
	76.200	29.370	28.575	23.020	0.8	3.2	99.5	107	15.2	5 400	7 200	**HM89443**	**HM89410**	23.9	46.5	44.6	62.0	73.0	0.8	3.2	0.55	1.10	0.60	0.415	0.254
34.925	65.088	18.034	18.288	13.970	SP	1.2	60.0	58.5	8.40	6 000	8 000	**LM48548**	**LM48510**	14.3	46.0	40.0	58.0	61.0	3.5	1.2	0.38	1.59	0.88	0.164	0.086
	69.012	26.982	26.721	15.875	0.8	1.2	57.7	55.0	7.95	5 900	7 800	**14136A**	**14276**	22.6	40.0	38.0	60.0	63.0	0.8	1.2	0.38	1.57	0.86	0.254	0.133
	72.233	25.400	25.400	19.842	2.4	2.4	83.8	87.4	12.4	5 700	7 600	**HM88649**	**HM88610**	20.7	48.5	42.5	60.0	69.0	2.4	2.4	0.55	1.10	0.60	0.301	0.185

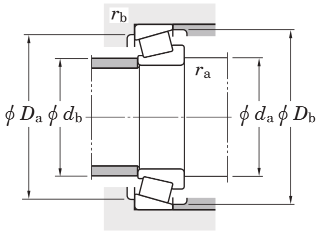
[Note] 1) SP indicates the specially chamfered from.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (34.925) ~ (38.100) mm





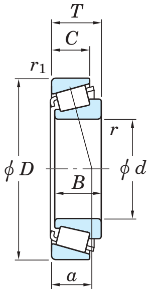
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. 2)		Load center (mm)	Mounting dimensions (mm)						Constant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r 1) min.	r_1 1) min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
34.925	72.238	20.638	20.638	15.875	3.6	1.2	62.3	61.3	8.90	5 600	7 400	**16137**	**16284**	16.6	46.5	40.5	63.0	67.0	3.6	1.2	0.40	1.49	0.82	0.236	0.144
	73.025	22.225	22.225	17.462	3.6	3.2	68.8	65.7	9.55	5 500	7 400	**02877**	**02820**	18.4	48.5	42.0	62.0	68.0	3.6	3.2	0.45	1.32	0.73	0.262	0.158
	73.025	22.225	22.225	17.462	0.8	3.2	68.8	65.7	9.55	5 500	7 400	**02878**	**02820**	18.4	42.5	42.0	62.0	68.0	0.8	3.2	0.45	1.32	0.73	0.265	0.158
	73.025	23.812	24.608	19.050	1.6	0.8	90.1	87.3	13.1	5 600	7 400	**25877R**	**25821**	15.8	43.0	40.5	65.0	68.0	1.6	0.8	0.29	2.07	1.14	0.310	0.165
	73.025	26.988	26.975	22.225	3.6	1.6	97.2	94.1	13.9	5 700	7 600	**23690**	**23620**	18.8	49.0	42.0	64.0	68.0	3.6	1.6	0.37	1.62	0.89	0.326	0.212
	76.200	20.638	20.940	15.507	1.6	1.2	71.6	65.9	9.70	5 300	7 000	**28137**	**28300**	16.5	43.5	41.0	68.0	71.0	1.6	1.2	0.40	1.49	0.82	0.315	0.137
	76.200	23.812	25.654	19.050	3.6	3.2	92.6	92.2	13.8	5 400	7 200	**2796R**	**2720**	15.9	47.5	41.0	66.0	70.0	3.6	3.2	0.30	1.98	1.09	0.344	0.185
	76.200	29.370	28.575	23.812	1.6	3.2	101	97.4	14.4	5 400	7 200	**31594**	**31520**	21.6	46.0	43.5	64.0	72.0	1.6	3.2	0.40	1.49	0.82	0.388	0.232
	79.375	29.370	29.771	23.812	3.6	3.2	109	105	15.7	5 200	6 900	**3478**	**3420**	20.8	50.0	43.5	67.0	74.0	3.6	3.2	0.37	1.64	0.90	0.462	0.256
	87.312	30.162	30.886	23.812	3.6	3.2	120	120	18.2	4 600	6 200	**3581R**	**3525**	20.5	48.0	45.5	75.0	81.0	3.6	3.2	0.31	1.96	1.08	0.622	0.300
	95.250	27.783	29.901	22.225	0.8	2.4	129	122	18.8	4 500	5 900	**449**	**432**	18.4	44.0	43.5	83.0	87.0	0.8	2.4	0.28	2.11	1.16	0.686	0.384
34.980	59.131	15.875	16.764	11.938	SP	1.2	44.9	48.5	6.85	6 400	8 500	**L68149**	**L68110**	13.2	45.5	39.0	53.0	56.0	3.5	1.2	0.42	1.44	0.79	0.112	0.056
	59.975	15.875	16.764	11.938	SP	1.2	44.9	48.5	6.85	6 400	8 500	**L68149**	**L68111**	13.2	45.5	39.0	53.0	56.0	3.5	1.2	0.42	1.44	0.79	0.112	0.063
35.000	79.375	23.812	25.400	19.050	0.8	0.8	101	105	15.8	5 000	6 700	**26883R**	**26822**	16.4	42.5	42.0	71.0	74.0	0.8	0.8	0.32	1.88	1.04	0.414	0.186
	80.000	21.000	22.403	17.826	0.8	1.2	85.0	74.8	11.4	4 900	6 600	**339**	**332**	15.1	42.5	41.5	73.0	75.0	0.8	1.2	0.27	2.20	1.21	0.385	0.144
35.717	72.233	25.400	25.400	19.842	3.6	2.4	83.8	87.4	12.4	5 700	7 600	**HM88648**	**HM88610**	20.7	52.0	42.5	60.0	69.0	3.6	2.4	0.55	1.10	0.60	0.291	0.185
36.487	73.025	23.812	24.608	19.050	1.6	0.8	90.1	87.3	13.1	5 600	7 400	**25880R**	**25821**	15.8	44.0	42.0	65.0	68.0	1.6	0.8	0.29	2.07	1.14	0.294	0.165
	73.025	23.812	25.654	19.050	3.6	0.8	92.6	92.2	13.8	5 400	7 200	**2794R**	**2735X**	15.9	49.0	42.5	66.0	69.0	3.6	0.8	0.30	1.98	1.09	0.344	0.134
36.512	76.200	29.370	28.575	23.020	3.6	0.8	99.5	107	15.2	5 400	7 200	**HM89449**	**HM89411**	23.9	54.0	44.5	65.0	73.0	3.6	0.8	0.55	1.10	0.60	0.386	0.258
	79.375	23.812	25.400	19.050	0.8	0.8	101	105	15.8	5 000	6 700	**26877R**	**26822**	16.4	44.0	43.0	71.0	74.0	0.8	0.8	0.32	1.88	1.04	0.404	0.186
	79.375	29.370	29.771	23.812	0.8	3.2	109	105	15.7	5 200	6 900	**3479**	**3420**	20.8	45.5	44.5	67.0	74.0	0.8	3.2	0.37	1.64	0.90	0.429	0.259
	85.725	30.162	30.162	23.812	0.8	3.2	135	136	20.3	4 800	6 400	**3878**	**3820**	22.9	48.0	47.0	73.0	81.0	0.8	3.2	0.40	1.49	0.82	0.605	0.285
38.000	63.000	17.000	17.000	13.500	SP	SP	54.7	58.2	8.25	6 000	8 000	**JL69349**	**JL69310**	14.6	49.0	41.0	60.0	56.5	3.5	1.2	0.42	1.44	0.79	0.128	0.070
38.100	63.500	12.700	11.908	9.525	1.6	0.8	32.1	33.1	4.60	5 800	7 700	**13889**	**13830**	11.9	45.0	42.5	59.0	60.0	1.6	0.8	0.35	1.73	0.95	0.104	0.045

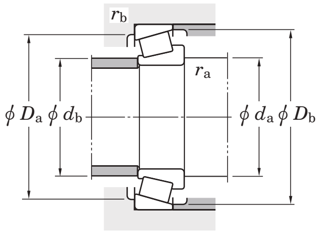
[Notes] 1) SP indicates the specially chamfered from.
2) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (38.100) ~ (40.000) mm





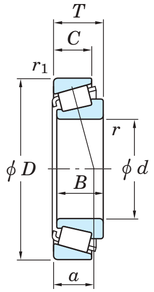
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Load center (mm)	Mounting dimensions (mm)						Constant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r [1] min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
38.100	65.088	12.700	11.908	9.525	1.6	0.8	32.1	33.1	4.60	5 800	7 700	**13889**	**13836**	11.9	45.0	42.5	59.0	61.0	1.6	0.8	0.35	1.73	0.95	0.104	0.046
	65.088	18.034	18.288	13.970	SP	1.2	53.9	56.5	8.15	5 800	7 800	**LM29748**	**LM29710**	13.8	49.0	42.5	59.0	62.0	3.5	1.2	0.33	1.80	0.99	0.154	0.079
	65.088	19.812	18.288	15.748	2.4	1.2	53.9	56.5	8.15	5 800	7 800	**LM29749**	**LM29711**	15.6	46.0	42.5	58.0	62.0	2.4	1.2	0.33	1.80	0.99	0.159	0.092
	69.012	19.050	19.050	15.083	2.0	2.4	61.7	62.0	8.95	5 600	7 500	**13687**	**13621**	16.1	46.5	43.0	61.0	65.0	2.0	2.4	0.40	1.49	0.82	0.191	0.102
	71.438	15.875	16.520	11.908	1.6	1.0	57.6	53.8	7.70	5 700	7 600	**19150R**	**19281**	14.5	45.0	43.0	63.0	66.0	1.6	1.0	0.44	1.35	0.74	0.167	0.105
	71.996	17.018	16.520	14.288	1.6	1.6	57.6	53.8	7.70	5 700	7 600	**19150R**	**19283**	15.7	45.0	43.0	63.0	66.0	1.6	1.6	0.44	1.35	0.74	0.167	0.132
	71.996	19.000	20.638	14.237	3.6	1.6	62.3	61.3	8.90	5 600	7 400	**16150**	**16282**	15.0	49.5	43.0	63.0	67.0	3.6	1.6	0.40	1.49	0.82	0.207	0.121
	72.238	20.638	20.638	15.875	3.6	1.2	62.3	61.3	8.90	5 600	7 400	**16150**	**16284**	16.6	49.5	43.0	63.0	67.0	3.6	1.2	0.40	1.49	0.82	0.207	0.144
	72.238	23.812	20.638	19.050	3.6	2.4	62.3	61.3	8.90	5 600	7 400	**16150**	**16283**	19.8	49.5	43.0	61.0	67.0	3.6	2.4	0.40	1.49	0.82	0.207	0.183
	73.025	23.812	25.654	19.050	3.6	0.8	92.6	92.2	13.8	5 400	7 200	**2788R**	**2735X**	15.9	50.0	43.5	66.0	69.0	3.6	0.8	0.30	1.98	1.09	0.308	0.134
	76.200	23.812	25.654	19.050	3.6	0.8	92.6	92.2	13.8	5 400	7 200	**2788R**	**2729**	15.9	50.0	43.5	68.0	70.0	3.6	0.8	0.30	1.98	1.09	0.308	0.189
	79.375	29.370	29.771	23.812	3.6	3.2	109	105	15.7	5 200	6 900	**3490**	**3420**	20.8	52.0	45.9	67.0	74.0	3.6	3.2	0.37	1.64	0.90	0.419	0.256
	80.035	21.432	20.940	15.875	1.6	1.6	71.6	65.9	9.70	5 300	7 000	**28150**	**28317**	16.9	45.5	43.5	69.0	73.0	1.6	1.6	0.40	1.49	0.82	0.285	0.201
	80.035	24.608	23.698	18.512	0.8	1.6	91.6	91.6	13.3	5 200	6 900	**27880**	**27820**	22.2	48.0	47.0	68.0	75.0	0.8	1.6	0.56	1.07	0.59	0.378	0.208
	80.035	24.608	23.698	18.512	3.6	1.6	91.6	91.6	13.3	5 200	6 900	**27881**	**27820**	22.2	53.0	47.0	68.0	75.0	3.6	1.6	0.56	1.07	0.59	0.378	0.208
	82.550	29.370	28.575	23.020	0.8	3.2	109	117	16.9	4 900	6 600	**HM801346**	**HM801310**	24.4	51.0	49.0	68.0	78.0	0.8	3.2	0.55	1.10	0.60	0.483	0.282
	82.550	29.370	28.575	23.020	2.4	3.2	109	117	16.9	4 900	6 600	**HM801346X**	**HM801310**	24.4	54.0	49.0	68.0	78.0	2.4	3.2	0.55	1.10	0.60	0.483	0.282
	82.931	23.812	25.400	19.050	0.8	0.8	96.8	100	15.1	4 800	6 300	**25572**	**25520**	17.5	46.0	46.0	74.0	77.0	0.8	0.8	0.33	1.79	0.99	0.437	0.203
	88.501	26.988	29.083	22.225	3.6	1.6	123	112	17.2	4 900	6 500	**418**	**414**	16.9	51.0	44.5	77.0	80.0	3.6	1.6	0.26	2.28	1.25	0.523	0.325
	90.488	39.688	40.386	33.338	1.6	3.2	166	169	25.9	4 500	6 000	**4375**	**4335**	25.6	51.0	48.5	77.0	85.0	1.6	3.2	0.28	2.11	1.16	0.841	0.459
	101.600	34.925	36.068	26.988	3.6	3.2	164	159	24.8	4 000	5 300	**525**	**522**	22.2	54.0	48.0	89.0	95.0	3.6	3.2	0.29	2.10	1.16	1.05	0.411
39.688	73.025	16.667	17.462	12.700	0.8	1.6	57.6	55.8	8.15	5 200	6 900	**18587**	**18520**	14.5	46.0	46.0	66.0	69.0	0.8	1.6	0.35	1.71	0.94	0.215	0.085
	73.025	23.812	25.654	19.050	3.6	0.8	92.6	92.2	13.8	5 400	7 200	**2789R**	**2735X**	15.9	52.0	45.0	66.0	69.0	3.6	0.8	0.30	1.98	1.09	0.288	0.134
	80.167	29.370	30.391	23.812	0.8	3.2	114	106	16.2	5 000	6 700	**3386**	**3320**	18.7	46.5	45.5	70.0	75.0	0.8	3.2	0.27	2.20	1.21	0.442	0.217
	84.138	29.370	30.391	23.812	3.6	3.2	114	106	16.2	5 000	6 700	**3382**	**3328**	18.7	52.0	45.5	72.0	76.0	3.6	3.2	0.27	2.20	1.21	0.438	0.312
40.000	76.200	20.638	20.940	15.507	1.6	1.2	71.6	65.9	9.70	5 300	7 000	**28158**	**28300**	16.5	47.5	45.0	68.0	71.0	1.6	1.2	0.40	1.49	0.82	0.266	0.137
	80.000	21.000	22.403	17.826	3.6	1.2	85.0	74.8	11.4	4 900	6 600	**344**	**332**	15.1	52.0	45.5	73.0	75.0	3.6	1.2	0.27	2.20	1.21	0.334	0.144

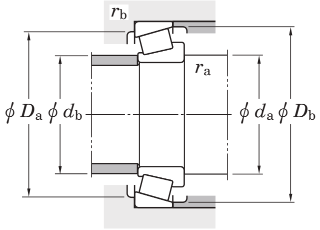
[Note] 1) SP indicates the specially chamfered from.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (40.000) ~ 42.070 mm



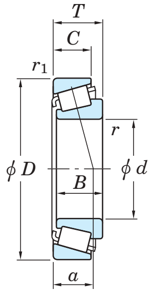


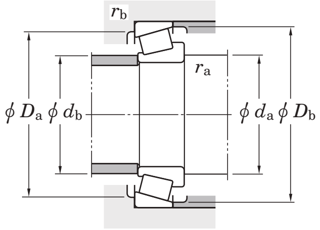
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Bearing No.		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
40.000	80.000	21.000	22.403	17.826	0.8	1.2	85.0	74.8	11.4	4 900	6 600	**344A**	**332**	15.1	46.0	45.5	73.0	75.0	0.8	1.2	0.27	2.20	1.21	0.334	0.144
	85.000	20.638	21.692	17.462	0.8	1.2	89.6	81.7	12.4	4 600	6 200	**350A**	**354A**	15.5	47.5	46.5	77.0	80.0	0.8	1.2	0.31	1.96	1.08	0.416	0.162
	88.501	26.988	29.083	22.225	3.6	1.6	123	112	17.2	4 900	6 500	**420**	**414**	16.9	52.0	46.0	77.0	80.0	3.6	1.6	0.26	2.28	1.25	0.465	0.325
	107.950	36.512	36.957	28.575	3.6	3.2	172	172	26.8	3 800	5 100	**543**	**532X**	23.9	57.0	50.0	94.0	100.0	3.6	3.2	0.30	2.03	1.11	1.17	0.570
40.483	82.550	29.370	28.575	23.020	3.6	3.2	109	117	16.9	4 900	6 600	**HM801349**	**HM801310**	24.4	58.0	49.0	68.0	78.0	3.6	3.2	0.55	1.10	0.60	0.450	0.282
41.275	73.025	16.667	17.462	12.700	3.6	1.6	57.6	55.8	8.15	5 200	6 900	**18590**	**18520**	14.5	53.0	46.0	66.0	69.0	3.6	1.6	0.35	1.71	0.94	0.199	0.085
	73.431	19.558	19.812	14.732	3.6	0.8	72.5	73.0	10.6	5 200	7 000	**LM501349**	**LM501310**	16.1	53.0	46.5	67.0	70.0	3.6	0.8	0.40	1.50	0.83	0.227	0.107
	73.431	21.430	19.812	16.604	3.6	0.8	72.5	73.0	10.6	5 200	7 000	**LM501349**	**LM501314**	18.0	53.0	46.5	66.0	70.0	3.6	0.8	0.40	1.50	0.83	0.227	0.126
	73.431	23.012	19.812	18.186	3.6	2.4	72.5	73.0	10.6	5 200	7 000	**LM501349**	**LM501311**	16.1	53.0	46.5	64.0	70.0	3.6	2.4	0.40	1.50	0.83	0.227	0.140
	76.200	18.009	17.384	14.288	1.6	1.6	64.7	63.3	9.15	5 200	6 900	**11162R**	**11300**	17.5	49.0	46.5	67.0	72.0	1.6	1.6	0.49	1.23	0.68	0.221	0.127
	76.200	22.225	23.020	17.462	3.6	0.8	82.9	83.3	12.3	5 200	6 900	**24780R**	**24720**	17.4	54.0	47.0	68.0	72.0	3.6	0.8	0.39	1.53	0.84	0.275	0.148
	80.000	21.000	22.403	17.826	0.8	1.2	85.0	74.8	11.4	4 900	6 600	**336**	**332**	15.1	47.0	46.0	73.0	75.0	0.8	1.2	0.27	2.20	1.21	0.325	0.144
	80.000	21.000	22.403	17.826	3.6	1.2	85.0	74.8	11.4	4 900	6 600	**342**	**332**	15.1	53.0	46.0	73.0	75.0	3.6	1.2	0.27	2.20	1.21	0.317	0.144
	82.550	26.543	25.654	20.193	3.6	3.2	105	105	15.4	4 900	6 500	**M802048**	**M802011**	23.3	57.0	50.6	70.0	79.0	3.6	3.2	0.55	1.10	0.60	0.403	0.227
	85.725	30.162	30.162	23.812	3.6	1.2	135	136	20.3	4 800	6 400	**3877**	**3821**	22.9	57.0	50.3	75.0	81.0	3.6	1.2	0.40	1.49	0.82	0.506	0.324
	87.312	30.162	30.886	23.812	0.8	3.2	120	120	18.2	4 600	6 200	**3576R**	**3525**	20.5	49.0	48.0	75.0	81.0	0.8	3.2	0.31	1.96	1.08	0.533	0.300
	88.501	26.988	29.083	22.225	3.6	1.6	123	112	17.2	4 900	6 500	**419**	**414**	16.9	54.0	47.0	77.0	80.0	3.6	1.6	0.26	2.28	1.25	0.441	0.325
	88.900	20.638	22.225	16.513	3.6	1.2	92.9	87.3	13.3	4 400	5 800	**365A**	**362A**	16.1	55.0	48.5	81.0	84.0	3.6	1.2	0.32	1.88	1.03	0.458	0.164
	88.900	30.162	29.370	23.020	0.8	3.2	124	125	18.5	4 600	6 100	**HM803145**	**HM803110**	26.1	54.0	53.0	74.0	85.0	0.8	3.2	0.55	1.10	0.60	0.577	0.318
	88.900	30.162	29.370	23.020	3.6	3.2	124	125	18.5	4 600	6 100	**HM803146**	**HM803110**	26.1	60.0	53.0	74.0	85.0	3.6	3.2	0.55	1.10	0.60	0.574	0.318
	90.488	39.688	40.386	33.338	3.6	3.2	166	169	25.9	4 500	6 000	**4388**	**4335**	25.6	57.0	51.0	77.0	85.0	3.6	3.2	0.28	2.11	1.16	0.775	0.454
	93.662	31.750	31.750	26.195	0.8	3.2	132	134	20.2	4 400	5 800	**46162**	**46368**	24.0	52.0	51.0	79.0	87.0	0.8	3.2	0.40	1.49	0.82	0.695	0.403
	95.250	30.162	29.370	23.020	3.6	3.2	130	140	20.7	3 300	4 400	**HM804840**	**HM804810**	26.5	61.0	54.0	81.0	91.0	3.6	3.2	0.55	1.10	0.60	0.719	0.351
	101.600	34.925	36.068	26.988	3.6	3.2	164	159	24.8	4 000	5 300	**526**	**522**	22.2	57.0	50.0	89.0	95.0	3.6	3.2	0.29	2.10	1.16	1.02	0.411
	104.775	36.512	36.512	28.575	1.6	3.2	176	195	29.3	3 800	5 100	**HM807035**	**HM807010**	29.3	60.0	57.0	89.0	100.0	1.6	3.2	0.49	1.23	0.68	1.19	0.497
42.070	90.488	39.688	40.386	33.338	3.6	3.2	166	169	25.9	4 500	6 000	**4395**	**4335**	25.6	58.0	51.0	77.0	85.0	3.6	3.2	0.28	2.11	1.16	0.751	0.459

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings
inch series

d 42.862 ~ 45.000 mm



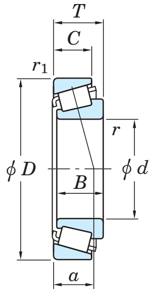


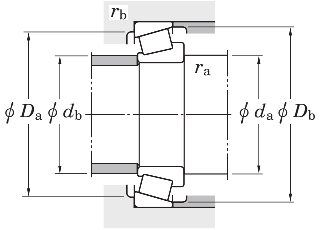
Boundary dimensions (mm) *d*	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Bearing No. Inner ring	Outer ring	Load center (mm) *a*	Mounting dimensions (mm) d_a	d_b	D_a	D_b	r_a max.	r_b max.	Constant *e*	Axial load factors Y_1	Y_0	(Refer.) Mass (kg) Inner ring	Outer ring
42.862	76.992	17.463	17.145	11.908	1.6	1.6	60.8	62.2	8.95	5 000	6 600	**12168**	**12303**	17.5	51.0	48.5	68.0	73.0	1.6	1.6	0.51	1.19	0.65	0.220	0.097
42.875	79.375	23.812	25.400	19.050	3.6	0.8	101	105	15.8	5 000	6 700	**26884R**	**26822**	16.1	55.0	48.5	71.0	74.0	3.6	0.8	0.32	1.88	1.04	0.314	0.186
	82.931	23.812	25.400	19.050	3.6	0.8	96.8	100	15.1	4 800	6 300	**25577**	**25520**	17.5	55.0	49.0	74.0	77.0	3.6	0.8	0.33	1.79	0.99	0.382	0.200
44.450	73.025	18.258	18.258	15.083	1.6	1.6	59.4	65.5	9.50	5 100	6 800	**L102849**	**L102810**	14.6	51.0	49.0	66.0	69.0	1.6	1.6	0.32	1.88	1.04	0.183	0.102
	76.992	17.463	17.145	11.908	1.6	1.6	60.8	62.2	8.95	5 000	6 600	**12175**	**12303**	17.5	52.0	49.5	68.0	73.0	1.6	1.6	0.51	1.19	0.65	0.206	0.097
	79.375	17.462	17.462	13.495	2.8	1.6	59.2	59.1	8.65	4 800	6 400	**18685**	**18620**	16.0	54.0	49.5	71.0	74.0	2.8	1.6	0.37	1.60	0.88	0.214	0.126
	82.931	23.812	25.400	19.050	5.2	0.8	96.8	100	15.1	4 800	6 300	**25582**	**25520**	17.5	59.0	51.0	74.0	77.0	5.2	0.8	0.33	1.79	0.99	0.361	0.200
	84.138	30.162	30.886	23.812	3.6	3.2	120	120	18.2	4 600	6 200	**3578R**	**3520**	20.5	57.0	51.0	74.0	79.5	3.6	3.2	0.31	1.96	1.08	0.479	0.221
	85.000	20.638	21.692	17.462	2.4	1.2	89.6	81.7	12.4	4 600	6 200	**355**	**354A**	15.5	54.0	50.0	77.0	80.0	2.4	1.2	0.31	1.96	1.08	0.344	0.160
	85.000	20.638	21.692	17.462	0.8	1.2	89.6	81.7	12.4	4 600	6 200	**355A**	**354A**	15.5	51.0	50.0	77.0	80.0	0.8	1.2	0.31	1.96	1.08	0.344	0.160
	88.900	30.162	29.370	23.020	3.6	3.2	124	125	18.5	4 600	6 100	**HM803149**	**HM803110**	26.1	62.0	53.4	74.0	85.0	3.6	3.2	0.55	1.10	0.60	0.525	0.318
	93.662	31.750	31.750	25.400	3.6	3.2	131	123	18.8	4 400	5 900	**49175**	**49368**	22.9	59.0	53.0	82.0	87.0	3.6	3.2	0.36	1.67	0.92	0.645	0.371
	93.662	31.750	31.750	26.195	0.8	3.2	132	134	20.2	4 400	5 800	**46175**	**46368**	24.0	55.0	54.0	79.0	87.0	0.8	3.2	0.40	1.49	0.82	0.609	0.403
	93.662	31.750	31.750	26.195	3.6	3.2	132	134	20.2	4 400	5 800	**46176**	**46368**	24.0	60.0	54.0	79.0	87.0	3.6	3.2	0.40	1.49	0.82	0.609	0.403
	95.250	27.783	28.575	22.225	0.8	2.4	135	141	21.6	4 100	5 400	**33885**	**33821**	20.4	53.0	53.0	85.0	90.0	0.8	2.4	0.33	1.82	1.00	0.714	0.264
	95.250	27.783	29.901	22.225	3.6	0.8	129	122	18.8	4 500	5 900	**438**	**432A**	18.4	57.0	51.0	84.0	87.0	3.6	0.8	0.28	2.11	1.16	0.555	0.375
	95.250	30.162	29.370	23.020	0.8	2.4	130	140	20.7	3 300	4 400	**HM804842**	**HM804810**	26.5	57.0	57.0	81.0	91.0	0.8	2.4	0.55	1.10	0.60	0.673	0.351
	95.250	30.162	29.370	23.020	3.6	2.4	130	140	20.7	3 300	4 400	**HM804843**	**HM804810**	26.5	63.0	57.0	81.0	91.0	3.6	2.4	0.55	1.10	0.60	0.670	0.351
	98.425	30.162	31.750	25.400	0.8	3.2	143	143	21.9	3 900	5 200	**49576**	**49520**	24.1	55.0	54.0	88.0	96.0	0.8	3.2	0.40	1.50	0.82	0.856	0.384
	101.600	34.925	36.068	26.988	3.6	3.2	164	159	24.8	4 000	5 300	**527**	**522**	22.2	59.0	53.0	89.0	95.0	3.6	3.2	0.29	2.10	1.16	0.939	0.411
	104.775	36.512	36.512	28.575	3.6	3.2	176	195	29.3	3 800	5 100	**HM807040**	**HM807010**	29.3	66.0	59.0	89.0	100.0	3.6	3.2	0.49	1.23	0.68	1.13	0.497
	111.125	38.100	36.957	30.162	3.6	3.2	172	172	26.8	3 800	5 100	**535**	**532A**	23.9	60.0	54.0	95.0	100.0	3.6	3.2	0.30	2.03	1.11	1.09	0.746
	120.650	41.275	41.275	31.750	3.6	3.2	218	217	34.0	3 500	4 600	**615**	**612**	27.3	62.0	56.0	105.0	110.0	3.6	3.2	0.31	1.91	1.05	1.48	0.853
44.983	93.264	30.162	30.302	23.812	3.6	3.2	129	137	20.9	4 200	5 500	**3776**	**3720**	22.2	59.0	53.0	82.0	88.0	3.6	3.2	0.34	1.77	0.97	0.650	0.288
45.000	85.000	20.638	21.692	17.462	1.6	1.2	89.6	81.7	12.4	4 600	6 200	**358**	**354A**	15.5	52.5	50.0	77.0	80.0	1.6	1.2	0.31	1.96	1.08	0.338	0.162

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d 45.242 ~ 49.212 mm



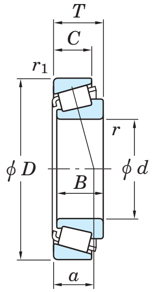


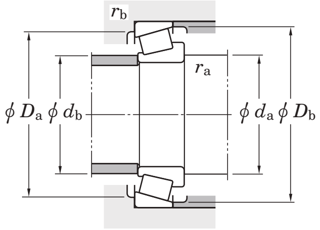
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
45.242	73.431	19.558	19.812	15.748	3.6	0.8	70.0	78.1	11.4	5 100	6 700	**LM102949**	**LM102910**	14.7	56.0	50.0	68.0	70.0	3.6	0.8	0.31	1.97	1.08	0.209	0.100
	77.788	19.842	19.842	15.080	3.6	0.8	71.7	73.5	10.7	4 900	6 500	**LM603049**	**LM603011**	17.5	57.0	50.0	71.0	74.0	3.6	0.8	0.43	1.41	0.77	0.243	0.120
	77.788	21.430	19.842	16.667	3.6	0.8	71.7	73.5	10.7	4 900	6 500	**LM603049**	**LM603012**	19.1	57.0	50.0	71.0	74.0	3.6	0.8	0.43	1.41	0.77	0.243	0.138
	79.974	19.842	19.842	15.080	3.6	0.8	71.7	73.5	10.7	4 900	6 500	**LM603049**	**LM603014**	17.5	57.0	50.0	71.0	74.0	3.6	0.8	0.43	1.41	0.77	0.243	0.152
45.618	85.000	23.812	25.400	19.050	3.6	2.4	96.8	100	15.1	4 800	6 300	**25590**	**25526**	17.5	58.0	51.0	74.0	78.0	3.6	2.4	0.33	1.79	0.99	0.344	0.241
45.987	74.976	18.000	18.000	14.000	2.4	1.6	66.2	74.6	10.8	5 000	6 600	**LM503349R**	**LM503310**	16.0	53.0	51.0	67.0	72.0	2.4	1.6	0.40	1.49	0.82	0.207	0.095
46.038	79.375	17.462	17.462	13.495	2.8	1.6	59.2	59.1	8.65	4 800	6 400	**18690**	**18620**	16.0	56.0	51.0	71.0	74.0	2.8	1.6	0.37	1.60	0.88	0.208	0.123
	85.000	20.638	21.692	17.462	3.6	1.2	89.6	81.7	12.4	4 600	6 200	**359A**	**354A**	15.5	57.0	51.0	77.0	80.0	3.6	1.2	0.31	1.96	1.08	0.323	0.160
	85.000	20.638	21.692	17.462	2.4	1.2	89.6	81.7	12.4	4 600	6 200	**359S**	**354A**	15.5	55.0	51.0	77.0	80.0	2.4	1.2	0.31	1.96	1.08	0.323	0.160
	85.000	25.400	25.608	20.638	3.6	1.2	100	106	16.0	4 600	6 100	**2984**	**2924**	18.9	58.0	52.0	76.0	80.0	3.6	1.2	0.35	1.73	0.95	0.389	0.220
47.625	88.900	20.638	22.225	16.513	3.6	1.2	92.9	87.3	13.3	4 400	5 800	**369A**	**362A**	16.1	60.0	53.0	81.0	84.0	3.6	1.2	0.32	1.88	1.03	0.373	0.164
	88.900	25.400	25.400	19.050	3.6	3.2	109	112	16.6	4 400	5 900	**M804049**	**M804010**	23.6	62.0	55.0	76.0	85.0	3.6	3.2	0.55	1.10	0.60	0.450	0.216
	95.250	30.162	29.370	23.020	3.6	3.2	130	140	20.7	3 300	4 400	**HM804846**	**HM804810**	26.5	64.0	57.0	81.0	91.0	3.6	3.2	0.55	1.10	0.60	0.617	0.351
	96.838	21.000	21.946	15.875	0.8	0.8	101	101	15.3	3 900	5 200	**386A**	**382A**	17.4	56.0	55.0	89.0	92.0	0.8	0.8	0.35	1.69	0.93	0.563	0.177
	101.600	34.925	36.068	26.988	3.6	3.2	164	159	24.8	4 000	5 300	**528**	**522**	22.2	62.0	55.0	89.0	95.0	3.6	3.2	0.29	2.10	1.16	0.871	0.411
	104.775	30.162	29.317	24.605	4.8	3.2	136	144	22.2	3 700	4 900	**463**	**453X**	23.6	65.0	56.0	92.0	98.0	4.8	3.2	0.34	1.79	0.98	0.838	0.372
	104.775	30.162	29.317	24.605	0.8	3.2	136	144	22.2	3 700	4 900	**467**	**453X**	23.6	57.0	56.0	92.0	98.0	0.8	3.2	0.34	1.79	0.98	0.844	0.372
	104.775	30.162	30.958	23.812	3.6	3.2	157	165	25.6	3 700	4 900	**45282**	**45220**	22.2	64.0	59.0	93.0	99.0	3.6	3.2	0.33	1.80	0.99	0.940	0.345
48.412	95.250	30.162	29.370	23.020	2.4	3.2	130	140	20.7	3 300	4 400	**HM804848**	**HM804810**	26.5	63.0	57.5	81.0	91.0	2.4	3.2	0.55	1.10	0.60	0.606	0.351
	95.250	30.162	29.370	23.020	3.6	3.2	130	140	20.7	3 300	4 400	**HM804849**	**HM804810**	26.5	66.0	57.5	81.0	91.0	3.6	3.2	0.55	1.10	0.60	0.604	0.351
49.212	88.900	20.638	22.225	16.513	0.8	1.2	92.9	87.3	13.3	4 400	5 800	**365S**	**362A**	16.1	55.0	54.0	81.0	84.0	0.8	1.2	0.32	1.88	1.03	0.366	0.164
	104.775	36.512	36.512	28.575	3.6	3.2	176	195	29.3	3 800	5 100	**HM807044**	**HM807010**	29.3	69.0	63.0	89.0	100.0	3.6	3.2	0.49	1.23	0.68	1.03	0.497
	114.300	44.450	44.450	34.925	3.6	3.2	237	230	35.1	3 800	5 000	**65390**	**65320**	31.7	70.0	60.0	97.0	107.0	3.6	3.2	0.43	1.40	0.77	1.28	0.894
	114.300	44.450	44.450	36.068	3.6	3.2	265	263	35.4	3 700	5 000	**HH506348**	**HH506310**	30.6	71.0	61.0	97.0	107.0	3.6	3.2	0.40	1.49	0.82	1.49	0.834

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings
inch series

d 49.987 ~ (50.800) mm





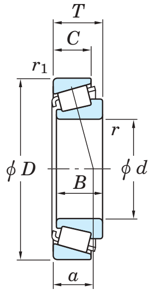
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Bearing No. 1)		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
49.987	92.075	24.608	25.400	19.845	2.4	0.8	107	119	17.9	4 200	5 600	**28579R**	**28521**	19.9	60.0	56.0	83.0	87.0	2.4	0.8	0.38	1.59	0.87	0.463	0.247
50.000	82.000	21.501	21.501	17.000	3.0	0.5	90.0	97.9	14.7	4 500	6 000	**JLM104948**	**JLM104910**	16.2	60.0	55.0	76.0	78.0	3.0	0.5	0.31	1.97	1.08	0.304	0.128
	88.900	20.638	22.225	16.513	2.0	1.2	92.9	87.3	13.3	4 400	5 800	**365**	**362A**	16.1	58.0	55.0	81.0	84.0	2.0	1.2	0.32	1.88	1.03	0.346	0.164
	88.900	20.638	22.225	16.513	2.4	1.2	92.9	87.3	13.3	4 400	5 800	**366**	**362A**	16.1	59.0	55.0	81.0	84.0	2.4	1.2	0.32	1.88	1.03	0.351	0.166
	90.000	28.000	28.000	23.000	3.0	2.5	132	138	21.1	4 300	5 800	**JM205149**	**JM205110**	20.2	62.0	57.0	80.0	85.0	3.0	2.5	0.33	1.82	1.00	0.508	0.243
	105.000	37.000	36.000	29.000	3.0	2.8	186	205	30.6	3 800	5 100	**JHM807045**	**JHM807012**	29.4	69.0	63.0	90.0	100.0	3.0	2.8	0.49	1.23	0.68	1.01	0.523
	110.000	22.000	21.996	18.824	0.8	1.2	109	116	17.7	3 400	4 500	**396**	**394A**	21.3	61.0	60.0	101.0	105.0	0.8	1.2	0.40	1.49	0.82	0.777	0.264
50.800	80.962	18.258	18.258	14.288	1.6	1.6	67.8	81.1	11.8	4 600	6 100	**L305649R**	**L305610**	16.0	58.0	56.0	73.0	77.0	1.6	1.6	0.35	1.69	0.93	0.228	0.119
	82.550	21.590	22.225	16.510	3.6	1.2	77.0	84.3	12.5	4 500	6 000	**LM104949**	**LM104911**	16.4	62.0	55.0	75.0	78.0	3.6	1.2	0.31	1.97	1.08	0.287	0.131
	85.725	19.050	18.263	12.700	1.6	1.6	63.8	66.4	9.55	4 400	5 900	**18200**	**18337**	22.7	59.0	56.0	76.0	81.0	1.6	1.6	0.57	1.06	0.58	0.268	0.134
	88.900	17.462	17.462	13.495	3.6	1.2	62.5	65.5	9.55	4 400	5 900	**18790**	**18724**	17.4	62.0	56.0	78.0	82.0	3.6	1.2	0.41	1.48	0.81	0.226	0.190
	88.900	20.638	22.225	16.513	1.6	1.2	92.9	87.3	13.3	4 400	5 800	**368**	**362A**	16.1	58.0	56.0	81.0	84.0	1.6	1.2	0.32	1.88	1.03	0.333	0.164
	88.900	20.638	22.225	16.513	3.6	1.2	92.9	87.3	13.3	4 400	5 800	**368A**	**362A**	16.1	62.0	56.0	81.0	84.0	3.6	1.2	0.32	1.88	1.03	0.331	0.164
	88.900	20.638	22.225	16.513	5.2	1.2	92.9	87.3	13.3	4 400	5 800	**370A**	**362A**	16.1	65.0	56.0	81.0	84.0	5.2	1.2	0.32	1.88	1.03	0.326	0.164
	92.075	24.608	25.400	19.845	3.6	0.8	107	119	17.9	4 200	5 600	**28580R**	**28521**	19.9	63.0	57.0	83.0	87.0	3.6	0.8	0.38	1.59	0.87	0.453	0.247
	93.264	20.638	22.225	15.083	2.4	1.2	105	98.5	15.1	4 200	5 600	**375**	**374**	17.1	60.0	57.0	85.0	88.0	2.4	1.2	0.34	1.77	0.97	0.416	0.174
	93.264	30.162	30.302	23.812	3.6	3.2	129	137	20.9	4 200	5 500	**3780**	**3720**	22.2	64.0	58.0	82.0	88.0	3.6	3.2	0.34	1.77	0.97	0.547	0.288
	93.264	30.162	30.302	23.812	3.6	0.8	129	137	20.9	4 200	5 500	**3780**	**3730**	22.2	64.0	58.0	84.0	88.0	3.6	0.8	0.34	1.77	0.97	0.547	0.293
	95.250	27.783	28.575	22.225	3.6	0.8	135	141	21.6	4 100	5 400	**33889**	**33822**	20.4	64.0	58.0	86.0	90.0	3.6	0.8	0.33	1.82	1.00	0.604	0.267
	96.838	21.000	21.946	15.875	0.8	0.8	101	101	15.3	3 900	5 200	**385AX**	**382A**	17.4	59.0	58.0	89.0	92.0	0.8	0.8	0.35	1.69	0.93	0.521	0.177
	97.630	24.608	24.608	19.446	3.6	0.8	113	131	19.7	3 900	5 200	**28678**	**28622**	21.2	65.0	58.0	88.0	92.0	3.6	0.8	0.40	1.49	0.82	0.569	0.267
	98.425	30.162	30.302	23.812	3.6	3.2	129	137	20.9	4 200	5 500	**3780**	**3732**	22.2	64.0	58.0	84.0	90.0	3.6	3.2	0.34	1.77	0.97	0.547	0.433
	101.600	31.750	31.750	25.400	3.6	3.2	143	143	21.9	3 900	5 200	**49585**	**49520**	24.1	66.0	59.0	88.0	96.0	3.6	3.2	0.40	1.50	0.82	0.736	0.384
	101.600	34.925	36.068	26.988	0.8	3.2	164	159	24.8	4 000	5 300	**529**	**522**	22.2	59.0	58.0	89.0	95.0	0.8	3.2	0.29	2.10	1.16	0.806	0.411
	101.600	34.925	36.068	26.988	3.6	3.2	164	159	24.8	4 000	5 300	**529X**	**522**	22.2	65.0	58.0	89.0	95.0	3.6	3.2	0.29	2.10	1.16	0.802	0.411
	104.775	30.162	30.958	23.812	6.4	3.2	157	165	25.6	3 700	4 900	**45284**	**45220**	22.2	71.0	59.0	93.0	99.0	6.4	3.2	0.33	1.80	0.99	0.873	0.345
	104.775	36.512	36.512	28.575	3.6	3.2	185	187	28.6	3 900	5 100	**59200**	**59412**	26.9	68.0	61.0	92.0	99.0	3.6	3.2	0.40	1.49	0.82	0.767	0.623

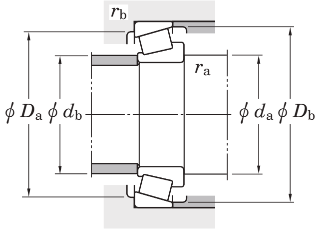
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings
inch series

d (50.800) ~ (55.000) mm





Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Constant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
50.800	104.775	36.512	36.512	28.575	3.6	3.2	176	195	29.3	3 800	5 100	**HM807046**	**HM807010**	29.3	70.0	63.0	89.0	100.0	3.6	3.2	0.49	1.23	0.68	0.995	0.497
	104.775	39.688	40.157	33.338	3.6	3.2	189	211	32.3	3 800	5 100	**4580**	**4535**	27.3	67.0	61.0	90.0	99.0	3.6	3.2	0.34	1.79	0.98	1.06	0.576
	107.950	36.512	36.957	28.575	3.6	3.2	172	172	26.8	3 800	5 100	**537**	**532X**	23.9	65.0	59.0	94.0	100.0	3.6	3.2	0.30	2.03	1.11	0.969	0.569
	112.712	30.162	30.162	23.812	3.6	3.2	184	207	32.1	3 300	4 500	**39575**	**39520**	23.3	68.0	61.0	101.0	107.0	3.6	3.2	0.34	1.77	0.97	1.13	0.355
	120.650	41.275	41.275	31.750	3.6	3.2	218	217	34.0	3 500	4 600	**619**	**612**	27.3	67.0	61.0	105.0	110.0	3.6	3.2	0.31	1.91	1.05	1.44	0.853
	127.000	44.450	44.450	34.925	3.6	3.2	259	269	41.0	3 300	4 400	**65200**	**65500**	35.2	75.0	69.0	107.0	119.0	3.6	3.2	0.49	1.23	0.68	1.86	1.03
51.592	88.900	20.638	22.225	16.513	2.0	1.2	92.9	87.3	13.3	4 400	5 800	**368S**	**362A**	16.1	59.0	56.0	81.0	84.0	2.0	1.2	0.32	1.88	1.03	0.321	0.164
52.388	92.075	24.608	25.400	19.845	3.6	0.8	107	119	17.9	4 200	5 600	**28584R**	**28521**	19.9	65.0	58.0	83.0	87.0	3.6	0.8	0.38	1.59	0.87	0.435	0.247
	104.775	30.162	29.317	24.605	1.6	3.2	136	144	22.2	3 700	4 900	**468**	**453X**	23.6	62.0	60.0	92.0	98.0	1.6	3.2	0.34	1.79	0.98	0.748	0.372
53.975	88.900	19.050	19.050	13.492	2.4	2.0	79.1	86.8	12.6	4 200	5 600	**LM806649**	**LM806610**	21.5	63.0	60.0	80.0	85.0	2.4	2.0	0.55	1.10	0.60	0.312	0.135
	95.250	27.783	28.575	22.225	1.6	0.8	135	141	21.6	4 100	5 400	**33895**	**33822**	20.4	63.0	60.0	86.0	90.0	1.6	0.8	0.33	1.82	1.00	0.550	0.267
	104.775	30.162	29.317	24.605	3.6	3.2	136	144	22.2	3 700	4 900	**456**	**453X**	23.6	68.0	61.0	92.0	98.0	3.6	3.2	0.34	1.79	0.98	0.728	0.372
	104.775	36.512	36.512	28.575	3.6	3.2	176	195	29.3	3 800	5 100	**HM807049**	**HM807010**	29.3	73.0	63.0	89.0	100.0	3.6	3.2	0.49	1.23	0.68	0.921	0.497
	104.775	39.688	40.157	33.338	3.6	3.2	189	211	32.3	3 800	5 100	**4595**	**4535**	27.3	70.0	63.0	90.0	99.0	3.6	3.2	0.34	1.79	0.98	0.981	0.576
	107.950	36.512	36.957	28.575	3.6	3.2	172	172	26.8	3 800	5 100	**539**	**532X**	23.9	68.0	61.0	94.0	100.0	3.6	3.2	0.30	2.03	1.11	0.894	0.569
	107.950	36.512	36.957	28.575	5.6	3.2	172	172	26.8	3 800	5 100	**539A**	**532X**	23.9	72.0	61.0	94.0	100.0	5.6	3.2	0.30	2.03	1.11	0.861	0.569
	117.475	33.338	31.750	23.812	3.6	3.2	162	152	23.2	3 500	4 600	**66212R**	**66462**	33.2	73.0	67.0	100.0	111.0	3.6	3.2	0.63	0.96	0.53	1.03	0.552
	120.650	41.275	41.275	31.750	3.6	3.2	218	217	34.0	3 500	4 600	**621**	**612**	27.3	70.0	63.0	105.0	110.0	3.6	3.2	0.31	1.91	1.05	1.36	0.853
	122.238	33.338	31.750	23.812	3.6	3.2	160	153	23.3	3 300	4 300	**66584**	**66520**	35.4	75.0	68.0	105.0	116.0	3.6	3.2	0.67	0.90	0.50	1.25	0.551
	122.238	43.658	43.764	36.512	3.6	3.2	276	318	43.6	3 200	4 300	**5578R**	**5535**	31.1	73.0	67.0	106.0	116.0	3.6	3.2	0.36	1.67	0.92	1.84	0.807
	123.825	38.100	36.678	30.162	3.6	3.2	202	223	34.8	3 200	4 200	**557S**	**552A**	28.7	71.0	65.0	109.0	116.0	3.6	3.2	0.35	1.73	0.95	1.47	0.756
	127.000	44.450	44.450	34.925	3.6	3.2	259	269	41.0	3 300	4 400	**65212**	**65500**	35.2	77.0	71.0	107.0	119.0	3.6	3.2	0.49	1.23	0.68	1.78	1.02
54.988	104.775	30.162	29.317	24.605	2.4	3.2	136	144	22.2	3 700	4 900	**466**	**453X**	23.6	67.0	61.0	92.0	98.0	2.4	3.2	0.34	1.79	0.98	0.708	0.372
54.991	135.755	53.975	56.007	44.450	3.6	3.2	333	357	49.3	3 000	4 000	**6381**	**6320**	34.8	76.0	70.0	117.0	126.0	3.6	3.2	0.32	1.85	1.02	2.75	1.37
55.000	90.000	23.000	23.000	18.500	1.6	0.5	102	115	17.2	4 200	5 500	**JLM506849**	**JLM506810**	20.1	63.0	61.0	82.0	86.0	1.6	0.5	0.40	1.49	0.82	0.370	0.183

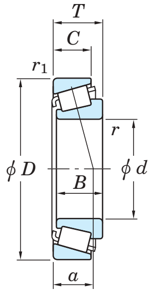
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

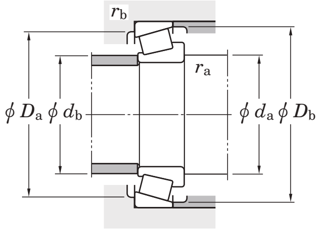
[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings
inch series

Koyo

d (55.000) ~ (60.000) mm





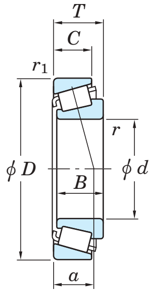
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. 1)		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
55.000	95.000	29.000	29.000	23.500	1.6	2.8	138	150	23.0	4 000	5 300	**JM207049**	**JM207010**	21.3	64.0	62.0	85.0	91.0	1.6	2.8	0.33	1.79	0.99	0.567	0.256
	96.838	21.000	21.946	15.875	2.4	0.8	101	101	15.3	3 900	5 200	**385**	**382A**	17.4	65.0	61.0	89.0	92.0	2.4	0.8	0.35	1.69	0.93	0.461	0.177
	96.838	21.000	21.946	15.875	3.6	0.8	101	101	15.3	3 900	5 200	**385X**	**382A**	17.4	67.0	61.0	89.0	92.0	3.6	0.8	0.35	1.69	0.93	0.459	0.177
	110.000	39.000	39.000	32.000	3.0	2.5	220	224	34.7	3 600	4 900	**JH307749**	**JH307710**	26.8	71.0	64.0	97.0	104.0	3.0	2.5	0.35	1.73	0.95	1.16	0.560
55.562	97.630	24.608	24.608	19.446	3.6	0.8	113	131	19.7	3 900	5 200	**28680**	**28622**	21.2	68.0	62.0	88.0	92.0	3.6	0.8	0.40	1.49	0.82	0.492	0.267
	122.238	43.658	43.764	36.512	1.2	3.2	276	318	43.6	3 200	4 300	**5566R**	**5535**	31.1	70.0	68.0	106.0	116.0	1.2	3.2	0.36	1.67	0.92	1.82	0.807
	127.000	36.512	36.512	26.988	3.6	3.2	209	235	36.2	3 000	4 000	**HM813840**	**HM813810**	32.9	76.0	70.0	111.0	121.0	3.6	3.2	0.50	1.20	0.66	1.72	0.606
55.575	96.838	21.000	21.946	15.875	2.4	0.8	101	101	15.3	3 900	5 200	**389**	**382A**	17.4	65.0	61.0	89.0	92.0	2.4	0.8	0.35	1.69	0.93	0.452	0.177
57.150	96.838	21.000	21.946	15.875	2.4	0.8	101	101	15.3	3 900	5 200	**387**	**382A**	17.4	66.0	62.0	89.0	92.0	2.4	0.8	0.35	1.69	0.93	0.428	0.177
	96.838	21.000	21.946	15.875	3.6	0.8	101	101	15.3	3 900	5 200	**387A**	**382A**	17.4	69.0	62.0	89.0	92.0	3.6	0.8	0.35	1.69	0.93	0.426	0.177
	96.838	21.000	21.946	15.875	5.2	0.8	101	101	15.3	3 900	5 200	**387AS**	**382A**	17.4	72.0	62.0	89.0	92.0	5.2	0.8	0.35	1.69	0.93	0.422	0.177
	96.838	21.000	21.946	15.875	0.8	0.8	101	101	15.3	3 900	5 200	**387S**	**382A**	17.4	63.0	62.0	89.0	92.0	0.8	0.8	0.35	1.69	0.93	0.431	0.177
	98.425	21.000	21.946	17.826	2.4	0.8	101	101	15.3	3 900	5 200	**387**	**382**	17.4	66.0	62.0	89.0	92.0	2.4	0.8	0.35	1.69	0.93	0.428	0.223
	104.775	30.162	29.317	24.605	2.4	3.2	136	144	22.2	3 700	4 900	**462**	**453X**	23.6	67.0	63.0	92.0	98.0	2.4	3.2	0.34	1.79	0.98	0.685	0.372
	104.775	30.162	29.317	24.605	3.6	3.2	136	144	22.2	3 700	4 900	**469**	**453X**	23.6	70.0	63.0	92.0	98.0	3.6	3.2	0.34	1.79	0.98	0.682	0.372
	104.775	30.162	30.958	23.812	6.4	0.8	157	165	25.6	3 700	4 900	**45291**	**45221**	22.2	76.0	65.0	95.0	99.0	6.4	0.8	0.33	1.80	0.99	0.742	0.350
	112.712	30.162	30.048	23.812	3.6	3.2	139	164	25.1	3 400	4 500	**3979**	**3920**	25.9	72.0	66.0	99.0	106.0	3.6	3.2	0.40	1.49	0.82	0.916	0.448
	112.712	30.162	30.162	23.812	3.6	3.2	184	207	32.1	3 300	4 500	**39580**	**39520**	23.3	72.0	66.0	101.0	107.0	3.6	3.2	0.34	1.77	0.97	1.05	0.355
	112.712	30.162	30.162	23.812	7.9	3.2	184	207	32.1	3 300	4 500	**39581**	**39520**	23.3	81.0	66.0	101.0	107.0	7.9	3.2	0.34	1.77	0.97	1.03	0.355
	117.475	30.162	30.162	23.812	3.6	3.2	148	179	27.4	3 200	4 200	**33225**	**33462**	27.8	74.0	68.0	104.0	112.0	3.6	3.2	0.44	1.38	0.76	1.13	0.442
	120.650	41.275	41.275	31.750	3.6	3.2	218	217	34.0	3 500	4 600	**623**	**612**	27.3	72.0	66.0	105.0	110.0	3.6	3.2	0.31	1.91	1.05	1.27	0.853
	127.000	44.450	44.450	34.925	3.6	3.2	259	269	41.0	3 300	4 400	**65225**	**65500**	35.2	80.0	71.0	107.0	119.0	3.6	3.2	0.49	1.23	0.68	1.69	1.02
57.531	96.838	21.000	21.946	15.875	3.6	0.8	101	101	15.3	3 900	5 200	**388A**	**382A**	17.4	69.0	63.0	89.0	92.0	3.6	0.8	0.35	1.69	0.93	0.420	0.177
59.972	122.238	33.338	31.750	23.812	0.8	3.2	160	153	23.3	3 300	4 300	**66589**	**66520**	35.4	74.0	73.0	105.0	116.0	0.8	3.2	0.67	0.90	0.50	1.11	0.551
60.000	95.000	24.000	24.000	19.000	5.0	2.5	108	125	18.9	3 900	5 200	**JLM508748**	**JLM508710**	21.2	75.0	66.0	85.0	91.0	5.0	2.5	0.40	1.49	0.82	0.402	0.196

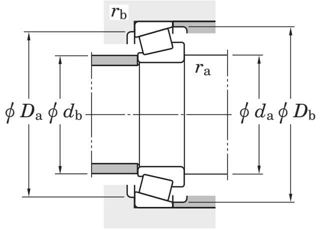
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (60.000) ~ (65.000) mm





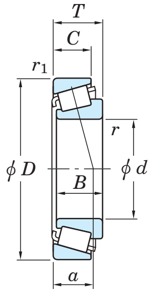
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. 1)		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
60.000	107.950	25.400	25.400	19.050	3.6	3.2	116	143	21.6	3 400	4 500	**29580**	**29520**	24.7	74.0	68.0	96.0	103.0	3.6	3.2	0.46	1.31	0.72	0.713	0.277
	110.000	22.000	21.996	18.824	0.8	1.2	109	116	17.7	3 400	4 500	**397**	**394A**	21.3	69.0	68.0	101.0	104.5	0.8	1.2	0.40	1.49	0.82	0.637	0.259
60.325	100.000	25.400	25.400	19.845	3.6	3.2	115	137	20.6	3 700	4 900	**28985**	**28921**	22.8	73.0	67.0	89.0	96.0	3.6	3.2	0.43	1.41	0.78	0.533	0.230
	101.600	25.400	25.400	19.845	3.6	3.2	115	137	20.6	3 700	4 900	**28985**	**28920**	22.8	73.0	67.0	89.0	96.0	3.6	3.2	0.43	1.41	0.78	0.533	0.269
	122.238	43.658	43.764	36.512	3.6	3.2	276	318	43.6	3 200	4 300	**5583R**	**5535**	31.1	78.0	72.0	106.0	116.0	3.6	3.2	0.36	1.67	0.92	1.66	0.807
	127.000	36.512	36.512	26.988	3.6	1.6	209	235	36.2	3 000	4 000	**HM813841**	**HM813811**	32.9	80.0	73.0	113.0	121.0	3.6	1.6	0.50	1.20	0.66	1.60	0.622
	127.000	36.512	36.512	26.988	1.6	3.2	209	235	36.2	3 000	4 000	**HM813841A**	**HM813810**	32.9	74.0	71.0	110.0	121.0	1.6	3.2	0.50	1.20	0.66	1.62	0.606
	127.000	44.450	44.450	34.925	3.6	3.2	259	269	41.0	3 300	4 400	**65237**	**65500**	35.2	82.0	71.0	107.0	119.0	3.6	3.2	0.49	1.23	0.68	1.59	1.02
	127.000	44.450	44.450	34.925	1.6	3.2	259	269	41.0	3 300	4 400	**65237A**	**65500**	35.2	78.0	71.0	107.0	119.0	1.6	3.2	0.49	1.23	0.68	1.59	1.02
	136.525	46.038	46.038	36.512	3.6	3.2	290	369	49.6	2 800	3 700	**H715332**	**H715311**	37.0	84.0	78.0	118.0	132.0	3.6	3.2	0.47	1.27	0.70	2.56	0.950
61.912	110.000	22.000	21.996	18.824	0.8	1.2	109	116	17.7	3 400	4 500	**392**	**394A**	21.3	70.0	69.0	101.0	104.5	0.8	1.2	0.40	1.49	0.82	0.606	0.259
63.500	107.950	25.400	25.400	19.050	1.6	3.2	116	143	21.6	3 400	4 500	**29586**	**29520**	24.7	73.0	71.0	96.0	103.0	1.6	3.2	0.46	1.31	0.72	0.649	0.277
	110.000	22.000	21.996	18.824	1.6	1.2	109	116	17.7	3 400	4 500	**390A**	**394A**	21.3	73.0	70.0	101.0	104.5	1.6	1.2	0.40	1.49	0.82	0.579	0.259
	110.000	22.000	21.996	18.824	3.6	1.2	109	116	17.7	3 400	4 500	**395**	**394A**	21.3	77.0	70.0	101.0	104.5	3.6	1.2	0.40	1.49	0.82	0.575	0.259
	110.000	25.400	25.400	19.050	3.6	1.2	116	143	21.6	3 400	4 500	**29585**	**29521**	24.7	77.0	71.0	99.0	104.0	3.6	1.2	0.46	1.31	0.72	0.644	0.333
	112.712	30.162	30.162	23.812	3.6	3.2	184	207	32.1	3 300	4 500	**39585**	**39520**	23.3	77.0	71.0	101.0	107.0	3.6	3.2	0.34	1.77	0.97	0.908	0.355
	120.000	29.794	29.007	24.237	0.8	2.0	148	161	25.0	3 200	4 200	**477**	**472**	25.7	73.0	72.0	108.0	113.0	0.8	2.0	0.38	1.56	0.86	0.967	0.493
	122.238	38.354	38.100	29.718	3.6	3.2	238	249	39.1	3 200	4 300	**HM212046**	**HM212011**	27.6	80.0	73.0	108.0	116.0	3.6	3.2	0.34	1.78	0.98	1.36	0.591
	122.238	43.658	43.764	36.512	3.6	3.2	276	318	43.6	3 200	4 300	**5584R**	**5535**	31.1	81.0	75.0	106.0	116.0	3.6	3.2	0.36	1.67	0.92	1.56	0.807
	127.000	36.512	36.170	28.575	3.6	3.2	196	226	35.3	3 000	4 000	**565**	**563**	28.6	80.0	73.0	112.0	120.0	3.6	3.2	0.36	1.65	0.91	1.43	0.648
	135.755	53.975	56.007	44.450	4.3	3.2	333	357	49.3	3 000	4 000	**6382**	**6320**	34.8	84.0	77.0	117.0	126.0	4.3	3.2	0.32	1.85	1.02	2.29	1.39
	136.525	41.275	41.275	31.750	3.6	3.2	302	308	48.1	2 900	3 800	**H414235**	**H414210**	30.3	82.0	78.0	121.0	129.0	3.6	3.2	0.36	1.67	0.92	2.11	0.796
64.986	112.712	30.162	30.924	23.812	2.4	3.2	184	207	32.1	3 300	4 500	**39586**	**39520**	23.3	76.0	72.0	101.0	107.0	2.4	3.2	0.34	1.77	0.97	0.845	0.355
65.000	105.000	24.000	23.000	18.500	3.0	1.0	120	129	19.6	3 500	4 700	**JLM710949**	**JLM710910**	23.8	77.0	71.0	96.0	100.5	3.0	1.0	0.45	1.32	0.73	0.513	0.234
	110.000	28.000	28.000	22.500	3.0	2.8	170	191	29.4	3 400	4 600	**JM511946**	**JM511910**	24.5	78.0	72.0	99.0	105.0	3.0	2.8	0.40	1.49	0.82	0.733	0.338

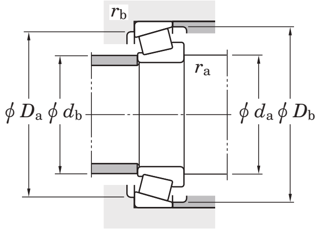
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings
inch series

d (65.000) ~ 68.262 mm





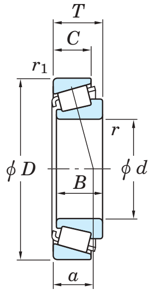
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Constant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
65.000	120.000	39.000	38.500	32.000	3.0	2.8	236	255	39.7	3 200	4 300	**JH211749**	**JH211710**	27.9	80.0	74.0	107.0	114.0	3.0	2.8	0.34	1.78	0.98	1.27	0.618
	120.000	39.000	38.500	32.000	7.1	2.8	236	255	39.7	3 200	4 300	**JH211749A**	**JH211710**	27.9	88.0	74.0	107.0	114.0	7.1	2.8	0.34	1.78	0.98	1.27	0.618
65.088	135.755	53.975	56.007	44.450	3.6	3.2	333	357	49.3	3 000	4 000	**6379**	**6320**	34.8	84.0	77.5	117.0	126.0	3.6	3.2	0.32	1.85	1.02	2.34	1.37
	136.525	46.038	46.038	36.512	3.6	3.2	290	369	49.6	2 800	3 700	**H715340**	**H715311**	37.0	88.0	82.0	118.0	132.0	3.6	3.2	0.47	1.27	0.70	2.39	0.950
65.883	122.238	43.658	43.764	36.512	3.6	3.2	276	318	43.6	3 200	4 300	**5595R**	**5535**	31.1	83.0	77.0	106.0	116.0	3.6	3.2	0.36	1.67	0.92	1.48	0.807
66.675	110.000	22.000	21.996	18.824	0.8	1.2	109	116	17.7	3 400	4 500	**395A**	**394A**	21.3	73.0	73.0	101.0	104.5	0.8	1.2	0.40	1.49	0.82	0.524	0.259
	110.000	22.000	21.996	18.824	3.6	1.2	109	116	17.7	3 400	4 500	**395S**	**394A**	21.3	79.0	73.0	101.0	104.5	3.6	1.2	0.40	1.49	0.82	0.519	0.259
	112.712	30.162	30.048	23.812	3.6	0.8	139	164	25.1	3 400	4 500	**3984**	**3925**	25.9	80.0	74.0	101.0	106.0	3.6	0.8	0.40	1.49	0.82	0.700	0.454
	112.712	30.162	30.162	23.812	3.6	3.2	184	207	32.1	3 300	4 500	**39590**	**39520**	23.3	80.0	74.0	101.0	107.0	3.6	3.2	0.34	1.77	0.97	0.832	0.355
	112.712	30.162	30.162	23.812	3.6	0.8	184	207	32.1	3 300	4 500	**39590**	**39521**	23.3	80.0	74.0	103.0	107.0	3.6	0.8	0.34	1.77	0.97	0.832	0.360
	117.475	30.162	30.162	23.812	3.6	3.2	148	179	27.4	3 200	4 200	**33262**	**33462**	27.8	81.0	75.0	104.0	112.0	3.6	3.2	0.44	1.38	0.76	0.910	0.436
	122.238	38.100	38.354	29.718	3.6	1.6	238	249	39.1	3 200	4 300	**HM212049**	**HM212010**	27.3	82.0	75.5	110.0	116.0	3.6	1.6	0.34	1.78	0.98	1.26	0.596
	127.000	36.512	36.512	26.988	3.6	1.6	209	235	36.2	3 000	4 000	**HM813844**	**HM813811**	32.9	85.0	78.0	113.0	121.0	3.6	1.6	0.50	1.20	0.66	1.42	0.622
	130.175	41.275	41.275	31.750	3.6	3.2	246	267	41.8	3 000	3 900	**641**	**633**	30.3	83.0	77.0	116.0	124.0	3.6	3.2	0.36	1.66	0.91	1.68	0.703
	135.755	53.975	56.007	44.450	4.3	3.2	333	357	49.3	3 000	4 000	**6386**	**6320**	34.8	87.0	77.5	117.0	126.0	4.3	3.2	0.32	1.85	1.02	2.27	1.37
	135.755	53.975	56.007	44.450	6.4	3.2	333	357	49.3	3 000	4 000	**6389**	**6320**	34.8	91.0	77.5	117.0	126.0	6.4	3.2	0.32	1.85	1.02	2.15	1.37
	136.525	41.275	41.275	31.750	3.6	3.2	302	308	48.1	2 900	3 800	**H414242**	**H414210**	30.3	85.0	81.0	121.0	129.0	3.6	3.2	0.36	1.67	0.92	2.01	0.796
	136.525	46.038	46.038	36.512	3.6	3.2	290	369	49.6	2 800	3 700	**H715341**	**H715311**	37.0	89.0	83.0	118.0	132.0	3.6	3.2	0.47	1.27	0.70	2.33	0.950
68.262	110.000	22.000	21.996	18.824	2.4	1.2	109	116	17.7	3 400	4 500	**399A**	**394A**	21.3	78.0	74.0	101.0	104.5	2.4	1.2	0.40	1.49	0.82	0.493	0.259
	110.000	22.000	21.996	18.824	5.2	1.2	109	116	17.7	3 400	4 500	**399AS**	**394A**	21.3	83.0	74.0	101.0	104.5	5.2	1.2	0.40	1.49	0.82	0.485	0.259
	117.475	30.162	30.162	23.812	3.6	3.2	148	179	27.4	3 200	4 200	**33269**	**33462**	27.8	82.0	76.0	104.0	112.0	3.6	3.2	0.44	1.38	0.76	0.870	0.436
	127.000	36.512	36.170	28.575	3.6	3.2	196	226	35.3	3 000	4 000	**570**	**563**	28.6	83.0	77.0	112.0	120.0	3.6	3.2	0.36	1.65	0.91	1.29	0.648
	136.525	41.275	41.275	31.750	3.6	3.2	284	308	46.1	2 900	3 800	**H414245**	**H414210**	30.3	86.0	82.0	121.0	129.0	3.6	3.2	0.36	1.67	0.92	1.92	0.788
	136.525	46.038	46.038	36.512	3.6	3.2	290	369	49.6	2 800	3 700	**H715343**	**H715311**	37.0	90.0	84.0	118.0	132.0	3.6	3.2	0.47	1.27	0.70	2.27	0.950
	152.400	47.625	46.038	31.750	3.6	3.2	306	278	38.3	2 700	3 600	**9185**	**9121**	44.5	94.0	81.5	130.0	145.0	3.6	3.2	0.66	0.91	0.50	2.67	1.20

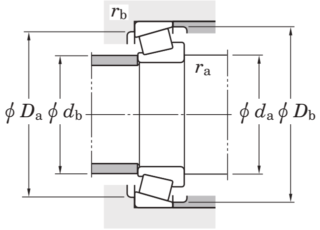
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d 69.850 ~ (73.025) mm





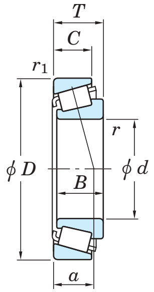
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
69.850	98.425	13.495	13.495	9.525	1.6	1.6	49.1	59.8	8.45	3 500	4 700	**LL713049**	**LL713010**	18.4	77.0	74.0	92.0	94.5	1.6	1.6	0.44	1.37	0.75	0.205	0.086
	112.712	22.225	21.996	15.875	1.6	0.8	115	127	19.4	3 300	4 400	**LM613449**	**LM613410**	21.9	78.0	76.0	104.0	107.0	1.6	0.8	0.42	1.44	0.79	0.562	0.238
	112.712	25.400	25.400	19.050	1.6	3.2	122	155	23.3	3 200	4 300	**29675**	**29620**	26.2	80.0	77.0	101.0	109.0	1.6	3.2	0.49	1.23	0.68	0.676	0.270
	117.475	30.162	30.162	23.812	3.6	3.2	148	179	27.4	3 200	4 200	**33275**	**33462**	27.8	84.0	77.0	104.0	112.0	3.6	3.2	0.44	1.38	0.76	0.830	0.436
	120.000	29.002	29.007	23.444	3.6	3.2	148	161	25.0	3 200	4 200	**482**	**472A**	24.9	83.0	77.0	106.0	114.0	3.6	3.2	0.38	1.56	0.86	0.791	0.462
	120.000	29.794	29.007	24.237	3.6	2.0	148	161	25.0	3 200	4 200	**482**	**472**	25.7	83.0	77.0	108.0	113.0	3.6	2.0	0.38	1.56	0.86	0.791	0.487
	120.000	32.545	32.545	26.195	3.6	3.2	189	218	33.9	3 100	4 200	**47487R**	**47420**	26.6	84.0	78.0	107.0	114.0	3.6	3.2	0.36	1.67	0.92	1.01	0.476
	120.650	32.545	32.545	26.195	3.6	0.8	189	218	33.9	3 100	4 200	**47487R**	**47423**	26.6	84.0	78.0	109.0	114.0	3.6	0.8	0.36	1.67	0.92	1.01	0.513
	123.825	30.162	29.007	24.605	3.6	3.2	148	161	25.0	3 200	4 200	**482**	**472X**	26.0	83.0	77.0	109.0	114.0	3.6	3.2	0.38	1.56	0.86	0.791	0.625
	127.000	36.512	36.170	28.575	3.6	3.2	196	226	35.3	3 000	4 000	**566**	**563**	28.6	85.0	78.0	112.0	120.0	3.6	3.2	0.36	1.65	0.91	1.24	0.648
	146.050	41.275	41.275	31.750	3.6	3.2	261	301	45.3	2 600	3 400	**655**	**653**	33.4	88.0	82.0	131.0	139.0	3.6	3.2	0.41	1.47	0.81	2.35	0.891
	150.089	44.450	46.672	36.512	3.6	3.2	330	368	50.1	2 500	3 400	**745AR**	**742**	32.4	88.0	82.0	134.0	142.0	3.6	3.2	0.33	1.84	1.01	2.79	1.07
	168.275	53.975	56.363	41.275	3.6	3.2	429	467	62.1	2 300	3 100	**835R**	**832**	35.0	91.0	84.0	149.0	155.0	3.6	3.2	0.30	2.00	1.10	4.32	1.72
69.952	121.442	24.608	23.012	17.462	2.0	2.0	113	127	19.4	3 000	4 000	**34274**	**34478**	26.8	81.0	78.0	110.0	116.0	2.0	2.0	0.45	1.33	0.73	0.764	0.316
70.000	110.000	26.000	25.000	20.500	1.0	2.5	129	158	23.9	3 300	4 400	**JLM813049**	**JLM813010**	26.1	78.0	77.0	98.0	105.0	1.0	2.5	0.49	1.23	0.68	0.590	0.300
	115.000	29.000	29.000	23.000	3.0	2.5	155	173	26.6	3 200	4 300	**JM612949**	**JM612910**	26.2	83.0	77.0	103.0	110.0	3.0	2.5	0.43	1.39	0.77	0.776	0.358
71.438	117.475	30.162	30.162	23.812	3.6	3.2	148	179	27.4	3 200	4 200	**33281**	**33462**	27.8	85.0	79.0	104.0	112.0	3.6	3.2	0.44	1.38	0.76	0.789	0.436
	120.000	32.545	32.545	26.195	3.6	3.2	189	218	33.9	3 100	4 200	**47490R**	**47420**	26.6	86.0	79.0	107.0	114.0	3.6	3.2	0.36	1.67	0.92	0.964	0.476
	127.000	36.512	36.170	28.575	3.6	3.2	196	226	35.3	3 000	4 000	**567A**	**563**	28.6	86.0	80.0	112.0	120.0	3.6	3.2	0.36	1.65	0.91	1.19	0.648
	127.000	36.512	36.512	26.988	3.6	1.6	209	235	36.2	3 000	4 000	**HM813849**	**HM813811**	32.9	89.0	81.9	113.0	121.0	3.6	1.6	0.50	1.20	0.66	1.28	0.622
	136.525	41.275	41.275	31.750	3.6	3.2	284	308	46.1	2 900	3 800	**H414249**	**H414210**	30.3	89.0	83.3	121.0	129.0	3.6	3.2	0.36	1.67	0.92	1.80	0.788
	136.525	46.038	46.038	36.512	3.6	3.2	290	369	49.6	2 800	3 700	**H715345**	**H715311**	37.0	93.0	87.0	118.0	132.0	3.6	3.2	0.47	1.27	0.70	2.15	0.950
73.025	112.712	25.400	25.400	19.050	3.6	3.2	122	155	23.3	3 200	4 300	**29685**	**29620**	26.2	86.0	80.0	101.0	109.0	3.6	3.2	0.49	1.23	0.68	0.602	0.270
	117.475	30.162	30.162	23.812	3.6	3.2	148	179	27.4	3 200	4 200	**33287**	**33462**	27.8	87.0	80.0	104.0	112.0	3.6	3.2	0.44	1.38	0.76	0.747	0.436
	127.000	36.512	36.170	28.575	3.6	3.2	196	226	35.3	3 000	4 000	**567**	**563**	28.6	88.0	81.0	112.0	120.0	3.6	3.2	0.36	1.65	0.91	1.14	0.648
	139.992	36.512	36.098	28.575	3.6	3.2	220	262	39.8	2 700	3 600	**576R**	**572**	31.0	90.0	83.0	125.0	133.0	3.6	3.2	0.40	1.49	0.82	1.74	0.779

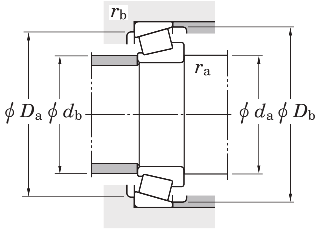
[Note] [1] To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings
inch series

d (73.025) ~ 76.200 mm





Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
73.025	146.050	41.275	41.275	31.750	3.6	3.2	261	301	45.3	2 600	3 400	**657**	**653**	33.4	90.0	85.0	131.0	139.0	3.6	3.2	0.41	1.47	0.81	2.28	0.880
	149.225	53.975	54.229	44.450	3.6	3.2	357	404	54.4	2 700	3 500	**6460**	**6420**	39.3	93.0	87.0	129.0	141.0	3.6	3.2	0.36	1.66	0.91	2.79	1.61
	150.089	44.450	46.672	36.512	3.6	3.2	330	368	50.1	2 500	3 400	**744R**	**742**	32.4	91.0	85.0	134.0	142.0	3.6	3.2	0.33	1.84	1.01	2.66	1.07
	161.925	47.625	48.260	38.100	3.6	3.2	342	391	52.4	2 400	3 200	**762**	**752**	35.5	92.0	97.0	144.0	150.0	3.6	3.2	0.34	1.76	0.97	3.18	1.61
73.817	112.712	25.400	25.400	19.050	1.6	3.2	122	155	23.3	3 200	4 300	**29688**	**29620**	26.2	83.0	81.0	101.0	109.0	1.6	3.2	0.49	1.23	0.68	0.588	0.270
	127.000	36.512	36.170	28.575	0.8	3.2	196	226	35.3	3 000	4 000	**568**	**563**	28.6	83.0	82.0	112.0	120.0	0.8	3.2	0.36	1.65	0.91	1.12	0.648
74.612	139.992	36.512	36.098	28.575	3.6	3.2	220	262	39.8	2 700	3 600	**577R**	**572**	31.0	91.0	85.0	125.0	133.0	3.6	3.2	0.40	1.49	0.82	1.69	0.779
75.000	115.000	25.000	25.000	19.000	3.0	2.8	127	151	23.0	3 100	4 200	**JLM714149**	**JLM714110**	25.5	87.0	81.0	104.0	110.0	3.0	2.8	0.46	1.31	0.72	0.612	0.269
	120.000	31.000	29.500	25.000	3.0	2.8	182	216	33.2	3 100	4 100	**JM714249**	**JM714210**	30.0	88.0	82.9	108.0	115.0	3.0	2.8	0.44	1.35	0.74	0.846	0.430
	145.000	51.000	51.000	42.000	3.0	2.5	362	412	55.2	2 700	3 600	**JH415647**	**JH415610**	36.6	94.0	89.0	129.0	139.0	3.0	2.5	0.36	1.66	0.91	2.66	1.18
76.200	121.442	24.608	23.012	17.462	3.6	2.0	113	127	19.4	3 000	4 000	**34301**	**34478**	26.8	89.0	83.0	110.0	116.0	3.6	2.0	0.45	1.33	0.73	0.617	0.313
	127.000	30.162	31.000	22.225	3.6	3.2	179	225	32.3	2 400	3 200	**42687**	**42620**	27.1	90.0	84.0	114.0	121.0	3.6	3.2	0.42	1.43	0.79	1.05	0.434
	127.000	30.162	31.000	22.225	6.4	3.2	179	225	32.3	2 400	3 200	**42688**	**42620**	27.1	96.0	84.0	114.0	121.0	6.4	3.2	0.42	1.43	0.79	1.04	0.434
	133.350	30.162	29.769	22.225	6.4	3.2	167	198	30.0	2 700	3 600	**495AX**	**492A**	29.8	98.0	86.0	120.0	128.0	6.4	3.2	0.44	1.35	0.74	1.20	0.430
	133.350	33.338	33.338	26.195	6.4	3.2	193	245	37.2	2 700	3 700	**47678R**	**47620**	29.2	97.0	90.0	119.0	128.0	6.4	3.2	0.40	1.48	0.82	1.29	0.577
	133.350	33.338	33.338	26.195	0.8	3.2	193	245	37.2	2 700	3 700	**47680R**	**47620**	29.2	86.0	85.0	119.0	128.0	0.8	3.2	0.40	1.48	0.82	1.39	0.577
	135.733	44.450	46.101	34.925	3.6	3.2	267	337	51.0	2 800	3 700	**5760**	**5735**	33.0	94.0	88.0	119.0	130.0	3.6	3.2	0.41	1.48	0.81	1.85	0.877
	136.525	30.162	29.769	22.225	3.6	3.2	167	198	30.0	2 700	3 600	**495A**	**493**	29.8	92.0	86.0	122.0	130.0	3.6	3.2	0.44	1.35	0.74	1.26	0.544
	139.992	36.512	36.098	28.575	3.6	3.2	220	262	39.8	2 700	3 600	**575R**	**572**	31.0	92.0	86.0	125.0	133.0	3.6	3.2	0.40	1.49	0.82	1.64	0.779
	139.992	36.512	36.098	28.575	6.7	3.2	220	262	39.8	2 700	3 600	**575SR**	**572**	31.0	99.0	86.0	125.0	133.0	6.7	3.2	0.40	1.49	0.82	1.61	0.779
	149.225	53.975	54.229	44.450	3.6	3.2	357	404	54.4	2 700	3 500	**6461**	**6420**	39.3	96.0	89.5	129.0	141.0	3.6	3.2	0.36	1.66	0.91	2.64	1.61
	149.225	53.975	54.229	44.450	9.5	3.2	357	404	54.4	2 700	3 500	**6461A**	**6420**	39.3	105.0	90.0	129.0	141.0	9.5	3.2	0.36	1.66	0.91	2.60	1.61
	150.089	44.450	46.672	36.512	3.6	3.2	330	368	50.1	2 500	3 400	**748SR**	**742**	32.4	93.0	87.0	134.0	142.0	3.6	3.2	0.33	1.84	1.01	2.51	1.06
	152.400	41.275	41.275	31.750	3.6	3.2	261	301	45.3	2 600	3 400	**659**	**652**	33.4	93.0	87.0	134.0	141.0	3.6	3.2	0.41	1.47	0.81	2.16	1.25
	190.500	57.150	57.531	46.038	3.6	3.2	549	602	76.9	2 000	2 700	**HH221430**	**HH221410**	42.5	101.0	95.0	171.0	179.0	3.6	3.2	0.33	1.79	0.99	6.33	2.21

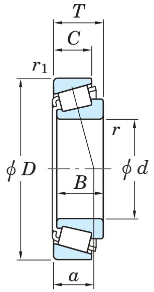
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

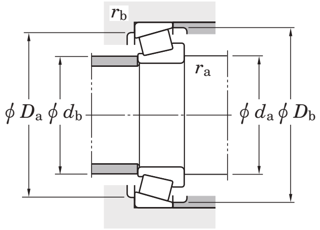
[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

Koyo

d 77.788 ~ (83.345) mm





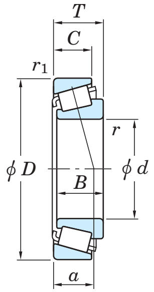
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
77.788	117.475	25.400	25.400	19.050	3.6	3.2	127	166	25.1	3 100	4 100	**LM814849**	**LM814810**	27.6	91.0	85.0	105.0	113.0	3.6	3.2	0.51	1.18	0.65	0.619	0.295
	121.442	24.608	23.012	17.462	3.6	2.0	113	127	19.4	3 000	4 000	**34306**	**34478**	26.8	90.0	84.0	110.0	116.0	3.6	2.0	0.45	1.33	0.73	0.583	0.313
	121.442	24.608	23.012	17.462	6.4	2.0	113	127	19.4	3 000	4 000	**34307**	**34478**	26.8	96.0	84.0	110.0	116.0	6.4	2.0	0.45	1.33	0.73	0.571	0.313
	127.000	30.162	31.000	22.225	3.6	3.2	179	225	32.3	2 400	3 200	**42690**	**42620**	27.1	91.0	85.0	114.0	121.0	3.6	3.2	0.42	1.43	0.79	1.00	0.434
79.375	146.050	41.275	41.275	31.750	3.6	3.2	261	301	45.3	2 600	3 400	**661**	**653**	33.4	96.0	90.0	131.0	139.0	3.6	3.2	0.41	1.47	0.81	2.04	0.880
	161.925	47.625	48.260	38.100	7.9	3.2	342	391	52.4	2 400	3 200	**756A**	**752**	35.5	106.0	91.0	144.0	150.0	7.9	3.2	0.34	1.76	0.97	2.95	1.59
	190.500	57.150	57.531	46.038	3.6	3.2	549	602	76.9	2 000	2 700	**HH221431**	**HH221410**	42.5	103.0	97.0	171.0	179.0	3.6	3.2	0.33	1.79	0.99	6.16	2.21
80.000	130.000	35.000	34.000	28.500	3.2	2.5	211	256	39.3	2 800	3 800	**JM515649**	**JM515610**	29.6	94.0	88.0	117.0	125.0	3.2	2.5	0.39	1.54	0.85	1.19	0.575
	200.000	52.761	49.212	34.925	3.6	3.2	433	471	58.8	1 400	1 900	**98316**	**98788**	54.5	111.0	105.0	174.0	188.0	3.6	3.2	0.63	0.95	0.52	5.73	2.28
80.962	133.350	30.162	29.769	22.225	3.6	3.2	167	198	30.0	2 700	3 600	**496**	**492A**	29.8	95.0	89.0	120.0	128.0	3.6	3.2	0.44	1.35	0.74	1.12	0.429
	133.350	33.338	33.338	26.195	3.6	3.2	193	245	37.2	2 700	3 700	**47681R**	**47620**	29.2	95.0	89.0	119.0	128.0	3.6	3.2	0.40	1.48	0.82	1.17	0.577
	139.992	36.512	36.098	28.575	3.6	3.2	220	262	39.8	2 700	3 600	**581R**	**572**	31.0	96.0	90.0	125.0	133.0	3.6	3.2	0.40	1.49	0.82	1.47	0.779
	150.089	44.450	46.672	36.512	5.2	3.2	330	368	50.1	2 500	3 400	**740R**	**742**	32.4	101.0	91.0	134.0	142.0	5.2	3.2	0.33	1.84	1.01	2.30	1.06
82.550	125.412	25.400	25.400	19.845	3.6	1.6	126	162	24.4	2 900	3 800	**27687**	**27620**	24.7	96.0	89.0	115.0	120.0	3.6	1.6	0.42	1.44	0.79	0.710	0.344
	133.350	30.162	29.769	22.225	3.6	3.2	167	198	30.0	2 700	3 600	**495**	**492A**	29.8	97.0	90.0	120.0	128.0	3.6	3.2	0.44	1.35	0.74	1.08	0.429
	133.350	33.338	33.338	26.195	3.6	0.8	193	245	37.2	2 700	3 700	**47686R**	**47620A**	29.2	97.0	90.0	121.0	128.0	3.6	0.8	0.40	1.48	0.82	1.13	0.577
	133.350	39.688	39.688	32.545	6.7	3.2	222	306	45.9	2 800	3 700	**HM516448**	**HM516410**	32.2	105.0	92.0	118.0	128.0	6.7	3.2	0.40	1.49	0.82	1.33	0.763
	139.700	36.512	36.098	28.575	3.6	3.2	220	262	39.8	2 700	3 600	**580R**	**572X**	31.0	98.0	91.0	125.0	133.0	3.6	3.2	0.40	1.49	0.82	1.41	0.765
	139.992	36.512	36.098	28.575	3.6	3.2	220	262	39.8	2 700	3 600	**580R**	**572**	31.0	98.0	91.0	125.0	133.0	3.6	3.2	0.40	1.49	0.82	1.41	0.779
	139.992	36.512	36.098	28.575	6.7	3.2	220	262	39.8	2 700	3 600	**582R**	**572**	31.0	104.0	91.0	125.0	133.0	6.7	3.2	0.40	1.49	0.82	1.40	0.779
	146.050	41.275	41.275	31.750	3.6	3.2	261	301	45.3	2 600	3 400	**663**	**653**	33.4	99.0	92.0	131.0	139.0	3.6	3.2	0.41	1.47	0.81	1.91	0.880
	150.089	44.450	46.672	36.512	3.6	3.2	330	368	50.1	2 500	3 400	**749AR**	**742**	32.4	99.0	93.0	134.0	142.0	3.6	3.2	0.33	1.84	1.01	2.23	1.06
	150.089	44.450	46.672	36.512	6.7	3.2	330	368	50.1	2 500	3 400	**750AR**	**742**	32.4	106.0	93.0	134.0	142.0	6.7	3.2	0.33	1.84	1.01	2.19	1.06
	161.925	47.625	48.260	38.100	3.6	3.2	342	391	52.4	2 400	3 200	**757**	**752**	35.5	100.0	94.0	144.0	150.0	3.6	3.2	0.34	1.76	0.97	2.83	1.59
83.345	125.412	25.400	25.400	19.845	0.8	1.6	126	162	24.4	2 900	3 800	**27689**	**27620**	24.7	90.0	90.0	115.0	120.0	0.8	1.6	0.42	1.44	0.79	0.746	0.344

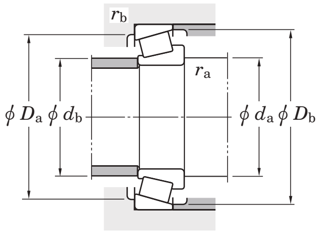
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (83.345) ~ (88.900) mm





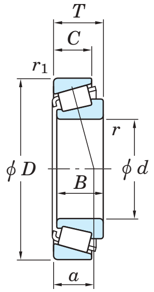
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
83.345	125.412	25.400	25.400	19.845	3.6	1.6	126	162	24.4	2 900	3 800	**27690**	**27620**	24.7	96.0	90.0	115.0	120.0	3.6	1.6	0.42	1.44	0.79	0.689	0.344
	125.412	25.400	25.400	19.845	6.4	1.6	126	162	24.4	2 900	3 800	**27691**	**27620**	24.7	102.0	90.0	115.0	120.0	6.4	1.6	0.42	1.44	0.79	0.646	0.344
84.138	133.350	30.162	29.769	22.225	3.6	3.2	167	198	30.0	2 700	3 600	**498**	**492A**	29.8	98.0	91.0	120.0	128.0	3.6	3.2	0.44	1.35	0.74	1.04	0.429
85.000	130.000	30.000	29.000	24.000	3.0	2.5	179	228	34.5	2 800	3 700	**JM716649**	**JM716610**	29.1	98.0	92.0	117.0	125.0	3.0	2.5	0.44	1.35	0.74	0.937	0.456
	140.000	39.000	38.000	31.500	3.0	2.5	254	308	46.4	2 700	3 500	**JHM516849**	**JHM516810**	32.8	100.0	93.9	125.0	134.0	3.0	2.5	0.41	1.47	0.81	1.54	0.759
	150.000	46.000	46.000	38.000	3.0	2.5	342	390	53.1	2 500	3 400	**JH217249**	**JH217210**	33.6	101.0	95.2	134.0	142.0	3.0	2.5	0.33	1.80	0.99	2.28	1.08
	200.000	52.761	49.212	34.925	3.6	3.2	433	471	58.8	1 400	1 900	**98335**	**98788**	54.5	115.0	109.0	174.0	188.0	3.6	3.2	0.63	0.95	0.52	5.47	2.28
85.026	150.089	44.450	46.672	36.512	3.6	3.2	330	368	50.1	2 500	3 400	**749R**	**742**	32.4	101.0	95.0	134.0	142.0	3.6	3.2	0.33	1.84	1.01	2.12	1.06
	150.089	44.450	46.672	36.512	5.2	3.2	330	368	50.1	2 500	3 400	**749SR**	**742**	32.4	104.0	95.0	134.0	142.0	5.2	3.2	0.33	1.84	1.01	2.08	1.06
85.725	133.350	30.162	29.769	22.225	3.6	3.2	167	198	30.0	2 700	3 600	**497**	**492A**	29.8	99.0	93.0	120.0	128.0	3.6	3.2	0.44	1.35	0.74	0.978	0.429
	136.525	30.162	29.769	22.225	6.4	3.2	167	198	30.0	2 700	3 600	**497A**	**493**	29.8	105.0	93.0	122.0	130.0	6.4	3.2	0.44	1.35	0.74	0.965	0.544
	142.138	42.862	42.862	34.133	4.8	3.2	276	351	52.4	2 600	3 500	**HM617049**	**HM617010**	35.2	106.0	95.7	125.0	137.0	4.8	3.2	0.43	1.39	0.76	1.72	0.902
	146.050	41.275	41.275	31.750	3.6	3.2	261	301	45.3	2 600	3 400	**665**	**653**	33.4	102.0	95.0	131.0	139.0	3.6	3.2	0.41	1.47	0.81	1.77	0.880
	146.050	41.275	41.275	31.750	6.4	3.2	261	301	45.3	2 600	3 400	**665A**	**653**	33.4	107.0	95.0	131.0	139.0	6.4	3.2	0.41	1.47	0.81	1.76	0.880
	152.400	39.688	36.322	30.162	3.6	3.2	230	287	42.5	2 400	3 300	**596**	**592A**	37.1	102.0	96.0	135.0	144.0	3.6	3.2	0.44	1.36	0.75	1.83	1.04
	161.925	47.625	48.260	38.100	3.6	3.2	342	391	52.4	2 400	3 200	**758**	**752**	35.5	103.0	97.0	144.0	150.0	3.6	3.2	0.34	1.76	0.97	2.67	1.59
	168.275	41.275	41.275	30.162	3.6	3.2	282	349	50.4	2 200	3 000	**677**	**672**	38.6	105.0	99.0	149.0	160.0	3.6	3.2	0.47	1.28	0.70	2.89	1.22
	168.275	53.975	56.363	41.275	3.6	3.2	429	467	62.1	2 300	3 100	**841R**	**832**	35.0	104.0	97.0	149.0	155.0	3.6	3.2	0.30	2.00	1.10	3.47	1.72
88.900	123.825	20.638	20.638	16.670	1.6	1.6	102	145	21.5	2 800	3 700	**L217849**	**L217810**	20.7	97.0	94.0	116.0	119.0	1.6	1.6	0.33	1.82	1.00	0.507	0.235
	152.400	39.688	39.688	30.162	6.4	3.2	311	359	53.5	2 400	3 200	**HM518445**	**HM518410**	33.1	110.0	98.0	135.0	146.0	6.4	3.2	0.40	1.49	0.82	2.10	0.768
	161.925	47.625	48.260	38.100	3.6	3.2	342	391	52.4	2 400	3 200	**759**	**752**	35.5	106.0	99.0	144.0	150.0	3.6	3.2	0.34	1.76	0.97	2.50	1.59
	161.925	47.625	48.260	38.100	7.1	3.2	342	391	52.4	2 400	3 200	**766**	**752**	35.5	113.0	99.0	144.0	150.0	7.1	3.2	0.34	1.76	0.97	2.48	1.59
	161.925	53.975	55.100	42.862	3.6	3.2	395	471	61.4	2 400	3 200	**6580R**	**6535**	49.8	109.0	98.0	141.0	154.0	3.6	3.2	0.40	1.50	0.82	3.09	1.65
	168.275	41.275	41.275	30.162	3.6	3.2	282	349	50.4	2 200	3 000	**679**	**672**	38.6	107.0	101.0	149.0	160.0	3.6	3.2	0.47	1.28	0.70	2.75	1.22
	190.500	57.150	57.531	44.450	7.9	3.2	482	565	72.4	2 100	2 700	**855R**	**854**	40.0	118.0	103.0	170.0	174.0	7.9	3.2	0.33	1.79	0.99	5.05	2.66

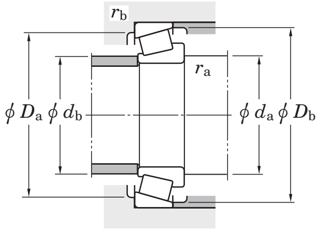
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (88.900) ~ 99.975 mm





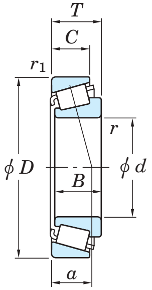
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
88.900	190.500	57.150	57.531	46.038	7.9	3.2	549	602	76.9	2 000	2 700	**HH221434**	**HH221410**	42.5	120.0	105.0	171.0	179.0	7.9	3.2	0.33	1.79	0.99	5.57	2.21
	200.000	52.761	49.212	34.925	3.6	3.2	433	471	58.8	1 400	1 900	**98350**	**98788**	54.5	118.0	112.0	174.0	188.0	3.6	3.2	0.63	0.95	0.52	5.27	2.28
89.974	146.975	40.000	40.000	32.500	7.1	3.6	259	310	46.6	2 500	3 300	**HM218248**	**HM218210**	30.8	112.0	99.0	133.0	141.0	7.1	3.6	0.33	1.80	0.99	1.66	0.784
90.000	145.000	35.000	34.000	27.000	3.0	2.5	244	291	43.5	2 500	3 400	**JM718149**	**JM718110**	32.7	105.0	99.0	131.0	139.0	3.0	2.5	0.44	1.35	0.74	1.47	0.652
	155.000	44.000	44.000	35.500	3.0	2.5	363	407	54.8	2 400	3 200	**JHM318448**	**JHM318410**	34.5	106.0	100.0	140.0	148.0	3.0	2.5	0.34	1.76	0.97	2.37	1.00
	161.925	53.975	55.100	42.862	3.0	3.2	395	471	61.4	2 400	3 200	**6581XR**	**6535**	41.0	102.0	98.0	141.0	154.0	3.0	3.2	0.40	1.50	0.82	3.02	1.65
90.488	161.925	47.625	48.260	38.100	3.6	3.2	342	391	52.4	2 400	3 200	**760**	**752**	35.5	107.0	101.0	144.0	150.0	3.6	3.2	0.34	1.76	0.97	2.42	1.59
92.075	146.050	33.338	34.925	26.195	3.6	3.2	223	293	43.2	2 500	3 300	**47890R**	**47820**	32.6	107.0	101.0	131.0	140.0	3.6	3.2	0.45	1.34	0.74	1.46	0.657
	168.275	41.275	41.275	30.162	3.6	3.2	282	349	50.4	2 200	3 000	**681**	**672**	38.6	110.0	104.0	149.0	160.0	3.6	3.2	0.47	1.28	0.70	2.61	1.22
	168.275	41.275	41.275	30.162	6.4	3.2	282	349	50.4	2 200	3 000	**681A**	**672**	38.6	116.0	104.0	149.0	160.0	6.4	3.2	0.47	1.28	0.70	2.60	1.22
	180.975	47.625	48.006	38.100	3.6	3.2	362	438	56.6	2 100	2 800	**778**	**772**	39.5	111.0	105.0	161.0	168.0	3.6	3.2	0.39	1.56	0.86	3.65	1.92
	190.500	57.150	57.531	44.450	7.9	3.2	482	565	72.4	2 100	2 700	**857R**	**854**	39.9	121.0	106.0	170.0	174.0	7.9	3.2	0.33	1.79	0.99	4.86	2.66
95.000	150.000	35.000	34.000	27.000	3.0	2.5	235	294	43.4	2 400	3 300	**JM719149**	**JM719113**	33.5	109.0	104.0	135.0	143.0	3.0	2.5	0.44	1.36	0.75	1.43	0.766
95.250	128.588	15.875	15.083	11.908	1.6	1.6	72.6	93.0	13.1	2 600	3 500	**LL319349**	**LL319310**	20.3	103.0	100.0	122.0	125.0	1.6	1.6	0.35	1.71	0.94	0.393	0.147
	130.175	20.638	21.432	16.670	1.6	1.6	121	167	24.7	2 600	3 500	**L319249**	**L319210**	22.2	107.0	101.0	122.0	125.0	1.6	1.6	0.35	1.72	0.95	0.548	0.246
	146.050	33.338	34.925	26.195	3.6	3.2	223	293	43.2	2 500	3 300	**47896R**	**47820**	32.6	110.0	103.0	131.0	140.0	3.6	3.2	0.45	1.34	0.74	1.34	0.657
	147.638	35.717	36.322	26.192	5.2	0.8	230	287	42.5	2 400	3 300	**594A**	**592XE**	33.4	113.0	104.0	135.0	142.0	5.2	0.8	0.44	1.36	0.75	1.45	0.620
	157.162	36.512	36.116	26.195	3.6	3.2	227	288	41.7	2 300	3 000	**52375**	**52618**	36.0	112.0	105.0	142.0	153.0	3.6	3.2	0.47	1.26	0.69	1.94	0.694
	168.275	41.275	41.275	30.162	3.6	3.2	282	349	50.4	2 200	3 000	**683**	**672**	38.6	113.0	106.0	149.0	160.0	3.6	3.2	0.47	1.28	0.70	2.46	1.22
	190.500	57.150	57.531	44.450	7.9	3.2	482	565	72.4	2 100	2 700	**864R**	**854**	39.9	123.0	108.0	170.0	174.0	7.9	3.2	0.33	1.79	0.99	4.64	2.66
	190.500	57.150	57.531	46.038	7.9	3.2	549	602	76.9	2 000	2 700	**HH221440**	**HH221410**	42.5	125.0	110.0	171.0	179.0	7.9	3.2	0.33	1.79	0.99	5.16	2.21
98.425	168.275	41.275	41.275	30.162	3.6	3.2	282	349	50.4	2 200	3 000	**685**	**672**	38.6	116.0	109.0	149.0	160.0	3.6	3.2	0.47	1.28	0.70	2.29	1.22
	190.500	57.150	57.531	46.038	3.6	3.2	549	602	76.9	2 000	2 700	**HH221442**	**HH221410**	42.5	119.0	113.0	171.0	179.0	3.6	3.2	0.33	1.79	0.99	4.97	2.21
99.975	212.725	66.675	66.675	53.975	3.6	3.2	641	699	87.1	1 800	2 400	**HH224334**	**HH224310**	47.6	122.0	117.0	192.0	202.0	3.6	3.2	0.33	1.84	1.01	7.91	3.03

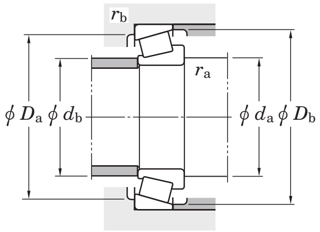
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d 99.982 ~ (107.950) mm





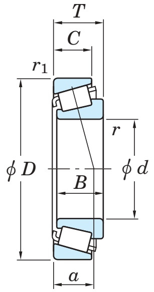
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
99.982	190.500	57.150	57.531	46.038	6.4	3.2	549	602	76.9	2 000	2 700	**HH221447**	**HH221410**	42.5	126.0	114.0	171.0	179.0	6.4	3.2	0.33	1.79	0.99	4.84	2.21
100.000	155.000	36.000	35.000	28.000	3.0	2.5	256	328	47.7	2 300	3 100	**JM720249**	**JM720210**	35.6	110.0	110.0	139.0	148.0	3.0	2.5	0.47	1.27	0.70	1.64	0.763
	160.000	41.000	40.000	32.000	3.0	2.5	298	378	54.6	2 300	3 000	**JHM720249**	**JHM720210**	38.3	110.0	111.0	143.0	153.0	3.0	2.5	0.47	1.28	0.70	2.11	0.964
100.012	157.162	36.512	36.116	26.195	3.6	3.2	227	288	41.7	2 300	3 000	**52393**	**52618**	36.0	113.0	115.0	142.0	153.0	3.6	3.2	0.47	1.26	0.69	1.74	0.694
101.600	157.162	36.512	36.116	26.195	3.6	3.2	227	288	41.7	2 300	3 000	**52400**	**52618**	36.0	114.0	115.0	142.0	153.0	3.6	3.2	0.47	1.26	0.69	1.67	0.694
	157.162	36.512	36.116	26.195	7.9	3.2	227	288	41.7	2 300	3 000	**52401**	**52618**	36.0	126.0	111.0	142.0	153.0	7.9	3.2	0.47	1.26	0.69	1.64	0.694
	168.275	41.275	41.275	30.162	3.6	3.2	282	349	50.4	2 200	3 000	**687**	**672**	38.6	114.0	115.0	146.0	157.0	3.6	3.2	0.47	1.28	0.70	2.15	1.22
	180.975	47.625	48.006	38.100	3.6	3.2	362	438	56.6	2 100	2 800	**780**	**772**	39.5	114.0	120.0	156.0	165.0	3.6	3.2	0.39	1.56	0.86	3.09	1.92
	190.500	57.150	57.531	44.450	7.9	3.2	482	565	72.4	2 100	2 700	**861R**	**854**	39.9	129.0	114.0	170.0	174.0	7.9	3.2	0.33	1.79	0.99	4.20	2.66
	190.500	57.150	57.531	46.038	7.9	3.2	549	602	76.9	2 000	2 700	**HH221449**	**HH221410**	42.5	123.0	119.0	168.0	178.0	7.9	3.2	0.33	1.79	0.99	4.72	2.21
	200.000	52.761	49.212	34.925	3.6	3.2	433	471	58.8	1 400	1 900	**98400**	**98788**	54.5	114.0	123.0	170.0	185.0	3.6	3.2	0.63	0.95	0.52	4.55	2.28
	212.725	66.675	66.675	53.975	7.1	3.2	563	674	84.1	1 800	2 400	**941**	**932**	47.6	121.0	135.0	181.0	192.0	7.1	3.2	0.33	1.84	1.01	7.07	4.07
	212.725	66.675	66.675	53.975	7.1	3.2	641	699	87.1	1 800	2 400	**HH224335**	**HH224310**	47.6	121.0	134.0	189.0	201.0	7.1	3.2	0.33	1.84	1.01	7.76	3.03
104.775	180.975	47.625	48.006	38.100	3.6	3.2	362	438	56.6	2 100	2 800	**782**	**772**	39.5	117.0	120.0	156.0	165.0	3.6	3.2	0.39	1.56	0.86	2.90	1.92
	180.975	47.625	48.006	38.100	6.4	3.2	362	438	56.6	2 100	2 800	**786**	**772**	39.5	123.0	120.0	156.0	165.0	6.4	3.2	0.39	1.56	0.86	2.88	1.92
	180.975	47.625	48.006	38.100	7.1	3.2	362	438	56.6	2 100	2 800	**787**	**772**	39.5	129.0	116.0	161.0	168.0	7.1	3.2	0.39	1.56	0.86	2.87	1.92
	190.500	47.625	49.212	34.925	3.6	3.2	381	483	60.9	1 900	2 600	**71412**	**71750**	40.9	117.0	131.0	167.0	177.0	3.6	3.2	0.42	1.44	0.79	3.96	1.72
106.362	165.100	36.512	36.512	26.988	3.6	3.2	245	325	46.3	2 200	2 900	**56418R**	**56650**	38.6	122.0	116.0	149.0	159.0	3.6	3.2	0.50	1.21	0.66	1.84	0.852
107.950	146.050	21.432	21.432	16.670	1.6	1.6	108	167	23.5	2 300	3 100	**L521949R**	**L521910**	26.2	116.0	114.0	136.0	141.0	1.6	1.6	0.39	1.53	0.84	0.665	0.325
	158.750	23.020	21.438	15.875	3.6	3.2	130	169	23.9	2 200	3 000	**37425**	**37625**	36.5	121.0	121.0	141.0	148.0	3.6	3.2	0.61	0.99	0.54	0.893	0.484
	159.987	34.925	34.925	26.988	3.6	3.2	231	319	45.8	2 200	2 900	**LM522546**	**LM522510**	32.9	122.0	116.0	146.0	154.0	3.6	3.2	0.40	1.50	0.82	1.64	0.784
	161.925	34.925	34.925	26.988	3.6	3.2	216	293	41.8	2 200	2 900	**48190**	**48120**	39.1	121.0	120.0	145.0	154.0	3.6	3.2	0.51	1.19	0.65	1.57	0.820
	165.100	36.512	36.512	26.988	3.6	3.2	245	325	46.3	2 200	2 900	**56425R**	**56650**	38.6	123.0	117.0	149.0	159.0	3.6	3.2	0.50	1.21	0.66	1.76	0.852
	168.275	36.512	36.512	26.988	3.6	3.2	245	325	46.3	2 200	2 900	**56425R**	**56662**	38.6	123.0	117.0	150.0	160.0	3.6	3.2	0.50	1.21	0.66	1.76	1.03
	190.500	47.625	49.212	34.925	3.6	3.2	381	483	60.9	1 900	2 600	**71425**	**71750**	40.9	121.0	131.0	167.0	177.0	3.6	3.2	0.42	1.44	0.79	3.76	1.72

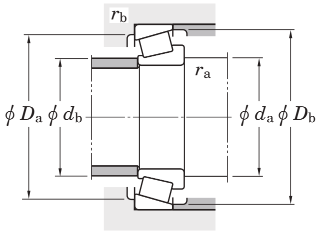
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d (107.950) ~ 127.000 mm





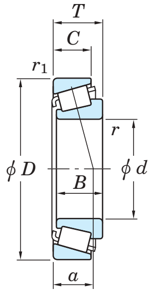
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. [1]		Load center (mm)	Mounting dimensions (mm)						Con-stant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
107.950	212.725	66.675	66.675	53.975	7.9	3.2	563	674	84.1	1 800	2 400	**936**	**932**	47.6	137.0	122.0	187.0	193.0	7.9	3.2	0.33	1.84	1.01	6.52	4.07
	212.725	66.675	66.675	53.975	7.9	3.2	641	699	87.1	1 800	2 400	**HH224340**	**HH224310**	47.6	129.0	134.0	189.0	201.0	7.9	3.2	0.33	1.84	1.01	7.21	3.03
109.538	158.750	23.020	21.438	15.875	3.6	3.2	130	169	23.9	2 200	3 000	**37431**	**37625**	36.5	123.0	116.0	143.0	152.0	6.4	6.4	0.61	0.99	0.54	0.848	0.484
109.987	159.987	34.925	34.925	26.988	7.9	3.2	231	319	45.8	2 200	2 900	**LM522548**	**LM522510**	32.9	131.0	121.0	146.0	154.0	7.9	3.2	0.40	1.50	0.82	1.52	0.784
	159.987	34.925	34.925	26.988	3.6	3.2	231	319	45.8	2 200	2 900	**LM522549**	**LM522510**	32.9	123.0	121.0	146.0	154.0	3.6	3.2	0.40	1.50	0.82	1.55	0.784
109.992	177.800	41.275	41.275	30.162	3.6	3.2	294	380	53.4	2 000	2 700	**64433R**	**64700**	42.8	128.0	121.0	160.0	172.6	3.6	3.2	0.52	1.16	0.64	2.69	1.10
110.000	165.000	35.000	35.000	26.500	3.0	2.5	245	325	46.3	2 200	2 900	**JM822049**	**JM822010**	38.1	121.0	121.0	148.0	157.0	3.0	2.5	0.50	1.21	0.66	1.64	0.826
	180.000	47.000	46.000	38.000	3.0	2.5	385	487	62.3	2 000	2 700	**JHM522649**	**JHM522610**	40.6	121.0	125.0	160.0	171.0	3.0	2.5	0.41	1.48	0.81	3.08	1.49
114.300	177.800	41.275	41.275	30.162	3.6	3.2	294	380	53.4	2 000	2 700	**64450R**	**64700**	42.8	131.0	125.0	160.0	172.0	3.6	3.2	0.52	1.16	0.64	2.45	1.10
	180.975	34.925	31.750	25.400	3.6	3.2	216	247	35.1	2 000	2 700	**68450**	**68712**	40.6	127.0	131.0	161.0	170.0	3.6	3.2	0.50	1.21	0.66	1.89	1.04
	190.500	47.625	49.212	34.925	3.6	3.2	381	483	60.9	1 900	2 600	**71450**	**71750**	40.9	127.0	131.0	167.0	177.0	3.6	3.2	0.42	1.44	0.79	3.33	1.72
	212.725	66.675	66.675	53.975	7.1	3.2	563	674	84.1	1 800	2 400	**938**	**932**	47.6	141.0	128.0	187.0	193.0	7.1	3.2	0.33	1.84	1.01	5.96	4.07
	212.725	66.675	66.675	53.975	7.1	3.2	641	699	87.1	1 800	2 400	**HH224346**	**HH224310**	47.6	134.0	134.0	189.0	201.0	7.1	3.2	0.33	1.84	1.01	6.64	3.03
	273.050	82.550	82.550	53.975	6.4	6.4	885	898	104	1 500	1 900	**HH926744**	**HH926710**	76.1	133.0	151.0	230.0	252.0	6.4	6.4	0.63	0.95	0.52	15.0	6.97
114.976	212.725	66.675	66.675	53.975	7.1	3.2	641	699	87.1	1 800	2 400	**HH224349**	**HH224310**	47.6	135.0	134.0	189.0	201.0	7.1	3.2	0.33	1.84	1.01	6.58	3.03
115.087	190.500	47.625	49.212	34.925	3.6	3.2	381	483	60.9	1 900	2 600	**71453**	**71750**	40.9	133.0	126.0	171.0	181.0	3.6	3.2	0.42	1.44	0.79	3.28	1.72
	190.500	47.625	49.212	34.925	7.9	3.2	381	483	60.9	1 900	2 600	**71455**	**71750**	40.9	136.0	131.0	167.0	177.0	7.9	3.2	0.42	1.44	0.79	3.25	1.72
117.475	180.975	34.925	31.750	25.400	3.6	3.2	216	247	35.1	2 000	2 700	**68462**	**68712**	40.6	130.0	131.0	161.0	170.0	3.6	3.2	0.50	1.21	0.66	1.75	1.04
	180.975	34.925	31.750	25.400	7.9	3.2	216	247	35.1	2 000	2 700	**68463**	**68712**	40.6	141.0	125.0	163.0	172.0	7.9	3.2	0.50	1.21	0.66	1.61	1.05
120.650	190.500	46.038	46.038	34.925	3.6	1.6	393	512	63.9	1 900	2 500	**HM624749**	**HM624710**	41.6	146.0	132.0	174.0	184.0	3.6	1.6	0.43	1.41	0.77	3.20	1.44
	254.000	77.788	82.550	61.912	9.5	6.4	895	1 050	125	1 500	2 000	**HH228340**	**HH228310**	54.3	158.0	142.0	223.0	234.0	9.5	6.4	0.32	1.87	1.03	12.6	6.00
127.000	254.000	77.788	82.550	61.912	9.5	6.4	895	1 050	125	1 500	2 000	**HH228349**	**HH228310**	54.3	164.0	148.0	223.0	234.0	9.5	6.4	0.32	1.87	1.03	11.8	6.00

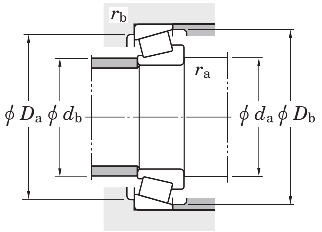
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Single-row tapered roller bearings inch series

d 133.350 ~ 292.100 mm





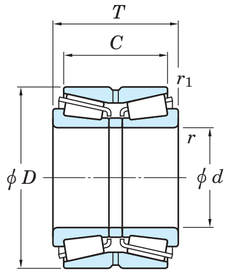
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No. 1)		Load center (mm)	Mounting dimensions (mm)						Constant	Axial load factors		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Inner ring	Outer ring	a	d_a	d_b	D_a	D_b	r_a max.	r_b max.	e	Y_1	Y_0	Inner ring	Outer ring
133.350	177.008	25.400	26.195	20.638	1.6	1.6	176	278	38.2	1 900	2 500	**L327249**	**L327210**	29.1	142.0	145.0	164.0	171.0	1.6	1.6	0.35	1.72	0.95	1.14	0.543
142.875	200.025	41.275	39.688	34.130	7.9	3.3	307	491	66.5	1 700	2 200	**48684**	**48620**	38.4	166.0	151.0	185.0	193.0	7.9	3.3	0.34	1.78	0.98	2.43	1.38
	200.025	41.275	39.688	34.130	3.6	3.3	307	491	66.5	1 700	2 200	**48685**	**48620**	38.4	156.0	157.0	182.0	192.0	3.6	3.3	0.34	1.78	0.98	2.46	1.38
170.000	230.000	39.000	38.000	31.000	3.0	2.5	363	558	72.8	1 400	1 900	**JHM534149**	**JHM534110**	43.6	181.0	184.0	214.0	222.0	3.0	2.5	0.38	1.57	0.86	3.17	1.29
	240.000	46.000	44.500	37.000	3.0	2.5	443	666	77.1	1 400	1 800	**JM734449**	**JM734410**	50.6	181.0	184.0	220.0	231.0	3.0	2.5	0.44	1.37	0.75	4.31	2.00
171.450	222.250	25.400	24.608	19.050	1.6	1.6	197	299	38.7	1 400	1 900	**L435049**	**L435010**	36.0	181.0	179.0	211.0	215.0	1.6	1.6	0.38	1.60	0.88	1.63	0.697
180.000	250.000	47.000	45.000	37.000	3.0	2.5	456	705	81.7	1 300	1 700	**JM736149**	**JM736110**	55.2	191.0	193.0	230.0	242.0	3.0	2.5	0.48	1.25	0.69	4.47	2.10
190.000	260.000	46.000	44.000	36.500	3.0	2.5	461	723	81.4	1 200	1 700	**JM738249**	**JM738210**	56.0	201.0	203.0	240.0	251.0	3.0	2.5	0.48	1.26	0.69	4.71	2.18
196.850	254.000	28.575	27.783	21.433	1.6	1.6	236	387	48.2	1 200	1 600	**L540049**	**L540010**	43.1	206.0	214.0	238.0	245.0	1.6	1.6	0.40	1.51	0.83	2.34	1.02
200.000	300.000	65.000	62.000	51.000	3.6	2.5	773	1 140	124	1 100	1 500	**JHM840449**	**JHM840410**	72.1	213.0	218.0	270.0	288.0	3.6	2.5	0.52	1.15	0.63	9.97	5.13
220.878	317.500	47.625	52.388	36.513	3.2	3.2	611	928	103	970	1 300	**LM245833**	**LM245810**	50.5	234.0	253.0	296.0	304.0	3.2	3.2	0.33	1.80	0.99	9.56	2.78
228.600	358.775	71.438	71.438	53.975	3.6	3.2	968	1 590	166	840	1 100	**M249732**	**M249710**	64.4	242.0	279.0	330.0	343.0	3.6	3.2	0.33	1.80	0.99	20.1	6.44
230.188	317.500	47.625	52.388	36.513	3.2	3.2	611	928	103	970	1 300	**LM245846**	**LM245810**	50.5	242.0	238.0	309.0	312.0	3.2	3.2	0.33	1.80	0.99	8.25	2.78
231.775	317.500	47.625	52.388	36.513	3.2	3.2	611	928	103	970	1 300	**LM245848**	**LM245810**	50.5	244.0	240.0	309.0	312.0	3.2	3.2	0.33	1.80	0.99	8.02	2.78
	336.550	65.088	65.088	50.800	6.4	3.2	887	1 380	150	920	1 200	**M246942**	**M246910**	59.9	258.0	249.0	313.0	322.0	6.4	3.2	0.33	1.80	0.99	13.1	5.44
	358.775	71.438	71.438	53.975	6.4	3.2	968	1 590	166	920	1 200	**M249734**	**M249710**	64.4	258.0	253.0	335.0	343.0	6.4	3.2	0.33	1.80	0.99	19.9	6.44
254.000	358.775	71.438	71.438	53.975	3.6	3.2	968	1 590	166	840	1 100	**M249749**	**M249710**	64.4	268.0	279.0	330.0	343.0	3.6	3.2	0.33	1.80	0.99	14.8	6.44
257.175	342.900	57.150	57.150	44.450	6.4	3.2	764	1 280	135	870	1 200	**M349549**	**M349510**	60.1	276.0	276.0	320.0	330.0	6.4	3.2	0.35	1.73	0.95	9.27	3.99
292.100	374.650	47.625	47.625	34.925	3.6	3.2	587	971	111	760	1 000	**L555249**	**L555210**	64.7	306.0	309.0	351.0	360.0	3.6	3.2	0.40	1.49	0.82	7.97	3.53

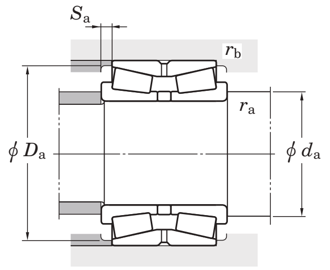
[Note] 1) To the bearings with supplementary code "J" attached at the front of bearing number, tolerances shown in table 7-8 on page A72 are applied.

[Remark] Inch series tapered roller bearings with bore diameter larger than 100 mm are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d 25 ~ (60) mm



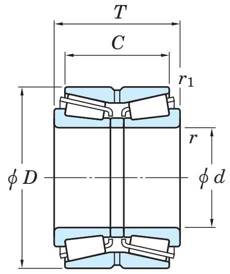


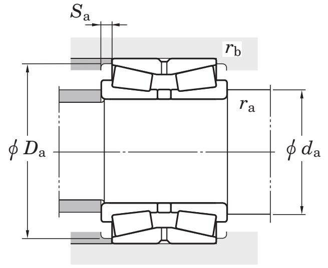
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
25	62	40	29.5	1.5	0.6	85.2	84.9	5.80	4 500	6 400	**46T30305DJR/29.5**	33.5	58.5	5	1.5	0.6	0.83	0.82	1.22	0.8	0.592
30	72	45	31.5	1.5	0.6	109	110	7.70	3 900	5 400	**46T30306DJR/31.5**	38.5	68	6.5	1.5	0.6	0.83	0.82	1.22	0.8	0.872
35	80	51	35.5	2	0.6	135	138	9.85	3 400	4 800	**46T30307DJR/35.5**	45	76.5	7.5	2	0.6	0.83	0.82	1.22	0.8	1.2
40	80	45	37.5	1.5	0.6	134	138	10.3	4 000	5 300	**46T30208JR/37.5**	48.5	75	3.5	1.5	0.6	0.37	1.8	2.68	1.76	0.954
	80	55	43.5	1.5	0.6	166	182	13.6	4 000	5 300	**46T32208JR/43.5**	48.5	75	5.5	1.5	0.6	0.37	1.8	2.68	1.76	1.19
	90	56	39.5	2	0.6	172	180	13.1	3 000	4 200	**46T30308DJR/39.5**	50	86.5	8	2	0.6	0.83	0.82	1.22	0.8	1.67
	90	56	45.5	2	0.6	194	202	15.5	3 600	4 900	**46T30308JR/45.5**	50	82	5	2	0.6	0.35	1.96	2.91	1.91	1.67
45	85	47	37.5	1.5	0.6	144	155	11.6	3 700	4 900	**46T30209JR/37.5**	53.5	80	4.5	1.5	0.6	0.4	1.67	2.48	1.63	1.1
	85	55	43.5	1.5	0.6	180	207	15.6	3 700	4 900	**46T32209JR-1/43.5**	53.5	81	5.5	1.5	0.6	0.4	1.67	2.48	1.63	1.31
	100	60	41.5	2	0.6	204	214	15.8	2 700	3 800	**46T30309DJR/41.5**	55	96	9	2	0.6	0.83	0.82	1.22	0.8	2.15
	100	60	49.5	2	0.6	242	256	19.9	3 300	4 300	**46T30309JR/49.5**	55	93	5	2	0.6	0.35	1.96	2.91	1.91	2.2
50	90	49	39.5	1.5	0.6	164	183	13.8	3 400	4 600	**46T30210JR/39.5**	58.5	85	4.5	1.5	0.6	0.42	1.61	2.39	1.57	1.22
	90	55	43.5	1.5	0.6	182	211	15.9	3 500	4 600	**46T32210JR/43.5**	58.5	85	5.5	1.5	0.6	0.42	1.61	2.39	1.57	1.39
	110	64	51.5	2	0.6	295	305	24.0	3 000	4 000	**46T30310JR/51.5**	62	102	6	2	0.6	0.35	1.96	2.91	1.91	2.68
	110	73	52.5	2	0.6	247	266	19.8	2 500	3 500	**46T30310DJR/52.5**	62	105	10	2	0.6	0.83	0.82	1.22	0.8	3.11
	110	90	71.5	2	0.6	378	440	34.2	3 000	4 000	**46T32310JR/71.5**	62	102	9	2	0.6	0.35	1.96	2.91	1.91	3.95
55	100	51	41.5	2	0.6	203	226	17.3	3 100	4 100	**46T30211JR/41.5**	65	94	4.5	2	0.6	0.4	1.67	2.48	1.63	1.6
	100	60	48.5	2	0.6	230	266	20.5	3 100	4 100	**46T32211JR-1/48.5**	65	95	5.5	2	0.6	0.4	1.67	2.48	1.63	1.87
	120	70	49	2	0.6	276	297	22.3	2 300	3 200	**46T30311DJR/49**	67	113	10.5	2	0.6	0.83	0.82	1.22	0.8	3.54
	120	70	57	2	0.6	320	341	27.0	2 700	3 600	**46T30311JR/57**	67	111	6.5	2	0.6	0.35	1.96	2.91	1.91	3.57
	120	97	76	2	0.6	429	500	39.1	2 700	3 600	**46T32311JR/76**	67	111	10.5	2	0.6	0.35	1.96	2.91	1.91	4.98
60	110	53	43.5	2	0.6	228	254	19.7	2 800	3 800	**46T30212JR/43.5**	70	103	4.5	2	0.6	0.4	1.67	2.48	1.63	2.04
	110	66	54.5	2	0.6	282	334	25.9	2 800	3 800	**46T32212JR/54.5**	70	104	5.5	2	0.6	0.4	1.67	2.48	1.63	—
	130	74	51	2.5	1	327	359	27.1	2 100	2 900	**46T30312DJR/51**	74	124	11.5	2.5	1	0.83	0.82	1.22	0.8	4.45
	130	74	59	2.5	1	372	401	31.9	2 500	3 300	**46T30312JR/59**	74	120	7.5	2.5	1	0.35	1.96	2.91	1.91	4.46

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d (60) ~ (90) mm



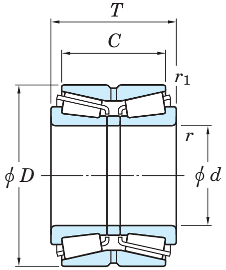


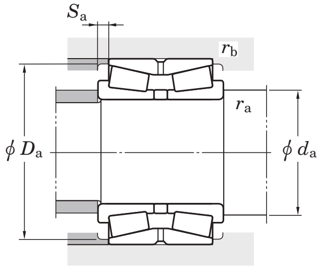
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
60	130	104	81	2.5	1	524	629	44.1	2 500	3 300	**46T32312JR/81**	74	120	11.5	2.5	1	0.35	1.96	2.91	1.91	6.45
65	120	56	46.5	2	0.6	275	311	24.3	2 600	3 400	**46T30213JR/46.5**	75	113	4.5	2	0.6	0.4	1.67	2.48	1.63	—
	120	73	61.5	2	0.6	337	406	31.7	2 600	3 400	**46T32213JR/61.5**	75	115	5.5	2	0.6	0.4	1.67	2.48	1.63	3.4
	140	79	53	2.5	1	377	417	31.4	1 900	2 700	**46T30313DJR/53**	79	133	13	2.5	1	0.83	0.82	1.22	0.8	5.3
	140	79	63	2.5	1	437	478	37.6	2 300	3 000	**46T30313JR/63**	79	130	8	2.5	1	0.35	1.96	2.91	1.91	5.51
	140	108	84	2.5	1	593	714	49.6	2 300	3 100	**46T32313JR/84**	79	130	12	2.5	1	0.35	1.96	2.91	1.91	7.71
70	125	59	48.5	2	0.6	296	346	27.1	2 400	3 300	**46T30214JR/48.5**	80	118	5	2	0.6	0.42	1.61	2.39	1.57	—
	125	74	61.5	2	0.6	363	450	35.2	2 400	3 300	**46T32214JR/61.5**	80	119	6	2	0.6	0.42	1.61	2.39	1.57	3.7
	150	83	57	2.5	1	421	470	34.9	1 800	2 500	**46T30314DJR/57**	84	142	13	2.5	1	0.83	0.82	1.22	0.8	6.48
	150	83	67	2.5	1	493	546	42.2	2 100	2 800	**46T30314JR/67**	84	140	8	2.5	1	0.35	1.96	2.91	1.91	6.65
	150	116	92	2.5	1	679	829	57.2	2 200	2 900	**46T32314JR/92**	84	140	12	2.5	1	0.35	1.96	2.91	1.91	9.46
75	115	30	26	1.5	0.6	89.9	105	7.30	2 500	3 300	**46215**	83.5	106.5	2	1.5	0.6	0.32	2.12	3.15	2.07	0.994
	115	38	30	1.5	0.6	153	207	15.6	2 500	3 300	**46215A**	83.5	107.4	4	1.5	0.6	0.32	2.12	3.15	2.07	1.32
	130	62	51.5	2	0.6	305	362	28.2	2 300	3 100	**46T30215JR/51.5**	85	124	5	2	0.6	0.44	1.55	2.31	1.52	3.12
	130	74	61.5	2	0.6	373	469	36.4	2 300	3 100	**46T32215JR/61.5**	85	125	6	2	0.6	0.44	1.55	2.31	1.52	3.85
	160	87	69	2.5	1	557	621	44.9	2 000	2 600	**46T30315JR/69**	89	149	9	2.5	1	0.35	1.96	2.91	1.91	7.8
	160	125	99	2.5	1	779	963	64.6	2 000	2 700	**46T32315JR/99**	89	149	13	2.5	1	0.35	1.96	2.91	1.91	11.5
80	125	34	30	1.5	0.6	136	155	11.3	2 300	3 100	**46216**	88.5	116.9	2	1.5	0.6	0.35	1.95	2.90	1.91	1.38
	140	64	51.5	2	0.6	346	405	31.2	2 200	2 900	**46T30216JR/51.5**	92	132	6	2	0.6	0.42	1.61	2.39	1.57	3.76
	140	78	63.5	2	0.6	434	542	41.5	2 200	2 900	**46T32216JR/63.5**	92	134	7	2	0.6	0.42	1.61	2.39	1.57	4.71
	170	92	73	2.5	1	630	711	49.9	1 800	2 500	**46T30316JR/73**	94	159	9.5	2.5	1	0.35	1.96	2.91	1.91	9.44
85	150	70	57	2	0.6	391	463	35.1	2 000	2 700	**46T30217JR/57**	97	141	6.5	2	0.6	0.42	1.61	2.39	1.57	4.79
	150	86	69	2	0.6	498	630	47.5	2 000	2 700	**46T32217JR/69**	97	142	8.5	2	0.6	0.42	1.61	2.39	1.57	6.05
	180	98	77	3	1	679	768	53.0	1 700	2 300	**46T30317JR/77**	103	167	10.5	3	1	0.35	1.96	2.91	1.91	11
	180	137	108	3	1	941	1 170	77.6	1 800	2 400	**46T32317JR/108**	103	167	14.5	3	1	0.35	1.96	2.91	1.91	16
90	140	37	33	2	0.6	171	199	14.4	2 100	2 800	**46218**	100	130.6	2	2	0.6	0.35	1.95	2.90	1.91	1.89

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d (90) ~ 110 mm



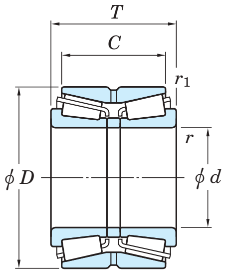


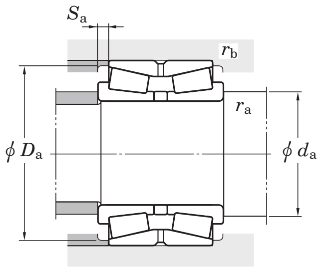
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
90	140	46	37	2	0.6	196	266	19.6	2 000	2 700	**46218A**	100	129.9	4.5	2	0.6	0.32	2.12	3.15	2.07	2.37
	160	74	61	2	0.6	438	522	39.0	1 900	2 500	**46T30218JR/61**	102	150	6.5	2	0.6	0.42	1.61	2.39	1.57	5.85
	160	94	77	2	0.6	565	724	53.7	1 900	2 500	**46T32218JR/77**	102	152	8.5	2	0.6	0.42	1.61	2.39	1.57	7.53
	190	102	81	3	1	741	841	57.1	1 600	2 200	**46T30318JR/81**	108	177	10.5	3	1	0.35	1.96	2.91	1.91	13
	190	144	115	3	1	989	1 230	78.7	1 700	2 200	**46T32318JR/115**	108	177	14.5	3	1	0.35	1.96	2.91	1.91	18.6
95	170	78	63	2.5	1	496	598	44.0	1 800	2 400	**46T30219JR/63**	109	159	7.5	2.5	1	0.42	1.61	2.39	1.57	7.01
	170	100	83	2.5	1	667	877	64.1	1 800	2 400	**46T32219JR/83**	109	161	8.5	2.5	1	0.42	1.61	2.39	1.57	9.25
	200	108	85	3	1	798	909	60.9	1 600	2 100	**46T30319JR/85**	113	186	11.5	3	1	0.35	1.96	2.91	1.91	14.8
	200	151	118	3	1	1 110	1 390	89.2	1 600	2 100	**46T32319JR/118**	113	186	16.5	3	1	0.35	1.96	2.91	1.91	21.4
100	150	46	37	2	0.6	226	293	21.3	1 900	2 500	**46220A**	110	142	4.5	2	0.6	0.35	1.95	2.90	1.91	2.53
	165	52	46	2.5	0.6	249	305	22.0	1 700	2 300	**46320**	112	154	3	2	0.6	0.35	1.95	2.90	1.91	4.03
	165	65	52	2.5	0.6	333	443	32.4	1 800	2 300	**46320A**	112	153	6.5	2	0.6	0.35	1.95	2.90	1.91	4.97
	180	83	67	2.5	1	554	676	49.1	1 700	2 200	**46T30220JR/67**	114	168	8	2.5	1	0.42	1.61	2.39	1.57	8.33
	180	107	87	2.5	1	745	990	63.9	1 700	2 200	**46T32220JR/87**	114	171	10	2.5	1	0.42	1.61	2.39	1.57	11.1
	215	112	87	3	1	906	1 040	68.0	1 500	1 900	**46T30320JR/87**	118	200	12.5	3	1	0.35	1.96	2.91	1.91	18.1
	215	162	127	3	1	1 240	1 570	96.9	1 500	2 000	**46T32320JR/127**	118	200	17.5	3	1	0.35	1.96	2.91	1.91	27.2
105	190	88	70	2.5	1	618	761	52.3	1 600	2 100	**46T30221JR/70**	119	178	9	2.5	1	0.42	1.61	2.39	1.57	9.87
	190	115	95	2.5	1	840	1 130	73.0	1 600	2 100	**46T32221JR/95**	119	180	10	2.5	1	0.42	1.61	2.39	1.57	13.5
	225	116	91	3	1	995	1 160	73.6	1 400	1 800	**46T30321JR/91**	123	209	12.5	3	1	0.35	1.96	2.91	1.91	20.7
	225	170	133	3	1	1 360	1 730	107	1 400	1 900	**46T32321JR/133**	123	209	18.5	3	1	0.35	1.96	2.91	1.91	30.9
110	170	45	40	2.5	0.6	219	304	21.2	1 700	2 200	**46222**	122	158	2.5	2	0.6	0.35	1.95	2.90	1.91	3.58
	180	56	50	2.5	0.6	308	388	27.7	1 600	2 100	**46322**	122	168	3	2	0.6	0.35	1.95	2.90	1.91	5.13
	180	70	56	2.5	0.6	391	533	38.1	1 600	2 100	**46322A**	122	168	7	2	0.6	0.35	1.92	2.86	1.88	6.43
	200	92	74	2.5	1	695	868	58.1	1 500	2 000	**46T30222JR/74**	124	188	9	2.5	1	0.42	1.61	2.39	1.57	11.6
	200	121	101	2.5	1	938	1 280	80.4	1 500	2 000	**46T32222JR/101**	124	190	10	2.5	1	0.42	1.61	2.39	1.57	15.9
	240	118	93	3	1	1 030	1 180	75.2	1 300	1 700	**46T30322JR/93**	128	222	12.5	3	1	0.35	1.96	2.91	1.91	23.8
	240	181	142	3	1	1 480	1 890	115	1 300	1 700	**46T32322JR/142**	128	222	19.5	3	1	0.35	1.96	2.91	1.91	37.3

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d **120 ~ (150) mm**





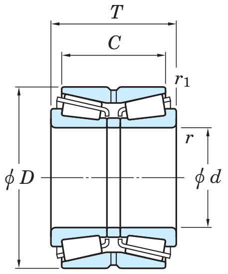
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
120	180	46	41	2.5	0.6	232	317	21.8	1 500	2 000	**46224**	132	170	2.5	2	0.6	0.35	1.95	2.90	1.91	3.81
	180	58	46	2.5	0.6	309	460	32.2	1 500	2 100	**46224A**	132	169	6	2	0.6	0.35	1.95	2.90	1.91	4.66
	200	62	55	2.5	0.6	367	470	32.8	1 400	1 900	**46324**	132	184	3.5	2	0.6	0.35	1.95	2.90	1.91	7.28
	200	78	62	2.5	0.6	486	672	47.0	1 400	1 900	**46324A**	132	185	8	2	0.6	0.35	1.95	2.90	1.91	9.14
	200	100	84	2.5	0.6	670	1 010	62.5	1 400	1 900	**46324AS**	132	190	8	2	0.6	0.35	1.95	2.90	1.91	12.0
	215	97	78	2.5	1	745	945	61.7	1 400	1 800	**46T30224JR/78**	134	203	9.5	2.5	1	0.44	1.55	2.31	1.52	13.9
	215	132	109	2.5	1	1 010	1 380	84.0	1 400	1 900	**46T32224JR/109**	134	204	11.5	2.5	1	0.44	1.55	2.31	1.52	19.8
	260	128	101	3	1	1 220	1 430	89.9	1 200	1 600	**46T30324JR/101**	138	239	13.5	3	1	0.35	1.96	2.91	1.91	30.6
	260	188	145	4	1.5	1 720	2 210	131	1 200	1 600	**46T32324JR/145**	142	239	21.5	4	1.5	0.35	1.96	2.91	1.91	45.9
130	200	52	46	2.5	0.6	299	425	28.9	1 400	1 800	**46226**	142	187	3	2	0.6	0.35	1.95	2.90	1.91	5.57
	200	65	52	2.5	0.6	400	618	42.5	1 400	1 900	**46226A**	142	185	6.5	2	0.6	0.35	1.95	2.90	1.91	7.06
	210	64	57	2.5	0.6	404	535	36.8	1 400	1 800	**46326**	142	196	3.5	2	0.6	0.36	1.87	2.79	1.83	7.81
	210	80	64	2.5	0.6	513	723	49.7	1 300	1 800	**46326A**	142	198	8	2	0.6	0.36	1.87	2.79	1.83	9.57
	230	98	78.5	3	1	809	1 020	65.7	1 300	1 700	**46T30226JR/78.5**	148	218	9.5	3	1	0.44	1.55	2.31	1.52	15.7
	230	145	117.5	3	1	1 190	1 660	99.9	1 300	1 700	**46T32226JR/117.5**	148	219	14	3	1	0.44	1.55	2.31	1.52	24.1
	280	137	107.5	4	1.5	1 410	1 670	102	1 100	1 400	**46T30326JR/107.5**	152	255	15	4	1.5	0.35	1.96	2.91	1.91	38.1
140	210	53	47	2.5	0.6	299	404	27.3	1 300	1 800	**46228**	152	196	3	2	0.6	0.33	2.03	3.02	1.98	5.85
	210	66	53	2.5	0.6	452	639	43.4	1 300	1 800	**46228A**	152	199	6.5	2	0.6	0.47	1.43	2.12	1.40	7.18
	225	68	61	3	1	423	564	38.1	1 200	1 700	**46328**	154	210	3.5	2.5	1	0.35	1.95	2.90	1.91	9.56
	225	85	68	3	1	597	836	56.6	1 200	1 700	**46328A**	154	212	8	2.5	1	0.35	1.95	2.90	1.91	11.8
	250	102	82.5	3	1	902	1 140	71.8	1 200	1 500	**46T30228JR/82.5**	158	237	9.5	3	1	0.44	1.55	2.31	1.52	19.7
	250	153	125.5	3	1	1 360	1 920	112	1 200	1 600	**46T32228JR/125.5**	158	238	14	3	1	0.44	1.55	2.31	1.52	30.2
	300	145	115.5	4	1.5	1 610	1 920	114	1 000	1 300	**46T30328JR/115.5**	162	273	15	4	1.5	0.35	1.96	2.91	1.91	46.6
150	225	56	50	3	1	348	476	31.6	1 200	1 600	**46230**	164	213	3	2.5	1	0.33	2.03	3.02	1.98	7.09
	225	70	56	3	1	472	703	47.0	1 200	1 600	**46230A**	164	213	7	2.5	1	0.33	2.03	3.02	1.98	8.82
	250	80	71	3	1	587	786	49.2	1 100	1 500	**46330**	164	233	4.5	2.5	1	0.35	1.95	2.90	1.91	14.6
	250	100	80	3	1	748	1 070	66.2	1 100	1 500	**46330A**	164	234	10	2.5	1	0.35	1.95	2.90	1.91	17.6
	270	109	87	3	1	1 040	1 330	80.9	1 100	1 400	**46T30230JR/87**	168	255	11	3	1	0.44	1.55	2.31	1.52	24.6

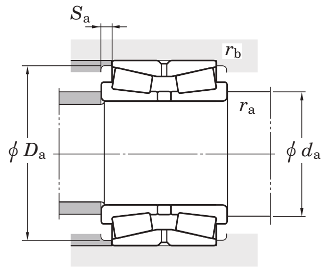
[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

Koyo

d (150) ~ (200) mm



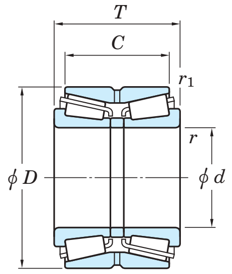


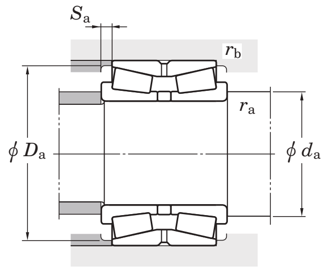
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
150	270	164	130	3	1	1 510	2 130	122	1 100	1 400	**46T32230JR/130**	168	254	17	3	1	0.44	1.55	2.31	1.52	38
	320	154	120	4	1.5	1 800	2 160	129	930	1 200	**46T30330JR/120**	172	292	17	4	1.5	0.35	1.96	2.91	1.91	56
160	240	60	53	3	1	405	565	37.0	1 100	1 500	**46232**	174	228	3.5	2.5	1	0.33	2.03	3.02	1.98	8.71
	240	75	60	3	1	508	756	49.8	1 100	1 500	**46232A**	174	226	7.5	2.5	1	0.33	2.03	3.02	1.98	10.6
	270	86	76	3	1	695	950	57.5	1 000	1 400	**46332**	174	252	5	2.5	1	0.35	1.95	2.90	1.91	18.8
	270	108	86	3	1	871	1 270	75.1	1 000	1 400	**46332A**	174	252	11	2.5	1	0.35	1.95	2.90	1.91	23.1
	290	115	91	3	1	1 160	1 500	89.3	980	1 300	**46T30232JR/91**	178	269	12	3	1	0.44	1.55	2.31	1.52	29.9
	290	178	144	3	1	1 700	2 420	137	1 000	1 300	**46T32232JR/144**	178	274	17	3	1	0.44	1.55	2.31	1.52	47.6
170	260	67	60	3	1	480	642	41.7	1 000	1 400	**46234**	184	243	3.5	2.5	1	0.33	2.03	3.02	1.98	11.4
	260	84	67	3	1	629	969	62.6	1 000	1 400	**46234A**	184	244	8.5	2.5	1	0.33	2.03	3.02	1.98	14.7
	280	88	78	3	1	754	1 050	62.5	970	1 300	**46334**	184	263	5	2.5	1	0.33	2.06	3.06	2.01	19.8
	280	110	88	3	1	938	1 390	81.5	980	1 300	**46334A**	184	260	11	2.5	1	0.33	2.06	3.06	2.01	24.7
	310	125	97	4	1.5	1 330	1 730	103	900	1 200	**46T30234JR/97**	192	288	14	4	1.5	0.44	1.55	2.31	1.52	37.5
	310	192	152	4	1.5	1 930	2 760	152	910	1 200	**46T32234JR/152**	192	294	20	4	1.5	0.44	1.55	2.31	1.52	58.8
180	280	74	66	3	1	582	801	49.4	950	1 300	**46236**	194	263	4	2.5	1	0.33	2.03	3.02	1.98	15.5
	280	93	74	3	1	732	1 080	65.6	960	1 300	**46236A**	194	261	9.5	2.5	1	0.33	2.03	3.02	1.98	19.0
	300	96	85	4	1.5	872	1 240	74.5	910	1 200	**46336**	198	277	5.5	3	1.5	0.33	2.06	3.06	2.01	25.8
	300	120	96	4	1.5	1 080	1 630	95.1	900	1 200	**46336A**	198	279	12	3	1.5	0.33	2.06	3.06	2.01	31.3
	320	127	99	4	1.5	1 320	1 740	102	860	1 200	**46T30236JR/99**	202	297	14	4	1.5	0.45	1.5	2.23	1.47	40.1
	320	192	152	4	1.5	2 060	3 030	164	880	1 200	**46T32236JR/152**	202	303	20	4	1.5	0.45	1.5	2.23	1.47	62.5
190	290	75	67	3	1	610	866	52.9	910	1 200	**46238**	204	272	4	2.5	1	0.32	2.12	3.15	2.07	16.5
	290	94	75	3	1	793	1 170	70.2	900	1 200	**46238A**	204	274	9.5	2.5	1	0.33	2.03	3.02	1.98	20.0
	320	104	92	4	1.5	1 020	1 450	84.1	830	1 100	**46338**	208	298	6	3	1.5	0.35	1.95	2.90	1.91	31.9
	320	130	104	4	1.5	1 230	1 860	106	840	1 100	**46338A**	208	298	13	3	1.5	0.35	1.95	2.90	1.91	39.0
	340	133	105	4	1.5	1 560	2 060	118	800	1 100	**46T30238JR/105**	212	318	14	4	1.5	0.44	1.55	2.31	1.52	47.8
	340	204	160	4	1.5	2 340	3 480	187	810	1 100	**46T32238JR/160**	212	323	22	4	1.5	0.44	1.55	2.31	1.52	75.1
200	310	82	73	3	1	716	1 040	61.6	850	1 100	**46240**	214	288	4.5	2.5	1	0.32	2.12	3.15	2.07	21.4

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d (200) ~ (300) mm



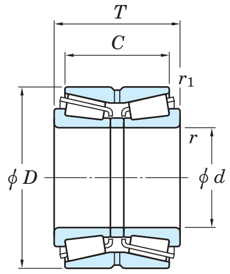


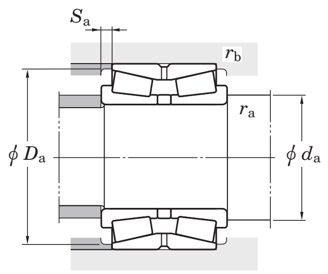
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
200	310	103	82	3	1	893	1 380	80.2	840	1 100	**46240A**	214	289	10.5	2.5	1	0.32	2.12	3.15	2.07	26.3
	340	112	100	4	1.5	1 100	1 580	90.2	780	1 000	**46340**	218	316	6	3	1.5	0.35	1.95	2.90	1.91	39.6
	340	140	112	4	1.5	1 350	2 040	113	770	1 000	**46340A**	218	319	14	3	1.5	0.35	1.95	2.90	1.91	48.2
	360	142	110	4	1.5	1 700	2 240	126	750	1 000	**46T30240JR/110**	222	336	16	4	1.5	0.44	1.55	2.31	1.52	56.5
	360	218	174	4	1.5	2 660	3 760	200	770	1 000	**46T32240JR/174**	222	340	22	4	1.5	0.41	1.66	2.47	1.62	88.2
220	340	90	80	4	1.5	849	1 240	71.0	750	990	**46244**	238	319	5	3	1.5	0.32	2.12	3.15	2.07	27.8
	340	113	90	4	1.5	1 040	1 620	91.5	750	1 000	**46244A**	238	318	11.5	3	1.5	0.32	2.12	3.15	2.07	34.2
	370	120	107	5	1.5	1 260	1 810	101	700	930	**46344**	242	346	6.5	4	1.5	0.35	1.95	2.90	1.91	49.1
	370	150	120	5	1.5	1 600	2 470	136	710	940	**46344A**	242	343	15	4	1.5	0.35	1.95	2.90	1.91	60.1
	400	150	114	4	1.5	2 170	2 880	160	660	890	**46T30244JR/114**	242	371	18	4	1.5	0.42	1.61	2.39	1.57	75.8
240	360	92	82	4	1.5	962	1 430	79.7	690	920	**46248**	258	338	5	3	1.5	0.32	2.12	3.15	2.07	29.6
	360	115	92	4	1.5	1 240	1 980	108	690	920	**46248A**	258	341	11.5	3	1.5	0.32	2.12	3.15	2.07	36.9
	400	128	114	5	1.5	1 490	2 180	121	630	840	**46348**	262	377	7	4	1.5	0.35	1.95	2.90	1.91	59.0
	400	160	128	5	1.5	1 940	3 060	162	630	850	**46348A**	262	373	16	4	1.5	0.35	1.95	2.90	1.91	76.2
260	400	104	92	5	1.5	1 170	1 830	100	610	820	**46252**	282	373	6	4	1.5	0.33	2.03	3.02	1.98	44.6
	400	130	104	5	1.5	1 520	2 480	133	610	810	**46252A**	282	376	13	4	1.5	0.32	2.12	3.15	2.07	54.8
	440	144	128	5	1.5	1 900	2 880	151	560	750	**46352**	282	410	8	4	1.5	0.35	1.95	2.90	1.91	83.8
	440	180	144	5	1.5	2 430	3 960	204	570	760	**46352A**	282	409	18	4	1.5	0.35	1.95	2.90	1.91	105
280	420	106	94	5	1.5	1 260	1 970	106	570	760	**46256**	302	395	6	4	1.5	0.33	2.03	3.02	1.98	46.9
	420	133	106	5	1.5	1 570	2 610	139	570	760	**46256A**	302	394	13.5	4	1.5	0.33	2.03	3.02	1.98	58.9
	460	146	130	6	2	1 950	2 930	154	530	700	**46356**	308	430	8	5	2	0.35	1.95	2.90	1.91	90.0
	460	183	146	6	2	2 470	3 940	203	520	690	**46356A**	308	434	18.5	5	2	0.35	1.95	2.90	1.91	111
300	460	118	105	5	1.5	1 630	2 400	127	500	670	**46260**	322	436	6.5	4	1.5	0.32	2.12	3.15	2.07	64.6
	460	148	118	5	1.5	2 050	3 230	165	510	680	**46260A**	322	433	15	4	1.5	0.32	2.12	3.15	2.07	80.2
	500	160	142	6	2	2 320	3 540	183	470	620	**46360**	328	469	9	5	2	0.35	1.95	2.90	1.91	116
	500	200	160	6	2	2 860	4 630	231	470	630	**46360A**	328	466	20	5	2	0.35	1.95	2.90	1.91	144

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d (300) ~420 mm



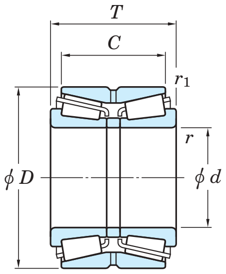


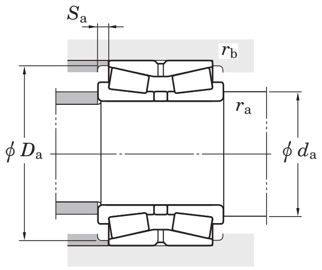
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
300	500	200	160	6	1.5	3 140	4 650	237	—	—	**46360D**	328	475	20	5	1.5	0.40	1.68	2.50	1.64	139
320	480	121	108	5	1.5	1 800	2 700	142	480	640	**46264**	342	452	6.5	4	1.5	0.32	2.12	3.15	2.07	71.6
	480	151	121	5	1.5	2 060	3 410	171	470	630	**46264A**	342	454	15	4	1.5	0.32	2.12	3.15	2.07	87.7
	540	176	157	6	2	2 880	4 570	228	420	560	**46364**	348	502	9.5	5	2	0.35	1.95	2.90	1.91	154
	540	220	176	6	2	3 280	5 390	264	430	570	**46364A**	348	497	22	5	2	0.35	1.95	2.90	1.91	190
340	520	133	118	6	2	1 940	3 070	157	420	570	**46268**	368	489	7.5	5	2	0.32	2.12	3.15	2.07	95.3
	520	165	133	6	2	2 420	4 060	203	420	560	**46268A**	368	491	16	5	2	0.32	2.12	3.15	2.07	117
	580	190	169	6	2	2 980	4 620	227	380	510	**46368**	368	539	10.5	5	2	0.35	1.95	2.90	1.91	198
	580	238	190	6	2	3 820	6 340	303	370	500	**46368A**	368	543	24	5	2	0.35	1.95	2.90	1.91	244
360	540	134	120	6	2	2 070	3 290	166	400	530	**46272**	388	510	7	5	2	0.32	2.12	3.15	2.07	93.0
	540	169	134	6	2	2 530	4 230	210	390	530	**46272A**	388	512	17.5	5	2	0.32	2.12	3.15	2.07	124
	600	192	171	6	2	3 600	4 880	264	360	480	**46372**	388	557	10.5	5	2	0.35	1.95	2.90	1.91	206
	600	240	192	6	2	4 590	7 230	345	360	480	**46372A**	388	568	24	5	2	0.39	1.74	2.59	1.70	254
380	560	135	122	6	2	2 190	3 560	177	370	500	**46276**	408	530	6.5	5	2	0.32	2.12	3.15	2.07	100
	560	171	135	6	2	2 810	4 670	228	380	500	**46276A**	408	531	18	5	2	0.39	1.74	2.59	1.70	129
	620	194	173	6	2	3 380	5 220	250	340	450	**46376**	408	582	10.5	5	2	0.39	1.74	2.59	1.70	215
	620	243	194	6	2	4 390	7 360	342	330	440	**46376A**	408	587	24.5	5	2	0.35	1.95	2.90	1.91	265
400	600	148	132	6	2	2 350	3 720	183	340	460	**46280**	428	560	8	5	2	0.32	2.12	3.15	2.07	135
	600	185	148	6	2	3 030	5 150	245	340	460	**46280A**	428	563	18.5	5	2	0.32	2.12	3.15	2.07	167
	650	200	178	6	3	3 740	5 920	283	320	420	**46380**	428	605	11	5	2.5	0.35	1.95	2.90	1.91	243
	650	250	200	6	3	5 110	8 850	406	310	420	**46380A**	428	610	25	5	2.5	0.35	1.95	2.90	1.91	306
420	620	150	134	6	2	2 520	4 130	200	320	420	**46284**	448	590	8	5	2	0.33	2.03	3.02	1.98	142
	620	188	150	6	2	3 390	5 660	267	320	430	**46284A**	448	589	19	5	2	0.39	1.74	2.59	1.70	176
	700	224	200	6	3	4 650	6 880	324	290	380	**46384**	448	656	12	5	2.5	0.39	1.74	2.59	1.70	325
	700	280	224	6	3	6 040	9 620	430	290	380	**46384A**	448	659	28	5	2.5	0.39	1.74	2.59	1.70	400

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d 440 ~ 500 mm



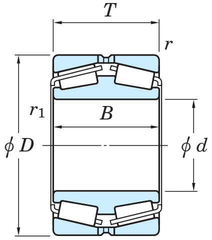


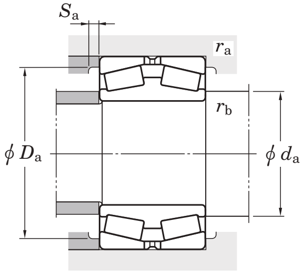
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
440	650	157	140	6	3	2 840	4 430	212	300	390	**46288**	468	622	8.5	5	2.5	0.33	2.03	3.02	1.98	156
	650	196	157	6	3	3 770	6 370	300	300	400	**46288A**	468	620	19.5	5	2.5	0.39	1.74	2.59	1.70	198
	720	226	201	6	3	4 950	8 110	372	270	360	**46388**	468	676	12.5	5	2.5	0.39	1.74	2.59	1.70	354
	720	283	226	6	3	6 210	10 100	447	270	360	**46388A**	468	679	28.5	5	2.5	0.40	1.68	2.51	1.65	418
460	680	163	145	6	3	3 130	5 340	253	280	370	**46292**	488	637	9	5	2.5	0.37	1.83	2.72	1.78	196
	680	204	163	6	3	4 040	6 850	317	280	370	**46292A**	488	646	20.5	5	2.5	0.39	1.74	2.59	1.70	232
	760	240	214	7.5	4	5 460	9 000	408	250	330	**46392**	496	710	13	6	3	0.39	1.74	2.59	1.70	424
	760	300	240	7.5	4	7 130	11 600	504	250	330	**46392A**	496	718	30	6	3	0.39	1.74	2.59	1.70	506
480	700	165	147	6	3	3 180	5 300	247	260	340	**46296**	508	672	9	5	2.5	0.33	2.03	3.02	1.98	186
	700	206	165	6	3	4 040	7 230	333	260	340	**46296A**	508	666	20.5	5	2.5	0.33	2.03	3.02	1.98	240
	790	248	221	7.5	4	5 820	8 920	405	230	310	**46396**	516	742	13.5	6	3	0.39	1.74	2.59	1.70	457
	790	310	248	7.5	4	7 530	12 400	528	230	310	**46396A**	516	749	31	6	3	0.39	1.74	2.59	1.70	560
500	720	167	149	6	3	3 230	5 690	265	250	330	**462/500**	528	679	9	5	2.5	0.40	1.71	2.54	1.67	210
	720	209	167	6	3	4 390	7 850	356	250	330	**462/500A**	528	690	21	5	2.5	0.42	1.62	2.41	1.58	258
	830	264	235	7.5	4	6 570	10 900	477	210	280	**463/500**	536	776	14.5	6	3	0.39	1.74	2.59	1.70	559
	830	330	264	7.5	4	8 510	14 000	586	210	280	**463/500A**	536	784	33	6	3	0.39	1.74	2.59	1.70	669

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDI type

d 100 ~ (220) mm



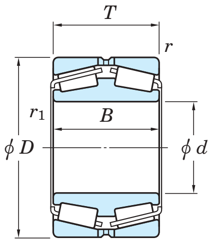


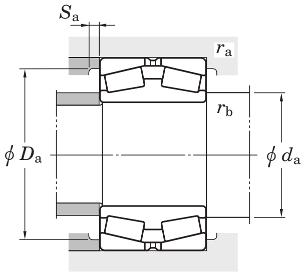
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)						Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	B	T	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
100	165	52	52	2	2.5	298	384	28.0	1 800	2 300	**45320**	119	155	148	3.9	2	2	0.35	1.95	2.90	1.91	4.26
110	180	56	56	2	2.5	378	505	36.1	1 600	2 100	**45322**	128	170	160	4	2	2	0.35	1.95	2.90	1.91	5.40
120	180	46	46	2	2.5	286	424	29.7	1 500	2 100	**45224**	138	170	163	4	2	2	0.26	2.55	3.80	2.50	4.08
	200	62	62	2	2.5	444	598	41.7	1 400	1 900	**45324**	142	190	178	4	2	2	0.35	1.95	2.90	1.91	7.92
130	200	52	52	2	2.5	376	548	37.8	1 400	1 800	**45226**	152	190	179	4	2	2	0.27	2.47	3.67	2.41	5.96
	210	64	64	2	2.5	476	657	45.2	1 300	1 800	**45326**	153	200	185	4	2	2	0.36	1.87	2.79	1.83	8.41
140	210	53	53	2	2.5	390	564	38.5	1 300	1 800	**45228**	159	200	188	4	2	2	0.27	2.47	3.67	2.41	6.45
	225	68	68	2.5	3	611	807	51.3	1 200	1 700	**45328**	160	213	210	4	2	2.5	0.40	1.68	2.50	1.64	10.0
150	225	56	56	2.5	3	445	686	45.8	1 200	1 600	**45230**	174	213	203	4	2	2.5	0.26	2.55	3.80	2.50	7.87
	250	80	80	2.5	3	684	955	59.8	1 100	1 500	**45330**	179	238	220	4	2	2.5	0.35	1.95	2.90	1.91	15.5
160	240	60	60	2.5	3	488	705	46.6	1 100	1 500	**45232**	184	228	217	5	2	2.5	0.24	2.79	4.15	2.73	9.22
	270	86	86	2.5	3	832	1 100	73.2	1 000	1 400	**45332**	193	258	237	4	2	2.5	0.35	1.95	2.90	1.91	19.8
170	260	67	67	2.5	3	654	956	62.1	1 000	1 400	**45234**	195	248	233	5	2	2.5	0.31	2.21	3.29	2.16	12.4
	280	88	88	2.5	3	834	1 210	72.7	970	1 300	**45334**	201	268	247	5	2	2.5	0.33	2.03	3.02	1.98	21.6
180	280	74	74	2.5	3	722	1 050	62.5	950	1 300	**45236**	208	268	250	5	2	2.5	0.28	2.43	3.61	2.37	16.8
	300	96	96	3	4	992	1 370	81.2	910	1 200	**45336**	210	286	263	5	2.5	3	0.35	1.95	2.90	1.91	26.5
190	290	75	75	2.5	3	751	1 130	66.3	900	1 200	**45238**	219	278	260	5	2	2.5	0.26	2.55	3.80	2.50	17.7
	320	104	104	3	4	1 130	1 590	91.3	840	1 100	**45338**	224	306	280	5	2.5	3	0.35	1.95	2.90	1.91	34.0
200	310	82	82	2.5	3	913	1 410	83.1	830	1 100	**45240**	234	298	280	5	2	2.5	0.26	2.55	3.80	2.50	22.9
	340	112	112	3	4	1 250	1 840	104	770	1 000	**45340**	244	326	300	5	2.5	3	0.35	1.95	2.90	1.91	41.9
220	340	90	90	3	4	933	1 460	83.4	740	990	**45244**	259	326	306	5	2.5	3	0.28	2.43	3.61	2.37	28.5

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDI type

d (220) ~ (420) mm



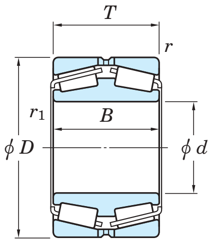


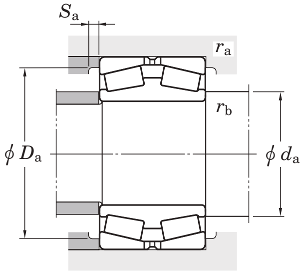
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds ($\min^{-1}$)		Bearing No.	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d	D	B	T	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
220	370	120	120	4	5	1 400	2 060	113	700	930	**45344**	263	352	324	5	3	4	0.35	1.95	2.90	1.91	50.8
230	350	90	90	3	4	991	1 560	88.6	710	950	**45246**	267	336	318	6	2.5	3	0.28	2.43	3.61	2.37	30.6
240	360	92	92	3	4	1 150	1 790	99.8	690	920	**45248**	271	346	325	5	2.5	3	0.32	2.12	3.15	2.07	32.2
	400	128	128	4	5	1 650	2 470	133	630	840	**45348**	286	382	354	5	3	4	0.35	1.95	2.90	1.91	65.4
260	400	104	104	4	5	1 320	2 120	113	610	810	**45252**	302	382	360	6	3	4	0.25	2.74	4.08	2.68	48.1
	440	144	144	4	5	2 180	3 440	179	560	750	**45352**	313	422	386	6	3	4	0.35	1.95	2.90	1.91	92.2
280	420	106	106	4	5	1 490	2 470	133	560	750	**45256**	321	402	370	6	3	4	0.25	2.69	4.00	2.63	51.9
	460	146	146	5	6	2 310	3 320	175	520	700	**45356**	323	438	409	6	4	5	0.39	1.74	2.59	1.70	93.1
300	460	118	118	4	5	1 870	3 150	162	500	670	**45260**	350	442	418	6	3	4	0.25	2.74	4.08	2.68	78.5
	500	160	160	5	6	2 670	4 240	216	470	630	**45360**	356	478	440	6	4	5	0.35	1.95	2.90	1.91	129
320	480	121	121	4	5	1 830	3 180	161	470	630	**45264**	368	462	434	6	3	4	0.26	2.55	3.80	2.50	77.8
	540	176	176	5	6	3 380	5 280	264	430	570	**45364R**	378	518	474	6	4	5	0.32	2.12	3.15	2.07	167
340	520	133	133	5	6	2 380	3 850	186	420	570	**45268**	398	498	464	6	4	5	0.26	2.55	3.80	2.50	104
	580	190	190	5	6	3 790	5 470	269	390	510	**45368**	401	558	515	6	4	5	0.32	2.12	3.15	2.07	202
360	540	134	134	5	6	2 370	3 910	196	400	540	**45272**	408	518	488	11	4	5	0.32	2.12	3.15	2.07	101
	600	192	192	5	6	4 230	6 750	324	360	490	**45372**	419	578	528	10	4	5	0.32	2.12	3.15	2.07	228
380	560	135	135	5	6	2 300	3 790	185	380	500	**45276**	428	538	510	6	4	5	0.27	2.47	3.67	2.41	112
	620	194	194	5	6	3 860	6 360	303	340	450	**45376**	445	598	545	6	4	5	0.32	2.12	3.15	2.07	234
400	600	148	148	5	6	3 020	4 960	239	340	450	**45280**	452	578	545	6	4	5	0.33	2.03	3.02	1.98	143
	650	200	200	6	6	4 840	7 810	368	320	420	**45380**	458	622	580	11	5	5	0.39	1.74	2.59	1.70	265
420	620	150	150	5	6	3 010	5 200	248	320	430	**45284**	475	598	564	6	4	5	0.33	2.03	3.02	1.98	152

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDI type

d (420) ~ 500 mm





Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.	Mounting dimensions (mm)						Con-stant	Axial load factors			(Refer.) Mass (kg)
d	D	B	T	r min.	r_1 min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.		d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
420	700	224	224	6	6	5 430	8 380	389	280	380	**45384**	488	672	623	7	5	5	0.39	1.74	2.59	1.70	352
440	650	157	157	6	6	3 190	5 500	256	300	390	**45288**	500	622	592	10	5	5	0.28	2.43	3.61	2.37	182
	720	226	226	6	6	5 750	9 130	417	270	360	**45388**	506	692	642	7	5	5	0.39	1.74	2.59	1.70	367
460	680	163	163	6	6	3 480	5 660	265	280	370	**45292**	510	652	616	6	5	5	0.39	1.74	2.59	1.70	197
	760	240	240	7.5	7.5	6 570	10 400	463	250	330	**45392**	532	724	677	7	6	6	0.39	1.74	2.59	1.70	444
480	700	165	165	6	6	3 830	6 710	307	260	350	**45296**	531	672	625	6	5	5	0.40	1.68	2.50	1.64	215
500	720	167	167	6	6	4 300	7 350	340	250	330	**452/500**	545	692	645	8	5	5	0.39	1.74	2.59	1.70	222
	830	264	264	7.5	7.5	7 970	12 300	555	210	280	**453/500**	587	794	729	7	6	6	0.33	2.03	3.02	1.98	586

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Spherical roller bearings

Spherical roller bearings feature a large load rating capacity and self-aligning capability.

This type of bearing is suitable for low- or medium-speed applications which involve heavy or impact loading.

- These bearings are divided into R(RR), RZ and RHA types, which differ in internal structure. (refer to Table 1.)
- Each type can be produced with a cylindrical bore or tapered bore.

  Bearings with a tapered bore can be fit and removed easily using an adapter assembly or withdrawal sleeve.

  The rate of taper is equivalent among all bearing series.

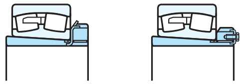
  240 and 241 series ... 1 : 30 (supplementary code "K30")
  Others ... 1 : 12 (supplementary code "K")

Spherical roller bearings

Cylindrical bore   Tapered bore

Bore diameter **25** – **500** mm

Adapter assemblies

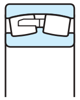
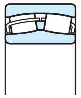
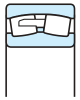


Bore diameter **20** – **470** mm

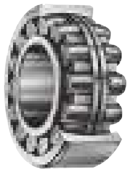
Withdrawal sleeves

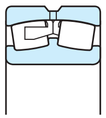
Bore diameter **35** – **480** mm

Table 1 Spherical roller bearings : types and structures

Structure	 R, RR type	 RZ type	 RHA type
Roller	Convex asymmetrical roller	Convex symmetrical roller	Convex symmetrical roller
Cage	Copper alloy prong type machined cage	Pressed cage	Copper alloy integral type machined cage
Inner ring (with or without rib)	With center rib	Without center rib (guide ring)	Without center rib (guide ring)
	With ribs on both sides (to prevent rollers from falling)	Without ribs on both sides	With ribs on both sides (to prevent rollers from falling)
Characteristics	Excellent high-speed properties	Excellent high-speed properties Large load rating capacity Usable at high temperatures (up to 200°C)	Large load rating capacity

■ Spherical roller bearings for shaker screens





- These bearings consist of convex asymmetric rollers and a prong type, copper alloy, outer ring guided, machined cage. This cage possesses optimum characteristics for use with shaker screens.
- The bearings most commonly used with shaker screens are 223 series spherical roller bearings.
  They are identified by the supplementary code "ROVS W502." The outer ring outside diameter tolerance of these bearings is held to a small allowable variation.

Bearings with lubrication holes and a lubrication groove

- Outer rings can be provided with lubrication holes, a lubrication groove and an anti-rotation pin hole. (Specifications are given in Table 4.)
- Inner rings can also be provided with lubrication holes and a lubrication groove.

Table 2 Supplementary codes for identification of bearings with lubrication holes, lubrication groove and anti-rotation pin hole (outer ring)

Supplementary code		Number of lubrication holes	Hole layout
With lubrication holes and lubrication groove	With lubrication holes, lubrication groove and anti-rotation pin hole		
W33	**W3N**	3[1]	3 equally spaced positions[1]
W33A	W3NA	4	4 equally spaced positions
–	W3NB	5	6 equally spaced positions[2]
W33C	W3NC	6	6 equally spaced positions
–	W3ND	7	8 equally spaced positions[2]
W33T	–	8	8 equally spaced positions

Table 3 Supplementary codes for identification of bearings with lubrication holes and/or lubrication groove

Supplementary code	Inner ring		Outer ring	
	Number of lubrication holes	Lubrication groove	Number of lubrication holes	Lubrication groove
W513	3	–	3	○
W518	3	–	3	–
W26	3	–	–	–

[Notes] 1) Also 4 or 6 holes are provided in smaller size bearings, consult with JTEKT.
2) One hole is used for the antirotation pin.

[Remark] Boldfaced codes indicate JTEKT standards.

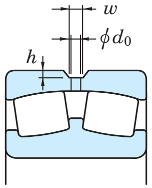


Table 4 (1) Lubrication hole and lubrication groove dimensions

Unit : mm

Bore diameter number	Nominal bore diameter d	239			230			240			231			241			222			232			213			223		
		d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h
5	25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	0.7	–	–	–	–	–	–	–	–	–
6	30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	0.7	–	–	–	3	4	0.7	–	–	–
7	35	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	0.8	–	–	–	3	4	0.7	3	4	1
8	40	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	0.8	–	–	–	3	4	0.7	4	5	1
9	45	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	0.8	–	–	–	3	4	0.7	4	6	1
10	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	0.8	–	–	–	3	4	0.7	4	6	1
11	55	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	0.8	–	–	–	3	4	0.7	4	6	1.1
12	60	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	1	–	–	–	3	4	1	4	6	1.1
13	65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	1	–	–	–	3	4	1	4	6	1.2
14	70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	1	–	–	–	3	4	1	5	7	1.3
15	75	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	1	–	–	–	3	4	1	5	7	1.3
16	80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	4	1	4	6	1.2	4	6	1	5	7	1.3
17	85	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	5	1	4	6	1.2	4	6	1.2	6	8	1.3
18	90	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	5	1	5	8	1.2	4	6	1.2	6	8	1.3
19	95	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	6	1.2	5	8	1.2	4	6	1.2	6	8	2
20	100	–	–	–	4	5	1	–	–	–	5	6	1.4	–	–	–	5	6	1.2	5	8	1.2	4	6	1.2	6	8	2
22	110	–	–	–	5	7	1	–	–	–	5	6	1.4	6	8	1.5	5	7	1.5	6	8	1.7	4	6	1.2	6	8	2
24	120	–	–	–	5	7	1	5	6	1.4	5	6	1.4	6	8	1.5	5	7	1.5	6	10	1.7	–	–	–	8	10	2.5
26	130	–	–	–	5	7	1.2	6	8	1.5	5	6	1.5	6	8	1.5	5	7	1.5	6	10	1.7	–	–	–	8	12	2.5
28	140	4	5	1	5	7	1.2	6	8	1.5	6	8	1.5	8	10	2	6	8	1.8	8	10	2.5	–	–	–	12	14	3
30	150	5	7	1	5	8	1.2	6	8	1.5	6	10	1.5	8	10	2	6	10	1.8	8	10	2.5	–	–	–	12	14	3
32	160	5	7	1.2	5	8	1.2	6	8	1.5	8	12	2	10	12	2	10	12	2.5	10	12	2.5	–	–	–	12	14	3
34	170	5	7	1.2	6	10	1.5	8	10	2	8	12	2	10	12	2	12	14	3	10	12	2.5	–	–	–	12	14	3
36	180	6	7	1.3	8	12	1.5	10	12	2.5	10	12	2.5	10	12	2	12	14	3	10	12	2.5	–	–	–	14	16.5	4
38	190	5	7	1.2	10	12	2.5	10	12	2.5	10	12	2.5	10	12	2	12	14	3	12	14	3	–	–	–	14	16.5	4
40	200	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	–	–	–	14	16.5	4
44	220	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	–	–	–	14	16.5	4
48	240	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
52	260	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
56	280	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
60	300	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
64	320	10	12	2.5	12	14	3	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
68	340	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
72	360	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4

Table 4 (2) Lubrication hole and lubrication groove dimensions

Unit : mm

Bore diameter number	Nominal bore diameter d	239			230			240			231			241			222			232			213			223		
		d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h
76	380	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
80	400	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
84	420	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
88	440	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
92	460	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
96	480	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
/500	500	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	5	–	–	–	14	16.5	4	–	–	–	–	–	–

Boundary dimensions	As specified in JIS B 1512.
Tolerances	As specified in JIS B 1514-1, class 0. (refer to Table 7-3 on pp. A 60 – A 63.) Refer to Table 7-11 on p. A 76 for the tolerance of tapered bores.
Radial internal clearance	As specified in JIS B 1520. (refer to Table 10-9 on p. A 108.)
Recommended fits	Refer to Table 9-4 on pp. A 91, 92.
Standard cages	Refer to Table 5.
Allowable aligning angle	Refer to Table 5. (varies depending on bearing series.)
Equivalent radial load	Dynamic equivalent radial load $\left(\text{When } \frac{F_a}{F_r} \leq e\right)$ $P_r = F_r + Y_1 F_a$ $\left(\text{When } \frac{F_a}{F_r} > e\right)$ $P_r = 0.67F_r + Y_2 F_a$ Static equivalent radial load $P_{0r} = F_r + Y_0 F_a$ [Note] Refer to the specification table for the values of axial load factors Y_1, Y_2 and Y_0 and of constant e.

[Remark] If the ratio of axial load to radial load exceeds the value e given in the specification table ($F_a / F_r > e$), slippage occurs between rollers in rows that are not axial-loaded and the raceway. This may cause smearing, especially when the bearing is large. Consult with JTEKT on the use of bearings under such conditions.

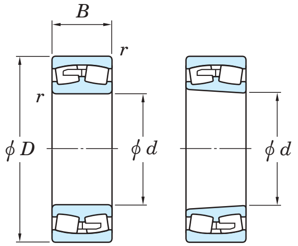
Table 5 Application of standard cages and allowable aligning angle

Bearing series	Standard cages		Allowable aligning angle
	Pressed cage	Machined cage	
239 R	——	23930R – 239/500R	0.026 rad (1.5°)
230 R	——	23038R – 230/500R	0.026 rad (1.5°)
RZ	23020RZ – 23036RZ	——	
RHA	——	23038RHA – 23096RHA	
240 R(RR)	——	24036RR – 240/500R	0.035 rad (2°)
RZ	24022RZ – 24034RZ	——	
RHA	——	24038RHA – 24096RHA	
231 R	——	23136R – 231/500R	0.026 rad (1.5°)
RZ	23120RZ – 23134RZ	——	
RHA	——	23136RHA – 23196RHA	
241 R(RR)	——	24132RR – 241/500R	0.044 rad (2.5°)
RZ	24122RZ – 24130RZ	——	
RHA	——	24136RHA – 24196RHA	
222 R(RR)	——	22232RR – 22272R	0.026 rad (1.5°)
RZ	22205RZ – 22230RZ	——	
RHA	——	22232RHA – 22260RHA	
232 R	——	23232R – 232/500R	0.044 rad (2.5°)
RZ	23216RZ – 23230RZ	——	
RHA	——	23232RHA – 23296RHA	
213 R	——	——	0.017 rad (1°)
RZ	21306RZ – 21322RZ	——	
223 R(RR)	——	22330R – 22360R	0.035 rad (2°)
RZ	22308RZ – 22326RZ	——	
RHA	——	22330RHA – 22356RHA	

Spherical roller bearings

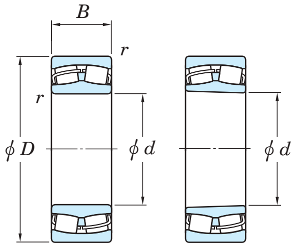
d 25 ~ 70 mm

R, RR



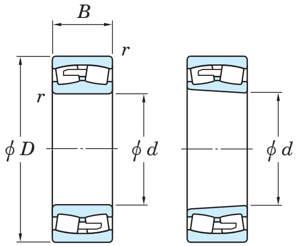
Cylindrical bore   Tapered bore

RZ

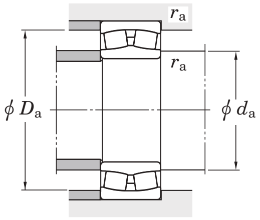


Cylindrical bore   Tapered bore

RHA



Cylindrical bore   Tapered bore



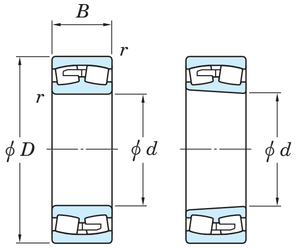
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
25	52	18	1	56.8	48.1	3.90	9 600	12 800	**22205RZ**	**22205RZK**	31	31	46	46	1	0.35	1.91	2.85	1.87	0.188	0.184
30	62	20	1	76.6	65.9	5.30	8 100	10 900	**22206RZ**	**22206RZK**	36	36.5	56	55.5	1	0.33	2.04	3.04	2.00	0.296	0.290
	72	19	1.1	74.2	62.7	4.80	7 200	9 600	**21306RZ**	**21306RZK**	37	41.5	65	61.5	1	0.27	2.49	3.71	2.43	0.430	0.424
35	72	23	1.1	100	88.7	7.75	6 900	9 200	**22207RZ**	**22207RZK**	42	42.5	65	64	1	0.32	2.09	3.11	2.04	0.459	0.449
	80	21	1.5	86.8	75.8	5.90	6 200	8 300	**21307RZ**	**21307RZK**	43.5	46.5	71.5	68.5	1.5	0.27	2.49	3.71	2.43	0.572	0.564
40	80	23	1.1	114	102	9.55	6 200	8 300	**22208RZ**	**22208RZK**	47	49	73	72.5	1	0.28	2.37	3.53	2.32	0.602	0.591
	90	23	1.5	105	95.5	7.55	5 600	7 600	**21308RZ**	**21308RZK**	48.5	53.5	81.5	77	1.5	0.26	2.55	3.80	2.50	0.781	0.770
	90	33	1.5	170	152	11.8	5 600	7 600	**22308RZ**	**22308RZK**	48.5	51	81.5	78.5	1.5	0.37	1.83	2.72	1.79	1.08	1.06
45	85	23	1.1	119	110	10.2	5 800	7 700	**22209RZ**	**22209RZK**	52	53.5	78	77.5	1	0.26	2.55	3.80	2.50	0.602	0.590
	100	25	1.5	132	124	9.95	5 000	6 700	**21309RZ**	**21309RZK**	53.5	60	91.5	86	1.5	0.26	2.62	3.90	2.56	1.05	1.04
	100	36	1.5	208	183	13.8	5 100	6 700	**22309RZ**	**22309RZK**	53.5	55.5	91.5	87	1.5	0.37	1.83	2.72	1.79	1.42	1.39
50	90	23	1.1	128	122	12.7	5 400	7 200	**22210RZ**	**22210RZK**	57	58.5	83	82.5	1	0.24	2.79	4.15	2.73	0.648	0.634
	110	27	2	157	151	12.0	4 500	6 100	**21310RZ**	**21310RZK**	60	67	100	94.5	2	0.25	2.71	4.04	2.65	1.37	1.35
	110	40	2	255	237	17.5	4 500	6 200	**22310RZ**	**22310RZK**	60	62.5	100	95.5	2	0.36	1.85	2.76	1.81	1.92	1.88
55	100	25	1.5	154	144	15.0	4 700	6 300	**22211RZ**	**22211RZK**	63.5	64	91.5	91.5	1.5	0.24	2.84	4.23	2.78	0.867	0.849
	120	29	2	180	165	13.0	4 100	5 600	**21311RZ**	**21311RZK**	65	71.5	110	101.5	2	0.25	2.71	4.03	2.65	1.69	1.67
	120	43	2	296	264	21.1	4 100	5 500	**22311RZ**	**22311RZK**	65	66	110	104	2	0.36	1.85	2.76	1.81	2.40	2.35
60	110	28	1.5	190	181	18.7	4 300	5 800	**22212RZ**	**22212RZK**	68.5	70	101.5	100	1.5	0.25	2.74	4.08	2.68	1.19	1.17
	130	31	2.1	210	193	15.1	3 900	5 100	**21312RZ**	**21312RZK**	72	77.5	118	110	2	0.24	2.78	4.14	2.72	2.11	2.08
	130	46	2.1	354	334	24.9	3 900	5 100	**22312RZ**	**22312RZK**	72	73.5	118	113	2	0.36	1.86	2.77	1.82	3.06	2.99
65	120	31	1.5	222	211	20.7	4 000	5 200	**22213RZ**	**22213RZK**	73.5	76	111.5	109	1.5	0.25	2.69	4.00	2.63	1.55	1.52
	140	33	2.1	242	232	19.8	3 600	4 700	**21313RZ**	**21313RZK**	77	85.5	128	119	2	0.24	2.83	4.21	2.76	2.62	2.58
	140	48	2.1	382	360	30.8	3 600	4 700	**22313RZ**	**22313RZK**	77	79.5	128	122	2	0.34	1.98	2.94	1.93	3.66	3.58
70	125	31	1.5	233	222	24.4	3 700	5 000	**22214RZ**	**22214RZK**	78.5	80	116.5	114	1.5	0.24	2.87	4.27	2.80	1.64	1.61
	150	35	2.1	268	260	21.6	3 300	4 400	**21314RZ**	**21314RZK**	82	91	138	126.5	2	0.24	2.84	4.23	2.78	3.19	3.15
	150	51	2.1	435	413	35.0	3 300	4 400	**22314RZ**	**22314RZK**	82	85.5	138	131	2	0.34	1.98	2.94	1.93	4.45	4.36

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

Spherical roller bearings

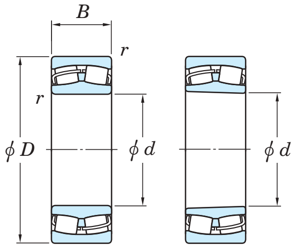
d 75 ~ (110) mm

R, RR



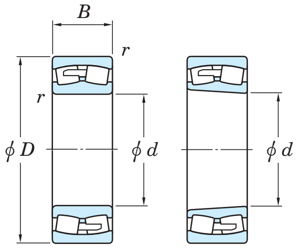
Cylindrical bore   Tapered bore

RZ

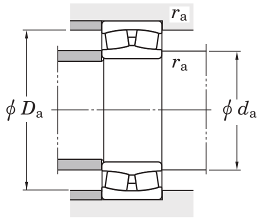


Cylindrical bore   Tapered bore

RHA



Cylindrical bore   Tapered bore



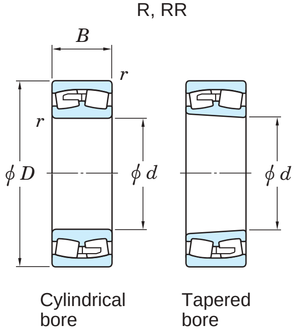
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Bearing No.		Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
75	130	31	1.5	241	236	28.2	3 600	4 700	**22215RZ**	**22215RZK**	83.5	85.5	121.5	119	1.5	0.22	3.07	4.57	3.00	1.73	1.69
	160	37	2.1	306	298	24.3	3 000	4 100	**21315RZ**	**21315RZK**	87	98	148	138	2	0.24	2.87	4.27	2.80	3.81	3.76
	160	55	2.1	492	473	38.4	3 000	4 100	**22315RZ**	**22315RZK**	87	91	148	139.5	2	0.35	1.95	2.90	1.91	5.45	5.33
80	140	33	2	271	271	30.5	3 300	4 400	**22216RZ**	**22216RZK**	90	92	130	128	2	0.22	3.07	4.57	3.00	2.17	2.13
	140	44.4	2	305	342	31.2	3 300	4 400	**23216RZ**	**23216RZK**	90	93	130	124	2	0.29	2.35	3.50	2.30	2.95	2.86
	170	39	2.1	344	339	27.5	2 900	3 900	**21316RZ**	**21316RZK**	92	104	158	146	2	0.23	2.88	4.29	2.82	4.53	4.47
	170	58	2.1	539	521	41.7	2 900	3 900	**22316RZ**	**22316RZK**	92	97	158	148	2	0.35	1.95	2.90	1.91	6.44	6.30
85	150	36	2	322	324	35.7	3 000	4 100	**22217RZ**	**22217RZK**	95	97	140	137	2	0.22	3.01	4.48	2.94	2.75	2.69
	150	49.2	2	358	410	36.2	3 000	4 100	**23217RZ**	**23217RZK**	95	99	140	134	2	0.30	2.25	3.34	2.20	3.78	3.67
	180	41	3	374	372	29.6	2 800	3 600	**21317RZ**	**21317RZK**	99	109	166	154	2.5	0.23	2.89	4.33	2.83	5.32	5.25
	180	60	3	601	586	47.8	2 800	3 600	**22317RZ**	**22317RZK**	99	103	166	157	2.5	0.33	2.02	3.00	1.97	7.47	7.31
90	160	40	2	372	381	39.2	2 900	3 900	**22218RZ**	**22218RZK**	100	104	150	145	2	0.24	2.79	4.15	2.73	3.50	3.43
	160	52.4	2	421	482	42.9	2 900	3 900	**23218RZ**	**23218RZK**	100	103	150	141	2	0.32	2.14	3.19	2.09	4.63	4.50
	190	43	3	413	416	32.9	2 600	3 400	**21318RZ**	**21318RZK**	104	116	176	162	2.5	0.23	2.91	4.30	2.84	6.20	6.11
	190	64	3	672	662	50.5	2 600	3 400	**22318RZ**	**22318RZK**	104	108	176	166	2.5	0.34	2.00	2.98	1.96	8.82	8.63
95	170	43	2.1	417	422	42.7	2 800	3 600	**22219RZ**	**22219RZK**	107	109	158	154	2	0.24	2.76	4.11	2.70	4.24	4.15
	170	55.6	2.1	457	516	43.9	2 800	3 600	**23219RZ**	**23219RZK**	107	110	158	150	2	0.30	2.25	3.34	2.20	5.50	5.35
	200	45	3	452	461	36.3	2 500	3 200	**21319RZ**	**21319RZK**	109	123	186	171	2.5	0.23	2.92	4.35	2.86	7.16	7.06
	200	67	3	733	726	55.6	2 500	3 200	**22319RZ**	**22319RZK**	109	114	186	174	2.5	0.33	2.02	3.00	1.97	10.2	9.98
100	150	37	1.5	262	332	33.7	2 900	3 900	**23020RZ**	**23020RZK**	109	110	141	138	1.5	0.22	3.01	4.48	2.94	2.34	2.27
	165	52	2	412	510	48.5	2 800	3 600	**23120RZ**	**23120RZK**	110	114	155	147	2	0.29	2.33	3.47	2.28	4.52	4.38
	180	46	2.1	470	481	47.6	2 600	3 400	**22220RZ**	**22220RZK**	112	115	168	163	2	0.25	2.74	4.08	2.68	5.11	5.00
	180	60.3	2.1	533	629	53.5	2 600	3 400	**23220RZ**	**23220RZK**	112	116	168	157	2	0.32	2.09	3.11	2.04	6.85	6.66
	215	47	3	519	524	40.2	2 200	3 000	**21320RZ**	**21320RZK**	114	131	201	184	2.5	0.22	3.02	4.49	2.95	8.79	8.68
	215	73	3	875	877	63.9	2 200	3 000	**22320RZ**	**22320RZK**	114	121	201	187	2.5	0.35	1.95	2.90	1.91	13.2	12.9
110	170	45	2	377	486	48.4	2 600	3 400	**23022RZ**	**23022RZK**	120	123	160	156	2	0.24	2.84	4.23	2.78	3.85	3.74

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

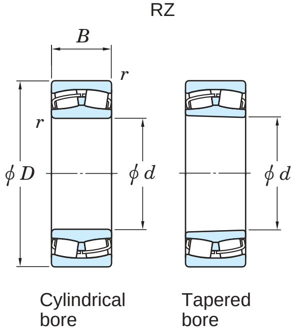
Spherical roller bearings

d (110) ~ 140 mm

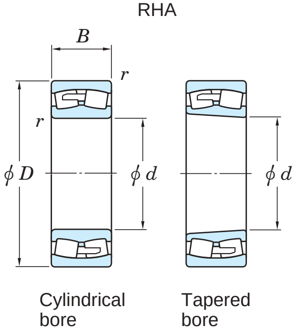
R, RR

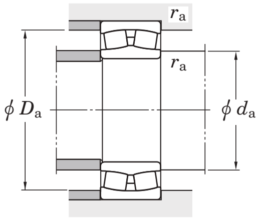


RZ



RHA



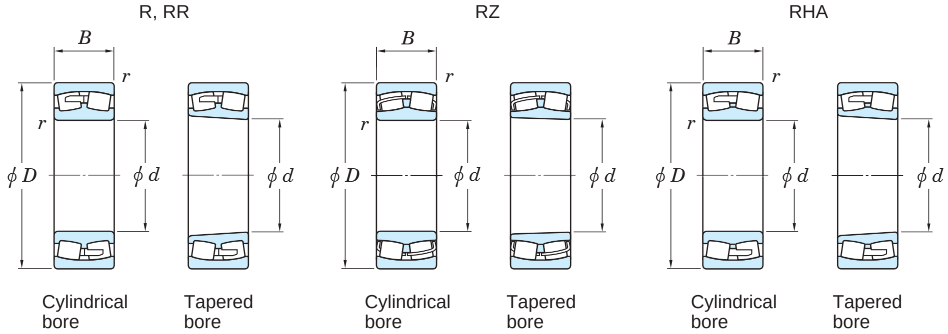


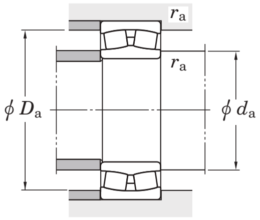
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
110	170	60	2	472	647	58.6	2 600	3 600	**24022RZ**	**24022RZK30**	120	120	160	151	2	0.32	2.08	3.10	2.04	5.07	4.99
	180	56	2	484	605	53.7	2 500	3 300	**23122RZ**	**23122RZK**	120	125	170	161	2	0.29	2.36	3.51	2.31	5.72	5.54
	180	69	2	569	778	63.4	2 500	3 300	**24122RZ**	**24122RZK30**	120	120	170	154	2	0.37	1.84	2.74	1.80	6.98	6.87
	200	53	2.1	612	642	58.7	2 300	3 000	**22222RZ**	**22222RZK**	122	127	188	180	2	0.26	2.64	3.93	2.58	7.37	7.21
	200	69.8	2.1	672	792	65.4	2 300	3 000	**23222RZ**	**23222RZK**	122	127	188	173	2	0.34	1.99	2.96	1.94	9.76	9.48
	240	50	3	604	616	46.0	1 900	2 600	**21322RZ**	**21322RZK**	124	147	226	205	2.5	0.21	3.19	4.75	3.12	11.8	11.7
	240	80	3	1 040	1 040	77.7	1 900	2 600	**22322RZ**	**22322RZK**	124	136	226	208	2.5	0.33	2.03	3.02	1.98	18.1	17.7
120	180	46	2	394	524	51.6	2 300	3 200	**23024RZ**	**23024RZK**	130	132	170	165	2	0.23	2.95	4.40	2.89	4.20	4.07
	180	60	2	484	709	61.8	2 300	3 200	**24024RZ**	**24024RZK30**	130	130	170	160	2	0.30	2.23	3.32	2.18	5.43	5.34
	200	62	2	571	714	61.2	2 200	3 000	**23124RZ**	**23124RZK**	130	137	190	176	2	0.29	2.34	3.49	2.29	7.98	7.74
	200	80	2	733	1 020	78.6	2 200	3 000	**24124RZ**	**24124RZK30**	130	133	190	172	2	0.38	1.75	2.61	1.72	10.2	10.0
	215	58	2.1	706	764	67.2	2 100	2 800	**22224RZ**	**22224RZK**	132	138	203	193	2	0.26	2.60	3.87	2.54	9.31	9.10
	215	76	2.1	772	956	78.9	2 100	2 900	**23224RZ**	**23224RZK**	132	139	203	185	2	0.34	1.97	2.94	1.93	12.2	11.8
	260	86	3	1 120	1 130	87.2	1 800	2 500	**22324RZ**	**22324RZK**	134	149	246	228	2.5	0.33	2.03	3.02	1.98	22.8	22.3
130	200	52	2	509	674	63.6	2 200	2 900	**23026RZ**	**23026RZK**	140	145	190	182	2	0.24	2.87	4.27	2.80	6.15	5.97
	200	69	2	625	914	77.3	2 200	2 900	**24026RZ**	**24026RZK30**	140	143	190	177	2	0.32	2.14	3.18	2.09	8.03	7.90
	210	64	2	621	799	68.4	2 100	2 800	**23126RZ**	**23126RZK**	140	147	200	187	2	0.28	2.42	3.61	2.37	8.71	8.44
	210	80	2	754	1 080	91.8	2 100	2 800	**24126RZ**	**24126RZK30**	140	145	200	184	2	0.36	1.90	2.83	1.86	10.8	10.6
	230	64	3	821	914	74.4	1 900	2 600	**22226RZ**	**22226RZK**	144	148	216	206	2.5	0.26	2.55	3.80	2.50	11.6	11.3
	230	80	3	880	1 090	89.4	1 900	2 600	**23226RZ**	**23226RZK**	144	151	216	201	2.5	0.33	2.05	3.05	2.00	14.4	14.0
	280	93	4	1 310	1 340	98.6	1 700	2 200	**22326RZ**	**22326RZK**	148	160	262	245	3	0.33	2.03	3.02	1.98	28.5	27.9
140	210	53	2	530	723	67.9	2 100	2 800	**23028RZ**	**23028RZK**	150	155	200	192	2	0.23	2.98	4.44	2.92	6.62	6.42
	210	69	2	640	957	81.7	2 100	2 800	**24028RZ**	**24028RZK30**	150	153	200	188	2	0.30	2.28	3.39	2.23	8.49	8.35
	225	68	2.1	710	940	79.6	1 900	2 600	**23128RZ**	**23128RZK**	152	158	213	201	2	0.28	2.45	3.65	2.40	10.6	10.3
	225	85	2.1	853	1 170	90.7	1 900	2 600	**24128RZ**	**24128RZK30**	152	153	213	194	2	0.36	1.89	2.82	1.85	13.1	12.9
	250	68	3	947	1 030	85.2	1 800	2 300	**22228RZ**	**22228RZK**	154	158	236	224	2.5	0.26	2.60	3.87	2.54	14.5	14.2
	250	88	3	1 020	1 290	103	1 800	2 300	**23228RZ**	**23228RZK**	154	161	236	214	2.5	0.34	1.99	2.96	1.95	19.0	18.4
	300	102	4	1 470	1 570	105	1 500	2 100	**22328RZ**	**22328RZK**	158	172	282	255	3	0.35	1.95	2.90	1.90	35.7	34.9

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

Spherical roller bearings

d 150 ~ (170) mm



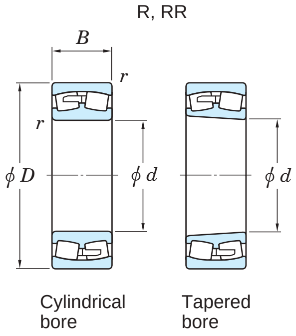


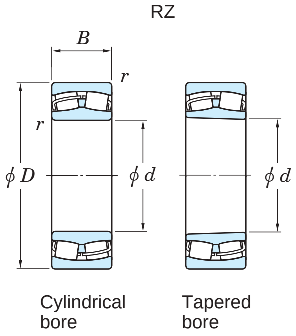
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
150	210	45	2	418	622	62.5	1 600	2 100	**23930R**	**23930RK**	160	170	200	195	2	0.20	3.44	5.12	3.36	5.09	4.93
	225	56	2.1	579	797	76.3	1 900	2 500	**23030RZ**	**23030RZK**	162	166	213	205	2	0.22	3.04	4.53	2.97	8.01	7.77
	225	75	2.1	724	1 100	90.3	1 900	2 500	**24030RZ**	**24030RZK**	162	163	213	199	2	0.30	2.23	3.32	2.18	10.6	10.4
	250	80	2.1	902	1 230	102	1 800	2 300	**23130RZ**	**23130RZK**	162	171	238	216	2	0.30	2.24	3.34	2.19	16.4	15.9
	250	100	2.1	1 110	1 590	116	1 800	2 300	**24130RZ**	**24130RZK**	162	166	238	213	2	0.38	1.77	2.64	1.73	19.9	19.6
	270	73	3	1 080	1 200	102	1 700	2 200	**22230RZ**	**22230RZK**	164	172	256	243	2.5	0.25	2.69	4.00	2.63	18.9	18.5
	270	96	3	1 200	1 540	121	1 700	2 200	**23230RZ**	**23230RZK**	164	173	256	230	2.5	0.34	1.96	2.93	1.92	24.5	23.8
	320	108	4	1 540	1 600	175	1 200	1 500	**22330R**	**22330RK**	168	195	302	273	3	0.38	1.78	2.64	1.74	43.6	42.7
	320	108	4	1 620	1 740	121	1 200	1 500	**22330RHA**	**22330RHAK**	168	196	302	273	3	0.35	1.93	2.87	1.88	40.3	39.4
160	220	45	2	426	649	65.4	1 500	2 000	**23932R**	**23932RK**	170	179	210	204	2	0.19	3.60	5.37	3.52	5.37	5.20
	240	60	2.1	667	924	86.0	1 800	2 300	**23032RZ**	**23032RZK**	172	177	228	219	2	0.22	3.01	4.48	2.94	9.74	9.44
	240	80	2.1	829	1 270	103	1 800	2 300	**24032RZ**	**24032RZK30**	172	175	228	215	2	0.30	2.24	3.34	2.19	12.9	12.7
	270	86	2.1	1 070	1 430	117	1 700	2 200	**23132RZ**	**23132RZK**	172	182	258	234	2	0.30	2.22	3.30	2.17	20.8	20.2
	270	109	2.1	1 270	1 720	145	1 300	1 700	**24132RR**	**24132RRK30**	172	188	258	230	2	0.39	1.72	2.56	1.68	25.9	25.5
	290	80	3	1 110	1 270	127	1 200	1 600	**22232R**	**22232RK**	174	199	276	257	2.5	0.28	2.40	3.57	2.35	23.4	22.9
	290	80	3	1 120	1 320	97.1	1 200	1 600	**22232RHA**	**22232RHAK**	174	200	276	257	2.5	0.27	2.49	3.71	2.44	21.9	21.4
	290	104	3	1 290	1 650	163	1 200	1 600	**23232R**	**23232RK**	174	194	276	245	2.5	0.38	1.79	2.66	1.75	31.0	30.1
	290	104	3	1 370	1 780	139	1 200	1 600	**23232RHA**	**23232RHAK**	174	193	276	245	2.5	0.36	1.87	2.78	1.83	29.4	28.5
	340	114	4	1 720	1 790	188	1 100	1 400	**22332R**	**22332RK**	178	207	322	290	3	0.38	1.76	2.62	1.72	51.9	51.0
	340	114	4	1 780	1 940	135	1 100	1 400	**22332RHA**	**22332RHAK**	178	210	322	290	3	0.35	1.94	2.89	1.90	48.0	47.1
170	230	45	2	441	691	69.6	1 400	1 900	**23934R**	**23934RK**	180	189	220	214	2	0.18	3.78	5.63	3.70	5.67	5.49
	260	67	2.1	795	1 090	97.9	1 700	2 200	**23034RZ**	**23034RZK**	182	189	248	236	2	0.23	2.90	4.31	2.83	13.2	12.8
	260	90	2.1	1 010	1 540	120	1 700	2 200	**24034RZ**	**24034RZK30**	182	184	248	227	2	0.32	2.11	3.15	2.07	17.5	17.2
	280	88	2.1	1 150	1 550	124	1 500	2 100	**23134RZ**	**23134RZK**	182	194	268	249	2	0.29	2.30	3.43	2.25	21.9	21.2
	280	109	2.1	1 320	1 820	154	1 200	1 600	**24134RR**	**24134RRK30**	182	198	268	241	2	0.37	1.80	2.68	1.76	27.2	26.8
	310	86	4	1 190	1 390	141	1 100	1 500	**22234R**	**22234RK**	188	212	292	271	3	0.29	2.29	3.41	2.24	29.0	28.4
	310	86	4	1 260	1 490	109	1 100	1 500	**22234RHA**	**22234RHAK**	188	210	292	271	3	0.28	2.45	3.64	2.39	27.1	26.5
	310	110	4	1 560	1 920	127	1 100	1 500	**23234RR**	**23234RRK**	188	209	292	268	3	0.37	1.85	2.75	1.80	37.2	36.1
	310	110	4	1 520	1 940	147	1 100	1 500	**23234RHA**	**23234RHAK**	188	207	292	261	3	0.36	1.89	2.82	1.85	35.6	34.6

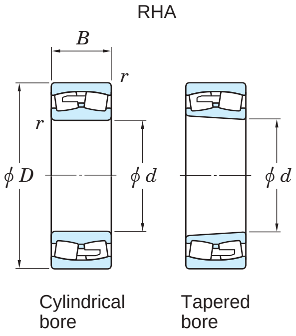
[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

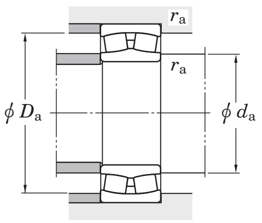
Spherical roller bearings

d (170) ~ (190) mm







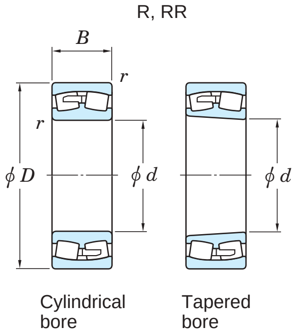


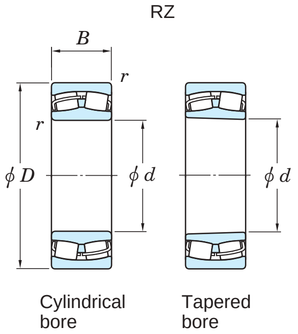
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
170	360	120	4	1 830	1 920	206	1 000	1 300	**22334R**	**22334RK**	188	221	342	307	3	0.38	1.77	2.64	1.73	62.0	60.8
	360	120	4	1 990	2 200	150	1 000	1 300	**22334RHA**	**22334RHAK**	188	222	342	307	3	0.35	1.95	2.91	1.91	57.3	56.1
180	250	52	2	599	939	88.9	1 300	1 700	**23936R**	**23936RK**	190	203	240	232	2	0.19	3.55	5.29	3.48	8.22	7.97
	280	74	2.1	966	1 330	118	1 500	1 900	**23036RZ**	**23036RZK**	192	202	268	253	2	0.24	2.84	4.23	2.78	17.4	16.9
	280	100	2.1	1 170	1 710	138	1 200	1 600	**24036RR**	**24036RRK30**	192	206	268	246	2	0.34	2.00	2.98	1.96	23.4	23.0
	300	96	3	1 260	1 800	165	1 100	1 500	**23136R**	**23136RK**	194	214	286	259	2.5	0.33	2.04	3.04	2.00	28.4	27.5
	300	96	3	1 330	1 790	139	1 100	1 500	**23136RHA**	**23136RHAK**	194	215	286	265	2.5	0.31	2.19	3.25	2.14	26.5	25.6
	300	118	3	1 530	2 120	176	1 100	1 500	**24136RR**	**24136RRK30**	194	211	286	258	2.5	0.38	1.78	2.65	1.74	34.4	33.9
	300	118	3	1 510	2 240	155	1 100	1 500	**24136RHA**	**24136RHAK30**	194	207	286	255	2.5	0.38	1.79	2.66	1.75	31.8	31.2
	320	86	4	1 220	1 450	165	1 100	1 400	**22236R**	**22236RK**	198	222	302	281	3	0.28	2.37	3.53	2.32	30.5	29.8
	320	86	4	1 320	1 610	118	1 100	1 400	**22236RHA**	**22236RHAK**	198	221	302	281	3	0.26	2.55	3.80	2.50	28.5	27.8
	320	112	4	1 640	2 100	134	1 100	1 400	**23236RR**	**23236RRK**	198	219	302	279	3	0.36	1.87	2.78	1.83	39.8	38.6
	320	112	4	1 660	2 170	166	1 100	1 400	**23236RHA**	**23236RHAK**	198	220	302	277	3	0.34	1.97	2.93	1.92	37.7	36.5
	380	126	4	2 180	2 360	263	920	1 200	**22336R**	**22336RK**	198	237	362	327	3	0.36	1.89	2.81	1.84	71.4	69.9
	380	126	4	2 180	2 410	163	930	1 200	**22336RHA**	**22336RHAK**	198	235	362	323	3	0.34	1.97	2.94	1.93	66.0	64.5
190	260	52	2	608	969	90.7	1 200	1 600	**23938R**	**23938RK**	200	212	250	241	2	0.18	3.69	5.50	3.61	8.40	8.10
	290	75	2.1	923	1 370	132	1 100	1 500	**23038R**	**23038RK**	202	221	278	260	2	0.25	2.67	3.97	2.61	18.8	18.2
	290	75	2.1	992	1 430	115	1 100	1 500	**23038RHA**	**23038RHAK**	202	219	278	260	2	0.25	2.75	4.10	2.69	17.2	16.6
	290	100	2.1	1 240	1 840	161	1 100	1 500	**24038RR**	**24038RRK30**	202	215	278	257	2	0.33	2.06	3.07	2.02	24.5	24.1
	290	100	2.1	1 230	1 920	152	1 100	1 500	**24038RHA**	**24038RHAK30**	202	215	278	256	2	0.32	2.14	3.19	2.09	22.4	22.0
	320	104	3	1 370	2 000	162	1 000	1 400	**23138R**	**23138RK**	204	229	306	275	2.5	0.34	1.96	2.92	1.92	35.5	34.4
	320	104	3	1 520	2 080	161	1 000	1 400	**23138RHA**	**23138RHAK**	204	227	306	281	2.5	0.31	2.14	3.19	2.10	33.2	32.1
	320	128	3	1 750	2 470	198	1 000	1 400	**24138RR**	**24138RRK30**	204	223	306	272	2.5	0.39	1.74	2.59	1.70	43.0	42.4
	320	128	3	1 770	2 630	179	1 000	1 400	**24138RHA**	**24138RHAK30**	204	222	306	272	2.5	0.38	1.76	2.63	1.72	40.1	39.5
	340	92	4	1 390	1 730	172	1 000	1 300	**22238R**	**22238RK**	208	236	322	296	3	0.29	2.29	3.41	2.24	37.4	36.6
	340	92	4	1 420	1 770	128	1 000	1 300	**22238RHA**	**22238RHAK**	208	234	322	296	3	0.27	2.52	3.76	2.46	34.9	34.1
	340	120	4	1 830	2 370	160	1 000	1 300	**23238RR**	**23238RRK**	208	233	322	294	3	0.36	1.86	2.76	1.81	48.5	47.1
	340	120	4	1 870	2 470	185	990	1 300	**23238RHA**	**23238RHAK**	208	233	322	293	3	0.35	1.94	2.89	1.90	44.9	43.5
	400	132	5	2 380	2 610	258	880	1 200	**22338R**	**22338RK**	212	248	378	342	4	0.38	1.79	2.66	1.75	84.1	82.4

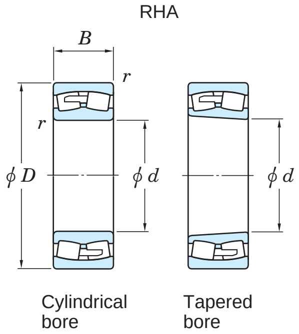
[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

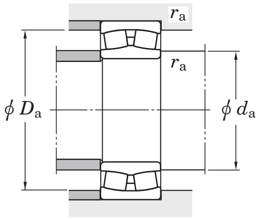
Spherical roller bearings

d (190) ~ (220) mm







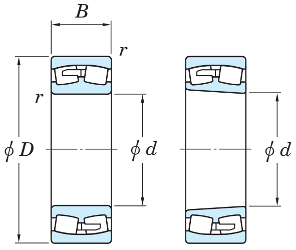


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
190	400	132	5	2 430	2 810	192	870	1 200	**22338RHA**	**22338RHAK**	212	251	378	342	4	0.34	1.99	2.97	1.95	77.7	76.0
200	280	60	2.1	753	1 190	109	1 100	1 500	**23940R**	**23940RK**	212	226	268	259	2	0.20	3.44	5.13	3.37	12.0	11.6
	310	82	2.1	1 120	1 670	155	1 000	1 400	**23040R**	**23040RK**	212	235	298	278	2	0.26	2.62	3.90	2.56	24.1	23.4
	310	82	2.1	1 180	1 680	133	1 100	1 400	**23040RHA**	**23040RHAK**	212	231	298	278	2	0.25	2.68	3.99	2.62	22.0	21.3
	310	109	2.1	1 430	2 110	180	1 100	1 400	**24040RR**	**24040RRK30**	212	228	298	273	2	0.33	2.02	3.00	1.97	31.2	30.7
	310	109	2.1	1 440	2 230	173	1 100	1 400	**24040RHA**	**24040RHAK30**	212	227	298	272	2	0.33	2.06	3.07	2.02	28.5	28.0
	340	112	3	1 740	2 350	186	980	1 300	**23140RR**	**23140RRK**	214	241	326	298	2.5	0.33	2.04	3.03	1.99	43.3	42.0
	340	112	3	1 730	2 340	178	970	1 300	**23140RHA**	**23140RHAK**	214	239	326	297	2.5	0.32	2.10	3.13	2.06	40.8	39.5
	340	140	3	2 030	2 820	222	990	1 300	**24140RR**	**24140RRK30**	214	234	326	289	2.5	0.40	1.68	2.49	1.64	53.3	52.5
	340	140	3	2 000	2 970	196	990	1 300	**24140RHA**	**24140RHAK30**	214	232	326	286	2.5	0.41	1.65	2.46	1.62	49.5	48.7
	360	98	4	1 620	2 050	138	930	1 200	**22240RR**	**22240RRK**	218	252	342	316	3	0.30	2.26	3.36	2.21	45.0	44.0
	360	98	4	1 630	2 030	146	940	1 300	**22240RHA**	**22240RHAK**	218	247	342	316	3	0.27	2.50	3.72	2.45	42.0	41.0
	360	128	4	1 950	2 610	228	940	1 300	**23240R**	**23240RK**	218	244	342	306	3	0.38	1.79	2.67	1.75	58.1	56.4
	360	128	4	2 080	2 780	209	930	1 200	**23240RHA**	**23240RHAK**	218	245	342	309	3	0.35	1.92	2.86	1.88	55.1	53.4
	420	138	5	2 510	2 750	288	830	1 100	**22340R**	**22340RK**	222	260	398	359	4	0.38	1.80	2.68	1.76	95.4	93.5
	420	138	5	2 570	2 920	193	820	1 100	**22340RHA**	**22340RHAK**	222	262	398	356	4	0.34	1.99	2.97	1.95	88.1	86.2
220	300	60	2.1	792	1 300	119	1 000	1 400	**23944R**	**23944RK**	232	246	288	279	2	0.18	3.70	5.50	3.61	13.0	12.6
	340	90	3	1 230	1 890	173	940	1 300	**23044R**	**23044RK**	234	256	326	301	2.5	0.26	2.55	3.80	2.50	31.5	30.6
	340	90	3	1 370	1 950	148	940	1 200	**23044RHA**	**23044RHAK**	234	255	326	307	2.5	0.25	2.69	4.01	2.63	28.8	27.9
	340	118	3	1 660	2 480	208	950	1 300	**24044RR**	**24044RRK30**	234	251	326	300	2.5	0.33	2.04	3.04	2.00	40.5	39.8
	340	118	3	1 680	2 630	199	950	1 300	**24044RHA**	**24044RHAK30**	234	248	326	297	2.5	0.33	2.08	3.09	2.03	37.0	36.4
	370	120	4	1 810	2 700	205	880	1 200	**23144R**	**23144RK**	238	266	352	319	3	0.34	2.00	2.98	1.96	54.8	53.2
	370	120	4	2 000	2 790	208	870	1 200	**23144RHA**	**23144RHAK**	238	263	352	324	3	0.31	2.15	3.20	2.10	51.2	49.6
	370	150	4	2 360	3 390	258	880	1 200	**24144RR**	**24144RRK30**	238	258	352	315	3	0.39	1.71	2.55	1.67	67.3	66.2
	370	150	4	2 330	3 550	229	880	1 200	**24144RHA**	**24144RHAK30**	238	255	352	313	3	0.40	1.69	2.52	1.65	62.0	61.0
	400	108	4	2 000	2 410	257	820	1 100	**22244RR**	**22244RRK**	238	276	382	355	3	0.28	2.40	3.57	2.34	60.3	59.0
	400	108	4	1 980	2 440	168	820	1 100	**22244RHA**	**22244RHAK**	238	274	382	349	3	0.27	2.52	3.76	2.47	58.8	57.5
	400	144	4	2 350	3 200	259	830	1 100	**23244R**	**23244RK**	238	268	382	336	3	0.39	1.71	2.55	1.68	81.6	79.2
	400	144	4	2 520	3 350	239	810	1 100	**23244RHA**	**23244RHAK**	238	272	382	346	3	0.36	1.89	2.81	1.85	77.4	75.0

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

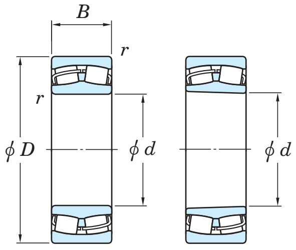
d (220) ~ (260) mm

R, RR



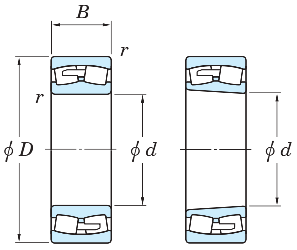
Cylindrical bore Tapered bore

RZ

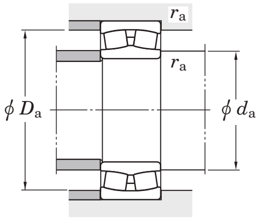


Cylindrical bore Tapered bore

RHA



Cylindrical bore Tapered bore



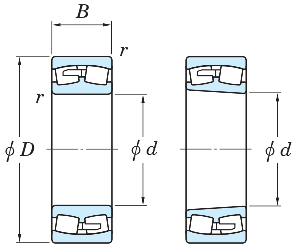
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
220	460	145	5	2 980	3 380	359	720	960	**22344R**	**22344RK**	242	290	438	393	4	0.34	2.00	2.99	1.96	124	122
	460	145	5	2 960	3 470	226	730	970	**22344RHA**	**22344RHAK**	242	290	438	390	4	0.32	2.08	3.09	2.03	115	113
240	320	60	2.1	814	1 380	128	940	1 300	**23948R**	**23948RK**	252	265	308	298	2	0.17	3.95	5.88	3.86	14.0	13.5
	360	92	3	1 480	2 190	161	860	1 100	**23048RR**	**23048RRK**	254	276	346	327	2.5	0.25	2.73	4.07	2.67	33.9	32.9
	360	92	3	1 470	2 180	166	860	1 100	**23048RHA**	**23048RHAK**	254	275	346	327	2.5	0.24	2.83	4.21	2.77	31.9	30.9
	360	118	3	1 750	2 710	228	870	1 200	**24048RR**	**24048RRK30**	254	272	346	321	2.5	0.31	2.20	3.27	2.15	43.5	42.9
	360	118	3	1 750	2 840	215	870	1 200	**24048RHA**	**24048RHAK30**	254	269	346	321	2.5	0.30	2.24	3.33	2.19	39.6	39.0
	400	128	4	2 280	3 220	213	790	1 100	**23148RR**	**23148RRK**	258	287	382	353	3	0.32	2.11	3.14	2.06	67.2	65.1
	400	128	4	2 270	3 200	233	790	1 000	**23148RHA**	**23148RHAK**	258	286	382	353	3	0.31	2.19	3.25	2.14	63.1	61.1
	400	160	4	2 640	3 850	287	800	1 100	**24148RR**	**24148RRK30**	258	280	382	340	3	0.39	1.75	2.60	1.71	82.7	81.4
	400	160	4	2 670	4 130	262	800	1 100	**24148RHA**	**24148RHAK30**	258	278	382	340	3	0.39	1.72	2.56	1.68	76.6	75.3
	440	120	4	2 390	2 940	295	730	970	**22248R**	**22248RK**	258	299	422	384	3	0.29	2.35	3.50	2.30	85.0	83.2
	440	120	4	2 400	2 990	202	730	970	**22248RHA**	**22248RHAK**	258	299	422	384	3	0.27	2.49	3.71	2.43	79.4	77.6
	440	160	4	3 050	3 970	310	730	970	**23248RR**	**23248RRK**	258	295	422	376	3	0.38	1.78	2.64	1.74	110	107
	440	160	4	3 080	4 130	289	730	970	**23248RHA**	**23248RHAK**	258	295	422	376	3	0.36	1.87	2.78	1.83	104	101
	500	155	5	3 360	4 020	347	650	870	**22348R**	**22348RK**	262	320	478	420	4	0.35	1.94	2.89	1.90	157	154
	500	155	5	3 400	3 990	255	650	870	**22348RHA**	**22348RHAK**	262	315	478	426	4	0.32	2.12	3.16	2.07	145	142
260	360	75	2.1	1 140	1 880	160	820	1 100	**23952R**	**23952RK**	272	292	348	333	2	0.19	3.54	5.27	3.46	24.0	23.3
	400	104	4	1 670	2 570	212	760	1 000	**23052R**	**23052RK**	278	304	382	359	3	0.25	2.65	3.95	2.59	50.7	49.3
	400	104	4	1 850	2 720	201	760	1 000	**23052RHA**	**23052RHAK**	278	302	382	359	3	0.25	2.75	4.10	2.69	46.3	44.9
	400	140	4	2 280	3 570	282	770	1 000	**24052RR**	**24052RRK30**	278	296	382	352	3	0.33	2.02	3.01	1.98	66.3	65.2
	400	140	4	2 270	3 670	265	770	1 000	**24052RHA**	**24052RHAK30**	278	292	382	347	3	0.33	2.06	3.07	2.02	60.3	59.4
	440	144	4	2 760	3 850	231	710	940	**23152RR**	**23152RRK**	278	313	422	387	3	0.33	2.05	3.06	2.01	92.2	89.4
	440	144	4	2 790	4 000	285	700	930	**23152RHA**	**23152RHAK**	278	311	422	384	3	0.32	2.12	3.16	2.08	87.4	84.6
	440	180	4	3 250	4 700	345	720	950	**24152RR**	**24152RRK30**	278	304	422	374	3	0.40	1.69	2.51	1.65	114	112
	440	180	4	3 210	4 950	309	720	950	**24152RHA**	**24152RHAK30**	278	299	422	368	3	0.41	1.66	2.47	1.62	106	105
	480	130	5	2 800	3 460	347	650	870	**22252R**	**22252RK**	282	326	458	419	4	0.28	2.40	3.57	2.35	110	108
	480	130	5	2 790	3 430	226	650	870	**22252RHA**	**22252RHAK**	282	324	458	418	4	0.27	2.50	3.72	2.44	103	101
	480	174	5	3 440	4 640	326	640	860	**23252R**	**23252RK**	282	325	458	408	4	0.40	1.69	2.51	1.65	144	140

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

Spherical roller bearings

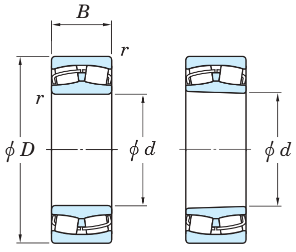
d (260) ~ (300) mm

R, RR



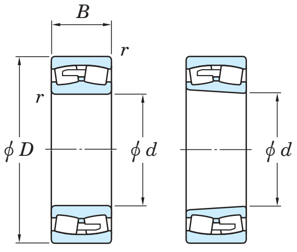
Cylindrical bore   Tapered bore

RZ

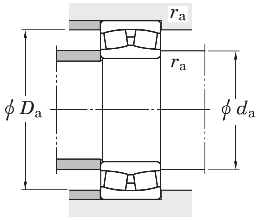


Cylindrical bore   Tapered bore

RHA



Cylindrical bore   Tapered bore



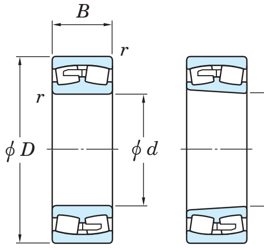
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Bearing No.		Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
260	480	174	5	3 590	4 900	280	650	860	**23252RHA**	**23252RHAK**	282	322	458	408	4	0.36	1.87	2.78	1.83	137	133
	540	165	6	3 540	4 380	363	590	780	**22352R**	**22352RK**	288	346	512	453	5	0.35	1.94	2.89	1.90	196	192
	540	165	6	3 900	4 620	290	580	780	**22352RHA**	**22352RHAK**	288	342	512	461	5	0.31	2.15	3.21	2.11	181	177
280	380	75	2.1	1 160	1 960	165	760	1 000	**23956R**	**23956RK**	292	312	368	353	2	0.18	3.74	5.57	3.66	26.0	25.2
	420	106	4	1 790	2 860	235	710	950	**23056R**	**23056RK**	298	322	402	377	3	0.25	2.74	4.08	2.68	54.5	52.9
	420	106	4	1 940	2 950	218	700	940	**23056RHA**	**23056RHAK**	298	322	402	380	3	0.24	2.87	4.27	2.80	49.8	48.2
	420	140	4	2 370	3 780	291	710	950	**24056RR**	**24056RRK30**	298	316	402	373	3	0.31	2.15	3.21	2.11	70.2	69.1
	420	140	4	2 390	4 000	287	710	950	**24056RHA**	**24056RHAK30**	298	314	402	372	3	0.31	2.20	3.28	2.15	64.0	62.9
	460	146	5	2 910	4 160	250	660	880	**23156RR**	**23156RRK**	302	332	438	407	4	0.32	2.14	3.18	2.09	98.8	95.7
	460	146	5	2 940	4 290	304	650	870	**23156RHA**	**23156RHAK**	302	331	438	406	4	0.30	2.22	3.30	2.17	93.4	90.3
	460	180	5	3 390	5 140	370	660	880	**24156RR**	**24156RRK30**	302	326	438	396	4	0.38	1.79	2.67	1.75	122	120
	460	180	5	3 320	5 240	322	660	880	**24156RHA**	**24156RHAK30**	302	321	438	390	4	0.38	1.76	2.62	1.72	113	112
	500	130	5	2 640	3 380	308	610	810	**22256R**	**22256RK**	302	347	478	438	4	0.28	2.42	3.60	2.37	114	112
	500	130	5	2 900	3 670	240	610	810	**22256RHA**	**22256RHAK**	302	346	478	440	4	0.26	2.64	3.93	2.58	106	104
	500	176	5	3 370	4 910	323	610	820	**23256R**	**23256RK**	302	345	478	421	4	0.37	1.83	2.72	1.79	153	149
	500	176	5	3 770	5 300	365	600	800	**23256RHA**	**23256RHAK**	302	343	478	430	4	0.35	1.95	2.91	1.91	145	141
	580	175	6	3 930	4 910	407	530	710	**22356R**	**22356RK**	308	372	552	486	5	0.34	1.98	2.95	1.93	229	225
	580	175	6	4 390	5 260	325	530	700	**22356RHA**	**22356RHAK**	308	367	552	495	5	0.31	2.19	3.25	2.14	212	208
300	420	90	3	1 610	2 610	220	680	910	**23960R**	**23960RK**	314	336	406	387	2.5	0.20	3.42	5.09	3.34	40.0	38.8
	460	118	4	2 190	3 480	286	630	840	**23060R**	**23060RK**	318	351	442	412	3	0.25	2.69	4.00	2.63	75.8	73.7
	460	118	4	2 370	3 700	255	630	840	**23060RHA**	**23060RHAK**	318	347	442	416	3	0.24	2.79	4.16	2.73	68.9	66.8
	460	160	4	2 950	4 690	354	640	850	**24060RR**	**24060RRK30**	318	342	442	406	3	0.33	2.04	3.04	2.00	99.5	97.9
	460	160	4	2 950	4 910	350	640	850	**24060RHA**	**24060RHAK30**	318	338	442	404	3	0.32	2.09	3.11	2.04	90.7	89.1
	500	160	5	3 450	5 030	351	590	790	**23160RR**	**23160RRK**	322	358	478	439	4	0.32	2.09	3.11	2.04	131	127
	500	160	5	3 430	4 970	345	580	780	**23160RHA**	**23160RHAK**	322	357	478	439	4	0.31	2.18	3.25	2.13	123	119
	500	200	5	4 160	6 280	433	590	790	**24160RR**	**24160RRK30**	322	349	478	425	4	0.40	1.67	2.49	1.63	162	160
	500	200	5	4 030	6 420	385	590	790	**24160RHA**	**24160RHAK30**	322	347	478	424	4	0.39	1.72	2.56	1.68	150	148
	540	140	5	3 360	4 330	412	550	740	**22260R**	**22260RK**	322	368	518	467	4	0.27	2.48	3.69	2.43	145	142
	540	140	5	3 320	4 360	284	550	740	**22260RHA**	**22260RHAK**	322	370	518	467	4	0.26	2.62	3.90	2.56	135	132

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

Spherical roller bearings

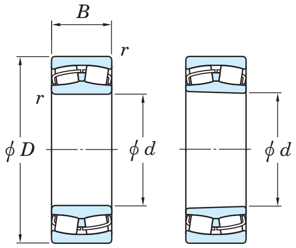
d (300) ~ (360) mm

R, RR



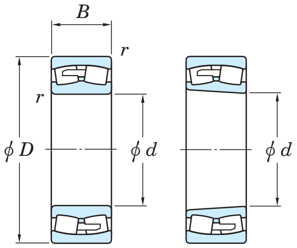
Cylindrical bore   Tapered bore

RZ

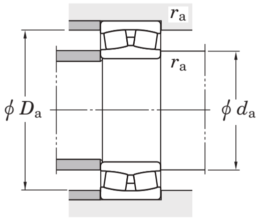


Cylindrical bore   Tapered bore

RHA



Cylindrical bore   Tapered bore



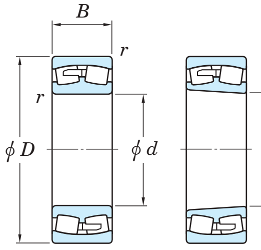
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
300	540	192	5	4 300	5 910	401	540	720	**23260R**	**23260RK**	322	370	518	464	4	0.37	1.83	2.72	1.79	197	192
	540	192	5	4 440	6 310	429	540	720	**23260RHA**	**23260RHAK**	322	371	518	464	4	0.35	1.93	2.88	1.89	187	182
	620	185	7.5	4 890	5 430	555	470	630	**22360R**	**22360RK**	336	390	584	547	6	0.32	2.09	3.10	2.04	289	284
320	440	90	3	1 670	2 870	233	630	840	**23964R**	**23964RK**	334	358	426	408	2.5	0.19	3.61	5.38	3.53	43.0	41.7
	480	121	4	2 290	3 740	295	590	790	**23064R**	**23064RK**	338	369	462	431	3	0.24	2.76	4.11	2.70	81.2	78.8
	480	121	4	2 490	3 850	278	590	780	**23064RHA**	**23064RHAK**	338	367	462	436	3	0.24	2.87	4.27	2.80	74.5	72.1
	480	160	4	3 020	4 920	382	590	790	**24064RR**	**24064RRK30**	338	363	462	427	3	0.31	2.16	3.22	2.11	105	103
	480	160	4	3 060	5 230	363	590	790	**24064RHA**	**24064RHAK30**	338	360	462	425	3	0.31	2.21	3.29	2.16	93.4	91.4
	540	176	5	3 650	5 700	366	530	700	**23164R**	**23164RK**	342	389	518	467	4	0.33	2.04	3.04	2.00	171	166
	540	176	5	4 040	5 960	404	530	700	**23164RHA**	**23164RHAK**	342	383	518	472	4	0.32	2.13	3.17	2.08	160	155
	540	218	5	4 680	6 950	486	530	710	**24164RR**	**24164RRK30**	342	373	518	460	4	0.39	1.72	2.56	1.68	208	205
	540	218	5	4 550	7 190	429	530	710	**24164RHA**	**24164RHAK30**	342	371	518	458	4	0.40	1.70	2.52	1.66	199	196
	580	150	5	3 420	4 540	385	490	660	**22264R**	**22264RK**	342	402	558	504	4	0.28	2.41	3.59	2.35	175	171
	580	208	5	4 550	6 550	496	500	670	**23264R**	**23264RK**	342	394	558	488	4	0.38	1.76	2.62	1.72	249	242
	580	208	5	5 020	7 030	464	490	650	**23264RHA**	**23264RHAK**	342	392	558	495	4	0.36	1.90	2.83	1.86	236	229
340	460	90	3	1 680	2 980	242	590	790	**23968R**	**23968RK**	354	377	446	426	2.5	0.18	3.82	5.69	3.74	45.0	43.6
	520	133	5	2 670	4 330	353	530	710	**23068R**	**23068RK**	362	397	498	465	4	0.25	2.69	4.00	2.63	108	105
	520	133	5	2 930	4 470	312	530	710	**23068RHA**	**23068RHAK**	362	393	498	468	4	0.24	2.80	4.18	2.74	98.7	95.7
	520	180	5	3 680	5 970	432	530	710	**24068RR**	**24068RRK30**	362	387	498	460	4	0.33	2.06	3.06	2.01	142	140
	520	180	5	3 720	6 330	430	530	710	**24068RHA**	**24068RHAK30**	362	385	498	459	4	0.32	2.11	3.14	2.06	130	128
	580	190	5	4 130	6 430	472	480	640	**23168R**	**23168RK**	362	413	558	497	4	0.34	1.97	2.93	1.93	216	210
	580	190	5	4 620	6 720	449	480	640	**23168RHA**	**23168RHAK**	362	407	558	503	4	0.32	2.11	3.14	2.06	202	196
	580	243	5	5 570	8 400	564	490	650	**24168RR**	**24168RRK30**	362	396	558	490	4	0.41	1.64	2.45	1.61	270	266
	580	243	5	5 490	8 810	449	490	650	**24168RHA**	**24168RHAK30**	362	390	558	482	4	0.42	1.61	2.39	1.57	259	255
	620	165	6	4 430	5 430	551	440	590	**22268R**	**22268RK**	368	424	592	551	5	0.28	2.43	3.61	2.37	221	216
	620	224	6	5 130	7 560	526	450	600	**23268R**	**23268RK**	368	423	592	521	5	0.38	1.77	2.63	1.73	306	297
	620	224	6	5 690	8 030	517	440	590	**23268RHA**	**23268RHAK**	368	418	592	532	5	0.36	1.88	2.81	1.84	290	281
360	480	90	3	1 710	3 060	248	550	730	**23972R**	**23972RK**	374	399	466	447	2.5	0.17	3.95	5.88	3.86	46.5	45.0

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

Spherical roller bearings

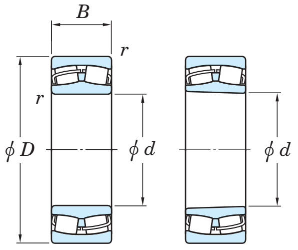
d (360) ~ (400) mm

R, RR



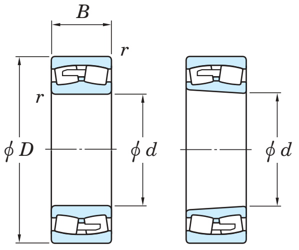
Cylindrical bore Tapered bore

RZ

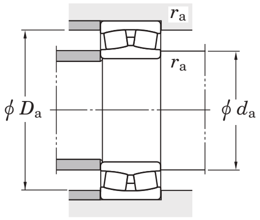


Cylindrical bore Tapered bore

RHA



Cylindrical bore Tapered bore

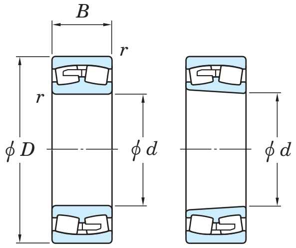


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	(kN) C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
360	540	134	5	2 860	4 800	375	500	660	**23072R**	**23072RK**	382	416	518	484	4	0.24	2.76	4.11	2.70	115	111
	540	134	5	3 040	4 770	334	500	660	**23072RHA**	**23072RHAK**	382	414	518	489	4	0.23	2.92	4.34	2.85	105	101
	540	180	5	3 810	6 300	465	500	660	**24072RR**	**24072RRK30**	382	407	518	481	4	0.31	2.15	3.21	2.11	149	147
	540	180	5	3 810	6 620	446	500	660	**24072RHA**	**24072RHAK30**	382	406	518	480	4	0.30	2.22	3.30	2.17	135	133
	600	192	5	4 740	7 040	459	440	590	**23172R**	**23172RK**	382	431	578	527	4	0.33	2.07	3.09	2.03	228	221
	600	192	5	4 830	7 210	474	450	590	**23172RHA**	**23172RHAK**	382	429	578	527	4	0.31	2.19	3.25	2.14	213	206
	600	243	5	5 080	7 690	437	450	600	**24172R**	**24172RK30**	382	420	578	512	4	0.39	1.74	2.59	1.70	287	283
	600	243	5	5 580	9 180	517	460	610	**24172RHA**	**24172RHAK30**	382	413	578	505	4	0.40	1.69	2.51	1.65	274	270
	650	170	6	4 710	5 830	583	410	550	**22272R**	**22272RK**	388	447	622	579	5	0.27	2.47	3.68	2.42	248	243
	650	232	6	6 080	8 810	548	410	540	**23272R**	**23272RK**	388	446	622	555	5	0.37	1.83	2.72	1.79	346	336
	650	232	6	6 220	9 050	591	410	550	**23272RHA**	**23272RHAK**	388	442	622	558	5	0.35	1.92	2.85	1.87	328	318
380	520	106	4	2 220	3 940	295	500	660	**23976R**	**23976RK**	398	425	502	481	3	0.19	3.62	5.39	3.54	70.0	67.9
	560	135	5	2 910	4 970	355	470	630	**23076R**	**23076RK**	402	433	538	503	4	0.24	2.79	4.16	2.73	122	118
	560	135	5	3 160	5 080	354	460	620	**23076RHA**	**23076RHAK**	402	434	538	512	4	0.22	3.03	4.51	2.96	112	108
	560	180	5	3 900	6 590	486	470	620	**24076RR**	**24076RRK30**	402	428	538	502	4	0.30	2.26	3.36	2.21	156	154
	560	180	5	3 900	6 910	454	470	620	**24076RHA**	**24076RHAK30**	402	426	538	502	4	0.29	2.32	3.45	2.27	142	139
	620	194	5	4 520	7 320	442	420	560	**23176R**	**23176RK**	402	454	598	540	4	0.31	2.18	3.24	2.13	240	233
	620	194	5	5 030	7 700	503	420	560	**23176RHA**	**23176RHAK**	402	450	598	547	4	0.30	2.26	3.36	2.21	224	217
	620	243	5	5 300	8 220	467	430	570	**24176R**	**24176RK30**	402	439	598	529	4	0.38	1.78	2.65	1.74	302	297
	620	243	5	5 870	9 840	561	420	560	**24176RHA**	**24176RHAK30**	402	438	598	534	4	0.38	1.78	2.65	1.74	288	283
	680	240	6	6 510	9 500	590	380	500	**23276R**	**23276RK**	408	469	652	583	5	0.36	1.85	2.76	1.81	386	375
	680	240	6	6 660	9 760	622	380	510	**23276RHA**	**23276RHAK**	408	466	652	586	5	0.35	1.94	2.89	1.90	365	354
400	540	106	4	2 350	4 300	320	470	620	**23980R**	**23980RK**	418	443	522	500	3	0.18	3.76	5.59	3.67	73.0	70.7
	600	148	5	3 390	5 790	408	420	560	**23080R**	**23080RK**	422	462	578	540	4	0.24	2.84	4.23	2.78	155	151
	600	148	5	3 690	5 860	398	420	560	**23080RHA**	**23080RHAK**	422	460	578	543	4	0.23	2.94	4.37	2.87	142	138
	600	200	5	4 820	8 110	444	430	570	**24080R**	**24080RK30**	422	450	578	531	4	0.32	2.09	3.12	2.05	206	203
	600	200	5	4 620	8 140	535	420	570	**24080RHA**	**24080RHAK30**	422	450	578	534	4	0.31	2.21	3.29	2.16	192	189
	650	200	6	4 730	7 780	521	390	520	**23180R**	**23180RK**	428	476	622	564	5	0.31	2.19	3.25	2.14	273	265

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

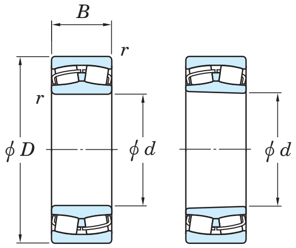
Spherical roller bearings

d (400) ~ (460) mm


R, RR

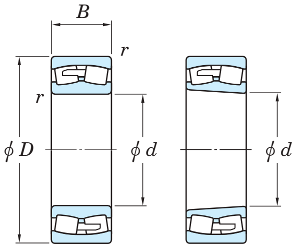
Cylindrical bore

Tapered bore


RZ

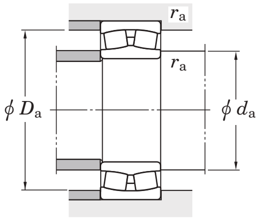
Cylindrical bore

Tapered bore


RHA

Cylindrical bore

Tapered bore



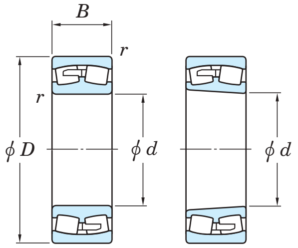
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.		Mounting dimensions (mm)					Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
400	650	200	6	5 410	8 300	542	390	520	**23180RHA**	**23180RHAK**	428	473	622	574	5	0.29	2.30	3.43	2.25	255	247
	650	250	6	5 840	9 140	499	390	530	**24180R**	**24180RK30**	428	461	622	558	5	0.37	1.82	2.70	1.78	338	333
	650	250	6	6 290	10 600	600	390	520	**24180RHA**	**24180RHAK30**	428	462	622	558	5	0.37	1.82	2.71	1.78	322	317
	720	256	6	6 540	9 850	590	350	470	**23280R**	**23280RK**	428	496	692	605	5	0.37	1.80	2.69	1.76	468	454
	720	256	6	7 320	10 600	665	350	460	**23280RHA**	**23280RHAK**	428	489	692	619	5	0.35	1.92	2.86	1.88	441	427
420	560	106	4	2 330	4 320	331	430	580	**23984R**	**23984RK**	438	465	542	522	3	0.17	3.91	5.82	3.82	76.0	73.6
	620	150	5	3 500	6 120	412	400	530	**23084R**	**23084RK**	442	483	598	560	4	0.23	2.90	4.31	2.83	164	159
	620	150	5	3 820	6 230	425	400	530	**23084RHA**	**23084RHAK**	442	480	598	563	4	0.22	3.02	4.49	2.95	150	145
	620	200	5	4 510	7 600	438	400	530	**24084R**	**24084RK30**	442	471	598	554	4	0.30	2.23	3.32	2.18	212	209
	620	200	5	4 730	8 490	555	400	530	**24084RHA**	**24084RHAK30**	442	471	598	554	4	0.29	2.31	3.44	2.26	198	195
	700	224	6	5 620	9 110	583	350	470	**23184R**	**23184RK**	448	506	672	604	5	0.33	2.03	3.02	1.98	363	352
	700	224	6	6 330	9 630	616	350	470	**23184RHA**	**23184RHAK**	448	500	672	615	5	0.31	2.19	3.25	2.14	339	328
	700	280	6	6 840	10 600	574	360	480	**24184R**	**24184RK30**	448	486	672	593	5	0.40	1.71	2.54	1.67	445	438
	700	280	6	7 420	12 400	685	350	470	**24184RHA**	**24184RHAK30**	448	486	672	596	5	0.39	1.72	2.56	1.68	425	418
	760	272	7.5	8 130	11 500	754	320	430	**23284R**	**23284RK**	456	514	724	652	6	0.37	1.84	2.74	1.80	556	540
	760	272	7.5	8 230	11 900	735	320	430	**23284RHA**	**23284RHAK**	456	512	724	652	6	0.36	1.90	2.83	1.86	525	508
440	600	118	4	2 910	5 330	387	400	530	**23988R**	**23988RK**	458	490	582	554	3	0.18	3.75	5.58	3.66	101	97.8
	650	157	6	3 790	6 540	455	370	500	**23088R**	**23088RK**	468	501	622	584	5	0.24	2.76	4.11	2.70	188	183
	650	157	6	4 230	6 910	465	370	490	**23088RHA**	**23088RHAK**	468	504	622	591	5	0.22	3.04	4.53	2.97	172	167
	650	212	6	4 910	8 320	475	370	490	**24088R**	**24088RK30**	468	494	622	579	5	0.29	2.35	3.50	2.30	247	243
	650	212	6	5 290	9 560	618	370	490	**24088RHA**	**24088RHAK30**	468	492	622	575	5	0.30	2.28	3.39	2.23	231	227
	720	226	6	5 800	9 600	591	330	440	**23188R**	**23188RK**	468	526	692	625	5	0.33	2.08	3.09	2.03	378	366
	720	226	6	6 590	10 300	655	330	440	**23188RHA**	**23188RHAK**	468	521	692	636	5	0.30	2.25	3.34	2.20	353	341
	720	280	6	7 080	11 200	589	340	450	**24188R**	**24188RK30**	468	507	692	615	5	0.38	1.76	2.62	1.72	460	453
	720	280	6	7 540	12 900	707	330	440	**24188RHA**	**24188RHAK30**	468	509	692	616	5	0.38	1.79	2.67	1.75	439	432
	790	280	7.5	8 580	12 300	793	300	400	**23288R**	**23288RK**	476	540	754	684	6	0.36	1.86	2.77	1.82	613	595
	790	280	7.5	8 670	12 700	776	300	390	**23288RHA**	**23288RHAK**	476	539	754	682	6	0.35	1.93	2.88	1.89	580	562
460	600	90	3	1 800	3 660	306	350	460	**23896R**	**23896RK**	476	519	586	568	2.5	0.13	5.06	7.53	4.95	60.4	58.4

[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

Spherical roller bearings

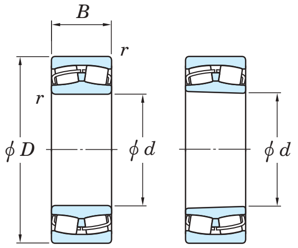
d (460) ~ 500 mm

R, RR



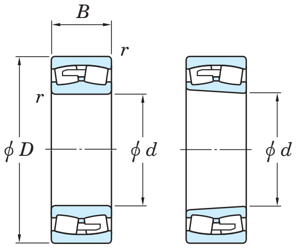
Cylindrical bore　Tapered bore

RZ

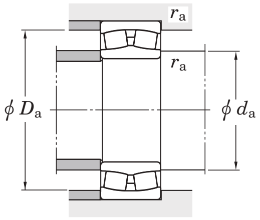


Cylindrical bore　Tapered bore

RHA



Cylindrical bore　Tapered bore

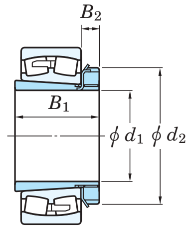


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Bearing No.		Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
460	620	118	4	2 890	5 350	404	370	500	**23992R**	**23992RK**	478	512	602	577	3	0.17	3.89	5.79	3.80	107	104
	680	163	6	4 060	7 170	480	340	460	**23092R**	**23092RK**	488	529	652	613	5	0.23	2.92	4.34	2.85	215	209
	680	163	6	4 520	7 430	497	340	460	**23092RHA**	**23092RHAK**	488	527	652	618	5	0.22	3.04	4.53	2.97	197	191
	680	218	6	5 740	10 100	536	340	460	**24092R**	**24092RK30**	488	519	652	607	5	0.30	2.23	3.32	2.18	277	272
	680	218	6	5 660	10 300	656	340	460	**24092RHA**	**24092RHAK30**	488	518	652	604	5	0.29	2.33	3.46	2.27	259	254
	760	240	7.5	6 510	10 800	648	310	410	**23192R**	**23192RK**	496	552	724	656	6	0.33	2.07	3.09	2.03	450	436
	760	240	7.5	7 240	11 200	697	300	400	**23192RHA**	**23192RHAK**	496	546	724	669	6	0.30	2.22	3.31	2.17	420	406
	760	300	7.5	7 320	12 200	597	310	410	**24192R**	**24192RK30**	496	537	724	647	6	0.35	1.95	2.90	1.91	550	541
	760	300	7.5	8 390	14 200	746	310	410	**24192RHA**	**24192RHAK30**	496	535	724	651	6	0.38	1.75	2.61	1.72	525	516
	830	296	7.5	9 520	13 700	867	270	370	**23292R**	**23292RK**	496	567	794	718	6	0.36	1.85	2.76	1.81	720	699
	830	296	7.5	9 600	14 200	856	270	360	**23292RHA**	**23292RHAK**	496	564	794	714	6	0.35	1.92	2.85	1.87	679	658
480	650	128	5	3 290	6 130	446	350	460	**23996R**	**23996RK**	502	534	628	603	4	0.18	3.75	5.59	3.67	123	119
	700	165	6	4 190	7 540	505	320	430	**23096R**	**23096RK**	508	549	672	633	5	0.22	3.01	4.47	2.94	225	218
	700	165	6	4 670	7 860	532	320	430	**23096RHA**	**23096RHAK**	508	548	672	639	5	0.22	3.12	4.64	3.05	206	199
	700	218	6	5 540	9 650	514	320	430	**24096R**	**24096RK30**	508	539	672	626	5	0.29	2.32	3.45	2.26	287	282
	700	218	6	5 800	10 700	492	320	430	**24096RHA**	**24096RHAK30**	508	537	672	626	5	0.28	2.41	3.59	2.35	268	263
	790	248	7.5	6 840	11 500	698	280	380	**23196R**	**23196RK**	516	579	754	685	6	0.32	2.09	3.12	2.05	503	488
	790	248	7.5	7 740	12 000	638	280	380	**23196RHA**	**23196RHAK**	516	570	754	697	6	0.30	2.24	3.34	2.19	470	455
	790	308	7.5	8 730	14 800	707	280	380	**24196R**	**24196RK30**	516	560	754	678	6	0.39	1.74	2.59	1.70	606	597
	790	308	7.5	9 880	15 900	792	290	380	**24196RHA**	**24196RHAK30**	516	553	754	684	6	0.38	1.78	2.65	1.74	580	568
	870	310	7.5	10 500	15 100	953	250	340	**23296R**	**23296RK**	516	588	834	745	6	0.36	1.85	2.75	1.81	831	807
	870	310	7.5	10 600	15 700	791	250	340	**23296RHA**	**23296RHAK**	516	589	834	748	6	0.35	1.91	2.85	1.87	785	761
500	670	128	5	3 330	6 310	447	330	440	**239/500R**	**239/500RK**	522	553	648	622	4	0.17	3.87	5.76	3.79	131	127
	720	167	6	4 490	8 090	561	310	410	**230/500R**	**230/500RK**	528	568	692	656	5	0.23	2.94	4.37	2.87	235	228
	720	218	6	5 620	10 300	545	310	410	**240/500R**	**240/500RK30**	528	561	692	647	5	0.28	2.39	3.56	2.34	297	292
	830	264	7.5	7 750	13 000	708	260	350	**231/500R**	**231/500RK**	536	601	794	714	6	0.33	2.05	3.05	2.00	595	577
	830	325	7.5	9 350	15 900	763	260	350	**241/500R**	**241/500RK30**	536	591	794	712	6	0.36	1.85	2.76	1.81	712	701
	920	336	7.5	11 000	16 700	908	230	310	**232/500R**	**232/500RK**	536	622	884	774	6	0.39	1.74	2.59	1.70	1 020	992

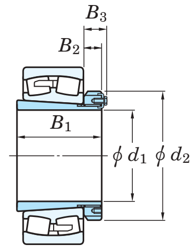
[Remark] Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

Adapter assemblies for spherical roller bearings

d_1 20 ~ 65 mm



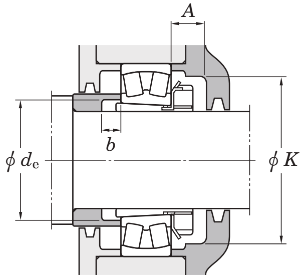
$d_1 \leq 180$ mm



$d_1 \geq 200$ mm

Boundary dimensions (mm)					Brg. bore	Designations	Mounting dimensions (mm)				Mass	(Refer.)	
d_1	B_1	d_2	B_2	B_3	d (mm)	Bearing + adapter ass'y	A min.	K min.	d_e min.	b min.	Brg.+adapter ass'y (kg)	Adapter sleeve No.	Locknut No.
20	29	38	8	—	25	22205RZK+**H305X**	15	45	29	5	0.269	A305X	AN05
25	31	45	8	—	30	22206RZK+**H306X**	15	50	34	5	0.404	A306X	AN06
	31	45	8	—	30	21306RZK+**H306X**	15	50	34	6	0.538	A306X	AN06
30	35	52	9	—	35	22207RZK+**H307X**	17	58	39	5	0.610	A307X	AN07
	35	52	9	—	35	21307RZK+**H307X**	17	58	39	7	0.725	A307X	AN07
35	36	58	10	—	40	22208RZK+**H308X**	17	65	44	5	0.793	A308X	AN08
	36	58	10	—	40	21308RZK+**H308X**	17	65	44	5	0.972	A308X	AN08
	46	58	10	—	40	22308RZK+**H2308X**	17	65	45	5	1.30	A2308X	AN08
40	39	65	11	—	45	22209RZK+**H309X**	17	72	49	8	0.855	A309X	AN09
	39	65	11	—	45	21309RZK+**H309X**	17	72	49	5	1.31	A309X	AN09
	50	65	11	—	45	22309RZK+**H2309X**	17	72	50	5	1.70	A2309X	AN09
45	42	70	12	—	50	22210RZK+**H310X**	19	76	54	10	0.953	A310X	AN10
	42	70	12	—	50	21310RZK+**H310X**	19	76	54	5	1.67	A310X	AN10
	55	70	12	—	50	22310RZK+**H2310X**	19	76	56	5	2.26	A2310X	AN10
50	45	75	12	—	55	22211RZK+**H311X**	19	85	60	11	1.22	A311X	AN11
	45	75	12	—	55	21311RZK+**H311X**	19	85	60	6	2.04	A311X	AN11
	59	75	12	—	55	22311RZK+**H2311X**	19	85	61	6	2.80	A2311X	AN11
55	47	80	13	—	60	22212RZK+**H312X**	20	90	65	9	1.59	A312X	AN12
	47	80	13	—	60	21312RZK+**H312X**	20	90	65	5	2.50	A312X	AN12
	62	80	13	—	60	22312RZK+**H2312X**	20	90	66	5	3.50	A2312X	AN12
60	50	85	14	—	65	22213RZK+**H313X**	21	96	70	8	2.01	A313X	AN13
	50	85	14	—	65	21313RZK+**H313X**	21	96	70	5	3.07	A313X	AN13
	65	85	14	—	65	22313RZK+**H2313X**	21	96	72	5	4.17	A2313X	AN13
65	55	98	15	—	75	22215RZK+**H315X**	23	110	80	12	2.58	A315X	AN15
	55	98	15	—	75	21315RZK+**H315X**	23	110	80	5	4.65	A315X	AN15
	73	98	15	—	75	22315RZK+**H2315X**	23	110	82	5	6.44	A2315X	AN15

d_1 70 ~ 110 mm

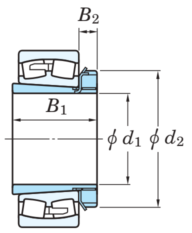


Boundary dimensions (mm)					Brg. bore	Designations	Mounting dimensions (mm)				Mass	(Refer.)	
d_1	B_1	d_2	B_2	B_3	d (mm)	Bearing + adapter ass'y	A min.	K min.	d_e min.	b min.	Brg.+adapter ass'y (kg)	Adapter sleeve No.	Locknut No.
70	59	105	17	—	80	22216RZK+**H316X**	25	120	86	12	3.22	A316X	AN16
	59	105	17	—	80	21316RZK+**H316X**	25	120	86	5	5.56	A316X	AN16
	78	105	17	—	80	22316RZK+**H2316X**	25	120	87	5	7.64	A2316X	AN16
75	63	110	18	—	85	22217RZK+**H317X**	27	128	91	12	3.93	A317X	AN17
	63	110	18	—	85	21317RZK+**H317X**	27	128	91	6	6.49	A317X	AN17
	82	110	18	—	85	22317RZK+**H2317X**	27	128	94	6	8.83	A2317X	AN17
80	65	120	18	—	90	22218RZK+**H318X**	28	139	96	10	4.88	A318X	AN18
	86	120	18	—	90	23218RZK+**H2318X**	28	139	99	18	6.20	A2318X	AN18
	65	120	18	—	90	21318RZK+**H318X**	28	139	96	6	7.56	A318X	AN18
	86	120	18	—	90	22318RZK+**H2318X**	28	139	99	6	10.3	A2318X	AN18
85	68	125	19	—	95	22219RZK+**H319X**	29	145	102	9	5.77	A319X	AN19
	68	125	19	—	95	21319RZK+**H319X**	29	145	102	7	8.68	A319X	AN19
	90	125	19	—	95	22319RZK+**H2319X**	29	145	105	7	12.0	A2319X	AN19
90	71	130	20	—	100	22220RZK+**H320X**	30	150	107	8	6.80	A320X	AN20
	97	130	20	—	100	23220RZK+**H2320X**	30	150	110	19	8.94	A2320X	AN20
	71	130	20	—	100	21320RZK+**H320X**	30	150	107	7	10.5	A320X	AN20
	97	130	20	—	100	22320RZK+**H2320X**	30	150	110	7	15.2	A2320X	AN20
100	81	145	21	—	110	23122RZK+**H3122X**	32	170	117	7	7.91	A3122X	AN22
	77	145	21	—	110	22222RZK+**H322X**	32	170	117	6	9.50	A322X	AN22
	105	145	21	—	110	23222RZK+**H2322X**	32	170	121	17	12.4	A2322X	AN22
	77	145	21	—	110	21322RZK+**H322X**	32	170	117	9	14.0	A322X	AN22
	105	145	21	—	110	22322RZK+**H2322X**	32	170	121	7	20.6	A2322X	AN22
110	72	145	22	—	120	23024RZK+**H3024X**	33	180	127	7	6.12	A3024	ANL24
	88	155	22	—	120	23124RZK+**H3124X**	33	180	128	7	10.5	A3124	AN24
	88	155	22	—	120	22224RZK+**H3124X**	33	180	128	11	11.9	A3124	AN24
	112	155	22	—	120	23224RZK+**H2324X**	33	180	131	17	15.1	A2324	AN24
	112	155	22	—	120	22324RZK+**H2324X**	33	180	131	7	25.6	A2324	AN24

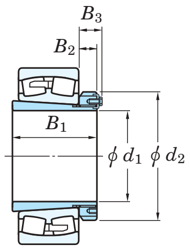
Adapter assemblies for spherical roller bearings

Koyo

d_1 115 ~ (150) mm



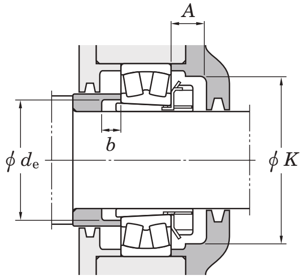
$d_1 \leq 180$ mm



$d_1 \geq 200$ mm

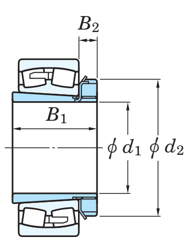
Boundary dimensions (mm)					Brg. bore	Designations	Mounting dimensions (mm)				Mass	(Refer.)	
d_1	B_1	d_2	B_2	B_3	d (mm)	Bearing + **adapter ass'y**	A min.	K min.	d_e min.	b min.	Brg.+adapter ass'y (kg)	Adapter sleeve No.	Locknut No.
115	80	155	23	—	130	23026RZK+**H3026**	34	190	137	8	9.01	A3026	ANL26
	92	165	23	—	130	23126RZK+**H3126**	34	190	138	8	12.3	A3126	AN26
	92	165	23	—	130	22226RZK+**H3126**	34	190	138	8	15.1	A3126	AN26
	121	165	23	—	130	23226RZK+**H2326**	34	190	142	21	18.8	A2326	AN26
	121	165	23	—	130	22326RZK+**H2326**	34	190	142	8	32.7	A2326	AN26
125	82	165	24	—	140	23028RZK+**H3028**	36	205	147	8	9.79	A3028	ANL28
	97	180	24	—	140	23128RZK+**H3128**	36	205	149	8	14.9	A3128	AN28
	97	180	24	—	140	22228RZK+**H3128**	36	205	149	8	18.8	A3128	AN28
	131	180	24	—	140	23228RZK+**H2328**	36	205	152	22	24.3	A2328	AN28
	131	180	24	—	140	22328RZK+**H2328**	36	205	152	8	40.8	A2328	AN28
135	87	180	26	—	150	23030RZK+**H3030**	37	220	158	8	11.9	A3030	ANL30
	111	195	26	—	150	23130RZK+**H3130**	37	220	160	8	21.7	A3130	AN30
	111	195	26	—	150	22230RZK+**H3130**	37	220	160	15	24.3	A3130	AN30
	139	195	26	—	150	23230RZK+**H2330**	37	220	163	20	30.8	A2330	AN30
	139	195	26	—	150	22330RK+**H2330**	37	220	163	8	49.7	A2330	AN30
	139	195	26	—	150	22330RHAK+**H2330**	37	220	163	8	46.4	A2330	AN30
140	93	190	28	—	160	23032RZK+**H3032**	39	230	168	8	15.0	A3032	ANL32
	119	210	28	—	160	23132RZK+**H3132**	39	230	170	8	27.9	A3132	AN32
	119	210	28	—	160	22232RK+**H3132**	39	230	170	14	30.6	A3132	AN32
	119	210	28	—	160	22232RHAK+**H3132**	39	230	170	14	29.1	A3132	AN32
	147	210	28	—	160	23232RK+**H2332**	39	230	174	18	39.6	A2332	AN32
	147	210	28	—	160	23232RHAK+**H2332**	39	230	174	18	38.0	A2332	AN32
	147	210	28	—	160	22332RK+**H2332**	39	230	174	8	60.5	A2332	AN32
	147	210	28	—	160	22332RHAK+**H2332**	39	230	174	8	56.6	A2332	AN32
150	101	200	29	—	170	23034RZK+**H3034**	40	250	179	8	19.2	A3034	ANL34
	122	220	29	—	170	23134RZK+**H3134**	40	250	180	8	30.0	A3134	AN34
	122	220	29	—	170	22234RK+**H3134**	40	250	180	10	37.2	A3134	AN34
	122	220	29	—	170	22234RHAK+**H3134**	40	250	180	10	35.3	A3134	AN34

d_1 (150) ~ (180) mm

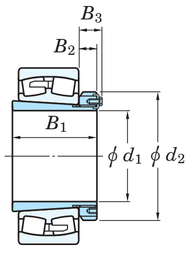


Boundary dimensions (mm)					Brg. bore	Designations	Mounting dimensions (mm)				Mass	(Refer.)	
d_1	B_1	d_2	B_2	B_3	d (mm)	Bearing + **adapter ass'y**	A min.	K min.	d_e min.	b min.	Brg.+adapter ass'y (kg)	Adapter sleeve No.	Locknut No.
150	154	220	29	—	170	23234RRK+**H2334**	40	250	185	18	47.2	A2334	AN34
	154	220	29	—	170	23234RHAK+**H2334**	40	250	185	18	45.3	A2334	AN34
	154	220	29	—	170	22334RK+**H2334**	40	250	185	8	71.5	A2334	AN34
	154	220	29	—	170	22334RHAK+**H2334**	40	250	185	8	66.8	A2334	AN34
160	109	210	30	—	180	23036RZK+**H3036**	41	260	189	8	24.2	A3036	ANL36
	131	230	30	—	180	23136RK+**H3136**	41	260	191	8	37.1	A3136	AN36
	131	230	30	—	180	23136RHAK+**H3136**	41	260	191	8	35.2	A3136	AN36
	131	230	30	—	180	22236RK+**H3136**	41	260	191	18	39.4	A3136	AN36
	131	230	30	—	180	22236RHAK+**H3136**	41	260	191	18	37.4	A3136	AN36
	161	230	30	—	180	23236RRK+**H2336**	41	260	195	22	50.5	A2336	AN36
	161	230	30	—	180	23236RHAK+**H2336**	41	260	195	22	48.4	A2336	AN36
	161	230	30	—	180	22336RK+**H2336**	41	260	195	8	81.8	A2336	AN36
	161	230	30	—	180	22336RHAK+**H2336**	41	260	195	8	76.4	A2336	AN36
170	112	220	31	—	190	23038RK+**H3038**	43	270	199	9	26.1	A3038	ANL38
	112	220	31	—	190	23038RHAK+**H3038**	43	270	199	9	24.5	A3038	ANL38
	141	240	31	—	190	23138RK+**H3138**	43	270	202	9	45.3	A3138	AN38
	141	240	31	—	190	23138RHAK+**H3138**	43	270	202	9	43.0	A3138	AN38
	141	240	31	—	190	22238RK+**H3138**	43	270	202	21	47.5	A3138	AN38
	141	240	31	—	190	22238RHAK+**H3138**	43	270	202	21	45.0	A3138	AN38
	169	240	31	—	190	23238RRK+**H2338**	43	270	206	21	59.2	A2338	AN38
	169	240	31	—	190	23238RHAK+**H2338**	43	270	206	21	56.7	A2338	AN38
	169	240	31	—	190	22338RK+**H2338**	43	270	206	9	95.6	A2338	AN38
	169	240	31	—	190	22338RHAK+**H2338**	43	270	206	9	89.2	A2338	AN38
180	120	240	32	—	200	23040RK+**H3040**	46	280	210	10	32.8	A3040	ANL40
	120	240	32	—	200	23040RHAK+**H3040**	46	280	210	10	30.7	A3040	ANL40
	150	250	32	—	200	23140RRK+**H3140**	46	280	212	10	54.7	A3140	AN40
	150	250	32	—	200	23140RHAK+**H3140**	46	280	212	10	51.8	A3140	AN40
	150	250	32	—	200	22240RRK+**H3140**	46	280	212	24	56.3	A3140	AN40

d_1 (180) ~ (240) mm



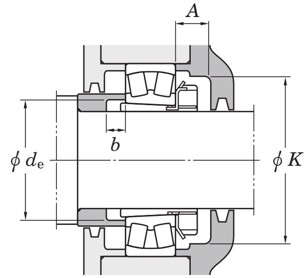
$d_1 \leq 180$ mm



$d_1 \geq 200$ mm

Boundary dimensions (mm)					**Brg. bore**	**Designations**	**Mounting dimensions** (mm)				**Mass**	(Refer.)	
d_1	B_1	d_2	B_2	B_3	d (mm)	Bearing + **adapter ass'y**	A min.	K min.	d_e min.	b min.	Brg.+adapter ass'y (kg)	Adapter sleeve No.	Locknut No.
180	150	250	32	—	200	22240RHAK+**H3140**	46	280	212	24	53.3	A3140	AN40
	176	250	32	—	200	23240RK+**H2340**	46	280	216	20	71.0	A2340	AN40
	176	250	32	—	200	23240RHAK+**H2340**	46	280	216	20	68.0	A2340	AN40
	176	250	32	—	200	22340RK+**H2340**	46	280	216	10	108	A2340	AN40
	176	250	32	—	200	22340RHAK+**H2340**	46	280	216	10	101	A2340	AN40
200	128	260	30	41	220	23044RK+**H3044**	—	—	231	12	41.4	A3044	ANL44
	128	260	30	41	220	23044RHAK+**H3044**	—	—	231	12	38.7	A3044	ANL44
	158	280	32	44	220	23144RK+**H3144**	—	—	233	10	68.4	A3144	AN44
	158	280	32	44	220	23144RHAK+**H3144**	—	—	233	10	64.8	A3144	AN44
	158	280	32	44	220	22244RRK+**H3144**	—	—	233	22	76.9	A3144	AN44
	158	280	32	44	220	22244RHAK+**H3144**	—	—	233	22	72.7	A3144	AN44
	183	280	32	44	220	23244RK+**H2344**	—	—	236	11	96.5	A2344	AN44
	183	280	32	44	220	23244RHAK+**H2344**	—	—	236	11	92.3	A2344	AN44
	183	280	32	44	220	22344RK+**H2344**	—	—	236	10	139	A2344	AN44
	183	280	32	44	220	22344RHAK+**H2344**	—	—	236	10	130	A2344	AN44
220	133	290	34	46	240	23048RRK+**H3048**	—	—	251	11	47.7	A3048	ANL48
	133	290	34	46	240	23048RHAK+**H3048**	—	—	251	11	44.8	A3048	ANL48
	169	300	34	46	240	23148RRK+**H3148**	—	—	254	11	83.6	A3148	AN48
	169	300	34	46	240	23148RHAK+**H3148**	—	—	254	11	79.1	A3148	AN48
	169	300	34	46	240	22248RK+**H3148**	—	—	254	19	101	A3148	AN48
	169	300	34	46	240	22248RHAK+**H3148**	—	—	254	19	95.6	A3148	AN48
	196	300	34	46	240	23248RRK+**H2348**	—	—	257	6	128	A2348	AN48
	196	300	34	46	240	23248RHAK+**H2348**	—	—	257	6	122	A2348	AN48
	196	300	34	46	240	22348RK+**H2348**	—	—	257	11	175	A2348	AN48
	196	300	34	46	240	22348RHAK+**H2348**	—	—	257	11	163	A2348	AN48
240	147	310	34	46	260	23052RK+**H3052**	—	—	272	13	65.4	A3052	ANL52
	147	310	34	46	260	23052RHAK+**H3052**	—	—	272	13	61.0	A3052	ANL52
	187	330	36	49	260	23152RRK+**H3152**	—	—	276	11	114	A3152	AN52

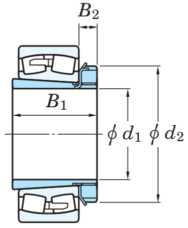
d_1 (240) ~ (300) mm



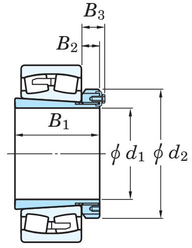
Boundary dimensions (mm)					**Brg. bore**	**Designations**	**Mounting dimensions** (mm)				**Mass**	(Refer.)	
d_1	B_1	d_2	B_2	B_3	d (mm)	Bearing + **adapter ass'y**	A min.	K min.	d_e min.	b min.	Brg.+adapter ass'y (kg)	Adapter sleeve No.	Locknut No.
240	187	330	36	49	260	23152RHAK+**H3152**	—	—	276	11	108	A3152	AN52
	187	330	36	49	260	22252RK+**H3152**	—	—	276	25	131	A3152	AN52
	187	330	36	49	260	22252RHAK+**H3152**	—	—	276	25	124	A3152	AN52
	208	330	36	49	260	23252RK+**H2352**	—	—	278	2	165	A2352	AN52
	208	330	36	49	260	23252RHAK+**H2352**	—	—	278	2	158	A2352	AN52
	208	330	36	49	260	22352RK+**H2352**	—	—	278	11	217	A2352	AN52
	208	330	36	49	260	22352RHAK+**H2352**	—	—	278	11	202	A2352	AN52
260	152	330	38	50	280	23056RK+**H3056**	—	—	292	12	71.5	A3056	ANL56
	152	330	38	50	280	23056RHAK+**H3056**	—	—	292	12	66.8	A3056	ANL56
	192	350	38	51	280	23156RRK+**H3156**	—	—	296	12	123	A3156	AN56
	192	350	38	51	280	23156RHAK+**H3156**	—	—	296	12	116	A3156	AN56
	192	350	38	51	280	22256RK+**H3156**	—	—	296	28	138	A3156	AN56
	192	350	38	51	280	22256RHAK+**H3156**	—	—	296	28	130	A3156	AN56
	221	350	38	51	280	23256RK+**H2356**	—	—	299	11	178	A2356	AN56
	221	350	38	51	280	23256RHAK+**H2356**	—	—	299	11	170	A2356	AN56
	221	350	38	51	280	22356RK+**H2356**	—	—	299	12	254	A2356	AN56
	221	350	38	51	280	22356RHAK+**H2356**	—	—	299	12	237	A2356	AN56
280	168	360	42	54	300	23060RK+**H3060**	—	—	313	12	97.7	A3060	ANL60
	168	360	42	54	300	23060RHAK+**H3060**	—	—	313	12	90.8	A3060	ANL60
	208	380	40	53	300	23160RRK+**H3160**	—	—	317	12	159	A3160	AN60
	208	380	40	53	300	23160RHAK+**H3160**	—	—	317	12	150	A3160	AN60
	208	380	40	53	300	22260RK+**H3160**	—	—	317	32	173	A3160	AN60
	208	380	40	53	300	22260RHAK+**H3160**	—	—	317	32	163	A3160	AN60
	240	380	40	53	300	23260RK+**H3260**	—	—	321	12	227	A3260	AN60
	240	380	40	53	300	23260RHAK+**H3260**	—	—	321	12	217	A3260	AN60
300	171	380	42	55	320	23064RK+**H3064**	—	—	334	13	105	A3064	ANL64
	171	380	42	55	320	23064RHAK+**H3064**	—	—	334	13	98.1	A3064	ANL64
	226	400	42	56	320	23164RK+**H3164**	—	—	339	13	202	A3164	AN64

Adapter assemblies for spherical roller bearings

d_1 (300) ~ 380 mm



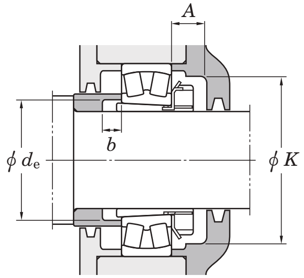
$d_1 \leq 180$ mm



$d_1 \geq 200$ mm

Boundary dimensions (mm)					Brg. bore d (mm)	Designations Bearing + **adapter ass'y**	Mounting dimensions (mm)				Mass Brg.+adapter ass'y (kg)	(Refer.)	
d_1	B_1	d_2	B_2	B_3			A min.	K min.	d_e min.	b min.		Adapter sleeve No.	Locknut No.
300	226	400	42	56	320	23164RHAK+**H3164**	—	—	339	13	191	A3164	AN64
	226	400	42	56	320	22264RK+**H3164**	—	—	339	39	207	A3164	AN64
	258	400	42	56	320	23264RK+**H3264**	—	—	343	13	283	A3264	AN64
	258	400	42	56	320	23264RHAK+**H3264**	—	—	343	13	270	A3264	AN64
320	187	400	45	58	340	23068RK+**H3068**	—	—	355	14	135	A3068	ANL68
	187	400	45	58	340	23068RHAK+**H3068**	—	—	355	14	126	A3068	ANL68
	254	440	55	72	340	23168RK+**H3168**	—	—	360	14	262	A3168	AN68
	254	440	55	72	340	23168RHAK+**H3168**	—	—	360	14	248	A3168	AN68
	288	440	55	72	340	23268RK+**H3268**	—	—	364	14	355	A3268	AN68
	288	440	55	72	340	23268RHAK+**H3268**	—	—	364	14	339	A3268	AN68
340	188	420	45	58	360	23072RK+**H3072**	—	—	375	14	143	A3072	ANL72
	188	420	45	58	360	23072RHAK+**H3072**	—	—	375	14	133	A3072	ANL72
	259	460	58	75	360	23172RK+**H3172**	—	—	380	14	278	A3172	AN72
	259	460	58	75	360	23172RHAK+**H3172**	—	—	380	14	263	A3172	AN72
	299	460	58	75	360	23272RK+**H3272**	—	—	385	14	400	A3272	AN72
	299	460	58	75	360	23272RHAK+**H3272**	—	—	385	14	382	A3272	AN72
360	193	450	48	62	380	23076RK+**H3076**	—	—	396	15	156	A3076	ANL76
	193	450	48	62	380	23076RHAK+**H3076**	—	—	396	15	146	A3076	ANL76
	264	490	60	77	380	23176RK+**H3176**	—	—	401	15	298	A3176	AN76
	264	490	60	77	380	23176RHAK+**H3176**	—	—	401	15	282	A3176	AN76
	310	490	60	77	380	23276RK+**H3276**	—	—	405	15	448	A3276	AN76
	310	490	60	77	380	23276RHAK+**H3276**	—	—	405	15	427	A3276	AN76
380	210	470	52	66	400	23080RK+**H3080**	—	—	417	15	195	A3080	ANL80
	210	470	52	66	400	23080RHAK+**H3080**	—	—	417	15	182	A3080	ANL80
	272	520	62	82	400	23180RK+**H3180**	—	—	421	15	339	A3180	AN80
	272	520	62	82	400	23180RHAK+**H3180**	—	—	421	15	321	A3180	AN80
	328	520	62	82	400	23280RK+**H3280**	—	—	427	15	539	A3280	AN80
	328	520	62	82	400	23280RHAK+**H3280**	—	—	427	15	512	A3280	AN80

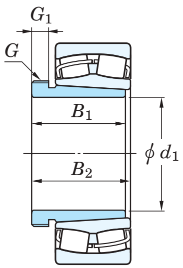
d_1 400 ~ 470 mm



Boundary dimensions (mm)					Brg. bore d (mm)	Designations Bearing + **adapter ass'y**	Mounting dimensions (mm)				Mass Brg.+adapter ass'y (kg)	(Refer.)	
d_1	B_1	d_2	B_2	B_3			A min.	K min.	d_e min.	b min.		Adapter sleeve No.	Locknut No.
400	212	490	52	66	420	23084RK+**H3084**	—	—	437	16	205	A3084	ANL84
	212	490	52	66	420	23084RHAK+**H3084**	—	—	437	16	191	A3084	ANL84
	304	540	70	90	420	23184RK+**H3184**	—	—	443	16	441	A3184	AN84
	304	540	70	90	420	23184RHAK+**H3184**	—	—	443	16	417	A3184	AN84
	352	540	70	90	420	23284RK+**H3284**	—	—	448	16	639	A3284	AN84
	352	540	70	90	420	23284RHAK+**H3284**	—	—	448	16	607	A3284	AN84
410	228	520	60	77	440	23088RK+**H3088**	—	—	458	17	252	A3088	ANL88
	228	520	60	77	440	23088RHAK+**H3088**	—	—	458	17	236	A3088	ANL88
	307	560	70	90	440	23188RK+**H3188**	—	—	464	17	474	A3188	AN88
	307	560	70	90	440	23188RHAK+**H3188**	—	—	464	17	449	A3188	AN88
	361	560	70	90	440	23288RK+**H3288**	—	—	469	17	718	A3288	AN88
	361	560	70	90	440	23288RHAK+**H3288**	—	—	469	17	685	A3288	AN88
430	234	540	60	77	460	23092RK+**H3092**	—	—	478	17	283	A3092	ANL92
	234	540	60	77	460	23092RHAK+**H3092**	—	—	478	17	265	A3092	ANL92
	326	580	75	95	460	23192RK+**H3192**	—	—	485	17	559	A3192	AN92
	326	580	75	95	460	23192RHAK+**H3192**	—	—	485	17	529	A3192	AN92
	382	580	75	95	460	23292RK+**H3292**	—	—	491	17	838	A3292	AN92
	382	580	75	95	460	23292RHAK+**H3292**	—	—	491	17	797	A3292	AN92
450	237	560	60	77	480	23096RK+**H3096**	—	—	499	18	295	A3096	ANL96
	237	560	60	77	480	23096RHAK+**H3096**	—	—	499	18	276	A3096	ANL96
	335	620	75	95	480	23196RK+**H3196**	—	—	505	18	628	A3196	AN96
	335	620	75	95	480	23196RHAK+**H3196**	—	—	505	18	595	A3196	AN96
	397	620	75	95	480	23296RK+**H3296**	—	—	512	18	966	A3296	AN96
	397	620	75	95	480	23296RHAK+**H3296**	—	—	512	18	920	A3296	AN96
470	247	580	68	85	500	230/500RK+**H30/500**	—	—	519	18	315	A30/500	ANL100
	356	630	80	100	500	231/500RK+**H31/500**	—	—	527	18	727	A31/500	AN100
	428	630	80	100	500	232/500RK+**H32/500**	—	—	534	18	1 167	A32/500	AN100

Withdrawal sleeves for spherical roller bearings

d_1 35 ~ (75) mm



Boundary dimensions (mm)					Brg. bore d (mm)	Designations Bearing + withdrawal sleeve	Mass Brg.+withdrawal sleeve (kg)	(Refer.) Applicable locknut No.
d_1	B_1	B_2	G 1) Screw size	G_1				
35	29	32	M45×1.5	6	40	22208RZK+**AH308**	0.681	AN09
	29	32	M45×1.5	6	40	21308RZK+**AH308**	0.860	AN09
	40	43	M45×1.5	7	40	22308RZK+**AH2308**	1.19	AN09
40	31	34	M50×1.5	6	45	22209RZK+**AH309**	0.699	AN10
	31	34	M50×1.5	6	45	21309RZK+**AH309**	1.14	AN10
	44	47	M50×1.5	7	45	22309RZK+**AH2309**	1.55	AN10
45	35	38	M55×2	7	50	22210RZK+**AHX310**	0.771	AN11
	35	38	M55×2	7	50	21310RZK+**AHX310**	1.49	AN11
	50	53	M55×2	9	50	22310RZK+**AHX2310**	2.09	AN11
50	37	40	M60×2	7	55	22211RZK+**AHX311**	1.01	AN12
	37	40	M60×2	7	55	21311RZK+**AHX311**	1.83	AN12
	54	57	M60×2	10	55	22311RZK+**AHX2311**	2.60	AN12
55	40	43	M65×2	8	60	22212RZK+**AHX312**	1.35	AN13
	40	43	M65×2	8	60	21312RZK+**AHX312**	2.27	AN13
	58	61	M65×2	11	60	22312RZK+**AHX2312**	3.29	AN13
60	42	45	M75×2	8	65	22213RZK+**AH313**	1.77	AN15
	42	45	M75×2	8	65	21313RZK+**AH313**	2.84	AN15
	61	64	M75×2	12	65	22313RZK+**AH2313**	3.98	AN15
65	43	47	M80×2	8	70	22214RZK+**AH314**	1.89	AN16
	43	47	M80×2	8	70	21314RZK+**AH314**	3.43	AN16
	64	68	M80×2	12	70	22314RZK+**AHX2314**	4.82	AN16
70	45	49	M85×2	8	75	22215RZK+**AH315**	2.01	AN17
	45	49	M85×2	8	75	21315RZK+**AH315**	4.07	AN17
	68	72	M85×2	12	75	22315RZK+**AHX2315**	5.87	AN17
75	48	52	M90×2	8	80	22216RZK+**AH316**	2.49	AN18
	48	52	M90×2	8	80	21316RZK+**AH316**	4.83	AN18

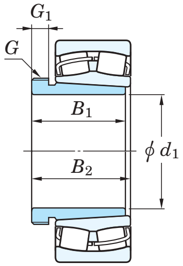
[Note] 1) Basic profile and dimensions of screw thread identified by prefix M are in accordance with JIS B 0205.
Basic profile and dimensions of screw thread identified by prefix Tr are in accordance with JIS B 0216.

d_1 (75) ~ (115) mm

Boundary dimensions (mm)					Brg. bore d (mm)	Designations Bearing + withdrawal sleeve	Mass Brg.+withdrawal sleeve (kg)	(Refer.) Applicable locknut No.
d_1	B_1	B_2	G 1) Screw size	G_1				
75	71	75	M90×2	12	80	22316RZK+**AHX2316**	6.90	AN18
80	52	56	M95×2	9	85	22217RZK+**AHX317**	3.12	AN19
	52	56	M95×2	9	85	21317RZK+**AHX317**	5.68	AN19
	74	78	M95×2	13	85	22317RZK+**AHX2317**	7.98	AN19
85	53	57	M100×2	9	90	22218RZK+**AHX318**	3.89	AN20
	63	67	M100×2	10	90	23218RZK+**AHX3218**	5.08	AN20
	53	57	M100×2	9	90	21318RZK+**AHX318**	6.58	AN20
	79	83	M100×2	14	90	22318RZK+**AHX2318**	9.41	AN20
90	57	61	M105×2	10	95	22219RZK+**AHX319**	4.68	AN21
	57	61	M105×2	10	95	21319RZK+**AHX319**	7.59	AN21
	85	89	M105×2	16	95	22319RZK+**AHX2319**	10.9	AN21
95	59	63	M110×2	10	100	22220RZK+**AHX320**	5.58	AN22
	73	77	M110×2	11	100	23220RZK+**AHX3220**	7.43	AN22
	59	63	M110×2	10	100	21320RZK+**AHX320**	9.26	AN22
	90	94	M110×2	16	100	22320RZK+**AHX2320**	13.9	AN22
105	68	72	M120×2	11	110	23122RZK+**AHX3122**	6.30	AN24
	82	91	M115×2	13	110	24122RZK30+**AH24122**	7.60	AN23
	68	72	M120×2	11	110	22222RZK+**AHX3122**	7.97	AN24
	82	86	M125×2	11	110	23222RZK+**AHX3222**	10.5	AN25
	63	67	M120×2	12	110	21322RZK+**AHX322**	12.3	AN24
	98	102	M125×2	16	110	22322RZK+**AHX2322**	19.1	AN25
115	60	64	M130×2	13	120	23024RZK+**AHX3024**	4.82	AN26
	73	82	M125×2	13	120	24024RZK30+**AH24024**	5.99	AN25
	75	79	M130×2	12	120	23124RZK+**AHX3124**	8.69	AN26
	93	102	M130×2	13	120	24124RZK30+**AH24124**	11.0	AN26
	75	79	M130×2	12	120	22224RZK+**AHX3124**	10.1	AN26

Withdrawal sleeves for spherical roller bearings

d_1 (115) ~ (150) mm



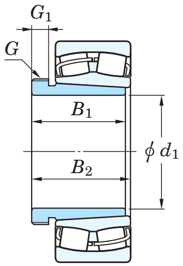
Boundary dimensions (mm)					Brg. bore	Designations	Mass	(Refer.)
d_1	B_1	B_2	G 1) Screw size	G_1	d (mm)	Bearing + withdrawal sleeve	Brg.+withdrawal sleeve (kg)	Applicable locknut No.
115	90	94	M135×2	13	120	23224RZK+**AHX3224**	13.1	AN27
	105	109	M135×2	17	120	22324RZK+**AHX2324**	23.9	AN27
125	67	71	M140×2	14	130	23026RZK+**AHX3026**	6.90	AN28
	83	93	M135×2	14	130	24026RZK30+**AH24026**	8.74	AN27
	78	82	M140×2	12	130	23126RZK+**AHX3126**	9.52	AN28
	94	104	M140×2	14	130	24126RZK30+**AH24126**	11.7	AN28
	78	82	M140×2	12	130	22226RZK+**AHX3126**	12.4	AN28
	98	102	M145×2	15	130	23226RZK+**AHX3226**	15.6	AN29
	115	119	M145×2	19	130	22326RZK+**AHX2326**	29.9	AN29
135	68	73	M150×2	14	140	23028RZK+**AHX3028**	7.43	AN30
	83	93	M145×2	14	140	24028RZK30+**AH24028**	9.26	AN29
	83	88	M150×2	14	140	23128RZK+**AHX3128**	11.5	AN30
	99	109	M150×2	14	140	24128RZK30+**AH24128**	14.1	AN30
	83	88	M150×2	14	140	22228RZK+**AHX3128**	15.4	AN30
	104	109	M155×3	15	140	23228RZK+**AHX3228**	20.3	AN31
	125	130	M155×3	20	140	22328RZK+**AHX2328**	35.0	AN31
145	72	77	M160×3	15	150	23030RZK+**AHX3030**	8.92	AN32
	90	101	M155×3	15	150	24030RZK30+**AH24030**	11.4	AN31
	96	101	M165×3	15	150	23130RZK+**AHX3130**	17.7	AN33
	115	126	M160×3	15	150	24130RZK30+**AH24130**	21.2	AN32
	96	101	M165×3	15	150	22230RZK+**AHX3130**	20.3	AN33
	114	119	M165×3	17	150	23230RZK+**AHX3230**	26.0	AN33
	135	140	M165×3	24	150	22330RK+**AHX2330**	45.5	AN33
	135	140	M165×3	24	150	22330RHAK+**AHX2330**	42.2	AN33
150	77	82	M170×3	16	160	23032RZK+**AH3032**	11.5	AN34
	95	106	M170×3	15	160	24032RZK30+**AH24032**	15.0	AN34
	103	108	M180×3	16	160	23132RZK+**AH3132**	23.4	AN36

[Note] 1) Basic profile and dimensions of screw thread identified by prefix M are in accordance with JIS B 0205.
Basic profile and dimensions of screw thread identified by prefix Tr are in accordance with JIS B 0216.

d_1 (150) ~ 170 mm

Boundary dimensions (mm)					Brg. bore	Designations	Mass	(Refer.)
d_1	B_1	B_2	G 1) Screw size	G_1	d (mm)	Bearing + withdrawal sleeve	Brg.+withdrawal sleeve (kg)	Applicable locknut No.
150	103	108	M180×3	16	160	22232RK+**AH3132**	26.1	AN36
	103	108	M180×3	16	160	22232RHAK+**AH3132**	24.6	AN36
	124	130	M180×3	20	160	23232RK+**AH3232**	35.1	AN36
	124	130	M180×3	20	160	23232RHAK+**AH3232**	32.6	AN36
	140	146	M180×3	24	160	22332RK+**AH2332**	55.7	AN36
	140	146	M180×3	24	160	22332RHAK+**AH2332**	51.8	AN36
160	85	90	M180×3	17	170	23034RZK+**AH3034**	15.2	AN36
	106	117	M180×3	16	170	24034RZK30+**AH24034**	20.0	AN36
	104	109	M190×3	16	170	23134RZK+**AH3134**	24.6	AN38
	125	136	M180×3	16	170	24134RRK30+**AH24134**	30.0	AN36
	104	109	M190×3	16	170	22234RK+**AH3134**	31.8	AN38
	104	109	M190×3	16	170	22234RHAK+**AH3134**	29.9	AN38
	134	140	M190×3	24	170	23234RRK+**AH3234**	42.3	AN38
	134	140	M190×3	24	170	23234RHAK+**AH3234**	39.4	AN38
	146	152	M190×3	24	170	22334RK+**AH2334**	66.1	AN38
	146	152	M190×3	24	170	22334RHAK+**AH2334**	61.4	AN38
170	92	98	M190×3	17	180	23036RZK+**AH3036**	19.7	AN38
	116	127	M190×3	16	180	24036RRK30+**AH24036**	26.1	AN38
	116	122	M200×3	19	180	23136RK+**AH3136**	31.7	AN40
	116	122	M200×3	19	180	23136RHAK+**AH3136**	29.8	AN40
	134	145	M190×3	16	180	24136RRK30+**AH24136**	37.6	AN38
	134	145	M190×3	16	180	24136RHAK30+**AH24136**	34.9	AN38
	105	110	M200×3	17	180	22236RK+**AH2236**	33.5	AN40
	105	110	M200×3	17	180	22236RHAK+**AH2236**	31.5	AN40
	140	146	M200×3	24	180	23236RRK+**AH3236**	45.1	AN40
	140	146	M200×3	24	180	23236RHAK+**AH3236**	41.8	AN40
	154	160	M200×3	24	180	22336RK+**AH2336**	75.7	AN40
	154	160	M200×3	24	180	22336RHAK+**AH2336**	70.3	AN40

d_1 180 ~ 190 mm



Boundary dimensions (mm) d_1	B_1	B_2	G 1) Screw size	G_1	Brg. bore d (mm)	Designations Bearing + withdrawal sleeve	Mass Brg.+withdrawal sleeve (kg)	(Refer.) Applicable locknut No.
180	96	102	Tr205×4	18	190	23038RK+**AH3038**	21.5	HNL41
	96	102	Tr205×4	18	190	23038RHAK+**AH3038**	19.9	HNL41
	118	131	M200×3	18	190	24038RRK30+**AH24038**	27.6	AN40
	118	131	M200×3	18	190	24038RHAK30+**AH24038**	25.5	AN40
	125	131	Tr210×4	20	190	23138RK+**AH3138**	39.3	HN42
	125	131	Tr210×4	20	190	23138RHAK+**AH3138**	37.0	HN42
	146	159	M200×3	18	190	24138RRK30+**AH24138**	46.7	AN40
	146	159	M200×3	18	190	24138RHAK30+**AH24138**	43.8	AN40
	112	117	Tr210×4	18	190	22238RRK+**AH2238**	40.9	HN42
	112	117	Tr210×4	18	190	22238RHAK+**AH2238**	38.4	HN42
	145	152	Tr210×4	25	190	23238RRK+**AH3238**	53.3	HN42
	145	152	Tr210×4	25	190	23238RHAK+**AH3238**	49.4	HN42
	160	167	Tr210×4	26	190	22338RK+**AH2338**	89.0	HN42
	160	167	Tr210×4	26	190	22338RHAK+**AH2338**	82.6	HN42
190	102	108	Tr215×4	19	200	23040RK+**AH3040**	27.2	HNL43
	102	108	Tr215×4	19	200	23040RHAK+**AH3040**	25.1	HNL43
	127	140	Tr210×4	18	200	24040RRK30+**AH24040**	34.6	HN42
	127	140	Tr210×4	18	200	24040RHAK30+**AH24040**	31.9	HN42
	134	140	Tr220×4	21	200	23140RRK+**AH3140**	47.9	HN44
	134	140	Tr220×4	21	200	23140RHAK+**AH3140**	45.0	HN44
	158	171	Tr210×4	18	200	24140RRK30+**AH24140**	57.6	HN42
	158	171	Tr210×4	18	200	24140RHAK30+**AH24140**	53.8	HN42
	118	123	Tr220×4	19	200	22240RRK+**AH2240**	48.7	HN44
	118	123	Tr220×4	19	200	22240RHAK+**AH2240**	45.7	HN44
	153	160	Tr220×4	25	200	23240RK+**AH3240**	64.7	HN44
	153	160	Tr220×4	25	200	23240RHAK+**AH3240**	60.1	HN44
	170	177	Tr220×4	26	200	22340RK+**AH2340**	101	HN44
	170	177	Tr220×4	26	200	22340RHAK+**AH2340**	93.4	HN44

[Note] 1) Basic profile and dimensions of screw thread identified by prefix M are in accordance with JIS B 0205.
Basic profile and dimensions of screw thread identified by prefix Tr are in accordance with JIS B 0216.

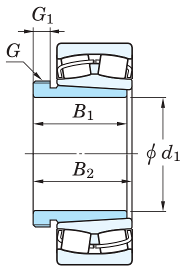
d_1 200 ~ 220 mm

Boundary dimensions (mm) d_1	B_1	B_2	G 1) Screw size	G_1	Brg. bore d (mm)	Designations Bearing + withdrawal sleeve	Mass Brg.+withdrawal sleeve (kg)	(Refer.) Applicable locknut No.
200	111	117	Tr235×4	20	220	23044RK+**AH3044**	38.0	HNL47
	111	117	Tr235×4	20	220	23044RHAK+**AH3044**	35.3	HNL47
	138	152	Tr230×4	20	220	24044RRK30+**AH24044**	48.1	—
	138	152	Tr230×4	20	220	24044RHAK30+**AH24044**	44.7	—
	145	151	Tr240×4	23	220	23144RK+**AH3144**	63.6	HN48
	145	151	Tr240×4	23	220	23144RHAK+**AH3144**	60.0	HN48
	170	184	Tr230×4	20	220	24144RRK30+**AH24144**	76.4	—
	170	184	Tr230×4	20	220	24144RHAK30+**AH24144**	71.2	—
	130	136	Tr240×4	20	220	22244RRK+**AH2244**	70.8	HN48
	130	136	Tr240×4	20	220	22244RHAK+**AH2244**	66.6	HN48
	181	189	Tr240×4	30	220	23244RK+**AH2344**	95.1	HN48
	181	189	Tr240×4	30	220	23244RHAK+**AH2344**	88.5	HN48
	181	189	Tr240×4	30	220	22344RK+**AH2344**	136	HN48
	181	189	Tr240×4	30	220	22344RHAK+**AH2344**	127	HN48
220	116	123	Tr260×4	21	240	23048RRK+**AH3048**	42.6	HNL52
	116	123	Tr260×4	21	240	23048RHAK+**AH3048**	39.7	HNL52
	138	153	Tr250×4	20	240	24048RRK30+**AH24048**	51.9	—
	138	153	Tr250×4	20	240	24048RHAK30+**AH24048**	48.0	—
	154	161	Tr260×4	25	240	23148RRK+**AH3148**	77.6	HN52
	154	161	Tr260×4	25	240	23148RHAK+**AH3148**	73.1	HN52
	180	195	Tr260×4	20	240	24148RRK30+**AH24148**	94.0	HN52
	180	195	Tr260×4	20	240	24148RHAK30+**AH24148**	87.9	HN52
	144	150	Tr260×4	21	240	22248RRK+**AH2248**	94.3	HN52
	144	150	Tr260×4	21	240	22248RHAK+**AH2248**	88.7	HN52
	189	197	Tr260×4	30	240	23248RRK+**AH2348**	126	HN52
	189	197	Tr260×4	30	240	23248RHAK+**AH2348**	117	HN52
	189	197	Tr260×4	30	240	22348RK+**AH2348**	170	HN52
	189	197	Tr260×4	30	240	22348RHAK+**AH2348**	158	HN52

Withdrawal sleeves for spherical roller bearings

Koyo

d_1 240 ~ 260 mm



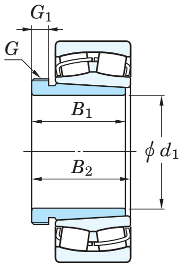
Boundary dimensions (mm)					Brg. bore	Designations	Mass	(Refer.)
d_1	B_1	B_2	G 1) Screw size	G_1	d (mm)	Bearing + withdrawal sleeve	Brg.+withdrawal sleeve (kg)	Applicable locknut No.
240	128	135	Tr280×4	23	260	23052RK+**AH3052**	60.0	HNL56
	128	135	Tr280×4	23	260	23052RHAK+**AH3052**	55.6	HNL56
	162	178	Tr270×4	22	260	24052RRK30+**AH24052**	77.0	—
	162	178	Tr270×4	22	260	24052RHAK30+**AH24052**	71.2	—
	172	179	Tr290×4	26	260	23152RK+**AH3152**	107	HN58
	172	179	Tr290×4	26	260	23152RHAK+**AH3152**	101	HN58
	202	218	Tr280×4	22	260	24152RRK30+**AH24152**	128	—
	202	218	Tr280×4	22	260	24152RHAK30+**AH24152**	120	—
	155	161	Tr290×4	23	260	22252RK+**AH2252**	122	HN58
	155	161	Tr290×4	23	260	22252RHAK+**AH2252**	115	HN58
	205	213	Tr290×4	30	260	23252RK+**AH2352**	164	HN58
	205	213	Tr290×4	30	260	23252RHAK+**AH2352**	153	HN58
	205	213	Tr290×4	30	260	22352RK+**AH2352**	212	HN58
	205	213	Tr290×4	30	260	22352RHAK+**AH2352**	197	HN58
260	131	139	Tr300×4	24	280	23056RK+**AH3056**	64.9	HNL60
	131	139	Tr300×4	24	280	23056RHAK+**AH3056**	60.2	HNL60
	162	179	Tr290×4	22	280	24056RRK30+**AH24056**	81.9	HN58
	162	179	Tr290×4	22	280	24056RHAK30+**AH24056**	75.7	HN58
	175	183	Tr310×5	28	280	23156RRK+**AH3156**	114	HN62
	175	183	Tr310×5	28	280	23156RHAK+**AH3156**	108	HN62
	202	219	Tr300×4	22	280	24156RRK30+**AH24156**	136	—
	202	219	Tr300×4	22	280	24156RHAK30+**AH24156**	128	—
	155	163	Tr310×5	24	280	22256RK+**AH2256**	127	HN62
	155	163	Tr310×5	24	280	22256RHAK+**AH2256**	119	HN62
	212	220	Tr310×5	30	280	23256RK+**AH2356**	175	HN62
	212	220	Tr310×5	30	280	23256RHAK+**AH2356**	163	HN62
	212	220	Tr310×5	30	280	22356RK+**AH2356**	247	HN62
	212	220	Tr310×5	30	280	22356RHAK+**AH2356**	230	HN62

[Note] 1) Basic profile and dimensions of screw thread identified by prefix M are in accordance with JIS B 0205.
Basic profile and dimensions of screw thread identified by prefix Tr are in accordance with JIS B 0216.

d_1 280 ~ (320) mm

Boundary dimensions (mm)					Brg. bore	Designations	Mass	(Refer.)
d_1	B_1	B_2	G 1) Screw size	G_1	d (mm)	Bearing + withdrawal sleeve	Brg.+withdrawal sleeve (kg)	Applicable locknut No.
280	145	153	Tr320×5	26	300	23060RK+**AH3060**	88.1	HNL64
	145	153	Tr320×5	26	300	23060RHAK+**AH3060**	81.2	HNL64
	184	202	Tr310×5	24	300	24060RRK30+**AH24060**	112	HN62
	184	202	Tr310×5	24	300	24060RHAK30+**AH24060**	105	HN62
	192	200	Tr330×5	30	300	23160RRK+**AH3160**	149	HN66
	192	200	Tr330×5	30	300	23160RHAK+**AH3160**	140	HN66
	224	242	Tr320×5	24	300	24160RRK30+**AH24160**	180	—
	224	242	Tr320×5	24	300	24160RHAK30+**AH24160**	168	—
	170	178	Tr330×5	26	300	22260RK+**AH2260**	160	HN66
	170	178	Tr330×5	26	300	22260RHAK+**AH2260**	150	HN66
	228	236	Tr330×5	34	300	23260RK+**AH3260**	223	HN66
	228	236	Tr330×5	34	300	23260RHAK+**AH3260**	208	HN66
300	149	157	Tr345×5	27	320	23064RK+**AH3064**	94.8	HNL69
	149	157	Tr345×5	27	320	23064RHAK+**AH3064**	88.1	HNL69
	184	202	Tr330×5	24	320	24064RRK30+**AH24064**	120	HN66
	184	202	Tr330×5	24	320	24064RHAK30+**AH24064**	108	HN66
	209	217	Tr350×5	31	320	23164RK+**AH3164**	191	HN70
	209	217	Tr350×5	31	320	23164RHAK+**AH3164**	180	HN70
	242	260	Tr340×5	24	320	24164RRK30+**AH24164**	226	—
	242	260	Tr340×5	24	320	24164RHAK30+**AH24164**	217	—
	180	190	Tr350×5	27	320	22264RK+**AH2264**	191	HN70
	246	254	Tr350×5	36	320	23264RK+**AH3264**	280	HN70
	246	254	Tr350×5	36	320	23264RHAK+**AH3264**	260	HN70
320	162	171	Tr365×5	28	340	23068RK+**AH3068**	125	HNL73
	162	171	Tr365×5	28	340	23068RHAK+**AH3068**	115	HNL73
	225	234	Tr370×5	33	340	23168RK+**AH3168**	239	HN74
	225	234	Tr370×5	33	340	23168RHAK+**AH3168**	225	HN74
	269	288	Tr360×5	26	340	24168RRK30+**AH24168**	293	—

d_1 (320) ~ 380 mm



Boundary dimensions (mm)					Brg. bore	Designations	Mass	(Refer.)
d_1	B_1	B_2	G [1)] Screw size	G_1	d (mm)	Bearing + withdrawal sleeve	Brg.+withdrawal sleeve (kg)	Applicable locknut No.
320	269	288	Tr360×5	26	340	24168RHAK30+**AH24168**	282	—
	264	273	Tr370×5	38	340	23268RK+**AH3268**	342	HN74
	264	273	Tr370×5	38	340	23268RHAK+**AH3268**	317	HN74
340	167	176	Tr385×5	30	360	23072RK+**AH3072**	132	HNL77
	167	176	Tr385×5	30	360	23072RHAK+**AH3072**	122	HNL77
	229	238	Tr400×5	35	360	23172RK+**AH3172**	254	HN80
	232	238	Tr400×5	35	360	23172RHAK+**AH3172**	239	HN80
	269	289	Tr380×5	26	360	24172RK30+**AH24172**	313	—
	269	289	Tr380×5	26	360	24172RHAK30+**AH24172**	300	—
	274	283	Tr400×5	40	360	23272RK+**AH3272**	388	HN80
	274	283	Tr400×5	40	360	23272RHAK+**AH3272**	360	HN80
360	170	180	Tr410×5	31	380	23076RK+**AH3076**	141	HNL82
	170	180	Tr410×5	31	380	23076RHAK+**AH3076**	131	HNL82
	232	242	Tr420×5	36	380	23176RK+**AH3176**	269	HN84
	240	242	Tr420×5	36	380	23176RHAK+**AH3176**	253	HN84
	271	291	Tr400×5	28	380	24176RK30+**AH24176**	328	HN80
	271	291	Tr400×5	28	380	24176RHAK30+**AH24176**	314	HN80
	284	294	Tr420×5	42	380	23276RK+**AH3276**	432	HN84
	284	294	Tr420×5	42	380	23276RHAK+**AH3276**	400	HN84
380	183	193	Tr430×5	33	400	23080RK+**AH3080**	178	HNL86
	183	193	Tr430×5	33	400	23080RHAK+**AH3080**	165	HNL86
	240	250	Tr440×5	38	400	23180RK+**AH3180**	305	HN88
	266	250	Tr440×5	38	400	23180RHAK+**AH3180**	287	HN88
	278	298	Tr420×5	28	400	24180RK30+**AH24180**	368	HN84
	278	298	Tr420×5	28	400	24180RHAK30+**AH24180**	352	HN84
	302	312	Tr440×5	44	400	23280RK+**AH3280**	521	HN88
	302	312	Tr440×5	44	400	23280RHAK+**AH3280**	480	HN88

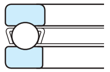
[Note] 1) Basic profile and dimensions of screw thread identified by prefix M are in accordance with JIS B 0205.
Basic profile and dimensions of screw thread identified by prefix Tr are in accordance with JIS B 0216.

d_1 400 ~ 480 mm

Boundary dimensions (mm)					Brg. bore	Designations	Mass	(Refer.)
d_1	B_1	B_2	G [1)] Screw size	G_1	d (mm)	Bearing + withdrawal sleeve	Brg.+withdrawal sleeve (kg)	Applicable locknut No.
400	186	196	Tr450×5	34	420	23084RK+**AH3084**	188	HNL90
	186	196	Tr450×5	34	420	23084RHAK+**AH3084**	174	HNL90
	266	276	Tr460×5	40	420	23184RK+**AH3184**	399	HN92
	270	276	Tr460×5	40	420	23184RHAK+**AH3184**	375	HN92
	321	331	Tr460×5	46	420	23284RK+**AH3284**	673	HN92
	321	331	Tr460×5	46	420	23284RHAK+**AH3284**	568	HN92
420	194	205	Tr470×5	35	440	23088RK+**AHX3088**	215	HNL94
	194	205	Tr470×5	35	440	23088RHAK+**AHX3088**	199	HNL94
	270	281	Tr480×5	42	440	23188RK+**AHX3188**	416	HN96
	285	281	Tr480×5	42	440	23188RHAK+**AHX3188**	391	HN96
	330	341	Tr480×5	48	440	23288RK+**AHX3288**	678	HN96
	330	341	Tr480×5	48	440	23288RHAK+**AHX3288**	627	HN96
440	202	213	Tr490×5	37	460	23092RK+**AHX3092**	244	HNL98
	202	213	Tr490×5	37	460	23092RHAK+**AHX3092**	226	HNL98
	285	296	Tr510×6	43	460	23192RK+**AHX3192**	494	HN102
	295	296	Tr510×6	43	460	23192RHAK+**AHX3192**	464	HN102
	349	360	Tr510×6	50	460	23292RK+**AHX3292**	795	HN102
	349	360	Tr510×6	50	460	23292RHAK+**AHX3292**	733	HN102
460	205	217	Tr520×6	38	480	23096RK+**AHX3096**	257	HNL104
	205	217	Tr520×6	38	480	23096RHAK+**AHX3096**	238	HNL104
	295	307	Tr530×6	45	480	23196RK+**AHX3196**	551	HN106
	313	307	Tr530×6	45	480	23196RHAK+**AHX3196**	518	HN106
	364	376	Tr530×6	52	480	23296RK+**AHX3296**	914	HN106
	364	376	Tr530×6	52	480	23296RHAK+**AHX3296**	844	HN106
480	209	221	Tr540×6	40	500	230/500RK+**AHX30/500**	271	HNL108
	313	325	Tr550×6	47	500	231/500RK+**AHX31/500**	648	HN110
	393	405	Tr550×6	54	500	232/500RK+**AHX32/500**	1 015	HN110

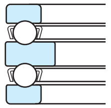
Thrust ball bearings

Single direction thrust ball bearings



Bore diameter **10 – 360** mm

Double direction thrust ball bearings



Bore diameter **10 – 190** mm

Thrust ball bearings are divided into single and double direction types. The former is able to accommodate axial load in one direction, while the latter is able to accommodate it in both directions.

Neither is suitable for applications that involve radial load or high-speed rotation.

Bearings whose housing race back face is spherical (with a spherical back face or aligning seat race) are designed with a self-aligning capability and can accommodate the effects of inaccurate mounting.

Boundary dimensions	As specified in JIS B 1512.
Tolerances	As specified in JIS B 1514-2. (refer to Table 7-9 on p. A 74.)
Recommended fits	Refer to Table 9-8 on p. A 98.
Standard cages	● Pressed cage (supplementary code : //) ● Copper alloy or carbon steel machined cage (supplementary code : FY or FC) ● Polyamide resin molded cage (supplementary code : MG)

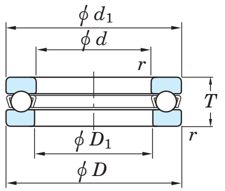
Application of standard cages

Bearing series	Molded cage	Pressed cage	Machined cage
511	51100 – 51107	51108 – 51132	51134 – 51172
512	51200 – 51207	51208 – 51224	51226 – 51272
532	53200 – 53207	53208 – 53224	53226 – 53272
532 U	53200U – 53207U	53208U – 53224U	53226U – 53272U
513	–	51305 – 51313	51314 – 51340
533	–	53305 – 53313	53314 – 53340
533 U	–	53305U – 53313U	53314U – 53340U
514	–	51405 – 51416	51417 – 51436
534	–	53405 – 53416	53417 – 53420
534 U	–	53405U – 53416U	53417U – 53420U
522	–	52202 – 52224	52226 – 52244
542	–	54202 – 54224	54226 – 54244
542 U	–	54205U – 54224U	54226U – 54244U
523	–	52305 – 52313	52314 – 52340
543	–	54305 – 54313	54314 – 54324
543 U	–	54305U – 54313U	54314U – 54324U
524	–	52405 – 52411	52412 – 52444
544	–	54405 – 54411	54412 – 54420
544 U	–	54405U – 54411U	54412U – 54420U

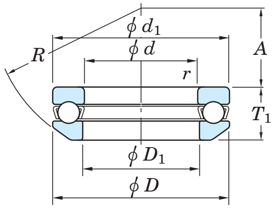
Required minimum axial load	A certain degree of load is necessary in order for bearings to operate satisfactorily. (refer to p. A 116.)
Allowable misalignment	Misalignment not allowed. (for flat back face type.)
Equivalent axial load	Dynamic equivalent axial load $P_a = F_a$ Static equivalent axial load $P_{0a} = F_a$

Single direction thrust ball bearings

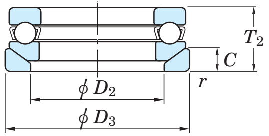
d 10 ~ (40) mm



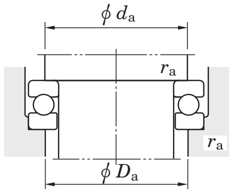
With flat
back faces

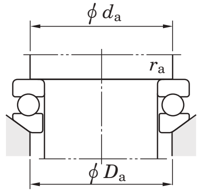


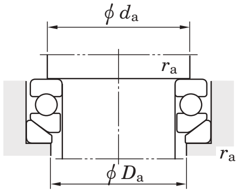
With spherical
back face



With aligning
seat race





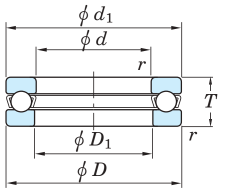


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.			Dimensions (mm)							Mounting dimensions (mm)			(Refer.) **Mass** (kg)		
d	D	T	T_1	T_2	r min.	C_a	C_{0a}	C_u	Grease lub.	Oil lub.	With flat back faces	With spherical back face	With aligning seat race	d_1 max.	D_1 min.	D_2	D_3	A	R	C	d_a min.	D_a max.	r_a max.	With flat back faces	With spherical back face	With aligning seat race
10	24	9	—	—	0.3	12.5	14.0	0.630	6 500	10 000	**51100**	—	—	24	11	—	—	—	—	—	18	16	0.3	0.020	—	—
	26	11	11.6	13	0.6	15.8	17.1	0.770	5 700	8 800	**51200**	**53200**	**53200U**	26	12	18	28	8.5	22	3.5	20	16	0.6	0.030	0.029	0.037
12	26	9	—	—	0.3	12.9	14.0	0.690	6 500	10 000	**51101**	—	—	26	13	—	—	—	—	—	20	18	0.3	0.022	—	—
	28	11	11.4	13	0.6	16.5	19.0	0.860	5 400	8 300	**51201**	**53201**	**53201U**	28	14	20	30	11.5	25	3.5	22	18	0.6	0.034	0.031	0.043
15	28	9	—	—	0.3	13.2	15.4	0.760	6 100	9 400	**51102**	—	—	28	16	—	—	—	—	—	23	20	0.3	0.024	—	—
	32	12	13.3	15	0.6	20.8	24.8	1.10	4 900	7 500	**51202**	**53202**	**53202U**	32	17	24	35	12	28	4	25	22	0.6	0.046	0.048	0.062
17	30	9	—	—	0.3	13.5	18.2	0.820	6 100	9 400	**51103**	—	—	30	18	—	—	—	—	—	25	22	0.3	0.028	—	—
	35	12	13.2	15	0.6	21.5	27.3	1.25	4 900	7 500	**51203**	**53203**	**53203U**	35	19	26	38	16	32	4	28	24	0.6	0.053	0.055	0.070
20	35	10	—	—	0.3	17.8	24.7	1.10	5 100	7 900	**51104**	—	—	35	21	—	—	—	—	—	29	26	0.3	0.040	—	—
	40	14	14.7	17	0.6	27.9	37.7	1.70	3 900	6 000	**51204**	**53204**	**53204U**	40	22	30	42	18	36	5	32	28	0.6	0.082	0.080	0.100
25	42	11	—	—	0.6	24.4	37.2	1.70	4 400	6 800	**51105**	—	—	42	26	—	—	—	—	—	35	32	0.6	0.059	—	—
	47	15	16.7	19	0.6	34.6	50.4	2.30	3 600	5 500	**51205**	**53205**	**53205U**	47	27	36	50	19	40	5.5	38	34	0.6	0.120	0.120	0.152
	52	18	19.8	22	1	44.7	61.4	2.75	3 100	4 800	**51305**	**53305**	**53305U**	52	27	38	55	21	45	6	41	36	1	0.180	0.180	0.224
	60	24	26.4	29	1	69.5	89.4	4.05	2 600	4 000	**51405**	**53405**	**53405U**	60	27	42	62	19	50	8	46	39	1	0.340	0.350	0.442
30	47	11	—	—	0.6	25.5	42.2	1.90	4 300	6 600	**51106**	—	—	47	32	—	—	—	—	—	40	37	0.6	0.068	—	—
	52	16	17.8	20	0.6	36.7	58.2	2.65	3 400	5 200	**51206**	**53206**	**53206U**	52	32	42	55	22	45	5.5	43	39	0.6	0.150	0.160	0.193
	60	21	22.6	25	1	53.5	78.7	3.55	2 700	4 200	**51306**	**53306**	**53306U**	60	32	45	62	22	50	7	48	42	1	0.270	0.270	0.326
	70	28	30.1	33	1	91.0	126	5.70	2 200	3 400	**51406**	**53406**	**53406U**	70	32	50	75	20	56	9	54	46	1	0.530	0.530	0.660
35	52	12	—	—	0.6	25.5	47.2	2.00	3 900	6 000	**51107**	—	—	52	37	—	—	—	—	—	45	42	0.6	0.090	—	—
	62	18	19.9	22	1	48.9	78.2	3.55	2 900	4 500	**51207**	**53207**	**53207U**	62	37	48	65	24	50	7	51	46	1	0.220	0.220	0.277
	68	24	25.6	28	1	69.3	105	4.75	2 400	3 700	**51307**	**53307**	**53307U**	68	37	52	72	24	56	7.5	55	48	1	0.390	0.400	0.484
	80	32	34	37	1.1	109	155	7.00	1 900	2 900	**51407**	**53407**	**53407U**	80	37	58	85	23	64	10	62	53	1	0.790	0.790	0.960
40	60	13	—	—	0.6	33.6	62.8	2.85	3 400	5 300	**51108**	—	—	60	42	—	—	—	—	—	52	48	0.6	0.120	—	—
	68	19	20.3	23	1	58.7	98.3	4.45	2 700	4 200	**51208**	**53208**	**53208U**	68	42	55	72	28.5	56	7	57	51	1	0.270	0.270	0.340
	78	26	28.5	31	1	86.6	135	6.05	2 100	3 300	**51308**	**53308**	**53308U**	78	42	60	82	28	64	8.5	63	55	1	0.550	0.570	0.690

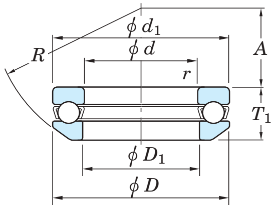
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single direction thrust ball bearings

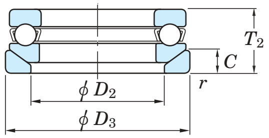
d (40) ~ 70 mm



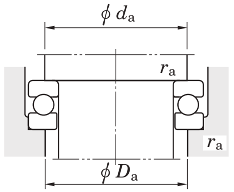
With flat
back faces

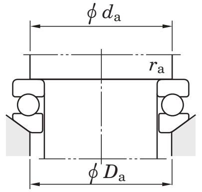


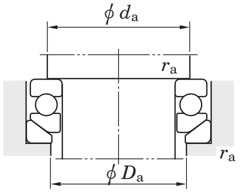
With spherical
back face



With aligning
seat race





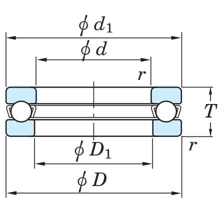


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.			Dimensions (mm)							Mounting dimensions (mm)			(Refer.) Mass (kg)		
d	D	T	T_1	T_2	r min.	C_a	C_{0a}	C_u	Grease lub.	Oil lub.	With flat back faces	With spherical back face	With aligning seat race	d_1 max.	D_1 min.	D_2	D_3	A	R	C	d_a min.	D_a max.	r_a max.	With flat back faces	With spherical back face	With aligning seat race
40	90	36	38.2	42	1.1	141	205	9.25	1 700	2 600	**51408**	**53408**	**53408U**	90	42	65	95	26	72	12	70	60	1	1.14	1.12	1.37
45	65	14	—	—	0.6	34.8	69.1	3.10	3 200	5 000	**51109**	—	—	65	47	—	—	—	—	—	57	53	0.6	0.150	—	—
	73	20	21.3	24	1	59.7	105	4.75	2 600	4 000	**51209**	**53209**	**53209U**	73	47	60	78	26	56	7.5	62	56	1	0.320	0.310	0.397
	85	28	30.1	33	1	100	163	7.40	1 900	3 000	**51309**	**53309**	**53309U**	85	47	65	90	25	64	10	69	61	1	0.690	0.680	0.850
	100	39	42.4	46	1.1	162	242	10.9	1 500	2 300	**51409**	**53409**	**53409U**	100	47	72	105	29	80	12.5	78	67	1	1.47	1.50	1.82
50	70	14	—	—	0.6	35.9	75.4	3.40	3 100	4 800	**51110**	—	—	70	52	—	—	—	—	—	62	58	0.6	0.160	—	—
	78	22	23.5	26	1	60.6	111	5.05	2 300	3 600	**51210**	**53210**	**53210U**	78	52	62	82	32.5	64	7.5	67	61	1	0.390	0.380	0.480
	95	31	34.3	37	1.1	121	202	9.10	1 800	2 700	**51310**	**53310**	**53310U**	95	52	72	100	28	72	11	77	68	1	1.00	1.01	1.24
	110	43	45.6	50	1.5	185	283	12.8	1 400	2 100	**51410**	**53410**	**53410U**	110	52	80	115	35	90	14	86	74	1.5	1.99	1.97	2.38
55	78	16	—	—	0.6	43.5	93.1	4.20	2 800	4 300	**51111**	—	—	78	57	—	—	—	—	—	69	64	0.6	0.240	—	—
	90	25	27.3	30	1	86.7	159	7.20	2 100	3 200	**51211**	**53211**	**53211U**	90	57	72	95	35	72	9	76	69	1	0.610	0.620	0.770
	105	35	39.3	42	1.1	149	246	11.1	1 600	2 400	**51311**	**53311**	**53311U**	105	57	80	110	30	80	11.5	85	75	1	1.34	1.41	1.69
	120	48	50.5	55	1.5	223	359	16.2	1 200	1 900	**51411**	**53411**	**53411U**	120	57	88	125	28	90	15.5	94	81	1.5	2.64	2.57	3.10
60	85	17	—	—	1	51.8	113	5.10	2 600	4 000	**51112**	—	—	85	62	—	—	—	—	—	75	70	1	0.290	—	—
	95	26	28	31	1	92.0	179	8.05	1 900	3 000	**51212**	**53212**	**53212U**	95	62	78	100	32.5	72	9	81	74	1	0.690	0.690	0.850
	110	35	38.3	42	1.1	154	267	12.1	1 500	2 300	**51312**	**53312**	**53312U**	110	62	85	115	41	90	11.5	90	80	1	1.43	1.47	1.78
	130	51	54	58	1.5	267	437	19.7	1 100	1 700	**51412**	**53412**	**53412U**	130	62	95	135	34	100	16	102	88	1.5	3.51	3.44	4.13
65	90	18	—	—	1	52.1	117	5.30	2 400	3 700	**51113**	—	—	90	67	—	—	—	—	—	80	75	1	0.340	—	—
	100	27	28.7	32	1	93.6	189	8.50	1 900	2 900	**51213**	**53213**	**53213U**	100	67	82	105	40	80	9	86	79	1	0.770	0.750	0.930
	115	36	39.4	43	1.1	159	287	13.0	1 400	2 200	**51313**	**53313**	**53313U**	115	67	90	120	38.5	90	12.5	95	85	1	1.57	1.61	1.95
	140	56	60.2	65	2	290	493	22.0	1 000	1 600	**51413**	**53413**	**53413U**	140	68	100	145	40	112	17.5	110	95	2	4.47	4.47	5.28
70	95	18	—	—	1	53.8	127	5.70	2 300	3 600	**51114**	—	—	95	72	—	—	—	—	—	85	80	1	0.360	—	—
	105	27	28.8	32	1	95.2	199	8.95	1 800	2 800	**51214**	**53214**	**53214U**	105	72	88	110	38	80	9	91	84	1	0.810	0.800	0.990
	125	40	44.2	48	1.1	167	291	13.1	1 300	2 000	**51314**	**53314**	**53314U**	125	72	98	130	43	100	13	103	92	1	2.06	2.15	2.56
	150	60	63.6	69	2	312	553	23.8	940	1 450	**51414**	**53414**	**53414U**	150	73	110	155	34	112	19.5	118	102	2	5.48	5.38	6.37

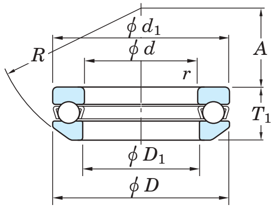
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Single direction thrust ball bearings

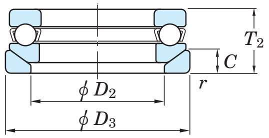
d **75 ~ (120) mm**



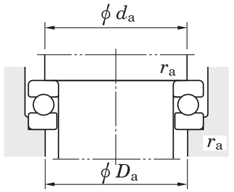
With flat
back faces

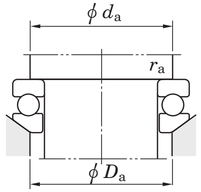


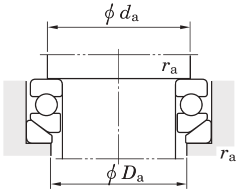
With spherical
back face



With aligning
seat race





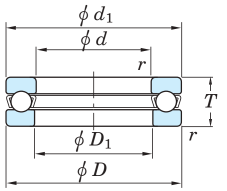


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.			Dimensions (mm)							Mounting dimensions (mm)			(Refer.) Mass (kg)		
d	D	T	T_1	T_2	r min.	C_a	C_{0a}	C_u	Grease lub.	Oil lub.	With flat back faces	With spherical back face	With aligning seat race	d_1 max.	D_1 min.	D_2	D_3	A	R	C	d_a min.	D_a max.	r_a max.	With flat back faces	With spherical back face	With aligning seat race
75	100	19	—	—	1	55.5	136	6.15	2 200	3 400	**51115**	—	—	100	77	—	—	—	—	—	90	85	1	0.420	—	—
	110	27	28.3	32	1	96.7	209	9.40	1 800	2 700	**51215**	**53215**	**53215U**	110	77	92	115	49	90	9.5	96	89	1	0.860	0.850	1.06
	135	44	48.1	52	1.5	192	339	15.0	1 200	1 900	**51315**	**53315**	**53315U**	135	77	105	140	37	100	15	111	99	1.5	2.68	2.72	3.27
	160	65	69	75	2	315	560	23.3	880	1 350	**51415**	**53415**	**53415U**	160	78	115	165	42	125	21	125	110	2	6.75	6.64	7.87
80	105	19	—	—	1	55.8	141	6.35	2 100	3 300	**51116**	—	—	105	82	—	—	—	—	—	95	90	1	0.430	—	—
	115	28	29.5	33	1	98.1	218	9.85	1 700	2 600	**51216**	**53216**	**53216U**	115	82	98	120	46	90	10	101	94	1	0.950	0.930	1.15
	140	44	47.6	52	1.5	200	368	15.8	1 200	1 800	**51316**	**53316**	**53316U**	140	82	110	145	50	112	15	116	104	1.5	2.82	2.86	3.43
	170	68	72.2	78	2.1	337	621	25.1	810	1 250	**51416**	**53416**	**53416U**	170	83	125	175	36	125	22	133	117	2	7.97	7.84	9.22
85	110	19	—	—	1	57.4	150	6.80	2 100	3 200	**51117**	—	—	110	87	—	—	—	—	—	100	95	1	0.460	—	—
	125	31	33.1	37	1	119	264	11.6	1 500	2 300	**51217**	**53217**	**53217U**	125	88	105	130	52	100	11	109	101	1	1.29	1.28	1.57
	150	49	53.1	58	1.5	232	419	17.5	1 100	1 700	**51317**	**53317**	**53317U**	150	88	115	155	43	112	17.5	124	111	1.5	3.66	3.63	4.44
	180	72	77	83	2.1	384	753	29.5	780	1 200	**51417**	**53417**	**53417U**	177	88	130	185	47	140	23	141	124	2	9.29	9.20	10.8
90	120	22	—	—	1	74.6	190	8.40	1 900	2 900	**51118**	—	—	120	92	—	—	—	—	—	108	102	1	0.680	—	—
	135	35	38.5	42	1.1	146	326	13.9	1 400	2 100	**51218**	**53218**	**53218U**	135	93	110	140	45	100	13.5	117	108	1	1.77	1.77	2.19
	155	50	54.6	59	1.5	242	454	18.5	1 000	1 600	**51318**	**53318**	**53318U**	155	93	120	160	40	112	18	129	116	1.5	3.88	3.87	4.71
	190	77	81.2	88	2.1	409	826	31.5	710	1 100	**51418**	**53418**	**53418U**	187	93	140	195	40	140	25.5	149	131	2	11.0	10.7	12.6
100	135	25	—	—	1	106	268	11.2	1 600	2 500	**51120**	—	—	135	102	—	—	—	—	—	121	114	1	0.990	—	—
	150	38	40.9	45	1.1	183	410	16.6	1 200	1 900	**51220**	**53220**	**53220U**	150	103	125	155	52	112	14	130	120	1	2.36	2.34	2.84
	170	55	59.2	64	1.5	296	595	23.2	940	1 450	**51320**	**53320**	**53320U**	170	103	135	175	46	125	18	142	128	1.5	5.11	5.10	6.05
	210	85	90	98	3	460	983	35.7	620	950	**51420**	**53420**	**53420U**	205	103	155	220	50	160	27	165	145	2.5	14.6	14.5	17.4
110	145	25	—	—	1	109	288	11.5	1 600	2 400	**51122**	—	—	145	112	—	—	—	—	—	131	124	1	1.08	—	—
	160	38	40.2	45	1.1	191	450	17.6	1 200	1 800	**51222**	**53222**	**53222U**	160	113	135	165	65	125	14	140	130	1	2.57	2.50	3.06
	190	63	67.2	72	2	334	704	25.9	810	1 250	**51322**	**53322**	**53322U**	187	113	150	195	51	140	20.5	158	142	2	7.72	7.63	8.90
	230	95	—	—	3	474	1 070	37.1	550	850	**51422**	—	—	225	113	—	—	—	—	—	181	159	2.5	19.8	—	—
120	155	25	—	—	1	111	305	11.9	1 500	2 300	**51124**	—	—	155	122	—	—	—	—	—	141	134	1	1.16	—	—

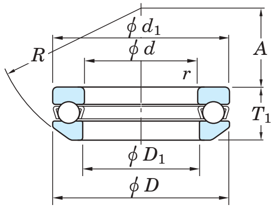
[Remark]　Standard cage types used for the above bearings are described earlier in this section.

Single direction thrust ball bearings

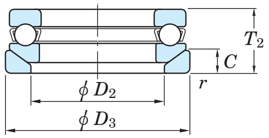
d (120) ~ (180) mm



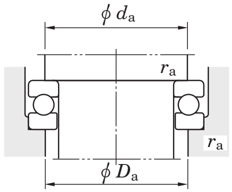
With flat
back faces

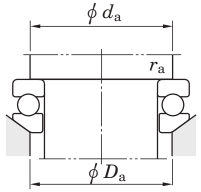


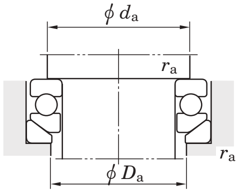
With spherical
back face



With aligning
seat race







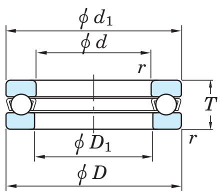
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.			Dimensions (mm)							Mounting dimensions (mm)			(Refer.) Mass (kg)		
d	D	T	T_1	T_2	r min.	C_a	C_{0a}	C_u	Grease lub.	Oil lub.	With flat back faces	With spherical back face	With aligning seat race	d_1 max.	D_1 min.	D_2	D_3	A	R	C	d_a min.	D_a max.	r_a max.	With flat back faces	With spherical back face	With aligning seat race
120	170	39	40.8	46	1.1	192	470	17.7	1 100	1 700	**51224**	**53224**	**53224U**	170	123	145	175	61	125	15	150	140	1	2.86	2.81	3.46
	210	70	74.1	80	2.1	389	869	30.5	710	1 100	**51324**	**53324**	**53324U**	205	123	165	220	63	160	22	173	157	2	10.6	10.4	12.4
	250	102	—	—	4	601	1 460	48.5	520	800	**51424**	—	—	245	123	—	—	—	—	—	196	174	3	25.0	—	—
130	170	30	—	—	1	130	350	13.0	1 300	2 000	**51126**	—	—	170	132	—	—	—	—	—	154	146	1	1.87	—	—
	190	45	47.9	53	1.5	254	620	22.2	970	1 500	**51226**	**53226**	**53226U**	187	133	160	195	67	140	17	166	154	1.5	4.09	3.98	4.88
	225	75	80.3	86	2.1	413	958	32.5	650	1 000	**51326**	**53326**	**53326U**	220	134	177	235	53	160	26	186	169	2	13.0	12.7	15.2
	270	110	—	—	4	623	1 540	49.0	490	750	**51426**	—	—	265	134	—	—	—	—	—	212	188	3	31.4	—	—
140	180	31	—	—	1	133	375	13.5	1 200	1 900	**51128**	—	—	178	142	—	—	—	—	—	164	156	1	2.02	—	—
	200	46	48.6	55	1.5	234	650	19.6	940	1 450	**51228**	**53228**	**53228U**	197	143	170	210	87	160	17	176	164	1.5	4.46	4.35	5.89
	240	80	84.9	92	2.1	458	1 130	36.9	620	950	**51328**	**53328**	**53328U**	235	144	190	250	68	180	26	199	181	2	15.5	15.1	18.0
	280	112	—	—	4	650	1 680	52.2	450	700	**51428**	—	—	275	144	—	—	—	—	—	222	198	3	33.9	—	—
150	190	31	—	—	1	137	400	13.9	1 200	1 900	**51130**	—	—	188	152	—	—	—	—	—	174	166	1	2.15	—	—
	215	50	53.3	60	1.5	266	652	21.8	840	1 300	**51230**	**53230**	**53230U**	212	153	180	225	79	160	20.5	189	176	1.5	5.64	5.45	7.14
	250	80	83.7	92	2.1	451	1 130	36.0	580	900	**51330**	**53330**	**53330U**	245	154	200	260	89.5	200	26	209	191	2	16.3	15.7	18.8
	300	120	—	—	4	711	1 910	57.4	420	650	**51430**	—	—	295	154	—	—	—	—	—	238	212	3	41.6	—	—
160	200	31	—	—	1	140	425	14.4	1 200	1 800	**51132**	—	—	198	162	—	—	—	—	—	184	176	1	2.28	—	—
	225	51	54.7	61	1.5	279	718	23.4	810	1 250	**51232**	**53232**	**53232U**	222	163	190	235	74	160	21	199	186	1.5	6.53	6.09	7.90
	270	87	91.7	100	3	512	1 340	41.3	550	850	**51332**	**53332**	**53332U**	265	164	215	280	77	200	29	225	205	2.5	21.0	21.0	23.4
	320	130	—	—	5	852	2 410	70.3	390	600	**51432**	—	—	315	164	—	—	—	—	—	254	226	4	51.2	—	—
170	215	34	—	—	1.1	168	510	16.7	1 100	1 700	**51134**	—	—	213	172	—	—	—	—	—	197	188	1	3.25	—	—
	240	55	58.7	65	1.5	326	834	26.3	750	1 150	**51234**	**53234**	**53234U**	237	173	200	250	91	180	21.5	212	198	1.5	8.12	7.69	9.83
	280	87	91.3	100	3	579	1 570	47.4	520	800	**51334**	**53334**	**53334U**	275	174	220	290	105	225	29	235	215	2.5	22.0	22.0	24.5
	340	135	—	—	5	943	2 730	77.2	360	550	**51434**	—	—	335	174	—	—	—	—	—	270	240	4	60.0	—	—
180	225	34	—	—	1.1	168	525	16.7	1 000	1 600	**51136**	—	—	222	183	—	—	—	—	—	207	198	1	3.39	—	—
	250	56	58.2	66	1.5	332	874	26.9	710	1 100	**51236**	**53236**	**53236U**	247	183	210	260	112	200	21.5	222	208	1.5	8.68	8.08	10.4
	300	95	99.3	109	3	578	1 580	46.2	490	750	**51336**	**53336**	**53336U**	295	184	240	310	91	225	32	251	229	2.5	28.1	26.9	29.9

[Remark] Standard cage types used for the above bearings are described earlier in this section.

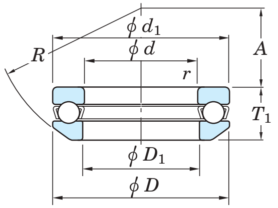
Single direction thrust ball bearings

Koyo

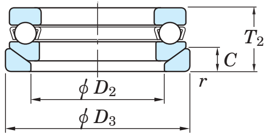
d (180) ~ 360 mm



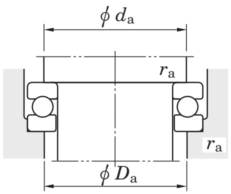
With flat
back faces

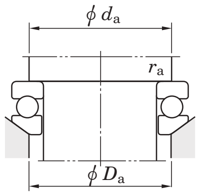


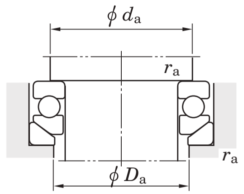
With spherical
back face



With aligning
seat race





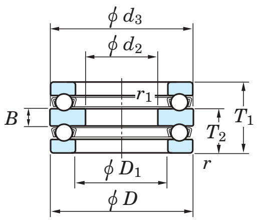


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.			Dimensions (mm)							Mounting dimensions (mm)			(Refer.) Mass (kg)		
d	D	T	T_1	T_2	r min.	C_a	C_{0a}	C_u	Grease lub.	Oil lub.	With flat back faces	With spherical back face	With aligning seat race	d_1 max.	D_1 min.	D_2	D_3	A	R	C	d_a min.	D_a max.	r_a max.	With flat back faces	With spherical back face	With aligning seat race
180	360	140	—	—	5	928	2 730	75.1	320	500	**51436**	—	—	355	184	—	—	—	—	—	286	254	4	69.5	—	—
190	240	37	—	—	1.1	213	655	20.2	970	1 500	**51138**	—	—	237	193	—	—	—	—	—	220	210	1	3.95	—	—
	270	62	65.7	73	2	385	1 060	31.4	650	1 000	**51238**	**53238**	**53238U**	267	194	230	280	98	200	23	238	222	2	11.7	11.2	13.9
	320	105	111	121	4	679	1 950	55.3	440	680	**51338**	**53338**	**53338U**	315	195	255	330	104	250	33	266	244	3	36.0	36.3	39.7
200	250	37	—	—	1.1	215	675	20.4	940	1 450	**51140**	—	—	247	203	—	—	—	—	—	230	220	1	4.13	—	—
	280	62	65.3	74	2	392	1 110	32.2	620	950	**51240**	**53240**	**53240U**	277	204	240	290	125	225	23	248	232	2	12.2	11.6	14.8
	340	110	118.4	130	4	745	2 220	61.1	420	650	**51340**	**53340**	**53340U**	335	205	270	350	92	250	38	282	258	3	42.9	42.7	46.7
220	270	37	—	—	1.1	221	740	21.3	880	1 350	**51144**	—	—	267	223	—	—	—	—	—	250	240	1	4.50	—	—
	300	63	65.6	75	2	428	1 310	36.6	580	900	**51244**	**53244**	**53244U**	297	224	260	310	118	225	25	268	252	2	13.5	12.6	15.9
240	300	45	—	—	1.5	301	1 020	28.0	750	1 150	**51148**	—	—	297	243	—	—	—	—	—	276	264	1.5	7.38	—	—
	340	78	81.6	92	2.1	553	1 800	47.8	520	800	**51248**	**53248**	**53248U**	335	244	290	350	122	250	30	299	281	2	23.1	20.9	25.6
260	320	45	—	—	1.5	289	990	26.2	710	1 100	**51152**	—	—	317	263	—	—	—	—	—	296	284	1.5	7.93	—	—
	360	79	82.8	93	2.1	556	1 880	48.1	490	750	**51252**	**53252**	**53252U**	355	264	305	370	152	280	30	319	301	2	25.0	22.6	28.5
280	350	53	—	—	1.5	411	1 430	36.4	640	900	**51156**	—	—	347	283	—	—	—	—	—	322	308	1.5	12.0	—	—
300	380	62	—	—	2	454	1 610	39.4	540	810	**51160**	—	—	376	304	—	—	—	—	—	348	332	2	17.5	—	—
	420	95	100.5	112	3	713	2 600	61.9	400	600	**51260**	**53260**	**53260U**	415	304	360	430	164	320	34	371	349	2.5	42.5	39.5	48.0
320	400	63	—	—	2	474	1 760	41.9	540	810	**51164**	—	—	396	324	—	—	—	—	—	368	352	2	19.0	—	—
	440	95	100.5	112	3	721	2 710	62.9	400	600	**51264**	**53264**	**53264U**	435	325	380	450	157	320	36	391	369	2.5	45.0	42.0	52.0
340	420	64	—	—	2	483	1 860	43.1	500	770	**51168**	—	—	416	344	—	—	—	—	—	388	372	2	20.5	—	—
	460	96	100.3	113	3	730	2 830	63.8	380	570	**51268**	**53268**	**53268U**	455	345	400	470	199	360	36	411	389	2.5	48.0	45.0	55.0
360	440	65	—	—	2	493	1 960	44.3	500	720	**51172**	—	—	436	364	—	—	—	—	—	408	392	2	21.5	—	—
	500	110	116.7	130	4	876	3 500	76.1	340	500	**51272**	**53272**	**53272U**	495	365	430	510	172	360	43	443	417	3	70.0	65.0	82.0

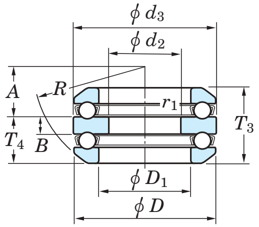
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Double direction thrust ball bearings

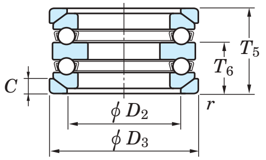
d_2 10 ~ (50) mm



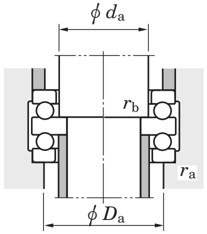
With flat
back faces

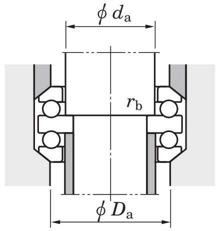


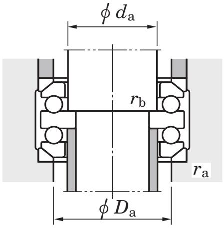
With spherical
back faces



With aligning
seat races





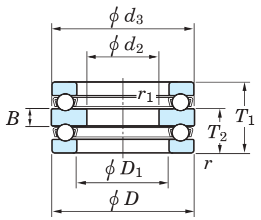


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.			Dimensions (mm)											Mounting dimensions (mm)				(Refer.) Mass (kg)	
d_2	D	T_1	T_3	T_5	r min.	r_1 min.	C_a	C_{0a}	C_u	Grease lub.	Oil lub.	With flat back faces	With spherical back faces	With aligning seat races	d_3 max.	D_1 min.	D_2	D_3	T_2	T_4	T_6	A	R	B	C	d_a min.	D_a max.	r_a max.	r_b max.	With flat back faces	With aligning seat races
10	32	22	24.6	28	0.6	0.3	20.8	24.8	1.10	4 900	7 500	**52202**	**54202**	**54202U**	32	17	24	35	13.5	14.8	16.5	10.5	28	5	4	15	24	0.6	0.3	0.085	0.118
15	40	26	27.4	32	0.6	0.3	27.9	37.7	1.70	3 900	6 000	**52204**	**54204**	**54204U**	40	22	30	42	16	16.7	19	16	36	6	5	20	30	0.6	0.3	0.150	0.190
	60	45	49.8	55	1	0.6	69.5	89.4	4.05	2 600	4 000	**52405**	**54405**	**54405U**	60	27	42	62	28	30.4	33	15	50	11	8	25	42	1	0.6	0.630	0.804
20	47	28	31.4	36	0.6	0.3	34.6	50.4	2.30	3 600	5 500	**52205**	**54205**	**54205U**	47	27	36	50	17.5	19.2	21.5	16.5	40	7	5.5	25	36	0.6	0.3	0.230	0.304
	52	34	37.6	42	1	0.3	44.7	61.4	2.75	3 100	4 800	**52305**	**54305**	**54305U**	52	27	38	55	21	22.8	25	18	45	8	6	25	38	1	0.3	0.330	0.428
	70	52	56.2	62	1	0.6	91.0	126	5.70	2 200	3 400	**52406**	**54406**	**54406U**	70	32	50	75	32	34.1	37	16	56	12	9	30	50	1	0.6	1.00	1.25
25	52	29	32.6	37	0.6	0.3	36.7	54.3	2.65	3 400	5 200	**52206**	**54206**	**54206U**	52	32	42	55	18	19.8	22	20	45	7	5.5	30	42	0.6	0.3	0.270	0.346
	60	38	41.2	46	1	0.3	53.5	78.7	3.55	2 700	4 200	**52306**	**54306**	**54306U**	60	32	45	62	23.5	25.1	27.5	19.5	50	9	7	30	45	1	0.3	0.490	0.602
	80	59	63	69	1.1	0.6	109	155	7.00	1 900	2 900	**52407**	**54407**	**54407U**	80	37	58	85	36.5	38.5	41.5	18.5	64	14	10	35	58	1	0.6	1.44	1.79
30	62	34	37.8	42	1	0.3	48.9	83.8	3.55	2 900	4 500	**52207**	**54207**	**54207U**	62	37	48	65	21	22.9	25	21	50	8	7	35	48	1	0.3	0.420	0.544
	68	36	38.6	44	1	0.6	58.7	98.3	4.45	2 700	4 200	**52208**	**54208**	**54208U**	68	42	55	72	22.5	23.8	26.5	25	56	9	7	40	55	1	0.6	0.540	0.680
	68	44	47.2	52	1	0.3	69.3	105	4.75	2 400	3 700	**52307**	**54307**	**54307U**	68	37	52	72	27	28.6	31	21	56	10	7.5	35	52	1	0.3	0.710	0.898
	78	49	54	59	1	0.6	86.6	135	6.05	2 100	3 300	**52308**	**54308**	**54308U**	78	42	60	82	30.5	33	35.5	23.5	64	12	8.5	40	60	1	0.6	1.06	1.34
	90	65	69.4	77	1.1	0.6	141	205	9.25	1 700	2 600	**52408**	**54408**	**54408U**	90	42	65	95	40	42.2	46	22	72	15	12	40	65	1	0.6	2.03	2.55
35	73	37	39.6	45	1	0.6	59.7	105	4.75	2 600	4 000	**52209**	**54209**	**54209U**	73	47	60	78	23	24.3	27	23	56	9	7.5	45	60	1	0.6	0.620	0.784
	85	52	56.2	62	1	0.6	100	163	7.40	1 900	3 000	**52309**	**54309**	**54309U**	85	47	65	90	32	34.1	37	21	64	12	10	45	65	1	0.6	1.29	1.62
	100	72	78.8	86	1.1	0.6	162	242	10.9	1 500	2 300	**52409**	**54409**	**54409U**	100	47	72	105	44.5	47.9	51.5	23.5	80	17	12.5	45	72	1	0.6	2.91	3.42
40	78	39	42	47	1	0.6	60.6	111	5.05	2 300	3 600	**52210**	**54210**	**54210U**	78	52	62	82	24	25.5	28	30.5	64	9	7.5	50	62	1	0.6	0.710	0.890
	95	58	64.6	70	1.1	0.6	121	186	9.10	1 800	2 700	**52310**	**54310**	**54310U**	95	52	72	100	36	39.3	42	23	72	14	11	50	72	1	0.6	1.86	2.35
	110	78	83.2	92	1.5	0.6	185	283	12.8	1 400	2 100	**52410**	**54410**	**54410U**	110	52	80	115	48	50.6	55	30	90	18	14	50	80	1.5	0.6	3.56	4.39
45	90	45	49.6	55	1	0.6	86.7	159	7.20	2 100	3 200	**52211**	**54211**	**54211U**	90	57	72	95	27.5	29.8	32.5	32.5	72	10	9	55	72	1	0.6	1.12	1.44
	105	64	72.6	78	1.1	0.6	149	246	11.1	1 600	2 400	**52311**	**54311**	**54311U**	105	57	80	110	39.5	43.8	46.5	25.5	80	15	11.5	55	80	1	0.6	2.51	3.21
	120	87	92	101	1.5	0.6	223	359	16.2	1 200	1 900	**52411**	**54411**	**54411U**	120	57	88	125	53.5	56	60.5	22.5	90	20	15.5	55	88	1.5	0.6	4.70	5.62
50	95	46	50	56	1	0.6	92.0	179	8.05	1 900	3 000	**52212**	**54212**	**54212U**	95	62	78	100	28	30	33	30.5	72	10	9	60	78	1	0.6	1.25	1.57
	110	64	70.6	78	1.1	0.6	154	267	12.1	1 500	2 300	**52312**	**54312**	**54312U**	110	62	85	115	39.5	42.8	46.5	36.5	90	15	11.5	60	85	1	0.6	2.68	3.37
	130	93	99	107	1.5	0.6	267	397	19.7	1 100	1 700	**52412**	**54412**	**54412U**	130	62	95	135	57	60	64	28	100	21	16	60	95	1.5	0.6	6.33	7.60

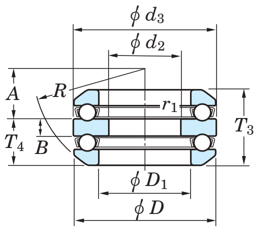
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Double direction thrust ball bearings

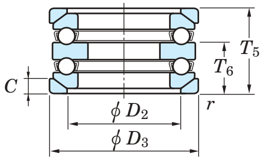
d_2 (50) ~ 95 mm



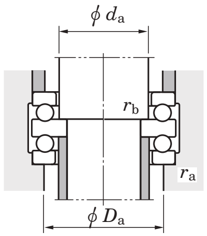
With flat back faces

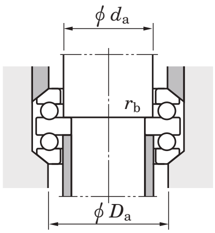


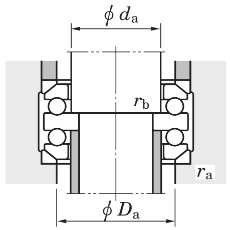
With spherical back faces



With aligning seat races





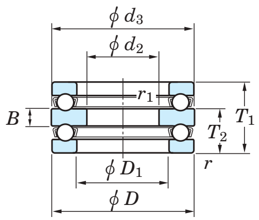


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.			Dimensions (mm)											Mounting dimensions (mm)				(Refer.) Mass (kg)	
d_2	D	T_1	T_3	T_5	r min.	r_1 min.	C_a	C_{0a}	C_u	Grease lub.	Oil lub.	With flat back faces	With spherical back faces	With aligning seat races	d_3 max.	D_1 min.	D_2	D_3	T_2	T_4	T_6	A	R	B	C	d_a min.	D_a max.	r_a max.	r_b max.	With flat back faces	With aligning seat races
50	140	101	109.4	119	2	1	290	493	22.0	1 000	1 600	**52413**	**54413**	**54413U**	140	68	100	145	62	66.2	71	34	112	23	17.5	65	100	2	1	8.03	9.72
55	100	47	50.4	57	1	0.6	93.6	189	8.50	1 900	2 900	**52213**	**54213**	**54213U**	100	67	82	105	28.5	30.2	33.5	38.5	80	10	9	65	82	1	0.6	1.36	1.70
	105	47	50.6	57	1	1	95.2	189	8.95	1 800	2 800	**52214**	**54214**	**54214U**	105	72	88	110	28.5	30.3	33.5	36.5	80	10	9	70	88	1	1	1.48	1.84
	115	65	71.8	79	1.1	0.6	159	287	13.0	1 400	2 200	**52313**	**54313**	**54313U**	115	67	90	120	40	43.4	47	34.5	90	15	12.5	65	90	1	0.6	2.90	3.66
	125	72	80.4	88	1.1	1	167	339	13.1	1 300	2 000	**52314**	**54314**	**54314U**	125	72	98	130	44	48.2	52	39	100	16	13	70	98	1	1	3.90	4.78
	150	107	114.2	125	2	1	312	553	23.8	940	1 450	**52414**	**54414**	**54414U**	150	73	110	155	65.5	69.1	74.5	28.5	112	24	19.5	70	110	2	1	9.71	11.6
60	110	47	49.6	57	1	1	96.7	209	9.40	1 800	2 700	**52215**	**54215**	**54215U**	110	77	92	115	28.5	29.8	33.5	47.5	90	10	9.5	75	92	1	1	1.57	1.96
	135	79	87.2	95	1.5	1	192	396	15.0	1 200	1 900	**52315**	**54315**	**54315U**	135	77	105	140	48.5	52.6	56.5	32.5	100	18	15	75	105	1.5	1	4.83	6.08
	160	115	123	135	2	1	315	560	23.3	880	1 350	**52415**	**54415**	**54415U**	160	78	115	165	70.5	74.5	80.5	36.5	125	26	21	75	115	2	1	11.8	14.3
65	115	48	51	58	1	1	98.1	218	9.85	1 700	2 600	**52216**	**54216**	**54216U**	115	82	98	120	29	30.5	34	45	90	10	10	80	98	1	1	1.69	2.09
	140	79	86.2	95	1.5	1	200	424	15.8	1 200	1 800	**52316**	**54316**	**54316U**	140	82	110	145	48.5	52.1	56.5	45.5	112	18	15	80	110	1.5	1	5.06	6.36
	170	120	128.4	140	2.1	1	337	621	25.1	810	1 250	**52416**	**54416**	**54416U**	170	83	125	175	73.5	77.7	83.5	30.5	125	27	22	80	125	2	1	14.0	16.6
	180	128	138	150	2.1	1.1	384	753	29.5	780	1 200	**52417**	**54417**	**54417U**	179.5	88	130	185	78.5	83.5	89.5	40.5	140	29	23	85	130	2	1	17.5	19.7
70	125	55	59.2	67	1	1	119	251	11.6	1 500	2 300	**52217**	**54217**	**54217U**	125	88	105	130	33.5	35.6	39.5	49.5	100	12	11	85	105	1	1	2.34	2.90
	150	87	95.2	105	1.5	1	232	489	17.5	1 100	1 700	**52317**	**54317**	**54317U**	150	88	115	155	53	57.1	62	39	112	19	17.5	85	115	1.5	1	6.43	8.03
	190	135	143.4	157	2.1	1.1	409	826	31.5	710	1 100	**52418**	**54418**	**54418U**	189.5	93	140	195	82.5	86.7	93.5	34.5	140	30	25.5	90	140	2	1	19.6	22.8
75	135	62	69	76	1.1	1	146	326	13.9	1 400	2 100	**52218**	**54218**	**54218U**	135	93	110	140	38	41.5	45	42	100	14	13.5	90	110	1	1	3.22	4.07
	155	88	97.2	106	1.5	1	242	524	18.5	1 000	1 600	**52318**	**54318**	**54318U**	155	93	120	160	53.5	58.1	62.5	36.5	112	19	18	90	120	1.5	1	6.60	8.44
80	210	150	160	176	3	1.1	460	983	35.7	620	950	**52420**	**54420**	**54420U**	209.5	103	155	220	91.5	96.5	104.5	43.5	160	33	27	100	155	2.5	1	26.6	32.0
85	150	67	72.8	81	1.1	1	183	410	16.6	1 200	1 900	**52220**	**54220**	**54220U**	150	103	125	155	41	43.9	48	49	112	15	14	100	125	1	1	4.29	5.25
	170	97	105.4	115	1.5	1	296	596	23.2	940	1 450	**52320**	**54320**	**54320U**	170	103	135	175	59	63.2	68	42	125	21	18	100	135	1.5	1	8.90	10.8
90	230	166	—	—	3	1.1	474	1 070	37.1	550	850	**52422**	—	—	229	113	—	—	101.5	—	—	—	—	37	—	110	170	2.5	1	34.9	—
95	160	67	71.4	81	1.1	1	191	431	17.6	1 200	1 800	**52222**	**54222**	**54222U**	160	113	135	165	41	43.2	48	62	125	15	14	110	135	1	1	4.68	5.66
	190	110	118.4	128	2	1	334	754	25.9	810	1 250	**52322**	**54322**	**54322U**	189.5	113	150	195	67	71.2	76	47	140	24	20.5	110	150	2	1	13.8	16.3
	250	177	—	—	4	1.5	601	1 460	48.5	520	800	**52424**	—	—	249	123	—	—	108.5	—	—	—	—	40	—	120	185	3	1.5	44.2	—

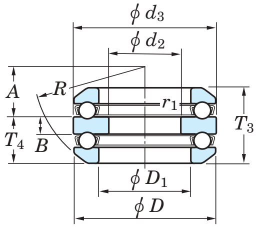
[Remark] Standard cage types used for the above bearings are described earlier in this section.

Double direction thrust ball bearings

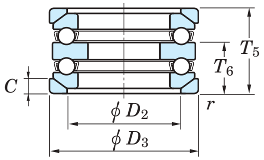
d_2 100 ~ 190 mm



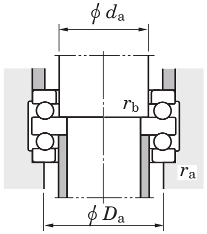
With flat back faces

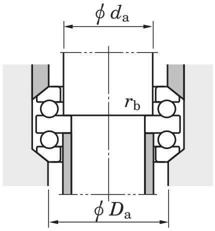


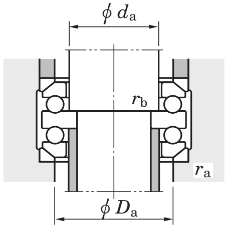
With spherical back faces



With aligning seat races







Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing No.			Dimensions (mm)											Mounting dimensions (mm)				(Refer.) **Mass** (kg)	
d_2	D	T_1	T_3	T_5	r min.	r_1 min.	C_a	C_{0a}	C_u	Grease lub.	Oil lub.	With flat back faces	With spherical back faces	With aligning seat races	d_3 max.	D_1 min.	D_2	D_3	T_2	T_4	T_6	A	R	B	C	d_a min.	D_a max.	r_a max.	r_b max.	With flat back faces	With aligning seat races
100	170	68	71.6	82	1.1	1.1	192	472	17.7	1 100	1 700	**52224**	**54224**	**54224U**	170	123	145	175	41.5	43.3	48.5	58.5	125	15	15	120	145	1	1	5.24	6.44
	210	123	131.2	143	2.1	1.1	389	931	30.5	710	1 100	**52324**	**54324**	**54324U**	209.5	123	165	220	75	79.1	85	58	160	27	22	120	165	2	1	17.2	22.9
	270	192	—	—	4	2	623	1 540	49.0	490	750	**52426**	—	—	269	134	—	—	117	—	—	—	—	42	—	130	200	3	2	56.5	—
110	190	80	85.8	96	1.5	1.1	254	622	22.2	970	1 500	**52226**	**54226**	**54226U**	189.5	133	160	195	49	51.9	57	63	140	18	17	130	160	1.5	1	7.72	9.29
	225	130	—	—	2.1	1.1	413	1 030	32.5	650	1 000	**52326**	—	—	224	134	—	—	80	—	—	—	—	30	—	130	177	2	1	22.1	—
	280	196	—	—	4	2	650	1 680	52.2	450	700	**52428**	—	—	279	144	—	—	120	—	—	—	—	44	—	140	206	3	2	60.6	—
120	200	81	86.2	99	1.5	1.1	234	669	19.6	940	1 450	**52228**	**54228**	**54228U**	199.5	143	170	210	49.5	52.1	58.5	83.5	160	18	17	140	170	1.5	1	8.31	10.5
	240	140	—	—	2.1	1.1	458	1 130	36.9	620	950	**52328**	—	—	239	144	—	—	85.5	—	—	—	—	31	—	140	190	2	1	27.8	—
	300	209	—	—	4	2	711	1 910	57.4	420	650	**52430**	—	—	299	154	—	—	127.5	—	—	—	—	46	—	150	225	3	2	73.9	—
130	215	89	95.6	109	1.5	1.1	266	768	21.8	840	1 300	**52230**	**54230**	**54230U**	214.5	153	180	225	54.5	57.8	64.5	74.5	160	20	20.5	150	180	1.5	1	10.6	13.6
	250	140	—	—	2.1	1.1	451	1 200	36.0	580	900	**52330**	—	—	249	154	—	—	85.5	—	—	—	—	31	—	150	200	2	1	29.2	—
	320	226	—	—	5	2	852	2 410	70.3	390	600	**52432**	—	—	319	164	—	—	138	—	—	—	—	50	—	160	240	4	2	90.3	—
135	340	236	—	—	5	2.1	943	2 730	77.2	360	550	**52434**	—	—	339	174	—	—	143	—	—	—	—	50	—	170	255	4	2	108	—
140	225	90	97.4	110	1.5	1.1	279	803	23.4	810	1 250	**52232**	**54232**	**54232U**	224.5	163	190	235	55	58.7	65	70	160	20	21	160	190	1.5	1	12.2	14.6
	270	153	—	—	3	1.1	512	1 570	41.3	550	850	**52332**	—	—	269	164	—	—	93	—	—	—	—	33	—	160	215	2.5	1	37.7	—
	360	245	—	—	5	3	928	2 730	75.1	320	500	**52436**	—	—	359	184	—	—	148.5	—	—	—	—	52	—	180	270	4	2.5	126	—
150	240	97	104.4	117	1.5	1.1	326	874	26.3	750	1 150	**52234**	**54234**	**54234U**	239.5	173	200	250	59	62.7	69	87	180	21	21.5	170	200	1.5	1	15.2	17.8
	250	98	102.4	118	1.5	2	332	986	26.9	710	1 100	**52236**	**54236**	**54236U**	249	183	210	260	59.5	61.7	69.5	108.5	200	21	21.5	180	210	1.5	2	15.9	19.6
	280	153	—	—	3	1.1	579	1 570	47.4	520	800	**52334**	—	—	279	174	—	—	93	—	—	—	—	33	—	170	220	2.5	1	39.6	—
	300	165	—	—	3	2	578	1 580	46.2	490	750	**52336**	—	—	299	184	—	—	101	—	—	—	—	37	—	180	240	2.5	2	50.9	—
160	270	109	116.4	131	2	2	385	1 010	31.4	650	1 000	**52238**	**54238**	**54238U**	269	194	220	280	66.5	70.2	77.5	93.5	200	24	23	190	230	2	2	21.6	25.2
	320	183	—	—	4	2	679	1 950	55.3	440	680	**52338**	—	—	319	195	—	—	111.5	—	—	—	—	40	—	190	255	3	2	64.9	—
170	280	109	115.6	133	2	2	392	1 110	32.2	620	950	**52240**	**54240**	**54240U**	279	204	240	290	66.5	69.8	78.5	120.5	225	24	23	200	240	2	2	22.7	27.3
	340	192	—	—	4	2	745	2 220	61.1	420	650	**52340**	—	—	339	205	—	—	117	—	—	—	—	42	—	200	270	3	2	77.8	—
190	300	110	115.2	134	2	2	428	1 310	36.6	580	900	**52244**	**54244**	**54244U**	299	224	260	310	67	69.6	79	114	225	24	25	220	260	2	2	23.9	29.5

[Remark]　Standard cage types used for the above bearings are described earlier in this section.

Spherical thrust roller bearings

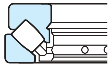
Spherical thrust roller bearings are designed to carry high axial loads. They can also support radial load if magnitude is no more than 55 % of the axial load being carried.

These bearings are not suitable for high-speed rotation.

Having a spherical housing race raceway surface, these bearings are self-alignings, adjusting to axial inclination.

They are usually used with oil lubrication.

Spherical thrust roller bearings

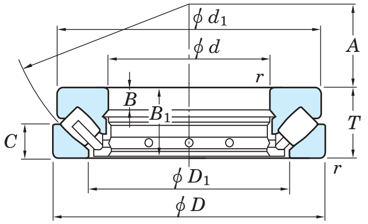


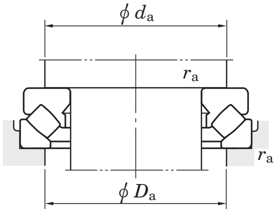
Bore diameter **60** – **500** mm

Boundary dimensions	As specified in JIS B 1512.
Tolerances	As specified in JIS B 1514-2, class 0. (refer to table 7-10 on p. A 75.)
Recommended fits	Refer to Table 9-8 on p. A 98.
Required minimum axial load	A certain degree of load is necessary in order for bearings to operate satisfactorily. (refer to p. A 116.)
Standard cage	Copper alloy machined cage (supplementary code : FY)
Allowable aligning angle	0.035 – 0.052 rad (2° – 3°) in general, depending on bearing series.
Equivalent axial load	Dynamic equivalent axial load $P_a = 1.2F_r + F_a$ Static equivalent axial load $P_{0a} \fallingdotseq 2.7F_r + F_a$ (Note : $F_r / F_a \leqq 0.55$)

Spherical thrust roller bearings

d 60 ~ 160 mm

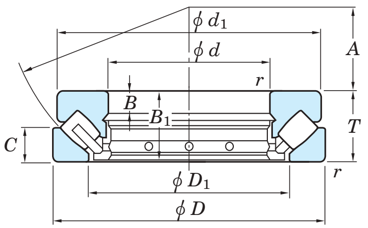


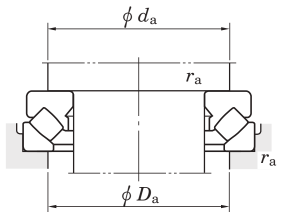


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed (min^{-1})	Bearing No.	Dimensions (mm)						Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u	Oil lub.		d_1	D_1	B	B_1	C	A	d_a min.	D_a max.	r_a max.	
60	130	42	1.5	399	884	73.7	2 700	**29412R**	123	89	15	39.5	20	38	90	108	1.5	2.75
65	140	45	2	450	1 020	73.4	2 500	**29413R**	133	96	16	42.5	21	42	100	115	2	3.41
70	150	48	2	485	1 100	105	2 300	**29414R**	142	103	17	45.5	23	44	105	125	2	4.16
75	160	51	2	584	1 360	102	2 100	**29415R**	152	109	18	48	24	47	115	132	2	4.98
80	170	54	2.1	631	1 480	128	2 000	**29416R**	162	117	19	51	26	50	120	140	2	5.95
85	150	39	1.5	400	1 000	100	2 600	**29317R**	143.5	114	13	37	19	50	115	135	1.5	2.87
	180	58	2.1	714	1 700	124	1 900	**29417R**	170	125	21	55	28	54	130	150	2	7.19
90	155	39	1.5	412	1 050	103	2 500	**29318R**	148.5	117	13	37	19	52	120	140	1.5	3.06
	190	60	2.1	821	2 010	158	1 800	**29418R**	180	132	22	57	29	56	135	157	2	8.28
100	170	42	1.5	481	1 270	118	2 300	**29320R**	163	129	14	40	20.8	58	130	150	1.5	3.91
	210	67	3	911	2 220	166	1 650	**29420R**	200	146	24	64	32	62	150	175	2.5	11.2
110	190	48	2	628	1 690	147	2 000	**29322R**	182	143	16	45.5	23	64	145	165	2	5.67
	230	73	3	1 120	2 810	203	1 500	**29422R**	220	162	26	69	35	69	165	190	2.5	14.7
120	210	54	2.1	759	2 030	182	1 800	**29324R**	200	159	18	51	26	70	160	180	2	7.90
	250	78	4	1 300	3 270	241	1 350	**29424R**	236	174	29	74	37	74	180	205	3	18.5
130	225	58	2.1	894	2 440	209	1 700	**29326R**	215	171	19	55	28	76	170	195	2	9.45
	270	85	4	1 490	3 870	270	1 250	**29426R**	255	189	31	81	41	81	195	225	3	23.5
140	240	60	2.1	898	2 490	206	1 600	**29328R**	230	183	20	57	29	82	185	205	2	11.1
	280	85	4	1 560	4 080	289	1 250	**29428R**	268	199	31	81	41	86	205	235	3	24.6
150	250	60	2.1	965	2 740	233	1 550	**29330R**	240	194	20	57	29	87	195	215	2	11.7
	300	90	4	1 730	4 620	334	1 100	**29430R**	285	214	32	86	44	92	220	250	3	29.6
160	270	67	3	1 150	3 070	272	1 400	**29332R**	260	208	23	64	32	92	210	235	2.5	15.4
	320	95	5	1 990	5 370	375	1 050	**29432R**	306	229	34	91	45	99	230	265	4	35.9

Spherical thrust roller bearings

d 170 ~ 320 mm

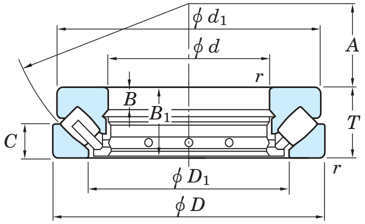


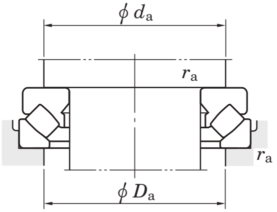


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed (min⁻¹)	Bearing No.	Dimensions (mm)						Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u	Oil lub.		d_1	D_1	B	B_1	C	A	d_a min.	D_a max.	r_a max.	
170	280	67	3	1 190	3 180	286	1 350	**29334R**	270	216	23	64	32	96	220	245	2.5	15.4
	340	103	5	2 120	5 880	389	950	**29434R**	324	243	37	99	50	104	245	285	4	44.0
180	300	73	3	1 380	3 170	330	1 250	**29336R**	290	232	25	69	35	103	235	260	2.5	20.7
	360	109	5	2 450	6 590	447	900	**29436R**	342	255	39	105	52	110	260	300	4	52.2
190	320	78	4	1 570	4 230	369	1 150	**29338R**	308	246	27	74	38	110	250	275	3	25.1
	380	115	5	2 790	7 690	504	850	**29438R**	360	271	41	111	55	117	275	320	4	61.4
200	280	48	2	641	2 170	151	1 600	**29240**	271	236	15	45	24	108	235	255	2	8.90
	340	85	4	1 810	5 040	415	1 050	**29340R**	325	261	29	81	41	116	265	295	3	31.2
	400	122	5	3 060	8 470	575	800	**29440R**	380	286	43	117	59	122	290	335	4	73.0
220	300	48	2	670	2 340	148	1 550	**29244**	292	254	15	45	24	117	260	275	2	10.0
	360	85	4	1 840	5 240	439	1 000	**29344R**	345	280	29	81	41	125	285	315	3	33.3
	420	122	6	3 160	8 990	619	750	**29444R**	400	308	43	117	58	132	310	355	5	74.2
240	340	60	2.1	1 030	3 670	233	1 250	**29248**	330	283	19	57	30	130	285	305	2	16.7
	380	85	4	1 790	5 330	99.3	950	**29348A**	365	300	29	81	41	135	300	330	3	35.5
	440	122	6	3 260	9 510	659	700	**29448R**	420	326	43	117	59	142	330	375	5	83.0
260	360	60	2.1	1 050	3 720	240	1 200	**29252**	350	302	19	57	30	139	305	325	2	18.5
	420	95	5	1 960	6 040	389	850	**29352**	405	329	32	91	45	148	330	365	4	51.5
	480	132	6	3 760	11 100	764	650	**29452R**	460	357	48	127	64	154	360	405	5	110
280	380	60	2.1	1 030	3 730	225	1 150	**29256**	370	323	19	57	30	150	325	345	2	19.5
	440	95	5	2 200	6 870	439	800	**29356**	423	348	32	91	46	158	350	390	4	53.2
	520	145	6	4 560	13 600	907	550	**29456R**	495	387	52	140	68	166	390	440	5	137
300	420	73	3	1 330	4 880	302	950	**29260**	405	353	21	69	38	162	355	380	2.5	30.5
	480	109	5	2 470	7 780	496	700	**29360**	460	379	37	105	50	168	380	420	4	74.9
	540	145	6	4 670	14 900	925	550	**29460R**	515	402	52	140	70	175	410	460	5	146
320	440	73	3	1 780	6 480	321	900	**29264R**	430	372	21	69	38	172	375	400	2.5	32.7
	500	109	5	2 890	9 380	573	650	**29364**	482	399	37	105	53	180	400	440	4	78.0
	580	155	7.5	5 190	16 100	1 040	500	**29464R**	555	435	55	149	75	191	435	495	6	179

Spherical thrust roller bearings

d 340 ~ 500 mm





Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed (min^{-1})	Bearing No.	Dimensions (mm)						Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u	Oil lub.		d_1	D_1	B	B_1	C	A	d_a min.	D_a max.	r_a max.	
340	460	73	3	1 800	6 420	307	900	**29268R**	445	395	21	69	37	183	395	420	2.5	34.7
	540	122	5	3 810	12 700	890	600	**29368R**	520	428	41	117	59	192	430	470	4	106
	620	170	7.5	6 190	19 400	1 210	450	**29468R**	590	462	61	164	82	201	465	530	6	224
360	500	85	4	1 650	6 080	332	750	**29272**	485	423	25	81	44	194	420	455	3	51.8
	560	122	5	3 890	13 200	923	550	**29372R**	540	448	41	117	59	202	450	495	4	110
	640	170	7.5	6 440	20 600	1 300	450	**29472R**	610	480	61	164	82	210	485	550	6	231
380	520	85	4	1 750	6 610	343	700	**29276**	505	441	27	81	42	202	440	475	3	52.8
	600	132	6	4 430	15 000	1 030	500	**29376R**	580	477	44	127	63	216	480	525	5	141
	670	175	7.5	6 780	22 000	1 300	410	**29476R**	640	504	63	168	85	230	510	575	6	263
400	540	85	4	1 980	7 610	377	700	**29280**	526	460	27	81	42	212	460	490	3	55.3
	620	132	6	4 630	16 100	1 080	500	**29380R**	596	494	44	127	64	225	500	550	5	144
	710	185	7.5	7 750	25 300	1 530	380	**29480R**	680	534	67	178	89	236	540	610	6	315
420	580	95	5	2 310	8 750	463	600	**29284**	564	489	30	91	46	225	490	525	4	75.4
	650	140	6	5 070	17 700	1 160	450	**29384R**	626	520	48	135	68	235	525	575	5	169
	730	185	7.5	7 960	26 500	1 630	370	**29484R**	700	556	67	178	89	244	560	630	6	330
440	600	95	5	2 340	8 970	441	600	**29288**	585	508	30	91	49	235	510	545	4	77.9
	680	145	6	5 360	18 800	1 250	420	**29388R**	655	548	49	140	70	245	550	600	5	190
	780	206	9.5	9 100	30 000	1 800	320	**29488R**	745	588	74	199	100	260	595	670	8	423
460	620	95	5	2 460	9 620	440	550	**29292**	605	530	30	91	46	245	530	570	4	81.0
	710	150	6	4 580	15 800	875	400	**29392**	685	567	51	144	72	257	575	630	5	216
	800	206	9.5	9 360	31 600	1 870	300	**29492R**	765	608	74	199	100	272	615	690	8	438
480	650	103	5	2 880	11 600	531	500	**29296**	635	556	33	99	55	259	555	595	4	89.0
	850	224	9.5	10 900	36 300	2 100	270	**29496R**	810	638	81	216	108	280	645	730	8	548
500	870	224	9.5	10 800	36 400	2 120	270	**294/500R**	830	661	81	216	107	290	670	750	8	562

Needle roller bearings

Needle roller bearings are small in sectional height, therefore useful in making machinery smaller and lighter. This type of bearing is used in a wide range of machinery, such as automobiles, motor cycles, electric machines, machine tools, aerospace and office equipment.

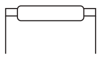
- Compact, highly rigid and superior in load carrying performance, compared with other types of bearings.
- Excellent for carrying oscillating loads; contains many small diameter rollers.

- Widely employed in stud type and yoke type track rollers used as guide rollers in cam mechanisms or linear motion units. Allowable loads of these truck rollers are examined with load ratings different form those of general bearings. For detailed information, contact us.
  Also used in miniature one-way clutches in the clutch mechanisms of office equipment, such as copying machines.

The catalog also covers bearings employing rollers other than those prescribed in JIS B 1506 "rollers for roller bearings".

For details, refer to JTEKT separate catalog “Needle Roller Bearings” (CAT. NO. B2020E)

Needle roller and cage assemblies

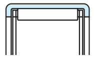


Bore diameter of a needle roller and cage assembly

Metric series **3 – 110** mm

Inch series **9.525 – 127.000** mm

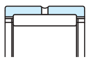
Drawn cup needle roller bearings



Metric series Roller set bore dia. **3 – 60** mm

Inch series Roller set bore dia. **3.175 – 69.850** mm

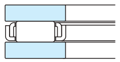
Heavy-duty needle roller bearings



Metric series Roller set bore dia. **5 – 175** mm

Inch series Roller set bore dia. **15.875 – 88.900** mm

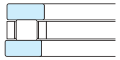
Needle roller thrust bearings



Metric series Bore dia. **6 – 160** mm

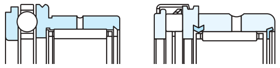
Inch series Bore dia. **6.350 – 104.780** mm

Cylindrical roller thrust bearings



Bore dia. **15 – 90** mm

Combined needle roller bearings



Roller set bore dia. **10 – 70** mm

Inner rings

Metric series Bore dia. **5 – 180** mm

Inch series Bore dia. **9.525 – 76.2** mm

Miniature one-way clutches (Refer.)

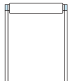
Roller set bore dia. **4 – 12** mm

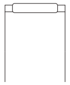
Table 1 (1) Types of needle roller bearing

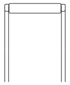
(1) Radial Needle Roller and Cage Assemblies

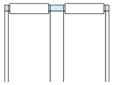
Metric Series | Inch Series

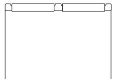
Single-Row, Double-Row

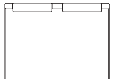

K, RF, RFN


RS, R, RP

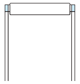

RV, V, VS


K ... ZW, WRF


WR, WRS

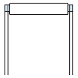

WRP

Single-Row

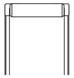

WJ, WJC

Metric Series

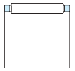
Assemblies for Crank Pin End Applications


K.BE


BE, GS


VE, VS P

Assemblies for Wrist Pin End Applications


K.SE

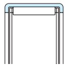

R P

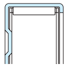

RE, UR P

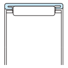
(2) Drawn Cup Needle Roller Bearings

Metric Series (Caged)

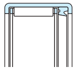
Open Ends, Closed One End

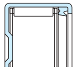

BKM,
BSM, HK

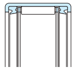

BK


BTM, BHTM

Sealed

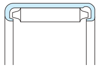

HK RS

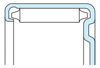

BK RS

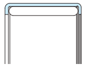

BKM UU,
BHKM UU,
HK .2RS

(Full Complement)

Open Ends, Closed One End

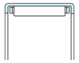

BM, BHM,
DL

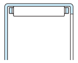

DLF

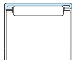

YM

Inch Series (Caged)

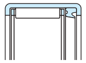
Open Ends, Closed One End

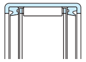

J,JH


MJ-1,MJH-1


BT

Sealed

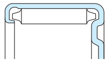

JT


JTT

(Full Complement)

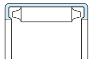
Open Ends, Closed One End


B,BH


M-1, MH-1


Y

Extra-Precision


GB,GBH

Inner Rings

Inch Series

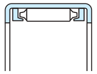

IRA,
IR (4 digit or less)

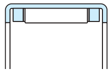
The needle roller bearings explained in this catalog are indicated in blue.
For additional details on Koyo's Needle Roller Bearing product line please refer to Catalog B2020E.

(3) Drawn Cup Roller Clutches

Metric Series

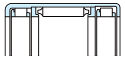
Clutches

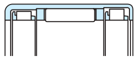

FC


FCS
FCL-K
FC-K


1WC
EWC

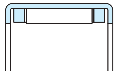
Clutch and Bearing Assemblies


FCB

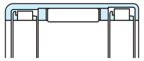

FCBL-K
FCBN-K

Inch Series

Clutches


RC
RC-FS

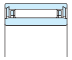
Clutch and Bearing Assemblies

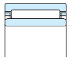

RCB
RCB-FS

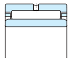
(4) Heavy-Duty Needle Roller Bearings

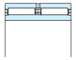
Metric Series (Caged, With Inner Ring)

Unsealed

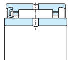

NKJ

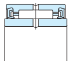

NQI


NKJ,NKJS
NA48,49,69

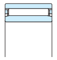

NA69

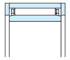
Sealed


NA49RS


NA49.2RS

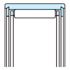
Without
Flanges

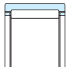

NAO

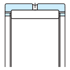

+SNSH

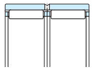
(Without Inner Ring)

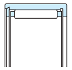
Unsealed


NK

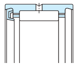

NQ

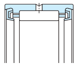

NK,NKS
RNA48,49,69


RNA69

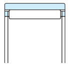

NKTN

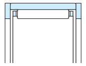
Sealed

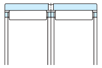

RNA49RS


RNA49.2RS

Without Flanges

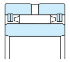

RNAO


+SNSH

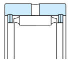

RNAO

(Full Complement) | Inch Series (Without Inner Ring) | Inner Rings

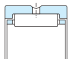
With Inner
Ring


NA

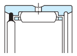
Without
Inner Ring

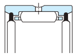

RNA

Unsealed


HJ

Sealed


HJ-RS


HJ-.2RS

Inch
Series

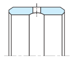

IR

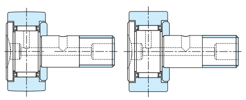
Table 1 (2) Types of needle roller bearing

(5) Track Rollers

[Stud-Type]

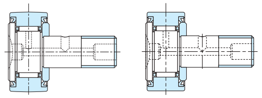
Metric Series (Caged)

Unsealed



KR KR.DZ

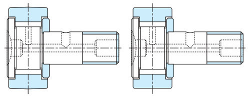
Sealed



KR .2RS KR.DZ.2RS

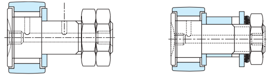
(Full Complement)

Unsealed



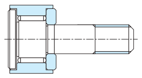
KRV KRV.DZ

Standard Series



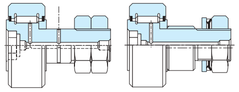
GC16-90/GCL16-90 GCR, GCRL

Small Series



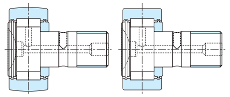
GC10-15/GCL10-15

Light Series



GCU,GCUL GCUR,GCURL

Cylindrical Rollers



NUKR NUKR.DZ

[Yoke-Type]

Metric Series (Caged, Without End Washers)

Unsealed, Without Inner Ring

RSTO RSTO.DZ

Unsealed, With Inner Ring

STO STO.DZ

Sealed, Without Inner Ring

RNA22.2RS RNA22.2RS.DZ

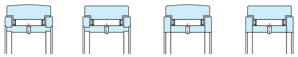
(Caged, Without End Washers)

Sealed, With Inner Ring

NA22.2RS NA22.2RS.DZ

(Caged, With End Washers)

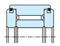
With Inner Ring



NATR NATR.DZ STO.ZZ STO.ZZ.DZ

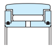
(Full Complement, With End Washers)

Small Series



FP,FPL

Non-Separable

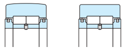


FG,FGL

Without Inner Ring Unsealed

RNA...B6
RNAB
RNAL

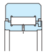
With Inner Ring, Cylindrical Rollers



NUTR NUTR.DZ

(Full Complement, With Metal Seals)

Non-Separable, Light Series, Heavy Series

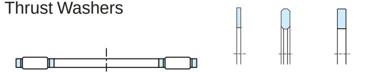


FGU,FGUL

(6) Thrust Bearings, Assemblies, Washers

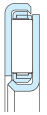
Metric Series

Thrust Needle Roller and Cage Assemblies and Thrust Washers



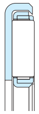
FNT, AXK, TP, TV
AS, WF
LS, WSF
WS.811, GS.811

Unitized Thrust Bearing Assemblies (Double-Washer)



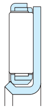
FNTKF, TPK JL, TVK JL

Unitized Thrust Bearing Assemblies (Single-Washer)



FNTK, TPK J, TVK J

Unitized Thrust Bearing Assemblies (Single-Washer)

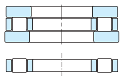


FNTF, TPK L, TVK L

Unitized Thrust Bearing Assembly AX Series

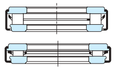
AX Thin AX Thick CP Thin CP Thick

Thrust Cylindrical Roller and Cage Assemblies and Thrust Washers



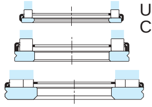
811, 812 Series
K.811,K.812

Needle Rollers, Cylindrical Rollers



AXZ,ARZ

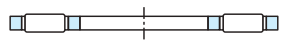
Unitized Cylindrical Rollers



AR

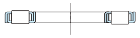
Inch Series

Thrust Needle Roller and Cage Assemblies and Thrust Washers



NTA

Thrust Cylindrical Roller and Cage Assembly



NTH

Cylindrical Roller Thrust Bearing

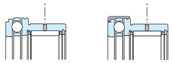
NTHA

(7) Combined Needle Roller Bearings

Metric Series (Heavy-Duty, Without Inner Ring)

Ball Thrust Series

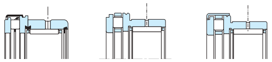
Separable Non-Separable



NAXK NAXK.Z

Cylindrical Roller Thrust Series

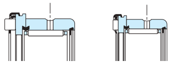
Non-Separable Separable Non-Separable



RAXZ500 NAXR NAXR.Z

Needle Roller and Cylindrical Roller Thrust Series

No Washer No Washer

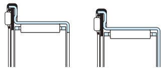


RAX500 RAX400

(Drawn Cup, Without Inner Ring)

Needle Roller Thrust Series

Open Ends Closed One End



RAX700 RAXF700

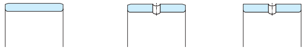
(8) Needle Rollers, Accessories

Inner Rings (Caged)

(Full Complement)

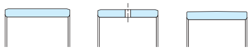
<Metric Series>

For Drawn Cup Needle Roller Bearings, Heavy-Duty



JR,IM..P JR.JS1 JRZ.JS1

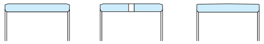
For Drawn Cup Needle Roller Bearings



IM IMC IM...R6

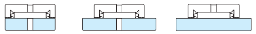
End Washer

For Machine-Tool Quality Precision-Combined Bearings



IM IMC IM...R6

For RNA Bearings (With Oil Holes, Extra Wide)



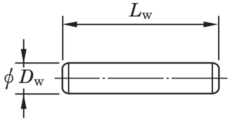
BIC BICG BIG,BIK,BIP

For Metric Series NAO and RNAO Bearings

SNSH

[Tolerances of needle roller bearings]

Table 2 Tolerance grades of needle rollers (JIS B 1506)



Unit : µm

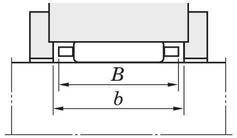
Class	Single [1)] plane diameter variation V_{Dwp} max.	Deviation [1)] from circular form $\varDelta_{Rw}$ max.	Gauge lot [1)] diameter variation V_{DwL} max.
2	1	1	2
3	1.5	1.5	3
5	2	2.5	5

Class	Actual [2)] length deviation $\varDelta_{Lws}$	Recommended gauge S
2	h 13	0/– 2, – 1/– 3, – 2/– 4, – 3/– 5, – 4/– 6, – 5/– 7, – 6/– 8, – 7/– 9, – 8/– 10
3		0/– 3, – 1.5/– 4.5, – 3/– 6, – 4.5/– 7.5, – 6/– 9,– 7/– 10
5		0/– 5, – 3/– 8, – 5/– 10

[Notes] 1) Values apply only at middle of roller length.
2) Applied tolerance differs according to L_w division.

[Remark] Along the entire length of the roller, all the actually measured diameters should not exceed the actual maximum diameter at the middle of the entire length of the roller by the lengths shown below.
a) Class 2 : 0.5 µm b) Class 3 : 0.8 µm
c) Class 5 : 1 µm

Table 3 Tolerance of needle roller cage width *B* (JIS B 1536-3)



Bearing type	*B* deviation (mm)	
	upper	lower
K, K...ZW	– 0.2	– 0.55
WJ, WJC	*0*	*– 0.38*

[Remark] Values in Italics are prescribed in JTEKT standards.

[Reference] The guide width (b) should satisfy the equation : $b = B + (\mathrm{H11})$

Table 4 Metric series drawn cup needle roller bearing gauge specifications (caged)

Unit : mm

Nominal bore diameter	Ring gage [1)]	Needle roller complement bore diameter	
		max.	min.
3	6.484	3.024	3.006
4	7.984	4.028	4.010
5	8.984	5.028	5.010
6	9.984	6.028	6.010
7	10.980	7.031	7.013
8	11.980	8.031	8.013
9	12.980	9.031	9.013
10	13.980	10.031	10.013
12	15.980	12.034	12.016
12	17.980	12.034	12.016
13	18.976	13.034	13.016
14	19.976	14.034	14.016
15	20.976	15.034	15.016
16	21.976	16.034	16.016
17	22.976	17.034	17.016
18	23.976	18.034	18.016
20	25.976	20.041	20.020
22	27.976	22.041	22.020
25	31.972	25.041	25.020
28	34.972	28.041	28.020
30	36.972	30.041	30.020
35	41.972	35.050	35.025
40	46.972	40.050	40.025
45	51.967	45.050	45.025
50	57.967	50.050	50.025
60	67.967	60.060	60.030

[Note] 1) The ring gage sizes are in accordance with ISO N6 lower limit.

Table 5 Inch series drawn cup needle roller bearing gauge specifications (caged)

Unit : mm

Bearing bore designation	Nominal shaft diameter	Nominal bore diameter	Ring gage	Needle roller complement bore diameter	
				max.	min.
2	3.175	3.175	6.363	3.218	3.195
2 $^1/_2$	3.970	3.967	7.155	4.013	3.99
3	4.763	4.763	8.730	4.806	4.783
4	6.350	6.350	11.125	6.411	6.388
5	7.938	7.938	12.713	7.998	7.976
H 5	H 7.938	7.938	14.300	7.998	7.976
6	9.525	9.525	14.300	9.586	9.563
H 6	H 9.525	9.525	15.888	9.586	9.563
7	11.113	11.113	15.888	11.174	11.151
H 7	H 11.113	11.113	17.475	11.174	11.151
8	12.700	12.700	17.475	12.761	12.738
H 8	H12.700	12.700	19.063	12.761	12.738
9	14.288	14.288	19.063	14.349	14.326
H 9	H 14.288	14.288	20.650	14.349	14.326
10	15.875	15.875	20.650	14.349	15.913
H 10	H 15.875	15.875	22.238	14.349	15.913
11	17.463	17.463	22.238	17.524	17.501
H 11	H 17.463	17.463	23.825	17.524	17.501
12	19.050	19.050	25.387	19.086	19.063
H 12	H 19.050	19.050	26.975	19.086	19.063
13	20.638	20.638	26.975	20.673	20.650
H 13	H 20.638	20.638	28.562	20.673	20.650
14	22.225	22.225	28.562	22.261	22.238
H 14	H 22.225	22.225	30.150	22.261	22.238
15	23.813	23.813	30.150	23.848	23.825
16	25.400	25.400	31.737	25.436	25.413
H 16	H 25.400	25.400	33.325	25.436	25.413
17	26.988	26.988	33.325	27.023	27.000
18	28.575	28.575	34.912	28.611	28.588
H 18	H 28.575	28.575	38.087	28.611	28.588
19	30.163	30.163	38.087	30.198	30.175
20	31.750	31.750	38.087	31.786	31.763
H 20	H 31.750	31.750	41.262	31.786	31.763
21	33.338	33.338	41.262	33.376	33.350
22	34.925	34.925	41.262	34.963	34.938
H 22	H 34.925	34.925	44.437	34.963	34.938
24	38.100	38.100	47.612	38.141	38.113
26	41.275	41.275	50.787	41.316	41.288
28	44.450	44.450	53.962	44.493	44.463
30	47.625	47.625	57.137	47.668	47.638
32	50.800	50.800	60.312	50.846	50.815
H 33	H 52.388	52.388	64.280	52.436	52.400
34	53.975	53.975	63.487	54.026	53.990
36	57.150	57.150	66.662	57.201	57.165
42	66.675	66.675	76.187	66.736	66.700
44	69.850	69.850	79.362	69.911	69.875
56	88.900	88.900	101.587	88.961	88.925
88	139.700	139.700	152.375	139.774	139.725

[Remark] Bearing bore should be checked with "go" and "no go" plug gages. The "go" gage size is the minimum needle roller complement bore diameter. The "no go" gage size is larger than the maximum needle roller complement bore diameter by 0.0001 in.

Table 6 Metric series caged needle roller complement bore diameter for bearings without inner rings

Unit : mm

F_w		$\varDelta F_{w\,\min}$	
over	up to	max.	min.
3	**6**	+ 0.018	+ 0.010
6	**10**	+ 0.022	+ 0.013
10	**18**	+ 0.027	+ 0.016
18	**30**	+ 0.033	+ 0.020
30	**50**	+ 0.041	+ 0.025
50	**80**	+ 0.049	+ 0.030
80	**120**	+ 0.058	+ 0.036
120	**180**	+ 0.068	+ 0.043
180	**250**	+ 0.079	+ 0.050
250	**315**	+ 0.088	+ 0.056
315	**400**	+ 0.098	+ 0.062

Table 7 Metric series heavy-duty needle roller bearing tolerances = JIS B 1415 (ISO 492) =

(1) Inner ring

Unit : µm

Nominal bore diameter d (mm)		Single plane mean bore diameter deviation Δ_{dmp}						Single plane bore diameter variation V_{dsp} Diameter series 9			Mean bore diameter variation V_{dmp}			Radial runout of assembled bearing inner ring K_{ia}			S_d	Single inner ring width deviation Δ_{Bs}						Inner ring width variation V_{Bs}		
		class 0		class 6		class 5		class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 5	class 5	class 0		class 6		class 5		class 0	class 6	class 5
over	up to	upper	lower	upper	lower	upper	lower	max.			max.			max.			max.	upper	lower	upper	lower	upper	lower	max.		
2.5	**10**	0	−8	0	−7	0	−5	10	9	5	6	5	3	10	6	4	7	0	−120	0	−120	0	−40	15	15	5
10	**18**	0	−8	0	−7	0	−5	10	9	5	6	5	3	10	7	4	7	0	−120	0	−120	0	−80	20	20	5
18	**30**	0	−10	0	−8	0	−6	13	10	6	8	6	3	13	8	4	8	0	−120	0	−120	0	−120	20	20	5
30	**50**	0	−12	0	−10	0	−8	15	13	8	9	8	4	15	10	5	8	0	−120	0	−120	0	−120	20	20	5
50	**80**	0	−15	0	−12	0	−9	19	15	9	11	9	5	20	10	5	8	0	−150	0	−150	0	−150	25	25	6
80	**120**	0	−20	0	−15	0	−10	25	19	10	15	11	5	25	13	6	9	0	−200	0	−200	0	−200	25	25	7
120	**150**	0	−25	0	−18	0	−13	31	23	13	19	14	7	30	18	8	10	0	−250	0	−250	0	−250	30	30	8
150	**180**	0	−25	0	−18	0	−13	31	23	13	19	14	7	30	18	8	10	0	−250	0	−250	0	−250	30	30	8
180	**250**	0	−30	0	−22	0	−15	38	28	15	23	17	8	40	20	10	11	0	−300	0	−300	0	−300	30	30	10

S_d : Perpendicularity of inner ring face with respect to the bore

(2) Outer ring

Unit : µm

Nominal outside diameter D (mm)		Single plane mean outside diameter deviation Δ_{Dmp}						Single plane outside diameter variation V_{Dsp} Diameter series 9			Mean outside diameter variation V_{Dmp}			Radial runout of assembled bearing outer ring K_{ea}			S_D	Δ_{Cs}		Ring width variation V_{Cs}		
		class 0		class 6		class 5		class 0[1]	class 6[1]	class 5	class 0[1]	class 6[1]	class 5	class 0	class 6	class 5	class 5	class 0, 6, 5		class 0	class 6	class 5
over	up to	upper	lower	upper	lower	upper	lower	max.			max.			max.			max.	upper	lower	max.		
6	**18**	0	−8	0	−7	0	−5	10	9	5	6	5	3	15	8	5	8	Shall conform to the tolerance Δ_{Bs} on d of the same bearing		Shall conform to the tolerance V_{Bs} on d of the same bearing		5
18	**30**	0	−9	0	−8	0	−6	12	10	6	7	6	3	15	9	6	8					5
30	**50**	0	−11	0	−9	0	−7	14	11	7	8	7	4	20	10	7	8					5
50	**80**	0	−13	0	−11	0	−9	16	14	9	10	8	5	25	13	8	8					6
80	**120**	0	−15	0	−13	0	−10	19	16	10	11	10	5	35	18	10	9					8
120	**150**	0	−18	0	−15	0	−11	23	19	11	14	11	6	40	20	11	10					8
150	**180**	0	−25	0	−18	0	−13	31	23	13	19	14	7	45	23	13	10					8
180	**250**	0	−30	0	−20	0	−15	38	25	15	23	15	8	50	25	15	11					10
250	**315**	0	−35	0	−25	0	−18	44	31	18	26	19	9	60	30	18	13					11

[Note] 1) Shall be applied when locating snap ring is not fitted.

S_D : Perpendicularity of outer ring outside surface with respect to the face

Δ_{Cs} : Deviation of a single outer ring width

Table 8 Inch series heavy-duty needle roller bearing (HJ outer ring)

(1) Outside diameter and width tolerances

Unit : mm

Nominal outside diameter D		Single plane mean outside diameter deviation (D_{mp})[1]		Deviaiton from nominal of width (C)	
over	up to	max.	min.	max.	min.
19.050	**50.800**	+0	–0.013	+0	–0.013
50.800	**82.550**	+0	–0.015		
82.550	**120.650**	+0	–0.020		

[Note] 1) "Single mean diameter" is defined as the mean diameter in a single radial plane.

(2) Roller complement bore tolerance

Unit : mm

Nominal roller complement bore diameter F_w		Deviaiton from nominal of the smallest single diameter of the roller complement bore (F_m)[1]	
over	up to	max.	min.
12.700	**15.875**	+0.043	+0.020
15.875	**28.575**	+0.046	+0.023
28.575	**41.275**	+0.048	+0.025
41.275	**47.625**	+0.050	+0.025
47.625	**69.850**	+0.053	+0.028
69.850	**76.200**	+0.058	+0.028
76.200	**101.600**	+0.060	+0.030

[Note] 1) "The smallest single diameter of the roller complement bore" is defined as the diameter of the cylinder which, when used as a bearing inner ring, results in zero radial internal clearance in the bearing on at least one diameter.

Table 9 Inch series heavy-duty needle roller bearing (IR inner ring)

(1) Bore and width tolerances

Unit : mm

Nominal bore diameter d		Single plane mean bore diameter deviation (d_{mp})[1]		Deviaiton from nominal of width (B)	
over	up to	max.	min.	max.	min.
7.938	**19.050**	+0	–0.010	+0.25	+0.12
19.050	**50.800**	+0	–0.013		
50.800	**82.550**	+0	–0.015		

[Note] 1) "Single mean diameter" is defined as the mean diameter in a single radial plane.

(2) Outside diameter tolerance

Unit : mm

Nominal outside diameter F		Single plane mean outside diameter deviation (F_{mp})[1]	
over	up to	max.	min.
12.700	**15.875**	–0.013	–0.023
15.875	**25.400**	–0.018	–0.031
25.400	**28.575**	–0.023	–0.036
28.575	**34.925**	–0.023	–0.036
34.925	**47.625**	–0.025	–0.038
47.625	**76.200**	–0.028	–0.040
76.200	**95.250**	–0.033	–0.046

[Note] 1) "Single mean diameter" is defined as the mean diameter in a single radial plane.

Table 10 Tolerance for metric series thrust needle roller and cage assemblies (type code : FNT)

(1) Bore diameter

Unit : mm

Nominal bore diameter D_{c1}		Smallest single bore diameter deviation (E11)	
over	up to	upper	lower
3	**6**	+0.095	+0.020
6	**10**	+0.115	+0.025
10	**18**	+0.142	+0.032
18	**30**	+0.170	+0.040
30	**50**	+0.210	+0.050
50	**80**	+0.250	+0.060
80	**120**	+0.292	+0.072
120	**180**	+0.335	+0.085

(2) Outside diameter

Unit : mm

Nominal outside diameter D_c		Largest single outside diameter deviation (c12)	
over	up to	upper	lower
18	**30**	–0.110	–0.320
30	**40**	–0.120	–0.370
40	**50**	–0.130	–0.380
50	**65**	–0.140	–0.440
65	**80**	–0.150	–0.450
80	**100**	–0.170	–0.520
100	**120**	–0.180	–0.530
120	**140**	–0.200	–0.600
140	**160**	–0.210	–0.610
160	**180**	–0.230	–0.630
180	**200**	–0.240	–0.700

Table 11 Tolerance for metric series thrust needle roller and cage assemblies (type code : AXK)

(1) Bore diameter

Unit : mm

Nominal bore diameter D_{c1}		Smallest single bore diameter deviation (E12)	
over	up to	upper	lower
3	**6**	+0.140	+0.020
6	**10**	+0.175	+0.025
10	**18**	+0.212	+0.032
18	**30**	+0.250	+0.040
30	**50**	+0.300	+0.050
50	**80**	+0.360	+0.060
80	**120**	+0.422	+0.072
120	**180**	+0.485	+0.085

(2) Outside diameter

Unit : mm

Nominal outside diameter D_c		Largest single outside diameter deviation (c13)	
over	up to	upper	lower
18	**30**	–0.110	–0.440
30	**40**	–0.120	–0.510
40	**50**	–0.130	–0.520
50	**65**	–0.140	–0.600
65	**80**	–0.150	–0.610
80	**100**	–0.170	–0.710
100	**120**	–0.180	–0.720
120	**140**	–0.200	–0.830
140	**160**	–0.210	–0.840
160	**180**	–0.230	–0.860
180	**200**	–0.240	–0.960

Table 12 Tolerance for metric series thrust washers (type code : AS series)

(1) Bore diameter

Unit : mm

Nominal bore diameter d		Smallest single bore diameter deviation (E13)	
over	up to	upper	lower
3	**6**	+0.200	+0.020
6	**10**	+0.245	+0.025
10	**18**	+0.302	+0.032
18	**30**	+0.370	+0.040
30	**50**	+0.440	+0.050
50	**80**	+0.520	+0.060
80	**120**	+0.612	+0.072
120	**180**	+0.715	+0.085

(2) Outside diameter

Unit : mm

Nominal outside diameter d_1		Largest single outside diameter deviation (e13)	
over	up to	upper	lower
18	**30**	–0.040	–0.370
30	**50**	–0.050	–0.440
50	**80**	–0.060	–0.520
80	**120**	–0.072	–0.612
120	**180**	–0.085	–0.715
180	**250**	–0.100	–0.820

Table 13 Tolerance for metric series thrust washers (type code : LS series)

(1) Bore diameter

Unit : mm

Nominal bore diameter d		Smallest single bore diameter deviation (E12)	
over	up to	upper	lower
3	**6**	+0.140	+0.020
6	**10**	+0.175	+0.025
10	**18**	+0.212	+0.032
18	**30**	+0.250	+0.040
30	**50**	+0.300	+0.050
50	**80**	+0.360	+0.060
80	**120**	+0.422	+0.072
120	**180**	+0.485	+0.085

(2) Outside diameter

Unit : mm

Nominal outside diameter d_1		Largest single outside diameter deviation (a12)	
over	up to	upper	lower
18	**30**	–0.300	–0.510
30	**40**	–0.310	–0.560
40	**50**	–0.320	–0.570
50	**65**	–0.340	–0.640
65	**80**	–0.360	–0.660
80	**100**	–0.380	–0.730
100	**120**	–0.410	–0.760
120	**140**	–0.460	–0.860
140	**160**	–0.520	–0.920
160	**180**	–0.580	–0.980
180	**200**	–0.660	–1.120

[Remark] Thickness tolerances for series LS heavy thrust washers are given in bearing tables.

Table 14 Tolerance for metric series shaft piloted washers of thrust bearings (type code : WS.811 and WS.812)

Unit : mm

Nominal bore diameter d		Tolerance class P0				Tolerance class P6				Tolerance class P5			
		Deviations Δ_{dmp}		Variation V_{dsp}	S_i 1)	Deviations Δ_{dmp}		Variation V_{dsp}	S_i 1)	Deviations Δ_{dmp}		Variation V_{dsp}	S_i 1)
over	up to	upper	lower	max.	min.	upper	lower	max.	min.	upper	lower	max.	min.
	18	+0	–0.008	0.006	0.010	+0	–0.008	0.006	0.005	+0	–0.008	0.006	0.003
18	**30**	+0	–0.010	0.008	0.010	+0	–0.010	0.008	0.005	+0	–0.010	0.008	0.003
30	**50**	+0	–0.012	0.009	0.010	+0	–0.012	0.009	0.006	+0	–0.012	0.009	0.003
50	**80**	+0	–0.015	0.011	0.010	+0	–0.015	0.011	0.007	+0	–0.015	0.011	0.004
80	**120**	+0	–0.020	0.015	0.015	+0	–0.020	0.015	0.008	+0	–0.020	0.015	0.004
120	**180**	+0	–0.025	0.019	0.015	+0	–0.025	0.019	0.009	+0	–0.025	0.019	0.005
180	**250**	+0	–0.030	0.023	0.020	+0	–0.030	0.023	0.010	+0	–0.030	0.023	0.005
250	**315**	+0	–0.035	0.026	0.025	+0	–0.035	0.026	0.013	+0	–0.035	0.026	0.007
315	**400**	+0	–0.040	0.030	0.030	+0	–0.040	0.030	0.015	+0	–0.040	0.030	0.007
400	**500**	+0	–0.045	0.034	0.030	+0	–0.045	0.034	0.018	+0	–0.045	0.034	0.009

[Note] 1) The values of the wall thickness variation S_e, for the housing piloted washer are identical to S_i for the shaft - piloted washers.

Δ_{dmp} : Single plane mean bore diameter deviation
V_{dsp} : Single plane bore diameter variation
S_i : Wall thickness variation

Table 15 Tolerance for metric series housing piloted washers of thrust bearings (type code : GS.811 and GS.812)

Unit : mm

Nominal outside diameter D		Tolerance class P0			Tolerance class P6			Tolerance class P5		
		Deviations Δ_{Dmp}		Variation V_{Dsp}	Deviations Δ_{Dmp}		Variation V_{Dsp}	Deviations Δ_{Dmp}		Variation V_{Dsp}
over	up to	upper	lower	max.	upper	lower	max.	upper	lower	max.
	30	+0	–0.013	0.010	+0	–0.013	0.010	+0	–0.013	0.010
30	**50**	+0	–0.016	0.012	+0	–0.016	0.012	+0	–0.016	0.012
50	**80**	+0	–0.019	0.014	+0	–0.019	0.014	+0	–0.019	0.014
80	**120**	+0	–0.022	0.017	+0	–0.022	0.017	+0	–0.022	0.017
120	**180**	+0	–0.025	0.019	+0	–0.025	0.019	+0	–0.025	0.019
180	**250**	+0	–0.030	0.023	+0	–0.030	0.023	+0	–0.030	0.023
250	**315**	+0	–0.035	0.026	+0	–0.035	0.026	+0	–0.035	0.026
315	**400**	+0	–0.040	0.030	+0	–0.040	0.030	+0	–0.040	0.030
400	**500**	+0	–0.045	0.034	+0	–0.045	0.034	+0	–0.045	0.034

[Note] Δ_{Dmp} : Single plane mean outside diameter deviation
V_{Dsp} : Single plane outside diameter variation

Table 16 Tolerance for inch series thrust needle roller and cage assemblies (type code : NTA)

Unit : mm

Needle roller diameter (nominal) D_w	Deviations			
	Bore diameter D_{c1}		Outside diameter D_c	
	upper	lower	upper	lower
1.981	+0.178	+0.051	–0.254	–0.508
3.175	+0.254	+0.051	–0.254	–0.635

Table 17 Tolerance for inch series thrust washers (type code : TRA, TRB, etc.)

(1) Bore diameter

Unit : mm

Nominal bore diameter d		Deviations	
over	up to	upper	lower
6.000	**57.200**	+0.300	+0.050
57.200	**133.400**	+0.430	+0.050

(2) Outside diameter

Unit : mm

Nominal Outside diameter d_1		Deviations	
over	up to	upper	lower
6.000	**133.400**	–0.025	–0.760

Table 18 Tolerance for combined needle roller bearings (thrust component thickness (C_1))

Unit : mm

Bearing series	Tolerance	
	upper	lower
NAXK, NAXK.Z	+0	–0.200
NAXR, NAXR.Z		
RAXZ	+0.100	–0.110

[Recommended fit and internal clearance]

Table 19 Recommended fit for metric series radial needle roller and cage assemblies

Condition	Tolerance zone class		
	Shaft		Housing bore
Radial clearance	$F_w \leqq 50$ mm	$F_w > 50$ mm	
Smaller than normal	j 5	h 5	G 6
Normal	h 5	g 5	
Larger than normal	g 6	f 6	

Table 20 Recommended fit for metric series drawn cup needle roller bearings

Bearing type	Operating condition	Shaft fit (recommended internal radial clearances)	Housing fit (recommended internal radial clearances)
HK, BK (caged)	One piece heavy section steel or cast iron housing	h5 (h6)	N6 (N7)
	Housing material of low rigidity	h5 (h6)	R6 (R7)
	Outer ring rotation (one piece heavy section steel or cast iron housing)	f5 (f6)	R6 (R7)
	Oscillating Motion	j5 (j6)	1)

[Note] 1) Tolerance dependent on housing design.

[Remark] When the bearing is provided with an inner ring, the shaft tolerance class h5 should be selected.

Table 21 Recommended fit for inch series drawn cup needle roller bearings

Bearing design	Shaft			Housing		
	Classification	max.	min.	Classification	max.	min.
J, JTT 1)	$F_w \leqq$ 5.556 mm (7/32")	0	–0.008 mm (–0.0003")	$D \leqq$ 7.144 mm (9/32")	+0.013 mm (–0.0005")	0
	5.556 mm (7/32") $< F_w \leqq$ 50.006 mm (1 31/32")	0	–0.013 mm (–0.0005")			
	50.006 mm (1 31/32") $< F_w \leqq$ 119.856 mm (4 23/32")	0	–0.015 mm (–0.0006")	7.144 mm (9/32") $< D$	+0.013 mm (–0.0005")	+0.013 mm (–0.0005")
	119.856 mm (4 23/32") $< F_w \leqq$ 180.181 mm (7 3/32")	0	–0.018 mm (–0.0007")			

[Note] 1) Special fits

When D = 8.733 mm (0.3438") : housing fit : –0.003 mm (–0.0001") maximum, –0.015 mm (–0.0006") minimum
When D = 22.212 mm (0.8745") : housing fit : +0.025 mm (+0.0010") maximum, 0 mm (0") minimum
When D = 152.400 mm (6.0000") : housing fit : +0.025 mm (+0.0010") maximum, –0.025 mm (–0.0010") minimum

Table 22 Recommended fit for metric series heavy-duty needle roller bearings

Without inner ring

Rotation conditions	Nominal housing bore diameter D (mm)	ISO tolerance zone for housing		Nominal shaft diameter F shaft (mm)	ISO tolerance zone for shaft	
		caged	full		caged	full
Load stationary relative to housing	all diameters	H7 (J7)	J6	all diameters	h6 (h5)	h5
General work with larger clearance		K7	—		g6	—
Load rotates relative to housing		N7	M6		f6	g5

[Remark] Care should be taken that the selected bearing internal clearance is appropriate for the operating conditions.

Table 23 Recommended fit for metric series needle roller thrust bearings

Bearing components	Shaft tolerance (shaft piloting)	Housing tolerance (housing piloting)
Needle roller and cage assembly. Types : AXK, FNT	h8	H8
Thin thrust washer. Type : AS	h8	H8
Heavy thrust washer. Type : LS	h8	H8
Shaft-piloted thrust washer. Type : WS.811	h6 (j6)	Clearance
Housing-piloted thrust washer. Type : GS.811	Clearance	H7 (K7)

Table 24 Recommended fit for metric series cylindrical roller thrust bearings

Bearing components	Shaft tolerance (shaft piloting)	Housing tolerance (housing piloting)	Piloting components
Thrust cylindrical roller and cage assembly. Types : K.811 and K.812	h8	H10	Shaft
Heavy thrust washer. Type : LS	h10	H11	Shaft
Shaft-piloted thrust washer. Types : WS.811, WS.812	h6 (j6)	Clearance	Shaft
Housing-piloted thrust washer. Types : GS.811, GS.812	Clearance	H7 (K7)	Housing

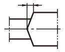
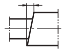
[Shaft and housing specifications]

Table 25 Specifications of shafts and housings (needle roller and cage assemblies, drawn cup needle roller bearings, and heavy-duty needle roller bearings)

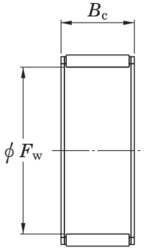
	Shaft		Housing bore	
	Raceway surface	Fitting surface	Raceway surface	Fitting surface
Roundness	· Shaft diameter ≦ 25 mm : 2.5 μm or less · Shaft diameter > 25 mm : 2.5 μm × (shaft diameter /25 mm) or less	One-half the shaft diameter tolerance or less	8 μm or one-half the bore tolerance or less	One-half the bore tolerance or less
Variation of mean diameter (Cylindricity)	Within the range of the bearing width, 5 μm or less per 25 mm or one-half the bearing tolerance or less (whichever is smaller)	One-half the shaft diameter tolerance or less	Within the range of the bearing width, 5 μm or less per 25 mm or one-half the bearing tolerance or less (whichever is smaller)	Within the length of the outer ring, 13 μm or one-half the diameter tolerance (whichever is smaller) or less
Surface roughness	0.2 a or less	0.8 a or less	0.2 a or less	1.6 a or less
Hardness	58 HRC or harder [1]	—	58 HRC or harder [1]	—
Shaft slope	13 μm or less per 25 mm		—	

[Note] 1) During the carburizing or induction-hardening of case hardened steel, not only must the surface hardness requirement specified above be met, but the case depth of HV 550 (52.3 HRC) must be met in the range of 0.08 D_w to 0.10 D_w mm. (D_w : roller diameter)

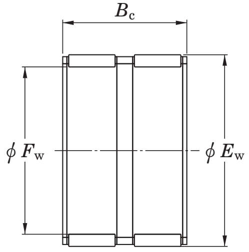
Table 26 Needle roller thrust bearing mounting surface specifications

Flatness (dishing or coning)		Maximum angle : Arctan 0.001
Squareness		Maximum angle : Arctan 0.0005
Roughness (Ra)	0.2 a or less	
Hardness	58 HRC or harder (refer to the note for Table 25 above regarding depth.)	

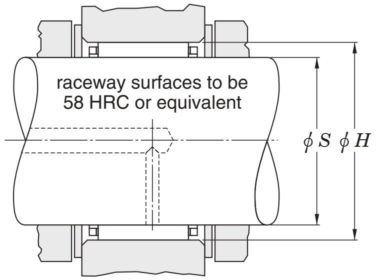
Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series
Shaft dia. 3 ~ (10) mm



K



K ZW

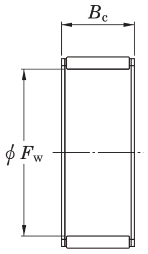


Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c −0.20 −0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
3	3	5	7	**K3X5X7TN**	1.56	1.29	0.200	P	48 000	74 000	0.0002	3.000	2.996	5.004	5.012
4	4	7	7	**K4X7X7TN**	1.83	1.32	0.200	P	34 000	52 000	0.0005	4.000	3.995	7.014	7.005
5	5	8	8	**K5X8X8TN**	2.18	1.71	0.260	P	31 000	47 000	0.0007	5.000	4.995	8.014	8.005
	5	8	10	**K5X8X10TN**	3.04	2.63	0.400	P	31 000	47 000	0.0008	5.000	4.995	8.014	8.005
	5	9	13	**K5X9X13TN**	4.29	3.55	0.540	P	26 000	40 000	0.002	5.000	4.995	9.014	9.005
6	6	9	8	**K6X9X8H**	3.19	2.90	0.420	S	29 000	44 000	0.0008	6.000	5.995	9.014	9.005
	6	9	8	**K6X9X8TN**	2.47	2.07	0.310	P	29 000	44 000	0.001	6.000	5.995	9.014	9.005
	6	9	10	**K6X9X10TN**	3.07	2.74	0.420	P	29 000	44 000	0.001	6.000	5.995	9.014	9.005
7	7	10	8	**K7X10X8TN**	2.74	2.44	0.370	P	28 000	42 000	0.001	7.000	6.994	10.014	10.005
	7	10	10	**K7X10X10TN**	3.40	3.22	0.490	P	28 000	42 000	0.001	7.000	6.994	10.014	10.005
	7	11	15	**K7X11X15TN**	6.44	6.24	0.940	P	23 000	35 000	0.003	7.000	6.994	11.017	11.006
8	8	11	8	**K8X11X8FV**	3.23	3.11	0.470	S	26 000	41 000	0.002	8.000	7.994	11.017	11.006
	8	11	8	**K8X11X8TN**	2.34	2.05	0.300	P	26 000	41 000	0.001	8.000	7.994	11.017	11.006
	8	11	10	**K8X11X10H**	4.57	4.89	0.740	S	26 000	41 000	0.002	8.000	7.994	11.017	11.006
	8	11	10	**K8X11X10FV**	4.01	4.11	0.630	S	26 000	41 000	0.002	8.000	7.994	11.017	11.006
	8	11	10	**K8x11x10TN**	3.84	3.91	0.600	P	26 000	41 000	0.001	8.000	7.994	11.006	11.017
	8	11	13	**K8x11x13TN**	5.18	5.75	0.870	P	26 000	41 000	0.002	8.000	7.994	11.006	11.017
	8	11	13	**K8X11X13H**	5.22	5.78	0.880	S	26 000	41 000	0.003	8.000	7.994	11.017	11.006
9	9	12	10	**K9X12X10FH**	4.27	4.60	0.700	S	26 000	40 000	0.003	9.000	8.994	12.017	12.006
	9	12	10	**K9X12X10FV**	4.27	4.60	0.700	S	26 000	40 000	0.002	9.000	8.994	12.017	12.006
	9	12	13	**K9X12X13FH**	5.57	6.47	0.980	S	26 000	40 000	0.003	9.000	8.994	12.017	12.006
	9	12	13	**K9X12X13FV**	5.57	6.47	0.980	S	26 000	40 000	0.003	9.000	8.994	12.017	12.006
	9	13	8	**K9X13X8H**	3.96	3.50	0.530	S	21 000	32 000	0.003	9.000	8.994	13.017	13.006
10	10	13	10	**K10X13X10H**	5.40	6.43	0.980	S	25 000	39 000	0.002	10.000	9.994	13.017	13.006
	10	13	10	**K10X13X10TN**	4.29	4.77	0.730	P	25 000	39 000	0.002	10.000	9.994	13.017	13.006
	10	13	13	**K10X13X13**	5.90	7.16	1.10	S	25 000	39 000	0.003	10.000	9.994	13.017	13.006

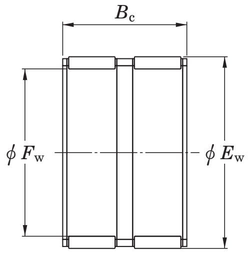
[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies single-row, double-row assemblies metric series K, K ZW series

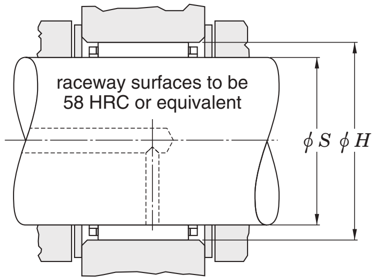
Shaft dia. (10) ~ (15) mm



K



K ZW

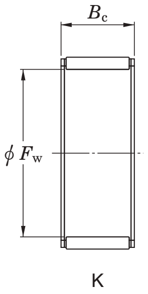


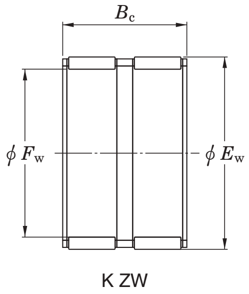
Boundary dimensions (mm) Shaft dia.	F_w	E_w	B_c $^{-0.20}_{-0.55}$	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Cage material 1) P / S	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	(Refer.) Mass (kg)	Recommended dimensions (mm) S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
10	10	13	16	**K10X13X16**	7.43	9.64	1.50	S	25 000	39 000	0.004	10.000	9.994	13.017	13.006
	10	14	10	**K10X14X10H**	6.12	6.29	0.960	S	20 000	31 000	0.003	10.000	9.994	14.017	14.006
	10	14	13	**K10X14X13H**	7.88	8.71	1.35	S	20 000	31 000	0.004	10.000	9.994	14.017	14.006
	10	16	12	**K10X16X12F**	8.39	7.47	1.15	S	15 000	24 000	0.006	10.000	9.994	16.017	16.006
	10	16	12	**K10X16X12TN**	7.50	6.40	0.970	P	15 000	24 000	0.005	10.000	9.994	16.017	16.006
12	12	15	10	**K12X15X10H**	5.85	7.51	1.15	S	24 000	37 000	0.003	12.000	11.992	15.017	15.006
	12	15	13	**K12X15X13H**	6.78	9.03	1.40	S	24 000	37 000	0.004	12.000	11.992	15.017	15.006
	12	16	13	**K12X16X13H**	7.49	8.51	1.60	S	19 000	30 000	0.006	12.000	11.992	16.017	16.006
	12	17	13	**K12X17X13**	8.93	9.29	1.20	S	16 000	25 000	0.008	12.000	11.992	17.017	17.006
	12	18	12	**K12X18X12H**	9.76	9.40	1.40	S	14 000	22 000	0.009	12.000	11.992	18.017	18.006
13	13	17	10	**K13X17X10**	7.22	8.33	1.25	S	19 000	29 000	0.004	13.000	12.992	17.017	17.006
	13	18	15	**K13X18X15F**	10.8	12.1	1.85	S	16 000	25 000	0.008	13.000	12.992	18.017	18.006
14	14	18	8	**K14X18X8**	5.39	5.82	0.880	S	19 000	29 000	0.004	14.000	13.992	18.017	18.006
	14	18	10	**K14X18X10**	7.17	8.41	1.30	S	19 000	29 000	0.005	14.000	13.992	18.017	18.006
	14	18	13	**K14X18X13**	9.73	12.5	1.90	S	19 000	29 000	0.006	14.000	13.992	18.017	18.006
	14	18	15	**K14X18X15**	10.5	13.8	2.15	S	19 000	29 000	0.007	14.000	13.992	18.017	18.006
	14	18	17	**K14X18X17H**	12.4	17.1	2.65	S	19 000	29 000	0.008	14.000	13.992	18.017	18.006
	14	19	13	**K14X19X13H**	10.2	11.4	1.75	S	16 000	24 000	0.008	14.000	13.992	19.020	19.007
	14	19	18	**K14X19X18F**	13.2	16.0	2.50	S	16 000	24 000	0.011	14.000	13.992	19.020	19.007
	14	20	12	**K14X20X12**	10.5	10.6	1.60	S	14 000	21 000	0.009	14.000	13.992	20.020	20.007
15	15	18	14	**K15X18X14TN**	7.92	11.9	1.80	P	13 000	23 000	0.003	15.000	14.992	18.017	18.006
	15	18	16	**K15X18X16F**	8.36	12.6	1.95	S	13 000	23 000	0.005	15.000	14.992	18.017	18.006
	15	18	17	**K15X18X17**	8.08	12.1	1.85	S	23 000	36 000	0.005	15.000	14.992	18.017	18.006
	15	19	10	**K15X19X10**	7.87	9.69	1.45	S	18 000	28 000	0.005	15.000	14.992	19.020	19.007
	15	19	13	**K15X19X13**	9.66	12.6	1.90	S	18 000	28 000	0.007	15.000	14.992	19.020	19.007
	15	19	17	**K15X19X17H**	12.3	17.2	2.65	S	18 000	28 000	0.009	15.000	14.992	19.020	19.007
	15	19	22	**K15X19X22ZW**	12.2	17.0	2.60	S	18 000	28 000	0.010	15.000	14.992	19.020	19.007

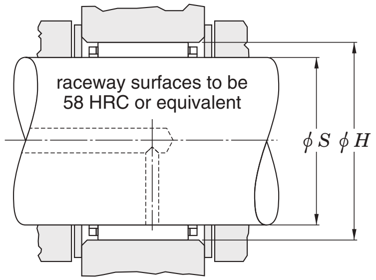
[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies single-row, double-row assemblies metric series K, K ZW series

Shaft dia. (15) ~ (18) mm



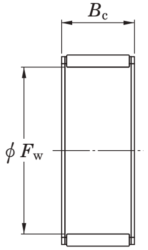




Boundary dimensions (mm) Shaft dia.	F_w	E_w	B_c −0.20 −0.55	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Cage material [1] P / S	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	(Refer.) Mass (kg)	Recommended dimensions (mm) S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
15	15	20	13	**K15X20X13H**	9.93	11.3	1.80	S	16 000	24 000	0.008	15.000	14.992	20.020	20.007
	15	21	15	**K15X21X15**	13.4	14.8	2.30	S	14 000	21 000	0.013	15.000	14.992	21.020	21.007
	15	21	21	**K15X21X21H**	18.0	21.7	3.40	S	14 000	21 000	0.018	15.000	14.992	21.020	21.007
16	16	20	8	**K16X20X8F**	6.37	7.51	1.15	S	18 000	28 000	0.005	16.000	15.992	20.020	20.007
	16	20	10	**K16X20X10H**	7.82	9.76	1.50	S	18 000	28 000	0.006	16.000	15.992	20.020	20.007
	16	20	13	**K16X20X13**	10.1	13.5	2.05	S	18 000	28 000	0.007	16.000	15.992	20.020	20.007
	16	20	14	**K16X20X14**	10.8	14.8	2.25	S	18 000	28 000	0.007	16.000	15.992	20.020	20.007
	16	20	17	**K16X20X17H**	12.9	18.5	2.85	S	18 000	28 000	0.008	16.000	15.992	20.020	20.007
	16	20	20	**K16X20X20**	13.4	19.5	3.05	S	18 000	28 000	0.011	16.000	15.992	20.020	20.007
	16	22	12	**K16X22X12**	11.2	11.9	1.80	S	19 000	29 000	0.010	16.000	15.992	22.020	22.007
	16	22	16	**K16X22X16H**	14.9	17.2	2.70	S	19 000	29 000	0.014	16.000	15.992	22.020	22.007
	16	22	20	**K16X22X20**	18.6	22.9	3.60	S	19 000	29 000	0.017	16.000	15.992	22.020	22.007
	16	24	20	**K16X24X20**	20.2	21.4	3.45	S	20 000	30 000	0.025	16.000	15.992	24.020	24.007
17	17	20	10	**K17X20X10**	5.96	8.53	1.30	S	16 000	25 000	0.004	17.000	16.992	20.020	20.007
	17	21	10	**K17X21X10**	8.12	10.4	1.60	S	17 000	26 000	0.006	17.000	16.992	21.020	21.007
	17	21	12.8	**K17X21X13H**	10.5	14.5	2.20	S	17 000	26 000	0.008	17.000	16.992	21.020	21.007
	17	21	15	**K17X21X15**	11.4	16.1	2.50	S	17 000	26 000	0.008	17.000	16.992	21.020	21.007
	17	21	17	**K17X21X17H**	13.4	19.8	3.05	S	17 000	26 000	0.011	17.000	16.992	21.020	21.007
	17	22	20	**K17X22X20FH**	17.0	23.3	3.65	S	17 000	27 000	0.015	17.000	16.992	22.020	22.007
	17	23	15	**K17X23X15F**	14.1	16.3	2.55	S	18 000	27 000	0.010	17.000	16.992	23.020	23.007
18	18	22	8	**K18X22X8F**	6.32	7.70	1.15	S	16 000	24 000	0.005	18.000	17.992	22.020	22.007
	18	22	10	**K18X22X10H**	8.41	11.1	1.70	S	16 000	24 000	0.006	18.000	17.992	22.020	22.007
	18	22	13	**K18X22X13H**	10.8	15.4	2.35	S	16 000	24 000	0.008	18.000	17.992	22.020	22.007
	18	22	14	**K18X22X14**	11.6	16.8	2.55	S	16 000	24 000	0.009	18.000	17.992	22.020	22.007
	18	22	14	**K18X22X14FV**	11.3	16.3	2.45	S	16 000	24 000	0.009	18.000	17.992	22.020	22.007
	18	22	17	**K18X22X17H**	13.3	19.9	3.10	S	16 000	24 000	0.009	18.000	17.992	22.020	22.007
	18	22	20	**K18X22X20F**	15.0	23.4	3.65	S	16 000	24 000	0.011	18.000	17.992	22.020	22.007
	18	24	12	**K18X24X12**	11.8	13.1	1.95	S	17 000	25 000	0.011	18.000	17.992	24.020	24.007

[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series
Shaft dia. (18) ~ (22) mm



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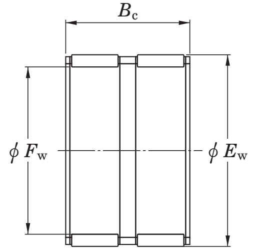
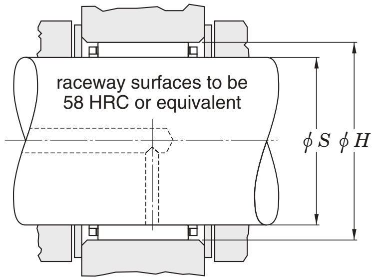


K ZW

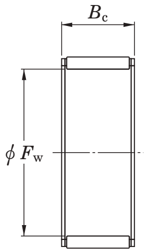


Boundary dimensions (mm) Shaft dia.	F_w	E_w	B_c −0.20 −0.55	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Cage material 1) P / S	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	(Refer.) Mass (kg)	Recommended dimensions (mm) S (Shaft) max.	min.	H (Housing) max.	min.
18	18	24	20	**K18X24X20H**	19.4	24.9	3.90	S	16 000	25 000	0.019	18.000	17.992	24.020	24.007
	18	25	22	**K18X25X22H**	23.3	28.6	4.50	S	17 000	26 000	0.025	18.000	17.992	25.020	25.007
	18	26	12	**K18X26X12FV**	13.8	13.5	2.10	S	11 000	17 000	0.020	18.000	17.992	26.020	26.007
	18	26	20	**K18X26X20F**	21.7	24.1	3.85	S	17 000	26 000	0.027	18.000	17.992	26.020	26.007
19	19	23	13	**K19X23X13**	10.8	15.5	2.35	S	15 000	23 000	0.008	19.000	18.991	23.020	23.007
	19	23	17	**K19X23X17**	13.4	20.6	3.20	S	15 000	23 000	0.011	19.000	18.991	23.020	23.007
20	20	24	8	**K20X24X8F**	7.31	9.60	1.50	S	14 000	22 000	0.005	20.000	19.991	24.020	24.007
	20	24	10	**K20X24X10H**	8.97	12.5	2.05	S	14 000	22 000	0.006	20.000	19.991	24.020	24.007
	20	24	12	**K20X24X12**	10.7	15.7	2.40	S	14 000	22 000	0.008	20.000	19.991	24.020	24.007
	20	24	13	**K20X24X13H**	11.5	17.3	1.30	S	14 000	22 000	0.009	20.000	19.991	24.020	24.007
	20	24	14	**K20X24X14**	12.4	18.9	2.85	S	14 000	22 000	0.009	20.000	19.991	24.020	24.007
	20	24	17	**K20X24X17H**	14.8	23.7	3.65	S	14 000	22 000	0.011	20.000	19.991	24.020	24.007
	20	26	12	**K20X26X12**	13.0	15.3	2.30	S	15 000	23 000	0.012	20.000	19.991	26.020	26.007
	20	26	13	**K20X26X13H**	13.4	15.9	2.35	S	15 000	23 000	0.014	20.000	19.991	26.020	26.007
	20	26	17	**K20X26X17H**	19.3	25.5	4.00	S	15 000	23 000	0.017	20.000	19.991	26.020	26.007
	20	26	20	**K20X26X20**	20.3	27.2	4.25	S	15 000	23 000	0.020	20.000	19.991	26.020	26.007
	20	28	20	**K20X28X20H**	24.6	29.0	2.70	S	15 000	23 000	0.028	20.000	19.991	28.020	28.007
	20	28	25	**K20X28X25H**	29.7	37.0	5.80	S	15 000	23 000	0.036	20.000	19.991	28.020	28.007
	20	30	30	**K20X30X30H**	38.9	45.8	7.20	S	16 000	24 000	0.055	20.000	19.991	30.020	30.007
	20	32	36	**K20X32X36H**	49.9	57.0	9.15	S	16 000	25 000	0.082	20.000	19.991	32.025	32.009
21	21	25	17	**K21X25X17H**	14.3	23.1	3.60	S	14 000	21 000	0.013	21.000	20.991	25.020	25.007
22	22	26	10	**K22X26X10H**	9.81	14.5	2.20	S	13 000	20 000	0.007	22.000	21.991	26.020	26.007
	22	26	13	**K22X26X13H**	11.8	18.3	2.95	S	13 000	20 000	0.012	22.000	21.991	26.020	26.007
	22	26	17	**K22X26X17H**	15.6	26.3	4.05	S	13 000	20 000	0.012	22.000	21.991	26.020	26.007
	22	26	18	**K22X26X18H**	15.3	25.5	4.00	S	13 000	20 000	0.017	22.000	21.991	26.020	26.007
	22	28	13	**K22X28X13**	13.9	17.1	2.60	S	13 000	20 000	0.015	22.000	21.991	28.020	28.007
	22	28	17	**K22X28X17H**	18.2	24.2	3.80	S	13 000	20 000	0.020	22.000	21.991	28.020	28.007

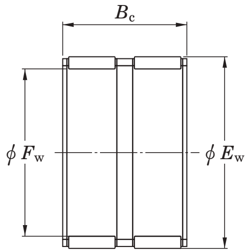
[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies single-row, double-row assemblies metric series K, K ZW series

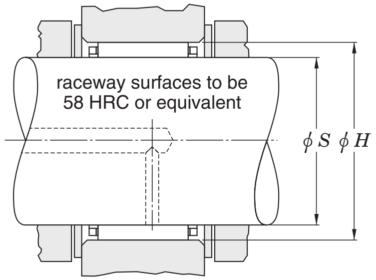
Shaft dia. (22) ~ (25) mm



K



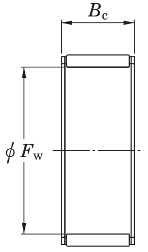
K ZW



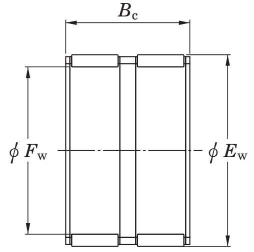
Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds ($\min^{-1}$)		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c −0.20 −0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
22	22	30	15	**K22X30X15H**	19.7	22.3	3.45	S	14 000	21 000	0.023	22.000	21.991	30.020	30.007
	22	30	20	**K22X30X20FV**	24.4	29.4	4.70	S	14 000	21 000	0.031	22.000	21.991	30.020	30.007
	22	32	24	**K22X32X24F**	33.1	37.9	6.05	S	14 000	22 000	0.046	22.000	21.991	32.025	32.009
	22	32	30	**K22X32X30H**	41.8	51.3	8.05	S	14 000	22 000	0.057	22.000	21.991	32.025	32.009
23	23	28	24	**K23X28X24F**	22.4	36.2	5.70	S	12 000	19 000	0.023	23.000	22.991	28.020	28.007
	23	35	16	**K23X35X16H**	25.9	25.1	3.90	S	14 000	21 000	0.040	23.000	22.991	35.025	35.009
24	24	28	10	**K24X28X10H**	9.67	14.6	2.20	S	12 000	18 000	0.027	24.000	23.991	28.020	28.007
	24	28	13	**K24X28X13H**	12.5	20.2	3.05	S	12 000	18 000	0.010	24.000	23.991	28.020	28.007
	24	28	16	**K24X28X16F**	12.6	20.4	3.10	S	12 000	18 000	0.012	24.000	23.991	28.020	28.007
	24	28	17	**K24X28X17H**	15.4	26.4	4.10	S	12 000	18 000	0.013	24.000	23.991	28.020	28.007
	24	30	10	**K24X30X10TN**	11.3	13.5	2.05	P	12 000	19 000	0.008	24.000	23.991	30.020	30.007
	24	30	17	**K24X30X17H**	19.8	27.7	4.35	S	12 000	19 000	0.020	24.000	23.991	30.020	30.007
	24	30	22	**K24X30X22**	25.0	37.3	5.80	S	12 000	19 000	0.024	24.000	23.991	30.020	30.007
	24	36	23	**K24X36X23H**	37.1	40.1	6.40	S	13 000	20 000	0.070	24.000	23.991	36.025	36.009
25	25	29	10	**K25X29X10H**	9.61	14.6	2.25	S	11 000	17 000	0.008	25.000	24.991	29.020	29.007
	25	29	13	**K25X29X13H**	12.8	21.1	3.20	S	11 000	17 000	0.010	25.000	24.991	29.020	29.007
	25	29	17	**K25X29X17H**	15.1	26.2	4.10	S	11 000	17 000	0.016	25.000	24.991	29.020	29.007
	25	30	13	**K25X30X13**	14.6	21.4	3.25	S	11 000	17 000	0.012	25.000	24.991	30.020	30.007
	25	30	17	**K25X30X17H**	18.8	29.8	4.60	S	11 000	17 000	0.016	25.000	24.991	30.020	30.007
	25	30	18	**K25X30X18**	20.6	33.4	5.30	S	11 000	17 000	0.017	25.000	24.991	30.020	30.007
	25	30	20	**K25X30X20H**	21.9	36.1	5.65	S	11 000	17 000	0.019	25.000	24.991	30.020	30.007
	25	30	24	**K25X30X24H**	24.8	42.4	6.60	S	11 000	17 000	0.024	25.000	24.991	30.020	30.007
	25	30	26	**K25X30X26ZW**	23.0	38.6	5.90	S	11 000	17 000	0.027	25.000	24.991	30.020	30.007
	25	31	14	**K25X31X14H**	16.8	22.7	3.45	S	12 000	18 000	0.017	25.000	24.991	31.025	31.009
	25	31	17	**K25X31X17H**	19.7	27.8	4.35	S	12 000	18 000	0.020	25.000	24.991	31.025	31.009
	25	31	21	**K25X31X21H**	25.1	38.0	5.95	S	12 000	18 000	0.026	25.000	24.991	31.025	31.009
	25	31	24	**K25X31X24FH**	25.3	38.5	6.05	S	12 000	18 000	0.031	25.000	24.991	31.025	31.009
	25	32	16	**K25X32X16**	19.8	25.3	4.00	S	12 000	18 000	0.027	25.000	24.991	32.025	32.009

[Note] 1) Cage material: P: polymer cage, S: steel cage

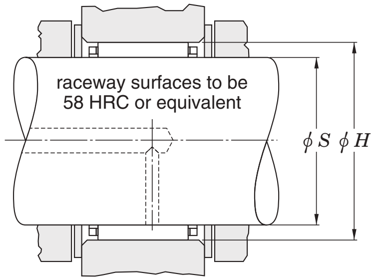
Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series
Shaft dia. (25) ~ 29 mm



K



K ZW



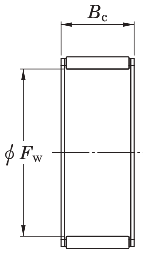
Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	$B_c\ ^{-0.20}_{-0.55}$		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	min.	H (Housing) max.	min.
25	25	33	20	**K25X33X20H**	28.8	37.6	5.95	S	12 000	18 000	0.035	25.000	24.991	33.025	33.009
	25	33	24	**K25X33X24H**	32.3	43.5	6.85	S	12 000	18 000	0.038	25.000	24.991	33.025	33.009
	25	33	25	**K25X33X25H**	33.0	44.6	7.00	S	12 000	18 000	0.041	25.000	24.991	33.025	33.009
	25	35	23.7	**K25X35X23,7H**	35.9	42.3	6.90	S	12 000	19 000	0.050	25.000	24.991	35.025	35.009
	25	35	25	**K25X35X25H**	37.8	46.2	7.25	S	12 000	19 000	0.054	25.000	24.991	35.025	35.009
	25	35	30	**K25X35X30H**	44.6	57.2	9.00	S	12 000	19 000	0.060	25.000	24.991	35.025	35.009
	25	35	36	**K25X35X36H**	52.4	70.4	11.0	S	12 000	19 000	0.074	25.000	24.991	35.025	35.009
	25	37	20	**K25X37X20H**	32.5	34.1	5.45	S	12 000	19 000	0.055	25.000	24.991	37.025	37.009
26	26	30	10	**K26X30X10F**	9.46	14.5	2.20	S	11 000	16 000	0.007	26.000	25.991	30.020	30.007
	26	30	13	**K26X30X13**	12.3	20.4	3.10	S	10 000	16 000	0.011	26.000	25.991	30.020	30.007
	26	30	17	**K26X30X17**	15.0	26.3	3.10	S	10 000	16 000	0.014	26.000	25.991	30.020	30.007
	26	30	22	**K26X30X22ZW**	16.7	30.2	4.60	S	10 000	16 000	0.018	26.000	25.991	30.020	30.007
28	28	32	21	**K28X32X21F**	18.7	35.7	5.55	S	9 900	15 000	0.018	28.000	27.991	32.025	32.009
	28	33	13	**K28X33X13F**	14.1	21.4	3.25	S	10 000	15 000	0.015	28.000	27.991	33.025	33.009
	28	33	17	**K28X33X17H**	19.8	33.0	5.10	S	10 000	15 000	0.018	28.000	27.991	33.025	33.009
	28	33	27	**K28X33X27**	29.0	53.8	8.30	S	10 000	15 000	0.027	28.000	27.991	33.025	33.009
	28	34	17	**K28X34X17**	21.1	31.5	6.30	S	10 000	16 000	0.022	28.000	27.991	34.025	34.009
	28	34	20	**K28X34X20H**	24.4	37.8	7.65	S	10 000	16 000	0.025	28.000	27.991	34.025	34.009
	28	35	15	**K28X35X15H**	19.5	25.6	3.95	S	10 000	16 000	0.025	28.000	27.991	35.025	35.009
	28	35	16	**K28X35X16H**	21.5	29.1	4.60	S	10 000	16 000	0.026	28.000	27.991	35.025	35.009
	28	35	27	**K28X35X27H**	35.2	54.7	8.50	S	10 000	16 000	0.042	28.000	27.991	35.025	35.009
	28	36	20	**K28X36X20FV**	27.8	37.0	5.95	S	10 000	16 000	0.039	28.000	27.991	36.025	36.009
	28	38	25	**K28X38X25,5**	40.9	52.7	8.25	S	11 000	16 000	0.059	28.000	27.991	38.025	38.009
	28	40	18	**K28X40X18H**	33.6	36.5	5.90	S	11 000	17 000	0.060	28.000	27.991	40.025	40.009
	28	40	25	**K28X40X25H**	45.5	54.0	8.55	S	11 000	17 000	0.072	28.000	27.991	40.025	40.009
	28	40	30	**K28X40X30H**	54.3	67.8	10.7	S	11 000	17 000	0.100	28.000	27.991	40.025	40.009
	28	41	25	**K28X41X25H**	49.2	57.1	9.05	S	11 000	17 000	0.082	28.000	27.991	41.025	41.009
29	29	34	27	**K29X34X27F**	28.9	54.0	8.40	S	9 700	15 000	0.033	29.000	28.991	34.025	34.009

[Note] 1) Cage material: P: polymer cage, S: steel cage

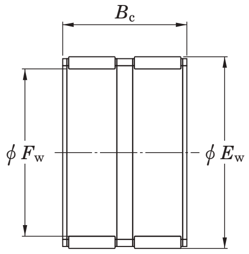
Radial needle roller and cage assemblies single-row, double-row assemblies metric series

K, K ZW series

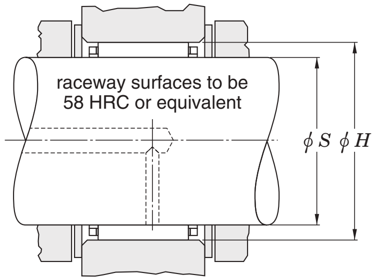
Shaft dia. 30 ~ (34) mm



K



K ZW

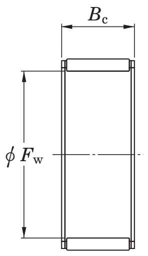


Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c −0.20 −0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
30	30	34	13	**K30X34X13**	13.5	24.1	3.65	S	9 200	14 000	0.011	30.000	29.991	34.025	34.009
	30	35	13	**K30X35X13H**	15.6	24.9	3.80	S	9 300	14 000	0.017	30.000	29.991	35.025	35.009
	30	35	17	**K30X35X17H**	20.2	34.6	5.35	S	9 300	14 000	0.022	30.000	29.991	35.025	35.009
	30	35	20	**K30X35X20H**	23.5	41.9	6.55	S	9 300	14 000	0.023	30.000	29.991	35.025	35.009
	30	35	22.8	**K30X35X23F**	25.6	46.8	7.40	S	9 300	14 000	0.028	30.000	29.991	35.025	35.009
	30	35	27	**K30X35X27H**	30.6	59.0	9.10	S	9 300	14 000	0.032	30.000	29.991	35.025	35.009
	30	35	27	**K30X35X27HZW**	19.9	33.6	5.10	S	9 300	14 000	0.033	30.000	29.991	35.025	35.009
	30	36	14	**K30X36X14**	18.0	26.2	4.00	S	9 500	15 000	0.020	30.000	29.991	36.025	36.009
	30	37	17.8	**K30X37X18**	24.3	34.8	6.00	S	9 600	15 000	0.033	30.000	29.991	37.025	37.009
	30	40	30	**K30X40X30H**	49.2	67.8	10.6	S	9 900	15 000	0.077	30.000	29.991	40.025	40.009
	30	42	30	**K30X42X30H**	54.2	68.6	10.8	S	10 000	16 000	0.096	30.000	29.991	42.025	42.009
	30	44	26	**K30X44X26H**	52.4	59.9	9.55	S	10 000	16 000	0.095	30.000	29.991	44.025	44.009
32	32	36	15	**K32X36X15F**	11.6	20.2	3.10	S	8 600	13 000	0.015	32.000	31.989	36.025	36.009
	32	37	13	**K32X37X13**	15.2	24.4	4.00	S	8 700	13 000	0.018	32.000	31.989	37.025	37.009
	32	37	17	**K32X37X17H**	20.0	34.8	5.40	S	8 700	13 000	0.020	32.000	31.989	37.025	37.009
	32	37	27	**K32X37X27**	29.3	56.8	8.85	S	8 700	13 000	0.035	32.000	31.989	37.025	37.009
	32	38	20	**K32X38X20H**	27.3	45.7	7.15	S	8 800	14 000	0.030	32.000	31.989	38.025	38.009
	32	38	26	**K32X38X26H**	33.2	58.8	9.15	S	8 800	14 000	0.037	32.000	31.989	38.025	38.009
	32	39	16	**K32X39X16H**	23.0	33.0	5.20	S	8 900	14 000	0.030	32.000	31.989	39.025	39.009
	32	39	18	**K32X39X18H**	25.8	38.2	6.05	S	8 900	14 000	0.033	32.000	31.989	39.025	39.009
	32	40	25	**K32X40X25H**	37.9	57.2	8.90	S	9 000	14 000	0.052	32.000	31.989	40.025	40.009
	32	40	36	**K32X40X36H**	52.3	86.4	13.6	S	9 000	14 000	0.080	32.000	31.989	40.025	40.009
	32	42	42	**K32X42X42H**	69.2	108	17.1	S	9 200	14 000	0.110	32.000	31.989	42.025	42.009
	32	46	18	**K32X46X18H**	39.2	41.9	6.80	S	9 600	15 000	0.075	32.000	31.989	46.025	46.009
	32	46	32	**K32X46X32H**	67.0	83.4	13.1	S	9 600	15 000	0.140	32.000	31.989	46.025	46.009
	32	46	40	**K32X46X40H**	81.7	108	12.2	S	9 600	15 000	0.158	32.000	31.989	46.025	46.009
33	33	51	23	**K33X51X23H**	55.9	57.6	9.35	S	9 600	15 000	0.140	33.000	32.989	51.029	51.010
34	34	38	11	**K34X38X11**	12.2	21.9	3.35	S	8 100	12 000	0.011	34.000	33.989	38.025	38.009

[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series

Shaft dia. (34) ~ (38) mm



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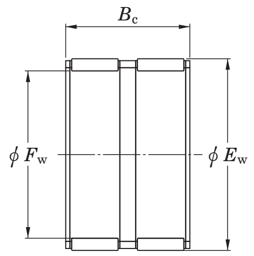
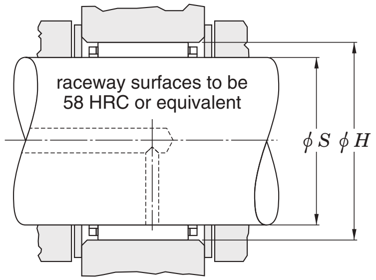


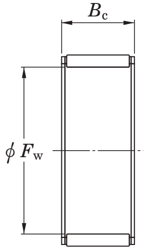
K ZW



Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c −0.20 −0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
34	34	44	26	**K34X44X26FH**	42.9	58.9	9.40	S	8 600	13 000	0.080	34.000	33.989	44.025	44.009
35	35	40	13	**K35X40X13H**	16.2	27.2	4.15	S	7 900	12 000	0.018	35.000	34.989	40.025	40.009
	35	40	17	**K35X40X17H**	22.1	40.8	6.35	S	7 900	12 000	0.025	35.000	34.989	40.025	40.009
	35	40	19	**K35X40X19H**	23.2	43.2	6.80	S	7 900	12 000	0.025	35.000	34.989	40.025	40.009
	35	40	25	**K35X40X25H**	28.4	56.2	8.70	S	7 900	12 000	0.035	35.000	34.989	40.025	40.009
	35	40	27	**K35X40X27H**	29.8	59.6	9.20	S	7 900	12 000	0.037	35.000	34.989	40.025	40.009
	35	42	16	**K35X42X16AH**	24.5	36.8	5.80	S	8 100	12 000	0.031	35.000	34.989	42.025	42.009
	35	42	18	**K35X42X18**	27.5	42.6	6.75	S	8 100	12 000	0.035	35.000	34.989	42.025	42.009
	35	42	20	**K35X42X20H**	30.4	48.5	7.65	S	8 100	12 000	0.037	35.000	34.989	42.025	42.009
	35	42	30	**K35X42X30FH**	40.5	70.0	10.9	S	8 100	12 000	0.061	35.000	34.989	42.025	42.009
	35	45	20	**K35X45X20FH**	36.5	49.9	8.00	S	8 400	13 000	0.059	35.000	34.989	45.025	45.009
	35	45	30	**K35X45X30F**	51.2	74.5	11.7	S	8 400	13 000	0.100	35.000	34.989	45.025	45.009
	35	45	35	**K35X45X35H**	62.1	95.5	15.0	S	8 400	13 000	0.085	35.000	34.989	45.025	45.009
	35	45	41	**K35X45X41**	70.8	113	17.7	S	8 400	13 000	0.120	35.000	34.989	45.025	45.009
	35	45	49	**K35X45X49H**	82.5	138	21.4	S	8 400	13 000	0.143	35.000	34.989	45.025	45.009
	35	45	49	**K35X45X49HZW**	71.8	115	18.1	S	8 400	13 000	0.143	35.000	34.989	45.025	45.009
	35	50	23	**K35X50X23H**	53.0	60.3	9.75	S	8 700	13 000	0.110	35.000	34.989	50.025	50.009
	35	50	40	**K35X50X40F**	79.7	102	16.2	S	8 700	13 000	0.200	35.000	34.989	50.025	50.009
36	36	40	29	**K36X40X29TN**	21.2	45.2	7.15	P	7 600	12 000	0.029	36.000	35.989	40.025	40.009
	36	42	16	**K36X42X16**	22.8	37.7	5.95	S	7 800	12 000	0.027	36.000	35.989	42.025	42.009
37	37	42	13	**K37X42X13H**	16.9	29.4	4.50	S	7 500	11 000	0.017	37.000	36.989	42.025	42.009
	37	42	17	**K37X42X17H**	21.9	41.0	6.35	S	7 500	11 000	0.025	37.000	36.989	42.025	42.009
	37	42	27	**K37X42X27F**	32.1	66.9	10.4	S	7 500	11 000	0.039	37.000	36.989	42.025	42.009
	37	44	19	**K37X44X19H**	29.7	48.0	7.65	S	7 600	12 000	0.039	37.000	36.989	44.025	44.009
38	38	41	9	**K38X41X9TN**	5.93	11.0	1.65	P	7 100	11 000	0.004	38.000	37.989	41.025	41.009
	38	43	17	**K38X43X17H**	21.8	41.0	6.35	S	7 300	11 000	0.032	38.000	37.989	43.025	43.009
	38	43	27	**K38X43X27**	31.9	67.0	10.4	S	7 300	11 000	0.041	38.000	37.989	43.025	43.009

[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series
Shaft dia. (38) ~ 42 mm



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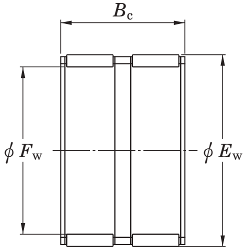
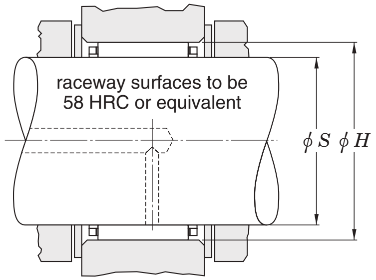


K ZW



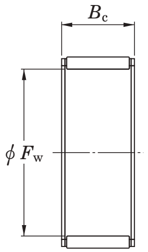
raceway surfaces to be 58 HRC or equivalent

Boundary dimensions (mm) Shaft dia.	F_w	E_w	B_c −0.20 −0.55	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Cage material 1) P / S	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	(Refer.) Mass (kg)	Recommended dimensions (mm) S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
38	38	46	19.8	**K38X46X20H**	33.3	51.0	8.10	S	7 500	12 000	0.055	38.000	37.989	46.025	46.009
	38	46	32	**K38X46X32H**	55.2	98.1	15.3	S	7 500	12 000	0.090	38.000	37.989	46.025	46.009
	38	50	25	**K38X50X25**	53.0	70.8	11.2	S	7 800	12 000	0.100	38.000	37.989	50.025	50.009
	38	50	33	**K38X50X33H**	68.3	98.2	15.4	S	7 800	12 000	0.126	38.000	37.989	50.025	50.009
	38	50	40	**K38X50X40FH**	76.2	113	17.8	S	7 800	12 000	0.170	38.000	37.989	50.025	50.009
40	40	45	13	**K40X45X13H**	17.6	31.7	4.80	S	6 900	11 000	0.022	40.000	39.989	45.025	45.009
	40	45	18	**K40X45X18H**	25.1	50.4	8.00	S	6 900	11 000	0.031	40.000	39.989	45.025	45.009
	40	45	21	**K40X45X21H**	23.3	45.2	8.50	S	6 900	11 000	0.033	40.000	39.989	45.025	45.009
	40	45	27	**K40X45X27H**	32.7	70.2	10.8	S	6 900	11 000	0.040	40.000	39.989	45.025	45.009
	40	45	27	**K40X45X27TN**	33.3	72.1	11.2	P	6 900	11 000	0.030	40.000	39.989	45.025	45.009
	40	45	29	**K40X45X29H**	34.7	75.9	11.7	S	6 900	11 000	0.050	40.000	39.989	45.025	45.009
	40	46	17	**K40X46X17**	25.2	44.0	6.95	S	7 000	11 000	0.033	40.000	39.989	46.025	46.009
	40	47	18	**K40X47X18**	28.0	45.6	7.25	S	7 000	11 000	0.041	40.000	39.989	47.025	47.009
	40	47	20	**K40X47X20**	31.1	52.1	8.25	S	7 000	11 000	0.042	40.000	39.989	47.025	47.009
	40	48	20	**K40X48X20FV1**	35.5	56.3	8.45	S	7 100	11 000	0.052	40.000	39.989	48.025	48.009
	40	48	20	**K40X48X20H**	35.5	56.3	8.95	S	7 100	11 000	0.050	40.000	39.989	48.025	48.009
	40	48	35	**K40X48X35H**	57.3	104	16.3	S	7 100	11 000	0.098	40.000	39.989	48.025	48.009
	40	50	27	**K40X50X27H**	53.0	81.0	12.7	S	7 200	11 000	0.084	40.000	39.989	50.025	50.009
	40	55	45	**K40X55X45H**	103	146	23.0	S	7 500	12 000	0.221	40.000	39.989	55.029	55.010
	40	56	26	**K40X56X26H**	63.7	75.7	12.0	S	7 600	12 000	0.138	40.000	39.989	56.029	56.010
41	41	48	31	**K41X48X31HZW**	38.0	68.1	10.6	S	6 800	11 000	0.067	41.000	40.989	48.025	48.009
42	42	47	13	**K42X47X13H**	18.7	34.9	5.30	S	6 500	10 000	0.027	42.000	41.989	47.025	47.009
	42	47	17	**K42X47X17H**	22.8	45.2	7.30	S	6 500	10 000	0.028	42.000	41.989	47.025	47.009
	42	47	27	**K42X47X27H**	33.8	74.7	11.6	S	6 500	10 000	0.041	42.000	41.989	47.025	47.009
	42	48	24	**K42X48X24F**	33.1	63.9	10.1	S	6 600	10 000	0.046	42.000	41.989	48.025	48.009
	42	50	13	**K42X50X13H**	20.9	28.9	4.45	S	6 700	10 000	0.035	42.000	41.989	50.025	50.009
	42	50	20	**K42X50X20H**	35.2	56.6	9.00	S	6 700	10 000	0.054	42.000	41.989	50.025	50.009
	42	50	30	**K42X50X30H**	51.3	91.9	14.4	S	6 700	10 000	0.080	42.000	41.989	50.025	50.009

[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series

Shaft dia. 43 ~ (47) mm



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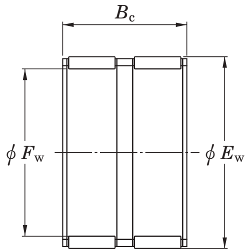
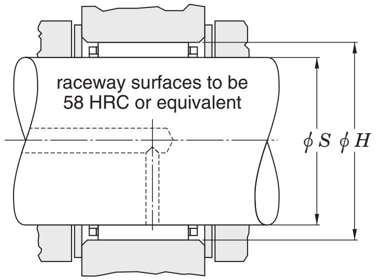


K ZW

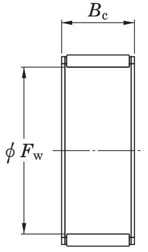


Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c −0.20 −0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
43	43	48	17	**K43X48X17FH**	23.0	45.8	6.85	S	6 400	9 800	0.036	43.000	42.989	48.025	48.009
	43	48	27	**K43X48X27H**	34.8	78.0	12.1	S	6 400	9 800	0.050	43.000	42.989	48.025	48.009
44	44	50	22	**K44X50X22H**	31.6	60.6	9.45	S	6 400	9 900	0.046	44.000	43.989	50.025	50.009
	44	50	30	**K44X50X30,5HZW**	35.5	70.5	10.7	S	6 400	9 900	0.068	44.000	43.989	50.025	50.009
45	45	50	13	**K45X50X13H**	18.4	35.1	5.35	S	6 100	9 400	0.022	45.000	44.989	50.025	50.009
	45	50	15	**K45X50X15H**	19.4	37.3	5.75	S	6 100	9 400	0.028	45.000	44.989	50.025	50.009
	45	50	17	**K45X50X17H**	24.9	51.8	8.05	S	6 100	9 400	0.030	45.000	44.989	50.025	50.009
	45	50	20	**K45X50X20F**	27.0	57.4	9.00	S	6 100	9 400	0.040	45.000	44.989	50.025	50.009
	45	50	21	**K45X50X21CH**	24.6	50.4	7.85	S	6 100	9 400	0.036	45.000	44.989	50.025	50.009
	45	50	27	**K45X50X27FH**	34.2	77.4	12.0	S	6 100	9 400	0.043	45.000	44.989	50.025	50.009
	45	50	27	**K45X50X27TN**	31.8	70.7	11.0	P	6 100	9 400	0.048	45.000	44.989	50.025	50.009
	45	52	18	**K45X52X18H**	30.1	52.0	8.25	S	6 200	9 500	0.045	45.000	44.989	52.029	52.010
	45	52	21	**K45X52X21F**	35.0	63.2	9.90	S	6 200	9 500	0.055	45.000	44.989	52.029	52.010
	45	53	20	**K45X53X20H**	36.0	59.5	9.45	S	6 200	9 600	0.054	45.000	44.989	53.029	53.010
	45	53	24.8	**K45X53X25H**	45.9	81.5	12.7	S	6 200	9 600	0.072	45.000	44.989	53.029	53.010
	45	53	25	**K45X53X25F**	42.5	73.7	11.7	S	6 200	9 600	0.075	45.000	44.989	53.029	53.010
	45	53	28	**K45X53X28H**	49.3	89.2	13.9	S	6 200	9 600	0.078	45.000	44.989	53.029	53.010
	45	55	20	**K45X55X20H**	42.0	62.2	10.0	S	6 400	9 800	0.074	45.000	44.989	55.029	55.010
	45	59	18	**K45X59X18H**	47.8	58.9	9.60	S	6 600	10 000	0.107	45.000	44.989	59.029	59.010
	45	59	18	**K45X59X18TN**	45.7	55.4	9.00	P	6 600	10 000	0.097	45.000	44.989	59.029	59.010
	45	59	36	**K45X59X36H**	82.4	118	18.6	S	6 600	10 000	0.181	45.000	44.989	59.029	59.010
	45	60	30	**K45X60X30H**	75.5	101	16.0	S	6 600	10 000	0.171	45.000	44.989	60.029	60.010
	45	60	45	**K45X60X45H**	108	160	25.2	S	6 600	10 000	0.280	45.000	44.989	60.029	60.010
46	46	53	36	**K46X53X36HZW**	48.6	96.7	15.3	S	6 100	9 300	0.100	46.000	45.989	53.029	53.010
47	47	52	15	**K47X52X15FH**	20.1	39.8	6.15	S	5 800	8 900	0.030	47.000	46.989	52.029	52.010
	47	52	17	**K47X52X17H**	24.2	50.4	7.85	S	5 800	8 900	0.032	47.000	46.989	52.029	52.010
	47	52	27	**K47X52X27H**	36.6	85.9	13.3	S	5 800	8 900	0.045	47.000	46.989	52.029	52.010

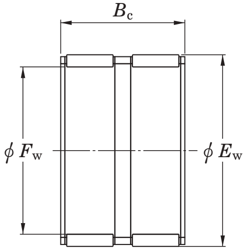
[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series

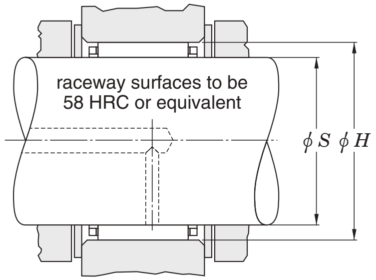
Shaft dia. (47) ~ (55) mm



K



K ZW

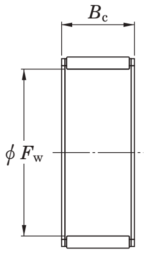


Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c −0.20 −0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
47	47	55	28	**K47X55X28FV1**	48.9	89.5	14.0	S	6 000	9 200	0.092	47.000	46.989	55.029	55.010
48	48	53	17	**K48X53X17H**	25.7	54.9	8.55	S	5 700	8 700	0.032	48.000	47.989	53.029	53.010
	48	54	19	**K48X54X19H**	30.9	61.2	9.85	S	5 700	8 800	0.042	48.000	47.989	54.029	54.010
49	49	55	32	**K49X55X32HZW**	40.2	86.4	13.4	S	5 600	8 600	0.080	49.000	48.989	55.029	55.010
	49	65	38	**K49X65X38H**	100	142	22.7	S	6 100	9 300	0.244	49.000	48.989	65.029	65.010
50	50	55	17	**K50X55X17H**	25.5	55.0	8.55	S	5 400	8 400	0.032	50.000	49.989	55.029	55.010
	50	55	20	**K50X55X20H**	30.2	68.5	10.7	S	5 400	8 400	0.038	50.000	49.989	55.029	55.010
	50	55	30	**K50X55X30**	38.2	92.4	14.4	S	5 400	8 400	0.057	50.000	49.989	55.029	55.010
	50	55	30	**K50X55X30FV1**	38.2	92.4	14.4	S	5 400	8 400	0.057	50.000	49.989	55.029	55.010
	50	56	23	**K50X56X23**	35.5	74.1	11.7	S	5 500	8 500	0.051	50.000	49.989	56.029	56.010
	50	57	18	**K50X57X18FH**	31.3	56.4	8.95	S	5 500	8 500	0.050	50.000	49.989	57.029	57.010
	50	58	20	**K50X58X20H**	38.8	67.8	10.8	S	5 600	8 600	0.065	50.000	49.989	58.029	58.010
	50	58	25	**K50X58X25H**	46.5	85.6	13.4	S	5 600	8 600	0.081	50.000	49.989	58.029	58.010
	50	58	35	**K50X58X35H**	64.9	131	20.6	S	5 600	8 600	0.105	50.000	49.989	58.029	58.010
	50	62	30	**K50X62X30H**	64.6	98.1	15.5	S	5 800	8 900	0.136	50.000	49.989	62.029	62.010
	50	66	30	**K50X66X30H**	80.9	109	17.4	S	5 900	9 100	0.192	50.000	49.989	66.029	66.010
	50	70	32	**K50X70X32H**	103	129	20.6	S	6 100	9 300	0.224	50.000	49.989	70.029	70.010
52	52	57	12	**K52X57X12**	18.4	36.7	5.60	S	5 200	8 000	0.022	52.000	51.987	57.029	57.010
	52	57	17	**K52X57X17H**	21.4	44.3	6.90	S	5 200	8 000	0.035	52.000	51.987	57.029	57.010
	52	60	24	**K52X60X24**	47.1	88.3	13.9	S	5 400	8 200	0.078	52.000	51.987	60.029	60.010
55	55	60	17	**K55X60X17**	26.0	58.3	9.10	S	4 900	7 600	0.037	55.000	54.987	60.029	60.010
	55	60	20	**K55X60X20H**	30.7	72.4	11.3	S	4 900	7 600	0.042	55.000	54.987	60.029	60.010
	55	60	27	**K55X60X27H**	40.1	102	15.7	S	4 900	7 600	0.055	55.000	54.987	60.029	60.010
	55	60	30	**K55X60X30FH**	40.6	103	16.1	S	4 900	7 600	0.068	55.000	54.987	60.029	60.010
	55	61	26	**K55X61X26H**	44.3	102	15.9	S	5 000	7 600	0.063	55.000	54.987	61.029	61.010
	55	62	18	**K55X62X18H**	33.2	62.8	10.0	S	5 000	7 700	0.055	55.000	54.987	62.029	62.010
	55	63	15	**K55X63X15F**	30.5	51.5	8.00	S	5 000	7 800	0.054	55.000	54.987	63.029	63.010

[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies single-row, double-row assemblies metric series K, K ZW series

Shaft dia. (55) ~ 68 mm



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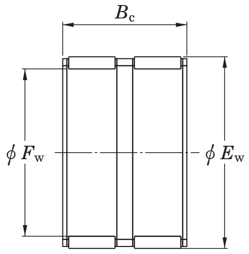
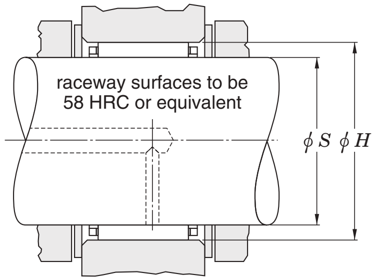


K ZW

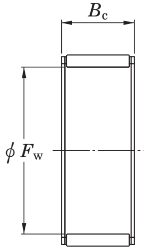


Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds ($\min^{-1}$)		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c -0.20 -0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	min.	H (Housing) max.	min.
55	55	63	20	**K55X63X20**	40.3	73.5	11.7	S	5 000	7 800	0.072	55.000	54.987	63.029	63.010
	55	63	25	**K55X63X25**	49.8	96.5	15.1	S	5 000	7 800	0.080	55.000	54.987	63.029	63.010
	55	63	32	**K55X63X32**	62.3	129	20.0	S	5 000	7 800	0.108	55.000	54.987	63.029	63.010
58	58	63	17	**K58X63X17F**	27.0	62.6	9.80	S	4 700	7 200	0.037	58.000	57.987	63.029	63.010
	58	64	19	**K58X64X19H**	32.9	70.6	11.3	S	4 700	7 200	0.037	58.000	57.987	64.029	64.010
	58	65	18	**K58X65X18H**	34.3	67.1	10.7	S	4 700	7 300	0.058	58.000	57.987	65.029	65.010
60	60	65	20	**K60X65X20H**	31.9	78.1	12.2	S	4 500	6 900	0.046	60.000	59.987	65.029	65.010
	60	65	26.8	**K60X65X27FH**	39.5	103	16.0	S	4 500	6 900	0.059	60.000	59.987	65.029	65.010
	60	65	29.8	**K60X65X30FH**	42.9	114	17.8	S	4 500	6 900	0.085	60.000	59.987	65.029	65.010
	60	65	30	**K60X65X30**	42.9	114	17.8	S	4 500	6 900	0.070	60.000	59.987	65.029	65.010
	60	68	17	**K60X68X17F**	34.2	61.4	9.50	S	4 600	7 100	0.066	60.000	59.987	68.029	68.010
	60	68	20	**K60X68X20H**	41.8	79.2	12.6	S	4 600	7 100	0.066	60.000	59.987	68.029	68.010
	60	68	23	**K60X68X23H**	49.0	97.2	15.4	S	4 600	7 100	0.089	60.000	59.987	68.029	68.010
	60	68	25	**K60X68X25**	51.6	104	16.3	S	4 600	7 100	0.091	60.000	59.987	68.029	68.010
	60	68	30	**K60X68X30ZW**	46.4	90.1	13.9	S	4 600	7 100	0.119	60.000	59.987	68.029	68.010
63	63	71	20	**K63X71X20**	41.4	79.4	12.7	S	4 400	6 700	0.070	63.000	62.987	71.029	71.010
64	64	70	16	**K64X70X16**	26.4	55.1	8.55	S	4 200	6 500	0.049	64.000	63.987	70.029	70.010
65	65	70	20	**K65X70X20CH**	28.6	69.2	10.8	S	4 100	6 400	0.050	65.000	64.987	70.029	70.010
	65	70	30	**K65X70X30**	44.4	123	19.1	S	4 100	6 400	0.075	65.000	64.987	70.029	70.010
	65	73	23	**K65X73X23H**	48.2	97.7	15.5	S	4 200	6 500	0.091	65.000	64.987	73.029	73.010
	65	73	30	**K65X73X30H**	60.1	129	20.3	S	4 200	6 500	0.116	65.000	64.987	73.029	73.010
68	68	74	20	**K68X74X20FH**	37.5	88.1	13.2	S	4 000	6 100	0.062	68.000	67.987	74.029	74.010
	68	74	28	**K68X74X28CH**	44.8	110	17.1	S	4 000	6 100	0.082	68.000	67.987	74.029	74.010
	68	74	30	**K68X74X30H**	47.6	119	18.5	S	4 000	6 100	0.098	68.000	67.987	74.029	74.010
	68	74	35	**K68X74X35HZW**	45.1	111	17.1	S	4 000	6 100	0.120	68.000	67.987	74.029	74.010
	68	76	20	**K68X76X20**	43.8	87.8	14.0	S	4 000	6 200	0.086	68.000	67.987	76.029	76.010

[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series

Shaft dia. 70 ~ 95 mm



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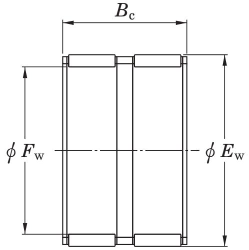
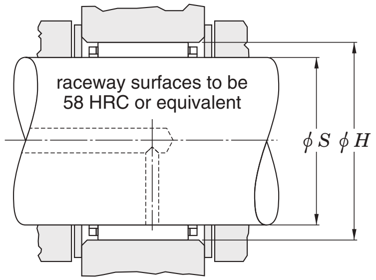


K ZW

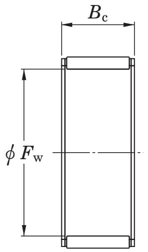


Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material 1)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c −0.20 −0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.		S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
70	70	76	20	**K70X76X20**	36.1	84.7	13.5	S	3 900	5 900	0.065	70.000	69.987	76.029	76.010
	70	76	30	**K70X76X30**	51.6	134.0	20.9	S	3 900	5 900	0.097	70.000	69.987	76.029	76.010
	70	78	20	**K70X78X20H**	43.6	87.9	14.0	S	3 900	6 000	0.090	70.000	69.987	78.029	78.010
	70	78	23	**K70X78X23F**	49.8	104.0	16.6	S	3 900	6 000	0.115	70.000	69.987	78.029	78.010
	70	78	24.8	**K70X78X25F**	49.8	104.0	16.6	S	3 900	6 000	0.115	70.000	69.987	78.029	78.010
	70	78	30	**K70X78X30H**	62.2	139.0	21.8	S	3 900	6 000	0.140	70.000	69.987	78.029	78.010
	70	78	46	**K70X78X46ZW**	78.4	187.0	29.5	S	3 900	6 000	0.188	70.000	69.987	78.029	78.010
	70	85	40	**K70X85X40F**	118	203	32.4	S	4 100	6 300	0.338	70.000	69.987	85.034	85.012
	70	88	30	**K70X88X30H**	115	175	28.1	S	4 100	6 400	0.205	70.000	69.987	88.034	88.012
72	72	80	20	**K72X80X20**	44.4	90.7	14.5	S	3 800	5 800	0.084	72.000	71.987	80.029	80.010
73	73	79	20	**K73X79X20**	37.0	88.7	14.1	S	3 700	5 700	0.068	73.000	72.987	79.029	79.010
75	75	81	20	**K75X81X20F**	37.4	90.7	14.5	S	3 600	5 500	0.075	75.000	74.987	81.034	81.012
	75	83	23	**K75X83X23**	52.5	114.0	18.2	S	3 600	5 600	0.104	75.000	74.987	83.034	83.012
	75	83	30	**K75X83X30**	60.9	138	21.7	S	3 600	5 600	0.141	75.000	74.987	83.034	83.012
	75	83	30	**K75X83X30FH**	60.9	138	21.7	S	3 600	5 600	0.141	75.000	74.987	83.034	83.012
80	80	86	20	**K80X86X20H**	38.6	96.7	15.4	S	3 400	5 200	0.072	80.000	79.987	86.034	86.012
	80	88	25	**K80X88X25FV1**	54.0	121	19.2	S	3 400	5 200	0.134	80.000	79.987	88.034	88.012
	80	88	30	**K80X88X30**	67.5	161	25.4	S	3 400	5 200	0.153	80.000	79.987	88.034	88.012
85	85	92	20	**K85X92X20H**	39.9	91.7	14.6	S	3 200	4 900	0.085	84.988	84.973	92.034	92.012
	85	93	25	**K85X93X25F**	58.8	138	21.7	S	3 200	4 900	0.128	84.988	84.973	93.034	93.012
	85	93	30	**K85X93X30H**	69.4	170.4	26.8	S	3 200	4 900	0.166	84.988	84.973	93.034	93.012
90	90	97	20	**K90X97X20**	46.3	114	18.1	S	3 000	4 600	0.095	89.988	89.973	97.034	97.012
	90	98	25	**K90X98X25F**	54.8	128	20.3	S	3 000	4 600	0.134	89.988	89.973	98.034	98.012
	90	98	30	**K90X98X30**	63.6	155	24.3	S	3 000	4 600	0.168	89.988	89.973	98.034	98.012
95	95	103	20	**K95X103X20**	49.3	114	18.3	S	2 800	4 400	0.130	94.988	94.973	103.034	103.012
	95	103	30	**K95X103X30F**	71.0	183	28.6	S	2 800	4 400	0.180	94.988	94.973	103.034	103.012

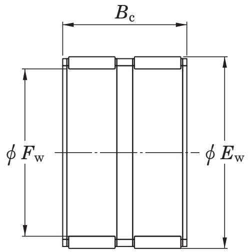
[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies
single-row, double-row assemblies
metric series
K, K ZW series

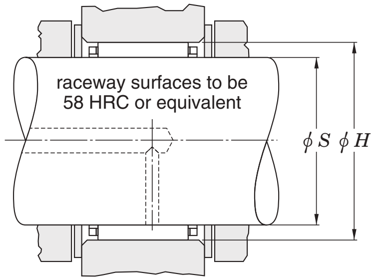
Shaft dia. 100 ~ 110 mm



K



K ZW

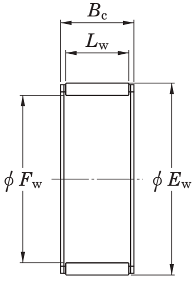


Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Cage material [1]	Limiting speeds (min^{-1})			(Refer.) Mass (kg)	Recommended dimensions (mm)			
Shaft dia.	F_w	E_w	B_c -0.20 -0.55		C_r	C_{0r}	C_u	P / S	Grease lub.	Oil lub.			S (Shaft) max.	S (Shaft) min.	H (Housing) max.	H (Housing) min.
100	100	108	30	**K100X108X30**	72.4	191	29.5	S	2 700	4 200		0.210	99.988	99.973	108.034	108.012
110	110	118	24	**K110X118X24**	64.0	168	25.6	S	2 400	3 800		0.165	109.988	109.973	118.034	118.012
	110	118	30	**K110X118X30H**	75.3	207	31.2	S	2 400	3 800		0.200	109.988	109.973	118.034	118.012

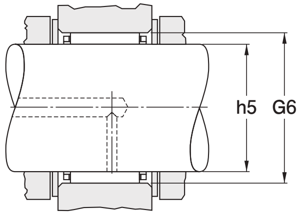
[Note] 1) Cage material: P: polymer cage, S: steel cage

Radial needle roller and cage assemblies
single-row assemblies
inch series

Shaft dia. 3/8 ~ (1 1/2) in
(9.525 ~ (38.100) mm)



WJ, WJC



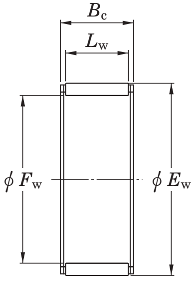
raceway surfaces to be
58 HRC or equivalent

Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Recommended dimensions (mm)				(Refer.) Mass (kg)
Shaft dia. (in)	F_w	E_w	B_c +0 −0.38		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Shaft dia. (h5) max.	Shaft dia. (h5) min.	Housing bore dia. (G6) max.	Housing bore dia. (G6) min.	
3/8	9.525	12.700	9.53	**WJC-060806**	3.87	4.00	0.600	24 000	37 000	9.525	9.520	12.715	12.705	0.003
1/2	12.700	15.875	12.70	**WJC-081008**	6.23	8.01	1.65	23 000	35 000	12.700	12.692	15.890	15.880	0.005
9/16	14.288	17.463	12.70	**WJC-091108**	6.81	9.25	1.40	22 000	34 000	14.288	14.280	17.478	17.468	0.006
5/8	15.875	19.050	12.70	**WJC-101208**	7.03	9.96	1.50	18 000	27 000	15.875	15.867	19.070	19.058	0.006
	15.875	22.225	15.88	**WJ-101410**	15.6	17.8	2.80	19 000	29 000	15.875	15.867	22.245	22.233	0.012
	15.875	22.225	22.23	**WJ-101414**	21.3	26.4	4.10	19 000	29 000	15.875	15.867	22.245	22.233	0.017
3/4	19.050	25.400	25.40	**WJ-121616**	26.8	37.2	5.80	16 000	24 000	19.050	19.040	25.420	25.408	0.023
13/16	20.638	26.988	22.23	**WJ-131714**	25.1	35.0	5.50	14 000	22 000	20.638	20.627	27.008	26.995	0.021
7/8	22.225	28.575	25.40	**WJ-141816**	29.2	43.5	6.75	13 000	20 000	22.225	22.215	28.595	28.583	0.026
1	25.400	33.338	19.05	**WJ-162112**	28.1	37.1	5.90	12 000	18 000	25.400	25.390	33.363	33.348	0.029
	25.400	33.338	25.40	**WJ-162116**	36.8	52.5	8.20	12 000	18 000	25.400	25.390	33.363	33.348	0.038
	25.400	33.338	31.75	**WJ-162120**	44.5	67.2	10.5	12 000	18 000	25.400	25.390	33.363	33.348	0.048
1 1/8	28.575	38.100	25.40	**WJ-182416**	42.4	57.8	9.05	10 000	16 000	28.575	28.565	38.125	38.110	0.041
	28.575	38.100	31.75	**WJ-182420**	52.0	74.7	11.7	10 000	16 000	28.575	28.565	38.125	38.110	0.065
1 1/4	31.750	41.275	19.05	**WJ-202612**	33.4	43.7	7.05	9 300	14 000	31.750	31.740	41.300	41.285	0.043
	31.750	41.275	25.40	**WJ-202616**	44.1	62.3	9.80	9 300	14 000	31.750	31.740	41.300	41.285	0.061
	31.750	41.275	31.75	**WJ-202620**	53.8	81.0	12.6	9 300	14 000	31.750	31.740	41.300	41.285	0.071
	31.750	41.275	38.10	**WJ-202624**	63.6	99.6	15.6	9 300	14 000	31.750	31.740	41.300	41.285	0.085
1 3/8	34.925	44.450	25.40	**WJ-222816**	45.8	67.2	10.5	8 300	13 000	34.925	34.915	44.475	44.460	0.067
	34.925	44.450	31.75	**WJ-222820**	56.0	87.2	13.6	8 300	13 000	34.925	34.915	44.475	44.460	0.077
1 1/2	38.100	47.625	25.40	**WJ-243016**	47.2	71.6	11.3	7 600	12 000	38.100	38.090	47.650	47.635	0.078
	38.100	47.625	31.75	**WJ-243020**	57.8	93.0	14.5	7 600	12 000	38.100	38.090	47.650	47.635	0.083

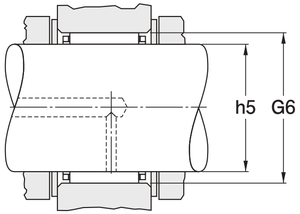
[Remarks] 1) Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
2) Minimum axial clearance should be 0.02 mm (0.008 in).

Radial needle roller and cage assemblies single-row assemblies inch series

Shaft dia. (1 $^1/_2$) ~ 3 in ((38.100) ~ 76.200 mm)



WJ, WJC



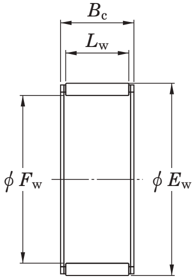
raceway surfaces to be
58 HRC or equivalent

Boundary dimensions (mm) Shaft dia. (in)	F_w	E_w	B_c +0 −0.38	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Recommended dimensions (mm) Shaft dia. (h5) max.	min.	Housing bore dia. (G6) max.	min.	(Refer.) Mass (kg)
1 $^1/_2$	38.100	47.625	38.10	**WJ-243024**	68.1	114.8	18.0	7 600	12 000	38.100	38.090	47.650	47.635	0.100
	38.100	47.625	44.45	**WJ-243028**	77.4	135.7	21.2	7 600	12 000	38.100	38.090	47.650	47.635	0.134
1 $^3/_4$	44.450	53.975	19.05	**WJ-283412**	39.5	59.6	9.60	6 400	9 900	44.450	44.440	54.003	53.985	0.058
	44.450	53.975	25.40	**WJ-283416**	52.0	85.0	13.4	6 400	9 900	44.450	44.440	54.003	53.985	0.084
	44.450	53.975	38.10	**WJ-283424**	74.7	136	21.3	6 400	9 900	44.450	44.440	54.003	53.985	0.115
2	50.800	60.325	19.05	**WJ-323812**	42.8	69.0	11.1	5 600	8 600	50.800	50.787	60.353	60.335	0.065
	50.800	60.325	25.40	**WJ-323816**	56.5	98.0	15.5	5 600	8 600	50.800	50.787	60.353	60.335	0.105
	50.800	60.325	31.75	**WJ-323820**	69.0	127	20.0	5 600	8 600	50.800	50.787	60.353	60.335	0.108
	50.800	60.325	38.10	**WJ-323824**	81.0	157	24.6	5 600	8 600	50.800	50.787	60.353	60.335	0.130
2 $^1/_{16}$	52.388	61.913	25.40	**WJ-333916**	57.8	102	16.2	5 400	8 300	52.388	52.375	61.940	61.923	0.099
2 $^1/_8$	53.975	63.500	25.40	**WJ-344016**	52.5	92.08	14.6	5 200	8 000	53.975	53.962	63.528	63.510	0.089
	53.975	63.500	38.10	**WJ-344024**	78.3	153	24.0	5 200	8 000	53.975	53.962	63.528	63.510	0.137
2 $^3/_{16}$	55.563	65.088	19.05	**WJ-354112**	44.5	75.17	12.2	5 000	7 800	55.563	55.550	65.115	65.098	0.070
	55.563	65.088	25.40	**WJ-354116**	57.8	107	16.9	5 000	7 800	55.563	55.550	65.115	65.098	0.094
2 $^1/_4$	57.150	66.675	25.40	**WJ-364216**	53.8	96.08	15.2	4 900	7 500	57.150	57.137	66.703	66.685	0.096
	57.150	66.675	31.75	**WJ-364220**	67.6	128	20.1	4 900	7 500	57.150	57.137	66.703	66.685	0.120
2 $^3/_8$	60.325	69.850	38.10	**WJ-384424**	81.4	167	26.1	4 600	7 100	60.325	60.312	69.878	69.860	0.151
2 $^1/_2$	63.500	73.025	25.40	**WJ-404616**	55.6	104	16.5	4 400	6 700	63.500	63.487	73.053	73.035	0.106
	63.500	73.025	31.75	**WJ-404620**	69.8	139	21.8	4 400	6 700	63.500	63.487	73.053	73.035	0.132
	63.500	73.025	38.10	**WJ-404624**	83.2	173	27.2	4 400	6 700	63.500	63.487	73.053	73.035	0.179
2 $^3/_4$	69.850	79.375	25.40	**WJ-445016**	57.8	112.54	17.8	4 000	6 100	69.850	69.837	79.403	79.385	0.116
3	76.200	85.725	25.40	**WJ-485416**	59.6	120.55	19.1	3 600	5 600	76.200	76.187	85.761	85.738	0.126
	76.200	85.725	38.10	**WJ-485424**	85.4	191.72	29.9	3 600	5 600	76.200	76.187	85.761	85.738	0.189

[Remarks] 1) Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
2) Minimum axial clearance should be 0.02 mm (0.008 in).

Radial needle roller and cage assemblies single-row assemblies inch series

Shaft dia. 3 $^1/_4$ ~ 5 in (82.550 ~ 127.000 mm)



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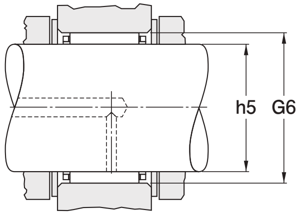


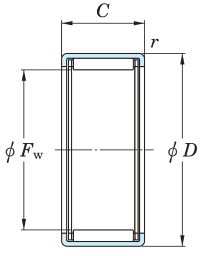
raceway surfaces to be 58 HRC or equivalent

Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Recommended dimensions (mm)				(Refer.) Mass (kg)
Shaft dia. (in)	F_w	E_w	B_c +0 −0.38		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Shaft dia. (h5) max.	Shaft dia. (h5) min.	Housing bore dia. (G6) max.	Housing bore dia. (G6) min.	
3 $^1/_4$	82.550	92.075	25.40	**WJ-525816**	61.4	128.55	20.4	3 300	5 100	82.550	82.535	92.111	92.088	0.136
	82.550	92.075	38.10	**WJ-525824**	88.1	204.62	31.9	3 300	5 100	82.550	82.535	92.111	92.088	0.220
3 $^1/_2$	88.900	98.425	25.40	**WJ-566216**	63.2	136.56	21.7	3 100	4 700	88.900	88.885	98.461	98.438	0.146
	88.900	101.600	25.40	**WJ-566416**	79.6	150.35	23.9	3 100	4 800	88.900	88.885	101.636	101.613	0.197
	88.900	101.600	38.10	**WJ-566424**	113	237.53	37.4	3 100	4 800	88.900	88.885	101.636	101.613	0.296
4	101.600	114.300	25.40	**WJ-647216**	83.6	166.59	30.9	2 700	4 200	101.600	101.585	114.336	114.313	0.224
	101.600	114.300	38.10	**WJ-647224**	119	263.33	40.6	2 700	4 200	101.600	101.585	114.336	114.313	0.335
5	127.000	152.400	38.10	**WJ-809624**	211	365.20	51.9	2 200	3 400	127.000	126.982	152.438	152.415	1.018

[Remarks] 1) Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
2) Minimum axial clearance should be 0.02 mm (0.008 in).

Drawn cup needle roller bearings caged, open ends, closed one end metric series HK, BK series

Shaft dia. 3 ~ (10) mm



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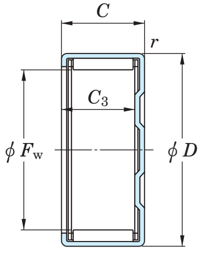

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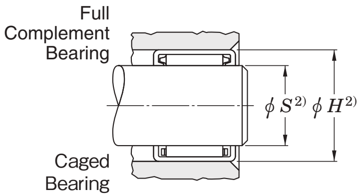


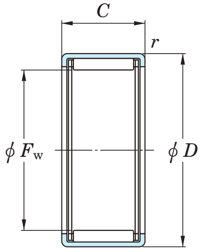
Shaft surface to be
58 HRC or equivalent

Shaft dia.	Boundary dimensions (mm) F_w	D	C +0 −0.3	C_3 min.	r min.	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	(Refer.) Mass (kg)	Inspection gage	Mounting inner ring (pages B466 to B475)
3	3	6.5	6	5.20	0.30	**BK0306**	1.20	0.78	0.130	30 000	46 000	0.001	Table 4	
	3	6.5	6	—	0.30	**HK0306**	1.60	1.14	0.130	30 000	46 000	0.001	Table 4	
4	4	8	8	6.40	0.40	**BK0408**	1.83	1.32	0.200	25 000	39 000	0.002	Table 4	
	4	8	8	—	0.40	**HK0408**	1.88	1.38	0.200	25 000	39 000	0.002	Table 4	
5	5	9	9	7.40	0.40	**BK0509**	2.52	2.07	0.320	23 000	36 000	0.002	Table 4	
	5	9	9	—	0.40	**HK0509**	2.52	2.07	0.320	23 000	36 000	0.002	Table 4	
6	6	10	8	6.40	0.40	**BK0608**	2.34	1.95	0.290	22 000	33 000	0.002	Table 4	
	6	10	8	—	0.40	**HK0608**	2.34	1.95	0.290	22 000	33 000	0.002	Table 4	
	6	10	9	7.40	0.40	**BK0609**	3.14	2.85	0.290	22 000	33 000	0.003	Table 4	
	6	10	9	—	0.40	**HK0609**	3.14	2.85	0.290	22 000	33 000	0.002	Table 4	
7	7	11	9	7.40	0.40	**BK0709**	3.24	3.10	0.470	21 000	32 000	0.003	Table 4	
	7	11	9	—	0.40	**HK0709**	3.23	3.05	0.470	21 000	32 000	0.003	Table 4	
8	8	12	8	6.40	0.40	**BK0808**	2.90	2.73	0.400	20 000	31 000	0.003	Table 4	
	8	12	8	—	0.40	**HK0808**	2.90	2.73	0.400	20 000	31 000	0.003	Table 4	
	8	12	10	8.40	0.40	**BK0810**	3.93	4.14	0.600	20 000	31 000	0.004	Table 4	JR5x8x12
	8	12	10	—	0.40	**HK0810**	3.95	4.07	0.600	20 000	31 000	0.004	Table 4	JR5x8x12
9	9	13	10	8.40	0.40	**BK0910**	4.57	5.07	0.770	19 000	30 000	0.004	Table 4	JR6x9x12
	9	13	10	—	0.40	**HK0910**	4.57	5.07	0.770	19 000	30 000	0.004	Table 4	JR6x9x12
	9	13	12	10.40	0.40	**BK0912**	5.65	6.65	1.00	19 000	30 000	0.005	Table 4	JR6x9x12
	9	13	12	—	0.40	**HK0912**	5.65	6.65	1.00	19 000	30 000	0.005	Table 4	JR6x9x12
10	10	14	10	8.40	0.40	**BK1010**	4.78	5.51	0.840	19 000	29 000	0.004	Table 4	JR7x10x10,5
	10	14	10	—	0.40	**HK1010**	4.78	5.51	0.840	19 000	29 000	0.004	Table 4	JR7x10x10,5
	10	14	12	10.40	0.40	**BK1012**	5.90	7.23	1.10	19 000	29 000	0.006	Table 4	JR7x10x12
	10	14	12	—	0.40	**HK1012**	5.90	7.23	1.10	19 000	29 000	0.005	Table 4	JR7x10x12

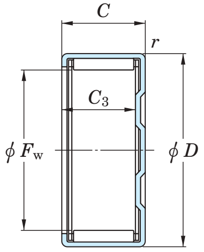
[Notes] 1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.
2) For the recommended mounting dimensions see Table 20.

Drawn cup needle roller bearings caged, open ends, closed one end metric series HK, BK series

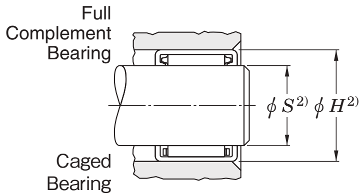
Shaft dia. (10) ~ (18) mm



HK



BK



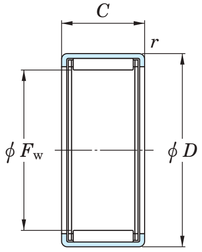
Shaft surface to be 58 HRC or equivalent

Boundary dimensions (mm)						Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)	Inspection gage	Mounting inner ring (pages B466 to B475)
Shaft dia.	F_w	D	C +0 −0.3	C_3 min.	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.			
10	10	14	15	13.40	0.40	**BK1015**	7.49	9.81	1.50	19 000	29 000	0.006	Table 4	JR7x10x16
	10	14	15	—	0.40	**HK1015**	7.49	9.81	1.50	19 000	29 000	0.006	Table 4	JR7x10x16
12	12	16	10	8.40	0.4	**BK1210**	4.96	6.08	0.890	18 000	28 000	0.006	Table 4	JR8x12x10,5
	12	16	10	—	0.4	**HK1210**	4.96	6.08	0.890	18 000	28 000	0.006	Table 4	JR8x12x10,5
	12	18	12	9.30	1	**BK1212**	6.61	7.29	1.10	14 000	22 000	0.012	Table 4	JR8x12x12,5
	12	18	12	—	1	**HK1212**	6.61	7.29	1.10	14 000	22 000	0.01	Table 4	JR8x12x12,5
13	13	19	12	9.30	1	**BK1312**	6.92	7.89	1.20	14 000	22 000	0.012	Table 4	JR10x13x12,5
	13	19	12	—	1	**HK1312**	6.92	7.89	1.20	14 000	22 000	0.01	Table 4	JR10x13x12,5
14	14	20	12	9.30	1	**BK1412**	7.21	8.50	1.30	14 000	21 000	0.014	Table 4	JR10x14x12
	14	20	12	—	1	**HK1412**	7.21	8.50	1.30	14 000	21 000	0.011	Table 4	JR10x14x12
15	15	21	12	9.30	1	**BK1512**	7.16	8.57	1.40	14 000	21 000	0.015	Table 4	JR12x15x12,5
	15	21	12	—	1	**HK1512**	7.49	9.11	1.40	14 000	21 000	0.012	Table 4	JR12x15x12,5
	15	21	16	13.30	1	**BK1516**	10.70	14.4	2.20	14 000	21 000	0.019	Table 4	JR12x15x16,5
	15	21	16	—	1	**HK1516**	10.70	14.4	2.20	14 000	21 000	0.018	Table 4	JR12x15x16,5
	15	21	22	19.30	1	**BK1522** 1)	13.50	19.4	2.95	14 000	21 000	0.022	Table 4	JR12x15x22,5
	15	21	22	—	1	**HK1522** 1)	13.50	19.4	2.95	14 000	21 000	0.024	Table 4	JR12x15x22,5
16	16	22	12	9.30	1	**BK1612**	7.76	9.72	1.50	14 000	21 000	0.016	Table 4	JR12x16x12
	16	22	12	—	1	**HK1612**	7.76	9.72	1.50	14 000	21 000	0.012	Table 4	JR12x16x12
	16	22	16	13.30	1	**BK1616**	11.1	15.3	2.35	14 000	21 000	0.02	Table 4	JR12x16x16
	16	22	16	—	1	**HK1616**	11.1	15.3	2.35	14 000	21 000	0.016	Table 4	JR12x16x16
	16	22	22	19.30	1	**BK1622** 1)	13.4	19.5	2.95	14 000	21 000	0.028	Table 4	JR12x16x22
	16	22	22	—	1	**HK1622** 1)	13.40	19.5	2.95	14 000	21 000	0.022	Table 4	JR12x16x22
17	17	23	12	9.30	1	**BK1712**	8.12	10.4	1.60	13 000	20 000	0.018	Table 4	
	17	23	12	—	1	**HK1712**	8.12	10.4	1.60	13 000	20 000	0.013	Table 4	
18	18	24	12	9.30	1	**BK1812**	8.41	11.11	1.70	12 000	18 000	0.017	Table 4	

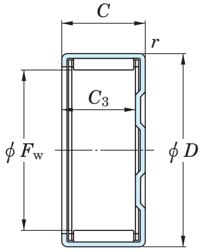
[Notes] 1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.
2) For the recommended mounting dimensions see Table 20.

Drawn cup needle roller bearings caged, open ends, closed one end metric series HK, BK series

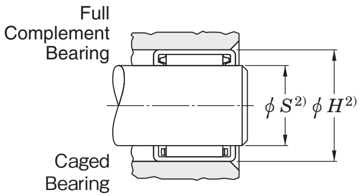
Shaft dia. (18) ~ (25) mm



HK



BK



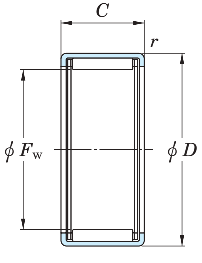
Shaft surface to be 58 HRC or equivalent

Shaft dia.	Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)	Inspection gage	Mounting inner ring (pages B466 to B475)
	F_w	D	C +0 −0.3	C_3 min.	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.			
18	18	24	12	—	1	**HK1812**	8.41	11.11	1.70	12 000	18 000	0.015	Table 4	
	18	24	16	13.30	1	**BK1816**	11.6	16.8	2.55	12 000	18 000	0.022	Table 4	JR15x18x16,5
	18	24	16	—	1	**HK1816**	11.6	16.8	2.55	12 000	18 000	0.018	Table 4	JR15x18x16,5
20	20	26	12	9.3	1	**BK2012**	8.97	12.5	1.90	11 000	16 000	0.017	Table 4	JR15x20x12
	20	26	12	—	1	**HK2012**	8.97	12.5	1.90	11 000	16 000	0.015	Table 4	JR15x20x12
	20	26	16	13.3	1	**BK2016**	12.40	18.90	2.85	11 000	16 000	0.024	Table 4	JR17x20x16,5
	20	26	16	—	1	**HK2016**	12.40	18.90	2.85	11 000	16 000	0.022	Table 4	JR17x20x16,5
	20	26	20	17.3	1	**BK2020**	15.50	25.30	3.95	11 000	16 000	0.027	Table 4	JR17x20x20,5
	20	26	20	—	1	**HK2020**	15.90	26.20	3.95	11 000	16 000	0.025	Table 4	JR17x20x20,5
	20	26	30	27.3	1	**BK2030** 1)	21.20	37.80	5.75	11 000	16 000	0.043	Table 4	JR17x20x30,5
	20	26	30	—	1	**HK2030** 1)	21.20	37.80	5.75	11 000	16 000	0.041	Table 4	JR17x20x30,5
22	22	28	10	8.4	1	**BK2210**	7.06	9.49	1.45	9 600	15 000	0.013	Table 4	
	22	28	10	—	1	**HK2210**	7.06	9.49	1.45	9 600	15 000	0.013	Table 4	
	22	28	12	9.3	1	**BK2212**	9.81	14.50	2.20	9 600	15 000	0.02	Table 4	JR17x22x13
	22	28	12	—	1	**HK2212**	9.81	14.50	2.20	9 600	15 000	0.015	Table 4	JR17x22x13
	22	28	16	13.3	1	**BK2216**	13.10	20.90	3.20	9 600	15 000	0.027	Table 4	JR17x22x16
	22	28	16	—	1	**HK2216**	13.10	20.90	3.20	9 600	15 000	0.022	Table 4	JR17x22x16
	22	28	20	17.3	1	**BK2220**	15.30	25.50	4.00	9 600	15 000	0.028	Table 4	JR17x22x23
	22	28	20	—	1	**HK2220**	15.30	25.50	4.00	9 600	15 000	0.026	Table 4	JR17x22x23
25	25	32	12	9.30	1	**BK2512**	10.90	14.70	2.25	8 500	13 000	0.025	Table 4	
	25	32	12	—	1	**HK2512**	10.90	14.70	2.25	8 500	13 000	0.021	Table 4	
	25	32	16	13.3	1	**BK2516**	15.60	23.50	3.55	8 500	13 000	0.031	Table 4	JR20x25x17
	25	32	16	—	1	**HK2516**	15.60	23.50	3.55	8 500	13 000	0.028	Table 4	JR20x25x17
	25	32	20	17.3	1	**BK2520**	20.60	33.40	5.30	8 500	13 000	0.043	Table 4	JR20x25x20,5
	25	32	20	—	1	**HK2520**	20.60	33.40	5.30	8 500	13 000	0.040	Table 4	JR20x25x20,5
	25	32	26	23.3	1	**BK2526**	25.70	44.40	6.95	8 500	13 000	0.051	Table 4	JR20x25x26,5
	25	32	26	—	1	**HK2526**	25.70	44.40	6.95	8 500	13 000	0.046	Table 4	JR20x25x26,5

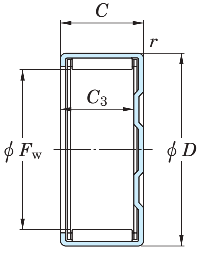
[Notes] 1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.
2) For the recommended mounting dimensions see Table 20.

Drawn cup needle roller bearings caged, open ends, closed one end metric series HK, BK series

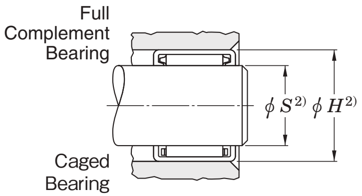
Shaft dia. (25) ~ (45) mm



HK



BK



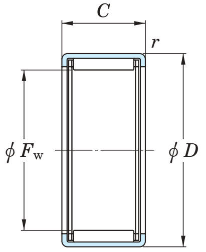
Shaft surface to be
58 HRC or equivalent

Shaft dia.	Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)	Inspection gage	Mounting inner ring (pages B466 to B475)
	F_w	D	C +0 −0.3	C_3 min.	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.			
25	25	32	38	35.3	1	**BK2538 1)**	35.30	66.90	10.6	8 500	13 000	0.077	Table 4	JR20x25x38,5
	25	32	38	—	1	**HK2538 1)**	35.30	66.90	10.6	8 500	13 000	0.068	Table 4	JR20x25x38,5
28	28	35	16	13.30	1	**BK2816**	15.9	24.9	3.85	7 500	12 000	0.038	Table 4	JR22x28x17
	28	35	16	—	1	**HK2816**	15.9	24.9	3.85	7 500	12 000	0.032	Table 4	JR22x28x17
	28	35	20	17.3	1	**BK2820**	20.9	35.3	5.60	7 500	12 000	0.047	Table 4	JR22x28x20,5
	28	35	20	—	1	**HK2820**	20.9	35.3	5.60	7 500	12 000	0.040	Table 4	JR22x28x20,5
30	30	37	12	9.3	1	**BK3012**	11.6	16.8	2.90	7 000	11 000	0.031	Table 4	
	30	37	12	—	1	**HK3012**	12.0	17.7	2.70	7 000	11 000	0.024	Table 4	
	30	37	16	13.30	1	**BK3016**	16.8	27.3	4.20	7 000	11 000	0.041	Table 4	JR25x30x17
	30	37	16	—	1	**HK3016**	16.8	27.3	4.20	7 000	11 000	0.032	Table 4	JR25x30x17
	30	37	20	17.3	1	**BK3020**	22.4	39.6	6.25	7 000	11 000	0.053	Table 4	JR25x30x20,5
	30	37	20	—	1	**HK3020**	22.4	39.6	6.25	7 000	11 000	0.042	Table 4	JR25x30x20,5
	30	37	26	23.3	1	**BK3026**	27.4	51.2	7.95	7 000	11 000	0.067	Table 4	JR25x30x26,5
	30	37	26	—	1	**HK3026**	27.4	51.2	7.95	7 000	11 000	0.054	Table 4	JR25x30x26,5
	30	37	38	35.3	1	**BK3038 1)**	38.4	79.2	12.5	7 000	11 000	0.093	Table 4	JR25x30x38,5
	30	37	38	—	1	**HK3038 1)**	38.4	79.2	12.5	7 000	11 000	0.075	Table 4	JR25x30x38,5
35	35	42	12	—	1	**HK3512**	13.0	20.6	2.90	5 900	9 100	0.028	Table 4	
	35	42	16	—	1	**HK3516**	17.4	29.9	4.60	5 900	9 100	0.037	Table 4	JR30x35x17
	35	42	20	17.3	1	**BK3520**	24.5	46.8	7.40	5 900	9 100	0.065	Table 4	JR30x35x20,5
	35	42	20	—	1	**HK3520**	24.5	46.8	7.40	5 900	9 100	0.049	Table 4	JR30x35x20,5
40	40	47	12	—	1	**HK4012**	14.7	25.3	3.40	5 200	7 900	0.033	Table 4	
	40	47	16	—	1	**HK4016**	18.9	34.8	5.35	5 200	7 900	0.042	Table 4	JR35x40x17
	40	47	20	17.3	1	**BK4020**	25.1	50.4	8.00	5 200	7 900	0.070	Table 4	JR35x40x20,5
	40	47	20	—	1	**HK4020**	25.1	50.4	8.00	5 200	7 900	0.060	Table 4	JR35x40x20,5
45	45	52	12	—	1	**HK4512**	14.1	24.8	3.75	4 600	7 000	0.036	Table 4	

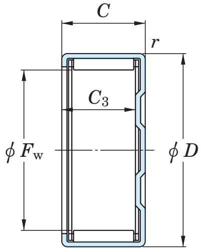
[Notes] 1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.
2) For the recommended mounting dimensions see Table 20.

Drawn cup needle roller bearings caged, open ends, closed one end metric series HK, BK series

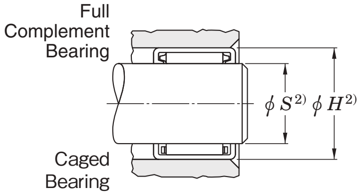
Shaft dia. (45) ~ 60 mm



HK



BK



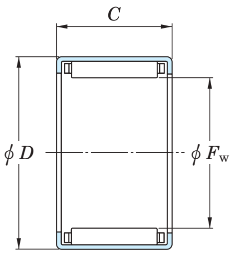
Shaft surface to be
58 HRC or equivalent

Shaft dia.	Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)	Inspection gage	Mounting inner ring (pages B466 to B475)
	F_w	D	C +0 −0.3	C_3 min.	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.			
45	45	52	16	—	1	**HK4516**	19.8	38.5	5.95	4 600	7 000	0.048	Table 4	JR40x45x17
	45	52	20	17.3	1	**BK4520**	26.3	55.4	8.80	4 600	7 000	0.079	Table 4	JR40x45x20,5
	45	52	20	—	1	**HK4520**	27.2	58.2	8.80	4 600	7 000	0.059	Table 4	JR40x45x20,5
50	50	58	12	—	1	**HK5012**	17.0	28.7	4.40	4 100	6 300	0.045	Table 4	
	50	58	20	—	1	**HK5020**	30.9	62.2	8.80	4 100	6 300	0.072	Table 4	JR45x50x20
	50	58	25	—	1	**HK5025**	35.5	74.1	11.7	4 100	6 300	0.092	Table 4	JR45x50x25,5
55	55	63	20	—	1	**HK5520**	31.0	64.4	10.0	3 700	5 700	0.079	Table 4	
60	60	68	12	—	1	**HK6012**	18.6	34.4	5.25	3 400	5 200	0.060	Table 4	
	60	68	20	—	1	**HK6020**	32.5	70.2	10.9	3 400	5 200	0.090	Table 4	

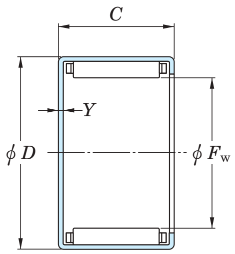
[Notes] 1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.
2) For the recommended mounting dimensions see Table 20.

Drawn cup needle roller bearings caged, open ends, closed one end inch series J, JH, MJ-1, MJH-1 series

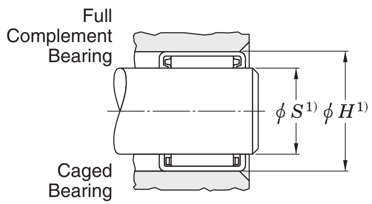
Shaft dia. 1/8 ~ 1/2 in (3.175 ~ 12.700 mm)



J, JH



MJ-1, MJH-1



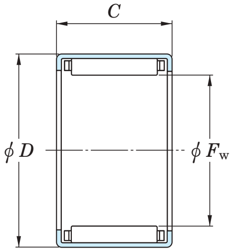
Shaft surface to be
58 HRC or equivalent

Boundary dimensions (mm)					Bearing No.		Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)		Inspection gage
Shaft dia. (in)	F_w	D	C +0 −0.3	Y max.	With open ends	With closed end	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	With open ends	With closed end	
1/8	3.175	6.350	4.78	—	**JP-23-F**	—	0.90	0.61	0.100	33 000	51 000	0.001	—	Table 5
	3.175	6.350	6.35	—	**JP-24-F**	—	1.33	1.01	0.150	33 000	51 000	0.001	—	Table 5
5/32	3.970	7.142	4.78	—	**JP-2 1/2 3F**	—	0.91	0.62	0.110	31 000	47 000	0.001	—	Table 5
3/16	4.763	8.733	4.77	—	**JP-33-F**	—	1.07	0.73	0.120	25 000	38 000	0.001	—	Table 5
	4.763	8.733	6.35	—	**JP-34-F**	—	1.72	1.34	0.200	25 000	38 000	0.001	—	Table 5
	4.763	8.733	9.53	1.02	**J-36**	**MJ-361**	2.28	1.92	0.290	25 000	38 000	0.002	0.002	Table 5
1/4	6.350	11.113	7.92	1.02	**J-45**	**MJ-451**	2.21	1.74	0.300	20 000	30 000	0.003	0.003	Table 5
	6.350	11.113	11.13	1.02	**J-47**	**MJ-471**	3.40	3.01	0.450	20 000	30 000	0.004	0.004	Table 5
5/16	7.938	12.700	7.92	—	**J-55**	—	2.40	2.01	0.340	18 000	28 000	0.003	—	Table 5
	7.938	12.700	11.13	1.02	**J-57**	**MJ-571**	4.03	3.92	0.590	18 000	28 000	0.004	0.005	Table 5
	7.938	14.288	11.13	1.02	**JH-57**	**MJH-571**	4.65	3.76	0.570	14 000	22 000	0.006	0.007	Table 5
3/8	9.525	14.288	7.92	1.02	**J-65**	**MJ-651**	2.73	2.49	0.430	18 000	27 000	0.004	0.004	Table 5
	9.525	14.288	9.53	1.02	**J-66**	**MJ-661**	3.53	3.46	0.530	18 000	27 000	0.004	0.005	Table 5
	9.525	14.288	12.70	1.02	**J-68**	**MJ-681**	5.22	5.72	0.860	18 000	27 000	0.005	0.006	Table 5
	9.525	15.875	12.70	—	**JH-68**	—	6.59	6.08	0.920	13 000	20 000	0.008	—	Table 5
7/16	11.113	15.875	12.70	1.02	**J-78**	**MJ-781**	6.34	7.67	1.15	17 000	26 000	0.006	0.007	Table 5
	11.113	17.463	12.70	—	**JH-78**	—	7.10	6.89	1.05	13 000	19 000	0.009	—	Table 5
1/2	12.700	17.463	7.92	1.02	**J-85**	**MJ-851**	3.46	3.66	0.630	16 000	25 000	0.005	0.005	Table 5
	12.700	17.463	9.53	1.02	**J-86**	**MJ-861**	4.67	5.39	0.830	16 000	25 000	0.005	0.006	Table 5
	12.700	17.463	12.70	1.02	**J-88**	**MJ-881**	6.32	7.92	1.20	16 000	25 000	0.007	0.008	Table 5
	12.700	17.463	19.05	—	**J-812**	—	10.23	14.72	2.25	16 000	25 000	0.010	—	Table 5
	12.700	19.050	11.13	1.02	**JH-87**	**MJH-871**	6.39	6.20	0.950	12 000	19 000	0.009	0.010	Table 5
	12.700	19.050	12.70	1.02	**JH-88**	**MJH-881**	7.56	7.69	1.15	12 000	19 000	0.010	0.012	Table 5
	12.700	19.050	19.05	—	**JH-812**	—	12.32	14.41	2.25	12 000	19 000	0.015	—	Table 5

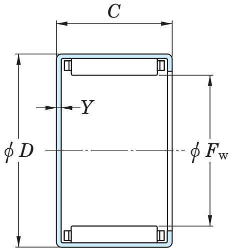
[Note] 1) For the recommended mounting dimensions see Table 21.

Drawn cup needle roller bearings caged, open ends, closed one end inch series J, JH, MJ-1, MJH-1 series

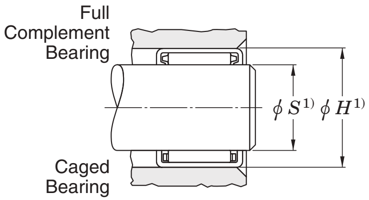
Shaft dia. $^{9}/_{16} \sim {}^{7}/_{8}$ **in**
(14.288 ~ 22.225 mm)



J, JH



MJ-1, MJH-1



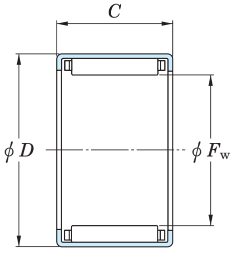
Shaft surface to be 58 HRC or equivalent

Boundary dimensions (mm)					Bearing No.		Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)		Inspection gage
Shaft dia. (in)	F_w	D	C $^{+0}_{-0.3}$	Y max.	With open ends	With closed end	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	With open ends	With closed end	
$^{9}/_{16}$	14.288	19.050	11.13	1.02	**J-97**	**MJ-971**	5.47	6.80	1.05	16 000	25 000	0.007	0.009	Table 5
	14.288	19.050	12.70	1.02	**J-98**	**MJ-981**	6.23	8.03	1.20	16 000	25 000	0.008	0.009	Table 5
	14.288	19.050	15.88	—	**J-910**	—	8.27	11.60	1.75	16 000	25 000	0.010	—	Table 5
	14.288	20.638	12.70	1.02	**JH-98**	**MJH-981**	7.98	8.49	1.30	12 000	18 000	0.011	0.014	Table 5
$^{5}/_{8}$	15.875	20.638	12.70	1.02	**J-108**	**MJ-1081**	6.71	9.13	1.40	13 000	21 000	0.009	0.010	Table 5
	15.875	20.638	15.88	1.02	**J-1010**	**MJ-10101**	8.80	12.94	1.95	13 000	21 000	0.010	0.013	Table 5
	15.875	20.638	19.05	1.02	**J-1012**	**MJ-10121**	11.80	18.86	2.90	13 000	21 000	0.013	0.015	Table 5
	15.875	22.212	15.88	1.02	**JH-1010**	**MJH-10101**	11.57	14.10	2.15	14 000	21 000	0.015	0.017	Table 5
	15.875	22.212	25.40	1.02	**JH-1016**	**MJH-10161**	19.79	28.11	4.35	14 000	21 000	0.024	0.028	Table 5
$^{11}/_{16}$	17.463	22.212	19.05	1.02	**J-1112**	**MJ-11121**	12.46	20.91	3.20	12 000	19 000	0.014	0.016	Table 5
	17.463	23.813	15.88	1.02	**JH-1110**	**MJH-11101**	12.05	15.21	2.30	13 000	19 000	0.016	0.019	Table 5
	17.463	23.813	19.05	—	**JH-1112**	—	16.10	22.20	3.10	13 000	19 000	0.019	—	Table 5
$^{3}/_{4}$	19.050	25.400	9.53	—	**J-126**	—	6.49	7.05	1.10	11 000	18 000	0.010	—	Table 5
	19.050	25.400	12.70	—	**J-128**	—	9.94	12.19	1.85	11 000	18 000	0.014	—	Table 5
	19.050	25.400	15.88	1.02	**J-1210**	**MJ-12101**	12.50	16.32	2.50	11 000	18 000	0.017	0.020	Table 5
	19.050	25.400	19.05	1.02	**J-1212**	**MJ-12121**	15.52	21.62	3.35	11 000	18 000	0.020	0.025	Table 5
	19.050	26.988	19.05	1.02	**JH-1212**	**MJH-12121**	19.08	23.58	3.70	12 000	18 000	0.026	0.031	Table 5
$^{13}/_{16}$	20.638	26.988	22.23	—	**J-1314**	—	19.31	29.31	4.55	10 000	16 000	0.025	—	Table 5
	20.638	28.575	19.05	1.27	**JH-1312**	**MJH-13121**	18.77	24.50	3.85	11 000	16 000	0.028	0.034	Table 5
$^{7}/_{8}$	22.225	28.575	9.53	—	**J-146**	—	7.20	8.43	1.30	9 700	15 000	0.012	—	Table 5
	22.225	28.575	12.70	—	**J-148**	—	10.94	14.50	2.20	9 700	15 000	0.015	—	Table 5
	22.225	28.575	19.05	1.02	**J-1412**	**MJ-14121**	17.88	27.18	4.20	9 700	15 000	0.024	0.028	Table 5
	22.225	28.575	25.40	1.02	**J-1416**	**MJ-14161**	23.66	38.97	6.05	9 700	15 000	0.031	0.059	Table 5
	22.225	30.163	19.05	1.27	**JH-1412**	**MJH-14121**	18.33	24.50	3.75	9 800	15 000	0.030	0.036	Table 5
	22.225	30.163	25.40	1.27	**JH-1416**	**MJH-14161**	25.40	37.37	5.80	9 800	15 000	0.040	0.048	Table 5

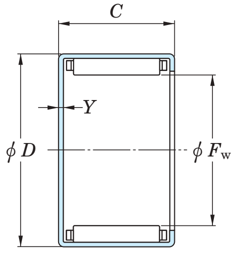
[Note] 1) For the recommended mounting dimensions see Table 21.

Drawn cup needle roller bearings caged, open ends, closed one end inch series J, JH, MJ-1, MJH-1 series

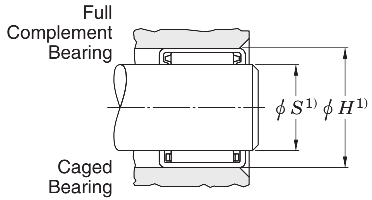
Shaft dia. 1 ~ (1 $^3/_4$) in
(25.400 ~ (44.450) mm)



J, JH



MJ-1, MJH-1



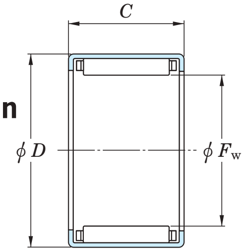
Shaft surface to be 58 HRC or equivalent

Boundary dimensions (mm)					Bearing No.		Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)		Inspection gage
Shaft dia. (in)	F_w	D	C $^{+0}_{-0.3}$	Y max.	With open ends	With closed end	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	With open ends	With closed end	
1	25.400	31.750	19.05	—	**J-1612**	—	18.15	28.82	4.45	8 400	13 000	0.026	—	Table 5
	25.400	31.750	25.40	1.02	**J-1616**	**MJ-16161**	24.95	43.41	6.75	8 400	13 000	0.035	0.042	Table 5
	25.400	33.338	19.05	1.27	**JH-1612**	**MJH-16121**	20.68	29.58	4.60	8 500	13 000	0.034	0.040	Table 5
	25.400	33.338	25.40	1.27	**JH-1616**	**MJH-16161**	27.58	42.88	6.65	8 500	13 000	0.045	0.054	Table 5
1 $^1/_8$	28.575	34.925	12.70	1.02	**J-188**	**MJ-1881**	11.65	16.95	2.55	7 400	11 000	0.020	0.023	Table 5
	28.575	34.925	19.05	1.02	**J-1812**	**MJ-18121**	19.04	31.76	4.90	7 400	11 000	0.029	0.035	Table 5
	28.575	34.925	25.40	1.02	**J-1816**	**MJ-18161**	26.16	48.04	7.40	7 400	11 000	0.039	0.047	Table 5
	28.575	38.100	19.05	1.27	**JH-1812**	**MJH-18121**	23.35	31.32	4.75	7 600	12 000	0.046	0.055	Table 5
	28.575	38.100	25.40	1.27	**JH-1816**	**MJH-18161**	33.14	49.38	7.70	7 600	12 000	0.061	0.074	Table 5
	28.575	38.100	28.58	1.27	**JH-1818**	**MJH-18181**	36.30	55.16	8.60	7 600	12 000	0.069	0.082	Table 5
1 $^1/_4$	31.750	38.100	19.05	1.02	**J-2012**	**MJ-20121**	19.84	34.70	5.35	6 600	10 000	0.036	0.043	Table 5
	31.750	38.100	25.40	1.02	**J-2016**	**MJ-20161**	28.82	56.49	8.70	6 600	10 000	0.043	0.051	Table 5
	31.750	41.275	19.05	—	**JH-2012**	—	24.11	33.94	5.80	6 800	10 000	0.050	—	Table 5
	31.750	41.275	25.40	—	**JH-2016**	—	33.94	52.93	8.20	6 800	10 000	0.067	—	Table 5
	31.750	41.275	31.75	—	**JH-2020**	—	43.37	72.51	10.8	6 800	10 000	0.084	—	Table 5
1 $^3/_8$	34.925	41.275	12.70	1.02	**J-228**	**MJ-2281**	13.97	22.91	3.50	6 000	9 200	0.024	0.028	Table 5
	34.925	41.275	19.05	—	**J-2212**	—	22.82	42.97	6.65	6 000	9 200	0.035	—	Table 5
	34.925	44.450	19.05	1.27	**JH-2212**	**MJH-22121**	26.24	38.43	5.90	6 100	9 400	0.055	0.065	Table 5
	34.925	44.450	25.40	1.27	**JH-2216**	**MJH-22161**	36.52	58.72	9.20	6 100	9 400	0.073	0.087	Table 5
1 $^1/_2$	38.100	47.625	19.05	1.27	**J-2412**	**MJ-24121**	29.89	47.15	7.40	5 600	8 600	0.059	0.094	Table 5
	38.100	47.625	25.40	1.27	**J-2416**	**MJ-24161**	39.32	66.72	10.4	5 600	8 600	0.079	0.094	Table 5
	38.100	47.625	31.75	—	**J-2420**	—	49.38	89.85	14.0	5 600	8 600	0.099	—	Table 5
1 $^5/_8$	41.275	50.800	15.88	—	**J-2610**	—	26.11	40.97	6.25	5 100	7 900	0.053	—	Table 5
	41.275	50.800	25.40	1.27	**J-2616**	**M-26161**	39.28	68.95	10.8	5 100	7 900	0.085	0.101	Table 5
1 $^3/_4$	44.450	53.975	19.05	1.27	**J-2812**	**MJ-28121**	29.58	49.38	7.45	4 700	7 300	0.068	0.081	Table 5

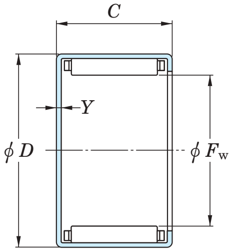
[Note] 1) For the recommended mounting dimensions see Table 21.

Drawn cup needle roller bearings caged, open ends, closed one end inch series J, JH, MJ-1, MJH-1 series

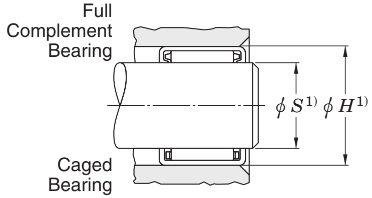
Shaft dia. (1 $^{3}/_{4}$) ~ 2 $^{3}/_{4}$ in ((44.450) ~ 69.850 mm)



J, JH



MJ-1, MJH-1



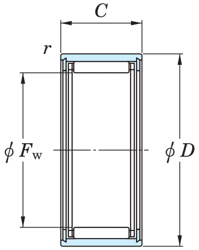
Shaft surface to be 58 HRC or equivalent

Boundary dimensions (mm)					Bearing No.		Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)		Inspection gage
Shaft dia. (in)	F_w	D	C $^{+0}_{-0.3}$	Y max.	With open ends	With closed end	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	With open ends	With closed end	
1 $^{3}/_{4}$	44.450 44.450	53.975 53.975	25.40 38.10	1.27 1.27	**J-2816** **J-2824**	**MJ-28161** **MJ-28241**	40.08 59.61	72.95 121.88	11.4 18.9	4 700 4 700	7 300 7 300	0.091 0.136	0.108 0.162	Table 5 Table 5
1 $^{7}/_{8}$	47.625	57.150	25.40	1.27	**J-3016**	**MJ-30161**	41.10	76.06	11.9	4 400	6 800	0.097	0.115	Table 5
2	50.800	60.325	25.40	1.27	**J-3216**	**MJ-32161**	42.39	81.40	12.7	4 100	6 300	0.103	0.137	Table 5
2 $^{1}/_{4}$	57.150 57.150	66.675 66.675	19.05 25.40	— —	**J-3612** **J-3616**	— —	35.41 46.26	65.83 92.52	10.0 14.4	3 600 3 600	5 600 5 600	0.086 0.114	— —	Table 5 Table 5
2 $^{3}/_{4}$	69.850	79.375	19.05	—	**J-4412**	—	36.25	72.95	11.3	2 900	4 500	0.103	—	Table 5

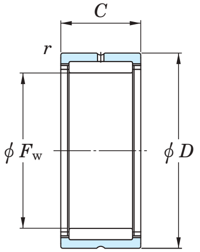
[Note] 1) For the recommended mounting dimensions see Table 21.

Heavy-duty needle roller bearings without inner rings metric series NK, NKS, RNA48, RNA49 RNA69, NKTN series

Shaft dia. 5 ~ (17) mm



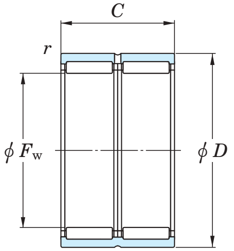
NK ($\phi F_w \le 10$)



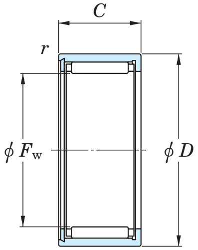
NK ($\phi F_w \ge 12$), NKS, RNA48, RNA49, RNA69 ($\phi F_w \le 35$)

Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)
Shaft dia.	F_w	D	C	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	
5	5	10	10	0.2	**NK5/10TN**	2.18	1.71	0.260	31 000	47 000	0.004
	5	10	12	0.2	**NK5/12TN**	3.04	2.63	0.400	31 000	47 000	0.004
6	6	12	10	0.2	**NK6/10**	3.19	2.90	0.420	29 000	44 000	0.005
	6	12	12	0.2	**NK6/12TN**	3.07	2.74	0.420	29 000	44 000	0.006
7	7	14	10	0.3	**NK7/10TN**	2.74	2.44	0.370	28 000	42 000	0.007
	7	14	12	0.3	**NK7/12TN**	3.40	3.22	0.490	28 000	42 000	0.009
8	8	15	12	0.3	**NK8/12**	4.57	4.89	0.740	26 000	41 000	0.011
	8	15	12	0.3	**NK8/12ASR1**	4.57	4.89	0.740	26 000	41 000	0.011
	8	15	16	0.3	**NK8/16**	5.22	5.78	0.880	26 000	41 000	0.013
9	9	16	12	0.3	**NK9/12**	4.27	4.60	0.700	26 000	40 000	0.012
	9	16	16	0.3	**NK9/16**	5.57	6.47	0.980	26 000	40 000	0.015
10	10	17	12	0.3	**NK10/12**	5.40	6.43	0.980	25 000	39 000	0.013
	10	17	16	0.3	**NK10/16TN**	5.30	6.27	0.940	25 000	39 000	0.015
12	12	19	12	0.3	**NK12/12**	6.86	7.60	1.15	19 000	30 000	0.013
	12	19	16	0.3	**NK12/16**	6.78	9.03	1.40	24 000	37 000	0.018
14	14	22	13	0.3	**RNA4900**	9.39	10.3	1.55	16 000	24 000	0.018
	14	22	16	0.3	**NK14/16**	12.4	14.8	2.25	16 000	24 000	0.023
	14	22	20	0.3	**NK14/20**	14.7	18.4	2.90	16 000	24 000	0.028
15	15	23	16	0.3	**NK15/16**	12.4	15.0	2.30	15 000	24 000	0.024
	15	23	20	0.3	**NK15/20**	14.7	18.6	2.95	15 000	24 000	0.031
16	16	24	13	0.3	**RNA4901**	10.5	12.3	1.85	18 000	28 000	0.020
	16	24	16	0.3	**NK16/16**	15.4	20.2	2.50	18 000	28 000	0.025
	16	24	20	0.3	**NK16/20**	16.1	21.3	3.20	18 000	28 000	0.036
	16	24	22	0.3	**RNA6901**	16.1	21.3	3.30	18 000	28 000	0.036
17	17	25	16	0.3	**NK17/16**	13.6	17.5	2.70	17 000	27 000	0.027

Shaft dia. (17) ~ 25 mm



RNA69
($\phi F_w \ge 40$)

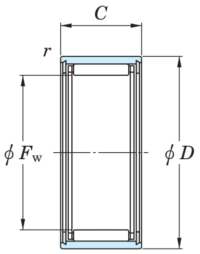


NKTN

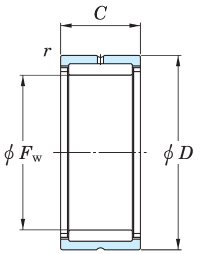
Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)
Shaft dia.	F_w	D	C	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	
17	17	25	20	0.3	**NK17/20**	15.4	20.4	3.25	17 000	27 000	0.034
18	18	26	16	0.3	**NK18/16**	13.6	17.7	2.70	16 000	25 000	0.028
	18	26	20	0.3	**NK18/20**	16.1	22.0	3.50	16 000	25 000	0.035
19	19	27	16	0.3	**NK19/16**	14.1	19.0	2.90	15 000	24 000	0.029
	19	27	20	0.3	**NK19/20**	18.8	23.6	3.75	15 000	24 000	0.037
	19	30	16	0.3	**NKS18**	15.9	16.2	2.45	17 000	26 000	0.045
20	20	28	13	0.3	**RNA4902**	11.8	15.3	2.35	14 000	22 000	0.023
	20	28	16	0.3	**NK20/16**	14.1	19.1	2.90	14 000	22 000	0.030
	20	28	20	0.3	**NK20/20**	17.5	25.3	4.00	14 000	22 000	0.038
	20	28	23	0.3	**RNA6902**	18.4	26.9	4.20	14 000	22 000	0.042
	20	32	20	0.6	**NKS20**	24.4	26.7	4.30	15 000	24 000	0.058
21	21	29	16	0.3	**NK21/16**	15.3	21.6	3.30	14 000	21 000	0.032
	21	29	20	0.3	**NK21/20**	18.1	26.9	4.25	14 000	21 000	0.040
22	22	30	13	0.3	**RNA4903**	12.2	16.4	2.50	13 000	20 000	0.025
	22	30	16	0.3	**NK22/16**	15.2	21.7	3.30	13 000	20 000	0.033
	22	30	20	0.3	**NK22/20**	18.0	27.0	4.30	13 000	20 000	0.041
	22	30	23	0.3	**RNA6903**	19.8	30.6	4.75	13 000	20 000	0.056
	22	35	20	0.6	**NKS22**	22.9	27.1	4.30	14 000	21 000	0.069
24	24	32	16	0.3	**NK24/16**	16.2	24.3	3.70	12 000	18 000	0.035
	24	32	20	0.3	**NK24/20**	19.3	30.3	4.80	12 000	18 000	0.045
	24	37	20	0.6	**NKS24**	29.1	32.8	5.30	13 000	20 000	0.073
25	25	33	16	0.3	**NK25/16**	16.1	24.4	3.75	11 000	17 000	0.037
	25	33	20	0.3	**NK25/20**	19.1	30.4	4.80	11 000	17 000	0.047
	25	37	17	0.3	**RNA4904**	21.3	25.5	3.95	12 000	18 000	0.061
	25	37	30	0.3	**RNA6904**	36.6	51.0	7.95	12 000	18 000	0.091
	25	38	20	0.6	**NKS25**	29.1	33.0	5.30	12 000	19 000	0.076

Heavy-duty needle roller bearings without inner rings metric series NK, NKS, RNA48, RNA49 RNA69, NKTN series

Shaft dia. 26 ~ 37 mm



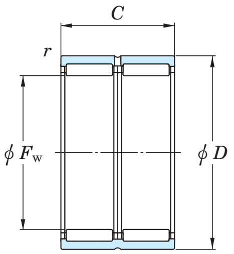
NK ($\phi F_w \le 10$)



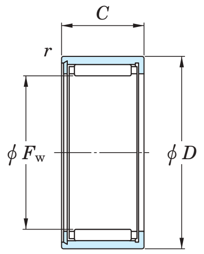
NK ($\phi F_w \ge 12$), NKS, RNA48, RNA49, RNA69 ($\phi F_w \le 35$)

Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)
Shaft dia.	F_w	D	C	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	
26	26	34	16	0.3	**NK26/16**	16.6	25.7	3.95	11 000	17 000	0.039
	26	34	20	0.3	**NK26/20**	19.7	32.0	5.05	11 000	17 000	0.048
28	28	37	20	0.3	**NK28/20**	22.6	34.4	5.50	10 000	16 000	0.057
	28	37	30	0.3	**NK28/30**	29.0	53.8	8.30	10 000	16 000	0.088
	28	39	17	0.3	**RNA49/22**	23.3	29.6	4.55	10 000	16 000	0.059
	28	39	30	0.3	**RNA69/22**	30.6	50.7	3.95	10 000	16 000	0.107
	28	42	20	0.6	**NKS28**	30.3	38.4	6.15	11 000	16 000	0.094
29	29	38	20	0.3	**NK29/20**	23.4	36.4	5.80	9 800	15 000	0.059
	29	38	30	0.3	**NK29/30**	29.8	56.4	8.70	9 700	15 000	0.090
30	30	40	20	0.3	**NK30/20**	24.2	38.3	6.10	9 500	15 000	0.071
	30	40	30	0.3	**NK30/30**	34.7	61.0	9.45	9 500	15 000	0.107
	30	42	17	0.3	**RNA4905**	24.3	31.7	4.90	9 700	15 000	0.071
	30	42	30	0.3	**RNA6905**	39.7	59.6	9.30	9 700	15 000	0.127
	30	45	20	0.6	**NKS30**	34.3	42.8	6.85	9 900	15 000	0.114
32	32	42	20	0.3	**NK32/20**	24.8	40.4	6.45	8 800	14 000	0.074
	32	42	30	0.3	**NK32/30**	35.6	64.3	9.95	8 800	14 000	0.112
	32	45	17	0.3	**RNA49/28**	25.1	33.8	5.20	9 000	14 000	0.080
	32	45	30	0.3	**RNA69/28**	43.2	62.5	9.75	9 100	14 000	0.140
	32	47	22	0.6	**NKS32**	36.0	46.2	7.40	9 200	14 000	0.120
35	35	45	20	0.3	**NK35/20**	26.1	44.4	7.05	8 000	12 000	0.081
	35	45	30	0.3	**NK35/30**	37.4	70.6	11.0	8 000	12 000	0.122
	35	47	18	0.3	**RNA4906**	25.9	36.0	5.55	8 200	13 000	0.081
	35	47	30	0.3	**RNA6906**	42.6	68.2	10.6	8 200	13 000	0.148
	35	50	22	0.6	**NKS35**	37.5	49.9	8.00	8 400	13 000	0.130
37	37	47	20	0.3	**NK37/20**	26.6	46.4	7.40	7 600	12 000	0.084
	37	47	30	0.3	**NK37/30**	38.2	73.9	11.5	7 600	12 000	0.128
	37	52	22	0.6	**NKS37**	39.0	53.4	8.55	7 900	12 000	0.134

Shaft dia. 38 ~ 52 mm



RNA69 ($\phi F_w \ge 40$)

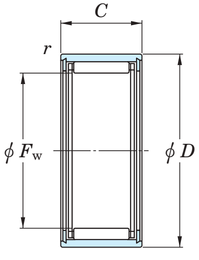


NKTN

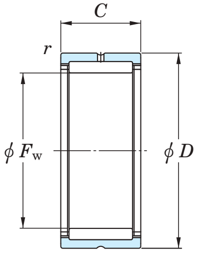
Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)
Shaft dia.	F_w	D	C	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	
38	38	48	20	0.3	**NK38/20**	21.7	40.9	6.40	7 300	11 000	0.087
	38	48	30	0.3	**NK38/30**	31.9	67.0	10.4	7 300	11 000	0.131
40	40	50	20	0.3	**NK40/20**	27.8	50.4	8.05	7 000	11 000	0.089
	40	50	30	0.3	**NK40/30**	40.0	80.2	12.4	7 000	11 000	0.137
	40	52	20	0.6	**RNA49/32**	32.0	49.3	7.85	7 100	11 000	0.100
	40	52	36	0.6	**RNA69/32**	48.6	84.5	26.1	7 100	11 000	0.185
	40	55	22	0.6	**NKS40**	40.3	57.0	9.15	7 200	11 000	0.140
42	42	52	20	0.3	**NK42/20**	28.3	52.4	8.35	6 600	10 000	0.085
	42	52	30	0.3	**NK42/30**	40.7	83.5	13.0	6 600	10 000	0.141
	42	55	20	0.6	**RNA4907**	32.8	51.7	8.25	6 700	10 000	0.114
	42	55	36	0.6	**RNA6907**	49.9	88.7	13.7	6 700	10 000	0.218
43	43	53	20	0.3	**NK43/20**	29.0	54.4	8.65	6 400	9 900	0.096
	43	53	30	0.3	**NK43/30**	41.6	86.6	13.4	6 400	9 900	0.134
	43	58	22	0.6	**NKS43**	41.6	60.7	9.75	6 700	10 000	0.150
45	45	55	20	0.3	**NK45/20**	29.5	56.4	9.00	6 100	9 400	0.100
	45	55	30	0.3	**NK45/30**	42.3	89.8	13.9	6 100	9 400	0.151
	45	60	22	0.6	**NKS45**	43.0	64.2	10.3	6 400	9 800	0.156
47	47	57	20	0.3	**NK47/20**	30.0	58.5	9.30	5 900	9 000	0.104
	47	57	30	0.3	**NK47/30**	43.0	93.1	14.4	5 900	9 000	0.158
48	48	62	22	0.6	**RNA4908**	44.2	67.8	10.9	5 900	9 100	0.154
	48	62	40	0.6	**RNA6908**	70.8	124	19.8	5 900	9 100	0.300
50	50	62	25	0.3	**NK50/25**	40.7	79.3	12.5	5 500	8 500	0.171
	50	62	35	0.6	**NK50/35**	55.0	117	18.2	5 500	8 500	0.242
	50	65	22	1	**NKS50**	45.5	71.3	11.4	5 700	8 700	0.170
52	52	68	22	0.6	**RNA4909**	46.8	74.8	12.0	5 400	8 400	0.201
	52	68	40	0.6	**RNA6909**	74.7	137	21.7	5 400	8 400	0.392

Heavy-duty needle roller bearings without inner rings metric series NK, NKS, RNA48, RNA49 RNA69, NKTN series

Shaft dia. 55 ~ (75) mm



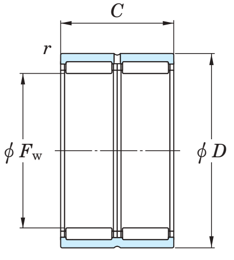
NK (ϕF_w ≤ 10)



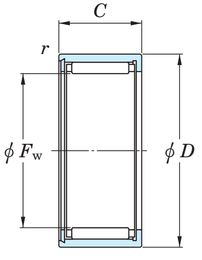
NK (ϕF_w ≥ 12), NKS, RNA48, RNA49, RNA69 (ϕF_w ≤ 35)

Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)
Shaft dia.	F_w	D	C	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	
55	55	68	25	0.6	**NK55/25**	46.1	87.3	13.9	5 000	7 800	0.207
	55	68	35	0.6	**NK55/35**	62.3	129	20.0	5 000	7 800	0.293
	55	72	22	1	**NKS55**	47.9	78.4	12.6	5 100	7 900	0.225
58	58	72	22	0.6	**RNA4910**	48.9	82.0	13.2	4 800	7 400	0.179
	58	72	40	0.6	**RNA6910**	75.7	144	22.8	4 800	7 400	0.364
60	60	72	25	0.6	**NK60/25**	44.3	94.0	14.9	4 400	7 000	0.202
	60	72	35	0.6	**NK60/35**	59.9	139	21.5	4 400	7 000	0.286
	60	80	28	1.1	**NKS60**	66.9	103	16.5	4 800	7 300	0.337
63	63	80	25	1	**RNA4911**	62.0	107	17.1	4 500	6 900	0.285
	63	80	45	1	**RNA6911**	94.2	172	27.8	4 500	6 900	0.540
65	65	78	25	0.6	**NK65/25**	48.2	97.7	15.5	4 200	6 500	0.257
	65	78	35	0.6	**NK65/35**	65.2	144	22.4	4 200	6 500	0.298
	65	85	28	1.1	**NKS65**	71.0	114	18.3	4 200	6 700	0.362
68	68	82	25	0.6	**NK68/25**	49.0	101	16.1	4 000	6 200	0.287
	68	82	35	0.6	**NK68/35**	66.2	149	23.2	4 000	6 200	0.350
	68	85	25	1	**RNA4912**	64.8	116	18.6	4 100	6 300	0.304
	68	85	45	1	**RNA6912**	99.3	189	30.5	4 100	6 300	0.546
70	70	85	25	0.6	**NK70/25**	43.6	87.9	16.6	3 900	6 000	0.298
	70	85	35	0.6	**NK70/35**	62.2	139	24.0	3 900	6 000	0.411
	70	90	28	1.1	**NKS70**	72.6	120	19.3	4 000	6 200	0.383
72	72	90	25	1	**RNA4913**	66.0	121	19.4	3 900	5 900	0.346
	72	90	45	1	**RNA6913**	107	213	34.5	3 900	5 900	0.679
73	73	90	25	0.6	**NK73/25**	61.5	119	19.0	3 800	5 800	0.320
	73	90	35	0.6	**NK73/35**	82.5	173	27.1	3 800	5 800	0.450
75	75	92	25	0.6	**NK75/25**	43.7	90.2	19.0	3 600	5 600	0.364
	75	92	35	0.6	**NK75/35**	60.9	138	27.1	3 600	5 600	0.518

Shaft dia. (75) ~ 110 mm



RNA69
(ϕF_w ≥ 40)

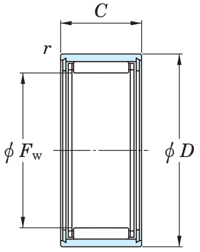


NKTN

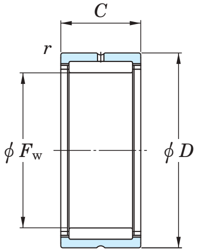
Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		(Refer.) Mass (kg)
Shaft dia.	F_w	D	C	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	
75	75	95	28	1.1	**NKS75**	76.5	132	21.1	3 700	5 800	0.413
80	80	95	25	1	**NK80/25**	65.0	131	21.0	3 400	5 300	0.331
	80	95	35	1	**NK80/35**	79.7	184	28.7	3 400	5 300	0.380
	80	100	30	1	**RNA4914**	86.3	157	25.1	3 500	5 400	0.502
	80	100	54	1	**RNA6914**	137	286	45.7	3 500	5 400	0.946
85	85	105	25	1	**NK85/25**	76.4	137	22.2	3 300	5 000	0.506
	85	105	30	1	**RNA4915**	92.4	175	28.0	3 300	5 000	0.528
	85	105	35	1	**NK85/35**	108	214	34.7	3 300	5 000	0.610
	85	105	54	1	**RNA6915**	143	308	49.3	3 300	5 000	1.020
90	90	110	25	1	**NK90/25**	79.5	147	23.8	3 100	4 700	0.450
	90	110	30	1	**RNA4916**	91.5	176	28.1	3 100	4 700	0.556
	90	110	35	1	**NK90/35**	113	230	36.1	3 100	4 700	0.745
	90	110	54	1	**RNA6916**	126	320	50.8	3 100	4 700	1.050
95	95	115	26	1	**NK95/26**	49.3	114	24.6	2 800	4 400	0.572
	95	115	36	1	**NK95/36**	114	238	37.3	2 900	4 500	0.803
100	100	120	26	1	**NK100/26**	83.6	163	25.8	2 800	4 200	0.530
	100	120	35	1.1	**RNA4917**	110	230	36.0	2 800	4 200	0.715
	100	120	36	1	**NK100/36**	118	254	39.1	2 800	4 200	0.658
	100	120	63	1.1	**RNA6917**	150	416	63.0	2 800	4 200	1.350
105	105	125	26	1	**NK105/26**	52.2	127	19.9	2 600	3 900	0.595
	105	125	35	1.1	**RNA4918**	114	245	37.8	2 600	4 000	0.746
	105	125	63	1.1	**RNA6918**	154	437	66.0	2 600	4 000	1.500
110	110	130	30	1.1	**NK110/30**	103	220	33.6	2 500	3 800	0.660
	110	130	35	1.1	**RNA4919**	115	253	38.4	2 500	3 800	0.777
	110	130	40	1.1	**NK110/40**	132	301	45.7	2 500	3 800	0.900
	110	130	63	1.1	**RNA6919**	158	458	68.8	2 500	3 800	1.470

Heavy-duty needle roller bearings without inner rings metric series NK, NKS, RNA48, RNA49 RNA69, NKTN series

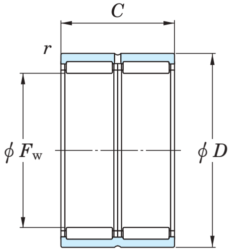
Shaft dia. 115 ~ 175 mm



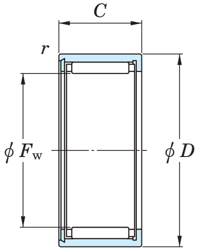
NK ($\phi F_w \le 10$)



NK ($\phi F_w \ge 12$), NKS, RNA48, RNA49, RNA69 ($\phi F_w \le 35$)



RNA69 ($\phi F_w \ge 40$)

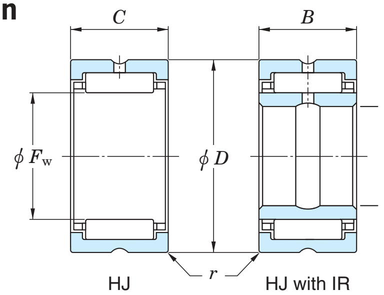


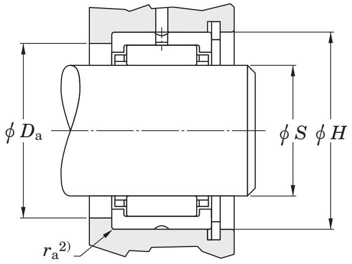
NKTN

Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)
Shaft dia.	F_w	D	C	r min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	
115	115	140	40	1.1	**RNA4920**	139	296	43.9	2 400	3 700	1.220
120	120	140	30	1	**RNA4822**	90.3	230	33.7	2 300	3 500	0.785
125	125	150	40	1.1	**RNA4922**	147	325	47.0	2 200	3 400	1.320
130	130	150	30	1	**RNA4824**	94.1	249	35.7	2 100	3 200	0.850
135	135	165	45	1.1	**RNA4924**	177	407	58.5	2 000	3 100	1.980
145	145	165	35	1	**RNA4826**	112	323	44.8	1 900	2 900	1.100
150	150	180	50	1.5	**RNA4926**	201	495	68.7	1 800	2 800	2.420
155	155	175	35	1.1	**RNA4828**	116	346	47.1	1 700	2 700	1.170
160	160	190	50	1.5	**RNA4928**	214	549	74.8	1 700	2 600	2.560
165	165	190	40	1.1	**RNA4830**	142	402	53.5	1 600	2 500	1.540
175	175	200	40	1.1	**RNA4832**	146	425	55.6	1 500	2 400	1.910

Heavy-duty needle roller bearings
inch series
HJ type

Shaft dia. $^{5}/_{8}$ ~ ($1\,^{3}/_{4}$) in
(15.875 ~ (44.450) mm)





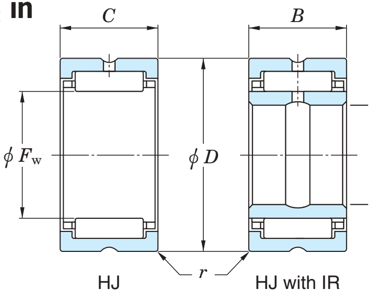
Shaft suface to be 58 HRC or equivalent

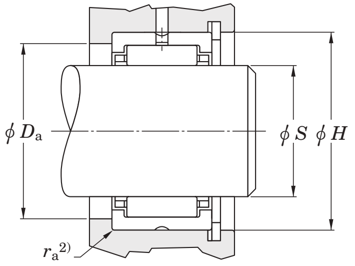
Boundary dimensions (mm)					Bearing No.	Used with inner ring No. 1)	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)	Recommended dimensions								Shoulder dia.
													Clearance fit				Tight transition fit				
													S (h6)		H (H7)		S (f6)		H (N7)		
Shaft dia. (in)	F_w	D	C (B)	r min.			C_r	C_{0r}	C_u	Grease lub.	Oil lub.		max.	min.	max.	min.	max.	min.	max.	min.	D_a ±0.38
$^{5}/_{8}$	15.875	28.575	19.050	0.64	**HJ-101812**	**IR-061012**	19.3	20.7	3.25	20 000	30 000	0.050	15.875	15.865	28.595	28.575	15.860	15.850	28.567	28.547	23.83
$^{3}/_{4}$	19.050	31.750	19.050	1.02	**HJ-122012**	**IR-081212**	20.7	23.3	3.65	16 000	25 000	0.059	19.050	19.037	31.775	31.750	19.030	19.017	31.742	31.717	26.97
	19.050	31.750	25.400	1.02	**HJ-122016**	**IR-081216**	27.5	33.7	5.30	16 000	25 000	0.077	19.050	19.037	31.775	31.750	19.030	19.017	31.742	31.717	26.97
$^{7}/_{8}$	22.225	34.925	19.050	1.02	**HJ-142212**	**IR-101412**	23	27.9	4.35	13 000	21 000	0.064	22.225	22.212	34.950	34.925	22.205	22.192	34.917	34.892	30.18
	22.225	34.925	25.400	1.02	**HJ-142216**	**IR-101416**	30.7	40.3	6.35	13 000	21 000	0.086	22.225	22.212	34.950	34.925	22.205	22.192	34.917	34.892	30.18
1	25.400	38.100	19.050	1.02	**HJ-162412**	**IR-121612**	25.3	32.5	5.10	12 000	18 000	0.073	25.400	25.387	38.125	38.100	25.380	25.367	38.092	38.067	33.32
	25.400	38.100	25.400	1.02	**HJ-162416**	**IR-121616**	33.6	47.2	7.40	12 000	18 000	0.095	25.400	25.387	38.125	38.100	25.380	25.367	38.092	38.067	33.32
	25.400	38.100	25.400	1.02	**HJ-162416**	**IR-131616**	33.6	47.2	7.40	12 000	18 000	0.095	25.400	25.387	38.125	38.100	25.380	25.367	38.092	38.067	33.32
$1\,^{1}/_{8}$	28.575	41.275	25.400	1.02	**HJ-182616**	**IR-141816**	36.3	53.8	8.45	10 000	16 000	0.104	28.575	28.562	41.300	41.275	28.555	28.542	41.267	41.242	36.53
	28.575	41.275	25.400	1.02	**HJ-182616**	**IR-151816**	36.3	53.8	8.45	10 000	16 000	0.104	28.575	28.562	41.300	41.275	28.555	28.542	41.267	41.242	36.53
	28.575	41.275	31.750	1.02	**HJ-182620**	**IR-141820**	44.9	70.3	10.9	10 000	16 000	0.132	28.575	28.562	41.300	41.275	28.555	28.542	41.267	41.242	36.53
	28.575	41.275	31.750	1.02	**HJ-182620**	**IR-151820**	44.9	70.3	10.9	10 000	16 000	0.132	28.575	28.562	41.300	41.275	28.555	28.542	41.267	41.242	36.53
$1\,^{1}/_{4}$	31.750	44.450	25.400	1.02	**HJ-202816**	**IR-162016**	37.4	57.4	9.00	9 100	14 000	0.113	31.750	31.735	44.475	44.450	31.725	31.709	44.442	44.417	39.67
	31.750	44.450	31.750	1.02	**HJ-202820**	**IR-162020**	46.3	75.2	11.7	9 100	14 000	0.145	31.750	31.735	44.475	44.450	31.725	31.709	44.442	44.417	39.67
$1\,^{3}/_{8}$	34.925	47.625	25.400	1.02	**HJ-223016**	**IR-182216**	39.8	64.1	10.1	8 200	13 000	0.127	34.925	34.910	47.650	47.625	34.900	34.884	47.617	47.592	42.88
	34.925	47.625	31.750	1.02	**HJ-223020**	**IR-182220**	49.4	84.1	13.0	8 200	13 000	0.159	34.925	34.910	47.650	47.625	34.900	34.884	47.617	47.592	42.88
$1\,^{1}/_{2}$	38.100	52.388	25.400	1.52	**HJ-243316**	**IR-202416**	47.6	72.5	11.4	7 600	12 000	0.154	38.100	38.085	52.418	52.388	38.075	38.059	52.380	52.349	47.63
	38.100	52.388	31.750	1.52	**HJ-243320**	**IR-192420**	58.7	95.2	14.9	7 600	12 000	0.195	38.100	38.085	52.418	52.388	38.075	38.059	52.380	52.349	47.63
	38.100	52.388	31.750	1.52	**HJ-243320**	**IR-202420**	58.7	95.2	14.9	7 600	12 000	0.195	38.100	38.085	52.418	52.388	38.075	38.059	52.380	52.349	47.63
$1\,^{5}/_{8}$	41.275	55.563	25.400	1.52	**HJ-263516**	**IR-212616**	48.5	76.5	12.1	7 000	11 000	0.163	41.275	41.260	55.593	55.563	41.250	41.234	55.555	55.524	50.80
	41.275	55.563	31.750	1.52	**HJ-263520**	**IR-212620**	60.1	100.5	15.7	7 000	11 000	0.209	41.275	41.260	55.593	55.563	41.250	41.234	55.555	55.524	50.80
	41.275	55.563	31.750	1.52	**HJ-263520**	**IR-222620**	60.1	100.5	15.7	7 000	11 000	0.209	41.275	41.260	55.593	55.563	41.250	41.234	55.555	55.524	50.80
$1\,^{3}/_{4}$	44.450	58.738	25.400	1.52	**HJ-283716**	**IR-232816**	49.8	81.0	12.8	6 400	9 900	0.177	44.450	44.435	58.768	58.738	44.425	44.409	58.730	58.699	53.98
	44.450	58.738	25.400	1.52	**HJ-283716**	**IR-242816**	49.8	81.0	12.8	6 400	9 900	0.177	44.450	44.435	58.768	58.738	44.425	44.409	58.730	58.699	53.98
	44.450	58.738	31.750	1.52	**HJ-283720**	**IR-222820**	61.8	106	16.6	6 400	9 900	0.222	44.450	44.435	58.768	58.738	44.425	44.409	58.730	58.699	53.98

[Notes] 1) See pages B478 to B480 for inch series inner rings. Order inner rings separately.
2) $r_{a\,max}$ is equal to the minimum bearing chamfer (r_{min}) at unmarked end.

Heavy-duty needle roller bearings
inch series
HJ type

Shaft dia. (1 $^3/_4$) ~ 3 $^1/_2$ in
((44.450) ~ 88.900 mm)





Shaft suface to be 58 HRC or equivalent

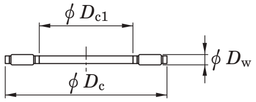
	Boundary dimensions (mm)				Bearing No.	Used with inner ring No. 1)	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		(Refer.) Mass (kg)	Recommended dimensions								Shoulder dia.
													Clearance fit				Tight transition fit				
													S (h6)		H (H7)		S (f6)		H (N7)		
Shaft dia. (in)	F_w	D	C (B)	r min.			C_r	C_{0r}	C_u	Grease lub.	Oil lub.		max.	min.	max.	min.	max.	min.	max.	min.	D_a ±0.38
1 $^3/_4$	44.450	58.738	31.750	1.52	**HJ-283720**	**IR-232820**	61.8	106	16.6	6 400	9 900	0.222	44.450	44.435	58.768	58.738	44.425	44.409	58.730	58.699	53.98
	44.450	58.738	31.750	1.52	**HJ-283720**	**IR-242820**	61.8	106	16.6	6 400	9 900	0.222	44.450	44.435	58.768	58.738	44.425	44.409	58.730	58.699	53.98
1 $^7/_8$	47.625	61.913	31.750	1.52	**HJ-303920**	**IR-253020**	65.4	117	18.1	6 000	9 200	0.236	47.625	47.610	61.943	61.913	47.600	47.584	61.905	61.874	57.15
2	50.800	65.088	25.400	1.52	**HJ-324116**	**IR-273216**	53.8	93.0	14.7	5 600	8 600	0.200	50.800	50.782	65.118	65.088	50.770	50.752	65.080	65.049	60.33
	50.800	65.088	31.750	1.52	**HJ-324120**	**IR-243220**	66.7	122	19.1	5 600	8 600	0.249	50.800	50.782	65.118	65.088	50.770	50.752	65.080	65.049	60.33
	50.800	65.088	31.750	1.52	**HJ-324120**	**IR-253220**	66.7	122	19.1	5 600	8 600	0.249	50.800	50.782	65.118	65.088	50.770	50.752	65.080	65.049	60.33
	50.800	65.088	31.750	1.52	**HJ-324120**	**IR-263220**	66.7	122	19.1	5 600	8 600	0.249	50.800	50.782	65.118	65.088	50.770	50.752	65.080	65.049	60.33
	50.800	65.088	31.750	1.52	**HJ-324120**	**IR-273220**	66.7	122	19.1	5 600	8 600	0.249	50.800	50.782	65.118	65.088	50.770	50.752	65.080	65.049	60.33
2 $^1/_4$	57.150	76.200	38.100	1.52	**HJ-364824**	**IR-283624**	89.9	164	25.7	5 000	7 600	0.458	57.150	57.132	76.230	76.200	57.120	57.102	76.192	76.162	68.28
	57.150	76.200	44.450	1.52	**HJ-364828**	**IR-283628**	104	198	30.8	5 000	7 600	0.531	57.150	57.132	76.230	76.200	57.120	57.102	76.192	76.162	68.28
2 $^1/_2$	63.500	82.550	38.100	2.03	**HJ-405224**	**IR-314024**	97.0	187	29.4	4 400	6 800	0.499	63.500	63.482	82.586	82.550	63.470	63.452	82.537	82.502	74.63
	63.500	82.550	38.100	2.03	**HJ-405224**	**IR-324024**	97.0	187	29.4	4 400	6 800	0.499	63.500	63.482	82.586	82.550	63.470	63.452	82.537	82.502	74.63
	63.500	82.550	44.450	2.03	**HJ-405228**	**IR-314028**	97.0	187	35.2	4 400	6 800	0.499	63.500	63.482	82.586	82.550	63.470	63.452	82.537	82.502	74.63
	63.500	82.550	44.450	2.03	**HJ-405228**	**IR-324028**	97.0	187	35.2	4 400	6 800	0.499	63.500	63.482	82.586	82.550	63.470	63.452	82.537	82.502	74.63
2 $^3/_4$	69.850	88.900	25.400	2.03	**HJ-445616**	—	67.2	120	19.1	4 000	6 200	0.363	69.850	69.832	88.936	88.900	69.820	69.802	88.887	88.852	80.98
	69.850	88.900	38.100	2.03	**HJ-445624**	**IR-364424**	101	203	31.9	4 000	6 200	0.544	69.850	69.832	88.936	88.900	69.820	69.802	88.887	88.852	80.98
	69.850	88.900	44.450	2.03	**HJ-445628**	**IR-354428**	117	245	38.2	4 000	6 200	0.635	69.850	69.832	88.936	88.900	69.820	69.802	88.887	88.852	80.98
	69.850	88.900	44.450	2.03	**HJ-445628**	**IR-364428**	117	245	38.2	4 000	6 200	0.635	69.850	69.832	88.936	88.900	69.820	69.802	88.887	88.852	80.98
3	76.200	95.250	38.100	2.03	**HJ-486024**	**IR-404824**	107	226	35.5	3 700	5 600	0.585	76.200	76.182	95.286	95.250	76.170	76.152	95.237	95.202	87.33
	76.200	95.250	44.450	2.03	**HJ-486028**	**IR-384828**	124	273	42.5	3 700	5 600	0.685	76.200	76.182	95.286	95.250	76.170	76.152	95.237	95.202	87.33
	76.200	95.250	44.450	2.03	**HJ-486028**	**IR-404828**	124	273	42.5	3 700	5 600	0.685	76.200	76.182	95.286	95.250	76.170	76.152	95.237	95.202	87.33
3 $^1/_4$	82.550	107.950	44.450	2.03	**HJ-526828**	**IR-445228**	162	305	48.3	3 400	5 300	1.016	82.550	82.527	107.986	107.950	82.514	82.492	107.937	107.902	98.43
	82.550	107.950	50.800	2.03	**HJ-526832**	**IR-445232**	184	358	56.2	3 400	5 300	1.161	82.550	82.527	107.986	107.950	82.514	82.492	107.937	107.902	98.43
3 $^1/_2$	88.900	114.300	50.800	2.03	**HJ-567232**	**IR-475632**	187	375	58.9	3 200	4 900	1.238	88.900	88.877	114.336	114.300	88.864	88.842	114.287	114.252	104.78
	88.900	114.300	50.800	2.03	**HJ-567232**	**IR-485632**	187	375	58.9	3 200	4 900	1.238	88.900	88.877	114.336	114.300	88.864	88.842	114.287	114.252	104.78

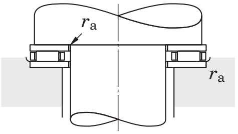
[Notes] 1) See pages B478 to B480 for inch series inner rings. Order inner rings separately.
2) $r_{a\ max}$ is equal to the minimum bearing chamfer (r_{min}) at unmarked end.

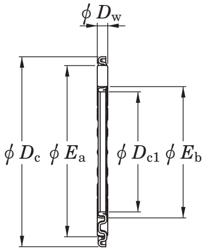
Needle roller thrust bearings, assemblies, washers thrust needle roller and cage assemblies, thrust washers metric series

AXK, FNT series

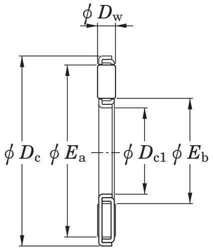
Shaft dia. 6 ~ 45 mm



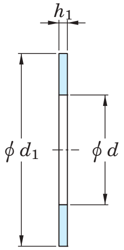




AXK



FNT



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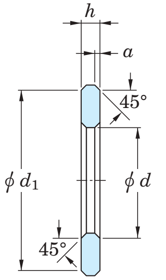

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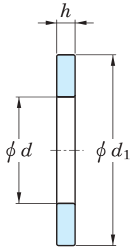

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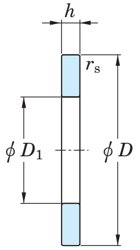


GS.811

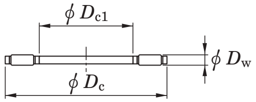
Shaft dia.	Boundary dimensions (mm) D_{c1}	D_c	D_w	E_a	E_b	r_a max.	Bearing No.	Basic load ratings (kN) C_a	C_{0a}	Fatigue load limit (kN) C_u	Limiting speed (min⁻¹) Oil lub.	(Refer.) Mass (kg)
6	6	19	2	16.9	7.8	0.3	**AXK0619TN**	6.37	14.3	1.40	23 000	0.001
				18.0	8.0	0.3	**FNT-619**	6.82	15.6	1.50	21 000	0.002
8	8	21	2	18.6	9.6	0.3	**AXK0821TN**	8.34	21.1	2.00	20 000	0.001
				20.0	10.0	0.3	**FNT-821**	7.67	19.1	1.85	20 000	0.002
10	10	24	2	22.5	11.0	0.3	**AXK1024**	9.32	25.9	2.90	17 000	0.003
				23.0	12.0	0.3	**FNT-1024**	9.14	25.2	2.40	17 000	0.002
12	12	26	2	24.5	13.0	0.3	**AXK1226**	10.8	32.3	3.40	15 000	0.004
				25.0	14.0	0.3	**FNT-1226**	9.92	29.0	2.75	15 000	0.004
15	15	28	2	27.0	17.0	0.3	**AXK1528**	11.1	35.2	3.35	15 000	0.004
				27.0	17.0	0.3	**FNT-1528**	10.2	31.3	3.00	15 000	0.004
17	17	30	2	28.7	18.3	0.3	**AXK1730TN**	11.7	38.7	3.70	14 000	0.004
				29.0	19.0	0.3	**FNT-1730**	10.8	34.8	3.35	14 000	0.004
20	20	35	2	34.0	22.0	0.3	**AXK2035**	12.8	45.4	4.40	12 000	0.006
				34.0	22.0	0.3	**FNTA-2035**	13.8	50.7	4.80	12 000	0.005
25	25	42	2	41.0	29.0	0.6	**AXK2542**	14.3	56.8	5.50	10 000	0.007
				41.0	27.0	0.6	**FNT-2542**	18.0	75.3	8.05	9 700	0.008
30	30	47	2	46.0	35.0	0.6	**AXK3047**	16.0	68.1	6.60	9 000	0.009
				46.0	32.0	0.6	**FNTA-3047**	18.6	82.4	8.65	8 900	0.009
35	35	52	2	51.0	40.0	0.6	**AXK3552**	17.4	79.5	7.70	8 100	0.010
				51.0	37.0	0.6	**FNT-3552**	21.7	104.0	11.1	7 900	0.010
40	40	60	3	58.0	45.0	0.6	**AXK4060**	27.1	110.0	11.9	7 000	0.016
				57.0	43.0	0.6	**FNT-4060**	31.5	132.0	14.6	7 100	0.020
45	45	65	3	63.0	50.0	0.6	**AXK4565**	29.0	124.0	13.4	6 500	0.020
				63.0	47.0	0.6	**FNT-4565**	37.6	172.0	18.5	6 400	0.024

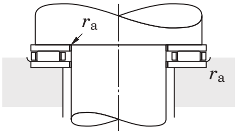
Washer dimensions (mm) d	D, d_1	D_1	Thin h_1 (mm)	Thin Washer No.	Thin (Refer.) Mass (kg)	Heavy (LS) h (h11) (mm)	Heavy (LS) a (mm)	Heavy (LS) Washer No.	Heavy (LS) (Refer.) Mass (kg)	Heavy h (mm)	Heavy r min. (mm)	Heavy Washer No. Shaft piloted	Heavy Washer No. Housing piloted	Heavy (Refer.) Mass (kg)
6	19		1.00	AS0619	0.001									
8	21		1.00	AS0821	0.002	2.75	0.30	LS0821	0.004					
10	24		1.00	AS1024	0.003	2.75	0.50	LS1024	0.008					
12	26		1.00	AS1226	0.003	2.75	0.50	LS1226	0.009					
15	28	16	1.00	AS1528	0.003	2.75	0.50	LS1528	0.010	2.75	0.30	WS.81102	GS.81102	0.0100
17	30	18	1.00	AS1730	0.003	2.75	0.50	LS1730	0.011	2.75	0.30	WS.81103	GS.81103	0.011
20	35	21	1.00	AS2035	0.005	2.75	0.50	LS2035	0.014	2.75	0.30	WS.81104	GS.81104	0.014
25	42	26	1.00	AS2542	0.007	3.00	1.00	LS2542	0.021	3.00	0.60	WS.81105	GS.81105	0.021
30	47	32	1.00	AS3047	0.008	3.00	1.00	LS3047	0.023	3.00	0.60	WS.81106	GS.81106	0.023
35	52	37	1.00	AS3552	0.009	3.50	1.00	LS3552	0.030	3.50	0.60	WS.81107	GS.81107	0.032
40	60	42	1.00	AS4060	0.012	3.50	1.00	LS4060	0.041	3.50	0.60	WS.81108	GS.81108	0.043
45	65	47	1.00	AS4565	0.013	4.00	1.00	LS4565	0.052	4.00	0.60	WS.81109	GS.81109	0.054

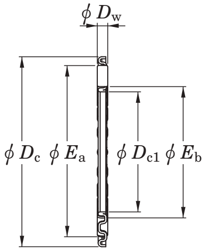
Needle roller thrust bearings, assemblies, washers thrust needle roller and cage assemblies, thrust washers metric series

AXK, FNT series

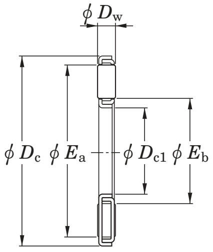
Shaft dia. 50 ~ 160 mm







AXK



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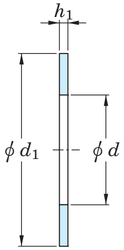

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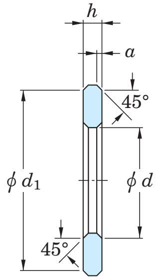
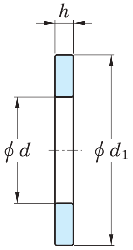
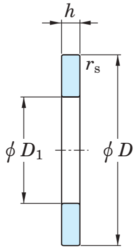


LS



WS.811

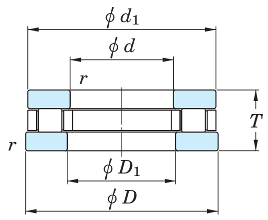


GS.811

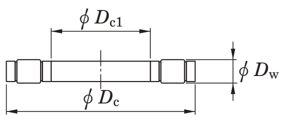
Boundary dimensions (mm)							Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed (min⁻¹)	(Refer.) Mass (kg)	Washer dimensions (mm)			Thin			Heavy (LS)				Heavy				
Shaft dia.	D_{c1}	D_c	D_w	E_a	E_b	r_a max.		C_a	C_{0a}	C_u	Oil lub.		d	D, d_1	D_1	h_1 (mm)	Washer No.	(Refer.) Mass (kg)	h (h11) (mm)	a (mm)	Washer No.	(Refer.) Mass (kg)	h (mm)	r min. (mm)	Washer No. Shaft piloted	Housing piloted	(Refer.) Mass (kg)
50	50	70	3	68.0 68.0	55.0 52.0	0.6 0.6	**AXK5070** **FNT-5070**	30.8 37.9	137.0 179.0	14.9 19.1	6 000 5 900	0.020 0.026	50	70	52	1.00	AS5070	0.014	4.00	1.00	LS5070	0.0560	4.00	0.60	WS.81110	GS.81110	0.059
55	55	78	3	76.0 76.0	60.0 57.0	0.6 0.6	**AXK5578** **FNT-5578**	39.4 48.5	195.0 254.0	20.5 26.3	5 300 5 300	0.026 0.033	55	78	57	1.00	AS5578	0.018	5.00	1.00	LS5578	0.0910	5.00	0.60	WS.81111	GS.81111	0.094
60	60	85	3	83.0	65.0	0.6	**AXK6085**	44.5	234.0	24.7	4 900	0.035	60	85	62	1.00	AS6085	0.022	4.75	1.50	LS6085	0.102	4.75	1.00	WS.81112	GS.81112	0.106
65	65	90	3	88.0	70.0	0.6	**AXK6590**	46.7	254	26.8	4 600	0.036	65	90	67	1.00	AS6590	0.023	5.25	1.50	LS6590	0.121	5.25	1.00	WS.81113	GS.81113	0.125
70	70	95	4	93.0 93.0	74.0 73.0	0.6 0.6	**AXK7095** **FNTA-7095**	53.8 66.6	253 333	28.0 35.3	4 400 4 400	0.055 0.057	70	95	72	1.00	AS7095	0.025	5.25	1.50	LS7095	0.1280	5.25	1.00	WS.81114	GS.81114	0.133
75	75	100	4	98.0 98.0	79.0 78.0	0.6 0.6	**AXK75100** **FNT-75100**	55.1 71.6	266 374	29.4 39.7	4 200 4 100	0.058 0.064	75	100	77	1.00	AS75100	0.027	5.75	1.50	LS75100	0.1500	5.75	1.00	WS.81115	GS.81115	0.155
80	80	105	4	103.0 103.0	84.0 83.0	0.6 0.6	**AXK80105** **FNTA-80105**	56.4 71.3	279 379	30.8 40.1	4 000 3 900	0.092 0.062	80	105	82	1.00	AS80105	0.028	5.75	1.50	LS80105	0.1580	5.75	1.00	WS.81116	GS.81116	0.165
85	85	110	4	108.0	89.0	0.6	**AXK85110**	57.6	291	32.2	3 800	0.063	85	110	87	1.00	AS85110	0.028	5.75	1.50	LS85110	0.166	5.75	1.00	WS.81117	GS.81117	0.173
90	90	120	4	118.0	94.0	0.6	**AXK90120**	72.9	405	43.0	3 500	0.081	90	120	92	1.00	AS90120	0.038	6.50	1.50	LS90120	0.245	6.50	1.00	WS.81118	GS.81118	0.253
100	100	135	4	133.0	105.0	0.6	**AXK100135**	90.2	552	56.4	3 100	0.106	100	135		1.00	AS100135	0.050									
110	110	145	4	143.0	115.0	0.6	**AXK110145**	93.2	591	59.0	2 800	0.117	110	145		1.00	AS110145	0.055	7.00	1.50	LS110145	0.373	7.00				
120	120	155	4	153.0	125.0	0.6	**AXK120155**	98.5	650	63.5	2 700	0.126	120	155		1.00	AS120155	0.059									
130	130	170	5	167.0	136.0	0.6	**AXK130170**	132	829	78.7	2 400	0.198	130	170		1.00	AS130170	0.074	9.00	1.50	LS130170	0.065					
140	140	180	5	177.0	146.0	0.6	**AXK140180**	136	887	82.5	2 300	0.221	140	180		1.00	AS140180	0.078									
150	150	190	5	187.0	156.0	0.6	**AXK150190**	141	944	86.2	2 200	0.225	150	190		1.00	AS150190	0.083									
160	160	200	5	197.0	166.0	0.6	**AXK160200**	146	1 000	89.9	2 100	0.249	160	200		1.00	AS160200	0.089									

Needle roller thrust bearings, assemblies, washers thrust cylindrical roller and cage assemblies, thrust washers metric series

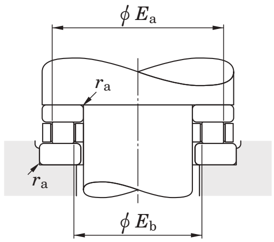
Shaft dia. 15 ~ 55 mm

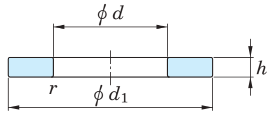


811, 812

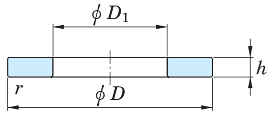


K.811, K.812





WS.811, WS.812

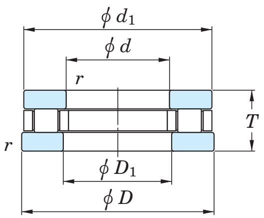


GS.811, GS.812

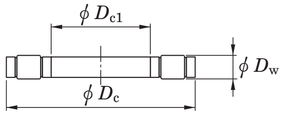
Shaft dia.	Boundary dimensions (mm) D_{c1} (E11)	D_c (a13)	D_w	T	E_b max.	E_a min.	r_a max.	Bearing No.	Basic load ratings (kN) C_a	C_{0a}	Fatigue load limit (kN) C_u	Limiting speed (min^{-1}) Oil lub.	(Refer.) Mass (kg)	Washer dimensions (mm) d	D_1	D, d_1	h max.	h min.	r min.	Washer No. Shaft piloted	Housing piloted	(Refer.) Mass (kg)
15	15	28	3.5	9	18	25	0.3	**K.81102LPB**	12.1	26.3	3.70	12 000	0.006	15	16	28	2.75	2.64	0.3	WS.81102	GS.81102	0.010
	15	28	3.5	9	18	25	0.3	**K.81102TVP**	12.8	28.6	4.05	12 000	0.006	15	16	28	2.75	2.64	0.3	WS.81102	GS.81102	0.010
17	17	30	3.5	—	20	27	0.3	**K.81103LPB**	12.6	28.6	4.05	11 000	0.008	17	18	30	2.75	2.64	0.3	WS.81103	GS.81103	0.011
	17	30	3.5	9	20	27	0.3	**K.81103TVP**	14.2	33.4	4.70	11 000	0.008	17	18	30	2.75	2.64	0.3	WS.81103	GS.81103	0.011
20	20	35	4.5	10	23	32	0.3	**K.81104TVP**	23.6	56.8	6.85	9 500	0.009	20	21	35	2.75	2.62	0.3	WS.81104	GS.81104	0.014
25	25	42	5.0	11	28	39	0.6	**K.81105TVP**	31.2	81.0	11.4	8 000	0.014	25	26	42	3.00	2.87	0.6	WS.81105	GS.81105	0.021
30	30	47	5.0	—	33	44	0.6	**K.81106LPB**	28.5	69.5	10.7	6 700	0.026	30	32	47	3.00	2.87	0.6	WS.81106	GS.81106	0.023
	30	47	5.0	11	33	44	0.6	**K.81106TVP**	33.0	91.1	12.8	6 700	0.016	30	32	47	3.00	2.87	0.6	WS.81106	GS.81106	0.023
	30	52	7.5	—	33	49	0.6	**K.81206LPB**	53.4	129	13.9	6 300	0.052	30	32	52	4.25	4.12	0.6	WS.81206	GS.81206	0.047
	30	52	7.5	16	33	49	0.6	**K.81206TVP**	56.9	141	15.2	6 300	0.034	30	32	52	4.25	4.12	0.6	WS.81206	GS.81206	0.047
35	35	52	5.0	—	38	49	0.6	**K.81107LPB**	30.8	86.0	12.1	6 000	0.025	35	37	52	3.50	3.34	0.6	WS.81107	GS.81107	0.032
	35	52	5.0	12	38	49	0.6	**K.81107TVP**	34.8	101	14.2	6 000	0.020	35	37	52	3.50	3.34	0.6	WS.81107	GS.81107	0.032
	35	62	7.5	—	41	56	1.0	**K.81207LPB**	58.3	152	16.5	5 300	0.073	35	37	62	5.25	5.09	1.0	WS.81207	GS.81207	0.085
	35	62	7.5	18	41	56	1.0	**K.81207TVP**	61.6	164	17.7	5 300	0.055	35	37	62	5.25	5.09	1.0	WS.81207	GS.81207	0.085
40	40	60	6.0	—	44	56	0.6	**K.81108LPB**	44.2	126	12.0	5 300	0.044	40	42	60	3.50	3.34	0.6	WS.81108	GS.81108	0.043
	40	60	6.0	13	44	56	0.6	**K.81108TVP**	49.8	148	14.1	5 300	0.031	40	42	60	3.50	3.34	0.6	WS.81108	GS.81108	0.043
	40	68	9.0	19	45	63	1.0	**K.81208TVP**	86.8	233	26.9	4 800	0.076	40	42	68	5.00	4.84	1.0	WS.81208	GS.81208	0.093
45	45	65	6.0	—	49	61	0.6	**K.81109LPB**	47.0	140	13.4	4 800	0.035	45	47	65	4.00	3.84	0.6	WS.81109	GS.81109	0.054
	45	65	6.0	14	49	61	0.6	**K.81109TVP**	52.3	163	15.5	4 800	0.035	45	47	65	4.00	3.84	0.6	WS.81109	GS.81109	0.054
	45	73	9.0	—	50	68	1.0	**K.81209TVP**	94.2	266	30.8	4 500	0.083	45	47	73	5.50	5.34	1.0	WS.81209	GS.81209	0.112
50	50	70	6.0	14	54	66	0.6	**K.81110LPB**	49.7	155	14.8	4 300	0.052	50	52	70	4.00	3.84	0.6	WS.81110	GS.81110	0.059
	50	70	6.0	14	54	66	0.6	**K.81110TVP**	54.8	177	17.0	4 300	0.042	50	52	70	4.00	3.84	0.6	WS.81110	GS.81110	0.059
	50	78	9.0	22	55	73	1.0	**K.81210TVP**	101	299	34.6	4 000	0.089	50	52	78	6.5	6.34	1.0	WS.81210	GS.81210	0.144
55	55	78	6.0	16	60	73	0.6	**K.81111TVP**	60.3	207	19.8	4 000	0.066	55	57	78	5.00	4.81	0.6	WS.81111	GS.81111	0.094
	55	90	11.0	—	61	84	1.0	**K.81211LPB**	127	359	39.6	3 600	0.156	55	57	90	7.00	6.81	1.0	WS.81211	GS.81211	0.219
	55	90	11.0	25	61	84	1.0	**K.81211TVP**	138	403	45.2	3 600	0.140	55	57	90	7.00	6.81	1.0	WS.81211	GS.81211	0.219

Needle roller thrust bearings, assemblies, washers thrust cylindrical roller and cage assemblies, thrust washers metric series

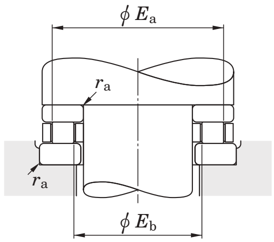
Shaft dia. 60 ~ 90 mm

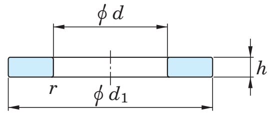


811, 812

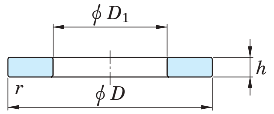


K.811, K.812





WS.811, WS.812

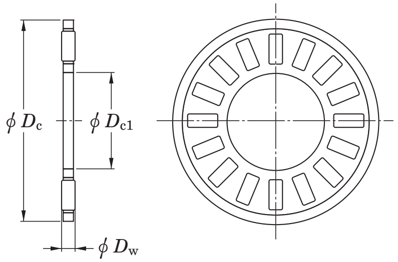


GS.811, GS.812

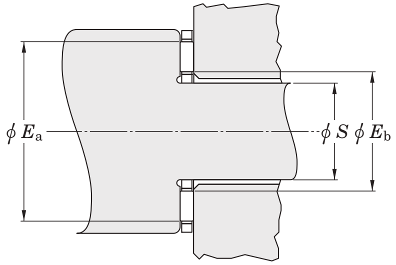
Shaft dia.	Boundary dimensions (mm)							Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed (min^{-1})	(Refer.) Mass (kg)	Washer dimensions (mm)						Washer No.		(Refer.) Mass (kg)
	D_{c1} (E11)	D_c (a13)	D_w	T	E_b max.	E_a min.	r_a max.		C_a	C_{0a}	C_u	Oil lub.		d	D_1	D, d_1	h max.	h min.	r min.	Shaft piloted	Housing piloted	
60	60	85	7.5	17	65	80	1.0	**K.81112TVP**	84.4	281	30.4	3 600	0.103	60	62	85	4.75	4.56	1.0	WS.81112	GS.81112	0.106
	60	95	11.0	26	66	89	1.0	**K.81212LPB**	129	378	42.4	3 400	0.166	60	62	95	7.50	7.31	1.0	WS.81212	GS.81212	0.251
65	65	90	7.5	18	70	85	1.0	**K.81113TVP**	88.3	305	33.0	3 400	0.109	65	67	90	5.25	5.06	1.0	WS.81113	GS.81113	0.125
	65	100	11.0	27	71	94	1.0	**K.81213LPB**	134	403	45.2	3 200	0.176	65	67	100	8.00	7.81	1.0	WS.81213	GS.81213	0.285
70	70	95	7.5	18	75	90	1.0	**K.81114TVP**	92.1	328	35.5	3 200	0.056	70	72	95	5.25	5.06	1.0	WS.81114	GS.81114	0.133
	70	105	11.0	27	76	99	1.0	**K.81214LPB**	138	428	48.0	3 000	0.186	70	72	105	8.00	7.81	1.0	WS.81214	GS.81214	0.302
75	75	100	7.5	19	80	95	1.0	**K.81115LPB**	86.1	305	33.0	3 000	0.091	75	77	100	5.75	5.56	1.0	WS.81115	GS.81115	0.155
	75	110	11.0	27	81	104	1.0	**K.81215LPB**	143	453	50.9	2 800	0.197	75	77	110	8.00	7.81	1.0	WS.81215	GS.81215	0.319
80	80	105	7.5	19	85	100	1.0	**K.81116LPB**	87.5	316	34.2	2 800	0.103	80	82	105	5.75	5.56	1.0	WS.81116	GS.81116	0.165
	80	115	11.0	28	86	109	1.0	**K.81216LPB**	147	478	53.7	2 600	0.208	80	82	115	8.50	8.31	1.0	WS.81216	GS.81216	0.357
85	85	110	7.5	19	90	105	1.0	**K.81117LPB**	88.9	328	35.5	2 600	0.108	85	87	110	5.75	5.53	1.0	WS.81117	GS.81117	0.173
	85	125	12.0	31	93	117	1.0	**K.81217LPB**	174	572	65.5	2 400	0.376	85	88	125	9.50	9.28	1.0	WS.81217	GS.81217	0.492
90	90	120	9.0	22	96	114	1.0	**K.81118LPB**	119	432	49.3	2 400	0.156	90	92	120	6.50	6.28	1.0	WS.81118	GS.81118	0.253
	90	135	14.0	35	98	127	1.0	**K.81218LPB**	215	691	81.5	2 400	0.540	90	93	135	10.50	10.28	1.1	WS.81218	GS.81218	0.655

Needle roller thrust bearings, assemblies, washers thrust needle roller and cage assemblies, thrust washers inch series

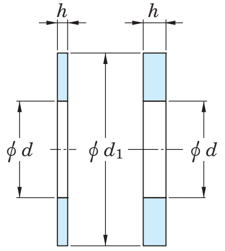
Shaft dia. 1/4 ~ (7/8) in (6.35 ~ (22.23) mm)

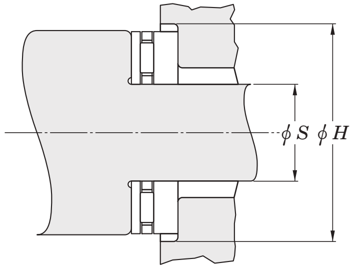


NTA



Raceway hardness to be 58 HRC or equivalent





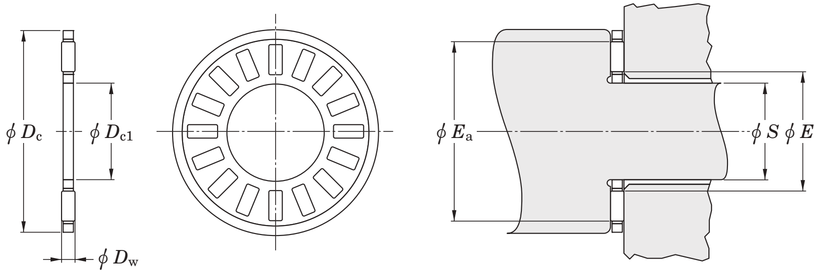
Shaft dia. (in)	Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed [1] (min⁻¹)	(Refer.) Mass (kg)	Washer No.	Washer dimensions (mm)				Piloting dimensions (mm)		Dia. to clear O.D. (mm)	(Refer.) Washer mass (kg)
	D_{c1}	D_c	D_w	E_b	E_a		C_a	C_{0a}	C_u				d	d_1	h max.	h min.	S max.	S min.	H [2]	
1/4	6.35	17.45	1.984	8.636	14.732	**NTA-411**	5.12	10.76	1.05	26 000	0.001	TRA-411	6.35	17.45	0.81	0.76	6.35	6.27	18.26	0.001
												TRB-411	6.35	17.45	1.60	1.52	6.35	6.27	18.26	0.002
												TRC-411	6.35	17.45	2.41	2.34	6.35	6.27	18.26	0.004
5/16	7.92	19.05	1.984	10.16	16.256	**NTA-512**	5.83	13.17	1.30	24 000	0.002	TRA-512	7.92	19.05	0.81	0.76	7.92	7.85	19.84	0.001
												TRB-512	7.92	19.05	1.60	1.52	7.92	7.85	19.84	0.003
3/8	9.53	20.625	1.984	11.68	18.034	**NTA-613**	6.05	14.32	1.40	22 000	0.002	TRA-613	9.53	20.62	0.81	0.76	9.53	9.45	21.44	0.001
												TRB-613	9.53	20.62	1.60	1.52	9.53	9.45	21.44	0.003
												TRC-613	9.53	20.62	2.41	2.34	9.53	9.45	21.44	0.004
1/2	12.70	23.80	1.984	14.99	21.08	**NTA-815**	7.16	19.13	1.85	19 000	0.002	TRA-815	12.70	23.80	0.81	0.76	12.70	12.62	24.61	0.002
												TRB-815	12.70	23.80	1.60	1.52	12.70	12.62	24.61	0.004
												TRC-815	12.70	23.80	2.41	2.34	12.70	12.62	24.61	0.005
9/16	14.275	25.40	1.9837	16.51	22.606	**NTA-916**	7.70	21.53	2.10	18 000	0.003	TRA-916	14.27	25.40	0.81	0.76	14.27	14.20	26.19	0.002
												TRB-916	14.27	25.40	1.60	1.52	14.27	14.20	26.19	0.004
												TRC-916	14.27	25.40	2.41	2.34	14.27	14.20	26.19	0.006
5/8	15.88	28.575	1.9837	18.03	25.908	**NTA-1018**	9.79	30.38	2.85	15 000	0.003	TRA-1018	15.88	28.58	0.81	0.76	15.88	15.80	29.36	0.003
												TRB-1018	15.88	28.58	1.60	1.52	15.88	15.80	29.36	0.005
												TRC-1018	15.88	28.58	2.41	2.34	15.88	15.80	29.36	0.008
												TRD-1018	15.88	28.58	3.20	3.12	15.88	15.80	29.36	0.011
												TRE-1018	15.88	28.58	3.99	3.91	15.88	15.80	29.36	0.013
3/4	19.05	31.75	1.9837	21.34	28.956	**NTA-1220**	10.90	36.48	3.40	14 000	0.004	TRA-1220	19.05	31.75	0.81	0.76	19.05	18.97	32.54	0.003
												TRB-1220	19.05	31.75	1.60	1.52	19.05	18.97	32.54	0.006
												TRC-1220	19.05	31.75	2.41	2.34	19.05	18.97	32.54	0.010
												TRD-1220	19.05	31.75	3.20	3.12	19.05	18.97	32.54	0.012
												TRE-1220	19.05	31.75	3.99	3.91	19.05	18.97	32.54	0.015
7/8	22.23	36.50	1.984	24.38	33.782	**NTA-1423**	13.43	49.82	4.65	12 000	0.005	TRA-1423	22.23	36.50	0.81	0.76	22.23	22.15	37.31	0.004
												TRB-1423	22.23	36.50	1.60	1.52	22.23	22.15	37.31	0.008

[Notes] 1) Limiting speeds listed are based on adequate oil lubrication.
Suggestions for an application requiring O.D. piloting should be determined in consultation with JTEKT.

2) If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

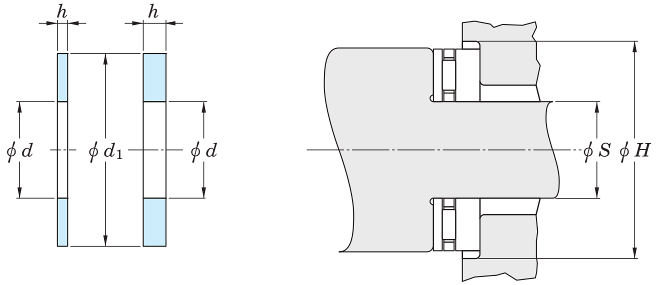
Needle roller thrust bearings, assemblies, washers thrust needle roller and cage assemblies, thrust washers inch series

Shaft dia. ($^7/_8$) ~ (1 $^1/_2$) in ((22.23) ~ (38.10) mm)



NTA

Raceway hardness to be 58 HRC or equivalent



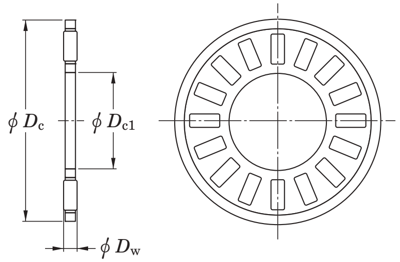
Shaft dia. (in)	Boundary dimensions (mm) D_{c1}	D_c	D_w	E_b	E_a	Bearing No.	Basic load ratings (kN) C_a	C_{0a}	Fatigue load limit (kN) C_u	Limiting speed [1] (min^{-1})	(Refer.) Mass (kg)	Washer No.	Washer dimensions (mm) d	d_1	h max.	h min.	Piloting dimensions (mm) S max.	S min.	Dia. to clear O.D. (mm) H [2]	(Refer.) Washer mass (kg)
$^7/_8$												TRC-1423	22.23	36.50	2.41	2.34	22.23	22.15	37.31	0.012
												TRD-1423	22.23	36.50	3.20	3.12	22.23	22.15	37.31	0.015
	22.23	42.85	1.984	25.91	39.878	**NTC-1427**	18.46	78.29	8.05	9 800	0.008	TRB-1427	22.23	42.86	1.60	1.52	22.23	22.15	43.66	0.013
												TRC-1427	22.23	42.86	2.41	2.34	22.23	22.15	43.66	0.020
												TRD-1427	22.23	42.86	3.20	3.12	22.23	22.15	43.66	0.026
1	25.40	39.675	1.984	27.69	36.83	**NTA-1625**	13.83	53.82	5.00	11 000	0.006	TRA-1625	25.40	39.67	0.81	0.76	25.40	25.32	40.49	0.005
												TRB-1625	25.40	39.67	1.60	1.52	25.40	25.32	40.49	0.009
												TRD-1625	25.40	39.67	3.20	3.12	25.40	25.32	40.49	0.017
												TRE-1625	25.40	39.67	3.99	3.91	25.40	25.32	40.49	0.021
1 $^1/_8$	28.58	44.45	1.9837	30.73	41.656	**NTA-1828**	16.68	71.17	7.30	9 600	0.009	TRA-1828	28.58	44.45	0.81	0.76	28.58	28.50	45.24	0.006
												TRB-1828	28.58	44.45	1.60	1.52	28.58	28.50	45.24	0.011
												TRC-1828	28.58	44.45	2.41	2.34	28.58	28.50	45.24	0.017
												TRD-1828	28.58	44.45	3.20	3.12	28.58	28.50	45.24	0.022
1 $^1/_4$	31.75	49.20	1.9837	34.04	46.228	**NTA-2031**	20.15	93.41	9.55	8 600	0.010	TRA-2031	31.75	49.20	0.81	0.76	31.75	31.67	50.01	0.007
												TRB-2031	31.75	49.20	1.60	1.52	31.75	31.67	50.01	0.014
												TRC-2031	31.75	49.20	2.41	2.34	31.75	31.67	50.01	0.020
												TRD-2031	31.75	49.20	3.20	3.12	31.75	31.67	50.01	0.026
												TRF-2031	31.75	49.20	4.78	4.70	31.75	31.67	50.01	0.041
1 $^3/_8$	34.93	52.375	1.9837	37.08	49.53	**NTA-2233**	21.35	103.20	10.5	8 000	0.010	TRA-2233	34.93	52.37	0.81	0.76	34.93	34.85	53.19	0.007
												TRB-2233	34.93	52.37	1.60	1.52	34.93	34.85	53.19	0.015
												TRC-2233	34.93	52.37	2.41	2.34	34.93	34.85	53.19	0.018
												TRD-2233	34.93	52.37	3.20	3.12	34.93	34.85	53.19	0.029
												TRE-2233	34.93	52.37	3.99	3.91	34.93	34.85	53.19	0.037
												TRF-2233	34.93	52.37	4.78	4.70	34.93	34.85	53.19	0.044
1 $^1/_2$	38.10	55.55	1.9837	40.39	52.578	**NTA-2435**	23.22	117.88	12.0	7 600	0.011	TRA-2435	38.10	55.55	0.81	0.76	38.10	38.02	56.36	0.008
												TRB-2435	38.10	55.55	1.60	1.52	38.10	38.02	56.36	0.015

[Notes] 1) Limiting speeds listed are based on adequate oil lubrication.
Suggestions for an application requiring O.D. piloting should be determined in consultation with JTEKT.

2) If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

Needle roller thrust bearings, assemblies, washers thrust needle roller and cage assemblies, thrust washers inch series

Shaft dia. (1 $^{1}/_{2}$) ~ (2 $^{1}/_{2}$) in ((38.10) ~ (63.50) mm)



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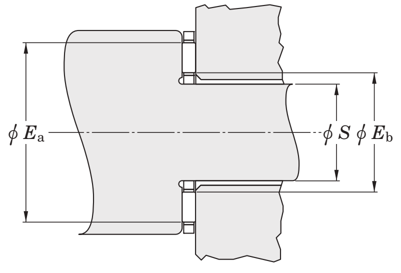
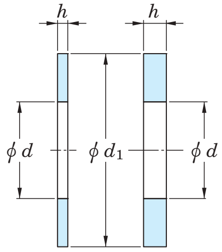
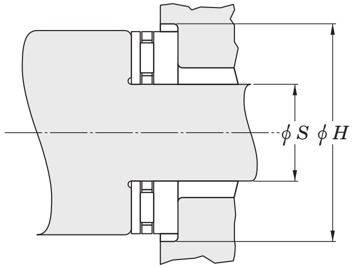


Raceway hardness to be 58 HRC or equivalent





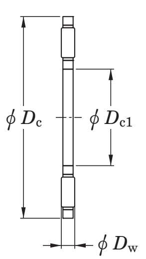
Shaft dia. (in)	Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed 1) (min^{-1})	(Refer.) Mass (kg)	Washer No.	Washer dimensions (mm)				Piloting dimensions (mm)		Dia. to clear O.D. (mm)	(Refer.) Washer mass (kg)
	D_{c1}	D_c	D_w	E_b	E_a		C_a	C_{0a}	C_u				d	d_1	h max.	h min.	S max.	S min.	H 2)	
1 $^{1}/_{2}$	38.10	55.55	1.9837	40.39	52.578	**NTA-2435**	23.22	117.88	12.0	7 600	0.011	TRC-2435	38.10	55.55	2.41	2.34	38.10	38.02	56.36	0.023
												TRD-2435	38.10	55.55	3.20	3.12	38.10	38.02	56.36	0.030
												TRF-2435	38.10	55.55	4.78	4.70	38.10	38.02	56.36	0.045
1 $^{3}/_{4}$	44.45	63.50	1.984	46.74	58.928	**NTA-2840**	25.31	137.45	14.0	6 800	0.014	TRA-2840	44.45	63.50	0.81	0.76	44.45	44.37	64.29	0.010
												TRB-2840	44.45	63.50	1.60	1.52	44.45	44.37	64.29	0.020
												TRC-2840	44.45	63.50	2.41	2.34	44.45	44.37	64.29	0.029
												TRD-2840	44.45	63.50	3.20	3.12	44.45	44.37	64.29	0.038
												TRF-2840	44.45	63.50	4.78	4.70	44.45	44.37	64.29	0.057
2	50.80	69.85	1.9837	53.09	65.278	**NTA-3244**	24.02	132.56	13.5	6 100	0.015	TRA-3244	50.80	69.85	0.81	0.76	50.80	50.72	70.64	0.011
												TRB-3244	50.80	69.85	1.60	1.52	50.80	50.72	70.64	0.022
												TRC-3244	50.80	69.85	2.41	2.34	50.80	50.72	70.64	0.033
												TRD-3244	50.80	69.85	3.20	3.12	50.80	50.72	70.64	0.044
												TRF-3244	50.80	69.85	4.78	4.70	50.80	50.72	70.64	0.066
2 $^{1}/_{8}$	53.98	73.025	1.984	56.39	68.58	**NTA-3446**	24.42	137.45	14.0	5 800	0.016	TRA-3446	53.98	73.03	0.81	0.76	53.98	53.90	73.81	0.012
												TRB-3446	53.98	73.03	1.60	1.52	53.98	53.90	73.81	0.024
												TRC-3446	53.98	73.03	2.41	2.34	53.98	53.90	73.81	0.035
												TRD-3446	53.98	73.03	3.20	3.12	53.98	53.90	73.81	0.047
2 $^{1}/_{4}$	57.15	76.20	1.984	59.44	71.628	**NTA-3648**	24.78	142.34	14.6	5 600	0.017	TRA-3648	57.15	76.20	0.81	0.76	57.15	57.07	76.99	0.012
												TRB-3648	57.15	76.20	1.60	1.52	57.15	57.07	76.99	0.022
												TRC-3648	57.15	76.20	2.41	2.34	57.15	57.07	76.99	0.037
												TRD-3648	57.15	76.20	3.20	3.12	57.15	57.07	76.99	0.048
												TRF-3648	57.15	76.20	4.78	4.70	57.15	57.07	76.99	0.071
	57.15	79.375	3.175	59.94	75.184	**NTA-3650**	37.68	177.04	18.6	5 300	0.029						57.15	57.07	76.99	
2 $^{1}/_{2}$	63.50	82.55	1.9837	65.79	77.978	**NTA-4052**	25.53	152.13	15.6	5 100	0.019	TRA-4052	63.50	82.55	0.81	0.76	63.50	63.42	83.34	0.013
												TRB-4052	63.50	82.55	1.60	1.52	63.50	63.42	83.34	0.027
												TRC-4052	63.50	82.55	2.41	2.34	63.50	63.42	83.34	0.041

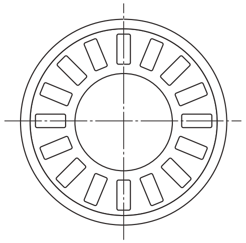
[Notes] 1) Limiting speeds listed are based on adequate oil lubrication.
Suggestions for an application requiring O.D. piloting should be determined in consultation with JTEKT.

2) If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

Needle roller thrust bearings, assemblies, washers thrust needle roller and cage assemblies, thrust washers inch series

Shaft dia. (2 $^1/_2$) ~ 4 $^1/_8$ in ((63.50) ~ 104.78 mm)

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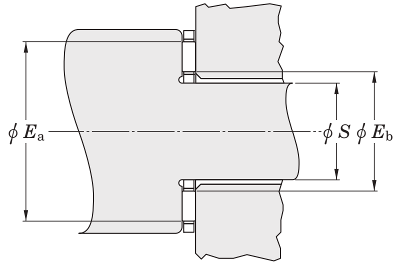
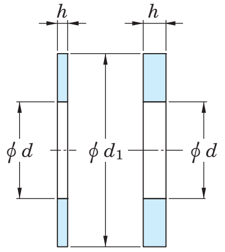
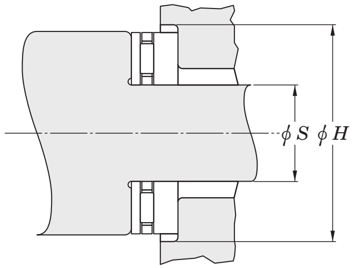


Raceway hardness to be 58 HRC or equivalent





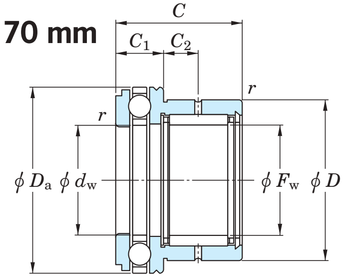
Shaft dia. (in)	Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speed 1) (min^{-1})	(Refer.) Mass (kg)	Washer No.	Washer dimensions (mm)				Piloting dimensions (mm)		Dia. to clear O.D. (mm)	(Refer.) Washer mass (kg)
	D_{c1}	D_c	D_w	E_b	E_a		C_a	C_{0a}	C_u				d	d_1	h max.	h min.	S max.	S min.	H 2)	
2 $^1/_2$	63.50	82.55	1.9837	65.79	77.978	**NTA-4052**	25.53	152.13	15.6	5 100	0.019	TRC-4052	63.50	82.55	3.20	3.12	63.50	63.42	83.34	0.054
2 $^3/_4$	69.85	92.075	3.175	72.64	87.884	**NTA-4458**	47.60	255.8	26.8	4 600	0.037	TRA-4458	69.85	92.08	0.81	0.76	69.85	69.77	92.86	0.018
												TRB-4458	69.85	92.08	1.60	1.52	69.85	69.77	92.86	0.035
												TRC-4458	69.85	92.08	2.41	2.34	69.85	69.77	92.86	0.051
												TRD-4458	69.85	92.08	3.20	3.12	69.85	69.77	92.86	0.069
												TRF-4458	69.85	92.08	4.78	4.70	69.85	69.77	92.86	0.104
3	76.20	95.25	1.9837	78.49	90.678	**NTA-4860**	26.96	172.1	17.6	4 400	0.022	TRA-4860	76.20	95.25	0.81	0.76	76.20	76.12	96.04	0.015
												TRB-4860	76.20	95.25	1.60	1.52	76.20	76.12	96.04	0.032
												TRD-4860	76.20	95.25	3.20	3.12	76.20	76.12	96.04	0.061
3 $^1/_4$	82.55	104.78	3.175	85.34	100.58	**NTA-5266**	51.60	294.9	30.9	4 000	0.042	TRA-5266	82.55	104.78	0.81	0.76	82.55	82.47	105.56	0.020
												TRD-5266	82.55	104.78	3.20	3.12	82.55	82.47	105.56	0.080
3 $^3/_4$	95.25	117.48	3.175	98.04	113.28	**NTA-6074**	56.05	344.3	35.5	3 500	0.050	TRA-6074	95.25	117.48	0.81	0.76	95.25	95.17	118.26	0.023
												TRB-6074	95.25	117.48	1.60	1.52	95.25	95.17	118.26	0.046
												TRC-6074	95.25	117.48	2.41	2.34	95.25	95.17	118.26	0.069
												TRD-6074	95.25	117.48	3.20	3.12	95.25	95.17	118.26	0.092
4 $^1/_8$	104.78	128.57	3.175	107.44	124.46	**NTA-6681**	63.61	414.6	41.3	3 200	0.062	TRA-6681	104.78	128.57	0.81	0.76	104.78	104.70	129.39	0.027
												TRC-6681	104.78	128.57	2.41	2.34	104.78	104.70	129.39	0.081
												TRD-6681	104.78	128.57	3.20	3.12	104.78	104.70	129.39	0.109
												TRF-6681	104.78	128.57	4.78	4.70	104.78	104.70	129.39	0.161

[Notes] 1) Limiting speeds listed are based on adequate oil lubrication.
Suggestions for an application requiring O.D. piloting should be determined in consultation with JTEKT.

2) If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

Combined needle roller bearings
ball thrust series
metric series

Shaft dia. 10 ~ 70 mm



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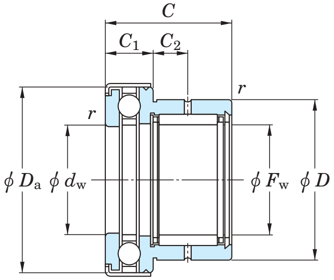

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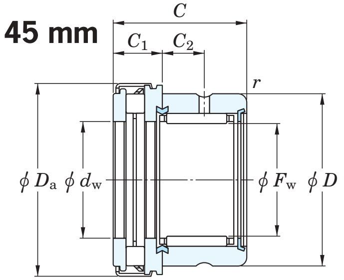
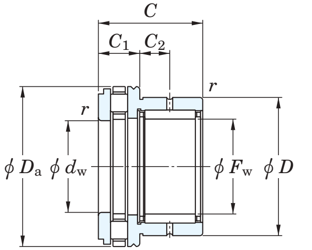
Shaft dia.	Boundary dimensions (mm)								Bearing No.	Limiting speed (min^{-1})	Basic load ratings (kN)				Fatigue load limits (kN) C_u		(Refer.) Mass (kg)	Matching inner ring No.
	F_w	D	C	d_w (E7)	D_a	C_1	C_2	r min.		Oil lub.	Radial C_r	Radial C_{0r}	Thrust C_a	Thrust C_{0a}	Radial	Thrust		
10	10	19	23	10	24	9	6.5	0.3	**NAXK10**	9 500	7.9	8.7	10.4	14	1.35	0.630	0.04	JR7x10x16
	10	19	23	10	25	9	6.5	0.3	**NAXK10Z**	9 500	7.9	8.7	10.4	14	1.35	0.630	0.04	JR7x10x16
12	12	21	23	12	26	9	6.5	0.3	**NAXK12**	9 000	7.5	8.5	10.7	15.4	1.30	0.690	0.046	JR9x12x16
	12	21	23	12	27	9	6.5	0.3	**NAXK12Z**	9 000	7.5	8.5	10.7	15.4	1.30	0.690	0.047	JR9x12x16
15	15	24	23	15	28	9	6.5	0.3	**NAXK15**	8 500	9.7	12.6	10.9	16.8	1.90	0.760	0.047	JR12x15x16
	15	24	23	15	29	9	6.5	0.3	**NAXK15Z**	8 500	9.7	12.6	10.9	16.8	1.90	0.760	0.05	JR12x15x16
17	17	26	25	17	30	9	8	0.3	**NAXK17**	8 500	11.4	16.1	11.8	19.6	2.50	0.880	0.06	JR14x17x17
	17	26	25	17	31	9	8	0.3	**NAXK17Z**	8 500	11.4	16.1	11.8	19.6	2.50	0.880	0.064	JR14x17x17
20	20	30	30	20	35	10	10.5	0.3	**NAXK20**	7 000	14.8	23.7	15.5	26.6	3.65	1.20	0.089	JR17x20x20
	20	30	30	20	36	10	10.5	0.3	**NAXK20Z**	7 000	14.8	23.7	15.5	26.6	3.65	1.20	0.094	JR17x20x20
25	25	37	30	25	42	11	9.5	0.6	**NAXK25**	6 300	18.8	29.8	18.8	35.5	4.60	1.60	0.134	JR20x25x20
	25	37	30	25	43	11	9.5	0.6	**NAXK25Z**	6 300	18.8	29.8	18.8	35.5	4.60	1.60	0.141	JR20x25x20
30	30	42	30	30	47	11	9.5	0.6	**NAXK30**	5 600	20.2	34.6	19.5	39.9	5.35	2.15	0.146	JR25x30x20
	30	42	30	30	48	11	9.5	0.6	**NAXK30Z**	5 600	20.2	34.6	19.5	39.9	5.35	2.15	0.154	JR25x30x20
35	35	47	30	35	52	12	9	0.6	**NAXK35**	5 300	22.1	40.8	20.8	46.6	6.35	2.10	0.176	JR30x35x20
	35	47	30	35	53	12	9	0.6	**NAXK35Z**	5 300	22.1	40.8	20.8	46.6	6.35	2.10	0.184	JR30x35x20
40	40	52	32	40	60	13	10	0.6	**NAXK40**	4 500	23.8	47	28	62.9	7.30	2.85	0.224	JR35x40x20
	40	52	32	40	61	13	10	0.6	**NAXK40Z**	4 500	23.8	47	28	62.9	7.30	2.85	0.233	JR35x40x20
45	45	58	32	45	65	14	9	0.6	**NAXK45**	4 500	24.9	51.8	29	69.2	8.05	3.10	0.262	JR40x45x20
	45	58	32	45	66.5	14	9	0.6	**NAXK45Z**	4 500	24.9	51.8	29	69.2	8.05	3.10	0.275	JR40x45x20
50	50	62	35	50	70	14	10	0.6	**NAXK50**	4 300	30.2	68.5	29.9	75.5	10.7	3.40	0.316	JR45x50x25
	50	62	35	50	71.5	14	10	0.6	**NAXK50Z**	4 300	30.2	68.5	29.9	75.5	10.7	3.40	0.332	JR45x50x25
60	60	72	40	60	85	17	12	1	**NAXK60**	3 600	31.9	78.1	43	113	12.2	5.10	0.48	JR50x60x25
70	70	85	40	70	95	18	11	1	**NAXK70**	3 400	43.6	87.9	41.6	110	13.9	4.95	0.659	JR60x70x25

Combined needle roller bearings cylindrical roller thrust series metric series

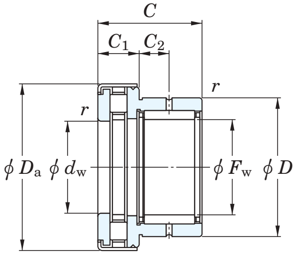
Shaft dia. 10 ~ 45 mm



RAXZ 500



NAXR

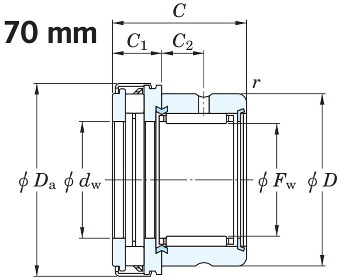


NAXR.Z

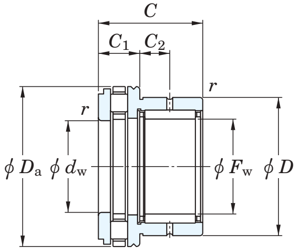
	Boundary dimensions (mm)								Bearing No.			Limiting speed (min⁻¹)	Basic load ratings (kN)				Fatigue load limits (kN) C_u		(Refer.) **Mass** (kg)	**Matching inner ring No.**
													Radial		Thrust					
Shaft dia.	F_w	D	C	d_w (E7)	D_a	C_1	C_2	r min.	RAXZ	NAXR	NAXR.Z		C_r	C_{0r}	C_a	C_{0a}	Radial	Thrust		
10	10	19	21.5	10	22.4	7.5	6	0.35	**RAXZ 510**	—	—	15 500	5.9	7.2	8.2	17.9	1.15	1.85	0.026	IM 7 10 16 P
12	12	21	22	12	26.4	8	6	0.35	**RAXZ 512**	—	—	13 000	6.8	9.0	12.7	29.5	1.30	3.10	0.033	IM 9 12 16 P
15	15	24	23	15	28	9	6.5	0.3	—	**NAXR15**	—	12 000	9.7	12.6	12.1	26.3	2.30	3.70	0.032	JR12x15x16
	15	24	23	15	29	9	6.5	0.3	—	—	**NAXR15.Z**	12 000	9.7	12.6	12.1	26.3	2.30	3.70	0.035	JR12x15x16
	15	24	22	15	28.4	8	6	0.35	**RAXZ 515**	—	—	11 500	9.7	12.6	14.0	34.0	1.80	3.65	0.036	IM 12 15 16 P
17	17	26	25	17	30	9	8.0	0.3	—	**NAXR17**	—	11 000	11.4	16.1	12.6	28.6	2.70	4.05	0.050	JR14x17x17
	17	26	25	17	31	9	8.0	0.3	—	—	**NAXR17.Z**	11 000	11.4	16.1	12.6	28.6	2.70	4.05	0.053	JR14x17x17
	17	26	24	17	30.4	8	8	0.65	**RAXZ 517**	—	—	10 500	11.8	16.3	15.0	39.0	2.50	4.15	0.044	IM 14 17 17 P
20	20	30	30	20	35	10	10.5	0.3	—	**NAXR20TN**	—	9 500	14.8	23.7	23.6	56.8	4.00	8.00	0.090	JR17x20x20
	20	30	30	20	36	10	10.5	0.3	—	—	**NAXR20Z.TN**	9 500	14.8	23.7	23.6	56.8	4.00	8.00	0.095	JR17x20x20
	20	30	29	20	35.4	11	9	0.85	**RAXZ 520**	—	—	9 000	14.8	23.7	22.0	54.0	3.55	5.55	0.070	IM 15 20 20 P
25	25	37	30	25	42	11	9.5	0.6	—	**NAXR25TN**	—	8 000	18.8	29.8	31.2	81.0	4.80	11.4	0.146	JR20x25x20
	25	37	30	25	43	11	9.5	0.6	—	—	**NAXR25Z.TN**	8 000	18.8	29.8	31.2	81.0	4.80	11.4	0.152	JR20x25x20
	25	37	29	25	43	11	9	0.85	**RAXZ 525**	—	—	7 500	15.1	26.2	25.5	70.0	4.25	7.15	0.105	IM 20 25 20 P
30	30	42	30	30	47	11	9.5	0.6	—	**NAXR30TN**	—	6 700	20.2	34.6	33.0	91.1	6.10	12.8	0.162	JR25x30x20
	30	42	30	30	48	11	9.5	0.6	—	—	**NAXR30Z.TN**	6 700	20.2	34.6	33.0	91.1	6.10	12.8	0.169	JR25x30x20
	30	42	29	30	48	11	9	0.85	**RAXZ 530**	—	—	6 500	20.2	34.6	26.5	77.0	5.25	7.90	0.118	IM 25 30 20 P
35	35	47	30	35	52	12	9.0	0.6	—	**NAXR35**	—	6 000	22.1	40.8	30.9	86.0	7.05	12.1	0.186	JR30x35x20
	35	47	30	35	53	12	9.0	0.6	—	—	**NAXR35.Z**	6 000	22.1	40.8	30.9	86.0	7.05	12.1	0.195	JR30x35x20
	35	47	30	35	54	12	9	0.85	**RAXZ 535**	—	—	5 500	22.1	40.8	33.8	94.0	6.15	8.80	0.146	IM 30 35 20 P
40	40	52	32	40	60	13	10.0	0.6	—	**NAXR40**	—	5 300	23.8	47.0	44.5	126.0	8.05	12.0	0.288	JR35x40x20
	40	52	32	40	61	13	10.0	0.6	—	—	**NAXR40.Z**	5 300	23.8	47.0	44.5	126.0	8.05	12.0	0.299	JR35x40x20
	40	52	31	40	61	13	9	0.85	**RAXZ 540**	—	—	5 000	23.8	47.0	46.0	129.0	7.00	5.95	0.174	IM 35 40 20 P
45	45	58	32	45	65	14	9.0	0.6	—	**NAXR45TN**	—	4 800	24.9	51.8	47.0	140.0	9.00	15.5	0.360	JR40x45x20
	45	58	32	45	66	14	9.0	0.6	—	—	**NAXR45Z.TN**	4 800	24.9	51.8	47.0	140.0	9.00	15.5	0.370	JR40x45x20
	45	58	31	45	66	13	9	0.85	**RAXZ 545**	—	—	4 500	24.9	51.8	49.0	143.0	7.90	6.60	0.206	IM 40 45 20 P

Combined needle roller bearings cylindrical roller thrust series metric series

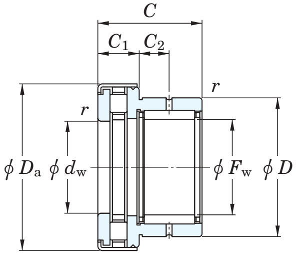
Shaft dia. 50 ~ 70 mm



RAXZ 500



NAXR

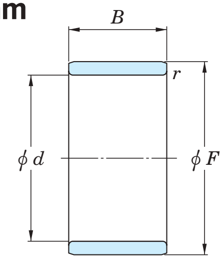


NAXR.Z

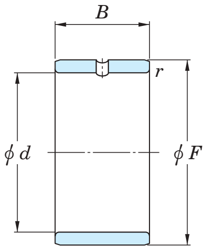
Shaft dia.	Boundary dimensions (mm) F_w	D	C	d_w (E7)	D_a	C_1	C_2	r min.	Bearing No. RAXZ	NAXR	NAXR.Z	Limiting speed (min^{-1})	Basic load ratings (kN) Radial C_r	C_{0r}	Thrust C_a	C_{0a}	Fatigue load limits (kN) C_u Radial	Thrust	(Refer.) Mass (kg)	Matching inner ring No.
50	50	62	35	50	70	14	10.0	0.6	—	**NAXR50**	—	4 300	30.2	68.5	49.7	155.0	12.5	14.8	0.432	JR45x50x25
	50	62	35	50	71	14	10.0	0.6	—	—	**NAXR50.Z**	4 300	30.2	68.5	49.7	155.0	12.5	14.8	0.452	JR45x50x25
	50	62	34	50	71	13	11	1.3	**RAXZ 550**	—	—	4 000	30.2	68.5	51.0	157.0	9.60	7.25	0.232	IM 45 50 25 P
60	60	72	36	60	86	15	11	1.3	**RAXZ 560**	—	—	3 500	31.9	78.1	71.0	255.0	11.5	18.4	0.327	IM 55 60 25 P
70	70	85	36	70	96	15	11	1.3	**RAXZ 570**	—	—	3 000	36.1	84.7	77.0	295.0	13.3	21.2	0.435	IM 60 70 25 P

Needle roller bearings, accessories
inner rings
metric series

Shaft dia. 5 ~ (10) mm



JR, IM..P

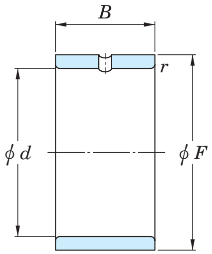


JR.JS1

Shaft dia.	Boundary dimensions (mm)				Bearing No.	(Refer.) Mass (kg)
	d	*F*	*B*	*r* min.		
5	5	8	8	0.3	**JR5x8x8JS1**	0.002
	5	8	12	0.3	**JR5x8x12**	0.003
	5	8	16	0.3	**JR5x8x16**	0.004
6	6	9	8	0.3	**JR6x9x8JS1**	0.002
	6	9	12	0.3	**JR6x9x12**	0.003
	6	9	16	0.3	**JR6x9x16**	0.004
	6	10	10	0.3	**JR6x10x10**	0.004
	6	10	10	0.3	**JR6x10x10JS1**	0.004
	6	10	12	0.3	**JRZ6x10x12JS1**	0.005
7	7	10	10.5	0.3	**JR7x10x10,5**	0.003
	7	10	12	0.3	**JR7x10x12**	0.004
	7	10	16	0.3	**JR7x10x16**	0.005
8	8	12	10	0.3	**JR8x12x10**	0.005
	8	12	10	0.3	**JR8x12x10JS1**	0.005
	8	12	10.5	0.3	**JR8x12x10,5**	0.005
	8	12	12	0.3	**JRZ8xl2x12JS1**	0.006
	8	12	12.5	0.3	**JR8x12x12,5**	0.006
	8	12	16	0.3	**IM 8 12 16 P**	0.007
9	9	12	12	0.3	**JR9x12x12**	0.005
	9	12	16	0.3	**JR9x12x16**	0.006
10	10	13	12.5	0.3	**JR10x13x12,5**	0.005
	10	14	11	0.3	**JR10x14x11JS1**	0.007
	10	14	12	0.3	**JR10x14x12**	0.007
	10	14	12	0.3	**JR10x14x12JS1**	0.007
	10	14	13	0.3	**JR10x14x13**	0.007
	10	14	14	0.3	**JRZ10x14x14JS1**	0.008
	10	14	16	0.3	**JR10x14x16**	0.009

[Note] 1) Please contact JTEKT about outside diameter tolerance.

Shaft dia. (10) ~ (15) mm



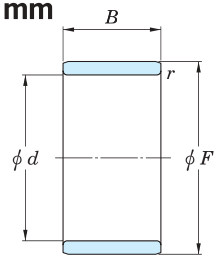
JRZ.JS1

Shaft dia.	Boundary dimensions (mm)				Bearing No.	(Refer.) Mass (kg)
	d	*F*	*B*	*r* min.		
10	10	14	20	0.3	**JR10x14x20**	0.012
12	12	15	12.5	0.3	**JR12x15x12,5**	0.006
	12	15	16	0.3	**JR12x15x16**	0.008
	12	15	16.5	0.3	**JR12x15x16,5**	0.008
	12	15	18.5	0.3	**JR12x15x18,5**	0.009
	12	15	22.4	0.2	**IM 12 15 22,4 P**	0.011
	12	15	22.5	0.3	**JR12x15x22,5**	0.011
	12	16	12	0.3	**JR12x16x12**	0.008
	12	16	12	0.3	**JR12x16x12JS1**	0.008
	12	16	13	0.3	**JR12x16x13**	0.008
	12	16	14	0.3	**JRZ12x16x14JS1**	0.010
	12	16	16	0.3	**JR12x16x16**	0.011
	12	16	20	0.3	**JR12x16x20**	0.014
	12	16	22	0.3	**JR12x16x22**	0.015
13	13	18	16	0.35	**IM 13 18 16 P**	0.015
14	14	17	17	0.3	**JR14x17x17**	0.009
15	15	18	16.5	0.3	**JR15x18x16,5**	0.010
	15	19	16	0.3	**JR15x19x16**	0.013
	15	19	20	0.3	**JR15x19x20**	0.017
	15	20	12	0.3	**JR15x20x12**	0.012
	15	20	12	0.3	**JR15x20x12JS1**	0.012
	15	20	13	0.3	**JR15x20x13**	0.014
	15	20	14	0.3	**JRZ15x20x14JS1**	0.015
	15	20	16	0.3	**JR15x20x16**	0.017
	15	20	20	0.35	**IM 15 20 20 P**	0.021
	15	20	23	0.3	**JR15x20x23**	0.025

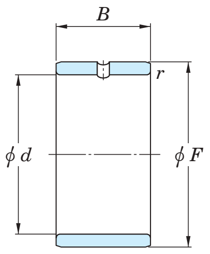
[Note] 1) Please contact JTEKT about outside diameter tolerance.

Needle roller bearings, accessories
inner rings
metric series

Shaft dia. (15) ~ (20) mm



JR, IM..P

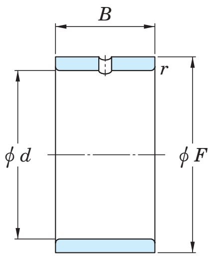


JR.JS1

Shaft dia.	Boundary dimensions (mm) d	F	B	r min.	Bearing No.	(Refer.) Mass (kg)
15	15	20	26	0.3	**JR15x20x26**	0.028
17	17	20	16.5	0.3	**JR17x20x16,5**	0.011
	17	20	20	0.3	**JR17x20x20**	0.014
	17	20	20.5	0.3	**JR17x20x20,5**	0.014
	17	20	30.5	0.3	**JR17x20x30,5**	0.021
	17	21	16	0.3	**JR17x21x16**	0.015
	17	21	20	0.3	**JR17x21x20**	0.019
	17	22	13	0.3	**JR17x22x13**	0.015
	17	22$^{1)}$	13	0.35	**IM 4903**	0.015
	17	22	16	0.3	**JR17x22x16**	0.019
	17	22	16	0.3	**JR17x22x16JS1**	0.019
	17	22	16	0.3	**JRZ17x22x16JS1**	0.019
	17	22	20	0.35	**IM 17 22 20 P**	0.023
	17	22	23	0.3	**JR17x22x23**	0.028
	17	22	26	0.3	**JR17x22x26**	0.031
	17	22	32	0.3	**JR17x22x32**	0.038
20	20	24	16	0.3	**JR20x24x16**	0.018
	20	24	20	0.3	**JR20x24x20**	0.022
	20	25	16	0.3	**JR20x25x16**	0.022
	20	25	16	0.3	**JR20x25x16JS1**	0.022
	20	25	17	0.3	**JR20x25x17**	0.023
	20	25	18	0.3	**JRZ20x25x18JS1**	0.025
	20	25	20	0.3	**JR20x25x20**	0.028
	20	25	20.5	0.3	**JR20x25x20,5**	0.029
	20	25	26	0.3	**JR20x25x26**	0.036
	20	25	26.5	0.3	**JR20x25x26,5**	0.037
	20	25	30	0.3	**JR20x25x30**	0.042
	20	25	32	0.3	**JR20x25x32**	0.044

[Note] 1) Please contact JTEKT about outside diameter tolerance.

Shaft dia. (20) ~ (30) mm



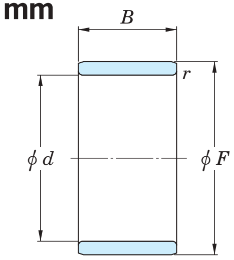
JRZ.JS1

Shaft dia.	Boundary dimensions (mm) d	F	B	r min.	Bearing No.	(Refer.) Mass (kg)
20	20	25	38.5	0.3	**JR20x25x38,5**	0.054
22	22	26	16	0.3	**JR22x26x16**	0.019
	22	26	20	0.3	**JR22x26x20**	0.023
	22	28	17	0.3	**JR22x28x17**	0.030
	22	28	20.5	0.3	**JR22x28x20,5**	0.038
	22	28	30	0.3	**JR22x28x30**	0.056
23	23	28	20	0.35	**IM 23 28 20 P**	0.030
25	25	29	20	0.3	**JR25x29x20**	0.027
	25	29	30	0.3	**JR25x29x30**	0.040
	25	30	16	0.3	**JR25x30x16**	0.027
	25	30	16	0.3	**JR25x30x16JS1**	0.027
	25	30	17	0.3	**JR25x30x17**	0.028
	25	30	18	0.3	**JRZ25x30x18JS1**	0.031
	25	30	20	0.3	**JR25x30x20**	0.034
	25	30	20.5	0.3	**JR25x30x20,5**	0.035
	25	30	26	0.3	**JR25x30x26**	0.044
	25	30	26.5	0.3	**JR25x30x26,5**	0.045
	25	30	30	0.3	**JR25x30x30**	0.051
	25	30	32	0.3	**JR25x30x32**	0.054
	25	30	38.5	0.3	**JR25x30x38,5**	0.066
28	28	32	17	0.3	**JR28x32x17**	0.028
	28	32	20	0.3	**JR28x32x20**	0.030
	28	32	30	0.3	**JR28x32x30**	0.044
30	30	35	16	0.3	**JR30x35x16**	0.031
	30	35	17	0.3	**JR30x35x17**	0.033
	30	35$^{1)}$	17	0.35	**IM 4906**	0.033

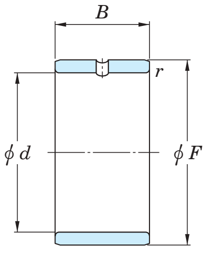
[Note] 1) Please contact JTEKT about outside diameter tolerance.

Needle roller bearings, accessories inner rings metric series

Shaft dia. (30) ~ 38 mm



JR, IM..P

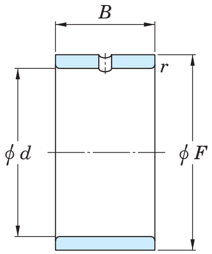


JR.JS1

Shaft dia.	Boundary dimensions (mm) d	F	B	r min.	Bearing No.	(Refer.) Mass (kg)
30	30	35	18	0.3	**JRZ30x35x18JS1**	0.036
	30	35	20	0.3	**JR30x35x20**	0.039
	30	35	20	0.3	**JRZ30x35x20JS1**	0.039
	30	35	20.5	0.3	**JR30x35x20,5**	0.040
	30	35	26	0.3	**JR30x35x26**	0.054
	30	35	30	0.3	**JR30x35x30**	0.057
	30	35	32	0.3	**JR30x35x32**	0.062
	30	38	20	0.6	**JR30x38x20JS1**	0.067
32	32	37	20	0.3	**JR32x37x20**	0.043
	32	37	30	0.3	**JR32x37x30**	0.064
	32	40	20	0.6	**JR32x40x20**	0.069
	32	40	36	0.6	**JR32x40x36**	0.128
35	35	40	17	0.3	**JR35x40x17**	0.040
	35	40	20	0.3	**JR35x40x20**	0.046
	35	40	20.5	0.3	**JR35x40x20,5**	0.049
	35	40	22	0.3	**JR35x40x22**	0.052
	35	40	30	0.3	**JR35x40x30**	0.071
	35	40	34	0.3	**JR35x40x34**	0.080
	35	40	40	0.3	**JR35x40x40**	0.094
	35	42	20	0.6	**JR35x42x20**	0.065
	35	42	20	0.6	**JR35x42x20JS1**	0.065
	35	42	23	0.6	**JRZ35x42x23JS1**	0.074
	35	42	36	0.6	**JR35x42x36**	0.122
	35	44	22	0.6	**JR35x44x22**	0.097
37	37	42	20	0.35	**IM 37 42 20 P**	0.046
38	38	43	20	0.3	**JR38x43x20**	0.050
	38	43	30	0.3	**JR38x43x30**	0.075

[Note] 1) Please contact JTEKT about outside diameter tolerance.

Shaft dia. 40 ~ 45 mm



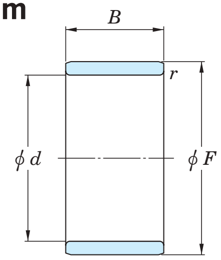
JRZ.JS1

Shaft dia.	Boundary dimensions (mm) d	F	B	r min.	Bearing No.	(Refer.) Mass (kg)
40	40	45	17	0.3	**JR40x45x17**	0.044
	40	45	20	0.3	**JR40x45x20**	0.052
	40	45	20.5	0.3	**JR40x45x20,5**	0.054
	40	45	25	0.35	**IM 40 45 25 P**	0.062
	40	45	30	0.3	**JR40x45x30**	0.078
	40	45	34	0.3	**JR40x45x34**	0.089
	40	45	40	0.3	**JR40x45x40**	0.115
	40	48	22	0.6	**JR40x48x22**	0.094
	40	48	23	0.6	**JRZ40x48x23JS1**	0.100
	40	48	40	0.6	**JR40x48x40**	0.173
	40	50	20	1	**JR40x50x20**	0.110
42	42	47	20	0.3	**JR42x47x20**	0.055
	42	47	30	0.3	**JR42x47x30**	0.083
45	45	50	20	0.3	**JR45x50x20**	0.058
	45	50	25	0.6	**JR45x50x25**	0.073
	45	50	25.5	0.3	**JR45x50x25,5**	0.075
	45	50	35	0.6	**JR45x50x35**	0.103
	45	50	40	0.3	**JR45x50x40**	0.117
	45	52	22	0.6	**JR45x52x22**	0.090
	45	52 1)	22	0.85	**IM 4909**	0.087
	45	52	23	0.6	**JR45x52x23**	0.096
	45	52	23	0.6	**JRZ45x52x23JS1**	0.096
	45	52	40	0.6	**JR45x52x40**	0.167
	45	55	20	1	**JR45x55x20**	0.133
	45	55	20	1	**JR45x55x20JS1**	0.133
	45	55	22	1	**JR45x55x22**	0.135
	45	55	40	1	**JR45x55x40**	0.247

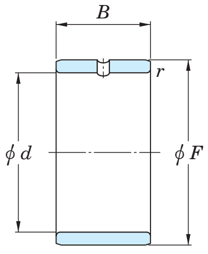
[Note] 1) Please contact JTEKT about outside diameter tolerance.

Needle roller bearings, accessories
inner rings
metric series

Shaft dia. 50 ~ 60 mm



JR, IM..P

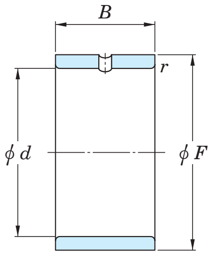


JR.JS1

Shaft dia.	Boundary dimensions (mm) *d*	*F*	*B*	*r* min.	Bearing No.	(Refer.) Mass (kg)
50	50	55	20	0.3	**JR50x55x20**	0.065
	50	55	25	0.6	**JR50x55x25**	0.081
	50	55	35	0.65	**IM 50 55 35 P**	0.107
	50	55	35	0.6	**JR50x55x35**	0.113
	50	55	40	0.3	**JR50x55x40**	0.130
	50	58	22	0.6	**JR50x58x22**	0.117
	50	58	23	0.6	**JRZ50x58x23JS1**	0.122
	50	58	40	0.6	**JR50x58x40**	0.213
	50	60	20	1	**JR50x60x20**	0.155
	50	60	20	1	**JR50x60x20JS1**	0.155
	50	60	25	1	**JR50x60x25**	0.170
	50	60	40	1	**JR50x60x40**	0.310
55	55	60	25	0.6	**JR55x60x25**	0.088
	55	60	35	0.65	**IM 55 60 35 P**	0.118
	55	60	35	0.6	**JR55x60x35**	0.124
	55	63	25	1	**JR55x63x25**	0.141
	55	63	45	1	**JR55x63x45**	0.286
	55	65	30	1	**JR55x65x30**	0.222
	55	65	60	1	**JR55x65x60**	0.444
58	58	65	25	0.85	**IM 58 65 25 P**	0.125
60	60	68	25	0.6	**JR60x68x25**	0.153
	60	68	35	0.6	**JR60x68x35**	0.220
	60	68	45	1	**JR60x68x45**	0.284
	60	70	25	1	**JR60x70x25**	0.200
	60	70	30	1	**JR60x70x30**	0.240
	60	70	35	0.85	**IM 60 70 35 P**	0.280
	60	70	60	1	**JR60x70x60**	0.480

[Note] 1) Please contact JTEKT about outside diameter tolerance.

Shaft dia. 65 ~ (90) mm



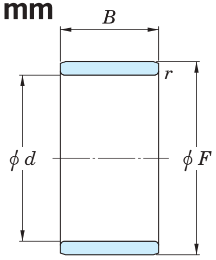
JRZ.JS1

Shaft dia.	Boundary dimensions (mm) *d*	*F*	*B*	*r* min.	Bearing No.	(Refer.) Mass (kg)
65	65	72	25	1	**JR65x72x25**	0.143
	65	72	45	1	**JR65x72x45**	0.266
	65	73	25	0.6	**JR65x73x25**	0.170
	65	73	35	0.6	**JR65x73x35**	0.240
	65	75	28	1	**JR65x75x28**	0.240
	65	75	30	1	**JR65x75x30**	0.260
	65	75	60	1	**JR65x75x60**	0.520
70	70	80	25	1	**JR70x80x25**	0.230
	70	80	30	1	**JR70x80x30**	0.270
	70	80	35	1	**JR70x80x35**	0.320
	70	80	54	1	**JR70x80x54**	0.500
	70	80	60	1	**JR70x80x60**	0.556
75	75	85	25	1	**JR75x85x25**	0.240
	75	85	30	1	**JR75x85x30**	0.289
	75	85	35	1	**JR75x85x35**	0.338
	75	85	54	1	**JR75x85x54**	0.530
80	80	90	25	1	**JR80x90x25**	0.260
	80	90	30	1	**JR80x90x30**	0.306
	80	90	35	1	**JR80x90x35**	0.355
	80	90	54	1	**JR80x90x54**	0.565
85	85	95	26	1	**JR85x95x26**	0.290
	85	95	30	1	**JR85x95x30**	0.334
	85	95	36	1	**JR85x95x36**	0.397
	85	100	35	1.1	**JR85x100x35**	0.595
	85	100	63	1.1	**JR85x100x63**	1.080
90	90	100	26	1	**JR90x100x26**	0.300

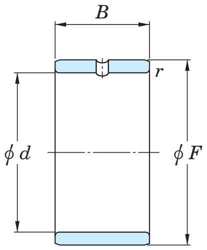
[Note] 1) Please contact JTEKT about outside diameter tolerance.

Needle roller bearings, accessories inner rings metric series

Shaft dia. (90) ~ 170 mm



JR, IM..P

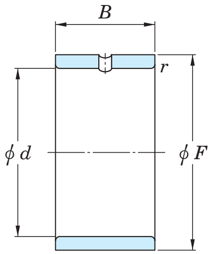


JR.JS1

Shaft dia.	Boundary dimensions (mm) *d*	*F*	*B*	*r* min.	Bearing No.	(Refer.) Mass (kg)
90	90	100	30	1	**JR90x100x30**	0.350
	90	100	36	1	**JR90x100x36**	0.422
	90	105	32	1.1	**JR90x105x32**	0.580
	90	105	35	1.1	**JR90x105x35**	0.624
	90	105	63	1.1	**JR90x105x63**	1.140
95	95	105	26	1	**JR95x105x26**	0.310
	95	105	36	1	**JR95x105x36**	0.430
	95	110	35	1.1	**JR95x110x35**	0.653
	95	110	63	1.1	**JR95x110x63**	1.200
100	100	110	30	1.1	**JR100x110x30**	0.384
	100	110	40	1.1	**JR100x110x40**	0.510
	100	115	40	1.1	**JR100x115x40**	0.790
110	110	120	30	1	**JR110x120x30**	0.425
	110	125	40	1.1	**JR110x125x40**	0.870
120	120	130	30	1	**JR120x130x30**	0.460
	120	135	45	1.1	**JR120x135x45**	1.060
130	130	145	35	1.1	**JR130x145x35**	0.890
	130	150	50	1.5	**JR130x150x50**	1.730
140	140	155	35	1.1	**JR140x155x35**	0.955
	140	160	50	1.5	**JR140x160x50**	1.860
150	150	165	40	1.1	**JR150x165x40**	1.170
160	160	175	40	1.1	**JR160x175x40**	1.240
170	170	185	45	1.1	**JR170x185x45**	1.480

[Note] 1) Please contact JTEKT about outside diameter tolerance.

Shaft dia. 180 mm



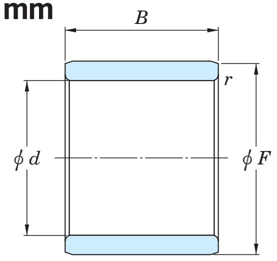
JRZ.JS1

Shaft dia.	Boundary dimensions (mm) *d*	*F*	*B*	*r* min.	Bearing No.	(Refer.) Mass (kg)
180	180	195	45	1.1	**JR180x195x45**	1.560

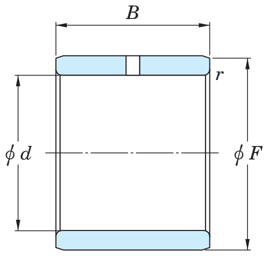
[Note] 1) Please contact JTEKT about outside diameter tolerance.

Needle roller bearings, accessories
inner rings for machine-tool quality precision-combined bearings
metric series

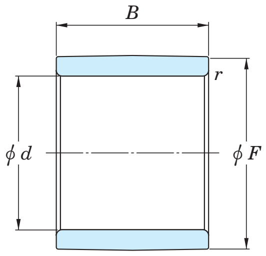
Shaft dia. 17 ~ 45 mm



IM



IMC



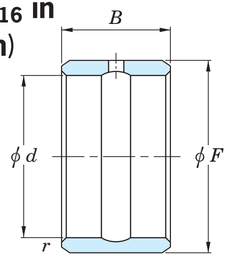
IM...R6

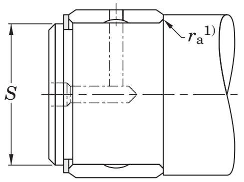
Shaft dia.	Boundary dimensions (mm)				Bearing No.	(Refer.) Mass (kg)
	d	*F* 1)	*B*	*r* min.		
17	17	20	27.5	0.2	**IM 19017**	0.019
	17	20	32	0.2	**IM 20617**	0.021
20	20	25	27.5	0.35	**IM 19020**	0.038
	20	25	32	0.35	**IM 20620**	0.044
25	25	30	27.5	0.35	**IM 19025**	0.042
	25	30	32	0.35	**IM 20625**	0.052
30	30	35	27.5	0.35	**IM 19030**	0.053
	30	35	32	0.35	**IM 20630**	0.061
35	35	40	27.5	0.35	**IM 19035**	0.063
	35	40	32	0.35	**IM 20635**	0.072
40	40	45	27.5	0.35	**IM 19040**	0.069
	40	45	32	0.35	**IM 20640**	0.080
45	45	50	30.5	0.65	**IM 19045**	0.085
	45	50	35	0.65	**IM 20645**	0.096

[Note] 1) Please contact JTEKT about outside diameter tolerance.

Heavy-duty needle roller bearings inner rings inch series

Shaft dia. $^{3}/_{8}$ ~ 1 $^{5}/_{16}$ in (9.525 ~ 33.338 mm)





Boundary dimensions (mm) Shaft dia. (in)	*d*	*F*	*B*	*r* min.	Inner ring No.	(Refer.) Mass (kg)	Shaft dia. (mm) Loose transition fit max.	min.	Interference fit max.	min.	Used with bearing No.
$^{3}/_{8}$	9.525	15.875	19.05	0.64	**IR-061012**	0.018	9.520	9.510	9.538	9.530	**HJ-101812**
$^{1}/_{2}$	12.700	19.050	19.05	1.02	**IR-081212**	0.023	12.692	12.682	12.715	12.708	**HJ-122012**
	12.700	19.050	25.40	1.02	**IR-081216**	0.032	12.692	12.682	12.715	12.708	**HJ-122016**
$^{5}/_{8}$	15.875	22.225	19.05	1.02	**IR-101412**	0.027	15.867	15.857	15.890	15.883	**HJ-142212**
	15.875	22.225	25.40	1.02	**IR-101416**	0.036	15.867	15.857	15.890	15.883	**HJ-142216**
$^{11}/_{16}$	17.463	22.225	19.05	1.02	**IR-111412**	0.023	17.455	17.445	17.478	17.470	**HJ-142212**
$^{3}/_{4}$	19.050	25.400	19.05	1.02	**IR-121612**	0.032	19.042	19.030	19.068	19.058	**HJ-162412**
	19.050	25.400	25.40	1.02	**IR-121616**	0.041	19.042	19.030	19.068	19.058	**HJ-162416**
$^{13}/_{16}$	20.638	25.400	25.40	1.02	**IR-131616**	0.032	20.630	20.617	20.655	20.645	**HJ-162416**
$^{7}/_{8}$	22.225	28.575	25.40	1.02	**IR-141816**	0.050	22.217	22.205	22.243	22.233	**HJ-182616**
	22.225	28.575	31.75	1.02	**IR-141820**	0.059	22.217	22.205	22.243	22.233	**HJ-182620**
$^{15}/_{16}$	23.813	28.575	25.40	1.02	**IR-151816**	0.036	23.805	23.792	23.830	23.820	**HJ-182616**
	23.813	28.575	31.75	1.02	**IR-151820**	0.045	23.805	23.792	23.830	23.820	**HJ-182620**
1	25.400	31.750	25.40	1.02	**IR-162016**	0.054	25.392	25.380	25.418	25.408	**HJ-202816**
	25.400	31.750	31.75	1.02	**IR-162020**	0.068	25.392	25.380	25.418	25.408	**HJ-202820**
1 $^{1}/_{8}$	28.575	34.925	25.40	1.02	**IR-182216**	0.059	28.567	28.555	28.593	28.583	**HJ-223016**
	28.575	34.925	31.75	1.02	**IR-182220**	0.077	28.567	28.555	28.593	28.583	**HJ-223020**
1 $^{3}/_{16}$	30.163	38.100	31.75	1.52	**IR-192420**	0.100	30.155	30.142	30.180	30.170	**HJ-243320**
1 $^{1}/_{4}$	31.750	38.100	25.40	1.52	**IR-202416**	0.068	31.740	31.725	31.770	31.760	**HJ-243316**
	31.750	38.100	31.75	1.52	**IR-202420**	0.082	31.740	31.725	31.770	31.760	**HJ-243320**
1 $^{5}/_{16}$	33.338	41.275	25.40	1.52	**IR-212616**	0.086	33.327	33.312	33.358	33.348	**HJ-263516**
	33.338	41.275	31.75	1.52	**IR-212620**	0.109	33.327	33.312	33.358	33.348	**HJ-263520**

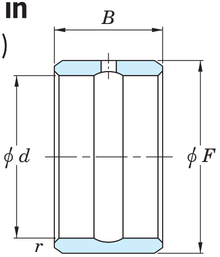
[Note] 1) $r_{\mathrm{a\,max}}$ is equal to the minimum bearing chamfer ($r_{\mathrm{s\,min}}$).

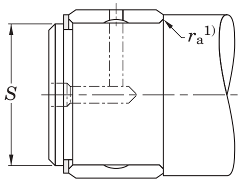
Shaft dia. 1 $^{3}/_{8}$ ~ (2 $^{1}/_{2}$) in (34.925 ~ (63.500) mm)

Boundary dimensions (mm) Shaft dia. (in)	*d*	*F*	*B*	*r* min.	Inner ring No.	(Refer.) Mass (kg)	Shaft dia. (mm) Loose transition fit max.	min.	Interference fit max.	min.	Used with bearing No.
1 $^{3}/_{8}$	34.925	41.275	31.75	1.52	**IR-222620**	0.091	34.915	34.900	34.945	34.935	**HJ-263520**
	34.925	44.450	31.75	1.52	**IR-222820**	0.141	34.915	34.900	34.945	34.935	**HJ-283720**
1 $^{7}/_{16}$	36.513	44.450	25.40	1.52	**IR-232816**	0.095	36.502	36.487	36.533	36.523	**HJ-283716**
	36.513	44.450	31.75	1.52	**IR-232820**	0.118	36.502	36.487	36.533	36.523	**HJ-283720**
1 $^{1}/_{2}$	38.100	44.450	25.40	1.52	**IR-242816**	0.077	38.090	38.075	38.120	38.110	**HJ-283716**
	38.100	44.450	31.75	1.52	**IR-242820**	0.095	38.090	38.075	38.120	38.110	**HJ-283720**
	38.100	50.800	31.75	1.52	**IR-243220**	0.209	38.090	38.075	38.120	38.110	**HJ-324120**
1 $^{9}/_{16}$	39.688	47.625	31.75	1.52	**IR-253020**	0.127	39.677	39.662	39.708	39.698	**HJ-303920**
	39.688	50.800	31.75	1.52	**IR-253220**	0.186	39.677	39.662	39.708	39.698	**HJ-324120**
1 $^{5}/_{8}$	41.275	50.800	31.75	1.52	**IR-263220**	0.163	41.265	41.250	41.295	41.285	**HJ-324120**
1 $^{11}/_{16}$	42.863	50.800	25.40	1.52	**IR-273216**	0.109	42.852	42.837	42.883	42.873	**HJ-324116**
	42.863	50.800	31.75	1.52	**IR-273220**	0.136	42.852	42.837	42.883	42.873	**HJ-324120**
1 $^{3}/_{4}$	44.450	57.150	38.10	1.52	**IR-283624**	0.286	44.440	44.425	44.470	44.460	**HJ-364824**
	44.450	57.150	44.45	1.52	**IR-283628**	0.336	44.440	44.425	44.470	44.460	**HJ-364828**
1 $^{15}/_{16}$	49.213	63.500	38.10	2.03	**IR-314024**	0.358	49.202	49.187	49.233	49.223	**HJ-405224**
	49.213	63.500	44.45	2.03	**IR-314028**	0.417	49.202	49.187	49.233	49.223	**HJ-405228**
2	50.800	63.500	38.10	2.03	**IR-324024**	0.322	50.790	50.772	50.823	50.810	**HJ-405224**
	50.800	63.500	44.45	2.03	**IR-324028**	0.376	50.790	50.772	50.823	50.810	**HJ-405228**
2 $^{3}/_{16}$	55.563	69.850	44.45	2.03	**IR-354428**	0.467	55.552	55.535	55.585	55.573	**HJ-445628**
2 $^{1}/_{4}$	57.150	69.850	38.10	2.03	**IR-364424**	0.358	57.140	57.122	57.173	57.160	**HJ-445624**
	57.150	69.850	44.45	2.03	**IR-364428**	0.417	57.140	57.122	57.173	57.160	**HJ-445628**
2 $^{3}/_{8}$	60.325	76.200	44.45	2.03	**IR-384828**	0.562	60.315	60.297	60.348	60.335	**HJ-486028**
2 $^{1}/_{2}$	63.500	76.200	38.10	2.03	**IR-404824**	0.395	63.490	63.472	63.523	63.510	**HJ-486024**

Heavy-duty needle roller bearings inner rings inch series

Shaft dia. (2 $^1/_2$) ~ 3 in ((63.500) ~ 76.200 mm)





Boundary dimensions (mm)					Inner ring No.	(Refer.) Mass (kg)	Shaft dia. (mm)				Used with bearing No.
Shaft dia. (in)	d	F	B	r min.			Loose transition fit max.	Loose transition fit min.	Interference fit max.	Interference fit min.	
2 $^1/_2$	63.500	76.200	44.45	2.03	**IR-404828**	0.463	63.490	63.472	63.523	63.510	**HJ-486028**
2 $^3/_4$	69.850	82.550	44.45	2.03	**IR-445228**	0.503	69.840	69.822	69.873	69.860	**HJ-526828**
	69.850	82.550	50.80	2.03	**IR-445232**	0.576	69.840	69.822	69.873	69.860	**HJ-526832**
2 $^{15}/_{16}$	74.613	88.900	50.80	2.03	**IR-475632**	0.694	74.602	74.585	74.635	74.623	**HJ-567232**
3	76.200	88.900	50.80	2.03	**IR-485632**	0.621	76.190	76.172	76.223	76.210	**HJ-567232**

[Note] 1) $r_{a\,\max}$ is equal to the minimum bearing chamfer ($r_{s\,\min}$).

Miniature one-way clutches

Miniature one-way clutches consist of a case carburizing steel drawn cup, metal or synthetic resin spring, synthetic resin cage and needle rollers.

They are used in clutch mechanisms of various machines. Use in office automation equipment such as copying and facsimile machines is especially common.

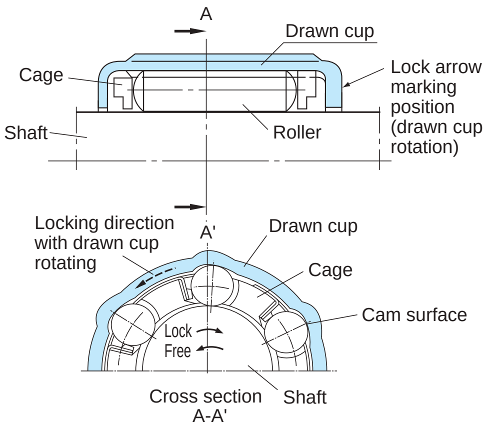
- Useful for making equipment smaller and lighter, due to a drawn cup made of thin sheet steel.
- Locking protrusions are provided around the drawn cup, so that creeping can be prevented without having to hold the surface dimensional accuracy precisely.
- Pre-lubricated with optimum grease, so that no lubrication is necessary under normal operating conditions.
- Unit products with a synthetic resin housing are also available.
  They are compatible with components of various types, such as gears, timing pulleys, cams and rubber rollers. Consult with JTEKT for further information.

1WC series

EWC series

Various housings and unit products

Structure and principles



[When the clutch system works]

When the shaft rotates clockwise as in cross section A-A', rollers are locked while engaged with the drawn cup cam surfaces by the effect of springs (wedging of the shaft by the cam surfaces). The drawn cup is driven as a consequence.

[Clutch idle running]

When the shaft rotates counter-clockwise as in cross section A-A', rollers move away from the drawn cup cam surfaces and rotate freely.

Miniature one-way clutch types and characteristics

	1WC series (with metal springs)	EWC series (with synthetic resin springs)	
	Heavy load type	Heavy load type	Light load type
	1WC...	EWC...C	EWC...A
Torque capacity	Heavy load	Heavy load	Light load
Operating temperature range	− 10 to + 90°C	− 10 to + 70°C	
Locking life	Locking system can function more than one million. (Note : this estimation is valid as long as torque magnitude does not exceed the torque capacity shown in the specification table.)		
Insert molding	Possible	Impossible	
Delivery of clutch only	Possible		
Unit delivery	Possible		

Shaft tolerance

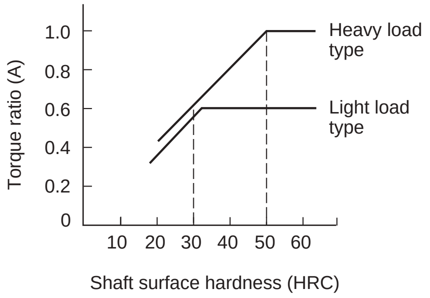
	Heavy load type (1WC... , EWC...C)	Light load type (EWC...A)
Shaft tolerance class	h 8	
Surface hardness	50 HRC or harder	30 HRC or harder
Roughness (Ra)	0.3 a or less	0.8 a or less
Roundness and cylindricity	0.005 mm or less	

[Remarks] In some operating conditions, shafts need not be as accurate as shown here.

For example :

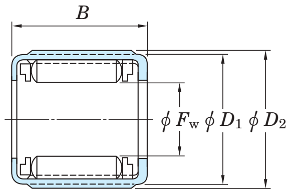
1. When clutch engaging accuracy is considered unimportant, or when a radial load or moment is not generated, the shaft diameter tolerance can be :
   - shaft diameter 6 mm or less, and EWC0809 (C, A) : 0 to − 0.040 mm
   - shaft diameter 8 mm or more : h 10
2. When the loaded torque is smaller than the torque capacity, shaft surface hardness can be determined as follows :
   * The diagram on the right shows approximate shaft surface hardness relative to torque ratio A.

$$\text{Torque ratio (A)} = \frac{\text{Loaded torque}}{\text{Heavy load type torque capacity}}$$

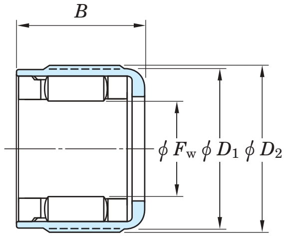


Miniature one-way clutches

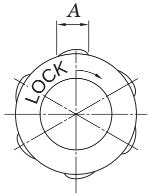
d 4 ~ 12 mm

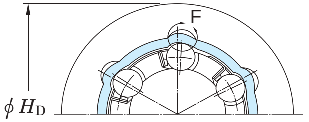


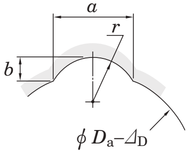
1WC series



EWC series







Details of section F

Shaft dia. (mm)	Boundary dimensions (mm)					Torque capacity	Designations		No. of outer ring protrusion [1]	Recommended housing dimensions (mm)						(Refer.) Mass (g)	
d	F_w	D_1	D_2	B	A	(N·m)	1WC series (With metal springs)	EWC series (With resin springs)		H_D	a	b	r	D_a	Δ_D [2]	1WC	EWC
4	4	8	8.4	6	2.6	0.08	—	**EWC0406A**	4	12	2.65	0.50	2	8	0.06	—	1.0
	4	8	8.4	6	2.6	0.15	—	**EWC0406C**	4	12	2.65	0.50	2	8	0.06	—	1.0
6	6	10	10.4	8	2.8	0.25	—	**EWC0608A**	6	14	2.8	0.57	2	10	0.08	—	1.7
	6	10	10.4	8	2.8	0.44	—	**EWC0608C**	6	14	2.8	0.57	2	10	0.08	—	1.7
	6	10	10.4	8	2.8	0.44	**1WC0608**	—	6	14	2.8	0.57	2	10	0.08	2.0	—
	6	10	10.4	12	2.8	0.88	**1WC0612**	—	6	14	2.8	0.57	2	10	0.08	3.0	—
8	8	12	12.4	9	2.6	0.49	—	**EWC0809A**	6	16	2.6	0.48	2	12	0.10	—	2.4
	8	12	12.4	9	2.6	0.88	—	**EWC0809C**	6	16	2.6	0.48	2	12	0.10	—	2.4
	8	14.2	15	12	3.6	1.18	—	**EWC0812A**	6	18.5	3.6	0.87	2.3	14.2	0.11	—	5.8
	8	14.2	15	12	3.6	1.96	—	**EWC0812C**	6	18.5	3.6	0.87	2.3	14.2	0.11	—	5.8
	8	14.2	15	12	3.6	1.96	**1WC0812**	—	6	18.5	3.6	0.87	2.3	14.2	0.11	7.0	—
	8	14.2	15	14.5	3.6	2.65	**1WC0815**	—	6	18.5	3.6	0.87	2.3	14.2	0.11	8.0	—
10	10	16	17	10	5	1.18	—	**EWC1010A**	6	21	5.0	1.20	3.2	16	0.13	—	6.0
	10	16	17	10	5	1.96	—	**EWC1010C**	6	21	5.0	1.20	3.2	16	0.13	—	6.0
	10	16	17	12	5	1.37	—	**EWC1012A**	6	21	5.0	1.20	3.2	16	0.13	—	6.8
	10	16	17	12	5	2.35	—	**EWC1012C**	6	21	5.0	1.20	3.2	16	0.13	—	6.8
	10	16	17	12	5	2.35	**1WC1012**	—	6	21	5.0	1.20	3.2	16	0.13	8.0	—
12	12	18	19	16	5.1	6.28	**1WC1216**	—	8	23	5.1	1.20	3.3	18	0.14	12	—

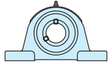
[Notes] 1) Provided at equal intervals.
2) Recommended interference when polyacetal resin housing is used.

Ball bearing units

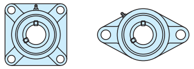
Ball bearing units consist of pre-lubricated sealed ball bearings and a housing which varies in shape.

They are capable of aligning themselves efficiently using the spherical fitting surface between the bearing and housing, effectively preventing overloads due to misalignment.

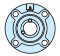
Pillow block type



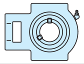
Flanged type



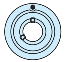
Flanged type with spigot joint



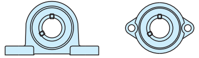
Take-up type



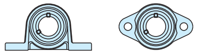
Cartridge type



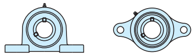
Light duty units



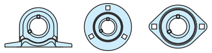
"Compact" series (made from light alloy)



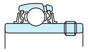
Stainless-series



Pressed steel units



Ball bearings for units



For details, refer to JTEKT separate catalog "Ball bearing units" (CAT. NO. B2007E).

K-series super thin section ball bearings

Koyo K-series super thin section ball bearings were developed to meet current engineering needs for thinner, lighter bearings. They are used extensively in automation and labor saving equipment, such as industrial robots.

These bearings are sorted into nine dimension series according to cross-sectional area.

Those of the same dimension series have an equivalent cross-sectional area irrespective of the bore diameter.

They are available in three types that differ in structure.

- Deep groove type

  Carries radial load, axial load in both directions, and combined loads.

- Angular contact type

  Has a 30° contact angle, and carries radial load and axial load in one direction.
  Two bearings are usually used together facing one another.

- Four-point contact type

  Has a contact angle of 30° both to the right and to the left.
  Able to carry axial load in both directions. Also able to support moment and radial loads.

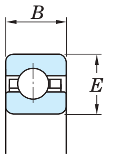
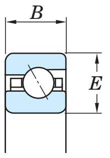
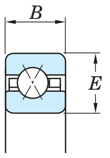
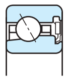
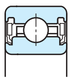
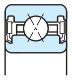
		Bearing type code			
		C (Deep groove type)	A (Angular contact type)	X (Four-point contact type)	
Dimension series code	Cross-sectional dimension $B = E$ (mm)				Bore diameter (mm)
T	4.762	K T C	K T A	K T X	25.4 to 38.1
A	6.35	K A C	K A A	K A X	50.8 to 304.8
B	7.938	K B C	K B A	K B X	50.8 to 508
C	9.525	K C C	K C A	K C X	101.6 to 762
D	12.7	K D C	K D A	K D X	
F	19.05	K F C	K F A	K F X	101.6 to 1 016
G	25.4	K G C	K G A	K G X	
J	$B = 11.1$ $E = 9.525$	–	KJA...RD 	–	101.6 to 304.8
U	$B = 12.7$ $E = 9.525$	KUC...2RD 	–	KUX...2RD 	

Table 1　K-series super thin section ball bearings : tolerance

Unit : µm

Bore diameter number	Single plane mean bore diameter deviation Δ_{dmp}					Single plane mean outside diameter deviation Δ_{Dmp}					Single inner (outer) ring width deviation Δ_{Bs}, Δ_{Cs}			Radial runout of assembled bearing ring, max.										Assembled bearing ring face runout with raceway, max.				Bore diameter number
														Inner ring K_{ia}					Outer ring K_{ea}					Inner ring S_{ia}		Outer ring S_{ea}		
	classes K0, K1, K2		class K3	class K4	class K6	classes K0, K1, K2		class K3	class K4	class K6	classes K0, K1, K2	classes K3, K4	class K6	class K0		class K3	classes K1, K4	classes K2, K6	class K0		class K3	classes K1, K4	classes K2, K6	classes K1, K4	classes K0, K2 K3, K6	classes K1, K4	classes K0, K2 K3, K6	
	div. Ⅰ	div. Ⅱ				div. Ⅰ	div. Ⅱ							div. Ⅰ	div. Ⅱ				div. Ⅰ	div. Ⅱ								
010	0 −10		0 −5	0 −5	0 −4	0 −13		0 −8	0 −5	0 −5	0 −127			13	8	8	5	4	20	10	10	5	5	8	Same as limit values for radial runout of assembled bearing inner ring	8	Same as limit values for radial runout of assembled bearing outer ring	**010**
015	0 −13		0 −8		0 −5									15	10	10												**015**
020	0 −15		0 −10	0 −8				0 −10	0 −8					20	13				25	13	13	8				10		**020**
025																												**025**
030						0 −15				0 −8					15					15	15	10				13		**030**
035	0 −20		0 −13		0 −6									25		13	8	5	30					10				**035**
040																												**040**
042						0 −20		0 −13	0 −10	0 −10					20				36	20	20		8					**042**
045																												**045**
047	0 −25		0 −15	0 −10	0 −8									30		15		8										**047**
050																												**050**
055						0 −25		0 −15	0 −13						25				41	25	23	13				15		**055**
060																												**060**
065																												**065**
070						0 −30		0 −18													25		10					**070**
075	0 −30		0 −18	0 −13	0 −10									41	30	20	10		46	30				13				**075**
080																												**080**
090																												**090**
100	0 −36	0 −36	0 −20		0 −13	0 −36	0 −36	0 −20		0 −13				46	36	25	13	10	51	36	30	15		15		18		**100**
110																												**110**
120								0 −23	0 −15												36	18	13			20		**120**
140	0 −41			0 −15		0 −41				0 −15	0 −254	0 −254	0 −254			30								18				**140**
160	0 −46	0 −41	0 −23			0 −46	0 −41	0 −25	0 −18						41	36	18			41	41	20		20		23		**160**
180														51														**180**
200	0 −51	0 −46	0 −25	0 −18		0 −51	0 −46	0 −30	0 −20						46	41	20			46	46	23		23		25		**200**
250	0 −76					0 −76																						**250**
300																												**300**
350	0 −102	0 −51				0 −102	0 −51								51					51								**350**
400																												**400**

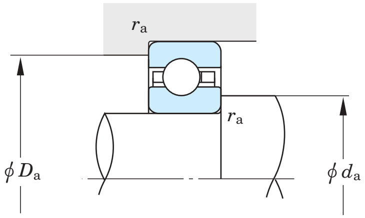
[Notes]　Division Ⅰ is for deep groove type ball bearings.
Division Ⅱ is for angular contact type and four-point contact type ball bearings.

Table 2 Standard radil internal clearance of deep groove and four-point contact type ball bearings

Unit : µm

Bore diameter number	Radial internal clearance				
	classes K0, K1, K2		class K3	class K4	class K6
	Deep groove type	Four-point contact type			
010	25 – 41	25 – 38	18 – 28	13 – 23	10 – 20
015	30 – 46	30 – 43	20 – 30		13 – 23
020	30 – 61	30 – 56	20 – 46	15 – 30	10 – 25
025					
030					15 – 30
035	41 – 71	41 – 66	25 – 51		
040					
042				20 – 36	20 – 36
045					
047	51 – 86	51 – 76	30 – 56		
050					
055				25 – 41	
060					
065					
070			36 – 61		
075	61 – 107	61 – 86			
080					
090					
100	71 – 122	71 – 97	41 – 66		25 – 41
110					
120			46 – 71	30 – 46	
140	81 – 132				30 – 46
160	91 – 142	81 – 107	51 – 76	36 – 51	
180					
200	102 – 152	91 – 117	61 – 86	36 – 56	
250	152 – 203				
300					
350	203 – 254	102 – 127			
400					

Table 3 Mounting dimensions



Unit : mm

Dimension series	Bearing type			ϕd_a		ϕD_a		r_a
				max.	min.	min.	max.	max.
T	KTC	KTA	KTX	d + 5.3	d + 3.4	d + 4.2	d + 6.1	0.2
A	KAC	KAA	KAX	d + 7.3	d + 4.6	d + 5.4	d + 8.2	0.4
B	KBC	KBA	KBX	d + 9.3	d + 5.7	d + 6.6	d + 10.2	0.8
C	KCC	KCA	KCX	d + 11.3	d + 6.9	d + 7.7	d + 12.2	0.8
D	KDC	KDA	KDX	d + 15.3	d + 9.2	d + 10.1	d + 16.2	1.3
F	KFC	KFA	KFX	d + 23.3	d + 13.9	d + 14.8	d + 24.2	1.8
G	KGC	KGA	KGX	d + 31.3	d + 18.7	d +19.5	d + 32.1	1.8
J	–	KJA	–	d + 11.3	d + 6.9	d + 7.7	d + 12.2	0.2
U	KUC	–	KUX					

Table 4 Shaft diameter and housing bore diameter tolerance

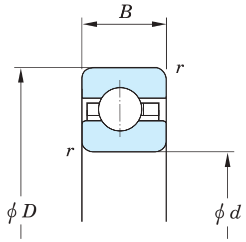
Unit : μm

Bore diameter number	Inner ring rotation										Outer ring rotation										Bore diameter number
	Shaft diameter tolerance					Housing bore diameter tolerance					Shaft diameter tolerance					Housing bore diameter tolerance					
	classes K0, K1, K2		class K3	class K4	class K6	classes K0, K1, K2		class K3	class K4	class K6	classes K0, K1, K2		class K3	class K4	class K6	classes K0, K1, K2		class K3	class K4	class K6	
	div. Ⅰ	div. Ⅱ				div. Ⅰ	div. Ⅱ				div. Ⅰ	div. Ⅱ				div. Ⅰ	div. Ⅱ				
010	+10 0		+5 0	+5 0	+4 0	+13 0	+13 0	+8 0	+5 0	+5 0	−10 −20		−5 −10	−5 −10	−4 −8	−13 −25	−13 −25	−8 −15	−5 −10	−5 −10	**010**
015	+13 0		+8 0		+5 0						−13 −25		−8 −15		−5 −10						**015**
020	+15 0		+10 0	+8 0		+15 0		+10 0	+8 0		−15 −30		−10 −20	−8 −15		−15 −30		−10 −20	−8 −15		**020**
025																					**025**
030							+15 0			+8 0							−15 −30			−8 −15	**030**
035	+20 0		+13 0		+6 0						−20 −40		−13 −25		−6 −13						**035**
040																					**040**
042						+20 0		+13 0	+10 0	+10 0						−20 −40		−13 −25	−10 −20	−10 −20	**042**
045																					**045**
047	+25 0		+15 0	+10 0	+8 0						−25 −50		−15 −30	−10 −20	−8 −15						**047**
050																					**050**
055						+25 0		+15 0	+13 0							−25 −50		−15 −30	−13 −25		**055**
060																					**060**
065																					**065**
070						+30 0		+18 0								−30 −60		−18 −35			**070**
075	+30 0		+18 0	+13 0	+10 0						−30 −60		−18 −35	−13 −25	−10 −20						**075**
080																					**080**
090																					**090**
100	+35 0	+35 0	+20 0		+13 0	+35 0	+35 0	+20 0		+13 0	−35 −70	−35 −70	−20 −40		−13 −25	−35 −70	−35 −70	−20 −40		−13 −25	**100**
110																					**110**
120								+23 0	+15 0									−23 −45	−15 −30		**120**
140	+40 0			+15 0		+40 0				+15 0	−48 −80			−15 −30		−40 −80				−15 −30	**140**
160	+45 0	+40 0	+23 0			+45 0	+40 0	+25 0	+18 0		−45 −90	−40 −80	−23 −45			−45 −90	−40 −80	−25 −50	−18 −35		**160**
180																					**180**
200	+50 0	+45 0	+25 0	+18 0		+50 0	+45 0	+30 0	+20 0		−50 −100	−45 −90	−25 −50	−15 −35		−50 −100	−45 −90	−30 −60	−18 −40		**200**
250	+75 0					+75 0					−75 −150					−75 −150					**250**
300																					**300**
350	+100 0	+50 0				+100 0	+50 0				−100 −200	−50 −100				−100 −200	−50 −100				**350**
400																					**400**

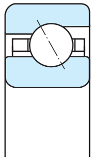
[Notes] Division Ⅰ is for deep groove type ball bearings.
Division Ⅱ is for angular contact type and four-point contact type ball bearings.

K-series super thin section ball bearings open type

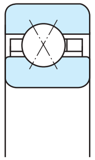
d 25.4 ~ (114.3) mm



Deep groove type



Angular contact type

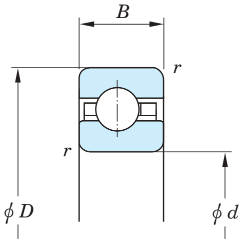


Four-point contact type

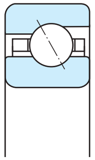
Boundary dimensions (mm)				Deep groove type			Angular contact type					Four-point contact type					(Refer.) Mass (kg)		
d	D	B	r min.	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	C_a	C_{0a}	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	C_a	C_{0a}	Deep groove type	Angular contact type	Four-point contact type
25.4	34.925	4.762	0.4	**KTC010**	2.50	1.95	**KTA010**	2.65	2.20	3.45	6.70	**KTX010**	2.15	1.65	3.70	7.15	0.012	0.011	0.012
38.1	47.625	4.762	0.4	**KTC015**	2.90	2.70	**KTA015**	3.05	3.10	4.00	9.35	**KTX015**	2.50	2.30	4.20	10.5	0.018	0.017	0.018
50.8	63.5	6.35	0.6	**KAC020**	4.50	4.30	**KAA020**	4.75	4.95	6.25	14.9	**KAX020**	3.90	3.70	6.60	16.9	0.045	0.045	0.045
	66.675	7.938	1	**KBC020**	6.35	5.85	**KBA020**	6.75	6.70	8.90	20.4	**KBX020**	5.55	5.00	9.35	22.0	0.073	0.068	0.073
63.5	76.2	6.35	0.6	**KAC025**	4.85	5.20	**KAA025**	5.10	5.95	6.75	18.0	**KAX025**	4.20	4.45	7.05	20.9	0.059	0.054	0.059
	79.375	7.938	1	**KBC025**	6.90	7.00	**KBA025**	7.35	8.15	9.65	24.6	**KBX025**	6.00	6.00	10.0	27.3	0.086	0.086	0.086
76.2	88.9	6.35	0.6	**KAC030**	5.20	6.10	**KAA030**	5.45	7.00	7.15	21.2	**KAX030**	4.50	5.25	7.45	24.9	0.068	0.064	0.068
	92.075	7.938	1	**KBC030**	7.35	8.15	**KBA030**	7.70	9.35	10.2	28.3	**KBX030**	6.35	7.00	10.6	32.5	0.109	0.100	0.109
88.9	101.6	6.35	0.6	**KAC035**	5.45	7.00	**KAA035**	5.75	8.00	7.55	24.3	**KAX035**	4.75	6.00	7.80	29.0	0.082	0.077	0.082
	104.775	7.938	1	**KBC035**	7.75	9.30	**KBA035**	8.20	10.7	10.8	32.5	**KBX035**	6.70	8.00	11.1	37.8	0.122	0.122	0.122
101.6	114.3	6.35	0.6	**KAC040**	5.75	7.85	**KAA040**	6.00	9.05	7.90	27.4	**KAX040**	4.95	6.80	8.10	33.0	0.086	0.086	0.086
	117.475	7.938	1	**KBC040**	8.10	10.5	**KBA040**	8.60	12.1	11.3	36.8	**KBX040**	7.05	9.00	11.6	43.1	0.136	0.136	0.136
	120.65	9.525	1	**KCC040**	10.3	12.4	**KCA040**	11.2	14.9	14.7	45.1	**KCX040**	8.95	10.6	14.8	50.0	0.204	0.200	0.204
	127	12.7	1.5	**KDC040**	15.7	17.2	**KDA040**	16.5	19.7	21.7	59.8	**KDX040**	13.6	14.8	22.6	67.4	0.354	0.363	0.354
	139.7	19.05	2	**KFC040**	28.2	28.1	**KFA040**	30.3	32.9	39.8	99.6	**KFX040**	24.6	24.0	41.0	103	0.862	0.871	0.862
	152.4	25.4	2	**KGC040**	42.6	39.6	**KGA040**	45.2	46.0	59.5	139	**KGX040**	37.3	34.5	62.4	141	1.63	1.64	1.63
107.95	120.65	6.35	0.6	**KAC042**	5.85	8.30	**KAA042**	6.15	9.55	8.10	29.0	**KAX042**	5.10	7.15	8.25	35.0	0.091	0.091	0.091
	123.825	7.938	1	**KBC042**	8.25	10.9	**KBA042**	8.75	12.7	11.5	38.6	**KBX042**	7.15	9.40	11.7	45.2	0.141	0.141	0.141
	127	9.525	1	**KCC042**	10.5	13.0	**KCA042**	11.5	15.8	15.1	47.8	**KCX042**	9.15	11.2	15.0	53.0	0.213	0.209	0.213
	133.35	12.7	1.5	**KDC042**	15.8	17.8	**KDA042**	16.8	20.8	22.1	62.9	**KDX042**	13.7	15.3	22.8	70.2	0.376	0.381	0.376
	146.05	19.05	2	**KFC042**	28.8	29.4	**KFA042**	30.6	34.0	40.3	103	**KFX042**	25.1	25.2	41.8	109	0.907	0.925	0.907
	158.75	25.4	2	**KGC042**	42.2	39.9	**KGA042**	46.2	48.0	60.8	146	**KGX042**	36.9	34.3	61.8	142	1.72	1.74	1.72
114.3	127	6.35	0.6	**KAC045**	6.00	8.75	**KAA045**	6.25	10.1	8.25	30.5	**KAX045**	5.20	7.55	8.40	37.0	0.100	0.095	0.100
	130.175	7.938	1	**KBC045**	8.45	11.6	**KBA045**	8.90	13.3	11.7	40.4	**KBX045**	7.35	10.0	12.0	48.3	0.150	0.154	0.150
	133.35	9.525	1	**KCC045**	10.7	13.7	**KCA045**	11.7	16.6	15.4	50.4	**KCX045**	9.30	11.8	15.3	56.1	0.218	0.222	0.218
	139.7	12.7	1.5	**KDC045**	16.3	19.0	**KDA045**	17.2	21.8	22.6	66.0	**KDX045**	14.2	16.3	23.4	75.5	0.399	0.399	0.399

K-series super thin section ball bearings open type

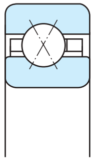
d (114.3) ~ (165.1) mm



Deep groove type



Angular contact type

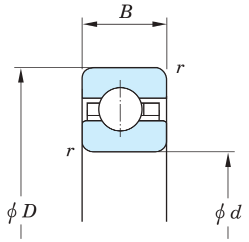


Four-point contact type

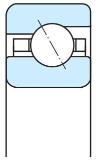
Boundary dimensions (mm)				Deep groove type			Angular contact type					Four-point contact type					(Refer.) Mass (kg)		
d	*D*	*B*	*r* min.	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	C_a	C_{0a}	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	C_a	C_{0a}	Deep groove type	Angular contact type	Four-point contact type
114.3	152.4	19.05	2	**KFC045**	29.4	30.8	**KFA045**	31.7	36.4	41.7	110	**KFX045**	25.6	26.3	42.6	115	0.953	0.971	0.953
	165.1	25.4	2	**KGC045**	43.6	42.7	**KGA045**	47.1	50.1	62.0	152	**KGX045**	38.1	36.4	63.6	152	1.81	1.79	1.81
120.65	133.35	6.35	0.6	**KAC047**	6.10	9.20	**KAA047**	6.40	10.6	8.40	32.1	**KAX047**	5.30	7.95	8.55	39.0	0.104	0.100	0.104
	136.525	7.938	1	**KBC047**	8.55	12.1	**KBA047**	9.10	14.2	12.0	42.9	**KBX047**	7.45	10.4	12.1	50.4	0.154	0.159	0.154
	139.7	9.525	1	**KCC047**	10.9	14.4	**KCA047**	12.0	17.5	15.7	53.0	**KCX047**	9.50	12.4	15.5	59.1	0.227	0.231	0.227
	146.05	12.7	1.5	**KDC047**	16.5	19.6	**KDA047**	17.5	22.8	23.0	69.1	**KDX047**	14.3	16.8	23.6	78.2	0.426	0.422	0.426
	158.75	19.05	2	**KFC047**	29.9	32.1	**KFA047**	32.0	37.5	42.2	114	**KFX047**	26.1	27.5	43.3	121	0.998	1.03	0.998
	171.45	25.4	2	**KGC047**	44.9	45.2	**KGA047**	48.0	52.1	63.1	158	**KGX047**	39.2	38.6	65.4	162	1.86	1.89	1.86
127	139.7	6.35	0.6	**KAC050**	6.20	9.65	**KAA050**	6.50	11.1	8.55	33.6	**KAX050**	5.35	8.35	8.65	41.1	0.109	0.104	0.109
	142.875	7.938	1	**KBC050**	8.80	12.8	**KBA050**	9.25	14.8	12.2	44.7	**KBX050**	7.60	11.0	12.4	53.6	0.172	0.168	0.172
	146.05	9.525	1	**KCC050**	11.1	15.0	**KCA050**	12.2	18.4	16.0	55.7	**KCX050**	9.65	12.9	15.8	62.1	0.263	0.245	0.263
	152.4	12.7	1.5	**KDC050**	16.9	20.8	**KDA050**	17.8	23.8	23.4	72.2	**KDX050**	14.7	17.9	24.2	83.5	0.454	0.445	0.454
	165.1	19.05	2	**KFC050**	30.5	33.4	**KFA050**	32.4	38.6	42.6	117	**KFX050**	26.5	28.7	44.0	127	1.04	1.08	1.04
	177.8	25.4	2	**KGC050**	46.2	47.6	**KGA050**	48.8	54.2	64.3	164	**KGX050**	40.3	40.7	67.1	173	1.95	2.00	1.95
139.7	152.4	6.35	0.6	**KAC055**	6.40	10.5	**KAA055**	6.75	12.1	8.85	36.8	**KAX055**	5.55	9.10	8.90	45.1	0.113	0.113	0.113
	155.575	7.938	1	**KBC055**	9.10	13.9	**KBA055**	9.60	16.2	12.6	49.0	**KBX055**	7.85	12.0	12.7	58.8	0.186	0.181	0.186
	158.75	9.525	1	**KCC055**	11.5	16.4	**KCA055**	12.5	19.8	16.5	60.0	**KCX055**	10.0	14.1	16.2	68.2	0.268	0.263	0.268
	165.1	12.7	1.5	**KDC055**	17.5	22.6	**KDA055**	18.4	25.9	24.2	78.5	**KDX055**	15.2	19.4	24.9	91.6	0.481	0.481	0.481
	177.8	19.05	2	**KFC055**	31.5	36.1	**KFA055**	33.6	42.1	44.3	128	**KFX055**	27.4	31.0	45.3	140	1.13	1.17	1.13
	190.5	25.4	2	**KGC055**	47.0	49.8	**KGA055**	50.5	58.3	66.4	177	**KGX055**	41.0	42.6	68.0	184	2.13	2.15	2.13
152.4	165.1	6.35	0.6	**KAC060**	6.60	11.4	**KAA060**	6.95	13.2	9.15	39.9	**KAX060**	5.75	9.85	9.15	49.1	0.127	0.127	0.127
	168.275	7.938	1	**KBC060**	9.35	15.1	**KBA060**	9.90	17.6	13.0	53.3	**KBX060**	8.10	13.0	13.1	64.1	0.200	0.200	0.200
	171.45	9.525	1	**KCC060**	11.9	17.7	**KCA060**	12.9	21.5	17.0	65.3	**KCX060**	10.3	15.3	16.7	74.2	0.286	0.290	0.286
	177.8	12.7	1.5	**KDC060**	18.0	24.4	**KDA060**	19.0	27.9	24.9	84.7	**KDX060**	15.7	21.0	25.5	99.7	0.526	0.522	0.526
	190.5	19.05	2	**KFC060**	32.5	38.8	**KFA060**	34.8	45.6	45.8	138	**KFX060**	28.2	33.3	46.5	152	1.22	1.23	1.22
	203.2	25.4	2	**KGC060**	49.3	54.7	**KGA060**	52.0	62.4	68.4	189	**KGX060**	42.9	46.8	71.1	205	2.31	2.30	2.31
165.1	177.8	6.35	0.6	**KAC065**	6.80	12.3	**KAA065**	7.15	14.2	9.40	43.0	**KAX065**	5.90	10.6	9.40	53.2	0.136	0.136	0.136
	180.975	7.938	1	**KBC065**	9.65	16.3	**KBA065**	10.1	18.8	13.3	56.9	**KBX065**	8.35	14.0	13.4	69.3	0.213	0.213	0.213

K-series super thin section ball bearings
open type

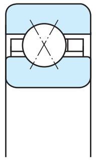
d (165.1) ~ 228.6 mm



Deep groove type



Angular contact type

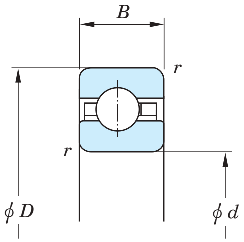


Four-point contact type

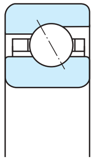
Boundary dimensions (mm)				Deep groove type			Angular contact type					Four-point contact type					(Refer.) Mass (kg)		
				Bearing No.	Basic load ratings (kN)		Bearing No.	Basic load ratings (kN)				Bearing No.	Basic load ratings (kN)						
d	D	B	r min.		C_r	C_{0r}		C_r	C_{0r}	C_a	C_{0a}		C_r	C_{0r}	C_a	C_{0a}	Deep groove type	Angular contact type	Four-point contact type
165.1	184.15	9.525	1	**KCC065**	12.2	19.0	**KCA065**	13.4	23.3	17.6	70.6	**KCX065**	10.6	16.4	17.1	80.3	0.308	0.308	0.308
	190.5	12.7	1.5	**KDC065**	18.6	26.1	**KDA065**	19.5	30.0	25.6	90.9	**KDX065**	16.1	22.5	26.2	108	0.553	0.562	0.553
	203.2	19.05	2	**KFC065**	33.4	41.5	**KFA065**	36.0	49.1	47.3	149	**KFX065**	29.0	35.6	47.7	164	1.32	1.33	1.32
	215.9	25.4	2	**KGC065**	50.0	57.0	**KGA065**	53.5	66.5	70.3	202	**KGX065**	43.5	48.8	71.8	216	2.45	2.45	2.45
177.8	190.5	6.35	0.6	**KAC070**	7.00	13.2	**KAA070**	7.35	15.2	9.65	46.1	**KAX070**	6.05	11.4	9.60	57.2	0.141	0.145	0.141
	193.675	7.938	1	**KBC070**	9.90	17.4	**KBA070**	10.4	20.2	13.7	61.2	**KBX070**	8.55	15.0	13.7	74.6	0.227	0.227	0.227
	196.85	9.525	1	**KCC070**	12.5	20.4	**KCA070**	13.6	24.7	17.9	74.9	**KCX070**	10.9	17.6	17.5	86.3	0.331	0.336	0.331
	203.2	12.7	1.5	**KDC070**	19.0	27.9	**KDA070**	20.0	32.1	26.3	97.2	**KDX070**	16.5	24.0	26.7	116	0.594	0.603	0.594
	215.9	19.05	2	**KFC070**	34.3	44.1	**KFA070**	37.0	52.6	48.7	159	**KFX070**	29.8	37.9	48.7	176	1.45	1.43	1.45
	228.6	25.4	2	**KGC070**	52.1	61.8	**KGA070**	54.8	70.7	72.2	214	**KGX070**	45.3	53.0	74.5	237	2.63	2.66	2.63
190.5	203.2	6.35	0.6	**KAC075**	7.15	14.1	**KAA075**	7.50	16.2	9.90	49.2	**KAX075**	6.20	12.2	9.80	61.3	0.154	0.154	0.154
	206.375	7.938	1	**KBC075**	10.1	18.6	**KBA075**	10.7	21.6	14.1	65.4	**KBX075**	8.80	16.0	14.0	79.8	0.240	0.245	0.240
	209.55	9.525	1	**KCC075**	12.8	21.7	**KCA075**	14.0	26.5	18.4	80.2	**KCX075**	11.1	18.7	17.8	92.4	0.354	0.354	0.354
	215.9	12.7	1.5	**KDC075**	19.5	29.7	**KDA075**	20.5	34.1	27.0	103	**KDX075**	16.9	25.6	27.3	124	0.640	0.644	0.640
	228.6	19.05	2	**KFC075**	35.1	46.8	**KFA075**	37.5	54.8	49.3	166	**KFX075**	30.5	40.2	49.8	188	1.54	1.54	1.54
	241.3	25.4	2	**KGC075**	52.6	64.1	**KGA075**	56.2	74.8	73.9	227	**KGX075**	45.8	55.0	75.2	249	2.77	2.81	2.77
203.2	215.9	6.35	0.6	**KAC080**	7.35	15.0	**KAA080**	7.70	17.3	10.1	52.3	**KAX080**	6.35	13.0	10.0	65.3	0.172	0.163	0.172
	219.075	7.938	1	**KBC080**	10.4	19.7	**KBA080**	11.0	23.0	14.4	69.7	**KBX080**	9.00	17.0	14.3	85.1	0.259	0.259	0.259
	222.25	9.525	1	**KCC080**	13.1	23.1	**KCA080**	14.4	28.2	18.9	85.5	**KCX080**	11.4	19.9	18.2	98.5	0.381	0.381	0.381
	228.6	12.7	1.5	**KDC080**	20.0	31.5	**KDA080**	21.0	36.2	27.6	110	**KDX080**	17.3	27.1	27.9	132	0.694	0.689	0.694
	241.3	19.05	2	**KFC080**	35.9	49.5	**KFA080**	38.5	58.3	50.6	177	**KFX080**	31.2	42.5	50.7	200	1.59	1.64	1.59
	254	25.4	2	**KGC080**	54.5	69.0	**KGA080**	57.4	78.9	75.5	239	**KGX080**	47.4	59.2	77.6	270	2.95	2.97	2.95
228.6	241.3	6.35	0.6	**KAC090**	7.65	16.8	**KAA090**	8.00	19.3	10.5	58.6	**KAX090**	6.60	14.5	10.4	73.4	0.200	0.186	0.200
	244.475	7.938	1	**KBC090**	10.8	22.1	**KBA090**	11.4	25.6	15.0	77.6	**KBX090**	9.35	19.1	14.8	95.6	0.299	0.290	0.299
	247.65	9.525	1	**KCC090**	13.7	25.7	**KCA090**	14.9	31.4	19.6	95.1	**KCX090**	11.9	22.2	18.9	111	0.426	0.445	0.426
	254	12.7	1.5	**KDC090**	20.8	35.0	**KDA090**	21.8	40.3	28.7	122	**KDX090**	18.0	30.2	28.9	148	0.780	0.767	0.780
	266.7	19.05	2	**KFC090**	37.4	54.8	**KFA090**	40.3	65.3	53.1	198	**KFX090**	32.5	47.2	52.6	224	1.77	1.79	1.77
	279.4	25.4	2	**KGC090**	56.8	76.1	**KGA090**	59.8	87.1	78.7	264	**KGX090**	49.4	65.3	80.5	302	3.27	3.27	3.27

K-series super thin section ball bearings open type

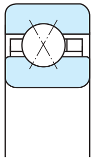
d **254 ~ 406.4 mm**



Deep groove type



Angular contact type

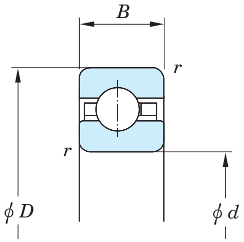


Four-point contact type

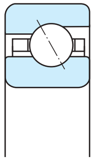
Boundary dimensions (mm)				Deep groove type	Basic load ratings (kN)		Angular contact type	Basic load ratings (kN)				Four-point contact type	Basic load ratings (kN)				(Refer.) Mass (kg)		
d	*D*	*B*	*r* min.	Bearing No.	C_r	C_{0r}	Bearing No.	C_r	C_{0r}	C_a	C_{0a}	Bearing No.	C_r	C_{0r}	C_a	C_{0a}	Deep groove type	Angular contact type	Four-point contact type
254	266.7	6.35	0.6	**KAC100**	7.95	18.6	**KAA100**	8.30	21.4	11.0	64.8	**KAX100**	6.85	16.0	10.7	81.4	0.227	0.204	0.227
	269.875	7.938	1	**KBC100**	11.2	24.4	**KBA100**	11.9	28.4	15.6	86.1	**KBX100**	9.75	21.1	15.3	106	0.331	0.322	0.331
	273.05	9.525	1	**KCC100**	14.2	28.4	**KCA100**	15.6	34.9	20.5	106	**KCX100**	12.3	24.5	19.5	123	0.481	0.472	0.481
	279.4	12.7	1.5	**KDC100**	21.6	38.6	**KDA100**	22.7	44.4	29.8	135	**KDX100**	18.7	33.3	29.8	164	0.853	0.848	0.853
	292.1	19.05	2	**KFC100**	38.8	60.2	**KFA100**	41.6	71.1	54.7	215	**KFX100**	33.7	51.8	54.3	249	1.95	2.00	1.95
	304.8	25.4	2	**KGC100**	59.0	83.2	**KGA100**	62.0	95.3	81.6	289	**KGX100**	51.2	71.5	83.1	334	3.58	3.63	3.58
279.4	292.1	6.35	0.6	**KAC110**	8.20	20.3	**KAA110**	8.60	23.4	11.3	71.0	**KAX110**	7.10	17.6	11.1	89.5	0.236	0.227	0.236
	295.275	7.938	1	**KBC110**	11.6	26.7	**KBA110**	12.3	31.0	16.1	94.0	**KBX110**	10.1	23.1	15.7	117	0.340	0.354	0.340
	298.45	9.525	1	**KCC110**	14.7	31.1	**KCA110**	16.1	38.0	21.1	115	**KCX110**	12.7	26.8	20.1	135	0.526	0.517	0.526
	304.8	12.7	1.5	**KDC110**	22.3	42.2	**KDA110**	23.4	48.5	30.8	147	**KDX110**	19.3	36.4	30.7	180	0.934	0.930	0.934
	317.5	19.05	2	**KFC110**	40.2	65.5	**KFA110**	43.2	78.0	56.9	236	**KFX110**	34.8	56.4	55.9	273	2.18	2.15	2.18
	330.2	25.4	2	**KGC110**	61.0	90.3	**KGA110**	64.1	104	84.3	314	**KGX110**	52.9	77.7	85.5	366	3.90	3.94	3.90
304.8	317.5	6.35	0.6	**KAC120**	8.45	22.1	**KAA120**	8.90	25.5	11.7	77.3	**KAX120**	7.35	19.1	11.4	97.6	0.254	0.245	0.254
	320.675	7.938	1	**KBC120**	12.0	29.0	**KBA120**	12.7	33.8	16.7	103	**KBX120**	10.4	25.1	16.2	127	0.376	0.386	0.376
	323.85	9.525	1	**KCC120**	15.2	33.8	**KCA120**	16.5	41.2	21.8	125	**KCX120**	13.1	29.2	20.6	147	0.567	0.558	0.567
	330.2	12.7	1.5	**KDC120**	23.0	45.7	**KDA120**	24.2	52.6	31.8	160	**KDX120**	20.0	39.5	31.5	197	1.02	1.01	1.02
	342.9	19.05	2	**KFC120**	41.4	70.9	**KFA120**	44.3	83.8	58.3	254	**KFX120**	35.9	61.1	57.4	297	2.36	2.36	2.36
	355.6	25.4	2	**KGC120**	62.9	97.5	**KGA120**	66.0	112	86.9	339	**KGX120**	54.5	83.9	87.8	399	4.22	4.30	4.22
355.6	371.475	7.938	1	**KBC140**	12.7	33.7	**KBA140**	13.4	39.1	17.6	118	**KBX140**	11.0	29.1	17.0	148	0.476	0.445	0.476
	374.65	9.525	1	**KCC140**	16.0	39.1	**KCA140**	17.5	47.9	23.0	145	**KCX140**	13.9	33.8	21.6	171	0.689	0.649	0.689
	381	12.7	1.5	**KDC140**	24.3	52.9	**KDA140**	25.5	60.9	33.6	184	**KDX140**	21.1	45.7	33.1	229	1.24	1.17	1.24
	393.7	19.05	2	**KFC140**	43.7	81.5	**KFA140**	46.8	96.5	61.6	293	**KFX140**	37.9	70.3	60.2	345	2.72	2.61	2.72
	406.4	25.4	2	**KGC140**	66.3	112	**KGA140**	69.7	128	91.7	389	**KGX140**	57.5	96.2	92.0	463	4.90	4.94	4.90
406.4	422.275	7.938	1	**KBC160**	13.3	38.3	**KBA160**	14.0	44.5	18.4	135	**KBX160**	11.5	33.1	17.7	169	0.544	0.508	0.544
	425.45	9.525	1	**KCC160**	16.8	44.4	**KCA160**	18.4	54.5	24.2	165	**KCX160**	14.6	38.4	22.6	195	0.785	0.739	0.785
	431.8	12.7	1.5	**KDC160**	25.5	60.0	**KDA160**	26.8	69.1	35.2	209	**KDX160**	22.1	51.8	34.5	261	1.41	1.33	1.41
	444.5	19.05	2	**KFC160**	45.8	92.2	**KFA160**	49.0	109	64.5	331	**KFX160**	39.7	79.6	62.7	394	3.22	3.08	3.22
	457.2	25.4	2	**KGC160**	69.5	126	**KGA160**	73.0	145	96.0	439	**KGX160**	60.3	109	95.9	528	5.58	5.62	5.58

K-series super thin section ball bearings open type

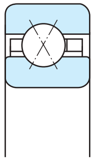
d 457.2 ~ 1 016 mm



Deep groove type



Angular contact type

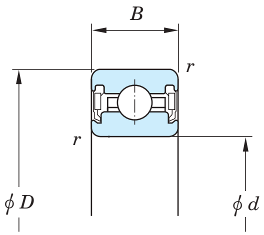


Four-point contact type

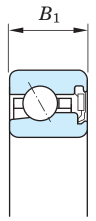
Boundary dimensions (mm)				Deep groove type			Angular contact type					Four-point contact type					(Refer.) Mass (kg)		
					Basic load ratings (kN)			Basic load ratings (kN)					Basic load ratings (kN)						
d	D	B	r min.	Bearing No.	C_r	C_{0r}	Bearing No.	C_r	C_{0r}	C_a	C_{0a}	Bearing No.	C_r	C_{0r}	C_a	C_{0a}	Deep groove type	Angular contact type	Four-point contact type
457.2	473.075	7.938	1	**KBC180**	13.9	42.9	**KBA180**	14.6	49.9	19.2	151	**KBX180**	12.0	37.1	18.4	190	0.612	0.572	0.612
	476.25	9.525	1	**KCC180**	17.5	49.8	**KCA180**	19.2	61.2	25.3	185	**KCX180**	15.2	43.0	23.4	220	0.880	0.830	0.880
	482.6	12.7	1.5	**KDC180**	26.6	67.1	**KDA180**	27.6	77.3	36.3	234	**KDX180**	23.0	58.0	35.8	293	1.58	1.49	1.58
	495.3	19.05	2	**KFC180**	47.8	103	**KFA180**	51.5	123	67.7	373	**KFX180**	41.4	88.8	65.0	442	3.58	3.48	3.58
	508	25.4	2	**KGC180**	72.5	140	**KGA180**	76.0	161	100	488	**KGX180**	62.8	121	99.4	592	6.21	6.26	6.21
508	523.875	7.938	1	**KBC200**	14.4	47.6	**KBA200**	15.2	55.3	20.0	168	**KBX200**	12.5	41.2	19.0	211	0.680	0.635	0.680
	527.05	9.525	1	**KCC200**	18.2	55.1	**KCA200**	19.9	67.5	26.2	205	**KCX200**	15.8	47.7	24.2	244	0.980	0.921	0.980
	533.4	12.7	1.5	**KDC200**	27.6	74.3	**KDA200**	29.0	85.6	38.1	259	**KDX200**	23.9	64.2	37.0	326	1.75	1.66	1.75
	546.1	19.05	2	**KFC200**	49.6	114	**KFA200**	53.4	136	70.3	412	**KFX200**	43.0	98.1	67.2	491	4.04	3.84	4.04
	558.8	25.4	2	**KGC200**	75.2	154	**KGA200**	78.9	178	104	538	**KGX200**	65.2	133	103	657	8.53	6.89	8.53
635	654.05	9.525	1	**KCC250**	19.7	68.5	**KCA250**	21.6	84.0	28.4	255	**KCX250**	17.1	59.2	26.0	304	1.22	1.14	1.22
	660.4	12.7	1.5	**KDC250**	29.9	92.1	**KDA250**	31.4	106	41.3	322	**KDX250**	25.9	79.6	39.7	407	2.17	2.06	2.17
	673.1	19.05	2	**KFC250**	53.7	140	**KFA250**	57.6	167	75.8	506	**KFX250**	46.5	121	72.0	612	4.94	4.76	4.94
	685.8	25.4	2	**KGC250**	81.4	190	**KGA250**	85.4	219	112	663	**KGX250**	70.5	164	110	819	8.85	8.53	8.85
762	781.05	9.525	1	**KCC300**	21.1	81.9	**KCA300**	23.1	101	30.3	305	**KCX300**	18.3	70.8	27.6	365	1.46	1.37	1.46
	787.4	12.7	1.5	**KDC300**	32.0	110	**KDA300**	33.5	127	44.1	384	**KDX300**	27.7	95.0	42.1	487	2.60	2.47	2.60
	800.1	19.05	2	**KFC300**	57.3	167	**KFA300**	61.6	200	81.0	605	**KFX300**	49.6	144	76.3	733	5.90	5.67	5.90
	812.8	25.4	2	**KGC300**	86.8	226	**KGA300**	91.1	260	120	788	**KGX300**	75.2	195	116	980	10.6	10.2	10.6
889	927.1	19.05	2	**KFC350**	60.6	194	**KFA350**	65.2	232	85.8	703	**KFX350**	52.5	168	80.1	854	6.85	6.62	6.85
	939.8	25.4	2	**KGC350**	91.7	261	**KGA350**	96.2	301	127	912	**KGX350**	79.4	226	122	1 140	12.3	11.9	12.3
1 016	1 054.1	19.05	2	**KFC400**	63.5	221	**KFA400**	68.4	264	90.0	801	**KFX400**	55.0	191	83.6	975	7.80	7.53	7.80
	1 066.8	25.4	2	**KGC400**	96.2	297	**KGA400**	101	342	133	1 040	**KGX400**	83.3	257	128	1 300	14.0	13.5	14.0

K-series super thin section ball bearings sealed type

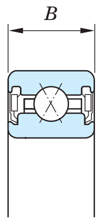
d 101.6 ~ 304.8 mm



Deep groove type
U size
(With seals)



Angular contact type
J size
(With seal)



Four-point contact type
U size
(With seals)

Boundary dimensions (mm) d	D	B	B_1	r min.	Deep groove type Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Angular contact type Bearing No.	Basic load ratings (kN) C_r	C_{0r}	C_a	C_{0a}	Four-point contact type Bearing No.	Basic load ratings (kN) C_r	C_{0r}	C_a	C_{0a}	(Refer.) Mass (kg) Deep groove type	Angular contact type	Four-point contact type
101.6	120.65	12.7	11.1	0.4	**KUC040 2RD**	10.3	12.4	**KJA040 RD**	11.2	14.9	14.7	45.1	**KUX040 2RD**	8.95	10.6	14.8	50.0	0.249	0.222	0.249
107.95	127	12.7	11.1	0.4	**KUC042 2RD**	10.5	13.0	**KJA042 RD**	11.5	15.8	15.1	47.8	**KUX042 2RD**	9.15	11.2	15.0	53.0	0.263	0.236	0.263
114.3	133.35	12.7	11.1	0.4	**KUC045 2RD**	10.7	13.7	**KJA045 RD**	11.7	16.6	15.4	50.4	**KUX045 2RD**	9.30	11.8	15.3	56.1	0.277	0.254	0.277
120.65	139.7	12.7	11.1	0.4	**KUC047 2RD**	10.9	14.4	**KJA047 RD**	12.0	17.5	15.7	53.0	**KUX047 2RD**	9.50	12.4	15.5	59.1	0.295	0.268	0.295
127	146.05	12.7	11.1	0.4	**KUC050 2RD**	11.1	15.0	**KJA050 RD**	12.2	18.4	16.0	55.7	**KUX050 2RD**	9.65	12.9	15.8	62.1	0.308	0.281	0.308
139.7	158.75	12.7	11.1	0.4	**KUC055 2RD**	11.5	16.4	**KJA055 RD**	12.5	19.8	16.5	60.0	**KUX055 2RD**	10.0	14.1	16.2	68.2	0.336	0.304	0.336
152.4	171.45	12.7	11.1	0.4	**KUC060 2RD**	11.9	17.7	**KJA060 RD**	12.9	21.5	17.0	65.3	**KUX060 2RD**	10.3	15.3	16.7	74.2	0.367	0.331	0.367
165.1	184.15	12.7	11.1	0.4	**KUC065 2RD**	12.2	19.0	**KJA065 RD**	13.4	23.3	17.6	70.6	**KUX065 2RD**	10.6	16.4	17.1	80.3	0.395	0.354	0.395
177.8	196.85	12.7	11.1	0.4	**KUC070 2RD**	12.5	20.4	**KJA070 RD**	13.6	24.7	17.9	74.9	**KUX070 2RD**	10.9	17.6	17.5	86.3	0.422	0.381	0.422
190.5	209.55	12.7	11.1	0.4	**KUC075 2RD**	12.8	21.7	**KJA075 RD**	14.0	26.5	18.4	80.2	**KUX075 2RD**	11.1	18.7	17.8	92.4	0.449	0.404	0.449
203.2	222.25	12.7	11.1	0.4	**KUC080 2RD**	13.1	23.1	**KJA080 RD**	14.4	28.2	18.9	85.5	**KUX080 2RD**	11.4	19.9	18.2	98.5	0.481	0.431	0.481
228.6	247.65	12.7	11.1	0.4	**KUC090 2RD**	13.7	25.7	**KJA090 RD**	14.9	31.4	19.6	95.1	**KUX090 2RD**	11.9	22.2	18.9	111	0.535	0.499	0.535
254	273.05	12.7	11.1	0.4	**KUC100 2RD**	14.2	28.4	**KJA100 RD**	15.6	34.9	20.5	106	**KUX100 2RD**	12.3	24.5	19.5	123	0.594	0.531	0.594
279.4	298.45	12.7	11.1	0.4	**KUC110 2RD**	14.7	31.1	**KJA110 RD**	16.1	38.0	21.1	115	**KUX110 2RD**	12.7	26.8	20.1	135	0.649	0.581	0.649
304.8	323.85	12.7	11.1	0.4	**KUC120 2RD**	15.2	33.8	**KJA120 RD**	16.5	41.2	21.8	125	**KUX120 2RD**	13.1	29.2	20.6	147	0.708	0.630	0.708

Bearings for railway rolling stock axle journals

Bearings used to support rolling stock axle journals are required to be very strong and, at the same time, to be small because of limited space.

Double-row bearings that are larger in width than general bearings are popular in that they are compact and have high load ratings.

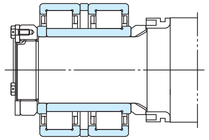
■ Cylindrical roller bearings

- Feature good high-speed performance, and can be maintained and inspected easily because of their separable structure.
  Most commonly used bearing.
- Those with a rib next to the inner ring are able to support not only radial load but also a certain degree of axial load, so that a ball bearing is not required to accommodate the axial load.

■ Sealed type cylindrical roller bearing units and tapered roller bearing units

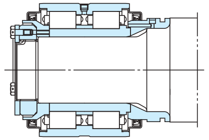
- Maintenance-free : pre-lubricated with grease and provided with oil seals.
- Can be used with a simplified axle box, or with an adapter instead.
- The inch series axle bearing units (ABU) are as specified in the "association of american rail-roads".

Cylindrical roller bearings



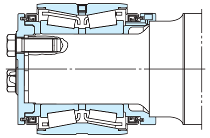
Bore diameter **85 – 133** mm

Sealed type cylindrical roller bearing units



Bore diameter **95 – 120** mm

Sealed type tapered roller bearing units(ABU)



Bore diameter **101.600 – 177.787** mm

Tolerances	● Cylindrical roller and axial load support ball bearings : as specified in JIS B 1514-1, class 0 (Table 7-3 on pp. A 60–A 63). (The tolerances for cylindrical roller bearing width and overall width are as shown in Table 1.) ● Metric series ABU bearings: refer to Table 2. ● Inch series ABU bearings : refer to Table 3.
Recommended fits	Refer to Table 4.
Radial internal clearance	● Cylindrical roller bearings : class C 3 UIC* standard cylindrical roller bearings : class C 4 (refer to Table 10-8 on p. A 106.) ● Axial load support ball bearings : class C 5 However, the clearance class should be adjusted according to the axle box structure. Consult with JTEKT for further information. ● ABU bearings : class C 3 (refer to Table 10-10 on p. A 110) *Denotes that the bearings are compatible with axle journals and axle boxes standardized by the UIC.

Table 1 Cylindrical roller bearings for axle journals : tolerances for inner ring width, outer ring width and overall width

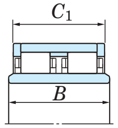
(1) Tolerances for inner ring width and inner ring overall width Unit : µm

Bearing type	Design	Nominal bore diameter d (mm)		Δ_{Bs} or Δ_{B1s}	
		over	up to	upper	lower
Inner ring one-piece type, Inner ring with a rib and loose rib	1-1, 1-2 2-1, 2-3	80	120	0	– 400
		120	180	0	– 500
Two inner rings and spacer	2-2	80	120	0	– 600
		120	180	0	– 700

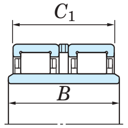
(2) Tolerances for outer ring width and outer ring overall width Unit : µm

Bearing type	Design	Nominal bore diameter d (mm)		Δ_{Cs} or Δ_{C1s}	
		over	up to	upper	lower
Outer ring one-piece type	2-3	80	120	0	– 300
		120	180	0	– 350
Outer ring and two loose ribs	1-1	80	120	+ 100	– 200
		120	180	+ 100	– 250
Two outer rings	2-1[1]	120	180	0	– 500
Two outer rings and spacer	1-2 2-1, 2-2	80	120	0	– 500
		120	180	0	– 600

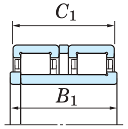
[Note] 1) (2-1) means that spacer shown in Design 2-1 is removed.



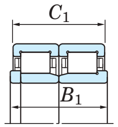
1-1



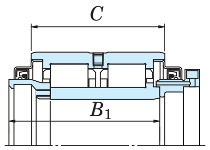
1-2



2-1



2-2



2-3

Table 2 Metric series ABU bearing tolerances

Unit : µm

Nominal bore diameter d (mm)	Single plane mean bore diameter deviation Δ_{dmp}		Single plane mean outside diameter deviation Δ_{Dmp}		Single outer ring width deviation Δ_{Cs}		Actual overall width of inner rings deviation Δ_{B1s}	
	upper	lower	upper	lower	upper	lower	upper	lower
110	0	– 20	0	– 125	+ 50	– 50	+ 500	– 500
120	0	– 20			+ 100	– 100		
130	0	– 25			+ 100	– 100		

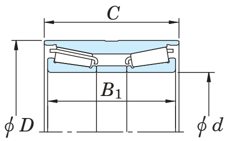


Table 3 Inch series ABU bearing tolerances

Unit : µm

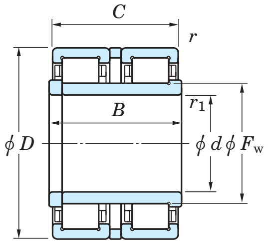
Nominal bore diameter d (mm)	Single plane mean bore diameter deviation Δ_{dmp}		Single plane mean outside diameter deviation Δ_{Dmp}		Single outer ring width deviation Δ_{Cs}		Actual overall width of inner rings deviation Δ_{B1s}	
	upper	lower	upper	lower	upper	lower	upper	lower
101.6to177.8	+ 25	0	+ 127	0	+ 50	– 250	+ 710	– 510

Table 4 Axle journal bearing recommended fits

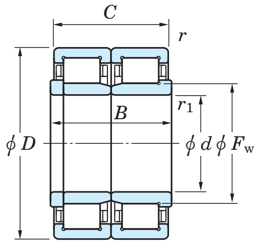
Bearing type	Axle journal diameter (mm)		Axle journal tolerance class	Axle box bore tolerance class
	over	up to		
Cylindrical roller bearing Tapered roller bearing	50	100	(m 6), n 6	H 7
	100	140	n 6	
	140	240	p 6	
Axial load support deep groove ball bearing	All diameters		k 5	Clearance fit (clearance of approx. 0.2 to 0.6 mm)

Cylindrical roller bearings for railway rolling stock axle journals

d 85 ~ (120) mm



Design 1

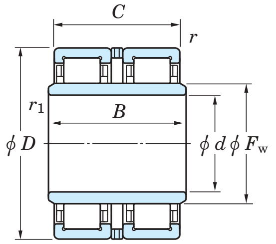


Design 2

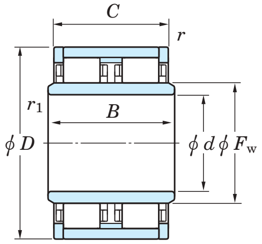
Boundary dimensions (mm)							Basic load ratings (kN)		Bearing No.2)	Design3)	(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 1) min.	C_r	C_{0r}			
85	150	130	120	101.5	1.1	(7)	369	592	**2U2217SC**	3	8.6
90	160	88	80	107	2	2	355	529	**2CR90D**	1	7.2
95	170	120	105	114	1.1	(10)	497	804	**2UJ95**	4	10.9
	170	125	115	113.5	2.5	(7)	441	687	**2CR95A**	1	11.5
	170	130	130	114	2	2	441	688	**2UJ1917**	3	11.4
	170	140	125	114	1.1	(10)	555	926	**4UJ95**	5	12.7
100	180	150	134	120	1.1	(10)	594	990	**4UJ100**	5	15.1
	190	140	130	122	2.5	(7)	697	1 120	**20DC19130/140**	3	16.9
	200	170	170	125	2	(7)	755	1 160	**2CR100**	1	23.7
	200	170	170	125	2	(10)	755	1 160	**20DC20170**	3	23.2
110	200	180	160	134	1.1	(7)	721	1 190	**JC3**	5	22.6
	220	180	160	138	2.5	(7)	789	1 190	**JC6**	1	30.0
	220	185	180	138	2	(7)	922	1 460	**2CR110**	1	31.3
	225	150	140	138	1.1	(7)	833	1 230	**JC1A**	4	27.7
	225	150	140	138	2.5	(7)	897	1 350	**22DC23140/150**	3	26.7
	235	180	160	141	2.5	(7)	934	1 430	**JC2A**	3	35.3
116	220	185	180	142	2	(7)	891	1 470	**2CR116**	1	30.5
	225	150	140	197.5	1.1	(7)	786	1 220	**2UJ116**	4	26.0
120	225	170	165	145	3	(10)	876	1 380	**JC35**	1	29.4
	230	170	165	145	3	(10)	943	1 460	**JC34**	1	30.8
	230	177	150	145	3	(30)	943	1 460	**JC27X**	(1)	29.7
	240	160	160	150	3	7.5	961	1 500	**(24NJ/NJP2480)**	2	33.9
	240	180	160	150	1.1	(10)	1 020	1 580	**JC11**	4	35.5
	240	180	176	150	3	(7)	1 020	1 580	**JC12**	1	37.7

[Notes]
1) Values in ( ) indicate axial chamfer dimension.
2) Bearings indicated in ( ) are in accordance with UIC standards.
3) (1) means that the inner ring (rib side) shown in Design 1 has a special form.
(2) means that loose rib shown in Design 2 is replaced with thrust collar.

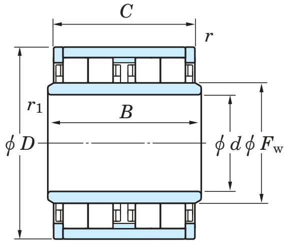
d (120) ~ 133 mm



Design 3



Design 4

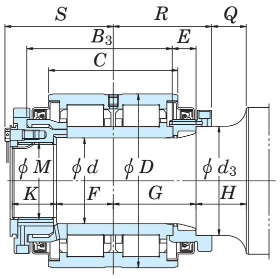


Design 5

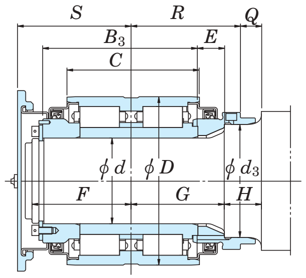
Boundary dimensions (mm)							Basic load ratings (kN)		Bearing No.2)	Design3)	(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 1) min.	C_r	C_{0r}			
120	240	185	180	150	2	(7)	983	1 600	**2CR120A**	1	37.8
130	220	170	160	152	1.1	0.6	865	1 520	**4UJ130B**	5	25.2
	240	160	160	157	3	5	867	1 390	**(2CR2624A)**	2	32.0
	240	180	160	158	1.1	(10)	970	1 610	**4UJ130A**	5	35.8
	240	204	198	157	3	5	867	1 390	**(2CR2624)**	2	35.4
	250	160	160	158	3	7.5	1 090	1 720	**(26NJ/NJP2580)**	2	36.4
	260	180	160	163	1.1	(10)	1 080	1 710	**JC5**	4	42.7
	260	185	180	163	3	(7)	1 030	1 610	**2CR130A**	1	44.2
	260	186	172	164	3	7.5	1 220	1 930	**26NJ/NUJ2686**	(2)	44.6
	260	205.5	180	163	3	(30)	1 030	1 610	**JC21**	(1)	45.1
	270	215	210	164	4	(15)	1 280	2 000	**JC29**	3	55.1
	280	215	210	167	4	(15)	1 440	2 250	**JC9-1**	3	61.4
133	280	215	210	167	4	(15)	1 440	2 250	**JC9-2**	3	59.8

Sealed type cylindrical roller bearings for railway rolling stock axle journals

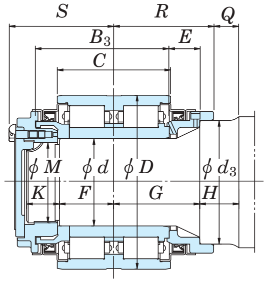
d 95 ~ 120 mm



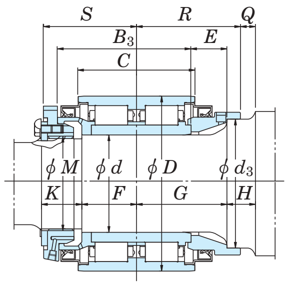
Design 1



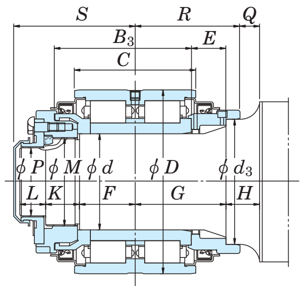
Design 2



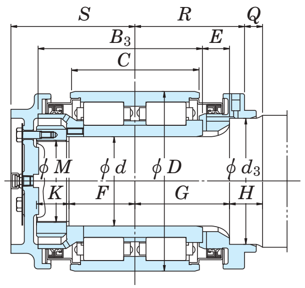
Design 3



Design 4

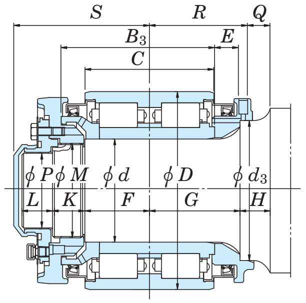


Design 5

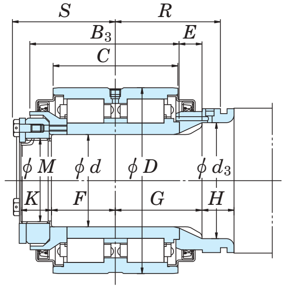


Design 6

Shaft dia. (mm)	Unit No.	Design	Boundary dimensions (mm)																Bearing No.	Basic load ratings (kN)		(Refer.) Unit Mass (kg)
d			d Brg.	D	C	B_3	d_3	E	F	G	H	K	L	M	P	Q	R	S		C_r	C_{0r}	
95	**JB1425**	1	95	190	140	158	120	25	62	90	35	48	—	M85×4	—	18	107	119	**19RDC19140/158**	610	910	24.5
100	**JB1199B**	2	100	195	150	175	130	30	120	105	42	—	—	—	—	24	123	130	**20RDC20150/133B**	673	1 040	27.5
110	**JB1462**	3	110	220	145	171	155	39	70	110	50	42	—	M100×2	—	33	127	134	**S-JC33**	789	1 190	35.9
120	**JB1356**	4	120	220	150	170	158	46	70	116	36	51	—	M115×4	—	19	133	131	**24RDC22150/170**	702	1 110	34.9
	JB1380D	5	120	230	150	171	155	43	70	113	42	42	33	M110×2	85	25	130	152	**JC32**	831	1 290	39.0
	JB1010	6	120	240	170	218	168	35	87	125	45	43	—	M110×2	—	25	145	164	**JC17**	1 020	1 580	57.7
	JB1240	7	120	240	160	193	168	31	80	113	38	40	38	M110×2	85	27	128	169	**JC26**	935	1 420	51.1
	JB1377	8	120	240	160	192	150	30	83	112	40	38	—	M110×4	—	—	135	131	**24RDC24160/192A**	935	1 420	42.0



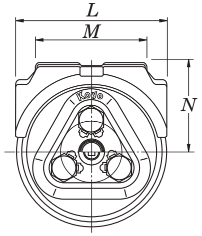
Design 7

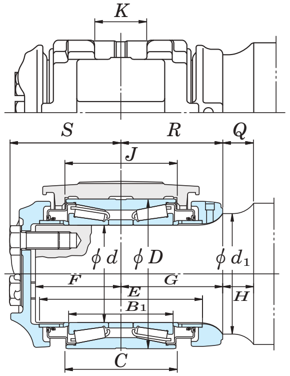


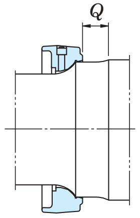
Design 8

Sealed type tapered roller bearings for railway rolling stock axle journals (ABU bearing)

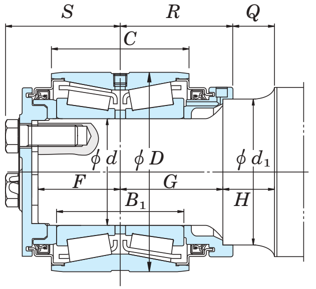
d 101.6 ~ 177.787 mm
110 ~ 130 mm



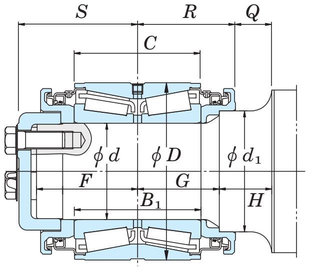




The shape of the backing ring used for JB1204P, JB1205P and JB1206P.



JB1486



JB1450

Dynamic equivalent load
(when $F_a/F_r \leqq e$)
$P=F_r+Y_2F_a$
(when $F_a/F_r>e$)
$P=0.67F_r+Y_3F_a$
Static equivalent load
$P_0=F_r+Y_0F_a$

Class	Axle size	Unit No.	Boundary dimensions (mm)														Adapter No.	Dimensions of adapter (mm)					Bolt size	Dimensions (mm)	Bearing No.	Basic load ratings (kN)		Constant	Axial load factors			(Refer.) Mass (kg)	
			d Brg.	d Axle[1]	D	B_1	C	d_1[1]	E	F	G	H	Q	R	S		J	K	L	M	N		p		C_r	C_{0r}	e	Y_2	Y_3	Y_0	Unit	Adapter
B	4 1/4×8	JB1201	101.600	101.702 101.676	165.100	106.362	114.300	127.0	182.6	101.6	117.5	41.3	41.3	117.5	134.8	JB701	117.5	68.3	165.9	124.6	101.6	3/4-10 UNC	61.9	HM120848/ HM120817XD	402	769	0.26	2.55	3.80	2.50	17.3	3.8
C	5 ×9	JB1202	119.062	119.164 119.139	195.262	136.525	142.875	149.2	217.5	112.7	134.9	36.5	36.5	134.9	147.0	JB702	146.0	74.6	196.1	143.7	117.5	7/8-9 UNC	76.2	HM124646/ HM124618XD	626	1 200	0.26	2.55	3.80	2.50	25.3	6.1
D	5 1/2×10	JB1203	131.750	131.864 131.839	207.962	146.050	152.400	161.9	227.0	115.9	139.7	44.5	44.5	139.7	150.5	JB703	155.6	74.6	208.8	156.4	123.8	7/8-9 UNC	88.9	HM127446/ HM127415XD	641	1 270	0.26	2.55	3.80	2.50	28.3	7.4
E	6 ×11	JB1204	144.450	144.564 144.539	220.662	155.575	163.512	177.8	241.3	127.0	150.8	46.0	46.0	150.8	164.1	JB704	166.7	96.8	221.5	181.8	136.5	1-8 UNC	98.4	HM129848/ HM129814XD	667	1 380	0.26	2.55	3.80	2.50	34.3	10.8
		JB1204P	144.450	144.564 144.539	220.662	155.575	163.512	178.613 178.562	241.3	127.0	150.8	46.0	36.8	160.0	164.1	JB704	166.7	96.8	221.5	181.8	136.5	1-8 UNC	98.4	HM129848/ HM129814XD	667	1 380	0.26	2.55	3.80	2.50	35.0	10.8
F	6 1/2×12	JB1205	157.150	157.264 157.239	252.412	177.800	184.150	190.5	273.0	134.9	163.5	46.0	46.0	163.5	176.6	JB705	187.3	96.8	253.2	194.5	152.4	1 1/8-7 UNC	108.0	HM133444/ HM133416XD	910	1 890	0.26	2.55	3.80	2.50	51.6	16.3
		JB1205P	157.150	157.264 157.239	252.412	177.800	184.150	191.313 191.262	273.0	134.9	163.5	46.0	36.7	172.8	176.6	JB705	187.3	96.8	253.2	194.5	152.4	1 1/8-7 UNC	108.0	HM133444/ HM133416XD	910	1 890	0.26	2.55	3.80	2.50	52.4	16.3
G	7 ×12	JB1206P	177.787	177.902 177.876	276.225	180.975	185.738	203.251 203.200	269.9	130.2	150.8	58.7	46.0	163.5	180.1	JB706[2]	189.7	181.0	—	279.4	168.3	1 1/4-7 UNC	117.5	HM136948/ HM136916XD	1 080	2 220	0.26	2.55	3.80	2.50	59.2	23

—	110	JB558	110	110.076 110.054	175	125	130	155	206	105	135	30	30	135	136.4	JB558	134	70	175	135	110	M22	75	JT9	481	972	0.26	2.55	3.80	2.50	22.0	5.6
—		JB1486	110	110.059 110.037	205	130	140	150.068 150.043	—	85	105	53	43	115	118.4	—	—	—	—	—	—	M22	75	JT13	743	1 220	0.26	2.55	3.80	2.50	27.3	—
—	120	JB613	120	120.076 120.054	195	136	142	155	217	113	135	30	30	135	147.5	JB613	146	74.5	196	142.5	118	M22	75	JT10	626	1 200	0.26	2.55	3.80	2.50	27.0	6.2
—		JB1450	120	120.059 120.037	220	155	155	150.068 150.043	—	125	100	55	35	120	164.4	—	—	—	—	—	—	M22	75	JT12	907	1 670	0.26	2.55	3.80	2.50	36.6	—
—	130	JB633	130	130.076 130.054	208	146	152	165	227	139	139	26	26	139	149.2	JB633[2]	156	110	255	232	130	M22	89	JT11	641	1 270	0.26	2.55	3.80	2.50	30.0	14.3

[Notes] 1) Upper figures : max. value ; lower : min.value

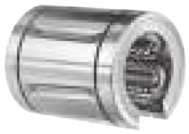
2) JB706 and JB633 indicate the specifications of wide adapters. Others indicate narrow adapters (shown in figures above).

Linear ball bearings

Linear ball bearings have an outer cylinder and a cage with three or more elliptic raceways inside.

Balls are aligned on these raceways.

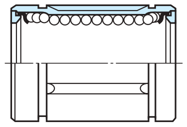
	Ball complement bore diameter (mm)
SDM series	6 –120
SDMF, SDMK series	6 – 80
SDE series	5 – 80

Standard type	Clearance adjustable type	Open type
		
Suitable for a wide range of applications and widely used in practice. The upper-class type is used for general purposes. The precision-class type is used when the bearing is required to be highly accurate.	The outer cylinder and side plate are slit axially so that the clearance between the bearing and shaft can be adjusted. Together with the use of a boreadjustable housing, a no-clearance state or light-preloaded state can be realized without fitting.	The outer cylinder and side plate each have a slit which is equivalent in size to a recirculating ball row raceway, so that the bearing does not interfere with a shaft strut during operation. This type is suitable for use with very long shafts. The bore diameter is adjustable.

Flanged type

Can be fit quickly, and helps make equipment smaller and lighter in weight. Helps reduce cost.

Sealed type



One or both side(s) is/are sealed with special synthetic rubber so that foreign material cannot enter the bearing while the grease is kept from leaking.
This sealing can be provided on all bearings of the standard, clearance adjustable, open, and flanged types.

Bearing numbering system

SDM	35	UU	AJ	□□	□
Series code	Ball complement bore diameter number	Seal code	Shape code	Material code	Tolerance code

Series code		SDM : metric series SDMF : metric series (flanged type) SDMK : metric series (flanged type) SDE : metric series (popular ones in europe) SDB : inch series
Ball complement bore diameter number	Metric series	35 : ball complement bore diameter 35 mm
	Inch series	4 : ball complement bore diameter 4/16 = 1/4 inch
Seal code		UU : both sides sealed U : single side sealed Not specified : not sealed
Shape code		Not specified : standard type AJ : clearance adjustable type OP : open type
Material code	Outer cylinder and balls	Not specified : high carbon chrome bearing steel
	Cage	Not specified : cold rolled steel sheet MG : synthetic resin
Tolerance code		Not specified : upper-class P : precision-class

Linear ball bearing service life

Linear ball bearing service life refers to the distance that the bearing travels until the outer cylinder, balls or shaft become damaged because of rolling contact fatigue from repeated stress.

The basic dynamic load rating refers to the magnitude of a constant load which makes a bearing's service life end after it travels a distance of 50 km.

The linear ball bearing service life and the basic dynamic load rating bear the relation shown below :

$$L = 50\left(\frac{C}{P}\right)^3$$

where :

L : service life km
P : radial load on the bearing N
C : bearing basic dynamic load rating N
(refer to the specification table.)

Shaft surface hardness is closely related to running performance. In general, it is best for the hardness to be 60 thru 64 HRC.

If the hardness is 60 HRC or lower, the basic dynamic load rating (C) should be corrected by multiplying it by the appropriate hardness coefficient selected from Table 1.

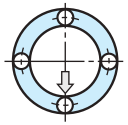
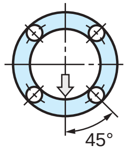
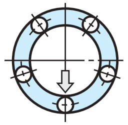
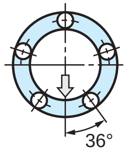
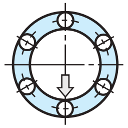
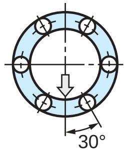
Table 1 Hardness coefficients

Shaft hardness HRC	Hardness coefficient f_H
60	1
59	0.97
57	0.88
55	0.76
53	0.64
51	0.52

- Ball row arrangement and load rating

The basic load ratings given in the specification table are those measured when a load is applied directly above a ball row (Q_1). When the load is applied between two ball rows, the load ratings become larger (Q_2). Table 2 lists the ratios of Q_2 ratings to Q_1 ratings.

Table 2 Ball row arrangement and the comparison of load ratings

Number of ball rows	When a load is applied directly above a row (Q_1)	When a load is applied between two rows (Q_2)	Ratios of Q_2 to Q_1
4			1.414
5			1.463
6			1.280

[Note] When there are only three rows, $Q_2 / Q_1 = 1$

Table 4 SDM series linear ball bearing tolerances Unit : μm

Bearing number SDM	Ball complement bore diameter (F_w) deviation				Outside diameter (D) deviation		Overall length (L) deviation		B deviation		Eccentricity	
	Precision-class		Upper-class								Precision-class	Upper-class
	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.	
6, 8	0	– 6	0	– 9	0	– 11	0	– 200	0	– 200	8	12
10, 12, 13, 16	0	– 6	0	– 9	0	– 13	0	– 200	0	– 200	8	12
20	0	– 7	0	– 10	0	– 16	0	– 200	0	– 200	10	15
25, 30	0	– 7	0	– 10	0	– 16	0	– 300	0	– 300	10	15
35, 38, 40, 50	0	– 8	0	– 12	0	– 19	0	– 300	0	– 300	12	20
60	0	– 9	0	– 15	0	– 22	0	– 300	0	– 300	17	25
80	0	– 9	0	– 15	0	– 22	0	– 400	0	– 400	17	25
100, 120	0	– 10	0	– 20	0	– 25	0	– 400	0	– 400	20	30

Recommended fits for linear ball bearings

Table 3 lists the recommended fits for linear ball bearings.

When a bearing is mounted with a housing, the normal clearance fit should be selected. When the application is highly precise or special, the transition fit should be selected.

For the clearance adjustable and open type bearings, it is best for the shaft diameter to be smaller than the ball complement bore diameter lower deviation, and for the housing bore diameter to be larger than the bearing outside diameter upper deviation.

Table 3 Linear ball bearing recommended fits

Bearing	Tolerance	Shaft tolerance class		Housing bore tolerance class	
		Normal clearance	Close clearance	Clearance fit	Transition fit
SDM, SDB	Upper-class	f 6, g 6	h 6	H 7	JS 7 (J 7)
	Precision-class	f 5, g 5	h 5	H 6	JS 6 (J 6)
SDE	–	h 6	js 6 (j 6)	H 7	JS 7 (J 7)

Linear ball bearing clearance

Linear ball bearings provide linear motion smoothly with little wear when the clearance is 0.003 to 0.012 mm. However, when clearance increase due to wear is considered critical, e.g. when the bearing is provided to press die sets, precision machine tools or precision testers; when the bearing becomes unable to slide because of moment; or when smooth bearing operation is needed with no clearance provided, the clearance is adjusted to zero or negative.

In such a case, shafts generally need to be mounted by "selective fitting."

They should be handled carefully so as not to be preloaded excessively.

As Fig. 1 shows, the clearance of bearings with numbers SDM 6 thru SDM 10 can be easily set to zero or negative, by adjusting one of the three ball rows with a bolt.

Consult with JTEKT on the gauging of linear ball bearings and shafts which should be mounted by "selective fitting," as well as on the whole design of shafts.

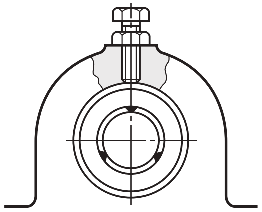


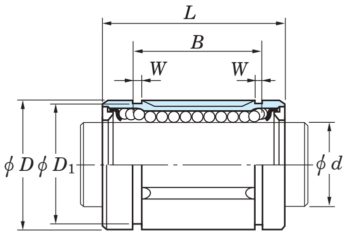
Fig. 1 Clearance adjustment

Table 5 SDE series linear ball bearing tolerances Unit : μm

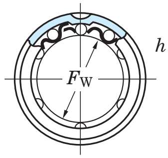
Bearing number SDE	Ball complement bore diameter (F_w) deviation		Outside diameter (D) deviation		Overall length (L) deviation		B deviation		Eccentricity
	upper	lower	upper	lower	upper	lower	upper	lower	max.
5, 8	+ 8	0	0	– 8	0	– 200	0	– 200	12
10, 12	+ 8	0	0	– 9	0	– 200	0	– 200	12
16	+ 9	– 1	0	– 9	0	– 200	0	– 200	12
20	+ 9	– 1	0	– 11	0	– 200	0	– 200	15
25, 30	+ 11	– 1	0	– 11	0	– 300	0	– 300	15
40, 50	+ 13	– 2	0	– 13	0	– 300	0	– 300	17
60	+ 13	– 2	0	– 15	0	– 400	0	– 400	20
80	+ 16	– 4	0	– 15	0	– 400	0	– 400	20

Linear ball bearings

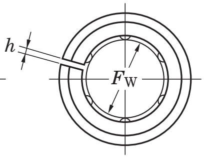
d 5 ~ (20) mm



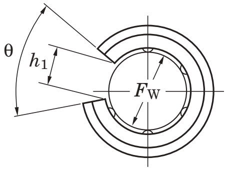
SDM, SDE



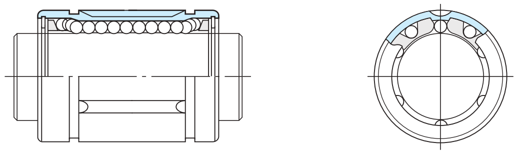
Standard type



Clearance adjustable type (...AJ)



Open type (...OP)



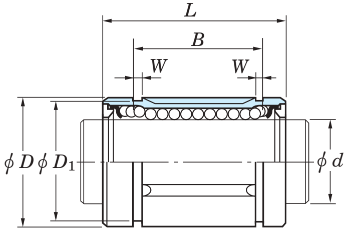
SDM...MD

Shaft dia. (mm)	Dimensions (mm)									Bearing No.[1]			No. of ball rows			Basic load ratings (N)		(Refer.) Mass (g)
d	F_w	D	L	B	W	D_1	h	h_1	θ	Standard type	Clearance adjustable type	Open type	Standard type	Clearanece adjustable type	Open type	C_r	C_{0r}	Standard type
5	5	12	22	14.5	1.1	11.5	—	—	—	**SDE5**	—	—	3	—	—	108	183	10
6	6	12	19	13.5	1.1	11.5	1	—	—	**SDM6**	**SDM6AJ**	—	3	3	—	108	186	7
	6	12	19	13.5	1.1	11.5	1	—	—	**SDM6MG**	**SDM6AJMG**	—	4	4	—	108	186	6
8	8	15	17	11.5	1.1	14.3	1	—	—	**SDM8S**	**SDM8SAJ**	—	3	3	—	96	160	10
	8	15	17	11.5	1.1	14.3	1	—	—	**SDM8SMG**	**SDM8SAJMG**	—	4	4	—	96	160	9
	8	15	24	17.5	1.1	14.3	1	—	—	**SDM8**	**SDM8AJ**	—	3	3	—	122	223	14
	8	15	24	17.5	1.1	14.3	1	—	—	**SDM8MG**	**SDM8AJMG**	—	4	4	—	134	255	13
	8	16	25	16.5	1.1	15.2	1	—	—	**SDE8**	**SDE8AJ**	—	3	3	—	122	223	20
	8	16	25	16.5	1.1	15.2	1	—	—	**SDE8MG**	**SDE8AJMG**	—	4	4	—	134	255	18
10	10	19	29	22	1.3	18	1	6.8	80°	**SDM10**	**SDM10AJ**	**SDM10OP**	4	4	3	259	424	27
	10	19	29	22	1.3	18	1	—	—	**SDM10MG**	**SDM8AJMG**	—	4	4	—	259	424	23
	10	19	29	22	1.3	18	1	6.8	80°	**SDE10**	**SDE10AJ**	**SDE10OP**	4	4	3	259	424	27
	10	19	29	22	1.3	18	1	—	—	**SDE10MG**	**SDE10AJMG**	—	4	4	—	259	424	23
12	12	21	30	23	1.3	20	1.5	8	80°	**SDM12**	**SDM12AJ**	**SDM12OP**	4	4	3	260	431	31
	12	21	30	23	1.3	20	1.5	—	—	**SDM12MG**	**SDM12AJMG**	—	4	4	—	260	431	27
	12	22	32	22.9	1.3	21	1.5	7.5	78°	**SDE12**	**SDE12AJ**	**SDE12OP**	4	4	3	289	503	42
	12	22	32	22.9	1.3	21	1.5	—	—	**SDE12MG**	**SDM12AJMG**	—	4	4	—	289	503	37
13	13	23	32	23	1.3	22	1.5	9	80°	**SDM13**	**SDM13AJ**	**SDM13OP**	4	4	3	289	506	41
	13	23	32	23	1.3	22	1.5	—	—	**SDM13MG**	**SDM13AJMG**	—	4	4	—	289	506	35
16	16	26	36	24.9	1.3	24.9	1.5	10	78°	**SDE16**	**SDE16AJ**	**SDE16OP**	4	4	3	319	587	53
	16	26	36	24.9	1.3	24.9	1.5	—	—	**SDE16MG**	**SDE16AJMG**	—	4	4	—	319	587	47
	16	28	37	26.5	1.6	27	1.5	11	80°	**SDM16**	**SDM16AJ**	**SDM16OP**	4	4	3	480	766	69
	16	28	37	26.5	1.6	27	1.5	—	—	**SDM16MG**	**SDM16AJMG**	—	4	4	—	480	766	59
20	20	32	42	30.5	1.6	30.5	1.5	11	60°	**SDM20**	**SDM20AJ**	**SDM20OP**	5	5	4	590	1 010	92
	20	32	42	30.5	1.6	30.5	1.5	—	—	**SDM20MG**	**SDM20AJMG**	—	5	5	—	590	1 010	79

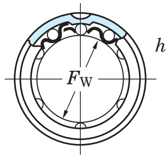
[Note] 1) JTEKT also manufactures sealed types, which are identified by U (one side sealed) or UU (both sides sealed) after ball complement bore diameter number.

Linear ball bearings

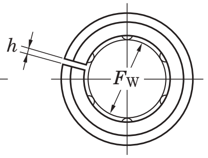
d (20) ~ 80 mm



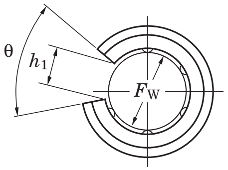
SDM, SDE



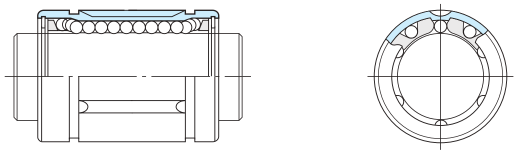
Standard type



Clearance adjustable type (...AJ)



Open type (...OP)



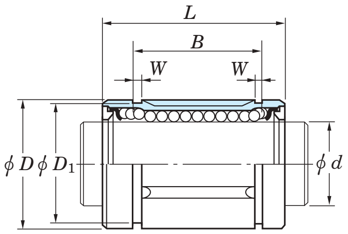
SDM...MD

Shaft dia. (mm) d	Dimensions (mm) F_w	D	L	B	W	D_1	h	h_1	θ	Bearing No.[1] Standard type	Clearance adjustable type	Open type	No. of ball rows Standard type	Clearance adjustable type	Open type	Basic load ratings (N) C_r	C_{0r}	(Refer.) Mass (g) Standard type
20	20	32	45	31.5	1.6	30.3	2	10	60°	**SDE20**	**SDE20AJ**	**SDE20OP**	5	5	4	590	1 010	96
	20	32	45	31.5	1.6	30.3	2	—	—	**SDE20MG**	**SDE20AJMG**	—	5	5	—	590	1 010	88
25	25	40	58	44.1	1.85	37.5	2	12.5	60°	**SDE25**	**SDE25AJ**	**SDE25OP**	5	5	4	1 130	2 030	190
	25	40	58	44.1	1.85	37.5	2	—	—	**SDE25MG**	**SDE25AJMG**	—	5	5	—	1 130	2 030	170
	25	40	59	41	1.85	38	2	12	60°	**SDM25**	**SDM25AJ**	**SDM25OP**	5	5	4	1 130	2 030	200
	25	40	59	41	1.85	38	2	—	—	**SDM25MG**	**SDM25AJMG**	—	5	5	—	1 130	2 030	170
30	30	45	64	44.5	1.85	43	2.5	15	50°	**SDM30**	**SDM30AJ**	**SDM30OP**	6	6	5	1 470	2 770	250
	30	45	64	44.5	1.85	43	2.5	—	—	**SDM30MG**	**SDM30AJMG**	—	6	6	—	1 470	2 770	220
	30	47	68	52.1	1.85	44.5	2	12.5	50°	**SDE30**	**SDE30AJ**	**SDE30OP**	6	6	5	1 470	2 770	340
	30	47	68	52.1	1.85	44.5	2	—	—	**SDE30MG**	**SDE30AJMG**	—	6	6	—	1 470	2 770	320
35	35	52	70	49.5	2.1	49	2.5	17	50°	**SDM35**	**SDM35AJ**	**SDM35OP**	6	6	5	1 580	3 070	370
	35	52	70	49.5	2.1	49	2.5	—	—	**SDM35MG**	**SDM35AJMG**	—	6	6	—	1 580	3 070	330
38	38	57	76	58.5	2.1	54.5	3	18	50°	**SDM38**	**SDM38AJ**	**SDM38OP**	6	6	5	2 020	3 600	490
40	40	60	80	60.5	2.1	57	3	20	50°	**SDM40**	**SDM40AJ**	**SDM40OP**	6	6	5	2 180	4 010	590
	40	60	80	60.5	2.1	57	3	—	—	**SDM40MG**	**SDM40AJMG**	—	6	6	—	2 180	4 010	530
	40	62	80	60.6	2.15	59	3	16.8	50°	**SDE40**	**SDE40AJ**	**SDE40OP**	6	6	5	2 180	4 010	710
	40	62	80	60.6	2.15	59	3	—	—	**SDE40MG**	**SDE40AJMG**	—	6	6	—	2 180	4 010	650
50	50	75	100	77.6	2.65	72	3	21	50°	**SDE50**	**SDE50AJ**	**SDE50OP**	6	6	5	4 020	7 110	1 050
	50	80	100	74	2.6	76.5	3	25	50°	**SDM50**	**SDM50AJ**	**SDM50OP**	6	6	5	4 420	7 150	1 500
60	60	90	110	85	3.15	86.5	3	30	50°	**SDM60**	**SDM60AJ**	**SDM60OP**	6	6	5	5 170	9 030	1 850
	60	90	125	101.7	3.15	86.5	3	27.2	54°	**SDE60**	**SDE60AJ**	**SDE60OP**	6	6	5	6 470	11 100	1 900
80	80	120	140	105.5	4.15	116	3	40	50°	**SDM80**	**SDM80AJ**	**SDM80OP**	6	6	5	8 180	12 800	4 200
	80	120	165	133.7	4.15	116	3	36.3	54°	**SDE80**	**SDE80AJ**	**SDE80OP**	6	6	5	8 890	14 500	4 800

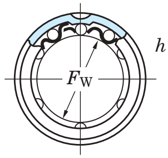
[Note] 1) JTEKT also manufactures sealed types, which are identified by U (one side sealed) or UU (both sides sealed) after ball complement bore diameter number.

Linear ball bearings

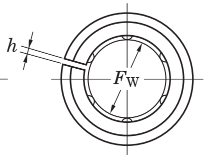
d 100 ~ 120 mm



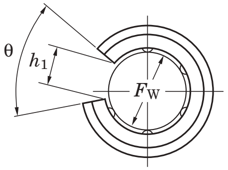
SDM, SDE



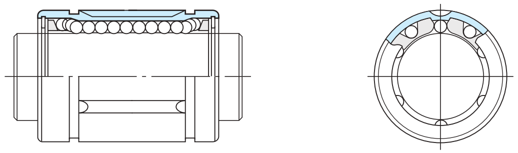
Standard type



Clearance adjustable type (...AJ)



Open type (...OP)



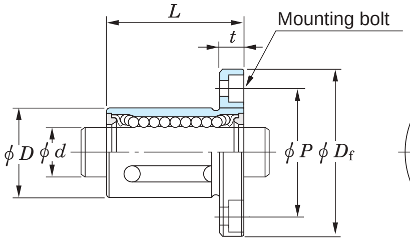
SDM...MD

Shaft dia. (mm)	Dimensions (mm)									Bearing No.[1]			No. of ball rows			Basic load ratings (N)		(Refer.) Mass (g)
d	F_w	D	L	B	W	D_1	h	h_1	θ	Standard type	Clearance adjustable type	Open type	Standard type	Clearanece adjustable type	Open type	C_r	C_{0r}	Standard type
100	100	150	175	125.5	4.15	145	3	50	50°	**SDM100**	**SDM100AJ**	**SDM100OP**	6	6	5	12 300	19 700	8 200
120	120	180	200	158.6	4.15	175	4	85	80°	**SDM120**	**SDM120AJ**	**SDM120OP**	8	8	6	22 300	39 100	15 500

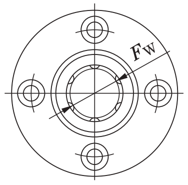
[Note] 1) JTEKT also manufactures sealed types, which are identified by U (one side sealed) or UU (both sides sealed) after ball complement bore diameter number.

Linear ball bearings flanged type

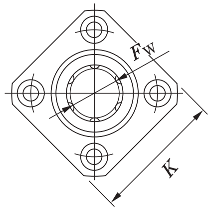
d 6 ~ 50 mm



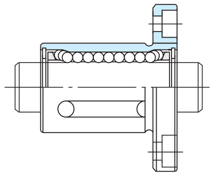
SDMF, SDMK



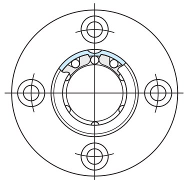
Round-flanged



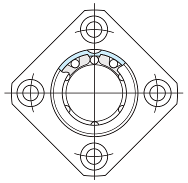
Square-flanged



SDMF...MG
SDMK...MG (Synthetic resin)



Round-flanged

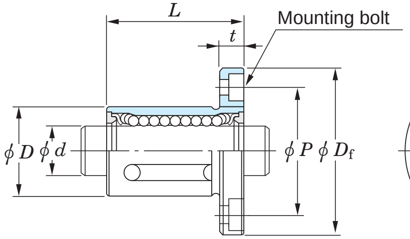


Square-flanged

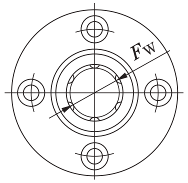
Shaft dia. (mm)	Dimensions (mm)							Bolt size	Bearing No.		No. of ball rows	Basic load ratings (N)		(Refer.) Mass (g)
d	F_w	D	L	D_f	K	t	P		Round-flanged type	Square-flanged type		C_r	C_{0r}	Round-flanged type
6	6	12	19	28	22	5	20	M3	**SDMF6**	**SDMK6**	3	108	186	23
	6	12	19	28	22	5	20	M3	**SDMF6MG**	**SDMK6MG**	4	108	186	22
8	8	15	24	32	25	5	24	M3	**SDMF8**	**SDMK8**	3	122	223	35
	8	15	24	32	25	5	24	M3	**SDMF8MG**	**SDMK8MG**	4	134	255	34
10	10	19	29	40	30	6	29	M4	**SDMF10**	**SDMK10**	4	259	424	65
	10	19	29	40	30	6	29	M4	**SDMF10MG**	**SDMK10MG**	4	259	424	61
12	12	21	30	42	32	6	32	M4	**SDMF12**	**SDMK12**	4	260	431	72
	12	21	30	42	32	6	32	M4	**SDMF12MG**	**SDMK12MG**	4	260	431	68
13	13	23	32	43	34	6	33	M4	**SDMF13**	**SDMK13**	4	289	506	83
	13	23	32	43	34	6	33	M4	**SDMF13MG**	**SDMK13MG**	4	289	506	77
16	16	28	37	48	37	6	38	M4	**SDMF16**	**SDMK16**	4	480	766	120
	16	28	37	48	37	6	38	M4	**SDMF16MG**	**SDMK16MG**	4	480	766	110
20	20	32	42	54	42	8	43	M5	**SDMF20**	**SDMK20**	5	590	1 010	170
	20	32	42	54	42	8	43	M5	**SDMF20MG**	**SDMK20MG**	5	590	1 010	160
25	25	40	59	62	50	8	51	M5	**SDMF25**	**SDMK25**	5	1 130	2 030	290
	25	40	59	62	50	8	51	M5	**SDMF25MG**	**SDMK25MG**	5	1 130	2 030	270
30	30	45	64	74	58	10	60	M6	**SDMF30**	**SDMK30**	6	1 470	2 770	440
	30	45	64	74	58	10	60	M6	**SDMF30MG**	**SDMK30MG**	6	1 470	2 770	410
35	35	52	70	82	64	10	67	M6	**SDMF35**	**SDMK35**	6	1 580	3 070	610
	35	52	70	82	64	10	67	M6	**SDMF35MG**	**SDMK35MG**	6	1 580	3 070	560
40	40	60	80	96	75	13	78	M8	**SDMF40**	**SDMK40**	6	2 180	4 010	1 000
	40	60	80	96	75	13	78	M8	**SDMF40MG**	**SDMK40MG**	6	2 180	4 010	930
50	50	80	100	116	92	13	98	M8	**SDMF50**	**SDMK50**	6	4 420	7 150	2 000

Linear ball bearings flanged type

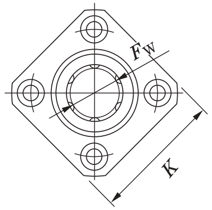
d 60 ~ 80 mm



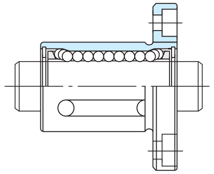
SDMF, SDMK



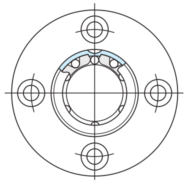
Round-flanged



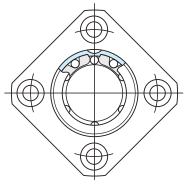
Square-flanged



SDMF...MG
SDMK...MG (Synthetic resin)



Round-flanged



Square-flanged

Shaft dia. (mm)	Dimensions (mm)							Bolt size	Bearing No.			No. of ball rows	Basic load ratings (N)		(Refer.) Mass (g)
d	F_w	D	L	D_f	K	t	P		Round-flanged type	Square-flanged type			C_r	C_{0r}	Round-flanged type
60	60	90	110	134	106	18	112	M10	**SDMF60**	**SDMK60**		6	5 170	9 030	2 800
80	80	120	140	164	136	18	142	M10	**SDMF80**	**SDMK80**		6	8 180	12 800	5 400

Locknuts, lockwashers & lock plates

Bearings are often fit to a shaft with an adapter sleeve, locknut, lockwasher or lock plate.

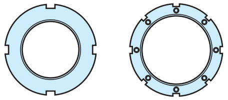
These accessories make it easy to attach and remove bearings.

They are standardized in JIS.

- Locknuts are standardized such that they can be used with either adapter sleeves, withdrawal sleeves or shafts.
- Lockwashers and lock plates are used as locks on locknuts.

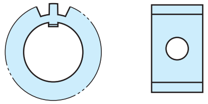
Lockwashers are used with bearings of bore diameter number 40 or lower. Lock plates are used with those of bore diameter 44 or higher.

Locknuts



AN (ANL)	02 – 100
HN (HNL)	41 – 110

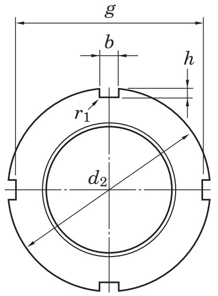
Lockwashers and lock plates

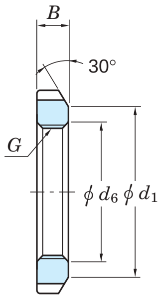


AW (AWL)	00 – 40(X)
AL (ALL)	44 – 100

Locknuts
for adapter sleeves and shafts

AN02 ~ 25





Locknut No.	Thread size1) G	d_2	d_1	g	d_6	b	h	B	r_1 max.	(Refer.) Mass (kg)	Applicable2) adapter sleeve (bore No.)	Applicable3) lockwasher No.
		Standard dimensions (mm)										
AN 02	M 15×1	25	21	21	15.5	4	2	5	0.4	0.010	—	AW 02
03	M 17×1	28	24	24	17.5	4	2	5	0.4	0.013	—	03
04	M 20×1	32	26	28	20.5	4	2	6	0.4	0.019	04	04
AN 05	M 25×1.5	38	32	34	25.8	5	2	7	0.4	0.025	05	AW 05
06	M 30×1.5	45	38	41	30.8	5	2	7	0.4	0.043	06	06
07	M 35×1.5	52	44	48	35.8	5	2	8	0.4	0.053	07	07
AN 08	M 40×1.5	58	50	53	40.8	6	2.5	9	0.5	0.085	08	AW 08
09	M 45×1.5	65	56	60	45.8	6	2.5	10	0.5	0.119	09	09
10	M 50×1.5	70	61	65	50.8	6	2.5	11	0.5	0.148	10	10
AN 11	M 55×2	75	67	69	56	7	3	11	0.5	0.158	11	AW 11
12	M 60×2	80	73	74	61	7	3	11	0.5	0.174	12	12
13	M 65×2	85	79	79	66	7	3	12	0.5	0.203	13	13
AN 14	M 70×2	92	85	85	71	8	3.5	12	0.5	0.242	14	AW 14
15	M 75×2	98	90	91	76	8	3.5	13	0.5	0.287	15	15
16	M 80×2	105	95	98	81	8	3.5	15	0.6	0.397	16	16
AN 17	M 85×2	110	102	103	86	8	3.5	16	0.6	0.451	17	AW 17
18	M 90×2	120	108	112	91	10	4	16	0.6	0.556	18	18
19	M 95×2	125	113	117	96	10	4	17	0.6	0.658	19	19
AN 20	M100×2	130	120	122	101	10	4	18	0.6	0.698	20	AW 20
21	M105×2	140	126	130	106	12	5	18	0.7	0.845	21	21
22	M110×2	145	133	135	111	12	5	19	0.7	0.965	22	22
AN 23	M115×2	150	137	140	116	12	5	19	0.7	1.01	—	AW 23
24	M120×2	155	138	145	121	12	5	20	0.7	1.08	24	24
25	M125×2	160	148	150	126	12	5	21	0.7	1.19	—	25

[Notes] 1) Basic profile and dimension of screw thread are in accordance with JIS B 0205.
2) Applicable to adapter sleeve series A31, A2, A3 and A23.
3) Applicable to lockwashers with flat inner tongue.

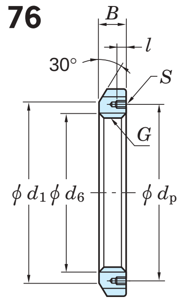
[Remark] Locknut series AN is used for adapter assembly series H2, H3, H23 and H31, while locknut series ANL is used for adapter assembly series H30.

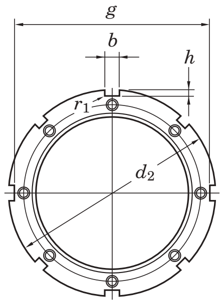
AN 26 ~ 40
ANL24 ~ 40

Locknut No.	Thread size1) G	d_2	d_1	g	d_6	b	h	B	r_1 max.	(Refer.) Mass (kg)	Applicable2) adapter sleeve (bore No.)	Applicable3) lockwasher No.
		Standard dimensions (mm)										
AN 26	M130×2	165	149	155	131	12	5	21	0.7	1.25	26	AW 26
AN 27	M135×2	175	160	163	136	14	6	22	0.7	1.55	—	AW 27
28	M140×2	180	160	168	141	14	6	22	0.7	1.56	28	28
AN 29	M145×2	190	172	178	146	14	6	24	0.7	1.80	—	AW 29
30	M150×2	195	171	183	151	14	6	24	0.7	2.03	30	30
31	M155×3	200	182	186	156.5	16	7	25	0.7	2.30	—	—
AN 32	M160×3	210	182	196	161.5	16	7	25	0.7	2.59	32	AW 32
33	M165×3	210	193	196	166.5	16	7	26	0.7	2.70	—	—
34	M170×3	220	193	206	171.5	16	7	26	0.7	2.80	34	34
AN 36	M180×3	230	203	214	181.5	18	8	27	0.7	3.07	36	AW 36
38	M190×3	240	214	224	191.5	18	8	28	0.7	3.39	38	38
40	M200×3	250	226	234	201.5	18	8	29	0.7	3.69	40	40
ANL24	M120×2	145	133	135	121	12	5	20	0.7	0.78	24	AWL24
26	M130×2	155	143	145	131	12	5	21	0.7	0.88	26	26
28	M140×2	165	151	153	141	14	6	22	0.7	0.99	28	28
ANL30	M150×2	180	164	168	151	14	6	24	0.7	1.33	30	AWL30
32	M160×3	190	174	176	161.5	16	7	25	0.7	1.56	32	32
34	M170×3	200	184	186	171.5	16	7	26	0.7	1.72	34	34
ANL36	M180×3	210	192	194	181.5	18	8	27	0.7	1.95	36	AWL36
38	M190×3	220	202	204	191.5	18	8	28	0.7	2.08	38	38
40	M200×3	240	218	224	201.5	18	8	29	0.7	2.98	40	40

Locknuts
for adapter sleeves and shafts

AN 44 ~ 100
ANL 44 ~ 76





Locknut No.	Thread1) size	Standard dimensions (mm)								Tapped hole2) (mm)			(Refer.) Mass (kg)	Applicable adapter sleeve3) (bore No.)	Applicable lock plate No.
	G	d_2	d_1	g	d_6	b	h	B	r_1 max.	l	S Thread size	d_p			
AN 44	Tr220×4	280	250	260	222	20	10	32	0.8	15	M 8×1.25	238	5.16	44	AL 44
48	Tr240×4	300	270	280	242	20	10	34	0.8	15	M 8×1.25	258	5.91	48	44
52	Tr260×4	330	300	306	262	24	12	36	0.8	18	M10×1.5	281	7.99	52	52
AN 56	Tr280×4	350	320	326	282	24	12	38	0.8	18	M10×1.5	301	8.99	56	AL 52
60	Tr300×4	380	340	356	302	24	12	40	0.8	18	M10×1.5	326	11.7	60	60
64	Tr320×5	400	360	376	322.5	24	12	42	0.8	18	M10×1.5	345	13.0	64	64
AN 68	Tr340×5	440	400	410	342.5	28	15	55	1	21	M12×1.75	372	23.0	68	AL 68
72	Tr360×5	460	420	430	362.5	28	15	58	1	21	M12×1.75	392	25.0	72	68
76	Tr380×5	490	450	454	382.5	32	18	60	1	21	M12×1.75	414	30.8	76	76
AN 80	Tr400×5	520	470	484	402.5	32	18	62	1	27	M16×2	439	36.7	80	AL 80
84	Tr420×5	540	490	504	422.5	32	18	70	1	27	M16×2	459	43.3	84	80
88	Tr440×5	560	510	520	442.5	36	20	70	1	27	M16×2	477	45.1	88	88
AN 92	Tr460×5	580	540	540	462.5	36	20	75	1	27	M16×2	497	50.2	92	AL 88
96	Tr480×5	620	560	580	482.5	36	20	75	1	27	M16×2	527	62.0	96	96
100	Tr500×5	630	580	584	502.5	40	23	80	1	27	M16×2	539	63.1	/500	100
ANL44	Tr220×4	260	242	242	222	20	9	30	0.8	12	M 6×1	229	3.09	44	ALL44
48	Tr240×4	290	270	270	242	20	10	34	0.8	15	M 8×1.25	253	5.16	48	48
52	Tr260×4	310	290	290	262	20	10	34	0.8	15	M 8×1.25	273	5.67	52	48
ANL56	Tr280×4	330	310	310	282	24	10	38	0.8	15	M 8×1.25	293	6.78	56	ALL56
60	Tr300×4	360	336	336	302	24	12	42	0.8	15	M 8×1.25	316	9.62	60	60
64	Tr320×5	380	356	356	322.5	24	12	42	0.8	15	M 8×1.25	335	9.94	64	64
ANL68	Tr340×5	400	376	376	342.5	24	12	45	1	15	M 8×1.25	355	11.7	68	ALL64
72	Tr360×5	420	394	394	362.5	28	13	45	1	15	M 8×1.25	374	12.0	72	72
76	Tr380×5	450	422	422	382.5	28	14	48	1	18	M10×1.5	398	14.9	76	76

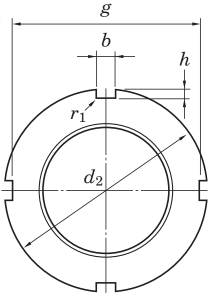
[Notes]
1) Basic profile and dimension of screw thread are in accordance with JIS B 0216.
2) Basic profile and dimension of bore with internal thread are in accordance with JIS B 0205.
3) Applicable to adapter sleeve series A31, A32, A23 and A30.

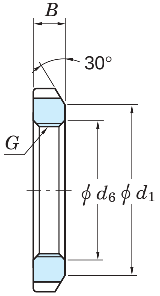
ANL 80 ~ 100

Locknut No.	Thread1) size	Standard dimensions (mm)								Tapped hole2) (mm)			(Refer.) Mass (kg)	Applicable adapter sleeve3) (bore No.)	Applicable lock plate No.
	G	d_2	d_1	g	d_6	b	h	B	r_1 max.	l	S Thread size	d_p			
ANL80	Tr400×5	470	442	442	402.5	28	14	52	1	18	M10×1.5	418	16.9	80	ALL76
84	Tr420×5	490	462	462	422.5	32	14	52	1	18	M10×1.5	438	17.4	84	84
88	Tr440×5	520	490	490	442.5	32	15	60	1	21	M12×1.75	462	26.2	88	88
ANL92	Tr460×5	540	510	510	462.5	32	15	60	1	21	M12×1.75	482	26.9	92	ALL88
96	Tr480×5	560	530	530	482.5	36	15	60	1	21	M12×1.75	502	28.3	96	96
100	Tr500×5	580	550	550	502.5	36	15	68	1	21	M12×1.75	522	33.6	/500	96

Locknuts for withdrawal sleeves

HN 42 ~ 110
HNL 41 ~ 64





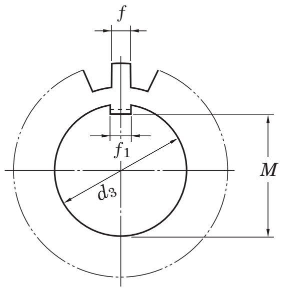
Locknut No.	Thread[1] size G	Standard dimensions (mm) d_2	d_1	g	d_6	b	h	B	r_1 max.	(Refer.) Mass (kg)	Withdrawal sleeve No.			
HN 42	Tr210×4	270	238	250	212	20	10	30	0.8	4.75	AH3138	AH2238	AH3238	AH2338
44	Tr220×4	280	250	260	222	20	10	32	0.8	5.35	3140	2240	3240	2340
48	Tr240×4	300	270	280	242	20	10	34	0.8	6.20	3144	2244	—	2344
HN 52	Tr260×4	330	300	306	262	24	12	36	0.8	8.55	AH3148	AH2248	—	AH2348
58	Tr290×4	370	330	346	292	24	12	40	0.8	11.8	3152	2252	—	2352
62	Tr310×5	390	350	366	312.5	24	12	42	0.8	13.4	3156	2256	—	2356
HN 66	Tr330×5	420	380	390	332.5	28	15	52	1	20.4	AH3160	AH2260	AH3260	—
70	Tr350×5	450	410	420	352.5	28	15	55	1	25.2	3164	2264	3264	—
74	Tr370×5	470	430	440	372.5	28	15	58	1	28.2	3168	—	3268	—
HN 80	Tr400×5	520	470	484	402.5	32	18	62	1	40.0	AH3172	—	AH3272	—
84	Tr420×5	540	490	504	422.5	32	18	70	1	46.9	3176	—	3276	—
88	Tr440×5	560	510	520	442.5	36	20	70	1	48.5	3180	—	3280	—
HN 92	Tr460×5	580	540	540	462.5	36	20	75	1	55.0	AH3184	—	AH3284	—
96	Tr480×5	620	560	580	482.5	36	20	75	1	67.0	X3188	—	X3288	—
102	Tr510×6	650	590	604	513	40	23	80	1	75.0	X3192	—	X3292	—
HN 106	Tr530×6	670	610	624	533	40	23	80	1	78.0	AHX3196	—	AHX3296	—
110	Tr550×6	700	640	654	553	40	23	80	1	92.5	X31/500	—	X32/500	—
HNL 41	Tr205×4	250	232	234	207	18	8	30	0.8	3.43	AH3038	AH238	—	—
43	Tr215×4	260	242	242	217	20	9	30	0.8	3.72	3040	240	—	—
47	Tr235×4	280	262	262	237	20	9	34	0.8	4.60	3044	244	—	—
HNL 52	Tr260×4	310	290	290	262	20	10	34	0.8	5.80	AH3048	AH248	—	—
56	Tr280×4	330	310	310	282	24	10	38	0.8	6.72	3052	252	—	—
60	Tr300×4	360	336	336	302	24	12	42	0.8	9.60	3056	256	—	—
HNL 64	Tr320×5	380	356	356	322.5	24	12	42	1	10.3	AH3060	—	—	—

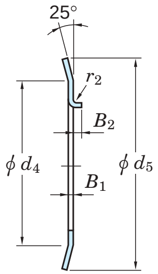
[Note] 1) Basic profile and dimension of screw thread are in accordance with JIS B 0216.
[Remark] Number of slots on nut may sometimes exceed that shown in the figure.

HNL 69 ~ 108

Locknut No.	Thread[1] size G	Standard dimensions (mm) d_2	d_1	g	d_6	b	h	B	r_1 max.	(Refer.) Mass (kg)	Withdrawal sleeve No.			
HNL 69	Tr345×5	410	384	384	347.5	28	13	45	1	11.5	3064	—	—	—
73	Tr365×5	430	404	404	367.5	28	13	48	1	14.2	3068	—	—	—
HNL 77	Tr385×5	450	422	422	387.5	28	14	48	1	15.0	AH3072	—	—	—
82	Tr410×5	480	452	452	412.5	32	14	52	1	19.0	3076	—	—	—
86	Tr430×5	500	472	472	432.5	32	14	52	1	19.8	3080	—	—	—
HNL 90	Tr450×5	520	490	490	452.5	32	15	60	1	23.8	AH3084	—	—	—
94	Tr470×5	540	510	510	472.5	32	15	60	1	25.0	X3088	—	—	—
98	Tr490×5	580	550	550	492.5	36	15	60	1	34.0	X3092	—	—	—
HNL104	Tr520×6	600	570	570	523	36	15	68	1	37.0	AHX3096	—	—	—
108	Tr540×6	630	590	590	543	40	20	68	1	43.5	X30/500	—	—	—

AW 00 ~ 24(X)





With bent inner tongue

With flat inner tongue

Lockwasher No.		Standard dimensions (mm)									No. of tooth	(Refer.) Mass (kg/100pcs.)	Applicable adapter sleeve (bore No.)	Applicable locknut No.
With bent inner tongue	With flat inner tongue	d_3	M	f_1	B_1	f	d_4	d_5	r_2	B_2				
AW 00	**AW 00X**	10	8.5	3	1	3	13	21	0.5	2	9	0.131	—	AN 00
01	**01X**	12	10.5	3	1	3	17	25	0.5	2	9	0.192	—	01
02	**02X**	15	13.5	4	1	4	21	28	1	2.5	13	0.253	—	02
AW 03	**AW 03X**	17	15.5	4	1	4	24	32	1	2.5	13	0.313	—	AN 03
04	**04X**	20	18.5	4	1	4	26	36	1	2.5	13	0.350	04	04
05	**05X**	25	23	5	1.2	5	32	42	1	2.5	13	0.640	05	05
AW 06	**AW 06X**	30	27.5	5	1.2	5	38	49	1	2.5	13	0.780	06	AN 06
07	**07X**	35	32.5	6	1.2	5	44	57	1	2.5	15	1.04	07	07
08	**08X**	40	37.5	6	1.2	6	50	62	1	2.5	15	1.23	08	08
AW 09	**AW 09X**	45	42.5	6	1.2	6	56	69	1	2.5	17	1.52	09	AN 09
10	**10X**	50	47.5	6	1.2	6	61	74	1	2.5	17	1.60	10	10
11	**11X**	55	52.5	8	1.2	7	67	81	1	4	17	1.96	11	11
AW 12	**AW 12X**	60	57.5	8	1.5	7	73	86	1.2	4	17	2.53	12	AN 12
13	**13X**	65	62.5	8	1.5	7	79	92	1.2	4	19	2.90	13	13
14	**14X**	70	66.5	8	1.5	8	85	98	1.2	4	19	3.34	14	14
AW 15	**AW 15X**	75	71.5	8	1.5	8	90	104	1.2	4	19	3.56	15	AN 15
16	**16X**	80	76.5	10	1.8	8	95	112	1.2	4	19	4.64	16	16
17	**17X**	85	81.5	10	1.8	8	102	119	1.2	4	19	5.24	17	17
AW 18	**AW 18X**	90	86.5	10	1.8	10	108	126	1.2	4	19	6.23	18	AN 18
19	**19X**	95	91.5	10	1.8	10	113	133	1.2	4	19	6.70	19	19
20	**20X**	100	96.5	12	1.8	10	120	142	1.2	6	19	7.65	20	20
AW 21	**AW 21X**	105	100.5	12	1.8	12	126	145	1.2	6	19	8.26	21	AN 21
22	**22X**	110	105.5	12	1.8	12	133	154	1.2	6	19	9.40	22	22
23	**23X**	115	110.5	12	2	12	137	159	1.5	6	19	10.8	—	23
AW 24	**AW 24X**	120	115	14	2	12	138	164	1.5	6	19	10.5	24	AN 24

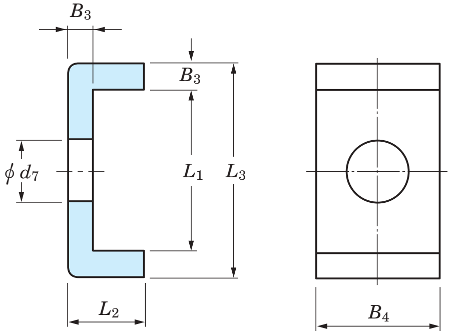
[Remark]
1) AW00~AW40, AW00X~AW40X are applicable to adapter assembly series H31, H2, H3 and H23.
2) AWL24~AWL40, AWL24X~AWL40X are applied to adapter assembly series H30.
3) For adapter sleeves with narrow slits, lockwashers with flat inner tongue should be used. Either type of lockwasher can be used for adapter sleeves with wide slits.

AW 25 ~ 40(X)
AWL24 ~ 40(X)

Lockwasher No.		Standard dimensions (mm)									No. of tooth	(Refer.) Mass (kg/100pcs.)	Applicable adapter sleeve (bore No.)	Applicable locknut No.
With bent inner tongue	With flat inner tongue	d_3	M	f_1	B_1	f	d_4	d_5	r_2	B_2				
AW 25	**AW 25X**	125	120	14	2	12	148	170	1.5	6	19	11.8	—	25
26	**26X**	130	125	14	2	12	149	175	1.5	6	19	11.3	26	26
AW 27	**AW 27X**	135	130	14	2	14	160	185	1.5	6	19	14.4	—	AN 27
28	**28X**	140	135	16	2	14	160	192	1.5	8	19	14.2	28	28
29	**29X**	145	140	16	2	14	172	202	1.5	8	19	16.8	—	29
AW 30	**AW 30X**	150	145	16	2	14	171	205	1.5	8	19	15.5	30	AN 30
31	**31X**	155	147.5	16	2.5	16	182	212	1.5	8	19	20.9	—	31
32	**32X**	160	154	18	2.5	16	182	217	1.5	8	19	22.2	32	32
AW 33	**AW 33X**	165	157.5	18	2.5	16	193	222	1.5	8	19	24.1	—	AN 33
34	**34X**	170	164	18	2.5	16	193	232	1.5	8	19	24.7	34	34
36	**36X**	180	174	20	2.5	18	203	242	1.5	8	19	26.8	36	36
AW 38	**AW 38X**	190	184	20	2.5	18	214	252	1.5	8	19	27.8	38	AN 38
40	**40X**	200	194	20	2.5	18	226	262	1.5	8	19	29.3	40	40
AWL24	**AWL24X**	120	115	14	2	12	133	155	1.5	6	19	7.70	24	ANL24
26	**26X**	130	125	14	2	12	143	165	1.5	6	19	8.70	26	26
28	**28X**	140	135	16	2	14	151	175	1.5	8	19	10.9	28	28
AWL30	**AWL30X**	150	145	16	2	14	164	190	1.5	8	19	11.3	30	ANL30
32	**32X**	160	154	18	2.5	16	174	200	1.5	8	19	16.2	32	32
34	**34X**	170	164	18	2.5	16	184	210	1.5	8	19	19.0	34	34
AWL36	**AWL36X**	180	174	20	2.5	18	192	220	1.5	8	19	18.0	36	ANL36
38	**38X**	190	184	20	2.5	18	202	230	1.5	8	19	20.5	38	38
40	**40X**	200	194	20	2.5	18	218	250	1.5	8	19	21.4	40	40

Lock plates

AL 44 ~ 100
ALL44 ~ 96



Lock plate No.	Standard dimensions (mm)						(Refer.) Mass (kg/100pcs.)	Applicable locknut No.
	B_3	B_4	L_2	d_7	L_1	L_3		
AL 44	4	20	12	9	22.5	30.5	2.60	AN 44,48
52	4	24	12	12	25.5	33.5	3.39	52,56
60	4	24	12	12	30.5	38.5	3.79	60
AL 64	5	24	15	12	31	41	5.35	AN 64
68	5	28	15	14	38	48	6.65	68,72
76	5	32	15	14	40	50	7.96	76
AL 80	5	32	15	18	45	55	8.20	AN 80,84
88	5	36	15	18	43	53	9.00	88,92
96	5	36	15	18	53	63	10.4	96
100	5	40	15	18	45	55	10.5	100
ALL44	4	20	12	7	13.5	21.5	2.12	ANL44
48	4	20	12	9	17.5	25.5	2.29	48,52
56	4	24	12	9	17.5	25.5	2.92	56
ALL60	4	24	12	9	20.5	28.5	3.16	ANL60
64	5	24	15	9	21	31	4.56	64,68
72	5	28	15	9	20	30	5.03	72
ALL76	5	28	15	12	24	34	5.28	ANL76,80
84	5	32	15	12	24	34	6.11	84
88	5	32	15	14	28	38	6.45	88,92
96	5	36	15	14	28	38	7.29	96,100

[Remark] Lock plate series AL are applicable to adapter assembly series H31, H32 and H23, while lock plate series ALL are applicable to H30.

Exsev&Ceramic bearing series

More and more bearings are being used in extreme special environments, such as in a vacuum, or in a clean, corrosive, or heated place. In some cases bearings are required to be insulated or antimagnetic.

Applications of bearings in such environments are increasing in the field of state-of-the-art technology, e.g. vacuum equipment, aerospace equipment and semi-conductor production facilities. Bearings made of conventional materials and lubricants can hardly meet these new needs.

JTEKT has succeeded in developing a series of bearings for use in extreme special environments, having started from the study of the very basics of materials and testing of their performance under various severe conditions.

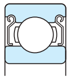
JTEKT has standardized the following bearings as the "Koyo **EXSEV** bearing series".

- Exsev bearings for use in a clean environment
  Designed for use in a vacuum.
  The friction surface of the bearing interior is coated with solid lubricant (or soft metal). Bearings pre-lubricated with special grease are also available.

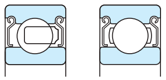
- Exsev bearings for use in a vacuum environment
  Produce insignificant contamination, provided with rolling elements and a cage made of self-lubricating materials. Optimal for use in environments which need to be clean.

- Ceramic bearings
  Ceramic rings and rolling elements (silicon nitride Si_3N_4) ensure excellent performance in various extreme special environments.

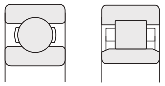
Exsev bearings for use in a vacuum environment



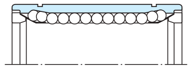
Exsev bearings for use in a clean environment



Ceramic bearings



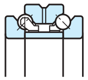
Linear ball bearings for vacuum



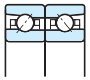
For details, refer to JTEKT separate catalog "**EXSEV** bearings and Ceramic bearings for extreme special environments" (CAT. NO. B2004E).

Bearings for machine tool spindles (for support of axial loading)

Double direction angular contact thrust ball bearings



Matched pair angular contact ball bearing (ACT type)



JTEKT supplies double direction angular contact thrust ball bearings and ACT type matched pair angular contact ball bearings which are used with machine tool spindles to support axial loading.

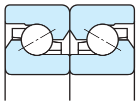
These bearings were developed to meet needs which have grown as machine tool spindle rotation has become faster and more accurate.

Several dimension series are available for selection according to operating conditions.

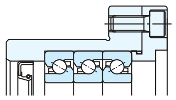
For details, refer to JTEKT separate catalog "Precision Ball and Roller Bearings for Machine Tools" (CAT. NO. B2005E).

Precision ball screw support bearings and bearing units

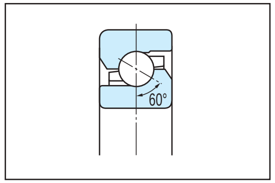
Support bearings



Support bearing units



- Support bearings were developed to support precision ball screw shafts. They have the same structure as angular contact thrust ball bearings with a contact angle of 60°.



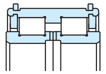
- Have a large axial load carrying capacity. Also able to carry a certain degree of radial load.
- Highly rigid in the axial direction.
- Starting torque is small.

- Support bearing units consist of the bearings described above and a precisely processed housing. Units with a Koyo precision ball screw are also available.

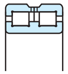
For details, refer to JTEKT separate catalog "Precision Ball and Roller Bearings for Machine Tools" (CAT. NO. B2005E).

Full complement type cylindrical roller bearings for crane sheaves

Shielded type



Open type



Crane rope sheaves and running wheels which are operated at low or medium speed are generally equipped with full complement type cylindrical roller bearings because the operation of these machines involves heavy, impact loading.

These bearings are divided into shielded and open types. The shielded type is often used with the outer ring rotation.

■ Shielded type

- The shielded type was developed for use with rope sheaves. It is shielded, non-separable and pre-lubricated with grease.
- Bearings with locating snap rings around the outer ring can be positioned and fit to sheaves with ease.
- The bearing surface is coated with phosphate for rust prevention.

■ Open type

- Open type bearings are further divided into those used on the fixed side and those used on the free side. The former carry axial load in both directions. The relative position of the latter's inner ring and outer ring can be adjusted by moving them along the axis.
- Open type bearings are separable because the outer ring divided into two annular pieces in a plane perpendicular to its axis. Triple-row and four-row bearings are available along with double-row types.

For details, refer to JTEKT separate catalog "Large size ball & roller bearings" (CAT. NO. B2002E).

Rolling mill roll neck bearings

Rolling mill roll neck four-row cylindrical roller bearings and tapered roller bearings are designed to achieve the maximum load rating capacity in a limited space.

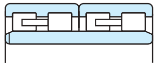
■ Four-row cylindrical roller bearings

- Suitable for high-speed rotation. Thin section designs are also available.
- The inner ring raceway surface and the roll can be finished simultaneously after the inner ring is mounted on the roll neck. This feature is useful in improving rolling mill accuracy.

■ Four-row tapered roller bearings

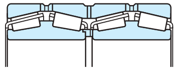
- Suitable for low- and medium-speed rotation. Available in both metric and inch series.
- The internal clearance is preadjusted, facilitating mounting.
- More sealed type four-row tapered roller bearings are being used currently.

Four-row cylindrical roller bearings

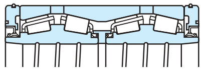


Cylindrical bore

Four-row tapered roller bearings



Open type



Sealed type

For details, refer to JTEKT separate catalog "Roll neck bearings for rolling mill" (CAT. NO. B2013E).

Bearings

1) General Bearings

Large size ball & roller bearings

(CAT.NO.B2002E)

Koyo
LARGE SIZE
BALL & ROLLER BEARINGS
JTEKT

This catalog provides information on various large size ball and roller bearings for purposes such as steel making equipment, equipment for wind-power generation, civil engineering and construction machinery, and other large industrial machineries.

It contains large size bearings with bore diameter of 100 mm or more.

Needle roller bearings

(CAT.NO.B2020E)

Koyo
Needle Roller Bearings

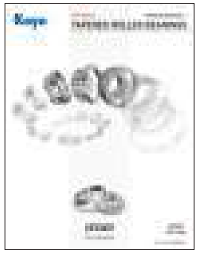
More useful catalog of needle roller bearings as the Koyo brand.

The products published to the catalog

· Radial needle roller and cage assemblies
· Drawn cup needle roller bearings
· Drawn cup roller clutches
· Heavy-duty needle roller bearings
· Track rollers
· Thrust bearings, assemblies, washers
· Combined needle roller bearings
· Needle rollers, accessories

Inch series tapered roller bearings

(CAT.NO.B2009E)



Koyo

This is the special catalog for tapered roller bearings containing frequently used series in addition to the products included in the "Ball & Roller Bearings" catalog (CAT.NO.B2001E), for improvement in the contents and easier reference.

EXSEV BEARINGS AND CERAMIC BEARINGS

(CAT.NO.B2004E)

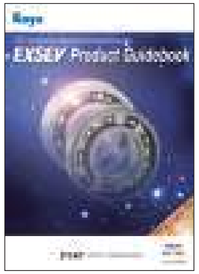
Koyo

Suitable for use in special environments, such as clean room, vacuum, high-temperature, or chemical.

Available in sizes of 4 mm to 40 mm bearing bore.

EXSEV product guidebook

(CAT.NO.B1005E)



Koyo
EXSEV Product Guidebook

This is a summarized version of EXSEV BEARINGS AND CERAMIC BEARINGS FOR EXTREME SPECIAL ENVIRONMENTS (Cat. No.B2004E).

Please utilize this guidebook when selecting bearings.

CERAMIC BEARINGS

(CAT.NO.B1013E)

Koyo
CERAMIC BEARINGS

This pamphlet is targeting and introducing ceramic bearings.

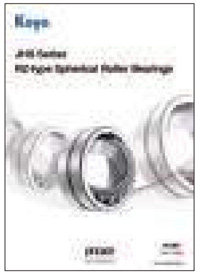
For the easy selection, this pamphlet is introducing ceramic bearings at each use.

The following contents are included in this pamphlet:

· Ceramics Production Processes
· Properties of ceramic materials
· Features

JHS series RZ-type spherical roller bearings

(CAT.NO.B2023E)

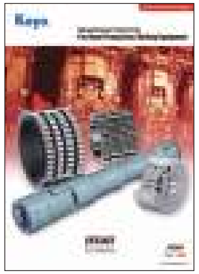


This pamphlet introduces our "JHS Series" RZ-type Spherical Roller Bearings, which are a new generation of high-performance bearings made possible with advanced designs and processing technologies.
In addition to introducing the JHS Series, this pamphlet will also explain the features and structures of JHS Series RZ-type Spherical Roller Bearings.

2) Products for Steel Production Equipment

High-performance product series for steel production/rolling equipment

(CAT.NO.B1001E)



In this pamphlet, we will introduce high-performance products (bearings, drive shafts, and oil seals) that contribute to stable operations of steel production equipment.
This pamphlet contains two parts: an overall introduction and product introduction.

Products to be introduced include the following

· Bearings for roll necks
· Drive shafts for rolling mills
· Bearings for backing shafts of cluster mills
· Products for continuous casting machines

Cylindrical roller bearings for multi-roll mill backup rolls

(CAT.NO.B2012E)

Special designed bearings for multi-roll mill backup rolls.
The outer ring is made of special material and is heat-treated for surface hardness to ensure impact resistance, and thus reliability. In addition, JHS210 bearings meet the needs of our customers for long service lives.
This catalog provides information on the handling of the bearings (key points for the disassembling and inspecting of the bearings) as well as actual examples of bearing failures and countermeasures.

Roll neck bearings for rolling mill

(CAT.NO.B2013E)

This bearing is used for rolling mill roll necks.
This catalog includes data about countermeasures for damages particular to this application as well as dimensions tables.

Drive shafts for steel production/industrial equipment

(CAT.NO.B2021E)

Drive shafts for steel production/industrial equipment are included in this catalog.

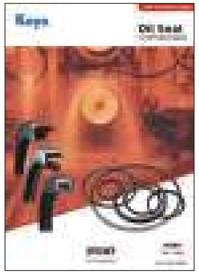
Products line up, handling explanation cases of failures, technical data that includes selection criteria for each application are shown in this catalog.

Also, specifications, product introduction (phase adjustment, hyper coupling), etc are shown in this catalog.

This catalog can widely be used for from drive shaft selection to maintenance.

Oil seal for steel production equipment

(CAT.NO.B1020E)



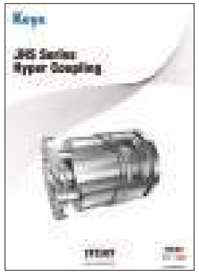
This pamphlet introduces oil seals that are used in steel production equipment.

This pamphlet includes features and other information on products used in the following equipment:

· Rolling Mill
· Continuous Casting Machines
· Sintering Machine Pallet Cars and Converter Furnaces

JHS series hyper coupling

(CAT.NO.B1010E)



The hyper coupling is a torque limiter (cut-off device) that protects drive systems for heavy loads.

This catalog will show you operating principles, features of the products, examples of the applications, and the product lineup.

3) General Industrial equipment

New ceramic ball bearings for electric motors

(CAT.NO.B1017E)

This pamphlet introduces our new ceramic ball bearings which have similar insulation properties to conventional ceramic ball bearings (silicon nitride), and their thermal expansion is close to that of steel ball bearings, so that there is very little change in clearance due to temperature.

Low-torque Long-life deep groove ball bearIngs for electric motors

(CAT.NO.B1018E)

This pamphlet introduces our new deep groove ball bearings, with optimized grease composition which greatly reduces torque and extends service life, and also reduces energy consumption by the motor and contributes to reducing the need for maintenance.

Slim Bearing

(CAT.NO.B1021E)

This pamphlet introduces our slim bearings for which the seal groove width has been reduced by welding the shield directly to the outer ring instead of attaching the shield to the outer ring seal groove.

Motor-use Deep Groove Ball Bearings with Optimized Sound Output

(CAT.NO.B1022E)

This pamphlet introduces our deep groove ball bearings for which sound from unpleasant frequencies to the human ear has been reduced by optimizing the inner raceway surface through the use of 3D analysis.

Products for machine tools

(CAT.NO.B1016E)

This pamphlet introduces JTEKT's products for machine tools.

Contents

- Changes in Spindle Technologies
- Introduction to High-ability NX Series

(Ultra-high speed angular ball bearings and ultra-high speed cylindrical roller bearings)

- Introduction to bearings for spindle
- Introduction to ball screw-related products and spindle unit products
- Product line-up

Precision ball & roller bearings for machine tools

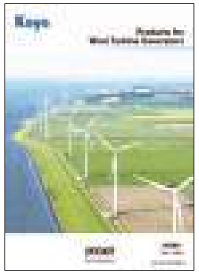
(CAT.NO.B2005E)

This catalog includes high precision products such as cylindrical roller bearings and angular contact ball bearings, that are used for spindles of machine tools, and support bearing for precision ball screws.

This catalog gives technical descriptions including references for handling of bearings such as the guideline for selection of bearing, example of bearing installation, and example of bearing failures.

Products for Wind Turbine Generators

(CAT.NO.B1002E)



This catalog introduces main shaft bearings, gearbox bearings, and generator bearings for wind turbine generators.

The catalog also includes main shaft oil seals, hydraulic pumps, and machine tools for large components of wind turbine generators.

Product information for agricultural and construction equipment

(CAT.NO.B1009E)

This catalog is introducing the function needed to an agricultural machine and a construction machine, our technology and goods.

- Optimum design technologies (High performance tapered roller bearing)
- Heat treatment technologies (KE bearing, SH bearing)
- Analysis technologies, Surface reforming technology
- JHS Series Spherical Roller Bearings
- Propeller shaft for construction machinery, Oil seal, Hydraulic Components

High Wing Series Drive Shafts

(CAT.NO.B2022E)

Drive shafts for construction machinery/railway rolling stocks are included in this catalog.

Products line up, handling explanation, technical data that include cases of failures, specifications, etc are shown in this catalog.

This catalog can widely be used for from drive shaft selection to maintenance.

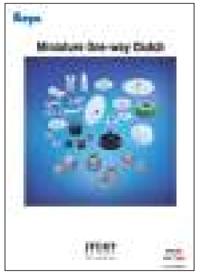
Bearings for Aerospace Applications

(CAT.NO.B1003JE)

This pamphlet introduces bearings that are used in airplanes and in space. The bearing usage locations and the airplane eras are gathered together and introduced in lists.

Miniature One-way Clutch

(CAT.NO.B2024E)



Miniature one-way clutches are used in clutch systems in various machines, including office automation equipment, ATMs, and various ticket vending machines.
This catalog also includes recommended polyacetal resin and steel housing dimensions.

Ball bearing units

(CAT.NO.B2007E)

This catalog has information about ball bearing units.
Technical descriptions, selection of ball bearing units, and dimensional tables of units, such as pillow block type, take-up type, cartridge type, and ball bearing for units, are included in this catalog.
Stainless-series and "compact" series are also included in this catalog.

Traction drive unit

(CAT.NO.B1011E)

A Traction Drive Unit has been conceived from bearing core technologies. A reducer with a minimal rotation irregularity is suitable for high-accuracy feeding, which is unachievable by using gears.

Oil seals & o-rings

(CAT.NO.R2001E)

This catalog includes oil seals, o-rings and back up rings.
Includes dimensional tables, technical explanations and handling information.

4) Automotive Components

The 3rd generation ball hub units

(CAT.NO.B1004E)

This pamphlet introduces the main characteristics and design of the 3rd generation ball type hub units.
Features JTEKT's recommended hub unit numbers.

Tapered roller bearings for axle drive pinions

(CAT.NO.B1006E)

This pamphlet introduces tapered roller bearings for axle drive pinions.
Technology for torque reduction and longer service life, examination and evaluation methods, and recommended series bearing numbers.

Bearings


■Hub units


■Clutch release bearings

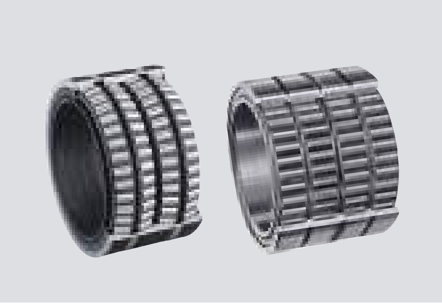

■Water pump bearings


■Bearings for rocker arms


■CPA bearings


■LFT Ⅲ bearings


■KE bearings


■Roll neck bearings for rolling mill
(Steel production/rolling equipment)


■Bearings for wind turbine generator


■EXSEV & Ceramic bearings


■Bearings for railway rolling stock axle journals


■Drive shafts


■ Bearings for machine tools


■ Bearings for aircraft/aerospace

Automotive Components


■ Steering systems


■ TORSEN LSD


■ Intelligent torque controlled coupling (ITCC)


■ Drive shafts (CVJ)

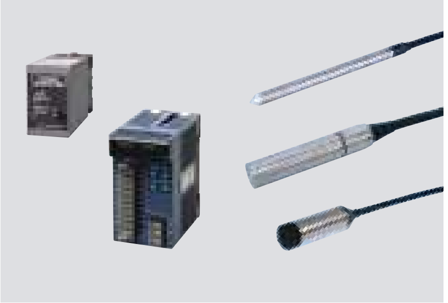

■ Electric pumps for idle-stop system

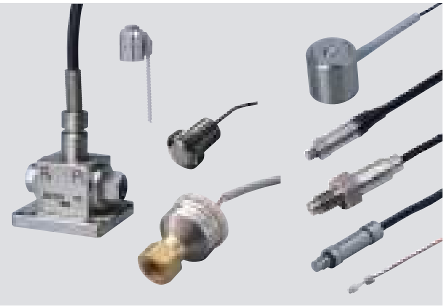

■ Pump for CVT


■ Linear solenoid valve for AT and CVT


■ Damper pulleys

Sensors


■ Water level meters


■ Pressure sensors/Transducers

Machine tools

[Grinders]

■**Grinding center TG4**

■**Cam shaft grinder GC20Mi**

■**Cylindrical grinder e300G**

[Machining Centers]

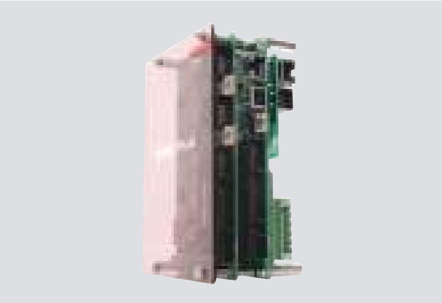
■**Horizontal spindle machining center FH630SX-i**

■**Vertical spindle machining center FV2090S**

Mechatronics

■**Programmable controller**

TOYOPUC-PC10G



TOYOPUC-Plus

■**Direct circuit monitor**

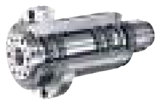
■**Small safety PLC TOYOPUC-PCS-J**

Koyo Machine Industries Co., Ltd.


■Centerless grinding machine


■Surface grinding machine


■Fully automatic assembly inspection system


■Precision spindle unit


■Drive shaft


■Ball screws


■Indexing chuck


■Intermediate shafts

Toyooki Kogyo Co., Ltd.

Energy-saving hydraulic equipment


■Small pack


■TOYOPAC"ECO"


■Reduced wiring 4 pin connector solenoid valve


■Toyopac motion

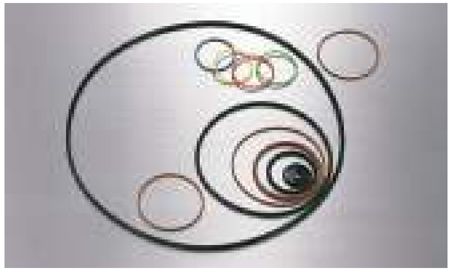
Inspection and testing machine


■High performance straightening machine

Automotive components

Koyo Sealing Techno Co., Ltd.

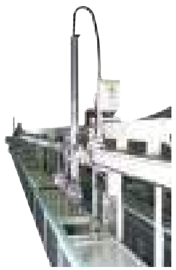

■Oil seals of various types


■O-rings of various types


■Functional parts of various types


■Bonded piston seals for AT and CVT

CNK Co., Ltd.


■Loader

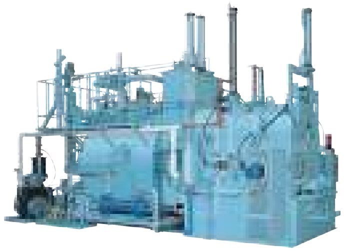

■DLC coating equipment


■Round eddy-current coolant system


■Heat treatment equipment

Koyo Thermo Systems Co., Ltd.


■Vacuum heat treatment furnace


■Non-frame KCF carburizing and quenching furnaces


■Vertical diffusion systems

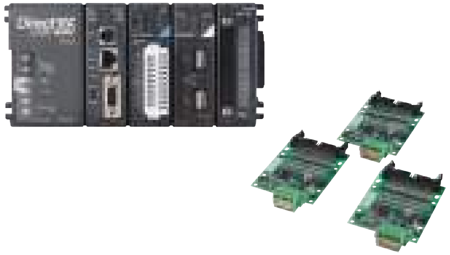

■Electronic device for continuous furnace


■High temperature clean oven

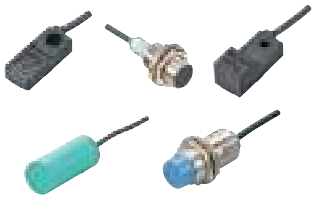

■Experimental small electric furnace

Koyo Electronics Industries Co., Ltd.


■Rotary encoders


■Programmable controllers


■HMI


■Proximity switch

HOUKO Co., Ltd


■General purpose cylindrical grinders G32 series

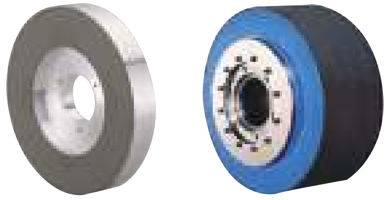

■CNC cylindrical grinders GE3/GL3S series


■Production type Cylindrical grinders GL4E series


■CNC large cylindrical grinders GE6 series

Toyoda Van Moppes Ltd.


■Cam profile grinding vitrified wheel


■Two-sided surface grinding, centerless grinding wheel


■Rotary dressers


■Diamond centers

Supplementary table 1 (1) Boundary dimensions of radial bearings (except tapered roller bearings) – diameter series 7, 8, 9, 0 –

Unit : mm

Deep groove ball brg.			67						68										69										160	60							
Angular contact ball brg.																														70							
Self-aligning ball brg.																																					
Cylindrical roller brg.																			N 19	N 29		NNU 49								NU 10		NN 30					
Needle roller brg.												NA 48										NA 49	NA 59	NA 69													
Spherical roller brg.											238										239											230	240				
Bore dia. No.	Bore dia.	Diameter series 7					Diameter series 8										Diameter series 9											Diameter series 0									
		Outside dia.	Dimension series				Outside dia.	Dimension series									Outside dia.	Dimension series										Outside dia.	Dimension series								
			17	27	37	17~37		08	18	28	38	48	58	68	08	18~68		09	19	29	39	49	59	69	09	19~39	49~69		00	10	20	30	40	50	60	00	10~60
	d	*D*	Width *B*			*r* min.	*D*	Width *B*							*r* min.		*D*	Width *B*							*r* min.			*D*	Width *B*							*r* min.	
–	0.6	2	0.8	–	–	0.05	2.5	–	1	–	1.4					0.05	–	–	–	–	–					–	–	–	–	–	–	–					–
1	1	2.5	1	–	–	0.05	3	–	1	–	1.5					0.05	4	–	1.6	–	2.3					0.1	–	–	–	–	–	–					–
–	1.5	3	1	–	1.8	0.05	4	–	1.2	–	2					0.05	5	–	2	–	2.6					0.15	–	6	–	2.5	–	3					0.15
2	2	4	1.2	–	2	0.05	5	–	1.5	–	2.3					0.08	6	–	2.3	–	3					0.15	–	7	–	2.8	–	3.5					0.15
–	2.5	5	1.5	–	2.3	0.08	6	–	1.8	–	2.6					0.08	7	–	2.5	–	3.5					0.15	–	8	–	2.8	–	4					0.15
3	3	6	2	2.5	3	0.08	7	–	2	–	3					0.1	8	–	3	–	4					0.15	–	9	–	3	–	5					0.15
4	4	7	2	2.5	3	0.08	9	–	2.5	3.5	4					0.1	11	–	4	–	5	–	–	–	–	0.15	–	12	–	4	–	6					0.2
5	5	8	2	2.5	3	0.08	11	–	3	4	5					0.15	13	–	4	–	6	10	–	–	–	0.2	0.15	14	–	5	–	7					0.2
6	6	10	2.5	3	3.5	0.1	13	–	3.5	5	6					0.15	15	–	5	–	7	10	–	–	–	0.2	0.15	17	–	6	–	9					0.3
7	7	11	2.5	3	3.5	0.1	14	–	3.5	5	6	–	–	–	–	0.15	17	–	5	–	7	10	–	–	–	0.3	0.15	19	–	6	8	10	–	–	–	–	0.3
8	8	12	2.5	–	3.5	0.1	16	–	4	5	6	8	–	–	–	0.2	19	–	6	–	9	11	–	–	–	0.3	0.2	22	–	7	9	11	14	19	25	–	0.3
9	9	14	3	–	4.5	0.1	17	–	4	5	6	8	–	–	–	0.2	20	–	6	–	9	11	–	–	–	0.3	0.3	24	–	7	10	12	15	20	27	–	0.3
00	10	15	3	–	4.5	0.1	19	–	5	6	7	9	–	–	–	0.3	22	–	6	8	10	13	16	22	–	0.3	0.3	26	–	8	10	12	16	21	29	–	0.3
01	12	18	4	–	5	0.2	21	–	5	6	7	9	–	–	–	0.3	24	–	6	8	10	13	16	22	–	0.3	0.3	28	7	8	10	12	16	21	29	0.3	0.3
02	15	21	4	–	5	0.2	24	–	5	6	7	9	–	–	–	0.3	28	–	7	8.5	10	13	18	23	–	0.3	0.3	32	8	9	11	13	17	23	30	0.3	0.3
03	17	23	4	–	5	0.2	26	–	5	6	7	9	–	–	–	0.3	30	–	7	8.5	10	13	18	23	–	0.3	0.3	35	8	10	12	14	18	24	32	0.3	0.3
04	20	27	4	–	5	0.2	32	4	7	8	10	12	16	22	0.3	0.3	37	7	9	11	13	17	23	30	0.3	0.3	0.3	42	8	12	14	16	22	30	40	0.3	0.6
/22	22	–	–	–	–	–	34	4	7	–	10	–	16	22	0.3	0.3	39	7	9	11	13	17	23	30	0.3	0.3	0.3	44	8	12	14	16	22	30	40	0.3	0.6
05	25	32	4	–	5	0.2	37	4	7	8	10	12	16	22	0.3	0.3	42	7	9	11	13	17	23	30	0.3	0.3	0.3	47	8	12	14	16	22	30	40	0.3	0.6
/28	28	–	–	–	–	–	40	4	7	–	10	–	16	22	0.3	0.3	45	7	9	11	13	17	23	30	0.3	0.3	0.3	52	8	12	15	18	24	32	43	0.3	0.6
06	30	37	4	–	5	0.2	42	4	7	8	10	12	16	22	0.3	0.3	47	7	9	11	13	17	23	30	0.3	0.3	0.3	55	9	13	16	19	25	34	45	0.3	1
/32	32	–	–	–	–	–	44	4	7	–	10	–	16	22	0.3	0.3	52	7	10	13	15	20	27	36	0.3	0.6	0.6	58	9	13	16	20	26	35	47	0.3	1
07	35	–	–	–	–	–	47	4	7	8	10	12	16	22	0.3	0.3	55	7	10	13	15	20	27	36	0.3	0.6	0.6	62	9	14	17	20	27	36	48	0.3	1
08	40	–	–	–	–	–	52	4	7	8	10	12	16	22	0.3	0.3	62	8	12	14	16	22	30	40	0.3	0.6	0.6	68	9	15	18	21	28	38	50	0.3	1
09	45						58	4	7	8	10	13	18	23	0.3	0.3	68	8	12	14	16	22	30	40	0.3	0.6	0.6	75	10	16	19	23	30	40	54	0.6	1
10	50						65	5	7	10	12	15	20	27	0.3	0.3	72	8	12	14	16	22	30	40	0.3	0.6	0.6	80	10	16	19	23	30	40	54	0.6	1
11	55						72	7	9	11	13	17	23	30	0.3	0.3	80	9	13	16	19	25	34	45	0.3	1	1	90	11	18	22	26	35	46	63	0.6	1.1
12	60						78	7	10	12	14	18	24	32	0.3	0.3	85	9	13	16	19	25	34	45	0.3	1	1	95	11	18	22	26	35	46	63	0.6	1.1
13	65						85	7	10	13	15	20	27	36	0.3	0.6	90	9	13	16	19	25	34	45	0.3	1	1	100	11	18	22	26	35	46	63	0.6	1.1
14	70						90	8	10	13	15	20	27	36	0.3	0.6	100	10	16	19	23	30	40	54	0.6	1	1	110	13	20	24	30	40	54	71	0.6	1.1
15	75						95	8	10	13	15	20	27	36	0.3	0.6	105	10	16	19	23	30	40	54	0.6	1	1	115	13	20	24	30	40	54	71	0.6	1.1
16	80						100	8	10	13	15	20	27	36	0.3	0.6	110	10	16	19	23	30	40	54	0.6	1	1	125	14	22	27	34	45	60	80	0.6	1.1
17	85						110	9	13	16	19	25	34	45	0.3	1	120	11	18	22	26	35	46	63	0.6	1.1	1.1	130	14	22	27	34	45	60	80	0.6	1.1
18	90						115	9	13	16	19	25	34	45	0.3	1	125	11	18	22	26	35	46	63	0.6	1.1	1.1	140	16	24	30	37	50	67	90	1	1.5
19	95						120	9	13	16	19	25	34	45	0.3	1	130	11	18	22	26	35	46	63	0.6	1.1	1.1	145	16	24	30	37	50	67	90	1	1.5
20	100						125	9	13	16	19	25	34	45	0.3	1	140	13	20	24	30	40	54	71	0.6	1.1	1.1	150	16	24	30	37	50	67	90	1	1.5
21	105						130	9	13	16	19	25	34	45	0.3	1	145	13	20	24	30	40	54	71	0.6	1.1	1.1	160	18	26	33	41	56	75	100	1	2
22	110						140	10	16	19	23	30	40	54	0.6	1	150	13	20	24	30	40	54	71	0.6	1.1	1.1	170	19	28	36	45	60	80	109	1	2
24	120						150	10	16	19	23	30	40	54	0.6	1	165	14	22	27	34	45	60	80	0.6	1.1	1.1	180	19	28	36	46	60	80	109	1	2
26	130						165	11	18	22	26	35	46	63	0.6	1.1	180	16	24	30	37	50	67	90	1	1.5	1.5	200	22	33	42	52	69	95	125	1.1	2
28	140						175	11	18	22	26	35	46	63	0.6	1.1	190	16	24	30	37	50	67	90	1	1.5	1.5	210	22	33	42	53	69	95	125	1.1	2
30	150						190	13	20	24	30	40	54	71	0.6	1.1	210	19	28	36	45	60	80	109	1	2	2	225	24	35	45	56	75	100	136	1.1	2.1
32	160						200	13	20	24	30	40	54	71	0.6	1.1	220	19	28	36	45	60	80	109	1	2	2	240	25	38	48	60	80	109	145	1.5	2.1
34	170						215	14	22	27	34	45	60	80	0.6	1.1	230	19	28	36	45	60	80	109	1	2	2	260	28	42	54	67	90	122	160	1.5	2.1
36	180						225	14	22	27	34	45	60	80	0.6	1.1	250	22	33	42	52	69	95	125	1.1	2	2	280	31	46	60	74	100	136	180	2	2.1
38	190						240	16	24	30	37	50	67	90	1	1.5	260	22	33	42	52	69	95	125	1.1	2	2	290	31	46	60	75	100	136	180	2	2.1
40	200						250	16	24	30	37	50	67	90	1	1.5	280	25	38	48	60	80	109	145	1.5	2.1	2.1	310	34	51	66	82	109	150	200	2	2.1
44	220						270	16	24	30	37	50	67	90	1	1.5	300	25	38	48	60	80	109	145	1.5	2.1	2.1	340	37	56	72	90	118	160	218	2.1	3
48	240						300	19	28	36	45	60	80	109	1	2	320	25	38	48	60	80	109	145	1.5	2.1	2.1	360	37	56	72	92	118	160	218	2.1	3
52	260						320	19	28	36	45	60	80	109	1	2	360	31	46	60	75	100	136	180	2	2.1	2.1	400	44	65	82	104	140	190	250	3	4
56	280						350	22	33	42	52	69	95	125	1.1	2	380	31	46	60	75	100	136	180	2	2.1	2.1	420	44	65	82	106	140	190	250	3	4
60	300						380	25	38	48	60	80	109	145	1.5	2.1	420	37	56	72	90	118	160	218	2.1	3	3	460	50	74	95	118	160	218	290	4	4
64	320						400	25	38	48	60	80	109	145	1.5	2.1	440	37	56	72	90	118	160	218	2.1	3	3	480	50	74	95	121	160	218	290	4	4
68	340						420	25	38	48	60	80	109	145	1.5	2.1	460	37	56	72	90	118	160	218	2.1	3	3	520	57	82	106	133	180	243	325	4	5
72	360						440	25	38	48	60	80	109	145	1.5	2.1	480	37	56	72	90	118	160	218	2.1	3	3	540	57	82	106	134	180	243	325	4	5
76	380						480	31	46	60	75	100	136	180	2	2.1	520	44	65	82	106	140	190	250	3	4	4	560	57	82	106	135	180	243	325	4	5
80	400						500	31	46	60	75	100	136	180	2	2.1	540	44	65	82	106	140	190	250	3	4	4	600	63	90	118	148	200	272	355	5	5
84	420						520	31	46	60	75	100	136	180	2	2.1	560	44	65	82	106	140	190	250	3	4	4	620	63	90	118	150	200	272	355	5	5
88	440						540	31	46	60	75	100	136	180	2	2.1	600	50	74	95	118	160	218	290	4	4	4	650	67	94	122	157	212	280	375	5	6
92	460						580	37	56	72	90	118	160	218	2.1	3	620	50	74	95	118	160	218	290	4	4	4	680	71	100	128	163	218	300	400	5	6
96	480						600	37	56	72	90	118	160	218	2.1	3	650	54	78	100	128	170	230	308	4	5	5	700	71	100	128	165	218	300	400	5	6
/500	500						620	37	56	72	90	118	160	218	2.1	3	670	54	78	100	128	170	230	308	4	5	5	720	71	100	128	167	218	300	400	5	6
/530	530						650	37	56	72	90	118	160	218	2.1	3	710	57	82	106	136	180	243	325	4	5	5	780	80	112	145	185	250	335	450	6	6
/560	560						680	37	56	72	90	118	160	218	2.1	3	750	60	85	112	140	190	258	345	5	5	5	820	82	115	150	195	258	355	462	6	6
/600	600						730	42	60	78	98	128	175	236	3	3	800	63	90	118	150	200	272	355	5	5	5	870	85	118	155	200	272	365	488	6	6
/630	630						780	48	69	88	112	150	200	272	3	4	850	71	100	128	165	218	300	400	5	6	6	920	92	128	170	212	290	388	515	6	7.5
/670	670						820	48	69	88	112	150	200	272	3	4	900	73	103	136	170	230	308	412	5	6	6	980	100	136	180	230	308	425	560	6	7.5
/710	710						870	50	74	95	118	160	218	290	4	4	950	78	106	140	180	243	325	438	5	6	6	1030	103	140	185	236	315	438	580	6	7.5
/750	750						920	54	78	100	128	170	230	308	4	5	1000	80	112	145	185	250	335	450	6	6	6	1090	109	150	195	250	335	462	615	7.5	7.5
/800	800						980	57	82	106	136	180	243	325	4	5	1060	82	115	150	195	258	355	462	6	6	6	1150	112	155	200	258	345	475	630	7.5	7.5
/850	850						1030	57	82	106	136	180	243	325	4	5	1120	85	118	155	200	272	365	488	6	6	6	1220	118	165	212	272	365	500	670	7.5	7.5
/900	900						1090	60	85	112	140	190	258	345	5	5	1180	88	122	165	206	280	375	500	6	6	6	1280	122	170	218	280	375	515	690	7.5	7.5
/950	950						1150	63	90	118	150	200	272	355	5	5	1250	95	132	175	224	300	400	545	6	7.5	7.5	1360	132	180	236	300	412	560	730	7.5	7.5
/1000	1000						1220	71	100	128	165	218	300	400	5	6	1320	103	140	185	236	315	438	580	6	7.5	7.5	1420	136	185	243	308	412	560	750	7.5	7.5
/1060	1060						1280	71	100	128	165	218	300	400	5	6	1400	109	150	195	250	335	462	615	7.5	7.5	7.5	1500	140	195	250	325	438	600	800	9.5	9.5
/1120	1120						1360	78	106	140	180	243	325	438	5	6	1460	109	150	195	250	335	462	615	7.5	7.5	7.5	1580	145	200	265	345	462	615	825	9.5	9.5
/1180	1180						1420	78	106	140	180	243	325	438	5	6	1540	115	160	206	272	355	488	650	7.5	7.5	7.5	1660	155	212	272	355	475	650	875	9.5	9.5
/1250	1250						1500	80	112	145	185	250	335	450	6	6	1630	122	170	218	280	375	515	690	7.5	7.5	7.5	1750	–	218	290	375	500	–	–	–	9.5
/1320	1320						1600	88	122	165	206	280	375	500	6	6	1720	128	175	230	300	400	545	710	7.5	7.5	7.5	1850	–	230	300	400	530	–	–	–	12
/1400	1400						1700	95	132	175	224	300	400	545	6	7.5	1820	–	185	243	315	425	–	–	–	9.5	9.5	1950	–	243	315	412	545	–	–	–	12
/1500	1500						1820	–	140	185	243	315	–	–	–	7.5	1950	–	195	258	335	450	–	–	–	9.5	9.5	2120	–	272	355	462	615	–	–	–	12
/1600	1600						1950	–	155	200	265	345	–	–	–	7.5	2060	–	200	265	345	462	–	–	–	9.5	9.5	2240	–	280	365	475	630	–	–	–	12
/1700	1700						2060	–	160	206	272	355	–	–	–	7.5	2180	–	212	280	355	475	–	–	–	9.5	9.5	2360	–	290	375	500	650	–	–	–	15
/1800	1800						2180	–	165	218	290	375	–	–	–	9.5	2300	–	218	290	375	500	–	–	–	12	12	2500	–	308	400	530	690	–	–	–	15
/1900	1900						2300	–	175	230	300	400	–	–	–	9.5	2430	–	230	308	400	530	–	–	–	12	12	–	–	–	–	–	–	–	–	–	–
/2000	2000						2430	–	190	250	325	425	–	–	–	9.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

[Remark] The chamfer dimensions (*r*) in this table are not always applicable to the following corners. (a) Snap ring groove side corner of outer ring with snap ring groove. (b) No-rib side bearing ring corner of thin section cylindrical roller bearing. (c) Front bearing ring corner of angular contact ball bearing. (d) Inner ring corner of tapered bore bearing.

Supplementary table 1 (2) Boundary dimensions of radial bearings (except tapered roller bearings) – diameter series 1, 2, 3, 4 –

Unit : mm

Deep groove ball bearing												62		42							63		43					64		
Angular contact ball bearing												72			32 52						73			33 53				74		
Self-aligning ball bearing												12		22							13		23							
Cylindrical roller bearing						NN 31						NU 2		NU 22	NU 32						NU 3		NU 23	NU 33				NU 4		
Needle roller bearing																														
Spherical roller bearing						231	241							222	232						213		223							
		Diameter series 1								Diameter series 2									Diameter series 3								Diameter series 4			
Bore dia. No.	Bore dia.	Outside dia.	Dimension series							Outside dia.	Dimension series								Outside dia.	Dimension series							Outside dia.	Dimension series		
			01	11	21	31	41	01	11~41		82	02	12	22	32	42	82	02~42		83	03	13	23	33	83	03~33		04	24	04. 24
	d	*D*	Width *B*					*r* min.		*D*	Width *B*						*r* min.		*D*	Width *B*					*r* min.		*D*	Width *B*		*r* min.
–	0.6																													
1	1																													
–	1.5																													
2	2									–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–				
–	2.5									–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–				
3	3									10	2.5	4	–	–	5	–	0.1	0.15	13	–	5	–	–	7	–	0.2				
4	4									13	3	5	–	–	7	–	0.15	0.2	16	–	5	–	–	9	–	0.3				
5	5									16	3.5	5	–	–	8	–	0.15	0.3	19	–	6	–	–	10	–	0.3				
6	6									19	4	6	–	–	10	–	0.2	0.3	22	–	7	–	11	13	–	0.3				
7	7									22	5	7	–	–	11	–	0.3	0.3	26	–	9	–	13	15	–	0.3	–	–	–	–
8	8									24	5	8	–	–	12	–	0.3	0.3	28	–	9	–	13	15	–	0.3	30	10	14	0.6
9	9									26	6	8	–	–	13	–	0.3	0.3	30	–	10	–	14	16	–	0.6	32	11	15	0.6
00	10									30	7	9	–	14	14.3	–	0.3	0.6	35	9	11	–	17	19	0.3	0.6	37	12	16	0.6
01	12									32	7	10	–	14	15.9	–	0.3	0.6	37	9	12	–	17	19	0.3	1	42	13	19	1
02	15									35	8	11	–	14	15.9	20	0.3	0.6	42	9	13	–	17	19	0.3	1	52	15	24	1.1
03	17									40	8	12	–	16	17.5	22	0.3	0.6	47	10	14	–	19	22.2	0.6	1	62	17	29	1.1
04	20									47	9	14	–	18	20.6	27	0.3	1	52	10	15	–	21	22.2	0.6	1.1	72	19	33	1.1
/22	22									50	9	14	–	18	20.6	27	0.3	1	56	11	16	–	21	25	0.6	1.1	–	–	–	–
05	25									52	10	15	–	18	20.6	27	0.3	1	62	12	17	–	24	25.4	0.6	1.1	80	21	36	1.5
/28	28									58	10	16	–	19	23	30	0.6	1	68	13	18	–	24	30	0.6	1.1	–	–	–	–
06	30									62	10	16	–	20	23.8	32	0.6	1	72	13	19	–	27	30.2	0.6	1.1	90	23	40	1.5
/32	32									65	11	17	–	21	25	33	0.6	1	75	14	20	–	28	32	0.6	1.1	–	–	–	–
07	35									72	12	17	–	23	27	37	0.6	1.1	80	14	21	–	31	34.9	0.6	1.5	100	25	43	1.5
08	40									80	13	18	–	23	30.2	40	0.6	1.1	90	16	23	–	33	36.5	1	1.5	110	27	46	2
09	45									85	13	19	–	23	30.2	40	0.6	1.1	100	17	25	–	36	39.7	1	1.5	120	29	50	2
10	50									90	13	20	–	23	30.2	40	0.6	1.1	110	19	27	–	40	44.4	1	2	130	31	53	2.1
11	55									100	14	21	–	25	33.3	45	0.6	1.5	120	21	29	–	43	49.2	1.1	2	140	33	57	2.1
12	60									110	16	22	–	28	36.5	50	1	1.5	130	22	31	–	46	54	1.1	2.1	150	35	60	2.1
13	65									120	18	23	–	31	38.1	56	1	1.5	140	24	33	–	48	58.7	1.1	2.1	160	37	64	2.1
14	70									125	18	24	–	31	39.7	56	1	1.5	150	25	35	–	51	63.5	1.5	2.1	180	42	74	3
15	75									130	18	25	–	31	41.3	56	1	1.5	160	27	37	–	55	68.3	1.5	2.1	190	45	77	3
16	80									140	19	26	–	33	44.4	60	1	2	170	28	39	–	58	68.3	1.5	2.1	200	48	80	3
17	85									150	21	28	–	36	49.2	65	1.1	2	180	30	41	–	60	73	2	3	210	52	86	4
18	90	150	–	–	–	–	60	–	2	160	22	30	–	40	52.4	69	1.1	2	190	30	43	–	64	73	2	3	225	54	90	4
19	95	160	–	–	–	–	65	–	2	170	24	32	–	43	55.6	75	1.1	2.1	200	33	45	–	67	77.8	2	3	240	55	95	4
20	100	165	21	30	39	52	65	1.1	2	180	25	34	–	46	60.3	80	1.5	2.1	215	36	47	51	73	82.6	2.1	3	250	58	98	4
21	105	175	22	33	42	56	69	1.1	2	190	27	36	–	50	65.1	85	1.5	2.1	225	37	49	53	77	87.3	2.1	3	260	60	100	4
22	110	180	22	33	42	56	69	1.1	2	200	28	38	–	53	69.8	90	1.5	2.1	240	42	50	57	80	92.1	3	3	280	65	108	4
24	120	200	25	38	48	62	80	1.5	2	215	–	40	42	58	76	95	–	2.1	260	44	55	62	86	106	3	3	310	72	118	5
26	130	210	25	38	48	64	80	1.5	2	230	–	40	46	64	80	100	–	3	280	48	58	66	93	112	3	4	340	78	128	5
28	140	225	27	40	50	68	85	1.5	2.1	250	–	42	50	68	88	109	–	3	300	50	62	70	102	118	4	4	360	82	132	5
30	150	250	31	46	60	80	100	2	2.1	270	–	45	54	73	96	118	–	3	320	–	65	75	108	128	–	4	380	85	138	5
32	160	270	34	51	66	86	109	2	2.1	290	–	48	58	80	104	128	–	3	340	–	68	79	114	136	–	4	400	88	142	5
34	170	280	34	51	66	88	109	2	2.1	310	–	52	62	86	110	140	–	4	360	–	72	84	120	140	–	4	420	92	145	5
36	180	300	37	56	72	96	118	2.1	3	320	–	52	62	86	112	140	–	4	380	–	75	88	126	150	–	4	440	95	150	6
38	190	320	42	60	78	104	128	3	3	340	–	55	65	92	120	150	–	4	400	–	78	92	132	155	–	5	460	98	155	6
40	200	340	44	65	82	112	140	3	3	360	–	58	70	98	128	160	–	4	420	–	80	97	138	165	–	5	480	102	160	6
44	220	370	48	69	88	120	150	3	4	400	–	65	78	108	144	180	–	4	460	–	88	106	145	180	–	5	540	115	180	6
48	240	400	50	74	95	128	160	4	4	440	–	72	85	120	160	200	–	4	500	–	95	114	155	195	–	5	580	122	190	6
52	260	440	57	82	106	144	180	4	4	480	–	80	90	130	174	218	–	5	540	–	102	123	165	206	–	6	620	132	206	7.5
56	280	460	57	82	106	146	180	4	5	500	–	80	90	130	176	218	–	5	580	–	108	132	175	224	–	6	670	140	224	7.5
60	300	500	63	90	118	160	200	5	5	540	–	85	98	140	192	243	–	5	620	–	109	140	185	236	–	7.5	710	150	236	7.5
64	320	540	71	100	128	176	218	5	5	580	–	92	105	150	208	258	–	5	670	–	112	155	200	258	–	7.5	750	155	250	9.5
68	340	580	78	106	140	190	243	5	5	620	–	92	118	165	224	280	–	6	710	–	118	165	212	272	–	7.5	800	165	265	9.5
72	360	600	78	106	140	192	243	5	5	650	–	95	122	170	232	290	–	6	750	–	125	170	224	290	–	7.5	850	180	280	9.5
76	380	620	78	106	140	194	243	5	5	680	–	95	132	175	240	300	–	6	780	–	128	175	230	300	–	7.5	900	190	300	9.5
80	400	650	80	112	145	200	250	6	6	720	–	103	140	185	256	315	–	6	820	–	136	185	243	308	–	7.5	950	200	315	12
84	420	700	88	122	165	224	280	6	6	760	–	109	150	195	272	335	–	7.5	850	–	136	190	250	315	–	9.5	980	206	325	12
88	440	720	88	122	165	226	280	6	6	790	–	112	155	200	280	345	–	7.5	900	–	145	200	265	345	–	9.5	1030	212	335	12
92	460	760	95	132	175	240	300	6	7.5	830	–	118	165	212	296	365	–	7.5	950	–	155	212	280	365	–	9.5	1060	218	345	12
96	480	790	100	136	180	248	308	6	7.5	870	–	125	170	224	310	388	–	7.5	980	–	160	218	290	375	–	9.5	1120	230	365	15
/500	500	830	106	145	190	264	325	7.5	7.5	920	–	136	185	243	336	412	–	7.5	1030	–	170	230	300	388	–	12	1150	236	375	15
/530	530	870	109	150	195	272	335	7.5	7.5	980	–	145	200	258	355	450	–	9.5	1090	–	180	243	325	412	–	12	1220	250	400	15
/560	560	920	115	160	206	280	355	7.5	7.5	1030	–	150	206	272	365	475	–	9.5	1150	–	190	258	335	438	–	12	1280	258	412	15
/600	600	980	122	170	218	300	375	7.5	7.5	1090	–	155	212	280	388	488	–	9.5	1220	–	200	272	355	462	–	15	1360	272	438	15
/630	630	1030	128	175	230	315	400	7.5	7.5	1150	–	165	230	300	412	515	–	12	1280	–	206	280	375	488	–	15	1420	280	450	15
/670	670	1090	136	185	243	336	412	7.5	7.5	1220	–	175	243	315	438	545	–	12	1360	–	218	300	400	515	–	15	1500	290	475	15
/710	710	1150	140	195	250	345	438	9.5	9.5	1280	–	180	250	325	450	560	–	12	1420	–	224	308	412	530	–	15	–	–	–	–
/750	750	1220	150	206	272	365	475	9.5	9.5	1360	–	195	265	345	475	615	–	15	1500	–	236	325	438	560	–	15	–	–	–	–
/800	800	1280	155	212	272	375	475	9.5	9.5	1420	–	200	272	355	488	615	–	15	1600	–	258	355	462	600	–	15				
/850	850	1360	165	224	290	400	500	12	12	1500	–	206	280	375	515	650	–	15	1700	–	272	375	488	630	–	19				
/900	900	1420	165	230	300	412	515	12	12	1580	–	218	300	388	515	670	–	15	1780	–	280	388	500	650	–	19				
/950	950	1500	175	243	315	438	545	12	12	1660	–	230	315	412	530	710	–	15	1850	–	290	400	515	670	–	19				
/1000	1000	1580	185	258	335	462	580	12	12	1750	–	243	330	425	560	750	–	15	1950	–	300	412	545	710	–	19				
/1060	1060	1660	190	265	345	475	600	12	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–				
/1120	1120	1750	–	280	365	475	630	–	15																					
/1180	1180	1850	–	290	388	500	670	–	15																					
/1250	1250	1950	–	308	400	530	710	–	15																					
/1320	1320	2060	–	325	425	560	750	–	15																					
/1400	1400	2180	–	345	450	580	775	–	19																					
/1500	1500	2300	–	355	462	600	800	–	19																					

[Remark] The chamfer dimensions (*r*) in this table are not always applicable to the following corners.
(a) Snap ring groove side corner of outer ring with snap ring groove. (b) No-rib side bearing ring corner of thin section cylindrical roller bearing.
(c) Front bearing ring corner of angular contact ball bearing. (d) Inner ring corner of tapered bore bearing.

Supplementary table 2 Boundary dimensions of tapered roller bearings

Unit : mm

Tapered roller bearing		329						320				330						331				
		Diameter series 9						Diameter series 0										Diameter series 1				
Bore dia. No.	Bore dia.	Outside dia.	Dimension series 29			Chamfer Inner ring	Chamfer Outer ring	Outside dia.	Dimension series 20			Dimension series 30			Chamfer Inner ring	Chamfer Outer ring	Outside dia.	Dimension series 31			Chamfer Inner ring	Chamfer Outer ring
	d	*D*	*T*	*B*	*C*	*r* min.		*D*	*T*	*B*	*C*	*T*	*B*	*C*	*r* min.		*D*	*T*	*B*	*C*	*r* min.	
00	**10**																					
01	**12**																					
02	**15**																					
03	**17**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–					
04	**20**	**37**	12	12	9	0.3	0.3	**42**	15	15	12	–	–	–	0.6	0.6						
/22	**22**	**40**	12	12	9	0.3	0.3	**44**	15	15	11.5	–	–	–	0.6	0.6						
05	**25**	**42**	12	12	9	0.3	0.3	**47**	15	15	11.5	17	17	14	0.6	0.6						
/28	**28**	**45**	12	12	9	0.3	0.3	**52**	16	16	12	–	–	–	1	1						
06	**30**	**47**	12	12	9	0.3	0.3	**55**	17	17	13	20	20	16	1	1						
/32	**32**	**52**	14	15	10	0.6	0.6	**58**	17	17	13	–	–	–	1	1	–	–	–	–	–	–
07	**35**	**55**	14	14	11.5	0.6	0.6	**62**	18	18	14	21	21	17	1	1	–	–	–	–	–	–
08	**40**	**62**	15	15	12	0.6	0.6	**68**	19	19	14.5	22	22	18	1	1	**75**	26	26	20.5	1.5	1.5
09	**45**	**68**	15	15	12	0.6	0.6	**75**	20	20	15.5	24	24	19	1	1	**80**	26	26	20.5	1.5	1.5
10	**50**	**72**	15	15	12	0.6	0.6	**80**	20	20	15.5	24	24	19	1	1	**85**	26	26	20	1.5	1.5
11	**55**	**80**	17	17	14	1	1	**90**	23	23	17.5	27	27	21	1.5	1.5	**95**	30	30	23	1.5	1.5
12	**60**	**85**	17	17	14	1	1	**95**	23	23	17.5	27	27	21	1.5	1.5	**100**	30	30	23	1.5	1.5
13	**65**	**90**	17	17	14	1	1	**100**	23	23	17.5	27	27	21	1.5	1.5	**110**	34	34	26.5	1.5	1.5
14	**70**	**100**	20	20	16	1	1	**110**	25	25	19	31	31	25.5	1.5	1.5	**120**	37	37	29	2	1.5
15	**75**	**105**	20	20	16	1	1	**115**	25	25	19	31	31	25.5	1.5	1.5	**125**	37	37	29	2	1.5
16	**80**	**110**	20	20	16	1	1	**125**	29	29	22	36	36	29.5	1.5	1.5	**130**	37	37	29	2	1.5
17	**85**	**120**	23	23	18	1.5	1.5	**130**	29	29	22	36	36	29.5	1.5	1.5	**140**	41	41	32	2.5	2
18	**90**	**125**	23	23	18	1.5	1.5	**140**	32	32	24	39	39	32.5	2	1.5	**150**	45	45	35	2.5	2
19	**95**	**130**	23	23	18	1.5	1.5	**145**	32	32	24	39	39	32.5	2	1.5	**160**	49	49	38	2.5	2
20	**100**	**140**	25	25	20	1.5	1.5	**150**	32	32	24	39	39	32.5	2	1.5	**165**	52	52	40	2.5	2
21	**105**	**145**	25	25	20	1.5	1.5	**160**	35	35	26	43	43	34	2.5	2	**175**	56	56	44	2.5	2
22	**110**	**150**	25	25	20	1.5	1.5	**170**	38	38	29	47	47	37	2.5	2	**180**	56	56	43	2.5	2
24	**120**	**165**	29	29	23	1.5	1.5	**180**	38	38	29	48	48	38	2.5	2	**200**	62	62	48	2.5	2
26	**130**	**180**	32	32	25	2	1.5	**200**	45	45	34	55	55	43	2.5	2	–	–	–	–	–	–
28	**140**	**190**	32	32	25	2	1.5	**210**	45	45	34	56	56	44	2.5	2	–	–	–	–	–	–
30	**150**	**210**	38	38	30	2.5	2	**225**	48	48	36	59	59	46	3	2.5	–	–	–	–	–	–
32	**160**	**220**	38	38	30	2.5	2	**240**	51	51	38	–	–	–	3	2.5						
34	**170**	**230**	38	38	30	2.5	2	**260**	57	57	43	–	–	–	3	2.5						
36	**180**	**250**	45	45	34	2.5	2	**280**	64	64	48	–	–	–	3	2.5						
38	**190**	**260**	45	45	34	2.5	2	**290**	64	64	48				3	2.5						
40	**200**	**280**	51	51	39	3	2.5	**310**	70	70	53				3	2.5						
44	**220**	**300**	51	51	39	3	2.5	**340**	76	76	57				4	3						
48	**240**	**320**	51	51	39	3	2.5	**360**	76	76	57				4	3						
52	**260**	**360**	63.5	63.5	48	3	2.5	**400**	87	87	65				5	4						
56	**280**	**380**	63.5	63.5	48	3	2.5	**420**	87	87	65				5	4						
60	**300**	**420**	76	76	57	4	3	**460**	100	100	74				5	4						
64	**320**	**440**	76	76	57	4	3	**480**	100	100	74				5	4						
68	**340**	**460**	76	76	57	4	3	–	–	–	–				–	–						
72	**360**	**480**	76	76	57	4	3	–	–	–	–				–	–						

[Remark] In the new JIS, new dimension series (classified by contact angle) is also specified in accordance with ISO standards.

302				322			332					303 , 303D					313			323					Tapered roller bearing	
Diameter series 2												Diameter series 3														
Outside dia.	Dimension series 02			Dimension series 22			Dimension series 32			Chamfer Inner ring	Chamfer Outer ring	Outside dia.	Dimension series 03				Dimension series 13			Dimension series 23			Chamfer Inner ring	Chamfer Outer ring	Bore dia.	Bore dia. No.
D	*T*	*B*	*C*	*T*	*B*	*C*	*T*	*B*	*C*	*r* min.		*D*	*T*	*B*	*C* 303	*C* 303D	*T*	*B*	*C*	*T*	*B*	*C*	*r* min.		*d*	
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–				–	–	–	–	–	**10**	**00**
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–				–	–	–	–	–	**12**	**01**
(35	11.75	11	10)	–	–	–	–	–	–	–	–	**42**	14.25	13	11	–				–	–	–	1	1	**15**	**02**
40	13.25	12	11	17.25	16	14	–	–	–	1	1	**47**	15.25	14	12	–				20.25	19	16	1	1	**17**	**03**
47	15.25	14	12	19.25	18	15	–	–	–	1	1	**52**	16.25	15	13	–				22.25	21	18	1.5	1.5	**20**	**04**
50	–	–	–	–	–	–				–	–	**56**	–	–	–	–				–	–	–	–	–	**22**	**/22**
52	16.25	15	13	19.25	18	16 2)	22	22	18	1	1	**62**	18.25	17	15	13				25.25	24	20	1.5	1.5	**25**	**05**
58	–	–	–	(20.25	19	16) 1)	24	24	19	1	1	**68**	–	–	–	–				–	–	–	–	–	**28**	**/28**
62	17.25	16	14	21.25	20	17	25	25	19.5	1	1	**72**	20.75	19	16	14				28.75	27	23	1.5	1.5	**30**	**06**
65	18.25	17	15	(22	21.5	17) 1)	26	26	20.5	1	1	**75**	–	–	–	–				29.75	28	23	1.5	1.5	**32**	**/32**
72	18.25	17	15	24.25	23	19	28	28	22	1.5	1.5	**80**	22.75	21	18	15				32.75	31	25	2	1.5	**35**	**07**
80	19.75	18	16	24.75	23	19	32	32	25	1.5	1.5	**90**	25.25	23	20	17				35.25	33	27	2	1.5	**40**	**08**
85	20.75	19	16	24.75	23	19	32	32	25	1.5	1.5	**100**	27.25	25	22	18				38.25	36	30	2	1.5	**45**	**09**
90	21.75	20	17	24.75	23	19 3)	32	32	24.5	1.5	1.5	**110**	29.25	27	23	19				42.25	40	33	2.5	2	**50**	**10**
100	22.75	21	18	26.75	25	21	35	35	27	2	1.5	**120**	31.5	29	25	21				45.5	43	35	2.5	2	**55**	**11**
110	23.75	22	19	29.75	28	24	38	38	29	2	1.5	**130**	33.5	31	26	22				48.5	46	37	3	2.5	**60**	**12**
120	24.75	23	20	32.75	31	27	41	41	32	2	1.5	**140**	36	33	28	23				51	48	39	3	2.5	**65**	**13**
125	26.25	24	21	33.25	31	27	41	41	32	2	1.5	**150**	38	35	30	25				54	51	42	3	2.5	**70**	**14**
130	27.25	25	22	33.25	31	27	41	41	31	2	1.5	**160**	40	37	31	26				58	55	45	3	2.5	**75**	**15**
140	28.25	26	22	35.25	33	28	46	46	35	2.5	2	**170**	42.5	39	33	27				61.5	58	48	3	2.5	**80**	**16**
150	30.5	28	24	38.5	36	30	49	49	37	2.5	2	**180**	44.5	41	34	28				63.5	60	49	4	3	**85**	**17**
160	32.5	30	26	42.5	40	34	55	55	42	2.5	2	**190**	46.5	43	36	30	–	–	–	67.5	64	53	4	3	**90**	**18**
170	34.5	32	27	45.5	43	37	58	58	44	3	2.5	**200**	49.5	45	38	32	–	–	–	71.5	67	55	4	3	**95**	**19**
180	37	34	29	49	46	39	63	63	48	3	2.5	**215**	51.5	47	39	–	56.5	51	35	77.5	73	60	4	3	**100**	**20**
190	39	36	30	53	50	43	68	68	52	3	2.5	**225**	53.5	49	41	–	58	53	36	81.5	77	63	4	3	**105**	**21**
200	41	38	32	56	53	46	–	–	–	3	2.5	**240**	54.5	50	42	–	63	57	38	84.5	80	65	4	3	**110**	**22**
215	43.5	40	34	61.5	58	50	–	–	–	3	2.5	**260**	59.5	55	46	–	68	62	42	90.5	86	69	4	3	**120**	**24**
230	43.75	40	34	67.75	64	54	–	–	–	4	3	**280**	63.75	58	49	–	72	66	44	–	–	–	5	4	**130**	**26**
250	45.75	42	36	71.75	68	58	–	–	–	4	3	**300**	67.75	62	53	–	77	70	47	–	–	–	5	4	**140**	**28**
270	49	45	38	77	73	60	–	–	–	4	3	**320**	72	65	55		82	75	50	–	–	–	5	4	**150**	**30**
290	52	48	40	84	80	67	–	–	–	4	3	**340**	75	68	58	–	–	–	–	–	–	–	5	4	**160**	**32**
310	57	52	43	91	86	71	–	–	–	5	4	**360**	80	72	62	–	–	–	–	–	–	–	5	4	**170**	**34**
320	57	52	43	91	86	71	–	–	–	5	4	–	–	–	–	–	–	–	–	–	–	–	–	–	**180**	**36**
340	60	55	46	97	92	75	–	–	–	5	4														**190**	**38**
360	64	58	48	104	98	82	–	–	–	5	4														**200**	**40**
–	–	–	–	–	–	–	–	–	–	–	–														**220**	**44**
																									240	**48**
																									260	**52**
																									280	**56**
																									300	**60**
																									320	**64**
																									340	**68**
																									360	**72**

[Notes] 1) Bearing group with large contact angle
2) Outer ring width *C* of bearings with large contact angle is 15 mm.
3) Outer ring width *C* of bearings with large contact angle is 18 mm.

Supplementary table 3 Boundary dimensions of single direction thrust bearings (with flat back faces) – diameter series 0, 1, 2, 3, 4, 5 –

Unit : mm

Thrust ball brg.										511							512							513							514						
Spherical thrust roller bearings																292							293							294							
Bore dia. No.	Bore dia.	Diameter series 0					Diameter series 1							Diameter series 2							Diameter series 3							Diameter series 4							Diameter series 5		
		Outside dia.	Dimension series			Chamfer	Outside dia.	Dimension series					Chamfer	Outside dia.	Dimension series					Chamfer	Outside dia.	Dimension series					Chamfer	Outside dia.	Dimension series					Chamfer	Outside dia.	*	Chamfer
			70	90	10			71	91	11	11				72	92	12	12				73	93	13	13				74	94	14	14				95	
	d	D	Height		T	r min.	D	Height		T	d_1 max.	D_1 min.	r min.	D	Height		T	d_1 max.	D_1 min.	r min.	D	Height		T	d_1 max.	D_1 min.	r min.	D	Height		T	d_1 max.	D_1 min.	r min.	D	T	r min.
4	4	12	4	–	6	0.3	–	–	–	–	–	–	–	16	6	–	8	16	4	0.3	20	7	–	11	20	4	0.6										
6	6	16	5	–	7	0.3	–	–	–	–	–	–	–	20	6	–	9	20	6	0.3	24	8	–	12	24	6	0.6										
8	8	18	5	–	7	0.3	–	–	–	–	–	–	–	22	6	–	9	22	8	0.3	26	8	–	12	26	8	0.6										
00	10	20	5	–	7	0.3	24	6	–	9	24	11	0.3	26	7	–	11	26	12	0.6	30	9	–	14	30	10	0.6										
01	12	22	5	–	7	0.3	26	6	–	9	26	13	0.3	28	7	–	11	28	14	0.6	32	9	–	14	32	12	0.6										
02	15	26	5	–	7	0.3	28	6	–	9	28	16	0.3	32	8	–	12	32	17	0.6	37	10	–	15	37	15	0.6										
03	17	28	5	–	7	0.3	30	6	–	9	30	18	0.3	35	8	–	12	35	19	0.6	40	10	–	16	40	19	0.6	–	–	–	–	–	–	–	52	21	1
04	20	32	6	–	8	0.3	35	7	–	10	35	21	0.3	40	9	–	14	40	22	0.6	47	12	–	18	47	22	1	–	–	–	–	–	–	–	60	24	1
05	25	37	6	–	8	0.3	42	8	–	11	42	26	0.6	47	10	–	15	47	27	0.6	52	12	–	18	52	27	1	60	16	21	24	60	27	1	73	29	1.1
06	30	42	6	–	8	0.3	47	8	–	11	47	32	0.6	52	10	–	16	52	32	0.6	60	14	–	21	60	32	1	70	18	24	28	70	32	1	85	34	1.1
07	35	47	6	–	8	0.3	52	8	–	12	52	37	0.6	62	12	–	18	62	37	1	68	15	–	24	68	37	1	80	20	27	32	80	37	1.1	100	39	1.1
08	40	52	6	–	9	0.3	60	9	–	13	60	42	0.6	68	13	–	19	68	42	1	78	17	22	26	78	42	1	90	23	30	36	90	42	1.1	110	42	1.5
09	45	60	7	–	10	0.3	65	9	–	14	65	47	0.6	73	13	–	20	73	47	1	85	18	24	28	85	47	1	100	25	34	39	100	47	1.1	120	45	2
10	50	65	7	–	10	0.3	70	9	–	14	70	52	0.6	78	13	–	22	78	52	1	95	20	27	31	95	52	1.1	110	27	36	43	110	52	1.5	135	51	2
11	55	70	7	–	10	0.3	78	10	–	16	78	57	0.6	90	16	21	25	90	57	1	105	23	30	35	105	57	1.1	120	29	39	48	120	57	1.5	150	58	2.1
12	60	75	7	–	10	0.3	85	11	–	17	85	62	1	95	16	21	26	95	62	1	110	23	30	35	110	62	1.1	130	32	42	51	130	62	1.5	160	60	2.1
13	65	80	7	–	10	0.3	90	11	–	18	90	67	1	100	16	21	27	100	67	1	115	23	30	36	115	67	1.1	140	34	45	56	140	68	2	170	63	2.1
14	70	85	7	–	10	0.3	95	11	–	18	95	72	1	105	16	21	27	105	72	1	125	25	34	40	125	72	1.1	150	36	48	60	150	73	2	180	67	3
15	75	90	7	–	10	0.3	100	11	–	19	100	77	1	110	16	21	27	110	77	1	135	27	36	44	135	77	1.5	160	38	51	65	160	78	2	190	69	3
16	80	95	7	–	10	0.3	105	11	–	19	105	82	1	115	16	21	28	115	82	1	140	27	36	44	140	82	1.5	170	41	54	68	170	83	2.1	200	73	3
17	85	100	7	–	10	0.3	110	11	–	19	110	87	1	125	18	24	31	125	88	1	150	29	39	49	150	88	1.5	180	42	58	72	177	88	2.1	215	78	4
18	90	105	7	–	10	0.3	120	14	–	22	120	92	1	135	20	27	35	135	93	1.1	155	29	39	50	155	93	1.5	190	45	60	77	187	93	2.1	225	82	4
20	100	120	9	–	14	0.6	135	16	21	25	135	102	1	150	23	30	38	150	103	1.1	170	32	42	55	170	103	1.5	210	50	67	85	205	103	3	250	90	4
22	110	130	9	–	14	0.6	145	16	21	25	145	112	1	160	23	30	38	160	113	1.1	190	36	48	63	187	113	2	230	54	73	95	225	113	3	270	95	5
24	120	140	9	–	14	0.6	155	16	21	25	155	122	1	170	23	30	39	170	123	1.1	210	41	54	70	205	123	2.1	250	58	78	102	245	123	4	300	109	5
26	130	150	9	–	14	0.6	170	18	24	30	170	132	1	190	27	36	45	187	133	1.5	225	42	58	75	220	134	2.1	270	63	85	110	265	134	4	320	115	5
28	140	160	9	–	14	0.6	180	18	24	31	178	142	1	200	27	36	46	197	143	1.5	240	45	60	80	235	144	2.1	280	63	85	112	275	144	4	340	122	5
30	150	170	9	–	14	0.6	190	18	24	31	188	152	1	215	29	39	50	212	153	1.5	250	45	60	80	245	154	2.1	300	67	90	120	295	154	4	360	125	6
32	160	180	9	–	14	0.6	200	18	24	31	198	162	1	225	29	39	51	222	163	1.5	270	50	67	87	265	164	3	320	73	95	130	315	164	5	380	132	6
34	170	190	9	–	14	0.6	215	20	27	34	213	172	1.1	240	32	42	55	237	173	1.5	280	50	67	87	275	174	3	340	78	103	135	335	174	5	400	140	6
36	180	200	9	–	14	0.6	225	20	27	34	222	183	1.1	250	32	42	56	247	183	1.5	300	54	73	95	295	184	3	360	82	109	140	355	184	5	420	145	6
38	190	215	11	–	17	1	240	23	30	37	237	193	1.1	270	36	48	62	267	194	2	320	58	78	105	315	195	4	380	85	115	150	375	195	5	440	150	6
40	200	225	11	–	17	1	250	23	30	37	247	203	1.1	280	36	48	62	277	204	2	340	63	85	110	335	205	4	400	90	122	155	395	205	5	460	155	7.5
44	220	250	14	–	22	1	270	23	30	37	267	223	1.1	300	36	48	63	297	224	2	360	63	85	112	355	225	4	420	90	122	160	415	225	6	500	170	7.5
48	240	270	14	–	22	1	300	27	36	45	297	243	1.5	340	45	60	78	335	244	2.1	380	63	85	112	375	245	4	440	90	122	160	435	245	6	540	180	7.5
52	260	290	14	–	22	1	320	27	36	45	317	263	1.5	360	45	60	79	355	264	2.1	420	73	95	130	415	265	5	480	100	132	175	475	265	6	580	190	9.5
56	280	310	14	–	22	1	350	32	42	53	347	283	1.5	380	45	60	80	375	284	2.1	440	73	95	130	435	285	5	520	109	145	190	515	285	6	620	206	9.5
60	300	340	18	24	30	1	380	36	48	62	376	304	2	420	54	73	95	415	304	3	480	82	109	140	475	305	5	540	109	145	190	535	305	6	670	224	9.5
64	320	360	18	24	30	1	400	36	48	63	396	324	2	440	54	73	95	435	325	3	500	82	109	140	495	325	5	580	118	155	205	575	325	7.5	710	236	9.5
68	340	380	18	24	30	1	420	36	48	64	416	344	2	460	54	73	96	455	345	3	540	90	122	160	535	345	5	620	125	170	220	615	345	7.5	750	243	12
72	360	400	18	24	30	1	440	36	48	65	436	364	2	500	63	85	110	495	365	4	560	90	122	160	555	365	5	640	125	170	220	635	365	7.5	780	250	12
76	380	420	18	24	30	1	460	36	48	65	456	384	2	520	63	85	112	515	385	4	600	100	132	175	595	385	6	670	132	175	224	665	385	7.5	820	265	12
80	400	440	18	24	30	1	480	36	48	65	476	404	2	540	63	85	112	535	405	4	620	100	132	175	615	405	6	710	140	185	243	705	405	7.5	850	272	12
84	420	460	18	24	30	1	500	36	48	65	495	424	2	580	73	95	130	575	425	5	650	103	140	180	645	425	6	730	140	185	243	725	425	7.5	900	290	15
88	440	480	18	24	30	1	540	45	60	80	535	444	2.1	600	73	95	130	595	445	5	680	109	145	190	675	445	6	780	155	206	265	775	445	9.5	950	308	15
92	460	500	18	24	30	1	560	45	60	80	555	464	2.1	620	73	95	130	615	465	5	710	112	150	195	705	465	6	800	155	206	265	795	465	9.5	980	315	15
96	480	520	18	24	30	1	580	45	60	80	575	484	2.1	650	78	103	135	645	485	5	730	112	150	195	725	485	6	850	165	224	290	845	485	9.5	1000	315	15
/500	500	540	18	24	30	1	600	45	60	80	595	504	2.1	670	78	103	135	665	505	5	750	112	150	195	745	505	6	870	165	224	290	865	505	9.5	1060	335	15
/530	530	580	23	30	38	1.1	640	50	67	85	635	534	3	710	82	109	140	705	535	5	800	122	160	212	795	535	7.5	920	175	236	308	915	535	9.5	1090	335	15
/560	560	610	23	30	38	1.1	670	50	67	85	665	564	3	750	85	115	150	745	565	5	850	132	175	224	845	565	7.5	980	190	250	335	975	565	12	1150	355	15
/600	600	650	23	30	38	1.1	710	50	67	85	705	604	3	800	90	122	160	795	605	5	900	136	180	236	895	605	7.5	1030	195	258	335	1025	605	12	1220	375	15
/630	630	680	23	30	38	1.1	750	54	73	95	745	634	3	850	100	132	175	845	635	6	950	145	190	250	945	635	9.5	1090	206	280	365	1085	635	12	1280	388	15
/670	670	730	27	36	45	1.5	800	58	78	105	795	674	4	900	103	140	180	895	675	6	1000	150	200	258	995	675	9.5	1150	218	290	375	1145	675	15	1320	388	15
/710	710	780	32	42	53	1.5	850	63	85	112	845	714	4	950	109	145	190	945	715	6	1060	160	212	272	1055	715	9.5	1220	230	308	400	1215	715	15	1400	412	15
/750	750	820	32	42	53	1.5	900	67	90	120	895	755	4	1000	112	150	195	995	755	6	1120	165	224	290	1115	755	9.5	1280	236	315	412	1275	755	15			
/800	800	870	32	42	53	1.5	950	67	90	120	945	805	4	1060	118	155	205	1055	805	7.5	1180	170	230	300	1175	805	9.5	1360	250	335	438	1355	805	15			
/850	850	920	32	42	53	1.5	1000	67	90	120	995	855	4	1120	122	160	212	1115	855	7.5	1250	180	243	315	1245	855	12	1440	–	354	–	–	–	15			
/900	900	980	36	48	63	2	1060	73	95	130	1055	905	5	1180	125	170	220	1175	905	7.5	1320	190	250	335	1315	905	12	1520	–	372	–	–	–	15			
/950	950	1030	36	48	63	2	1120	78	103	135	1115	955	5	1250	136	180	236	1245	955	7.5	1400	200	272	355	1395	955	12	1600	–	390	–	–	–	15			
/1000	1000	1090	41	54	70	2.1	1180	82	109	140	1175	1005	5	1320	145	190	250	1315	1005	9.5	1460	–	276	–	–	–	12	1670	–	402	–	–	–	15			
/1060	1060	1150	41	54	70	2.1	1250	85	115	150	1245	1065	5	1400	155	206	265	1395	1065	9.5								1770	–	426	–	–	–	15			
/1120	1120	1220	45	60	80	2.1	1320	90	122	160	1315	1125	5	1460	–	206	–	–	–	9.5								1860	–	444	–	–	–	15			
/1180	1180	1280	45	60	80	2.1	1400	100	132	175	1395	1185	6	1520	–	206	–	–	–	9.5								1950	–	462	–	–	–	19			
/1250	1250	1360	50	67	85	3	1460	–	–	175	1455	1255	6	1610	–	216	–	–	–	9.5																	
/1320	1320	1440	–	–	95	3	1540	–	–	175	1535	1325	6	1700	–	228	–	–	–	9.5																	
/1400	1400	1520	–	–	95	3	1630	–	–	180	1620	1410	6																								
/1500	1500	1630	–	–	105	4	1750	–	–	195	1740	1510	6																								
/1600	1600	1730	–	–	105	4	1850	–	–	195	1840	1610	6																								
/1700	1700	1840	–	–	112	4	1970	–	–	212	1960	1710	7.5																								
/1800	1800	1950	–	–	120	4	2080	–	–	220	2070	1810	7.5																								
/1900	1900	2060	–	–	130	5	2180	–	–	220	2170	1910	7.5																								
/2000	2000	2160	–	–	130	5	2300	–	–	236	2290	2010	7.5																								
/2120	2120	2300	–	–	140	5	2430	–	–	243	2420	2130	7.5																								
/2240	2240	2430	–	–	150	5	2570	–	–	258	2560	2250	9.5																								
/2360	2360	2550	–	–	150	5	2700	–	–	265	2690	2370	9.5																								
/2500	2500	2700	–	–	160	5	2850	–	–	272	2840	2510	9.5																								

* Dimension series

Supplementary table 4 Boundary dimensios of double direction thrust ball bearings (with flat back faces)

Unit : mm

Bore dia. No.	522									523										524									Bore dia. No.
	Diameter series 2									Diameter series 3										Diameter series 4									
	Dimension series 22									Dimension series 23										Dimension series 24									
	Bore dia. d_2	Out-side dia. D	Height T_1	Central race height B	d_3 max.	D_1 min.	r min.	r_1 min.	(Refer.) d 1)	Bore dia. d_2	Out-side dia. D	Height T_1	Central race height B	d_3 max.	D_1 min.	r min.	r_1 min.	(Refer.) d 1)		Bore dia. d_2	Out-side dia. D	Height T_1	Central race height B	d_3 max.	D_1 min.	r min.	r_1 min.	(Refer.) d 1)	
02	**10**	32	22	5	32	17	0.6	0.3	15	**10**	–	–	–	–	–	–	–	–		–	–	–	–	–	–	–	–	–	**02**
04	**15**	40	26	6	40	22	0.6	0.3	20	**15**	–	–	–	–	–	–	–	–		–	–	–	–	–	–	–	–	–	**04**
05	**20**	47	28	7	47	27	0.6	0.3	25	**20**	52	34	8	52	27	1	0.3	25		**15**	60	45	11	60	27	1	0.6	25	**05**
06	**25**	52	29	7	52	32	0.6	0.3	30	**25**	60	38	9	60	32	1	0.3	30		**20**	70	52	12	70	32	1	0.6	30	**06**
07	**30**	62	34	8	62	37	1	0.3	35	**30**	68	44	10	68	37	1	0.3	35		**25**	80	59	14	80	37	1.1	0.6	35	**07**
08	**30**	68	36	9	68	42	1	0.6	40	**30**	78	49	12	78	42	1	0.6	40		**30**	90	65	15	90	42	1.1	0.6	40	**08**
09	**35**	73	37	9	73	47	1	0.6	45	**35**	85	52	12	85	47	1	0.6	45		**35**	100	72	17	100	47	1.1	0.6	45	**09**
10	**40**	78	39	9	78	52	1	0.6	50	**40**	95	58	14	95	52	1.1	0.6	50		**40**	110	78	18	110	52	1.5	0.6	50	**10**
11	**45**	90	45	10	90	57	1	0.6	55	**45**	105	64	15	105	57	1.1	0.6	55		**45**	120	87	20	120	57	1.5	0.6	55	**11**
12	**50**	95	46	10	95	62	1	0.6	60	**50**	110	64	15	110	62	1.1	0.6	60		**50**	130	93	21	130	62	1.5	0.6	60	**12**
13	**55**	100	47	10	100	67	1	0.6	65	**55**	115	65	15	115	67	1.1	0.6	65		**50**	140	101	23	140	68	2	1	65	**13**
14	**55**	105	47	10	105	72	1	1	70	**55**	125	72	16	125	72	1.1	1	70		**55**	150	107	24	150	73	2	1	70	**14**
15	**60**	110	47	10	110	77	1	1	75	**60**	135	79	18	135	77	1.5	1	75		**60**	160	115	26	160	78	2	1	75	**15**
16	**65**	115	48	10	115	82	1	1	80	**65**	140	79	18	140	82	1.5	1	80		**65**	170	120	27	170	83	2.1	1	80	**16**
17	**70**	125	55	12	125	88	1	1	85	**70**	150	87	19	150	88	1.5	1	85		**65**	180	128	29	179.5	88	2.1	1.1	85	**17**
18	**75**	135	62	14	135	93	1.1	1	90	**75**	155	88	19	155	93	1.5	1	90		**70**	190	135	30	189.5	93	2.1	1.1	90	**18**
20	**85**	150	67	15	150	103	1.1	1	100	**85**	170	97	21	170	103	1.5	1	100		**80**	210	150	33	209.5	103	3	1.1	100	**20**
22	**95**	160	67	15	160	113	1.1	1	110	**95**	190	110	24	189.5	113	2	1	110		**90**	230	166	37	229	113	3	1.1	110	**22**
24	**100**	170	68	15	170	123	1.1	1.1	120	**100**	210	123	27	209.5	123	2.1	1.1	120		**95**	250	177	40	249	123	4	1.5	120	**24**
26	**110**	190	80	18	189.5	133	1.5	1.1	130	**110**	225	130	30	224	134	2.1	1.1	130		**100**	270	192	42	269	134	4	2	130	**26**
28	**120**	200	81	18	199.5	143	1.5	1.1	140	**120**	240	140	31	239	144	2.1	1.1	140		**110**	280	196	44	279	144	4	2	140	**28**
30	**130**	215	89	20	214.5	153	1.5	1.1	150	**130**	250	140	31	249	154	2.1	1.1	150		**120**	300	209	46	299	154	4	2	150	**30**
32	**140**	225	90	20	224.5	163	1.5	1.1	160	**140**	270	153	33	269	164	3	1.1	160		**130**	320	226	50	319	164	5	2	160	**32**
34	**150**	240	97	21	239.5	173	1.5	1.1	170	**150**	280	153	33	279	174	3	1.1	170		**135**	340	236	50	339	174	5	2.1	170	**34**
36	**150**	250	98	21	249	183	1.5	2	180	**150**	300	165	37	299	184	3	2	180		**140**	360	245	52	359	184	5	3	180	**36**
38	**160**	270	109	24	269	194	2	2	190	**160**	320	183	40	319	195	4	2	190		–	–	–	–	–	–	–	–	–	**38**
40	**170**	280	109	24	279	204	2	2	200	**170**	340	192	42	339	205	4	2	200		–	–	–	–	–	–	–	–	–	**40**
44	**190**	300	110	24	299	224	2	2	220	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–	–	–	–	**44**

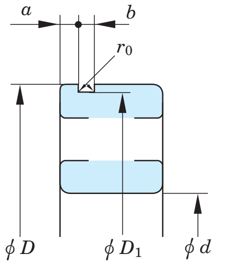
[Note] 1) Nominal bore diameter of single direction bearings of the same diameter series and with the same nominal outside diameter.

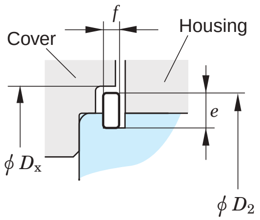
Supplementary table 5 (1) Dimension of snap ring grooves and locationg snap rings – diameter series 18, 19 –

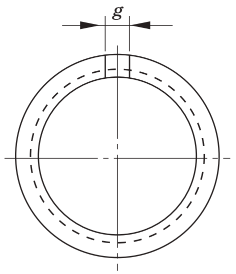
Unit : mm

Applicable bearing			Snap ring groove									Locating snap ring							Housing
Bore dia. *d*		Outside dia. *D*	Snap ring groove dia. D_1		Position of snap ring groove *a*				Snap ring groove width *b*		Fillet radius of snap ring groove r_0	No.	Section height *e*		Thickness *f*		Mounted state		Shoulder bore dia. D_x
Dimension series					Dimension series 18		Dimension series 19										Distance between cut ends *g*	Locating snap ring O.D. D_2	
18	19		max.	min.	max.	min.	max.	min.	max.	min.	max.		max.	min.	max.	min.	max.	max.	max.
–	10	22	20.8	20.5	–	–	1.05	0.9	1.05	0.8	0.2	NR 1022	2.0	1.85	0.7	0.6	2	24.8	25.5
–	12	24	22.8	22.5	–	–	1.05	0.9	1.05	0.8	0.2	NR 1024	2.0	1.85	0.7	0.6	2	26.8	27.5
–	15	28	26.7	26.4	–	–	1.3	1.15	1.2	0.95	0.25	NR 1028	2.05	1.9	0.85	0.75	3	30.8	31.5
–	17	30	28.7	28.4	–	–	1.3	1.15	1.2	0.95	0.25	NR 1030	2.05	1.9	0.85	0.75	3	32.8	33.5
20	–	32	30.7	30.4	1.3	1.15	–	–	1.2	0.95	0.25	NR 1032	2.05	1.9	0.85	0.75	3	34.8	35.5
22	–	34	32.7	32.4	1.3	1.15	–	–	1.2	0.95	0.25	NR 1034	2.05	1.9	0.85	0.75	3	36.8	37.5
25	20	37	35.7	35.4	1.3	1.15	1.7	1.55	1.2	0.95	0.25	NR 1037	2.05	1.9	0.85	0.75	3	39.8	40.5
–	22	39	37.7	37.4	–	–	1.7	1.55	1.2	0.95	0.25	NR 1039	2.05	1.9	0.85	0.75	3	41.8	42.5
28	–	40	38.7	38.4	1.3	1.15	–	–	1.2	0.95	0.25	NR 1040	2.05	1.9	0.85	0.75	3	42.8	43.5
30	25	42	40.7	40.4	1.3	1.15	1.7	1.55	1.2	0.95	0.25	NR 1042	2.05	1.9	0.85	0.75	3	44.8	45.5
32	–	44	42.7	42.4	1.3	1.15	–	–	1.2	0.95	0.25	NR 1044	2.05	1.9	0.85	0.75	4	46.8	47.5
–	28	45	43.7	43.4	–	–	1.7	1.55	1.2	0.95	0.25	NR 1045	2.05	1.9	0.85	0.75	4	47.8	48.5
35	30	47	45.7	45.4	1.3	1.15	1.7	1.55	1.2	0.95	0.25	NR 1047	2.05	1.9	0.85	0.75	4	49.8	50.5
40	32	52	50.7	50.4	1.3	1.15	1.7	1.55	1.2	0.95	0.25	NR 1052	2.05	1.9	0.85	0.75	4	54.8	55.5
–	35	55	53.7	53.4	–	–	1.7	1.55	1.2	0.95	0.25	NR 1055	2.05	1.9	0.85	0.75	4	57.8	58.5
45	–	58	56.7	56.4	1.3	1.15	–	–	1.2	0.95	0.25	NR 1058	2.05	1.9	0.85	0.75	4	60.8	61.5
–	40	62	60.7	60.3	–	–	1.7	1.55	1.2	0.95	0.25	NR 1062	2.05	1.9	0.85	0.75	4	64.8	65.5
50	–	65	63.7	63.3	1.3	1.15	–	–	1.2	0.95	0.25	NR 1065	2.05	1.9	0.85	0.75	4	67.8	68.5
–	45	68	66.7	66.3	–	–	1.7	1.55	1.2	0.95	0.25	NR 1068	2.05	1.9	0.85	0.75	5	70.8	72
55	50	72	70.7	70.3	1.7	1.55	1.7	1.55	1.2	0.95	0.25	NR 1072	2.05	1.9	0.85	0.75	5	74.8	76
60	–	78	76.2	75.8	1.7	1.55	–	–	1.6	1.3	0.4	NR 1078	3.25	3.1	1.12	1.02	5	82.7	84
–	55	80	77.9	77.5	–	–	2.1	1.9	1.6	1.3	0.4	NR 1080	3.25	3.1	1.12	1.02	5	84.4	86
65	60	85	82.9	82.5	1.7	1.55	2.1	1.9	1.6	1.3	0.4	NR 1085	3.25	3.1	1.12	1.02	5	89.4	91
70	65	90	87.9	87.5	1.7	1.55	2.1	1.9	1.6	1.3	0.4	NR 1090	3.25	3.1	1.12	1.02	5	94.4	96
75	–	95	92.9	92.5	1.7	1.55	–	–	1.6	1.3	0.4	NR 1095	3.25	3.1	1.12	1.02	5	99.4	101
80	70	100	97.9	97.5	1.7	1.55	2.5	2.3	1.6	1.3	0.4	NR 1100	3.25	3.1	1.12	1.02	5	104.4	106
–	75	105	102.6	102.1	–	–	2.5	2.3	1.6	1.3	0.4	NR 1105	4.04	3.89	1.12	1.02	5	110.7	112
85	80	110	107.6	107.1	2.1	1.9	2.5	2.3	1.6	1.3	0.4	NR 1110	4.04	3.89	1.12	1.02	5	115.7	117
90	–	115	112.6	112.1	2.1	1.9	–	–	1.6	1.3	0.4	NR 1115	4.04	3.89	1.12	1.02	5	120.7	122
95	85	120	117.6	117.1	2.1	1.9	3.3	3.1	1.6	1.3	0.4	NR 1120	4.04	3.89	1.12	1.02	7	125.7	127
100	90	125	122.6	122.1	2.1	1.9	3.3	3.1	1.6	1.3	0.4	NR 1125	4.04	3.89	1.12	1.02	7	130.7	132
105	95	130	127.6	127.1	2.1	1.9	3.3	3.1	1.6	1.3	0.4	NR 1130	4.04	3.89	1.12	1.02	7	135.7	137
110	100	140	137.6	137.1	2.5	2.3	3.3	3.1	2.2	1.9	0.6	NR 1140	4.04	3.89	1.7	1.6	7	145.7	147
–	105	145	142.6	142.1	–	–	3.3	3.1	2.2	1.9	0.6	NR 1145	4.04	3.89	1.7	1.6	7	150.7	152
120	110	150	147.6	147.1	2.5	2.3	3.3	3.1	2.2	1.9	0.6	NR 1150	4.04	3.89	1.7	1.6	7	155.7	157
130	120	165	161.8	161.3	3.3	3.1	3.7	3.5	2.2	1.9	0.6	NR 1165	4.85	4.7	1.7	1.6	7	171.5	173
140	–	175	171.8	171.3	3.3	3.1	–	–	2.2	1.9	0.6	NR 1175	4.85	4.7	1.7	1.6	10	181.5	183
–	130	180	176.8	176.3	–	–	3.7	3.5	2.2	1.9	0.6	NR 1180	4.85	4.7	1.7	1.6	10	186.5	188
150	140	190	186.8	186.3	3.3	3.1	3.7	3.5	2.2	1.9	0.6	NR 1190	4.85	4.7	1.7	1.6	10	196.5	198
160	–	200	196.8	196.3	3.3	3.1	–	–	2.2	1.9	0.6	NR 1200	4.85	4.7	1.7	1.6	10	206.5	208

[Remark] Minimum chamfer dimension tolerances on snap ring groove-side outer ring are as follows :
Bearings belonging to dimension series 18 : 0.3 mm for those with nominal outside diameter not more than 78 mm ; 0.5 mm for those with nominal diameter over 78 mm.
Bearings belonging to dimension series 19 : 0.3 mm for those with nominal outside diameter not more than 47 mm ; 0.5 mm for those with nominal diameter over 47 mm.





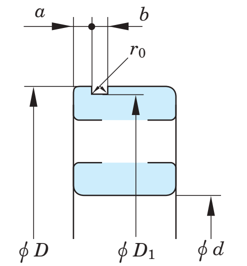


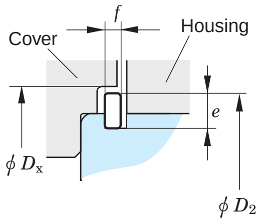
Supplementary table 5 (2) Dimension of snap ring grooves and locationg snap rings – diameter series 0, 2, 3, 4 –

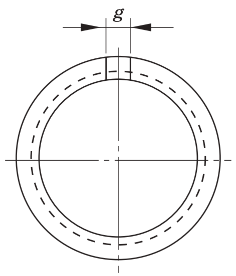
Unit : mm

Applicable bearing					Snap ring groove									Locating snap ring							Housing
Bore dia. *d*				Outside dia. *D*	Snap ring groove dia. D_1		Position of snap ring groove *a*				Snap ring groove width *b*		Fillet radius of snap ring groove r_0	No.	Section height *e*		Thickness *f*		Mounted state		Shoulder bore dia. D_x
Diameter series							Diameter series												Distance between cut ends *g*	Locating snap ring O.D. D_2	
0	2	3	4				0		2, 3, 4												
					max.	min.	max.	min.	max.	min.	max.	min.	max.		max.	min.	max.	min.	max.	max.	max.
–	**10**	**9**	**8**	**30**	28.17	27.91	–	–	2.06	1.9	1.65	1.35	0.4	**NR 30**	3.25	3.1	1.12	1.02	3	34.7	35.5
15	**12**	**–**	**9**	**32**	30.15	29.9	2.06	1.9	2.06	1.9	1.65	1.35	0.4	**NR 32**	3.25	3.1	1.12	1.02	3	36.7	37.5
17	**15**	**10**	**–**	**35**	33.17	32.92	2.06	1.9	2.06	1.9	1.65	1.35	0.4	**NR 35**	3.25	3.1	1.12	1.02	3	39.7	40.5
–	**–**	**12**	**10**	**37**	34.77	34.52	–	–	2.06	1.9	1.65	1.35	0.4	**NR 37**	3.25	3.1	1.12	1.02	3	41.3	42
–	**17**	**–**	**–**	**40**	38.1	37.85	–	–	2.06	1.9	1.65	1.35	0.4	**NR 40**	3.25	3.1	1.12	1.02	3	44.6	45.5
20	**–**	**15**	**12**	**42**	39.75	39.5	2.06	1.9	2.06	1.9	1.65	1.35	0.4	**NR 42**	3.25	3.1	1.12	1.02	3	46.3	47
22	**–**	**–**	**–**	**44**	41.75	41.5	2.06	1.9	–	–	1.65	1.35	0.4	**NR 44**	3.25	3.1	1.12	1.02	3	48.3	49
25	**20**	**17**	**–**	**47**	44.6	44.35	2.06	1.9	2.46	2.31	1.65	1.35	0.4	**NR 47**	4.04	3.89	1.12	1.02	4	52.7	53.5
–	**22**	**–**	**–**	**50**	47.6	47.35	–	–	2.46	2.31	1.65	1.35	0.4	**NR 50**	4.04	3.89	1.12	1.02	4	55.7	56.5
28	**25**	**20**	**15**	**52**	49.73	49.48	2.06	1.9	2.46	2.31	1.65	1.35	0.4	**NR 52**	4.04	3.89	1.12	1.02	4	57.9	58.5
30	**–**	**–**	**–**	**55**	52.6	52.35	2.08	1.88	–	–	1.65	1.35	0.4	**NR 55**	4.04	3.89	1.12	1.02	4	60.7	61.5
–	**–**	**22**	**–**	**56**	53.6	53.35	–	–	2.46	2.31	1.65	1.35	0.4	**NR 56**	4.04	3.89	1.12	1.02	4	61.7	62.5
32	**28**	**–**	**–**	**58**	55.6	55.35	2.08	1.88	2.46	2.31	1.65	1.35	0.4	**NR 58**	4.04	3.89	1.12	1.02	4	63.7	64.5
35	**30**	**25**	**17**	**62**	59.61	59.11	2.08	1.88	3.28	3.07	2.2	1.9	0.6	**NR 62**	4.04	3.89	1.7	1.6	4	67.7	68.5
–	**32**	**–**	**–**	**65**	62.6	62.1	–	–	3.28	3.07	2.2	1.9	0.6	**NR 65**	4.04	3.89	1.7	1.6	4	70.7	71.5
40	**–**	**28**	**–**	**68**	64.82	64.31	2.49	2.29	3.28	3.07	2.2	1.9	0.6	**NR 68**	4.85	4.7	1.7	1.6	5	74.6	76
–	**35**	**30**	**20**	**72**	68.81	68.3	–	–	3.28	3.07	2.2	1.9	0.6	**NR 72**	4.85	4.7	1.7	1.6	5	78.6	80
45	**–**	**32**	**–**	**75**	71.83	71.32	2.49	2.29	3.28	3.07	2.2	1.9	0.6	**NR 75**	4.85	4.7	1.7	1.6	5	81.6	83
50	**40**	**35**	**25**	**80**	76.81	76.3	2.49	2.29	3.28	3.07	2.2	1.9	0.6	**NR 80**	4.85	4.7	1.7	1.6	5	86.6	88
–	**45**	**–**	**–**	**85**	81.81	81.31	–	–	3.28	3.07	2.2	1.9	0.6	**NR 85**	4.85	4.7	1.7	1.6	5	91.6	93
55	**50**	**40**	**30**	**90**	86.79	86.28	2.87	2.67	3.28	3.07	3	2.7	0.6	**NR 90**	4.85	4.7	2.46	2.36	5	96.5	98
60	**–**	**–**	**–**	**95**	91.82	91.31	2.87	2.67	–	–	3	2.7	0.6	**NR 95**	4.85	4.7	2.46	2.36	5	101.6	103
65	**55**	**45**	**35**	**100**	96.8	96.29	2.87	2.67	3.28	3.07	3	2.7	0.6	**NR100**	4.85	4.7	2.46	2.36	5	106.5	108
70	**60**	**50**	**40**	**110**	106.81	106.3	2.87	2.67	3.28	3.07	3	2.7	0.6	**NR110**	4.85	4.7	2.46	2.36	5	116.6	118
75	**–**	**–**	**–**	**115**	111.81	111.3	2.87	2.67	–	–	3	2.7	0.6	**NR115**	4.85	4.7	2.46	2.36	5	121.6	123
–	**65**	**55**	**45**	**120**	115.21	114.71	–	–	4.06	3.86	3.4	3.1	0.6	**NR120**	7.21	7.06	2.82	2.72	7	129.7	131.5
80	**70**	**–**	**–**	**125**	120.22	119.71	2.87	2.67	4.06	3.86	3.4	3.1	0.6	**NR125**	7.21	7.06	2.82	2.72	7	134.7	136.5
85	**75**	**60**	**50**	**130**	125.22	124.71	2.87	2.67	4.06	3.86	3.4	3.1	0.6	**NR130**	7.21	7.06	2.82	2.72	7	139.7	141.5
90	**80**	**65**	**55**	**140**	135.23	134.72	3.71	3.45	4.9	4.65	3.4	3.1	0.6	**NR140**	7.21	7.06	2.82	2.72	7	149.7	152
95	**–**	**–**	**–**	**145**	140.23	139.73	3.71	3.45	–	–	3.4	3.1	0.6	**NR145**	7.21	7.06	2.82	2.72	7	154.7	157
100	**85**	**70**	**60**	**150**	145.24	144.73	3.71	3.45	4.9	4.65	3.4	3.1	0.6	**NR150**	7.21	7.06	2.82	2.72	7	159.7	162
105	**90**	**75**	**65**	**160**	155.22	154.71	3.71	3.45	4.9	4.65	3.4	3.1	0.6	**NR160**	7.21	7.06	2.82	2.72	7	169.7	172
110	**95**	**80**	**–**	**170**	163.65	163.14	3.71	3.45	5.69	5.44	3.8	3.5	0.6	**NR170**	9.6	9.45	3.1	3	10	182.9	185
120	**100**	**85**	**70**	**180**	173.66	173.15	3.71	3.45	5.69	5.44	3.8	3.5	0.6	**NR180**	9.6	9.45	3.1	3	10	192.9	195
–	**105**	**90**	**75**	**190**	183.64	183.13	–	–	5.69	5.44	3.8	3.5	0.6	**NR190**	9.6	9.45	3.1	3	10	202.9	205
130	**110**	**95**	**80**	**200**	193.65	193.14	5.69	5.44	5.69	5.44	3.8	3.5	0.6	**NR200**	9.6	9.45	3.1	3	10	212.9	215

[Remark] 1. Snap ring groove dimension does not apply to bearings of dimension series 00, 82 and 83.
2. The minimum permissible chamfer dimension for snap ring groove-side outer ring is 0.5 mm, except 0.3 mm for bearings belonging to diameter series 0 with nominal outside diameter not more than 35 mm.







Supplementary table 6 Shaft tolerances (deviation from nominal dimensions)

Unit : μm (Refer.)

Nominal shaft dia. (mm)		Deviation classes of shaft dia.																											Nominal shaft dia. (mm)		$\varDelta_{dmp}$[1] of bearing
over	up to	d 6	e 6	f 6	g 5	g 6	h 5	h 6	h 7	h 8	h 9	h 10	js 5	js 6	js 7	j 5	j 6	k 5	k 6	k 7	m 5	m 6	m 7	n 5	n 6	p 6	r 6	r 7	over	up to	(class 0)
3	6	–30 –38	–20 –28	–10 –18	–4 –9	–4 –12	–0 –5	–0 –8	0 –12	0 –18	0 –30	0 –48	±2.5	±4	±6	+3 –2	+6 –2	+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+16 +4	+13 +8	+16 +8	+20 +12	+23 +15	+27 +15	3	6	0 –8
6	10	–40 –49	–25 –34	–13 –22	–5 –11	–5 –14	–0 –6	–0 –9	0 –15	0 –22	0 –36	0 –58	±3	±4.5	±7.5	+4 –2	+7 –2	+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+21 +6	+16 +10	+19 +10	+24 +15	+28 +19	+34 +19	6	10	0 –8
10	18	–50 –61	–32 –43	–16 –27	–6 –14	–6 –17	–0 –8	0 –11	0 –18	0 –27	0 –43	0 –70	±4	±5.5	±9	+5 –3	+8 –3	+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+25 +7	+20 +12	+23 +12	+29 +18	+34 +23	+41 +23	10	18	0 –8
18	30	–65 –78	–40 –53	–20 –33	–7 –16	–7 –20	–0 –9	0 –13	0 –21	0 –33	0 –52	0 –84	±4.5	±6.5	±10.5	+5 –4	+9 –4	+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+29 +8	+24 +15	+28 +15	+35 +22	+41 +28	+49 +28	18	30	0 –10
30	50	–80 –96	–50 –66	–25 –41	–9 –20	–9 –25	0 –11	0 –16	0 –25	0 –39	0 –62	0 –100	±5.5	±8	±12.5	+6 –5	+11 –5	+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+34 +9	+28 +17	+33 +17	+42 +26	+50 +34	+59 +34	30	50	0 –12
50	80	–100 –119	–60 –79	–30 –49	–10 –23	–10 –29	0 –13	0 –19	0 –30	0 –46	0 –74	0 –120	±6.5	±9.5	±15	+6 –7	+12 –7	+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+41 +11	+33 +20	+39 +20	+51 +32	+60 +41	+71 +41	50	65	0 –15
																											+62 +43	+73 +43	65	80	
80	120	–120 –142	–72 –94	–36 –58	–12 –27	–12 –34	0 –15	0 –22	0 –35	0 –54	0 –87	0 –140	±7.5	±11	±17.5	+6 –9	+13 –9	+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+48 +13	+38 +23	+45 +23	+59 +37	+73 +51	+86 +51	80	100	0 –20
																											+76 +54	+89 +54	100	120	
120	180	–145 –170	–85 –110	–43 –68	–14 –32	–14 –39	0 –18	0 –25	0 –40	0 –63	0 –100	0 –160	±9	±12.5	±20	+7 –11	+14 –11	+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+55 +15	+45 +27	+52 +27	+68 +43	+88 +63	+103 +63	120	140	0 –25
																											+90 +65	+105 +65	140	160	
																											+93 +68	+108 +68	160	180	
180	250	–170 –199	–100 –129	–50 –79	–15 –35	–15 –44	0 –20	0 –29	0 –46	0 –72	0 –115	0 –185	±10	±14.5	±23	+7 –13	+16 –13	+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+63 +17	+51 +31	+60 +31	+79 +50	+106 +77	+123 +77	180	200	0 –30
																											+109 +80	+126 +80	200	225	
																											+113 +84	+130 +84	225	250	
250	315	–190 –222	–110 –142	–56 –88	–17 –40	–17 –49	0 –23	0 –32	0 –52	0 –81	0 –130	0 –210	±11.5	±16	±26	+7 –16	±16	+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+72 +20	+57 +34	+66 +34	+88 +56	+126 +94	+146 +94	250	280	0 –35
																											+130 +98	+150 +98	280	315	
315	400	–210 –246	–125 –161	–62 –98	–18 –43	–18 –54	0 –25	0 –36	0 –57	0 –89	0 –140	0 –230	±12.5	±18	±28.5	+7 –18	±18	+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+78 +21	+62 +37	+73 +37	+98 +62	+144 +108	+165 +108	315	355	0 –40
																											+150 +114	+171 +114	355	400	
400	500	–230 –270	–135 –175	–68 –108	–20 –47	–20 –60	0 –27	0 –40	0 –63	0 –97	0 –155	0 –250	±13.5	±20	±31.5	+7 –20	±20	+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+86 +23	+67 +40	+80 +40	+108 +68	+166 +126	+189 +126	400	450	0 –45
																											+172 +132	+195 +132	450	500	
500	630	–260 –304	–145 –189	–76 –120	–22 –54	–22 –66	0 –32	0 –44	0 –70	0 –110	0 –175	0 –280	±16	±22	±35	–	–	+32 0	+44 0	+70 0	+58 +26	+70 +26	+96 +26	+76 +44	+88 +44	+122 +78	+194 +150	+220 +150	500	560	0 –50
																											+199 +155	+225 +155	560	630	
630	800	–290 –340	–160 –210	–80 –130	–24 –60	–24 –74	0 –36	0 –50	0 –80	0 –125	0 –200	0 –320	±18	±25	±40	–	–	+36 0	+50 0	+80 0	+66 +30	+80 +30	+110 +30	+86 +50	+100 +50	+138 +88	+225 +175	+255 +175	630	710	0 –75
																											+235 +185	+265 +185	710	800	
800	1000	–320 –376	–170 –226	–86 –142	–26 –66	–26 –82	0 –40	0 –56	0 –90	0 –140	0 –230	0 –360	±20	±28	±45	–	–	+40 0	+56 0	+90 0	+74 +34	+90 +34	+124 +34	+96 +56	+112 +56	+156 +100	+266 +210	+300 +210	800	900	0 –100
																											+276 +220	+310 +220	900	1000	

[Note] 1) $\varDelta_{dmp}$: single plane mean bore diameter deviation

Supplementary table 7 Housing bore tolerances (deviation from nominal dimensions)

Unit : μm (Refer.)

Nominal bore dia. (mm)		Deviation classes of housing bore																											Nominal bore dia. (mm)		Δ_{Dmp} [1] of bearing
over	up to	E 6	F 6	F 7	G 6	G 7	H 6	H 7	H 8	H 9	H 10	JS 5	JS 6	JS 7	J 6	J 7	K 5	K 6	K 7	M 5	M 6	M 7	N 5	N 6	N 7	P 6	P 7	R 7	over	up to	(class 0)
10	18	+43 +32	+27 +16	+34 +16	+17 +6	+24 +6	+11 0	+18 0	+27 0	+43 0	+70 0	±4	±5.5	±9	+6 −5	+10 −8	+2 −6	+2 −9	+6 −12	−4 −12	−4 −15	0 −18	−9 −17	−9 −20	−5 −23	−15 −26	−11 −29	−16 −34	10	18	0 −8
18	30	+53 +40	+33 +20	+41 +20	+20 +7	+28 +7	+13 0	+21 0	+33 0	+52 0	+84 0	±4.5	±6.5	±10.5	+8 −5	+12 −9	+1 −8	+2 −11	+6 −15	−5 −14	−4 −17	0 −21	−12 −21	−11 −24	−7 −28	−18 −31	−14 −35	−20 −41	18	30	0 −9
30	50	+66 +50	+41 +25	+50 +25	+25 +9	+34 +9	+16 0	+25 0	+39 0	+62 0	+100 0	±5.5	±8	±12.5	+10 −6	+14 −11	+2 −9	+3 −13	+7 −18	−5 −16	−4 −20	0 −25	−13 −24	−12 −28	−8 −33	−21 −37	−17 −42	−25 −50	30	50	0 −11
50	80	+79 +60	+49 +30	+60 +30	+29 +10	+40 +10	+19 0	+30 0	+46 0	+74 0	+120 0	±6.5	±9.5	±15	+13 −6	+18 −12	+3 −10	+4 −15	+9 −21	−6 −19	−5 −24	0 −30	−15 −28	−14 −33	−9 −39	−26 −45	−21 −51	−30 −60	50	65	0 −13
																												−32 −62	65	80	
80	120	+94 +72	+58 +36	+71 +36	+34 +12	+47 +12	+22 0	+35 0	+54 0	+87 0	+140 0	±7.5	±11	±17.5	+16 −6	+22 −13	+2 −13	+4 −18	+10 −25	−8 −23	−6 −28	0 −35	−18 −33	−16 −38	−10 −45	−30 −52	−24 −59	−38 −73	80	100	0 −15
																												−41 −76	100	120	
120	180	+110 +85	+68 +43	+83 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+100 0	+160 0	±9	±12.5	±20	+18 −7	+26 −14	+3 −15	+4 −21	+12 −28	−9 −27	−8 −33	0 −40	−21 −39	−20 −45	−12 −52	−36 −61	−28 −68	−48 −88	120	140	(up to 150) 0 −18 (over to 150) 0 −25
																												−50 −90	140	160	
																												−53 −93	160	180	
180	250	+129 +100	+79 +50	+96 +50	+44 +15	+61 +15	+29 0	+46 0	+72 0	+115 0	+185 0	±10	±14.5	±23	+22 −7	+30 −16	+2 −18	+5 −24	+13 −33	−11 −31	−8 −37	0 −46	−25 −45	−22 −51	−14 −60	−41 −70	−33 −79	−60 −106	180	200	0 −30
																												−63 −109	200	225	
																												−67 −113	225	250	
250	315	+142 +110	+88 +56	+108 +56	+49 +17	+69 +17	+32 0	+52 0	+81 0	+130 0	+210 0	±11.5	±16	±26	+25 −7	+36 −16	+3 −20	+5 −27	+16 −36	−13 −36	−9 −41	0 −52	−27 −50	−25 −57	−14 −66	−47 −79	−36 −88	−74 −126	250	280	0 −35
																												−78 −130	280	315	
315	400	+161 +125	+98 +62	+119 +62	+54 +18	+75 +18	+36 0	+57 0	+89 0	+140 0	+230 0	±12.5	±18	±28.5	+29 −7	+39 −18	+3 −22	+7 −29	+17 −40	−14 −39	−10 −46	0 −57	−30 −55	−26 −62	−16 −73	−51 −87	−41 −98	−87 −144	315	355	0 −40
																												−93 −150	355	400	
400	500	+175 +135	+108 +68	+131 +68	+60 +20	+83 +20	+40 0	+63 0	+97 0	+155 0	+250 0	±13.5	±20	±31.5	+33 −7	+43 −20	+2 −25	+8 −32	+18 −45	−16 −43	−10 −50	0 −63	−33 −60	−27 −67	−17 −80	−55 −95	−45 −108	−103 −166	400	450	0 −45
																												−109 −172	450	500	
500	630	+189 +145	+120 +76	+146 +76	+66 +22	+92 +22	+44 0	+70 0	+110 0	+175 0	+280 0	±16	±22	±35	–	–	0 −32	0 −44	0 −70	−26 −58	−26 −70	−26 −96	−44 −76	−44 −88	−44 −114	−78 −122	−78 −148	−150 −220	500	560	0 −50
																												−155 −225	560	630	
630	800	+210 +160	+130 +80	+160 +80	+74 +24	+104 +24	+50 0	+80 0	+125 0	+200 0	+320 0	±18	±25	±40	–	–	0 −36	0 −50	0 −80	−30 −66	−30 −80	−30 −110	−50 −86	−50 −100	−50 −130	−88 −138	−88 −168	−175 −255	630	710	0 −75
																												−185 −265	710	800	
800	1000	+226 +170	+142 +86	+176 +86	+82 +26	+116 +26	+56 0	+90 0	+140 0	+230 0	+360 0	±20	±28	±45	–	–	0 −40	0 −56	0 −90	−34 −74	−34 −90	−34 −124	−56 −96	−56 −112	−56 −146	−100 −156	−100 −190	−210 −300	800	900	0 −100
																												−220 −310	900	1000	
1000	1250	+261 +195	+164 +98	+203 +98	+94 +28	+133 +28	+66 0	+105 0	+165 0	+260 0	+420 0	±23.5	±33	±52.5	–	–	0 −47	0 −66	0 −105	−40 −87	−40 −106	−40 −145	−66 −113	−66 −132	−66 −171	−120 −186	−120 −225	−250 −355	1000	1120	0 −125
																												−260 −365	1120	1250	

[Note] 1) Δ_{Dmp} : single plane mean outside diameter deviation

Supplementary table 8 Numerical values for standard tolerance grades IT (ISO 286-1 : 1988)

Basic size (mm)		Standard tolerance grades (IT)																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14[1]	15[1]	16[1]	17[1]	18[1]
over	up to	Tolerances (μm)											Tolerances (mm)						
–	3	0.8	1.2	2	3	4	6	10	14	25	40	60	0.10	0.14	0.26	0.40	0.60	1.00	1.40
3	6	1	1.5	2.5	4	5	8	12	18	30	48	75	0.12	0.18	0.30	0.48	0.75	1.20	1.80
6	10	1	1.5	2.5	4	6	9	15	22	36	58	90	0.15	0.22	0.36	0.58	0.90	1.50	2.20
10	18	1.2	2	3	5	8	11	18	27	43	70	110	0.18	0.27	0.43	0.70	1.10	1.80	2.70
18	30	1.5	2.5	4	6	9	13	21	33	52	84	130	0.21	0.33	0.52	0.84	1.30	2.10	3.30
30	50	1.5	2.5	4	7	11	16	25	39	62	100	160	0.25	0.39	0.62	1.00	1.60	2.50	3.90
50	80	2	3	5	8	13	19	30	46	74	120	190	0.30	0.46	0.74	1.20	1.90	3.00	4.60
80	120	2.5	4	6	10	15	22	35	54	87	140	220	0.35	0.54	0.87	1.40	2.20	3.50	5.40
120	180	3.5	5	8	12	18	25	40	63	100	160	250	0.40	0.63	1.00	1.60	2.50	4.00	6.30
180	250	4.5	7	10	14	20	29	46	72	115	185	290	0.46	0.72	1.15	1.85	2.90	4.60	7.20
250	315	6	8	12	16	23	32	52	81	130	210	320	0.52	0.81	1.30	2.10	3.20	5.20	8.10
315	400	7	9	13	18	25	36	57	89	140	230	360	0.57	0.89	1.40	2.30	3.60	5.70	8.90
400	500	8	10	15	20	27	40	63	97	155	250	400	0.63	0.97	1.55	2.50	4.00	6.30	9.70
500	630	–	–	–	–	–	44	70	110	175	280	440	0.70	1.10	1.75	2.80	4.40	7.00	11.00
630	800	–	–	–	–	–	50	80	125	200	320	500	0.80	1.25	2.00	3.20	5.00	8.00	12.50
800	1000	–	–	–	–	–	56	90	140	230	360	560	0.90	1.40	2.30	3.60	5.60	9.00	14.00
1000	1250	–	–	–	–	–	66	105	165	260	420	660	1.05	1.65	2.60	4.20	6.60	10.50	16.50
1250	1600	–	–	–	–	–	78	125	195	310	500	780	1.25	1.95	3.10	5.00	7.80	12.50	19.50
1600	2000	–	–	–	–	–	92	150	230	370	600	920	1.50	2.30	3.70	6.00	9.20	15.00	23.00
2000	2500	–	–	–	–	–	110	175	280	440	700	1100	1.75	2.80	4.40	7.00	11.00	17.50	28.00
2500	3150	–	–	–	–	–	135	210	330	540	860	1350	2.10	3.30	5.40	8.60	13.50	21.00	33.00

[Note] 1) Standard tolerance grades IT 14 to IT 18 (incl.) shall not be used for basic sizes less than or equal to 1 mm.

Supplementary table 9 Greek alphabet list

Name	Roman type	Italic type		Name	Roman type	Italic type	
	Capital	Capital	Lowercase		Capital	Capital	Lowercase
alpha	Α	Α	α	nu	Ν	Ν	ν
beta	Β	Β	β	xi	Ξ	Ξ	ξ
gamma	Γ	Γ	γ	omicron	Ο	Ο	ο
delta	Δ	⊿	δ	pi	Π	Π	π
epsilon	Ε	Ε	ε	rho	Ρ	Ρ	ρ
zeta	Ζ	Ζ	ζ	sigma	Σ	Σ	σ
eta	Η	Η	η	tau	Τ	Τ	τ
theta	Θ	Θ	θ	upsilon	Υ	Υ	υ
iota	Ι	Ι	ι	phi	Φ	Φ	ϕ
kappa	Κ	Κ	κ	chi	Χ	Χ	χ
lambda	Λ	Λ	λ	psi	Ψ	Ψ	ψ
mu	Μ	Μ	μ	omega	Ω	Ω	ω

Supplementary table 10 Prefixes used with SI units

Factor	Prefix		Factor	Prefix	
	Name	Symbol		Name	Symbol
10^{18}	exa	E	10^{-1}	deci	d
10^{15}	peta	P	10^{-2}	centi	c
10^{12}	tera	T	10^{-3}	milli	m
10^{9}	giga	G	10^{-6}	micro	μ
10^{6}	mega	M	10^{-9}	nano	n
10^{3}	kilo	k	10^{-12}	pico	p
10^{2}	hecto	h	10^{-15}	femto	f
10	deka	da	10^{-18}	atto	a

Supplementary table 11 (1) SI units and conversion factors

Mass	SI units	Other units [1]	Conversion into SI units	Conversion from SI units
Angle	rad [radian(s)]	° [degree(s)] * ′ [minute(s)] * ″ [second(s)] *	1° = π /180 rad 1′ = π /10 800 rad 1″ = π /648 000 rad	1 rad = 57.295 78°
Length	m [meter(s)]	Å [Angstrom unit] μ [micron(s)] in [inch(es)] ft [foot(feet)] yd [yard(s)] mile [mile(s)]	1Å = 10^{-10}m = 0.1nm = 100pm 1μ = 1 μm 1in = 25.4 mm 1ft = 12 in = 0.304 8 m 1yd = 3 ft = 0.914 4 m 1mile = 5 280 ft = 1 609.344 m	1m = 10^{10}Å 1m = 39.37 in 1m = 3.280 8 ft 1m = 1.093 6 yd 1km = 0.621 4 mile
Area	m^2	a [are(s)] ha [hectare(s)] acre [acre(s)]	1a = 100 m^2 1ha = 10^4 m^2 1acre = 4 840 yd^2 = 4 046.86 m^2	 1km^2 = 247.1 acre
Volume	m^3	ℓ , L [liter(s)] * cc [cubic centimeters] gal(US) [gallon(s)] floz(US) [fluid ounce(s)] barrel(US) [barrels(US)]	1 ℓ = 1 dm^3 = 10^{-3} m^3 1cc = 1 cm^3 = 10^{-6} m^3 1gal(US)= 231 in^3 = 3.785 41dm^3 1floz(US)= 29.573 5 cm^3 1barrel(US)= 158.987 dm^3	1m^3 = 10^3 ℓ 1m^3 = 10^6 cc 1m^3 = 264.17 gal 1m^3 = 33 814 floz 1m^3 = 6.289 8 barrel
Time	s [second(s)]	min [minute(s)] * h [hour(s)] * d [day(s)] *		
Angular velocity	rad / s			
Velocity	m / s	kn [knot(s)] m / h *	1kn = 1 852 m / h	1km / h = 0.539 96 kn
Acceleration	m / s^2	G	1G = 9.806 65 m / s^2	1m / s^2 = 0.101 97 G
Frequency	Hz [hertz]	c / s [cycle(s)/second]	1c / s = 1s^{-1} = 1 Hz	
Rotational frequency	s^{-1}	rpm [revolutions per minute] min^{-1} * r / min	1rpm = 1 / 60 s^{-1}	1s^{-1} = 60 rpm
Mass	kg [kilogram(s)]	t [ton(s)] * Ib [pound(s)] gr [grain(s)] oz [ounce(s)] ton (UK) [ton(s)(UK)] ton (US) [ton(s)(US)] car [carat(s)]	1t = 10^3 kg 1lb = 0.453 592 37 kg 1gr = 64.798 91 mg 1oz = 1/16 lb = 28.349 5 g 1ton(UK) = 1 016.05 kg 1ton(US) = 907.185 kg 1car = 200 mg	 1kg = 2.204 6 lb 1g = 15.432 4 gr 1kg = 35.274 0 oz 1t = 0.984 2 ton(UK) 1t = 1.102 3 ton(US) 1g = 5 car

[Note] * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 11 (2) SI units and conversion factors

Mass	SI units	Other units [1]	Conversion into SI units	Conversion from SI units
Density	kg / m^3			
Linear density	kg / m			
Momentum	kg·m / s			
Moment of momentum, angular momentum	kg·m^2 / s			
Moment of inertia	kg·m^2			
Force	N [newton(s)]	dyn [dyne(s)] kgf [kilogram-force] gf [gram-force] tf [ton-force] lbf [pound-force]	1dyn = 10^{-5} N 1kgf = 9.806 65 N 1gf = 9.806 65×10^{-3} N 1tf = 9.806 65×10^3 N 1lbf = 4.448 22 N	1N = 10^5 dyn 1N = 0.101 97 kgf 1N = 0.224 809 lbf
Moment of force	N·m [Newton meter(s)]	gf·cm kgf·cm kgf·m tf·m lbf·ft	1gf·cm = 9.806 65×10^{-5} N·m 1kgf·cm = 9.806 65×10^{-2} N·m 1kgf·m = 9.806 65 N·m 1tf·m = 9.806 65×10^3 N·m 1lbf·ft = 1.355 82 N·m	 1N·m = 0.101 97 kgf·m 1N·m = 0.737 56 lbf·ft
Pressure, Normal stress	Pa [Pascal(s)] or N / m^2 {1 Pa = 1 N / m^2}	gf / cm^2 kgf / mm^2 kgf / m^2 lbf / in^2 bar [bar(s)] at [engineering air pressure] mH_2O, mAq [meter water column] atm [atmosphere] mHg [meter merury column] Torr [torr]	1gf/cm^2 = 9.806 65×10 Pa 1kgf/mm^2 = 9.806 65×10^6 Pa 1kgf/m^2 = 9.806 65 Pa 1lbf/in^2 = 6 894.76 Pa 1bar = 10^5 Pa 1at = 1kgf/cm^2 = 9.806 65×10^4 Pa 1mH_2O = 9.806 65×10^3 Pa 1atm = 101 325 Pa 1mHg = $\frac{101\ 325}{0.76}$ Pa 1Torr = 1 mmHg = 133.322 Pa	 1MPa = 0.101 97 kgf / mm^2 1Pa = 0.101 97 kgf / m^2 1Pa = 0.145×10^{-3} lbf / in^2 1Pa = 10^{-2} mbar 1Pa = 7.500 6×10^{-3} Torr
Viscosity	Pa·s [pascal second]	P [poise] kgf·s / m^2	10^{-2} P = 1 cP = 1 mPa·s 1kgf·s / m^2 = 9.806 65 Pa·s	 1Pa·s = 0.101 97 kgf·s / m^2
Kinematic viscosity	m^2 / s	St [stokes]	10^{-2} St = 1 cSt = 1 mm^2 / s	
Surface tension	N / m			

Supplementary table 11 (3) SI units and conversion factors

Mass	SI units	Other units 1)	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J=1 N·m}	eV [electron volt(s)] * erg [erg(s)] kgf·m lbf·ft	1eV = (1.602 189 2± 0.000 004 6)×10^{-19} J 1 erg = 10^{-7} J 1 kgf·m = 9.806 65 J 1 lbf·ft = 1.355 82 J	1 J = 10^{7} erg 1 J = 0.101 97 kgf·m 1 J = 0.737 56 lbf·ft
Power	W [watt(s)]	erg / s [ergs per second] kgf·m / s PS [French horse-power] HP [horse-power (British)] lbf·ft / s	1 erg / s = 10^{-7} W 1 kgf·m / s = 9.806 65 W 1 PS = 75 kgf·m / s = 735.5 W 1 HP = 550 lbf·ft / s = 745.7 W 1 lbf·ft / s = 1.355 82 W	1 W = 0.101 97 kgf·m / s 1 W = 0.001 36 PS 1 W = 0.001 34 HP
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	℃ [Celsius(s)] {t℃ = (t+273.15)K}	℉ [degree(s) Fahrenheit]	t ℉ = $\frac{5}{9}$(t–32)℃	t ℃ = ($\frac{9}{5}$t+32)℉
Linear expansion coefficient	K^{-1}	$℃^{-1}$ [per degree]		
Heat	J [joule(s)] {1 J=1 N·m}	erg [erg(s)] kgf·m cal_{IT} [I. T. calories]	1 erg = 10^{-7} J 1 cal_{IT} = 4.186 8 J 1 $Mcal_{IT}$ = 1.163 kW·h	1 J = 10^{7} erg 1 J = 0.238 85 cal_{IT} 1 kW·h = 0.86 × 10^{6} cal_{IT}
Thermal conductivity	W / (m·K)	W / (m·℃) cal / (s·m·℃)	1 W / (m·℃) = 1 W / (m·K) 1 cal / (s·m·℃) = 4.186 05 W / (m·K)	
Coefficient of heat transfer	W / (m^2·K)	W / (m^2·℃) cal / (s·m^2·℃)	1 W / (m^2·℃) = 1 W / (m^2·K) 1 cal / (s·m^2·℃) = 4.186 05 W / (m^2·K)	
Heat capacity	J / K	J / ℃	1 J / ℃ = 1 J / K	
Massic heat capacity	J / (kg·K)	J / (kg·℃)		

[Note] * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 11 (4) SI units and conversion factors

Mass	SI units	Other units 1)	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge, quantity of electricity	C [coulomb(s)] {1 C = 1 A·s}	A·h *	1 A·h = 3.6 kC	
Tension, electric potential	V [volt(s)] {1 V = 1 W / A}			
Capacitance	F [farad(s)] {1 F = 1 C / V}			
Magnetic field strength	A / m	Oe [oersted(s)]	1 Oe = $\frac{10^3}{4\pi}$ A / m	1 A / m = 4 π × 10^{-3} Oe
Magnetic flux density	T [tesla(s)] {1T=1N / (A·m) =1Wb / m^2 =1V·s / m^2}	Gs [gauss(es)] γ [gamma(s)]	1 Gs = 10^{-4} T 1 γ = 10^{-9} T	1 T = 10^{4} Gs 1 T = 10^{9} γ
Magnetic flux	Wb [weber(s)] {1 Wb = 1 V·s}	Mx [maxwell(s)]	1 Mx = 10^{-8} Wb	1 Wb = 10^{8} Mx
Self inductance	H [henry(-ries)] {1 H = 1 Wb / A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω = 1 V / A}			
Conductance (to direct current)	S [siemens] {1 S = 1 A / V}			
Active power	W {1 W=1 J / s =1 A·V}			

Supplementary table 12 Inch/millimeter conversion

Inch		Inches										
		0	1	2	3	4	5	6	7	8	9	10
		mm										
0	0	**0**	**25.4000**	**50.8000**	**76.2000**	**101.6000**	**127.0000**	**152.4000**	**177.8000**	**203.2000**	**228.6000**	**254.0000**
1/64	0.015625	0.3969	25.7969	51.1969	76.5969	101.9969	127.3969	152.7969	178.1969	203.5969	228.9969	254.3969
1/32	0.03125	0.7938	26.1938	51.5938	76.9938	102.3938	127.7938	153.1938	178.5938	203.9938	229.3938	254.7938
3/64	0.046875	1.1906	26.5906	51.9906	77.3906	102.7906	128.1906	153.5906	178.9906	204.3906	229.7906	255.1906
1/16	0.0625	1.5875	26.9875	52.3875	77.7875	103.1875	128.5875	153.9875	179.3875	204.7875	230.1875	255.5875
5/64	0.078125	1.9844	27.3844	52.7844	78.1844	103.5844	128.9844	154.3844	179.7844	205.1844	230.5844	255.9844
3/32	0.09375	2.3812	27.7812	53.1812	78.5812	103.9812	129.3812	154.7812	180.1812	205.5812	230.9812	256.3812
7/64	0.109375	2.7781	28.1781	53.5781	78.9781	104.3781	129.7781	155.1781	180.5781	205.9781	231.3781	256.7781
1/8	0.125	**3.1750**	**28.5750**	**53.9750**	**79.3750**	**104.7750**	**130.1750**	**155.5750**	**180.9750**	**206.3750**	**231.7750**	**257.1750**
9/64	0.140625	3.5719	28.9719	54.3719	79.7719	105.1719	130.5719	155.9719	181.3719	206.7719	232.1719	257.5719
5/32	0.15625	3.9688	29.3688	54.7688	80.1688	105.5688	130.9688	156.3688	181.7688	207.1688	232.5688	257.9688
11/64	0.171875	4.3656	29.7656	55.1656	80.5656	105.9656	131.3656	156.7656	182.1656	207.5656	232.9656	258.3656
3/16	0.1875	4.7625	30.1625	55.5625	80.9625	106.3625	131.7625	157.1625	182.5625	207.9625	233.3625	258.7625
13/64	0.203125	5.1594	30.5594	55.9594	81.3594	106.7594	132.1594	157.5594	182.9594	208.3594	233.7594	259.1594
7/32	0.21875	5.5562	30.9562	56.3562	81.7562	107.1562	132.5562	157.9562	183.3562	208.7562	234.1562	259.5562
15/64	0.234375	5.9531	31.3531	56.7531	82.1531	107.5531	132.9531	158.3531	183.7531	209.1531	234.5531	259.9531
1/4	0.25	**6.3500**	**31.7500**	**57.1500**	**82.5500**	**107.9500**	**133.3500**	**158.7500**	**184.1500**	**209.5500**	**234.9500**	**260.3500**
17/64	0.265625	6.7469	32.1469	57.5469	82.9469	108.3469	133.7469	159.1469	184.5469	209.9469	235.3469	260.7469
9/32	0.28125	7.1438	32.5438	57.9438	83.3438	108.7438	134.1438	159.5438	184.9438	210.3438	235.7438	261.1438
19/64	0.296875	7.5406	32.9406	58.3406	83.7406	109.1406	134.5406	159.9406	185.3406	210.7406	236.1406	261.5406
5/16	0.3125	7.9375	33.3375	58.7375	84.1375	109.5375	134.9375	160.3375	185.7375	211.1375	236.5375	261.9375
21/64	0.328125	8.3344	33.7344	59.1344	84.5344	109.9344	135.3344	160.7344	186.1344	211.5344	236.9344	262.3344
11/32	0.34375	8.7312	34.1312	59.5312	84.9312	110.3312	135.7312	161.1312	186.5312	211.9312	237.3312	262.7312
23/64	0.359375	9.1281	34.5281	59.9281	85.3281	110.7281	136.1281	161.5281	186.9281	212.3281	237.7281	263.1281
3/8	0.375	**9.5250**	**34.9250**	**60.3250**	**85.7250**	**111.1250**	**136.5250**	**161.9250**	**187.3250**	**212.7250**	**238.1250**	**263.5250**
25/64	0.390625	9.9219	35.3219	60.7219	86.1219	111.5219	136.9219	162.3219	187.7219	213.1219	238.5219	263.9219
13/32	0.40625	10.3188	35.7188	61.1188	86.5188	111.9188	137.3188	162.7188	188.1188	213.5188	238.9188	264.3188
27/64	0.421875	10.7156	36.1156	61.5156	86.9156	112.3156	137.7156	163.1156	188.5156	213.9156	239.3156	264.7156
7/16	0.4375	11.1125	36.5125	61.9125	87.3125	112.7125	138.1125	163.5125	188.9125	214.3125	239.7125	265.1125
29/64	0.453125	11.5094	36.9094	62.3094	87.7094	113.1094	138.5094	163.9094	189.3094	214.7094	240.1094	265.5094
15/32	0.46875	11.9062	37.3062	62.7062	88.1062	113.5062	138.9062	164.3062	189.7062	215.1062	240.5062	265.9062
31/64	0.484375	12.3031	37.7031	63.1031	88.5031	113.9031	139.3031	164.7031	190.1031	215.5031	240.9031	266.3031
1/2	0.5	**12.7000**	**38.1000**	**63.5000**	**88.9000**	**114.3000**	**139.7000**	**165.1000**	**190.5000**	**215.9000**	**241.3000**	**266.7000**
33/64	0.515625	13.0969	38.4969	63.8969	89.2969	114.6969	140.0969	165.4969	190.8969	216.2969	241.6969	267.0969
17/32	0.53125	13.4938	38.8938	64.2938	89.6938	115.0938	140.4938	165.8938	191.2938	216.6938	242.0938	267.4938
35/64	0.546875	13.8906	39.2906	64.6906	90.0906	115.4906	140.8906	166.2906	191.6906	217.0906	242.4906	267.8906
9/16	0.5625	14.2875	39.6875	65.0875	90.4875	115.8875	141.2875	166.6875	192.0875	217.4875	242.8875	268.2875
37/64	0.578125	14.6844	40.0844	65.4844	90.8844	116.2844	141.6844	167.0844	192.4844	217.8844	243.2844	268.6844
19/32	0.59375	15.0812	40.4812	65.8812	91.2812	116.6812	142.0812	167.4812	192.8812	218.2812	243.6812	269.0812
39/64	0.609375	15.4781	40.8781	66.2781	91.6781	117.0781	142.4781	167.8781	193.2781	218.6781	244.0781	269.4781
5/8	0.625	**15.8750**	**41.2750**	**66.6750**	**92.0750**	**117.4750**	**142.8750**	**168.2750**	**193.6750**	**219.0750**	**244.4750**	**269.8750**
41/64	0.640625	16.2719	41.6719	67.0719	92.4719	117.8719	143.2719	168.6719	194.0719	219.4719	244.8719	270.2719
21/32	0.65625	16.6688	42.0688	67.4688	92.8688	118.2688	143.6688	169.0688	194.4688	219.8688	245.2688	270.6688
43/64	0.671875	17.0656	42.4656	67.8656	93.2656	118.6656	144.0656	169.4656	194.8656	220.2656	245.6656	271.0656
11/16	0.6875	17.4625	42.8625	68.2625	93.6625	119.0625	144.4625	169.8625	195.2625	220.6625	246.0625	271.4625
45/64	0.703125	17.8594	43.2594	68.6594	94.0594	119.4594	144.8594	170.2594	195.6594	221.0594	246.4594	271.8594
23/32	0.71875	18.2562	43.6562	69.0562	94.4562	119.8562	145.2562	170.6562	196.0562	221.4562	246.8562	272.2562
47/64	0.734375	18.6531	44.0531	69.4531	94.8531	120.2531	145.6531	171.0531	196.4531	221.8531	247.2531	272.6531
3/4	0.75	**19.0500**	**44.4500**	**69.8500**	**95.2500**	**120.6500**	**146.0500**	**171.4500**	**196.8500**	**222.2500**	**247.6500**	**273.0500**
49/64	0.765625	19.4469	44.8469	70.2469	95.6469	121.0469	146.4469	171.8469	197.2469	222.6469	248.0469	273.4469
25/32	0.78125	19.8438	45.2438	70.6438	96.0438	121.4438	146.8438	172.2438	197.6438	223.0438	248.4438	273.8438
51/64	0.796875	20.2406	45.6406	71.0406	96.4406	121.8406	147.2406	172.6406	198.0406	223.4406	248.8406	274.2406
13/16	0.8125	20.6375	46.0375	71.4375	96.8375	122.2375	147.6375	173.0375	198.4375	223.8375	249.2375	274.6375
53/64	0.828125	21.0344	46.4344	71.8344	97.2344	122.6344	148.0344	173.4344	198.8344	224.2344	249.6344	275.0344
27/32	0.84375	21.4312	46.8312	72.2312	97.6312	123.0312	148.4312	173.8312	199.2312	224.6312	250.0312	275.4312
55/64	0.859375	21.8281	47.2281	72.6281	98.0281	123.4281	148.8281	174.2281	199.6281	225.0281	250.4281	275.8281
7/8	0.875	**22.2250**	**47.6250**	**73.0250**	**98.4250**	**123.8250**	**149.2250**	**174.6250**	**200.0250**	**225.4250**	**250.8250**	**276.2250**
57/64	0.890625	22.6219	48.0219	73.4219	98.8219	124.2219	149.6219	175.0219	200.4219	225.8219	251.2219	276.6219
29/32	0.90625	23.0188	48.4188	73.8188	99.2188	124.6188	150.0188	175.4188	200.8188	226.2188	251.6188	277.0188
59/64	0.921875	23.4156	48.8156	74.2156	99.6156	125.0156	150.4156	175.8156	201.2156	226.6156	252.0156	277.4156
15/16	0.9375	23.8125	49.2125	74.6125	100.0125	125.4125	150.8125	176.2125	201.6125	227.0125	252.4125	277.8125
61/64	0.953125	24.2094	49.6094	75.0094	100.4094	125.8094	151.2094	176.6094	202.0094	227.4094	252.8094	278.2094
31/32	0.96875	24.6062	50.0062	75.4062	100.8062	126.2062	151.6062	177.0062	202.4062	227.8062	253.2062	278.6062
63/64	0.984375	25.0031	50.4031	75.8031	101.2031	126.6031	152.0031	177.4031	202.8031	228.2031	253.6031	279.0031

Supplementary table 13 Steel hardness conversion

Rockwell	Vicker's	Brinell		Rockwell		Shore
C-scale 1 471.0 N		Standard ball	Tungsten carbide ball	A-scale 588.4 N	B-scale 980.7 N	
68	940			85.6		97
67	900			85.0		95
66	865			84.5		92
65	832		739	83.9		91
64	800		722	83.4		88
63	772		705	82.8		87
62	746		688	82.3		85
61	720		670	81.8		83
60	697		654	81.2		81
59	674		634	80.7		80
58	653		615	80.1		78
57	633		595	79.6		76
56	613		577	79.0		75
55	595	–	560	78.5		74
54	577	–	543	78.0		72
53	560	–	525	77.4		71
52	544	500	512	76.8		69
51	528	487	496	76.3		68
50	513	475	481	75.9		67
49	498	464	469	75.2		66
48	484	451	455	74.7		64
47	471	442	443	74.1		63
46	458	432	432	73.6		62
45	446	421		73.1		60
44	434	409		72.5		58
43	423	400		72.0		57
42	412	390		71.5		56
41	402	381		70.9		55
40	392	371		70.4	–	54
39	382	362		69.9	–	52
38	372	353		69.4	–	51
37	363	344		68.9	–	50
36	354	336		68.4	(109.0)	49
35	345	327		67.9	(108.5)	48
34	336	319		67.4	(108.0)	47
33	327	311		66.8	(107.5)	46
32	318	301		66.3	(107.0)	44
31	310	294		65.8	(106.0)	43
30	302	286		65.3	(105.5)	42
29	294	279		64.7	(104.5)	41
28	286	271		64.3	(104.0)	41
27	279	264		63.8	(103.0)	40
26	272	258		63.3	(102.5)	38
25	266	253		62.8	(101.5)	38
24	260	247		62.4	(101.0)	37
23	254	243		62.0	100.0	36
22	248	237		61.5	99.0	35
21	243	231		61.0	98.5	35
20	238	226		60.5	97.8	34
(18)	230	219		–	96.7	33
(16)	222	212		–	95.5	32
(14)	213	203		–	93.9	31
(12)	204	194		–	92.3	29
(10)	196	187			90.7	28
(8)	188	179			89.5	27
(6)	180	171			87.1	26
(4)	173	165			85.5	25
(2)	166	158			83.5	24
(0)	160	152			81.7	24

Supplementary table 14 Surface roughness comparison

Arithmetical mean deviation of the profile R_a	Maximum height of the profile R_{max}	Ten-point height of irregularities R_z	Roughness grade numbers N
0.013 a	0.05 S	0.05 Z	–
0.025 a	0.1 S	0.1 Z	N 1
0.05 a	0.2 S	0.2 Z	N 2
0.10 a	0.4 S	0.4 Z	N 3
0.20 a	0.8 S	0.8 Z	N 4
0.40 a	1.6 S	1.6 Z	N 5
0.80 a	3.2 S	3.2 Z	N 6
1.6 a	6.3 S	6.3 Z	N 7
3.2 a	12.5 S	12.5 Z	N 8
6.3 a	25 S	25 Z	N 9
12.5 a	50 S	50 Z	N 10
25 a	100 S	100 Z	N 11
50 a	200 S	200 Z	N 12
100 a	400 S	400 Z	–

[Note] Above table is applicable only when processed surface peaks are of equal height.
Above table is roughly applicable to processed surface for general use.
Numbers are combined only for convenience in deciding surface roughness.

Supplementary table 15 Viscosity conversion

Kinematic viscosity mm^2/s	Saybolt SUS (second)		Redwood R (second)		Engler E (degree)
	100°F	210°F	50°C	100°C	
2	32.6	32.8	30.8	31.2	1.14
3	36.0	36.3	33.3	33.7	1.22
4	39.1	39.4	35.9	36.5	1.31
5	42.3	42.6	38.5	39.1	1.40
6	45.5	45.8	41.1	41.7	1.48
7	48.7	49.0	43.7	44.3	1.56
8	52.0	52.4	46.3	47.0	1.65
9	55.4	55.8	49.1	50.0	1.75
10	58.8	59.2	52.1	52.9	1.84
11	62.3	62.7	55.1	56.0	1.93
12	65.9	66.4	58.2	59.1	2.02
13	69.6	70.1	61.4	62.3	2.12
14	73.4	73.9	64.7	65.6	2.22
15	77.2	77.7	68.0	69.1	2.32
16	81.1	81.7	71.5	72.6	2.43
17	85.1	85.7	75.0	76.1	2.54
18	89.2	89.8	78.6	79.7	2.64
19	93.3	94.0	82.1	83.6	2.76
20	97.5	98.2	85.8	87.4	2.87
21	102	102	89.5	91.3	2.98
22	106	107	93.3	95.1	3.10
23	110	111	97.1	98.9	3.22
24	115	115	101	103	3.34
25	119	120	105	107	3.46
26	123	124	109	111	3.58
27	128	129	112	115	3.70
28	132	133	116	119	3.82
29	137	138	120	123	3.95
30	141	142	124	127	4.07
31	145	146	128	131	4.20
32	150	150	132	135	4.32
33	154	155	136	139	4.45
34	159	160	140	143	4.57
35	163	164	144	147	4.70
36	168	170	148	151	4.83
37	172	173	153	155	4.96
38	177	178	156	159	5.08
39	181	183	160	164	5.21
40	186	187	164	168	5.34
41	190	192	168	172	5.47
42	195	196	172	176	5.59
43	199	201	176	180	5.72
44	204	205	180	185	5.85
45	208	210	184	189	5.98
46	213	215	188	193	6.11
47	218	219	193	197	6.24
48	222	224	197	202	6.37
49	227	228	201	206	6.50
50	231	233	205	210	6.63
55	254	256	225	231	7.24
60	277	279	245	252	7.90
65	300	302	266	273	8.55
70	323	326	286	294	9.21
75	346	349	306	315	9.89
80	371	373	326	336	10.5
85	394	397	347	357	11.2
90	417	420	367	378	11.8
95	440	443	387	399	12.5
100	464	467	408	420	13.2
120	556	560	490	504	15.8
140	649	653	571	588	18.4
160	742	747	653	672	21.1
180	834	840	734	757	23.7
200	927	933	816	841	26.3
250	1159	1167	1020	1051	32.9
300	1391	1400	1224	1241	39.5

[Remark] $1mm^2/s = 1$ cSt (centi stokes)

Bearing No. index

Bearing series (series name)	Description	Page
⓪ **02400**	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B227, B229, B231
02800	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B229, B231, B233
03000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B225
07000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B225, B227
08000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B231
09000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B225
① **11000R**	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B237
112	Self-aligning ball bearing, extended inner ring type	A6, A55, A56, B125, B134
113	Self-aligning ball bearing, extended inner ring type	A6, A55, A56, B125, B134
12	Self-aligning ball bearing, open type	A6, A55, A56, B125, B126
12‥K	Self-aligning ball bearing, open type, tapered bore	A6, A56, B125, B126
1200	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B227
12000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B239
12500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B225
13	Self-aligning ball bearing, open type	A6, A55, A56, B125, B126
13‥K	Self-aligning ball bearing, open type, tapered bore	A6, A56, B125, B126
1300	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B225
13600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235
13800	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B235
14000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B229, B231
15000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B227, B229, B231
15500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B229
160	Single-row deep groove ball bearing, open type	A4, A55, B7, B8
16000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B235
1700	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B227
17000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B227, B229
17500R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B225
18000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B243
18500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235, B237
18600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B239, B241
18700	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B243
19000R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235
1900R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B227, B229
1WC	Miniature one-way clutch, with metal spring	B482, B484
② **20DC**	Cylindrical roller bearing for railway rolling stock axle journal	C22, C25
21000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B225
213	Spherical roller bearing	A10, A55, A56, A59, B291, B294
22	Self-aligning ball bearing, open type	A6, A55, A56, B125, B126
22‥2RS	Self-aligning ball bearing, sealed type	A6, A56, B125, B132
22‥K	Self-aligning ball bearing, open type, tapered bore	A6, A56, B125, B126
222	Spherical roller bearing	A10, A55, A56, A59, B291, B294
223	Spherical roller bearing	A10, A55, A56, A59, B291, B294
23	Self-aligning ball bearing, open type	A6, A55, A56, B125, B126
23‥2RS	Self-aligning ball bearing, sealed type	A6, A56, B125, B132
23‥K	Self-aligning ball bearing, open type, tapered bore	A6, A56, B125, B126
230	Spherical roller bearing	A10, A55, A56, A59, B291, B296
230‥K	Spherical roller bearing, tapered bore	A10, A55, A56, A59, B291, B296
231	Spherical roller bearing	A10, A55, A56, A59, B291, B294
231‥K	Spherical roller bearing, tapered bore	A10, A55, A56, A59, B291, B294
232	Spherical roller bearing	A10, A55, A56, A59, B291, B296
232‥K	Spherical roller bearing, tapered bore	A10, A55, A56, A59, B291, B296
23600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233
238	Spherical roller bearing	A10, A55, A56, A59, B291, B314
238‥K	Spherical roller bearing, tapered bore	A10, A55, A56, A59, B291, B314
239	Spherical roller bearing	A10, A55, A56, A59, B291, B300
239‥K	Spherical roller bearing, tapered bore	A10, A55, A56, A59, B291, B300
240	Spherical roller bearing	A10, A55, A56, A59, B291, B298
240‥K	Spherical roller bearing, tapered bore	A10, A55, A56, A59, B291, B298
241	Spherical roller bearing	A10, A55, A56, A59, B291, B298
241‥K	Spherical roller bearing, tapered bore	A10, A55, A56, A59, B291, B298
24700R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B237
2500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B231
25500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235, B239, B241
25800R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233
2600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B227, B229
26000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B229, B231
26800R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B239
2700R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B235
27600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B257, B259
27800	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235
28000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B235
28500R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B243, B245
28600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B243, B247
28900	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B249
2900	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B241
292	Spherical thrust roller bearing	A11, A55, A56, A59, B355, B358
293	Spherical thrust roller bearing	A11, A55, A56, A59, B355, B356
294	Spherical thrust roller bearing	A11, A55, A56, A59, B355, B356
29500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B249
29600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B253, B255
2CR	Cylindrical roller bearing for railway rolling stock axle journal	C22, C25
2U	Cylindrical roller bearing for railway rolling stock axle journal	C22, C25
③ **302**	Single-row tapered roller bearing, metric series	A9, A55, A56, B185, B194
303	Single-row tapered roller bearing, metric series	A9, A55, A56, B185, B194
3100	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B229
313	Single-row tapered roller bearing, metric series	A9, A55, A56, B185, B214
31500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233
32	Double-row angular contact ball bearing (with filling slot)	A5, A55, A56, B55, B118
320	Single-row tapered roller bearing, metric series	A9, A55, A56, B185, B194
322	Single-row tapered roller bearing, metric series	A9, A55, A56, B185, B194
323	Single-row tapered roller bearing, metric series	A9, A55, A56, B185, B194

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329	Single-row tapered roller bearing, metric series	A9, A55, B185, B198
33	Double-row angular contact ball bearing (with filling slot)	A5, A55, A56, B55, B118
330	Single-row tapered roller bearing, metric series	A9, A55, A56, B185, B196
3300	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235
33000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B247, B251, B253
331	Single-row tapered roller bearing, metric series	A9, A55, B185, B200
332	Single-row tapered roller bearing, metric series	A9, A55, B185, B196
335	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B235, B237
33800	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B239, B243, B245
3400	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B235
34000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B253, B255, B257
3500R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B237, B239
355	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B237, B239, B241
365	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B237, B241, B243, B245
3700	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B239, B243
37000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B263, B265
375	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B243
3800	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B237
385	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B241, B243, B247
3900	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B247, B251
395	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B243, B249, B251
39500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B245, B247, B249, B251
④ **41000**	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B229
415	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235, B237
42	Double-row deep groove ball bearing	A4, A55, A56, B5, B52
42600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B255, B257
43	Double-row deep groove ball bearing	A4, A55, A56, B5, B52
4300	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235, B237
435	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B233, B239
4500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B245
452	Double-row tapered roller bearing (TDI type)	A9, A55, A56, B284
45200	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B241, B243, B247
453	Double-row tapered roller bearing (TDI type)	A9, A55, A56, B284
455	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B241, B245, B247
46000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B237, B239
462	Double-row tapered roller bearing (TDO type)	A9, A55, A56, B268
46T	Double-row tapered roller bearing (TDO type)	A9, A55, A56, B268
47400R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B253
475	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B249, B253
47600R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B255, B257
47800R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B261
48100	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B263
48600	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B267
49000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B239
495	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B255, B257, B259

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4UJ	Cylindrical roller bearing for railway rolling stock axle journal	C22, C25
⑤ **511**	Single direction thrust ball bearing with flat back face	A11, A55, A56, A59, B337, B338
512	Single direction thrust ball bearing with flat back face	A11, A55, A56, A59, B337, B338
513	Single direction thrust ball bearing with flat back face	A11, A55, A56, A59, B337, B338
514	Single direction thrust ball bearing with flat back face	A11, A55, A56, A59, B337, B338
52	Double-row angular contact ball bearing	A5, A55, A56, B55, B118
52··2RS	Double-row angular contact ball bearing, contact sealed	A5, A56, B55, B118
52··ZZ	Double-row angular contact ball bearing, shielded	A5, A56, B55, B118
52000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B261, B263
522	Double direction thrust ball bearing with flat back faces	A11, A55, A56, B337, B348
523	Double direction thrust ball bearing with flat back faces	A11, A55, A56, B337, B348
524	Double direction thrust ball bearing with flat back faces	A11, A55, A56, B337, B348
525	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B235, B237, B238, B241, B243
53	Double-row angular contact ball bearing	A5, A55, A56, B55, B118
53··2RS	Double-row angular contact ball bearing, contact sealed	A5, A56, B55, B118
53··ZZ	Double-row angular contact ball bearing, shielded	A5, A56, B55, B118
532	Single direction thrust ball bearing with spherical back face	A11, A55, A56, A59, B337, B338
532··U	Single direction thrust ball bearing with aligning seat race	A11, A55, A56, A59, B337, B338
533	Single direction thrust ball bearing with spherical back face	A11, A55, A56, A59, B337, B338
533··U	Single direction thrust ball bearing with aligning seat race	A11, A55, A56, A59, B337, B338
534	Single direction thrust ball bearing with spherical back face	A11, A55, A56, A59, B337, B338
534··U	Single direction thrust ball bearing with aligning seat race	A11, A55, A56, A59, B337, B338
535	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B237, B239, B245
542	Double direction thrust ball bearing with spherical back faces	A11, A55, A56, B337, B348
542··U	Double direction thrust ball bearing with aligning seat races	A11, A55, A56, B337, B348
543	Double direction thrust ball bearing with spherical back faces	A11, A55, A56, B337, B348
543··U	Double direction thrust ball bearing with aligning seat races	A11, A55, A56, B337, B348
544	Double direction thrust ball bearing with spherical back faces	A11, A55, A56, B337, B348

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5500R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B245, B247, B249, B251
555	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B245
56000R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B263
565	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B249, B251, B253, B256
5700	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B255
575R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B253, B255, B257
59000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B243
595	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B259, B261
60	Single-row deep groove ball bearing, open type, extra-small ball bearing, miniature ball bearing, open type	A4, A55, A56, B5, B7, B8, B40
60‥2RD	Single-row deep groove ball bearing, extremely light contact sealed, extra-small ball bearing, miniature ball bearing, extremely light contact sealed	A4, A56, B5, B6, B20, B42
60‥2RS	Single-row deep groove ball bearing, contact sealed, extra-small ball bearing, miniature ball bearing, contact sealed	A4, A56, B5, B6, B20, B42
60‥2RU	Single-row deep groove ball bearing, non-contact sealed, extra-small ball bearing, miniature ball bearing, non-contact sealed	A4, A56, B5, B6, B20, B42
60‥N	Single-row deep groove ball bearing, snap ring groove type	A4, A56, B5, B32
60‥NR	Single-row deep groove ball bearing, snap ring groove type, locating snap ring type	A4, A56, B5, B32
60‥ZZ	Single-row deep groove ball bearing, shielded, extra-small ball bearing, miniature ball bearing, shielded	A4, A56, B5, B6, B20, B42
615	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B239, B245, B247
62	Single-row deep groove ball bearing, open type, extra-small ball bearing, miniature ball bearing, open type	A4, A48, A54, A55, A56, B7, B8, B40
62‥2RD	Single-row deep groove ball bearing, extremely light contact sealed, extra-small ball bearing, miniature ball bearing, extremely light contact sealed	A4, A56, B5, B6, B20, B42
62‥2RS	Single-row deep groove ball bearing, contact sealed, extra-small ball bearing, miniature ball bearing, contact sealed	A4, A56, B5, B6, B20, B40
62‥2RU	Single-row deep groove ball bearing, non-contact sealed, extra-small ball bearing, miniature ball bearing, non-contact sealed	A4, A56, B5, B6, B20, B42
62‥N	Single-row deep groove ball bearing, snap ring groove type	A4, A56, B5, B32
62‥NR	Single-row deep groove ball bearing, snap ring groove type, locating snap ring type	A4, A56, B5, B32
62‥ZZ	Single-row deep groove ball bearing, shielded, extra-small ball bearing, miniature ball bearing, shielded	A4, A56, B5, B6, B20, B40
63	Single-row deep groove ball bearing, open type, extra-small ball bearing, miniature ball bearing, open type	A4, A46, A49, A55, A56, B5, B7, B8, B40
63‥2RD	Single-row deep groove ball bearing, extremely light contact sealed, extra-small ball bearing, miniature ball bearing, extremely light contact sealed	A4, A56, B4, B5, B6, B20
63‥2RS	Single-row deep groove ball bearing, contact sealed, extra-small ball bearing, miniature ball bearing, contact sealed	A4, A56, B5, B6, B20, B42
63‥2RU	Single-row deep groove ball bearing, non-contact sealed, extra-small ball bearing, miniature ball bearing, non-contact sealed	A4, A56, B5, B6, B20, B42
63‥N	Single-row deep groove ball bearing, snap ring groove type	A4, A56, B5, B32
63‥NR	Single-row deep groove ball bearing, snap ring groove type, locating snap ring type	A4, A56, B5, B32
63‥ZZ	Single-row deep groove ball bearing, shielded, extra-small ball bearing, miniature ball bearing, shielded	A4, A56, B5, B6, B20, B40
6300	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B245, B249, B251
635	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B251
64	Single-row deep groove ball bearing, open type	A4, A55, B7, B8
6400	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B255
64000R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B265
65000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B245, B247, B249
6500R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B259, B261
65300	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B241
655	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B253, B255, B257, B259
66000R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B245
66500	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B245, B247
67	Single-row deep groove ball bearing, open type	A4, A55, B7, B8
67‥2RS	Single-row deep groove ball bearing, contact sealed	A4, A56, B5, B6, B20
67‥2RU	Single-row deep groove ball bearing, non-contact sealed	A4, A56, B5, B6, B20
67‥ZZ	Single-row deep groove ball bearing, shielded	A4, A56, B5, B6, B20
675	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B259, B261, B263
68	Single-row deep groove ball bearing, open type, extra-small ball bearing, miniature ball bearing, open type	A4, A55, A56, B5, B7, B8, B40
68‥2RD	Single-row deep groove ball bearing, extremely light contact sealed	A4, A56, B5, B6, B20
68‥2RS	Single-row deep groove ball bearing, contact sealed	A4, A56, B5, B6, B20
68‥2RU	Single-row deep groove ball bearing, non-contact sealed	A4, A56, B5, B6, B20
68‥N	Single-row deep groove ball bearing, snap ring groove type	A4, A56, B5, B32
68‥NR	Single-row deep groove ball bearing, snap ring groove type, locating snap ring type	A4, A56, B5, B32
68‥ZZ	Single-row deep groove ball bearing, shielded	A4, A56, B5, B6, B20
68000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B265

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69··2RD	Single-row deep groove ball bearing, extremely light contact sealed, extra-small ball bearing, miniature ball bearing, extremely light contact sealed	A4, A56, B5, B6, B20, B42
69··2RS	Single-row deep groove ball bearing, contact sealed, extra-small ball bearing, miniature ball bearing, contact sealed	A4, A56, B5, B6, B20, B42
69··2RU	Single-row deep groove ball bearing, non-contact sealed, extra-small ball bearing, miniature ball bearing, non-contact sealed	A4, A56, B5, B6, B20, B42
69··N	Single-row deep groove ball bearing, snap ring groove type	A4, A56, B5, B32
69··NR	Single-row deep groove ball bearing, snap ring groove type, locating snap ring type	A4, A56, B5, B32
69··ZZ	Single-row deep groove ball bearing, shielded, extra-small ball bearing, miniature ball bearing, shielded	A4, A56, B5, B6, B20, B42
⑦ **70**	Single-row angular contact ball bearing	A5, A55, A56, B55, B62
70··DB	Matched pair angular contact ball bearing, back-to-back arrangement	A5, A56, B55, B90
70··DF	Matched pair angular contact ball bearing, face-to-face arrangement	A5, A56, B55, B90
70··DT	Matched pair angular contact ball bearing, tandem arrangement	A5, A56, B55, B90
71000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B263, B265
72	Single-row angular contact ball bearing	A5, A55, A56, B55, B62
72··DB	Matched pair angular contact ball bearing, back-to-back arrangement	A5, A56, B55, B90
72··DF	Matched pair angular contact ball bearing, face-to-face arrangement	A5, A56, B55, B90
72··DT	Matched pair angular contact ball bearing, tandem arrangement	A5, A56, B55, B90
73	Single-row angular contact ball bearing	A5, A55, A56, B55, B62
73··DB	Matched pair angular contact ball bearing, back-to-back arrangement	A5, A56, B55, B90
73··DF	Matched pair angular contact ball bearing, face-to-face arrangement	A5, A56, B55, B90
73··DT	Matched pair angular contact ball bearing, tandem arrangement	A5, A56, B55, B90
74	Single-row angular contact ball bearing	A5, A55, A56, B55, B64
74··DB	Matched pair angular contact ball bearing, back-to-back arrangement	A5, A56, B55, B92
74··DF	Matched pair angular contact ball bearing, face-to-face arrangement	A5, A56, B55, B92
74··DT	Matched pair angular contact ball bearing, tandem arrangement	A5, A56, B55, B92
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755	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B255, B257, B259, B261
775	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B261, B263
79	Single-row angular contact ball bearing	A5, A55, A56, B55, B62
79··DB	Matched pair angular contact ball bearing, back-to-back arrangement	A5, A56, B55, B90
79··DF	Matched pair angular contact ball bearing, face-to-face arrangement	A5, A56, B55, B90
79··DT	Matched pair angular contact ball bearing, tandem arrangement	A5, A56, B55, B90
⑧ **835R**	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B253, B259
855R	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B259, B261, B263
⑨ **9100**	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B251
935	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B263, B265
98000	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B257, B259, B261, B263
Ⓐ **A2000**	Single-row tapered roller bearing, inch series	A9, A55, A56, A59, B225
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AH23	Withdrawal sleeve for spherical roller bearing	A10, A55, A56, B326
AH240	Withdrawal sleeve for spherical roller bearing	A10, A55, A56, B328
AH241	Withdrawal sleeve for spherical roller bearing	A10, A55, A56, B327
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AHX3	Withdrawal sleeve for spherical roller bearing	A10, A55, A56, B326
AHX30	Withdrawal sleeve for spherical roller bearing	A10, A55, A56, B327
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AXK	Thrust needle roller and cage assemblies, without races, one-piece cage, metric series	A12, B363, B444
Ⓑ **BK**	Drawn cup needle roller bearing, caged, closed one end, metric series	A8, B363, B414
Ⓔ **EWC**	Miniature one-way clutch, with synthetic resin spring	B482, B484
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F62	Extra-small ball bearing, miniature ball bearing, flanged type, open type	A4, A56, B5, B46
F62··ZZ	Extra-small ball bearing, miniature ball bearing, flanged type, shielded	A4, A56, B5, B46

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2017.9

Koyo® Ball & Roller Bearings

VEGETABLE OIL INK

CAT. NO. B2001E-7
Printed in Japan '17.09-3CDS ('06.1)

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Reference insert page 1-1 for Koyo Ball & Roller Bearings Catalogue
(comparison between JIS B 1514-1:2006 and JIS B 1514-1:2017)

Table 1-1 Comparison table between GPS symbols with descriptions and previous terms for radial bearings.

Nominal dimension 1)	Symbol for characteristic 1)	GPS symbol and specification modifier 2)	Description 3)	Conventional term 4)
$\boldsymbol{B}$			Nominal inner ring width	Nominal inner ring width
	VBs	(LP)(SR)	**Symmetrical rings:** range of two point sizes of inner ring width	Variation of inner ring width
		(GN) ALS (SR) ⟨⌯| ⟩	**Asymmetrical rings:** range of minimum circumscribed sizes of inner ring width, between two opposite lines, obtained from any longitudinal section which includes the inner ring bore axis	
	ΔBs	(LP)	**Symmetrical rings:** deviation of a two-point size of inner ring width from its nominal size	Deviation of single inner ring width
		(GN) ALS ⟨⌯| ⟩	**Asymmetrical rings, upper limit:** deviation of a minimum circumscribed size of inner ring width, between two opposite lines, in any longitudinal section which includes the inner ring bore axis, from its nominal size	
		(LP)	**Asymmetrical rings, lower limit:** deviation of a two-point size of inner ring width from its nominal size	
$\boldsymbol{C}$			Nominal outer ring width	Nominal outer ring width
	VCs	(LP)(SR)	**Symmetrical rings:** range of two point sizes of outer ring width	Variation of outer ring width
		(GN) ALS (SR) ⟨⌯| ⟩	**Asymmetrical rings:** range of minimum circumscribed sizes of outer ring width, between two opposite lines, obtained from any longitudinal section which includes the outer ring outside axis	
	ΔCs	(LP)	**Symmetrical rings:** deviation of a two-point size of outer ring width from its nominal size	Deviation of single outer ring width
		(GN) ALS ⟨⌯| ⟩	**Asymmetrical rings, upper limit:** deviation of a minimum circumscribed size of outer ring width, between two opposite lines, in any longitudinal section which includes the outer ring outside axis, from its nominal size	
		(LP)	**Asymmetrical rings, lower limit:** deviation of a two-point size of outer ring width from its nominal size	
$\boldsymbol{C_1}$			Nominal outer ring flange width	Nominal outer ring flange width
	VC1s	(LP)(SR)	Range of two point sizes of outer ring flange width	Variation of outer ring flange width
	ΔC1s	(LP)	Deviation of a two-point size of outer ring flange width from its nominal size	Deviation of single outer ring flange width
$\boldsymbol{d}$			Nominal bore diameter of a cylindrical bore or at the theoretical small end of a tapered bore	Nominal bore diameter
	Vdmp	(LP)(SD) ACS (SR)	Range of mid-range sizes (out of two-point sizes) of bore diameter obtained from any cross-section of a cylindrical bore	Variation of mean bore diameter
	Δdmp	(LP)(SD) ACS	**Cylindrical bore:** deviation of a mid-range size (out of two-point sizes) of bore diameter in any cross-section from its nominal size	Deviation of mean bore diameter (at the theoretical small end) in a single plane
		(LP)(SD) SCS	**Tapered bore:** single plane deviation of a mid-range size (out of two-point sizes) of bore diameter at the theoretical small end from its nominal size	
	Vdsp	(LP)(SR) ACS	Range of two-point sizes of bore diameter in any cross-section of a cylindrical or tapered bore	Variation of single bore diameter in a single plane
	Δds	(LP)	Deviation of a two-point size of the bore diameter from its nominal size	Deviation of a single bore diameter
$\boldsymbol{d_1}$			Nominal diameter at the theoretical large end of a tapered bore	Nominal diameter at the theoretical large end of a basically tapered bore
	Δd1mp	(LP)(SD) SCS	Deviation of a mid-range size (out of two-point sizes) of bore diameter at the theoretical large end of a tapered bore from its nominal size	Deviation of mean bore diameter in a single plane at the theoretical large end of a basically tapered bore

Note 1) Symbols as defined in **JIS B 0124** except for the format used.
Tolerance values associated to characteristics are symbolized by "t" followed by the symbols for the characteristics, for example "t_{VBs}".
2) Symbols as defined in **JIS B 0420-1** and **ISO 1101**. See **JIS B 1514-1**:2017 **Annex D**.
3) Description based on **JIS B 0022**, **JIS B 0420-1** and **ISO 1101**.
4) Terms in **JIS B 1514-1**:2006.

JIS B 1514-1 and JIS B 1514-2 were revised to introduce geometrical product specifications (GPS) in 2017.
So this reference insert page is provided in order to compare the GPS symbols, descriptions and conventional terms.

CAT.NO.B2001E_ref '1709

Nominal dimension 1)	**Symbol for characteristic** 1)	**GPS symbol and specification modifier** 2)	**Description** 3)	**Conventional term** 4)
D			Nominal outside diameter	Nominal outside diameter
	VDmp	(LP)(SD)ACS(SR)	Range of mid-range sizes (out of two-point sizes) of outside diameter obtained from any cross-section	Variation of mean outside diameter
	ΔDmp	(LP)(SD)ACS	Deviation of a mid-range size (out of two-point sizes) of outside diameter in any cross-section from its nominal size	Deviation of mean outside diameter in a single plane
	VDsp	(LP)(SR)ACS	Range of two-point sizes of outside diameter in any cross-section	Variation of outside diameter in a single plane
	ΔDs	(LP)	Deviation of a two-point size of outside diameter from its nominal size	Deviation of a single outside diameter
D_1			Nominal outside diameter of outer ring flange	Nominal outside diameter of outer ring flange
	ΔD1s	(LP)	Deviation of a two-point size of outside diameter of outer ring flange from its nominal size	Deviation of a single outside diameter of outer ring flange
	Kea	↗ 5)	Circular radial run-out of outer ring outside surface of assembled bearing with respect to datum, i.e. axis, established from the inner ring bore surface	Radial run-out of outer ring of assembled bearing
	Kia	↗ 5)	Circular radial run-out of inner ring bore of assembled bearing with respect to datum, i.e. axis, established from the outer ring outside surface	Radial run-out of inner ring of assembled bearing
	Sd	↗ 5)	Circular axial run-out of inner ring face with respect to datum, i.e. axis, established from the inner ring bore surface	Perpendicularity of inner ring face with respect to the bore
	SD 6)	⊥	Perpendicularity of outer ring outside surface axis with respect to datum established from the outer ring face	Perpendicularity of outer ring outside surface with respect to the face
	SD1 6)	⊥	Perpendicularity of outer ring outside surface axis with respect to datum established from the outer ring flange back face	Perpendicularity of outer ring outside surface with respect to the flange back face
	Sea	↗ 5)	Circular axial run-out of outer ring face of assembled bearing with respect to datum, i.e. axis, established from the inner ring bore surface	Axial run-out of outer ring of assembled bearing
	Sea1	↗ 5)	Circular axial run-out of outer ring flange back face of assembled bearing with respect to datum, i.e. axis, established from the inner ring bore surface	Axial run-out of outer ring flange back face of assembled bearing
	Sia	↗ 5)	Circular axial run-out of inner ring face of assembled bearing with respect to datum, i.e. axis, established from the outer ring outside surface	Axial run-out of inner ring of assembled bearing
SL			Taper slope: Taper slope is the difference between nominal diameters at the theoretical large end and small end of a tapered bore $(d_1 - d)$	–
	ΔSL		Deviation of taper slope of a tapered inner ring bore from its nominal size	–
α			Frustum angle of tapered inner ring bore 7)	Angle of taper (half the cone angle) of inner ring bore
T			Nominal assembled bearing width	Nominal assembled bearing width
	ΔTs	(GN) 5)	Deviation of minimum circumscribed size of assembled bearing width from its nominal size	Deviation of the actual (assembled) bearing width
T_1			Nominal effective width of inner subunit assembled with a master outer ring	Nominal effective width of inner subunit
	ΔT1s	(GN) 5)	Deviation of minimum circumscribed size of effective width (inner subunit assembled with a master outer ring) from its nominal size	Deviation of the actual effective width of inner subunit
T_2			Nominal effective width of outer ring assembled with a master inner subunit	Nominal effective width of outer ring
	ΔT2s	(GN) 5)	Deviation of minimum circumscribed size of effective width (outer ring assembled with a master inner subunit) from its nominal size	Deviation of the actual effective width of outer ring

Note 1) Symbols as defined in **JIS B 0124** except for the format used.
Tolerance values associated to characteristics are symbolized by "t" followed by the symbols for the characteristics, for example "t_{VBs}".
2) Symbols as defined in **JIS B 0420-1** and **ISO 1101**. See **JIS B 1514-1**:2017 **Annex D**.
3) Description based on **JIS B 0022**, **JIS B 0420-1** and **ISO 1101**
4) Terms in **JIS B 1514-1**:2006.
5) Symbols for direction of gravity, fixed parts and movable parts, according to **ISO/TS 17863**.
6) Tolerance values have become half the values compared to **JIS B 1514-1**:2006, because SD and SD1 are defined as perpendicularity of outer ring outside surface axis in **JIS B 1514-1**:2017.
7) Definition is changed to frustum angle of tapered inner ring bore in accordance with the description in **ISO 1119**.

Reference insert page 1-2 for Koyo Ball & Roller Bearings Catalogue
(comparison between JIS B 1514-1:2006 and JIS B 1514-1:2017)

Table 1-2 Comparison table between GPS symbols with descriptions and previous terms for thrust bearings.

Nominal dimension[1]	Symbol for characteristic[1]	GPS symbol and specification modifier[2]	Description[3]	Conventional term[4]
d			Nominal bore diameter of shaft washer, single-direction bearing	Nominal bore diameter of shaft washer, single-direction bearing
	Δdmp	(LP)(SD)ACS	Deviation of a mid-range size (out of two-point sizes) of shaft washer bore diameter in any cross-section from its nominal size	Deviation of mean bore diameter in a single plane of shaft washer, single-direction bearing
	Vdsp	(LP)(SR)ACS	Range of two-point sizes of shaft washer bore diameter in any cross-section	Variation of bore diameter in a single plane of shaft washer, single-direction bearing
d_2			Nominal bore diameter of central shaft washer, double-direction bearing	Nominal bore diameter of central washer, double-direction bearing
	Δd2mp	(LP)(SD)ACS	Deviation of a mid-range size (out of two-point sizes) of central shaft washer bore diameter in any cross-section from its nominal size	Deviation of mean bore diameter in a single plane of central shaft washer, double-direction bearing
	Vd2sp	(LP)(SR)ACS	Range of two-point sizes of central shaft washer bore diameter in any cross-section	Variation of bore diameter in a single plane of central shaft washer, double-direction bearing
D			Nominal outside diameter of housing washer	Nominal outside diameter of housing washer
	ΔDmp	(LP)(SD)ACS	Deviation of a mid-range size (out of two-point sizes) of housing washer outside diameter in any cross-section from its nominal size	Deviation of mean outside diameter in a single plane of housing washer
	VDsp	(LP)(SR)ACS	Range of two-point sizes of housing washer outside diameter in any cross-section	Variation of outside diameter in a single plane of housing washer
T			Nominal assembled bearing height, single-direction bearing	Nominal bearing height, single-direction bearing
	ΔTs	(GN)[5]	Deviation of minimum circumscribed size of assembled bearing height from its nominal size, single-direction bearing	Deviation of the actual bearing height, single-direction bearing
T_1			Nominal assembled bearing height, double-direction bearing	Nominal bearing height, double-direction bearing
	ΔT1s	(GN)[5]	Deviation of minimum circumscribed size of assembled bearing height from its nominal size, double-direction bearing	Deviation of the actual bearing height, double-direction bearing
	Se[6]	(LP)(SR)	**Thrust cylindrical roller bearings:** range of two-point sizes of thickness between housing washer raceway and the back face	Variation in thickness between housing washer raceway and back face
		(LS)(SN)ALS(SR)◁⌯	**Thrust ball bearings:** range of minimum spherical sizes between the raceway and the opposite back face of the housing washer, obtained from any longitudinal section which includes the housing washer outside surface axis	
	Si[6]	(LP)(SR)	**Thrust cylindrical roller bearings:** range of two-point sizes of thickness between shaft washer raceway and the back face	Variation in thickness between shaft washer raceway and back face
		(LS)(SN)ALS(SR)◁⌯	**Thrust ball bearings:** range of minimum spherical sizes between the raceway and the opposite back face of the shaft washer, obtained from any longitudinal section which includes the shaft washer bore axis	

Note 1) Symbols as defined in **JIS B 0124** except for the format used.
Tolerance values associated to characteristics are symbolized by "t" followed by the symbols for the characteristics, for example "t_{Vdsp}".
2) Symbols as defined in **JIS B 0420-1** and **ISO 1101**. See **JIS B 1514-2**:2017 **Annex D**.
3) Description based on **JIS B 0420-1**
4) Terms in **JIS B 1514-2**:2006.
5) Symbols for direction of gravity, fixed parts and movable parts, according to **ISO/TS 17863**.
6) Applies only to thrust bearings with 90° contact angle and thrust cylindrical roller bearings with 90° contact angle.

Koyo®

[Correction Booklet]

Ball & Roller Bearings
(CAT.NO.B2001E-7)

Double-row tapered roller bearings
Fatigue load limits

TDO type
(B268~B282)

TDI type
(B284~B288)

This booklet includes corrections for the fatigue load limits in the section on double-row tapered roller bearings (TDO and TDI types) in the Ball & Roller Bearings Catalog.

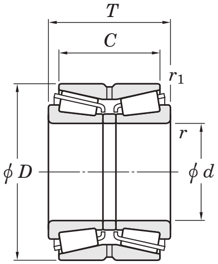
Due to space limitations, the "Limiting speeds" column in the original document has been replaced with the "Bearing No." column.

JTEKT CORPORATION

CAT. NO. B2001E-7_mod'20.04

Double-row tapered roller bearings TDO type

d 25 ~ (60) mm

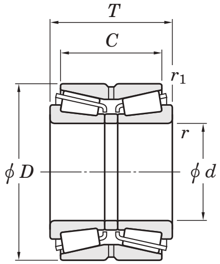


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	*D*	*T*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	C_u	
25	62	40	29.5	1.5	0.6	85.2	84.9	11.6	**46T30305DJR/29.5**
30	72	45	31.5	1.5	0.6	109	110	15.4	**46T30306DJR/31.5**
35	80	51	35.5	2	0.6	135	138	19.7	**46T30307DJR/35.5**
40	80	45	37.5	1.5	0.6	134	138	20.6	**46T30208JR/37.5**
	80	55	43.5	1.5	0.6	166	182	27.3	**46T32208JR/43.5**
	90	56	39.5	2	0.6	172	180	26.2	**46T30308DJR/39.5**
	90	56	45.5	2	0.6	194	202	31.0	**46T30308JR/45.5**
45	85	47	37.5	1.5	0.6	144	155	23.1	**46T30209JR/37.5**
	85	55	43.5	1.5	0.6	180	207	31.2	**46T32209JR-1/43.5**
	100	60	41.5	2	0.6	204	214	31.7	**46T30309DJR/41.5**
	100	60	49.5	2	0.6	242	256	39.8	**46T30309JR/49.5**
50	90	49	39.5	1.5	0.6	164	183	27.6	**46T30210JR/39.5**
	90	55	43.5	1.5	0.6	182	211	31.8	**46T32210JR/43.5**
	110	64	51.5	2	0.6	295	305	47.9	**46T30310JR/51.5**
	110	73	52.5	2	0.6	247	266	39.5	**46T30310DJR/52.5**
	110	90	71.5	2	0.6	378	440	68.4	**46T32310JR/71.5**
55	100	51	41.5	2	0.6	203	226	34.6	**46T30211JR/41.5**
	100	60	48.5	2	0.6	230	266	41.0	**46T32211JR-1/48.5**
	120	70	49	2	0.6	276	297	44.6	**46T30311DJR/49**
	120	70	57	2	0.6	320	341	53.9	**46T30311JR/57**
	120	97	76	2	0.6	429	500	78.2	**46T32311JR/76**
60	110	53	43.5	2	0.6	228	254	39.4	**46T30212JR/43.5**
	110	66	54.5	2	0.6	282	334	51.8	**46T32212JR/54.5**
	130	74	51	2.5	1	327	359	54.2	**46T30312DJR/51**
	130	74	59	2.5	1	372	401	63.8	**46T30312JR/59**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings TDO type

d (60) ~ (90) mm

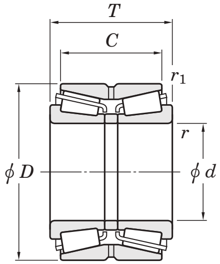


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	
60	130	104	81	2.5	1	524	629	88.3	**46T32312JR/81**
65	120	56	46.5	2	0.6	275	311	48.7	**46T30213JR/46.5**
	120	73	61.5	2	0.6	337	406	63.3	**46T32213JR/61.5**
	140	79	53	2.5	1	377	417	62.8	**46T30313DJR/53**
	140	79	63	2.5	1	437	478	75.3	**46T30313JR/63**
	140	108	84	2.5	1	593	714	99.2	**46T32313JR/84**
70	125	59	48.5	2	0.6	296	346	54.2	**46T30214JR/48.5**
	125	74	61.5	2	0.6	363	450	70.4	**46T32214JR/61.5**
	150	83	57	2.5	1	421	470	69.8	**46T30314DJR/57**
	150	83	67	2.5	1	493	546	84.4	**46T30314JR/67**
	150	116	92	2.5	1	679	829	114	**46T32314JR/92**
75	115	30	26	1.5	0.6	89.9	105	14.6	**46215**
	115	38	30	1.5	0.6	153	207	31.2	**46215A**
	130	62	51.5	2	0.6	305	362	56.4	**46T30215JR/51.5**
	130	74	61.5	2	0.6	373	469	72.7	**46T32215JR/61.5**
	160	87	69	2.5	1	557	621	89.8	**46T30315JR/69**
	160	125	99	2.5	1	779	963	129	**46T32315JR/99**
80	125	34	30	1.5	0.6	136	155	22.6	**46216**
	140	64	51.5	2	0.6	346	405	62.3	**46T30216JR/51.5**
	140	78	63.5	2	0.6	434	542	83.1	**46T32216JR/63.5**
	170	92	73	2.5	1	630	711	99.8	**46T30316JR/73**
85	150	70	57	2	0.6	391	463	70.3	**46T30217JR/57**
	150	86	69	2	0.6	498	630	95.1	**46T32217JR/69**
	180	98	77	3	1	679	768	106	**46T30317JR/77**
	180	137	108	3	1	941	1 170	155	**46T32317JR/108**
90	140	37	33	2	0.6	171	199	28.8	**46218**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings TDO type

d (90) ~ 110 mm

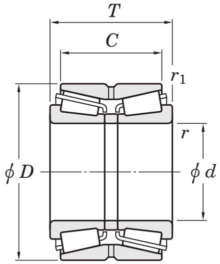


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	
90	140	46	37	2	0.6	196	266	39.3	**46218A**
	160	74	61	2	0.6	438	522	78.1	**46T30218JR/61**
	160	94	77	2	0.6	565	724	107	**46T32218JR/77**
	190	102	81	3	1	741	841	114	**46T30318JR/81**
	190	144	115	3	1	989	1 230	157	**46T32318JR/115**
95	170	78	63	2.5	1	496	598	88.1	**46T30219JR/63**
	170	100	83	2.5	1	667	877	128	**46T32219JR/83**
	200	108	85	3	1	798	909	122	**46T30319JR/85**
	200	151	118	3	1	1 110	1 390	178	**46T32319JR/118**
100	150	46	37	2	0.6	226	293	42.6	**46220A**
	165	52	46	2.5	0.6	249	305	44.1	**46320**
	165	65	52	2.5	0.6	333	443	64.7	**46320A**
	180	83	67	2.5	1	554	676	98.2	**46T30220JR/67**
	180	107	87	2.5	1	745	990	128	**46T32220JR/87**
	215	112	87	3	1	906	1 040	136	**46T30320JR/87**
	215	162	127	3	1	1 240	1 570	194	**46T32320JR/127**
105	190	88	70	2.5	1	618	761	105	**46T30221JR/70**
	190	115	95	2.5	1	840	1 130	146	**46T32221JR/95**
	225	116	91	3	1	995	1 160	147	**46T30321JR/91**
	225	170	133	3	1	1 360	1 730	214	**46T32321JR/133**
110	170	45	40	2.5	0.6	219	304	42.5	**46222**
	180	56	50	2.5	0.6	308	388	55.3	**46322**
	180	70	56	2.5	0.6	391	533	76.1	**46322A**
	200	92	74	2.5	1	695	868	116	**46T30222JR/74**
	200	121	101	2.5	1	938	1 280	161	**46T32222JR/101**
	240	118	93	3	1	1 030	1 180	150	**46T30322JR/93**
	240	181	142	3	1	1 480	1 890	230	**46T32322JR/142**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d 120 ~ (150) mm

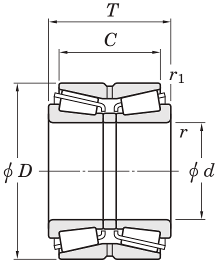


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	*D*	*T*	*C*	*r* min.	*r*1 min.	*C*r	*C*0r	*C*u	
120	180	46	41	2.5	0.6	232	317	43.6	**46224**
	180	58	46	2.5	0.6	309	460	64.4	**46224A**
	200	62	55	2.5	0.6	367	470	65.7	**46324**
	200	78	62	2.5	0.6	486	672	93.9	**46324A**
	200	100	84	2.5	0.6	670	1 010	125	**46324AS**
	215	97	78	2.5	1	745	945	123	**46T30224JR/78**
	215	132	109	2.5	1	1 010	1 380	168	**46T32224JR/109**
	260	128	101	3	1	1 220	1 430	180	**46T30324JR/101**
	260	188	145	4	1.5	1 720	2 210	261	**46T32324JR/145**
130	200	52	46	2.5	0.6	299	425	57.8	**46226**
	200	65	52	2.5	0.6	400	618	85.0	**46226A**
	210	64	57	2.5	0.6	404	535	73.6	**46326**
	210	80	64	2.5	0.6	513	723	99.3	**46326A**
	230	98	78.5	3	1	809	1 020	131	**46T30226JR/78.5**
	230	145	117.5	3	1	1 190	1 660	200	**46T32226JR/117.5**
	280	137	107.5	4	1.5	1 410	1 670	203	**46T30326JR/107.5**
140	210	53	47	2.5	0.6	299	404	54.5	**46228**
	210	66	53	2.5	0.6	452	639	86.9	**46228A**
	225	68	61	3	1	423	564	76.1	**46328**
	225	85	68	3	1	597	836	113	**46328A**
	250	102	82.5	3	1	902	1 140	144	**46T30228JR/82.5**
	250	153	125.5	3	1	1 360	1 920	224	**46T32228JR/125.5**
	300	145	115.5	4	1.5	1 610	1 920	228	**46T30328JR/115.5**
150	225	56	50	3	1	348	476	63.2	**46230**
	225	70	56	3	1	472	703	94.1	**46230A**
	250	80	71	3	1	587	786	98.4	**46330**
	250	100	80	3	1	748	1 070	132	**46330A**
	270	109	87	3	1	1 040	1 330	162	**46T30230JR/87**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings TDO type

d (150) ~ (200) mm

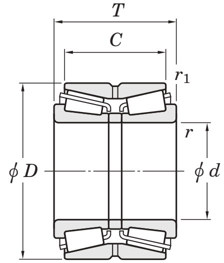


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	*D*	*T*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	C_u	
150	270	164	130	3	1	1 510	2 130	245	**46T32230JR/130**
	320	154	120	4	1.5	1 800	2 160	257	**46T30330JR/120**
160	240	60	53	3	1	405	565	74.0	**46232**
	240	75	60	3	1	508	756	99.6	**46232A**
	270	86	76	3	1	695	950	115	**46332**
	270	108	86	3	1	871	1 270	150	**46332A**
	290	115	91	3	1	1 160	1 500	179	**46T30232JR/91**
	290	178	144	3	1	1 700	2 420	273	**46T32232JR/144**
170	260	67	60	3	1	480	642	83.4	**46234**
	260	84	67	3	1	629	969	125	**46234A**
	280	88	78	3	1	754	1 050	125	**46334**
	280	110	88	3	1	938	1 390	163	**46334A**
	310	125	97	4	1.5	1 330	1 730	205	**46T30234JR/97**
	310	192	152	4	1.5	1 930	2 760	303	**46T32234JR/152**
180	280	74	66	3	1	582	801	98.9	**46236**
	280	93	74	3	1	732	1 080	131	**46236A**
	300	96	85	4	1.5	872	1 240	149	**46336**
	300	120	96	4	1.5	1 080	1 630	190	**46336A**
	320	127	99	4	1.5	1 320	1 740	204	**46T30236JR/99**
	320	192	152	4	1.5	2 060	3 030	328	**46T32236JR/152**
190	290	75	67	3	1	610	866	106	**46238**
	290	94	75	3	1	793	1 170	140	**46238A**
	320	104	92	4	1.5	1 020	1 450	168	**46338**
	320	130	104	4	1.5	1 230	1 860	212	**46338A**
	340	133	105	4	1.5	1 560	2 060	235	**46T30238JR/105**
	340	204	160	4	1.5	2 340	3 480	373	**46T32238JR/160**
200	310	82	73	3	1	716	1 040	123	**46240**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings TDO type

d (200) ~ (300) mm

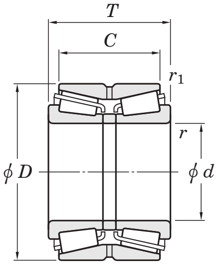


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	
200	310	103	82	3	1	893	1 380	160	**46240A**
	340	112	100	4	1.5	1 100	1 580	180	**46340**
	340	140	112	4	1.5	1 350	2 040	226	**46340A**
	360	142	110	4	1.5	1 700	2 240	252	**46T30240JR/110**
	360	218	174	4	1.5	2 660	3 760	399	**46T32240JR/174**
220	340	90	80	4	1.5	849	1 240	142	**46244**
	340	113	90	4	1.5	1 040	1 620	183	**46244A**
	370	120	107	5	1.5	1 260	1 810	202	**46344**
	370	150	120	5	1.5	1 600	2 470	272	**46344A**
	400	150	114	4	1.5	2 170	2 880	320	**46T30244JR/114**
240	360	92	82	4	1.5	962	1 430	159	**46248**
	360	115	92	4	1.5	1 240	1 980	216	**46248A**
	400	128	114	5	1.5	1 490	2 180	241	**46348**
	400	160	128	5	1.5	1 940	3 060	325	**46348A**
260	400	104	92	5	1.5	1 170	1 830	200	**46252**
	400	130	104	5	1.5	1 520	2 480	265	**46252A**
	440	144	128	5	1.5	1 900	2 880	302	**46352**
	440	180	144	5	1.5	2 430	3 960	408	**46352A**
280	420	106	94	5	1.5	1 260	1 970	213	**46256**
	420	133	106	5	1.5	1 570	2 610	277	**46256A**
	460	146	130	6	2	1 950	2 930	308	**46356**
	460	183	146	6	2	2 470	3 940	407	**46356A**
300	460	118	105	5	1.5	1 630	2 400	254	**46260**
	460	148	118	5	1.5	2 050	3 230	331	**46260A**
	500	160	142	6	2	2 320	3 540	366	**46360**
	500	200	160	6	2	2 860	4 630	463	**46360A**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d (300) ~420 mm

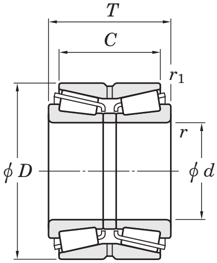


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	
300	500	200	160	6	1.5	3 140	4 650	474	**46360D**
320	480	121	108	5	1.5	1 800	2 700	283	**46264**
	480	151	121	5	1.5	2 060	3 410	342	**46264A**
	540	176	157	6	2	2 880	4 570	457	**46364**
	540	220	176	6	2	3 280	5 390	528	**46364A**
340	520	133	118	6	2	1 940	3 070	314	**46268**
	520	165	133	6	2	2 420	4 060	406	**46268A**
	580	190	169	6	2	2 980	4 620	454	**46368**
	580	238	190	6	2	3 820	6 340	606	**46368A**
360	540	134	120	6	2	2 070	3 290	332	**46272**
	540	169	134	6	2	2 530	4 230	419	**46272A**
	600	192	171	6	2	3 600	4 880	473	**46372**
	600	240	192	6	2	4 590	7 230	689	**46372A**
380	560	135	122	6	2	2 190	3 560	355	**46276**
	560	171	135	6	2	2 810	4 670	456	**46276A**
	620	194	173	6	2	3 380	5 220	500	**46376**
	620	243	194	6	2	4 390	7 360	683	**46376A**
400	600	148	132	6	2	2 350	3 720	366	**46280**
	600	185	148	6	2	3 030	5 150	491	**46280A**
	650	200	178	6	3	3 740	5 920	565	**46380**
	650	250	200	6	3	5 110	8 850	811	**46380A**
420	620	150	134	6	2	2 520	4 130	399	**46284**
	620	188	150	6	2	3 390	5 660	534	**46284A**
	700	224	200	6	3	4 650	6 880	647	**46384**
	700	280	224	6	3	6 040	9 620	861	**46384A**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDO type

d 440 ~ 500 mm

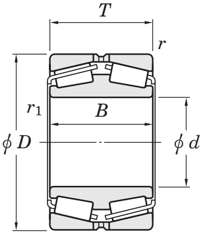


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	D	T	C	r min.	r_1 min.	C_r	C_{0r}	C_u	
440	650	157	140	6	3	2 840	4 430	423	**46288**
	650	196	157	6	3	3 770	6 370	600	**46288A**
	720	226	201	6	3	4 950	8 110	744	**46388**
	720	283	226	6	3	6 210	10 100	893	**46388A**
460	680	163	145	6	3	3 130	5 340	507	**46292**
	680	204	163	6	3	4 040	6 850	635	**46292A**
	760	240	214	7.5	4	5 460	9 000	817	**46392**
	760	300	240	7.5	4	7 130	11 600	1 010	**46392A**
480	700	165	147	6	3	3 180	5 300	494	**46296**
	700	206	165	6	3	4 040	7 230	666	**46296A**
	790	248	221	7.5	4	5 820	8 920	810	**46396**
	790	310	248	7.5	4	7 530	12 400	1 060	**46396A**
500	720	167	149	6	3	3 230	5 690	529	**462/500**
	720	209	167	6	3	4 390	7 850	712	**462/500A**
	830	264	235	7.5	4	6 570	10 900	955	**463/500**
	830	330	264	7.5	4	8 510	14 000	1 170	**463/500A**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDI type

d 100 ~ (220) mm

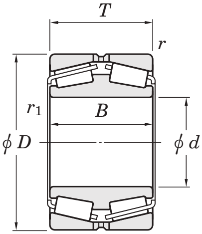


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	D	B	T	r min.	r_1 min.	C_r	C_{0r}	C_u	
100	165	52	52	2	2.5	298	384	55.9	**45320**
110	180	56	56	2	2.5	378	505	72.2	**45322**
120	180	46	46	2	2.5	286	424	59.4	**45224**
	200	62	62	2	2.5	444	598	83.4	**45324**
130	200	52	52	2	2.5	376	548	75.6	**45226**
	210	64	64	2	2.5	476	657	90.3	**45326**
140	210	53	53	2	2.5	390	564	76.9	**45228**
	225	68	68	2.5	3	611	807	103	**45328**
150	225	56	56	2.5	3	445	686	91.6	**45230**
	250	80	80	2.5	3	684	955	120	**45330**
160	240	60	60	2.5	3	488	705	93.1	**45232**
	270	86	86	2.5	3	832	1 100	146	**45332**
170	260	67	67	2.5	3	654	956	124	**45234**
	280	88	88	2.5	3	834	1 210	145	**45334**
180	280	74	74	2.5	3	722	1 050	125	**45236**
	300	96	96	3	4	992	1 370	162	**45336**
190	290	75	75	2.5	3	751	1 130	133	**45238**
	320	104	104	3	4	1 130	1 590	183	**45338**
200	310	82	82	2.5	3	913	1 410	166	**45240**
	340	112	112	3	4	1 250	1 840	208	**45340**
220	340	90	90	3	4	933	1 460	167	**45244**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings TDI type

d (220) ~ (420) mm

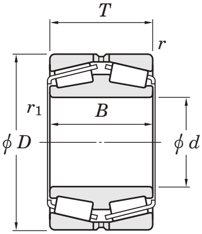


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	D	B	T	r min.	r_1 min.	C_r	C_{0r}	C_u	
220	370	120	120	4	5	1 400	2 060	226	**45344**
230	350	90	90	3	4	991	1 560	177	**45246**
240	360	92	92	3	4	1 150	1 790	200	**45248**
	400	128	128	4	5	1 650	2 470	265	**45348**
260	400	104	104	4	5	1 320	2 120	227	**45252**
	440	144	144	4	5	2 180	3 440	357	**45352**
280	420	106	106	4	5	1 490	2 470	265	**45256**
	460	146	146	5	6	2 310	3 320	351	**45356**
300	460	118	118	4	5	1 870	3 150	325	**45260**
	500	160	160	5	6	2 670	4 240	431	**45360**
320	480	121	121	4	5	1 830	3 180	322	**45264**
	540	176	176	5	6	3 380	5 280	528	**45364R**
340	520	133	133	5	6	2 380	3 850	372	**45268**
	580	190	190	5	6	3 790	5 470	537	**45368**
360	540	134	134	5	6	2 370	3 910	393	**45272**
	600	192	192	5	6	4 230	6 750	648	**45372**
380	560	135	135	5	6	2 300	3 790	371	**45276**
	620	194	194	5	6	3 860	6 360	606	**45376**
400	600	148	148	5	6	3 020	4 960	478	**45280**
	650	200	200	6	6	4 840	7 810	735	**45380**
420	620	150	150	5	6	3 010	5 200	496	**45284**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Double-row tapered roller bearings
TDI type

d (420) ~ 500 mm

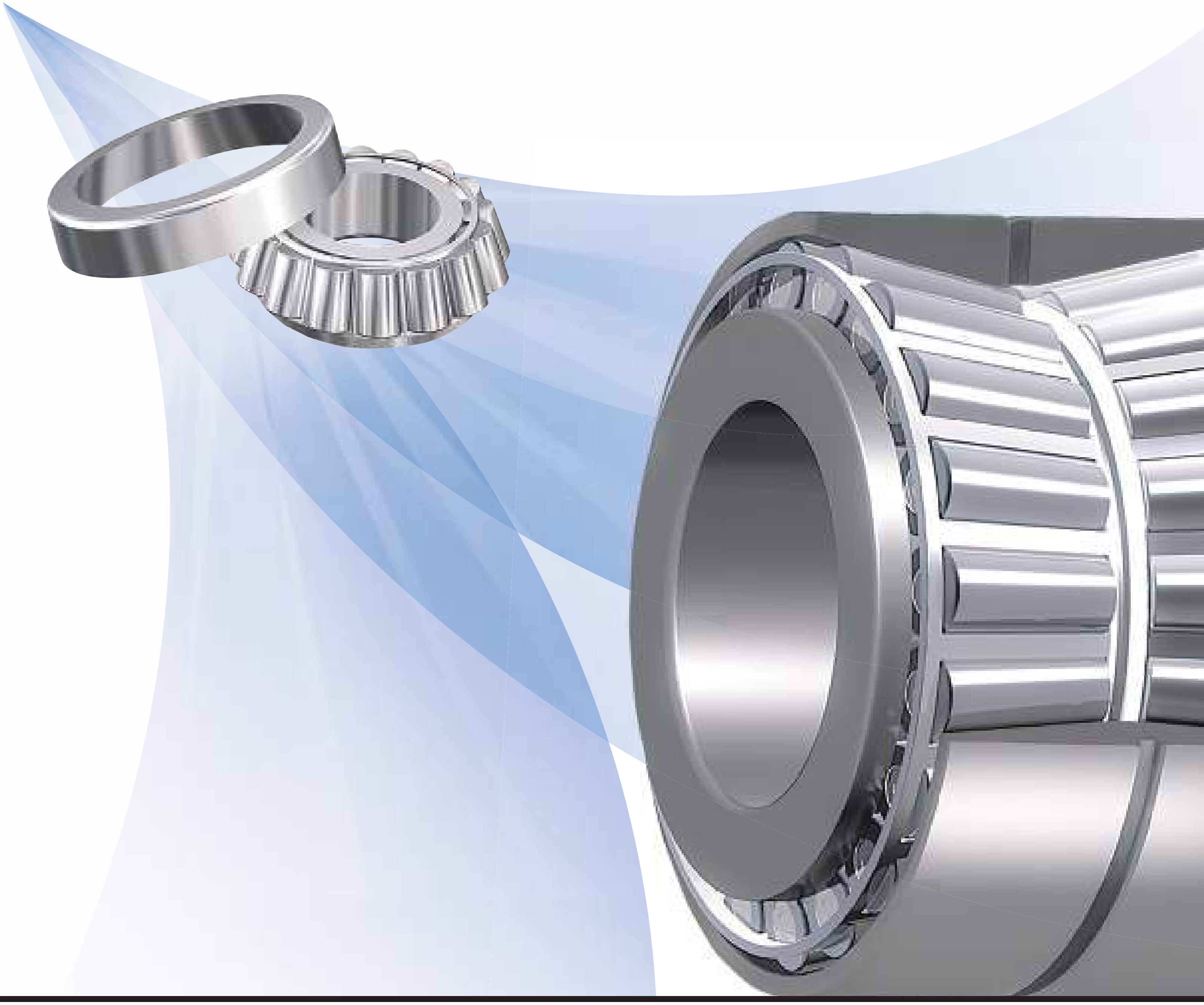


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.
d	D	B	T	r min.	r_1 min.	C_r	C_{0r}	C_u	
420	700	224	224	6	6	5 430	8 380	777	**45384**
440	650	157	157	6	6	3 190	5 500	512	**45288**
	720	226	226	6	6	5 750	9 130	834	**45388**
460	680	163	163	6	6	3 480	5 660	531	**45292**
	760	240	240	7.5	7.5	6 570	10 400	927	**45392**
480	700	165	165	6	6	3 830	6 710	614	**45296**
500	720	167	167	6	6	4 300	7 350	681	**452/500**
	830	264	264	7.5	7.5	7 970	12 300	1 110	**453/500**

[Remark] Bearings not shown above (e.g. inch series) are shown in catalog "large size ball & roller bearings".

Inch Series

TAPERED ROLLER BEARINGS



CAT. NO. BS001EN-ODS

Koyo®

Inch Series

TAPERED ROLLER BEARINGS

Publication of
New Koyo Inch series
Tapered Roller Bearing Catalog

Allow us to express our heartfelt appreciation for your valuable patronage.

At this time we are pleased to provide you with our new Koyo Inch Series Tapered Roller Bearing Catalog.

JTEKT Corporation has long enjoyed a strong reputation as a maker of inch-series tapered roller bearings from the time of its predecessor Koyo Seiko, and in recent years we have continued intense R&D activities to make improvements in such areas as the size, weight, and environmental friendliness of these bearings. The fruits of these efforts are reflected in the bearings described in this new catalog.

You will notice that this new catalogue has undergone a thorough revision from the previous version and contains model information based on the latest results.

We believe this catalogue will prove valuable to you in your selection and use of Koyo bearings, and we look forward to your continued patronage.

★The contents of this catalog are subject to change without prior notice. Every possible effort has been made to ensure that the data herein is correct; however, JTEKT cannot assume responsibility for any errors or omissions.

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Contents

Technical section

Specification tables

Single-row

Double-row

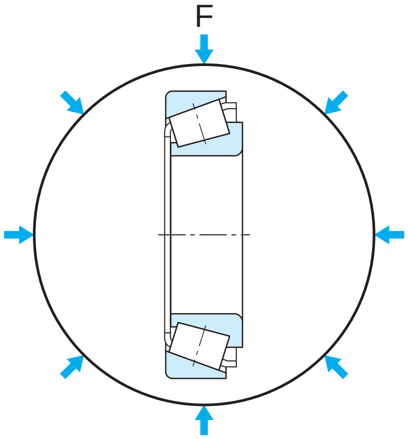
Supplementary tables

1 Outstanding features of tapered roller bearings

1) Higher load ratings

Tapered roller bearings with higher load ratings can accept radial loads or axial loads in one direction and combined radial and axial loads.

This type of bearing is suitable for use under heavy load or impact load.



2) The cup can be mounted separately from the cone assembly

Since the cup is separable from the cone assembly, the cone assembly can be installed on the shaft and the cup in the housing, individually.

This feature facilitates mounting of the bearing while making the design of the shaft and housing simpler. In addition, more options regarding the fitting practice employed are available than with any other type of bearing.

3) Mounted clearance is adjustable

In general, bearings of unitized design are supplied with a predetermined radial clearance which will vary according to fitting practice and application. Tapered roller bearings on the other hand can be adjusted at the time of installation by varying the axial location of either the cone assembly or cup.

2 Structure of tapered roller bearings

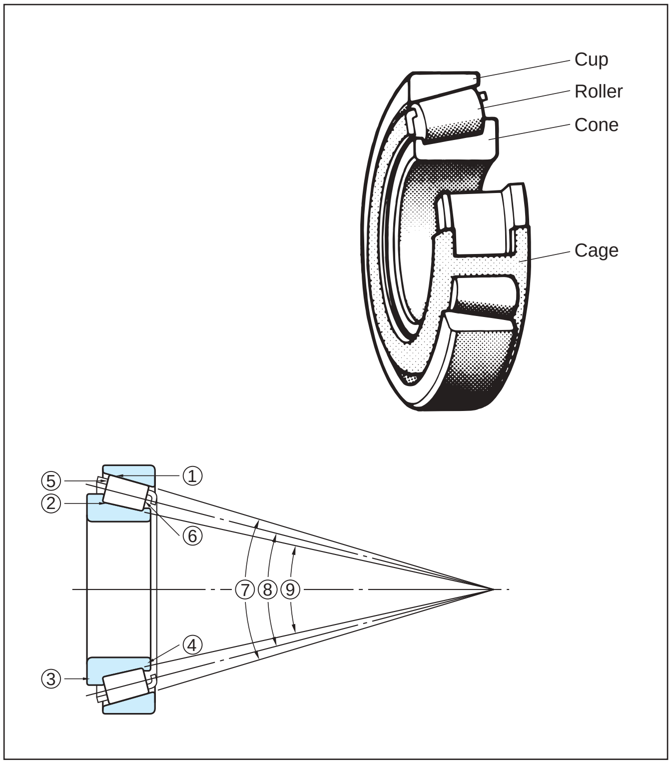
2.1 Single-row

Tapered roller bearings consist of cup, cone, rollers and a cage. This bearing contains tapered rollers for its rolling element which are guided by the cone backface rib on the roller large end face.

The raceway surfaces of cone and cup and the rolling contact surface of rollers are designed so that the respective apexes converge at a point on the bearing center line.

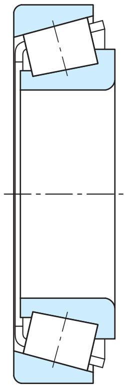
Bearings are classified into standard, intermediate and steep types, in accordance with their contact angle (α).

The larger the contact angle is, the greater the bearing resistance to axial load.

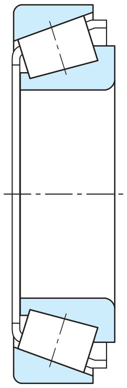


① Cup raceway
② Cone raceway
③ Cone backface rib
④ Cone front face rib
⑤ Roller large end face
⑥ Roller small end face
⑦ Included cup angle
⑧ Included roller center angle
⑨ Included cone angle

TS type (pages 38, 108)

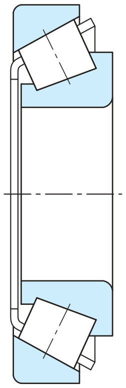


Standard contact angle



Medium contact angle

TSS type (page 102)

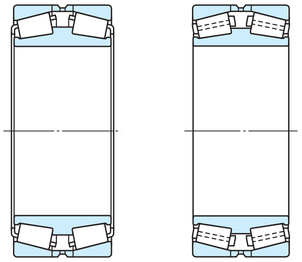


Steep contact angle

2.2 Double-row

■ Double-row (Face to face)

TDI type (page 110)



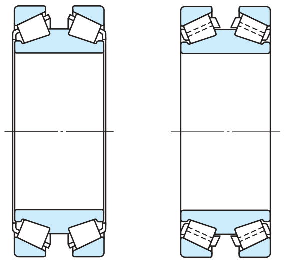
Design 1 Design 1-P

The TDI type bearing is made up of two single-row cups and one double cone, and is generally provided with a cup spacer.
The bearing with cup spacer is handy for mounting, as its end play has been pre-adjusted for each application.

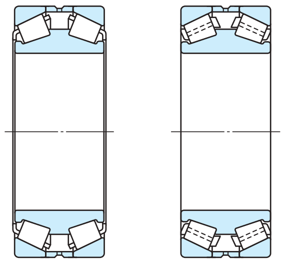
The spacer is provided with an lubrication groove and several lubrication holes.

Used for roll neck of medium-duty rolling mills, speed reducers, etc.

TDIS type ······ For axial suport (page 120)



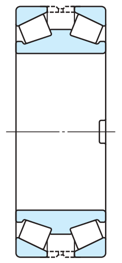
Design 1 Design 1-P



Design 2 Design 2-P

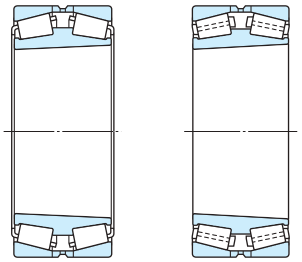
The TDIS type bearing is of the same construction as the TDI type, except that it has larger contact angle so that it can accommodate heavier axial load.

Used for applications where the axial load is greater than the radial load or where only the axial load is applied.
The bearing with the key way on the cone is mainly used for rollling mill roll necks. The bearing may be also used with pre-load without using the cup spacer.



Example of key way

TDIT type ······ Tapered bore (page 122)



Design 1 Design 1-P

Where the interference fit is necessary, and needs to be removed frequently, the use of TDIT type is convenient.
It is also possible to mount the bearing on the shaft by using an adaptor sleeve.

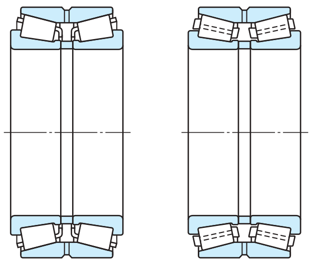
Used for roll neck of light or medium-duty rolling mills and roll neck of calendar mills.

The use of a hydraulic unit will facilitate bearing mounting/dismounting.

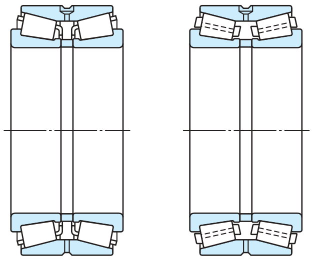
The roll neck taper needs to be matched to the bore diameter of bearing by using taper gauge, sign bar gauge, etc.

■ Double-row (Back to back)

TDO, TDOS type (page 126)



Design 1　　Design 1-P



Design 2　　Design 2-P

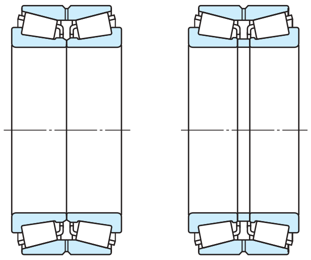
The TDO type bearing is made up of one double cup, two single-row cones and one cone spacer. The cup is provided with several lubrication holes.

The cone spacer has been adjusted to provide an end play suitable to each application.
It is also possible to freely adjust the end play for use by removing the cone spacer, however, it requires time and labor.

Suitable to case where moment may act.
Used for speed reducer, winding machine, etc.

The steep angle type (TDOS type) having large contact angle has increased axial load capacity, and is widely used for worm shaft of medium, heavy duty applications, thrust bearing of reducers etc.

TNA type (page 146)



Design 1　　Design 2
(with cone spacer)

The TNA type bearing has different assembled width tolerance from the TDO type, specially selected for the TNA type.

[Reference] Features of bearing with pin type cage

(1) Load rating can be increased.
The pin type cage accommodates a larger number of rollers, thus making it possible to increase the load rating of bearing.

(2) Reduced friction resistance
Friction coefficient of pin type cage is reduced, as contact area of roller and cage is limited.

(3) Easy mounting/dismounting
The pin type cage is provided with a tap hole for lifting.
The use of tap hole will facilitate the work.
Use ISO metric thread for lifting tap screw.

3 Bearing service life

3.1 Bearing service life

When bearings rotate under load, material flakes from the surfaces of cone and cup or rolling elements by fatigue arising from repeated contact stress.

This phenomenon is called flaking.

The total number of bearing rotations until flaking occurs is regarded as the bearing "(fatigue) service life".

"(Fatigue) service life" differs greatly depending upon bearing structures, dimensions, materials, and processing methods.

Since this phenomenon results from fatigue distribution in bearing materials themselves, differences in bearing service life should be statistically considered.

When a group of identical bearings are rotated under the same conditions, the total number of revolutions until 90 % of the bearings are left without flaking (i.e. a service life of 90 % reliability) is defined as the basic rating life. In operation at a constant speed, the basic rating life can be expressed in terms of time.

3.2 Basic dynamic load ratings

Basic dynamic load ratings, C

The basic dynamic load rating is either pure radial (for radial bearings) or central axial load (for thrust bearings) of constant magnitude in a constant direction, under which the basic rating life of 1 million revolutions can be obtained, when the cone rotates while the cup is stationary, or vice versa. The basic dynamic load rating, which represents the capacity of a bearing under rolling fatigue, is specified as the basic dynamic radial load rating (C_r) for radial bearings, and basic dynamic axial load rating (C_a) for thrust bearings. These load ratings are listed in the specification table.

These values are prescribed by ISO 281/1990, and are subject to change by conformance to the latest ISO standards.

3.3 Calculation of service life

Generally, the relationship between the dynamic load rating, applied load and basic rating life of the bearing is expressed as follows :

$$L_{10} = \left(\frac{C}{P}\right)^{10/3} \quad \cdots\cdots\cdots (3.1)$$

where :

L_{10} : basic rating life $\times 10^6$ revolutions

C : basic dynamic load rating N

P : dynamic equivalent radial (or axial) load N

In case the bearing operates at a constant speed, it is often convenient to express the life in terms of hours which can be obtained by the following equation :

$$L_{10h} = \left(\frac{C}{P}\right)^{10/3} \frac{16\,667}{n} \quad \cdots\cdots\cdots (3.2)$$

where :

L_{10h} : life in terms of hours h

$$\left\{ \begin{aligned} L_{10h} &= L_{10} \times \frac{10^6}{60n} \\ &= \left(\frac{C}{P}\right)^{10/3} \frac{10^6}{60n} \\ &= \left(\frac{C}{P}\right)^{10/3} \frac{16\,667}{n} \end{aligned} \right\}$$

n : rotational speed min^{-1}

Life calculation can be further simplified by the use of service life coefficient (f_h) and coefficient of rotational speed (f_n) as tabulated in **Tables 3.3** and **3.4**.

$$L_{10h} = 500 \cdot f_h^{10/3} \quad \cdots\cdots\cdots (3.3)$$

$$f_h = f_n \cdot \frac{C}{P} \quad \cdots\cdots\cdots (3.4)$$

$$f_n = \left(\frac{33.3}{n}\right)^{3/10} \quad \cdots\cdots\cdots (3.5)$$

3.4 Correction of basic dynamic load rating for high temperature use and dimension stabilizing treatment

In high temperature operation, bearing material hardness deteriorates, as material compositions are altered. As a result, the basic dynamic load rating is diminished. Once altered, material composition is not recovered, even if operating temperatures return to normal.

Therefore, for bearings used in high temperature operation, the basic dynamic load rating should be corrected by multiplying the basic dynamic load rating values specified in the bearing specification table by the temperature coefficient values in **Table 3.1**.

Table 3.1 Temperature coefficient values

Bearing temperature, ℃	**125**	**150**	**175**	**200**	**250**
Temperature coefficient	1	1	0.95	0.90	0.75

3.5 Modified rating life L_{nm}

The life of rolling bearings was standardized as a basic rating life in the 1960s, but in actual applications, sometimes the actual life and the basic rating life have been quite different due to the lubrication status and the influence of the usage environment. To make the calculated life closer to the actual life, a corrected rating life has been considered since the 1980s. In this corrected rating life, bearing characteristic factor a_2 (a correction factor for the case in which the characteristics related to the life are changed due to the bearing materials, manufacturing process, and design) and usage condition factor a_3 (a correction factor that takes into account usage conditions that have a direct influence on the bearing life, such as the lubrication) or factor a_{23} formed from the interdependence of these two factors, are considered with the basic rating life. These factors were handled differently by each bearing manufacturer, but they have been standardized as a modified rating life in **ISO 281** in 2007. In 2013, **JIS B 1518** (dynamic load ratings and rating life) was amended to conform to the **ISO**.

The basic rating life (L_{10}) shown in **Equation (3.1)** is the (fatigue) life with a dependability of 90 % under normal usage conditions for rolling bearings that have standard factors such as internal design, materials, and manufacturing quality. **JIS B 1518**:2013 specifies a calculation method based on **ISO 281**:2007. To calculate accurate bearing life under a variety of operating conditions, it is necessary to consider elements such as the effect of changes in factors that can be anticipated when using different reliabilities and system approaches, and interactions between factors. Therefore, the specified calculation method considers additional stress due to the lubrication status, lubricant contamination, and fatigue load limit C_u (refer to p. 10) on the inside of the bearing. The life that uses this life modification factor a_{ISO}, which considers the above factors, is called modified rating life L_{nm} and is calculated with the following **Equation (3.6)**.

$$L_{nm} = a_1 \, a_{\mathrm{ISO}} \, L_{10} \quad \cdots\cdots (3.6)$$

In this equation,

L_{nm} : modified rating life 10^6 rotations

(This rating life has been modified for one of or a combination of the following: reliability of 90 % or higher, fatigue load limit, special bearing characteristics, lubrication contamination, and special operating conditions.)

L_{10} : basic rating life 10^6 rotations

(reliability: 90 %)

a_1 : life modification factor for reliability ··············· refer to section (1)

a_{ISO} : life modification factor ··············· refer to section (2)

[Remark]

When bearing dimensions are to be selected given L_{nm} greater than 90 % in reliability, the strength of shaft and housing must be considered.

(1) Life modification factor for reliability a_1

The term “reliability” is defined as “for a group of apparently identical rolling bearings, operating under the same conditions, the percentage of the group that is expected to attain or exceed a specified life” in **ISO 281**:2007. Values of a_1 used to calculate a modified rating life with a reliability of 90 % or higher (a failure probability of 10 % or less) are shown in **Table 3.2**.

Table 3.2 Life modification factor for reliability a_1

Reliability, %	L_{nm}	a_1
90	L_{10m}	1
95	L_{5m}	0.64
96	L_{4m}	0.55
97	L_{3m}	0.47
98	L_{2m}	0.37
99	L_{1m}	0.25
99.2	$L_{0.8m}$	0.22
99.4	$L_{0.6m}$	0.19
99.6	$L_{0.4m}$	0.16
99.8	$L_{0.2m}$	0.12
99.9	$L_{0.1m}$	0.093
99.92	$L_{0.08m}$	0.087
99.94	$L_{0.06m}$	0.080
99.95	$L_{0.05m}$	0.077

(Citation from **JIS B 1518**:2013)

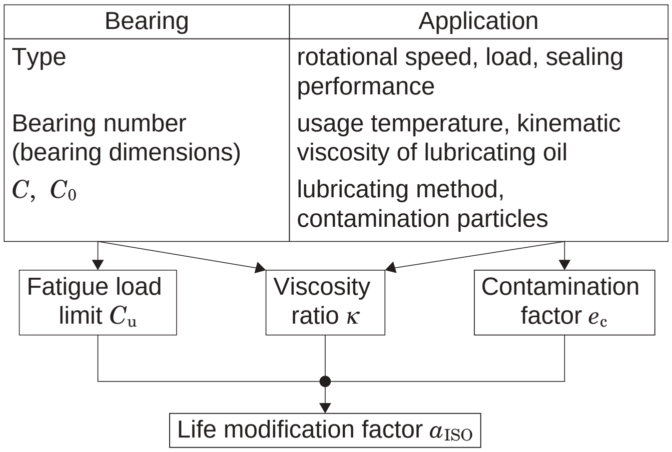
(2) Life modification factor a_{ISO}

a) System approach

The various influences on bearing life are dependent on each other. The system approach of calculating the modified life has been evaluated as a practical method for determining life modification factor a_{ISO} (ref. **Fig. 3.1**). Life modification factor a_{ISO} is calculated with the following equation. A diagram is available for each bearing type (radial ball bearings, radial roller bearings, thrust ball bearings, and thrust roller bearings). (Each diagram (**Fig. 3.2**) is a citation from **JIS B 1518**:2013.)

Note that in practical use, this is set so that life modification factor $a_{\mathrm{ISO}} \leqq 50$.

$$a_{\mathrm{ISO}} = f\left(\frac{e_c C_u}{P}, \kappa\right) \quad \cdots\cdots (3.7)$$



Bearing	Application
Type	rotational speed, load, sealing performance
Bearing number (bearing dimensions)	usage temperature, kinematic viscosity of lubricating oil
C, C_0	lubricating method, contamination particles

Fig. 3.1 System approach

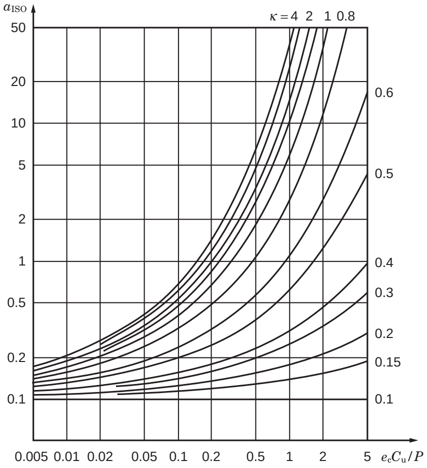


Fig. 3.2 Life modification factor a_{ISO} (Radial roller bearings)

(**Fig. 3.2** Citation from **JIS B 1518**:2013)

b) Fatigue load limit C_u

For regulated steel materials or alloy steel that has equivalent quality, the fatigue life is unlimited so long as the load condition does not exceed a certain value and so long as the lubrication conditions, lubrication cleanliness class, and other operating conditions are favorable. For general high-quality materials and bearings with high manufacturing quality, the fatigue stress limit is reached at a contact stress of approximately 1.5 GPa between the raceway and rolling elements. If one or both of the material quality and manufacturing quality are low, the fatigue stress limit will also be low.

The term “fatigue load limit” C_u is defined as “bearing load under which the fatigue stress limit is just reached in the most heavily loaded raceway contact” in **ISO 281**:2007. and is affected by factors such as the bearing type, size, and material.

For details on the fatigue load limits of special bearings and other bearings not listed in this catalog, contact JTEKT.

c) Contamination factor e_c

If solid particles in the contaminated lubricant are caught between the raceway and the rolling elements, indentations may form on one or both of the raceway and the rolling elements. These indentations will lead to localized increases in stress, which will decrease the life. This decrease in life attributable to the contamination of the lubricant can be calculated from the contamination level as contamination factor e_c.

D_{pw} shown in this table is the pitch diameter of ball/roller set, which is expressed simply as $D_{pw} = (D + d)/2$. (D: Outside diameter, d: Bore diameter)

For information such as details on special lubricating conditions or detailed investigations, contact JTEKT.

Table 3.3 Values of contamination factor e_c

Contamination level	e_c	
	$D_{pw} < 100$ mm	$D_{pw} \leqq 100$ mm
Extremely high cleanliness: The size of the particles is approximately equal to the thickness of the lubricant oil film, this is found in laboratory-level environments.	1	1
High cleanliness: The oil has been filtered by an extremely fine filter, this is found with standard grease-packed bearings and sealed bearings.	0.8 to 0.6	0.9 to 0.8
Standard cleanliness: The oil has been filtered by a fine filter, this is found with standard grease-packed bearings and shielded bearings.	0.6 to 0.5	0.8 to 0.6
Minimal contamination: The lubricant is slightly contaminated.	0.5 to 0.3	0.6 to 0.4
Normal contamination: This is found when no seal is used and a coarse filter is used in an environment in which wear debris and particles from the surrounding area penetrate into the lubricant.	0.3 to 0.1	0.4 to 0.2
High contamination: This is found when the surrounding environment is considerably contaminated and the bearing sealing is insufficient.	0.1 to 0	0.1 to 0
Extremely high contamination	0	0

(**Table 3.3** Citation from **JIS B 1518**:2013)

d) Viscosity ratio κ

The lubricant forms an oil film on the roller contact surface, which separates the raceway and the rolling elements. The status of the lubricant oil film is expressed by viscosity ratio κ, the actual kinematic viscosity at the operating temperature ν divided by the reference kinematic viscosity ν_1 as shown in the following equation.

A κ greater than 4, equal to 4, or less than 0.1 is not applicable.

For details on lubricants such as grease and lubricants with extreme pressure additives, contact JTEKT.

$$\kappa = \frac{\nu}{\nu_1} \quad \text{(3.8)}$$

ν : Actual kinematic viscosity at the operating temperature; the viscosity of the lubricant at the operating temperature

ν_1 : Reference kinematic viscosity; determined according to the speed and pitch diameter of ball/roller set D_{pw} of the bearing (ref. Fig. 3.3)

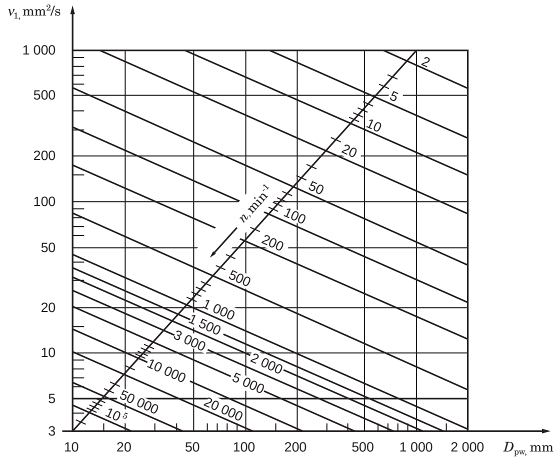


Fig. 3.3 Reference kinematic viscosity ν_1

(**Fig. 3.3** Citation from **JIS B 1518**:2013)

Table 3.4 Speed factor

Rotational speed n (min^{-1})	Coefficient of rotational speed f_n	Rotational speed n (min^{-1})	Coefficient of rotational speed f_n	Rotational speed n (min^{-1})	Coefficient of rotational speed f_n	Rotational speed n (min^{-1})	Coefficient of rotational speed f_n
10	1.435	**65**	0.819	**650**	0.410	**4 000**	0.238
11	1.395	**70**	0.800	**700**	0.401	**4 200**	0.234
12	1.359	**75**	0.784	**750**	0.393	**4 400**	0.231
13	1.326	**80**	0.769	**800**	0.385	**4 600**	0.228
14	1.297	**85**	0.756	**850**	0.379	**4 800**	0.225
15	1.271	**90**	0.742	**900**	0.372	**5 000**	0.222
16	1.246	**95**	0.731	**950**	0.366	**5 200**	0.220
17	1.224	**100**	0.719	**1 000**	0.361	**5 400**	0.217
18	1.203	**110**	0.699	**1 050**	0.355	**5 600**	0.215
19	1.184	**120**	0.681	**1 100**	0.350	**5 800**	0.213
20	1.166	**130**	0.665	**1 150**	0.346	**6 000**	0.211
21	1.149	**140**	0.650	**1 200**	0.341	**6 200**	0.209
22	1.133	**150**	0.637	**1 250**	0.337	**6 400**	0.207
23	1.118	**160**	0.625	**1 300**	0.333	**6 600**	0.205
24	1.104	**170**	0.613	**1 400**	0.326	**6 800**	0.203
25	1.090	**180**	0.603	**1 500**	0.319	**7 000**	0.201
26	1.077	**190**	0.593	**1 600**	0.313	**7 200**	0.199
27	1.065	**200**	0.584	**1 700**	0.307	**7 400**	0.198
28	1.054	**220**	0.568	**1 800**	0.302	**7 600**	0.196
29	1.043	**240**	0.553	**1 900**	0.297	**8 000**	0.193
30	1.032	**260**	0.540	**2 000**	0.293	**8 500**	0.190
31	1.022	**280**	0.528	**2 100**	0.289	**9 000**	0.187
32	1.012	**300**	0.517	**2 200**	0.285	**9 500**	0.184
33.3	1.000	**320**	0.507	**2 300**	0.281	**10 000**	0.181
34	0.994	**340**	0.498	**2 400**	0.277	**11 000**	0.176
36	0.977	**360**	0.490	**2 500**	0.274	**12 000**	0.171
38	0.962	**380**	0.482	**2 600**	0.271	**13 000**	0.167
40	0.947	**400**	0.475	**2 700**	0.268	**14 000**	0.163
42	0.933	**420**	0.467	**2 800**	0.265	**15 000**	0.160
44	0.920	**440**	0.461	**2 900**	0.262	**16 000**	0.157
46	0.908	**460**	0.455	**3 000**	0.259	**17 000**	0.154
48	0.896	**480**	0.449	**3 200**	0.254	**18 000**	0.152
50	0.886	**500**	0.444	**3 400**	0.250	**19 000**	0.149
55	0.866	**550**	0.432	**3 600**	0.246	**20 000**	0.147
60	0.838	**600**	0.420	**3 800**	0.242		

3.6 Basic static load rating

Excessive static load or impact load even at very low rotation causes partial permanent deformation of the rolling element and raceway contacting surfaces. This permanent deformation increases with the load; if it exceeds a certain limit, smooth rotation will be hindered.

The basic static load rating is the static load which responds to the calculated contact stress shown below, at the contact center between the raceway and rolling elements which receive the maximum load.

- Roller bearings ··············· 4 000 MPa

The total extent of contact stress-caused permanent deformation on surfaces of rolling elements and raceway will be approximately 0.000 1 times greater than the rolling element diameter.

The basic static load rating for radial bearings is specified as the basic static radial load rating. This load ratings are listed in the bearing specification table, using C_{0r}.

This value is prescribed by ISO 78/1987 and is subject to change by conformance to the latest ISO standards.

3.7 Safety coefficient

The allowable static equivalent load for a bearing is determined by the basic static load rating of the bearing; however, bearing service life, which is affected by permanent deforma-

Table 3.5 Life factor

Service life coefficient f_h	L_{10} (10^6 rev.)	L_{10h} (h)
0.70	0.30	150
0.75	0.38	190
0.80	0.48	240
0.85	0.58	290
0.90	0.70	350
0.95	0.84	420
1.00	1.00	500
1.05	1.18	590
1.10	1.37	685
1.15	1.59	795
1.20	1.84	920
1.25	2.10	1 050
1.30	2.40	1 200
1.35	2.72	1 360
1.40	3.07	1 530
1.45	3.45	1 730
1.50	3.86	1 930
1.55	4.31	2 160
1.60	4.79	2 400
1.65	5.31	2 650
1.70	5.86	2 930
1.75	6.46	3 230
1.80	7.09	3 550
1.85	7.77	3 890
1.90	8.50	4 250
1.95	9.26	4 630
2.00	10.1	5 040
2.05	10.9	5 470
2.10	11.9	5 930
2.15	12.8	6 420
2.20	13.8	6 920
2.25	14.9	7 460
2.30	16.1	8 030
2.35	17.2	8 620
2.40	18.5	9 250
2.45	19.8	9 920
2.50	21.2	10 600
2.55	22.6	11 300
2.60	24.2	12 100
2.65	25.8	12 900
2.70	27.4	13 700
2.75	29.1	14 600
2.80	30.9	15 500
2.85	32.8	16 400
2.90	34.8	17 400
2.95	36.8	18 400
3.00	38.9	19 500
3.05	41.1	20 600
3.10	43.4	21 700
3.15	45.8	22 900
3.20	48.3	24 100
3.25	50.8	25 400
3.30	53.5	26 800
3.35	56.3	28 100
3.40	59.1	29 600
3.45	62.0	31 000
3.50	65.1	32 500
3.55	68.2	34 100
3.60	71.5	35 800
3.65	74.9	37 400
3.70	78.3	39 200
3.75	81.9	41 000
3.80	85.6	42 800
3.85	89.4	44 700
3.90	93.4	46 700
3.95	97.4	48 700
4.00	102	50 800
4.05	106	52 900
4.10	110	55 200
4.15	115	57 400
4.20	120	59 800
4.25	124	62 200
4.30	129	64 600
4.35	134	67 200
4.40	140	69 800
4.45	145	72 500
4.50	150	75 200
4.55	156	78 000
4.60	162	80 900
4.65	168	83 900
4.70	174	87 000
4.75	180	90 800
4.80	187	93 300
4.85	193	96 600
4.90	200	99 900
4.95	207	103 000
5.00	214	107 000
5.10	228	114 000
5.20	244	122 000
5.30	260	130 000
5.40	276	138 000
5.50	294	147 000
5.60	312	156 000
5.70	331	165 000
5.80	351	175 000
5.90	371	186 000
6.00	392	196 000
6.50	513	256 000
7.00	656	328 000
7.50	826	413 000
8.00	1 020	512 000
8.50	1 250	627 000
9.00	1 520	758 000
9.50	1 820	908 000
10.00	2 150	1 080 000

tion, differs in accordance with the performance required of the bearing and operating conditions.

Therefore, a safety coefficient is designated, based on empirical data, so as to ensure safety in relation to basic static load rating.

$$f_s = \frac{C_0}{P_0} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \text{(3.9)}$$

where :

f_s : safety coefficient (ref. **Table 3.6**)

C_0 : basic static load rating N

P_0 : static equivalent load N

Table 3.6 Values of safety coefficient f_s

Operating condition		f_s (min.)	
		Ball bearing	**Roller bearing**
With bearing rotation	When high accuracy is required	2	3
	Normal operation	1	1.5
	When impact load is applied	1.5	3
Without bearing rotation (occasional oscillation)	Normal operation	0.5	1
	When impact load or uneven distribution load is applied	1	2

[Remark] For spherical thrust roller bearings, $f_s \geqq 4$.

4 Equivalent load

4.1 Dynamic equivalent load

Bearings are used under various operating conditions; however, in most cases, bearings receive radial and axial load combined, while the load magnitude fluctuates during operation.

Therefore, it is impossible to directly compare the actual load and basic dynamic load rating.

The two are compared by replacing the loads applied to the shaft center with one of a constant magnitude and in a specific direction, that yields the same bearing service life as under actual load and rotational speed.

This theoretical load is referred to as the dynamic equivalent load (P).

4.1.1 Calculation of dynamic equivalent load

Dynamic equivalent loads for radial bearings and thrust bearings ($\alpha \neq 90°$) which receive a combined load of a constant magnitude in a specific direction can be calculated using the following equation,

$$P = XF_r + YF_a \quad \text{(4.1)}$$

where :

P : dynamic equivalent load N

(for radial bearings,
P_r : dynamic equivalent radial load
for thrust bearings,
P_a : dynamic equivalent axial load)

F_r : radial load N

F_a : axial load N

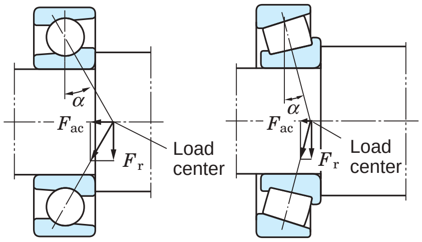
X : radial load factor

Y : axial load factor

(values of X and Y are listed in the bearing specification table.)

- When $F_a/F_r \leqq e$ for single-row radial bearings, it is taken that $X = 1$, and $Y = 0$.
  Hence, the dynamic equivalent load rating is $P_r = F_r$.
  (Values of e, which designates the limit of F_a/F_r, are listed in the bearing specification table.)
- For single-row tapered roller bearings, axial component forces (F_{ac}) are generated as shown in **Fig. 4.1**, therefore a pair of bearings is arranged face-to-face or back-to-back.
  The axial component force can be calculated using the following equation.

$$F_{ac} = \frac{F_r}{2\,Y} \quad \text{(4.2)}$$

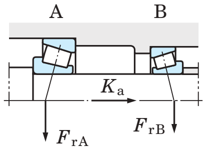
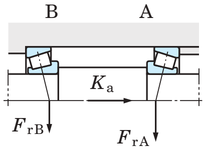


(Load center position is listed in the bearing specification table.)

Fig. 4.1 Axial component force

For instance, when radial loads F_{rA} and F_{rB} are on tapered roller bearings A and B as shown in **Table 4.1** and, in addition, a axial load K_a from the outside is on bearing A, the dynamic equivalent loads P_A and P_B on bearings A and B are as follows :

Table 4.1 Dynamic equivalent load calculation : when a pair of tapered roller bearings is arranged face-to-face or back-to-back.

Paired mounting		Loading condition	Bearing	Axial load	Dynamic equivalent load
Back-to-back arrangement	Face-to-face arrangement				
		$\frac{F_{rB}}{2\,Y_B} + K_a \geqq \frac{F_{rA}}{2\,Y_A}$	Bearing A	$\frac{F_{rB}}{2\,Y_B} + K_a$	$P_A = XF_{rA} + Y_A\left(\frac{F_{rB}}{2\,Y_B} + K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
			Bearing B	–	$P_B = F_{rB}$
		$\frac{F_{rB}}{2\,Y_B} + K_a < \frac{F_{rA}}{2\,Y_A}$	Bearing A	–	$P_A = F_{rA}$
			Bearing B	$\frac{F_{rA}}{2\,Y_A} - K_a$	$P_B = XF_{rB} + Y_B\left(\frac{F_{rA}}{2\,Y_A} - K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$

4.2 Static equivalent load

The static equivalent load is a theoretical load calculated such that, during rotation at very low speed or when bearings are stationary, the same contact stress as that imposed under actual loading condition is generated at the contact center between raceway and rolling element to which the maximum load is applied.

For radial bearings, radial load passing through the bearing center is used for the calculation; for thrust bearings, axial load in a direction along the bearing axis is used.

The static equivalent load can be calculated using the following equations.

[Radial bearings] ··· The greater value obtained by the following two equations is used.

$P_0 = X_0 F_r + Y_0 F_a$ ············ (4.3)

$P_{0r} = F_r$ ············ (4.4)

---

where :

P_{0r} : static equivalent radial load N

P_{0a} : static equivalent axial load N

F_r : radial load N

F_a : axial load N

X_0 : static radial load factor

Y_0 : static axial load factor

(values of X_0 and Y_0 are listed in the bearing specification table.)

5 Bearing tolerances

5.1 Boundary tolerances for tapered roller bearings

Koyo Inch Series tapered roller bearings are manufactured to the five tolerance levels recognized by the ANSI/ABMA, Classes 4, 2, 3, 0 and 00, in order to ascending precision.

Metric J series For "J" prefix Bearing No. tapered roller bearings are produced in Classes PK, PN, PC and PB, in accordance with industry standards. These classes provide quality levels suitable for all applications. The higher grades have reduced runout tolerances, producing smoother rotation of the bearings with less noise and vibration.

Improved mounting fits are also obtained because of closer tolerances on bore and outside diameter. Tolerances class4 to class 00 and class PK to class PB are shown in **Table 5.1**, **5.2**. Koyo tapered roller bearings may be supplied in any precision desired.

Table 5.1 Tolerances and permissible values for Inch series tapered roller bearings

(1) Cone

Applied bearing type	Cone bore d				Single plane mean bore diameter deviation Δ_{dmp}														
	over		up to		Class 4			Class 2			Class 3			Class 0			Class 00		
					upper		lower	upper		lower	upper		lower	upper		lower	upper		lower
	mm	inch	mm	inch	μm	inch		μm	inch		μm	inch		μm	inch		μm	inch	
All types	–	–	76.2	3.0	13	0.0005	0	13	0.0005	0	13	0.0005	0	13	0.0005	0	8	0.0003	0
	76.2	3.0	304.8	12.0	25	0.0010	0	25	0.0010	0	13	0.0005	0	13	0.0005	0	8	0.0003	0
	304.8	12.0	609.6	24.0	51	0.0020	0	51	0.0020	0	25	0.0010	0	–	–	–	–	–	–
	609.6	24.0	914.4	36.0	76	0.0030	0	–	–	–	38	0.0015	0	–	–	–	–	–	–
	914.4	36.0	1 219.2	48.0	102	0.0040	0	–	–	–	51	0.0020	0	–	–	–	–	–	–
	1 219.2	48.0	1 828.8	72.0	127	0.0050	0	–	–	–	76	0.0030	0	–	–	–	–	–	–

(2) Cup

Applied bearing type	Cup outside diameter D				Single plane mean outside diameter deviation Δ_{Dmp}														
	over		up to		Class 4			Class 2			Class 3			Class 0			Class 00		
					upper		lower	upper		lower	upper		lower	upper		lower	upper		lower
	mm	inch	mm	inch	μm	inch		μm	inch		μm	inch		μm	inch		μm	inch	
All types	–	–	304.8	12.0	25	0.0010	0	25	0.0010	0	13	0.0005	0	13	0.0005	0	8	0.0003	0
	304.8	12.0	609.6	24.0	51	0.0020	0	51	0.0020	0	25	0.0010	0	–	–	–	–	–	–
	609.6	24.0	914.4	36.0	76	0.0030	0	76	0.0030	0	38	0.0015	0	–	–	–	–	–	–
	914.4	36.0	1 219.2	48.0	102	0.0040	0	–	–	–	51	0.0020	0	–	–	–	–	–	–
	1 219.2	48.0	2 133.6	84.0	127	0.0050	0	–	–	–	76	0.0030	0	–	–	–	–	–	–

(3) Assembled bearing width and overall width

Applied bearing type	Cone bore d				Cup OD D				Actual bearing width deviation Δ_{Ts}															
	over		up to		over		up to		Class 4				Class 2				Class 3				Class 0, 00			
									upper		lower		upper		lower		upper		lower		upper		lower	
	mm	inch	mm	inch	mm	inch	mm	inch	μm	inch	μm	inch	μm	inch	μm	inch	μm	inch	μm	inch	μm	inch	μm	inch
Single row	0	0	101.6	4	0	0	2 133.6	84	203	0.0080	0	0	203	0.0080	0	0	203	0.0080	–203	–0.0080	203	0.0080	–203	–0.0080
	101.6	4	304.8	12	0	0	2 133.6	84	356	0.0140	–254	–0.0100	203	0.0080	0	0	203	0.0080	–203	–0.0080	203	0.0080	–203	–0.0080
	304.8	12	609.6	24	0	0	508.0	20	381	0.0150	–381	–0.0150	381	0.0150	–381	–0.0150	203	0.0080	–203	–0.0080	–	–	–	–
	304.8	12	609.6	24	508	20	2 133.6	84	381	0.0150	–381	–0.0150	381	0.0150	–381	–0.0150	381	0.0150	–381	–0.0150	–	–	–	–
	609.6	24	1 828.8	72	0	0	2 133.6	84	381	0.0150	–381	–0.0150	–	–	–	–	381	0.0150	–381	–0.0150	–	–	–	–
Double row	0	0	101.6	4	0	0	2 133.6	84	406	0.0160	0	0	406	0.0160	0	0	406	0.0160	–406	–0.0160	406	0.0160	–406	–0.0160
	101.6	4	304.8	12	0	0	2 133.6	84	711	0.0280	–508	–0.0200	406	0.0160	–203	–0.0080	406	0.0160	–406	–0.0160	406	0.0160	–406	–0.0160
	304.8	12	609.6	24	0	0	508.0	20	762	0.0300	–762	–0.0300	762	0.0300	–762	–0.0300	406	0.0160	–406	–0.0160	–	–	–	–
	304.8	12	609.8	24	508	20	2 133.6	84	762	0.0300	–762	–0.0300	762	0.0300	–762	–0.0300	762	0.0300	–762	–0.0300	–	–	–	–
	609.8	24	1 828.8	72	0	0	2 133.6	84	762	0.0300	–762	–0.0300	–	–	–	–	762	0.0300	–762	–0.0300	–	–	–	–

(4) Radial runout of assmbled bearing cone / cup

Applied bearing type	Cup outside diameter D				Assembled bearing runout K_{ia}, K_{ea}									
	over		up to		Class 4		Class 2		Class 3		Class 0		Class 00	
					max.		max.		max.		max.		max.	
	mm	inch	mm	inch	μm	inch	μm	inch	μm	inch	μm	inch	μm	inch
All types	–	–	**304.8**	**12**	51	0.0020	38	0.0015	8	0.0003	4	0.00015	2	0.000075
	304.8	**12**	**609.6**	**24**	51	0.0020	38	0.0015	18	0.0007	–	–	–	–
	609.6	**24**	**914.4**	**36**	76	0.0030	51	0.0020	51	0.0020	–	–	–	–
	914.4	**36**	**2 133.6**	**84**	76	0.0030	–	–	76	0.0030	–	–	–	–

Table 5.2 Tolerances for metric "J" series tapered roller bearing

(1) Bore diameter and width of cone and assembled width

Unit : μm

Cone Bore d (mm)		Single plane mean bore diameter deviation Δ_{dmp}								Single cone width deviation Δ_{Bs}								Actual bearing width deviation Δ_{Ts}							
		Class K		Class N		Class C		Class B		Class K		Class N		Class C		Class B		Class K		Class N		Class C		Class B	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
0	**10**	0	–12	0	–12	0	–7	0	–5	0	–120	0	–50	0	–200	0	–200	200	0	100	0	200	–200	200	–200
10	**18**	0	–12	0	–12	0	–7	0	–5	0	–120	0	–50	0	–200	0	–200	200	0	100	0	200	–200	200	–200
18	**30**	0	–12	0	–12	0	–8	0	–6	0	–120	0	–50	0	–200	0	–200	200	0	100	0	200	–200	200	–200
30	**50**	0	–12	0	–12	0	–10	0	–8	0	–120	0	–50	0	–240	0	–240	200	0	100	0	200	–200	200	–200
50	**80**	0	–15	0	–15	0	–12	0	–9	0	–150	0	–50	0	–300	0	–300	200	0	100	0	200	–200	200	–200
80	**120**	0	–20	0	–20	0	–15	0	–10	0	–200	0	–50	0	–400	0	–400	200	–200	100	0	200	–200	200	–200
120	**180**	0	–25	0	–25	0	–18	0	–13	0	–250	0	–50	0	–500	0	–500	350	–250	150	0	350	–250	350	–250
180	**250**	0	–30	0	–30	0	–22	0	–15	0	–300	0	–50	0	–600	0	–600	350	–250	150	0	350	–250	350	–250
250	**315**	0	–35	0	–35	0	–25	0	–18	0	–350	0	–50	0	–700	0	–700	400	–400	200	0	350	–250	350	–250
315	**400**	0	–40	0	–40	0	–30	–	–	0	–400	0	–50	0	–800	–	–	450	–450	200	0	400	–400	–	–
400	**500**	0	–45	0	–45	0	–35	–	–	0	–450	0	–50	0	–900	–	–	500	–500	200	0	450	–450	–	–
500	**630**	0	–60	–	–	0	–40	–	–	0	–500	0	–50	0	–1 100	–	–	600	–600	–	–	500	–500	–	–
630	**800**	0	–75	–	–	0	–50	–	–	0	–750	–	–	0	–1 600	–	–	750	–750	–	–	600	–600	–	–
800	**1 000**	0	–100	–	–	0	–60	–	–	0	–1 000	–	–	0	–2 000	–	–	900	–900	–	–	750	–750	–	–
1 000	**1 250**	0	–125	–	–	0	–75	–	–	0	–1 250	–	–	0	–2 000	–	–	1 050	–1 050	–	–	750	–750	–	–
1 250	**1 600**	0	–160	–	–	0	–90	–	–	0	–1 600	–	–	0	–2 000	–	–	1 200	–1 200	–	–	900	–900	–	–

(2) Outside diameter and width of cup and radial runout of assembled bearing cone / cup

Unit : μm

Cup OD D (mm)		Single plane mean outside diameter deviation Δ_{Dmp}								Single cup width deviation Δ_{Cs}								Assembled bearing radial runout K_{ia}, K_{ea}							
		Class K		Class N		Class C		Class B		Class K		Class N		Class C		Class B		Class K		Class N		Class C		Class B	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	K_{ia} max.	K_{ea} max.	K_{ia} max.	K_{ea} max.	K_{ia} max.	K_{ea} max.	K_{ia} max.	K_{ea} max.
0	**18**	0	–12	0	–12	0	–8	0	–6	0	–120	0	–100	0	–200	0	–200	15	18	15	18	5	6	3	4
18	**30**	0	–12	0	–12	0	–8	0	–6	0	–120	0	–100	0	–200	0	–200	15	18	15	18	5	6	3	4
30	**50**	0	–14	0	–14	0	–9	0	–7	0	–120	0	–100	0	–200	0	–200	18	20	18	20	5	7	3	5
50	**80**	0	–16	0	–16	0	–11	0	–9	0	–120	0	–100	0	–240	0	–240	20	25	20	25	6	8	4	5
80	**120**	0	–18	0	–18	0	–13	0	–10	0	–150	0	–100	0	–300	0	–300	25	35	25	35	7	10	4	6
120	**150**	0	–20	0	–20	0	–15	0	–11	0	–200	0	–100	0	–400	0	–400	30	40	30	40	8	11	5	7
150	**180**	0	–25	0	–25	0	–18	0	–13	0	–250	0	–100	0	–500	0	–500	35	45	35	45	11	13	6	8
180	**250**	0	–30	0	–30	0	–20	0	–15	0	–300	0	–100	0	–600	0	–600	50	50	50	50	13	15	8	10
250	**315**	0	–35	0	–35	0	–25	0	–18	0	–350	0	–100	0	–700	0	–700	60	60	60	60	13	18	9	11
315	**400**	0	–40	0	–40	0	–28	0	–20	0	–400	0	–100	0	–800	–	–	70	70	70	70	15	20	–	13
400	**500**	0	–45	0	–45	0	–33	–	–	0	–450	0	–100	0	–900	–	–	80	80	80	80	20	24	–	–
500	**630**	0	–50	0	–50	0	–38	–	–	0	–500	–	–	0	–1 100	–	–	90	100	–	100	25	30	–	–
630	**800**	0	–75	–	–	0	–45	–	–	0	–750	–	–	0	–1 600	–	–	100	120	–	–	30	36	–	–
800	**1 000**	0	–100	–	–	0	–60	–	–	0	–1 000	–	–	0	–2 000	–	–	115	140	–	–	37	43	–	–
1 000	**1 250**	0	–125	–	–	0	–80	–	–	0	–1 250	–	–	0	–2 000	–	–	130	160	–	–	45	52	–	–
1 250	**1 600**	0	–160	–	–	0	–100	–	–	0	–1 600	–	–	0	–2 000	–	–	150	180	–	–	55	62	–	–

6 Numbering system

The numbering system of the inch series tapered roller bearings is specified by the ABMA Standard as follows.

This will provide a guideline for identification of duty, angularity and dimensions of the inch series tapered roller bearings.

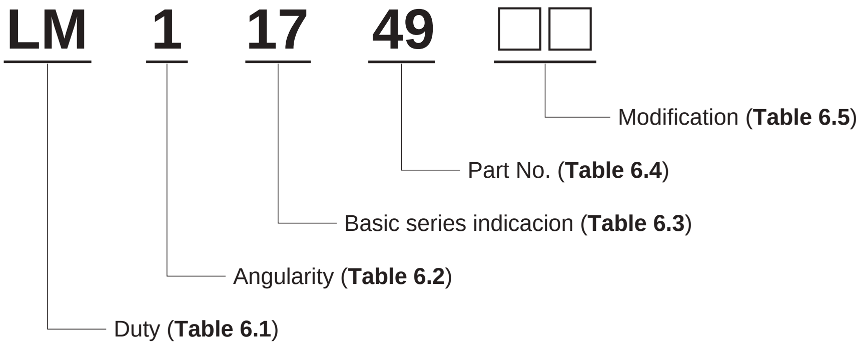


Table 6.1 Duty

Inch series tapered roller bearings will be divided into ten classes according to their duty as follows :

Code	Details
EL	Extra Light
LL	Lighter than Light
L	Light
LM	Light Medium
M	Medium
HM	Heavy Medium
H	Heavy
HH	Heavier than Heavy
EH	Extra Heavy
T	Thrust only

Table 6.2 Angularity

The first digit following the prefix letters will indicate approximately the included angle (α) of the outer race or the cup angle according to the following code.

Code	Details
1	0 < α < 24º
2	24º ≦ α < 25º 30´
3	25º 30´ ≦ α < 27º
4	27º ≦ α < 28º 30´
5	28º 30´ ≦ α < 30º 30´
6	30º 30´ < α < 32º 30´
7	32º 30´ ≦ α < 36º
8	36º ≦ α < 45º
9	45º ≦ α , but not thrust only
0	Thrust bearing only

Table 6.3 Basic series indication

The selection of the basic series indication in relation to the maximum theoretical bore of the bearing will then be in accord with the following tabulation :

Series indication	Max. bore range (inch)
00 to **19** incl.	**0** – **1**
20 to **99** incl.	**1** – **2**
000 to **029** incl.	
039 to **129** incl.	**2** – **3**
130 to **189** incl.	**3** – **4**
190 to **239** incl.	**4** – **5**
240 to **289** incl.	**5** – **6**
290 to **339** incl.	**6** – **7**
340 to **389** incl.	**7** – **8**
390 to **429** incl.	**8** – **9**

Table 6.4 Part No.

The 5th and 6th digits or the last two digits of the bearing number indicate the part number of the individual member of the bearing.

Bearing member	Code
Cup : (Outer ring)	Expressed by 10 to 19, and 10 is used for the cup of the minimum outside diameter of the series.
Cone : (Inner ring)	Expressed by 30 to 49, and 49 is used for the cone of the maximum bore size of the series.

Table 6.5 Modification

These codes indicate the special design features. Some examples are;

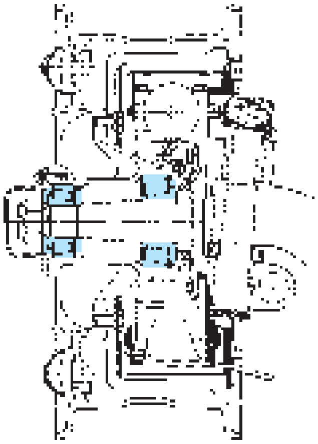
Code	Details
A	Bearing limit for overall width or size in master closer then standard.
B	Single cup with flange.
BR	Single or double cup or cone with snap ring.
BW	Single cup with flange and slotted.
CR	Rib cup.
CP	Chrome plated cone and cup.
D	Double cone or cup – minimum length.
DA	Spherical O.D. – double cup – self-aligning –

7 Typical applications

Automotive

• Front wheels

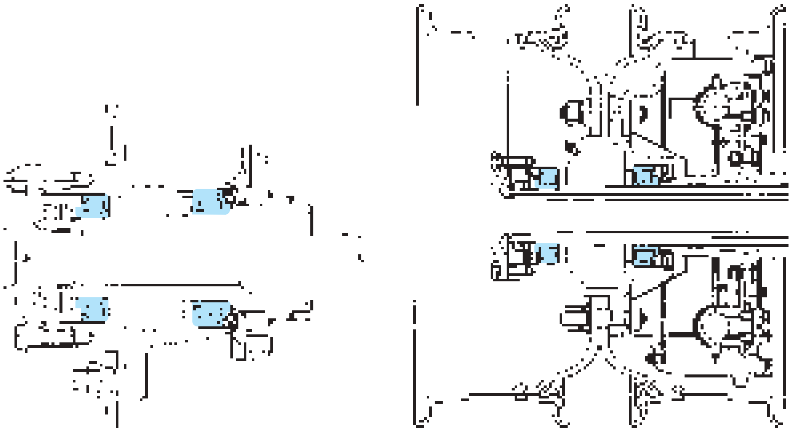
In general, automotive front wheel bearings are primarily subjected to radial loads. However, during cornering or running on bad roads, substantial moment loads can be imposed. Therefore, it is extremely important to select bearings which can absorb these moment loads without difficulty. At the present time, two tapered roller bearings are generally used in each front wheels of trucks.



• Rear wheels

Tapered roller bearings are generally used in rear wheels of trucks and buses over 2 tons in gross vehicle weight.

Since the cone and cup can misalign during cornering, which can have an adverse affect on service life, bearings which offer superior performance under these conditions should be selected.



• Differentials

The bearings used in automotive differentials are preloaded to maintain accuracy between the drive pinion and ring gear. The accuracy of gear engagement affects greatly the performance of the differential as well as running noise.

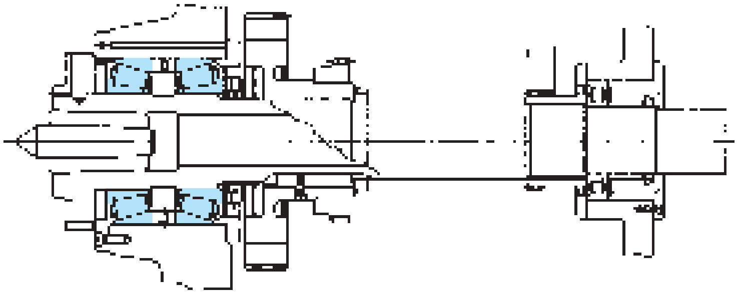
From this point of view, it is necessary to select bearings which will provide optimum rigidity so that satisfactory engagement of the gears is obtained during operation. The pinion shaft is supported by either two tapered roller bearings (cantilever mount) mounted back to back, or two steep angle tapered roller bearings plus a single cylindrical roller bearing opposite the tapered roller bearings (straddle mount).

The differential ring gear is supported by tapered roller bearings mounted face to face.

General industries

• Machine tool spindles

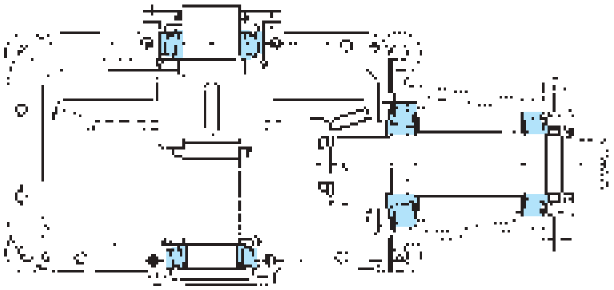
Tapered roller bearings are widely used to support spindles of various machine tools such as engine lathes and milling machines. Since these spindles require rigidity and accuracy of guidance in both radial and axial directions, a pair of tapered roller bearings are usually mounted in a back-to-back arrangement and adjusted to obtain the proper preload. In addition to providing rigid radial and axial support, tapered roller bearings simplify the machine structure and promote simple preload adjustment.



• Electric railway car gear units

The driving axles of electric cars are equipped with gearing units to transmit the torque and rotation generated by the traction main motors. In the parallel cardan gear units (currently more widely used than square cardan gear units), both the pinion shaft and gear housing are generally fitted with tapered roller bearings.

• Bevel-gear units



• Farm equipment, transmission

Specification tables of tapered roller bearings

Single-row

Double-row

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
335	334	47	332	41,43,45,47,49,51,53,55,57,59,61
	335	51		
	335S	49		
	336	59	332A	43,47,51,53,55,59
	337	55		
	338	43		
	339	53		
	339X	53		
	340	51		
	341	41		
	342	59		
	342A	59		
	342S	61		
	343	51		
	344	57		
	344A	57		
	346	49		
	347	55		
	348	45		
355	350	59	352	59,65
	350A	57	353	63
	355	61,63	354	61
	355A	63	354A	57,61,63,65
	355X	63	354X	57
	357	57		
	358	65		
	358A	65		
	359A	65		
	359S	65		
365	365	67	362	65
	365A	59	362A	59,65,67,69,71
	365S	67		
	366	67	363	65
	367	65		
	368	69		
	368A	69		
	368S	71		
	369A	65		
	369S	65		
	370A	69		
375	375	69	372	65,67,71
	375S	69	372A	69
	376	65	374	69
	376A	65		
	377	71		
	377A	71		
	377S	71		
375	378A	67		
385	385	73	382	73
	385A	69	382A	65,69,73,75
	385AS	69	382S	69
	385AX	69	383A	71
	385X	73	383X	73
	386	73		
	386A	65		
	387	73		
	387A	73		
	387AS	73		
	387S	73		
	388A	75		
	389	73		
	389AS	71		
	389S	73		
395	390	75	393A	75
	390A	77	393AS	75
	392	77	394	69,75,77
	395	77	394A	67,75,77,79,81
	395A	79		
	395S	79	394AS	69
	396	67		
	397	75		
	398	69		
	399	79		
	399A	81		
	399AS	81		
415	415	57	414	45,51,53,57,59
	416	45		
	417	51	414A	45,53,57
	418	57	414X	57
	419	59		
	420	59		
	421	53		
	422	57		
	423X	59		
	424X	53		
435	435	63	432	51,53,59,61,63
	436	65		
	438	63	432A	49,57,61,63,65
	439	61		
	440	57		
	441	53		
	442S	59		
	443	49		
	444	57		

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
435	447	61		
	449	51		
455	455	69	452	69
	455S	69	453	71
	456	71	453A	61,63,67,73
	458	63	453X	61,65,67,71,
	458S	65		73
	460	63	454	69,73
	461	61		
	462	73		
	463	67		
	464	61		
	464A	61		
	465	67		
	465A	67		
	466	73		
	466S	73		
	467	67		
	468	71		
	469	73		
475	475	73	472	77,79,81
	475X	73	472A	73,77,79,81,
	476	77		83
	476A	77	472X	79,83
	477	79		
	478	79		
	478S	81		
	479	81		
	480	81		
	482	81,83		
	482A	81		
	483	79		
	484	83		
	486X	83		
495	495	87	492	87
	495A	85	492A	83,85,87,89
	495AS	87	493	85,87,89,91
	495AX	85		
	495S	83		
	495X	91		
	496	87		
	496AS	87		
	496X	87		
	497	89		
	497A	89		
	498	89		
	499A	89		

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
525	525	57	522	57,61,63,65,
	525A	57		67,69
	525X	57		
	526	61		
	526A	61		
	527	63		
	527S	65		
	528	67		
	528A	67		
	529	69		
	529X	69		
535	535	63	532	63,67
	536	67	532A	63
	537	69	532X	57,59,61,67,
	539	71		69,71
	539A	71	533A	71
	540	71		
	541	61		
	542	57		
	543	59		
	545	67		
	546	67		
555	554	77	552	77
	555	71	552A	71,75
	555S	75	553	77
	555SA	75	553X	71,75,77,79,
	557A	77		81
	557S	71		
	558	77		
	558A	77		
	559	79		
	560	81		
	560S	81		
565	565	79	563	79,81,83,85
	565S	79		
	566	83		
	566S	83		
	567	83		
	567A	83		
	567S	83		
	568	85		
	569	79		
	570	81		
575R	575R	85	572	83,85,87,89
	575SR	85	572X	89
	576R	83		
	577R	85		

Series No. INDEX Single-row

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
575R	578R	87		
	580R	89		
	581R	87		
	582R	89		
595	590	87	592	91
	590A	85	592A	87,89,91
	593	91	592XE	85,91,93
	593A	91	592XS	87
	593S	91	593X	89
	594	93		
	594A	93		
	595	89		
	595A	87		
	596	91		
	596S	91		
	596X	89		
	597	93		
	597X	93		
	598	93		
	598A	93		
	599X	89		
615	615	63	612	57,63,67,71,
	617	67		73,75
	618X	67	612A	57,63,67,71,
	619	71		75
	620	57	612S	71
	621	71	613X	71
	622A	73		
	622X	73		
	623	75		
	623A	75		
	624	71		
635	635	75	632	75,81
	636	73	633	73,77,79,81,
	637	77		83
	639	79		
	641	81		
	642	81		
	643	83		
	644	83		
	645	83		
655	655	83	652	85,89
	656	79	652A	83,89
	657	83,85	653	79,83,85,87,
	658	85		89,91
	659	85	653X	85
	661	87		

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
655	662	87		
	663	89		
	663A	89		
	664	89		
	665	91		
	665A	91		
675	677	91	672	91,93,95
	679	91	673SA	91
	681	93		
	681A	93		
	683	93		
	685	93		
	687	95		
745R	740R	87	742	79,83,85,87,
	744AR	83		89
	744R	85		
	745AR	83		
	745SR	79		
	747SR	79		
	748R	87		
	748SR	85		
	749AR	89		
	749R	89		
	749SR	89		
	750AR	89		
	750R	87		
755	755	85,87	752	85,87,89,91,
	756A	87		93
	757	89	752A	85,91
	758	91	753	87
	759	91		
	760	93		
	762	85		
	766	91		
775	775	91	772	91,93,95
	776	93		
	778	93		
	779	93		
	780	95		
	782	95		
	783	95		
	786	95		
	787	95		
795	795	97	792	97,99
	797	99		
	799	99		

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
835R	835R	83	832	83,87,89,91
	838XR	87		
	839R	89		
	841R	91		
	850AR	91		
855R	855R	91	854	87,89,91,93,95
	857R	93		
	857XR	91	854X	91
	860R	95		
	861R	95		
	862R	93		
	863R	95		
	863XR	95		
	864R	93		
	864XR	87		
	865XR	89		
	866R	93		
	867AR	93		
	867XR	89		
	869R	91		
935	935	95	930	97
	936	95	932	95,97
	938	97		
	938S	97		
	939	97		
	941	95		
	942	97		
	947	97		
1200	1280	41	1220	41
1300	1380	41	1328	41
			1329	41
1600	1674	47	1620	47,49
	1680	49		
1700	1755	41	1729	39,41
	1774	39	1729X	39,41
	1775	39	1730	39,41
	1779	41		
	1780	41		
1900R	1975R	41	1922	41,43
	1985R	43	1931	41
	1986R	41	1932	41
	1987R	43		
	1988R	43		
	1994XR	41		
	1997XR	43		

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
A2000	A2031	39	A2126	39
	A2037	39		
	A2043	39		
	A2047	39		
2500	2558	45	2520	43,47,49
	2559	45	2523	45
	2578	43	2523S	45
	2580	47	2525	45
	2581	49		
	2582	47		
	2585	49		
	2586	45		
2600	2682	43	2631	39,41,43,45
	2684	41		
	2685	41		
	2687	43		
	2688	43		
	2689	43		
	2689X	43		
	2690	45		
	2691	45		
	2693X	39		
	2694X	41		
	2695X	45		
2700R	2776R	55	2720	51
	2780R	53	2729	49,55
	2785R	49	2729X	51
	2786R	51	2734	53
	2788AR	55	2735X	49,51,53,55,57
	2788R	55		
	2789R	57	2736	49
	2790R	49		
	2793R	51		
	2794R	53		
	2796R	51		
2800	2875	47	2820	47,51,53
	2876	49	2821	49,51
	2877	51		
	2878	51		
	2879	49		
	2880	53		
2900	2973	61	2924	61,63,65
	2975	63	2925	65
	2984	65		

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Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
3100	3187	47	3120	41,43,45,47,49
	3188	47		
	3188S	47	3125	47
	3188X	41	3126	47
	3189	43	3129	47
	3189X	43	3130	43,47,49
	3190	45		
	3190S	45		
	3191	47		
	3192	45		
	3193	47		
	3194	49		
	3196	49		
	3197	49		
	3198	45		
	3199	47		
3300	3378	53	3320	53,57
	3379	51	3325	51
	3381	55	3328	57,59
	3382	57	3329	53,57
	3383	59	3331	55
	3384	59	3339	55
	3386	57		
	3387	55		
3400	3474	47	3420	47,49,51,53,55
	3476	49		
	3476X	49	3422	49
	3477	49		
	3478	51		
	3479	53		
	3480	53		
	3482	51		
	3483	49		
	3490	55		
	3492X	53		
3500R	3576R	59	3520	55,59,61,65
	3577R	59	3525	51,59,63
	3578AR	63	3526	57
	3578R	61		
	3579R	61		
	3580R	55		
	3581R	51		
	3582R	59		
	3583R	57		
	3585R	59		
	3586R	65		

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
3700	3767	71	3720	57,63,65,67,69
	3774	57		
	3775	69	3726	65
	3776	65	3730	63,65,67,69,71
	3777	65		
	3778	65	3732	63,65,69
	3779	65		
	3780	69		
	3781	67		
	3781A	67		
	3782	63		
	3783	63		
	3784	69		
3800	3872	51	3820	51,53
	3872A	51	3821	51,55,59
	3875	55		
	3876	55		
	3877	59		
	3877A	59		
	3878	53		
	3879	59		
	3880	59		
3900	3975	69	3920	75
	3977	77	3925	69,77,79,81
	3978	75	3926	75
	3979	75		
	3980	77		
	3981	75		
	3982	79		
	3984	81		
	3994	81		
A4000	A4044	39	A4138	39
	A4050	39		
	A4059	39		
4300	4367	57	4335	51,57,59,61,63
	4368	51		
	4370	63		
	4375	57		
	4388	59		
	4395	61		
4500	4559	65	4535	65,69,71
	4580	69	4536	69
	4595	71		
5500R	5552R	79	5520	71
	5554R	79	5535	57,67,71,73,75,77,79,81
	5557R	81		
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Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
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	5562R	67		
	5564R	79		
	5565R	71		
	5566R	73		
	5577R	71		
	5578R	71		
	5582R	77		
	5583R	77		
	5584R	79		
	5595R	79		
5700	5760	85	5735	85,87
	5795	87		
A6000	A6062	39	A6157	39
	A6067	39	A6162	39
	A6075	39		
6300	6375	75	6320	73,75,77,79,81
	6376	77		
	6379	79		
	6380	73		
	6381	73		
	6382	79		
	6386	81		
	6386A	81		
	6387	75		
	6389	81		
	6391	75		
6400	6454	83	6420	75,79,83,85
	6455	75		
	6460	85		
	6461	85		
	6461A	85		
	6464	79		
	6465	75		
	6466	85		
	6475	79		
	6484	83		
6500R	6552R	91	6520	87
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	6554R	87	6535	85,87,89,91,93
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	6556R	87	6536	85
	6557R	89		
	6559R	89		
	6575R	85		
	6576R	87		

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
6500R	6578R	89		
	6580R	91		
	6581XR	93		
9100	9180	77	9120	77
	9181	77	9121	77,81
	9185	81		
9200R	9278R	105	9220	105,107
	9285R	107		
9300R	9378R	107	9320	107
	9380R	107	9321	107
	9382R	107		
	9385R	107		
02400	02473	43	02420	43,45,47
	02474	43	02421	43
	02475	47		
	02475A	47		
	02476	47		
	02477	45		
02800	02872	45	02820	45,47,51,53
	02875	47	02830	45,47,51
	02876	47	02831	45
	02877	51		
	02878	51		
	02884	53		
03000	03062	39	03162	39
07000	07079	39	07196	39,41
	07087	41	07204	41
	07093	41	07205	41
	07097	41	07210X	41
	07098	41		
	07100	41		
	07100S	41		
	07100SA	41		
08000	08118	45	08231	45,47
	08125	47		
09000	09062	39	09194	39
	09067	39	09195	39
	09070	39	09196	39
	09073X	39		
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	09078	39		
	09078X	39		
	09099X	39		
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	11157XR	57	11315	57
	11162R	59		
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Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
11000R	11163R	59		
	11165XR	61		
	11165XSR	61		
11500	11590	103	11520	103
LM11700R	LM11749R	39	LM11710	39
LM11900	LM11949	39	LM11910	39
12000	12168	61	12303	61
	12175	61		
12500	12580	39	12520	39
M12600	M12648	41	M12610	41
	M12648A	41		
	M12649	41		
LM12700	LM12749	41	LM12711	41
13600	13682	53	13620	53,55
	13685	55	13621	55
	13686	55	13624	55
	13687	55		
13800	13889	55	13830	55,57
	13892	57	13836	55
14000	14116	47	14274	45,47
	14117A	45	14274A	45,47,49,51
	14118	45	14276	45,51
	14118A	45	14277	49
	14120A	45	14283	45
	14123A	47		
	14125	47		
	14130	49		
	14131	49		
	14136A	51		
	14137A	51		
	14138A	51		
	14139	51		
15000	15100	41,43	15243	41
	15101	41,43	15245	41,43,45,47
	15102	43	15250	43
	15103	43	15250R	43
	15106	43	15250X	43
	15112	43		
	15113	43		
	15116	45		
	15117	45		
	15118	47		
	15119	47		
	15120	47		
	15123	47		
	15125	47		
	15126	47		

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
15500	15572	41	15520	41,43
	15578	41	15523	43
	15579X	43		
	15580	43		
	15590	43		
16000	16131	49	16282	53,55
	16137	51	16283	55
	16143	53	16284	49,51,53,55
	16150	55		
	16151	55		
17000	17098	41	17244	41,45
	17098X	41		
	17118	45		
	17118S	45		
	17119	45		
17500R	17580R	39	17520	39
17800	17887	65	17831	65
18000	18200	69	18337	69
18500	18587	57	18520	57,59
	18590	59		
	18591	59		
18600	18685	61	18620	61,65
	18690	65		
18700	18780	65	18720	65
	18790	69	18721	69
			18723	69
			18724	69
19000R	19138R	51	19268	51,53
	19143R	53	19268X	55
	19150R	55	19269	55
			19281	53,55
			19282	55
			19283	53,55
21000	21063	39	21212	39
	21075	39	21213	39
	21078	39		
L21500	L21549	39	L21511	39
23000	23092	103	23256	103
	23098	103		
	23100	103		
23600	23685	49	23620	49,51
	23690	51	23621	53
	23691	53	23623	53
24700R	24780R	59	24720	59
	24781R	59	24721	59
			24722	59

Series No.	Cone (Inner ring)	Page	Cup (Outer ring)	Page
25500	25570	53	25519	53
	25572	55	25520	55,61
	25576	61	25521	61
	25577	61	25522	61
	25578	61	25523	61
	25580	61,63	25524	61
	25581	61	25526	63,65
	25582	61	25527	65
	25583	61		
	25584	65		
	25590	65		
25800R	25877R	51	25820	51
	25878R	51	25821	51,53
	25880R	53		
26000	26093	41	26274	49
	26100	43	26283	41,43,45,49
	26112	45	26283S	45
	26118	45	26300	49
	26118S	45		
	26126	49		
	26131	49		
	26132	49		
26800R	26877R	53	26820	53,59,61
	26878R	55	26821	59
	26880R	57	26822	53,61
	26881R	57	26822A	55
	26882R	59	26823	61
	26883R	53	26824	57
	26884R	61	26830	57
	26885R	59		
	26886R	61		
27600	27680	83	27620	83,85,87,89
	27684	85		
	27687	87		
	27689	89		
	27690	89		
	27691	89		
27800	27875	51	27820	51,55
	27880	55		
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28000	28118	47	28300	51,57
	28137	51	28315	51
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	28150	55		
	28151	55		
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	28579R	67	28521	65,67,69,71
	28580R	69	28523	69
	28584R	71		
28600	28678	69	28622	69,73
	28680	73	28623	73
	28680X	73		
	28682	73		
28900	28980	75	28920	75,77
	28985	77	28921	77
	28995	77	28921A	77
29500	29580	75	29520	75,77
	29582	75	29521	77
	29585	77	29522	75,79
	29586	77		
	29588	79		
	29590	79		
29600	29675	81	29620	81,83,85
	29676	81	29630	83
	29680	83		
	29681	83		
	29685	83		
	29688	85		
LM29700	LM29748	55	LM29710	55
	LM29749	55	LM29711	55
31500	31590	49	31520	51
	31593	51	31521	49,51,53
	31594	51		
	31597	53		
33000	33225	75	33461	75
	33251	79	33462	75,81,83
	33261	81	33472	79
	33262	81		
	33269	81		
	33275	81		
	33281	83		
	33287	83		
33800	33880	57	33821	63
	33885	63	33822	57,69,71
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	34275	83	34492A	83
	34294	85	34500	85
	34295	85		
	34300	85		
	34301	85		
	34304	87		
	34306	87		
	34307	87		
37000	37425	95	37625	95,97
	37431	97	37637	95
M38500	M38547	53	M38511	53
39000	39236	75	39412	75
	39250	77	39422	77
			39433	77
39500	39575	69	39520	69,75,79,81
	39578	71	39521	81
	39580	75	39522	75
	39581	75	39528	71
	39585	79		
	39586	79		
	39590	81		
41000	41100	43	41286	43,45
	41106	43		
	41125	45		
	41126	45		
42000	42381	93	42584	93
42600	42683	83	42620	83,85,87
	42686	85	42624	85
	42686X	85		
	42687	85		
	42688	85		
	42690	87		
43000	43096	103	43312	103
	43112	103		
	43117	103		
	43118	103		
	43125	103		
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	43132	103		
44000	44126	103	44348	103
	44131	103		
	44143	103		
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44000	44162	103		
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	L44649R	43		
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	45282	67	45221	63,69,71,73
	45284	69		
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	45287	71		
	45289	73		
	45290	73		
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	46150	57	46369	55,63
	46151	57		
	46162	61		
	46175	63		
	46176	63		
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	46790AR	99		
	46790R	99		
	46792R	99		
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47600R	47675R	83	47620	85,87,89
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	47680R	85		
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LM48500	LM48548	51	LM48510	51
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49500	49576	63	49520	63,67,69
	49577	63	49521	69
	49580	67	49522	63
	49581	67		
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52000	52375	93	52618	93,95
	52387	93	52630X	93
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53000	53150	103	53375	103
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	53176	103	53387X	103
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	55206	105		
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	55187CR	105		
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56000R	56418R	95	56650	95
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	59175	63	59413	63
	59176	63	59425	63
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65300	65383	61	65320	61,63,67
	65384	63	65321	63
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66000R	66187R	67	66461	67,69,75
	66200R	69	66462	67,71
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	66225R	75		
66500	66583	73	66520	71,73,75,77
	66584	71		
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	66586	75		
	66587	75		
	66588	77		
	66589	75		
LM67000	LM67043	43	LM67010	43,47
	LM67048	47		
67300	67388	99	67320	99
			67322	99
68000	68450	97	68709	97
	68462	97	68712	97
	68463	97		
L68100	L68149	51,53	L68110	51
			L68111	53
69000	69350X	91	69630	91
	69354	91		
71000	71412	95	71750	95,97
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	71432	97		
	71437	97		
	71450	97		
	71453	97		
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72000	72187	105	72487	105
	72200	105	72500	105
	72212	105		
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74000	74500	99	74850	99

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	78215	105	78551	105
	78225	105		
	78238	105		
	78250	105		
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LM78300	LM78349	53	LM78310	53
80300	80385	101	80325	101
HM81600	HM81649	39	HM81610	39
M84200	M84249	41	M84210	41
M86600R	M86643R	43	M86610	43,45,47
	M86647R	43		
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	M86649R	45		
M88000	M88040	43,45	M88010	43,45,47,49
	M88043	45	M88011	45
	M88046	47		
	M88048	49		
HM88500	HM88542	49	HM88510	49
	HM88547	49	HM88512	49
HM88600	HM88630	43	HM88610	43,47,49,51,53
	HM88638	49		
	HM88644	47,49	HM88611	47
	HM88648	53	HM88612	49
	HM88649	51		
HM89400	HM89440	49	HM89410	49
	HM89443	49	HM89411	49,51,53
	HM89446	51		
	HM89448	53		
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95000	95475	97	95925	97,99
	95500	99		
98000	98316	87	98788	87,89,91,95
	98335	89		
	98350	91		
	98394X	95		
	98400	95		
L102800	L102849	61	L102810	61
LM102900	LM102949	65	LM102910	65
LM104900	LM104949	67	LM104911	67
L183400	L183448	101	L183410	101
HM212000	HM212044	77	HM212010	77,79,81
	HM212046	79	HM212011	79
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	HM212049	81		

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	HH221438	93		
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	HH224335	95		
	HH224340	95		
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			L225818	99
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244000	EE244180	101	244235	101
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M249700	M249732	99	M249710	99,101
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M272700	M272749	101	M272710	101
M276400	M276449	101	M276410	101
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380000	EE380080	107	380190	107
390000	EE390095	107	390200	107
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L476500	L476548	101	L476510	101
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LM501300	LM501349	59	LM501310	59
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LM522500	LM522546	95	LM522510	95,97
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L540000	L540049	99	L540010	99
L555200	L555249	101	L555210	101
L570600	L570649	101	L570610	101
LL575300	LL575349	101	LL575310	101
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			LM603012	65
			LM603014	65
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HM617000	HM617045	89	HM617010	89
	HM617048	89		
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			L623114	97
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			HM624716	97
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649000	EE649240	101	649310	101
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H924000	H924045	107	H924010	107
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HM926700	HM926740	107	HM926710	107
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	HM926749	107		
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JM207000	JM207049	109	JM207010	109
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JH307700	JH307749	109	JH307710	109
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JH415600	JH415647	109	JH415610	109
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JHM534100	JHM534149	109	JHM534110	109
JM612900	JM612949	109	JM612910	109
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JLM714100	JLM714149	109	JLM714110	109
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JM718100	JM718149	109	JM718110	109
JM719100	JM719149	109	JM719113	109
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JM720200	JM720249	109	JM720210	109
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JM736100	JM736149	109	JM736110	109
JM738200	JM738249	109	JM738210	109
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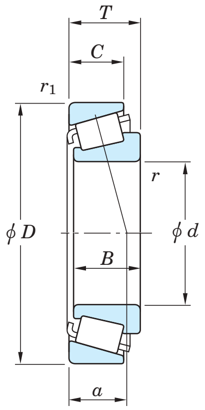
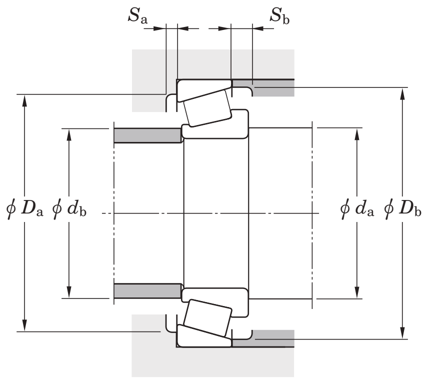
JM822000	JM822049	109	JM822010	109
JHM840400	JHM840449	109	JHM840410	109

TS type

d 7.938 ～ 20.638 mm

0.3125 ～ 0.8125 inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

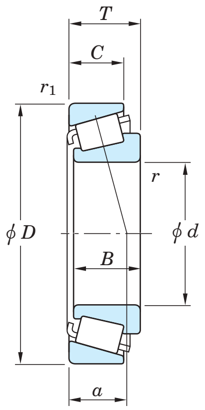
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

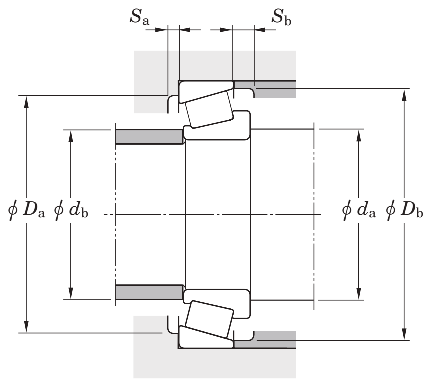
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
7.938	0.3125	31.991	1.2595	10.008	0.3940	10.785	0.4246	7.938	0.3125	0.5	0.02	1.2	0.05	13.4	9.30	1.25	**A2031**	**A2126**	7.1	0.28	12.5	0.49	12.5	0.49	26.0	1.02	29.0	1.14	0.40	1.48	0.82	3.10	2.15	1.45
9.525	0.3750	31.991	1.2595	10.008	0.3940	10.785	0.4246	7.938	0.3125	1.2	0.05	1.2	0.05	13.4	9.30	1.25	**A2037**	**A2126**	7.1	0.28	15.0	0.59	13.5	0.53	26.0	1.02	29.0	1.14	0.40	1.48	0.82	3.10	2.15	1.45
11.112	0.4375	31.991	1.2595	10.008	0.3940	14.351	0.5650	7.938	0.3125	0.8	0.03	1.2	0.05	13.4	9.30	1.25	**A2043**	**A2126**	7.1	0.28	15.5	0.61	14.5	0.57	26.0	1.02	29.0	1.14	0.40	1.48	0.82	3.10	2.15	1.45
	0.4375	34.988	1.3775	10.998	0.4330	10.988	0.4326	8.730	0.3437	1.2	0.05	1.2	0.05	15.7	11.9	1.55	**A4044**	**A4138**	8.3	0.33	17.5	0.69	15.5	0.61	29.0	1.14	32.0	1.26	0.45	1.33	0.73	3.65	2.80	1.29
11.986	0.4719	31.991	1.2595	10.008	0.3940	10.785	0.4246	7.938	0.3125	0.8	0.03	1.2	0.05	13.4	9.30	1.25	**A2047**	**A2126**	7.1	0.28	16.5	0.65	15.5	0.61	26.0	1.02	29.0	1.14	0.40	1.48	0.82	3.10	2.15	1.45
12.700	0.5000	34.988	1.3775	10.998	0.4330	10.988	0.4326	8.730	0.3437	1.2	0.05	1.2	0.05	15.7	11.9	1.55	**A4050**	**A4138**	8.3	0.33	18.5	0.73	17.0	0.67	29.0	1.14	32.0	1.26	0.45	1.33	0.73	3.65	2.80	1.29
14.989	0.5901	34.988	1.3775	10.998	0.4330	10.988	0.4326	8.730	0.3437	0.8	0.03	1.2	0.05	15.7	11.9	1.55	**A4059**	**A4138**	8.3	0.33	19.5	0.77	19.0	0.75	29.0	1.14	32.0	1.26	0.45	1.33	0.73	3.65	2.80	1.29
15.875	0.6250	34.988	1.3775	10.998	0.4330	10.998	0.4330	8.712	0.3430	1.2	0.05	1.2	0.05	18.1	14.3	1.90	**L21549**	**L21511**	7.6	0.30	21.5	0.85	19.5	0.77	29.0	1.14	32.5	1.28	0.32	1.88	1.04	4.15	2.25	1.83
	0.6250	39.992	1.5745	12.014	0.4730	11.153	0.4391	9.525	0.3750	1.2	0.05	1.2	0.05	18.2	15.1	2.00	**A6062**	**A6157**	10.3	0.41	22.0	0.87	20.5	0.81	34.0	1.34	37.0	1.46	0.53	1.14	0.63	4.20	3.75	1.11
	0.6250	41.275	1.6250	14.288	0.5625	14.681	0.5780	11.112	0.4375	1.2	0.05	2.0	0.08	27.3	20.5	2.85	**03062**	**03162**	9.3	0.37	21.5	0.85	20.0	0.79	34.0	1.34	37.5	1.48	0.31	1.93	1.06	6.30	3.35	1.88
	0.6250	42.862	1.6875	16.670	0.6563	16.670	0.6563	13.495	0.5313	1.6	0.06	1.6	0.06	38.2	29.5	4.15	**17580R**	**17520**	10.9	0.43	23.0	0.91	21.0	0.83	36.5	1.44	39.0	1.54	0.33	1.81	1.00	8.80	4.95	1.77
	0.6250	49.225	1.9380	19.845	0.7813	21.539	0.8480	14.288	0.5625	0.8	0.03	1.2	0.05	47.2	37.7	5.40	**09062**	**09195**	10.6	0.42	22.0	0.87	21.5	0.85	42.0	1.65	44.5	1.75	0.27	2.26	1.24	10.9	4.95	2.20
	0.6250	53.975	2.1250	22.225	0.8750	21.839	0.8598	15.875	0.6250	0.8	0.03	2.4	0.09	52.6	41.2	5.65	**21063**	**21212**	16.6	0.65	29.0	1.14	26.5	1.04	43.0	1.69	50.0	1.97	0.59	1.02	0.56	12.2	12.3	0.99
16.000	0.6299	47.000	1.8504	21.000	0.8268	21.000	0.8268	16.000	0.6299	1.0	0.04	2.0	0.08	45.4	37.7	5.05	**HM81649**	**HM81610**	15.0	0.59	27.5	1.08	23.0	0.91	37.5	1.48	43.0	1.69	0.55	1.10	0.60	10.5	9.85	1.07
16.993	0.6690	41.275	1.6250	11.905	0.4687	11.153	0.4391	8.730	0.3437	0.8	0.03	1.2	0.05	18.2	15.1	2.00	**A6067**	**A6162**	10.2	0.40	22.0	0.87	21.0	0.83	34.5	1.36	37.0	1.46	0.53	1.14	0.63	4.20	3.75	1.11
17.000	0.6693	49.225	1.9380	23.020	0.9063	21.539	0.8480	17.462	0.6875	2.0	0.08	1.6	0.06	47.2	37.7	5.40	**09099X**	**09196**	13.8	0.54	27.0	1.06	24.0	0.94	41.5	1.63	44.5	1.75	0.27	2.26	1.24	10.9	4.95	2.20
17.462	0.6875	39.878	1.5700	13.843	0.5450	14.605	0.5750	10.668	0.4200	1.2	0.05	1.2	0.05	31.8	26.0	3.60	**LM11749R**	**LM11710**	8.6	0.34	23.0	0.91	21.5	0.85	34.0	1.34	37.0	1.46	0.29	2.10	1.15	7.30	3.55	2.04
17.653	0.6950	49.225	1.9380	23.020	0.9063	21.539	0.8480	17.462	0.6875	2.4	0.09	1.6	0.06	47.2	37.7	5.40	**09070**	**09196**	13.8	0.54	26.0	1.02	24.0	0.94	41.5	1.63	44.5	1.75	0.27	2.26	1.24	10.9	4.95	2.20
18.000	0.7087	49.225	1.9380	23.020	0.9063	21.539	0.8480	17.462	0.6875	1.0	0.04	1.6	0.06	47.2	37.7	5.40	**09073X**	**09196**	13.8	0.54	23.0	0.91	24.0	0.94	41.5	1.63	44.5	1.75	0.27	2.26	1.24	10.9	4.95	2.20
19.004	0.7482	56.896	2.2400	19.368	0.7625	19.837	0.7810	15.875	0.6250	1.6	0.06	1.2	0.05	50.0	43.1	6.20	**1774**	**1729**	12.5	0.49	27.0	1.06	25.0	0.98	49.0	1.93	51.0	2.01	0.31	1.95	1.07	11.6	6.10	1.90
	0.7482	56.896	2.2400	19.368	0.7625	19.837	0.7810	15.875	0.6250	1.6	0.06	1.6	0.06	50.0	43.1	6.20	**1774**	**1729X**	12.5	0.49	27.0	1.06	25.0	0.98	49.0	1.93	52.0	2.05	0.31	1.95	1.07	11.6	6.10	1.90
19.050	0.7500	39.992	1.5745	12.014	0.4730	11.153	0.4391	9.525	0.3750	1.0	0.04	1.2	0.05	18.2	15.1	2.00	**A6075**	**A6157**	10.3	0.41	24.0	0.94	23.0	0.91	34.0	1.34	37.0	1.46	0.53	1.14	0.63	4.20	3.75	1.11
	0.7500	45.237	1.7810	15.494	0.6100	16.637	0.6550	12.065	0.4750	1.2	0.05	1.2	0.05	36.8	30.1	4.25	**LM11949**	**LM11910**	10.0	0.39	25.0	0.98	23.5	0.93	39.5	1.56	41.5	1.63	0.30	2.00	1.10	8.45	4.35	1.95
	0.7500	49.225	1.9380	19.845	0.7813	21.539	0.8480	14.288	0.5625	1.2	0.05	1.2	0.05	47.2	37.7	5.40	**09078**	**09195**	10.6	0.42	25.5	1.00	24.0	0.94	42.0	1.65	44.5	1.75	0.27	2.26	1.24	10.9	4.95	2.20
	0.7500	49.225	1.9380	21.209	0.8350	19.050	0.7500	17.462	0.6875	1.2	0.05	1.6	0.06	47.2	37.7	5.40	**09067**	**09196**	13.8	0.54	25.5	1.00	24.0	0.94	41.5	1.63	44.5	1.75	0.27	2.26	1.24	10.9	4.95	2.20
	0.7500	49.225	1.9380	23.020	0.9063	21.539	0.8480	17.462	0.6875	SP	SP	3.6	0.14	47.2	37.7	5.40	**09074**	**09194**	13.8	0.54	26.0	1.02	24.0	0.94	39.0	1.54	44.5	1.75	0.27	2.26	1.24	10.9	4.95	2.20
	0.7500	49.225	1.9380	23.020	0.9063	21.539	0.8480	17.462	0.6875	1.6	0.06	1.6	0.06	47.2	37.7	5.40	**09078X**	**09196**	13.8	0.54	25.5	1.00	24.0	0.94	41.5	1.63	44.5	1.75	0.27	2.26	1.24	10.9	4.95	2.20
	0.7500	53.975	2.1250	19.368	0.7625	19.837	0.7810	15.875	0.6250	1.6	0.06	0.8	0.03	50.0	43.1	6.20	**1775**	**1730**	12.5	0.49	27.0	1.06	25.0	0.98	48.5	1.91	50.0	1.97	0.31	1.95	1.07	11.6	6.10	1.90
	0.7500	53.975	2.1250	22.225	0.8750	21.839	0.8598	15.875	0.6250	1.6	0.06	0.4	0.02	52.6	41.2	5.65	**21075**	**21213**	16.6	0.65	31.5	1.24	26.5	1.04	43.0	1.69	50.0	1.97	0.59	1.02	0.56	12.2	12.3	0.99
	0.7500	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	3.6	0.14	1.2	0.05	83.8	75.2	11.2	**2693X**	**2631**	13.9	0.55	30.0	1.18	25.0	0.98	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
20.000	0.7874	50.005	1.9687	13.495	0.5313	14.260	0.5614	9.525	0.3750	1.6	0.06	1.0	0.04	33.3	28.8	4.05	**07079**	**07196**	10.8	0.43	27.5	1.08	26.0	1.02	44.5	1.75	47.0	1.85	0.40	1.49	0.82	7.65	5.25	1.46
	0.7874	53.975	2.1250	22.225	0.8750	21.839	0.8598	15.875	0.6250	2.0	0.08	2.4	0.09	52.6	41.2	5.65	**21078**	**21212**	16.6	0.65	31.5	1.24	26.5	1.04	43.0	1.69	50.0	1.97	0.59	1.02	0.56	12.2	12.3	0.99
20.638	0.8125	49.225	1.9380	19.845	0.7813	19.845	0.7813	15.875	0.6250	1.6	0.06	1.6	0.06	45.5	37.7	5.35	**12580**	**12520**	12.7	0.50	28.5	1.12	26.0	1.02	42.5	1.67	45.5	1.79	0.32	1.86	1.02	10.5	5.80	1.81

Note 1) SP indicates the specially chamfered from.

TS type

d 21.430 ~ (25.400) mm
0.8437 ~ (1.0000) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a/F_r \leq e$		$F_a/F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

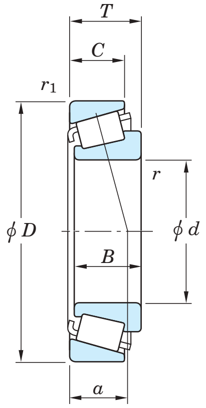
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

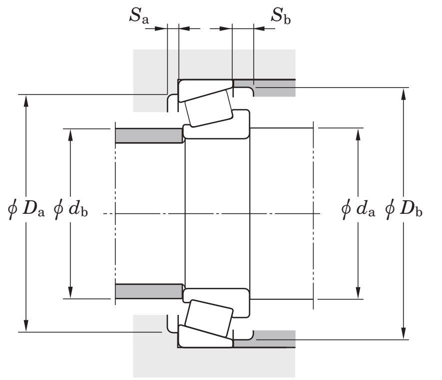
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
21.430	0.8437	50.005	1.9687	17.526	0.6900	18.288	0.7200	13.970	0.5500	1.2	0.05	1.2	0.05	48.8	40.7	5.80	**M12649**	**M12610**	11.1	0.44	27.5	1.08	25.5	1.00	44.0	1.73	46.0	1.81	0.28	2.16	1.19	11.2	5.35	2.10
21.987	0.8656	45.974	1.8100	15.494	0.6100	16.637	0.6550	12.065	0.4750	1.2	0.05	1.2	0.05	37.5	34.6	4.85	**LM12749**	**LM12711**	10.0	0.39	27.5	1.08	26.0	1.02	40.0	1.57	42.5	1.67	0.31	1.96	1.08	8.65	4.50	1.91
22.225	0.8750	50.005	1.9687	17.526	0.6900	18.288	0.7200	13.970	0.5500	1.2	0.05	1.2	0.05	48.8	40.7	5.80	**M12648**	**M12610**	11.1	0.44	28.5	1.12	26.5	1.04	44.0	1.73	46.0	1.81	0.28	2.16	1.19	11.2	5.35	2.10
	0.8750	50.005	1.9687	17.526	0.6900	18.288	0.7200	13.970	0.5500	1.2	0.05	1.2	0.05	48.8	40.7	5.80	**M12648A**	**M12610**	11.1	0.44	28.5	1.12	26.5	1.04	44.0	1.73	46.0	1.81	0.28	2.16	1.19	11.2	5.35	2.10
	0.8750	50.800	2.0000	15.011	0.5910	14.260	0.5614	12.700	0.5000	1.2	0.05	1.6	0.06	33.3	28.8	4.05	**07087**	**07210X**	12.3	0.48	28.5	1.12	27.0	1.06	44.5	1.75	47.5	1.87	0.40	1.49	0.82	7.65	5.25	1.46
	0.8750	52.388	2.0625	19.368	0.7625	20.168	0.7940	14.288	0.5625	1.6	0.06	1.6	0.06	45.9	37.9	5.45	**1380**	**1328**	11.6	0.46	29.5	1.16	29.5	1.16	45.0	1.77	48.5	1.91	0.29	2.05	1.13	10.7	5.35	2.00
	0.8750	53.975	2.1250	19.368	0.7625	20.168	0.7940	14.288	0.5625	1.6	0.06	1.6	0.06	45.9	37.9	5.45	**1380**	**1329**	11.6	0.46	29.5	1.16	29.5	1.16	46.0	1.81	49.0	1.93	0.29	2.05	1.13	10.7	5.35	2.00
	0.8750	56.896	2.2400	19.368	0.7625	19.837	0.7810	15.875	0.6250	1.2	0.05	1.2	0.05	50.0	43.1	6.20	**1755**	**1729**	12.5	0.49	29.0	1.14	27.5	1.08	49.0	1.93	51.0	2.01	0.31	1.95	1.07	11.6	6.10	1.90
	0.8750	57.150	2.2500	17.462	0.6875	17.462	0.6875	13.495	0.5313	1.6	0.06	1.6	0.06	47.2	42.7	6.10	**15572**	**15520**	12.7	0.50	32.5	1.28	30.5	1.20	51.0	2.01	53.0	2.09	0.35	1.73	0.95	10.8	6.40	1.69
	0.8750	57.150	2.2500	19.845	0.7813	19.355	0.7620	15.875	0.6250	0.8	0.03	1.6	0.06	60.8	57.1	8.25	**1975R**	**1922**	13.9	0.55	29.0	1.14	28.0	1.10	51.0	2.01	53.5	2.11	0.33	1.82	1.00	14.0	7.90	1.77
	0.8750	57.150	2.2500	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	1.6	0.06	65.8	55.7	8.05	**1280**	**1220**	15.3	0.60	29.5	1.16	29.0	1.14	49.0	1.93	52.0	2.05	0.35	1.73	0.95	15.2	9.00	1.69
	0.8750	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	1.6	0.06	1.2	0.05	83.8	75.2	11.2	**2684**	**2631**	13.9	0.55	31.5	1.24	29.0	1.14	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
	0.8750	80.000	3.1496	20.996	0.8266	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**341**	**332**	15.1	0.59	33.5	1.32	32.0	1.26	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
22.606	0.8900	47.000	1.8504	15.500	0.6102	15.500	0.6102	12.000	0.4724	1.6	0.06	1.0	0.04	35.0	32.8	4.45	**LM72849**	**LM72810**	12.3	0.48	30.0	1.18	28.0	1.10	40.5	1.59	44.0	1.73	0.47	1.27	0.70	8.05	6.50	1.24
23.812	0.9375	50.292	1.9800	14.224	0.5600	14.732	0.5800	10.668	0.4200	1.6	0.06	1.2	0.05	39.1	37.0	5.15	**L44640R**	**L44610**	10.8	0.43	30.5	1.20	28.5	1.12	44.5	1.75	47.0	1.85	0.37	1.60	0.88	8.95	5.70	1.56
	0.9375	52.000	2.0472	15.011	0.5910	14.260	0.5614	12.700	0.5000	1.6	0.06	2.0	0.08	33.3	28.8	4.05	**07093**	**07205**	12.3	0.48	30.5	1.20	28.5	1.12	44.5	1.75	48.0	1.89	0.40	1.49	0.82	7.65	5.25	1.46
	0.9375	56.896	2.2400	19.368	0.7625	19.837	0.7810	15.875	0.6250	0.8	0.03	1.2	0.05	50.0	43.1	6.20	**1779**	**1729**	12.5	0.49	29.5	1.16	28.5	1.12	49.0	1.93	51.0	2.01	0.31	1.95	1.07	11.6	6.10	1.90
	0.9375	56.896	2.2400	19.368	0.7625	19.837	0.7810	15.875	0.6250	0.8	0.03	1.6	0.06	50.0	43.1	6.20	**1779**	**1729X**	12.5	0.49	29.5	1.16	28.5	1.12	49.0	1.93	52.0	2.05	0.31	1.95	1.07	11.6	6.10	1.90
	0.9375	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	0.8	0.03	1.2	0.05	83.8	75.2	11.2	**2685**	**2631**	13.9	0.55	30.5	1.20	30.0	1.18	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
	0.9375	71.996	2.8345	19.000	0.7480	18.923	0.7450	15.875	0.6250	2.4	0.09	1.6	0.06	69.8	60.0	8.85	**26093**	**26283**	14.3	0.56	35.0	1.38	32.0	1.26	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
24.981	0.9835	50.005	1.9687	13.495	0.5313	14.260	0.5614	9.525	0.3750	1.6	0.06	1.0	0.04	33.3	28.8	4.05	**07098**	**07196**	10.8	0.43	31.0	1.22	29.0	1.14	44.5	1.75	47.0	1.85	0.40	1.49	0.82	7.65	5.25	1.46
	0.9835	62.000	2.4409	16.002	0.6300	16.566	0.6522	14.288	0.5625	1.6	0.06	1.6	0.06	47.4	40.6	5.80	**17098**	**17244**	12.7	0.50	33.0	1.30	30.5	1.20	54.0	2.13	57.0	2.24	0.38	1.57	0.86	10.9	7.15	1.53
25.000	0.9842	50.005	1.9687	13.495	0.5313	14.260	0.5614	9.525	0.3750	1.6	0.06	1.0	0.04	33.3	28.8	4.05	**07097**	**07196**	10.8	0.43	31.0	1.22	29.0	1.14	44.5	1.75	47.0	1.85	0.40	1.49	0.82	7.65	5.25	1.46
	0.9842	62.000	2.4409	16.002	0.6300	16.566	0.6522	14.288	0.5625	1.6	0.06	1.6	0.06	47.4	40.6	5.80	**17098X**	**17244**	12.7	0.50	33.0	1.30	30.5	1.20	54.0	2.13	57.0	2.24	0.38	1.57	0.86	10.9	7.15	1.53
	0.9842	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	2.0	0.08	1.2	0.05	83.8	75.2	11.2	**2694X**	**2631**	13.9	0.55	33.0	1.30	31.0	1.22	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
	0.9842	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	3.6	0.14	3.2	0.13	98.6	89.3	13.3	**3188X**	**3120**	20.3	0.80	40.0	1.57	35.0	1.38	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
25.400	1.0000	50.005	1.9687	13.495	0.5313	14.260	0.5614	9.525	0.3750	1.0	0.04	1.0	0.04	33.3	28.8	4.05	**07100**	**07196**	10.8	0.43	30.5	1.20	29.5	1.16	44.5	1.75	47.0	1.85	0.40	1.49	0.82	7.65	5.25	1.46
	1.0000	50.005	1.9687	13.495	0.5313	14.260	0.5614	9.525	0.3750	1.6	0.06	1.0	0.04	33.3	28.8	4.05	**07100S**	**07196**	10.8	0.43	31.5	1.24	29.5	1.16	44.5	1.75	47.0	1.85	0.40	1.49	0.82	7.65	5.25	1.46
	1.0000	50.005	1.9687	13.495	0.5313	14.260	0.5614	9.525	0.3750	3.2	0.13	1.0	0.04	33.3	28.8	4.05	**07100SA**	**07196**	10.8	0.43	35.0	1.38	29.5	1.16	44.5	1.75	47.0	1.85	0.40	1.49	0.82	7.65	5.25	1.46
	1.0000	50.292	1.9800	14.224	0.5600	14.732	0.5800	10.668	0.4200	1.2	0.05	1.2	0.05	39.1	37.0	5.15	**L44643R**	**L44610**	10.8	0.43	31.5	1.24	29.5	1.16	44.5	1.75	47.0	1.85	0.37	1.60	0.88	8.95	5.70	1.56
	1.0000	51.994	2.0470	15.011	0.5910	14.260	0.5614	12.700	0.5000	1.0	0.04	1.2	0.05	33.3	28.8	4.05	**07100**	**07204**	12.3	0.48	30.5	1.20	29.5	1.16	45.0	1.77	48.0	1.89	0.40	1.49	0.82	7.65	5.25	1.46
	1.0000	53.975	2.1250	19.368	0.7625	19.837	0.7810	15.875	0.6250	0.8	0.03	0.8	0.03	50.0	43.1	6.20	**1780**	**1730**	12.5	0.49	30.5	1.20	30.0	1.18	48.5	1.91	50.0	1.97	0.31	1.95	1.07	11.6	6.10	1.90
	1.0000	57.150	2.2500	17.462	0.6875	17.462	0.6875	13.495	0.5313	1.2	0.05	1.6	0.06	47.2	42.7	6.10	**15578**	**15520**	12.7	0.50	32.5	1.28	30.5	1.20	51.0	2.01	53.0	2.09	0.35	1.73	0.95	10.8	6.40	1.69
	1.0000	58.738	2.3125	19.050	0.7500	19.355	0.7620	15.080	0.5937	1.2	0.05	1.2	0.05	60.8	57.1	8.25	**1986R**	**1932**	13.1	0.52	32.5	1.28	30.5	1.20	52.0	2.05	54.0	2.13	0.33	1.82	1.00	14.0	7.90	1.77
	1.0000	59.530	2.3437	23.368	0.9200	23.114	0.9100	18.288	0.7200	0.8	0.03	1.6	0.06	63.0	57.1	7.95	**M84249**	**M84210**	18.2	0.72	36.0	1.42	32.5	1.28	49.5	1.95	56.0	2.20	0.55	1.10	0.60	14.6	13.6	1.07
	1.0000	60.325	2.3750	19.845	0.7813	19.355	0.7620	15.875	0.6250	3.6	0.14	1.2	0.05	60.8	57.1	8.25	**1994XR**	**1931**	13.9	0.55	37.0	1.46	30.5	1.20	52.0	2.05	55.0	2.17	0.33	1.82	1.00	14.0	7.90	1.77
	1.0000	61.912	2.4375	19.050	0.7500	20.638	0.8125	14.288	0.5625	0.8	0.03	2.0	0.08	55.7	50.7	7.30	**15101**	**15243**	13.2	0.52	32.5	1.28	31.5	1.24	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.0000	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	3.6	0.14	1.2	0.05	55.7	50.7	7.30	**15100**	**15245**	13.2	0.52	38.0	1.50	31.5	1.24	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67

Note 1) SP indicates the specially chamfered from.

TS type

d (25.400) ~ (28.575) mm
(1.0000) ~ (1.1250) inch





$P = XF_r + YF_a$

$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

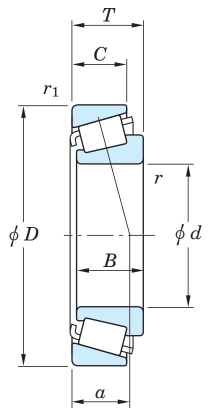
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

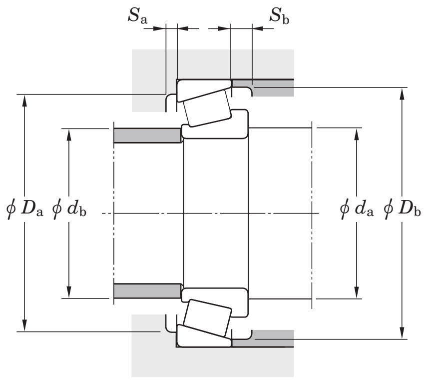
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
25.400	1.0000	63.500	2.5000	19.050	0.7500	20.638	0.8125	14.288	0.5625	0.8	0.03	1.2	0.05	55.7	50.7	7.30	**15101**	**15250R**	13.2	0.52	32.5	1.28	31.5	1.24	55.0	2.17	59.0	2.32	0.35	1.71	0.94	12.9	7.75	1.67
	1.0000	63.500	2.5000	20.638	0.8125	20.638	0.8125	15.875	0.6250	3.6	0.14	1.2	0.05	55.7	50.7	7.30	**15100**	**15250**	15.0	0.59	38.0	1.50	31.5	1.24	55.0	2.17	59.0	2.32	0.35	1.71	0.94	12.9	7.75	1.67
	1.0000	63.500	2.5000	20.638	0.8125	20.638	0.8125	15.875	0.6250	3.6	0.14	1.6	0.06	55.7	50.7	7.30	**15100**	**15250X**	15.0	0.59	38.0	1.50	31.5	1.24	55.0	2.17	59.0	2.32	0.35	1.71	0.94	12.9	7.75	1.67
	1.0000	63.500	2.5000	20.638	0.8125	20.638	0.8125	15.875	0.6250	1.6	0.06	1.6	0.06	55.7	50.7	7.30	**15102**	**15250X**	15.0	0.59	34.0	1.34	31.5	1.24	55.0	2.17	59.0	2.32	0.35	1.71	0.94	12.9	7.75	1.67
	1.0000	64.292	2.5312	21.432	0.8438	21.432	0.8438	16.670	0.6563	1.6	0.06	1.6	0.06	69.1	70.7	9.90	**M86643R**	**M86610**	18.0	0.71	38.0	1.50	36.5	1.44	54.0	2.13	61.0	2.40	0.55	1.10	0.60	16.0	14.9	1.07
	1.0000	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	1.2	0.05	1.2	0.05	83.8	75.2	11.2	**2687**	**2631**	13.9	0.55	33.5	1.32	31.5	1.24	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
	1.0000	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	1.6	0.06	63.7	61.1	8.80	**02473**	**02420**	17.1	0.67	34.5	1.36	33.5	1.32	59.0	2.32	63.0	2.48	0.42	1.44	0.79	14.8	10.5	1.41
	1.0000	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	0.8	0.03	63.7	61.1	8.80	**02473**	**02421**	17.1	0.67	34.5	1.36	33.5	1.32	59.0	2.32	63.0	2.48	0.42	1.44	0.79	14.8	10.5	1.41
	1.0000	72.000	2.8346	19.000	0.7480	18.923	0.7450	15.875	0.6250	1.6	0.06	1.6	0.06	69.8	60.0	8.85	**26100**	**26283**	14.3	0.56	34.5	1.36	32.5	1.28	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
	1.0000	72.233	2.8438	25.400	1.0000	25.400	1.0000	19.842	0.7812	0.8	0.03	2.4	0.09	83.8	87.4	12.4	**HM88630**	**HM88610**	20.7	0.81	39.5	1.56	39.5	1.56	60.0	2.36	69.0	2.72	0.55	1.10	0.60	19.6	18.3	1.07
	1.0000	72.626	2.8593	24.608	0.9688	24.257	0.9550	17.462	0.6875	2.4	0.09	1.6	0.06	77.3	60.5	8.75	**41100**	**41286**	20.7	0.81	41.0	1.61	36.5	1.44	61.0	2.40	68.0	2.68	0.60	1.00	0.55	17.9	18.4	0.97
	1.0000	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	0.8	0.03	0.8	0.03	98.6	89.3	13.3	**3189**	**3130**	20.3	0.80	35.5	1.40	35.0	1.38	63.0	2.48	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.0000	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	2.0	0.08	3.2	0.13	98.6	89.3	13.3	**3189X**	**3120**	20.3	0.80	37.5	1.48	35.0	1.38	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.0000	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**338**	**332**	15.1	0.59	36.5	1.44	35.0	1.38	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.0000	80.000	3.1496	24.176	0.9518	22.403	0.8820	21.000	0.8268	0.8	0.03	2.4	0.09	85.0	74.8	11.4	**338**	**332A**	18.3	0.72	36.5	1.44	35.0	1.38	71.0	2.80	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
25.987	1.0231	50.292	1.9800	14.224	0.5600	14.732	0.5800	10.668	0.4200	3.6	0.14	1.2	0.05	39.1	37.0	5.15	**L44645R**	**L44610**	10.8	0.43	36.5	1.44	31.0	1.22	44.5	1.75	47.0	1.85	0.37	1.60	0.88	8.95	5.70	1.56
	1.0231	57.150	2.2500	17.462	0.6875	17.462	0.6875	13.495	0.5313	3.6	0.14	1.6	0.06	47.2	42.7	6.10	**15579X**	**15520**	12.7	0.50	38.5	1.52	32.0	1.26	51.0	2.01	53.0	2.09	0.35	1.73	0.95	10.8	6.40	1.69
26.157	1.0298	63.500	2.5000	20.638	0.8125	20.638	0.8125	15.875	0.6250	0.8	0.03	1.2	0.05	55.7	50.7	7.30	**15103**	**15250**	15.0	0.59	33.5	1.32	33.0	1.30	55.0	2.17	59.0	2.32	0.35	1.71	0.94	12.9	7.75	1.67
26.162	1.0300	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	1.6	0.06	1.2	0.05	83.8	75.2	11.2	**2682**	**2631**	13.9	0.55	34.5	1.36	32.0	1.26	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
26.975	1.0620	57.150	2.2500	19.845	0.7813	19.355	0.7620	15.875	0.6250	0.8	0.03	1.6	0.06	60.8	57.1	8.25	**1987R**	**1922**	13.9	0.55	32.5	1.28	31.5	1.24	51.0	2.01	53.5	2.11	0.33	1.82	1.00	14.0	7.90	1.77
26.987	1.0625	72.626	2.8593	24.608	0.9688	24.257	0.9550	17.462	0.6875	2.4	0.09	1.6	0.06	77.3	60.5	8.75	**41106**	**41286**	20.7	0.81	42.0	1.65	36.5	1.44	61.0	2.40	68.0	2.68	0.60	1.00	0.55	17.9	18.4	0.97
26.988	1.0625	50.292	1.9800	14.224	0.5600	14.732	0.5800	10.668	0.4200	3.6	0.14	1.2	0.05	39.1	37.0	5.15	**L44649R**	**L44610**	10.8	0.43	37.5	1.48	31.0	1.22	44.5	1.75	47.0	1.85	0.37	1.60	0.88	8.95	5.70	1.56
	1.0625	57.150	2.2500	19.845	0.7813	19.355	0.7620	15.875	0.6250	3.2	0.13	1.6	0.06	60.8	57.1	8.25	**1997XR**	**1922**	13.9	0.55	37.5	1.48	31.5	1.24	51.0	2.01	53.5	2.11	0.33	1.82	1.00	14.0	7.90	1.77
	1.0625	60.325	2.3750	19.842	0.7812	17.462	0.6875	15.875	0.6250	3.6	0.14	1.6	0.06	47.2	42.7	6.10	**15580**	**15523**	15.1	0.59	38.5	1.52	32.0	1.26	51.0	2.01	54.0	2.13	0.35	1.73	0.95	10.8	6.40	1.69
	1.0625	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	0.8	0.03	1.2	0.05	55.7	50.7	7.30	**15106**	**15245**	13.2	0.52	33.5	1.32	33.0	1.30	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.0625	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	1.6	0.06	1.2	0.05	83.8	75.2	11.2	**2688**	**2631**	13.9	0.55	35.0	1.38	33.0	1.30	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
28.575	1.1250	57.150	2.2500	17.462	0.6875	17.462	0.6875	13.495	0.5313	3.6	0.14	1.6	0.06	47.2	42.7	6.10	**15590**	**15520**	12.7	0.50	39.0	1.54	33.5	1.32	51.0	2.01	53.0	2.09	0.35	1.73	0.95	10.8	6.40	1.69
	1.1250	57.150	2.2500	19.845	0.7813	19.355	0.7620	15.875	0.6250	0.8	0.03	1.6	0.06	60.8	57.1	8.25	**1985R**	**1922**	13.9	0.55	34.0	1.34	33.5	1.32	51.0	2.01	53.5	2.11	0.33	1.82	1.00	14.0	7.90	1.77
	1.1250	57.150	2.2500	19.845	0.7813	19.355	0.7620	15.875	0.6250	3.6	0.14	1.6	0.06	60.8	57.1	8.25	**1988R**	**1922**	13.9	0.55	39.5	1.56	33.5	1.32	51.0	2.01	53.5	2.11	0.33	1.82	1.00	14.0	7.90	1.77
	1.1250	59.131	2.3280	15.875	0.6250	16.764	0.6600	11.811	0.4650	SP	SP	1.2	0.05	44.8	43.1	6.05	**LM67043**	**LM67010**	13.0	0.51	40.5	1.59	34.0	1.34	52.0	2.05	56.0	2.20	0.41	1.46	0.80	10.3	7.25	1.42
	1.1250	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	3.6	0.14	1.2	0.05	55.7	50.7	7.30	**15112**	**15245**	13.2	0.52	40.0	1.57	34.0	1.34	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.1250	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	0.8	0.03	1.2	0.05	55.7	50.7	7.30	**15113**	**15245**	13.2	0.52	34.5	1.36	34.0	1.34	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.1250	64.292	2.5312	21.432	0.8438	21.432	0.8438	16.670	0.6563	1.6	0.06	1.6	0.06	69.1	70.7	9.90	**M86647R**	**M86610**	18.0	0.71	40.0	1.57	38.0	1.50	54.0	2.13	61.0	2.40	0.55	1.10	0.60	16.0	14.9	1.07
	1.1250	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	1.2	0.05	1.2	0.05	83.8	75.2	11.2	**2689**	**2631**	13.9	0.55	36.0	1.42	34.0	1.34	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
	1.1250	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	4.8	0.19	1.2	0.05	83.8	75.2	11.2	**2689X**	**2631**	13.9	0.55	42.0	1.65	34.0	1.34	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
	1.1250	66.421	2.6150	25.400	1.0000	25.357	0.9983	20.638	0.8125	2.4	0.09	3.2	0.13	89.2	85.1	12.7	**2578**	**2520**	16.0	0.63	39.0	1.54	35.0	1.38	57.0	2.24	62.5	2.46	0.27	2.19	1.21	20.7	9.65	2.14
	1.1250	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	1.6	0.06	63.7	61.1	8.80	**02474**	**02420**	17.1	0.67	36.5	1.44	36.0	1.42	59.0	2.32	63.0	2.48	0.42	1.44	0.79	14.8	10.5	1.41
	1.1250	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	2.4	0.09	1.6	0.06	70.2	71.1	10.0	**M88040**	**M88010**	19.2	0.76	42.0	1.65	39.0	1.54	58.0	2.28	65.0	2.56	0.55	1.10	0.60	16.3	15.2	1.07

Note 1) SP indicates the specially chamfered from.

TS type

d (28.575) ~ (30.162) mm
(1.1250) ~ (1.1875) inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

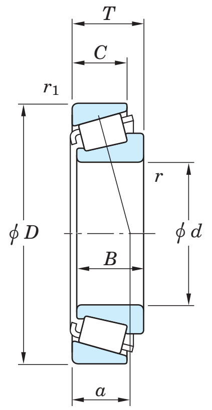
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

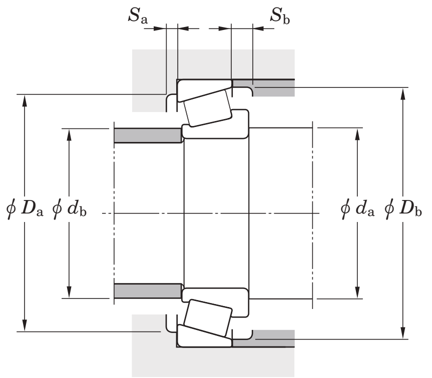
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r1) (min.)		$r_1$1) (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
28.575	1.1250	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	2.4	0.09	2.4	0.09	70.2	71.1	10.0	**M88040**	**M88011**	19.2	0.76	42.0	1.65	39.0	1.54	58.0	2.28	65.0	2.56	0.55	1.10	0.60	16.3	15.2	1.07
	1.1250	72.000	2.8346	19.000	0.7480	18.923	0.7450	15.875	0.6250	1.6	0.06	1.6	0.06	59.4	60.0	7.25	**26112**	**26283**	14.3	0.56	37.0	1.46	35.0	1.38	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
	1.1250	72.626	2.8593	24.608	0.9688	24.257	0.9550	17.462	0.6875	4.8	0.19	1.6	0.06	77.3	60.5	8.75	**41125**	**41286**	20.7	0.81	48.0	1.89	36.5	1.44	61.0	2.40	68.0	2.68	0.60	1.00	0.55	17.9	18.4	0.97
	1.1250	72.626	2.8593	24.608	0.9688	24.257	0.9550	17.462	0.6875	1.6	0.06	1.6	0.06	77.3	60.5	8.75	**41126**	**41286**	20.7	0.81	41.5	1.63	36.5	1.44	61.0	2.40	68.0	2.68	0.60	1.00	0.55	17.9	18.4	0.97
	1.1250	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	3.6	0.14	3.2	0.13	98.6	89.3	13.3	**3192**	**3120**	20.3	0.80	42.5	1.67	37.0	1.46	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.1250	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	1.2	0.05	3.2	0.13	98.6	89.3	13.3	**3198**	**3120**	20.3	0.80	39.0	1.54	37.0	1.46	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.1250	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	3.2	0.13	68.8	65.7	9.55	**02872**	**02820**	18.4	0.72	37.5	1.48	37.0	1.46	62.0	2.44	68.0	2.68	0.45	1.32	0.73	16.0	12.4	1.29
	1.1250	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	0.8	0.03	68.8	65.7	9.55	**02872**	**02830**	18.4	0.72	37.5	1.48	37.0	1.46	64.0	2.52	69.0	2.72	0.45	1.32	0.73	16.0	12.4	1.29
	1.1250	80.962	3.1875	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	0.8	0.03	68.8	65.7	9.55	**02872**	**02831**	18.4	0.72	37.5	1.48	37.0	1.46	67.0	2.64	69.0	2.72	0.45	1.32	0.73	16.0	12.4	1.29
29.000	1.1417	50.292	1.9800	14.224	0.5600	14.732	0.5800	10.668	0.4200	3.6	0.14	1.2	0.05	36.3	37.2	5.15	**L45449**	**L45410**	10.9	0.43	39.5	1.56	33.0	1.30	44.5	1.75	48.0	1.89	0.37	1.62	0.89	8.35	5.25	1.58
	1.1417	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	1.0	0.04	1.2	0.05	83.8	75.2	11.2	**2695X**	**2631**	13.9	0.55	35.0	1.38	34.0	1.34	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
29.367	1.1562	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	3.6	0.14	1.2	0.05	83.8	75.2	11.2	**2690**	**2631**	13.9	0.55	41.0	1.61	35.0	1.38	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
	1.1562	66.421	2.6150	23.812	0.9375	25.433	1.0013	19.050	0.7500	0.8	0.03	1.2	0.05	83.8	75.2	11.2	**2691**	**2631**	13.9	0.55	35.5	1.40	35.0	1.38	58.0	2.28	60.0	2.36	0.25	2.36	1.30	19.5	8.45	2.30
29.985	1.1805	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	0.8	0.03	3.2	0.13	98.6	89.3	13.3	**3190S**	**3120**	20.3	0.80	39.0	1.54	38.0	1.50	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
29.987	1.1806	62.000	2.4409	16.002	0.6300	16.566	0.6522	14.288	0.5625	1.6	0.06	1.6	0.06	47.4	40.6	5.80	**17118**	**17244**	12.7	0.50	37.0	1.46	34.5	1.36	54.0	2.13	57.0	2.24	0.38	1.57	0.86	10.9	7.15	1.53
	1.1806	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	1.2	0.05	1.2	0.05	55.7	50.7	7.30	**15117**	**15245**	13.2	0.52	36.5	1.44	35.0	1.38	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.1806	71.996	2.8345	19.000	0.7480	18.923	0.7450	15.875	0.6250	1.6	0.06	2.0	0.08	69.8	60.0	8.85	**26118**	**26283S**	14.3	0.56	38.0	1.50	36.0	1.42	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
	1.1806	72.000	2.8346	19.000	0.7480	18.923	0.7450	15.875	0.6250	1.6	0.06	1.6	0.06	69.8	60.0	8.85	**26118**	**26283**	14.3	0.56	38.0	1.50	36.0	1.42	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
30.000	1.1811	62.000	2.4409	16.002	0.6300	16.566	0.6522	14.288	0.5625	1.6	0.06	1.6	0.06	47.4	40.6	5.80	**17118S**	**17244**	12.7	0.50	37.0	1.46	34.5	1.36	54.0	2.13	57.0	2.24	0.38	1.57	0.86	10.9	7.15	1.53
	1.1811	68.956	2.7148	19.845	0.7813	19.202	0.7560	15.875	0.6250	0.8	0.03	3.2	0.13	57.7	55.0	7.95	**14118**	**14274A**	15.5	0.61	37.0	1.46	36.5	1.44	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.1811	69.012	2.7170	19.845	0.7813	19.583	0.7710	15.875	0.6250	3.6	0.14	1.2	0.05	57.7	55.0	7.95	**14117A**	**14276**	15.5	0.61	42.5	1.67	39.5	1.56	60.0	2.36	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.1811	69.012	2.7170	19.845	0.7813	19.583	0.7710	15.875	0.6250	3.6	0.14	3.2	0.13	57.7	55.0	7.95	**14118A**	**14274**	15.5	0.61	42.5	1.67	39.5	1.56	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.1811	69.850	2.7500	23.812	0.9375	25.357	0.9983	19.050	0.7500	3.6	0.14	1.2	0.05	89.2	85.1	12.7	**2586**	**2523**	14.4	0.57	42.0	1.65	35.5	1.40	61.0	2.40	64.0	2.52	0.27	2.19	1.21	20.7	9.65	2.14
	1.1811	71.996	2.8345	19.000	0.7480	18.923	0.7450	15.875	0.6250	1.6	0.06	1.6	0.06	69.8	60.0	8.85	**26118S**	**26283**	14.3	0.56	38.0	1.50	36.0	1.42	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
	1.1811	72.085	2.8380	29.522	1.1623	26.721	1.0520	18.415	0.7250	3.6	0.14	2.4	0.09	57.7	55.0	7.95	**14120A**	**14283**	22.6	0.89	42.5	1.67	39.5	1.56	60.0	2.36	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.1811	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	3.6	0.14	3.2	0.13	98.6	89.3	13.3	**3190**	**3120**	20.3	0.80	43.0	1.69	38.0	1.50	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.1811	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**348**	**332**	15.1	0.59	39.5	1.56	39.5	1.56	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.1811	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	0.8	0.03	1.6	0.06	123	112	17.2	**416**	**414**	16.9	0.67	39.5	1.56	39.5	1.56	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.1811	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	0.8	0.03	3.2	0.13	123	112	17.2	**416**	**414A**	16.9	0.67	39.5	1.56	39.5	1.56	76.0	2.99	79.0	3.11	0.26	2.28	1.25	28.6	12.9	2.22
30.112	1.1855	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	0.8	0.03	1.2	0.05	55.7	50.7	7.30	**15116**	**15245**	13.2	0.52	36.0	1.42	35.5	1.40	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
30.162	1.1875	58.738	2.3125	14.684	0.5781	15.080	0.5937	10.716	0.4219	3.6	0.14	1.0	0.04	37.0	33.3	4.60	**08118**	**08231**	13.5	0.53	41.5	1.63	35.0	1.38	52.0	2.05	55.0	2.17	0.48	1.26	0.69	8.45	6.85	1.23
	1.1875	62.000	2.4409	16.002	0.6300	16.566	0.6522	14.288	0.5625	1.6	0.06	1.6	0.06	47.4	40.6	5.80	**17119**	**17244**	12.7	0.50	37.0	1.46	34.5	1.36	54.0	2.13	57.0	2.24	0.38	1.57	0.86	10.9	7.15	1.53
	1.1875	64.292	2.5312	21.432	0.8438	21.432	0.8438	16.670	0.6563	1.6	0.06	1.6	0.06	69.1	70.7	9.90	**M86649R**	**M86610**	18.0	0.71	41.0	1.61	38.0	1.50	54.0	2.13	61.0	2.40	0.55	1.10	0.60	16.0	14.9	1.07
	1.1875	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	1.6	0.06	63.7	61.1	8.80	**02477**	**02420**	17.1	0.67	38.0	1.50	36.0	1.42	59.0	2.32	63.0	2.48	0.42	1.44	0.79	14.8	10.5	1.41
	1.1875	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	2.4	0.09	1.6	0.06	70.2	71.1	10.0	**M88043**	**M88010**	19.2	0.76	43.5	1.71	39.5	1.56	58.0	2.28	65.0	2.56	0.55	1.10	0.60	16.3	15.2	1.07
	1.1875	69.850	2.7500	23.812	0.9375	25.357	0.9983	19.050	0.7500	2.4	0.09	1.6	0.06	89.2	85.1	12.7	**2558**	**2523S**	14.4	0.57	40.0	1.57	36.5	1.44	61.0	2.40	64.0	2.52	0.27	2.19	1.21	20.7	9.65	2.14
	1.1875	69.850	2.7500	23.812	0.9375	25.357	0.9983	19.050	0.7500	0.8	0.03	1.2	0.05	89.2	85.1	12.7	**2559**	**2523**	14.4	0.57	37.0	1.46	36.5	1.44	61.0	2.40	64.0	2.52	0.27	2.19	1.21	20.7	9.65	2.14
	1.1875	72.022	2.8355	23.812	0.9375	25.357	0.9983	19.050	0.7500	2.4	0.09	0.8	0.03	89.2	85.1	12.7	**2558**	**2525**	14.4	0.57	40.0	1.57	36.5	1.44	64.0	2.52	65.0	2.56	0.27	2.19	1.21	20.7	9.65	2.14

Note 1) SP indicates the specially chamfered from.

TS type

d (30.162) ~ (31.750) mm
(1.1875) ~ (1.2500) inch





$P = XF_r + YF_a$ $P_0 = 0.5\ F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

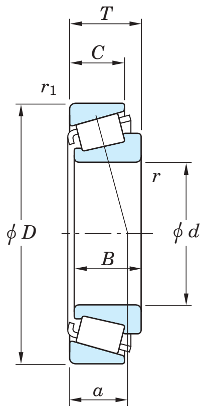
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

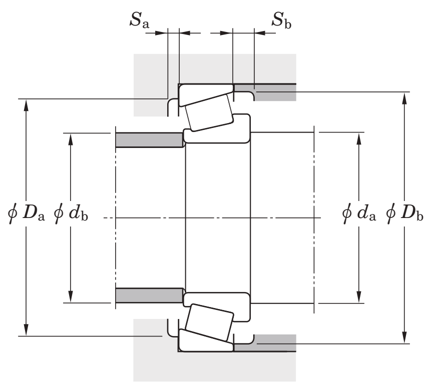
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r 1) (min.)		r_1 1) (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
30.162	1.1875	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	0.8	0.03	0.8	0.03	98.6	89.3	13.3	**3187**	**3130**	20.3	0.80	39.0	1.54	38.5	1.52	63.0	2.48	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.1875	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	3.6	0.14	3.2	0.13	98.6	89.3	13.3	**3191**	**3120**	20.3	0.80	44.0	1.73	38.5	1.52	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.1875	76.200	3.0000	30.162	1.1875	29.997	1.1810	23.812	0.9375	3.6	0.14	0.8	0.03	98.6	89.3	13.3	**3191**	**3129**	20.3	0.80	44.0	1.73	38.5	1.52	65.0	2.56	69.0	2.72	0.33	1.80	0.99	23.0	13.1	1.76
	1.1875	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	0.8	0.03	3.2	0.13	109	105	15.7	**3474**	**3420**	20.8	0.82	41.0	1.61	40.0	1.57	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.1875	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**334**	**332**	15.1	0.59	39.5	1.56	39.5	1.56	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.1875	80.000	3.1496	24.176	0.9518	22.403	0.8820	21.000	0.8268	0.8	0.03	2.4	0.09	85.0	74.8	11.4	**334**	**332A**	18.3	0.72	39.5	1.56	39.5	1.56	71.0	2.80	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.1875	80.035	3.1510	21.432	0.8438	20.940	0.8244	15.875	0.6250	1.6	0.06	1.6	0.06	71.6	65.9	9.70	**28118**	**28317**	16.9	0.67	40.0	1.57	37.5	1.48	69.0	2.72	73.0	2.87	0.40	1.49	0.82	16.5	11.3	1.46
30.213	1.1895	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	3.6	0.14	1.2	0.05	55.7	50.7	7.30	**15118**	**15245**	13.2	0.52	41.5	1.63	35.5	1.40	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.1895	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	1.6	0.06	1.2	0.05	55.7	50.7	7.30	**15119**	**15245**	13.2	0.52	37.5	1.48	35.5	1.40	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.1895	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	0.8	0.03	1.2	0.05	55.7	50.7	7.30	**15120**	**15245**	13.2	0.52	36.0	1.42	35.5	1.40	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
30.226	1.1900	69.012	2.7170	19.845	0.7813	19.583	0.7710	15.875	0.6250	0.8	0.03	3.2	0.13	57.7	55.0	7.95	**14116**	**14274**	15.5	0.61	37.0	1.46	36.5	1.44	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
30.955	1.2187	64.292	2.5312	21.432	0.8438	21.432	0.8438	16.670	0.6563	2.4	0.09	1.6	0.06	69.1	70.7	9.90	**M86648R**	**M86610**	18.0	0.71	41.0	1.61	38.0	1.50	54.0	2.13	61.0	2.40	0.55	1.10	0.60	16.0	14.9	1.07
31.623	1.2450	66.675	2.6250	20.638	0.8125	20.638	0.8125	15.875	0.6250	1.6	0.06	1.6	0.06	58.1	54.5	7.90	**1674**	**1620**	15.7	0.62	45.0	1.77	38.5	1.52	58.0	2.28	61.0	2.40	0.37	1.62	0.89	13.5	8.55	1.57
31.750	1.2500	58.738	2.3125	14.684	0.5781	15.080	0.5937	10.716	0.4219	1.0	0.04	1.0	0.04	37.0	33.3	4.60	**08125**	**08231**	13.5	0.53	37.5	1.48	36.0	1.42	52.0	2.05	55.0	2.17	0.48	1.26	0.69	8.45	6.85	1.23
	1.2500	59.131	2.3280	15.875	0.6250	16.764	0.6600	11.811	0.4650	SP	SP	1.2	0.05	44.8	43.1	6.05	**LM67048**	**LM67010**	13.0	0.51	42.5	1.67	36.0	1.42	52.0	2.05	56.0	2.20	0.41	1.46	0.80	10.3	7.25	1.42
	1.2500	62.000	2.4409	18.161	0.7150	19.050	0.7500	14.288	0.5625	SP	SP	1.2	0.05	55.7	50.7	7.30	**15123**	**15245**	13.2	0.52	42.5	1.67	36.5	1.44	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.2500	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	3.6	0.14	1.2	0.05	55.7	50.7	7.30	**15125**	**15245**	13.2	0.52	42.5	1.67	36.5	1.44	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.2500	62.000	2.4409	19.050	0.7500	20.638	0.8125	14.288	0.5625	0.8	0.03	1.2	0.05	55.7	50.7	7.30	**15126**	**15245**	13.2	0.52	37.0	1.46	36.5	1.44	55.0	2.17	58.0	2.28	0.35	1.71	0.94	12.9	7.75	1.67
	1.2500	66.421	2.6150	25.400	1.0000	25.357	0.9983	20.638	0.8125	0.8	0.03	3.2	0.13	89.2	85.1	12.7	**2580**	**2520**	16.0	0.63	38.5	1.52	37.5	1.48	57.0	2.24	62.5	2.46	0.27	2.19	1.21	20.7	9.65	2.14
	1.2500	66.421	2.6150	25.400	1.0000	25.357	0.9983	20.638	0.8125	3.6	0.14	3.2	0.13	89.2	85.1	12.7	**2582**	**2520**	16.0	0.63	44.0	1.73	37.5	1.48	57.0	2.24	62.5	2.46	0.27	2.19	1.21	20.7	9.65	2.14
	1.2500	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	3.6	0.14	1.6	0.06	63.7	61.1	8.80	**02475**	**02420**	17.1	0.67	44.5	1.75	38.5	1.52	59.0	2.32	63.0	2.48	0.42	1.44	0.79	14.8	10.5	1.41
	1.2500	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	1.6	0.06	1.6	0.06	63.7	61.1	8.80	**02475A**	**02420**	17.1	0.67	42.0	1.65	38.0	1.50	59.0	2.32	63.0	2.48	0.42	1.44	0.79	14.8	10.5	1.41
	1.2500	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	1.6	0.06	63.7	61.1	8.80	**02476**	**02420**	17.1	0.67	39.0	1.54	38.5	1.52	59.0	2.32	63.0	2.48	0.42	1.44	0.79	14.8	10.5	1.41
	1.2500	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	1.6	0.06	1.6	0.06	70.2	71.1	10.0	**M88046**	**M88010**	19.2	0.76	43.0	1.69	40.5	1.59	58.0	2.28	65.0	2.56	0.55	1.10	0.60	16.3	15.2	1.07
	1.2500	68.956	2.7148	19.845	0.7813	19.583	0.7710	15.875	0.6250	3.6	0.14	3.2	0.13	57.7	55.0	7.95	**14125**	**14274A**	15.5	0.61	44.0	1.73	37.5	1.48	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.2500	69.012	2.7170	26.982	1.0623	26.721	1.0520	15.875	0.6250	4.3	0.17	3.2	0.13	57.7	55.0	7.95	**14123A**	**14274**	22.6	0.89	44.0	1.73	40.0	1.57	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.2500	71.973	2.8336	27.000	1.0630	25.400	1.0000	21.443	0.8442	1.6	0.06	1.6	0.06	83.8	87.4	12.4	**HM88644**	**HM88611**	22.3	0.88	45.0	1.77	42.5	1.67	60.0	2.36	69.0	2.72	0.55	1.10	0.60	19.6	18.3	1.07
	1.2500	72.034	2.8360	30.162	1.1875	29.997	1.1810	23.812	0.9375	0.8	0.03	2.8	0.11	98.6	89.3	13.3	**3188**	**3126**	20.3	0.80	40.0	1.57	39.5	1.56	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.2500	72.233	2.8438	25.400	1.0000	25.400	1.0000	19.842	0.7812	1.6	0.06	2.4	0.09	83.8	87.4	12.4	**HM88644**	**HM88610**	20.7	0.81	45.0	1.77	42.5	1.67	60.0	2.36	69.0	2.72	0.55	1.10	0.60	19.6	18.3	1.07
	1.2500	72.626	2.8593	28.575	1.1250	29.997	1.1810	22.225	0.8750	0.8	0.03	3.2	0.13	98.6	89.3	13.3	**3188**	**3125**	18.7	0.74	40.0	1.57	39.5	1.56	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.2500	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	0.8	0.03	0.8	0.03	98.6	89.3	13.3	**3188**	**3130**	20.3	0.80	40.0	1.57	39.5	1.56	63.0	2.48	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.2500	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	1.6	0.06	0.8	0.03	98.6	89.3	13.3	**3188S**	**3130**	20.3	0.80	41.5	1.63	39.5	1.56	63.0	2.48	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.2500	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	3.6	0.14	0.8	0.03	98.6	89.3	13.3	**3193**	**3130**	20.3	0.80	45.5	1.79	39.5	1.56	63.0	2.48	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.2500	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	2.4	0.09	3.2	0.13	98.6	89.3	13.3	**3199**	**3120**	20.3	0.80	42.5	1.67	39.5	1.56	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.2500	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	3.6	0.14	3.2	0.13	68.8	65.7	9.55	**02875**	**02820**	17.1	0.67	45.5	1.79	39.5	1.56	62.0	2.44	68.0	2.68	0.45	1.32	0.73	16.0	12.4	1.29
	1.2500	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	3.6	0.14	0.8	0.03	68.8	65.7	9.55	**02875**	**02830**	17.1	0.67	45.5	1.79	39.5	1.56	64.0	2.52	69.0	2.72	0.45	1.32	0.73	16.0	12.4	1.29
	1.2500	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	3.2	0.13	68.8	65.7	9.55	**02876**	**02820**	17.1	0.67	40.0	1.57	39.5	1.56	62.0	2.44	68.0	2.68	0.45	1.32	0.73	16.0	12.4	1.29
	1.2500	73.025	2.8750	22.225	0.8750	23.812	0.9375	17.462	0.6875	3.6	0.14	3.2	0.13	80.3	78.1	11.5	**2875**	**2820**	16.3	0.64	44.5	1.75	39.0	1.54	62.0	2.44	68.0	2.68	0.37	1.63	0.89	18.6	11.7	1.59

Note 1) SP indicates the specially chamfered from.

TS type

d (31.750) ~ 33.338 mm
(1.2500) ~ 1.3125 inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

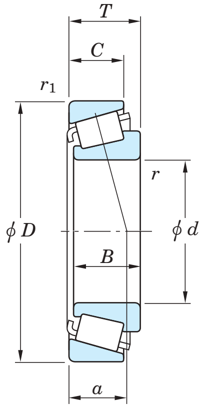
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

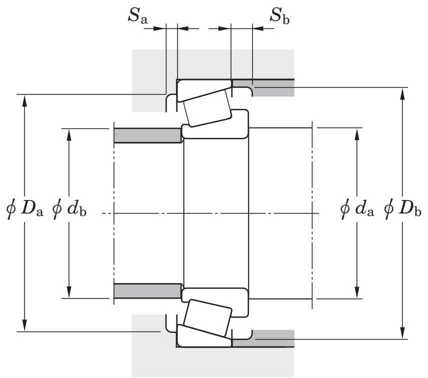
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		*D*		*T*		*B*		*C*		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone	Cup	*a*		d_a		d_b		D_a		D_b		*e*	Y_1	Y_0			*K*
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				Radial	Axial	
31.750	1.2500	73.025	2.8750	22.225	0.8750	23.812	0.9375	17.462	0.6875	0.8	0.03	0.8	0.03	80.3	78.1	11.5	**2879**	**2821**	16.3	0.64	39.0	1.54	39.0	1.54	65.0	2.56	68.0	2.68	0.37	1.63	0.89	18.6	11.7	1.59
	1.2500	73.025	2.8750	26.543	1.0450	25.400	1.0000	21.000	0.8268	1.6	0.06	2.4	0.09	83.8	87.4	12.4	**HM88644**	**HM88612**	21.8	0.86	45.0	1.77	42.5	1.67	60.0	2.36	69.0	2.72	0.55	1.10	0.60	19.6	18.3	1.07
	1.2500	73.025	2.8750	26.988	1.0625	26.975	1.0620	22.225	0.8750	3.6	0.14	1.6	0.06	97.2	94.1	13.9	**23685**	**23620**	18.8	0.74	45.0	1.77	40.0	1.57	64.0	2.52	68.0	2.68	0.37	1.62	0.89	22.6	14.2	1.58
	1.2500	73.025	2.8750	29.370	1.1563	27.783	1.0938	23.020	0.9063	1.2	0.05	3.2	0.13	93.0	101	14.2	**HM88542**	**HM88510**	23.4	0.92	45.5	1.79	42.5	1.67	59.0	2.32	70.0	2.76	0.55	1.10	0.60	21.7	20.3	1.07
	1.2500	73.812	2.9060	29.370	1.1563	27.783	1.0938	23.020	0.9063	1.2	0.05	3.2	0.13	93.0	101	14.2	**HM88542**	**HM88512**	23.4	0.92	45.5	1.79	42.5	1.67	59.0	2.32	70.0	2.76	0.55	1.10	0.60	21.7	20.3	1.07
	1.2500	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.020	0.9063	0.8	0.03	0.8	0.03	99.5	107	15.2	**HM89440**	**HM89411**	23.9	0.94	45.5	1.79	44.5	1.75	65.0	2.56	73.0	2.87	0.55	1.10	0.60	23.2	21.7	1.07
	1.2500	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	1.6	0.06	3.2	0.13	109	105	15.7	**3476X**	**3420**	20.8	0.82	43.0	1.69	41.0	1.61	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.2500	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**346**	**332**	15.1	0.59	40.0	1.57	39.5	1.56	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.2500	80.167	3.1562	29.370	1.1563	29.771	1.1721	23.812	0.9375	1.2	0.05	3.2	0.13	109	105	15.7	**3476**	**3422**	20.8	0.82	43.0	1.69	41.0	1.61	68.0	2.68	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.2500	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	0.8	0.03	0.8	0.03	129	122	18.8	**443**	**432A**	18.4	0.72	42.0	1.65	41.0	1.61	84.0	3.31	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
31.986	1.2593	72.233	2.8438	25.400	1.0000	25.400	1.0000	19.842	0.7812	3.2	0.13	2.4	0.09	83.8	87.4	12.4	**HM88638**	**HM88610**	20.7	0.81	48.5	1.91	42.5	1.67	60.0	2.36	69.0	2.72	0.55	1.10	0.60	19.6	18.3	1.07
32.004	1.2600	72.000	2.8346	19.000	0.7480	18.923	0.7450	15.875	0.6250	1.6	0.06	1.6	0.06	69.8	60.0	8.85	**26126**	**26283**	14.3	0.56	39.5	1.56	37.5	1.48	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
32.542	1.2812	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	0.8	0.03	3.2	0.13	98.6	89.3	13.3	**3194**	**3120**	20.3	0.80	41.0	1.61	40.0	1.57	61.0	2.40	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
33.338	1.3125	66.421	2.6150	25.400	1.0000	25.357	0.9983	20.638	0.8125	0.8	0.03	3.2	0.13	89.2	85.1	12.7	**2581**	**2520**	16.0	0.63	39.5	1.56	39.0	1.54	57.0	2.24	62.5	2.46	0.27	2.19	1.21	20.7	9.65	2.14
	1.3125	66.421	2.6150	25.400	1.0000	25.357	0.9983	20.638	0.8125	3.6	0.14	3.2	0.13	89.2	85.1	12.7	**2585**	**2520**	16.0	0.63	45.0	1.77	39.0	1.54	57.0	2.24	62.5	2.46	0.27	2.19	1.21	20.7	9.65	2.14
	1.3125	66.675	2.6250	20.638	0.8125	20.638	0.8125	15.875	0.6250	3.6	0.14	1.6	0.06	58.1	54.5	7.90	**1680**	**1620**	15.7	0.62	45.0	1.77	38.5	1.52	58.0	2.28	61.0	2.40	0.37	1.62	0.89	13.5	8.55	1.58
	1.3125	68.262	2.6875	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	1.6	0.06	70.2	71.1	10.0	**M88048**	**M88010**	19.2	0.76	42.5	1.67	41.0	1.61	58.0	2.28	65.0	2.56	0.55	1.10	0.60	16.3	15.2	1.07
	1.3125	68.956	2.7148	19.845	0.7813	19.583	0.7710	15.875	0.6250	3.6	0.14	3.2	0.13	57.7	55.0	7.95	**14130**	**14274A**	15.5	0.61	45.0	1.77	38.5	1.52	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.3125	68.956	2.7148	19.845	0.7813	19.583	0.7710	15.875	0.6250	0.8	0.03	3.2	0.13	57.7	55.0	7.95	**14131**	**14274A**	15.5	0.61	39.5	1.56	38.5	1.52	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.3125	69.012	2.7170	22.385	0.8813	19.583	0.7710	18.415	0.7250	3.6	0.14	2.4	0.09	57.7	55.0	7.95	**14130**	**14277**	18.0	0.71	45.0	1.77	38.5	1.52	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.3125	69.723	2.7450	19.050	0.7500	18.923	0.7450	19.050	0.7500	3.6	0.14	1.6	0.06	69.8	60.0	8.85	**26131**	**26274**	14.3	0.56	44.5	1.75	38.5	1.52	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
	1.3125	72.000	2.8346	19.000	0.7480	18.923	0.7450	15.875	0.6250	3.6	0.14	1.6	0.06	59.4	60.0	7.25	**26131**	**26283**	14.3	0.56	44.5	1.75	38.5	1.52	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
	1.3125	72.000	2.8346	19.000	0.7480	18.923	0.7450	15.875	0.6250	1.6	0.06	1.6	0.06	69.8	60.0	8.85	**26132**	**26283**	14.3	0.56	40.5	1.59	38.0	1.50	62.0	2.44	65.0	2.56	0.36	1.67	0.92	16.1	9.90	1.62
	1.3125	72.238	2.8440	20.638	0.8125	20.638	0.8125	15.875	0.6250	3.6	0.14	1.2	0.05	62.3	61.3	8.90	**16131**	**16284**	16.6	0.65	46.0	1.81	39.5	1.56	63.0	2.48	67.0	2.64	0.40	1.49	0.82	14.4	9.90	1.46
	1.3125	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	3.6	0.14	1.8	0.07	98.6	89.3	13.3	**3196**	**3130**	20.3	0.80	47.0	1.85	40.5	1.59	63.0	2.48	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.3125	72.626	2.8593	30.162	1.1875	29.997	1.1810	23.812	0.9375	0.8	0.03	0.8	0.03	98.6	89.3	13.3	**3197**	**3130**	20.3	0.80	41.5	1.63	40.5	1.59	63.0	2.48	67.0	2.64	0.33	1.80	0.99	23.0	13.1	1.76
	1.3125	73.025	2.8750	22.225	0.8750	23.812	0.9375	17.462	0.6875	3.6	0.14	0.8	0.03	80.3	78.1	11.5	**2876**	**2821**	16.3	0.64	46.0	1.81	40.0	1.57	65.0	2.56	68.0	2.68	0.37	1.63	0.89	18.6	11.7	1.59
	1.3125	73.025	2.8750	23.812	0.9375	25.654	1.0100	19.050	0.7500	1.6	0.06	0.8	0.03	92.6	92.2	13.8	**2790R**	**2735X**	15.9	0.63	42.0	1.65	40.0	1.57	66.0	2.60	69.0	2.72	0.30	1.98	1.09	21.5	11.1	1.93
	1.3125	73.025	2.8750	29.370	1.1563	27.783	1.0938	23.020	0.9063	0.8	0.03	3.2	0.13	93.0	101	14.2	**HM88547**	**HM88510**	23.4	0.92	45.5	1.79	42.6	1.68	59.0	2.32	70.0	2.76	0.55	1.10	0.60	21.7	20.3	1.07
	1.3125	74.612	2.9375	23.812	0.9375	25.654	1.0100	19.050	0.7500	3.6	0.14	0.8	0.03	92.6	92.2	13.8	**2785R**	**2736**	15.9	0.63	46.0	1.81	40.0	1.57	66.0	2.60	70.0	2.76	0.30	1.98	1.09	21.5	11.1	1.93
	1.3125	76.200	3.0000	19.000	0.7480	18.923	0.7450	15.875	0.6250	3.6	0.14	1.6	0.06	69.8	60.0	8.85	**26131**	**26300**	14.3	0.56	44.5	1.75	38.5	1.52	64.0	2.52	67.0	2.64	0.36	1.67	0.92	16.1	9.90	1.62
	1.3125	76.200	3.0000	23.812	0.9375	25.654	1.0100	19.050	0.7500	3.6	0.14	0.8	0.03	92.6	92.2	13.8	**2785R**	**2729**	15.9	0.63	46.0	1.81	40.0	1.57	68.0	2.68	70.0	2.76	0.30	1.98	1.09	21.5	11.1	1.93
	1.3125	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.020	0.9063	0.8	0.03	3.2	0.13	99.5	107	15.2	**HM89443**	**HM89410**	23.9	0.94	46.5	1.83	44.6	1.76	62.0	2.44	73.0	2.87	0.55	1.10	0.60	23.2	21.7	1.07
	1.3125	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.812	0.9375	0.8	0.03	1.2	0.05	101	97.4	14.4	**31590**	**31521**	21.6	0.85	43.0	1.69	42.5	1.67	66.0	2.60	72.0	2.83	0.40	1.49	0.82	23.6	16.2	1.46
	1.3125	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	3.6	0.14	3.2	0.13	109	105	15.7	**3477**	**3420**	20.8	0.82	47.5	1.87	41.0	1.61	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.3125	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	0.8	0.03	3.2	0.13	109	105	15.7	**3483**	**3420**	20.8	0.82	41.0	1.61	41.0	1.61	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.3125	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**335S**	**332**	15.1	0.59	41.5	1.63	40.5	1.59	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3125	80.167	3.1562	29.370	1.1563	29.771	1.1721	23.812	0.9375	3.6	0.14	3.2	0.13	109	105	15.7	**3477**	**3422**	20.8	0.82	47.5	1.87	41.0	1.61	68.0	2.68	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60

Note 1) SP indicates the specially chamfered from.

TS type

d 34.925 ~ (34.980) mm
1.3750 ~ (1.3772) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

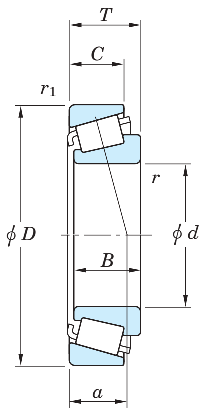
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d mm	d inch	D mm	D inch	T mm	T inch	B mm	B inch	C mm	C inch	$r^{1)}$ (min.) mm	$r^{1)}$ (min.) inch	$r_1^{1)}$ (min.) mm	$r_1^{1)}$ (min.) inch	C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a mm	a inch	d_a mm	d_a inch	d_b mm	d_b inch	D_a mm	D_a inch	D_b mm	D_b inch	e	Y_1	Y_0	Radial	Axial	K
34.925	1.3750	65.088	2.5625	18.034	0.7100	18.288	0.7200	13.970	0.5500	SP	SP	1.2	0.05	60.0	58.5	8.40	**LM48548**	**LM48510**	14.3	0.56	46.0	1.81	40.0	1.57	58.0	2.28	61.0	2.40	0.38	1.59	0.88	13.8	8.90	1.55
	1.3750	68.956	2.7148	19.845	0.7813	19.583	0.7710	15.875	0.6250	1.6	0.06	3.2	0.13	57.7	55.0	7.95	**14137A**	**14274A**	15.5	0.61	42.0	1.65	40.0	1.57	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.3750	68.956	2.7148	19.845	0.7813	19.583	0.7710	15.875	0.6250	3.6	0.14	3.2	0.13	57.7	55.0	7.95	**14138A**	**14274A**	15.5	0.61	46.0	1.81	40.0	1.57	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.3750	69.012	2.7170	26.982	1.0623	26.721	1.0520	15.875	0.6250	0.8	0.03	1.2	0.05	57.7	55.0	7.95	**14136A**	**14276**	22.6	0.89	40.0	1.57	38.0	1.50	60.0	2.36	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.3750	72.233	2.8438	25.400	1.0000	25.400	1.0000	19.842	0.7812	2.4	0.09	2.4	0.09	83.8	87.4	12.4	**HM88649**	**HM88610**	20.7	0.81	48.5	1.91	42.5	1.67	60.0	2.36	69.0	2.72	0.55	1.10	0.60	19.6	18.3	1.07
	1.3750	72.238	2.8440	20.638	0.8125	20.638	0.8125	15.875	0.6250	3.6	0.14	1.2	0.05	62.3	61.3	8.90	**16137**	**16284**	16.6	0.65	46.5	1.83	40.5	1.59	63.0	2.48	67.0	2.64	0.40	1.49	0.82	14.4	9.90	1.46
	1.3750	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	3.6	0.14	3.2	0.13	68.8	65.7	9.55	**02877**	**02820**	18.4	0.72	48.5	1.91	42.0	1.65	62.0	2.44	68.0	2.68	0.45	1.32	0.73	16.0	12.4	1.29
	1.3750	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	3.6	0.14	0.8	0.03	68.8	65.7	9.55	**02877**	**02830**	18.4	0.72	48.5	1.91	42.0	1.65	64.0	2.52	69.0	2.72	0.45	1.32	0.73	16.0	12.4	1.29
	1.3750	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	3.2	0.13	68.8	65.7	9.55	**02878**	**02820**	18.4	0.72	42.5	1.67	42.0	1.65	62.0	2.44	68.0	2.68	0.45	1.32	0.73	16.0	12.4	1.29
	1.3750	73.025	2.8750	22.225	0.8750	23.812	0.9375	17.462	0.6875	3.6	0.14	3.2	0.13	80.3	78.1	11.5	**2877**	**2820**	16.3	0.64	47.5	1.87	41.0	1.61	62.0	2.44	68.0	2.68	0.37	1.63	0.89	18.6	11.7	1.59
	1.3750	73.025	2.8750	22.225	0.8750	23.812	0.9375	17.462	0.6875	0.8	0.03	0.8	0.03	80.3	78.1	11.5	**2878**	**2821**	16.3	0.64	42.5	1.67	41.0	1.61	65.0	2.56	68.0	2.68	0.37	1.63	0.89	18.6	11.7	1.59
	1.3750	73.025	2.8750	23.812	0.9375	24.608	0.9688	19.050	0.7500	1.6	0.06	0.8	0.03	90.1	87.3	13.1	**25877R**	**25821**	15.8	0.62	43.0	1.69	40.5	1.59	65.0	2.56	68.0	2.68	0.29	2.07	1.14	20.9	10.4	2.02
	1.3750	73.025	2.8750	23.812	0.9375	24.608	0.9688	19.050	0.7500	3.6	0.14	2.4	0.09	90.1	87.3	13.1	**25878R**	**25820**	15.8	0.62	47.0	1.85	40.5	1.59	64.0	2.52	68.0	2.68	0.29	2.07	1.14	20.9	10.4	2.02
	1.3750	73.025	2.8750	23.812	0.9375	25.654	1.0100	19.050	0.7500	5.2	0.20	0.8	0.03	92.6	92.2	13.8	**2786R**	**2735X**	15.9	0.63	51.0	2.01	41.0	1.61	66.0	2.60	69.0	2.72	0.30	1.98	1.09	21.5	11.1	1.93
	1.3750	73.025	2.8750	26.988	1.0625	26.975	1.0620	22.225	0.8750	3.6	0.14	1.6	0.06	97.2	94.1	13.9	**23690**	**23620**	18.8	0.74	49.0	1.93	42.0	1.65	64.0	2.52	68.0	2.68	0.37	1.62	0.89	22.6	14.2	1.58
	1.3750	76.200	3.0000	20.638	0.8125	20.940	0.8244	15.507	0.6105	1.6	0.06	1.2	0.05	71.6	65.9	9.70	**28137**	**28300**	16.5	0.65	43.5	1.71	41.0	1.61	68.0	2.68	71.0	2.80	0.40	1.49	0.82	16.5	11.3	1.46
	1.3750	76.200	3.0000	23.812	0.9375	25.654	1.0100	19.050	0.7500	0.8	0.03	1.6	0.06	92.6	92.2	13.8	**2793R**	**2729X**	15.9	0.63	42.0	1.65	41.0	1.61	67.0	2.64	70.0	2.76	0.30	1.98	1.09	21.5	11.1	1.93
	1.3750	76.200	3.0000	23.812	0.9375	25.654	1.0100	19.050	0.7500	3.6	0.14	3.2	0.13	92.6	92.2	13.8	**2796R**	**2720**	15.9	0.63	47.5	1.87	41.0	1.61	66.0	2.60	70.0	2.76	0.30	1.98	1.09	21.5	11.1	1.93
	1.3750	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.020	0.9063	3.6	0.14	0.8	0.03	99.5	107	15.2	**HM89446**	**HM89411**	23.9	0.94	53.0	2.09	44.5	1.75	65.0	2.56	73.0	2.87	0.55	1.10	0.60	23.2	21.7	1.07
	1.3750	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.812	0.9375	3.6	0.14	1.2	0.05	101	97.4	14.4	**31593**	**31521**	21.6	0.85	50.0	1.97	43.5	1.71	66.0	2.60	72.0	2.83	0.40	1.49	0.82	23.6	16.2	1.46
	1.3750	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.812	0.9375	1.6	0.06	3.2	0.13	101	97.4	14.4	**31594**	**31520**	21.6	0.85	46.0	1.81	43.5	1.71	64.0	2.52	72.0	2.83	0.40	1.49	0.82	23.6	16.2	1.46
	1.3750	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	3.6	0.14	3.2	0.13	109	105	15.7	**3478**	**3420**	20.8	0.82	50.0	1.97	43.5	1.71	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.3750	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	0.8	0.03	3.2	0.13	109	105	15.7	**3482**	**3420**	20.8	0.82	44.0	1.73	43.5	1.71	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.3750	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**335**	**332**	15.1	0.59	42.5	1.67	41.5	1.63	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3750	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	1.2	0.05	1.2	0.05	85.0	74.8	11.4	**340**	**332**	15.1	0.59	43.5	1.71	41.5	1.63	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3750	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	3.6	0.14	1.2	0.05	85.0	74.8	11.4	**343**	**332**	15.1	0.59	47.5	1.87	41.5	1.63	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3750	80.000	3.1496	24.176	0.9518	22.403	0.8820	21.000	0.8268	0.8	0.03	2.4	0.09	85.0	74.8	11.4	**335**	**332A**	18.3	0.72	42.5	1.67	41.5	1.63	71.0	2.80	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3750	80.000	3.1496	24.176	0.9518	22.403	0.8820	21.000	0.8268	3.6	0.14	2.4	0.09	85.0	74.8	11.4	**343**	**332A**	18.3	0.72	47.5	1.87	41.5	1.63	71.0	2.80	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3750	80.000	3.1496	29.370	1.1563	30.391	1.1965	23.812	0.9375	3.6	0.14	3.2	0.13	114	106	16.2	**3379**	**3325**	18.7	0.74	48.0	1.89	41.5	1.63	70.0	2.76	75.0	2.95	0.27	2.20	1.21	26.6	12.4	2.14
	1.3750	80.035	3.1510	24.608	0.9688	23.698	0.9330	18.512	0.7288	0.8	0.03	1.6	0.06	91.6	91.6	13.3	**27875**	**27820**	22.2	0.87	45.5	1.79	44.5	1.75	68.0	2.68	75.0	2.95	0.56	1.07	0.59	21.2	20.3	1.04
	1.3750	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	1.2	0.05	135	136	20.3	**3872**	**3821**	22.9	0.90	53.0	2.09	46.0	1.81	75.0	2.95	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46
	1.3750	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	0.8	0.03	3.2	0.13	135	136	20.3	**3872A**	**3820**	22.9	0.90	46.0	1.81	46.0	1.81	73.0	2.87	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46
	1.3750	87.312	3.4375	30.162	1.1875	30.886	1.2160	23.812	0.9375	3.6	0.14	3.2	0.13	120	120	18.2	**3581R**	**3525**	20.5	0.81	48.0	1.89	45.5	1.79	75.0	2.95	81.0	3.19	0.31	1.96	1.08	27.9	14.6	1.91
	1.3750	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	0.8	0.03	1.6	0.06	123	112	17.2	**417**	**414**	16.9	0.67	42.5	1.67	42.0	1.65	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.3750	90.488	3.5625	39.688	1.5625	40.386	1.5900	33.338	1.3125	3.6	0.14	3.2	0.13	166	169	25.9	**4368**	**4335**	25.6	1.01	51.0	2.01	46.0	1.81	77.0	3.03	85.0	3.35	0.28	2.11	1.16	38.8	18.9	2.06
	1.3750	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	0.8	0.03	2.4	0.09	129	122	18.8	**449**	**432**	18.4	0.72	44.0	1.73	43.5	1.71	83.0	3.27	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
34.976	1.3770	68.262	2.6875	15.875	0.6250	16.520	0.6504	11.908	0.4688	1.6	0.06	1.6	0.06	57.6	53.8	7.70	**19138R**	**19268**	14.5	0.57	42.5	1.67	40.5	1.59	61.0	2.40	65.0	2.56	0.44	1.35	0.74	13.2	10.0	1.32
	1.3770	68.956	2.7148	19.845	0.7813	19.583	0.7710	15.875	0.6250	1.2	0.05	3.2	0.13	57.7	55.0	7.95	**14139**	**14274A**	15.5	0.61	41.5	1.63	40.0	1.57	59.0	2.32	63.0	2.48	0.38	1.57	0.86	13.4	8.70	1.53
	1.3770	80.000	3.1496	21.006	0.8270	20.940	0.8244	15.875	0.6250	1.6	0.06	1.6	0.06	71.6	65.9	9.70	**28138**	**28315**	16.5	0.65	43.5	1.71	41.0	1.61	69.0	2.72	73.0	2.87	0.40	1.49	0.82	16.5	11.3	1.46
34.980	1.3772	59.131	2.3280	15.875	0.6250	16.764	0.6600	11.938	0.4700	SP	SP	1.2	0.05	44.9	48.5	6.85	**L68149**	**L68110**	13.2	0.52	45.5	1.79	39.0	1.54	53.0	2.09	56.0	2.20	0.42	1.44	0.79	10.3	7.35	1.41

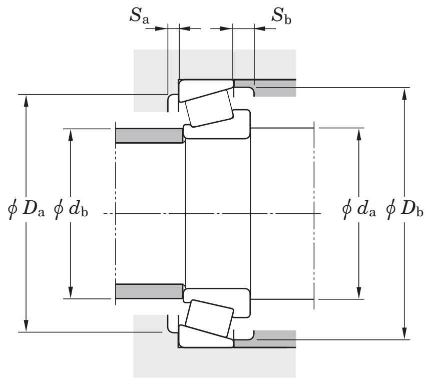
Note 1) SP indicates the specially chamfered from.

TS type

d (34.980) ~ (36.512) mm

(1.3772) ~ (1.4375) inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a\,/\,F_r \leqq e$		$F_a\,/\,F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

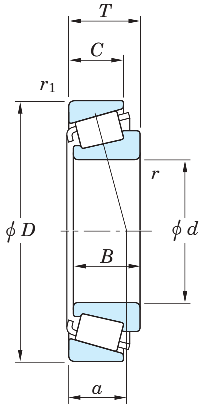
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

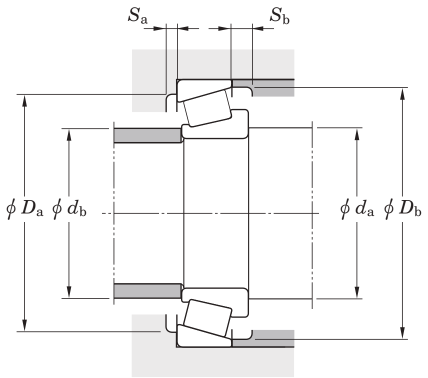
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1{}^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
34.980	1.3772	59.975	2.3612	15.875	0.6250	16.764	0.6600	11.938	0.4700	SP	SP	1.2	0.05	44.9	48.5	6.85	**L68149**	**L68111**	13.2	0.52	45.5	1.79	39.0	1.54	53.0	2.09	56.0	2.20	0.42	1.44	0.79	10.3	7.35	1.41
34.988	1.3775	61.973	2.4399	16.700	0.6575	17.000	0.6693	13.599	0.5354	SP	SP	1.0	0.04	51.2	52.8	7.45	**LM78349**	**LM78310**	14.5	0.57	46.0	1.81	40.0	1.57	54.0	2.13	59.0	2.32	0.44	1.35	0.74	11.8	8.95	1.32
	1.3775	65.987	2.5979	20.638	0.8125	20.638	0.8125	16.670	0.6563	3.6	0.14	2.4	0.09	70.7	67.0	10.3	**M38547**	**M38511**	15.1	0.59	46.0	1.81	39.5	1.56	59.0	2.32	62.0	2.44	0.35	1.70	0.93	15.7	9.50	1.66
35.000	1.3780	73.025	2.8750	26.988	1.0625	26.975	1.0620	22.225	0.8750	3.6	0.14	0.8	0.03	97.2	94.1	13.9	**23691**	**23621**	18.8	0.74	49.0	1.93	42.0	1.65	63.0	2.48	68.0	2.68	0.37	1.62	0.89	22.6	14.2	1.58
	1.3780	77.788	3.0625	26.988	1.0625	26.975	1.0620	22.225	0.8750	3.6	0.14	0.8	0.03	97.2	94.1	13.9	**23691**	**23623**	18.8	0.74	49.0	1.93	42.0	1.65	65.0	2.56	71.0	2.80	0.37	1.62	0.89	22.6	14.2	1.58
	1.3780	79.375	3.1250	23.812	0.9375	25.400	1.0000	19.050	0.7500	0.8	0.03	0.8	0.03	101	105	15.8	**26883R**	**26822**	16.4	0.65	42.5	1.67	42.0	1.65	71.0	2.80	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.3780	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	1.6	0.06	3.2	0.13	109	105	15.7	**3480**	**3420**	20.8	0.82	44.5	1.75	42.5	1.67	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.3780	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	3.6	0.14	3.2	0.13	109	105	15.7	**3492X**	**3420**	20.8	0.82	49.0	1.93	44.0	1.73	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.3780	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**339**	**332**	15.1	0.59	42.5	1.67	41.5	1.63	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3780	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	2.0	0.08	1.2	0.05	85.0	74.8	11.4	**339X**	**332**	15.1	0.59	45.5	1.79	41.5	1.63	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3780	80.000	3.1496	24.176	0.9518	22.403	0.8820	21.000	0.8268	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**339**	**332A**	18.3	0.72	42.5	1.67	41.5	1.63	71.0	2.80	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.3780	80.167	3.1562	25.400	1.0000	25.400	1.0000	20.638	0.8125	0.8	0.03	3.2	0.13	101	105	15.8	**26883R**	**26820**	18.0	0.71	42.5	1.67	42.0	1.65	69.0	2.72	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.3780	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	0.8	0.03	1.6	0.06	123	112	17.2	**421**	**414**	16.9	0.67	42.5	1.67	42.0	1.65	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.3780	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	0.8	0.03	3.2	0.13	123	112	17.2	**421**	**414A**	16.9	0.67	42.5	1.67	42.0	1.65	76.0	2.99	79.0	3.11	0.26	2.28	1.25	28.6	12.9	2.22
	1.3780	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	3.6	0.14	2.4	0.09	129	122	18.8	**441**	**432**	18.4	0.72	49.0	1.93	43.5	1.71	83.0	3.27	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
35.306	1.3900	73.025	2.8750	22.225	0.8750	23.812	0.9375	17.462	0.6875	3.6	0.14	3.2	0.13	80.3	78.1	11.5	**2880**	**2820**	16.3	0.64	48.0	1.89	42.0	1.65	62.0	2.44	68.0	2.68	0.37	1.63	0.89	18.6	11.7	1.59
35.717	1.4062	72.233	2.8438	25.400	1.0000	25.400	1.0000	19.842	0.7812	3.6	0.14	2.4	0.09	83.8	87.4	12.4	**HM88648**	**HM88610**	20.7	0.81	52.0	2.05	42.5	1.67	60.0	2.36	69.0	2.72	0.55	1.10	0.60	19.6	18.3	1.07
36.449	1.4350	73.025	2.8750	22.225	0.8750	22.225	0.8750	17.462	0.6875	0.8	0.03	3.2	0.13	68.8	65.7	9.55	**02884**	**02820**	18.4	0.72	44.5	1.75	42.0	1.65	62.0	2.44	69.0	2.72	0.45	1.32	0.73	16.0	12.4	1.29
36.487	1.4365	73.025	2.8750	23.812	0.9375	24.608	0.9688	19.050	0.7500	1.6	0.06	0.8	0.03	90.1	87.3	13.1	**25880R**	**25821**	15.8	0.62	44.0	1.73	42.0	1.65	65.0	2.56	68.0	2.68	0.29	2.07	1.14	20.9	10.4	2.02
	1.4365	73.025	2.8750	23.812	0.9375	25.654	1.0100	19.050	0.7500	1.6	0.06	0.8	0.03	92.6	92.2	13.8	**2780R**	**2735X**	15.9	0.63	44.5	1.75	42.5	1.67	66.0	2.60	69.0	2.72	0.30	1.98	1.09	21.5	11.1	1.93
	1.4365	73.025	2.8750	23.812	0.9375	25.654	1.0100	19.050	0.7500	3.6	0.14	0.8	0.03	92.6	92.2	13.8	**2794R**	**2735X**	15.9	0.63	49.0	1.93	42.5	1.67	66.0	2.60	69.0	2.72	0.30	1.98	1.09	21.5	11.1	1.93
	1.4365	79.375	3.1250	25.400	1.0000	25.654	1.0100	20.638	0.8125	1.6	0.06	3.2	0.13	92.6	92.2	13.8	**2780R**	**2734**	17.5	0.69	44.5	1.75	42.5	1.67	68.0	2.68	70.0	2.76	0.30	1.98	1.09	21.5	11.1	1.93
	1.4365	80.167	3.1562	29.370	1.1563	30.391	1.1965	23.812	0.9375	3.6	0.14	3.2	0.13	114	106	16.2	**3378**	**3320**	18.7	0.74	49.0	1.93	44.5	1.75	70.0	2.76	75.0	2.95	0.27	2.20	1.21	26.6	12.4	2.14
	1.4365	81.755	3.2187	29.370	1.1563	30.391	1.1965	23.812	0.9375	3.6	0.14	3.2	0.13	114	106	16.2	**3378**	**3329**	18.7	0.74	49.0	1.93	44.5	1.75	71.0	2.80	75.0	2.95	0.27	2.20	1.21	26.6	12.4	2.14
36.512	1.4375	68.262	2.6875	15.875	0.6250	16.520	0.6504	11.908	0.4688	1.6	0.06	1.6	0.06	57.6	53.8	7.70	**19143R**	**19268**	14.5	0.57	44.0	1.73	42.0	1.65	61.0	2.40	65.0	2.56	0.44	1.35	0.74	13.2	10.0	1.32
	1.4375	69.012	2.7170	19.050	0.7500	19.050	0.7500	15.083	0.5938	3.6	0.14	0.8	0.03	61.7	62.0	8.95	**13682**	**13620**	16.1	0.63	48.0	1.89	41.5	1.63	62.0	2.44	65.0	2.56	0.40	1.49	0.82	14.2	9.75	1.46
	1.4375	71.438	2.8125	15.875	0.6250	16.520	0.6504	11.908	0.4688	1.6	0.06	1.0	0.04	57.6	53.8	7.70	**19143R**	**19281**	14.5	0.57	44.0	1.73	42.0	1.65	63.0	2.48	66.0	2.60	0.44	1.35	0.74	13.2	10.0	1.32
	1.4375	71.996	2.8345	17.018	0.6700	16.520	0.6504	14.288	0.5625	1.6	0.06	1.6	0.06	57.6	53.8	7.70	**19143R**	**19283**	15.7	0.62	44.0	1.73	42.0	1.65	63.0	2.48	66.0	2.60	0.44	1.35	0.74	13.2	10.0	1.32
	1.4375	71.996	2.8345	19.000	0.7480	20.638	0.8125	14.237	0.5605	3.6	0.14	1.6	0.06	62.3	61.3	8.90	**16143**	**16282**	15.0	0.59	48.5	1.91	42.0	1.65	63.0	2.48	67.0	2.64	0.40	1.49	0.82	14.4	9.90	1.46
	1.4375	72.238	2.8440	20.638	0.8125	20.638	0.8125	15.875	0.6250	3.6	0.14	1.2	0.05	62.3	61.3	8.90	**16143**	**16284**	16.6	0.65	48.5	1.91	42.0	1.65	63.0	2.48	67.0	2.64	0.40	1.49	0.82	14.4	9.90	1.46
	1.4375	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.020	0.9063	0.8	0.03	0.8	0.03	99.5	107	15.2	**HM89448**	**HM89411**	23.9	0.94	48.5	1.91	44.5	1.75	65.0	2.56	73.0	2.87	0.55	1.10	0.60	23.2	21.7	1.07
	1.4375	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.020	0.9063	3.6	0.14	0.8	0.03	99.5	107	15.2	**HM89449**	**HM89411**	23.9	0.94	54.0	2.13	44.5	1.75	65.0	2.56	73.0	2.87	0.55	1.10	0.60	23.2	21.7	1.07
	1.4375	76.200	3.0000	29.370	1.1563	28.575	1.1250	23.812	0.9375	3.6	0.14	1.2	0.05	101	97.4	14.4	**31597**	**31521**	21.6	0.85	51.0	2.01	44.5	1.75	66.0	2.60	72.0	2.83	0.40	1.49	0.82	23.6	16.2	1.46
	1.4375	79.375	3.1250	23.812	0.9375	25.400	1.0000	19.050	0.7500	0.8	0.03	0.8	0.03	101	105	15.8	**26877R**	**26822**	16.4	0.65	44.0	1.73	43.0	1.69	71.0	2.80	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.4375	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	0.8	0.03	3.2	0.13	109	105	15.7	**3479**	**3420**	20.8	0.82	45.5	1.79	44.5	1.75	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.4375	82.550	3.2500	23.812	0.9375	25.400	1.0000	19.050	0.7500	3.6	0.14	2.0	0.08	96.8	100	15.1	**25570**	**25519**	17.5	0.69	51.0	2.01	45.0	1.77	73.0	2.87	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.4375	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	0.8	0.03	3.2	0.13	135	136	20.3	**3878**	**3820**	22.9	0.90	48.0	1.89	47.0	1.85	73.0	2.87	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46
	1.4375	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	2.4	0.09	1.6	0.06	123	112	17.2	**424X**	**414**	16.9	0.67	47.5	1.87	43.0	1.69	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22

Note 1) SP indicates the specially chamfered from.

TS type

d (36.512) ~ (38.100) mm
(1.4375) ~ (1.5000) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

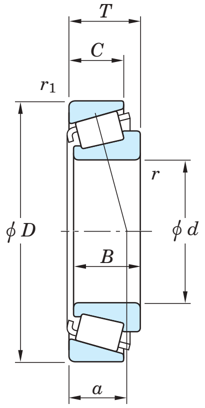
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

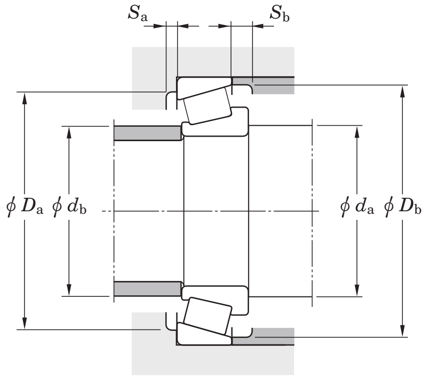
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
36.512	1.4375	93.662	3.6875	31.750	1.2500	31.750	1.2500	26.195	1.0313	1.6	0.06	3.2	0.13	132	134	20.2	**46143**	**46368**	24.0	0.94	49.0	1.93	47.5	1.87	79.0	3.11	87.0	3.43	0.40	1.49	0.82	30.8	21.1	1.46
	1.4375	93.662	3.6875	31.750	1.2500	31.750	1.2500	26.195	1.0313	1.6	0.06	1.2	0.05	132	134	20.2	**46143**	**46369**	24.0	0.94	49.0	1.93	47.5	1.87	79.0	3.11	87.0	3.43	0.40	1.49	0.82	30.8	21.1	1.46
38.100	1.5000	63.500	2.5000	12.700	0.5000	11.908	0.4688	9.525	0.3750	1.6	0.06	0.8	0.03	32.1	33.1	4.60	**13889**	**13830**	11.9	0.47	45.0	1.77	42.5	1.67	59.0	2.32	60.0	2.36	0.35	1.73	0.95	7.30	4.30	1.69
	1.5000	65.088	2.5625	12.700	0.5000	11.908	0.4688	9.525	0.3750	1.6	0.06	0.8	0.03	32.1	33.1	4.60	**13889**	**13836**	11.9	0.47	45.0	1.77	42.5	1.67	59.0	2.32	61.0	2.40	0.35	1.73	0.95	7.30	4.30	1.69
	1.5000	65.088	2.5625	18.034	0.7100	18.288	0.7200	13.970	0.5500	SP	SP	1.2	0.05	53.9	56.5	8.15	**LM29748**	**LM29710**	13.8	0.54	49.0	1.93	42.5	1.67	59.0	2.32	62.0	2.44	0.33	1.80	0.99	12.4	7.05	1.76
	1.5000	65.088	2.5625	19.812	0.7800	18.288	0.7200	15.748	0.6200	2.4	0.09	1.2	0.05	53.9	56.5	8.15	**LM29749**	**LM29711**	15.6	0.61	46.0	1.81	42.5	1.67	58.0	2.28	62.0	2.44	0.33	1.80	0.99	12.4	7.05	1.76
	1.5000	68.262	2.6875	19.997	0.7873	16.520	0.6504	16.030	0.6311	1.6	0.06	1.6	0.06	57.6	53.8	7.70	**19150R**	**19269**	18.6	0.73	45.0	1.77	43.0	1.69	63.0	2.48	66.0	2.60	0.44	1.35	0.74	13.2	10.0	1.32
	1.5000	68.275	2.6880	20.000	0.7874	16.520	0.6504	16.032	0.6312	1.6	0.06	1.6	0.06	57.6	53.8	7.70	**19150R**	**19268X**	18.7	0.74	45.0	1.77	43.0	1.69	61.0	2.40	65.0	2.56	0.44	1.35	0.74	13.2	10.0	1.32
	1.5000	69.012	2.7170	19.050	0.7500	19.050	0.7500	15.083	0.5938	3.6	0.14	0.8	0.03	61.7	62.0	8.95	**13685**	**13620**	16.1	0.63	49.5	1.95	43.0	1.69	62.0	2.44	65.0	2.56	0.40	1.49	0.82	14.2	9.75	1.46
	1.5000	69.012	2.7170	19.050	0.7500	19.050	0.7500	15.083	0.5938	2.0	0.08	2.4	0.09	61.7	62.0	8.95	**13687**	**13621**	16.1	0.63	46.5	1.83	43.0	1.69	61.0	2.40	65.0	2.56	0.40	1.49	0.82	14.2	9.75	1.46
	1.5000	69.012	2.7170	26.195	1.0313	26.187	1.0310	15.083	0.5938	1.6	0.06	2.4	0.09	61.7	62.0	8.95	**13686**	**13621**	16.1	0.63	46.5	1.83	43.0	1.69	61.0	2.40	65.0	2.56	0.40	1.49	0.82	14.2	9.75	1.46
	1.5000	69.012	2.7170	26.195	1.0313	26.195	1.0313	15.083	0.5938	1.6	0.06	0.8	0.03	61.7	62.0	8.95	**13686**	**13620**	16.1	0.63	46.5	1.83	43.0	1.69	62.0	2.44	65.0	2.56	0.40	1.49	0.82	14.2	9.75	1.46
	1.5000	69.969	2.7547	21.996	0.8660	19.050	0.7500	18.029	0.7098	3.6	0.14	1.6	0.06	61.7	62.0	8.95	**13685**	**13624**	16.1	0.63	49.5	1.95	43.0	1.69	61.0	2.40	65.0	2.56	0.40	1.49	0.82	14.2	9.75	1.46
	1.5000	71.438	2.8125	15.875	0.6250	16.520	0.6504	11.908	0.4688	1.6	0.06	1.0	0.04	57.6	53.8	7.70	**19150R**	**19281**	14.5	0.57	45.0	1.77	43.0	1.69	63.0	2.48	66.0	2.60	0.44	1.35	0.74	13.2	10.0	1.32
	1.5000	71.438	2.8125	17.462	0.6875	16.520	0.6504	15.875	0.6250	1.6	0.06	1.6	0.06	57.6	53.8	7.70	**19150R**	**19282**	16.1	0.63	45.0	1.77	43.0	1.69	63.0	2.48	66.0	2.60	0.44	1.35	0.74	13.2	10.0	1.32
	1.5000	71.996	2.8346	17.018	0.6700	16.520	0.6504	14.288	0.5625	1.6	0.06	1.6	0.06	57.6	53.8	7.70	**19150R**	**19283**	15.7	0.62	45.0	1.77	43.0	1.69	63.0	2.48	66.0	2.60	0.44	1.35	0.74	13.2	10.0	1.32
	1.5000	71.996	2.8346	19.000	0.7480	20.638	0.8125	14.237	0.5605	3.6	0.14	1.6	0.06	62.3	61.3	8.90	**16150**	**16282**	15.0	0.59	49.5	1.95	43.0	1.69	63.0	2.48	67.0	2.64	0.40	1.49	0.82	14.4	9.90	1.46
	1.5000	72.238	2.8440	20.638	0.8125	20.638	0.8125	15.875	0.6250	3.6	0.14	1.2	0.05	62.3	61.3	8.90	**16150**	**16284**	16.6	0.65	49.5	1.95	43.0	1.69	63.0	2.48	67.0	2.64	0.40	1.49	0.82	14.4	9.90	1.46
	1.5000	72.238	2.8440	20.638	0.8125	20.638	0.8125	15.875	0.6250	2.4	0.09	1.2	0.05	62.3	61.3	8.90	**16151**	**16284**	16.6	0.65	49.5	1.95	43.0	1.69	63.0	2.48	67.0	2.64	0.40	1.49	0.82	14.4	9.90	1.46
	1.5000	72.238	2.8440	23.812	0.9375	20.638	0.8125	19.050	0.7500	3.6	0.14	2.4	0.09	62.3	61.3	8.90	**16150**	**16283**	19.8	0.78	49.5	1.95	43.0	1.69	61.0	2.40	67.0	2.64	0.40	1.49	0.82	14.4	9.90	1.46
	1.5000	73.025	2.8750	23.812	0.9375	25.654	1.0100	19.050	0.7500	4.3	0.17	0.8	0.03	92.6	92.2	13.8	**2776R**	**2735X**	15.9	0.63	52.0	2.05	43.5	1.71	66.0	2.60	69.0	2.72	0.30	1.98	1.09	21.5	11.1	1.93
	1.5000	73.025	2.8750	23.812	0.9375	25.654	1.0100	19.050	0.7500	1.6	0.06	0.8	0.03	92.6	92.2	13.8	**2788AR**	**2735X**	15.9	0.63	46.0	1.81	43.5	1.71	66.0	2.60	69.0	2.72	0.30	1.98	1.09	21.5	11.1	1.93
	1.5000	73.025	2.8750	23.812	0.9375	25.654	1.0100	19.050	0.7500	3.6	0.14	0.8	0.03	92.6	92.2	13.8	**2788R**	**2735X**	15.9	0.63	50.0	1.97	43.5	1.71	66.0	2.60	69.0	2.72	0.30	1.98	1.09	21.5	11.1	1.93
	1.5000	76.200	3.0000	23.812	0.9375	25.654	1.0100	19.050	0.7500	3.6	0.14	0.8	0.03	92.6	92.2	13.8	**2788R**	**2729**	15.9	0.63	50.0	1.97	43.5	1.71	68.0	2.68	70.0	2.76	0.30	1.98	1.09	21.5	11.1	1.93
	1.5000	79.375	3.1250	23.812	0.9375	25.400	1.0000	19.050	0.7500	0.8	0.03	2.4	0.09	101	105	15.8	**26878R**	**26822A**	16.4	0.65	45.0	1.77	44.5	1.75	69.0	2.72	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.5000	79.375	3.1250	29.370	1.1563	29.771	1.1721	23.812	0.9375	3.6	0.14	3.2	0.13	109	105	15.7	**3490**	**3420**	20.8	0.82	52.0	2.05	45.9	1.81	67.0	2.64	74.0	2.91	0.37	1.64	0.90	25.5	15.9	1.60
	1.5000	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	3.6	0.14	1.2	0.05	85.0	74.8	11.4	**347**	**332**	15.1	0.59	50.0	1.97	44.0	1.73	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.5000	80.000	3.1496	24.176	0.9518	22.403	0.8820	21.000	0.8268	0.8	0.03	2.4	0.09	85.0	74.8	11.4	**337**	**332A**	18.3	0.72	44.5	1.75	44.0	1.73	71.0	2.80	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.5000	80.035	3.1510	21.432	0.8438	20.940	0.8244	15.875	0.6250	1.6	0.06	1.6	0.06	71.6	65.9	9.70	**28150**	**28317**	16.9	0.67	45.5	1.79	43.5	1.71	69.0	2.72	73.0	2.87	0.40	1.49	0.82	16.5	11.3	1.46
	1.5000	80.035	3.1510	21.432	0.8438	20.940	0.8244	15.875	0.6250	3.6	0.14	1.6	0.06	71.6	65.9	9.70	**28151**	**28317**	16.9	0.67	45.5	1.79	43.5	1.71	69.0	2.72	73.0	2.87	0.40	1.49	0.82	16.5	11.3	1.46
	1.5000	80.035	3.1510	24.608	0.9688	23.698	0.9330	18.512	0.7288	0.8	0.03	1.6	0.06	91.6	91.6	13.3	**27880**	**27820**	22.2	0.87	48.0	1.89	47.0	1.85	68.0	2.68	75.0	2.95	0.56	1.07	0.59	21.2	20.3	1.04
	1.5000	80.035	3.1510	24.608	0.9688	23.698	0.9330	18.512	0.7288	3.6	0.14	1.6	0.06	91.6	91.6	13.3	**27881**	**27820**	22.2	0.87	53.0	2.09	47.0	1.85	68.0	2.68	75.0	2.95	0.56	1.07	0.59	21.2	20.3	1.04
	1.5000	80.035	3.1510	29.370	1.1563	30.391	1.1965	23.812	0.9375	0.8	0.03	1.6	0.06	114	106	16.2	**3387**	**3339**	18.7	0.74	45.0	1.77	44.5	1.75	71.0	2.80	75.0	2.95	0.27	2.20	1.21	26.6	12.4	2.14
	1.5000	80.167	3.1562	29.370	1.1563	30.391	1.1965	23.812	0.9375	3.6	0.14	0.8	0.03	114	106	16.2	**3381**	**3331**	18.7	0.74	51.0	2.01	44.5	1.75	72.0	2.83	75.0	2.95	0.27	2.20	1.21	26.6	12.4	2.14
	1.5000	82.550	3.2500	29.370	1.1563	28.575	1.1250	23.020	0.9063	0.8	0.03	3.2	0.13	109	117	16.9	**HM801346**	**HM801310**	24.4	0.96	51.0	2.01	49.0	1.93	68.0	2.68	78.0	3.07	0.55	1.10	0.60	25.5	23.8	1.07
	1.5000	82.550	3.2500	29.370	1.1563	28.575	1.1250	23.020	0.9063	2.4	0.09	3.2	0.13	109	117	16.9	**HM801346X**	**HM801310**	24.4	0.96	54.0	2.13	49.0	1.93	68.0	2.68	78.0	3.07	0.55	1.10	0.60	25.5	23.8	1.07
	1.5000	82.931	3.2650	23.812	0.9375	25.400	1.0000	19.050	0.7500	0.8	0.03	0.8	0.03	96.8	100	15.1	**25572**	**25520**	17.5	0.69	46.0	1.81	46.0	1.81	74.0	2.91	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.5000	84.138	3.3125	30.162	1.1875	30.886	1.2160	23.812	0.9375	1.6	0.06	3.2	0.13	120	120	18.2	**3580R**	**3520**	20.5	0.81	48.0	1.89	45.5	1.79	74.0	2.91	79.5	3.13	0.31	1.96	1.08	27.9	14.6	1.91
	1.5000	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	0.8	0.03	1.2	0.05	135	136	20.3	**3875**	**3821**	22.9	0.90	49.5	1.95	48.5	1.91	75.0	2.95	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46
	1.5000	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	1.2	0.05	135	136	20.3	**3876**	**3821**	22.9	0.90	55.0	2.17	48.5	1.91	75.0	2.95	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46

Note 1) SP indicates the specially chamfered from.

TS type

d (38.100) ~ (40.000) mm
(1.5000) ~ (1.5748) inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

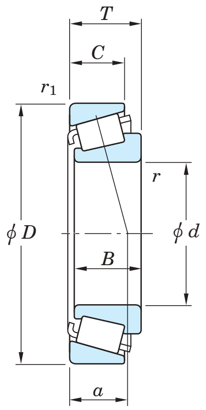
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

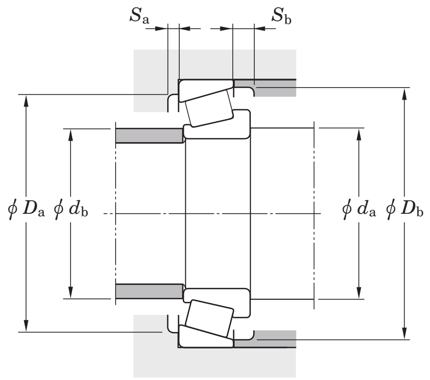
Boundary dimensions *d* mm	*d* inch	*D* mm	*D* inch	*T* mm	*T* inch	*B* mm	*B* inch	*C* mm	*C* inch	r[1] (min.) mm	r[1] (min.) inch	r_1[1] (min.) mm	r_1[1] (min.) inch	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Bearing No. Cone (Inner ring)	Bearing No. Cup (Outer ring)	Load center *a* mm	Load center *a* inch	Mounting dimensions d_a mm	d_a inch	d_b mm	d_b inch	D_a mm	D_a inch	D_b mm	D_b inch	Con-stant *e*	Axial load factors Y_1	Axial load factors Y_0	Reference rating (kN) (500 rpm for 3 000 Hrs.) Radial	Reference rating (kN) (500 rpm for 3 000 Hrs.) Axial	Factor *K*
38.100	1.5000	87.312	3.4375	30.162	1.1875	30.886	1.2160	23.812	0.9375	3.6	0.14	0.8	0.03	120	120	18.2	**3583R**	**3526**	20.5	0.81	52.0	2.05	45.5	1.79	76.0	2.99	80.0	3.15	0.31	1.96	1.08	27.9	14.6	1.91
	1.5000	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	0.8	0.03	1.6	0.06	123	112	17.2	**415**	**414**	16.9	0.67	45.0	1.77	44.5	1.75	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.5000	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	3.6	0.14	1.6	0.06	123	112	17.2	**418**	**414**	16.9	0.67	51.0	2.01	44.5	1.75	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.5000	88.900	3.5000	26.988	1.0625	29.083	1.1450	22.225	0.8750	0.8	0.03	0.8	0.03	123	112	17.2	**415**	**414X**	16.9	0.67	45.0	1.77	44.5	1.75	78.0	3.07	79.0	3.11	0.26	2.28	1.25	28.6	12.9	2.22
	1.5000	90.488	3.5625	39.688	1.5625	40.386	1.5900	33.338	1.3125	1.6	0.06	3.2	0.13	166	169	25.9	**4375**	**4335**	25.6	1.01	51.0	2.01	48.5	1.91	77.0	3.03	85.0	3.35	0.28	2.11	1.16	38.8	18.9	2.06
	1.5000	93.662	3.6875	31.750	1.2500	31.750	1.2500	25.400	1.0000	3.6	0.14	3.2	0.13	131	123	18.8	**49150**	**49368**	24.0	0.94	52.0	2.05	46.0	1.81	82.0	3.23	87.0	3.43	0.36	1.67	0.92	30.6	18.8	1.62
	1.5000	93.662	3.6875	31.750	1.2500	31.750	1.2500	26.195	1.0313	0.8	0.03	3.2	0.13	132	134	20.2	**46150**	**46368**	24.0	0.94	49.0	1.93	47.5	1.87	79.0	3.11	87.0	3.43	0.40	1.49	0.82	30.8	21.1	1.46
	1.5000	93.662	3.6875	31.750	1.2500	31.750	1.2500	26.195	1.0313	3.6	0.14	3.2	0.13	132	134	20.2	**46151**	**46368**	24.0	0.94	54.0	2.13	47.5	1.87	79.0	3.11	87.0	3.43	0.40	1.49	0.82	30.8	21.1	1.46
	1.5000	95.250	3.7500	27.783	1.0938	28.575	1.1250	22.225	0.8750	3.6	0.14	0.8	0.03	135	141	21.6	**33880**	**33822**	20.4	0.80	54.0	2.13	48.0	1.89	86.0	3.39	90.0	3.54	0.33	1.82	1.00	31.4	17.7	1.77
	1.5000	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	0.8	0.03	0.8	0.03	129	122	18.8	**440**	**432A**	18.4	0.72	46.5	1.83	45.5	1.79	84.0	3.31	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
	1.5000	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	3.6	0.14	0.8	0.03	129	122	18.8	**444**	**432A**	18.4	0.72	52.0	2.05	45.5	1.79	84.0	3.31	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
	1.5000	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	3.6	0.14	3.2	0.13	164	159	24.8	**525**	**522**	22.2	0.87	54.0	2.13	48.0	1.89	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	1.5000	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	0.8	0.03	3.2	0.13	164	159	24.8	**525X**	**522**	22.2	0.87	49.0	1.93	48.0	1.89	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	1.5000	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	3.6	0.14	3.2	0.13	172	172	26.8	**542**	**532X**	23.9	0.94	55.0	2.17	49.0	1.93	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
38.913	1.5320	122.238	4.8125	51.595	2.0313	51.702	2.0355	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5561R**	**5535**	39.0	1.54	57.0	2.24	52.0	2.05	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
39.624	1.5600	63.500	2.5000	12.700	0.5000	11.908	0.4688	9.525	0.3750	1.6	0.06	0.8	0.03	32.1	33.1	4.60	**13892**	**13830**	11.9	0.47	45.0	1.77	42.5	1.67	59.0	2.32	60.0	2.36	0.35	1.73	0.95	7.30	4.30	1.69
39.688	1.5625	73.025	2.8750	16.667	0.6562	17.462	0.6875	12.700	0.5000	0.8	0.03	1.6	0.06	57.6	55.8	8.15	**18587**	**18520**	14.5	0.57	46.0	1.81	46.0	1.81	66.0	2.60	69.0	2.72	0.35	1.71	0.94	13.2	7.90	1.67
	1.5625	73.025	2.8750	23.812	0.9375	25.654	1.0100	19.050	0.7500	3.6	0.14	0.8	0.03	92.6	92.2	13.8	**2789R**	**2735X**	15.9	0.63	52.0	2.05	45.0	1.77	66.0	2.60	69.0	2.72	0.30	1.98	1.09	21.5	11.1	1.93
	1.5625	80.000	3.1496	23.812	0.9375	25.400	1.0000	19.050	0.7500	1.6	0.06	1.2	0.05	101	105	15.8	**26880R**	**26824**	16.4	0.65	48.0	1.89	45.5	1.79	70.0	2.76	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.5625	80.167	3.1562	25.400	1.0000	25.400	1.0000	20.638	0.8125	3.6	0.14	0.8	0.03	101	105	15.8	**26881R**	**26830**	18.0	0.71	52.0	2.05	45.5	1.79	71.0	2.80	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.5625	80.167	3.1562	29.370	1.1563	30.391	1.1965	23.812	0.9375	0.8	0.03	3.2	0.13	114	106	16.2	**3386**	**3320**	18.7	0.74	46.5	1.83	45.5	1.79	70.0	2.76	75.0	2.95	0.27	2.20	1.21	26.6	12.4	2.14
	1.5625	81.755	3.2187	29.370	1.1563	30.391	1.1965	23.812	0.9375	3.6	0.14	3.2	0.13	114	106	16.2	**3382**	**3329**	18.7	0.74	52.0	2.05	45.5	1.79	71.0	2.80	75.0	2.95	0.27	2.20	1.21	26.6	12.4	2.14
	1.5625	84.138	3.3125	29.370	1.1563	30.391	1.1965	23.812	0.9375	3.6	0.14	3.2	0.13	114	106	16.2	**3382**	**3328**	18.7	0.74	52.0	2.05	45.5	1.79	72.0	2.83	76.0	2.99	0.27	2.20	1.21	26.6	12.4	2.14
	1.5625	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	3.6	0.14	1.6	0.06	123	112	17.2	**422**	**414**	16.9	0.67	52.0	2.05	46.5	1.83	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.5625	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	3.6	0.14	3.2	0.13	123	112	17.2	**422**	**414A**	16.9	0.67	52.0	2.05	46.5	1.83	76.0	2.99	79.0	3.11	0.26	2.28	1.25	28.6	12.9	2.22
	1.5625	90.488	3.5625	39.688	1.5625	40.386	1.5900	33.338	1.3125	3.6	0.14	3.2	0.13	166	169	25.9	**4367**	**4335**	25.6	1.01	55.0	2.17	49.0	1.93	77.0	3.03	85.0	3.35	0.28	2.11	1.16	38.8	18.9	2.06
	1.5625	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	3.2	0.13	129	137	20.9	**3774**	**3720**	22.2	0.87	55.0	2.17	51.0	2.01	82.0	3.23	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	1.5625	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	3.6	0.14	3.2	0.13	164	159	24.8	**525A**	**522**	22.2	0.87	56.0	2.20	49.0	1.93	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	1.5625	120.040	4.7260	41.275	1.6250	41.275	1.6250	31.750	1.2500	0.8	0.03	3.2	0.13	218	217	34.0	**620**	**612A**	27.3	1.07	52.0	2.05	52.0	2.05	103.0	4.06	109.0	4.29	0.31	1.91	1.05	50.9	27.4	1.86
	1.5625	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	0.8	0.03	3.2	0.13	218	217	34.0	**620**	**612**	27.3	1.07	52.0	2.05	52.0	2.05	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
39.980	1.5740	76.200	3.0000	18.009	0.7090	17.384	0.6844	14.288	0.5625	1.6	0.06	1.6	0.06	64.7	63.3	9.15	**11157R**	**11300**	17.5	0.69	48.5	1.91	46.0	1.81	67.0	2.64	72.0	2.83	0.49	1.23	0.68	14.9	12.4	1.20
	1.5740	80.000	3.1496	18.009	0.7090	17.384	0.6844	14.288	0.5625	1.6	0.06	1.6	0.06	64.7	63.3	9.15	**11157R**	**11315**	17.5	0.69	48.5	1.91	46.0	1.81	67.0	2.64	72.0	2.83	0.49	1.23	0.68	14.9	12.4	1.20
	1.5740	80.035	3.1510	21.432	0.8438	20.940	0.8244	15.875	0.6250	3.6	0.14	1.6	0.06	71.6	65.9	9.70	**28159**	**28317**	16.9	0.67	52.0	2.05	45.0	1.77	69.0	2.72	73.0	2.87	0.40	1.49	0.82	16.5	11.3	1.46
40.000	1.5748	76.200	3.0000	18.009	0.7090	17.384	0.6844	14.288	0.5625	2.0	0.08	1.6	0.06	64.7	63.3	9.15	**11157XR**	**11300**	17.5	0.69	52.0	2.05	46.0	1.81	67.0	2.64	72.0	2.83	0.49	1.23	0.68	14.9	12.4	1.20
	1.5748	76.200	3.0000	20.638	0.8125	20.940	0.8244	15.507	0.6105	1.6	0.06	1.2	0.05	71.6	65.9	9.70	**28158**	**28300**	16.5	0.65	47.5	1.87	45.0	1.77	68.0	2.68	71.0	2.80	0.40	1.49	0.82	16.5	11.3	1.46
	1.5748	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	3.6	0.14	1.2	0.05	85.0	74.8	11.4	**344**	**332**	15.1	0.59	52.0	2.05	45.5	1.79	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.5748	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**344A**	**332**	15.1	0.59	46.0	1.81	45.5	1.79	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.5748	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	0.8	0.03	1.2	0.05	89.6	81.7	12.4	**350A**	**354A**	15.5	0.61	47.5	1.87	46.5	1.83	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91
	1.5748	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	2.4	0.09	1.6	0.06	89.6	81.7	12.4	**357**	**354X**	15.5	0.61	51.0	2.01	46.5	1.83	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91

Note 1) SP indicates the specially chamfered from.

TS type

d (40.000) ~ (41.275) mm
(1.5748) ~ (1.6250) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

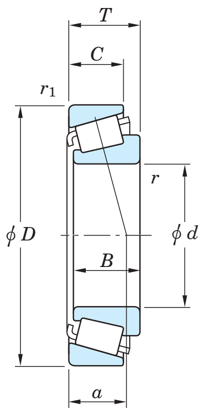
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

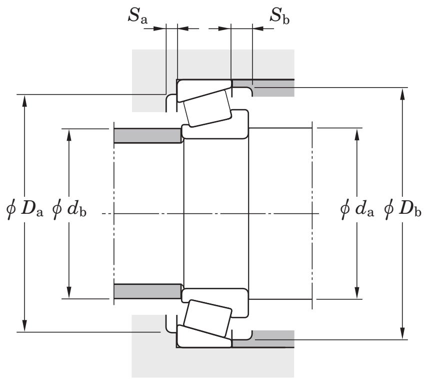
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u	Cone	Cup	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
40.000	1.5748	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	0.8	0.03	1.2	0.05	135	136	20.3	**3879**	**3821**	22.9	0.90	51.0	2.01	50.0	1.97	75.0	2.95	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46
	1.5748	87.312	3.4375	30.162	1.1875	30.886	1.2160	23.812	0.9375	3.6	0.14	3.2	0.13	120	120	18.2	**3582R**	**3525**	20.5	0.81	53.0	2.09	48.5	1.91	75.0	2.95	81.0	3.19	0.31	1.96	1.08	27.9	14.6	1.91
	1.5748	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	3.6	0.14	1.6	0.06	123	112	17.2	**420**	**414**	16.9	0.67	52.0	2.05	46.0	1.81	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.5748	90.119	3.5480	23.000	0.9055	21.692	0.8540	21.808	0.8586	4.0	0.16	2.4	0.09	89.6	81.7	12.4	**350**	**352**	17.8	0.70	54.0	2.13	46.5	1.83	78.0	3.07	82.0	3.23	0.31	1.96	1.08	20.7	10.8	1.91
	1.5748	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	3.6	0.14	2.4	0.09	129	122	18.8	**442S**	**432**	23.6	0.93	54.0	2.13	49.0	1.93	83.0	3.27	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
	1.5748	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	3.6	0.14	3.2	0.13	172	172	26.8	**543**	**532X**	23.9	0.94	57.0	2.24	50.0	1.97	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
40.483	1.5938	82.550	3.2500	29.370	1.1563	28.575	1.1250	23.020	0.9063	3.6	0.14	3.2	0.13	109	117	16.9	**HM801349**	**HM801310**	24.4	0.96	58.0	2.28	49.0	1.93	68.0	2.68	78.0	3.07	0.55	1.10	0.60	25.5	23.8	1.07
41.275	1.6250	73.025	2.8750	16.667	0.6562	17.462	0.6875	12.700	0.5000	3.6	0.14	1.6	0.06	57.6	55.8	8.15	**18590**	**18520**	14.5	0.57	53.0	2.09	46.0	1.81	66.0	2.60	69.0	2.72	0.35	1.71	0.94	13.2	7.90	1.67
	1.6250	73.025	2.8750	16.667	0.6562	17.462	0.6875	12.700	0.5000	1.2	0.05	1.6	0.06	57.6	55.8	8.15	**18591**	**18520**	14.5	0.57	47.5	1.87	46.0	1.81	66.0	2.60	69.0	2.72	0.35	1.71	0.94	13.2	7.90	1.67
	1.6250	73.431	2.8910	19.558	0.7700	19.812	0.7800	14.732	0.5800	3.6	0.14	0.8	0.03	72.5	73.0	10.6	**LM501349**	**LM501310**	16.1	0.63	53.0	2.09	46.5	1.83	67.0	2.64	70.0	2.76	0.40	1.50	0.83	16.7	11.4	1.46
	1.6250	73.431	2.8910	21.430	0.8437	19.812	0.7800	16.604	0.6537	3.6	0.14	0.8	0.03	72.5	73.0	10.6	**LM501349**	**LM501314**	18.0	0.71	53.0	2.09	46.5	1.83	66.0	2.60	70.0	2.76	0.40	1.50	0.83	16.7	11.4	1.46
	1.6250	73.431	2.8910	23.012	0.9060	19.812	0.7800	18.186	0.7160	3.6	0.14	2.4	0.09	72.5	73.0	10.6	**LM501349**	**LM501311**	16.1	0.63	53.0	2.09	46.5	1.83	64.0	2.52	70.0	2.76	0.40	1.50	0.83	16.7	11.4	1.46
	1.6250	76.200	3.0000	18.009	0.7090	17.384	0.6844	14.288	0.5625	1.6	0.06	1.6	0.06	64.7	63.3	9.15	**11162R**	**11300**	17.5	0.69	49.0	1.93	46.5	1.83	67.0	2.64	72.0	2.83	0.49	1.23	0.68	14.9	12.4	1.20
	1.6250	76.200	3.0000	18.009	0.7090	17.384	0.6844	14.288	0.5625	1.6	0.06	1.6	0.06	64.7	63.3	9.15	**11162UR**	**11300**	17.5	0.69	49.0	1.93	46.0	1.81	67.0	2.64	72.0	2.83	0.49	1.23	0.68	14.9	12.4	1.20
	1.6250	76.200	3.0000	18.009	0.7090	17.384	0.6844	14.288	0.5625	0.8	0.03	1.6	0.06	64.7	63.3	9.15	**11163R**	**11300**	17.5	0.69	47.0	1.85	46.5	1.83	67.0	2.64	72.0	2.83	0.49	1.23	0.68	14.9	12.4	1.20
	1.6250	76.200	3.0000	22.225	0.8750	23.020	0.9063	17.462	0.6875	3.6	0.14	0.8	0.03	82.9	83.3	12.3	**24780R**	**24720**	17.4	0.69	54.0	2.13	47.0	1.85	68.0	2.68	72.0	2.83	0.39	1.53	0.84	19.2	12.9	1.49
	1.6250	76.200	3.0000	22.225	0.8750	23.020	0.9063	17.462	0.6875	3.6	0.14	3.2	0.13	82.9	83.3	12.3	**24780R**	**24722**	17.4	0.69	54.0	2.13	47.0	1.85	66.0	2.60	72.0	2.83	0.39	1.53	0.84	19.2	12.9	1.49
	1.6250	76.200	3.0000	22.225	0.8750	23.020	0.9063	17.462	0.6875	0.8	0.03	0.8	0.03	82.9	83.3	12.3	**24781R**	**24720**	17.4	0.69	47.0	1.85	47.0	1.85	68.0	2.68	72.0	2.83	0.39	1.53	0.84	19.2	12.9	1.49
	1.6250	76.200	3.0000	25.400	1.0000	23.020	0.9063	20.638	0.8125	3.6	0.14	2.4	0.09	82.9	83.3	12.3	**24780R**	**24721**	20.6	0.81	54.0	2.13	47.0	1.85	66.0	2.60	72.0	2.83	0.39	1.53	0.84	19.2	12.9	1.49
	1.6250	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	0.8	0.03	1.2	0.05	85.0	74.8	11.4	**336**	**332**	15.1	0.59	47.0	1.85	46.0	1.81	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.6250	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	3.6	0.14	1.2	0.05	85.0	74.8	11.4	**342**	**332**	15.1	0.59	53.0	2.09	46.0	1.81	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.6250	80.000	3.1496	28.575	1.1250	29.977	1.1802	17.826	0.7018	3.6	0.14	1.2	0.05	85.0	74.8	11.4	**342A**	**332**	22.7	0.89	53.0	2.09	46.0	1.81	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.6250	80.000	3.1496	31.750	1.2500	29.977	1.1802	21.000	0.8268	3.6	0.14	2.4	0.09	85.0	74.8	11.4	**342A**	**332A**	22.7	0.89	53.0	2.09	46.0	1.81	71.0	2.80	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.6250	80.167	3.1562	25.400	1.0000	25.400	1.0000	20.638	0.8125	0.8	0.03	3.2	0.13	101	105	15.8	**26885R**	**26820**	17.9	0.70	48.0	1.89	47.0	1.85	69.0	2.72	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.6250	80.167	3.1562	29.370	1.1563	25.400	1.0000	24.608	0.9688	3.6	0.14	3.2	0.13	101	105	15.8	**26882R**	**26821**	17.9	0.70	54.0	2.13	47.0	1.85	68.0	2.68	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.6250	82.550	3.2500	26.543	1.0450	25.654	1.0100	20.193	0.7950	3.6	0.14	3.2	0.13	105	105	15.4	**M802048**	**M802011**	23.3	0.92	57.0	2.24	50.6	1.99	70.0	2.76	79.0	3.11	0.55	1.10	0.60	24.2	22.6	1.07
	1.6250	84.138	3.3125	29.370	1.1563	30.391	1.1965	23.812	0.9375	3.6	0.14	3.2	0.13	114	106	16.2	**3383**	**3328**	18.7	0.74	52.0	2.05	46.0	1.81	72.0	2.83	76.0	2.99	0.27	2.20	1.21	26.6	12.4	2.14
	1.6250	84.138	3.3125	29.370	1.1563	30.391	1.1965	23.812	0.9375	0.8	0.03	3.2	0.13	114	106	16.2	**3384**	**3328**	18.7	0.74	48.0	1.89	41.5	1.63	72.0	2.83	76.0	2.99	0.27	2.20	1.21	26.6	12.4	2.14
	1.6250	84.138	3.3125	30.162	1.1875	30.886	1.2160	23.812	0.9375	3.6	0.14	3.2	0.13	120	120	18.2	**3577R**	**3520**	20.5	0.81	54.0	2.13	48.0	1.89	74.0	2.91	79.5	3.13	0.31	1.96	1.08	27.9	14.6	1.91
	1.6250	84.138	3.3125	30.162	1.1875	30.886	1.2160	23.812	0.9375	1.6	0.06	3.2	0.13	120	120	18.2	**3585R**	**3520**	20.5	0.81	50.0	1.97	48.0	1.89	74.0	2.91	79.5	3.13	0.31	1.96	1.08	27.9	14.6	1.91
	1.6250	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	1.2	0.05	135	136	20.3	**3877**	**3821**	22.9	0.90	57.0	2.24	50.3	1.98	75.0	2.95	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46
	1.6250	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	2.4	0.09	1.2	0.05	135	136	20.3	**3877A**	**3821**	22.9	0.90	55.0	2.17	50.3	1.98	75.0	2.95	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46
	1.6250	85.725	3.3750	30.162	1.1875	30.162	1.1875	23.812	0.9375	0.8	0.03	1.2	0.05	135	136	20.3	**3880**	**3821**	22.9	0.90	52.0	2.05	50.3	1.98	75.0	2.95	81.0	3.19	0.40	1.49	0.82	31.5	21.7	1.46
	1.6250	87.312	3.4375	30.162	1.1875	30.886	1.2160	23.812	0.9375	0.8	0.03	3.2	0.13	120	120	18.2	**3576R**	**3525**	20.5	0.81	49.0	1.93	48.0	1.89	75.0	2.95	81.0	3.19	0.31	1.96	1.08	27.9	14.6	1.91
	1.6250	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	3.6	0.14	1.6	0.06	123	112	17.2	**419**	**414**	16.9	0.67	54.0	2.13	47.0	1.85	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.6250	88.501	3.4843	26.988	1.0625	29.083	1.1450	22.225	0.8750	0.8	0.03	1.6	0.06	123	112	17.2	**423X**	**414**	16.9	0.67	49.0	1.93	47.0	1.85	77.0	3.03	80.0	3.15	0.26	2.28	1.25	28.6	12.9	2.22
	1.6250	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	3.6	0.14	1.2	0.05	92.9	87.3	13.3	**365A**	**362A**	16.1	0.63	55.0	2.17	48.5	1.91	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	1.6250	88.900	3.5000	30.162	1.1875	29.370	1.1563	23.020	0.9063	0.8	0.03	3.2	0.13	124	125	18.5	**HM803145**	**HM803110**	26.1	1.03	54.0	2.13	53.0	2.09	74.0	2.91	85.0	3.35	0.55	1.10	0.60	28.8	26.9	1.07
	1.6250	88.900	3.5000	30.162	1.1875	29.370	1.1563	23.020	0.9063	3.6	0.14	3.2	0.13	124	125	18.5	**HM803146**	**HM803110**	26.1	1.03	60.0	2.36	53.0	2.09	74.0	2.91	85.0	3.35	0.55	1.10	0.60	28.8	26.9	1.07
	1.6250	90.488	3.5625	39.688	1.5625	40.386	1.5900	33.338	1.3125	3.6	0.14	3.2	0.13	166	169	25.9	**4388**	**4335**	25.6	1.01	57.0	2.24	51.0	2.01	77.0	3.03	85.0	3.35	0.28	2.11	1.16	38.8	18.9	2.06

Note 1) SP indicates the specially chamfered from.

TS type

d (41.275) ~ (44.450) mm
(1.6250) ~ (1.7500) inch





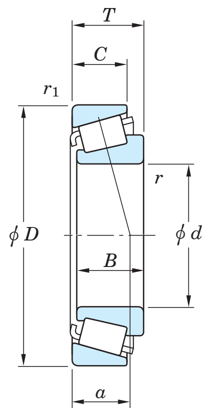
$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

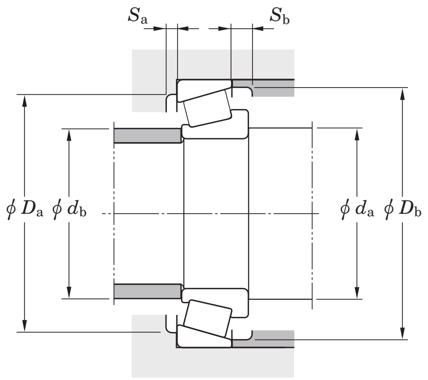
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u	Cone	Cup	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
41.275	1.6250	93.662	3.6875	31.750	1.2500	31.750	1.2500	25.400	1.0000	3.6	0.14	3.2	0.13	131	123	18.8	**49162**	**49368**	22.9	0.90	55.0	2.17	49.0	1.93	82.0	3.23	87.0	3.43	0.36	1.67	0.92	30.6	18.8	1.62
	1.6250	93.662	3.6875	31.750	1.2500	31.750	1.2500	26.195	1.0313	0.8	0.03	3.2	0.13	132	134	20.2	**46162**	**46368**	24.0	0.94	52.0	2.05	51.0	2.01	79.0	3.11	87.0	3.43	0.40	1.49	0.82	30.8	21.1	1.46
	1.6250	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	1.2	0.05	2.4	0.09	129	122	18.8	**439**	**432**	18.4	0.72	51.0	2.01	48.5	1.91	83.0	3.27	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
	1.6250	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	3.6	0.14	0.8	0.03	129	122	18.8	**447**	**432A**	18.4	0.72	55.0	2.17	48.5	1.91	84.0	3.31	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
	1.6250	95.250	3.7500	30.162	1.1875	29.370	1.1563	23.020	0.9063	3.6	0.14	3.2	0.13	130	140	20.7	**HM804840**	**HM804810**	26.5	1.04	61.0	2.40	54.0	2.13	81.0	3.19	91.0	3.58	0.55	1.10	0.60	30.4	28.4	1.07
	1.6250	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	3.6	0.14	3.2	0.13	164	159	24.8	**526**	**522**	22.2	0.87	57.0	2.24	50.0	1.97	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	1.6250	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	0.8	0.03	3.2	0.13	164	159	24.8	**526A**	**522**	22.2	0.87	52.0	2.05	50.0	1.97	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	1.6250	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	1.6	0.06	3.2	0.13	136	144	22.2	**464A**	**453X**	23.6	0.93	54.0	2.13	52.0	2.05	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	1.6250	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	1.6	0.06	3.2	0.13	185	187	28.6	**59162**	**59412**	26.9	1.06	55.0	2.17	54.0	2.13	92.0	3.62	99.0	3.90	0.40	1.49	0.82	43.2	29.6	1.46
	1.6250	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	1.6	0.06	3.2	0.13	176	195	29.3	**HM807035**	**HM807010**	29.3	1.15	60.0	2.36	57.0	2.24	89.0	3.50	100.0	3.94	0.49	1.23	0.68	41.3	34.4	1.20
	1.6250	107.950	4.2500	27.783	1.0938	29.317	1.1542	22.225	0.8750	2.4	0.09	0.8	0.03	136	144	22.2	**464**	**453A**	23.6	0.93	56.0	2.20	52.0	2.05	97.0	3.82	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	1.6250	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	3.6	0.14	3.2	0.13	172	172	26.8	**541**	**532X**	23.9	0.94	58.0	2.28	52.0	2.05	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
42.000	1.6535	76.200	3.0000	18.009	0.7090	17.384	0.6844	14.288	0.5625	2.0	0.08	1.6	0.06	64.7	63.3	9.15	**11165XR**	**11300**	17.5	0.69	51.0	2.01	46.0	1.81	67.0	2.64	72.0	2.83	0.49	1.23	0.68	14.9	12.4	1.20
	1.6535	76.200	3.0000	18.009	0.7090	17.384	0.6844	14.288	0.5625	4.3	0.17	3.6	0.14	64.7	63.3	9.15	**11165XSR**	**11300**	17.5	0.69	53.0	2.09	46.0	1.81	67.0	2.64	72.0	2.83	0.49	1.23	0.68	14.9	12.4	1.20
42.070	1.6563	90.488	3.5625	39.688	1.5625	40.386	1.5900	33.338	1.3125	3.6	0.14	3.2	0.13	166	169	25.9	**4395**	**4335**	25.6	1.01	58.0	2.28	51.0	2.01	77.0	3.03	85.0	3.35	0.28	2.11	1.16	38.8	18.9	2.06
42.850	1.6870	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	0.8	0.03	3.2	0.13	136	144	22.2	**461**	**453X**	23.6	0.93	54.5	2.15	54.0	2.13	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
42.862	1.6875	76.992	3.0312	17.463	0.6875	17.145	0.6750	11.908	0.4688	1.6	0.06	1.6	0.06	56.6	62.2	8.15	**12168**	**12303**	17.5	0.69	51.0	2.01	48.5	1.91	68.0	2.68	73.0	2.87	0.51	1.19	0.65	13.0	11.3	1.16
	1.6875	82.931	3.2650	26.988	1.0625	25.400	1.0000	22.225	0.8750	2.4	0.09	2.4	0.09	96.8	100	15.1	**25578**	**25523**	20.7	0.81	53.0	2.09	49.5	1.95	72.0	2.83	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.6875	83.058	3.2700	23.812	0.9375	25.400	1.0000	19.050	0.7500	3.6	0.14	3.2	0.13	96.8	100	15.1	**25576**	**25521**	17.5	0.69	55.0	2.17	49.0	1.93	72.0	2.83	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.6875	84.138	3.3125	30.162	1.1875	30.886	1.2160	23.812	0.9375	3.6	0.14	3.2	0.13	120	120	18.2	**3579R**	**3520**	20.5	0.81	56.0	2.20	49.5	1.95	74.0	2.91	79.5	3.13	0.31	1.96	1.08	27.9	14.6	1.91
	1.6875	85.000	3.3464	25.400	1.0000	25.608	1.0082	20.638	0.8125	3.6	0.14	1.2	0.05	100	106	16.0	**2973**	**2924**	18.9	0.74	55.0	2.17	49.0	1.93	76.0	2.99	80.0	3.15	0.35	1.73	0.95	23.3	13.8	1.69
	1.6875	114.300	4.5000	44.450	1.7500	44.450	1.7500	34.925	1.3750	2.0	0.08	3.2	0.13	237	230	35.1	**65383**	**65320**	31.7	1.25	60.0	2.36	56.0	2.20	97.0	3.82	107.0	4.21	0.43	1.40	0.77	55.4	40.7	1.36
42.875	1.6880	76.200	3.0000	25.400	1.0000	25.400	1.0000	20.638	0.8125	1.6	0.06	1.6	0.06	101	105	15.8	**26886R**	**26823**	18.0	0.71	51.0	2.01	48.5	1.91	69.0	2.72	73.0	2.87	0.32	1.88	1.04	23.5	12.8	1.83
	1.6880	79.375	3.1250	23.812	0.9375	25.400	1.0000	19.050	0.7500	3.6	0.14	0.8	0.03	101	105	15.8	**26884R**	**26822**	16.1	0.63	55.0	2.17	48.5	1.91	71.0	2.80	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.6880	80.000	3.1496	21.000	0.8268	22.403	0.8820	17.826	0.7018	3.6	0.14	1.2	0.05	85.0	74.8	11.4	**342S**	**332**	15.1	0.59	54.0	2.13	47.5	1.87	73.0	2.87	75.0	2.95	0.27	2.20	1.21	19.6	9.15	2.14
	1.6880	80.167	3.1562	25.400	1.0000	25.400	1.0000	20.638	0.8125	3.6	0.14	3.2	0.13	101	105	15.8	**26884R**	**26820**	18.0	0.71	55.0	2.17	48.5	1.91	69.0	2.72	74.0	2.91	0.32	1.88	1.04	23.5	12.8	1.83
	1.6880	82.931	3.2650	23.812	0.9375	25.400	1.0000	19.050	0.7500	3.6	0.14	0.8	0.03	96.8	100	15.1	**25577**	**25520**	17.5	0.69	55.0	2.17	49.0	1.93	74.0	2.91	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.6880	83.058	3.2700	23.812	0.9375	25.400	1.0000	19.050	0.7500	3.6	0.14	3.2	0.13	96.8	100	15.1	**25577**	**25521**	17.5	0.69	55.0	2.17	49.0	1.93	72.0	2.83	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
44.450	1.7500	73.025	2.8750	18.258	0.7188	18.258	0.7188	15.083	0.5938	1.6	0.06	1.6	0.06	59.4	65.5	9.50	**L102849**	**L102810**	14.6	0.57	51.0	2.01	49.0	1.93	66.0	2.60	69.0	2.72	0.32	1.88	1.04	13.7	7.45	1.84
	1.7500	76.992	3.0312	17.463	0.6875	17.145	0.6750	11.908	0.4688	1.6	0.06	1.6	0.06	60.8	62.2	8.95	**12175**	**12303**	17.5	0.69	52.0	2.05	49.5	1.95	68.0	2.68	73.0	2.87	0.51	1.19	0.65	13.0	11.3	1.16
	1.7500	79.375	3.1250	17.462	0.6875	17.462	0.6875	13.495	0.5313	2.8	0.11	1.6	0.06	59.2	59.1	8.65	**18685**	**18620**	16.0	0.63	54.0	2.13	49.5	1.95	71.0	2.80	74.0	2.91	0.37	1.60	0.88	13.6	8.70	1.56
	1.7500	82.931	3.2650	23.812	0.9375	25.400	1.0000	19.050	0.7500	3.6	0.14	2.4	0.09	96.8	100	15.1	**25580**	**25524**	17.5	0.69	57.0	2.24	50.0	1.97	72.0	2.83	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.7500	82.931	3.2650	23.812	0.9375	25.400	1.0000	19.050	0.7500	5.2	0.20	0.8	0.03	96.8	100	15.1	**25582**	**25520**	17.5	0.69	59.0	2.32	51.0	2.01	74.0	2.91	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.7500	82.931	3.2650	36.830	1.4500	35.878	1.4125	19.050	0.7500	SP	SP	0.8	0.03	96.8	100	15.1	**25583**	**25520**	17.5	0.69	59.0	2.32	51.0	2.01	74.0	2.91	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.7500	83.058	3.2700	23.876	0.9400	25.400	1.0000	19.114	0.7525	0.5	0.02	2.0	0.08	96.8	100	15.1	**25581**	**25522**	17.6	0.69	51.0	2.01	50.0	1.97	73.0	2.87	77.0	3.03	0.33	1.79	0.99	22.5	12.9	1.75
	1.7500	84.138	3.3125	30.162	1.1875	30.886	1.2160	23.812	0.9375	3.6	0.14	3.2	0.13	120	120	18.2	**3578R**	**3520**	20.5	0.81	57.0	2.24	51.0	2.01	74.0	2.91	79.5	3.13	0.31	1.96	1.08	27.9	14.6	1.91
	1.7500	85.000	3.3465	19.000	0.7480	21.692	0.8540	19.000	0.7480	2.4	0.09	2.0	0.08	89.6	81.7	12.4	**355**	**354**	13.7	0.54	54.0	2.13	50.0	1.97	77.0	3.03	81.0	3.19	0.31	1.96	1.08	20.7	10.8	1.91
	1.7500	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	2.4	0.09	1.2	0.05	89.6	81.7	12.4	**355**	**354A**	15.5	0.61	54.0	2.13	50.0	1.97	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91

Note 1) SP indicates the specially chamfered from.

TS type
d (44.450) mm
(1.7500) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

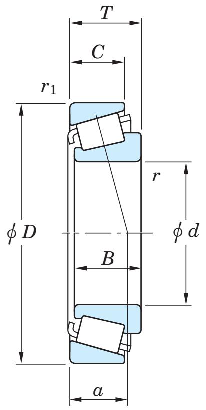
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

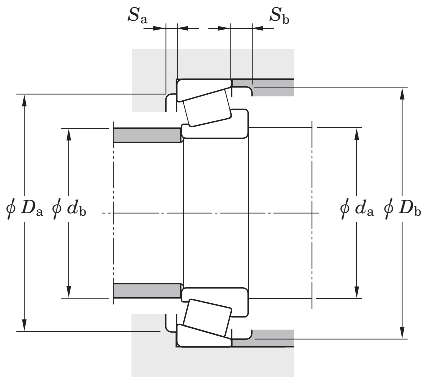
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone	Cup	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
44.450	1.7500	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	0.8	0.03	1.2	0.05	89.6	81.7	12.4	**355A**	**354A**	15.5	0.61	51.0	2.01	50.0	1.97	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91
	1.7500	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	3.6	0.14	1.2	0.05	89.6	81.7	12.4	**355X**	**354A**	15.5	0.61	56.0	2.20	50.0	1.97	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91
	1.7500	85.000	3.3465	23.812	0.9375	25.400	1.0000	19.050	0.7500	3.6	0.14	2.4	0.09	96.8	100	15.1	**25580**	**25526**	17.5	0.69	57.0	2.24	50.0	1.97	74.0	2.91	78.0	3.07	0.33	1.79	0.99	22.5	12.9	1.75
	1.7500	85.000	3.3465	25.400	1.0000	25.608	1.0082	20.638	0.8125	3.6	0.14	1.2	0.05	100	106	16.0	**2975**	**2924**	18.9	0.74	54.0	2.13	51.0	2.01	76.0	2.99	80.0	3.15	0.35	1.73	0.95	23.3	13.8	1.69
	1.7500	87.312	3.4375	30.162	1.1875	30.886	1.2160	23.812	0.9375	5.6	0.22	3.2	0.13	120	120	18.2	**3578AR**	**3525**	20.5	0.81	57.0	2.24	51.0	2.01	75.0	2.95	81.0	3.19	0.31	1.96	1.08	27.9	14.6	1.91
	1.7500	88.900	3.5000	30.162	1.1875	29.370	1.1563	23.020	0.9063	3.6	0.14	3.2	0.13	124	125	18.5	**HM803149**	**HM803110**	26.1	1.03	62.0	2.44	53.4	2.10	74.0	2.91	85.0	3.35	0.55	1.10	0.60	28.8	26.9	1.07
	1.7500	90.000	3.5433	23.000	0.9055	21.692	0.8540	23.000	0.9055	2.4	0.09	2.0	0.08	89.6	81.7	12.4	**355**	**353**	17.8	0.70	54.0	2.13	50.0	1.97	78.0	3.07	81.0	3.19	0.31	1.96	1.08	20.7	10.8	1.91
	1.7500	90.488	3.5625	39.688	1.5625	40.386	1.5900	33.338	1.3125	3.6	0.14	3.2	0.13	166	169	25.9	**4370**	**4335**	25.6	1.01	57.0	2.24	51.0	2.01	77.0	3.03	85.0	3.35	0.28	2.11	1.16	38.8	18.9	2.06
	1.7500	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	0.8	0.03	129	137	20.9	**3782**	**3730**	22.2	0.87	58.0	2.28	52.0	2.05	84.0	3.31	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	1.7500	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	6.4	0.25	3.2	0.13	129	137	20.9	**3783**	**3720**	22.2	0.87	64.0	2.52	54.0	2.13	82.0	3.23	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	1.7500	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	6.4	0.25	0.8	0.03	129	137	20.9	**3783**	**3730**	22.2	0.87	64.0	2.52	54.0	2.13	84.0	3.31	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	1.7500	93.662	3.6875	31.750	1.2500	31.750	1.2500	25.400	1.0000	3.6	0.14	3.2	0.13	131	123	18.8	**49175**	**49368**	22.9	0.90	59.0	2.32	53.0	2.09	82.0	3.23	87.0	3.43	0.36	1.67	0.92	30.6	18.8	1.62
	1.7500	93.662	3.6875	31.750	1.2500	31.750	1.2500	25.400	1.0000	0.8	0.03	3.2	0.13	131	123	18.8	**49176**	**49368**	22.9	0.90	54.0	2.13	53.0	2.09	82.0	3.23	87.0	3.43	0.36	1.67	0.92	30.6	18.8	1.62
	1.7500	93.662	3.6875	31.750	1.2500	31.750	1.2500	26.195	1.0313	0.8	0.03	3.2	0.13	132	134	20.2	**46175**	**46368**	24.0	0.94	55.0	2.17	54.0	2.13	79.0	3.11	87.0	3.43	0.40	1.49	0.82	30.8	21.1	1.46
	1.7500	93.662	3.6875	31.750	1.2500	31.750	1.2500	26.195	1.0313	3.6	0.14	3.2	0.13	132	134	20.2	**46176**	**46368**	24.0	0.94	60.0	2.36	54.0	2.13	79.0	3.11	87.0	3.43	0.40	1.49	0.82	30.8	21.1	1.46
	1.7500	93.662	3.6875	31.750	1.2500	31.750	1.2500	26.195	1.0313	3.6	0.14	1.2	0.05	132	134	20.2	**46176**	**46369**	24.0	0.94	60.0	2.36	54.0	2.13	79.0	3.11	87.0	3.43	0.40	1.49	0.82	30.8	21.1	1.46
	1.7500	95.250	3.7500	27.783	1.0938	28.575	1.1250	22.225	0.8750	0.8	0.03	2.4	0.09	135	141	21.6	**33885**	**33821**	20.4	0.80	53.0	2.09	53.0	2.09	85.0	3.35	90.0	3.54	0.33	1.82	1.00	31.4	17.7	1.77
	1.7500	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	0.8	0.03	2.4	0.09	129	122	18.8	**435**	**432**	18.4	0.72	52.0	2.05	51.0	2.01	83.0	3.27	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
	1.7500	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	3.6	0.14	0.8	0.03	129	122	18.8	**438**	**432A**	18.4	0.72	57.0	2.24	51.0	2.01	84.0	3.31	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
	1.7500	95.250	3.7500	30.162	1.1875	29.370	1.1563	23.020	0.9063	0.8	0.03	2.4	0.09	130	140	20.7	**HM804842**	**HM804810**	26.5	1.04	57.0	2.24	57.0	2.24	81.0	3.19	91.0	3.58	0.55	1.10	0.60	30.4	28.4	1.07
	1.7500	95.250	3.7500	30.162	1.1875	29.370	1.1563	23.020	0.9063	3.6	0.14	2.4	0.09	130	140	20.7	**HM804843**	**HM804810**	26.5	1.04	63.0	2.48	57.0	2.24	81.0	3.19	91.0	3.58	0.55	1.10	0.60	30.4	28.4	1.07
	1.7500	95.250	3.7500	30.162	1.1875	29.370	1.1563	23.020	0.9063	3.6	0.14	0.8	0.03	130	140	20.7	**HM804843**	**HM804811**	26.5	1.04	63.0	2.48	57.0	2.24	83.0	3.27	91.0	3.58	0.55	1.10	0.60	30.4	28.4	1.07
	1.7500	98.425	3.8750	30.162	1.1875	30.302	1.1930	23.812	0.9375	6.4	0.25	3.2	0.13	129	137	20.9	**3783**	**3732**	22.2	0.87	64.0	2.52	54.0	2.13	84.0	3.31	90.0	3.54	0.34	1.77	0.97	30.1	17.4	1.73
	1.7500	98.425	3.8750	30.162	1.1875	31.750	1.2500	25.400	1.0000	0.8	0.03	3.2	0.13	143	143	21.9	**49576**	**49520**	24.1	0.95	55.0	2.17	54.0	2.13	88.0	3.46	96.0	3.78	0.40	1.50	0.82	33.4	22.8	1.46
	1.7500	101.600	4.0000	31.750	1.2500	31.750	1.2500	25.400	1.0000	0.8	0.03	0.8	0.03	143	143	21.9	**49576**	**49522**	24.1	0.95	55.0	2.17	54.0	2.13	90.0	3.54	96.0	3.78	0.40	1.50	0.82	33.4	22.8	1.46
	1.7500	101.600	4.0000	31.750	1.2500	31.750	1.2500	25.400	1.0000	3.6	0.14	3.2	0.13	143	143	21.9	**49577**	**49520**	24.1	0.95	60.0	2.36	54.0	2.13	88.0	3.46	96.0	3.78	0.40	1.50	0.82	33.4	22.8	1.46
	1.7500	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	3.6	0.14	3.2	0.13	164	159	24.8	**527**	**522**	22.2	0.87	59.0	2.32	53.0	2.09	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	1.7500	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	0.8	0.03	0.8	0.03	157	165	25.6	**45280**	**45221**	22.2	0.87	55.0	2.17	54.0	2.13	95.0	3.74	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76
	1.7500	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	3.6	0.14	1.0	0.04	185	187	28.6	**59175**	**59413**	26.9	1.06	63.0	2.48	56.0	2.20	92.0	3.62	99.0	3.90	0.40	1.49	0.82	43.2	29.6	1.46
	1.7500	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	0.8	0.03	3.2	0.13	185	187	28.6	**59176**	**59412**	26.9	1.06	57.0	2.24	56.0	2.20	92.0	3.62	99.0	3.90	0.40	1.49	0.82	43.2	29.6	1.46
	1.7500	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	3.6	0.14	3.2	0.13	176	195	29.3	**HM807040**	**HM807010**	29.3	1.15	66.0	2.60	59.0	2.32	89.0	3.50	100.0	3.94	0.49	1.23	0.68	41.3	34.4	1.20
	1.7500	107.950	4.2500	27.783	1.0938	29.317	1.1542	22.225	0.8750	0.8	0.03	0.8	0.03	136	144	22.2	**458**	**453A**	23.6	0.93	55.0	2.17	54.0	2.13	97.0	3.82	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	1.7500	107.950	4.2500	27.783	1.0938	29.317	1.1542	22.225	0.8750	3.6	0.14	0.8	0.03	136	144	22.2	**460**	**453A**	23.6	0.93	60.0	2.36	54.0	2.13	97.0	3.82	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	1.7500	107.950	4.2500	36.512	1.4375	36.512	1.4375	28.575	1.1250	3.6	0.14	3.2	0.13	185	187	28.6	**59175**	**59425**	26.9	1.06	63.0	2.48	56.0	2.20	93.0	3.66	101.0	3.98	0.40	1.49	0.82	43.2	29.6	1.46
	1.7500	111.125	4.3750	38.100	1.5000	36.957	1.4550	30.162	1.1875	3.6	0.14	3.2	0.13	172	172	26.8	**535**	**532A**	23.9	0.94	60.0	2.36	54.0	2.13	95.0	3.74	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
	1.7500	111.125	4.3750	38.100	1.5000	36.957	1.4550	33.338	1.3125	3.6	0.14	3.2	0.13	172	172	26.8	**535**	**532**	23.9	0.94	60.0	2.36	54.0	2.13	95.0	3.74	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
	1.7500	114.300	4.5000	44.450	1.7500	44.450	1.7500	34.925	1.3750	2.0	0.08	3.2	0.13	237	230	35.1	**65384**	**65320**	31.7	1.25	62.0	2.44	56.0	2.20	97.0	3.82	107.0	4.21	0.43	1.40	0.77	55.4	40.7	1.36
	1.7500	114.300	4.5000	44.450	1.7500	44.450	1.7500	34.925	1.3750	2.0	0.08	0.8	0.03	237	230	35.1	**65384**	**65321**	31.7	1.25	62.0	2.44	56.0	2.20	98.0	3.86	107.0	4.21	0.43	1.40	0.77	55.4	40.7	1.36
	1.7500	114.300	4.5000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	3.2	0.13	237	230	35.1	**65385**	**65320**	31.7	1.25	65.0	2.56	56.0	2.20	97.0	3.82	107.0	4.21	0.43	1.40	0.77	55.4	40.7	1.36
	1.7500	120.040	4.7260	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**615**	**612A**	27.3	1.07	62.0	2.44	56.0	2.20	103.0	4.06	109.0	4.29	0.31	1.91	1.05	50.9	27.4	1.86
	1.7500	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**615**	**612**	27.3	1.07	62.0	2.44	56.0	2.20	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86

Note 1) SP indicates the specially chamfered from.

TS type

d 44.869 ~ (47.625) mm
1.7665 ~ (1.8750) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

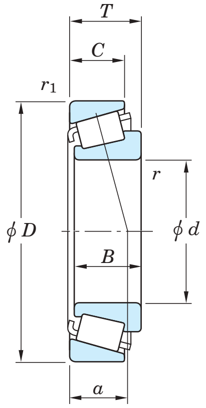
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
44.869	1.7665	92.075	3.6250	24.608	0.9688	25.400	1.0000	19.845	0.7813	3.6	0.14	0.8	0.03	107	119	17.9	**28576R**	**28521**	19.9	0.78	59.0	2.32	53.0	2.09	83.0	3.27	87.0	3.43	0.38	1.59	0.87	24.7	15.9	1.55
44.983	1.7710	85.000	3.3465	26.988	1.0625	25.400	1.0000	22.225	0.8750	1.6	0.06	2.4	0.09	96.8	100	15.1	**25584**	**25527**	20.7	0.81	53.0	2.09	51.0	2.01	73.0	2.87	78.0	3.07	0.33	1.79	0.99	22.5	12.9	1.75
	1.7710	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	3.2	0.13	129	137	20.9	**3776**	**3720**	22.2	0.87	59.0	2.32	53.0	2.09	82.0	3.23	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	1.7710	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	4.3	0.17	3.2	0.13	164	159	24.8	**527S**	**522**	22.2	0.87	61.0	2.40	53.0	2.09	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
45.000	1.7717	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	1.6	0.06	1.2	0.05	89.6	81.7	12.4	**358**	**354A**	15.5	0.61	52.5	2.07	50.0	1.97	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91
	1.7717	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	3.6	0.14	1.2	0.05	89.6	81.7	12.4	**358A**	**354A**	15.5	0.61	56.5	2.22	50.0	1.97	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91
	1.7717	90.000	3.5433	20.000	0.7874	22.225	0.8750	15.875	0.6250	2.0	0.08	2.0	0.08	92.9	87.3	13.3	**367**	**362**	15.4	0.61	55.0	2.17	51.0	2.01	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	1.7717	90.119	3.5480	23.000	0.9055	21.692	0.8540	21.808	0.8586	1.6	0.06	2.4	0.09	89.6	81.7	12.4	**358**	**352**	17.8	0.70	52.5	2.07	50.0	1.97	78.0	3.07	82.0	3.23	0.31	1.96	1.08	20.7	10.8	1.91
	1.7717	100.000	3.9370	25.000	0.9842	22.225	0.8750	21.824	0.8592	0.8	0.03	2.0	0.08	105	98.5	15.1	**376**	**372**	21.5	0.85	57.0	2.24	54.0	2.13	86.0	3.39	90.0	3.54	0.34	1.77	0.97	24.1	14.0	1.73
	1.7717	100.000	3.9370	25.000	0.9842	22.225	0.8750	21.824	0.8592	2.4	0.09	2.0	0.08	105	98.5	15.1	**376A**	**372**	21.5	0.85	57.0	2.24	54.0	2.13	86.0	3.39	90.0	3.54	0.34	1.77	0.97	24.1	14.0	1.73
	1.7717	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	2.4	0.09	3.2	0.13	136	144	22.2	**458S**	**453X**	23.6	0.93	59.0	2.32	55.0	2.17	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	1.7717	104.775	4.1250	39.688	1.5625	40.157	1.5810	33.338	1.3125	3.6	0.14	3.2	0.13	189	211	32.3	**4559**	**4535**	27.3	1.07	62.0	2.44	59.0	2.32	90.0	3.54	99.0	3.90	0.34	1.79	0.98	44.4	25.4	1.74
45.230	1.7807	79.985	3.1490	19.842	0.7812	20.638	0.8125	15.080	0.5937	2.0	0.08	1.2	0.05	69.1	70.8	10.4	**17887**	**17831**	15.9	0.63	52.0	2.05	49.5	1.95	72.0	2.83	76.0	2.99	0.37	1.64	0.90	15.9	9.95	1.60
45.237	1.7810	84.138	3.3125	30.162	1.1875	30.886	1.2160	23.812	0.9375	3.6	0.14	3.2	0.13	120	120	18.2	**3586R**	**3520**	20.5	0.81	58.0	2.28	52.0	2.05	74.0	2.91	79.5	3.13	0.31	1.96	1.08	27.9	14.6	1.91
45.242	1.7812	73.431	2.8910	19.558	0.7700	19.812	0.7800	15.748	0.6200	3.6	0.14	0.8	0.03	70.0	78.1	11.4	**LM102949**	**LM102910**	14.7	0.58	56.0	2.20	50.0	1.97	68.0	2.68	70.0	2.76	0.31	1.97	1.08	16.1	8.40	1.92
	1.7812	77.788	3.0625	19.842	0.7812	19.842	0.7812	15.080	0.5937	3.6	0.14	0.8	0.03	71.7	73.5	10.7	**LM603049**	**LM603011**	17.5	0.69	57.0	2.24	50.0	1.97	71.0	2.80	74.0	2.91	0.43	1.41	0.77	16.5	12.1	1.37
	1.7812	77.788	3.0625	21.430	0.8437	19.842	0.7812	16.667	0.6562	3.6	0.14	0.8	0.03	71.7	73.5	10.7	**LM603049**	**LM603012**	19.1	0.75	57.0	2.24	50.0	1.97	71.0	2.80	74.0	2.91	0.43	1.41	0.77	16.5	12.1	1.37
	1.7812	79.974	3.1486	19.842	0.7812	19.842	0.7812	15.080	0.5937	3.6	0.14	0.8	0.03	71.7	73.5	10.7	**LM603049**	**LM603014**	17.5	0.69	57.0	2.24	50.0	1.97	71.0	2.80	74.0	2.91	0.43	1.41	0.77	16.5	12.1	1.37
	1.7812	79.974	3.1486	21.430	0.8437	19.842	0.7812	16.667	0.6562	3.6	0.14	0.8	0.03	71.7	73.5	10.7	**LM603049**	**LM603015**	19.1	0.75	57.0	2.24	50.0	1.97	71.0	2.80	74.0	2.91	0.43	1.41	0.77	16.5	12.1	1.37
45.618	1.7960	85.000	3.3465	23.812	0.9375	25.400	1.0000	19.050	0.7500	3.6	0.14	2.4	0.09	96.8	100	15.1	**25590**	**25526**	17.5	0.69	58.0	2.28	51.0	2.01	74.0	2.91	78.0	3.07	0.33	1.79	0.99	22.5	12.9	1.75
45.987	1.8105	74.976	2.9518	18.000	0.7087	18.000	0.7087	14.000	0.5512	2.4	0.09	1.6	0.06	66.2	74.6	10.8	**LM503349R**	**LM503310**	16.0	0.63	53.0	2.09	51.0	2.01	67.0	2.64	72.0	2.83	0.40	1.49	0.82	15.2	10.4	1.46
46.038	1.8125	79.375	3.1250	17.462	0.6875	17.462	0.6875	13.495	0.5313	2.8	0.11	1.6	0.06	59.2	59.1	8.65	**18690**	**18620**	16.0	0.63	56.0	2.20	51.0	2.01	71.0	2.80	74.0	2.91	0.37	1.60	0.88	13.6	8.70	1.56
	1.8125	85.000	3.3465	17.462	0.6875	17.462	0.6875	13.495	0.5313	2.4	0.09	1.6	0.06	62.5	65.5	9.55	**18780**	**18720**	17.4	0.69	56.0	2.20	52.0	2.05	77.0	3.03	80.0	3.15	0.41	1.48	0.81	14.4	9.95	1.44
	1.8125	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	3.6	0.14	1.2	0.05	89.6	81.7	12.4	**359A**	**354A**	15.5	0.61	57.0	2.24	51.0	2.01	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91
	1.8125	85.000	3.3465	20.638	0.8125	21.692	0.8540	17.462	0.6875	2.4	0.09	1.2	0.05	89.6	81.7	12.4	**359S**	**354A**	15.5	0.61	55.0	2.17	51.0	2.01	77.0	3.03	80.0	3.15	0.31	1.96	1.08	20.7	10.8	1.91
	1.8125	85.000	3.3465	25.400	1.0000	25.608	1.0082	20.638	0.8125	3.6	0.14	1.2	0.05	100	106	16.0	**2984**	**2924**	18.9	0.74	58.0	2.28	52.0	2.05	76.0	2.99	80.0	3.15	0.35	1.73	0.95	23.3	13.8	1.69
	1.8125	87.312	3.4375	26.988	1.0625	25.608	1.0082	22.225	0.8750	3.6	0.14	2.4	0.09	100	106	16.0	**2984**	**2925**	18.6	0.73	58.0	2.28	52.0	2.05	76.0	2.99	80.0	3.15	0.35	1.73	0.95	23.3	13.8	1.69
	1.8125	95.250	3.7500	27.783	1.0938	29.901	1.1772	22.225	0.8750	3.6	0.14	0.8	0.03	129	122	18.8	**436**	**432A**	18.4	0.72	59.0	2.32	52.0	2.05	84.0	3.31	87.0	3.43	0.28	2.11	1.16	30.0	14.6	2.06
	1.8125	95.250	3.7500	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	3.2	0.13	129	137	20.9	**3777**	**3726**	22.2	0.87	60.0	2.36	53.0	2.09	83.0	3.27	89.0	3.50	0.34	1.77	0.97	30.1	17.4	1.73
47.625	1.8750	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	3.6	0.14	1.2	0.05	92.9	87.3	13.3	**369A**	**362A**	16.1	0.63	60.0	2.36	53.0	2.09	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	1.8750	88.900	3.5000	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	3.2	0.13	109	112	16.6	**M804049**	**M804010**	23.6	0.93	62.0	2.44	55.0	2.17	76.0	2.99	85.0	3.35	0.55	1.10	0.60	25.3	23.6	1.07
	1.8750	90.000	3.5433	20.000	0.7874	22.225	0.8750	20.000	0.7874	2.4	0.09	0.8	0.03	92.9	87.3	13.3	**369S**	**363**	15.4	0.61	57.0	2.24	53.0	2.09	82.0	3.23	85.0	3.35	0.32	1.88	1.03	21.4	11.7	1.83
	1.8750	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	6.4	0.25	0.8	0.03	129	137	20.9	**3778**	**3730**	22.2	0.87	67.0	2.64	55.0	2.17	84.0	3.31	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	1.8750	95.250	3.7500	30.162	1.1875	29.370	1.1563	23.020	0.9063	3.6	0.14	3.2	0.13	130	140	20.7	**HM804846**	**HM804810**	26.5	1.04	64.0	2.52	57.0	2.24	81.0	3.19	91.0	3.58	0.55	1.10	0.60	30.4	28.4	1.07
	1.8750	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	0.8	0.03	0.8	0.03	101	101	15.3	**386A**	**382A**	17.4	0.69	56.0	2.20	55.0	2.17	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	1.8750	98.425	3.8750	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	3.2	0.13	129	137	20.9	**3779**	**3732**	22.2	0.87	61.0	2.40	55.0	2.17	84.0	3.31	90.0	3.54	0.34	1.77	0.97	30.1	17.4	1.73

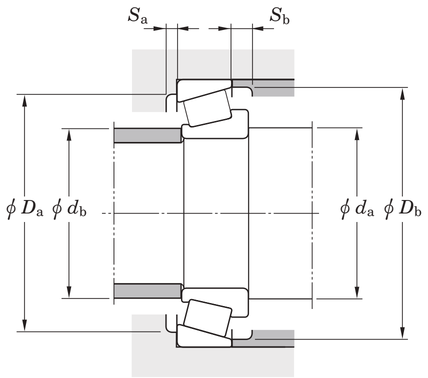
Note 1) SP indicates the specially chamfered from.

TS type

d (47.625) ~ (50.800) mm

(1.8750) ~ (2.0000) inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

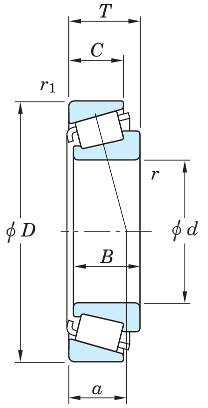
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r 1) (min.)		r_1 1) (min.)		C_r	C_{0r}	C_u	Cone	Cup	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
47.625	1.8750	101.600	4.0000	31.750	1.2500	29.370	1.1563	23.020	0.9063	3.6	0.14	3.2	0.13	143	143	21.9	**49580**	**49520**	24.1	0.95	62.0	2.44	59.0	2.32	88.0	3.46	96.0	3.78	0.40	1.50	0.82	33.4	22.8	1.46
	1.8750	101.600	4.0000	31.750	1.2500	31.750	1.2500	25.400	1.0000	6.4	0.25	3.2	0.13	143	143	21.9	**49581**	**49520**	24.1	0.95	68.0	2.68	59.0	2.32	88.0	3.46	96.0	3.78	0.40	1.50	0.82	33.4	22.8	1.46
	1.8750	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	3.6	0.14	3.2	0.13	164	159	24.8	**528**	**522**	22.2	0.87	62.0	2.44	55.0	2.17	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	1.8750	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	1.6	0.06	3.2	0.13	164	159	24.8	**528A**	**522**	22.2	0.87	58.0	2.28	55.0	2.17	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	1.8750	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	4.8	0.19	3.2	0.13	136	144	22.2	**463**	**453X**	23.6	0.93	65.0	2.56	56.0	2.20	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	1.8750	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	0.8	0.03	3.2	0.13	136	144	22.2	**467**	**453X**	23.6	0.93	57.0	2.24	56.0	2.20	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	1.8750	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	3.6	0.14	3.2	0.13	157	165	25.6	**45282**	**45220**	22.2	0.87	64.0	2.52	59.0	2.32	93.0	3.66	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76
	1.8750	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	3.6	0.14	3.2	0.13	185	187	28.6	**59187**	**59412**	26.9	1.06	65.0	2.56	59.0	2.32	92.0	3.62	99.0	3.90	0.40	1.49	0.82	43.2	29.6	1.46
	1.8750	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	1.6	0.06	3.2	0.13	185	187	28.6	**59188**	**59412**	26.9	1.06	60.0	2.36	58.0	2.28	92.0	3.62	99.0	3.90	0.40	1.49	0.82	43.2	29.6	1.46
	1.8750	107.950	4.2500	27.783	1.0938	29.317	1.1542	22.225	0.8750	4.8	0.19	0.8	0.03	136	144	22.2	**463**	**453A**	23.6	0.93	65.0	2.56	56.0	2.20	97.0	3.82	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	1.8750	107.950	4.2500	27.783	1.0938	29.317	1.1542	22.225	0.8750	0.8	0.03	0.8	0.03	136	144	22.2	**467**	**453A**	21.2	0.83	57.0	2.24	56.0	2.20	97.0	3.82	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	1.8750	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	3.6	0.14	3.2	0.13	172	172	26.8	**536**	**532X**	23.9	0.94	62.0	2.44	56.0	2.20	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
	1.8750	117.475	4.6250	33.338	1.3125	31.750	1.2500	23.812	0.9375	3.6	0.14	0.8	0.03	162	152	23.2	**66187R**	**66461**	33.2	1.31	67.0	2.64	64.0	2.52	102.0	4.02	111.0	4.37	0.63	0.96	0.53	37.5	40.1	0.93
	1.8750	117.475	4.6250	33.338	1.3125	31.750	1.2500	23.812	0.9375	3.6	0.14	3.2	0.13	162	152	23.2	**66187R**	**66462**	33.2	1.31	67.0	2.64	64.0	2.52	100.0	3.94	111.0	4.37	0.63	0.96	0.53	37.5	40.1	0.93
	1.8750	120.040	4.7260	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**617**	**612A**	27.3	1.07	65.0	2.56	59.0	2.32	103.0	4.06	109.0	4.29	0.31	1.91	1.05	50.9	27.4	1.86
	1.8750	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**617**	**612**	27.3	1.07	65.0	2.56	59.0	2.32	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
48.412	1.9060	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	3.2	0.13	129	137	20.9	**3781A**	**3720**	22.2	0.87	62.0	2.44	56.0	2.20	82.0	3.23	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	1.9060	95.250	3.7500	30.162	1.1875	29.370	1.1563	23.020	0.9063	2.4	0.09	3.2	0.13	130	140	20.7	**HM804848**	**HM804810**	26.5	1.04	63.0	2.48	57.5	2.26	81.0	3.19	91.0	3.58	0.55	1.10	0.60	30.4	28.4	1.07
	1.9060	95.250	3.7500	30.162	1.1875	29.370	1.1563	23.020	0.9063	3.6	0.14	3.2	0.13	130	140	20.7	**HM804849**	**HM804810**	26.5	1.04	66.0	2.60	57.5	2.26	81.0	3.19	91.0	3.58	0.55	1.10	0.60	30.4	28.4	1.07
49.212	1.9375	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	0.8	0.03	1.2	0.05	92.9	87.3	13.3	**365S**	**362A**	16.1	0.63	55.0	2.17	54.0	2.13	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	1.9375	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	0.8	0.03	129	137	20.9	**3781**	**3730**	22.2	0.87	62.0	2.44	56.0	2.20	84.0	3.31	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	1.9375	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	3.6	0.14	3.2	0.13	176	195	29.3	**HM807044**	**HM807010**	29.3	1.15	69.0	2.72	63.0	2.48	89.0	3.50	100.0	3.94	0.49	1.23	0.68	41.3	34.4	1.20
	1.9375	111.125	4.3750	38.100	1.5000	36.957	1.4550	33.338	1.3125	3.6	0.14	3.2	0.13	172	172	26.8	**545**	**532**	25.5	1.00	65.0	2.56	59.0	2.32	95.0	3.74	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
	1.9375	114.300	4.5000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	3.2	0.13	237	230	35.1	**65390**	**65320**	31.7	1.25	70.0	2.76	60.0	2.36	97.0	3.82	107.0	4.21	0.43	1.40	0.77	55.4	40.7	1.36
	1.9375	114.300	4.5000	44.450	1.7500	44.450	1.7500	36.068	1.4200	3.6	0.14	3.2	0.13	265	263	35.4	**HH506348**	**HH506310**	30.6	1.20	71.0	2.80	61.0	2.40	97.0	3.82	107.0	4.21	0.40	1.49	0.82	62.0	42.6	1.46
	1.9375	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	1.2	0.05	3.2	0.13	276	318	43.6	**5562R**	**5535**	31.1	1.22	63.0	2.48	60.0	2.36	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
49.982	1.9678	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	3.6	0.14	3.2	0.13	172	172	26.8	**546**	**532X**	23.9	0.94	65.0	2.56	59.0	2.32	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
49.987	1.9680	92.075	3.6250	24.608	0.9688	25.400	1.0000	19.845	0.7813	2.4	0.09	0.8	0.03	107	119	17.9	**28579R**	**28521**	19.9	0.78	60.0	2.36	56.0	2.20	83.0	3.27	87.0	3.43	0.38	1.59	0.87	24.7	15.9	1.55
	1.9680	100.000	3.9370	25.000	0.9842	22.225	0.8750	21.824	0.8592	2.4	0.09	2.0	0.08	105	98.5	15.1	**378A**	**372**	21.5	0.85	60.0	2.36	56.0	2.20	86.0	3.39	90.0	3.54	0.34	1.77	0.97	24.1	14.0	1.73
	1.9680	114.300	4.5000	44.450	1.7500	44.450	1.7500	36.068	1.4200	3.6	0.14	0.8	0.03	265	263	35.4	**HH506349**	**HH506311**	30.6	1.20	71.0	2.80	61.0	2.40	99.0	3.90	107.0	4.21	0.40	1.49	0.82	62.0	42.6	1.46
50.000	1.9685	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	2.0	0.08	1.2	0.05	92.9	87.3	13.3	**365**	**362A**	16.1	0.63	58.0	2.28	55.0	2.17	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	1.9685	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	2.4	0.09	1.2	0.05	92.9	87.3	13.3	**366**	**362A**	16.1	0.63	59.0	2.32	55.0	2.17	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	1.9685	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	2.4	0.09	3.2	0.13	136	144	22.2	**465**	**453X**	23.6	0.93	62.0	2.44	58.0	2.28	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	1.9685	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	3.6	0.14	3.2	0.13	136	144	22.2	**465A**	**453X**	23.6	0.93	64.5	2.54	58.0	2.28	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	1.9685	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	0.8	0.03	1.2	0.05	109	116	17.7	**396**	**394A**	21.3	0.84	61.0	2.40	60.0	2.36	101.0	3.98	105.0	4.13	0.40	1.49	0.82	25.0	17.2	1.46
	1.9685	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**618X**	**612**	27.3	1.07	67.0	2.64	61.0	2.40	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
50.800	2.0000	80.962	3.1875	18.258	0.7188	18.258	0.7188	14.288	0.5625	1.6	0.06	1.6	0.06	67.8	81.1	11.8	**L305649R**	**L305610**	16.0	0.63	58.0	2.28	56.0	2.20	73.0	2.87	77.0	3.03	0.35	1.69	0.93	15.5	9.45	1.65
	2.0000	82.550	3.2500	21.590	0.8500	22.225	0.8750	16.510	0.6500	3.6	0.14	1.2	0.05	77.0	84.3	12.5	**LM104949**	**LM104911**	16.4	0.65	62.0	2.44	55.0	2.17	75.0	2.95	78.0	3.07	0.31	1.97	1.08	17.8	9.25	1.92

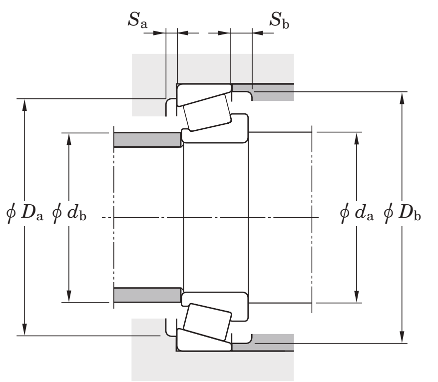
Note 1) SP indicates the specially chamfered from.

TS type

d (50.800) mm

(2.0000) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

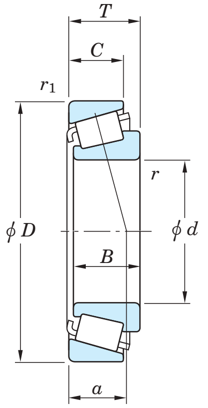
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

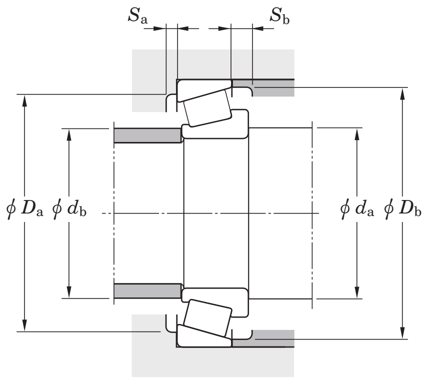
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone	Cup	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
50.800	2.0000	83.312	3.2800	17.462	0.6875	17.462	0.6875	13.495	0.5313	3.6	0.14	0.8	0.03	62.5	65.5	9.55	**18790**	**18721**	17.4	0.69	62.0	2.44	56.0	2.20	73.0	2.87	78.0	3.07	0.41	1.48	0.81	14.4	9.95	1.44
	2.0000	85.725	3.3750	19.050	0.7500	18.263	0.7190	12.700	0.5000	1.6	0.06	1.6	0.06	63.8	66.4	9.55	**18200**	**18337**	22.7	0.89	59.0	2.32	56.0	2.20	76.0	2.99	81.0	3.19	0.57	1.06	0.58	14.6	14.2	1.03
	2.0000	88.900	3.5000	17.462	0.6875	17.462	0.6875	13.495	0.5313	3.6	0.14	1.2	0.05	62.5	65.5	9.55	**18790**	**18724**	17.4	0.69	62.0	2.44	56.0	2.20	78.0	3.07	82.0	3.23	0.41	1.48	0.81	14.4	9.95	1.44
	2.0000	88.900	3.5000	20.638	0.8125	17.462	0.6875	16.670	0.6563	3.6	0.14	1.2	0.05	62.5	65.5	9.55	**18790**	**18723**	22.7	0.89	62.0	2.44	56.0	2.20	78.0	3.07	82.0	3.23	0.41	1.48	0.81	14.4	9.95	1.44
	2.0000	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	1.6	0.06	1.2	0.05	92.9	87.3	13.3	**368**	**362A**	16.1	0.63	58.0	2.28	56.0	2.20	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	2.0000	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	3.6	0.14	1.2	0.05	92.9	87.3	13.3	**368A**	**362A**	16.1	0.63	62.0	2.44	56.0	2.20	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	2.0000	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	5.2	0.20	1.2	0.05	92.9	87.3	13.3	**370A**	**362A**	16.1	0.63	65.0	2.56	56.0	2.20	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	2.0000	89.980	3.5425	24.750	0.9744	25.400	1.0000	19.987	0.7869	3.6	0.14	2.4	0.09	107	119	17.9	**28580R**	**28520**	20.0	0.79	63.0	2.48	57.0	2.24	81.0	3.19	86.0	3.39	0.38	1.59	0.87	24.7	15.9	1.55
	2.0000	92.075	3.6250	24.608	0.9688	25.400	1.0000	19.845	0.7813	3.6	0.14	0.8	0.03	107	119	17.9	**28580R**	**28521**	19.9	0.78	63.0	2.48	57.0	2.24	83.0	3.27	87.0	3.43	0.38	1.59	0.87	24.7	15.9	1.55
	2.0000	92.075	3.6250	27.780	1.0937	25.400	1.0000	23.017	0.9062	3.6	0.14	2.4	0.09	107	119	17.9	**28580R**	**28523**	23.1	0.91	63.0	2.48	57.0	2.24	81.0	3.19	86.0	3.39	0.38	1.59	0.87	24.7	15.9	1.55
	2.0000	93.264	3.6718	20.638	0.8125	22.225	0.8750	15.083	0.5938	2.4	0.09	1.2	0.05	105	98.5	15.1	**375**	**374**	17.1	0.67	60.0	2.36	57.0	2.24	85.0	3.35	88.0	3.46	0.34	1.77	0.97	24.2	14.0	1.73
	2.0000	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	0.8	0.03	0.8	0.03	129	137	20.9	**3775**	**3730**	22.2	0.87	58.0	2.28	58.0	2.28	84.0	3.31	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	2.0000	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	3.2	0.13	129	137	20.9	**3780**	**3720**	22.2	0.87	64.0	2.52	58.0	2.28	82.0	3.23	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	2.0000	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	0.8	0.03	129	137	20.9	**3780**	**3730**	22.2	0.87	64.0	2.52	58.0	2.28	84.0	3.31	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	2.0000	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	6.4	0.25	0.8	0.03	129	137	20.9	**3784**	**3730**	22.2	0.87	70.0	2.76	58.0	2.28	84.0	3.31	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	2.0000	95.250	3.7500	27.783	1.0938	28.575	1.1250	22.225	0.8750	3.6	0.14	0.8	0.03	135	141	21.6	**33889**	**33822**	20.4	0.80	64.0	2.52	58.0	2.28	86.0	3.39	90.0	3.54	0.33	1.82	1.00	31.4	17.7	1.77
	2.0000	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	1.6	0.06	0.8	0.03	101	101	15.3	**385AS**	**382A**	17.4	0.69	60.0	2.36	58.0	2.28	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.0000	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	0.8	0.03	0.8	0.03	101	101	15.3	**385AX**	**382A**	17.4	0.69	59.0	2.32	58.0	2.28	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.0000	96.838	3.8125	22.225	0.8750	22.225	0.8750	19.050	0.7500	3.6	0.14	1.6	0.06	105	98.5	15.1	**375S**	**372A**	21.5	0.85	63.0	2.48	57.0	2.24	86.0	3.39	90.0	3.54	0.34	1.77	0.97	24.1	14.0	1.73
	2.0000	96.838	3.8125	25.400	1.0000	21.946	0.8640	20.274	0.7982	2.4	0.09	2.4	0.09	101	101	15.3	**385A**	**382S**	21.8	0.86	61.0	2.40	60.0	2.36	87.0	3.43	91.0	3.58	0.35	1.69	0.93	23.2	14.1	1.65
	2.0000	97.630	3.8437	24.608	0.9688	24.608	0.9688	19.446	0.7656	3.6	0.14	0.8	0.03	113	131	19.7	**28678**	**28622**	21.2	0.83	65.0	2.56	58.0	2.28	88.0	3.46	92.0	3.62	0.40	1.49	0.82	26.1	17.9	1.45
	2.0000	98.425	3.8750	30.162	1.1875	30.302	1.1930	23.812	0.9375	3.6	0.14	3.2	0.13	129	137	20.9	**3780**	**3732**	22.2	0.87	64.0	2.52	58.0	2.28	84.0	3.31	90.0	3.54	0.34	1.77	0.97	30.1	17.4	1.73
	2.0000	101.600	4.0000	31.750	1.2500	31.750	1.2500	25.400	1.0000	3.6	0.14	3.2	0.13	143	143	21.9	**49585**	**49520**	24.1	0.95	66.0	2.60	59.0	2.32	88.0	3.46	96.0	3.78	0.40	1.50	0.82	33.4	22.8	1.46
	2.0000	101.600	4.0000	34.925	1.3750	31.750	1.2500	28.575	1.1250	3.6	0.14	3.2	0.13	143	143	21.9	**49585**	**49521**	27.3	1.07	66.0	2.60	59.0	2.32	88.0	3.46	96.0	3.78	0.40	1.50	0.82	33.4	22.8	1.46
	2.0000	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	0.8	0.03	3.2	0.13	164	159	24.8	**529**	**522**	22.2	0.87	59.0	2.32	58.0	2.28	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	2.0000	101.600	4.0000	34.925	1.3750	36.068	1.4200	26.988	1.0625	3.6	0.14	3.2	0.13	164	159	24.8	**529X**	**522**	22.2	0.87	65.0	2.56	58.0	2.28	89.0	3.50	95.0	3.74	0.29	2.10	1.16	38.4	18.7	2.05
	2.0000	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	6.4	0.25	3.2	0.13	157	165	25.6	**45284**	**45220**	22.2	0.87	71.0	2.80	59.0	2.32	93.0	3.66	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76
	2.0000	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	6.4	0.25	0.8	0.03	157	165	25.6	**45284**	**45221**	22.2	0.87	71.0	2.80	59.0	2.32	95.0	3.74	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76
	2.0000	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	2.4	0.09	0.8	0.03	157	165	25.6	**45285**	**45221**	22.2	0.87	63.0	2.48	59.0	2.32	95.0	3.74	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76
	2.0000	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	3.6	0.14	3.2	0.13	185	187	28.6	**59200**	**59412**	26.9	1.06	68.0	2.68	61.0	2.40	92.0	3.62	99.0	3.90	0.40	1.49	0.82	43.2	29.6	1.46
	2.0000	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	3.6	0.14	3.2	0.13	176	195	29.3	**HM807046**	**HM807010**	29.3	1.15	70.0	2.76	63.0	2.48	89.0	3.50	100.0	3.94	0.49	1.23	0.68	41.3	34.4	1.20
	2.0000	104.775	4.1250	39.688	1.5625	40.157	1.5810	33.338	1.3125	3.6	0.14	3.2	0.13	189	211	32.3	**4580**	**4535**	27.3	1.07	67.0	2.64	61.0	2.40	90.0	3.54	99.0	3.90	0.34	1.79	0.98	44.4	25.4	1.74
	2.0000	107.950	4.2500	32.558	1.2818	29.317	1.1542	27.000	1.0630	0.8	0.03	0.8	0.03	136	144	22.2	**455**	**452**	28.3	1.11	60.0	2.36	59.0	2.32	99.0	3.90	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	2.0000	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	3.6	0.14	3.2	0.13	172	172	26.8	**537**	**532X**	23.9	0.94	65.0	2.56	59.0	2.32	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
	2.0000	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	7.9	0.31	7.9	0.31	109	116	17.7	**398**	**394**	21.3	0.84	62.0	2.44	61.0	2.40	102.0	4.02	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.0000	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	0.8	0.03	3.2	0.13	109	116	17.7	**398**	**394AS**	21.3	0.84	62.0	2.44	61.0	2.40	99.0	3.90	105.0	4.13	0.40	1.49	0.82	25.0	17.2	1.46
	2.0000	110.000	4.3307	27.795	1.0943	29.317	1.1542	27.000	1.0630	3.6	0.14	2.0	0.08	136	144	22.2	**455S**	**454**	21.2	0.83	65.0	2.56	59.0	2.32	96.0	3.78	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	2.0000	111.125	4.3750	38.895	1.5313	40.157	1.5810	32.545	1.2813	3.6	0.14	3.2	0.13	189	211	32.3	**4580**	**4536**	26.5	1.04	67.0	2.64	61.0	2.40	96.0	3.78	102.0	4.02	0.34	1.79	0.98	44.4	25.4	1.74
	2.0000	112.712	4.4375	30.162	1.1875	30.048	1.1830	23.812	0.9375	3.6	0.14	0.8	0.03	139	164	25.1	**3975**	**3925**	25.9	1.02	68.0	2.68	61.0	2.40	101.0	3.98	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
	2.0000	112.712	4.4375	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	184	207	32.1	**39575**	**39520**	23.3	0.92	68.0	2.68	61.0	2.40	101.0	3.98	107.0	4.21	0.34	1.77	0.97	42.6	24.7	1.72
	2.0000	117.475	4.6250	33.338	1.3125	31.750	1.2500	23.812	0.9375	3.6	0.14	0.8	0.03	162	152	23.2	**66200R**	**66461**	33.2	1.31	71.0	2.80	65.0	2.56	102.0	4.02	111.0	4.37	0.63	0.96	0.53	37.5	40.1	0.93

Note 1) SP indicates the specially chamfered from.

TS type

d (50.800) ~ (53.975) mm
(2.0000) ~ (2.1250) inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

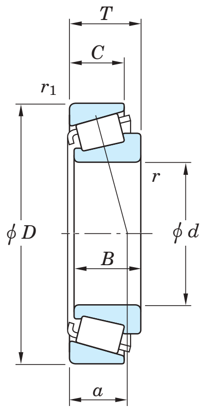
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

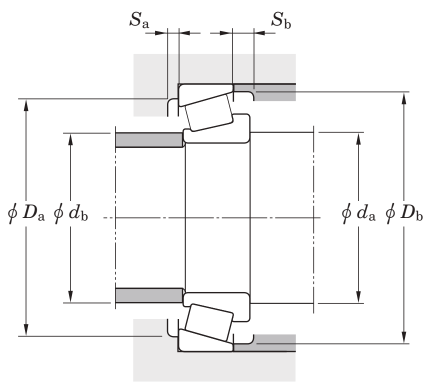
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
50.800	2.0000	120.000	4.7244	40.023	1.5757	41.275	1.6250	30.988	1.2200	3.6	0.14	3.0	0.12	218	217	34.0	**619**	**613X**	27.3	1.07	67.0	2.64	61.0	2.40	104.0	4.09	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
	2.0000	120.040	4.7260	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	1.6	0.06	218	217	34.0	**619**	**612A**	27.3	1.07	67.0	2.64	61.0	2.40	103.0	4.06	109.0	4.29	0.31	1.91	1.05	50.9	27.4	1.86
	2.0000	120.251	4.7343	44.450	1.7500	43.764	1.7230	36.512	1.4375	1.2	0.05	3.2	0.13	276	318	43.6	**5565R**	**5520**	31.9	1.26	67.0	2.64	65.0	2.56	110.0	4.33	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.0000	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**619**	**612**	27.3	1.07	67.0	2.64	61.0	2.40	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
	2.0000	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	2.4	0.09	3.2	0.13	202	223	34.8	**555**	**553X**	28.7	1.13	66.0	2.60	62.0	2.44	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.0000	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	1.2	0.05	3.2	0.13	276	318	43.6	**5565R**	**5535**	31.1	1.22	67.0	2.64	65.0	2.56	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.0000	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	1.6	0.06	209	235	36.2	**HM813836**	**HM813811**	32.9	1.30	72.0	2.83	66.0	2.60	113.0	4.45	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
	2.0000	127.000	5.0000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	3.2	0.13	259	269	41.0	**65200**	**65500**	35.2	1.39	75.0	2.95	69.0	2.72	107.0	4.21	119.0	4.69	0.49	1.23	0.68	60.6	50.5	1.20
	2.0000	127.000	5.0000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	1.2	0.05	259	269	41.0	**65200**	**65501**	35.2	1.39	75.0	2.95	69.0	2.72	110.0	4.33	120.0	4.72	0.49	1.23	0.68	60.6	50.5	1.20
	2.0000	136.525	5.3750	46.038	1.8125	44.450	1.7500	36.512	1.4375	3.6	0.14	3.2	0.13	259	269	41.0	**65200**	**65537**	36.7	1.44	75.0	2.95	69.0	2.72	110.0	4.33	120.0	4.72	0.49	1.23	0.68	60.6	50.5	1.20
51.592	2.0312	88.900	3.5000	20.638	0.8125	22.225	0.8750	16.513	0.6501	2.0	0.08	1.2	0.05	92.9	87.3	13.3	**368S**	**362A**	16.1	0.63	59.0	2.32	56.0	2.20	81.0	3.19	84.0	3.31	0.32	1.88	1.03	21.4	11.7	1.83
	2.0312	100.000	3.9370	25.000	0.9842	22.225	0.8750	21.824	0.8592	1.6	0.06	2.0	0.08	105	98.5	15.1	**377S**	**372**	21.5	0.85	60.0	2.36	58.0	2.28	86.0	3.39	90.0	3.54	0.34	1.77	0.97	24.1	14.0	1.73
52.388	2.0625	92.075	3.6250	24.608	0.9688	25.400	1.0000	19.845	0.7813	3.6	0.14	0.8	0.03	107	119	17.9	**28584R**	**28521**	19.9	0.78	65.0	2.56	58.0	2.28	83.0	3.27	87.0	3.43	0.38	1.59	0.87	24.7	15.9	1.55
	2.0625	93.264	3.6718	30.162	1.1875	30.302	1.1930	23.812	0.9375	2.4	0.09	0.8	0.03	129	137	20.9	**3767**	**3730**	22.2	0.87	63.0	2.48	59.0	2.32	84.0	3.31	88.0	3.46	0.34	1.77	0.97	30.1	17.4	1.73
	2.0625	95.250	3.7500	27.783	1.0938	28.575	1.1250	22.225	0.8750	1.6	0.06	0.8	0.03	135	141	21.6	**33890**	**33822**	20.4	0.80	61.0	2.40	59.0	2.32	86.0	3.39	90.0	3.54	0.33	1.82	1.00	31.4	17.7	1.77
	2.0625	95.250	3.7500	27.783	1.0938	28.575	1.1250	22.225	0.8750	3.6	0.14	0.8	0.03	135	141	21.6	**33891**	**33822**	20.4	0.80	66.0	2.60	59.0	2.32	86.0	3.39	90.0	3.54	0.33	1.82	1.00	31.4	17.7	1.77
	2.0625	100.000	3.9370	25.000	0.9842	22.225	0.8750	21.824	0.8592	2.4	0.09	2.0	0.08	105	98.5	15.1	**377**	**372**	21.5	0.85	62.0	2.44	58.0	2.28	86.0	3.39	90.0	3.54	0.34	1.77	0.97	24.1	14.0	1.73
	2.0625	100.000	3.9370	25.000	0.9842	22.225	0.8750	21.824	0.8592	4.8	0.19	2.0	0.08	105	98.5	15.1	**377A**	**372**	21.5	0.85	67.0	2.64	58.0	2.28	86.0	3.39	90.0	3.54	0.34	1.77	0.97	24.1	14.0	1.73
	2.0625	103.188	4.0625	38.100	1.5000	36.957	1.4550	30.162	1.1875	3.6	0.14	3.2	0.13	172	172	26.8	**540**	**533A**	23.9	0.94	71.0	2.80	60.0	2.36	95.0	3.74	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
	2.0625	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	1.6	0.06	3.2	0.13	136	144	22.2	**468**	**453X**	23.6	0.93	62.0	2.44	60.0	2.36	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	2.0625	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	3.6	0.14	1.6	0.06	172	172	26.8	**540**	**532X**	23.9	0.94	71.0	2.80	60.0	2.36	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
53.975	2.1250	88.900	3.5000	19.050	0.7500	19.050	0.7500	13.492	0.5312	2.4	0.09	2.0	0.08	79.1	86.8	12.6	**LM806649**	**LM806610**	21.5	0.85	63.0	2.48	60.0	2.36	80.0	3.15	85.0	3.35	0.55	1.10	0.60	18.1	16.9	1.07
	2.1250	95.250	3.7500	27.783	1.0938	28.575	1.1250	22.225	0.8750	1.6	0.06	0.8	0.03	135	141	21.6	**33895**	**33822**	20.4	0.80	63.0	2.48	60.0	2.36	86.0	3.39	90.0	3.54	0.33	1.82	1.00	31.4	17.7	1.77
	2.1250	100.000	3.9370	21.000	0.8268	21.946	0.8640	17.826	0.7018	1.6	0.06	2.0	0.08	101	101	15.3	**389AS**	**383A**	17.4	0.69	62.0	2.44	60.0	2.36	89.0	3.50	93.0	3.66	0.35	1.69	0.93	23.2	14.1	1.65
	2.1250	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	3.6	0.14	3.2	0.13	136	144	22.2	**456**	**453X**	23.6	0.93	68.0	2.68	61.0	2.40	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	2.1250	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	0.8	0.03	0.8	0.03	157	165	25.6	**45287**	**45221**	22.2	0.87	62.0	2.44	62.0	2.44	95.0	3.74	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76
	2.1250	104.775	4.1250	36.512	1.4375	36.512	1.4375	28.575	1.1250	3.6	0.14	3.2	0.13	176	195	29.3	**HM807049**	**HM807010**	29.3	1.15	73.0	2.87	63.0	2.48	89.0	3.50	100.0	3.94	0.49	1.23	0.68	41.3	34.4	1.20
	2.1250	104.775	4.1250	39.688	1.5625	40.157	1.5810	33.338	1.3125	3.6	0.14	3.2	0.13	189	211	32.3	**4595**	**4535**	27.3	1.07	70.0	2.76	63.0	2.48	90.0	3.54	99.0	3.90	0.34	1.79	0.98	44.4	25.4	1.74
	2.1250	107.950	4.2500	27.795	1.0943	29.317	1.1542	27.000	1.0630	3.6	0.14	0.8	0.03	136	144	22.2	**456**	**453**	23.6	0.93	68.0	2.68	61.0	2.40	99.0	3.90	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	2.1250	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	3.6	0.14	3.2	0.13	172	172	26.8	**539**	**532X**	23.9	0.94	68.0	2.68	61.0	2.40	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
	2.1250	107.950	4.2500	36.512	1.4375	36.957	1.4550	28.575	1.1250	5.6	0.22	3.2	0.13	172	172	26.8	**539A**	**532X**	23.9	0.94	72.0	2.83	61.0	2.40	94.0	3.70	100.0	3.94	0.30	2.03	1.11	40.4	20.5	1.97
	2.1250	117.475	4.6250	33.338	1.3125	31.750	1.2500	23.812	0.9375	3.6	0.14	3.2	0.13	162	152	23.2	**66212R**	**66462**	33.2	1.31	73.0	2.87	67.0	2.64	100.0	3.94	111.0	4.37	0.63	0.96	0.53	37.5	40.1	0.93
	2.1250	119.985	4.7238	32.751	1.2894	30.162	1.1875	26.949	1.0610	3.6	0.14	0.8	0.03	184	207	32.1	**39578**	**39528**	23.3	0.92	70.0	2.76	64.0	2.52	107.0	4.21	110.0	4.33	0.34	1.77	0.97	42.6	24.7	1.72
	2.1250	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**621**	**612**	27.3	1.07	70.0	2.76	63.0	2.48	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
	2.1250	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	0.8	0.03	0.8	0.03	218	217	34.0	**624**	**612S**	27.3	1.07	64.0	2.52	63.0	2.48	107.0	4.21	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
	2.1250	122.238	4.8125	33.338	1.3125	31.750	1.2500	23.812	0.9375	3.6	0.14	3.2	0.13	160	153	23.3	**66584**	**66520**	35.4	1.39	75.0	2.95	68.0	2.68	105.0	4.13	116.0	4.57	0.67	0.90	0.50	37.1	42.2	0.88
	2.1250	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	1.2	0.05	3.2	0.13	276	318	43.6	**5577R**	**5535**	31.1	1.22	67.0	2.64	65.0	2.56	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.1250	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5578R**	**5535**	31.1	1.22	73.0	2.87	67.0	2.64	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.1250	123.825	4.8750	38.100	1.5000	36.678	1.4440	30.162	1.1875	3.6	0.14	3.2	0.13	202	223	34.8	**557S**	**552A**	28.7	1.13	71.0	2.80	65.0	2.56	109.0	4.29	116.0	4.57	0.35	1.73	0.95	47.1	27.9	1.69

Note 1) SP indicates the specially chamfered from.

TS type

d (53.975) ~ (57.150) mm
(2.1250) ~ (2.2500) inch





$P = XF_r + YF_a$

$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \le e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

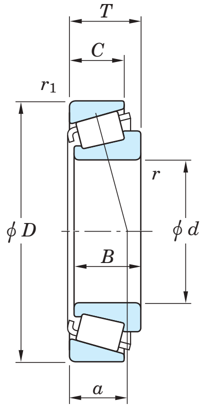
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

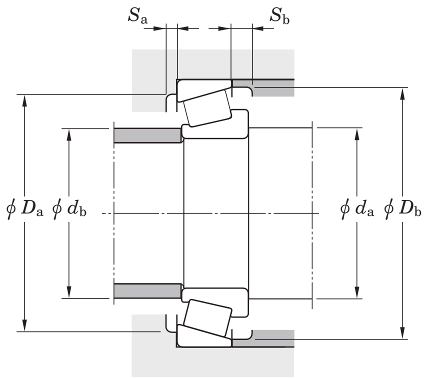
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r 1) (min.)		r_1 1) (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
53.975	2.1250	127.000	5.0000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	3.2	0.13	259	269	41.0	**65212**	**65500**	35.2	1.39	77.0	3.03	71.0	2.80	107.0	4.21	119.0	4.69	0.49	1.23	0.68	60.6	50.5	1.20
	2.1250	130.175	5.1250	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**636**	**633**	30.3	1.19	73.0	2.87	67.0	2.64	116.0	4.57	124.0	4.88	0.36	1.66	0.91	57.4	35.5	1.62
54.813	2.1580	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	0.8	0.03	3.2	0.13	333	357	49.3	**6380**	**6320**	34.8	1.37	70.0	2.76	68.0	2.68	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
54.986	2.1648	97.630	3.8437	24.608	0.9688	24.608	0.9688	19.446	0.7656	2.4	0.09	0.8	0.03	113	131	19.7	**28680X**	**28622**	21.2	0.83	65.0	2.56	58.0	2.28	88.0	3.46	92.0	3.62	0.40	1.49	0.82	26.1	17.9	1.45
54.988	2.1649	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	2.4	0.09	3.2	0.13	136	144	22.2	**466**	**453X**	23.6	0.93	67.0	2.64	61.0	2.40	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	2.1649	107.950	4.2500	27.783	1.0938	29.317	1.1542	22.225	0.8750	2.4	0.09	0.8	0.03	136	144	22.2	**466**	**453A**	23.6	0.93	67.0	2.64	61.0	2.40	97.0	3.82	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
	2.1649	110.000	4.3307	27.795	1.0943	29.317	1.1542	27.000	1.0630	2.4	0.09	2.0	0.08	136	144	22.2	**466**	**454**	25.7	1.01	67.0	2.64	61.0	2.40	96.0	3.78	100.0	3.94	0.34	1.79	0.98	31.7	18.2	1.74
54.991	2.1650	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	3.6	0.14	3.2	0.13	333	357	49.3	**6381**	**6320**	34.8	1.37	76.0	2.99	70.0	2.76	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
55.000	2.1654	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	2.4	0.09	0.8	0.03	101	101	15.3	**385**	**382A**	17.4	0.69	65.0	2.56	61.0	2.40	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.1654	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	3.6	0.14	0.8	0.03	101	101	15.3	**385X**	**382A**	17.4	0.69	67.0	2.64	61.0	2.40	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.1654	98.425	3.8750	21.000	0.8268	21.946	0.8640	17.826	0.7018	2.4	0.09	0.8	0.03	101	101	15.3	**385**	**382**	17.4	0.69	65.0	2.56	61.0	2.40	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.1654	100.000	3.9370	25.400	1.0000	21.946	0.8640	22.225	0.8750	2.4	0.09	1.2	0.05	101	101	15.3	**385**	**383X**	21.8	0.86	65.0	2.56	61.0	2.40	87.0	3.43	93.0	3.66	0.35	1.69	0.93	23.2	14.1	1.65
	2.1654	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	0.8	0.03	3.2	0.13	148	161	25.0	**475**	**472A**	24.9	0.98	67.0	2.64	66.0	2.60	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.1654	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	2.0	0.08	3.2	0.13	148	161	25.0	**475X**	**472A**	24.9	0.98	69.0	2.72	66.0	2.60	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.1654	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	0.8	0.03	3.2	0.13	218	217	34.0	**622X**	**612**	27.3	1.07	66.0	2.60	64.0	2.52	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
55.006	2.1656	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	0.8	0.03	3.2	0.13	218	217	34.0	**622A**	**612**	27.3	1.07	66.0	2.60	64.0	2.52	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
55.474	2.1840	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	2.4	0.09	0.8	0.03	101	101	15.3	**386**	**382A**	17.4	0.69	65.0	2.56	61.0	2.40	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
55.562	2.1875	97.630	3.8437	24.608	0.9688	24.608	0.9688	19.446	0.7656	3.6	0.14	0.8	0.03	113	131	19.7	**28680**	**28622**	21.2	0.83	68.0	2.68	62.0	2.44	88.0	3.46	92.0	3.62	0.40	1.49	0.82	26.1	17.9	1.45
	2.1875	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	2.4	0.09	3.2	0.13	136	144	22.2	**466S**	**453X**	23.6	0.93	67.0	2.64	61.0	2.40	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	2.1875	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	1.2	0.05	3.2	0.13	276	318	43.6	**5566R**	**5535**	31.1	1.22	70.0	2.76	68.0	2.68	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.1875	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	3.2	0.13	209	235	36.2	**HM813840**	**HM813810**	32.9	1.30	76.0	2.99	70.0	2.76	111.0	4.37	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
55.575	2.1880	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	2.4	0.09	0.8	0.03	101	101	15.3	**389**	**382A**	17.4	0.69	65.0	2.56	61.0	2.40	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.1880	96.838	3.8125	21.000	0.8268	26.256	1.0337	15.875	0.6250	2.4	0.09	0.8	0.03	101	101	15.3	**389S**	**382A**	17.4	0.69	65.0	2.56	61.0	2.40	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
55.753	2.1950	122.238	4.8125	33.338	1.3125	31.750	1.2500	23.812	0.9375	SP	SP	3.2	0.13	160	153	23.3	**66583**	**66520**	35.4	1.39	70.0	2.76	63.0	2.48	105.0	4.13	116.0	4.57	0.67	0.90	0.50	37.1	42.2	0.88
57.150	2.2500	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	2.4	0.09	0.8	0.03	101	101	15.3	**387**	**382A**	17.4	0.69	66.0	2.60	62.0	2.44	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.2500	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	3.6	0.14	0.8	0.03	101	101	15.3	**387A**	**382A**	17.4	0.69	69.0	2.72	62.0	2.44	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.2500	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	5.2	0.20	0.8	0.03	101	101	15.3	**387AS**	**382A**	17.4	0.69	72.0	2.83	62.0	2.44	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.2500	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	0.8	0.03	0.8	0.03	101	101	15.3	**387S**	**382A**	17.4	0.69	63.0	2.48	62.0	2.44	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.2500	98.425	3.8750	21.000	0.8268	21.946	0.8640	17.826	0.7018	2.4	0.09	0.8	0.03	101	101	15.3	**387**	**382**	17.4	0.69	66.0	2.60	62.0	2.44	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
	2.2500	98.425	3.8750	24.608	0.9688	24.608	0.9688	19.446	0.7656	3.6	0.14	0.8	0.03	113	131	19.7	**28682**	**28623**	21.2	0.83	70.0	2.76	63.0	2.48	88.0	3.46	93.0	3.66	0.40	1.49	0.82	26.1	17.9	1.45
	2.2500	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	2.4	0.09	3.2	0.13	136	144	22.2	**462**	**453X**	23.6	0.93	67.0	2.64	63.0	2.48	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	2.2500	104.775	4.1250	30.162	1.1875	29.317	1.1542	24.605	0.9687	3.6	0.14	3.2	0.13	136	144	22.2	**469**	**453X**	23.6	0.93	70.0	2.76	63.0	2.48	92.0	3.62	98.0	3.86	0.34	1.79	0.98	31.7	18.2	1.74
	2.2500	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	0.8	0.03	0.8	0.03	157	165	25.6	**45289**	**45221**	22.2	0.87	65.0	2.56	65.0	2.56	95.0	3.74	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76
	2.2500	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	2.4	0.09	0.8	0.03	157	165	25.6	**45290**	**45221**	22.2	0.87	68.0	2.68	65.0	2.56	95.0	3.74	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76
	2.2500	104.775	4.1250	30.162	1.1875	30.958	1.2188	23.812	0.9375	6.4	0.25	0.8	0.03	157	165	25.6	**45291**	**45221**	22.2	0.87	76.0	2.99	65.0	2.56	95.0	3.74	99.0	3.90	0.33	1.80	0.99	36.6	20.8	1.76

Note 1) SP indicates the specially chamfered from.

TS type

d (57.150) ~ (60.000) mm
(2.2500) ~ (2.3622) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

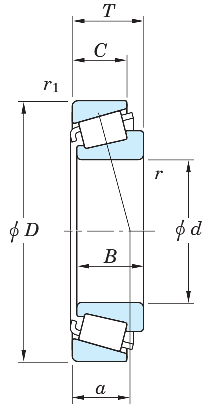
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

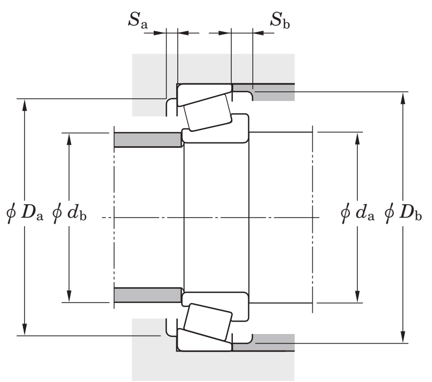
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1{}^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
57.150	2.2500	110.000	4.3307	22.000	0.8661	21.996	0.8660	22.000	0.8661	2.4	0.09	0.8	0.03	109	116	17.7	**390**	**394**	21.3	0.84	70.0	2.76	66.0	2.60	102.0	4.02	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.2500	111.125	4.3750	22.000	0.8661	21.996	0.8660	18.824	0.7411	2.4	0.09	1.2	0.05	109	116	17.7	**390**	**393AS**	21.3	0.84	70.0	2.76	66.0	2.60	101.0	3.98	105.0	4.13	0.40	1.49	0.82	25.0	17.2	1.46
	2.2500	112.712	4.4375	22.225	0.8750	21.996	0.8660	15.875	0.6250	2.4	0.09	3.2	0.13	109	116	17.7	**390**	**393A**	21.5	0.85	70.0	2.76	66.0	2.60	100.0	3.94	105.0	4.13	0.40	1.49	0.82	25.0	17.2	1.46
	2.2500	112.712	4.4375	30.162	1.1875	30.048	1.1830	23.812	0.9375	3.6	0.14	3.2	0.13	139	164	25.1	**3979**	**3920**	25.9	1.02	72.0	2.83	66.0	2.60	99.0	3.90	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
	2.2500	112.712	4.4375	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	184	207	32.1	**39580**	**39520**	23.3	0.92	72.0	2.83	66.0	2.60	101.0	3.98	107.0	4.21	0.34	1.77	0.97	42.6	24.7	1.72
	2.2500	112.712	4.4375	30.162	1.1875	30.162	1.1875	23.812	0.9375	7.9	0.31	3.2	0.13	184	207	32.1	**39581**	**39520**	23.3	0.92	81.0	3.19	66.0	2.60	101.0	3.98	107.0	4.21	0.34	1.77	0.97	42.6	24.7	1.72
	2.2500	112.712	4.4375	36.512	1.4375	30.162	1.1875	30.162	1.1875	3.6	0.14	3.2	0.13	184	207	32.1	**39580**	**39522**	29.7	1.17	72.0	2.83	66.0	2.60	101.0	3.98	107.0	4.21	0.34	1.77	0.97	42.6	24.7	1.72
	2.2500	117.475	4.6250	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	0.8	0.03	148	179	27.4	**33225**	**33461**	27.8	1.09	74.0	2.91	68.0	2.68	106.0	4.17	112.0	4.41	0.44	1.38	0.76	34.4	25.6	1.34
	2.2500	117.475	4.6250	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	148	179	27.4	**33225**	**33462**	27.8	1.09	74.0	2.91	68.0	2.68	104.0	4.09	112.0	4.41	0.44	1.38	0.76	34.4	25.6	1.34
	2.2500	117.475	4.6250	33.338	1.3125	31.750	1.2500	23.812	0.9375	3.6	0.14	0.8	0.03	162	152	23.2	**66225R**	**66461**	33.2	1.31	76.0	2.99	69.0	2.72	102.0	4.02	111.0	4.37	0.63	0.96	0.53	37.5	40.1	0.93
	2.2500	120.040	4.7260	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**623**	**612A**	27.3	1.07	72.0	2.83	66.0	2.60	103.0	4.06	109.0	4.29	0.31	1.91	1.05	50.9	27.4	1.86
	2.2500	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**623**	**612**	27.3	1.07	72.0	2.83	66.0	2.60	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
	2.2500	120.650	4.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	218	217	34.0	**623A**	**612**	27.3	1.07	78.0	3.07	66.0	2.60	105.0	4.13	110.0	4.33	0.31	1.91	1.05	50.9	27.4	1.86
	2.2500	122.238	4.8125	33.338	1.3125	31.750	1.2500	23.812	0.9375	3.6	0.14	3.2	0.13	160	153	23.3	**66587**	**66520**	35.4	1.39	77.0	3.03	71.0	2.80	105.0	4.13	116.0	4.57	0.67	0.90	0.50	37.1	42.2	0.88
	2.2500	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	3.6	0.14	3.2	0.13	202	223	34.8	**555S**	**553X**	28.7	1.13	73.0	2.87	67.0	2.64	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.2500	123.825	4.8750	38.100	1.5000	36.678	1.4440	30.162	1.1875	7.9	0.31	3.2	0.13	202	223	34.8	**555SA**	**552A**	28.7	1.13	82.0	3.23	67.0	2.64	109.0	4.29	116.0	4.57	0.35	1.73	0.95	47.1	27.9	1.69
	2.2500	127.000	5.0000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	3.2	0.13	259	269	41.0	**65225**	**65500**	35.2	1.39	80.0	3.15	71.0	2.80	107.0	4.21	119.0	4.69	0.49	1.23	0.68	60.6	50.5	1.20
	2.2500	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	4.3	0.17	3.2	0.13	333	357	49.3	**6375**	**6320**	34.8	1.37	78.0	3.07	70.0	2.76	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
	2.2500	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	0.8	0.03	3.2	0.13	333	357	49.3	**6387**	**6320**	34.8	1.37	71.0	2.80	70.0	2.76	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
	2.2500	136.525	5.3750	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**635**	**632**	30.3	1.19	75.0	2.95	69.0	2.72	118.0	4.65	125.0	4.92	0.36	1.66	0.91	57.4	35.5	1.62
	2.2500	149.225	5.8750	53.975	2.1250	41.275	1.6250	31.750	1.2500	6.4	0.25	3.2	0.13	357	404	54.4	**6465**	**6420**	39.3	1.55	86.0	3.39	81.0	3.19	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	2.2500	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	3.6	0.14	3.2	0.13	357	404	54.4	**6455**	**6420**	39.3	1.55	81.0	3.19	75.0	2.95	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
57.531	2.2650	96.838	3.8125	21.000	0.8268	21.946	0.8640	15.875	0.6250	3.6	0.14	0.8	0.03	101	101	15.3	**388A**	**382A**	17.4	0.69	69.0	2.72	63.0	2.48	89.0	3.50	92.0	3.62	0.35	1.69	0.93	23.2	14.1	1.65
58.738	2.3125	112.712	4.4375	33.338	1.3125	30.048	1.1830	26.988	1.0625	3.6	0.14	3.2	0.13	139	164	25.1	**3981**	**3926**	29.1	1.15	73.0	2.87	67.0	2.64	98.0	3.86	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
	2.3125	122.238	4.8125	51.595	2.0313	51.702	2.0355	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5558R**	**5535**	39.0	1.54	77.0	3.03	72.0	2.83	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.3125	127.000	5.0000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	3.2	0.13	259	269	41.0	**65231**	**65500**	35.2	1.39	81.0	3.19	71.0	2.80	107.0	4.21	119.0	4.69	0.49	1.23	0.68	60.6	50.5	1.20
59.530	2.3437	112.712	4.4375	30.162	1.1875	30.048	1.1830	23.812	0.9375	1.6	0.06	3.2	0.13	139	164	25.1	**3978**	**3920**	25.9	1.02	70.0	2.76	68.0	2.68	99.0	3.90	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
59.880	2.3575	127.000	5.0000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	3.2	0.13	259	269	41.0	**65235**	**65500**	35.2	1.39	82.0	3.23	71.0	2.80	107.0	4.21	119.0	4.69	0.49	1.23	0.68	60.6	50.5	1.20
59.972	2.3611	122.238	4.8125	33.338	1.3125	31.750	1.2500	23.812	0.9375	0.8	0.03	3.2	0.13	160	153	23.3	**66589**	**66520**	35.4	1.39	74.0	2.91	73.0	2.87	105.0	4.13	116.0	4.57	0.67	0.90	0.50	37.1	42.2	0.88
59.977	2.3613	101.600	4.0000	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	3.2	0.13	115	137	20.6	**28980**	**28920**	22.8	0.90	73.0	2.87	67.0	2.64	89.0	3.50	96.0	3.78	0.43	1.41	0.78	26.6	19.3	1.38
	2.3613	122.238	4.8125	33.338	1.3125	31.750	1.2500	23.812	0.9375	1.6	0.06	3.2	0.13	160	153	23.3	**66586**	**66520**	35.4	1.39	75.0	2.95	68.0	2.68	105.0	4.13	116.0	4.57	0.67	0.90	0.50	37.1	42.2	0.88
59.985	2.3616	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	3.6	0.14	3.2	0.13	333	357	49.3	**6391**	**6320**	34.8	1.37	79.0	3.11	70.0	2.76	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
59.987	2.3617	104.775	4.1250	21.432	0.8438	22.000	0.8661	15.875	0.6250	2.4	0.09	2.0	0.08	115	118	18.0	**39236**	**39412**	19.5	0.77	71.0	2.80	67.0	2.64	96.0	3.78	100.0	3.94	0.39	1.55	0.85	26.4	17.5	1.51
60.000	2.3622	107.950	4.2500	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	3.2	0.13	116	143	21.6	**29580**	**29520**	24.7	0.97	74.0	2.91	68.0	2.68	96.0	3.78	103.0	4.06	0.46	1.31	0.72	26.9	21.1	1.28
	2.3622	107.950	4.2500	25.400	1.0000	25.400	1.0000	19.050	0.7500	0.8	0.03	0.8	0.03	116	143	21.6	**29582**	**29522**	24.7	0.97	69.0	2.72	68.0	2.68	98.0	3.86	103.0	4.06	0.46	1.31	0.72	26.9	21.1	1.26
	2.3622	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	0.8	0.03	1.2	0.05	109	116	17.7	**397**	**394A**	21.3	0.84	69.0	2.72	68.0	2.68	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46

Note 1) SP indicates the specially chamfered from.

TS type

d (60.000) ~ (63.500) mm
(2.3622) ~ (2.5000) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

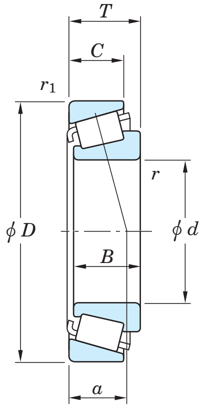
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

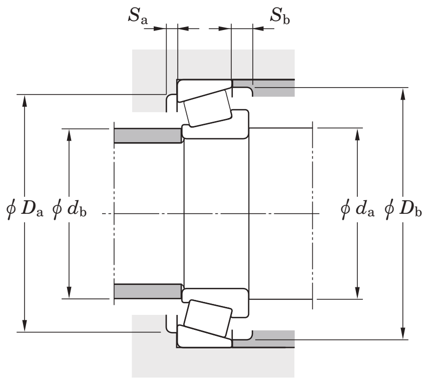
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
60.000	2.3622	112.712	4.4375	30.162	1.1875	30.048	1.1830	23.812	0.9375	3.6	0.14	0.8	0.03	139	164	25.1	**3977**	**3925**	25.9	1.02	74.0	2.91	68.0	2.68	101.0	3.98	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
	2.3622	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	2.0	0.08	3.2	0.13	148	161	25.0	**476**	**472A**	24.9	0.98	73.0	2.87	69.0	2.72	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.3622	120.000	4.7244	29.794	1.1730	29.007	1.1420	24.237	0.9542	1.6	0.06	2.0	0.08	148	161	25.0	**476A**	**472**	25.7	1.01	72.0	2.83	69.0	2.72	107.0	4.21	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.3622	122.238	4.8125	33.338	1.3125	31.750	1.2500	23.812	0.9375	3.6	0.14	3.2	0.13	160	153	23.3	**66585**	**66520**	35.4	1.39	79.0	3.11	73.0	2.87	105.0	4.13	116.0	4.57	0.67	0.90	0.50	37.1	42.2	0.88
	2.3622	122.238	4.8125	33.338	1.3125	31.750	1.2500	23.812	0.9375	0.8	0.03	3.2	0.13	160	153	23.3	**66588**	**66520**	35.4	1.39	72.0	2.83	65.0	2.56	105.0	4.13	116.0	4.57	0.67	0.90	0.50	37.1	42.2	0.88
60.325	2.3750	100.000	3.9370	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	3.2	0.13	115	137	20.6	**28985**	**28921**	22.8	0.90	73.0	2.87	67.0	2.64	89.0	3.50	96.0	3.78	0.43	1.41	0.78	26.6	19.3	1.38
	2.3750	100.000	3.9370	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	0.8	0.03	115	137	20.6	**28985**	**28921A**	22.8	0.90	73.0	2.87	67.0	2.64	92.0	3.62	96.0	3.78	0.43	1.41	0.78	26.6	19.3	1.38
	2.3750	101.600	4.0000	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	3.2	0.13	115	137	20.6	**28985**	**28920**	22.8	0.90	73.0	2.87	67.0	2.64	89.0	3.50	96.0	3.78	0.43	1.41	0.78	26.6	19.3	1.38
	2.3750	112.712	4.4375	30.162	1.1875	30.048	1.1830	23.812	0.9375	3.6	0.14	0.8	0.03	139	164	25.1	**3980**	**3925**	25.9	1.02	75.0	2.95	68.0	2.68	101.0	3.98	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
	2.3750	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	7.9	0.31	3.2	0.13	202	223	34.8	**557A**	**553X**	28.7	1.13	84.0	3.31	69.0	2.72	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.3750	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	2.4	0.09	3.2	0.13	202	223	34.8	**558**	**553X**	28.7	1.13	73.0	2.87	69.0	2.72	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.3750	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	3.6	0.14	3.2	0.13	202	223	34.8	**558A**	**553X**	28.7	1.13	76.0	2.99	69.0	2.72	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.3750	122.238	4.8125	38.100	1.5000	38.354	1.5100	29.718	1.1700	7.9	0.31	1.6	0.06	238	249	39.1	**HM212044**	**HM212010**	27.3	1.07	85.0	3.35	70.0	2.76	110.0	4.33	116.0	4.57	0.34	1.78	0.98	55.5	32.0	1.73
	2.3750	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	0.8	0.03	3.2	0.13	276	318	43.6	**5582R**	**5535**	31.1	1.22	73.0	2.87	72.0	2.83	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.3750	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5583R**	**5535**	31.1	1.22	78.0	3.07	72.0	2.83	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.3750	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	1.6	0.06	209	235	36.2	**HM813841**	**HM813811**	32.9	1.30	80.0	3.15	73.0	2.87	113.0	4.45	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
	2.3750	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	1.6	0.06	3.2	0.13	209	235	36.2	**HM813841A**	**HM813810**	32.9	1.30	74.0	2.91	71.0	2.80	110.0	4.33	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
	2.3750	127.000	5.0000	44.450	1.7500	44.450	1.7500	34.925	1.3750	3.6	0.14	3.2	0.13	259	269	41.0	**65237**	**65500**	35.2	1.39	82.0	3.23	71.0	2.80	107.0	4.21	119.0	4.69	0.49	1.23	0.68	60.6	50.5	1.20
	2.3750	127.000	5.0000	44.450	1.7500	44.450	1.7500	34.925	1.3750	1.6	0.06	3.2	0.13	259	269	41.0	**65237A**	**65500**	35.2	1.39	78.0	3.07	71.0	2.80	107.0	4.21	119.0	4.69	0.49	1.23	0.68	60.6	50.5	1.20
	2.3750	130.175	5.1250	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**637**	**633**	30.3	1.19	78.0	3.07	72.0	2.83	116.0	4.57	124.0	4.88	0.36	1.66	0.91	57.4	35.5	1.62
	2.3750	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	3.6	0.14	3.2	0.13	333	357	49.3	**6376**	**6320**	34.8	1.37	81.0	3.19	74.0	2.91	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
	2.3750	136.525	5.3750	46.038	1.8125	46.038	1.8125	36.512	1.4375	3.6	0.14	3.2	0.13	290	369	49.6	**H715332**	**H715311**	37.0	1.46	84.0	3.31	78.0	3.07	118.0	4.65	132.0	5.20	0.47	1.27	0.70	67.8	54.8	1.24
61.912	2.4375	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	0.8	0.03	1.2	0.05	109	116	17.7	**392**	**394A**	21.3	0.84	70.0	2.76	69.0	2.72	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.4375	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	3.6	0.14	3.2	0.13	202	223	34.8	**554**	**553X**	28.7	1.13	77.0	3.03	71.0	2.80	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.4375	123.825	4.8750	38.100	1.5000	36.678	1.4440	33.338	1.3125	3.6	0.14	3.2	0.13	202	223	34.8	**554**	**552**	28.7	1.13	77.0	3.03	71.0	2.80	109.0	4.29	116.0	4.57	0.35	1.73	0.95	47.1	27.9	1.69
	2.4375	125.000	4.9213	38.100	1.5000	36.678	1.4440	30.162	1.1875	3.6	0.14	3.2	0.13	202	223	34.8	**554**	**553**	28.7	1.13	77.0	3.03	71.0	2.80	109.0	4.29	116.0	4.57	0.35	1.73	0.95	47.1	27.9	1.69
	2.4375	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	1.6	0.06	209	235	36.2	**HM813843**	**HM813811**	32.9	1.30	81.0	3.19	75.0	2.95	113.0	4.45	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
	2.4375	139.700	5.5000	46.038	1.8125	46.038	1.8125	36.512	1.4375	3.6	0.14	3.2	0.13	290	369	49.6	**H715334**	**H715310**	37.0	1.46	86.0	3.39	79.0	3.11	120.0	4.72	133.0	5.24	0.47	1.27	0.70	67.8	54.8	1.24
	2.4375	152.400	6.0000	47.625	1.8750	46.038	1.8125	31.750	1.2500	3.6	0.14	3.2	0.13	306	278	38.3	**9180**	**9121**	44.5	1.75	90.0	3.54	81.0	3.19	130.0	5.12	145.0	5.71	0.66	0.91	0.50	71.3	79.9	0.89
	2.4375	158.750	6.2500	50.800	2.0000	46.038	1.8125	34.925	1.3750	3.6	0.14	3.2	0.13	306	278	38.3	**9180**	**9120**	47.6	1.87	90.0	3.54	81.0	3.19	134.0	5.28	145.0	5.71	0.66	0.91	0.50	71.3	79.9	0.89
	2.4375	158.750	6.2500	50.800	2.0000	46.038	1.8125	34.925	1.3750	0.8	0.03	3.2	0.13	306	278	38.3	**9181**	**9120**	47.6	1.87	85.0	3.35	78.0	3.07	134.0	5.28	145.0	5.71	0.66	0.91	0.50	71.3	79.9	0.89
62.738	2.4700	100.000	3.9370	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	3.2	0.13	115	137	20.6	**28995**	**28921**	22.8	0.90	75.0	2.95	69.0	2.72	89.0	3.50	96.0	3.78	0.43	1.41	0.78	26.6	19.3	1.38
63.500	2.5000	107.158	4.2188	22.000	0.8661	22.000	0.8661	21.204	0.8348	2.0	0.08	2.4	0.09	115	118	18.0	**39250**	**39422**	20.8	0.82	73.0	2.87	69.0	2.72	97.0	3.82	102.0	4.02	0.39	1.55	0.85	26.4	17.5	1.51
	2.5000	107.950	4.2500	25.400	1.0000	25.400	1.0000	19.050	0.7500	1.6	0.06	3.2	0.13	116	143	21.6	**29586**	**29520**	24.7	0.97	73.0	2.87	71.0	2.80	96.0	3.78	103.0	4.06	0.46	1.31	0.72	26.9	21.1	1.28
	2.5000	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	1.6	0.06	1.2	0.05	109	116	17.7	**390A**	**394A**	21.3	0.84	73.0	2.87	70.0	2.76	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.5000	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	3.6	0.14	1.2	0.05	109	116	17.7	**395**	**394A**	21.3	0.84	77.0	3.03	70.0	2.76	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.5000	110.000	4.3307	22.000	0.8661	21.996	0.8660	22.000	0.8661	3.6	0.14	0.8	0.03	109	116	17.7	**395**	**394**	21.3	0.84	77.0	3.03	70.0	2.76	102.0	4.02	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.5000	110.000	4.3307	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	1.2	0.05	116	143	21.6	**29585**	**29521**	24.7	0.97	77.0	3.03	71.0	2.80	99.0	3.90	104.0	4.09	0.46	1.31	0.72	26.9	21.1	1.28
	2.5000	110.058	4.3330	22.000	0.8661	22.000	0.8661	17.236	0.6786	2.0	0.08	2.4	0.09	115	118	18.0	**39250**	**39433**	20.8	0.82	73.0	2.87	69.0	2.72	98.0	3.86	103.0	4.06	0.39	1.55	0.85	26.4	17.5	1.51

Note 1) SP indicates the specially chamfered from.

TS type

d (63.500) ~ (66.675) mm
(2.5000) ~ (2.6250) inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

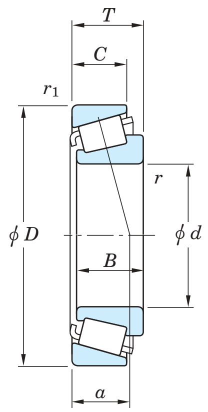
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

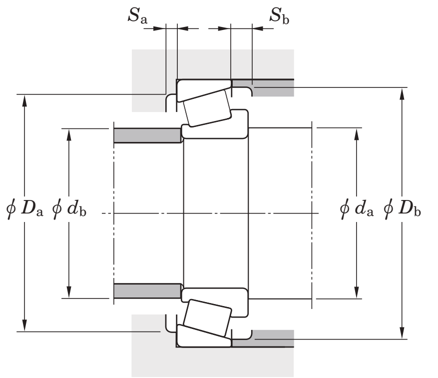
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1{}^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
63.500	2.5000	112.712	4.4375	30.162	1.1875	30.048	1.1830	23.812	0.9375	3.6	0.14	0.8	0.03	139	164	25.1	**3982**	**3925**	25.9	1.02	77.0	3.03	71.0	2.80	101.0	3.98	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
	2.5000	112.712	4.4375	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	184	207	32.1	**39585**	**39520**	23.3	0.92	77.0	3.03	71.0	2.80	101.0	3.98	107.0	4.21	0.34	1.77	0.97	42.6	24.7	1.72
	2.5000	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	0.8	0.03	3.2	0.13	148	161	25.0	**477**	**472A**	24.9	0.98	73.0	2.87	72.0	2.83	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.5000	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	3.6	0.14	3.2	0.13	148	161	25.0	**483**	**472A**	24.9	0.98	78.0	3.07	72.0	2.83	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.5000	120.000	4.7244	29.794	1.1730	29.007	1.1420	24.237	0.9542	0.8	0.03	2.0	0.08	129	161	18.8	**477**	**472**	25.7	1.01	73.0	2.87	72.0	2.83	108.0	4.25	113.0	4.45	0.38	1.56	0.86	34.5	22.7	1.52
	2.5000	120.000	4.7244	29.794	1.1730	30.162	1.1875	23.444	0.9230	0.8	0.03	0.8	0.03	148	179	27.4	**33251**	**33472**	27.4	1.08	73.0	2.87	72.0	2.83	107.0	4.21	113.0	4.45	0.44	1.38	0.76	34.4	25.6	1.34
	2.5000	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	3.6	0.14	3.2	0.13	202	223	34.8	**559**	**553X**	28.7	1.13	78.0	3.07	72.0	2.83	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.5000	122.238	4.8125	38.354	1.5100	38.100	1.5000	29.718	1.1700	3.6	0.14	3.2	0.13	238	249	39.1	**HM212046**	**HM212011**	27.6	1.09	80.0	3.15	73.0	2.87	108.0	4.25	116.0	4.57	0.34	1.78	0.98	55.5	32.0	1.73
	2.5000	122.238	4.8125	38.354	1.5100	38.100	1.5000	29.718	1.1700	7.1	0.28	1.6	0.06	238	249	39.1	**HM212047**	**HM212010**	27.6	1.09	87.0	3.43	73.0	2.87	110.0	4.33	116.0	4.57	0.34	1.78	0.98	55.5	32.0	1.73
	2.5000	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	5.2	0.20	3.2	0.13	276	318	43.6	**5564R**	**5535**	31.1	1.22	79.0	3.11	72.0	2.83	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.5000	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5584R**	**5535**	31.1	1.22	81.0	3.19	75.0	2.95	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.5000	122.238	4.8125	51.595	2.0313	51.702	2.0355	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5552R**	**5535**	39.0	1.54	81.0	3.19	72.0	2.83	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.5000	123.825	4.8750	30.162	1.1875	29.007	1.1420	24.605	0.9687	0.8	0.03	3.2	0.13	148	161	25.0	**477**	**472X**	26.0	1.02	73.0	2.87	72.0	2.83	109.0	4.29	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.5000	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	3.6	0.14	3.2	0.13	196	226	35.3	**565**	**563**	28.6	1.13	80.0	3.15	73.0	2.87	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
	2.5000	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	6.4	0.25	3.2	0.13	196	226	35.3	**565S**	**563**	28.6	1.13	86.0	3.39	73.0	2.87	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
	2.5000	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	1.6	0.06	209	235	36.2	**HM813842**	**HM813811**	32.9	1.30	82.0	3.23	76.0	2.99	113.0	4.45	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
	2.5000	130.175	5.1250	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**639**	**633**	30.3	1.19	81.0	3.19	74.0	2.91	116.0	4.57	124.0	4.88	0.36	1.66	0.91	57.4	35.5	1.62
	2.5000	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	4.3	0.17	3.2	0.13	333	357	49.3	**6382**	**6320**	34.8	1.37	84.0	3.31	77.0	3.03	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
	2.5000	136.525	5.3750	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	302	308	48.1	**H414235**	**H414210**	30.3	1.19	82.0	3.23	78.0	3.07	121.0	4.76	129.0	5.08	0.36	1.67	0.92	70.0	43.1	1.62
	2.5000	136.525	5.3750	46.038	1.8125	46.038	1.8125	36.512	1.4375	3.6	0.14	3.2	0.13	290	369	49.6	**H715336**	**H715311**	37.0	1.46	87.0	3.43	80.0	3.15	118.0	4.65	132.0	5.20	0.47	1.27	0.70	67.8	54.8	1.24
	2.5000	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	3.6	0.14	3.2	0.13	357	404	54.4	**6475**	**6420**	39.3	1.55	86.0	3.39	81.0	3.19	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	2.5000	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.6	0.14	3.2	0.13	330	368	50.1	**745SR**	**742**	32.4	1.28	84.0	3.31	77.0	3.03	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
64.960	2.5575	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**656**	**653**	33.4	1.31	86.0	3.39	79.0	3.11	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	2.5575	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	3.6	0.14	3.2	0.13	357	404	54.4	**6464**	**6420**	39.3	1.55	87.0	3.43	81.0	3.19	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	2.5575	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.6	0.14	3.2	0.13	330	368	50.1	**747SR**	**742**	32.4	1.28	86.0	3.39	81.0	3.19	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
64.963	2.5576	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	3.6	0.14	3.2	0.13	196	226	35.3	**569**	**563**	28.6	1.13	81.0	3.19	74.0	2.91	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
64.986	2.5585	112.712	4.4375	30.162	1.1875	30.924	1.2175	23.812	0.9375	2.4	0.09	3.2	0.13	184	207	32.1	**39586**	**39520**	23.3	0.92	76.0	2.99	72.0	2.83	101.0	3.98	107.0	4.21	0.34	1.77	0.97	42.6	24.7	1.72
64.988	2.5586	107.950	4.2500	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	0.8	0.03	116	143	21.6	**29588**	**29522**	24.7	0.97	78.0	3.07	72.0	2.83	98.0	3.86	103.0	4.06	0.46	1.31	0.72	26.9	21.1	1.28
65.000	2.5591	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	2.0	0.08	1.2	0.05	109	116	17.7	**399**	**394A**	21.3	0.84	76.0	2.99	73.0	2.87	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.5591	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	2.4	0.09	3.2	0.13	148	161	25.0	**478**	**472A**	24.9	0.98	77.0	3.03	73.0	2.87	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
65.088	2.5625	122.238	4.8125	51.595	2.0313	51.702	2.0355	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5554R**	**5535**	39.0	1.54	83.0	3.27	72.0	2.83	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.5625	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	3.6	0.14	3.2	0.13	333	357	49.3	**6379**	**6320**	34.8	1.37	84.0	3.31	77.5	3.05	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
	2.5625	136.525	5.3750	46.038	1.8125	46.038	1.8125	36.512	1.4375	3.6	0.14	3.2	0.13	290	369	49.6	**H715340**	**H715311**	37.0	1.46	88.0	3.46	82.0	3.23	118.0	4.65	132.0	5.20	0.47	1.27	0.70	67.8	54.8	1.24
65.883	2.5938	122.238	4.8125	43.658	1.7188	43.764	1.7230	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5595R**	**5535**	31.1	1.22	83.0	3.27	77.0	3.03	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
66.675	2.6250	107.950	4.2500	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	0.8	0.03	116	143	21.6	**29590**	**29522**	24.7	0.97	80.0	3.15	73.0	2.87	98.0	3.86	103.0	4.06	0.46	1.31	0.72	26.9	21.1	1.28
	2.6250	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	0.8	0.03	1.2	0.05	109	116	17.7	**395A**	**394A**	21.3	0.84	73.0	2.87	73.0	2.87	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.6250	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	3.6	0.14	1.2	0.05	109	116	17.7	**395S**	**394A**	21.3	0.84	79.0	3.11	73.0	2.87	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46

Note 1) SP indicates the specially chamfered from.

TS type

d (66.675) ~ (69.850) mm
(2.6250) ~ (2.7500) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

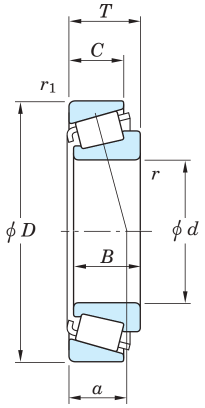
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

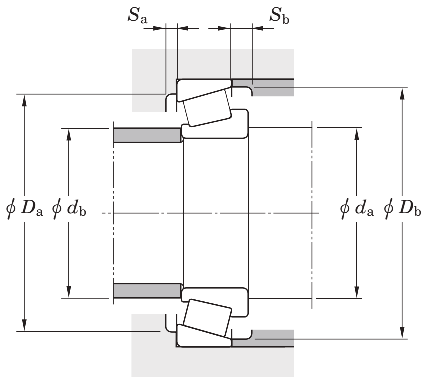
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Constant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
66.675	2.6250	112.712	4.4375	30.162	1.1875	30.048	1.1830	23.812	0.9375	3.6	0.14	0.8	0.03	139	164	25.1	**3984**	**3925**	25.9	1.02	80.0	3.15	74.0	2.91	101.0	3.98	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
	2.6250	112.712	4.4375	30.162	1.1875	30.048	1.1830	23.812	0.9375	5.6	0.22	0.8	0.03	139	164	25.1	**3994**	**3925**	25.9	1.02	84.0	3.31	74.0	2.91	101.0	3.98	106.0	4.17	0.40	1.49	0.82	32.4	22.3	1.46
	2.6250	112.712	4.4375	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	184	207	32.1	**39590**	**39520**	23.3	0.92	80.0	3.15	74.0	2.91	101.0	3.98	107.0	4.21	0.34	1.77	0.97	42.6	24.7	1.72
	2.6250	112.712	4.4375	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	0.8	0.03	184	207	32.1	**39590**	**39521**	23.3	0.92	80.0	3.15	74.0	2.91	103.0	4.06	107.0	4.21	0.34	1.77	0.97	42.6	24.7	1.72
	2.6250	117.475	4.6250	30.162	1.1875	30.162	1.1875	23.812	0.9375	5.6	0.22	3.2	0.13	148	179	27.4	**33261**	**33462**	27.8	1.09	86.0	3.39	76.0	2.99	104.0	4.09	112.0	4.41	0.44	1.38	0.76	34.4	25.6	1.34
	2.6250	117.475	4.6250	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	148	179	27.4	**33262**	**33462**	27.8	1.09	81.0	3.19	75.0	2.95	104.0	4.09	112.0	4.41	0.44	1.38	0.76	34.4	25.6	1.34
	2.6250	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	2.0	0.08	3.2	0.13	148	161	25.0	**478S**	**472A**	24.9	0.98	78.0	3.07	74.0	2.91	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.6250	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	2.4	0.09	3.2	0.13	148	161	25.0	**479**	**472A**	24.9	0.98	78.0	3.07	74.0	2.91	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.6250	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	3.6	0.14	3.2	0.13	202	223	34.8	**560**	**553X**	28.7	1.13	81.0	3.19	75.0	2.95	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.6250	122.238	4.8125	38.100	1.5000	38.354	1.5100	29.718	1.1700	3.6	0.14	1.6	0.06	238	249	39.1	**HM212049**	**HM212010**	27.3	1.07	82.0	3.23	75.5	2.97	110.0	4.33	116.0	4.57	0.34	1.78	0.98	55.5	32.0	1.73
	2.6250	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	1.6	0.06	209	235	36.2	**HM813844**	**HM813811**	32.9	1.30	85.0	3.35	78.0	3.07	113.0	4.45	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
	2.6250	130.175	5.1250	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**641**	**633**	30.3	1.19	83.0	3.27	77.0	3.03	116.0	4.57	124.0	4.88	0.36	1.66	0.91	57.4	35.5	1.62
	2.6250	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	4.3	0.17	3.2	0.13	333	357	49.3	**6386**	**6320**	34.8	1.37	87.0	3.43	77.5	3.05	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
	2.6250	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	8.6	0.34	3.2	0.13	333	357	49.3	**6386A**	**6320**	34.8	1.37	92.0	3.62	77.0	3.03	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
	2.6250	135.755	5.3447	53.975	2.1250	56.007	2.2050	44.450	1.7500	6.4	0.25	3.2	0.13	333	357	49.3	**6389**	**6320**	34.8	1.37	91.0	3.58	77.5	3.05	117.0	4.61	126.0	4.96	0.32	1.85	1.02	78.4	43.5	1.80
	2.6250	136.525	5.3750	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	302	308	48.1	**H414242**	**H414210**	30.3	1.19	85.0	3.35	81.0	3.19	121.0	4.76	129.0	5.08	0.36	1.67	0.92	70.0	43.1	1.62
	2.6250	136.525	5.3750	46.038	1.8125	46.038	1.8125	36.512	1.4375	3.6	0.14	3.2	0.13	290	369	49.6	**H715341**	**H715311**	37.0	1.46	89.0	3.50	83.0	3.27	118.0	4.65	132.0	5.20	0.47	1.27	0.70	67.8	54.8	1.24
68.262	2.6875	103.188	4.0625	43.658	1.7188	51.702	2.0355	36.512	1.4375	3.6	0.14	3.2	0.13	276	318	43.6	**5557R**	**5535**	31.1	1.22	86.0	3.39	72.0	2.83	106.0	4.17	116.0	4.57	0.36	1.67	0.92	64.5	39.5	1.63
	2.6875	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	2.4	0.09	1.2	0.05	109	116	17.7	**399A**	**394A**	21.3	0.84	78.0	3.07	74.0	2.91	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.6875	110.000	4.3307	22.000	0.8661	21.996	0.8660	18.824	0.7411	5.2	0.20	1.2	0.05	109	116	17.7	**399AS**	**394A**	21.3	0.84	83.0	3.27	74.0	2.91	101.0	3.98	104.5	4.11	0.40	1.49	0.82	25.0	17.2	1.46
	2.6875	117.475	4.6250	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	148	179	27.4	**33269**	**33462**	27.8	1.09	82.0	3.23	76.0	2.99	104.0	4.09	112.0	4.41	0.44	1.38	0.76	34.4	25.6	1.34
	2.6875	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	3.6	0.14	3.2	0.13	148	161	25.0	**480**	**472A**	24.9	0.98	82.0	3.23	75.0	2.95	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.6875	122.238	4.8125	38.100	1.5000	36.678	1.4440	30.162	1.1875	3.6	0.14	3.2	0.13	202	223	34.8	**560S**	**553X**	28.7	1.13	83.0	3.27	76.0	2.99	108.0	4.25	115.0	4.53	0.35	1.73	0.95	47.1	27.9	1.69
	2.6875	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	3.6	0.14	3.2	0.13	196	226	35.3	**570**	**563**	28.6	1.13	83.0	3.27	77.0	3.03	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
	2.6875	130.175	5.1250	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**642**	**633**	30.3	1.19	84.0	3.31	79.0	3.11	116.0	4.57	124.0	4.88	0.36	1.66	0.91	57.4	35.5	1.62
	2.6875	136.525	5.3750	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**642**	**632**	30.3	1.19	84.0	3.31	79.0	3.11	118.0	4.65	125.0	4.92	0.36	1.66	0.91	57.4	35.5	1.62
	2.6875	136.525	5.3750	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	284	308	46.1	**H414245**	**H414210**	30.3	1.19	86.0	3.39	82.0	3.23	121.0	4.76	129.0	5.08	0.36	1.67	0.92	70.0	43.1	1.62
	2.6875	136.525	5.3750	41.275	1.6250	41.275	1.6250	31.750	1.2500	7.1	0.28	3.2	0.13	302	308	48.1	**H414245A**	**H414210**	30.3	1.19	89.0	3.50	83.0	3.27	121.0	4.76	129.0	5.08	0.36	1.67	0.92	70.0	43.1	1.62
	2.6875	136.525	5.3750	46.038	1.8125	46.038	1.8125	36.512	1.4375	3.6	0.14	3.2	0.13	290	369	49.6	**H715343**	**H715311**	37.0	1.46	90.0	3.54	84.0	3.31	118.0	4.65	132.0	5.20	0.47	1.27	0.70	67.8	54.8	1.24
	2.6875	152.400	6.0000	47.625	1.8750	46.038	1.8125	31.750	1.2500	3.6	0.14	3.2	0.13	306	278	38.3	**9185**	**9121**	44.5	1.75	94.0	3.70	81.5	3.21	130.0	5.12	145.0	5.71	0.66	0.91	0.50	71.3	79.9	0.89
69.850	2.7500	98.425	3.8750	13.495	0.5313	13.495	0.5313	9.525	0.3750	1.6	0.06	1.6	0.06	49.1	59.8	8.45	**LL713049**	**LL713010**	18.4	0.72	77.0	3.03	74.0	2.91	92.0	3.62	94.5	3.72	0.44	1.37	0.75	11.1	8.35	1.33
	2.7500	112.712	4.4375	22.225	0.8750	21.996	0.8660	15.875	0.6250	1.6	0.06	0.8	0.03	115	127	19.4	**LM613449**	**LM613410**	21.9	0.86	78.0	3.07	76.0	2.99	104.0	4.09	107.0	4.21	0.42	1.44	0.79	26.4	18.8	1.41
	2.7500	112.712	4.4375	25.400	1.0000	25.400	1.0000	19.050	0.7500	1.6	0.06	3.2	0.13	122	155	23.3	**29675**	**29620**	26.2	1.03	80.0	3.15	77.0	3.03	101.0	3.98	109.0	4.29	0.49	1.23	0.68	28.1	23.4	1.20
	2.7500	112.712	4.4375	25.400	1.0000	25.400	1.0000	19.050	0.7500	1.6	0.06	3.2	0.13	122	155	23.3	**29676**	**29620**	26.2	1.03	80.0	3.15	77.0	3.03	101.0	3.98	109.0	4.29	0.49	1.23	0.68	28.1	23.4	1.20
	2.7500	117.475	4.6250	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	148	179	27.4	**33275**	**33462**	27.8	1.09	84.0	3.31	77.0	3.03	104.0	4.09	112.0	4.41	0.44	1.38	0.76	34.4	25.6	1.34
	2.7500	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	3.6	0.14	3.2	0.13	148	161	25.0	**482**	**472A**	24.9	0.98	83.0	3.27	77.0	3.03	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.7500	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	4.8	0.19	3.2	0.13	148	161	25.0	**482A**	**472A**	24.9	0.98	86.0	3.39	77.0	3.03	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.7500	120.000	4.7244	29.794	1.1730	29.007	1.1420	24.237	0.9542	3.6	0.14	2.0	0.08	148	161	25.0	**482**	**472**	25.7	1.01	83.0	3.27	77.0	3.03	108.0	4.25	113.0	4.45	0.38	1.56	0.86	34.5	22.7	1.52
	2.7500	120.000	4.7244	32.545	1.2813	32.545	1.2813	26.195	1.0313	3.6	0.14	3.2	0.13	189	218	33.9	**47487R**	**47420**	26.6	1.05	84.0	3.31	78.0	3.07	107.0	4.21	114.0	4.49	0.36	1.67	0.92	43.7	26.9	1.62
	2.7500	120.650	4.7500	32.545	1.2813	32.545	1.2813	26.195	1.0313	3.6	0.14	0.8	0.03	189	218	33.9	**47487R**	**47423**	26.6	1.05	84.0	3.31	78.0	3.07	109.0	4.29	114.0	4.49	0.36	1.67	0.92	43.7	26.9	1.62

Note 1) SP indicates the specially chamfered from.

TS type

d (69.850) ~ (73.025) mm
(2.7500) ~ (2.8750) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

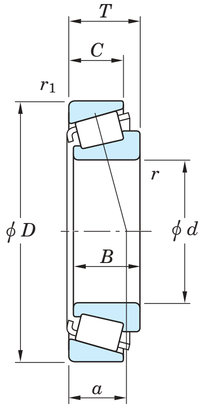
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u	Cone	Cup	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
69.850	2.7500	123.825	4.8750	30.162	1.1875	29.007	1.1420	24.605	0.9687	3.6	0.14	3.2	0.13	148	161	25.0	**482**	**472X**	26.0	1.02	83.0	3.27	77.0	3.03	109.0	4.29	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.7500	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	3.6	0.14	3.2	0.13	196	226	35.3	**566**	**563**	28.6	1.13	85.0	3.35	78.0	3.07	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
	2.7500	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	0.8	0.03	3.2	0.13	196	226	35.3	**566S**	**563**	28.6	1.13	79.0	3.11	78.0	3.07	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
	2.7500	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	1.6	0.06	209	235	36.2	**HM813846**	**HM813811**	32.9	1.30	88.0	3.46	81.0	3.19	113.0	4.45	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
	2.7500	130.175	5.1250	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**643**	**633**	30.3	1.19	86.0	3.39	80.0	3.15	116.0	4.57	124.0	4.88	0.36	1.66	0.91	57.4	35.5	1.62
	2.7500	136.525	5.3750	46.038	1.8125	46.038	1.8125	36.512	1.4375	3.6	0.14	3.2	0.13	290	369	49.6	**H715344**	**H715311**	37.0	1.46	92.0	3.62	85.0	3.35	118.0	4.65	132.0	5.20	0.47	1.27	0.70	67.8	54.8	1.24
	2.7500	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**655**	**653**	33.4	1.31	88.0	3.46	82.0	3.23	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	2.7500	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	5.2	0.20	3.2	0.13	357	404	54.4	**6454**	**6420**	39.3	1.55	94.0	3.70	85.0	3.35	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	2.7500	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	6.4	0.25	3.2	0.13	357	404	54.4	**6484**	**6420**	39.3	1.55	95.0	3.74	85.0	3.35	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	2.7500	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	5.2	0.20	3.2	0.13	330	368	50.1	**744AR**	**742**	32.4	1.28	92.0	3.62	82.0	3.23	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	2.7500	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.6	0.14	3.2	0.13	330	368	50.1	**745AR**	**742**	32.4	1.28	88.0	3.46	82.0	3.23	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	2.7500	168.275	6.6250	53.975	2.1250	56.363	2.2190	41.275	1.6250	3.6	0.14	3.2	0.13	429	467	62.1	**835R**	**832**	35.0	1.38	91.0	3.58	84.0	3.31	149.0	5.87	155.0	6.10	0.30	2.00	1.10	101	51.6	1.95
69.952	2.7540	121.442	4.7812	24.608	0.9688	23.012	0.9060	17.462	0.6875	2.0	0.08	2.0	0.08	113	127	19.4	**34274**	**34478**	26.8	1.06	81.0	3.19	78.0	3.07	110.0	4.33	116.0	4.57	0.45	1.33	0.73	26.0	20.0	1.30
70.000	2.7559	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	2.0	0.08	3.2	0.13	148	161	25.0	**484**	**472A**	24.9	0.98	80.0	3.15	77.0	3.03	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
	2.7559	125.052	4.9233	23.731	0.9343	23.012	0.9060	16.401	0.6457	2.0	0.08	2.0	0.08	113	127	19.4	**34275**	**34492A**	25.9	1.02	82.0	3.23	78.0	3.07	112.0	4.41	118.0	4.65	0.45	1.33	0.73	26.0	20.0	1.30
70.637	2.7810	112.712	4.4375	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	3.2	0.13	122	155	23.3	**29681**	**29620**	26.2	1.03	84.0	3.31	79.0	3.11	101.0	3.98	109.0	4.29	0.49	1.23	0.68	28.1	23.4	1.20
	2.7810	120.650	4.7500	25.400	1.0000	25.400	1.0000	19.050	0.7500	1.2	0.05	3.2	0.13	122	155	23.3	**29680**	**29630**	26.2	1.03	80.0	3.15	78.0	3.07	104.0	4.09	113.0	4.45	0.49	1.23	0.68	28.1	23.4	1.20
71.438	2.8125	117.475	4.6250	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	148	179	27.4	**33281**	**33462**	27.8	1.09	85.0	3.35	79.0	3.11	104.0	4.09	112.0	4.41	0.44	1.38	0.76	34.4	25.6	1.34
	2.8125	120.000	4.7244	32.545	1.2813	32.545	1.2813	26.195	1.0313	3.6	0.14	3.2	0.13	189	218	33.9	**47490R**	**47420**	26.6	1.05	86.0	3.39	79.0	3.11	107.0	4.21	114.0	4.49	0.36	1.67	0.92	43.7	26.9	1.62
	2.8125	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	3.6	0.14	3.2	0.13	196	226	35.3	**567A**	**563**	28.6	1.13	86.0	3.39	80.0	3.15	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
	2.8125	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	6.4	0.25	3.2	0.13	196	226	35.3	**567S**	**563**	28.6	1.13	92.0	3.62	80.0	3.15	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
	2.8125	127.000	5.0000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	1.6	0.06	209	235	36.2	**HM813849**	**HM813811**	32.9	1.30	89.0	3.50	81.9	3.22	113.0	4.45	121.0	4.76	0.50	1.20	0.66	48.6	41.7	1.17
	2.8125	130.175	5.1250	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	246	267	41.8	**644**	**633**	30.3	1.19	87.0	3.43	81.0	3.19	116.0	4.57	124.0	4.88	0.36	1.66	0.91	57.4	35.5	1.62
	2.8125	130.175	5.1250	41.275	1.6250	41.275	1.6250	31.750	1.2500	6.4	0.25	3.2	0.13	246	267	41.8	**645**	**633**	30.3	1.19	93.0	3.66	81.0	3.19	116.0	4.57	124.0	4.88	0.36	1.66	0.91	57.4	35.5	1.62
	2.8125	133.350	5.2500	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**495S**	**492A**	29.8	1.17	88.0	3.46	82.0	3.23	120.0	4.72	128.0	5.04	0.44	1.35	0.74	38.8	29.4	1.32
	2.8125	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	3.6	0.14	0.8	0.03	193	245	37.2	**47675R**	**47620A**	29.2	1.15	88.0	3.46	82.0	3.23	121.0	4.76	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
	2.8125	136.525	5.3750	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	284	308	46.1	**H414249**	**H414210**	30.3	1.19	89.0	3.50	83.3	3.28	121.0	4.76	129.0	5.08	0.36	1.67	0.92	70.0	43.1	1.62
	2.8125	136.525	5.3750	46.038	1.8125	46.038	1.8125	36.512	1.4375	3.6	0.14	3.2	0.13	290	369	49.6	**H715345**	**H715311**	37.0	1.46	93.0	3.66	87.0	3.43	118.0	4.65	132.0	5.20	0.47	1.27	0.70	67.8	54.8	1.24
73.000	2.8740	120.000	4.7244	29.002	1.1418	29.007	1.1420	23.444	0.9230	2.0	0.08	3.2	0.13	148	161	25.0	**486X**	**472A**	24.9	0.98	83.0	3.27	78.0	3.07	106.0	4.17	114.0	4.49	0.38	1.56	0.86	34.5	22.7	1.52
73.025	2.8750	112.712	4.4375	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	3.2	0.13	122	155	23.3	**29685**	**29620**	26.2	1.03	86.0	3.39	80.0	3.15	101.0	3.98	109.0	4.29	0.49	1.23	0.68	28.1	23.4	1.20
	2.8750	117.475	4.6250	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	3.2	0.13	127	166	25.1	**LM814845**	**LM814810**	27.6	1.09	87.0	3.43	81.0	3.19	105.0	4.13	113.0	4.45	0.51	1.18	0.65	29.2	25.4	1.15
	2.8750	117.475	4.6250	30.162	1.1875	30.162	1.1875	23.812	0.9375	3.6	0.14	3.2	0.13	148	179	27.4	**33287**	**33462**	27.8	1.09	87.0	3.43	80.0	3.15	104.0	4.09	112.0	4.41	0.44	1.38	0.76	34.4	25.6	1.34
	2.8750	125.412	4.9375	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	1.6	0.06	126	162	24.4	**27680**	**27620**	24.7	0.97	88.0	3.46	82.0	3.23	115.0	4.53	120.0	4.72	0.42	1.44	0.79	29.2	20.8	1.41
	2.8750	127.000	5.0000	30.162	1.1875	31.000	1.2205	22.225	0.8750	3.6	0.14	3.2	0.13	179	225	32.3	**42683**	**42620**	27.1	1.07	88.0	3.46	81.0	3.19	114.0	4.49	121.0	4.76	0.42	1.43	0.79	41.4	29.6	1.40
	2.8750	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	3.6	0.14	3.2	0.13	196	226	35.3	**567**	**563**	28.6	1.13	88.0	3.46	81.0	3.19	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
	2.8750	139.992	5.5115	36.512	1.4375	36.098	1.4212	28.575	1.1250	3.6	0.14	3.2	0.13	220	262	39.8	**576R**	**572**	31.0	1.22	90.0	3.54	83.0	3.27	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	2.8750	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**657**	**653**	33.4	1.31	90.0	3.54	85.0	3.35	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	2.8750	149.225	5.8750	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**657**	**652A**	33.4	1.31	90.0	3.54	85.0	3.35	132.0	5.20	141.0	5.55	0.41	1.47	0.81	60.9	42.6	1.43

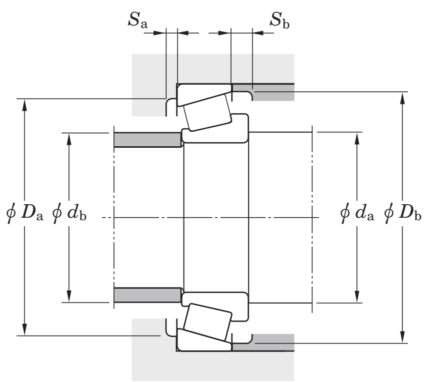
Note 1) SP indicates the specially chamfered from.

TS type

d (73.025) ~ (76.200) mm

(2.8750) ~ (3.0000) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

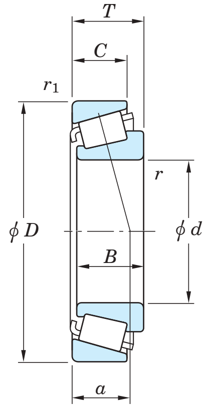
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

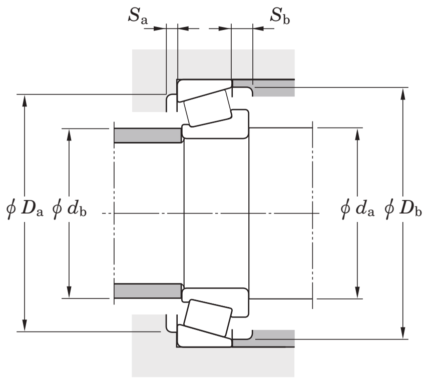
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
73.025	2.8750	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	3.6	0.14	3.2	0.13	357	404	54.4	**6460**	**6420**	39.3	1.55	93.0	3.66	87.0	3.43	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	2.8750	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.6	0.14	3.2	0.13	330	368	50.1	**744R**	**742**	32.4	1.28	91.0	3.58	85.0	3.35	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	2.8750	152.400	6.0000	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**657**	**652**	33.4	1.31	90.0	3.54	85.0	3.35	134.0	5.28	141.0	5.55	0.41	1.47	0.81	60.9	42.6	1.43
	2.8750	159.995	6.2990	47.625	1.8750	48.260	1.9000	38.100	1.5000	3.6	0.14	0.8	0.03	342	391	52.4	**762**	**752A**	35.5	1.40	92.0	3.62	97.0	3.82	146.0	5.75	149.0	5.87	0.34	1.76	0.97	80.0	46.6	1.72
	2.8750	161.925	6.3750	47.625	1.8750	48.260	1.9000	38.100	1.5000	3.6	0.14	3.2	0.13	342	391	52.4	**762**	**752**	35.5	1.40	92.0	3.62	97.0	3.82	144.0	5.67	150.0	5.91	0.34	1.76	0.97	80.0	46.6	1.72
73.817	2.9062	112.712	4.4375	25.400	1.0000	25.400	1.0000	19.050	0.7500	1.6	0.06	3.2	0.13	122	155	23.3	**29688**	**29620**	26.2	1.03	83.0	3.27	81.0	3.19	101.0	3.98	109.0	4.29	0.49	1.23	0.68	28.1	23.4	1.20
	2.9062	127.000	5.0000	36.512	1.4375	36.170	1.4240	28.575	1.1250	0.8	0.03	3.2	0.13	196	226	35.3	**568**	**563**	28.6	1.13	83.0	3.27	82.0	3.23	112.0	4.41	120.0	4.72	0.36	1.65	0.91	45.8	28.5	1.61
74.612	2.9375	139.992	5.5115	36.512	1.4375	36.098	1.4212	28.575	1.1250	3.6	0.14	3.2	0.13	220	262	39.8	**577R**	**572**	31.0	1.22	91.0	3.58	85.0	3.35	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	2.9375	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**658**	**653**	33.4	1.31	92.0	3.62	86.0	3.39	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	2.9375	150.000	5.9055	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.0	0.12	261	301	45.3	**658**	**653X**	33.4	1.31	92.0	3.62	86.0	3.39	133.0	5.24	141.0	5.55	0.41	1.47	0.81	60.9	42.6	1.43
74.976	2.9518	121.442	4.7812	24.608	0.9688	23.012	0.9060	17.462	0.6875	2.0	0.08	2.0	0.08	113	127	19.4	**34294**	**34478**	26.8	1.06	85.0	3.35	83.0	3.27	110.0	4.33	116.0	4.57	0.45	1.33	0.73	26.0	20.0	1.30
74.986	2.9522	127.000	5.0000	30.162	1.1875	31.000	1.2205	22.225	0.8750	2.4	0.09	3.2	0.13	179	225	32.3	**42686X**	**42620**	27.1	1.07	85.0	3.35	81.0	3.19	114.0	4.49	121.0	4.76	0.42	1.43	0.79	41.4	29.6	1.40
74.988	2.9523	127.000	5.0000	30.162	1.1875	31.000	1.2205	22.225	0.8750	6.4	0.25	3.2	0.13	179	225	32.3	**42686**	**42620**	27.1	1.07	95.0	3.74	84.0	3.31	114.0	4.49	121.0	4.76	0.42	1.43	0.79	41.4	29.6	1.40
75.000	2.9528	121.442	4.7812	24.608	0.9688	23.012	0.9060	17.462	0.6875	2.4	0.09	2.0	0.08	113	127	19.4	**34295**	**34478**	26.8	1.06	86.0	3.39	83.0	3.27	110.0	4.33	116.0	4.57	0.45	1.33	0.73	26.0	20.0	1.30
	2.9528	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	3.0	0.12	3.2	0.13	395	471	61.4	**6555R**	**6535**	41.0	1.61	95.0	3.74	85.0	3.35	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
76.200	3.0000	121.442	4.7812	24.608	0.9688	23.012	0.9060	17.462	0.6875	3.6	0.14	2.0	0.08	113	127	19.4	**34301**	**34478**	26.8	1.06	89.0	3.50	83.0	3.27	110.0	4.33	116.0	4.57	0.45	1.33	0.73	26.0	20.0	1.30
	3.0000	125.412	4.9375	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	1.6	0.06	126	162	24.4	**27684**	**27620**	24.7	0.97	91.0	3.58	84.0	3.31	115.0	4.53	120.0	4.72	0.42	1.44	0.79	29.2	20.8	1.41
	3.0000	127.000	5.0000	26.988	1.0625	23.012	0.9060	19.842	0.7812	2.0	0.08	3.2	0.13	113	127	19.4	**34300**	**34500**	29.2	1.15	86.0	3.39	83.0	3.27	112.0	4.41	118.0	4.65	0.45	1.33	0.73	26.0	20.0	1.30
	3.0000	127.000	5.0000	30.162	1.1875	31.000	1.2205	22.225	0.8750	3.6	0.14	3.2	0.13	179	225	32.3	**42687**	**42620**	27.1	1.07	90.0	3.54	84.0	3.31	114.0	4.49	121.0	4.76	0.42	1.43	0.79	41.4	29.6	1.40
	3.0000	127.000	5.0000	30.162	1.1875	31.000	1.2205	22.225	0.8750	6.4	0.25	3.2	0.13	179	225	32.3	**42688**	**42620**	27.1	1.07	96.0	3.78	84.0	3.31	114.0	4.49	121.0	4.76	0.42	1.43	0.79	41.4	29.6	1.40
	3.0000	129.975	5.1171	33.249	1.3090	31.000	1.2205	27.000	1.0630	3.6	0.14	2.4	0.09	179	225	32.3	**42687**	**42624**	30.1	1.19	90.0	3.54	84.0	3.31	114.0	4.49	121.0	4.76	0.42	1.43	0.79	41.4	29.6	1.40
	3.0000	133.350	5.2500	30.162	1.1875	29.769	1.1720	22.225	0.8750	6.4	0.25	3.2	0.13	167	198	30.0	**495AX**	**492A**	29.8	1.17	98.0	3.86	86.0	3.39	120.0	4.72	128.0	5.04	0.44	1.35	0.74	38.8	29.4	1.32
	3.0000	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	6.4	0.25	3.2	0.13	193	245	37.2	**47678R**	**47620**	29.2	1.15	97.0	3.82	90.0	3.54	119.0	4.69	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
	3.0000	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	3.6	0.14	0.8	0.03	193	245	37.2	**47679R**	**47620A**	29.2	1.15	91.0	3.58	85.0	3.35	121.0	4.76	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
	3.0000	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	0.8	0.03	3.2	0.13	193	245	37.2	**47680R**	**47620**	29.2	1.15	86.0	3.39	85.0	3.35	119.0	4.69	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
	3.0000	135.733	5.3438	44.450	1.7500	46.101	1.8150	34.925	1.3750	3.6	0.14	3.2	0.13	267	337	51.0	**5760**	**5735**	33.0	1.30	94.0	3.70	88.0	3.46	119.0	4.69	130.0	5.12	0.41	1.48	0.81	62.5	43.4	1.44
	3.0000	136.525	5.3750	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**495A**	**493**	29.8	1.17	92.0	3.62	86.0	3.39	122.0	4.80	130.0	5.12	0.44	1.35	0.74	38.8	29.4	1.32
	3.0000	139.992	5.5115	36.512	1.4375	36.098	1.4212	28.575	1.1250	3.6	0.14	3.2	0.13	220	262	39.8	**575R**	**572**	31.0	1.22	92.0	3.62	86.0	3.39	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	3.0000	139.992	5.5115	36.512	1.4375	36.098	1.4212	28.575	1.1250	6.7	0.26	3.2	0.13	220	262	39.8	**575SR**	**572**	31.0	1.22	99.0	3.90	86.0	3.39	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	3.0000	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	3.6	0.14	0.8	0.03	230	287	42.5	**590A**	**592XE**	33.4	1.31	95.0	3.74	89.0	3.50	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.0000	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	3.6	0.14	3.2	0.13	357	404	54.4	**6461**	**6420**	39.3	1.55	96.0	3.78	89.5	3.52	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	3.0000	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	9.5	0.37	3.2	0.13	357	404	54.4	**6461A**	**6420**	39.3	1.55	105.0	4.13	90.0	3.54	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	3.0000	149.225	5.8750	53.975	2.1250	54.229	2.1350	44.450	1.7500	6.4	0.25	3.2	0.13	357	404	54.4	**6466**	**6420**	39.3	1.55	100.0	3.94	90.0	3.54	129.0	5.08	141.0	5.55	0.36	1.66	0.91	83.9	51.9	1.62
	3.0000	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.6	0.14	3.2	0.13	330	368	50.1	**748SR**	**742**	32.4	1.28	93.0	3.66	87.0	3.43	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	3.0000	152.400	6.0000	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**659**	**652**	33.4	1.31	93.0	3.66	87.0	3.43	134.0	5.28	141.0	5.55	0.41	1.47	0.81	60.9	42.6	1.43
	3.0000	159.995	6.2990	47.625	1.8750	48.260	1.9000	38.100	1.5000	3.6	0.14	0.8	0.03	342	391	52.4	**755**	**752A**	35.5	1.40	95.0	3.74	88.0	3.46	146.0	5.75	149.0	5.87	0.34	1.76	0.97	80.0	46.6	1.72
	3.0000	160.338	6.3125	53.975	2.1250	55.100	2.1693	44.450	1.7500	6.4	0.25	3.2	0.13	395	471	61.4	**6575R**	**6521**	41.0	1.61	104.0	4.09	94.0	3.70	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
	3.0000	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	6.4	0.25	0.8	0.03	395	471	61.4	**6575R**	**6536**	41.0	1.61	104.0	4.09	92.0	3.62	144.0	5.67	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46

Note 1) SP indicates the specially chamfered from.

TS type

d (76.200) ~ (82.550) mm
(3.0000) ~ (3.2500) inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

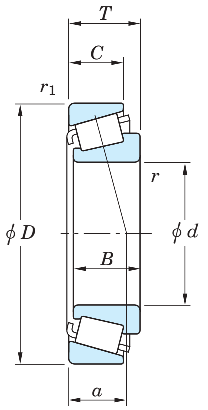
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

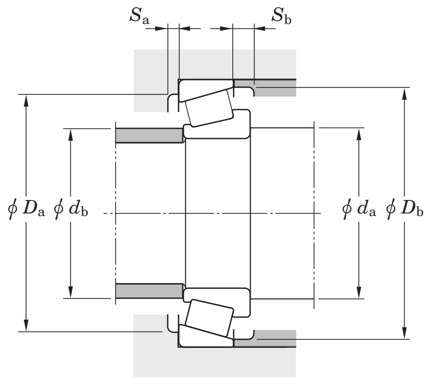
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
76.200	3.0000	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	3.6	0.14	3.2	0.13	395	471	61.4	**6576R**	**6535**	41.0	1.61	99.0	3.90	89.0	3.50	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
	3.0000	168.275	6.6250	47.625	1.8750	48.260	1.9000	38.100	1.5000	3.6	0.14	3.2	0.13	342	391	52.4	**755**	**753**	35.5	1.40	95.0	3.74	88.0	3.46	147.0	5.79	150.0	5.91	0.34	1.76	0.97	80.0	46.6	1.72
	3.0000	169.850	6.6870	62.705	2.4687	63.830	2.5130	44.450	1.7500	3.6	0.14	3.2	0.13	395	471	61.4	**6554R**	**6520**	41.0	1.61	99.0	3.90	89.0	3.50	147.0	5.79	162.0	6.38	0.40	1.50	0.82	92.9	63.5	1.46
	3.0000	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	3.6	0.14	3.2	0.13	549	602	76.9	**HH221430**	**HH221410**	42.5	1.67	101.0	3.98	95.0	3.74	171.0	6.73	179.0	7.05	0.33	1.79	0.99	129	73.6	1.75
77.356	3.0455	121.442	4.7812	24.608	0.9688	23.012	0.9060	17.462	0.6875	3.6	0.14	2.0	0.08	113	127	19.4	**34304**	**34478**	26.8	1.06	90.0	3.54	85.0	3.35	110.0	4.33	116.0	4.57	0.45	1.33	0.73	26.0	20.0	1.30
77.788	3.0625	117.475	4.6250	25.400	1.0000	25.400	1.0000	19.050	0.7500	3.6	0.14	3.2	0.13	127	166	25.1	**LM814849**	**LM814810**	27.6	1.09	91.0	3.58	85.0	3.35	105.0	4.13	113.0	4.45	0.51	1.18	0.65	29.2	25.4	1.15
	3.0625	121.442	4.7812	24.608	0.9688	23.012	0.9060	17.462	0.6875	3.6	0.14	2.0	0.08	113	127	19.4	**34306**	**34478**	26.8	1.06	90.0	3.54	84.0	3.31	110.0	4.33	116.0	4.57	0.45	1.33	0.73	26.0	20.0	1.30
	3.0625	121.442	4.7812	24.608	0.9688	23.012	0.9060	17.462	0.6875	6.4	0.25	2.0	0.08	113	127	19.4	**34307**	**34478**	26.8	1.06	96.0	3.78	84.0	3.31	110.0	4.33	116.0	4.57	0.45	1.33	0.73	26.0	20.0	1.30
	3.0625	127.000	5.0000	30.162	1.1875	31.000	1.2205	22.225	0.8750	3.6	0.14	3.2	0.13	179	225	32.3	**42690**	**42620**	27.1	1.07	91.0	3.58	85.0	3.35	114.0	4.49	121.0	4.76	0.42	1.43	0.79	41.4	29.6	1.40
	3.0625	133.350	5.2500	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**495AS**	**492A**	29.8	1.17	93.0	3.66	87.0	3.43	120.0	4.72	128.0	5.04	0.44	1.35	0.74	38.8	29.4	1.32
	3.0625	135.733	5.3438	44.450	1.7500	46.101	1.8150	34.925	1.3750	3.6	0.14	3.2	0.13	267	337	51.0	**5795**	**5735**	33.0	1.30	96.0	3.78	89.0	3.50	119.0	4.69	130.0	5.12	0.41	1.48	0.81	62.5	43.4	1.44
	3.0625	146.050	5.7500	33.338	1.3125	34.925	1.3750	26.195	1.0313	3.6	0.14	3.2	0.13	223	293	43.2	**47880R**	**47820**	32.6	1.28	93.0	3.66	87.0	3.43	131.0	5.16	140.0	5.51	0.45	1.34	0.74	51.6	39.5	1.31
79.375	3.1250	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**661**	**653**	33.4	1.31	96.0	3.78	90.0	3.54	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	3.1250	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	3.6	0.14	3.2	0.13	230	287	42.5	**595A**	**592XS**	33.4	1.31	98.0	3.86	91.0	3.58	133.0	5.24	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.1250	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.6	0.14	3.2	0.13	330	368	50.1	**750R**	**742**	32.4	1.28	96.0	3.78	90.0	3.54	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	3.1250	161.925	6.3750	47.625	1.8750	48.260	1.9000	38.100	1.5000	7.9	0.31	3.2	0.13	342	391	52.4	**756A**	**752**	35.5	1.40	106.0	4.17	91.0	3.58	144.0	5.67	150.0	5.91	0.34	1.76	0.97	80.0	46.6	1.72
	3.1250	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	3.6	0.14	3.2	0.13	549	602	76.9	**HH221431**	**HH221410**	42.5	1.67	103.0	4.06	97.0	3.82	171.0	6.73	179.0	7.05	0.33	1.79	0.99	129	73.6	1.75
79.985	3.1490	136.525	5.3750	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**496X**	**493**	29.8	1.17	94.0	3.70	88.0	3.46	122.0	4.80	130.0	5.12	0.44	1.35	0.74	38.8	29.4	1.32
	3.1490	139.992	5.5115	36.512	1.4375	36.098	1.4212	28.575	1.1250	3.6	0.14	3.2	0.13	220	262	39.8	**578R**	**572**	31.0	1.22	95.0	3.74	89.0	3.50	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	3.1490	152.400	6.0000	39.688	1.5625	36.322	1.4300	30.162	1.1875	3.6	0.14	3.2	0.13	230	287	42.5	**590**	**592A**	37.1	1.46	98.0	3.86	92.0	3.62	135.0	5.31	144.0	5.67	0.44	1.36	0.75	53.5	40.4	1.32
80.000	3.1496	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.0	0.12	3.2	0.13	330	368	50.1	**748R**	**742**	32.4	1.28	95.0	3.74	91.0	3.58	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	3.1496	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	3.0	0.12	3.2	0.13	395	471	61.4	**6556R**	**6535**	41.0	1.61	99.0	3.90	89.0	3.50	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
	3.1496	168.275	6.6250	53.975	2.1250	56.363	2.2190	41.275	1.6250	3.0	0.12	3.2	0.13	429	467	62.1	**838XR**	**832**	35.0	1.38	93.0	3.66	92.0	3.62	149.0	5.87	155.0	6.10	0.30	2.00	1.10	101	51.6	1.95
	3.1496	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	3.0	0.12	3.2	0.13	482	565	72.4	**864XR**	**854**	39.9	1.57	100.0	3.94	95.0	3.74	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.1496	200.000	7.8740	52.761	2.0772	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	433	471	58.8	**98316**	**98788**	54.5	2.15	111.0	4.37	105.0	4.13	174.0	6.85	188.0	7.40	0.63	0.95	0.52	101	109	0.93
80.962	3.1875	133.350	5.2500	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**496**	**492A**	29.8	1.17	95.0	3.74	89.0	3.50	120.0	4.72	128.0	5.04	0.44	1.35	0.74	38.8	29.4	1.32
	3.1875	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	3.6	0.14	3.2	0.13	193	245	37.2	**47681R**	**47620**	29.2	1.15	95.0	3.74	89.0	3.50	119.0	4.69	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
	3.1875	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	3.6	0.14	0.8	0.03	193	245	37.2	**47681R**	**47620A**	29.2	1.15	95.0	3.74	89.0	3.50	121.0	4.76	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
	3.1875	133.350	5.2500	39.688	1.5625	39.688	1.5625	32.545	1.2813	3.6	0.14	3.2	0.13	222	306	45.9	**HM516447**	**HM516410**	32.2	1.27	97.0	3.82	91.0	3.58	118.0	4.65	128.0	5.04	0.40	1.49	0.82	51.8	35.6	1.46
	3.1875	139.992	5.5115	36.512	1.4375	36.098	1.4212	28.575	1.1250	3.6	0.14	3.2	0.13	220	262	39.8	**581R**	**572**	31.0	1.22	96.0	3.78	90.0	3.54	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	3.1875	146.050	5.7500	38.100	1.5000	38.100	1.5000	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**662**	**653**	30.2	1.19	97.0	3.82	90.0	3.54	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	3.1875	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	5.2	0.20	3.2	0.13	330	368	50.1	**740R**	**742**	32.4	1.28	101.0	3.98	91.0	3.58	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
81.699	3.2165	136.525	5.3750	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**496AS**	**493**	29.8	1.17	96.0	3.78	90.0	3.54	122.0	4.80	130.0	5.12	0.44	1.35	0.74	38.8	29.4	1.32
82.550	3.2500	125.412	4.9375	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	1.6	0.06	126	162	24.4	**27687**	**27620**	24.7	0.97	96.0	3.78	89.0	3.50	115.0	4.53	120.0	4.72	0.42	1.44	0.79	29.2	20.8	1.41
	3.2500	133.350	5.2500	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**495**	**492A**	29.8	1.17	97.0	3.82	90.0	3.54	120.0	4.72	128.0	5.04	0.44	1.35	0.74	38.8	29.4	1.32
	3.2500	133.350	5.2500	33.338	1.3125	29.769	1.1720	25.400	1.0000	3.6	0.14	3.2	0.13	167	198	30.0	**495**	**492**	33.0	1.30	97.0	3.82	90.0	3.54	120.0	4.72	128.0	5.04	0.44	1.35	0.74	38.8	29.4	1.32
	3.2500	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	0.8	0.03	0.8	0.03	193	245	37.2	**47685R**	**47620A**	29.2	1.15	91.0	3.58	90.0	3.54	121.0	4.76	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45

Note 1) SP indicates the specially chamfered from.

TS type

d (82.550) ~ (85.725) mm
(3.2500) ~ (3.3750) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \le e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

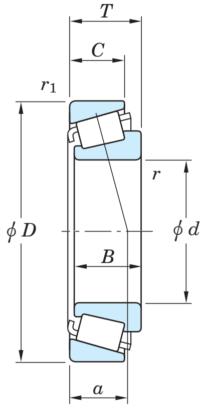
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
82.550	3.2500	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	3.6	0.14	0.8	0.03	193	245	37.2	**47686R**	**47620A**	29.2	1.15	97.0	3.82	90.0	3.54	121.0	4.76	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
	3.2500	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	6.7	0.26	0.8	0.03	193	245	37.2	**47687R**	**47620A**	29.2	1.15	103.0	4.06	90.0	3.54	121.0	4.76	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
	3.2500	133.350	5.2500	39.688	1.5625	39.688	1.5625	32.545	1.2813	6.7	0.26	3.2	0.13	222	306	45.9	**HM516448**	**HM516410**	32.2	1.27	105.0	4.13	92.0	3.62	118.0	4.65	128.0	5.04	0.40	1.49	0.82	51.8	35.6	1.46
	3.2500	133.350	5.2500	39.688	1.5625	39.688	1.5625	32.545	1.2813	3.6	0.14	3.2	0.13	222	306	45.9	**HM516449**	**HM516410**	32.2	1.27	99.0	3.90	92.0	3.62	118.0	4.65	128.0	5.04	0.40	1.49	0.82	51.8	35.6	1.46
	3.2500	139.700	5.5000	36.512	1.4375	36.098	1.4212	28.575	1.1250	3.6	0.14	3.2	0.13	220	262	39.8	**580R**	**572X**	31.0	1.22	98.0	3.86	91.0	3.58	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	3.2500	139.700	5.5000	36.512	1.4375	36.098	1.4212	28.575	1.1250	6.7	0.26	3.2	0.13	220	262	39.8	**582R**	**572X**	31.0	1.22	104.0	4.09	91.0	3.58	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	3.2500	139.992	5.5115	36.512	1.4375	36.098	1.4212	28.575	1.1250	3.6	0.14	3.2	0.13	220	262	39.8	**580R**	**572**	31.0	1.22	98.0	3.86	91.0	3.58	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	3.2500	139.992	5.5115	36.512	1.4375	36.098	1.4212	28.575	1.1250	6.7	0.26	3.2	0.13	220	262	39.8	**582R**	**572**	31.0	1.22	104.0	4.09	91.0	3.58	125.0	4.92	133.0	5.24	0.40	1.49	0.82	51.2	35.3	1.45
	3.2500	142.138	5.5960	42.862	1.6875	42.862	1.6875	34.133	1.3438	3.6	0.14	3.2	0.13	276	351	52.4	**HM617045**	**HM617010**	35.2	1.39	100.0	3.94	93.0	3.66	125.0	4.92	137.0	5.39	0.43	1.39	0.76	64.4	47.5	1.35
	3.2500	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**663**	**653**	33.4	1.31	99.0	3.90	92.0	3.62	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	3.2500	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	6.7	0.26	3.2	0.13	261	301	45.3	**663A**	**653**	33.4	1.31	105.0	4.13	92.0	3.62	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	3.2500	150.000	5.9055	35.992	1.4170	36.322	1.4300	27.000	1.0630	3.6	0.14	3.0	0.12	230	287	42.5	**595**	**593X**	33.4	1.31	100.0	3.94	93.0	3.66	134.0	5.28	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.2500	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.6	0.14	3.2	0.13	330	368	50.1	**749AR**	**742**	32.4	1.28	99.0	3.90	93.0	3.66	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	3.2500	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	6.7	0.26	3.2	0.13	330	368	50.1	**750AR**	**742**	32.4	1.28	106.0	4.17	93.0	3.66	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	3.2500	161.925	6.3750	47.625	1.8750	48.260	1.9000	38.100	1.5000	3.6	0.14	3.2	0.13	342	391	52.4	**757**	**752**	35.5	1.40	100.0	3.94	94.0	3.70	144.0	5.67	150.0	5.91	0.34	1.76	0.97	80.0	46.6	1.72
	3.2500	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	3.6	0.14	3.2	0.13	395	471	61.4	**6559R**	**6535**	41.0	1.61	104.0	4.09	98.0	3.86	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
	3.2500	168.275	6.6250	53.975	2.1250	56.363	2.2190	41.275	1.6250	0.8	0.03	3.2	0.13	429	467	62.1	**839R**	**832**	35.0	1.38	95.0	3.74	94.0	3.70	149.0	5.87	155.0	6.10	0.30	2.00	1.10	101	51.6	1.95
	3.2500	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	3.2	0.13	3.2	0.13	482	565	72.4	**867XR**	**854**	39.9	1.57	103.0	4.06	98.0	3.86	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
83.345	3.2813	125.412	4.9375	25.400	1.0000	25.400	1.0000	19.845	0.7813	0.8	0.03	1.6	0.06	126	162	24.4	**27689**	**27620**	24.7	0.97	90.0	3.54	90.0	3.54	115.0	4.53	120.0	4.72	0.42	1.44	0.79	29.2	20.8	1.41
	3.2813	125.412	4.9375	25.400	1.0000	25.400	1.0000	19.845	0.7813	3.6	0.14	1.6	0.06	126	162	24.4	**27690**	**27620**	24.7	0.97	96.0	3.78	90.0	3.54	115.0	4.53	120.0	4.72	0.42	1.44	0.79	29.2	20.8	1.41
	3.2813	125.412	4.9375	25.400	1.0000	25.400	1.0000	19.845	0.7813	6.4	0.25	1.6	0.06	126	162	24.4	**27691**	**27620**	24.7	0.97	102.0	4.02	90.0	3.54	115.0	4.53	120.0	4.72	0.42	1.44	0.79	29.2	20.8	1.41
	3.2813	133.350	5.2500	33.338	1.3125	33.338	1.3125	26.195	1.0313	3.6	0.14	3.2	0.13	193	245	37.2	**47688R**	**47620**	29.2	1.15	97.0	3.82	90.0	3.54	119.0	4.69	128.0	5.04	0.40	1.48	0.82	44.7	30.9	1.45
84.138	3.3125	133.350	5.2500	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**498**	**492A**	29.8	1.17	98.0	3.86	91.0	3.58	120.0	4.72	128.0	5.04	0.44	1.35	0.74	38.8	29.4	1.32
	3.3125	149.225	5.8750	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**664**	**652A**	33.4	1.31	100.0	3.94	95.0	3.74	132.0	5.20	141.0	5.55	0.41	1.47	0.81	60.9	42.6	1.43
	3.3125	152.400	6.0000	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**664**	**652**	33.4	1.31	100.0	3.94	95.0	3.74	134.0	5.28	141.0	5.55	0.41	1.47	0.81	60.9	42.6	1.43
84.963	3.3450	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	3.6	0.14	3.2	0.13	395	471	61.4	**6578R**	**6535**	41.0	1.61	109.0	4.29	98.0	3.86	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
84.976	3.3455	136.525	5.3750	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**499A**	**493**	29.8	1.17	98.0	3.86	92.0	3.62	122.0	4.80	130.0	5.12	0.44	1.35	0.74	38.8	29.4	1.32
85.000	3.3465	152.400	6.0000	39.688	1.5625	36.322	1.4300	30.162	1.1875	3.2	0.13	3.2	0.13	230	287	42.5	**596X**	**592A**	37.1	1.46	101.0	3.98	96.0	3.78	135.0	5.31	144.0	5.67	0.44	1.36	0.75	53.5	40.4	1.32
	3.3465	152.400	6.0000	39.688	1.5625	36.322	1.4300	30.162	1.1875	3.0	0.12	3.2	0.13	230	287	42.5	**599X**	**592A**	37.1	1.46	100.0	3.94	96.0	3.78	135.0	5.31	144.0	5.67	0.44	1.36	0.75	53.5	40.4	1.32
	3.3465	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	3.0	0.12	3.2	0.13	395	471	61.4	**6557R**	**6535**	41.0	1.61	95.0	3.74	85.0	3.35	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
	3.3465	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	3.0	0.12	3.2	0.13	482	565	72.4	**865XR**	**854**	39.9	1.57	105.0	4.13	100.0	3.94	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.3465	200.000	7.8740	52.761	2.0772	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	433	471	58.8	**98335**	**98788**	54.5	2.15	115.0	4.53	109.0	4.29	174.0	6.85	188.0	7.40	0.63	0.95	0.52	101	109	0.93
85.026	3.3475	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	3.6	0.14	3.2	0.13	330	368	50.1	**749R**	**742**	32.4	1.28	101.0	3.98	95.0	3.74	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
	3.3475	150.089	5.9090	44.450	1.7500	46.672	1.8375	36.512	1.4375	5.2	0.20	3.2	0.13	330	368	50.1	**749SR**	**742**	32.4	1.28	104.0	4.09	95.0	3.74	134.0	5.28	142.0	5.59	0.33	1.84	1.01	77.3	43.0	1.80
85.725	3.3750	133.350	5.2500	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**497**	**492A**	29.8	1.17	99.0	3.90	93.0	3.66	120.0	4.72	128.0	5.04	0.44	1.35	0.74	38.8	29.4	1.32
	3.3750	136.525	5.3750	30.162	1.1875	29.769	1.1720	22.225	0.8750	6.4	0.25	3.2	0.13	167	198	30.0	**497A**	**493**	29.8	1.17	105.0	4.13	93.0	3.66	122.0	4.80	130.0	5.12	0.44	1.35	0.74	38.8	29.4	1.32
	3.3750	142.138	5.5960	42.862	1.6875	42.862	1.6875	34.133	1.3438	1.6	0.06	3.2	0.13	276	351	52.4	**HM617048**	**HM617010**	35.2	1.39	98.0	3.86	92.0	3.62	125.0	4.92	137.0	5.39	0.43	1.39	0.76	64.4	47.5	1.35
	3.3750	142.138	5.5960	42.862	1.6875	42.862	1.6875	34.133	1.3438	4.8	0.19	3.2	0.13	276	351	52.4	**HM617049**	**HM617010**	35.2	1.39	106.0	4.17	95.7	3.77	125.0	4.92	137.0	5.39	0.43	1.39	0.76	64.4	47.5	1.35

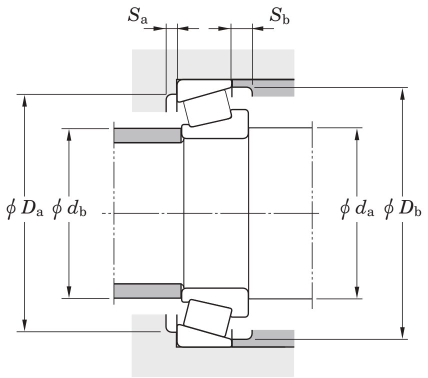
Note 1) SP indicates the specially chamfered from.

TS type

d (85.725) ~ 89.992 mm

(3.3750) ~ 3.5430 inch





$P = XF_r + YF_a$

$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

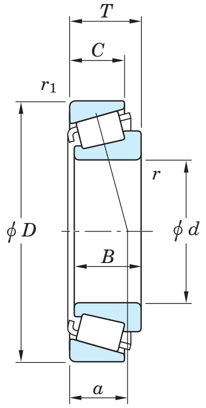
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

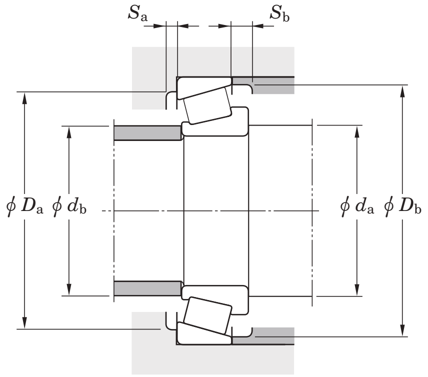
Boundary dimensions d mm	d inch	D mm	D inch	T mm	T inch	B mm	B inch	C mm	C inch	$r^{1)}$ (min.) mm	$r^{1)}$ (min.) inch	$r_1^{1)}$ (min.) mm	$r_1^{1)}$ (min.) inch	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Bearing No. Cone (Inner ring)	Bearing No. Cup (Outer ring)	Load center a mm	Load center a inch	Mounting dimensions d_a mm	d_a inch	d_b mm	d_b inch	D_a mm	D_a inch	D_b mm	D_b inch	Constant e	Axial load factors Y_1	Axial load factors Y_0	Reference rating (kN) (500 rpm for 3 000 Hrs.) Radial	Reference rating (kN) Axial	Factor K
85.725	3.3750	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.6	0.14	3.2	0.13	261	301	45.3	**665**	**653**	33.4	1.31	102.0	4.02	95.0	3.74	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	3.3750	146.050	5.7500	41.275	1.6250	41.275	1.6250	31.750	1.2500	6.4	0.25	3.2	0.13	261	301	45.3	**665A**	**653**	33.4	1.31	107.0	4.21	95.0	3.74	131.0	5.16	139.0	5.47	0.41	1.47	0.81	60.9	42.6	1.43
	3.3750	152.400	6.0000	39.688	1.5625	36.322	1.4300	30.162	1.1875	3.6	0.14	3.2	0.13	230	287	42.5	**596**	**592A**	37.1	1.46	102.0	4.02	96.0	3.78	135.0	5.31	144.0	5.67	0.44	1.36	0.75	53.5	40.4	1.32
	3.3750	161.925	6.3750	47.625	1.8750	48.260	1.9000	38.100	1.5000	3.6	0.14	3.2	0.13	342	391	52.4	**758**	**752**	35.5	1.40	103.0	4.06	97.0	3.82	144.0	5.67	150.0	5.91	0.34	1.76	0.97	80.0	46.6	1.72
	3.3750	161.925	6.3750	62.705	2.4687	63.830	2.5130	42.862	1.6875	6.7	0.26	3.2	0.13	395	471	61.4	**6553R**	**6535**	49.8	1.96	113.0	4.45	98.0	3.86	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
	3.3750	168.275	6.6250	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	3.2	0.13	282	349	50.4	**677**	**672**	38.6	1.52	105.0	4.13	99.0	3.90	149.0	5.87	160.0	6.30	0.47	1.28	0.70	65.8	52.9	1.24
	3.3750	168.275	6.6250	53.975	2.1250	56.363	2.2190	41.275	1.6250	3.6	0.14	3.2	0.13	429	467	62.1	**841R**	**832**	35.0	1.38	104.0	4.09	97.0	3.82	149.0	5.87	155.0	6.10	0.30	2.00	1.10	101	51.6	1.95
	3.3750	170.045	6.6947	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	2.4	0.09	282	349	50.4	**677**	**673SA**	38.6	1.52	105.0	4.13	99.0	3.90	151.0	5.94	160.0	6.30	0.47	1.28	0.70	65.8	52.9	1.24
87.312	3.4375	123.825	4.8750	20.638	0.8125	20.638	0.8125	16.670	0.6563	1.6	0.06	1.6	0.06	102	145	21.5	**L217847**	**L217810**	20.7	0.81	96.0	3.78	93.0	3.66	116.0	4.57	119.0	4.69	0.33	1.82	1.00	23.5	13.2	1.77
	3.4375	136.525	5.3750	30.162	1.1875	29.769	1.1720	22.225	0.8750	3.6	0.14	3.2	0.13	167	198	30.0	**495X**	**493**	29.8	1.17	100.0	3.94	94.0	3.70	122.0	4.80	130.0	5.12	0.44	1.35	0.74	38.8	29.4	1.32
	3.4375	152.400	6.0000	39.688	1.5625	36.322	1.4300	30.162	1.1875	3.6	0.14	3.2	0.13	230	287	42.5	**596S**	**592A**	37.1	1.46	103.0	4.06	97.0	3.82	135.0	5.31	144.0	5.67	0.44	1.36	0.75	53.5	40.4	1.32
	3.4375	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	7.9	0.31	3.2	0.13	482	565	72.4	**869R**	**854**	39.9	1.57	117.0	4.61	102.0	4.02	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.4375	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	7.9	0.31	3.2	0.13	549	602	76.9	**HH221432**	**HH221410**	42.5	1.67	118.0	4.65	103.0	4.06	171.0	6.73	179.0	7.05	0.33	1.79	0.99	129	73.6	1.75
88.824	3.4970	161.925	6.3750	62.705	2.4687	63.830	2.5130	42.862	1.6875	3.6	0.14	3.2	0.13	395	471	61.4	**6552XR**	**6535**	49.8	1.96	109.0	4.29	98.0	3.86	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
88.900	3.5000	123.825	4.8750	20.638	0.8125	20.638	0.8125	16.670	0.6563	1.6	0.06	1.6	0.06	102	145	21.5	**L217849**	**L217810**	20.7	0.81	97.0	3.82	94.0	3.70	116.0	4.57	119.0	4.69	0.33	1.82	1.00	23.5	13.2	1.77
	3.5000	146.050	5.7500	33.338	1.3125	34.925	1.3750	26.195	1.0313	3.6	0.14	3.2	0.13	223	293	43.2	**47885R**	**47820**	32.6	1.28	104.0	4.09	98.0	3.86	131.0	5.16	140.0	5.51	0.45	1.34	0.74	51.6	39.5	1.31
	3.5000	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	3.6	0.14	0.8	0.03	230	287	42.5	**593**	**592XE**	33.4	1.31	104.0	4.09	98.0	3.86	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.5000	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	6.4	0.25	0.8	0.03	230	287	42.5	**593A**	**592XE**	33.4	1.31	110.0	4.33	98.0	3.86	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.5000	152.400	6.0000	39.688	1.5625	36.322	1.4300	33.338	1.3125	3.6	0.14	3.2	0.13	230	287	42.5	**593**	**592**	37.1	1.46	104.0	4.09	98.0	3.86	135.0	5.31	144.0	5.67	0.44	1.36	0.75	53.5	40.4	1.32
	3.5000	152.400	6.0000	39.688	1.5625	39.688	1.5625	30.162	1.1875	6.4	0.25	3.2	0.13	311	359	53.5	**HM518445**	**HM518410**	33.1	1.30	110.0	4.33	98.0	3.86	135.0	5.31	146.0	5.75	0.40	1.49	0.82	72.3	49.6	1.46
	3.5000	159.995	6.2990	47.625	1.8750	48.260	1.9000	38.100	1.5000	7.1	0.28	0.8	0.03	342	391	52.4	**766**	**752A**	35.5	1.40	113.0	4.45	99.0	3.90	146.0	5.75	149.0	5.87	0.34	1.76	0.97	80.0	46.6	1.72
	3.5000	160.096	6.3030	30.124	1.1860	30.162	1.1875	22.301	0.8780	2.4	0.09	3.2	0.13	207	221	32.8	**69350X**	**69630**	30.6	1.20	103.0	4.06	97.0	3.82	143.0	5.63	149.0	5.87	0.42	1.42	0.78	47.7	34.5	1.38
	3.5000	161.925	6.3750	47.625	1.8750	48.260	1.9000	38.100	1.5000	3.6	0.14	3.2	0.13	342	391	52.4	**759**	**752**	35.5	1.40	106.0	4.17	99.0	3.90	144.0	5.67	150.0	5.91	0.34	1.76	0.97	80.0	46.6	1.72
	3.5000	161.925	6.3750	47.625	1.8750	48.260	1.9000	38.100	1.5000	7.1	0.28	3.2	0.13	342	391	52.4	**766**	**752**	35.5	1.40	113.0	4.45	99.0	3.90	144.0	5.67	150.0	5.91	0.34	1.76	0.97	80.0	46.6	1.72
	3.5000	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	3.6	0.14	3.2	0.13	395	471	61.4	**6580R**	**6535**	49.8	1.96	109.0	4.29	98.0	3.86	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
	3.5000	161.925	6.3750	62.705	2.4687	63.830	2.5130	42.862	1.6875	3.6	0.14	3.2	0.13	395	471	61.4	**6552R**	**6535**	49.8	1.96	109.0	4.29	98.0	3.86	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
	3.5000	168.275	6.6250	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	3.2	0.13	282	349	50.4	**679**	**672**	38.6	1.52	107.0	4.21	101.0	3.98	149.0	5.87	160.0	6.30	0.47	1.28	0.70	65.8	52.9	1.24
	3.5000	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	4.8	0.19	3.2	0.13	362	438	56.6	**775**	**772**	39.5	1.56	111.0	4.37	103.0	4.06	161.0	6.34	168.0	6.61	0.39	1.56	0.86	84.5	55.7	1.52
	3.5000	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	7.9	0.31	3.2	0.13	482	565	72.4	**855R**	**854**	40.0	1.57	118.0	4.65	103.0	4.06	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.5000	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	7.9	0.31	3.2	0.13	549	602	76.9	**HH221434**	**HH221410**	42.5	1.67	120.0	4.72	105.0	4.13	171.0	6.73	179.0	7.05	0.33	1.79	0.99	129	73.6	1.75
	3.5000	200.000	7.8740	52.761	2.0772	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	433	471	58.8	**98350**	**98788**	54.5	2.15	118.0	4.65	112.0	4.41	174.0	6.85	188.0	7.40	0.63	0.95	0.52	101	109	0.93
	3.5000	200.025	7.8750	61.912	2.4375	57.531	2.2650	49.212	1.9375	7.9	0.31	3.2	0.13	482	565	72.4	**855R**	**854X**	44.7	1.76	118.0	4.65	103.0	4.06	173.0	6.81	173.0	6.81	0.33	1.79	0.99	113	64.6	1.75
89.090	3.5075	152.400	6.0000	39.688	1.5625	36.322	1.4300	30.162	1.1875	3.6	0.14	3.2	0.13	230	287	42.5	**593S**	**592A**	37.1	1.46	104.0	4.09	98.0	3.86	135.0	5.31	144.0	5.67	0.44	1.36	0.75	53.5	40.4	1.32
89.814	3.5360	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	7.9	0.31	3.2	0.13	482	565	72.4	**857XR**	**854**	39.9	1.57	119.0	4.69	104.0	4.09	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
89.891	3.5390	168.275	6.6250	53.975	2.1250	56.363	2.2190	41.275	1.6250	3.6	0.14	3.2	0.13	429	467	62.1	**850AR**	**832**	35.0	1.38	107.0	4.21	101.0	3.98	149.0	5.87	155.0	6.10	0.30	2.00	1.10	101	51.6	1.95
89.974	3.5423	146.975	5.7864	40.000	1.5748	40.000	1.5748	32.500	1.2795	7.1	0.28	3.6	0.14	259	310	46.6	**HM218248**	**HM218210**	30.8	1.21	112.0	4.41	99.0	3.90	133.0	5.24	141.0	5.55	0.33	1.80	0.99	60.4	34.4	1.76
89.992	3.5430	160.096	6.3030	30.124	1.1860	30.162	1.1875	22.301	0.8780	2.4	0.09	3.2	0.13	207	221	32.8	**69354**	**69630**	30.6	1.20	103.0	4.06	97.0	3.82	143.0	5.63	149.0	5.87	0.42	1.42	0.78	47.7	34.5	1.38

Note 1) SP indicates the specially chamfered from.

TS type

d 90.000 ~ 98.425 mm
3.5433 ~ 3.8750 inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

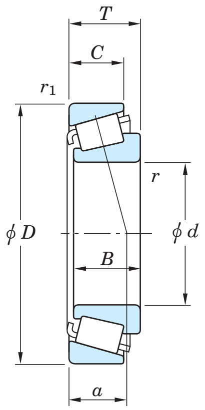
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

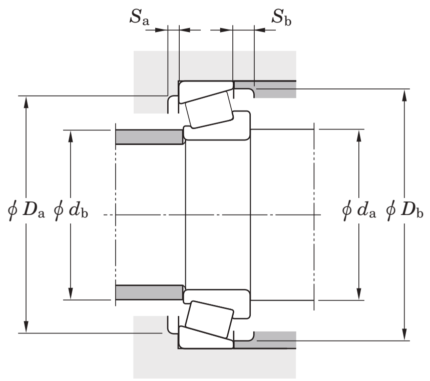
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
90.000	3.5433	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	3.0	0.12	0.8	0.03	230	287	42.5	**597X**	**592XE**	33.4	1.31	104.0	4.09	99.0	3.90	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.5433	160.000	6.2992	53.975	2.1250	55.100	2.1693	44.450	1.7500	3.0	0.12	3.0	0.12	395	471	61.4	**6581XR**	**6525X**	41.0	1.61	102.0	4.02	98.0	3.86	141.0	5.55	153.5	6.04	0.40	1.50	0.82	92.9	63.5	1.46
	3.5433	161.925	6.3750	53.975	2.1250	55.100	2.1693	42.862	1.6875	3.0	0.12	3.2	0.13	395	471	61.4	**6581XR**	**6535**	41.0	1.61	102.0	4.02	98.0	3.86	141.0	5.55	154.0	6.06	0.40	1.50	0.82	92.9	63.5	1.46
90.488	3.5625	161.925	6.3750	47.625	1.8750	48.260	1.9000	38.100	1.5000	3.6	0.14	3.2	0.13	342	391	52.4	**760**	**752**	35.5	1.40	107.0	4.21	101.0	3.98	144.0	5.67	150.0	5.91	0.34	1.76	0.97	80.0	46.6	1.72
92.075	3.6250	130.175	5.1250	20.638	0.8125	21.432	0.8438	16.670	0.6563	3.6	0.14	1.6	0.06	121	167	24.7	**L319245**	**L319210**	22.2	0.87	107.0	4.21	101.0	3.98	122.0	4.80	125.0	4.92	0.35	1.72	0.95	27.7	16.5	1.68
	3.6250	146.050	5.7500	33.338	1.3125	34.925	1.3750	26.195	1.0313	3.6	0.14	3.2	0.13	223	293	43.2	**47890R**	**47820**	32.6	1.28	107.0	4.21	101.0	3.98	131.0	5.16	140.0	5.51	0.45	1.34	0.74	51.6	39.5	1.31
	3.6250	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	3.6	0.14	0.8	0.03	230	287	42.5	**598**	**592XE**	33.4	1.31	107.0	4.21	101.0	3.98	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.6250	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	6.4	0.25	0.8	0.03	230	287	42.5	**598A**	**592XE**	33.4	1.31	113.0	4.45	101.0	3.98	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.6250	168.275	6.6250	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	3.2	0.13	282	349	50.4	**681**	**672**	38.6	1.52	110.0	4.33	104.0	4.09	149.0	5.87	160.0	6.30	0.47	1.28	0.70	65.8	52.9	1.24
	3.6250	168.275	6.6250	41.275	1.6250	41.275	1.6250	30.162	1.1875	6.4	0.25	3.2	0.13	282	349	50.4	**681A**	**672**	38.6	1.52	116.0	4.57	104.0	4.09	149.0	5.87	160.0	6.30	0.47	1.28	0.70	65.8	52.9	1.24
	3.6250	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	3.6	0.14	3.2	0.13	362	438	56.6	**778**	**772**	39.5	1.56	111.0	4.37	105.0	4.13	161.0	6.34	168.0	6.61	0.39	1.56	0.86	84.5	55.7	1.52
	3.6250	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	7.9	0.31	3.2	0.13	482	565	72.4	**857R**	**854**	39.9	1.57	121.0	4.76	106.0	4.17	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.6250	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	7.9	0.31	3.2	0.13	549	602	76.9	**HH221438**	**HH221410**	42.5	1.67	121.0	4.76	106.0	4.17	171.0	6.73	179.0	7.05	0.33	1.79	0.99	129	73.6	1.75
93.662	3.6875	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	3.6	0.14	0.8	0.03	230	287	42.5	**597**	**592XE**	33.4	1.31	109.0	4.29	102.0	4.02	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
94.976	3.7392	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	3.6	0.14	3.2	0.13	482	565	72.4	**867AR**	**854**	39.9	1.57	114.0	4.49	108.0	4.25	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
95.000	3.7402	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	6.4	0.25	3.2	0.13	482	565	72.4	**862R**	**854**	39.9	1.57	120.0	4.72	108.0	4.25	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
95.250	3.7500	128.588	5.0625	15.875	0.6250	15.083	0.5938	11.908	0.4688	1.6	0.06	1.6	0.06	72.6	93.0	13.1	**LL319349**	**LL319310**	20.3	0.80	103.0	4.06	100.0	3.94	122.0	4.80	125.0	4.92	0.35	1.71	0.94	16.4	9.85	1.67
	3.7500	130.175	5.1250	20.638	0.8125	21.432	0.8438	16.670	0.6563	1.6	0.06	1.6	0.06	121	167	24.7	**L319249**	**L319210**	22.2	0.87	107.0	4.21	101.0	3.98	122.0	4.80	125.0	4.92	0.35	1.72	0.95	27.7	16.5	1.68
	3.7500	146.050	5.7500	33.338	1.3125	34.925	1.3750	26.195	1.0313	3.6	0.14	3.2	0.13	223	293	43.2	**47896R**	**47820**	32.6	1.28	110.0	4.33	103.0	4.06	131.0	5.16	140.0	5.51	0.45	1.34	0.74	51.6	39.5	1.31
	3.7500	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	3.6	0.14	0.8	0.03	230	287	42.5	**594**	**592XE**	33.4	1.31	110.0	4.33	104.0	4.09	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.7500	147.638	5.8125	35.717	1.4062	36.322	1.4300	26.192	1.0312	5.2	0.20	0.8	0.03	230	287	42.5	**594A**	**592XE**	33.4	1.31	113.0	4.45	104.0	4.09	135.0	5.31	142.0	5.59	0.44	1.36	0.75	53.5	40.4	1.32
	3.7500	157.162	6.1875	36.512	1.4375	36.116	1.4219	26.195	1.0313	3.6	0.14	3.2	0.13	227	288	41.7	**52375**	**52618**	36.0	1.42	112.0	4.41	105.0	4.13	142.0	5.59	153.0	6.02	0.47	1.26	0.69	52.7	42.8	1.23
	3.7500	168.275	6.6250	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	3.2	0.13	282	349	50.4	**683**	**672**	38.6	1.52	113.0	4.45	106.0	4.17	149.0	5.87	160.0	6.30	0.47	1.28	0.70	65.8	52.9	1.24
	3.7500	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	3.6	0.14	3.2	0.13	362	438	56.6	**776**	**772**	39.5	1.56	114.0	4.49	107.0	4.21	161.0	6.34	168.0	6.61	0.39	1.56	0.86	84.5	55.7	1.52
	3.7500	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	7.9	0.31	3.2	0.13	482	565	72.4	**864R**	**854**	39.9	1.57	123.0	4.84	108.0	4.25	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.7500	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	7.9	0.31	3.2	0.13	549	602	76.9	**HH221440**	**HH221410**	42.5	1.67	125.0	4.92	110.0	4.33	171.0	6.73	179.0	7.05	0.33	1.79	0.99	129	73.6	1.75
96.838	3.8125	148.430	5.8437	28.575	1.1250	28.971	1.1406	21.433	0.8438	3.6	0.14	3.0	0.12	179	225	33.0	**42381**	**42584**	31.9	1.26	110.0	4.33	104.0	4.09	134.0	5.28	142.0	5.59	0.49	1.22	0.67	41.4	34.8	1.19
98.425	3.8750	160.000	6.2992	36.512	1.4375	36.116	1.4219	26.195	1.0313	3.6	0.14	3.0	0.12	227	288	41.7	**52387**	**52630X**	36.0	1.42	114.0	4.49	108.0	4.25	144.0	5.67	154.0	6.06	0.47	1.26	0.69	52.7	42.8	1.23
	3.8750	161.925	6.3750	36.512	1.4375	36.116	1.4219	26.195	1.0313	3.6	0.14	3.2	0.13	227	288	41.7	**52387**	**52637**	36.0	1.42	114.0	4.49	108.0	4.25	144.0	5.67	154.0	6.06	0.47	1.26	0.69	52.7	42.8	1.23
	3.8750	161.925	6.3750	39.688	1.5625	36.116	1.4219	29.370	1.1563	3.6	0.14	3.2	0.13	227	288	41.7	**52387**	**52638**	39.2	1.54	114.0	4.49	108.0	4.25	144.0	5.67	154.0	6.06	0.47	1.26	0.69	52.7	42.8	1.23
	3.8750	168.275	6.6250	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	3.2	0.13	282	349	50.4	**685**	**672**	38.6	1.52	116.0	4.57	109.0	4.29	149.0	5.87	160.0	6.30	0.47	1.28	0.70	65.8	52.9	1.24
	3.8750	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	3.6	0.14	3.2	0.13	362	438	56.6	**779**	**772**	39.5	1.56	116.0	4.57	110.0	4.33	161.0	6.34	168.0	6.61	0.39	1.56	0.86	84.5	55.7	1.52
	3.8750	184.150	7.2500	63.500	2.5000	63.500	2.5000	52.388	2.0625	6.4	0.25	3.2	0.13	557	687	86.9	**HH421246**	**HH421210**	46.2	1.82	127.0	5.00	115.0	4.53	163.0	6.42	176.0	6.93	0.37	1.60	0.88	131	83.5	1.56
	3.8750	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	3.6	0.14	3.2	0.13	482	565	72.4	**866R**	**854**	39.9	1.57	118.0	4.65	111.0	4.37	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.8750	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	3.6	0.14	3.2	0.13	549	602	76.9	**HH221442**	**HH221410**	42.5	1.67	119.0	4.69	113.0	4.45	171.0	6.73	179.0	7.05	0.33	1.79	0.99	129	73.6	1.75
	3.8750	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	3.6	0.14	3.2	0.13	641	699	87.1	**HH224332**	**HH224310**	47.6	1.87	122.0	4.80	117.0	4.61	192.0	7.56	202.0	7.95	0.33	1.84	1.01	151	84.2	1.80

Note 1) SP indicates the specially chamfered from.

TS type

d 99.975 ~ 107.950 mm
3.9360 ~ 4.2500 inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

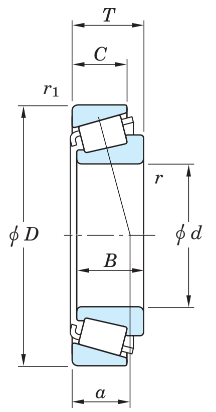
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
99.975	3.9360	156.975	6.1801	42.000	1.6535	42.000	1.6535	34.000	1.3386	7.9	0.31	3.6	0.14	308	396	58.3	**HM220149**	**HM220110**	32.4	1.28	123.0	4.84	108.0	4.25	142.0	5.59	151.0	5.94	0.33	1.80	0.99	71.8	40.8	1.76
	3.9360	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	3.6	0.14	3.2	0.13	641	699	87.1	**HH224334**	**HH224310**	47.6	1.87	122.0	4.80	117.0	4.61	192.0	7.56	202.0	7.95	0.33	1.84	1.01	151	84.2	1.80
99.982	3.9363	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	6.4	0.25	3.2	0.13	482	565	72.4	**863R**	**854**	39.9	1.57	125.0	4.92	103.0	4.06	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.9363	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	6.4	0.25	3.2	0.13	549	602	76.9	**HH221447**	**HH221410**	42.5	1.67	126.0	4.96	114.0	4.49	171.0	6.73	179.0	7.05	0.33	1.79	0.99	129	73.6	1.75
100.000	3.9370	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	3.6	0.14	3.2	0.13	362	438	56.6	**783**	**772**	39.5	1.56	118.0	4.65	111.0	4.37	161.0	6.34	168.0	6.61	0.39	1.56	0.86	84.5	55.7	1.52
	3.9370	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	6.0	0.24	3.2	0.13	482	565	72.4	**863XR**	**854**	39.9	1.57	122.0	4.80	117.0	4.61	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	3.9370	200.000	7.8740	52.761	2.0772	49.213	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	433	471	58.8	**98394X**	**98788**	54.7	2.15	126.0	4.96	120.5	4.75	174.0	6.85	188.0	7.40	0.63	0.95	0.52	101	109	0.93
100.012	3.9375	157.162	6.1875	36.512	1.4375	36.116	1.4219	26.195	1.0313	3.6	0.14	3.2	0.13	227	288	41.7	**52393**	**52618**	36.0	1.42	113.0	4.45	115.0	4.53	142.0	5.59	153.0	6.02	0.47	1.26	0.69	52.7	42.8	1.23
101.600	4.0000	157.162	6.1875	36.512	1.4375	36.116	1.4219	26.195	1.0313	3.6	0.14	3.2	0.13	227	288	41.7	**52400**	**52618**	36.0	1.42	114.0	4.49	115.0	4.53	142.0	5.59	153.0	6.02	0.47	1.26	0.69	52.7	42.8	1.23
	4.0000	157.162	6.1875	36.512	1.4375	36.116	1.4219	26.195	1.0313	7.9	0.31	3.2	0.13	227	288	41.7	**52401**	**52618**	36.0	1.42	126.0	4.96	111.0	4.37	142.0	5.59	153.0	6.02	0.47	1.26	0.69	52.7	42.8	1.23
	4.0000	161.925	6.3750	36.513	1.4375	36.116	1.4219	26.195	1.0313	3.6	0.14	3.2	0.13	227	288	41.7	**52400**	**52637**	36.0	1.42	117.0	4.61	111.0	4.37	144.0	5.67	154.0	6.06	0.47	1.26	0.69	52.7	42.8	1.23
	4.0000	168.275	6.6250	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	3.2	0.13	282	349	50.4	**687**	**672**	38.6	1.52	114.0	4.49	115.0	4.53	146.0	5.75	157.0	6.18	0.47	1.28	0.70	65.8	52.9	1.24
	4.0000	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	3.6	0.14	3.2	0.13	362	438	56.6	**780**	**772**	39.5	1.56	114.0	4.49	120.0	4.72	156.0	6.14	165.0	6.50	0.39	1.56	0.86	84.5	55.7	1.52
	4.0000	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	9.5	0.37	3.2	0.13	482	565	72.4	**860R**	**854**	39.9	1.57	126.0	4.96	114.0	4.49	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	4.0000	190.500	7.5000	57.150	2.2500	57.531	2.2650	44.450	1.7500	7.9	0.31	3.2	0.13	482	565	72.4	**861R**	**854**	39.9	1.57	129.0	5.08	114.0	4.49	170.0	6.69	174.0	6.85	0.33	1.79	0.99	113	64.6	1.75
	4.0000	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	7.9	0.31	3.2	0.13	549	602	76.9	**HH221449**	**HH221410**	42.5	1.67	123.0	4.84	119.0	4.69	168.0	6.61	178.0	7.01	0.33	1.79	0.99	129	73.6	1.75
	4.0000	200.000	7.8740	52.761	2.0772	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	433	471	58.8	**98400**	**98788**	54.5	2.15	114.0	4.49	123.0	4.84	170.0	6.69	185.0	7.28	0.63	0.95	0.52	101	109	0.93
	4.0000	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	0.28	3.2	0.13	563	674	84.1	**941**	**932**	47.6	1.87	121.0	4.76	135.0	5.31	181.0	7.13	192.0	7.56	0.33	1.84	1.01	133	73.9	1.80
	4.0000	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	0.28	3.2	0.13	641	699	87.1	**HH224335**	**HH224310**	47.6	1.87	121.0	4.76	134.0	5.28	189.0	7.44	201.0	7.91	0.33	1.84	1.01	151	84.2	1.80
104.775	4.1250	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	3.6	0.14	3.2	0.13	362	438	56.6	**782**	**772**	39.5	1.56	117.0	4.61	120.0	4.72	156.0	6.14	165.0	6.50	0.39	1.56	0.86	84.5	55.7	1.52
	4.1250	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	6.4	0.25	3.2	0.13	362	438	56.6	**786**	**772**	39.5	1.56	123.0	4.84	120.0	4.72	156.0	6.14	165.0	6.50	0.39	1.56	0.86	84.5	55.7	1.52
	4.1250	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	7.1	0.28	3.2	0.13	362	438	56.6	**787**	**772**	39.5	1.56	129.0	5.08	116.0	4.57	161.0	6.34	168.0	6.61	0.39	1.56	0.86	84.5	55.7	1.52
	4.1250	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	381	483	60.9	**71412**	**71750**	40.9	1.61	117.0	4.61	131.0	5.16	167.0	6.57	177.0	6.97	0.42	1.44	0.79	89.0	63.3	1.41
106.362	4.1875	165.100	6.5000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	3.2	0.13	245	325	46.3	**56418R**	**56650**	38.6	1.52	122.0	4.80	116.0	4.57	149.0	5.87	159.0	6.26	0.50	1.21	0.66	56.7	48.2	1.18
	4.1875	165.100	6.5000	36.513	1.4375	36.513	1.4375	26.988	1.0625	3.6	0.14	3.2	0.13	231	300	42.9	**56418**	**56650**	38.5	1.52	122.0	4.80	116.0	4.57	149.0	5.87	159.0	6.26	0.50	1.21	0.66	53.7	45.7	1.18
107.950	4.2500	146.050	5.7500	21.432	0.8438	21.432	0.8438	16.670	0.6563	1.6	0.06	1.6	0.06	108	167	23.5	**L521949R**	**L521910**	26.2	1.03	116.0	4.57	114.0	4.49	136.0	5.35	141.0	5.55	0.39	1.53	0.84	24.8	16.7	1.49
	4.2500	158.750	6.2500	23.020	0.9063	21.438	0.8440	15.875	0.6250	3.6	0.14	3.2	0.13	130	169	23.9	**37425**	**37625**	36.5	1.44	121.0	4.76	121.0	4.76	141.0	5.55	148.0	5.83	0.61	0.99	0.54	29.7	30.8	1.97
	4.2500	159.987	6.2987	34.925	1.3750	34.925	1.3750	26.988	1.0625	3.6	0.14	3.2	0.13	231	319	45.8	**LM522546**	**LM522510**	32.9	1.30	122.0	4.80	116.0	4.57	146.0	5.75	154.0	6.06	0.40	1.50	0.82	53.4	36.5	1.46
	4.2500	161.925	6.3750	23.020	0.9063	21.438	0.8440	15.875	0.6250	3.6	0.14	3.2	0.13	130	169	23.9	**37425**	**37637**	36.5	1.44	122.0	4.80	115.0	4.53	145.0	5.71	152.0	5.98	0.61	0.99	0.54	29.7	30.8	0.97
	4.2500	161.925	6.3750	34.925	1.3750	34.925	1.3750	26.988	1.0625	3.6	0.14	3.2	0.13	216	293	41.8	**48190**	**48120**	39.1	1.54	121.0	4.76	120.0	4.72	145.0	5.71	154.0	6.06	0.51	1.19	0.65	50.3	43.4	1.16
	4.2500	165.100	6.5000	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	3.2	0.13	245	325	46.3	**56425R**	**56650**	38.6	1.52	123.0	4.84	117.0	4.61	149.0	5.87	159.0	6.26	0.50	1.21	0.66	56.7	48.2	1.18
	4.2500	165.100	6.5000	36.513	1.4375	36.513	1.4375	26.988	1.0625	3.6	0.14	3.2	0.13	231	300	42.9	**56425**	**56650**	38.5	1.52	123.0	4.84	117.0	4.61	149.0	5.87	159.0	6.26	0.50	1.21	0.66	53.7	45.7	1.18
	4.2500	168.275	6.6250	36.512	1.4375	36.512	1.4375	26.988	1.0625	3.6	0.14	3.2	0.13	245	325	46.3	**56425R**	**56662**	38.6	1.52	123.0	4.84	117.0	4.61	150.0	5.91	160.0	6.30	0.50	1.21	0.66	56.7	48.2	1.18
	4.2500	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	381	483	60.9	**71425**	**71750**	40.9	1.61	121.0	4.76	131.0	5.16	167.0	6.57	177.0	6.97	0.42	1.44	0.79	89.0	63.3	1.41
	4.2500	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	13.5	0.53	3.2	0.13	563	674	84.1	**935**	**932**	47.6	1.87	148.0	5.83	122.0	4.80	187.0	7.36	193.0	7.60	0.33	1.84	1.01	133	73.9	1.80
	4.2500	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.9	0.31	3.2	0.13	563	674	84.1	**936**	**932**	47.6	1.87	137.0	5.39	122.0	4.80	187.0	7.36	193.0	7.60	0.33	1.84	1.01	133	73.9	1.80
	4.2500	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.9	0.31	3.2	0.13	641	699	87.1	**HH224340**	**HH224310**	47.6	1.87	129.0	5.08	134.0	5.28	189.0	7.44	201.0	7.91	0.33	1.84	1.01	151	84.2	1.80

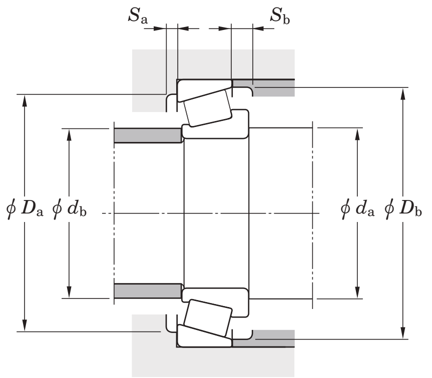
Note 1) SP indicates the specially chamfered from.

TS type

d 109.538 ~ 123.825 mm

4.3125 ~ 4.8750 inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

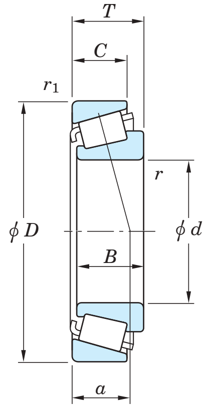
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

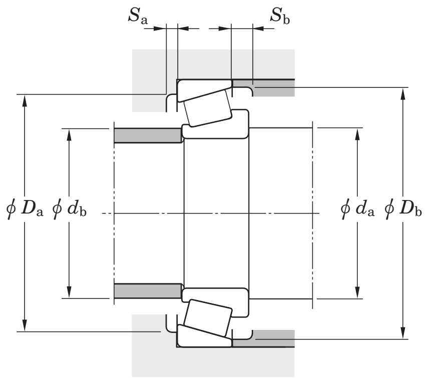
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u	Cone	Cup	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
109.538	4.3125	158.750	6.2500	23.020	0.9063	21.438	0.8440	15.875	0.6250	3.6	0.14	3.2	0.13	130	169	23.9	**37431**	**37625**	36.5	1.44	123.0	4.84	116.0	4.57	143.0	5.63	152.0	5.98	0.61	0.99	0.54	29.7	30.8	0.97
109.952	4.3288	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	381	483	60.9	**71432**	**71750**	40.9	1.61	129.0	5.08	123.0	4.84	171.0	6.73	181.0	7.13	0.42	1.44	0.79	89.0	63.3	1.41
109.987	4.3302	159.987	6.2987	34.925	1.3750	34.925	1.3750	26.988	1.0625	7.9	0.31	3.2	0.13	231	319	45.8	**LM522548**	**LM522510**	32.9	1.30	131.0	5.16	121.0	4.76	146.0	5.75	154.0	6.06	0.40	1.50	0.82	53.4	36.5	1.46
	4.3302	159.987	6.2987	34.925	1.3750	34.925	1.3750	26.988	1.0625	3.6	0.14	3.2	0.13	231	319	45.8	**LM522549**	**LM522510**	32.9	1.30	123.0	4.84	121.0	4.76	146.0	5.75	154.0	6.06	0.40	1.50	0.82	53.4	36.5	1.46
109.992	4.3304	177.800	7.0000	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	3.2	0.13	294	380	53.4	**64433R**	**64700**	42.8	1.69	128.0	5.04	121.0	4.76	160.0	6.30	172.6	6.80	0.52	1.16	0.64	68.4	60.3	1.13
110.000	4.3307	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	6.4	0.25	3.2	0.13	563	674	84.1	**942**	**932**	47.6	1.87	136.0	5.35	124.0	4.88	187.0	7.36	193.0	7.60	0.33	1.84	1.01	133	73.9	1.80
111.125	4.3750	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	381	483	60.9	**71437**	**71750**	40.9	1.61	129.0	5.08	123.0	4.84	171.0	6.73	181.0	7.13	0.42	1.44	0.79	89.0	63.3	1.41
111.917	4.4062	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	13.5	0.53	3.2	0.13	563	674	84.1	**947**	**932**	47.6	1.87	151.0	5.94	125.0	4.92	187.0	7.36	193.0	7.60	0.33	1.84	1.01	133	73.9	1.80
114.046	4.4900	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	0.28	3.2	0.13	563	674	84.1	**938S**	**932**	47.6	1.87	141.0	5.55	128.0	5.04	187.0	7.36	193.0	7.60	0.33	1.84	1.01	133	73.9	1.80
114.300	4.5000	152.400	6.0000	21.433	0.8438	21.433	0.8438	16.670	0.6563	1.6	0.06	1.6	0.06	121	197	27.3	**L623149**	**L623110**	27.7	1.09	130.0	5.12	120.0	4.72	143.0	5.63	148.0	5.83	0.41	1.45	0.80	27.5	19.4	1.42
	4.5000	155.575	6.1250	21.433	0.8438	21.433	0.8438	21.433	0.8438	1.6	0.06	1.6	0.06	121	197	27.3	**L623149**	**L623114**	27.7	1.09	130.0	5.12	120.0	4.72	143.0	5.63	149.0	5.87	0.41	1.45	0.80	27.5	19.4	1.42
	4.5000	177.800	7.0000	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	0.14	3.2	0.13	294	380	53.4	**64450R**	**64700**	42.8	1.69	131.0	5.16	125.0	4.92	160.0	6.30	172.0	6.77	0.52	1.16	0.64	68.4	60.3	1.13
	4.5000	180.975	7.1250	34.925	1.3750	31.750	1.2500	25.400	1.0000	3.6	0.14	3.2	0.13	216	247	35.1	**68450**	**68712**	40.6	1.60	127.0	5.00	131.0	5.16	161.0	6.34	170.0	6.69	0.50	1.21	0.66	49.7	42.2	1.18
	4.5000	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	381	483	60.9	**71450**	**71750**	40.9	1.61	127.0	5.00	131.0	5.16	167.0	6.57	177.0	6.97	0.42	1.44	0.79	89.0	63.3	1.41
	4.5000	206.375	8.1250	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	0.28	3.2	0.13	563	674	84.1	**938**	**930**	47.6	1.87	141.0	5.55	128.0	5.04	184.0	7.24	193.0	7.60	0.33	1.84	1.01	133	73.9	1.79
	4.5000	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	0.28	3.2	0.13	563	674	84.1	**938**	**932**	47.6	1.87	141.0	5.55	128.0	5.04	187.0	7.36	193.0	7.60	0.33	1.84	1.01	133	73.9	1.80
	4.5000	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	13.5	0.53	3.2	0.13	563	674	84.1	**939**	**932**	47.6	1.87	153.0	6.02	127.0	5.00	187.0	7.36	193.0	7.60	0.33	1.84	1.01	133	73.9	1.80
	4.5000	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	0.28	3.2	0.13	641	699	87.1	**HH224346**	**HH224310**	47.6	1.87	134.0	5.28	134.0	5.28	189.0	7.44	201.0	7.91	0.33	1.84	1.01	151	84.2	1.80
	4.5000	273.050	10.7500	82.550	3.2500	82.550	3.2500	53.975	2.1250	6.4	0.25	6.4	0.25	885	898	104	**HH926744**	**HH926710**	76.1	3.00	133.0	5.24	151.0	5.94	230.0	9.06	252.0	9.92	0.63	0.95	0.52	208	225	0.93
114.976	4.5266	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	0.28	3.2	0.13	641	699	87.1	**HH224349**	**HH224310**	47.6	1.87	135.0	5.31	134.0	5.28	189.0	7.44	201.0	7.91	0.33	1.84	1.01	151	84.2	1.80
115.087	4.5310	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	381	483	60.9	**71453**	**71750**	40.9	1.61	133.0	5.24	126.0	4.96	171.0	6.73	181.0	7.13	0.42	1.44	0.79	89.0	63.3	1.41
	4.5310	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	7.9	0.31	3.2	0.13	381	483	60.9	**71455**	**71750**	40.9	1.61	136.0	5.35	131.0	5.16	167.0	6.57	177.0	6.97	0.42	1.44	0.79	89.0	63.3	1.41
117.475	4.6250	179.975	7.0856	34.925	1.3750	31.750	1.2500	25.400	1.0000	3.6	0.14	0.8	0.03	216	247	35.1	**68462**	**68709**	40.7	1.60	132.0	5.20	125.0	4.90	165.0	6.50	172.0	6.77	0.50	1.21	0.66	49.7	42.2	1.18
	4.6250	180.975	7.1250	34.925	1.3750	31.750	1.2500	25.400	1.0000	3.6	0.14	3.2	0.13	216	247	35.1	**68462**	**68712**	40.6	1.60	130.0	5.12	131.0	5.16	161.0	6.34	170.0	6.69	0.50	1.21	0.66	49.7	42.2	1.18
	4.6250	180.975	7.1250	34.925	1.3750	31.750	1.2500	25.400	1.0000	7.9	0.31	3.2	0.13	216	247	35.1	**68463**	**68712**	40.6	1.60	141.0	5.55	125.0	4.92	163.0	6.42	172.0	6.77	0.50	1.21	0.66	49.7	42.2	1.18
120.650	4.7500	174.625	6.8750	35.720	1.4063	36.513	1.4375	27.783	1.0938	3.6	0.14	1.6	0.06	260	362	51.2	**M224749**	**M224710**	32.1	1.26	135.0	5.31	129.0	5.08	162.0	6.38	168.0	6.61	0.33	1.80	0.99	60.1	34.2	1.76
	4.7500	190.500	7.5000	46.038	1.8125	46.038	1.8125	34.925	1.3750	3.6	0.14	1.6	0.06	393	512	63.9	**HM624749**	**HM624710**	41.6	1.64	146.0	5.75	132.0	5.20	174.0	6.85	184.0	7.24	0.43	1.41	0.77	91.4	66.7	1.37
	4.7500	199.974	7.8730	46.038	1.8125	46.038	1.8125	34.925	1.3750	3.6	0.14	1.6	0.06	393	512	63.9	**HM624749**	**HM624716**	41.6	1.64	146.0	5.75	132.0	5.20	174.0	6.85	184.0	7.24	0.43	1.41	0.77	91.4	66.7	1.37
	4.7500	206.375	8.1250	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.2	0.13	3.2	0.13	409	548	67.2	**795**	**792**	45.7	1.80	139.0	5.47	134.0	5.28	186.0	7.32	198.0	7.80	0.46	1.31	0.72	95.2	74.6	1.27
	4.7500	234.950	9.2500	63.500	2.5000	63.500	2.5000	49.213	1.9375	6.4	0.25	3.2	0.13	656	826	100	**95475**	**95925**	49.9	1.96	149.0	5.87	137.0	5.39	209.0	8.23	217.0	8.54	0.37	1.62	0.89	154	97.1	1.58
	4.7500	254.000	10.0000	77.788	3.0625	82.550	3.2500	61.912	2.4375	9.5	0.37	6.4	0.25	895	1 050	125	**HH228340**	**HH228310**	54.3	2.14	158.0	6.22	142.0	5.59	223.0	8.78	234.0	9.21	0.32	1.87	1.03	211	116	1.82
	4.7500	273.050	10.7500	82.550	3.2500	82.550	3.2500	53.975	2.1250	6.4	0.25	6.4	0.25	885	898	104	**HH926749**	**HH926710**	76.2	3.00	168.0	6.61	147.5	5.80	230.0	9.06	253.0	9.97	0.63	0.95	0.52	208	225	0.92
	4.7500	279.400	11.0000	82.550	3.2500	82.550	3.2500	53.975	2.1250	6.4	0.25	6.4	0.25	885	898	104	**HH926749**	**HH926716**	76.1	3.00	168.0	6.61	147.0	5.79	233.0	9.17	253.0	9.96	0.63	0.95	0.52	208	225	0.93
123.825	4.8750	182.563	7.1875	39.688	1.5625	38.100	1.5000	33.338	1.3125	3.6	0.14	3.2	0.13	284	429	59.8	**48286**	**48220**	34.1	1.34	139.0	5.47	133.0	5.24	168.0	6.61	176.0	6.93	0.31	1.97	1.08	65.8	34.3	1.92

Note 1) SP indicates the specially chamfered from.

TS type

d 127.000 ~ 255.600 mm
5.0000 ~ 10.0630 inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

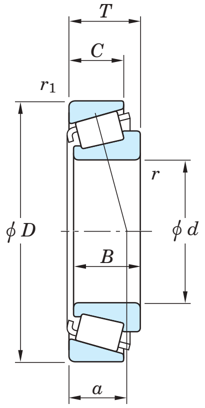
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		*D*		*T*		*B*		*C*		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone	Cup	*a*		d_a		d_b		D_a		D_b		*e*	Y_1	Y_0	Radial	Axial	*K*
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				(Inner ring)	(Outer ring)	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
127.000	5.0000	165.895	6.5313	18.258	0.7188	17.463	0.6875	13.495	0.5313	1.6	0.06	1.6	0.06	114	166	22.5	**LL225749**	**LL225710**	24.3	0.96	135.0	5.31	133.0	5.24	156.0	6.14	160.0	6.30	0.33	1.80	0.99	25.9	14.7	1.76
	5.0000	169.863	6.6875	25.400	1.0000	26.195	1.0313	20.638	0.8125	1.6	0.06	1.6	0.06	165	250	34.8	**L225849**	**L225810**	27.6	1.09	136.0	5.35	134.0	5.28	160.0	6.30	164.0	6.46	0.33	1.80	0.99	37.9	21.6	1.76
	5.0000	180.975	7.1250	25.400	1.0000	26.195	1.0313	20.638	0.8125	1.6	0.06	1.6	0.06	165	250	34.8	**L225849**	**L225818**	27.6	1.09	136.0	5.35	134.0	5.28	164.0	6.46	166.0	6.54	0.33	1.80	0.99	37.9	21.6	1.76
	5.0000	182.563	7.1875	39.688	1.5625	38.100	1.5000	33.338	1.3125	3.6	0.14	3.2	0.13	284	429	59.8	**48290**	**48220**	34.1	1.34	141.0	5.55	135.0	5.31	168.0	6.61	176.0	6.93	0.31	1.97	1.08	65.8	34.3	1.92
	5.0000	196.850	7.7500	46.038	1.8125	46.038	1.8125	38.100	1.5000	3.6	0.14	3.2	0.13	390	561	68.7	**67388**	**67322**	39.7	1.56	144.0	5.67	138.0	5.43	180.0	7.09	189.0	7.44	0.34	1.74	0.96	90.6	53.3	1.70
	5.0000	203.200	8.0000	46.038	1.8125	46.038	1.8125	38.100	1.5000	3.6	0.14	3.2	0.13	390	561	68.7	**67388**	**67320**	39.7	1.56	144.0	5.67	138.0	5.43	183.0	7.20	191.0	7.52	0.34	1.74	0.96	90.6	53.3	1.70
	5.0000	215.900	8.5000	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	0.14	3.2	0.13	403	549	66.1	**74500**	**74850**	49.7	1.96	148.0	5.83	141.0	5.55	196.0	7.72	208.0	8.19	0.49	1.23	0.68	94.0	78.3	1.20
	5.0000	234.950	9.2500	63.500	2.5000	63.500	2.5000	49.213	1.9375	6.4	0.25	3.2	0.13	656	826	100	**95500**	**95925**	49.9	1.96	154.0	6.06	142.0	5.59	209.0	8.23	217.0	8.54	0.37	1.62	0.89	154	97.1	1.58
	5.0000	254.000	10.0000	77.788	3.0625	82.550	3.2500	61.912	2.4375	9.5	0.37	6.4	0.25	895	1 050	125	**HH228349**	**HH228310**	54.3	2.14	164.0	6.46	148.0	5.83	223.0	8.78	234.0	9.21	0.32	1.87	1.03	211	116	1.82
128.588	5.0625	206.375	8.1250	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.2	0.13	3.2	0.13	409	548	67.2	**799**	**792**	45.7	1.80	146.0	5.75	140.0	5.51	186.0	7.32	198.0	7.80	0.46	1.31	0.72	95.2	74.6	1.27
130.000	5.1181	206.375	8.1250	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	0.14	3.2	0.13	409	548	67.2	**797**	**792**	45.7	1.80	148.0	5.83	141.0	5.55	186.0	7.32	198.0	7.80	0.46	1.31	0.72	95.2	74.6	1.27
133.350	5.2500	177.008	6.9688	25.400	1.0000	26.195	1.0313	20.638	0.8125	1.6	0.06	1.6	0.06	176	278	38.2	**L327249**	**L327210**	29.1	1.15	142.0	5.59	145.0	5.71	164.0	6.46	171.0	6.73	0.35	1.72	0.95	40.4	24.1	1.68
142.875	5.6250	200.025	7.8750	41.275	1.6250	39.688	1.5625	34.130	1.3437	7.9	0.31	3.3	0.13	307	491	66.5	**48684**	**48620**	38.4	1.51	166.0	6.54	151.0	5.94	185.0	7.28	193.0	7.60	0.34	1.78	0.98	71.3	41.0	1.74
	5.6250	200.025	7.8750	41.275	1.6250	39.688	1.5625	34.130	1.3437	3.6	0.14	3.3	0.13	307	491	66.5	**48685**	**48620**	38.4	1.51	156.0	6.14	157.0	6.18	182.0	7.17	192.0	7.56	0.34	1.78	0.98	71.3	41.0	1.74
158.750	6.4800	225.425	8.8750	41.275	1.6250	39.688	1.5625	33.338	1.3125	3.6	0.14	3.2	0.13	323	568	73.8	**46780R**	**46720**	44.0	1.73	176.0	6.93	169.0	6.65	209.0	8.23	218.0	8.58	0.38	1.57	0.86	74.6	48.9	1.53
165.100	6.5000	225.425	8.8750	41.275	1.6250	39.688	1.5625	33.338	1.3125	7.9	0.31	3.2	0.13	323	568	73.8	**46790AR**	**46720**	44.0	1.73	181.0	7.13	174.0	6.85	209.0	8.23	218.0	8.58	0.38	1.57	0.86	74.6	48.9	1.53
	6.5000	225.425	8.8750	41.275	1.6250	39.688	1.5625	33.338	1.3125	3.6	0.14	3.2	0.13	323	568	73.8	**46790R**	**46720**	44.0	1.73	181.0	7.13	174.0	6.85	209.0	8.23	218.0	8.58	0.38	1.57	0.86	74.6	48.9	1.53
166.688	6.5625	225.425	8.8750	41.275	1.6250	39.688	1.5625	33.338	1.3125	3.6	0.14	3.2	0.13	323	568	73.8	**46792R**	**46720**	44.0	1.73	182.0	7.17	175.0	6.89	209.0	8.23	218.0	8.58	0.38	1.57	0.86	74.6	48.9	1.53
171.450	6.7500	222.250	8.7500	25.400	1.0000	24.608	0.9688	19.050	0.7500	1.6	0.06	1.6	0.06	197	299	38.7	**L435049**	**L435010**	36.0	1.42	181.0	7.13	179.0	7.05	211.0	8.31	215.0	8.46	0.38	1.60	0.88	44.9	28.8	1.56
196.850	7.7500	254.000	10.0000	28.575	1.1250	27.783	1.0938	21.433	0.8438	1.6	0.06	1.6	0.06	236	387	48.2	**L540049**	**L540010**	43.1	1.70	206.0	8.11	214.0	8.43	238.0	9.37	245.0	9.65	0.40	1.51	0.83	53.5	36.3	1.47
212.725	8.3750	336.550	13.2500	65.088	2.5625	65.088	2.5625	50.800	2.0000	6.4	0.25	3.2	0.13	887	1 380	150	**M246932**	**M246910**	59.9	2.36	238.0	9.37	229.0	9.02	313.0	12.32	322.0	12.68	0.33	1.80	0.99	206	117	1.76
220.878	8.6960	317.500	12.5000	47.625	1.8750	52.388	2.0625	36.513	1.4375	3.2	0.13	3.2	0.13	611	928	103	**LM245833**	**LM245810**	50.5	1.99	234.0	9.21	253.0	9.96	296.0	11.65	304.0	11.97	0.33	1.80	0.99	141	80.0	1.76
228.600	9.0000	358.775	14.1250	71.438	2.8125	71.438	2.8125	53.975	2.1250	3.6	0.14	3.2	0.13	968	1 590	166	**M249732**	**M249710**	64.4	2.54	242.0	9.53	279.0	10.98	330.0	12.99	343.0	13.50	0.33	1.80	0.99	225	128	1.76
230.188	9.0625	317.500	12.5000	47.625	1.8750	52.388	2.0625	36.513	1.4375	3.2	0.13	3.2	0.13	611	928	103	**LM245846**	**LM245810**	50.5	1.99	242.0	9.53	238.0	9.37	309.0	12.17	312.0	12.28	0.33	1.80	0.99	141	80.0	1.76
231.775	9.1250	317.500	12.5000	47.625	1.8750	52.388	2.0625	36.513	1.4375	3.2	0.13	3.2	0.13	611	928	103	**LM245848**	**LM245810**	50.5	1.99	244.0	9.61	240.0	9.45	309.0	12.17	312.0	12.28	0.33	1.80	0.99	141	80.0	1.76
	9.1250	336.550	13.2500	65.088	2.5625	65.088	2.5625	50.800	2.0000	6.4	0.25	3.2	0.13	887	1 380	150	**M246942**	**M246910**	59.9	2.36	258.0	10.16	249.0	9.80	313.0	12.32	322.0	12.68	0.33	1.80	0.99	206	117	1.76
	9.1250	336.550	13.2500	65.088	2.5625	69.850	2.7500	50.800	2.0000	6.4	0.25	3.2	0.13	887	1 380	150	**M246943**	**M246910**	59.9	2.36	258.0	10.16	249.0	9.80	313.0	12.32	322.0	12.68	0.33	1.80	0.99	206	117	1.76
	9.1250	358.775	14.1250	71.438	2.8125	71.438	2.8125	53.975	2.1250	6.4	0.25	3.2	0.13	968	1 590	166	**M249734**	**M249710**	64.4	2.54	258.0	10.16	253.0	9.96	335.0	13.19	343.0	13.50	0.33	1.80	0.99	225	128	1.76
237.330	9.3437	336.550	13.2500	65.088	2.5625	65.088	2.5625	50.800	2.0000	6.4	0.25	3.2	0.13	887	1 380	150	**M246949**	**M246910**	59.9	2.36	262.0	10.31	253.0	9.96	313.0	12.32	322.0	12.68	0.33	1.80	0.99	206	117	1.76
	9.3437	358.775	14.1250	71.438	2.8125	71.438	2.8125	53.975	2.1250	6.4	0.25	3.2	0.13	968	1 590	166	**M249736**	**M249710**	64.4	2.54	262.0	10.31	258.0	10.16	335.0	13.19	343.0	13.50	0.33	1.80	0.99	225	128	1.76
254.000	10.0000	358.775	14.1250	71.438	2.8125	71.438	2.8125	53.975	2.1250	3.6	0.14	3.2	0.13	968	1 590	166	**M249749**	**M249710**	64.4	2.54	268.0	10.55	279.0	10.98	330.0	12.99	343.0	13.50	0.33	1.80	0.99	225	128	1.76
255.600	10.0630	342.900	13.5000	57.150	2.2500	63.500	2.5000	44.450	1.7500	1.6	0.06	3.2	0.13	764	1 280	135	**M349547**	**M349510**	60.1	2.37	279.0	10.98	267.0	10.51	322.0	12.68	333.0	13.11	0.35	1.73	0.95	177	105	1.68

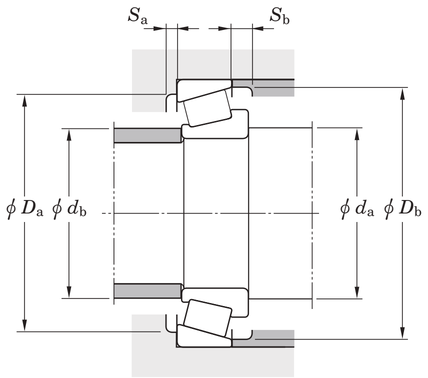
Note 1) SP indicates the specially chamfered from.

TS type

d 257.175∼ 1 092.200 mm

10.1250 ∼ 43.0000 inch





$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

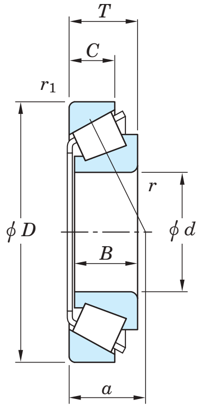
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

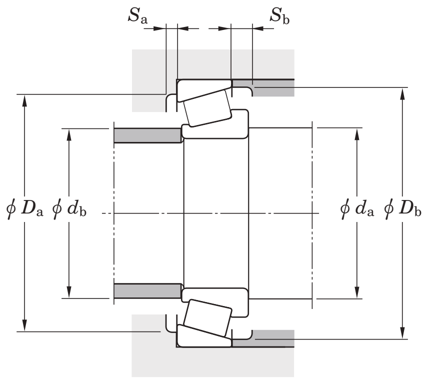
Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
257.175	10.1250	342.900	13.5000	57.150	2.2500	57.150	2.2500	44.450	1.7500	6.4	0.25	3.2	0.13	764	1 280	135	**M349549**	**M349510**	60.1	2.37	276.0	10.87	276.0	10.87	320.0	12.60	330.0	12.99	0.35	1.73	0.95	177	105	1.68
	10.1250	358.775	14.1250	71.438	2.8125	76.200	3.0000	53.975	2.1250	1.6	0.06	3.2	0.13	968	1 590	166	**M249747**	**M249710**	64.4	2.54	276.0	10.87	272.0	10.71	335.0	13.19	343.0	13.50	0.33	1.80	0.99	225	128	1.76
292.100	11.5000	374.650	14.7500	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	0.14	3.2	0.13	587	971	111	**L555249**	**L555210**	64.7	2.55	306.0	12.05	309.0	12.17	351.0	13.82	360.0	14.17	0.40	1.49	0.82	136	93.2	1.46
431.800	17.0000	533.400	21.0000	46.038	1.8125	46.038	1.8125	34.925	1.3750	3.2	0.13	3.2	0.13	698	1 380	143	**80385**	**80325**	69.1	2.72	450.0	17.72	446.0	17.56	510.0	20.08	510.0	20.08	0.31	1.96	1.08	160	83.3	1.91
450.850	17.7500	603.250	23.7500	85.725	3.3750	84.138	3.3125	60.325	2.3750	6.4	0.25	3.2	0.13	1 730	3 170	290	**LM770945**	**LM770910**	116.0	4.57	484.0	19.06	474.0	18.66	570.0	22.44	584.0	22.99	0.45	1.32	0.73	401	311	1.29
457.200	18.0000	573.088	22.5625	74.613	2.9375	74.613	2.9375	57.150	2.2500	6.4	0.25	6.4	0.25	1 380	2 930	263	**L570649**	**L570610**	100.4	3.95	485.0	19.09	475.0	18.70	543.0	21.38	558.0	21.97	0.40	1.49	0.82	319	219	1.45
	18.0000	596.900	23.5000	76.200	3.0000	73.025	2.8750	53.975	2.1250	9.5	0.37	3.2	0.13	1 410	2 620	243	**EE244180**	**244235**	103.1	4.06	494.0	19.45	478.0	18.82	567.0	22.32	570.5	22.47	0.40	1.48	0.82	325	225	1.44
479.425	18.8750	679.450	26.7500	128.588	5.0625	128.588	5.0625	101.600	4.0000	6.4	0.25	6.4	0.25	3 100	5 550	476	**M272749**	**M272710**	122.2	4.81	516.0	20.31	507.0	19.96	633.0	24.92	649.5	25.57	0.33	1.80	0.99	726	413	1.76
482.600	19.0000	634.873	24.9950	80.963	3.1875	80.963	3.1875	63.500	2.5000	6.4	0.25	3.2	0.13	1 660	3 290	292	**EE243190**	**243250**	100.0	3.94	516.0	20.31	510.0	20.08	603.0	23.74	609.5	24.00	0.34	1.75	0.96	382	224	1.70
488.950	19.2500	634.873	24.9950	84.138	3.3125	84.138	3.3125	61.913	2.4375	6.4	0.25	3.2	0.13	1 800	3 420	307	**LM772748**	**LM772710**	124.5	4.90	522.0	20.55	510.0	20.08	600.0	23.62	613.5	24.15	0.47	1.27	0.70	418	338	1.24
	19.2500	660.400	26.0000	93.663	3.6875	94.458	3.7188	69.850	2.7500	6.4	0.25	6.4	0.25	2 260	3 960	357	**EE640192**	**640260**	98.4	3.87	522.0	20.55	513.0	20.20	624.0	24.57	630.5	24.82	0.31	1.95	1.07	524	275	1.91
498.475	19.6250	634.873	24.9950	80.963	3.1875	80.963	3.1875	63.500	2.5000	6.4	0.25	3.2	0.13	1 660	3 290	292	**EE243196**	**243250**	100.0	3.94	528.0	20.79	522.0	20.55	603.0	23.74	609.5	24.00	0.34	1.75	0.96	382	224	1.70
536.575	21.1250	761.873	29.9950	146.050	5.7500	146.050	5.7500	114.300	4.5000	6.4	0.25	6.4	0.25	4 120	7 190	595	**M276449**	**M276410**	135.7	5.34	576.0	22.68	570.0	22.44	711.0	27.99	725.5	28.57	0.33	1.80	0.99	966	549	1.76
539.750	21.2500	635.000	25.0000	50.800	2.0000	50.800	2.0000	38.100	1.5000	6.4	0.25	6.4	0.25	943	1 970	175	**LL575349**	**LL575310**	101.4	3.99	564.0	22.20	555.0	21.85	612.0	24.09	621.0	24.45	0.41	1.48	0.81	215	149	1.44
549.097	21.6180	692.150	27.2500	80.963	3.1875	80.962	3.1875	61.913	2.4375	6.4	0.25	6.4	0.25	1 760	3 700	325	**L476548**	**L476510**	113.6	4.47	579.0	22.80	570.0	22.44	657.0	25.87	666.0	26.22	0.38	1.59	0.88	407	262	1.55
549.275	21.6250	692.150	27.2500	80.963	3.1875	80.963	3.1875	61.913	2.4375	6.4	0.25	6.4	0.25	1 760	3 700	325	**L476549**	**L476510**	113.6	4.47	579.0	22.80	570.0	22.44	657.0	25.87	666.0	26.22	0.38	1.59	0.88	407	262	1.55
584.200	23.0000	685.800	27.0000	49.213	1.9375	49.213	1.9375	34.925	1.3750	3.6	0.14	3.2	0.13	908	1 930	172	**LL778149**	**LL778110**	113.8	4.48	603.0	23.74	600.0	23.62	663.0	26.10	669.0	26.34	0.44	1.36	0.75	206	155	1.33
609.600	24.0000	762.000	30.0000	95.250	3.7500	92.075	3.6250	71.438	2.8125	6.4	0.25	6.4	0.25	2 140	4 510	379	**L879947**	**L879910**	153.0	6.02	642.0	25.28	633.0	24.92	720.0	28.35	743.0	29.25	0.49	1.23	0.67	496	416	1.19
	24.0000	787.400	31.0000	93.663	3.6875	93.663	3.6875	69.850	2.7500	6.4	0.25	6.4	0.25	2 480	4 970	420	**EE649240**	**649310**	126.9	5.00	642.0	25.28	633.0	24.92	747.0	29.41	756.0	29.76	0.37	1.61	0.89	574	365	1.57
759.924	29.9183	889.000	35.0000	88.900	3.5000	88.900	3.5000	71.999	2.8346	3.2	0.13	3.2	0.13	2 330	5 630	451	**L183448**	**L183410**	123.1	4.85	783.0	30.83	780.0	30.71	864.0	34.02	872.0	34.33	0.31	1.97	1.08	537	280	1.91
1092.200	43.0000	1320.800	52.0000	95.250	3.7500	88.900	3.5000	69.850	2.7500	6.4	0.25	6.4	0.25	3 330	7 140	540	**EE776430**	**776520**	170.5	6.71	1 135.0	44.69	1 130.0	44.49	1 260.0	49.61	1 280.5	50.41	0.57	1.05	0.58	761	746	1.02

Note 1) SP indicates the specially chamfered from.

TSS type

d 15.875 ~ (44.450) mm
0.6250 ~ (1.7500) inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

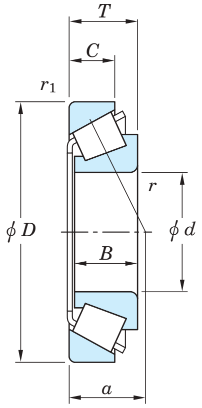
$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

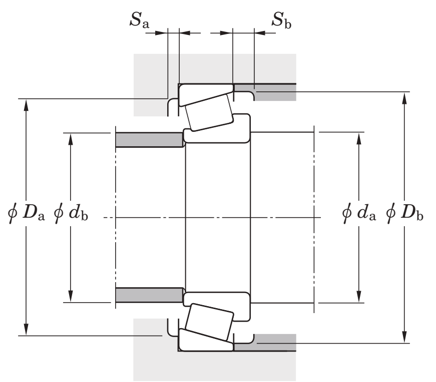
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d mm	d inch	D mm	D inch	T mm	T inch	B mm	B inch	C mm	C inch	r (min.) mm	r (min.) inch	r_1 (min.) mm	r_1 (min.) inch	C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a mm	a inch	d_a mm	d_a inch	d_b mm	d_b inch	D_a mm	D_a inch	D_b mm	D_b inch	e	Y_1	Y_0	Radial	Axial	K
15.875	0.6250	42.862	1.6875	14.288	0.5625	14.288	0.5625	9.525	0.3750	1.6	0.06	1.6	0.06	22.2	17.7	2.30	**11590**	**11520**	13.1	0.52	24.5	0.96	22.5	0.89	34.5	1.36	39.5	1.56	0.70	0.85	0.47	5.15	6.15	0.83
23.812	0.9375	65.088	2.5625	22.225	0.8750	21.463	0.8450	15.875	0.6250	1.6	0.06	1.6	0.06	59.7	51.7	7.10	**23092**	**23256**	20.1	0.79	38.5	1.52	34.5	1.36	53.0	2.09	61.0	2.40	0.73	0.82	0.45	13.8	17.3	0.80
24.384	0.9600	79.375	3.1250	25.400	1.0000	24.074	0.9478	17.462	0.6875	0.8	0.03	1.6	0.06	86.9	72.5	10.5	**43096**	**43312**	23.7	0.93	40.5	1.59	39.5	1.56	62.0	2.44	68.0	2.68	0.67	0.90	0.49	20.1	23.0	0.88
25.000	0.9842	65.088	2.5625	22.225	0.8750	21.463	0.8450	15.875	0.6250	1.6	0.06	1.6	0.06	59.7	51.7	7.10	**23098**	**23256**	20.1	0.79	39.0	1.54	34.5	1.36	53.0	2.09	61.0	2.40	0.73	0.82	0.45	13.8	17.3	0.80
25.400	1.0000	65.088	2.5625	22.225	0.8750	21.463	0.8450	15.875	0.6250	1.6	0.06	1.6	0.06	59.7	51.7	7.10	**23100**	**23256**	20.1	0.79	39.0	1.54	34.5	1.36	53.0	2.09	61.0	2.40	0.73	0.82	0.45	13.8	17.3	0.80
28.575	1.1250	79.375	3.1250	25.400	1.0000	24.074	0.9478	17.462	0.6875	0.8	0.03	1.6	0.06	86.9	72.5	10.5	**43112**	**43312**	23.7	0.93	42.5	1.67	41.5	1.63	67.0	2.64	74.0	2.91	0.67	0.90	0.49	20.1	23.0	0.88
29.987	1.1806	79.375	3.1250	25.400	1.0000	24.074	0.9478	17.462	0.6875	1.6	0.06	1.6	0.06	86.9	72.5	10.5	**43117**	**43312**	23.7	0.93	45.0	1.77	42.0	1.65	62.0	2.44	68.0	2.68	0.67	0.90	0.49	20.1	23.0	0.88
30.162	1.1875	79.375	3.1250	25.400	1.0000	24.074	0.9478	17.462	0.6875	1.6	0.06	1.6	0.06	86.9	72.5	10.5	**43118**	**43312**	23.7	0.93	45.0	1.77	42.0	1.65	62.0	2.44	68.0	2.68	0.67	0.90	0.49	20.1	23.0	0.88
31.750	1.2500	79.375	3.1250	25.400	1.0000	24.074	0.9478	17.462	0.6875	1.6	0.06	1.6	0.06	86.9	72.5	10.5	**43125**	**43312**	23.7	0.93	44.0	1.73	41.5	1.63	62.0	2.44	68.0	2.68	0.67	0.90	0.49	20.1	23.0	0.88
	1.2500	88.501	3.4843	25.400	1.0000	23.698	0.9330	17.462	0.6875	1.6	0.06	1.6	0.06	94.0	84.4	12.3	**44126**	**44348**	28.0	1.10	49.0	1.93	46.0	1.81	75.0	2.95	84.0	3.31	0.78	0.77	0.42	21.8	29.1	0.75
33.338	1.3125	79.375	3.1250	25.400	1.0000	24.074	0.9478	17.462	0.6875	3.6	0.14	1.6	0.06	86.9	72.5	10.5	**43131**	**43312**	23.7	0.93	51.0	2.01	48.0	1.89	62.0	2.44	68.0	2.68	0.67	0.90	0.49	20.1	23.0	0.88
	1.3125	79.375	3.1250	25.400	1.0000	24.074	0.9478	17.462	0.6875	2.0	0.08	1.6	0.06	86.9	72.5	10.5	**43132**	**43312**	23.7	0.93	48.0	1.89	42.0	1.65	62.0	2.44	73.0	2.87	0.67	0.90	0.49	20.1	23.0	0.88
	1.3125	88.501	3.4843	25.400	1.0000	23.698	0.9330	17.462	0.6875	2.0	0.08	1.6	0.06	94.0	84.4	12.3	**44131**	**44348**	28.0	1.10	51.0	2.01	48.0	1.89	75.0	2.95	84.0	3.31	0.78	0.77	0.42	21.8	29.1	0.75
36.512	1.4375	88.501	3.4843	25.400	1.0000	23.698	0.9330	17.462	0.6875	2.4	0.09	1.6	0.06	94.0	84.4	12.3	**44143**	**44348**	30.0	1.18	54.0	2.13	50.0	1.97	75.0	2.95	84.0	3.31	0.78	0.77	0.42	21.8	29.1	0.75
38.100	1.5000	88.501	3.4843	25.400	1.0000	23.698	0.9330	17.462	0.6875	2.4	0.09	1.6	0.06	94.0	84.4	12.3	**44150**	**44348**	28.0	1.10	55.0	2.17	51.0	2.01	75.0	2.95	84.0	3.31	0.78	0.77	0.42	21.8	29.1	0.75
	1.5000	95.250	3.7500	30.958	1.2188	28.301	1.1142	20.638	0.8125	1.6	0.06	0.8	0.03	111	98.4	14.4	**53150**	**53375**	30.0	1.18	55.0	2.17	52.5	2.07	81.0	3.19	89.0	3.50	0.74	0.81	0.45	25.7	32.6	0.79
	1.5000	95.250	3.7500	30.958	1.2188	28.575	1.1250	22.225	0.8750	3.6	0.14	0.8	0.03	124	120	17.4	**HM903241**	**HM903210**	30.8	1.21	61.0	2.40	54.0	2.13	81.0	3.19	91.0	3.58	0.74	0.81	0.45	29.0	36.6	0.79
	1.5000	98.425	3.8750	30.958	1.2188	28.301	1.1142	20.638	0.8125	1.6	0.06	0.8	0.03	111	98.4	14.4	**53150**	**53387**	30.0	1.18	55.0	2.17	53.0	2.09	82.0	3.23	91.0	3.58	0.74	0.81	0.45	25.7	32.6	0.79
39.688	1.5625	88.501	3.4843	25.400	1.0000	23.698	0.9330	17.462	0.6875	2.4	0.09	1.6	0.06	94.0	84.4	12.3	**44156**	**44348**	28.0	1.10	56.0	2.20	51.0	2.01	75.0	2.95	84.0	3.31	0.78	0.77	0.42	21.8	29.1	0.75
	1.5625	88.501	3.4843	25.400	1.0000	23.698	0.9330	17.462	0.6875	3.6	0.14	1.6	0.06	94.0	84.4	12.3	**44158**	**44348**	28.0	1.10	58.0	2.28	51.0	2.01	75.0	2.95	84.0	3.31	0.78	0.77	0.42	21.8	29.1	0.75
40.000	1.5748	88.501	3.4843	25.400	1.0000	23.698	0.9330	17.462	0.6875	2.4	0.09	1.6	0.06	94.0	84.4	12.3	**44157**	**44348**	28.0	1.10	56.0	2.20	51.0	2.01	75.0	2.95	84.0	3.31	0.78	0.77	0.42	21.8	29.1	0.75
41.275	1.6250	88.501	3.4843	25.400	1.0000	23.698	0.9330	17.462	0.6875	2.4	0.09	1.6	0.06	94.0	84.4	12.3	**44162**	**44348**	28.0	1.10	57.0	2.24	51.0	2.01	75.0	2.95	84.0	3.31	0.78	0.77	0.42	21.8	29.1	0.75
	1.6250	92.075	3.6250	26.195	1.0313	23.812	0.9375	16.670	0.6563	3.6	0.14	1.6	0.06	97.1	89.9	13.1	**M903345**	**M903310**	30.1	1.19	60.0	2.36	54.0	2.13	78.0	3.07	88.0	3.46	0.83	0.72	0.40	22.5	32.0	0.70
	1.6250	95.250	3.7500	30.958	1.2188	28.575	1.1250	22.225	0.8750	3.6	0.14	0.8	0.03	124	120	17.4	**HM903245**	**HM903210**	30.8	1.21	63.0	2.48	54.0	2.13	81.0	3.19	91.0	3.58	0.74	0.81	0.45	29.0	36.6	0.79
	1.6250	98.425	3.8750	30.958	1.2188	28.301	1.1142	20.638	0.8125	1.6	0.06	0.8	0.03	111	98.4	14.4	**53162**	**53387**	30.0	1.18	57.0	2.24	52.5	2.07	82.0	3.23	91.0	3.58	0.74	0.81	0.45	25.7	32.6	0.79
44.450	1.7500	95.250	3.7500	30.958	1.2188	28.301	1.1142	20.638	0.8125	3.6	0.14	0.8	0.03	111	98.4	14.4	**53177**	**53375**	30.0	1.18	63.0	2.48	52.5	2.07	81.0	3.19	89.0	3.50	0.74	0.81	0.45	25.7	32.6	0.79
	1.7500	95.250	3.7500	30.958	1.2188	28.301	1.1142	20.638	0.8125	2.0	0.08	0.8	0.03	111	98.4	14.4	**53178**	**53375**	30.0	1.18	60.0	2.36	52.5	2.07	81.0	3.19	89.0	3.50	0.74	0.81	0.45	25.7	32.6	0.79
	1.7500	95.250	3.7500	30.958	1.2188	28.575	1.1250	22.225	0.8750	3.6	0.14	0.8	0.03	124	120	17.4	**HM903249**	**HM903210**	30.8	1.21	65.0	2.56	54.0	2.13	81.0	3.19	91.0	3.58	0.74	0.81	0.45	29.0	36.6	0.79
	1.7500	98.425	3.8750	30.958	1.2188	28.301	1.1142	20.638	0.8125	1.2	0.05	1.6	0.06	111	98.4	14.4	**53176**	**53387X**	30.0	1.18	59.0	2.32	52.5	2.07	82.0	3.23	91.0	3.58	0.74	0.81	0.45	25.7	32.6	0.79
	1.7500	101.600	4.0000	30.958	1.2188	28.301	1.1142	20.638	0.8125	2.0	0.08	0.8	0.03	111	98.4	14.4	**53178**	**53398**	30.0	1.18	60.0	2.36	52.5	2.07	82.0	3.23	91.0	3.58	0.74	0.81	0.45	25.7	32.6	0.79
	1.7500	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	3.6	0.14	3.2	0.13	139	150	21.8	**55175CR**	**55437**	36.6	1.44	67.0	2.64	60.0	2.36	92.0	3.62	105.0	4.13	0.88	0.68	0.37	32.3	48.8	0.66
	1.7500	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	0.8	0.03	3.2	0.13	139	150	21.8	**55176CR**	**55437**	36.6	1.44	54.0	2.13	52.0	2.05	92.0	3.62	105.0	4.13	0.88	0.68	0.37	32.3	48.8	0.66
	1.7500	111.125	4.3750	30.162	1.1875	28.575	1.1250	20.638	0.8125	0.8	0.03	3.2	0.13	134	142	20.7	**HM907635**	**HM907614**	37.2	1.46	64.0	2.52	65.5	2.58	91.0	3.58	105.0	4.13	0.88	0.68	0.37	31.2	47.1	0.66

TSS type

d (44.450) ~ 68.262 mm
(1.7500) ~ 2.6875 inch





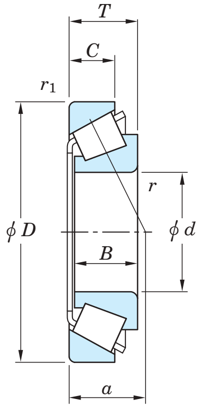
$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

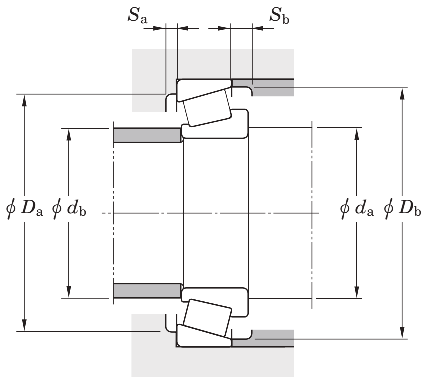
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d mm	d inch	D mm	D inch	T mm	T inch	B mm	B inch	C mm	C inch	r (min.) mm	r (min.) inch	r_1 (min.) mm	r_1 (min.) inch	C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a mm	a inch	d_a mm	d_a inch	d_b mm	d_b inch	D_a mm	D_a inch	D_b mm	D_b inch	e	Y_1	Y_0	Radial	Axial	K
44.450	1.7500	112.712	4.4375	30.162	1.1875	26.909	1.0594	20.638	0.8125	3.6	0.14	3.2	0.13	122	119	17.5	**55175**	**55443**	36.6	1.44	67.0	2.64	60.0	2.36	92.0	3.62	106.0	4.17	0.88	0.68	0.37	28.5	43.0	0.66
44.988	1.7712	95.250	3.7500	30.958	1.2188	28.575	1.1250	22.225	0.8750	3.6	0.14	0.8	0.03	124	120	17.4	**HM903248**	**HM903210**	30.8	1.21	65.0	2.56	54.0	2.13	81.0	3.19	91.0	3.58	0.74	0.81	0.45	29.0	36.6	0.79
47.625	1.8750	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	3.6	0.14	3.2	0.13	122	119	17.5	**55187**	**55437**	36.6	1.44	69.0	2.72	62.0	2.44	92.0	3.62	105.0	4.13	0.88	0.68	0.37	28.5	43.0	0.66
	1.8750	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	3.6	0.14	3.2	0.13	139	150	21.8	**55187CR**	**55437**	36.6	1.44	69.0	2.72	62.0	2.44	92.0	3.62	105.0	4.13	0.88	0.68	0.37	32.3	48.8	0.66
	1.8750	111.125	4.3750	30.162	1.1875	28.575	1.1250	20.638	0.8125	3.6	0.14	3.2	0.13	134	142	20.7	**HM907639**	**HM907614**	37.2	1.46	72.0	2.83	65.0	2.56	91.0	3.58	105.0	4.13	0.88	0.68	0.37	31.2	47.1	0.66
	1.8750	123.825	4.8750	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	176	166	24.8	**72187**	**72487**	38.0	1.50	72.0	2.83	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	41.2	51.9	0.79
49.974	1.9675	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	3.6	0.14	3.2	0.13	122	119	17.5	**55196**	**55437**	36.6	1.44	71.0	2.80	64.0	2.52	92.0	3.62	105.0	4.13	0.88	0.68	0.37	28.5	43.0	0.66
	1.9675	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	2.0	0.08	3.2	0.13	122	119	17.5	**55197**	**55437**	36.6	1.44	68.0	2.68	64.0	2.52	92.0	3.62	105.0	4.13	0.88	0.68	0.37	28.5	43.0	0.66
50.800	2.0000	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	3.6	0.14	3.2	0.13	122	119	17.5	**55200**	**55437**	36.6	1.44	71.0	2.80	64.0	2.52	92.0	3.62	105.0	4.13	0.88	0.68	0.37	28.5	43.0	0.66
	2.0000	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	3.6	0.14	3.2	0.13	139	150	21.8	**55200CR**	**55437**	36.6	1.44	71.0	2.80	64.0	2.52	92.0	3.62	105.0	4.13	0.88	0.68	0.37	32.3	48.8	0.66
	2.0000	111.125	4.3750	30.162	1.1875	28.575	1.1250	20.638	0.8125	3.6	0.14	3.2	0.13	134	142	20.7	**HM907643**	**HM907614**	37.2	1.46	74.0	2.91	65.5	2.58	91.0	3.58	105.0	4.13	0.88	0.68	0.37	31.2	47.1	0.66
	2.0000	123.825	4.8750	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	176	166	24.8	**72200**	**72487**	38.0	1.50	74.0	2.91	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	41.2	51.9	0.79
	2.0000	123.825	4.8750	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	194	190	28.4	**72200C**	**72487**	38.0	1.50	74.0	2.91	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	45.2	57.0	0.79
52.388	2.0625	111.125	4.3750	30.162	1.1875	26.909	1.0594	20.638	0.8125	3.6	0.14	3.2	0.13	122	119	17.5	**55206**	**55437**	36.6	1.44	72.0	2.83	64.0	2.52	92.0	3.62	105.0	4.13	0.88	0.68	0.37	28.5	43.0	0.66
53.975	2.1250	123.825	4.8750	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	176	166	24.8	**72212**	**72487**	38.0	1.50	77.0	3.03	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	41.2	51.9	0.79
	2.1250	123.825	4.8750	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	194	190	28.4	**72212C**	**72487**	38.0	1.50	77.0	3.03	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	45.2	57.0	0.79
	2.1250	127.000	5.0000	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	176	166	24.8	**72212**	**72500**	38.0	1.50	77.0	3.03	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	41.2	51.9	0.79
	2.1250	130.175	5.1250	36.512	1.4375	33.338	1.3125	23.812	0.9375	3.6	0.14	3.2	0.13	191	181	27.3	**HM911242R**	**HM911210**	41.8	1.65	79.0	3.11	74.0	2.91	109.0	4.29	124.0	4.88	0.82	0.73	0.40	44.3	62.1	0.71
	2.1250	136.525	5.3750	36.512	1.4375	33.236	1.3085	23.520	0.9260	0.8	0.03	3.2	0.13	188	177	26.8	**78214**	**78537**	46.2	1.82	75.0	2.95	77.0	3.03	115.0	4.53	130.0	5.12	0.87	0.69	0.38	43.6	64.6	0.68
	2.1250	140.030	5.5130	36.512	1.4375	33.236	1.3085	23.520	0.9260	3.6	0.14	2.4	0.09	188	177	26.8	**78215**	**78551**	46.2	1.82	81.0	3.19	75.0	2.95	117.0	4.61	132.0	5.20	0.87	0.69	0.38	43.6	64.6	0.68
55.562	2.1875	123.825	4.8750	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	176	166	24.8	**72218**	**72487**	38.0	1.50	78.0	3.07	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	41.2	51.9	0.79
57.150	2.2500	123.825	4.8750	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	176	166	24.8	**72225**	**72487**	38.0	1.50	80.0	3.15	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	41.2	51.9	0.79
	2.2500	123.825	4.8750	36.512	1.4375	32.791	1.2910	25.400	1.0000	3.6	0.14	3.2	0.13	194	190	28.4	**72225C**	**72487**	38.0	1.50	80.0	3.15	66.0	2.60	102.0	4.02	116.0	4.57	0.74	0.81	0.45	45.2	57.0	0.79
	2.2500	136.525	5.3750	36.512	1.4375	33.236	1.3085	23.520	0.9260	3.6	0.14	3.2	0.13	188	177	26.8	**78225**	**78537**	46.2	1.82	83.0	3.27	77.0	3.03	115.0	4.53	130.0	5.12	0.87	0.69	0.38	43.6	64.6	0.68
	2.2500	140.030	5.5130	36.512	1.4375	33.236	1.3085	23.520	0.9260	3.6	0.14	2.4	0.09	188	177	26.8	**78225**	**78551**	46.2	1.82	83.0	3.27	77.0	3.03	117.0	4.61	132.0	5.20	0.87	0.69	0.38	43.6	64.6	0.68
60.325	2.3750	130.175	5.1250	36.512	1.4375	33.338	1.3125	23.812	0.9375	5.2	0.20	3.2	0.13	191	181	27.3	**HM911245R**	**HM911210**	41.8	1.65	87.0	3.43	74.5	2.93	109.0	4.29	124.0	4.88	0.82	0.73	0.40	44.3	62.1	0.71
	2.3750	136.525	5.3750	36.512	1.4375	33.236	1.3085	23.520	0.9260	5.2	0.20	3.2	0.13	188	177	26.8	**78238**	**78537**	46.2	1.82	83.0	3.27	75.0	2.95	115.0	4.53	130.0	5.12	0.87	0.69	0.38	43.6	64.6	0.68
	2.3750	140.030	5.5130	36.512	1.4375	33.236	1.3085	23.520	0.9260	5.2	0.20	2.4	0.09	188	177	26.8	**78238**	**78551**	46.2	1.82	83.0	3.27	75.0	2.95	117.0	4.61	132.0	5.20	0.87	0.69	0.38	43.6	64.6	0.68
61.912	2.4375	130.175	5.1250	36.512	1.4375	33.338	1.3125	23.812	0.9375	3.6	0.14	3.2	0.13	191	181	27.3	**HM911249R**	**HM911210**	41.8	1.65	88.0	3.46	75.0	2.95	109.0	4.29	123.5	4.86	0.82	0.73	0.40	44.3	62.1	0.71
	2.4375	146.050	5.7500	41.275	1.6250	39.688	1.5625	25.400	1.0000	3.6	0.14	3.2	0.13	252	237	35.4	**H913842R**	**H913810**	45.6	1.80	90.0	3.54	82.5	3.25	124.0	4.88	138.0	5.43	0.78	0.77	0.42	58.7	78.5	0.75
63.500	2.5000	136.525	5.3750	36.512	1.4375	33.236	1.3085	23.520	0.9260	2.4	0.09	3.2	0.13	188	177	26.8	**78250**	**78537**	46.2	1.82	85.0	3.35	79.0	3.11	115.0	4.53	130.0	5.12	0.87	0.69	0.38	43.6	64.6	0.68
64.988	2.5586	136.525	5.3750	36.512	1.4375	32.923	1.2962	23.520	0.9260	3.6	0.14	3.2	0.13	188	177	26.8	**78255X**	**78537**	46.2	1.82	89.0	3.50	79.0	3.11	115.0	4.53	130.0	5.12	0.87	0.69	0.38	43.6	64.6	0.68
66.675	2.6250	177.800	7.0000	57.150	2.2500	53.975	2.1250	37.308	1.4688	3.6	0.14	3.2	0.13	418	372	48.4	**HH914449**	**HH914412**	57.9	2.28	106.0	4.17	85.5	3.37	146.0	5.75	165.0	6.50	0.80	0.75	0.41	97.3	133	0.73
68.262	2.6875	161.925	6.3750	49.212	1.9375	46.038	1.8125	31.750	1.2500	3.6	0.14	3.2	0.13	307	286	39.1	**9278R**	**9220**	50.2	1.98	95.0	3.74	85.0	3.35	138.0	5.43	153.0	6.02	0.71	0.85	0.47	71.6	86.8	0.83

TSS type

d 69.850 ~ 342.900 mm
2.7500 ~ 13.5000 inch



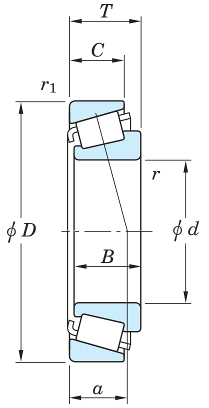


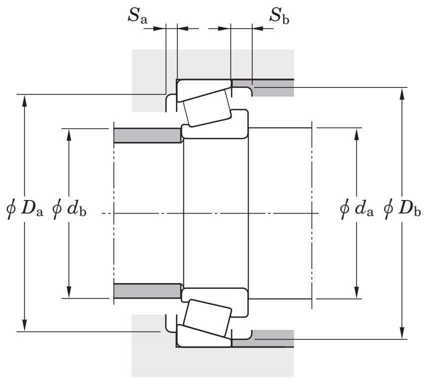
$P = XF_r + YF_a$ $P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$			
$F_a / F_r \leqq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		r (min.)		r_1 (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
69.850	2.7500	146.050	5.7500	41.275	1.6250	39.688	1.5625	25.400	1.0000	3.6	0.14	3.2	0.13	252	237	35.4	**H913849R**	**H913810**	45.6	1.80	95.0	3.74	82.5	3.25	124.0	4.88	138.0	5.43	0.78	0.77	0.42	58.7	78.5	0.75
69.914	2.7525	171.450	6.7500	49.212	1.9375	46.038	1.8125	31.750	1.2500	3.6	0.14	3.2	0.13	329	320	42.4	**9382R**	**9321**	55.1	2.17	105.0	4.13	98.0	3.86	147.0	5.79	164.0	6.46	0.76	0.79	0.43	76.9	100	0.77
76.200	3.0000	161.925	6.3750	49.212	1.9375	46.038	1.8125	31.750	1.2500	3.6	0.14	3.2	0.13	307	286	39.1	**9285R**	**9220**	50.2	1.98	103.0	4.06	90.5	3.56	138.0	5.43	153.0	6.02	0.71	0.85	0.47	71.6	86.8	0.83
	3.0000	177.800	7.0000	52.388	2.0625	46.038	1.8125	34.925	1.3750	3.6	0.14	3.2	0.13	329	320	42.4	**9380R**	**9320**	55.1	2.17	117.0	4.61	98.2	3.87	148.0	5.83	164.0	6.46	0.76	0.79	0.43	76.9	100	0.77
	3.0000	177.800	7.0000	52.388	2.0625	50.800	2.0000	34.925	1.3750	3.6	0.14	3.2	0.13	329	320	42.4	**9378R**	**9320**	55.1	2.17	117.0	4.61	98.2	3.87	148.0	5.83	164.0	6.46	0.76	0.79	0.43	76.9	100	0.77
84.138	3.3125	171.450	6.7500	49.212	1.9375	46.038	1.8125	31.750	1.2500	3.6	0.14	3.2	0.13	329	320	42.4	**9385R**	**9321**	55.1	2.17	111.0	4.37	98.0	3.86	147.0	5.79	164.0	6.46	0.76	0.79	0.43	76.9	100	0.77
96.838	3.8125	188.913	7.4375	50.800	2.0000	46.038	1.8125	31.750	1.2500	3.6	0.14	3.2	0.13	330	357	43.2	**90381**	**90744**	63.0	2.48	125.0	4.92	113.0	4.44	161.0	6.34	179.5	7.06	0.87	0.69	0.38	77	115	0.67
101.600	4.0000	250.825	9.8750	76.200	3.0000	73.025	2.8750	50.800	2.0000	6.4	0.25	6.4	0.25	685	691	81.3	**HH923649**	**HH923610**	74.0	2.91	149.0	5.87	131.0	5.16	207.0	8.15	229.0	9.02	0.71	0.85	0.47	162	196	0.83
	4.0000	250.825	9.8750	76.200	3.0000	73.025	2.8750	50.800	2.0000	6.4	0.25	3.2	0.13	685	691	81.3	**HH923649**	**HH923611**	74.0	2.91	149.0	5.87	131.0	5.16	210.0	8.27	229.0	9.02	0.71	0.85	0.47	162	196	0.83
111.125	4.3750	214.313	8.4375	55.563	2.1875	52.388	2.0625	39.688	1.5625	3.6	0.14	3.2	0.13	506	578	70.6	**H924045**	**H924010**	62.3	2.45	139.0	5.47	131.0	5.16	186.0	7.32	205.0	8.07	0.67	0.89	0.49	118	137	0.87
114.300	4.5000	228.600	9.0000	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	0.14	3.2	0.13	540	651	77.1	**HM926740**	**HM926710**	67.9	2.67	146.0	5.75	142.0	5.59	200.0	7.87	219.0	8.62	0.74	0.81	0.45	126	159	0.79
127.000	5.0000	228.600	9.0000	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	0.14	3.2	0.13	540	651	77.1	**HM926747**	**HM926710**	68.1	2.68	156.0	6.14	143.0	5.63	200.0	7.87	219.0	8.63	0.74	0.81	0.45	126	159	0.79
	5.0000	304.800	12.0000	88.900	3.5000	82.550	3.2500	57.150	2.2500	6.4	0.25	6.4	0.25	987	1 060	119	**HH932132**	**HH932110**	92.1	3.63	182.0	7.17	172.0	6.77	260.0	10.24	288.0	11.34	0.73	0.82	0.45	233	290	0.80
127.792	5.0312	228.600	9.0000	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	0.14	3.2	0.13	540	651	77.1	**HM926749**	**HM926710**	68.1	2.68	156.0	6.14	143.0	5.63	200.0	7.87	219.0	8.63	0.74	0.81	0.45	126	159	0.79
146.050	5.7500	304.800	12.0000	88.900	3.5000	82.550	3.2500	57.150	2.2500	6.4	0.25	6.4	0.25	987	1 060	119	**HH932145**	**HH932110**	92.1	3.63	195.0	7.68	174.5	6.87	260.0	10.24	288.0	11.34	0.73	0.82	0.45	233	290	0.80
155.575	6.1250	330.200	13.0000	85.725	3.3750	79.375	3.1250	53.975	2.1250	6.4	0.25	6.4	0.25	1 080	1 210	131	**H936340**	**H936310**	103.8	4.09	209.0	8.23	192.5	7.58	282.0	11.10	311.5	12.26	0.81	0.74	0.41	255	352	0.72
168.275	6.6250	330.200	13.0000	85.725	3.3750	79.375	3.1250	53.975	2.1250	6.4	0.25	6.4	0.25	1 080	1 210	131	**H936349**	**H936310**	103.8	4.09	218.0	8.58	192.5	7.58	282.0	11.10	311.5	12.26	0.81	0.74	0.41	255	352	0.72
	6.6250	342.900	13.5000	85.725	3.3750	79.375	3.1250	53.975	2.1250	6.4	0.25	6.4	0.25	1 080	1 210	131	**H936349**	**H936316**	103.8	4.09	218.0	8.58	192.5	7.58	287.0	11.30	311.5	12.26	0.81	0.74	0.41	255	352	0.72
177.800	7.0000	428.625	16.8750	106.362	4.1875	95.250	3.7500	61.912	2.4375	6.4	0.25	6.4	0.25	1 340	1 390	145	**EE350701**	**351687**	118.7	4.67	230.0	9.06	221.0	8.70	365.0	14.37	383.0	15.08	0.76	0.79	0.44	318	411	0.77
190.500	7.5000	428.625	16.8750	106.363	4.1875	95.250	3.7500	61.913	2.4375	6.4	0.25	6.4	0.25	1 340	1 390	145	**EE350750**	**351687**	118.7	4.67	240.0	9.45	237.0	9.33	365.0	14.37	383.0	15.08	0.76	0.79	0.44	318	411	0.77
203.200	8.0000	482.600	19.0000	117.475	4.6250	95.250	3.7500	73.025	2.8750	6.4	0.25	6.4	0.25	1 810	2 060	209	**EE380080**	**380190**	152.8	6.02	280.0	11.02	260.0	10.24	402.0	15.83	428.5	16.87	0.87	0.69	0.38	426	631	0.67
241.300	9.5000	508.000	20.0000	117.475	4.6250	95.250	3.7500	73.025	2.8750	6.4	0.25	6.4	0.25	1 550	1 800	178	**EE390095**	**390200**	168.1	6.62	297.0	11.69	288.0	11.34	423.0	16.65	456.0	17.96	0.94	0.64	0.35	366	587	0.62
254.000	10.0000	533.400	21.0000	133.350	5.2500	120.650	4.7500	77.788	3.0625	6.4	0.25	6.4	0.25	2 230	2 800	262	**HH953749**	**HH953710**	180.8	7.12	328.0	12.91	306.5	12.06	455.0	17.91	495.5	19.51	0.94	0.64	0.35	528	846	0.62
317.500	12.5000	622.300	24.5000	147.638	5.8125	131.763	5.1875	82.550	3.2500	14.3	0.56	12.7	0.50	2 790	3 490	316	**H961649**	**H961610**	210.5	8.29	410.0	16.14	373.0	14.69	531.0	20.91	581.5	22.90	0.94	0.64	0.35	659	1 060	0.62
342.900	13.5000	457.098	17.9960	66.675	2.6250	63.500	2.5000	46.038	1.8125	3.2	0.13	3.2	0.13	914	1 670	159	**LM961548**	**LM961510**	122.3	4.81	367.0	14.45	363.0	14.29	423.0	16.65	443.0	17.44	0.71	0.84	0.46	212	258	0.82

TS type
Metric "J" series
d 38.000 ~ 200.000 mm
1.4961 ~ 7.8740 inch





$P = XF_r + YF_a$
$P_0 = 0.5\,F_r + Y_0F_a$ or $P_0 = F_r$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

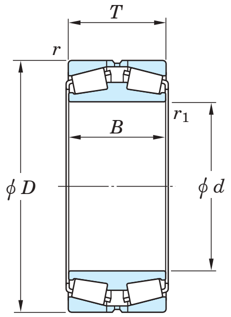
Note) The Values of "e" "Y_1" and "Y_0" are given in the table below.

Boundary dimensions														Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Load center		Mounting dimensions								Con-stant	Axial load factors		Reference rating (kN) (500 rpm for 3 000 Hrs.)		Factor
d		D		T		B		C		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u	Cone (Inner ring)	Cup (Outer ring)	a		d_a		d_b		D_a		D_b		e	Y_1	Y_0	Radial	Axial	K
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
38.000	1.4961	63.000	2.4803	17.000	0.6693	17.000	0.6693	13.500	0.5315	SP	SP	SP	SP	54.7	58.2	8.25	**JL69349**	**JL69310**	14.6	0.57	49.0	1.93	41.0	1.61	60.0	2.36	59.5	2.34	0.42	1.44	0.79	12.6	8.95	1.41
50.000	1.9685	82.000	3.2283	21.501	0.8465	21.501	0.8465	17.000	0.6693	3.0	0.12	0.5	0.02	90.0	97.9	14.7	**JLM104948**	**JLM104910**	16.2	0.64	60.0	2.36	55.0	2.17	76.0	2.99	78.0	3.07	0.31	1.97	1.08	20.8	10.8	1.92
	1.9685	90.000	3.5433	28.000	1.1024	28.000	1.1024	23.000	0.9055	3.0	0.12	2.5	0.10	132	138	21.1	**JM205149**	**JM205110**	20.2	0.80	62.0	2.44	57.0	2.24	80.0	3.15	85.0	3.35	0.33	1.82	1.00	30.6	17.2	1.78
	1.9685	105.000	4.1339	37.000	1.4567	36.000	1.4173	29.000	1.1417	3.0	0.12	2.8	0.11	186	205	30.6	**JHM807045**	**JHM807012**	29.4	1.16	69.0	2.72	63.0	2.48	90.0	3.54	100.0	3.94	0.49	1.23	0.68	43.5	36.3	1.20
55.000	2.1654	90.000	3.5433	23.000	0.9055	23.000	0.9055	18.500	0.7283	1.6	0.06	0.5	0.02	102	115	17.2	**JLM506849**	**JLM506810**	20.1	0.79	63.0	2.48	61.0	2.40	82.0	3.23	86.0	3.39	0.40	1.49	0.82	23.6	16.2	1.46
	2.1654	95.000	3.7402	29.000	1.1417	29.000	1.1417	23.500	0.9252	1.6	0.06	2.8	0.11	138	150	23.0	**JM207049**	**JM207010**	21.3	0.84	64.0	2.52	62.0	2.44	85.0	3.35	91.0	3.58	0.33	1.79	0.99	32.0	18.3	1.75
	2.1654	110.000	4.3307	39.000	1.5354	39.000	1.5354	32.000	1.2598	3.0	0.12	2.5	0.10	220	224	34.7	**JH307749**	**JH307710**	26.8	1.06	71.0	2.80	64.0	2.52	97.0	3.82	104.0	4.09	0.35	1.73	0.95	51.5	30.5	1.69
60.000	2.3622	95.000	3.7402	24.000	0.9449	24.000	0.9449	19.000	0.7480	5.0	0.20	2.5	0.10	108	125	18.9	**JLM508748**	**JLM508710**	21.2	0.83	75.0	2.95	66.0	2.60	85.0	3.35	91.0	3.58	0.40	1.49	0.82	25.0	17.2	1.46
65.000	2.5591	105.000	4.1339	24.000	0.9449	23.000	0.9055	18.500	0.7283	3.0	0.12	1.0	0.04	120	129	19.6	**JLM710949**	**JLM710910**	23.8	0.94	77.0	3.03	71.0	2.80	96.0	3.78	101.0	3.98	0.45	1.32	0.73	27.7	21.4	1.29
	2.5591	110.000	4.3307	28.000	1.1024	28.000	1.1024	22.500	0.8858	3.0	0.12	2.8	0.11	170	191	29.4	**JM511946**	**JM511910**	24.5	0.96	78.0	3.07	72.0	2.83	99.0	3.90	105.0	4.13	0.40	1.49	0.82	39.3	27.0	1.46
	2.5591	120.000	4.7244	39.000	1.5354	38.500	1.5157	32.000	1.2598	3.0	0.12	2.8	0.11	236	255	39.7	**JH211749**	**JH211710**	27.9	1.10	80.0	3.15	74.0	2.91	107.0	4.21	114.0	4.49	0.34	1.78	0.98	55.2	31.8	1.74
	2.5591	120.000	4.7244	39.000	1.5354	38.500	1.5157	32.000	1.2598	7.1	0.28	2.8	0.11	236	255	39.7	**JH211749A**	**JH211710**	27.9	1.10	88.0	3.46	74.0	2.91	107.0	4.21	114.0	4.49	0.34	1.78	0.98	55.2	31.8	1.74
70.000	2.7559	110.000	4.3307	26.000	1.0236	25.000	0.9843	20.500	0.8071	1.0	0.04	2.5	0.10	129	158	23.9	**JLM813049**	**JLM813010**	26.1	1.03	78.0	3.07	77.0	3.03	98.0	3.86	106.0	4.17	0.49	1.23	0.68	29.8	24.8	1.20
	2.7559	115.000	4.5276	29.000	1.1417	29.000	1.1417	23.000	0.9055	3.0	0.12	2.5	0.10	155	173	26.6	**JM612949**	**JM612910**	26.2	1.03	83.0	3.27	77.0	3.03	103.0	4.06	111.0	4.37	0.43	1.39	0.77	36.0	26.5	1.36
75.000	2.9528	115.000	4.5276	25.000	0.9843	25.000	0.9843	19.000	0.7480	3.0	0.12	2.8	0.11	127	151	23.0	**JLM714149**	**JLM714110**	25.5	1.00	87.0	3.43	81.0	3.19	104.0	4.09	111.0	4.37	0.46	1.31	0.72	29.4	23.0	1.28
	2.9528	120.000	4.7244	31.000	1.2205	29.500	1.1614	25.000	0.9843	3.0	0.12	2.8	0.11	182	216	33.2	**JM714249**	**JM714210**	30.0	1.18	88.0	3.46	82.9	3.26	108.0	4.25	115.0	4.53	0.44	1.35	0.74	42.2	32.1	1.32
	2.9528	145.000	5.7087	51.000	2.0079	51.000	2.0079	42.000	1.6535	3.0	0.12	2.5	0.10	362	412	55.2	**JH415647**	**JH415610**	36.6	1.44	94.0	3.70	89.0	3.50	129.0	5.08	139.0	5.47	0.36	1.66	0.91	85.1	52.7	1.62
80.000	3.1496	130.000	5.1181	35.000	1.3780	34.000	1.3386	28.500	1.1220	3.2	0.13	2.5	0.10	211	256	39.3	**JM515649**	**JM515610**	29.6	1.17	94.0	3.70	88.0	3.46	117.0	4.61	125.0	4.92	0.39	1.54	0.85	49.2	32.6	1.51
85.000	3.3465	130.000	5.1181	30.000	1.1811	29.000	1.1417	24.000	0.9449	3.0	0.12	2.5	0.10	179	228	34.5	**JM716649**	**JM716610**	29.1	1.15	98.0	3.86	92.0	3.62	117.0	4.61	125.0	4.92	0.44	1.35	0.74	41.3	31.4	1.32
	3.3465	140.000	5.5118	39.000	1.5354	38.000	1.4961	31.500	1.2402	3.0	0.12	2.5	0.10	254	308	46.4	**JHM516849**	**JHM516810**	32.8	1.29	100.0	3.94	93.9	3.70	125.0	4.92	134.0	5.28	0.41	1.47	0.81	59.5	41.4	1.44
	3.3465	150.000	5.9055	46.000	1.8110	46.000	1.8110	38.000	1.4961	3.0	0.12	2.5	0.10	342	390	53.1	**JH217249**	**JH217210**	33.6	1.32	101.0	3.98	95.2	3.75	134.0	5.28	142.0	5.59	0.33	1.80	0.99	80.3	45.6	1.76
90.000	3.5433	145.000	5.7087	35.000	1.3780	34.000	1.3386	27.000	1.0630	3.0	0.12	2.5	0.10	244	291	43.5	**JM718149**	**JM718110**	32.7	1.29	105.0	4.13	99.0	3.90	131.0	5.16	139.0	5.47	0.44	1.35	0.74	56.8	43.1	1.32
	3.5433	155.000	6.1024	44.000	1.7323	44.000	1.7323	35.500	1.3976	3.0	0.12	2.5	0.10	363	407	54.8	**JHM318448**	**JHM318410**	34.5	1.36	106.0	4.17	100.0	3.94	140.0	5.51	148.0	5.83	0.34	1.76	0.97	84.5	49.3	1.72
95.000	3.7402	150.000	5.9055	35.000	1.3780	34.000	1.3386	27.000	1.0630	3.0	0.12	2.5	0.10	235	294	43.4	**JM719149**	**JM719113**	33.5	1.32	109.0	4.29	104.0	4.09	135.0	5.31	143.0	5.63	0.44	1.36	0.75	54.5	41.2	1.32
100.000	3.9370	155.000	6.1024	36.000	1.4173	35.000	1.3780	28.000	1.1024	3.0	0.12	2.5	0.10	256	328	47.7	**JM720249**	**JM720210**	35.6	1.40	110.0	4.33	110.0	4.33	139.0	5.47	150.0	5.91	0.47	1.27	0.70	59.5	48.1	1.24
	3.9370	160.000	6.2992	41.000	1.6142	40.000	1.5748	32.000	1.2598	3.0	0.12	2.5	0.10	298	378	54.6	**JHM720249**	**JHM720210**	38.3	1.51	110.0	4.33	111.0	4.37	143.0	5.63	153.0	6.02	0.47	1.28	0.70	69.6	56.0	1.24
110.000	4.3307	165.000	6.4961	35.000	1.3780	35.000	1.3780	26.500	1.0433	3.0	0.12	2.5	0.10	245	325	46.3	**JM822049**	**JM822010**	38.1	1.50	121.0	4.76	121.0	4.76	148.0	5.83	157.0	6.18	0.50	1.21	0.66	56.7	48.2	1.18
	4.3307	180.000	7.0866	47.000	1.8504	46.000	1.8110	38.000	1.4961	3.0	0.12	2.5	0.10	385	487	62.3	**JHM522649**	**JHM522610**	40.6	1.60	121.0	4.76	125.0	4.92	160.0	6.30	171.0	6.73	0.41	1.48	0.81	90.1	62.5	1.44
170.000	6.6929	230.000	9.0551	39.000	1.5354	38.000	1.4961	31.000	1.2205	3.0	0.12	2.5	0.10	363	558	72.8	**JHM534149**	**JHM534110**	43.6	1.72	181.0	7.13	184.0	7.24	214.0	8.43	226.0	8.90	0.38	1.57	0.86	83.9	55.0	1.53
	6.6929	240.000	9.4488	46.000	1.8110	44.500	1.7520	37.000	1.4567	3.0	0.12	2.5	0.10	443	666	77.1	**JM734449**	**JM734410**	50.6	1.99	181.0	7.13	184.0	7.24	220.0	8.66	235.0	9.25	0.44	1.37	0.75	103	76.9	1.34
180.000	7.0866	250.000	9.8425	47.000	1.8504	45.000	1.7717	37.000	1.4567	3.0	0.12	2.5	0.10	456	705	81.7	**JM736149**	**JM736110**	55.2	2.17	191.0	7.52	193.0	7.60	230.0	9.06	242.0	9.53	0.48	1.25	0.69	106	87.1	1.22
190.000	7.4803	260.000	10.2362	46.000	1.8110	44.000	1.7323	36.500	1.4370	3.0	0.12	2.5	0.10	461	723	81.4	**JM738249**	**JM738210**	56.0	2.20	201.0	7.91	203.0	7.99	240.0	9.45	253.0	9.96	0.48	1.26	0.69	107	87.2	1.23
200.000	7.8740	300.000	11.8110	65.000	2.5591	62.000	2.4409	51.000	2.0079	3.6	0.14	2.5	0.10	773	1 140	124	**JHM840449**	**JHM840410**	72.1	2.84	213.0	8.39	218.0	8.58	270.0	10.63	289.0	11.38	0.52	1.15	0.63	181	161	1.12

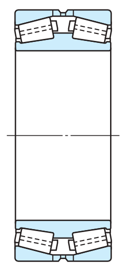
Note 1) SP indicates the specially chamfered from.

TDI type

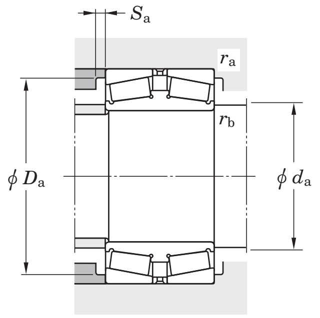
d 104.775 ~ (206.375) mm
4.1250 ~ (8.1250) inch



Design 1



Design 1-P

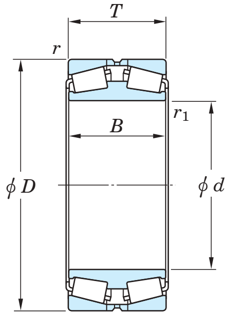


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions												Con-stant	Axial load factors		
d		D		B		T		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (max.)		D_a (max.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
104.775	4.1250	180.975	7.1250	102.362	4.0300	101.600	4.0000	3.200	0.1260	1.600	0.0630	620	876	113	**782D/772**	1	120.000	4.7244	166.000	6.5354	156.000	6.1417	4.400	0.1732	3.200	0.1260	1.600	0.0630	0.39	1.75	2.61	1.71
127.000	5.0000	182.563	7.1875	76.200	3.0000	76.200	3.0000	3.200	0.1260	1.600	0.0630	487	858	120	**48290D/48220**	1	141.000	5.5512	171.000	6.7323	167.000	6.5748	3.800	0.1496	3.200	0.1260	1.600	0.0630	0.31	2.21	3.29	2.16
	5.0000	234.950	9.2500	139.700	5.5000	152.400	6.0000	3.200	0.1260	5.200	0.2047	1 120	1 650	200	**95499D/95925**	1	151.000	5.9449	223.000	8.7795	205.000	8.0709	8.000	0.3150	3.200	0.1260	5.200	0.2047	0.37	1.83	2.72	1.79
	5.0000	254.000	10.0000	161.925	6.3750	171.450	6.7500	6.400	0.2520	3.200	0.1260	1 480	2 010	240	**EE153053D/153100**	1	154.000	6.0630	236.000	9.2913	218.000	8.5827	11.000	0.4331	6.400	0.2520	3.200	0.1260	0.32	2.10	3.13	2.05
130.005	5.1183	215.900	8.5000	123.825	4.8750	123.825	4.8750	3.200	0.1260	1.600	0.0630	691	1 100	132	**74510D/74850**	1	154.000	6.0630	204.000	8.0315	194.000	7.6378	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.49	1.38	2.06	1.35
133.350	5.2500	196.850	7.7500	92.075	3.6250	92.075	3.6250	3.200	0.1260	1.600	0.0630	669	1 120	137	**67390D/67322**	1	146.000	5.7480	185.000	7.2835	181.000	7.1260	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.34	1.96	2.92	1.92
	5.2500	203.200	8.0000	92.075	3.6250	92.075	3.6250	3.200	0.1260	1.600	0.0630	669	1 120	137	**67390D/67320**	1	146.000	5.7480	191.000	7.5197	181.000	7.1260	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.34	1.96	2.92	1.92
136.525	5.3750	190.500	7.5000	77.788	3.0625	77.788	3.0625	3.200	0.1260	1.600	0.0630	505	944	129	**48393D/48320**	1	150.000	5.9055	179.000	7.0472	175.000	6.8898	4.700	0.1850	3.200	0.1260	1.600	0.0630	0.32	2.10	3.13	2.06
	5.3750	225.425	8.8750	120.650	4.7500	120.650	4.7500	3.200	0.1260	1.600	0.0630	1 020	1 610	194	**H228649D/H228610**	1	156.000	6.1417	214.000	8.4252	202.000	7.9528	6.000	0.2362	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
	5.3750	225.425	8.8750	120.650	4.7500	120.650	4.7500	3.200	0.1260	1.600	0.0630	1 020	1 610	194	**45T272312**	1	155.000	6.1024	211.000	8.3071	201.000	7.9134	6.000	0.2362	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
139.700	5.5000	200.025	7.8750	77.788	3.0625	75.408	2.9688	3.300	0.1299	0.800	0.0315	527	982	133	**48680D/48620**	1	155.000	6.1024	188.000	7.4016	183.000	7.2047	4.000	0.1575	3.300	0.1299	0.800	0.0315	0.34	2.01	2.99	1.96
149.225	5.8750	254.000	10.0000	120.650	4.7500	120.650	4.7500	3.200	0.1260	1.600	0.0630	1 180	1 830	215	**99587D/99100**	1	172.000	6.7717	242.000	9.5276	224.000	8.8189	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.41	1.66	2.47	1.62
152.400	6.0000	222.250	8.7500	84.138	3.3125	84.138	3.3125	1.600	0.0630	1.600	0.0630	678	1 190	159	**M231649D/M231610**	1	168.000	6.6142	214.000	8.4252	202.000	7.9528	6.000	0.2362	1.600	0.0630	1.600	0.0630	0.33	2.03	3.02	1.98
	6.0000	254.000	10.0000	133.350	5.2500	133.350	5.2500	3.200	0.1260	1.600	0.0630	1 180	1 830	215	**99600D/99100**	1	172.000	6.7717	242.000	9.5276	224.000	8.8189	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.41	1.66	2.47	1.62
	6.0000	254.000	10.0000	158.750	6.2500	158.750	6.2500	3.200	0.1260	1.600	0.0630	1 180	1 830	215	**99603D/99100**	1	172.000	6.7717	242.000	9.5276	224.000	8.8189	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.41	1.66	2.47	1.62
177.800	7.0000	247.650	9.7500	90.488	3.5625	90.488	3.5625	3.200	0.1260	1.600	0.0630	741	1 400	160	**67790D/67720**	1	190.000	7.4803	236.000	9.2913	227.000	8.9370	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.44	1.54	2.29	1.50
	7.0000	279.400	11.0000	112.710	4.4374	112.713	4.4375	3.200	0.1260	1.600	0.0630	1 040	1 640	187	**82680D/82620**	1	197.000	7.7559	268.000	10.5512	252.000	9.9213	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.52	1.29	1.92	1.26
	7.0000	285.750	11.2500	106.360	4.1874	106.363	4.1875	3.200	0.1260	1.600	0.0630	956	1 430	165	**EE91700D/91112**	1	201.000	7.9134	274.000	10.7874	252.000	9.9213	4.000	0.1575	3.200	0.1260	1.600	0.0630	0.43	1.57	2.34	1.53
	7.0000	288.925	11.3750	123.825	4.8750	123.825	4.8750	3.200	0.1260	1.600	0.0630	1 180	1 920	216	**94706D/94113**	1	201.000	7.9134	277.000	10.9055	255.000	10.0394	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.47	1.44	2.15	1.41
	7.0000	288.925	11.3750	123.825	4.8750	123.825	4.8750	3.200	0.1260	1.600	0.0630	1 430	1 950	245	**HM237546D/HM237510**	1	201.000	7.9134	277.000	10.9055	261.000	10.2756	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.32	2.12	3.15	2.07
	7.0000	288.925	11.3750	158.750	6.2500	158.750	6.2500	3.200	0.1260	1.600	0.0630	1 430	1 950	245	**HM237546DD/HM237510**	1	201.000	7.9134	277.500	10.9252	261.000	10.2756	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.32	2.12	3.15	2.07
	7.0000	304.800	12.0000	109.438	4.3086	114.300	4.5000	3.200	0.1260	3.200	0.1260	1 220	1 690	199	**EE280700D/281200**	1	208.000	8.1890	293.000	11.5354	272.000	10.7087	7.000	0.2756	3.200	0.1260	3.200	0.1260	0.36	1.87	2.79	1.83
187.325	7.3750	269.875	10.6250	101.600	4.0000	101.600	4.0000	3.200	0.1260	1.600	0.0630	880	1 610	183	**M238849D/M238810**	1	207.000	8.1496	258.000	10.1575	246.000	9.6850	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
	7.3750	319.964	12.5970	168.275	6.6250	161.925	6.3750	4.800	0.1890	3.200	0.1260	1 610	2 450	271	**EE222074D/222126**	1	212.000	8.3465	305.000	12.0079	281.000	11.0630	4.000	0.1575	4.800	0.1890	3.200	0.1260	0.40	1.68	2.50	1.64
	7.3750	319.964	12.5970	168.275	6.6250	161.925	6.3750	4.800	0.1890	3.200	0.1260	1 830	2 530	285	**H239649D/H239610**	1	212.000	8.3465	305.000	12.0079	287.000	11.2992	5.000	0.1969	4.800	0.1890	3.200	0.1260	0.32	2.12	3.15	2.07
	7.3750	320.675	12.6250	168.275	6.6250	161.925	6.3750	4.800	0.1890	3.200	0.1260	1 610	2 450	271	**EE222074D/222128**	1	212.000	8.3465	306.000	12.0472	281.000	11.0630	4.000	0.1575	4.800	0.1890	3.200	0.1260	0.40	1.68	2.50	1.64
	7.3750	320.675	12.6250	168.275	6.6250	161.925	6.3750	4.800	0.1890	3.200	0.1260	1 830	2 530	285	**H239649D/H239612**	1	212.000	8.3465	306.000	12.0472	287.000	11.2992	5.000	0.1969	4.800	0.1890	3.200	0.1260	0.32	2.12	3.15	2.07
190.500	7.5000	365.049	14.3720	158.750	6.2500	152.400	6.0000	3.200	0.1260	3.200	0.1260	2 020	2 920	319	**EE420750D/421437**	1	239.000	9.4094	353.000	13.8976	317.000	12.4803	6.000	0.2362	3.200	0.1260	3.200	0.1260	0.40	1.68	2.50	1.64
	7.5000	368.300	14.5000	158.750	6.2500	152.400	6.0000	3.200	0.1260	3.200	0.1260	2 020	2 920	319	**EE420750D/421450**	1	239.000	9.4094	356.000	14.0157	317.000	12.4803	6.000	0.2362	3.200	0.1260	3.200	0.1260	0.40	1.68	2.50	1.64
199.975	7.8730	317.500	12.5000	133.350	5.2500	133.350	5.2500	3.200	0.1260	6.400	0.2520	1 300	2 270	244	**93788D/93125**	1	223.000	8.7795	306.000	12.0472	279.000	10.9843	7.000	0.2756	3.200	0.1260	6.400	0.2520	0.52	1.29	1.92	1.26
203.200	8.0000	317.500	12.5000	123.825	4.8750	123.825	4.8750	3.200	0.1260	1.600	0.0630	1 300	2 270	244	**93800D/93125**	1	223.000	8.7795	305.000	12.0079	278.000	10.9449	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.52	1.29	1.92	1.26
	8.0000	317.500	12.5000	133.350	5.2500	133.350	5.2500	3.200	0.1260	6.400	0.2520	1 300	2 270	244	**93801D/93125**	1	223.000	8.7795	305.000	12.0079	279.000	10.9843	7.000	0.2756	3.200	0.1260	6.400	0.2520	0.52	1.29	1.92	1.26
	8.0000	365.049	14.3720	158.750	6.2500	152.400	6.0000	3.200	0.1260	3.200	0.1260	2 020	2 920	319	**EE420800D/421437**	1	239.000	9.4094	352.000	13.8583	317.000	12.4803	6.000	0.2362	3.200	0.1260	3.200	0.1260	0.40	1.68	2.50	1.64
	8.0000	368.300	14.5000	158.750	6.2500	152.400	6.0000	3.200	0.1260	3.200	0.1260	2 020	2 920	319	**EE420800D/421450**	1	239.000	9.4094	355.000	13.9764	317.000	12.4803	6.000	0.2362	3.200	0.1260	3.200	0.1260	0.40	1.68	2.50	1.64
206.375	8.1250	282.575	11.1250	87.313	3.4375	87.313	3.4375	3.200	0.1260	0.800	0.0315	749	1 410	155	**67985D/67920**	1	220.000	8.6614	270.000	10.6299	260.000	10.2362	7.000	0.2756	3.200	0.1260	0.800	0.0315	0.51	1.33	1.97	1.30

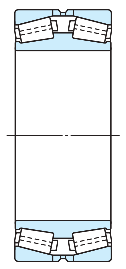
Note 1) SP indicates the specially chamfered from.

TDI type

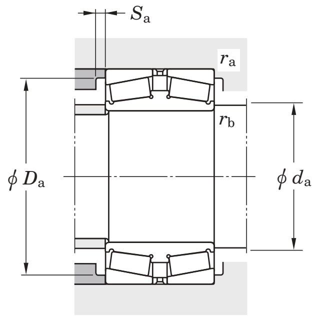
d (206.375) ~ 266.700 mm
(8.1250) ~ 10.5000 inch



Design 1



Design 1-P

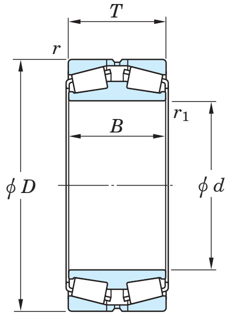


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions												Con-stant	Axial load factors		
d		D		B		T		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (max.)		D_a (max.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
206.375	8.1250	336.550	13.2500	180.975	7.1250	184.150	7.2500	3.200	0.1260	1.600	0.0630	2 230	3 800	400	**H242649D/H242610**	1	233.000	9.1732	324.000	12.7559	301.000	11.8504	9.000	0.3543	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
215.900	8.5000	285.750	11.2500	85.725	3.3750	85.725	3.3750	3.200	0.1260	0.800	0.0315	766	1 560	190	**LM742749D/LM742710**	1	228.000	8.9764	273.000	10.7480	266.000	10.4724	6.000	0.2362	3.200	0.1260	0.800	0.0315	0.48	1.40	2.09	1.37
	8.5000	288.925	11.3750	85.750	3.3760	85.725	3.3750	3.200	0.1260	0.800	0.0315	766	1 560	190	**LM742749D/LM742714**	1	228.000	8.9764	276.000	10.8661	266.000	10.4724	6.000	0.2362	3.200	0.1260	0.800	0.0315	0.48	1.40	2.09	1.37
216.103	8.5080	330.200	13.0000	130.175	5.1250	127.000	5.0000	3.200	0.1260	1.600	0.0630	1 430	2 360	255	**9974D/9920**	1	237.000	9.3307	317.000	12.4803	301.000	11.8504	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.55	1.22	1.82	1.19
	8.5080	330.200	13.0000	152.400	6.0000	142.875	5.6250	3.200	0.1260	3.200	0.1260	1 430	2 360	255	**9977D/9920**	1	239.000	9.4094	317.000	12.4803	301.000	11.8504	7.000	0.2756	3.200	0.1260	3.200	0.1260	0.55	1.22	1.82	1.19
218.000	8.5827	314.325	12.3750	115.888	4.5625	115.888	4.5625	3.200	0.1260	1.600	0.0630	1 400	2 550	281	**45T443112**	1	240.000	9.4488	304.000	11.9685	289.000	11.3780	9.000	0.3543	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
219.075	8.6250	358.775	14.1250	196.850	7.7500	200.025	7.8750	6.400	0.2520	1.600	0.0630	2 660	4 580	469	**H244849D/H244810**	1	245.000	9.6457	340.000	13.3858	320.000	12.5984	9.000	0.3543	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
220.663	8.6875	314.325	12.3750	115.888	4.5625	115.888	4.5625	3.200	0.1260	1.600	0.0630	1 320	2 450	269	**M244249D/M244210**	1	241.000	9.4882	301.000	11.8504	289.000	11.3780	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
228.600	9.0000	400.050	15.7500	139.700	5.5000	139.700	5.5000	3.200	0.1260	3.200	0.1260	1 960	2 950	318	**EE529091D/529157**	1	277.000	10.9055	387.000	15.2362	352.000	13.8583	6.000	0.2362	3.200	0.1260	3.200	0.1260	0.31	2.19	3.25	2.14
	9.0000	431.800	17.0000	177.800	7.0000	177.800	7.0000	6.000	0.2362	6.000	0.2362	2 980	4 280	447	**45T464318D**	1-P	280.000	11.0236	403.000	15.8661	377.000	14.8425	10.000	0.3937	5.000	0.1969	5.000	0.1969	0.40	1.68	2.50	1.64
	9.0000	431.800	17.0000	177.800	7.0000	177.800	7.0000	6.000	0.2362	6.000	0.2362	2 980	4 280	447	**45T464318D**	1-P	279.000	10.9843	403.000	15.8661	377.000	14.8425	10.000	0.3937	6.000	0.2362	6.000	0.2362	0.40	1.68	2.50	1.64
234.950	9.2500	327.025	12.8750	93.663	3.6875	93.663	3.6875	3.200	0.1260	1.600	0.0630	1 000	1 860	200	**8576D/8520**	1	256.000	10.0787	314.000	12.3622	300.000	11.8110	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.41	1.66	2.47	1.62
	9.2500	384.175	15.1250	209.550	8.2500	209.550	8.2500	6.400	0.2520	1.600	0.0630	3 120	5 370	542	**H247549D/H247510**	1-P	262.000	10.3150	365.000	14.3701	342.000	13.4646	8.000	0.3150	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
241.300	9.5000	355.524	13.9970	109.525	4.3120	109.525	4.3120	SP	SP	SP	SP	1 190	2 050	224	**45T483611**	1	267.000	10.5118	336.000	13.2283	319.000	12.5591	6.000	0.2362	2.500	0.0984	2.000	0.0787	0.35	1.91	2.84	1.86
	9.5000	355.600	14.0000	92.710	3.6500	92.862	3.6560	3.200	0.1260	1.600	0.0630	1 090	1 850	203	**EE170951D/171400**	1	278.000	10.9449	343.000	13.5039	328.000	12.9134	10.000	0.3937	3.200	0.1260	1.600	0.0630	0.36	1.86	2.77	1.82
	9.5000	368.300	14.5000	92.710	3.6500	92.862	3.6560	3.200	0.1260	1.600	0.0630	1 090	1 850	203	**EE170951D/171450**	1	278.000	10.9449	355.000	13.9764	328.000	12.9134	10.000	0.3937	3.200	0.1260	1.600	0.0630	0.36	1.86	2.77	1.82
241.478	9.5070	349.148	13.7460	107.950	4.2500	107.950	4.2500	3.200	0.1260	1.600	0.0630	1 190	2 050	224	**EE127097D/127135**	1	268.000	10.5512	336.000	13.2283	320.000	12.5984	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.35	1.91	2.84	1.86
244.475	9.6250	327.025	12.8750	92.075	3.6250	92.075	3.6250	3.200	0.1260	1.600	0.0630	985	1 890	203	**LM247748D/LM247710**	1	265.000	10.4331	314.000	12.3622	306.000	12.0472	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.32	2.10	3.13	2.06
	9.6250	381.000	15.0000	146.050	5.7500	146.050	5.7500	4.800	0.1890	3.200	0.1260	1 690	2 930	306	**EE126096D/126150**	1	269.000	10.5906	365.000	14.3701	337.000	13.2677	5.000	0.1969	4.800	0.1890	3.200	0.1260	0.52	1.31	1.95	1.28
247.650	9.7500	400.050	15.7500	119.060	4.6874	114.300	4.5000	6.400	0.2520	1.600	0.0630	1 630	2 570	274	**EE220975D/221575**	1	292.000	11.4961	381.000	15.0000	360.000	14.1732	6.000	0.2362	6.400	0.2520	1.600	0.0630	0.39	1.71	2.54	1.67
	9.7500	406.400	16.0000	215.900	8.5000	219.075	8.6250	6.400	0.2520	3.200	0.1260	3 490	6 250	612	**HH249949D/HH249910**	1-P	279.000	10.9843	387.000	15.2362	362.000	14.2520	11.000	0.4331	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
254.000	10.0000	355.600	14.0000	92.710	3.6500	92.862	3.6560	3.200	0.1260	1.600	0.0630	1 090	1 850	203	**EE171000D/171400**	1	278.000	10.9449	343.000	13.5039	328.000	12.9134	10.000	0.3937	3.200	0.1260	1.600	0.0630	0.36	1.86	2.77	1.82
	10.0000	358.775	14.1250	130.175	5.1250	130.175	5.1250	3.200	0.1260	3.200	0.1260	1 660	3 170	333	**M249748D/M249710**	1	277.000	10.9055	346.000	13.6220	330.100	12.9961	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.33	2.03	3.02	1.98
	10.0000	368.300	14.5000	92.710	3.6500	92.862	3.6560	3.200	0.1260	1.600	0.0630	1 090	1 850	203	**EE171000D/171450**	1	278.000	10.9449	355.000	13.9764	328.000	12.9134	10.000	0.3937	3.200	0.1260	1.600	0.0630	0.36	1.86	2.77	1.82
	10.0000	438.150	17.2500	165.100	6.5000	165.100	6.5000	6.400	0.2520	3.200	0.1260	2 960	4 370	454	**EE738101D/738172**	1	298.000	11.7323	410.000	16.1417	394.000	15.5118	12.000	0.4724	6.400	0.2520	3.200	0.1260	0.36	1.88	2.81	1.84
	10.0000	444.500	17.5000	133.350	5.2500	133.350	5.2500	6.400	0.2520	3.200	0.1260	1 850	2 770	294	**EE822101D/822175**	1	311.000	12.2441	425.000	16.7323	393.000	15.4724	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.42	1.62	2.42	1.59
260.350	10.2500	365.125	14.3750	107.950	4.2500	107.950	4.2500	6.400	0.2520	3.200	0.1260	1 210	2 150	231	**EE134102D/134143**	1	283.000	11.1417	346.000	13.6220	334.700	13.1772	8.000	0.3150	6.400	0.2520	3.200	0.1260	0.37	1.80	2.69	1.76
	10.2500	400.050	15.7500	119.060	4.6874	114.300	4.5000	6.400	0.2520	6.400	0.2520	1 630	2 570	274	**EE221025D/221575**	1	292.000	11.4961	381.000	15.0000	360.000	14.1732	6.000	0.2362	6.400	0.2520	6.400	0.2520	0.39	1.71	2.54	1.67
	10.2500	419.100	16.5000	155.575	6.1250	158.750	6.2500	3.200	0.1260	3.200	0.1260	2 110	3 520	363	**EE435103D/435165**	1	286.000	11.2598	405.000	15.9449	369.000	14.5276	5.500	0.2165	3.200	0.1260	3.200	0.1260	0.60	1.12	1.66	1.09
	10.2500	422.275	16.6250	152.400	6.0000	139.700	5.5000	3.200	0.1260	3.600	0.1417	2 180	3 360	355	**HM252347D/HM252310**	1	306.000	12.0472	409.000	16.1024	385.000	15.1575	1.000	0.0394	3.200	0.1260	3.600	0.1417	0.33	2.03	3.02	1.98
	10.2500	422.275	16.6250	155.575	6.1250	152.400	6.0000	3.200	0.1260	6.400	0.2520	2 180	3 360	355	**HM252348D/HM252310**	1	304.000	11.9685	409.000	16.1024	385.000	15.1575	1.000	0.0394	3.200	0.1260	6.400	0.2520	0.33	2.03	3.02	1.98
	10.2500	431.724	16.9970	148.433	5.8438	152.400	6.0000	3.600	0.1417	6.400	0.2520	2 180	3 360	355	**HM252348D/HM252315**	1	304.000	11.9685	418.000	16.4567	385.000	15.1575	4.000	0.1575	3.600	0.1417	6.400	0.2520	0.33	2.03	3.02	1.98
266.700	10.5000	355.600	14.0000	107.950	4.2500	109.538	4.3125	3.200	0.1260	1.600	0.0630	1 300	2 550	267	**LM451349D/LM451310**	1	285.000	11.2205	343.000	13.5039	332.000	13.0709	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.36	1.87	2.79	1.83
	10.5000	393.700	15.5000	130.175	5.1250	130.175	5.1250	6.400	0.2520	3.200	0.1260	1 590	3 090	325	**EE275106D/275155**	1	309.000	12.1654	374.000	14.7244	365.000	14.3701	5.000	0.1969	6.400	0.2520	3.200	0.1260	0.40	1.68	2.50	1.64

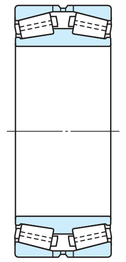
Note 1) SP indicates the specially chamfered from.

TDI type

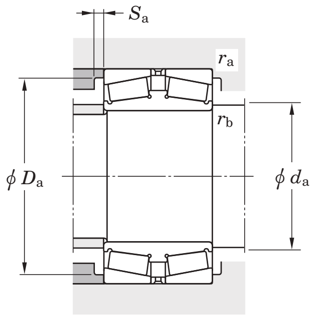
d 269.875 ~ 355.600 mm
10.6250 ~ 14.0000 inch



Design 1



Design 1-P

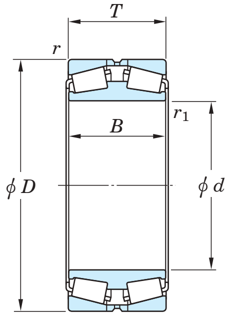


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions												Constant	Axial load factors		
d		D		B		T		$r^{1)}$ (min.)		$r_1{}^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (max.)		D_a (max.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b{}^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
269.875	10.6250	381.000	15.0000	136.525	5.3750	136.525	5.3750	3.200	0.1260	3.200	0.1260	1 840	3 350	349	**M252349D/M252310**	1	291.000	11.4567	368.000	14.4882	351.000	13.8189	6.000	0.2362	3.200	0.1260	3.200	0.1260	0.33	2.03	3.02	1.98
276.225	10.8750	393.700	15.5000	130.175	5.1250	130.175	5.1250	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275109D/275155**	1	309.000	12.1654	374.000	14.7244	365.000	14.3701	5.000	0.1969	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	10.8750	406.400	16.0000	122.240	4.8126	130.175	5.1250	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275109D/275160**	1	309.000	12.1654	387.000	15.2362	366.000	14.4094	9.000	0.3543	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
279.400	11.0000	393.700	15.5000	127.000	5.0000	127.000	5.0000	6.400	0.2520	1.600	0.0630	1 510	2 780	287	**EE135111D/135155**	1	305.000	12.0079	374.000	14.7244	361.000	14.2126	9.000	0.3543	6.400	0.2520	1.600	0.0630	0.38	1.77	2.64	1.73
	11.0000	457.200	18.0000	244.475	9.6250	244.475	9.6250	6.400	0.2520	1.600	0.0630	4 150	7 540	713	**HH255149D/HH255110**	1	315.000	12.4016	438.000	17.2441	407.000	16.0236	11.000	0.4331	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	11.0000	482.600	19.0000	177.800	7.0000	177.800	7.0000	4.800	0.1890	4.800	0.1890	2 660	3 980	399	**45T564818A**	1-P	309.000	12.1654	460.000	18.1102	424.000	16.6929	6.500	0.2559	4.800	0.1890	4.800	0.1890	0.80	0.85	1.26	0.83
279.578	11.0070	380.898	14.9960	117.475	4.6250	117.475	4.6250	3.200	0.1260	1.600	0.0630	1 420	2 820	286	**LM654644D/LM654610**	1	303.000	11.9291	368.000	14.4882	357.000	14.0551	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.43	1.57	2.34	1.53
285.750	11.2500	380.898	14.9960	117.475	4.6250	117.475	4.6250	3.200	0.1260	1.600	0.0630	1 420	2 820	286	**LM654648D/LM654610**	1	303.000	11.9291	368.000	14.4882	357.000	14.0551	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.43	1.57	2.34	1.53
288.925	11.3750	406.400	16.0000	144.463	5.6875	144.463	5.6875	3.200	0.1260	3.200	0.1260	2 160	4 420	445	**M255449D/M255410**	1	316.000	12.4409	394.000	15.5118	374.000	14.7244	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.34	2.00	2.97	1.95
292.100	11.5000	422.275	16.6250	130.175	5.1250	130.175	5.1250	3.200	0.1260	6.400	0.2520	1 980	3 410	358	**EE330116D/330166**	1	321.000	12.6378	409.000	16.1024	388.000	15.2756	7.000	0.2756	3.200	0.1260	6.400	0.2520	0.32	2.11	3.14	2.06
299.974	11.8100	438.048	17.2460	133.350	5.2500	134.938	5.3125	4.800	0.1890	3.200	0.1260	1 690	3 230	325	**EE129119D/129172**	1	339.000	13.3465	422.000	16.6142	401.000	15.7874	7.000	0.2756	4.800	0.1890	3.200	0.1260	0.40	1.68	2.50	1.64
300.038	11.8125	422.275	16.6250	150.813	5.9375	150.813	5.9375	3.200	0.1260	3.200	0.1260	2 130	4 030	409	**HM256849D/HM256810**	1	324.000	12.7559	408.000	16.0630	389.000	15.3150	7.000	0.2756	3.200	0.1260	3.200	0.1260	0.34	2.00	2.98	1.96
303.213	11.9375	495.300	19.5000	263.525	10.3750	263.525	10.3750	6.400	0.2520	3.200	0.1260	5 020	9 340	858	**HH258249D/HH258210**	1-P	342.000	13.4646	475.000	18.7008	442.000	17.4016	8.000	0.3150	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
304.648	11.9940	438.048	17.2460	131.763	5.1875	131.763	5.1875	3.200	0.1260	3.200	0.1260	1 890	3 450	350	**EE329117D/329172**	1	337.000	13.2677	424.000	16.6929	400.000	15.7480	10.000	0.3937	3.200	0.1260	3.200	0.1260	0.33	2.04	3.04	2.00
304.800	12.0000	419.100	16.5000	130.175	5.1250	130.175	5.1250	6.400	0.2520	1.600	0.0630	1 770	3 480	350	**M257149D/M257110**	1	331.000	13.0315	399.000	15.7087	388.000	15.2756	7.000	0.2756	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	12.0000	444.500	17.5000	111.125	4.3750	107.950	4.2500	1.600	0.0630	7.900	0.3110	1 550	2 760	288	**EE291200D/291750**	1	344.000	13.5433	434.000	17.0866	404.000	15.9055	11.000	0.4331	1.600	0.0630	7.900	0.3110	0.38	1.79	2.66	1.75
	12.0000	495.300	19.5000	171.450	6.7500	165.100	6.5000	6.400	0.2520	3.200	0.1260	2 740	4 680	461	**EE724121D/724195**	1	355.000	13.9764	475.000	18.7008	439.000	17.2835	6.000	0.2362	6.400	0.2520	3.200	0.1260	0.40	1.68	2.50	1.64
304.902	12.0040	412.648	16.2460	128.588	5.0625	128.588	5.0625	3.200	0.1260	3.200	0.1260	1 870	3 340	373	**M257248D/M257210**	1	330.000	12.9921	399.000	15.7087	386.000	15.1969	6.000	0.2362	3.200	0.1260	3.200	0.1260	0.32	2.12	3.15	2.07
305.003	12.0080	438.048	17.2460	133.350	5.2500	134.938	5.3125	4.800	0.1890	3.200	0.1260	1 690	3 230	325	**EE129123D/129172**	1	339.000	13.3465	421.000	16.5748	401.000	15.7874	7.000	0.2756	4.800	0.1890	3.200	0.1260	0.40	1.68	2.50	1.64
305.054	12.0100	499.948	19.6830	200.000	7.8740	200.000	7.8740	6.400	0.2520	3.200	0.1260	3 530	5 820	565	**HM858548D/HM858511**	1	343.000	13.5039	480.000	18.8976	447.000	17.5984	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.49	1.36	2.03	1.33
317.500	12.5000	447.675	17.6250	158.750	6.2500	158.750	6.2500	3.300	0.1299	1.600	0.0630	2 400	4 770	465	**HM259049D/HM259010**	1	346.000	13.6220	434.000	17.0866	412.000	16.2205	10.000	0.3937	3.300	0.1299	1.600	0.0630	0.33	2.02	3.00	1.97
333.375	13.1250	469.900	18.5000	166.688	6.5625	166.688	6.5625	3.200	0.1260	3.200	0.1260	2 900	5 680	548	**HM261049D/HM261010**	1-P	360.000	14.1732	456.000	17.9528	433.000	17.0472	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.33	2.02	3.00	1.97
342.900	13.5000	533.400	21.0000	139.690	5.4996	146.050	5.7500	3.200	0.1260	3.200	0.1260	2 350	3 580	362	**EE971355D/972100**	1	392.000	15.4331	520.000	20.4724	483.000	19.0157	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.33	2.03	3.02	1.98
	13.5000	533.400	21.0000	146.050	5.7500	139.690	5.4996	6.400	0.2520	6.400	0.2520	2 770	4 550	453	**45T695315A**	1	393.000	15.4724	505.000	19.8819	484.000	19.0551	11.000	0.4331	6.400	0.2520	6.400	0.2520	0.33	2.03	3.02	1.98
343.052	13.5060	457.098	17.9960	120.650	4.7500	120.650	4.7500	SP	SP	SP	SP	1 780	3 470	340	**45T694612**	1	363.000	14.2913	438.000	17.2441	425.000	16.7323	7.000	0.2756	2.000	0.0787	0.800	0.0315	0.47	1.43	2.12	1.40
346.075	13.6250	488.950	19.2500	174.625	6.8750	174.625	6.8750	3.200	0.1260	3.200	0.1260	2 890	5 800	553	**HM262749D/HM262710**	1	378.000	14.8819	475.000	18.7008	450.000	17.7165	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.33	2.02	3.00	1.97
347.663	13.6875	469.900	18.5000	138.113	5.4375	138.113	5.4375	3.200	0.1260	3.200	0.1260	2 240	4 520	439	**M262449D/M262410**	1	374.000	14.7244	456.000	17.9528	437.000	17.2047	9.000	0.3543	3.200	0.1260	3.200	0.1260	0.33	2.03	3.02	1.98
355.600	14.0000	444.500	17.5000	112.713	4.4375	114.300	4.5000	3.200	0.1260	1.600	0.0630	1 390	3 450	332	**L163149D/L163110**	1	377.000	14.8425	431.000	16.9685	418.000	16.4567	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.31	2.20	3.27	2.15
	14.0000	482.600	19.0000	133.350	5.2500	128.588	5.0625	3.200	0.1260	1.600	0.0630	1 910	3 510	346	**LM763449D/LM763410**	1	381.000	15.0000	469.000	18.4646	451.000	17.7559	4.000	0.1575	3.200	0.1260	1.600	0.0630	0.47	1.43	2.14	1.40
	14.0000	501.650	19.7500	127.000	5.0000	111.125	4.3750	3.200	0.1260	3.200	0.1260	1 700	3 280	322	**EE231401D/231975**	1	405.000	15.9449	488.000	19.2126	466.000	18.3465	2.000	0.0787	3.200	0.1260	3.200	0.1260	0.44	1.53	2.28	1.50

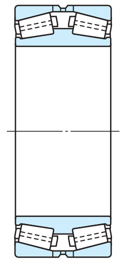
Note 1) SP indicates the specially chamfered from.

TDI type

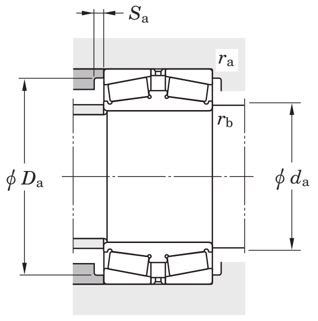
d 368.300 ～ 536.575 mm
14.5000 ～ 21.1250 inch



Design 1



Design 1-P

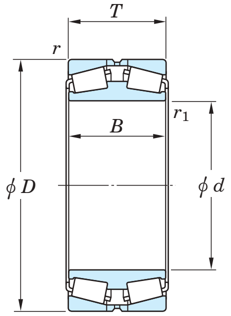


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions												Con-stant	Axial load factors		
d		*D*		*B*		*T*		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (max.)		D_a (max.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
368.300	14.5000	523.875	20.6250	185.738	7.3125	185.738	7.3125	6.400	0.2520	3.200	0.1260	3 420	6 780	644	**HM265049D/HM265010**	1-P	403.000	15.8661	500.000	19.6850	484.000	19.0551	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	14.5000	609.600	24.0000	254.000	10.0000	279.400	11.0000	6.400	0.2520	3.200	0.1260	5 420	9 060	813	**EE321146D/321240**	1	416.000	16.3780	585.000	23.0315	545.000	21.4567	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.36	1.90	2.83	1.86
374.574	14.7470	546.100	21.5000	193.675	7.6250	193.675	7.6250	6.400	0.2520	3.200	0.1260	4 090	8 430	773	**HM266445D/HM266410**	1-P	418.000	16.4567	525.000	20.6693	505.000	19.8819	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
384.175	15.1250	546.100	21.5000	193.675	7.6250	193.675	7.6250	6.400	0.2520	3.200	0.1260	4 090	8 430	773	**HM266449D/HM266410**	1-P	418.000	16.4567	525.000	20.6693	505.000	19.8819	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
393.700	15.5000	546.100	21.5000	141.288	5.5625	120.650	4.7500	6.400	0.2520	3.200	0.1260	1 860	3 810	357	**EE234157D/234215**	1	437.000	17.2047	525.000	20.6693	497.600	19.5906	1.000	0.0394	6.400	0.2520	3.200	0.1260	0.48	1.42	2.11	1.39
	15.5000	546.100	21.5000	138.113	5.4375	138.113	5.4375	6.400	0.2520	1.600	0.0630	2 300	4 700	445	**LM767745D/LM767710**	1	435.000	17.1260	525.000	20.6693	510.000	20.0787	9.000	0.3543	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
400.000	15.7480	650.000	25.5906	250.000	9.8425	250.000	9.8425	SP	SP	SP	SP	5 860	9 790	868	**45T806525**	1-P	460.000	18.1102	620.000	24.4094	585.000	23.0315	13.000	0.5118	5.000	0.1969	5.000	0.1969	0.39	1.74	2.59	1.70
406.400	16.0000	546.100	21.5000	141.288	5.5625	120.650	4.7500	6.400	0.2520	1.600	0.0630	1 860	3 810	357	**EE234161D/234215**	1	437.000	17.2047	520.000	20.4724	497.600	19.5906	1.000	0.0394	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
	16.0000	546.100	21.5000	138.113	5.4375	138.113	5.4375	6.400	0.2520	1.600	0.0630	2 300	4 700	445	**LM767749D/LM767710**	1	435.000	17.1260	520.000	20.4724	510.000	20.0787	9.000	0.3543	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
415.925	16.3750	590.550	23.2500	209.550	8.2500	209.550	8.2500	6.400	0.2520	3.200	0.1260	4 240	8 930	803	**M268749D/M268710**	1-P	456.000	17.9528	565.000	22.2441	545.000	21.4567	9.000	0.3543	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	16.3750	590.550	23.2500	209.550	8.2500	209.550	8.2500	6.400	0.2520	3.200	0.1260	4 590	9 070	818	**45T835921A**	1-P	451.000	17.7559	562.000	22.1260	548.000	21.5748	12.000	0.4724	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
419.227	16.5050	736.448	28.9940	406.400	16.0000	406.400	16.0000	6.400	0.2520	6.400	0.2520	10 900	19 000	1 540	**EE323166D/323290**	1-P	480.100	18.9016	710.000	27.9528	655.000	25.7874	9.000	0.3543	6.400	0.2520	6.400	0.2520	0.37	1.80	2.69	1.76
431.800	17.0000	635.000	25.0000	173.038	6.8125	173.038	6.8125	6.400	0.2520	6.400	0.2520	3 960	6 870	647	**EE931170D/931250**	1-P	482.000	18.9764	610.000	24.0157	585.000	23.0315	8.000	0.3150	6.400	0.2520	6.400	0.2520	0.32	2.10	3.13	2.06
431.902	17.0040	685.698	26.9960	254.000	10.0000	253.873	9.9950	6.400	0.2520	3.200	0.1260	6 420	11 600	1 000	**EE328172D/328269**	1-P	484.000	19.0551	660.000	25.9843	620.000	24.4094	11.000	0.4331	6.400	0.2520	3.200	0.1260	0.40	1.68	2.50	1.64
432.003	17.0080	609.524	23.9970	152.400	6.0000	152.400	6.0000	6.400	0.2520	3.600	0.1417	3 260	6 060	567	**EE736173D/736238**	1	473.000	18.6220	585.000	23.0315	565.000	22.2441	8.000	0.3150	6.400	0.2520	3.600	0.1417	0.35	1.95	2.90	1.91
447.675	17.6250	635.000	25.0000	223.838	8.8125	223.838	8.8125	6.400	0.2520	3.200	0.1260	4 920	10 500	917	**M270748D/M270710**	1-P	491.000	19.3307	610.000	24.0157	585.000	23.0315	8.000	0.3150	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	17.6250	635.000	25.0000	223.838	8.8125	223.838	8.8125	6.400	0.2520	3.200	0.1260	4 920	10 500	917	**M270749D/M270710**	1-P	491.000	19.3307	610.000	24.0157	585.000	23.0315	8.000	0.3150	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
457.200	18.0000	596.900	23.5000	133.350	5.2500	130.175	5.1250	3.200	0.1260	1.600	0.0630	2 410	5 230	486	**EE244181D/244235**	1	488.000	19.2126	580.000	22.8346	555.000	21.8504	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.40	1.67	2.48	1.63
	18.0000	596.900	23.5000	136.525	5.3750	133.350	5.2500	3.200	0.1260	1.600	0.0630	2 420	5 110	476	**L770849D/L770810**	1	488.000	19.2126	580.000	22.8346	560.000	22.0472	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.47	1.43	2.12	1.40
	18.0000	660.400	26.0000	155.572	6.1249	155.575	6.1250	6.400	0.2520	3.200	0.1260	2 900	5 260	482	**EE737179D/737260**	1	500.000	19.6850	635.000	25.0000	600.000	23.6220	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.37	1.80	2.69	1.76
479.425	18.8750	679.450	26.7500	238.125	9.3750	238.125	9.3750	6.400	0.2520	3.200	0.1260	5 200	10 800	924	**57567**	1	520.000	20.4724	655.000	25.7874	630.000	24.8031	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	18.8750	679.450	26.7500	238.125	9.3750	238.125	9.3750	6.400	0.2520	3.200	0.1260	5 310	11 100	952	**M272749D/M272710**	1-P	520.000	20.4724	655.000	25.7874	630.000	24.8031	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	18.8750	679.450	26.7500	238.125	9.3750	238.125	9.3750	6.400	0.2520	4.600	0.1811	5 740	11 600	1 000	**45T966824**	1-P	522.000	20.5512	651.000	25.6299	629.000	24.7638	12.500	0.4921	6.400	0.2520	SP	SP	0.33	2.03	3.02	1.98
482.600	19.0000	615.950	24.2500	158.750	6.2500	158.750	6.2500	6.400	0.2520	3.200	0.1260	3 040	7 110	639	**LM272249D/LM272210**	1	510.000	20.0787	590.000	23.2283	585.000	23.0315	8.000	0.3150	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
489.026	19.2530	634.873	24.9950	153.988	6.0625	153.988	6.0625	3.200	0.1260	3.200	0.1260	3 090	6 840	613	**LM772749D/LM772710**	1	510.000	20.0787	620.000	24.4094	595.000	23.4252	9.000	0.3543	3.200	0.1260	3.200	0.1260	0.47	1.43	2.12	1.40
501.650	19.7500	711.200	28.0000	250.825	9.8750	250.825	9.8750	6.400	0.2520	3.200	0.1260	5 890	12 400	1 040	**2TR502**	1	515.000	20.2756	683.000	26.8898	656.000	25.8268	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	19.7500	711.200	28.0000	250.825	9.8750	250.825	9.8750	6.400	0.2520	3.200	0.1260	6 150	12 800	1 100	**M274149D/M274110**	1-P	545.000	21.4567	685.000	26.9685	655.000	25.7874	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
508.000	20.0000	762.000	30.0000	219.075	8.6250	219.075	8.6250	6.400	0.2520	6.400	0.2520	5 690	9 970	888	**EE531201D/531300**	1-P	560.000	22.0472	740.000	29.1339	695.000	27.3622	11.000	0.4331	6.400	0.2520	6.400	0.2520	0.38	1.78	2.65	1.74
	20.0000	838.200	33.0000	266.700	10.5000	266.700	10.5000	9.500	0.3740	6.400	0.2520	7 160	11 700	1 000	**EE426201D/426330**	1-P	580.000	22.8346	810.000	31.8898	755.000	29.7244	7.000	0.2756	9.500	0.3740	6.400	0.2520	0.48	1.41	2.10	1.38
519.113	20.4375	736.600	29.0000	258.763	10.1875	258.763	10.1875	6.400	0.2520	3.200	0.1260	6 630	13 600	1 140	**M275349D/M275310**	1-P	560.000	22.0472	710.000	27.9528	680.000	26.7717	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
536.575	21.1250	761.873	29.9950	269.875	10.6250	269.875	10.6250	6.400	0.2520	3.200	0.1260	7 050	14 400	1 190	**M276449D/M276410**	1-P	575.000	22.6378	740.000	29.1339	700.000	27.5591	9.000	0.3543	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	21.1250	761.873	29.9950	269.875	10.6250	269.875	10.6250	6.400	0.2520	3.200	0.1260	6 520	1 300	1 090	**2TR537**	1-P	578.000	22.7559	733.000	28.8583	700.000	27.5591	1.500	0.0591	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98

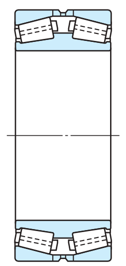
Note 1) SP indicates the specially chamfered from.

TDI type

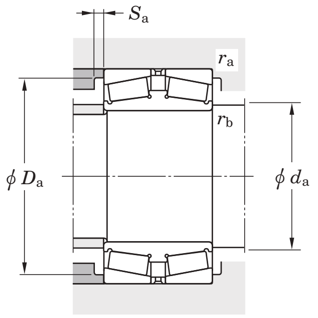
d 555.625 ～ 939.800 mm
21.8750 ～ 37.0000 inch



Design 1



Design 1-P



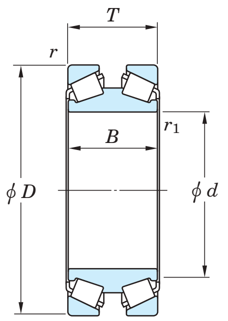
Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions												Con-stant	Axial load factors		
d		*D*		*B*		*T*		*r*1) (min.)		*r*₁1) (min.)		C_r	C_{0r}	C_u			d_a (max.)		D_a (max.)		D_a (min.)		S_a (min.)		r_a (max.)		r_b1) (max.)		*e*	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
555.625	21.8750	698.500	27.5000	165.100	6.5000	165.100	6.5000	6.400	0.2520	3.200	0.1260	3 580	8 510	737	**2TR555**	1-P	569.000	22.4016	670.000	26.3780	662.000	26.0630	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
558.800	22.0000	736.600	29.0000	196.850	7.7500	196.850	7.7500	6.400	0.2520	3.200	0.1260	4 500	9 870	854	**LM377449D/LM377410**	1-P	595.000	23.4252	710.000	27.9528	690.000	27.1654	9.000	0.3543	6.400	0.2520	3.200	0.1260	0.35	1.95	2.90	1.91
	22.0000	736.600	29.0000	196.850	7.7500	196.850	7.7500	6.400	0.2520	3.200	0.1260	4 800	10 800	923	**2TR559J**	1-P	595.000	23.4252	708.000	27.8740	689.000	27.1260	10.500	0.4134	6.400	0.2520	3.200	0.1260	0.35	1.95	2.90	1.91
571.500	22.5000	812.800	32.0000	285.750	11.2500	285.750	11.2500	6.400	0.2520	3.200	0.1260	8 150	17 500	1 400	**M278749D/M278710**	1-P	620.000	24.4094	790.000	31.1024	750.000	29.5276	11.000	0.4331	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	22.5000	812.800	32.0000	285.750	11.2500	285.750	11.2500	6.400	0.2520	3.200	0.1260	7 190	16 300	1 300	**2TR572C**	1	629.000	24.7638	784.000	30.8661	743.000	29.2520	6.500	0.2559	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
595.313	23.4375	844.550	33.2500	296.863	11.6875	296.863	11.6875	6.400	0.2520	3.200	0.1260	8 500	18 500	1 460	**M280049D/M280010**	1-P	650.000	25.5906	820.000	32.2835	785.000	30.9055	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
609.600	24.0000	787.400	31.0000	171.450	6.7500	171.450	6.7500	6.400	0.2520	3.200	0.1260	4 260	9 940	840	**EE649241D/649310**	1-P	645.000	25.3937	760.000	29.9213	740.000	29.1339	12.000	0.4724	6.400	0.2520	3.200	0.1260	0.37	1.82	2.70	1.78
635.000	25.0000	901.700	35.5000	317.500	12.5000	317.500	12.5000	6.400	0.2520	3.200	0.1260	9 370	19 900	1 540	**M281049D/M281010**	1-P	690.000	27.1654	870.000	34.2520	840.000	33.0709	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
	25.0000	939.800	37.0000	304.800	12.0000	304.800	12.0000	6.500	0.2559	4.000	0.1575	9 890	19 800	1 540	**2TR635D**	1-P	653.000	25.7087	911.000	35.8661	863.000	33.9764	16.000	0.6299	5.000	0.1969	3.000	0.1181	0.33	2.03	3.02	1.98
	25.0000	939.800	37.0000	304.800	12.0000	304.800	12.0000	6.500	0.2559	4.000	0.1575	9 890	19 800	1 540	**2TR635D**	1-P	710.000	27.9528	911.000	35.8661	863.000	33.9764	15.500	0.6102	6.500	0.2559	4.000	0.1575	0.33	2.03	3.02	1.98
682.625	26.8750	965.200	38.0000	338.138	13.3125	338.138	13.3125	6.400	0.2520	3.200	0.1260	11 500	25 400	1 910	**2TR683**	1-P	744.000	29.2913	937.000	36.8898	894.000	35.1969	15.500	0.6102	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
685.800	27.0000	876.300	34.5000	171.450	6.7500	168.275	6.6250	6.400	0.2520	3.200	0.1260	4 400	10 800	880	**EE655271D/655345**	1-P	730.000	28.7402	850.000	33.4646	830.000	32.6772	9.000	0.3543	6.400	0.2520	3.200	0.1260	0.42	1.62	2.42	1.59
711.200	28.0000	914.400	36.0000	149.225	5.8750	149.225	5.8750	6.400	0.2520	3.200	0.1260	3 780	8 930	747	**EE755281D/755360**	1-P	770.000	30.3150	890.000	35.0394	870.000	34.2520	8.000	0.3150	6.400	0.2520	3.200	0.1260	0.38	1.78	2.65	1.74
714.375	28.1250	1 016.000	40.0000	339.725	13.3750	339.725	13.3750	6.400	0.2520	3.200	0.1260	12 200	26 100	1 940	**M383240D/M383210**	1-P	775.000	30.5118	990.000	38.9764	940.000	37.0079	14.000	0.5512	6.400	0.2520	3.200	0.1260	0.35	1.92	2.86	1.88
730.250	28.7500	1 035.050	40.7500	365.125	14.3750	365.125	14.3750	6.400	0.2520	3.200	0.1260	12 300	27 100	2 000	**M283449D/M283410**	1-P	790.000	31.1024	1 010.000	39.7638	960.000	37.7953	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
749.300	29.5000	990.600	39.0000	293.000	11.5354	293.000	11.5354	6.400	0.2520	3.200	0.1260	9 820	23 900	1 780	**LM283649D/LM283610**	1-P	800.000	31.4961	960.000	37.7953	930.000	36.6142	12.000	0.4724	6.400	0.2520	3.200	0.1260	0.32	2.12	3.15	2.07
762.000	30.0000	1 079.500	42.5000	381.000	15.0000	381.000	15.0000	12.700	0.5000	4.800	0.1890	13 900	31 300	2 270	**M284249D/M284210**	1-P	830.000	32.6772	1 040.000	40.9449	1 000.000	39.3701	11.000	0.4331	12.700	0.5000	4.800	0.1890	0.33	2.03	3.02	1.98
825.500	32.5000	1 168.400	46.0000	409.575	16.1250	409.575	16.1250	12.700	0.5000	4.800	0.1890	16 300	36 200	2 550	**M285848D/M285810**	1-P	890.000	35.0394	1 130.000	44.4882	1 090.000	42.9134	15.000	0.5906	12.700	0.5000	4.800	0.1890	0.33	2.03	3.02	1.98
863.600	34.0000	1 130.300	44.5000	323.850	12.7500	323.850	12.7500	12.700	0.5000	4.800	0.1890	12 000	29 800	2 130	**LM286249D/LM286210**	1-P	920.000	36.2205	1 090.000	42.9134	1 070.000	42.1260	15.000	0.5906	12.700	0.5000	4.800	0.1890	0.32	2.08	3.10	2.04
	34.0000	1 219.200	48.0000	438.150	17.2500	425.450	16.7500	12.700	0.5000	4.800	0.1890	17 900	42 300	2 910	**EE547341D/547480**	1-P	940.000	37.0079	1 180.000	46.4567	1 130.000	44.4882	9.000	0.3543	12.700	0.5000	4.800	0.1890	0.33	2.03	3.02	1.98
939.800	37.0000	1 333.500	52.5000	463.550	18.2500	463.550	18.2500	12.700	0.5000	4.800	0.1890	21 000	47 700	3 210	**LM287849D/LM287810**	1-P	1 020.000	40.1575	1 290.000	50.7874	1 240.000	48.8189	15.000	0.5906	12.700	0.5000	4.800	0.1890	0.33	2.03	3.02	1.98

Note 1) SP indicates the specially chamfered from.

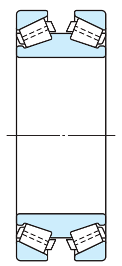
TDIS type

d 228.600 ~ 685.800 mm

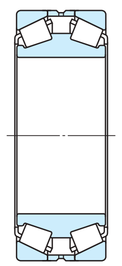
9.0000 ~ 27.0000 inch



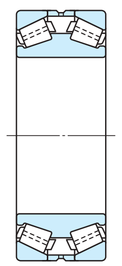
Design 1



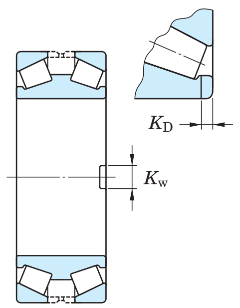
Design 1-P



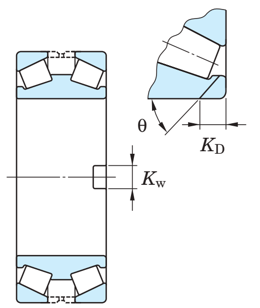
Design 2



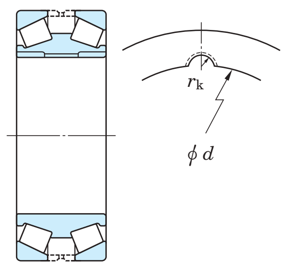
Design 2-P



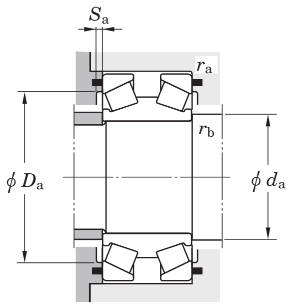
Face key way : A



Face key way : B



Bore key way : C



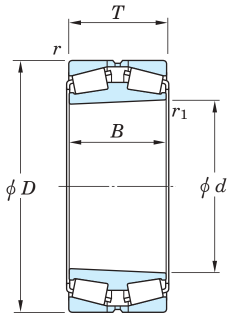
Boundary dimensions						Radial Basic load ratings (kN)		Radial Fatigue load limit (kN)	Axial Basic load ratings (kN)		Axial Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions						Face key way					Bore key way	Constant	Axial load factors		
d mm inch	D mm inch	B mm inch	T mm inch	$r^{1)}$ (min.) mm inch	$r_1^{1)}$ (min.) mm inch	C_r	C_{0r}	C_u	C_r	C_{0r}	C_u			d_a (max.) mm inch	D_a (max.) mm inch	D_a (min.) mm inch	S_a (min.) mm inch	r_a (max.) mm inch	r_b (max.) mm inch	Type	K_w mm inch	K_D mm inch	θ deg	qty×Position	R_k mm inch	e	Y_2	Y_3	Y_0
228.600 9.0000	431.800 17.0000	177.800 7.0000	177.800 7.0000	6.000 0.2362	SP SP	2 440	3 400	348	2 140	4 530	467	**45T464318A-1**	2-P	259.000 10.1969	377.000 14.8425	342.000 13.4646	8.500 0.3346	5.000 0.1969	5.000 0.1969	A	35 1.3780	15 0.5906	—	1×2	—	0.88	0.76	1.14	0.75
260.350 10.2500	419.100 16.5000	155.575 6.1250	158.750 6.2500	3.200 0.1260	3.200 0.1260	2 210	3 710	378	1 320	3 370	344	**45T524216**	2	291.000 11.4567	374.000 14.7244	349.000 13.7402	7.500 0.2953	3.000 0.1181	3.000 0.1181	B	40.2 1.5827	18 0.7087	45	1×2	—	0.60	1.12	1.67	1.10
273.050 10.7500	393.700 15.5000	130.175 5.1250	130.175 5.1250	6.400 0.2520	1.600 0.0630	1 480	2 760	281	1 030	2 930	298	**45T553913**	2	292.000 11.4961	359.000 14.1339	337.000 13.2677	7.500 0.2953	5.000 0.1969	1.500 0.0591	—	—	—	—	—	—	0.70	0.97	1.44	0.94
279.400 11.0000	482.600 19.0000	177.800 7.0000	177.800 7.0000	4.800 0.1890	4.800 0.1890	2 660	3 980	399	2 110	4 800	482	**45T564818B**	1-P	310.000 12.2047	424.000 16.6929	392.000 15.4331	6.500 0.2559	4.000 0.1575	4.000 0.1575	A	40 1.5748	12 0.4724	—	1×2	—	0.80	0.85	1.26	0.83
365.600 14.3937	514.350 20.2500	140.000 5.5118	140.000 5.5118	4.000 0.1575	SP SP	1 740	3 730	348	1 500	4 910	456	**45T735114A**	1	394.000 15.5118	457.000 17.9921	428.000 16.8504	5.500 0.2165	3.000 0.1181	2.500 0.0984	B	40 1.5748	20 0.7874	45	2×2	—	0.87	0.78	1.16	0.76
374.650 14.7500	501.650 19.7500	120.650 4.7500	130.175 5.1250	6.000 0.2362	3.300 0.1299	1 590	3 160	303	1 370	4 160	397	**45T755013A**	1	399.000 15.7087	463.000 18.2283	436.000 17.1654	2.500 0.0984	5.000 0.1969	3.000 0.1181	B	50 1.9685	10 0.3937	—	1×2	—	0.87	0.78	1.16	0.76
406.400 16.0000	546.100 21.5000	138.112 5.4375	138.112 5.4375	6.400 0.2520	SP SP	1 870	3 920	368	1 610	5 160	482	**45T815514**	1	436.000 17.1654	502.000 19.7638	474.000 18.6614	5.000 0.1969	5.000 0.1969	3.000 0.1181	A	50 1.9685	11 0.4331	—	1×2	—	0.87	0.78	1.16	0.76
482.600 19.0000	733.501 28.8780	200.025 7.8750	200.000 7.8740	6.400 0.2520	6.400 0.2520	3 690	7 100	611	4 000	11 600	1 010	**45T977320C**	1-P	513.000 20.1969	651.000 25.6299	603.000 23.7402	5.000 0.1969	5.000 0.1969	5.000 0.1969	B+C	50.8 2.0000	38.1 1.5000	45	2×2	8.05 0.3169	1.09	0.62	0.92	0.61
482.600 19.0000	733.501 28.8780	200.025 7.8750	200.000 7.8740	17.500 0.6890	6.400 0.2520	3 690	7 100	611	4 000	11 600	1 010	**45T977320D**	1-P	513.000 20.1969	651.000 25.6299	603.000 23.7402	5.000 0.1969	10.000 0.3937	5.000 0.1969	A	50.8 2.0000	19.05 0.7500	—	2×2	—	1.09	0.62	0.92	0.61
482.600 19.0000	733.501 28.8780	200.025 7.8750	200.000 7.8740	17.500 0.6890	6.400 0.2520	3 690	7 100	611	4 000	11 600	1 010	**45T977320J**	1-P	513.000 20.1969	651.000 25.6299	603.000 23.7402	5.000 0.1969	10.000 0.3937	5.000 0.1969	A	50.8 2.0000	19.05 0.7500	—	1×2	—	1.09	0.62	0.92	0.61
509.998 20.0787	733.500 28.8780	200.020 7.8748	200.020 7.8748	5.000 0.1969	6.000 0.2362	4 030	8 000	696	3 270	9 880	859	**2TR510L-1**	1-P	560.000 22.0472	667.000 26.2598	630.000 24.8031	3.500 0.1378	4.000 0.1575	5.000 0.1969	B	50.8 2.0000	38.1 1.5000	45	2×2	—	0.81	0.83	1.23	0.81
660.000 25.9843	814.000 32.0472	176.212 6.9375	176.212 6.9375	6.400 0.2520	SP SP	3 280	8 780	709	2 280	9 340	752	**2TR660C**	1	686.000 27.0079	766.000 30.1575	735.000 28.9370	5.000 0.1969	5.000 0.1969	2.500 0.0984	B	50 1.9685	20 0.7874	45	1×2	—	0.70	0.97	1.44	0.94
685.800 27.0000	939.800 37.0000	235.000 9.2520	228.600 9.0000	SP SP	SP SP	6 160	12 800	1 030	4 690	14 900	1 190	**2TR686A**	1-P	730.000 28.7402	868.000 34.1732	827.000 32.5591	8.500 0.3346	1.000 0.0394	3.000 0.1181	B	63.6 2.5039	38.5 1.5157	45	1×2	—	0.76	0.88	1.31	0.86
685.800 27.0000	939.800 37.0000	234.950 9.2500	227.810 8.9689	6.400 0.2520	SP SP	5 500	13 000	1 020	4 740	17 200	1 340	**2TR686C**	1-P	745.000 29.3307	865.000 34.0551	819.000 32.2441	6.500 0.2559	5.000 0.1969	3.000 0.1181	B	80 3.1496	38.1 1.5000	45	2×2	—	0.87	0.78	1.16	0.76

Note 1) SP indicates the specially chamfered from.

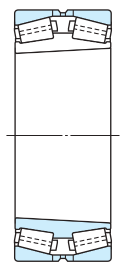
TDIT type

d **127.000 ~ 406.400 mm**

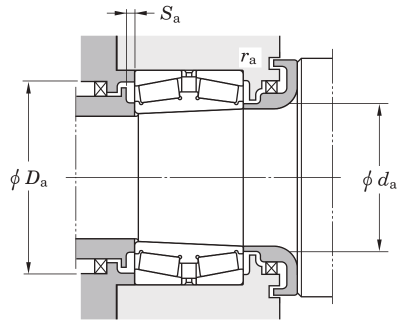
5.0000 ~ 16.0000 inch



Design 1



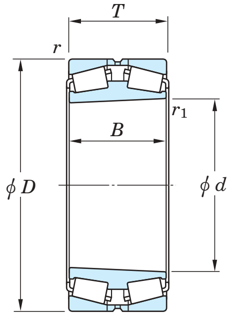
Design 1-P



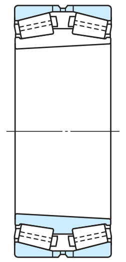
Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions												Con-stant	Axial load factors		
d		D		B		T		r (min.)		r_1 (min.)		C_r	C_{0r}	C_u			d_a (max.)		D_a (max.)		D_a (min.)		S_a (min.)		r_a (max.)		r_b (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
127.000	5.0000	182.563	7.1875	76.200	3.0000	76.200	3.0000	3.200	0.1260	1.600	0.0630	487	858	120	**48290TD/48220**	1	141.000	5.5512	171.000	6.7323	166.000	6.5354	3.800	0.1496	3.200	0.1260	1.600	0.0630	0.31	2.21	3.29	2.16
133.350	5.2500	196.850	7.7500	92.075	3.6250	92.075	3.6250	3.200	0.1260	1.600	0.0630	669	1 120	137	**67390TD/67322**	1	146.000	5.7480	185.000	7.2835	180.000	7.0866	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.34	1.96	2.92	1.92
136.525	5.3750	215.900	8.5000	123.825	4.8750	123.825	4.8750	3.200	0.1260	1.600	0.0630	691	1 100	132	**74539TD/74850**	1	154.000	6.0630	204.000	8.0315	193.000	7.5984	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.49	1.38	2.06	1.35
142.875	5.6250	200.025	7.8750	74.613	2.9375	77.788	3.0625	3.300	0.1299	0.800	0.0315	527	982	133	**48685TD/48620**	1	156.000	6.1417	188.000	7.4016	182.000	7.1654	4.000	0.1575	3.300	0.1299	0.800	0.0315	0.34	2.01	2.99	1.96
147.638	5.8125	241.300	9.5000	132.334	5.2100	133.351	5.2500	3.200	0.1260	1.600	0.0630	904	1 460	171	**82581TD/82950**	1	166.000	6.5354	229.000	9.0157	211.000	8.3071	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.44	1.53	2.27	1.49
152.400	6.0000	254.000	10.0000	120.650	4.7500	120.650	4.7500	3.200	0.1260	1.600	0.0630	1 180	1 830	215	**99600TD/99100**	1	172.000	6.7717	242.000	9.5276	223.000	8.7795	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.41	1.66	2.47	1.62
165.100	6.5000	269.875	10.6250	146.050	5.7500	146.050	5.7500	3.200	0.1260	1.600	0.0630	1 430	2 220	252	**H234649TD/H234610**	1	187.000	7.3622	258.000	10.1575	243.000	9.5669	5.000	0.1969	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
180.975	7.1250	288.925	11.3750	158.750	6.2500	158.750	6.2500	3.200	0.1260	1.600	0.0630	1 180	1 920	216	**94713TD/94113**	1	201.000	7.9134	277.000	10.9055	255.000	10.0394	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.47	1.44	2.15	1.41
	7.1250	288.925	11.3750	158.750	6.2500	158.750	6.2500	3.200	0.1260	1.600	0.0630	1 430	1 950	245	**HM237549TD/HM237510**	1	201.000	7.9134	277.000	10.9055	260.000	10.2362	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.32	2.12	3.15	2.07
190.500	7.5000	365.049	14.3720	152.400	6.0000	158.750	6.2500	3.200	0.1260	3.200	0.1260	2 020	2 920	319	**EE420750TD/421437**	1	239.000	9.4094	353.000	13.8976	317.000	12.4803	6.000	0.2362	3.200	0.1260	3.200	0.1260	0.40	1.68	2.50	1.64
198.438	7.8125	282.575	11.1250	87.313	3.4375	87.313	3.4375	3.200	0.1260	0.800	0.0315	749	1 410	155	**67980TD/67920**	1	220.000	8.6614	271.000	10.6693	259.000	10.1969	7.000	0.2756	3.200	0.1260	0.800	0.0315	0.51	1.33	1.97	1.30
209.550	8.2500	317.500	12.5000	184.150	7.2500	184.150	7.2500	3.200	0.1260	1.600	0.0630	1 300	2 270	244	**93826TD/93125**	1	223.000	8.7795	306.000	12.0472	278.000	10.9449	7.000	0.2756	3.200	0.1260	1.600	0.0630	0.52	1.29	1.92	1.26
219.075	8.6250	358.775	14.1250	200.025	7.8750	196.850	7.7500	6.400	0.2520	1.600	0.0630	2 660	4 580	469	**H244848TD/H244810**	1	245.000	9.6457	340.000	13.3858	319.000	12.5591	9.000	0.3543	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
222.250	8.7500	355.600	14.0000	130.175	5.1250	127.000	5.0000	3.200	0.1260	1.600	0.0630	1 410	2 630	278	**96876TD/96140**	1	253.000	9.9606	343.000	13.5039	312.000	12.2835	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.59	1.14	1.70	1.12
252.413	9.9375	358.775	14.1250	139.700	5.5000	130.175	5.1250	3.200	0.1260	1.600	0.0630	1 660	3 170	333	**M249746TD/M249710**	1	275.000	10.8268	346.000	13.6220	330.000	12.9921	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
263.525	10.3750	400.050	15.7500	192.088	7.5625	196.848	7.7499	6.400	0.2520	1.600	0.0630	1 630	2 570	274	**EE221039TD/221575**	1	292.000	11.4961	381.000	15.0000	359.000	14.1339	6.000	0.2362	6.400	0.2520	1.600	0.0630	0.39	1.71	2.54	1.67
266.700	10.5000	355.600	14.0000	109.538	4.3125	107.950	4.2500	3.200	0.1260	1.600	0.0630	1 300	2 550	267	**LM451349TD/LM451310**	1	285.000	11.2205	343.000	13.5039	332.000	13.0709	8.000	0.3150	3.200	0.1260	1.600	0.0630	0.36	1.87	2.79	1.83
280.000	11.0236	406.400	16.0000	206.375	8.1250	206.375	8.1250	3.200	0.1260	3.200	0.1260	1 650	2 950	307	**EE128113TD/128160**	1	308.000	12.1260	394.000	15.5118	368.000	14.4882	7.000	0.2756	3.200	0.1260	3.200	0.1260	0.39	1.75	2.61	1.71
288.925	11.3750	406.400	16.0000	144.463	5.6875	144.463	5.6875	3.200	0.1260	3.200	0.1260	2 160	4 420	445	**M255449TD/M255410**	1	316.000	12.4409	394.000	15.5118	373.000	14.6850	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.34	2.00	2.97	1.95
303.213	11.9375	495.300	19.5000	263.525	10.3750	263.525	10.3750	6.400	0.2520	3.200	0.1260	5 020	9 340	858	**HH258249TD/HH258210**	1-P	342.000	13.4646	476.000	18.7402	441.000	17.3622	8.000	0.3150	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
333.375	13.1250	469.900	18.5000	166.688	6.5625	166.688	6.5625	3.200	0.1260	3.200	0.1260	2 900	5 680	548	**HM261049TD/HM261010**	1-P	360.000	14.1732	456.000	17.9528	432.000	17.0079	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.33	2.02	3.00	1.97
	13.1250	523.875	20.6250	185.738	7.3125	185.738	7.3125	6.400	0.2520	3.200	0.1260	3 420	6 780	644	**HM265032TD/HM265010**	1-P	403.000	15.8661	500.000	19.6850	483.000	19.0157	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
344.091	13.5469	488.950	19.2500	184.150	7.2500	174.625	6.8750	3.200	0.1260	3.200	0.1260	2 890	5 800	553	**HM262746TD/HM262710**	1	376.000	14.8031	475.000	18.7008	450.000	17.7165	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.33	2.02	3.00	1.97
346.075	13.6250	488.950	19.2500	174.625	6.8750	174.625	6.8750	3.200	0.1260	3.200	0.1260	2 890	5 800	553	**HM262749TD/HM262710**	1	378.000	14.8819	475.000	18.7008	450.000	17.7165	8.000	0.3150	3.200	0.1260	3.200	0.1260	0.33	2.02	3.00	1.97
368.300	14.5000	523.875	20.6250	185.738	7.3125	185.738	7.3125	6.400	0.2520	3.200	0.1260	3 420	6 780	644	**HM265049TD/HM265010**	1-P	403.000	15.8661	500.000	19.6850	483.000	19.0157	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
384.175	15.1250	546.100	21.5000	193.675	7.6250	193.675	7.6250	6.400	0.2520	3.200	0.1260	4 090	8 430	773	**HM266449TD/HM266410**	1-P	418.000	16.4567	525.000	20.6693	505.000	19.8819	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
406.400	16.0000	590.550	23.2500	209.550	8.2500	209.550	8.2500	6.400	0.2520	3.200	0.1260	4 240	8 930	803	**M268743TD/M268710**	1-P	456.000	17.9528	570.000	22.4409	545.000	21.4567	9.000	0.3543	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98

TDIT type

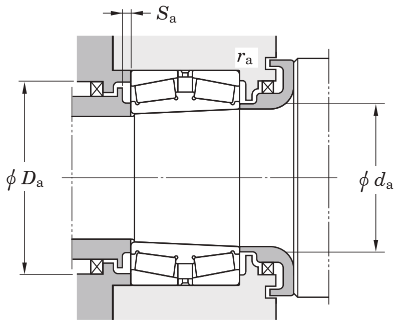
d 415.925 ~ 519.113 mm
16.3750 ~ 20.4375 inch



Design 1



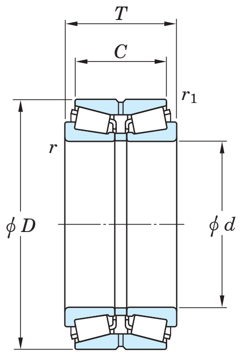
Design 1-P



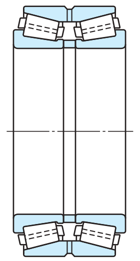
Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions												Con-stant	Axial load factors		
d		D		B		T		r (min.)		r_1 (min.)		C_r	C_{0r}	C_u			d_a (max.)		D_a (max.)		D_a (min.)		S_a (min.)		r_a (max.)		r_b (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
415.925	16.3750	590.550	23.2500	209.550	8.2500	209.550	8.2500	6.400	0.2520	3.200	0.1260	4 240	8 930	803	**M268749TD/M268710**	1-P	456.000	17.9528	570.000	22.4409	545.000	21.4567	9.000	0.3543	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
447.675	17.6250	635.000	25.0000	223.838	8.8125	223.838	8.8125	6.400	0.2520	3.200	0.1260	4 920	10 500	917	**M270749TD/M270710**	1-P	491.000	19.3307	610.000	24.0157	585.000	23.0315	8.000	0.3150	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
479.425	18.8750	679.450	26.7500	238.125	9.3750	238.125	9.3750	6.400	0.2520	3.200	0.1260	5 310	11 100	952	**M272749TD/M272710**	1-P	520.000	20.4724	655.000	25.7874	630.000	24.8031	7.000	0.2756	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
501.650	19.7500	711.200	28.0000	250.825	9.8750	250.825	9.8750	6.400	0.2520	3.200	0.1260	6 150	12 800	1 100	**M274149TD/M274110**	1-P	545.000	21.4567	690.000	27.1654	655.000	25.7874	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98
519.113	20.4375	736.600	29.0000	258.763	10.1875	258.763	10.1875	6.400	0.2520	3.200	0.1260	6 630	13 600	1 140	**M275349TD/M275310**	1-P	560.000	22.0472	710.000	27.9528	680.000	26.7717	10.000	0.3937	6.400	0.2520	3.200	0.1260	0.33	2.03	3.02	1.98

TDO · TDOS type

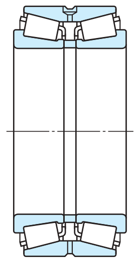
d 73.025 ~ (133.350) mm
2.8750 ~ (5.2500) inch



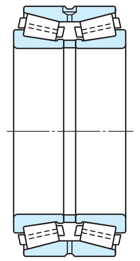
Design 1



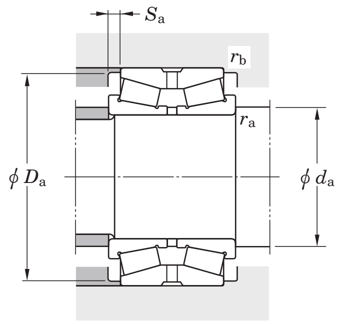
Design 1-P



Design 2



Design 2-P



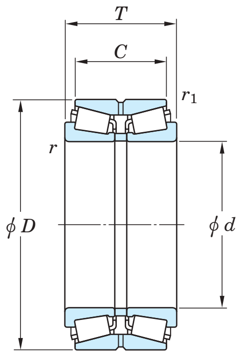
Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions										Constant	Axial load factors		
d		D		C		T		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		r_b[1] (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
73.025	2.8750	127.000	5.0000	65.088	2.5625	80.963	3.1875	1.600	0.0630	3.600	0.1417	337	453	71.0	**567/563D**	1	92.000	3.6220	118.000	4.6457	8.000	0.3150	1.600	0.0630	3.600	0.1417	0.36	1.86	2.76	1.81
76.200	3.0000	161.925	6.3750	70.637	2.7810	105.562	4.1560	0.800	0.0315	3.600	0.1417	526	573	78.0	**9285R/9220D**	1	95.000	3.7402	152.000	5.9843	17.500	0.6890	0.800	0.0315	3.600	0.1417	0.71	0.95	1.42	0.93
80.963	3.1875	136.525	5.3750	53.975	2.1250	69.850	2.7500	0.800	0.0315	3.600	0.1417	287	396	60.0	**496/493D**	1	99.000	3.8976	127.000	5.0000	8.000	0.3150	0.800	0.0315	3.600	0.1417	0.44	1.52	2.26	1.49
88.900	3.5000	152.400	6.0000	63.500	2.5000	82.550	3.2500	0.800	0.0315	3.600	0.1417	395	575	85.0	**593/592D**	1	107.000	4.2126	140.000	5.5118	9.600	0.3780	0.800	0.0315	3.600	0.1417	0.44	1.53	2.27	1.49
	3.5000	171.450	6.7500	95.250	3.7500	114.300	4.5000	0.800	0.0315	3.600	0.1417	591	779	103	**46T191710**	1	107.000	4.2126	158.000	6.2205	9.600	0.3780	0.800	0.0315	3.600	0.1417	0.37	1.84	2.74	1.80
95.250	3.7500	149.225	5.8750	52.388	2.0625	66.672	2.6249	0.800	0.0315	3.000	0.1181	307	449	66.0	**42375/587D**	1	110.000	4.3307	140.000	5.5118	7.200	0.2835	0.800	0.0315	3.000	0.1181	0.49	1.37	2.04	1.34
100.000	3.9370	304.800	12.0000	127.000	5.0000	184.160	7.2504	SP	SP	SP	SP	1 490	1 630	187	**46T203018**	1	117.000	4.6063	285.000	11.2205	28.000	1.1024	4.000	0.1575	2.000	0.0787	0.80	0.85	1.26	0.83
101.600	4.0000	168.275	6.6250	69.850	2.7500	92.075	3.6250	0.800	0.0315	3.600	0.1417	484	698	101	**687/672D**	1	120.000	4.7244	156.000	6.1417	11.200	0.4409	0.800	0.0315	3.600	0.1417	0.47	1.43	2.14	1.40
	4.0000	200.025	7.8750	80.216	3.1581	115.888	4.5625	2.400	0.0945	3.600	0.1417	743	941	118	**98400/98789D**	1	120.000	4.7244	185.000	7.2835	17.900	0.7047	2.400	0.0945	3.600	0.1417	0.63	1.07	1.59	1.04
104.775	4.1250	180.975	7.1250	85.725	3.3750	104.775	4.1250	1.600	0.0630	3.600	0.1417	620	876	113	**782/774D**	1	123.000	4.8425	165.000	6.4961	9.600	0.3780	1.600	0.0630	3.600	0.1417	0.39	1.75	2.61	1.71
105.000	4.1339	190.000	7.4803	70.000	2.7559	88.000	3.4646	SP	SP	SP	SP	530	632	84.0	**46T211909**	1	117.000	4.6063	178.000	7.0079	9.000	0.3543	2.000	0.0787	0.800	0.0315	0.42	1.60	2.38	1.56
107.950	4.2500	146.050	5.7500	39.688	1.5625	49.213	1.9375	0.800	0.0315	1.600	0.0630	186	334	47.0	**L521949R/L521910D**	1	117.000	4.6063	138.000	5.4331	4.800	0.1890	0.800	0.0315	1.600	0.0630	0.39	1.72	2.56	1.68
111.125	4.3750	214.313	8.4375	84.138	3.3125	115.888	4.5625	1.600	0.0630	3.600	0.1417	868	1 160	141	**H924045/H924010D**	1	130.000	5.1181	202.000	7.9528	15.900	0.6260	1.600	0.0630	3.600	0.1417	0.67	1.00	1.49	0.98
114.300	4.5000	212.725	8.3750	117.475	4.6250	142.875	5.6250	1.600	0.0630	7.100	0.2795	965	1 350	168	**938/932D**	1	143.000	5.6299	192.000	7.5591	12.700	0.5000	1.600	0.0630	7.100	0.2795	0.33	2.07	3.09	2.03
127.000	5.0000	169.975	6.6919	49.213	1.9375	58.738	2.3125	1.600	0.0630	1.000	0.0394	282	501	69.6	**L225849/L225812D**	1	136.000	5.3543	162.000	6.3780	4.800	0.1890	1.600	0.0630	1.000	0.0394	0.33	2.03	3.02	1.98
	5.0000	182.563	7.1875	73.025	2.8750	85.725	3.3750	3.600	0.1417	0.800	0.0315	487	858	120	**48290/48220D**	1	140.000	5.5118	174.000	6.8504	6.400	0.2520	3.600	0.1417	0.800	0.0315	0.31	2.21	3.29	2.16
	5.0000	196.850	7.7500	85.725	3.3750	101.600	4.0000	3.600	0.1417	0.800	0.0315	669	1 120	137	**67388/67322D**	1	140.000	5.5118	189.000	7.4409	7.900	0.3110	3.600	0.1417	0.800	0.0315	0.34	1.96	2.92	1.92
	5.0000	200.025	7.8750	85.725	3.3750	101.600	4.0000	3.600	0.1417	0.800	0.0315	669	1 120	137	**67388/67325D**	1	140.000	5.5118	189.000	7.4409	7.900	0.3110	3.600	0.1417	0.800	0.0315	0.34	1.96	2.92	1.92
	5.0000	215.900	8.5000	80.963	3.1875	106.363	4.1875	3.600	0.1417	1.600	0.0630	691	1 100	132	**74500/74851D**	1	140.000	5.5118	205.000	8.0709	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.49	1.38	2.06	1.35
	5.0000	228.600	9.0000	84.138	3.3125	115.888	4.5625	3.600	0.1417	2.400	0.0945	700	918	111	**97500/97901D**	1	140.000	5.5118	213.000	8.3858	15.900	0.6260	3.600	0.1417	2.400	0.0945	0.74	0.92	1.36	0.90
	5.0000	228.600	9.0000	84.138	3.3125	115.888	4.5625	3.600	0.1417	2.400	0.0945	925	1 300	154	**HM926747/HM926710D**	1	140.000	5.5118	219.000	8.6220	15.900	0.6260	3.600	0.1417	2.400	0.0945	0.74	0.92	1.36	0.90
	5.0000	234.950	9.2500	114.300	4.5000	142.875	5.6250	6.400	0.2520	1.600	0.0630	1 120	1 650	200	**95500/95927D**	1	145.000	5.7087	217.000	8.5433	14.300	0.5630	6.400	0.2520	1.600	0.0630	0.37	1.83	2.72	1.79
127.792	5.0312	228.600	9.0000	84.138	3.3125	115.888	4.5625	3.600	0.1417	2.400	0.0945	925	1 300	154	**HM926749/HM926710D**	1	140.000	5.5118	219.000	8.6220	15.900	0.6260	3.600	0.1417	2.400	0.0945	0.74	0.92	1.36	0.90
128.588	5.0625	206.375	8.1250	82.550	3.2500	107.950	4.2500	3.200	0.1260	0.800	0.0315	702	1 100	134	**799/792D**	1	140.000	5.5118	195.000	7.6772	12.700	0.5000	3.200	0.1260	0.800	0.0315	0.46	1.47	2.19	1.44
130.000	5.1181	206.375	8.1250	82.550	3.2500	107.950	4.2500	3.600	0.1417	0.800	0.0315	702	1 100	134	**797/792D**	1	143.000	5.6299	195.000	7.6772	12.700	0.5000	3.600	0.1417	0.800	0.0315	0.46	1.47	2.19	1.44
130.175	5.1250	196.850	7.7500	85.725	3.3750	101.600	4.0000	3.600	0.1417	0.800	0.0315	669	1 120	137	**67389/67322D**	1	143.000	5.6299	189.000	7.4409	7.900	0.3110	3.600	0.1417	0.800	0.0315	0.34	1.96	2.92	1.92
	5.1250	206.375	8.1250	82.550	3.2500	107.950	4.2500	3.600	0.1417	0.800	0.0315	702	1 100	134	**799A/792D**	1	143.000	5.6299	195.000	7.6772	12.700	0.5000	3.600	0.1417	0.800	0.0315	0.46	1.47	2.19	1.44
133.350	5.2500	177.008	6.9688	47.625	1.8750	57.150	2.2500	1.600	0.0630	0.800	0.0315	302	557	76.4	**L327249/L327210D**	1	142.000	5.5906	169.000	6.6535	4.800	0.1890	1.600	0.0630	0.800	0.0315	0.35	1.94	2.89	1.90
	5.2500	190.500	7.5000	73.025	2.8750	85.725	3.3750	3.600	0.1417	0.800	0.0315	505	944	129	**48385/48320D**	1	146.000	5.7480	182.000	7.1654	6.400	0.2520	3.600	0.1417	0.800	0.0315	0.32	2.10	3.13	2.06
	5.2500	196.850	7.7500	85.725	3.3750	101.600	4.0000	3.600	0.1417	0.800	0.0315	669	1 120	137	**67390/67322D**	1	146.000	5.7480	189.000	7.4409	7.900	0.3110	3.600	0.1417	0.800	0.0315	0.34	1.96	2.92	1.92
	5.2500	196.850	7.7500	85.725	3.3750	101.600	4.0000	7.900	0.3110	0.800	0.0315	669	1 120	137	**67391/67322D**	1	155.000	6.1024	189.000	7.4409	7.900	0.3110	7.900	0.3110	0.800	0.0315	0.34	1.96	2.92	1.92
	5.2500	200.025	7.8750	85.725	3.3750	101.600	4.0000	3.600	0.1417	0.800	0.0315	669	1 120	137	**67390/67325D**	1	146.000	5.7480	189.000	7.4409	7.900	0.3110	3.600	0.1417	0.800	0.0315	0.34	1.96	2.92	1.92

Note 1) SP indicates the specially chamfered from.

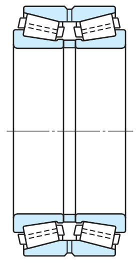
TDO · TDOS type

d (133.350) ~ (165.100) mm

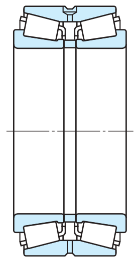
(5.2500) ~ (6.5000) inch



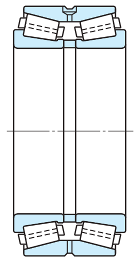
Design 1



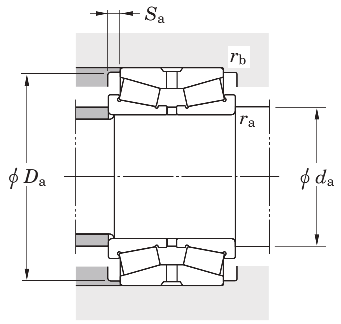
Design 1-P



Design 2



Design 2-P



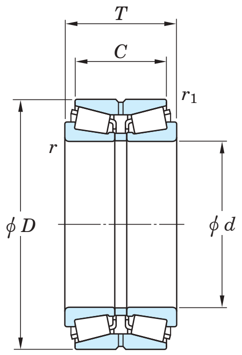
Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions										Constant	Axial load factors		
d		D		C		T		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
133.350	5.2500	215.900	8.5000	80.963	3.1875	106.363	4.1875	3.600	0.1417	1.600	0.0630	691	1 100	132	**74525/74851D**	1	146.000	5.7480	205.000	8.0709	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.49	1.38	2.06	1.35
	5.2500	234.950	9.2500	114.300	4.5000	142.875	5.6250	9.500	0.3740	1.600	0.0630	1 120	1 650	200	**95525/95927D**	1	158.000	6.2205	217.000	8.5433	14.300	0.5630	9.500	0.3740	1.600	0.0630	0.37	1.83	2.72	1.79
	5.2500	234.950	9.2500	114.300	4.5000	142.875	5.6250	4.700	0.1850	1.600	0.0630	1 120	1 650	200	**95528/95927D**	1	148.000	5.8268	217.000	8.5433	14.300	0.5630	4.700	0.1850	1.600	0.0630	0.37	1.83	2.72	1.79
136.525	5.3750	190.500	7.5000	73.025	2.8750	85.725	3.3750	3.600	0.1417	0.800	0.0315	505	944	129	**48393/48320D**	1	149.000	5.8661	182.000	7.1654	6.400	0.2520	3.600	0.1417	0.800	0.0315	0.32	2.10	3.13	2.06
	5.3750	215.900	8.5000	80.963	3.1875	106.363	4.1875	3.600	0.1417	1.600	0.0630	691	1 100	132	**74537/74851D**	1	149.000	5.8661	205.000	8.0709	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.49	1.38	2.06	1.35
	5.3750	228.600	9.0000	98.425	3.8750	123.825	4.8750	3.600	0.1417	1.600	0.0630	947	1 460	175	**896/892D**	1	149.000	5.8661	215.000	8.4646	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.42	1.60	2.39	1.57
139.700	5.5000	215.900	8.5000	80.963	3.1875	106.363	4.1875	3.600	0.1417	1.600	0.0630	691	1 100	132	**74550/74851D**	1	152.000	5.9843	205.000	8.0709	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.49	1.38	2.06	1.35
	5.5000	215.900	8.5000	80.963	3.1875	106.363	4.1875	6.400	0.2520	1.600	0.0630	691	1 100	132	**74550A/74851D**	1	158.000	6.2205	205.000	8.0709	12.700	0.5000	6.400	0.2520	1.600	0.0630	0.49	1.38	2.06	1.35
	5.5000	228.600	9.0000	98.425	3.8750	123.825	4.8750	3.600	0.1417	1.600	0.0630	947	1 460	175	**898/892D**	1	152.000	5.9843	215.000	8.4646	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.42	1.60	2.39	1.57
	5.5000	228.600	9.0000	98.425	3.8750	123.825	4.8750	6.400	0.2520	1.600	0.0630	947	1 460	175	**898A/892D**	1	158.000	6.2205	215.000	8.4646	12.700	0.5000	6.400	0.2520	1.600	0.0630	0.42	1.60	2.39	1.57
	5.5000	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	904	1 460	171	**82550/82932D**	1	152.000	5.9843	225.000	8.8583	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.44	1.53	2.27	1.49
	5.5000	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	1 080	1 660	198	**HM231132/HM231111D**	1	152.000	5.9843	223.000	8.7795	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.32	2.12	3.15	2.07
	5.5000	254.000	10.0000	111.125	4.3750	149.225	5.8750	7.100	0.2795	1.600	0.0630	1 180	1 830	215	**99550/99102D**	1	159.000	6.2598	237.000	9.3307	19.100	0.7520	7.100	0.2795	1.600	0.0630	0.41	1.66	2.47	1.62
	5.5000	307.975	12.1250	155.575	6.1250	200.025	7.8750	9.500	0.3740	2.400	0.0945	2 180	2 900	331	**HH234031/HH234011D**	1	164.000	6.4567	285.000	11.2205	22.200	0.8740	9.500	0.3740	2.400	0.0945	0.33	2.07	3.08	2.02
142.875	5.6250	200.025	7.8750	73.025	2.8750	87.315	3.4376	7.900	0.3110	0.800	0.0315	527	982	133	**48684/48620D**	1	164.000	6.4567	191.000	7.5197	7.100	0.2795	7.900	0.3110	0.800	0.0315	0.34	2.01	2.99	1.96
	5.6250	200.025	7.8750	73.025	2.8750	87.315	3.4376	3.600	0.1417	0.800	0.0315	527	982	133	**48685/48620D**	1	156.000	6.1417	191.000	7.5197	7.100	0.2795	3.600	0.1417	0.800	0.0315	0.34	2.01	2.99	1.96
	5.6250	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	904	1 460	171	**82562/82932D**	1	156.000	6.1417	225.000	8.8583	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.44	1.53	2.27	1.49
146.050	5.7500	193.675	7.6250	53.975	2.1250	65.085	2.5624	1.600	0.0630	0.800	0.0315	402	750	101	**36690/36620D**	1	155.000	6.1024	186.000	7.3228	5.600	0.2205	1.600	0.0630	0.800	0.0315	0.37	1.83	2.73	1.79
	5.7500	193.675	7.6250	53.975	2.1250	65.085	2.5624	4.800	0.1890	0.800	0.0315	402	750	101	**36691/36620D**	1	161.000	6.3386	186.000	7.3228	5.600	0.2205	4.800	0.1890	0.800	0.0315	0.37	1.83	2.73	1.79
	5.7500	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	904	1 460	171	**82576/82932D**	1	159.000	6.2598	225.000	8.8583	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.44	1.53	2.27	1.49
	5.7500	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	1 080	1 660	198	**HM231140/HM231111D**	1	159.000	6.2598	223.000	8.7795	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.32	2.12	3.15	2.07
	5.7500	254.000	10.0000	111.125	4.3750	149.225	5.8750	7.100	0.2795	1.600	0.0630	1 180	1 830	215	**99575/99102D**	1	166.000	6.5354	237.000	9.3307	19.100	0.7520	7.100	0.2795	1.600	0.0630	0.41	1.66	2.47	1.62
	5.7500	268.288	10.5625	125.413	4.9375	160.338	6.3125	6.400	0.2520	1.600	0.0630	1 410	2 090	239	**EE107057/107105D**	1	164.000	6.4567	249.000	9.8031	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.39	1.74	2.59	1.70
	5.7500	304.800	12.0000	97.633	3.8438	135.733	5.3438	3.200	0.1260	1.600	0.0630	1 280	1 600	195	**EE750576/751204D**	1-P	158.000	6.2205	268.000	10.5512	19.100	0.7520	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
149.225	5.8750	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	904	1 460	171	**82587/82932D**	1	162.000	6.3780	225.000	8.8583	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.44	1.53	2.27	1.49
	5.8750	236.538	9.3125	106.363	4.1875	131.763	5.1875	6.400	0.2520	1.600	0.0630	1 080	1 660	198	**HM231148/HM231111D**	1	167.000	6.5748	223.000	8.7795	12.700	0.5000	6.400	0.2520	1.600	0.0630	0.32	2.12	3.15	2.07
	5.8750	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	1 080	1 660	198	**HM231149/HM231111D**	1	162.000	6.3780	223.000	8.7795	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.32	2.12	3.15	2.07
150.813	5.9375	244.475	9.6250	79.375	3.1250	107.950	4.2500	3.600	0.1417	1.600	0.0630	694	989	131	**81593/81963D**	1	163.000	6.4173	227.000	8.9370	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.35	1.93	2.88	1.89
152.400	6.0000	222.250	8.7500	76.200	3.0000	100.010	3.9374	3.600	0.1417	0.800	0.0315	678	1 190	159	**M231649/M231610D**	1	165.000	6.4961	210.000	8.2677	11.900	0.4685	3.600	0.1417	0.800	0.0315	0.33	2.03	3.02	1.98
	6.0000	244.475	9.6250	79.375	3.1250	107.950	4.2500	3.600	0.1417	1.600	0.0630	694	989	131	**81600/81963D**	1	165.000	6.4961	227.000	8.9370	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.35	1.93	2.88	1.89
	6.0000	254.000	10.0000	111.125	4.3750	149.225	5.8750	7.100	0.2795	1.600	0.0630	1 180	1 830	215	**99600/99102D**	1	172.000	6.7717	237.000	9.3307	19.100	0.7520	7.100	0.2795	1.600	0.0630	0.41	1.66	2.47	1.62
	6.0000	268.288	10.5625	125.413	4.9375	160.338	6.3125	6.400	0.2520	1.600	0.0630	1 410	2 090	239	**EE107060/107105D**	1	171.000	6.7323	249.000	9.8031	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.39	1.74	2.59	1.70
	6.0000	307.975	12.1250	146.050	5.7500	200.025	7.8750	9.500	0.3740	2.400	0.0945	1 700	2 300	268	**EE450601/451215D**	1	177.000	6.9685	275.000	10.8268	27.000	1.0630	9.500	0.3740	2.400	0.0945	0.33	2.07	3.09	2.03
	6.0000	307.975	12.1250	155.575	6.1250	200.025	7.8750	9.500	0.3740	2.400	0.0945	2 180	2 900	331	**HH234048/HH234011D**	1	177.000	6.9685	285.000	11.2205	22.200	0.8740	9.500	0.3740	2.400	0.0945	0.33	2.07	3.08	2.02
158.750	6.2500	225.425	8.8750	69.850	2.7500	85.725	3.3750	3.600	0.1417	0.800	0.0315	554	1 140	148	**46780R/46720D**	1	171.000	6.7323	215.000	8.4646	7.900	0.3110	3.600	0.1417	0.800	0.0315	0.38	1.76	2.62	1.72
160.325	6.3120	288.925	11.3750	111.125	4.3750	142.875	5.6250	7.100	0.2795	1.600	0.0630	1 350	1 950	223	**HM237532/HM237510D**	1	180.000	7.0866	271.000	10.6693	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.32	2.12	3.15	2.07
165.100	6.5000	215.900	8.5000	47.625	1.8750	58.740	2.3126	1.600	0.0630	0.800	0.0315	331	600	78.1	**L433749/L433710D**	1	174.000	6.8504	207.000	8.1496	5.600	0.2205	1.600	0.0630	0.800	0.0315	0.36	1.85	2.76	1.81

Note 1) SP indicates the specially chamfered from.

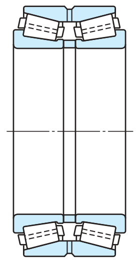
TDO · TDOS type

d (165.100) ~ 187.325 mm

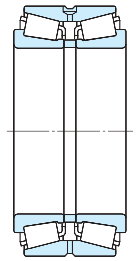
(6.5000) ~ 7.3750 inch



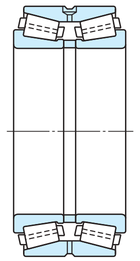
Design 1



Design 1-P



Design 2



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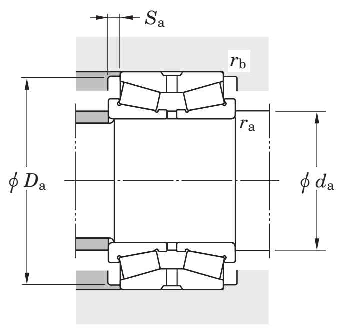


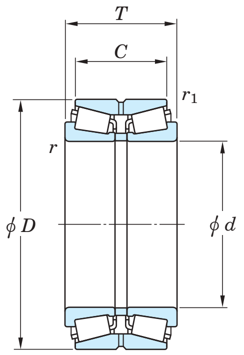
Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign[2]	Mounting dimensions										Con-stant	Axial load factors		
d		D		C		T		r[1] (min.)		r_1[1] (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		r_b[1] (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
165.100	6.5000	225.425	8.8750	69.850	2.7500	85.725	3.3750	3.600	0.1417	0.800	0.0315	554	1 140	148	**46790R/46720D**	1	177.300	6.9803	215.000	8.4646	7.900	0.3110	3.600	0.1417	0.800	0.0315	0.38	1.76	2.62	1.72
	6.5000	247.650	9.7500	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	741	1 400	160	**67780/67720D**	1	178.000	7.0079	238.000	9.3701	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.44	1.54	2.29	1.50
	6.5000	254.000	10.0000	76.200	3.0000	101.600	4.0000	4.800	0.1890	1.600	0.0630	815	1 240	162	**M235145/M235113D**	1	180.000	7.0866	240.000	9.4488	12.700	0.5000	4.800	0.1890	1.600	0.0630	0.32	2.12	3.15	2.07
	6.5000	288.925	11.3750	111.125	4.3750	142.875	5.6250	7.100	0.2795	1.600	0.0630	1 180	1 920	216	**94649/94114D**	1	185.000	7.2835	270.000	10.6299	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.47	1.44	2.15	1.41
	6.5000	288.925	11.3750	111.125	4.3750	142.875	5.6250	7.100	0.2795	1.600	0.0630	1 430	2 090	245	**HM237535/HM237510D**	1	185.000	7.2835	271.000	10.6693	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.32	2.12	3.15	2.07
	6.5000	288.925	11.3750	114.300	4.5000	146.050	5.7500	7.100	0.2795	1.600	0.0630	1 430	2 090	245	**HM237535/HM237511XD**	1	185.000	7.2835	271.000	10.6693	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.32	2.12	3.15	2.07
168.275	6.6250	247.650	9.7500	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	741	1 400	160	**67782/67720D**	1	181.000	7.1260	238.000	9.3701	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.44	1.54	2.29	1.50
	6.6250	250.000	9.8425	84.140	3.3126	103.190	4.0626	SP	SP	SP	SP	880	1 410	185	**46T342510**	1	180.300	7.0984	236.000	9.2913	9.500	0.3740	2.000	0.0787	0.500	0.0197	0.33	2.03	3.02	1.98
	6.6250	250.000	9.8425	84.140	3.3126	103.190	4.0626	0.800	0.0315	3.500	0.1378	880	1 410	185	**46T342510**	1	187.000	7.3622	235.000	9.2520	9.600	0.3780	0.800	0.0315	3.500	0.1378	0.33	2.03	3.02	1.98
	6.6250	360.000	14.1732	130.000	5.1181	190.000	7.4803	SP	SP	SP	SP	2 020	2 570	280	**46T343619**	1	186.100	7.3268	339.000	13.3465	30.000	1.1811	4.000	0.1575	1.000	0.0394	0.80	0.85	1.26	0.83
	6.6250	360.000	14.1732	130.000	5.1181	190.000	7.4803	1.600	0.0630	6.400	0.2520	2 020	2 570	280	**46T343619**	1	197.000	7.7559	338.000	13.3071	30.000	1.1811	1.600	0.0630	6.400	0.2520	0.80	0.85	1.26	0.83
170.000	6.6929	254.000	10.0000	76.200	3.0000	101.600	4.0000	4.800	0.1890	1.600	0.0630	815	1 240	162	**M235149/M235113D**	1	185.000	7.2835	240.000	9.4488	12.700	0.5000	4.800	0.1890	1.600	0.0630	0.32	2.12	3.15	2.07
171.450	6.7500	288.925	11.3750	111.125	4.3750	142.875	5.6250	7.100	0.2795	1.600	0.0630	1 180	1 920	216	**94675/94114D**	1	191.000	7.5197	270.000	10.6299	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.47	1.44	2.15	1.41
174.625	6.8750	247.650	9.7500	84.138	3.3125	103.188	4.0625	7.900	0.3110	0.800	0.0315	741	1 400	160	**67786/67720D**	1	196.000	7.7165	238.000	9.3701	9.500	0.3740	7.900	0.3110	0.800	0.0315	0.44	1.54	2.29	1.50
	6.8750	247.650	9.7500	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	741	1 400	160	**67787/67720D**	1	187.000	7.3622	238.000	9.3701	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.44	1.54	2.29	1.50
	6.8750	288.925	11.3750	111.125	4.3750	142.875	5.6250	7.100	0.2795	1.600	0.0630	1 180	1 920	216	**94687/94114D**	1	194.000	7.6378	270.000	10.6299	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.47	1.44	2.15	1.41
	6.8750	288.925	11.3750	111.125	4.3750	142.875	5.6250	7.100	0.2795	1.600	0.0630	1 350	1 950	223	**HM237542/HM237510D**	1	194.000	7.6378	271.000	10.6693	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.32	2.12	3.15	2.07
177.800	7.0000	227.013	8.9375	52.388	2.0625	66.672	2.6249	1.600	0.0630	0.800	0.0315	381	805	102	**36990/36920D**	1	186.000	7.3228	220.000	8.6614	7.100	0.2795	1.600	0.0630	0.800	0.0315	0.44	1.53	2.28	1.50
	7.0000	247.650	9.7500	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	741	1 400	160	**67790/67720D**	1	190.000	7.4803	238.000	9.3701	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.44	1.54	2.29	1.50
	7.0000	247.650	9.7500	84.138	3.3125	103.188	4.0625	10.400	0.4094	0.800	0.0315	741	1 400	160	**67791/67720D**	1	204.000	8.0315	238.000	9.3701	9.500	0.3740	10.400	0.4094	0.800	0.0315	0.44	1.54	2.29	1.50
	7.0000	269.875	10.6250	93.663	3.6875	119.063	4.6875	3.600	0.1417	1.600	0.0630	880	1 610	183	**M238840/M238810D**	1	190.000	7.4803	255.000	10.0394	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.33	2.03	3.02	1.98
	7.0000	285.750	11.2500	92.075	3.6250	136.525	5.3750	6.400	0.2520	1.600	0.0630	956	1 430	165	**EE91702/91113XD**	1*	196.000	7.7165	264.000	10.3937	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.43	1.57	2.34	1.53
	7.0000	288.925	11.3750	111.125	4.3750	142.875	5.6250	7.100	0.2795	1.600	0.0630	1 180	1 920	216	**94700/94114D**	1	197.000	7.7559	270.000	10.6299	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.47	1.44	2.15	1.41
	7.0000	288.925	11.3750	111.125	4.3750	142.875	5.6250	7.100	0.2795	1.600	0.0630	1 350	1 950	223	**HM237545/HM237510D**	1	197.000	7.7559	271.000	10.6693	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.32	2.12	3.15	2.07
	7.0000	288.925	11.3750	114.300	4.5000	146.050	5.7500	7.100	0.2795	1.600	0.0630	1 350	1 950	223	**HM237545/HM237511XD**	1*	197.000	7.7559	271.000	10.6693	15.900	0.6260	7.100	0.2795	1.600	0.0630	0.32	2.12	3.15	2.07
	7.0000	304.800	12.0000	98.425	3.8750	147.838	5.8204	6.400	0.2520	1.600	0.0630	1 220	1 600	199	**EE280702/281201D**	1	196.000	7.7165	282.000	11.1024	24.700	0.9724	6.400	0.2520	1.600	0.0630	0.36	1.87	2.79	1.83
	7.0000	320.675	12.6250	138.112	5.4375	185.738	7.3125	3.600	0.1417	1.600	0.0630	1 610	2 450	271	**EE222070/222127D**	1	190.000	7.4803	298.000	11.7323	23.800	0.9370	3.600	0.1417	1.600	0.0630	0.40	1.68	2.50	1.64
	7.0000	320.675	12.6250	138.113	5.4375	185.738	7.3125	3.600	0.1417	1.600	0.0630	1 830	2 530	285	**H239640/H239612D**	1	190.000	7.4803	301.000	11.8504	23.800	0.9370	3.600	0.1417	1.600	0.0630	0.32	2.12	3.15	2.07
179.975	7.0856	317.500	12.5000	111.125	4.3750	146.050	5.7500	3.600	0.1417	1.600	0.0630	1 300	2 270	244	**93708/93127D**	1	193.000	7.5984	295.000	11.6142	17.500	0.6890	3.600	0.1417	1.600	0.0630	0.52	1.29	1.92	1.26
	7.0856	319.976	12.5975	111.125	4.3750	146.050	5.7500	3.600	0.1417	1.600	0.0630	1 300	2 270	244	**93708/93128XD**	1*	193.000	7.5984	295.000	11.6142	17.500	0.6890	3.600	0.1417	1.600	0.0630	0.52	1.29	1.92	1.26
184.150	7.2500	266.700	10.5000	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	769	1 520	169	**67883/67820D**	1	197.000	7.7559	257.000	10.1181	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.48	1.41	2.11	1.38
	7.2500	288.925	11.3750	111.120	4.3748	142.880	5.6252	SP	SP	SP	SP	1 220	1 920	214	**46T372914**	1	203.200	8.0000	276.000	10.8661	15.900	0.6260	4.000	0.1575	SP	SP	0.40	1.68	2.50	1.64
	7.2500	288.925	11.3750	111.120	4.3748	142.880	5.6252	1.600	0.0630	7.000	0.2756	1 220	1 920	214	**46T372914**	1	213.000	8.3858	275.000	10.8268	15.900	0.6260	1.600	0.0630	7.000	0.2756	0.40	1.68	2.50	1.64
187.325	7.3750	266.700	10.5000	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	769	1 520	169	**67884/67820D**	1	200.000	7.8740	257.000	10.1181	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.48	1.41	2.11	1.38
	7.3750	269.875	10.6250	93.663	3.6875	119.063	4.6875	3.600	0.1417	1.600	0.0630	880	1 610	183	**M238849/M238810D**	1	200.000	7.8740	255.000	10.0394	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.33	2.03	3.02	1.98
	7.3750	282.575	11.1250	79.375	3.1250	107.950	4.2500	3.600	0.1417	1.600	0.0630	880	1 450	182	**87737/87112D**	1	200.000	7.8740	267.000	10.5118	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.42	1.62	2.42	1.59
	7.3750	320.675	12.6250	138.113	5.4375	185.738	7.3125	5.600	0.2205	1.600	0.0630	1 830	2 530	285	**H239649/H239612D**	1	204.000	8.0315	301.000	11.8504	23.800	0.9370	5.600	0.2205	1.600	0.0630	0.32	2.12	3.15	2.07

Note 1) SP indicates the specially chamfered from.

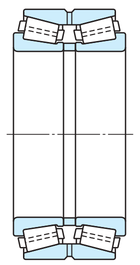
2) * means no lubrication holes or grooves on double cup.

TDO · TDOS type

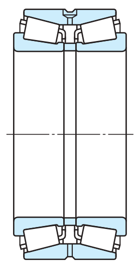
d 190.500 ~ (228.600) mm
7.5000 ~ (9.0000) inch



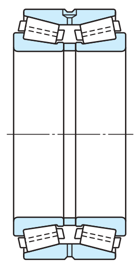
Design 1



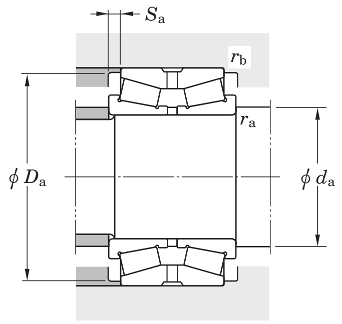
Design 1-P



Design 2



Design 2-P

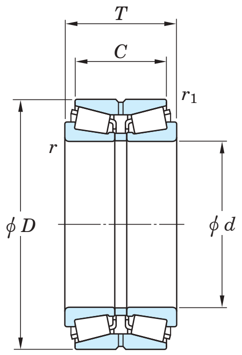


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions										Constant	Axial load factors		
d		D		C		T		$r^{1)}$ (min.)		$r_1{}^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b{}^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
190.500	7.5000	266.700	10.5000	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	769	1 520	169	**67885/67820D**	1	203.000	7.9921	257.000	10.1181	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.48	1.41	2.11	1.38
	7.5000	282.575	11.1250	79.375	3.1250	107.950	4.2500	3.600	0.1417	1.600	0.0630	880	1 450	182	**87750/87112D**	1	203.000	7.9921	267.000	10.5118	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.42	1.62	2.42	1.59
	7.5000	317.500	12.5000	111.125	4.3750	146.050	5.7500	4.300	0.1693	1.600	0.0630	1 300	2 270	244	**93750/93127D**	1	205.000	8.0709	295.000	11.6142	17.500	0.6890	4.300	0.1693	1.600	0.0630	0.52	1.29	1.92	1.26
	7.5000	368.300	14.5000	136.525	5.3750	193.675	7.6250	6.400	0.2520	1.600	0.0630	2 020	2 920	319	**EE420751/421451D**	1	209.000	8.2283	334.000	13.1496	28.600	1.1260	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
193.675	7.6250	282.575	11.1250	79.375	3.1250	107.950	4.2500	3.600	0.1417	1.600	0.0630	880	1 450	182	**87762/87112D**	1	206.000	8.1102	267.000	10.5118	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.42	1.62	2.42	1.59
196.850	7.7500	254.000	10.0000	47.625	1.8750	61.910	2.4374	1.600	0.0630	0.800	0.0315	404	773	96.5	**L540049/L540010D**	1	206.000	8.1102	244.000	9.6063	7.100	0.2795	1.600	0.0630	0.800	0.0315	0.40	1.70	2.53	1.66
	7.7500	257.175	10.1250	66.675	2.6250	85.725	3.3750	3.600	0.1417	0.800	0.0315	576	1 260	157	**LM739749/LM739710D**	1	210.000	8.2677	247.000	9.7244	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.45	1.51	2.25	1.48
200.025	7.8750	317.500	12.5000	111.125	4.3750	146.050	5.7500	4.300	0.1693	1.600	0.0630	1 300	2 270	244	**93787/93127D**	1	215.000	8.4646	294.500	11.5945	17.500	0.6890	4.300	0.1693	1.600	0.0630	0.52	1.29	1.92	1.26
	7.8750	355.600	14.0000	111.125	4.3750	152.400	6.0000	6.700	0.2638	1.600	0.0630	1 560	2 610	280	**EE130787/131401D**	1	220.000	8.6614	330.000	12.9921	20.600	0.8110	6.700	0.2638	1.600	0.0630	0.33	2.04	3.04	2.00
	7.8750	384.175	15.1250	193.675	7.6250	238.125	9.3750	6.400	0.2520	1.600	0.0630	3 120	5 370	542	**H247535/H247510D**	1-P	219.000	8.6220	362.000	14.2520	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
203.200	8.0000	276.225	10.8750	73.025	2.8750	90.485	3.5624	3.600	0.1417	0.800	0.0315	804	1 430	179	**LM241149/LM241110D**	1	217.000	8.5433	265.000	10.4331	8.700	0.3425	3.600	0.1417	0.800	0.0315	0.32	2.12	3.15	2.07
	8.0000	282.575	11.1250	82.550	3.2500	101.600	4.0000	3.600	0.1417	0.800	0.0315	749	1 410	155	**67983/67920D**	1	217.000	8.5433	272.000	10.7087	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.51	1.33	1.97	1.30
	8.0000	292.100	11.5000	101.600	4.0000	125.415	4.9376	3.600	0.1417	1.600	0.0630	1 170	2 050	230	**M241547/M241510D**	1	217.000	8.5433	278.000	10.9449	11.900	0.4685	3.600	0.1417	1.600	0.0630	0.33	2.03	3.02	1.98
	8.0000	317.500	12.5000	111.125	4.3750	146.050	5.7500	4.300	0.1693	1.600	0.0630	1 300	2 270	244	**93800/93127D**	1	218.000	8.5827	295.000	11.6142	17.500	0.6890	4.300	0.1693	1.600	0.0630	0.52	1.29	1.92	1.26
	8.0000	317.500	12.5000	111.125	4.3750	146.050	5.7500	7.900	0.3110	1.600	0.0630	1 300	2 270	244	**93800A/93127D**	1	225.000	8.8583	295.000	11.6142	17.500	0.6890	7.900	0.3110	1.600	0.0630	0.52	1.29	1.92	1.26
	8.0000	368.300	14.5000	136.525	5.3750	193.675	7.6250	3.200	0.1260	1.600	0.0630	2 020	2 920	319	**EE420801/421451D**	1	216.000	8.5039	334.000	13.1496	28.600	1.1260	3.200	0.1260	1.600	0.0630	0.40	1.68	2.50	1.64
	8.0000	406.400	16.0000	127.000	5.0000	196.850	7.7500	6.400	0.2520	3.200	0.1260	2 050	2 920	303	**EE114080/114161D**	1	222.000	8.7402	368.000	14.4882	34.900	1.3740	6.400	0.2520	3.200	0.1260	0.79	0.85	1.27	0.83
204.788	8.0625	292.100	11.5000	101.600	4.0000	125.415	4.9376	3.600	0.1417	1.600	0.0630	1 170	2 050	230	**M241549/M241510D**	1	218.000	8.5827	278.000	10.9449	11.900	0.4685	3.600	0.1417	1.600	0.0630	0.33	2.03	3.02	1.98
206.375	8.1250	282.575	11.1250	82.550	3.2500	101.600	4.0000	3.600	0.1417	0.800	0.0315	749	1 410	155	**67985/67920D**	1	220.000	8.6614	271.500	10.6890	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.51	1.33	1.97	1.30
	8.1250	317.500	12.5000	88.900	3.5000	127.000	5.0000	4.000	0.1575	1.600	0.0630	944	1 450	166	**EE132084/132126D**	1	221.000	8.7008	293.000	11.5354	19.100	0.7520	4.000	0.1575	1.600	0.0630	0.31	2.15	3.21	2.11
	8.1250	336.550	13.2500	169.863	6.6875	211.138	8.3125	3.200	0.1260	1.600	0.0630	2 230	3 800	400	**H242649/H242610DC**	2	219.000	8.6220	318.000	12.5197	20.600	0.8110	3.200	0.1260	1.600	0.0630	0.33	2.03	3.02	1.98
209.550	8.2500	282.575	11.1250	82.550	3.2500	101.600	4.0000	3.600	0.1417	0.800	0.0315	749	1 410	155	**67989/67920D**	1	223.000	8.7795	272.000	10.7087	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.51	1.33	1.97	1.30
	8.2500	317.500	12.5000	111.125	4.3750	146.050	5.7500	4.300	0.1693	1.600	0.0630	1 300	2 270	244	**93825/93127D**	1	225.000	8.8583	295.000	11.6142	17.500	0.6890	4.300	0.1693	1.600	0.0630	0.52	1.29	1.92	1.26
	8.2500	333.375	13.1250	114.300	4.5000	149.225	5.8750	6.400	0.2520	1.600	0.0630	1 520	2 480	265	**HM743345/HM743310D**	1	229.000	9.0157	316.000	12.4409	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.44	1.54	2.29	1.50
212.725	8.3750	285.750	11.2500	76.200	3.0000	98.425	3.8750	3.600	0.1417	0.800	0.0315	766	1 560	190	**LM742745/LM742710D**	1	226.000	8.8976	277.000	10.9055	11.100	0.4370	3.600	0.1417	0.800	0.0315	0.48	1.40	2.09	1.37
215.900	8.5000	285.750	11.2500	76.200	3.0000	98.425	3.8750	3.600	0.1417	0.800	0.0315	766	1 560	190	**LM742749/LM742710D**	1	230.000	9.0551	277.000	10.9055	11.100	0.4370	3.600	0.1417	0.800	0.0315	0.48	1.40	2.09	1.37
	8.5000	406.400	16.0000	147.638	5.8125	195.263	7.6875	6.400	0.2520	1.600	0.0630	2 420	3 480	370	**EE820085/820161D**	1	235.000	9.2520	372.000	14.6457	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.39	1.71	2.55	1.67
219.075	8.6250	358.775	14.1250	181.440	7.1433	196.850	7.7500	SP	SP	SP	SP	2 080	3 590	376	**46T443620**	2	237.900	9.3661	338.000	13.3071	7.700	0.3031	4.000	0.1575	1.000	0.0394	0.33	2.03	3.02	1.98
220.663	8.6875	314.325	12.3750	106.363	4.1875	131.763	5.1875	6.400	0.2520	1.600	0.0630	1 320	2 450	269	**M244249/M244210D**	1	240.000	9.4488	299.000	11.7717	12.700	0.5000	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
225.425	8.8750	355.600	14.0000	111.125	4.3750	152.400	6.0000	6.700	0.2638	1.600	0.0630	1 560	2 610	280	**EE130889/131401D**	1	245.000	9.6457	330.000	12.9921	20.600	0.8110	6.700	0.2638	1.600	0.0630	0.33	2.04	3.04	2.00
228.397	8.9920	431.800	17.0000	111.125	4.3750	196.850	7.7500	6.400	0.2520	3.200	0.1260	2 140	2 890	304	**EE113089/113171D**	1-P	248.000	9.7638	397.000	15.6299	42.900	1.6890	6.400	0.2520	3.200	0.1260	0.88	0.76	1.14	0.75
228.460	8.9945	431.800	17.0000	111.125	4.3750	196.850	7.7500	6.400	0.2520	3.200	0.1260	2 140	2 890	304	**EE113091/113171D**	1-P	248.000	9.7638	397.000	15.6299	42.900	1.6890	6.400	0.2520	3.200	0.1260	0.88	0.76	1.14	0.75
228.600	9.0000	327.025	12.8750	82.550	3.2500	114.300	4.5000	6.400	0.2520	1.600	0.0630	1 000	1 860	200	**8573/8520D**	1	248.000	9.7638	310.000	12.2047	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.41	1.66	2.47	1.62
	9.0000	355.600	14.0000	111.125	4.3750	152.400	6.0000	7.100	0.2795	1.600	0.0630	1 410	2 630	278	**96900/96140D**	1	249.000	9.8031	332.000	13.0709	20.600	0.8110	7.100	0.2795	1.600	0.0630	0.59	1.14	1.70	1.12

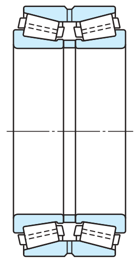
Note 1) SP indicates the specially chamfered from.

TDO · TDOS type

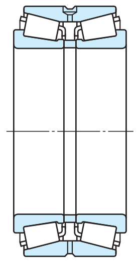
d (228.600) ~ (254.000) mm
(9.0000) ~ (10.0000) inch



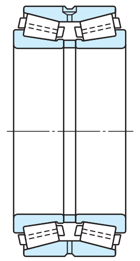
Design 1



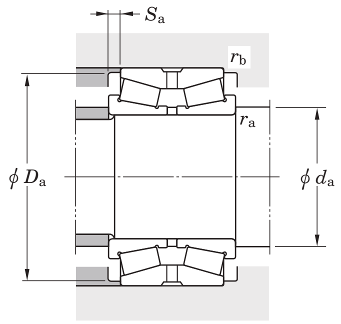
Design 1-P



Design 2



Design 2-P

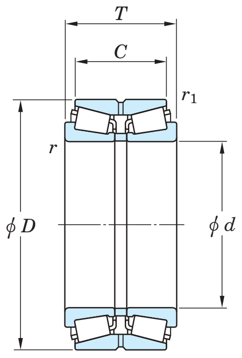


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions										Constant	Axial load factors		
d		*D*		*C*		*T*		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b^{1)}$ (max.)		*e*	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
228.600	9.0000	355.600	14.0000	111.125	4.3750	152.400	6.0000	6.700	0.2638	1.600	0.0630	1 560	2 610	280	**EE130902/131401D**	1	248.000	9.7638	330.000	12.9921	20.600	0.8110	6.700	0.2638	1.600	0.0630	0.33	2.04	3.04	2.00
	9.0000	355.600	14.0000	114.300	4.5000	152.400	6.0000	6.400	0.2520	1.600	0.0630	1 660	2 740	295	**HM746646/HM746610D**	1	248.000	9.7638	339.000	13.3465	19.100	0.7520	6.400	0.2520	1.600	0.0630	0.47	1.43	2.12	1.40
	9.0000	358.775	14.1250	117.475	4.6250	152.400	6.0000	3.600	0.1417	1.600	0.0630	1 660	3 170	333	**M249732/M249710D**	1	242.000	9.5276	343.000	13.5039	17.500	0.6890	3.600	0.1417	1.600	0.0630	0.33	2.03	3.02	1.98
	9.0000	400.050	15.7500	136.525	5.3750	187.325	7.3750	10.400	0.4094	1.600	0.0630	2 130	3 210	338	**EE430900/431576D**	1	256.000	10.0787	374.000	14.7244	25.400	1.0000	10.400	0.4094	1.600	0.0630	0.44	1.54	2.29	1.50
	9.0000	425.450	16.7500	158.750	6.2500	209.550	8.2500	7.100	0.2795	1.600	0.0630	2 530	3 950	411	**EE700091/700168D**	1	249.000	9.8031	382.000	15.0394	25.400	1.0000	7.100	0.2795	1.600	0.0630	0.33	2.03	3.02	1.98
	9.0000	488.950	19.2500	220.000	8.6614	345.000	13.5827	SP	SP	SP	SP	4 560	7 010	614	**46T464935B**	1-P	246.600	9.7087	465.000	18.3071	62.500	2.4606	4.000	0.1575	1.000	0.0394	0.94	0.72	1.07	0.70
	9.0000	488.950	19.2500	220.000	8.6614	345.000	13.5827	2.000	0.0787	6.000	0.2362	4 560	7 010	614	**46T464935B**	1-P	257.000	10.1181	464.000	18.2677	62.500	2.4606	2.000	0.0787	6.000	0.2362	0.94	0.72	1.07	0.70
	9.0000	488.950	19.2500	152.400	6.0000	254.000	10.0000	1.600	0.0630	6.400	0.2520	3 470	4 540	446	**HH949549/HH949510D**	1-P	257.000	10.1181	455.000	17.9134	50.800	2.0000	1.600	0.0630	6.400	0.2520	0.94	0.72	1.07	0.70
231.775	9.1250	358.775	14.1250	117.475	4.6250	152.400	6.0000	6.400	0.2520	1.600	0.0630	1 660	3 170	333	**M249734/M249710D**	1	251.000	9.8819	343.000	13.5039	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
234.950	9.2500	327.025	12.8750	82.550	3.2500	114.300	4.5000	6.400	0.2520	1.600	0.0630	1 000	1 860	200	**8575/8520D**	1	254.000	10.0000	310.000	12.2047	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.41	1.66	2.47	1.62
	9.2500	355.600	14.0000	111.125	4.3750	152.400	6.0000	7.100	0.2795	1.600	0.0630	1 410	2 630	278	**96925/96140D**	1	256.000	10.0787	332.000	13.0709	20.600	0.8110	7.100	0.2795	1.600	0.0630	0.59	1.14	1.70	1.12
	9.2500	384.175	15.1250	193.675	7.6250	238.125	9.3750	6.400	0.2520	1.600	0.0630	3 120	5 370	542	**H247548/H247510D**	1-P	254.000	10.0000	362.000	14.2520	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	9.2500	384.175	15.1250	193.675	7.6250	238.125	9.3750	6.400	0.2520	1.600	0.0630	3 120	5 370	542	**H247549/H247510D**	1-P	254.000	10.0000	362.000	14.2520	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
237.330	9.3437	358.775	14.1250	117.475	4.6250	152.400	6.0000	6.400	0.2520	1.600	0.0630	1 660	3 170	333	**M249736/M249710D**	1	257.000	10.1181	343.000	13.5039	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
241.300	9.5000	327.025	12.8750	82.550	3.2500	114.300	4.5000	6.400	0.2520	1.600	0.0630	1 000	1 860	200	**8578/8520D**	1	261.000	10.2756	310.000	12.2047	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.41	1.66	2.47	1.62
	9.5000	349.148	13.7460	101.600	4.0000	127.000	5.0000	6.400	0.2520	1.600	0.0630	1 190	2 050	224	**EE127095/127136D**	1	261.000	10.2756	330.000	12.9921	12.700	0.5000	6.400	0.2520	1.600	0.0630	0.35	1.91	2.84	1.86
	9.5000	355.498	13.9960	101.600	4.0000	127.000	5.0000	6.400	0.2520	1.600	0.0630	1 190	2 050	224	**EE127095/127139D**	1	261.000	10.2756	330.000	12.9921	12.700	0.5000	6.400	0.2520	1.600	0.0630	0.35	1.91	2.84	1.86
	9.5000	368.300	14.5000	85.725	3.3750	120.650	4.7500	6.400	0.2520	1.600	0.0630	1 090	1 850	203	**EE170950/171451D**	1	261.000	10.2756	336.000	13.2283	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.36	1.86	2.77	1.82
	9.5000	393.700	15.5000	109.538	4.3125	157.163	6.1875	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275095/275156D**	1	261.000	10.2756	378.000	14.8819	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	9.5000	406.400	16.0000	107.950	4.2500	155.575	6.1250	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275095/275161D**	1	261.000	10.2756	378.000	14.8819	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	9.5000	406.400	16.0000	184.150	7.2500	215.900	8.5000	6.400	0.2520	1.600	0.0630	2 950	4 810	494	**H249148/H249111D**	1	261.000	10.2756	385.000	15.1575	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	9.5000	444.500	17.5000	158.750	6.2500	209.550	8.2500	6.400	0.2520	1.600	0.0630	2 750	3 960	408	**EE923095/923176D**	1	261.000	10.2756	407.000	16.0236	25.400	1.0000	6.400	0.2520	1.600	0.0630	0.34	2.01	2.99	1.96
	9.5000	488.950	19.2500	196.850	7.7500	254.000	10.0000	6.400	0.2520	1.600	0.0630	3 610	5 570	553	**EE295950/295192D**	1	261.000	10.2756	446.000	17.5591	28.600	1.1260	6.400	0.2520	1.600	0.0630	0.31	2.18	3.24	2.13
244.475	9.6250	380.898	14.9960	127.000	5.0000	171.450	6.7500	6.400	0.2520	1.600	0.0630	1 690	2 930	306	**EE126097/126149D**	1	264.000	10.3937	357.000	14.0551	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.52	1.31	1.95	1.28
	9.6250	381.000	15.0000	127.000	5.0000	171.450	6.7500	6.400	0.2520	1.600	0.0630	1 690	2 930	306	**EE126097/126151D**	1	264.000	10.3937	357.000	14.0551	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.52	1.31	1.95	1.28
247.650	9.7500	368.300	14.5000	85.725	3.3750	120.650	4.7500	6.400	0.2520	1.600	0.0630	1 090	1 850	203	**EE170975/171451D**	1	267.000	10.5118	336.000	13.2283	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.36	1.86	2.77	1.82
	9.7500	406.400	16.0000	203.200	8.0000	247.650	9.7500	6.400	0.2520	1.600	0.0630	3 490	6 250	612	**HH249949/HH249910D**	1-P	267.000	10.5118	383.000	15.0787	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
249.250	9.8130	380.898	14.9960	127.000	5.0000	171.450	6.7500	6.400	0.2520	1.600	0.0630	1 690	2 930	306	**EE126098/126149D**	1	269.000	10.5906	357.000	14.0551	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.52	1.31	1.95	1.28
	9.8130	381.000	15.0000	127.000	5.0000	171.450	6.7500	6.400	0.2520	1.600	0.0630	1 690	2 930	306	**EE126098/126151D**	1	269.000	10.5906	357.000	14.0551	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.52	1.31	1.95	1.28
254.000	10.0000	347.663	13.6875	69.850	2.7500	101.600	4.0000	3.600	0.1417	1.600	0.0630	1 010	1 690	192	**LM249748/LM249710D**	1	268.000	10.5512	332.000	13.0709	15.900	0.6260	3.600	0.1417	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	358.775	14.1250	117.475	4.6250	152.400	6.0000	3.600	0.1417	1.600	0.0630	1 660	3 170	333	**M249749/M249710D**	1	268.000	10.5512	343.000	13.5039	17.500	0.6890	3.600	0.1417	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	365.125	14.3750	98.425	3.8750	130.175	5.1250	6.400	0.2520	1.600	0.0630	1 210	2 150	231	**EE134100/134144D**	1	273.000	10.7480	346.000	13.6220	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.37	1.80	2.69	1.76
	10.0000	393.700	15.5000	109.538	4.3125	157.163	6.1875	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275100/275156D**	1	273.000	10.7480	378.000	14.8819	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	10.0000	406.400	16.0000	107.950	4.2500	155.575	6.1250	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275100/275161D**	1	273.000	10.7480	378.000	14.8819	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	10.0000	422.275	16.6250	128.588	5.0625	173.038	6.8125	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252343/HM252311D**	1	274.000	10.7874	398.000	15.6693	22.200	0.8740	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	422.275	16.6250	128.588	5.0625	173.038	6.8125	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252344/HM252311D**	1	274.000	10.7874	398.000	15.6693	22.200	0.8740	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	422.275	16.6250	139.700	5.5000	178.592	7.0312	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252343/HM252310D**	1	274.000	10.7874	400.000	15.7480	19.400	0.7638	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	422.275	16.6250	139.700	5.5000	178.592	7.0312	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252344/HM252310D**	1	274.000	10.7874	400.000	15.7480	19.400	0.7638	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98

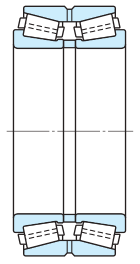
Note 1) SP indicates the specially chamfered from.

TDO · TDOS type

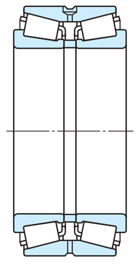
d (254.000) ~ 292.100 mm
(10.0000) ~ 11.5000 inch



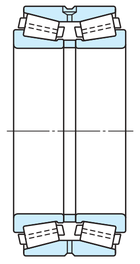
Design 1



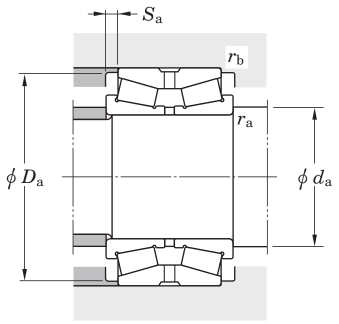
Design 1-P



Design 2



Design 2-P

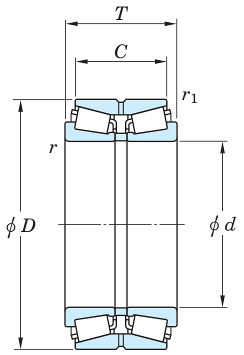


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions										Con-stant	Axial load factors		
d		D		C		T		$r^{1)}$ (min.)		$r_1{}^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b{}^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
254.000	10.0000	431.724	16.9970	128.588	5.0625	173.038	6.8125	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252343/HM252315D**	1	274.000	10.7874	398.000	15.6693	22.200	0.8740	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	431.724	16.9970	128.588	5.0625	173.038	6.8125	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252344/HM252315D**	1	274.000	10.7874	398.000	15.6693	22.200	0.8740	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	533.400	21.0000	165.100	6.5000	276.225	10.8750	6.400	0.2520	1.600	0.0630	3 820	5 600	524	**HH953749/HH953710D**	1-P	273.000	10.7480	496.000	19.5276	55.600	2.1890	6.400	0.2520	1.600	0.0630	0.94	0.72	1.07	0.70
260.350	10.2500	365.125	14.3750	98.425	3.8750	130.175	5.1250	6.400	0.2520	1.600	0.0630	1 210	2 150	231	**EE134102/134144D**	1	280.000	11.0236	355.000	13.9764	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.37	1.80	2.69	1.76
	10.2500	400.050	15.7500	107.950	4.2500	155.575	6.1250	9.500	0.3740	1.600	0.0630	1 630	2 570	274	**EE221026/221576D**	1	286.000	11.2598	372.000	14.6457	23.800	0.9370	9.500	0.3740	1.600	0.0630	0.39	1.71	2.54	1.67
	10.2500	422.275	16.6250	128.588	5.0625	173.038	6.8125	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252348/HM252311D**	1	280.000	11.0236	398.000	15.6693	22.200	0.8740	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.2500	422.275	16.6250	139.700	5.5000	178.592	7.0312	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252348/HM252310D**	1	280.000	11.0236	400.000	15.7480	19.400	0.7638	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.2500	422.275	16.6250	139.700	5.5000	178.592	7.0312	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252349/HM252310D**	1	280.000	11.0236	400.000	15.7480	19.400	0.7638	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.2500	431.724	16.9970	128.588	5.0625	173.038	6.8125	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252348/HM252315D**	1	280.000	11.0236	398.000	15.6693	22.200	0.8740	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.2500	431.724	16.9970	128.588	5.0625	173.038	6.8125	6.700	0.2638	1.600	0.0630	2 180	3 360	355	**HM252349/HM252315D**	1	280.000	11.0236	398.000	15.6693	22.200	0.8740	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.2500	488.950	19.2500	196.850	7.7500	254.000	10.0000	6.400	0.2520	1.600	0.0630	3 610	5 570	553	**EE295102/295192D**	1	280.000	11.0236	446.000	17.5591	28.600	1.1260	6.400	0.2520	1.600	0.0630	0.31	2.18	3.24	2.13
263.525	10.3750	355.600	14.0000	101.600	4.0000	127.000	5.0000	3.600	0.1417	1.600	0.0630	1 300	2 550	267	**LM451345/LM451310D**	1	277.000	10.9055	343.000	13.5039	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.36	1.87	2.79	1.83
266.700	10.5000	355.600	14.0000	101.600	4.0000	127.000	5.0000	3.600	0.1417	1.600	0.0630	1 300	2 550	267	**LM451349/LM451310D**	1	280.000	11.0236	343.000	13.5039	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.36	1.87	2.79	1.83
	10.5000	357.200	14.0630	101.600	4.0000	127.000	5.0000	3.600	0.1417	1.600	0.0630	1 300	2 550	267	**LM451349/LM451312D**	1	280.000	11.0236	343.000	13.5039	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.36	1.87	2.79	1.83
	10.5000	393.700	15.5000	109.538	4.3125	157.163	6.1875	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275105/275156D**	1	286.000	11.2598	378.000	14.8819	23.800	0.9370	6.400	0.2520	1.500	0.0591	0.40	1.68	2.50	1.64
	10.5000	406.400	16.0000	107.950	4.2500	155.575	6.1250	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275105/275161D**	1	286.000	11.2598	378.000	14.8819	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	10.5000	422.275	16.6250	139.700	5.5000	178.598	7.0314	6.700	0.2638	1.600	0.0630	2 110	3 420	352	**EE551050/551663D**	1	287.000	11.2992	390.000	15.3543	19.400	0.7638	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
	10.5000	431.724	16.9970	128.588	5.0625	173.038	6.8125	6.700	0.2638	1.600	0.0630	2 110	3 420	352	**EE551050/551701D**	1	287.000	11.2992	389.000	15.3150	22.200	0.8740	6.700	0.2638	1.600	0.0630	0.33	2.03	3.02	1.98
269.875	10.6250	381.000	15.0000	123.825	4.8750	158.750	6.2500	6.400	0.2520	1.600	0.0630	1 840	3 350	349	**M252349/M252310D**	1	289.000	11.3780	364.000	14.3307	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
273.050	10.7500	393.700	15.5000	109.538	4.3125	157.163	6.1875	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275108/275156D**	1	292.000	11.4961	378.000	14.8819	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	10.7500	406.400	16.0000	107.950	4.2500	155.575	6.1250	6.400	0.2520	1.600	0.0630	1 590	3 090	325	**EE275108/275161D**	1	292.000	11.4961	378.000	14.8819	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
273.060	10.7504	422.280	16.6252	177.800	7.0000	178.592	7.0312	3.100	0.1220	8.000	0.3150	2 180	3 360	355	**46T554218**	1	310.000	12.2047	407.000	16.0236	0.400	0.0157	4.000	0.1575	8.000	0.3150	0.33	2.03	3.02	1.98
279.400	11.0000	469.900	18.5000	149.225	5.8750	200.025	7.8750	9.500	0.3740	1.600	0.0630	2 650	4 370	437	**EE722110/722186D**	1	305.000	12.0079	431.000	16.9685	25.400	1.0000	9.500	0.3740	1.600	0.0630	0.38	1.79	2.67	1.75
	11.0000	488.950	19.2500	196.850	7.7500	254.000	10.0000	1.200	0.0472	1.600	0.0630	3 610	5 570	553	**EE295110/295192D**	1	288.000	11.3386	446.000	17.5591	28.600	1.1260	1.200	0.0472	1.600	0.0630	0.31	2.18	3.24	2.13
279.982	11.0229	380.898	14.9960	107.950	4.2500	139.700	5.5000	3.600	0.1417	1.600	0.0630	1 420	2 820	286	**LM654642/LM654610D**	1	294.000	11.5748	371.000	14.6063	15.900	0.6260	3.600	0.1417	1.600	0.0630	0.43	1.57	2.34	1.53
280.000	11.0236	406.400	16.0000	117.475	4.6250	149.225	5.8750	6.400	0.2520	1.600	0.0630	1 650	2 950	307	**EE128112/128160D**	1	299.000	11.7717	383.000	15.0787	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.39	1.75	2.61	1.71
	11.0236	406.400	16.0000	117.475	4.6250	149.225	5.8750	6.400	0.2520	1.600	0.0630	1 650	2 950	307	**EE128114/128160D**	1	299.000	11.7717	383.000	15.0787	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.39	1.75	2.61	1.71
280.192	11.0312	406.400	16.0000	85.725	3.3750	120.650	4.7500	6.700	0.2638	1.600	0.0630	1 120	1 980	209	**EE101103/101601D**	1	300.000	11.8110	375.000	14.7638	17.500	0.6890	6.700	0.2638	1.600	0.0630	0.41	1.66	2.47	1.62
	11.0312	406.400	16.0000	117.475	4.6250	149.225	5.8750	6.700	0.2638	1.600	0.0630	1 650	2 950	307	**EE128111/128160D**	1	300.000	11.8110	383.000	15.0787	15.900	0.6260	6.700	0.2638	1.600	0.0630	0.39	1.75	2.61	1.71
285.750	11.2500	358.775	14.1250	53.975	2.1250	76.200	3.0000	3.600	0.1417	1.600	0.0630	516	1 070	122	**545112/545142D**	1	299.000	11.7717	345.000	13.5827	11.100	0.4370	3.600	0.1417	1.600	0.0630	0.49	1.38	2.06	1.35
	11.2500	380.898	14.9960	107.950	4.2500	139.700	5.5000	3.600	0.1417	1.600	0.0630	1 420	2 820	286	**LM654649/LM654610D**	1	299.000	11.7717	371.000	14.6063	15.900	0.6260	3.600	0.1417	1.600	0.0630	0.43	1.57	2.34	1.53
	11.2500	501.650	19.7500	120.650	4.7500	203.200	8.0000	6.400	0.2520	3.200	0.1260	2 440	3 460	345	**EE147112/147198D**	1	305.000	12.0079	467.000	18.3858	41.300	1.6260	6.400	0.2520	3.200	0.1260	0.83	0.81	1.20	0.79
288.925	11.3750	406.400	16.0000	130.175	5.1250	165.100	6.5000	6.400	0.2520	1.600	0.0630	2 160	4 420	445	**M255449/M255410D**	1	308.000	12.1260	388.000	15.2756	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.34	2.00	2.97	1.95
292.100	11.5000	374.650	14.7500	79.375	3.1250	104.775	4.1250	3.600	0.1417	1.600	0.0630	1 010	1 940	222	**L555249/L555210D**	1	306.000	12.0472	361.000	14.2126	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.40	1.68	2.50	1.64
	11.5000	469.900	18.5000	149.225	5.8750	200.025	7.8750	9.500	0.3740	1.600	0.0630	2 650	4 370	437	**EE722115/722186D**	1	318.000	12.5197	431.000	16.9685	25.400	1.0000	9.500	0.3740	1.600	0.0630	0.38	1.79	2.67	1.75
	11.5000	558.800	22.0000	222.250	8.7500	298.450	11.7500	6.400	0.2520	1.600	0.0630	5 060	8 000	746	**EE790114/790223D**	1-P	311.000	12.2441	515.000	20.2756	38.100	1.5000	6.400	0.2520	1.600	0.0630	0.40	1.71	2.54	1.67

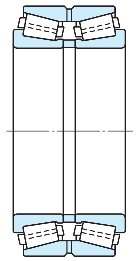
Note 1) SP indicates the specially chamfered from.

TDO · TDOS type

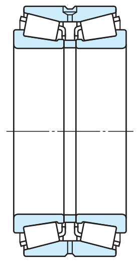
d 298.450 ~ 371.475 mm
11.7500 ~ 14.6250 inch



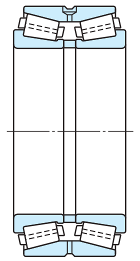
Design 1



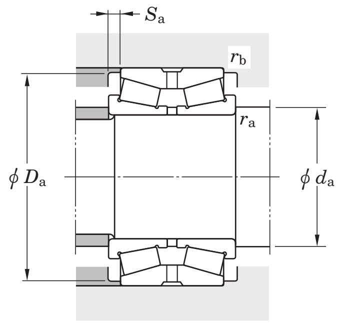
Design 1-P



Design 2



Design 2-P



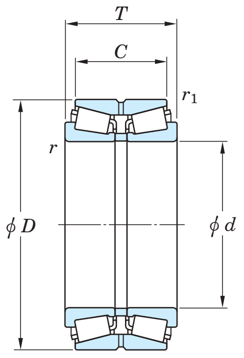
Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions										Con-stant	Axial load factors		
d		D		C		T		r[1) (min.)		r_1[1) (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		r_b[1) (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
298.450	11.7500	444.500	17.5000	98.425	3.8750	146.050	5.7500	7.900	0.3110	1.600	0.0630	1 550	2 760	288	**EE291175/291751D**	1	321.000	12.6378	414.000	16.2992	23.800	0.9370	7.900	0.3110	1.600	0.0630	0.38	1.79	2.66	1.75
300.038	11.8125	422.275	16.6250	136.525	5.3750	174.625	6.8750	6.400	0.2520	1.600	0.0630	2 130	4 030	409	**HM256849/HM256810D**	1	320.000	12.5984	403.000	15.8661	19.100	0.7520	6.400	0.2520	1.600	0.0630	0.34	2.00	2.98	1.96
304.800	12.0000	393.700	15.5000	82.550	3.2500	107.950	4.2500	6.400	0.2520	1.600	0.0630	1 130	2 360	266	**L357049/L357010D**	1	325.000	12.7953	379.000	14.9213	12.700	0.5000	6.400	0.2520	1.600	0.0630	0.36	1.88	2.80	1.84
	12.0000	412.750	16.2500	92.075	3.6250	123.825	4.8750	6.400	0.2520	1.600	0.0630	1 280	2 410	250	**EE109120/109163D**	1	325.000	12.7953	394.000	15.5118	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.43	1.58	2.35	1.55
	12.0000	444.500	17.5000	98.425	3.8750	146.050	5.7500	7.900	0.3110	1.600	0.0630	1 550	2 760	288	**EE291201/291751D**	1	328.000	12.9134	414.000	16.2992	23.800	0.9370	7.900	0.3110	1.600	0.0630	0.38	1.79	2.66	1.75
	12.0000	495.300	19.5000	120.650	4.7500	162.245	6.3876	6.400	0.2520	1.600	0.0630	2 360	3 840	393	**EE941205/941951D**	1	315.000	12.4016	463.000	18.2283	20.800	0.8189	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	12.0000	495.300	19.5000	127.000	5.0000	168.595	6.6376	6.400	0.2520	1.600	0.0630	2 360	3 840	393	**EE941205/941953D**	1	315.000	12.4016	463.000	18.2283	20.800	0.8189	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	12.0000	495.300	19.5000	146.050	5.7500	196.850	7.7500	16.000	0.6299	1.600	0.0630	2 740	4 680	461	**EE724119/724196D**	1	344.000	13.5433	458.000	18.0315	25.400	1.0000	16.000	0.6299	1.600	0.0630	0.40	1.68	2.50	1.64
	12.0000	495.300	19.5000	146.050	5.7500	196.850	7.7500	16.000	0.6299	1.600	0.0630	2 740	4 680	461	**EE724120/724196D**	1	344.000	13.5433	458.000	18.0315	25.400	1.0000	16.000	0.6299	1.600	0.0630	0.40	1.68	2.50	1.64
	12.0000	558.800	22.0000	222.250	8.7500	298.450	11.7500	1.200	0.0472	1.600	0.0630	5 060	8 000	746	**EE790120/790223D**	1-P	315.000	12.4016	515.000	20.2756	38.100	1.5000	1.200	0.0472	1.600	0.0630	0.40	1.71	2.54	1.67
311.150	12.2500	558.800	22.0000	111.125	4.3750	190.500	7.5000	9.500	0.3740	3.200	0.1260	2 360	3 490	346	**EE148122/148221D**	1	338.000	13.3071	505.000	19.8819	39.700	1.5630	9.500	0.3740	3.200	0.1260	0.88	0.77	1.15	0.75
317.500	12.5000	444.500	17.5000	98.425	3.8750	146.050	5.7500	7.900	0.3110	1.600	0.0630	1 550	2 760	288	**EE291250/291751D**	1	341.000	13.4252	414.000	16.2992	23.800	0.9370	7.900	0.3110	1.600	0.0630	0.38	1.79	2.66	1.75
	12.5000	447.675	17.6250	146.050	5.7500	180.975	7.1250	3.600	0.1417	1.600	0.0630	2 400	4 770	465	**HM259049./HM259010D.**	1	328.000	12.9134	428.000	16.8504	17.500	0.6890	3.600	0.1417	1.600	0.0630	0.33	2.02	3.00	1.97
	12.5000	622.300	24.5000	174.625	6.8750	304.800	12.0000	14.300	0.5630	3.200	0.1260	4 780	6 990	632	**H961649/H961610D**	1-P	354.000	13.9370	585.000	23.0315	65.100	2.5630	14.300	0.5630	3.200	0.1260	0.94	0.72	1.07	0.70
329.870	12.9870	533.400	21.0000	114.300	4.5000	165.100	6.5000	4.800	0.1890	1.600	0.0630	2 350	3 580	362	**EE971298/972102D**	1	346.500	13.6417	494.000	19.4488	25.400	1.0000	4.800	0.1890	1.600	0.0630	0.33	2.03	3.02	1.98
	12.9870	546.100	21.5000	152.400	6.0000	177.800	7.0000	4.800	0.1890	3.200	0.1260	2 350	3 580	362	**EE971298/972151D**	1	347.000	13.6614	500.000	19.6850	12.700	0.5000	4.800	0.1890	3.200	0.1260	0.33	2.03	3.02	1.98
330.200	13.0000	482.600	19.0000	88.900	3.5000	133.350	5.2500	7.100	0.2795	1.600	0.0630	1 320	2 500	247	**EE161300/161901D**	1	352.000	13.8583	454.000	17.8740	22.200	0.8740	7.100	0.2795	1.600	0.0630	0.50	1.35	2.01	1.32
	13.0000	482.600	19.0000	127.000	5.0000	177.800	7.0000	6.400	0.2520	1.600	0.0630	2 320	4 100	404	**EE526130/526191D**	1	350.000	13.7795	454.000	17.8740	25.400	1.0000	6.400	0.2520	1.600	0.0630	0.39	1.73	2.57	1.69
	13.0000	482.600	19.0000	127.000	5.0000	177.800	7.0000	3.200	0.1260	1.600	0.0630	2 320	4 100	404	**EE526132/526191D**	1	344.000	13.5433	454.000	17.8740	25.400	1.0000	3.200	0.1260	1.600	0.0630	0.39	1.73	2.57	1.69
333.375	13.1250	469.900	18.5000	152.400	6.0000	190.500	7.5000	6.400	0.2520	1.600	0.0630	2 900	5 680	548	**HM261049/HM261010D**	1-P	354.000	13.9370	449.000	17.6772	19.100	0.7520	6.400	0.2520	1.600	0.0630	0.33	2.02	3.00	1.97
342.900	13.5000	533.400	21.0000	114.300	4.5000	165.100	6.5000	4.800	0.1890	1.600	0.0630	2 350	3 580	362	**EE971354/972102D**	1	360.000	14.1732	494.000	19.4488	25.400	1.0000	4.800	0.1890	1.600	0.0630	0.33	2.03	3.02	1.98
	13.5000	546.100	21.5000	152.400	6.0000	177.800	7.0000	4.800	0.1890	3.200	0.1260	2 350	3 580	362	**EE971354/972151D**	1	360.000	14.1732	500.000	19.6850	12.700	0.5000	4.800	0.1890	3.200	0.1260	0.33	2.03	3.02	1.98
346.075	13.6250	482.600	19.0000	88.900	3.5000	133.350	5.2500	7.100	0.2795	1.600	0.0630	1 320	2 500	247	**EE161363/161901D**	1	368.000	14.4882	454.000	17.8740	22.200	0.8740	7.100	0.2795	1.600	0.0630	0.50	1.35	2.01	1.32
	13.6250	488.950	19.2500	158.750	6.2500	200.025	7.8750	6.400	0.2520	1.600	0.0630	2 890	5 800	553	**HM262749/HM262710D**	1	366.000	14.4094	467.000	18.3858	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.33	2.02	3.00	1.97
349.250	13.7500	514.350	20.2500	152.400	6.0000	193.675	7.6250	6.400	0.2520	1.600	0.0630	2 740	5 070	499	**EE333137/333203D**	1	370.000	14.5669	483.000	19.0157	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.37	1.80	2.69	1.76
355.600	14.0000	444.500	17.5000	111.125	4.3750	136.525	5.3750	3.600	0.1417	1.600	0.0630	1 390	3 450	332	**L163149/L163110D**	1	370.000	14.5669	428.000	16.8504	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.31	2.20	3.27	2.15
	14.0000	482.600	19.0000	88.900	3.5000	133.350	5.2500	7.100	0.2795	1.600	0.0630	1 320	2 500	247	**EE161400/161901D**	1	377.000	14.8425	454.000	17.8740	22.200	0.8740	7.100	0.2795	1.600	0.0630	0.50	1.35	2.01	1.32
	14.0000	501.650	19.7500	107.950	4.2500	155.575	6.1250	6.400	0.2520	1.600	0.0630	1 700	3 280	322	**EE231400/231976D**	1	376.000	14.8031	481.000	18.9370	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.44	1.53	2.28	1.50
	14.0000	514.350	20.2500	107.950	4.2500	155.575	6.1250	6.400	0.2520	1.600	0.0630	1 700	3 280	322	**EE231400/232026D**	1	376.000	14.8031	481.000	18.9370	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.44	1.53	2.28	1.50
	14.0000	514.350	20.2500	152.400	6.0000	193.675	7.6250	6.400	0.2520	1.600	0.0630	2 740	5 070	499	**EE333140/333203D**	1	376.000	14.8031	483.000	19.0157	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.37	1.80	2.69	1.76
368.249	14.4980	523.875	20.6250	169.863	6.6875	214.313	8.4375	6.400	0.2520	1.600	0.0630	3 590	7 060	663	**46T745221**	1	388.000	15.2756	505.000	19.8819	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	14.4980	523.875	20.6250	169.863	6.6875	214.313	8.4375	6.400	0.2520	1.600	0.0630	3 420	6 780	644	**HM265049/HM265010D**	1-P	388.000	15.2756	505.000	19.8819	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
368.300	14.5000	596.900	23.5000	133.350	5.2500	203.200	8.0000	9.500	0.3740	2.400	0.0945	3 410	5 410	526	**EE181453/182351D**	1-P	395.000	15.5512	555.000	21.8504	34.900	1.3740	9.500	0.3740	2.400	0.0945	0.41	1.63	2.42	1.59
371.475	14.6250	501.650	19.7500	107.950	4.2500	155.575	6.1250	6.400	0.2520	1.600	0.0630	1 700	3 280	322	**EE231462/231976D**	1	392.000	15.4331	481.000	18.9370	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.44	1.53	2.28	1.50
	14.6250	514.350	20.2500	107.950	4.2500	155.575	6.1250	6.400	0.2520	1.600	0.0630	1 700	3 280	322	**EE231462/232026D**	1	392.000	15.4331	481.000	18.9370	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.44	1.53	2.28	1.50

Note 1) SP indicates the specially chamfered from.

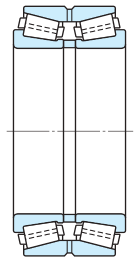
TDO · TDOS type

d 381.000 ~ 479.425 mm

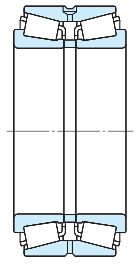
15.0000 ~ 18.8750 inch



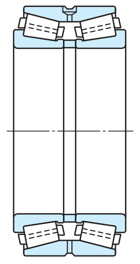
Design 1



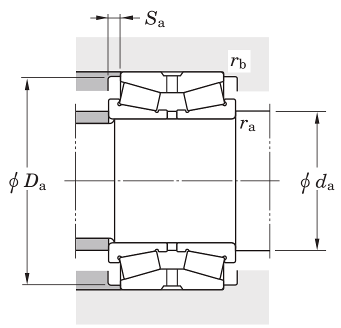
Design 1-P



Design 2



Design 2-P

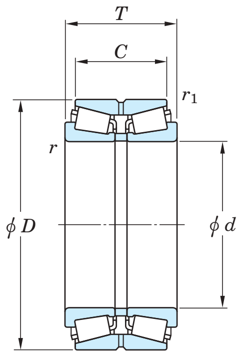


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions										Constant	Axial load factors		
d		*D*		*C*		*T*		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b^{1)}$ (max.)		*e*	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
381.000	15.0000	508.000	20.0000	88.900	3.5000	139.700	5.5000	6.400	0.2520	1.600	0.0630	1 480	2 980	288	**EE192150/192201D**	1	401.000	15.7874	480.000	18.8976	25.400	1.0000	6.400	0.2520	1.600	0.0630	0.53	1.27	1.89	1.24
	15.0000	546.100	21.5000	177.800	7.0000	222.250	8.7500	6.400	0.2520	1.600	0.0630	4 090	8 430	773	**HM266447/HM266410D**	1-P	401.000	15.7874	520.000	20.4724	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	15.0000	546.100	21.5000	177.800	7.0000	222.250	8.7500	1.600	0.0630	6.400	0.2520	3 550	6 980	646	**46T765522A**	1	409.000	16.1024	520.000	20.4724	22.300	0.8780	1.600	0.0630	6.400	0.2520	0.33	2.03	3.02	1.98
	15.0000	590.550	23.2500	193.675	7.6250	244.475	9.6250	6.400	0.2520	1.600	0.0630	4 240	8 930	803	**M268730/M268710D**	1-P	401.000	15.7874	565.000	22.2441	25.400	1.0000	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
384.175	15.1250	546.100	21.5000	177.800	7.0000	222.250	8.7500	6.400	0.2520	1.600	0.0630	4 090	8 430	773	**HM266449/HM266410D**	1-P	404.000	15.9055	520.000	20.4724	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
385.763	15.1875	514.350	20.2500	139.700	5.5000	177.800	7.0000	1.600	0.0630	6.400	0.2520	2 590	5 410	516	**LM665949/LM665910D**	1	414.000	16.2992	494.000	19.4488	19.100	0.7520	1.600	0.0630	6.400	0.2520	0.42	1.61	2.40	1.58
393.700	15.5000	539.750	21.2500	101.600	4.0000	142.875	5.6250	6.400	0.2520	1.600	0.0630	1 860	3 810	357	**EE234154/234213D**	1	414.000	16.2992	515.000	20.2756	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
	15.5000	546.100	21.5000	117.475	4.6250	158.750	6.2500	6.400	0.2520	1.600	0.0630	1 860	3 810	357	**EE234154/234216D**	1	414.000	16.2992	515.000	20.2756	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
396.875	15.6250	539.750	21.2500	101.600	4.0000	142.875	5.6250	6.400	0.2520	1.600	0.0630	1 860	3 810	357	**EE234156/234213D**	1	417.000	16.4173	515.000	20.2756	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
	15.6250	546.100	21.5000	117.475	4.6250	158.750	6.2500	6.400	0.2520	1.600	0.0630	1 860	3 810	357	**EE234156/234216D**	1	417.000	16.4173	515.000	20.2756	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
406.400	16.0000	539.750	21.2500	101.600	4.0000	142.875	5.6250	6.400	0.2520	1.600	0.0630	1 860	3 810	357	**EE234160/234213D**	1	428.000	16.8504	515.000	20.2756	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
	16.0000	546.100	21.5000	117.475	4.6250	158.750	6.2500	6.400	0.2520	1.600	0.0630	1 860	3 810	357	**EE234160/234216D**	1	428.000	16.8504	515.000	20.2756	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
	16.0000	574.675	22.6250	106.363	4.1875	157.163	6.1875	6.700	0.2638	1.600	0.0630	2 040	3 880	367	**EE285160/285228D**	1	428.000	16.8504	535.000	21.0630	25.400	1.0000	6.700	0.2638	1.600	0.0630	0.50	1.35	2.01	1.32
	16.0000	574.675	22.6250	118.000	4.6457	175.000	6.8898	SP	SP	SP	SP	2 530	4 620	439	**46T815718**	1-P	426.400	16.7874	550.000	21.6535	28.500	1.1220	4.000	0.1575	2.000	0.0787	0.70	0.97	1.44	0.94
	16.0000	590.550	23.2500	174.625	6.8750	228.600	9.0000	9.500	0.3740	1.600	0.0630	3 830	7 070	658	**EE833160X/833233D**	1	434.000	17.0866	560.000	22.0472	27.000	1.0630	9.500	0.3740	1.600	0.0630	0.32	2.08	3.10	2.04
	16.0000	609.524	23.9970	133.350	5.2500	177.800	7.0000	7.900	0.3110	1.600	0.0630	3 260	6 060	567	**EE736160/736239D**	1	431.000	16.9685	575.000	22.6378	22.200	0.8740	4.000	0.1575	7.900	0.3110	0.35	1.95	2.90	1.91
	16.0000	609.600	24.0000	123.825	4.8750	187.325	7.3750	6.700	0.2638	1.600	0.0630	3 060	5 280	503	**EE911600/912401D**	1	428.000	16.8504	570.000	22.4409	31.800	1.2520	6.700	0.2638	1.600	0.0630	0.38	1.76	2.62	1.72
	16.0000	673.100	26.5000	127.000	5.0000	192.639	7.5842	6.400	0.2520	1.600	0.0630	3 170	5 240	494	**EE571602/572651D**	1	428.000	16.8504	620.000	24.4094	32.800	1.2913	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	16.0000	673.100	26.5000	152.400	6.0000	192.639	7.5842	6.400	0.2520	1.600	0.0630	3 170	5 240	494	**EE571602/572653D**	1	428.000	16.8504	630.000	24.8031	20.100	0.7913	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
409.575	16.1250	546.100	21.5000	147.638	5.8125	185.738	7.3125	6.400	0.2520	1.600	0.0630	2 850	5 740	541	**M667948/M667911D**	1	431.000	16.9685	530.000	20.8661	19.100	0.7520	6.400	0.2520	1.600	0.0630	0.42	1.62	2.42	1.59
415.925	16.3750	590.550	23.2500	193.675	7.6250	244.475	9.6250	6.400	0.2520	1.600	0.0630	4 240	8 930	803	**M268749/M268710D**	1-P	437.000	17.2047	565.000	22.2441	25.400	1.0000	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
430.213	16.9375	603.250	23.7500	104.775	4.1250	159.639	6.2850	6.400	0.2520	1.600	0.0630	2 090	3 770	361	**EE241693/242377D**	1	451.000	17.7559	565.000	22.2441	27.400	1.0787	6.400	0.2520	1.600	0.0630	0.53	1.28	1.91	1.26
431.800	17.0000	571.500	22.5000	111.125	4.3750	155.575	6.1250	3.200	0.1260	1.600	0.0630	2 110	4 270	405	**LM869448/LM869410D**	1	447.000	17.5984	555.000	21.8504	22.200	0.8740	3.200	0.1260	1.600	0.0630	0.55	1.24	1.84	1.21
	17.0000	603.250	23.7500	104.775	4.1250	159.639	6.2850	6.400	0.2520	1.600	0.0630	2 090	3 770	361	**EE241701/242377D**	1	453.000	17.8346	565.000	22.2441	27.400	1.0787	6.400	0.2520	1.600	0.0630	0.53	1.28	1.91	1.26
	17.0000	673.100	26.5000	127.000	5.0000	192.639	7.5842	6.400	0.2520	1.600	0.0630	3 170	5 240	494	**EE571703/572651D**	1	453.000	17.8346	620.000	24.4094	32.800	1.2913	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
	17.0000	673.100	26.5000	152.400	6.0000	192.639	7.5842	6.400	0.2520	1.600	0.0630	3 170	5 240	494	**EE571703/572653D**	1	453.000	17.8346	630.000	24.8031	20.100	0.7913	6.400	0.2520	1.600	0.0630	0.40	1.68	2.50	1.64
441.325	17.3750	660.400	26.0000	138.113	5.4375	195.263	7.6875	10.400	0.4094	1.600	0.0630	2 900	5 260	482	**EE737173/737261D**	1	471.000	18.5433	615.000	24.2126	28.600	1.1260	10.400	0.4094	1.600	0.0630	0.37	1.80	2.69	1.76
447.675	17.6250	635.000	25.0000	206.375	8.1250	257.175	10.1250	6.400	0.2520	1.600	0.0630	4 920	10 500	917	**M270749/M270710D**	1-P	469.000	18.4646	605.000	23.8189	25.400	1.0000	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
457.200	18.0000	596.900	23.5000	120.650	4.7500	165.100	6.5000	9.500	0.3740	1.600	0.0630	2 410	5 230	486	**EE244180/244236D**	1	485.000	19.0945	570.000	22.4409	22.200	0.8740	9.500	0.3740	1.600	0.0630	0.40	1.67	2.48	1.63
	18.0000	605.000	23.8189	120.650	4.7500	165.100	6.5000	SP	SP	SP	SP	2 410	5 230	486	**46T916117**	2-P	489.000	19.2520	575.000	22.6378	22.000	0.8661	6.000	0.2362	0.800	0.0315	0.40	1.67	2.48	1.63
479.425	18.8750	679.450	26.7500	222.250	8.7500	276.225	10.8750	6.400	0.2520	1.600	0.0630	5 940	12 700	1 070	**46T966828**	2-P	490.000	19.2913	649.000	25.5512	27.000	1.0630	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	18.8750	679.450	26.7500	222.250	8.7500	276.225	10.8750	6.400	0.2520	1.600	0.0630	5 310	11 100	952	**M272749/M272710D**	1-P	500.000	19.6850	650.000	25.5906	27.000	1.0630	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	18.8750	679.450	26.7500	222.250	8.7500	276.225	10.8750	1.600	0.0630	6.400	0.2520	5 940	12 700	1 070	**46T966828**	1	508.000	20.0000	650.000	25.5906	27.000	1.0630	1.600	0.0630	6.400	0.2520	0.33	2.03	3.02	1.98
	18.8750	740.000	29.1339	230.000	9.0551	300.000	11.8110	1.600	0.0630	6.400	0.2520	7 020	13 100	1 110	**46T967430**	1-P	508.000	20.0000	696.000	27.4016	35.000	1.3780	1.600	0.0630	6.400	0.2520	0.33	2.03	3.02	1.98

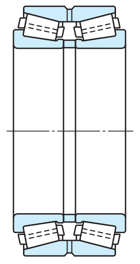
Note 1) SP indicates the specially chamfered from.

TDO · TDOS type

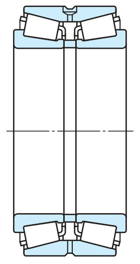
d 482.600 ~ (749.300) mm
19.0000 ~ (29.5000) inch



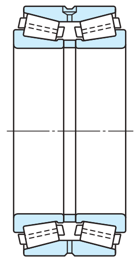
Design 1



Design 1-P



Design 2



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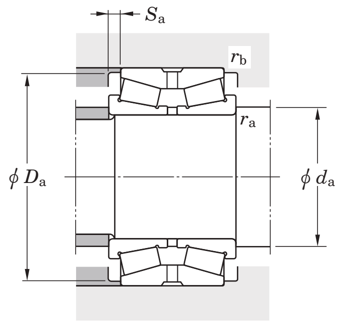
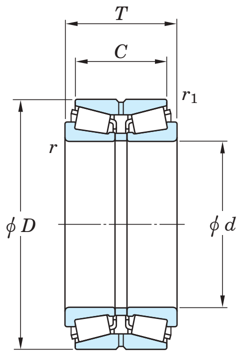


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions										Constant	Axial load factors		
d		D		C		T		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
482.600	19.0000	615.950	24.2500	146.050	5.7500	184.150	7.2500	6.400	0.2520	1.600	0.0630	3 040	7 110	639	**LM272249/LM272210D**	1	505.000	19.8819	595.000	23.4252	19.100	0.7520	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	19.0000	634.873	24.9950	142.875	5.6250	177.800	7.0000	6.400	0.2520	1.600	0.0630	2 840	6 590	585	**EE243190/243251D**	1	505.000	19.8819	610.000	24.0157	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.34	1.97	2.93	1.93
488.671	19.2390	660.400	26.0000	158.750	6.2500	206.375	8.1250	6.400	0.2520	1.600	0.0630	3 870	7 910	713	**EE640191/640261D**	1-P	510.000	20.0787	630.000	24.8031	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.31	2.20	3.27	2.15
488.950	19.2500	634.873	24.9950	136.525	5.3750	180.975	7.1250	6.400	0.2520	1.600	0.0630	3 090	6 840	613	**LM772748/LM772710D**	1	510.000	20.0787	615.000	24.2126	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.47	1.43	2.12	1.40
	19.2500	660.400	26.0000	158.750	6.2500	206.375	8.1250	6.400	0.2520	1.600	0.0630	3 870	7 910	713	**EE640192/640261D**	1-P	510.000	20.0787	630.000	24.8031	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.31	2.20	3.27	2.15
	19.2500	660.400	26.0000	158.750	6.2500	206.375	8.1250	1.600	0.0630	6.400	0.2520	3 940	8 090	722	**46T986621**	1	517.000	20.3543	631.000	24.8425	23.900	0.9409	1.600	0.0630	6.400	0.2520	0.31	2.20	3.27	2.15
489.026	19.2530	634.873	24.9950	142.875	5.6250	177.800	7.0000	6.400	0.2520	1.600	0.0630	2 840	6 590	585	**EE243192/243251D**	1	510.000	20.0787	610.000	24.0157	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.34	1.97	2.93	1.93
498.475	19.6250	634.873	24.9950	142.875	5.6250	177.800	7.0000	6.400	0.2520	1.600	0.0630	2 840	6 590	585	**EE243196/243251D**	1	520.000	20.4724	610.000	24.0157	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.34	1.97	2.93	1.93
508.000	20.0000	736.600	29.0000	114.300	4.5000	186.502	7.3426	6.400	0.2520	1.600	0.0630	3 160	5 150	475	**EE982003/982901D**	1-P	530.000	20.8661	690.000	27.1654	36.100	1.4213	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
520.700	20.5000	736.600	29.0000	114.300	4.5000	186.502	7.3426	6.400	0.2520	1.600	0.0630	3 160	5 150	475	**EE982051/982901D**	1-P	545.000	21.4567	690.000	27.1654	36.100	1.4213	6.400	0.2520	1.600	0.0630	0.48	1.42	2.11	1.39
533.400	21.0000	812.800	32.0000	187.325	7.3750	269.875	10.6250	9.500	0.3740	3.200	0.1260	5 680	11 000	947	**EE626210/626321D**	1-P	565.000	22.2441	760.000	29.9213	41.300	1.6260	9.500	0.3740	3.200	0.1260	0.44	1.54	2.29	1.50
536.575	21.1250	761.873	29.9950	247.650	9.7500	311.150	12.2500	6.400	0.2520	1.600	0.0630	7 060	14 400	1 190	**M276449/10CD**	2-P	555.000	21.8504	726.000	28.5827	32.000	1.2598	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
546.100	21.5000	736.600	29.0000	114.300	4.5000	165.100	6.5000	6.400	0.2520	3.200	0.1260	3 030	6 100	550	**EE542215/542291D**	1-P	570.000	22.4409	705.000	27.7559	25.400	1.0000	6.400	0.2520	3.200	0.1260	0.51	1.33	1.97	1.30
558.800	22.0000	736.600	29.0000	114.300	4.5000	165.100	6.5000	6.400	0.2520	3.200	0.1260	3 030	6 100	550	**EE542220/542291D**	1-P	580.000	22.8346	705.000	27.7559	25.400	1.0000	6.400	0.2520	3.200	0.1260	0.51	1.33	1.97	1.30
	22.0000	736.600	29.0000	138.113	5.4375	187.328	7.3751	6.400	0.2520	1.600	0.0630	3 710	8 050	714	**EE843220/843291D**	1-P	580.000	22.8346	710.000	27.9528	24.600	0.9685	6.400	0.2520	1.600	0.0630	0.34	1.97	2.93	1.93
	22.0000	736.600	29.0000	160.000	6.2992	225.425	8.8750	6.400	0.2520	1.600	0.0630	4 050	9 180	776	**2TR559**	1-P	580.000	22.8346	720.000	28.3465	32.700	1.2874	6.400	0.2520	1.600	0.0630	0.70	0.97	1.44	0.94
	22.0000	736.600	29.0000	177.800	7.0000	225.425	8.8750	6.400	0.2520	1.600	0.0630	4 500	9 870	854	**LM377449/LM377410D**	1-P	580.000	22.8346	710.000	27.9528	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.35	1.95	2.90	1.91
	22.0000	736.600	29.0000	177.800	7.0000	225.425	8.8750	1.600	0.0630	6.400	0.2520	4 800	10 800	923	**2TR559D**	1-P	587.000	23.1102	707.000	27.8346	23.900	0.9409	1.600	0.0630	6.400	0.2520	0.35	1.95	2.90	1.91
	22.0000	742.950	29.2500	138.113	5.4375	187.328	7.3751	6.400	0.2520	1.600	0.0630	3 710	8 050	714	**EE843220/843292D**	1-P	580.000	22.8346	710.000	27.9528	24.600	0.9685	6.400	0.2520	1.600	0.0630	0.34	1.97	2.93	1.93
560.000	22.0472	740.000	29.1339	140.000	5.5118	190.000	7.4803	SP	SP	SP	SP	3 710	8 050	714	**2TR560B**	1-P	585.000	23.0315	715.000	28.1496	25.000	0.9843	4.000	0.1575	0.800	0.0315	0.34	1.97	2.93	1.93
571.500	22.5000	812.800	32.0000	263.525	10.3750	333.375	13.1250	6.400	0.2520	1.600	0.0630	8 150	17 500	1 400	**M278749/10D**	1-P	600.000	23.6220	778.000	30.6299	35.000	1.3780	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
602.945	23.7380	787.400	31.0000	158.750	6.2500	206.375	8.1250	6.400	0.2520	1.600	0.0630	4 260	9 940	840	**EE649237/649311D**	1-P	625.000	24.6063	755.000	29.7244	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.37	1.82	2.70	1.78
	23.7380	793.750	31.2500	158.750	6.2500	206.375	8.1250	6.400	0.2520	1.600	0.0630	4 260	9 940	840	**EE649237/649313D**	1-P	625.000	24.6063	755.000	29.7244	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.37	1.82	2.70	1.78
609.600	24.0000	787.400	31.0000	158.750	6.2500	206.375	8.1250	6.400	0.2520	1.600	0.0630	4 260	9 940	840	**EE649240/649311D**	1-P	635.000	25.0000	755.000	29.7244	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.37	1.82	2.70	1.78
	24.0000	793.750	31.2500	158.750	6.2500	206.375	8.1250	6.400	0.2520	1.600	0.0630	4 260	9 940	840	**EE649240/649313D**	1-P	635.000	25.0000	755.000	29.7244	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.37	1.82	2.70	1.78
	24.0000	812.800	32.0000	146.050	5.7500	190.500	7.5000	6.400	0.2520	3.200	0.1260	4 100	8 590	743	**EE743240/743321D**	1-P	635.000	25.0000	770.000	30.3150	22.200	0.8740	6.400	0.2520	3.200	0.1260	0.33	2.06	3.06	2.01
682.625	26.8750	965.200	38.0000	311.150	12.2500	396.875	15.6250	9.500	0.3740	1.600	0.0630	11 500	25 400	1 910	**2TR683-1**	2-P	710.000	27.9528	926.000	36.4567	42.800	1.6850	9.500	0.3740	1.600	0.0630	0.33	2.03	3.02	1.98
685.800	27.0000	876.300	34.5000	152.400	6.0000	200.025	7.8750	6.400	0.2520	1.600	0.0630	4 400	10 800	880	**EE655270/655346D**	1-P	710.000	27.9528	850.000	33.4646	23.800	0.9370	6.400	0.2520	1.600	0.0630	0.42	1.62	2.42	1.59
711.200	28.0000	914.400	36.0000	139.700	5.5000	190.500	7.5000	6.400	0.2520	1.600	0.0630	3 780	8 930	747	**EE755280/755361D**	1-P	735.000	28.9370	880.000	34.6457	25.400	1.0000	6.400	0.2520	1.600	0.0630	0.38	1.78	2.65	1.74
723.900	28.5000	914.400	36.0000	139.700	5.5000	187.325	7.3750	3.200	0.1260	1.600	0.0630	3 780	8 930	747	**EE755285/755361D**	1-P	745.000	29.3307	880.000	34.6457	23.800	0.9370	3.200	0.1260	1.600	0.0630	0.38	1.78	2.65	1.74
749.300	29.5000	990.600	39.0000	265.000	10.4331	338.000	13.3071	6.400	0.2520	3.200	0.1260	9 820	23 900	1 780	**LM283649/LM283610D**	1-P	775.000	30.5118	960.000	37.7953	36.500	1.4370	6.400	0.2520	3.200	0.1260	0.32	2.12	3.15	2.07

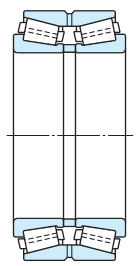
Note 1) SP indicates the specially chamfered from.

TDO · TDOS type

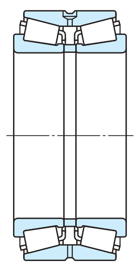
d (749.300) ~ 1 270.000 mm
(29.5000) ~ 50.0000 inch



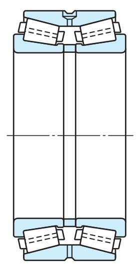
Design 1



Design 1-P



Design 2



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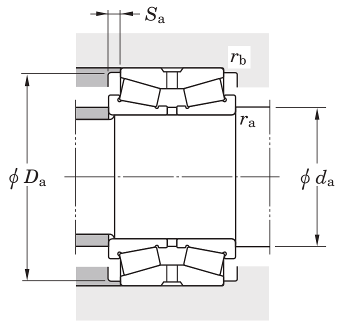
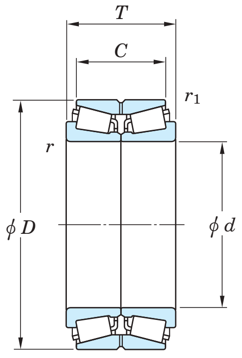


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions										Con-stant	Axial load factors		
d		D		C		T		$r^{1)}$ (min.)		$r_1^{1)}$ (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		$r_b^{1)}$ (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
749.300	29.5000	990.600	39.0000	265.000	10.4331	338.000	13.3071	3.200	0.1260	6.400	0.2520	9 820	23 900	1 780	**2TR749A**	1-P	778.000	30.6299	955.000	37.5984	36.500	1.4370	3.200	0.1260	6.400	0.2520	0.32	2.12	3.15	2.07
812.800	32.0000	1 016.000	40.0000	146.050	5.7500	190.500	7.5000	6.400	0.2520	1.600	0.0630	4 680	10 500	846	**EE762320/762401D**	1-P	840.000	33.0709	980.000	38.5827	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.43	1.59	2.36	1.55
1 270.000	50.0000	1 435.100	56.5000	101.600	4.0000	146.050	5.7500	6.400	0.2520	3.200	0.1260	3 650	11 800	841	**LL889049/LL889010D**	1	1 300.000	51.1811	1 410.000	55.5118	22.200	0.8740	6.400	0.2520	3.200	0.1260	0.57	1.18	1.76	1.16

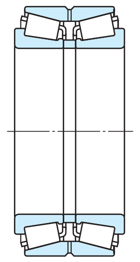
Note 1) SP indicates the specially chamfered from.

TNA type

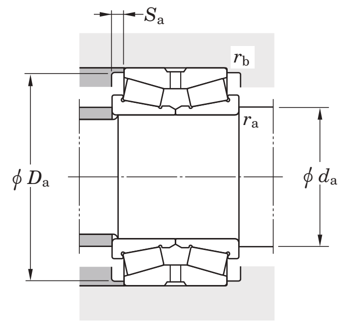
d 60.325 ~ 203.200 mm
2.3750 ~ 8.0000 inch



Design 1



Design 2

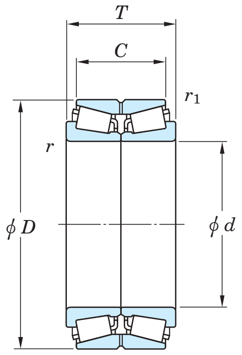


Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions										Con-stant	Axial load factors		
d		D		C		T		r (min.)		r_1 (min.)		C_r	C_{0r}	C_u			d_a (min.)		D_a (min.)		S_a (min.)		r_a (max.)		r_b (max.)		e	Y_2	Y_3	Y_0
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch				
60.325	2.3750	123.825	4.8750	63.500	2.5000	79.375	3.1250	1.600	0.0630	3.600	0.1417	426	446	69.6	**NA558/552D**	—	79.000	3.1102	112.000	4.4094	8.000	0.3150	1.600	0.0630	3.600	0.1417	0.35	1.95	2.90	1.91
76.200	3.0000	136.525	5.3750	53.975	2.1250	69.850	2.7500	0.800	0.0315	3.600	0.1417	287	396	59.9	**NA495A/493D**	—	95.000	3.7402	127.000	5.0000	8.000	0.3150	0.800	0.0315	3.600	0.1417	0.44	1.52	2.26	1.49
88.900	3.5000	161.925	6.3750	85.725	3.3750	104.775	4.1250	1.600	0.0630	3.600	0.1417	587	782	105	**NA759/752D**	—	107.000	4.2126	147.000	5.7874	9.600	0.3780	1.600	0.0630	3.600	0.1417	0.34	1.98	2.95	1.94
95.250	3.7500	161.925	6.3750	61.913	2.4375	82.547	3.2499	0.800	0.0315	3.600	0.1417	388	576	83.4	**NA52375/52637D**	—	114.000	4.4882	150.000	5.9055	10.400	0.4094	0.800	0.0315	3.600	0.1417	0.47	1.42	2.12	1.39
101.600	4.0000	168.275	6.6250	69.850	2.7500	92.075	3.6250	3.600	0.1417	0.800	0.0315	484	698	101	**NA691/672D**	2	120.000	4.7244	156.000	6.1417	11.200	0.4409	3.600	0.1417	0.800	0.0315	0.47	1.43	2.14	1.40
104.775	4.1250	180.975	7.1250	85.725	3.3750	104.775	4.1250	3.600	0.1417	1.600	0.0630	620	876	113	**NA782/774D**	2	123.000	4.8425	165.000	6.4961	9.600	0.3780	3.600	0.1417	1.600	0.0630	0.39	1.75	2.61	1.71
114.300	4.5000	190.500	7.5000	80.963	3.1875	106.363	4.1875	3.600	0.1417	1.600	0.0630	654	965	122	**NA71450/751D**	2	133.000	5.2362	177.000	6.9685	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.42	1.62	2.42	1.59
	4.5000	212.725	8.3750	117.475	4.6250	142.875	5.6250	3.600	0.1417	1.600	0.0630	965	1 350	168	**NA938//932D**	1	133.000	5.2362	192.000	7.5591	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.33	2.07	3.09	2.03
127.000	5.0000	182.563	7.1875	73.025	2.8750	85.725	3.3750	3.600	0.1417	0.800	0.0315	487	858	120	**NA48291/48220D**	2	145.000	5.7087	173.000	6.8110	6.400	0.2520	3.600	0.1417	0.800	0.0315	0.31	2.21	3.29	2.16
	5.0000	206.375	8.1250	82.550	3.2500	107.950	4.2500	3.600	0.1417	0.800	0.0315	702	1 100	134	**NA798/792D**	2	145.000	5.7087	194.000	7.6378	12.700	0.5000	3.600	0.1417	0.800	0.0315	0.46	1.47	2.19	1.44
	5.0000	234.950	9.2500	114.300	4.5000	142.875	5.6250	3.600	0.1417	1.600	0.0630	1 120	1 650	200	**NA95500//95927D**	1	145.000	5.7087	216.000	8.5039	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.37	1.83	2.72	1.79
133.350	5.2500	215.900	8.5000	80.963	3.1875	106.363	4.1875	3.600	0.1417	1.600	0.0630	691	1 100	132	**NA74525//74851D**	1	152.000	5.9843	204.000	8.0315	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.49	1.38	2.06	1.35
136.525	5.3750	190.500	7.5000	73.025	2.8750	85.725	3.3750	3.600	0.1417	0.800	0.0315	505	944	129	**NA48390//48320D**	1	155.000	6.1024	181.000	7.1260	6.400	0.2520	3.600	0.1417	0.800	0.0315	0.32	2.10	3.13	2.06
139.700	5.5000	244.475	9.6250	79.375	3.1250	107.950	4.2500	3.600	0.1417	1.600	0.0630	694	989	131	**NA81550/81963D**	2	158.000	6.2205	226.000	8.8976	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.35	1.93	2.88	1.89
142.875	5.6250	200.025	7.8750	73.025	2.8750	93.665	3.6876	3.600	0.1417	0.800	0.0315	527	982	133	**NA48686/48620D**	2	161.000	6.3386	190.000	7.4803	10.300	0.4055	3.600	0.1417	0.800	0.0315	0.34	2.01	2.99	1.96
146.050	5.7500	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	904	1 460	171	**NA82576/82932D**	2	164.000	6.4567	224.000	8.8189	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.44	1.53	2.27	1.49
	5.7500	241.300	9.5000	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	904	1 460	171	**NA82576/82951D**	2	164.000	6.4567	224.000	8.8189	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.44	1.53	2.27	1.49
149.225	5.8750	236.538	9.3125	106.363	4.1875	131.763	5.1875	3.600	0.1417	1.600	0.0630	1 080	1 660	198	**HM231149NA/HM231111D**	2	168.000	6.6142	222.000	8.7402	12.700	0.5000	3.600	0.1417	1.600	0.0630	0.32	2.12	3.15	2.07
152.400	6.0000	244.475	9.6250	79.375	3.1250	107.950	4.2500	3.600	0.1417	1.600	0.0630	694	989	131	**NA81600/81963D**	2	171.000	6.7323	226.000	8.8976	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.35	1.93	2.88	1.89
	6.0000	254.000	10.0000	111.125	4.3750	149.225	5.8750	3.600	0.1417	1.600	0.0630	1 180	1 830	215	**NA99600/99102D**	2	171.000	6.7323	236.000	9.2913	19.100	0.7520	3.600	0.1417	1.600	0.0630	0.41	1.66	2.47	1.62
165.100	6.5000	288.925	11.3750	111.125	4.3750	142.875	5.6250	3.600	0.1417	1.600	0.0630	1 350	1 950	223	**HM237536NA/HM237510D**	2	184.000	7.2441	270.000	10.6299	15.900	0.6260	3.600	0.1417	1.600	0.0630	0.32	2.12	3.15	2.07
165.496	6.5156	225.425	8.8750	69.850	2.7500	95.250	3.7500	3.600	0.1417	0.800	0.0315	554	1 140	148	**NA46791R/46720D**	2	184.000	7.2441	215.000	8.4646	12.700	0.5000	3.600	0.1417	0.800	0.0315	0.38	1.76	2.62	1.72
174.625	6.8750	247.650	9.7500	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	741	1 400	160	**NA67787//67720D**	1	193.000	7.5984	237.000	9.3307	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.44	1.54	2.29	1.50
177.800	7.0000	247.650	9.7500	84.138	3.3125	103.188	4.0625	3.600	0.1417	0.800	0.0315	741	1 400	160	**NA67790/67720D**	2	196.000	7.7165	237.000	9.3307	9.500	0.3740	3.600	0.1417	0.800	0.0315	0.44	1.54	2.29	1.50
	7.0000	282.575	11.1250	79.375	3.1250	107.950	4.2500	3.600	0.1417	1.600	0.0630	880	1 450	182	**NA87700//87112D**	1	196.000	7.7165	266.000	10.4724	14.300	0.5630	3.600	0.1417	1.600	0.0630	0.42	1.62	2.42	1.59
	7.0000	288.925	11.3750	111.125	4.3750	142.875	5.6250	5.600	0.2205	1.600	0.0630	1 180	1 920	216	**NA94700//94114D**	1	206.000	8.1102	269.000	10.5906	15.900	0.6260	5.600	0.2205	1.600	0.0630	0.47	1.44	2.15	1.41
187.325	7.3750	320.675	12.6250	138.113	5.4375	185.738	7.3125	5.600	0.2205	1.600	0.0630	1 830	2 530	285	**H239649NA/H239612D**	2	216.000	8.5039	300.000	11.8110	23.800	0.9370	5.600	0.2205	1.600	0.0630	0.32	2.12	3.15	2.07
190.500	7.5000	266.700	10.5000	84.138	3.3125	109.538	4.3125	3.600	0.1417	0.800	0.0315	728	1 410	156	**NA67885SW//20D**	1	209.000	8.2283	257.000	10.1181	12.700	0.5000	3.600	0.1417	0.800	0.0315	0.48	1.42	2.11	1.38
203.200	8.0000	317.500	12.5000	88.900	3.5000	120.650	4.7500	6.400	0.2520	1.600	0.0630	944	1 450	166	**NA132083//132126D**	1	232.000	9.1339	292.000	11.4961	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.31	2.15	3.21	2.11
	8.0000	317.500	12.5000	111.125	4.3750	146.050	5.7500	5.600	0.2205	1.600	0.0630	1 300	2 270	244	**NA93800/93127D**	2	232.000	9.1339	294.000	11.5748	17.500	0.6890	5.600	0.2205	1.600	0.0630	0.52	1.29	1.92	1.26

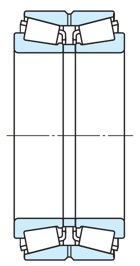
TNA type

d 228.600 ~ 406.400 mm

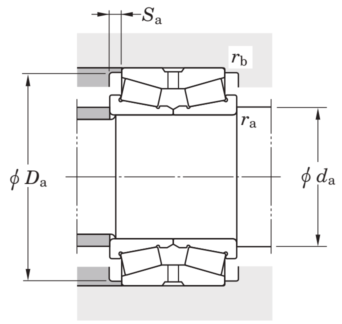
9.0000 ~ 16.0000 inch



Design 1



Design 2



Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Mounting dimensions										Con-stant	Axial load factors		
d mm	d inch	D mm	D inch	C mm	C inch	T mm	T inch	r (min.) mm	r (min.) inch	r_1 (min.) mm	r_1 (min.) inch	C_r	C_{0r}	C_u			d_a (min.) mm	d_a (min.) inch	D_a (min.) mm	D_a (min.) inch	S_a (min.) mm	S_a (min.) inch	r_a (max.) mm	r_a (max.) inch	r_b (max.) mm	r_b (max.) inch	e	Y_2	Y_3	Y_0
228.600	9.0000	355.600	14.0000	111.125	4.3750	146.050	5.7500	6.400	0.2520	1.600	0.0630	1 560	2 610	280	**NA130902/131401D**	2	257.000	10.1181	330.000	12.9921	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.33	2.04	3.04	2.00
241.300	9.5000	368.300	14.5000	85.725	3.3750	120.650	4.7500	6.400	0.2520	1.600	0.0630	1 090	1 850	203	**NA170950//171451D**	1	270.000	10.6299	335.000	13.1890	17.500	0.6890	6.400	0.2520	1.600	0.0630	0.36	1.86	2.77	1.82
244.475	9.6250	349.148	13.7460	101.600	4.0000	133.350	5.2500	6.400	0.2520	1.600	0.0630	1 190	2 050	224	**NA127096/127136D**	2	273.000	10.7480	329.000	12.9528	15.900	0.6260	6.400	0.2520	1.600	0.0630	0.35	1.91	2.84	1.86
254.000	10.0000	422.275	16.6250	128.588	5.0625	173.038	6.8125	6.400	0.2520	1.600	0.0630	2 180	3 360	355	**HM252343NA/HM252311D**	2	282.000	11.1024	397.000	15.6299	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	431.724	16.9970	128.588	5.0625	173.038	6.8125	6.400	0.2520	1.600	0.0630	2 180	3 360	355	**HM252344NA/HM252315D**	2	282.000	11.1024	397.000	15.6299	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
	10.0000	431.724	16.9970	128.588	5.0625	173.038	6.8125	6.400	0.2520	1.600	0.0630	2 110	3 420	352	**NA551002/551701D**	2	282.000	11.1024	388.000	15.2756	22.200	0.8740	6.400	0.2520	1.600	0.0630	0.33	2.03	3.02	1.98
260.350	10.2500	400.050	15.7500	107.950	4.2500	146.050	5.7500	6.400	0.2520	1.600	0.0630	1 630	2 570	274	**NA221026/221576D**	2	289.000	11.3780	371.000	14.6063	19.100	0.7520	6.400	0.2520	1.600	0.0630	0.39	1.71	2.54	1.67
	10.2500	422.275	16.6250	128.588	5.0625	173.038	6.8125	6.400	0.2520	1.600	0.0630	2 180	3 360	355	**HM252349NA/HM252311D**	2	289.000	11.3780	397.000	15.6299	22.200	0.8740	1.600	0.0630	1.600	0.0630	0.33	2.03	3.02	1.98
	10.2500	431.724	16.9970	128.588	5.0625	173.038	6.8125	6.400	0.2520	1.600	0.0630	2 180	3 360	355	**HM252349NA/HM252315D**	2	289.000	11.3780	397.000	15.6299	22.200	0.8740	1.600	0.0630	1.600	0.0630	0.33	2.03	3.02	1.98
304.800	12.0000	438.048	17.2460	123.825	4.8750	161.925	6.3750	1.600	0.0630	6.400	0.2520	1 890	3 450	350	**NA329120/329173D**	—	333.000	13.1102	411.000	16.1811	19.100	0.7520	1.600	0.0630	6.400	0.2520	0.33	2.04	3.04	2.00
	12.0000	444.500	17.5000	98.425	3.8750	139.700	5.5000	6.400	0.2520	1.600	0.0630	1 550	2 760	288	**NA291201//291751D**	1	333.000	13.1102	413.000	16.2598	20.600	0.8110	6.400	0.2520	1.600	0.0630	0.38	1.79	2.66	1.75
355.600	14.0000	501.650	19.7500	107.950	4.2500	146.050	5.7500	6.400	0.2520	1.600	0.0630	1 700	3 280	322	**NA231400//231976D**	1	384.000	15.1181	480.000	18.8976	19.100	0.7520	6.400	0.2520	1.600	0.0630	0.44	1.53	2.28	1.50
406.400	16.0000	574.675	22.6250	106.363	4.1875	157.163	6.1875	6.400	0.2520	1.600	0.0630	2 040	3 880	367	**NA285160//285228D**	1	435.000	17.1260	535.000	21.0630	25.400	1.0000	6.400	0.2520	1.600	0.0630	0.50	1.35	2.01	1.32

Supplementary tables

Supplementary table 1 Shaft tolerances (deviation from nominal dimensions)

Nominal shaft dia. (mm)		Deviation classes of shaft dia.															
over	up to	d 6	e 6	f 6	g 5	g 6	h 5	h 6	h 7	h 8	h 9	h 10	js 5	js 6	js 7	j 5	j 6
3	**6**	–30 –38	–20 –28	–10 –18	–4 –9	–4 –12	–0 –5	–0 –8	0 –12	0 –18	0 –30	0 –48	±2.5	±4	±6	+3 –2	+6 –2
6	**10**	–40 –49	–25 –34	–13 –22	–5 –11	–5 –14	–0 –6	–0 –9	0 –15	0 –22	0 –36	0 –58	±3	±4.5	±7.5	+4 –2	+7 –2
10	**18**	–50 –61	–32 –43	–16 –27	–6 –14	–6 –17	–0 –8	0 –11	0 –18	0 –27	0 –43	0 –70	±4	±5.5	±9	+5 –3	+8 –3
18	**30**	–65 –78	–40 –53	–20 –33	–7 –16	–7 –20	–0 –9	0 –13	0 –21	0 –33	0 –52	0 –84	±4.5	±6.5	±10.5	+5 –4	+9 –4
30	**50**	–80 –96	–50 –66	–25 –41	–9 –20	–9 –25	0 –11	0 –16	0 –25	0 –39	0 –62	0 –100	±5.5	±8	±12.5	+6 –5	+11 –5
50	**80**	–100 –119	–60 –79	–30 –49	–10 –23	–10 –29	0 –13	0 –19	0 –30	0 –46	0 –74	0 –120	±6.5	±9.5	±15	+6 –7	+12 –7
80	**120**	–120 –142	–72 –94	–36 –58	–12 –27	–12 –34	0 –15	0 –22	0 –35	0 –54	0 –87	0 –140	±7.5	±11	±17.5	+6 –9	+13 –9
120	**180**	–145 –170	–85 –110	–43 –68	–14 –32	–14 –39	0 –18	0 –25	0 –40	0 –63	0 –100	0 –160	±9	±12.5	±20	+7 –11	+14 –11
180	**250**	–170 –199	–100 –129	–50 –79	–15 –35	–15 –44	0 –20	0 –29	0 –46	0 –72	0 –115	0 –185	±10	±14.5	±23	+7 –13	+16 –13
250	**315**	–190 –222	–110 –142	–56 –88	–17 –40	–17 –49	0 –23	0 –32	0 –52	0 –81	0 –130	0 –210	±11.5	±16	±26	+7 –16	±16
315	**400**	–210 –246	–125 –161	–62 –98	–18 –43	–18 –54	0 –25	0 –36	0 –57	0 –89	0 –140	0 –230	±12.5	±18	±28.5	+7 –18	±18
400	**500**	–230 –270	–135 –175	–68 –108	–20 –47	–20 –60	0 –27	0 –40	0 –63	0 –97	0 –155	0 –250	±13.5	±20	±31.5	+7 –20	±20
500	**630**	–260 –304	–145 –189	–76 –120	–22 –54	–22 –66	0 –32	0 –44	0 –70	0 –110	0 –175	0 –280	±16	±22	±35	–	–
630	**800**	–290 –340	–160 –210	–80 –130	–24 –60	–24 –74	0 –36	0 –50	0 –80	0 –125	0 –200	0 –320	±18	±25	±40	–	–
800	**1 000**	–320 –376	–170 –226	–86 –142	–26 –66	–26 –82	0 –40	0 –56	0 –90	0 –140	0 –230	0 –360	±20	±28	±45	–	–

[Note] 1) Δ_{dmp} : single plane mean bore diameter deviation

Unit : μm (Refer.)

											Nominal shaft dia. (mm)		Δ_{dmp}[1)] of bearing (class 0)
k 5	k 6	k 7	m 5	m 6	m 7	n 5	n 6	p 6	r 6	r 7	over	up to	
+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+16 +4	+13 +8	+16 +8	+20 +12	+23 +15	+27 +15	**3**	**6**	0 −8
+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+21 +6	+16 +10	+19 +10	+24 +15	+28 +19	+34 +19	**6**	**10**	0 −8
+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+25 +7	+20 +12	+23 +12	+29 +18	+34 +23	+41 +23	**10**	**18**	0 −8
+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+29 +8	+24 +15	+28 +15	+35 +22	+41 +28	+49 +28	**18**	**30**	0 −10
+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+34 +9	+28 +17	+33 +17	+42 +26	+50 +34	+59 +34	**30**	**50**	0 −12
+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+41 +11	+33 +20	+39 +20	+51 +32	+60 +41	+71 +41	**50**	**65**	0 −15
									+62 +43	+73 +43	**65**	**80**	
+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+48 +13	+38 +23	+45 +23	+59 +37	+73 +51	+86 +51	**80**	**100**	0 −20
									+76 +54	+89 +54	**100**	**120**	
+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+55 +15	+45 +27	+52 +27	+68 +43	+88 +63	+103 +63	**120**	**140**	0 −25
									+90 +65	+105 +65	**140**	**160**	
									+93 +68	+108 +68	**160**	**180**	
+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+63 +17	+51 +31	+60 +31	+79 +50	+106 +77	+123 +77	**180**	**200**	0 −30
									+109 +80	+126 +80	**200**	**225**	
									+113 +84	+130 +84	**225**	**250**	
+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+72 +20	+57 +34	+66 +34	+88 +56	+126 +94	+146 +94	**250**	**280**	0 −35
									+130 +98	+150 +98	**280**	**315**	
+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+78 +21	+62 +37	+73 +37	+98 +62	+144 +108	+165 +108	**315**	**355**	0 −40
									+150 +114	+171 +114	**355**	**400**	
+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+86 +23	+67 +40	+80 +40	+108 +68	+166 +126	+189 +126	**400**	**450**	0 −45
									+172 +132	+195 +132	**450**	**500**	
+32 0	+44 0	+70 0	+58 +26	+70 +26	+96 +26	+76 +44	+88 +44	+122 +78	+194 +150	+220 +150	**500**	**560**	0 −50
									+199 +155	+225 +155	**560**	**630**	
+36 0	+50 0	+80 0	+66 +30	+80 +30	+110 +30	+86 +50	+100 +50	+138 +88	+225 +175	+255 +175	**630**	**710**	0 −75
									+235 +185	+265 +185	**710**	**800**	
+40 0	+56 0	+90 0	+74 +34	+90 +34	+124 +34	+96 +56	+112 +56	+156 +100	+266 +210	+300 +210	**800**	**900**	0 −100
									+276 +220	+310 +220	**900**	**1 000**	

Supplementary table 2 Housing bore tolerances (deviation from nominal dimensions)

Nominal bore dia. (mm)		Deviation classes of housing bore													
over	up to	E 6	F 6	F 7	G 6	G 7	H 6	H 7	H 8	H 9	H 10	JS 5	JS 6	JS 7	J 6	J 7
10	18	+43 +32	+27 +16	+34 +16	+17 +6	+24 +6	+11 0	+18 0	+27 0	±43 0	±70 0	±4	±5.5	±9	+6 –5	+10 –8
18	30	+53 +40	+33 +20	+41 +20	+20 +7	+28 +7	+13 0	+21 0	+33 0	±52 0	±84 0	±4.5	±6.5	±10.5	+8 –5	+12 –9
30	50	+66 +50	+41 +25	+50 +25	+25 +9	+34 +9	+16 0	+25 0	+39 0	±62 0	+100 0	±5.5	±8	±12.5	+10 –6	+14 –11
50	80	+79 +60	+49 +30	+60 +30	+29 +10	+40 +10	+19 0	+30 0	+46 0	±74 0	+120 0	±6.5	±9.5	±15	+13 –6	+18 –12
80	120	+94 +72	+58 +36	+71 +36	+34 +12	+47 +12	+22 0	+35 0	+54 0	±87 0	+140 0	±7.5	±11	±17.5	+16 –6	+22 –13
120	180	+110 +85	+68 +43	+83 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+100 0	+160 0	±9	±12.5	±20	+18 –7	+26 –14
180	250	+129 +100	+79 +50	+96 +50	+44 +15	+61 +15	+29 0	+46 0	+72 0	+115 0	+185 0	±10	±14.5	±23	+22 –7	+30 –16
250	315	+142 +110	+88 +56	+108 +56	+49 +17	+69 +17	+32 0	+52 0	+81 0	+130 0	+210 0	±11.5	±16	±26	+25 –7	+36 –16
315	400	+161 +125	+98 +62	+119 +62	+54 +18	+75 +18	+36 0	+57 0	+89 0	+140 0	+230 0	±12.5	±18	±28.5	+29 –7	+39 –18
400	500	+175 +135	+108 +68	+131 +68	+60 +20	+83 +20	+40 0	+63 0	+97 0	+155 0	+250 0	±13.5	±20	±31.5	+33 –7	+43 –20
500	630	+189 +145	+120 +76	+146 +76	+66 +22	+92 +22	+44 0	+70 0	+110 0	+175 0	+280 0	±16	±22	±35	–	–
630	800	+210 +160	+130 +80	+160 +80	+74 +24	+104 +24	+50 0	+80 0	+125 0	+200 0	+320 0	±18	±25	±40	–	–
800	1 000	+226 +170	+142 +86	+176 +86	+82 +26	+116 +26	+56 0	+90 0	+140 0	+230 0	+360 0	±20	±28	±45	–	–
1 000	1 250	+261 +195	+164 +98	+203 +98	+94 +28	+133 +28	+66 0	+105 0	+165 0	+260 0	+420 0	±23.5	±33	±52.5	–	–

[Note] 1) Δ_{Dmp} : single plane mean outside diameter deviation

Unit : μm (Refer.)

K 5	K 6	K 7	M 5	M 6	M 7	N 5	N 6	N 7	P 6	P 7	R 7	Nominal bore dia. (mm) over	up to	$\varDelta_{Dmp}$ 1) of bearing (class 0)
+2 −6	+2 −9	+6 −12	−4 −12	−4 −15	0 −18	−9 −17	−9 −20	−5 −23	−15 −26	−11 −29	−16 −34	**10**	**18**	0 −8
+1 −8	+2 −11	+6 −15	−5 −14	−4 −17	0 −21	−12 −21	−11 −24	−7 −28	−18 −31	−14 −35	−20 −41	**18**	**30**	0 −9
+2 −9	+3 −13	+7 −18	−5 −16	−4 −20	0 −25	−13 −24	−12 −28	−8 −33	−21 −37	−17 −42	−25 −50	**30**	**50**	0 −11
+3 −10	+4 −15	+9 −21	−6 −19	−5 −24	0 −30	−15 −28	−14 −33	−9 −39	−26 −45	−21 −51	−30 −60	**50**	**65**	0 −13
											−32 −62	**65**	**80**	
+2 −13	+4 −18	+10 −25	−8 −23	−6 −28	0 −35	−18 −33	−16 −38	−10 −45	−30 −52	−24 −59	−38 −73	**80**	**100**	0 −15
											−41 −76	**100**	**120**	
+3 −15	+4 −21	+12 −28	−9 −27	−8 −33	0 −40	−21 −39	−20 −45	−12 −52	−36 −61	−28 −68	−48 −88	**120**	**140**	(up to 150) 0 −18 (over to 150) 0 −25
											−50 −90	**140**	**160**	
											−53 −93	**160**	**180**	
+2 −18	+5 −24	+13 −33	−11 −31	−8 −37	0 −46	−25 −45	−22 −51	−14 −60	−41 −70	−33 −79	−60 −106	**180**	**200**	0 −30
											−63 −109	**200**	**225**	
											−67 −113	**225**	**250**	
+3 −20	+5 −27	+16 −36	−13 −36	−9 −41	0 −52	−27 −50	−25 −57	−14 −66	−47 −79	−36 −88	−74 −126	**250**	**280**	0 −35
											−78 −130	**280**	**315**	
+3 −22	+7 −29	+17 −40	−14 −39	−10 −46	0 −57	−30 −55	−26 −62	−16 −73	−51 −87	−41 −98	−87 −144	**315**	**355**	0 −40
											−93 −150	**355**	**400**	
+2 −25	+8 −32	+18 −45	−16 −43	−10 −50	0 −63	−33 −60	−27 −67	−17 −80	−55 −95	−45 −108	−103 −166	**400**	**450**	0 −45
											−109 −172	**450**	**500**	
0 −32	0 −44	0 −70	−26 −58	−26 −70	−26 −96	−44 −76	−44 −88	−44 −114	−78 −122	−78 −148	−150 −220	**500**	**560**	0 −50
											−155 −225	**560**	**630**	
0 −36	0 −50	0 −80	−30 −66	−30 −80	−30 −110	−50 −86	−50 −100	−50 −130	−88 −138	−88 −168	−175 −255	**630**	**710**	0 −75
											−185 −265	**710**	**800**	
0 −40	0 −56	0 −90	−34 −74	−34 −90	−34 −124	−56 −96	−56 −112	−56 −146	−100 −156	−100 −190	−210 −300	**800**	**900**	0 −100
											−220 −310	**900**	**1 000**	
0 −47	0 −66	0 −105	−40 −87	−40 −106	−40 −145	−66 −113	−66 −132	−66 −171	−120 −186	−120 −225	−250 −355	**1 000**	**1 120**	0 −125
											−260 −365	**1 120**	**1 250**	

Supplementary table 3 (1) SI units and conversion factors

Mass	SI units	Other units[1]	Conversion into SI units	Conversion from SI units
Angle	rad [radian(s)]	° [degree(s)] *	1° = π / 180 rad	1 rad = 57.295 78°
		' [minute(s)] *	1' = π / 10 800 rad	
		" [second(s)] *	1" = π / 648 000 rad	
Length	m [meter(s)]	Å [Angstrom unit]	1 Å = 10^{-10} m = 0.1 nm = 100 pm	1 m = 10^{10} Å
		μ [micron(s)]	1 μ = 1 μm	
		in [inch(es)]	1 in = 25.4 mm	1 m = 39.37 in
		ft [foot (feet)]	1 ft = 12 in = 0.304 8 m	1 m = 3.280 8 ft
		yd [yard(s)]	1 yd = 3 ft = 0.914 4 m	1 m = 1.093 6 yd
		mile [mile(s)]	1 mile = 5 280 ft = 1 609.344 m	1 km = 0.621 4 mile
Area	m^2	a [are(s)]	1 a = 100 m^2	
		ha [hectare(s)]	1 ha = 10^4 m^2	
		acre [acre(s)]	1 acre = 4 840 yd^2 = 4 046.86 m^2	1 km^2 = 247.1 acre
Volume	m^3	ℓ, L [liter(s)] *	1 ℓ = 1 dm^3 = 10^{-3} m^3	1 m^3 = 10^3ℓ
		cc [cubic centimeters]	1 cc = 1 cm^3 = 10^{-6} m^3	1 m^3 = 10^6 cc
		gal (US) [gallon(s)]	1 gal (US) = 231 in^3 = 3.785 41 dm^3	1 m^3 = 264.17 gal
		floz (US) [fluid ounce(s)]	1 floz (US) = 29.573 5 cm^3	1 m^3 = 33 814 floz
		barrel (US) [barrels (US)]	1 barrel (US) = 158.987 dm^3	1 m^3 = 6.289 8 barrel
Time	s [second(s)]	min [minute(s)] *		
		h [hour(s)] *		
		d [day(s)] *		
Angular velocity	rad / s			
Velocity	m / s	kn [knot(s)]	1 kn = 1 852 m / h	1 km / h = 0.539 96 kn
		m / h *		
Acceleration	m / s^2	G	1 G = 9.806 65 m / s^2	1 m / s^2 = 0.101 97 G
Frequency	Hz [hertz]	c / s [cycle(s) / second]	1 c / s = 1 s^{-1} = 1 Hz	
Rotational frequency	s^{-1}	rpm [revolutions per minute]	1 rpm = 1 / 60 s^{-1}	1 s^{-1} = 60 rpm
		min^{-1} *		
		r / min		
Mass	kg [kilogram(s)]	t [ton(s)] *	1 t = 10^3 kg	
		lb [pound(s)]	1 lb = 0.453 592 37 kg	1 kg = 2.204 6 lb
		gr [grain(s)]	1 gr = 64.798 91 mg	1 g = 15.432 4 gr
		oz [ounce(s)]	1 oz = 1 / 16 lb = 28.349 5 g	1 kg = 35.274 0 oz
		ton (UK) [ton(s) (UK)]	1 ton (UK) = 1 016.05 kg	1 t = 0.984 2 ton (UK)
		ton (US) [ton(s) (US)]	1 ton (US) = 907.185 kg	1 t = 1.102 3 ton (US)
		car [carat(s)]	1 car = 200 mg	1 g = 5 car

[Note] 1) * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 3 (2) SI units and conversion factors

Mass	SI units	Other units1)	Conversion into SI units	Conversion from SI units
Density	kg/m^3			
Linear density	kg/m			
Momentum	kg·m/s			
Moment of momentum, Angular momentum	kg·m^2/s			
Moment of inertia	kg·m^2			
Force	N [newton(s)]	dyn [dyne(s)]	1 dyn = 10^{-5} N	1 N = 10^5 dyn
		kgf [kilogram-force]	1 kgf = 9.806 65 N	1 N = 0.101 97 kgf
		gf [gram-force]	1 gf = 9.806 65 × 10^{-3} N	
		tf [ton-force]	1 tf = 9.806 65 × 10^3 N	
		lbf [pound-force]	1 lbf = 4.448 22 N	1 N = 0.224 809 lbf
Moment of force	N·m [newton meter(s)]	gf·cm	1 gf·cm = 9.806 65 × 10^{-5} N·m	
		kgf·cm	1 kgf·cm = 9.806 65 × 10^{-2} N·m	
		kgf·m	1 kgf·m = 9.806 65 N·m	1 N·m = 0.101 97 kgf·m
		tf·m	1 tf·m = 9.806 65 × 10^3 N·m	
		lbf·ft	1 lbf·ft = 1.355 82 N·m	1 N·m = 0.737 56 lbf·ft
Pressure, Normal stress	Pa [pascal(s)] or N/m^2 {1 Pa = 1 N/m^2}	gf/cm^2	1 gf/cm^2 = 9.806 65 × 10 Pa	
		kgf/mm^2	1 kgf/mm^2 = 9.806 65 × 10^6 Pa	1 MPa = 0.101 97 kgf/mm^2
		kgf/m^2	1 kgf/m^2 = 9.806 65 Pa	1 Pa = 0.101 97 kgf/m^2
		lbf/in^2	1 lbf/in^2 = 6 894.76 Pa	1 Pa = 0.145 × 10^{-3} lbf/in^2
		bar [bar(s)]	1 bar = 10^5 Pa	1 Pa = 10^{-2} mbar
		at [engineering air pressure]	1 at = 1 kgf/cm^2 = 9.806 65 × 10^4 Pa	
		mH_2O, mAq [meter water column]	1 mH_2O = 9.806 65 × 10^3 Pa	
		atm [atmosphere]	1 atm = 101 325 Pa	
		mHg [meter mercury column]	1 mHg = $\frac{101\,325}{0.76}$ Pa	
		Torr [torr]	1 Torr = 1 mmHg = 133.322 Pa	1 Pa = 7.500 6 × 10^{-3} Torr
Viscosity	Pa·s [pascal second]	P [poise]	10^{-2} P = 1 cP = 1 mPa·s	
		kgf·s/m^2	1 kgf·s/m^2 = 9.806 65 Pa·s	1 Pa·s = 0.101 97 kgf·s/m^2
Kinematic viscosity	m^2/s	St [stokes]	10^{-2} St = 1 cSt = 1 mm^2/s	
Surface tension	N/m			

Supplementary table 3 (3) SI units and conversion factors

Mass	SI units	Other units 1)	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J = 1 N·m}	eV [electron volt(s)] *	1 eV = (1.602 189 2 ± 0.000 004 6) × 10^{-19} J	
		erg [erg(s)]	1 erg = 10^{-7} J	1 J = 10^{7} erg
		kgf·m	1 kgf·m = 9.806 65 J	1 J = 0.101 97 kgf·m
		lbf·ft	1 lbf·ft = 1.355 82 J	1 J = 0.737 56 lbf·ft
Power	W [watt(s)]	erg / s [ergs per second]	1 erg / s = 10^{-7} W	
		kgf·m / s	1 kgf·m / s = 9.806 65 W	1 W = 0.101 97 kgf·m / s
		PS [French horse-power]	1 PS = 75 kgf·m / s = 735.5 W	1 W = 0.001 36 PS
		HP [horse-power (British)]	1 HP = 550 lbf·ft / s = 745.7 W	1 W = 0.001 34 HP
		lbf·ft / s	1 lbf·ft / s = 1.355 82 W	
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	°C [celsius(s)] {t °C = (t + 273.15) K}	°F [degree(s) Fahrenheit]	t °F = $\frac{5}{9}$ (t − 32) °C	t °C = ($\frac{9}{5}$ t + 32) °F
Linear expansion coefficient	K^{-1}	°C^{-1} [per degree]		
Heat	J [joule(s)] {1 J = 1 N·m}	erg [erg(s)]	1 erg = 10^{-7} J	1 J = 10^{7} erg
		kgf·m		
		cal_{IT} [I. T. calories]	1 cal_{IT} = 4.186 8 J	1 J = 0.238 85 cal_{IT}
			1 Mcal_{IT} = 1.163 kW·h	1 kW·h = 0.86 × 10^{6} cal_{IT}
Thermal conductivity	W / (m·K)	W / (m·°C)	1 W / (m·°C) = 1 W / (m·K)	
		cal / (s·m·°C)	1 cal / (s·m·°C) = 4.186 05 W / (m·K)	
Coefficient of heat transfer	W / (m^2·K)	W / (m^2·°C)	1 W / (m^2·°C) = 1 W/ (m^2·K)	
		cal / (s·m^2·°C)	1 cal / (s·m^2·°C) = 4.186 05 W / (m^2·K)	
Heat capacity	J / K	J / °C	1 J / °C = 1 J / K	
Massic heat capacity	J / (kg·K)	J / (kg·°C)		

[Note] 1) * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 3 (4) SI units and conversion factors

Mass	SI units	Other units[1)]	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge, quantity of electricity	C [coulomb(s)] {1 C = 1 A·s}	A·h *	1 A·h = 3.6 kC	
Tension, electric potential	V [volt(s)] {1 V = 1 W / A}			
Capacitance	F [farad(s)] {1 F = 1 C / V}			
Magnetic field strength	A / m	Oe [oersted(s)]	$1\ \mathrm{Oe} = \frac{10^3}{4\pi}\ \mathrm{A/m}$	$1\ \mathrm{A/m} = 4\pi \times 10^{-3}\ \mathrm{Oe}$
Magnetic flux density	T [tesla(s)] $\left\{\begin{array}{l}1\ \mathrm{T} = 1\ \mathrm{N/(A{\cdot}m)}\\ = 1\ \mathrm{Wb/m^2}\\ = 1\ \mathrm{V{\cdot}s/m^2}\end{array}\right\}$	Gs [gauss(es)] γ [gamma(s)]	$1\ \mathrm{Gs} = 10^{-4}\ \mathrm{T}$ $1\ \gamma = 10^{-9}\ \mathrm{T}$	$1\ \mathrm{T} = 10^4\ \mathrm{Gs}$ $1\ \mathrm{T} = 10^9\ \gamma$
Magnetic flux	Wb [weber(s)] {1 Wb = 1 V·s}	Mx [maxwell(s)]	$1\ \mathrm{Mx} = 10^{-8}\ \mathrm{Wb}$	$1\ \mathrm{Wb} = 10^8\ \mathrm{Mx}$
Self inductance	H [henry (-ries)] {1 H = 1 Wb / A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω = 1 V / A}			
Conductance (to direct current)	S [siemens] {1 S = 1 A / V}			
Active power	W $\left\{\begin{array}{l}1\ \mathrm{W} = 1\ \mathrm{J/s}\\ = 1\ \mathrm{A{\cdot}V}\end{array}\right\}$			

Supplementary table 4　Greek alphabet list

Name	Roman type	Italic type		Name	Roman type	Italic type	
	Capital	Capital	Lowercase		Capital	Capital	Lowercase
alpha	Α	*Α*	*α*	nu	Ν	*Ν*	*ν*
beta	Β	*Β*	*β*	xi	Ξ	*Ξ*	*ξ*
gamma	Γ	*Γ*	*γ*	omicron	Ο	*Ο*	*ο*
delta	Δ	*Δ*	*δ*	pi	Π	*Π*	*π*
epsilon	Ε	*Ε*	*ε*	rho	Ρ	*Ρ*	*ρ*
zeta	Ζ	*Ζ*	*ζ*	sigma	Σ	*Σ*	*σ*
eta	Η	*Η*	*η*	tau	Τ	*Τ*	*τ*
theta	Θ	*Θ*	*θ*	upsilon	Υ	*Υ*	*υ*
iota	Ι	*Ι*	*ι*	phi	Φ	*Φ*	*ϕ*
kappa	Κ	*Κ*	*κ*	chi	Χ	*Χ*	*χ*
lambda	Λ	*Λ*	*λ*	psi	Ψ	*Ψ*	*ψ*
mu	Μ	*Μ*	*μ*	omega	Ω	*Ω*	*ω*

Supplementary table 5　Prefixes used with SI units

Factor	Prefix		Factor	Prefix	
	Name	Symbol		Name	Symbol
10^{18}	exa	E	10^{-1}	deci	d
10^{15}	peta	P	10^{-2}	centi	c
10^{12}	tera	T	10^{-3}	milli	m
10^{9}	giga	G	10^{-6}	micro	μ
10^{6}	mega	M	10^{-9}	nano	n
10^{3}	kilo	k	10^{-12}	pico	p
10^{2}	hecto	h	10^{-15}	femto	f
10	deka	da	10^{-18}	atto	a

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BALL & ROLLER BEARINGS
General Bearings

JTEKT CORPORATION

CAT. NO. BS008EN-0DS

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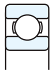
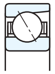
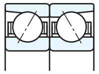
Bearing specification tables

Deep groove ball bearings


68, 69, 160, 62 ,63,
SB···, 3···

Angular contact ball bearings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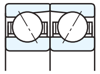
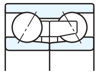
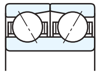

DF

78, 79, 70, 72, 73
AC···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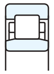
3···

Cylindrical roller bearings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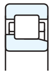
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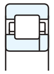
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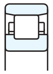
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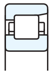
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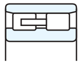
18, 28, 38, 19, 29,
10, 30, 31, 2, 22,
32, 3, 23, 33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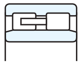
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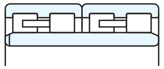
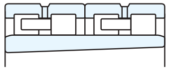
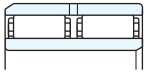
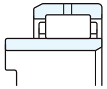
48, 39, 49,
30, 40, 31,

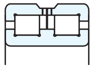

FC···,
3···,
4CR···

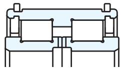

Tapered bore

FC···,
3···




99···, D99···,
T99···

Full complement cylindrical roller bearings

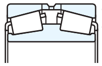

DC48(V), 49(V)


Shielded type

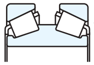
DC50(NR)

Tapered roller bearings

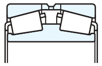

329, 320, 330, 331,
302, 322, 332, 303,
313, 323, inch series,
metric J series


TDI

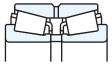
452, 453,
45T···,
2TR···
inch series


TDIS (For axial support)

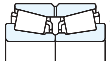
45T···,
2TR···


TDIT (Tapered bore)

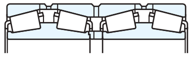
inch
series


TDO, TDOS

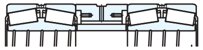
462, 463, 46T302,
46T322, 46T303,
46T323, 46T···,
2TR···, inch series


TNA

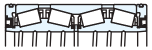
46T···,
inch
series


TQO

372, 472,
473, 47T···,
4TR···,
inch series

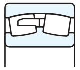
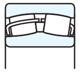

45D

45D···,
4TR···,


Sealed type

47TS···,
4TRS···,

Spherical roller bearings


R, RR

RH, RHR

RHA

238, 239, 230,
231, 241, 222,
232, 213, 223

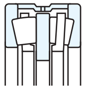
Thrust ball bearings

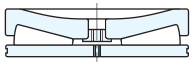

511, 512, 513, 514

Tapered roller thrust bearings

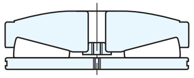


T···, THR···


2THR···

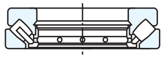

For screw down spindle

THR···

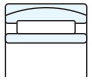
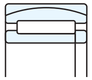
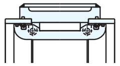

For screw down spindle

THR···X

Spherical thrust roller bearings

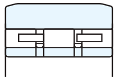
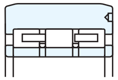
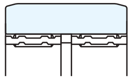

292, 293, 294

Bearings for continuous casting machines

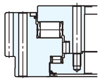

SC···

SCP···

HSC bearing unit

PBA···

Cylindrical roller bearings for the backing shafts of multi-roll mills




DC···

Slewing rim bearings for tunnel-boring machine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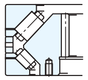
2TR···

Other products Supplementary table

LARGE SIZE
BALL & ROLLER BEARINGS

Koyo

Publication of
LARGE SIZE BALL & ROLLER BEARINGS

We are pleased to offer you this newly issued Koyo large size rolling bearing catalogue.

The conventional large size rolling bearing catalogue has been thoroughly revised. This catalogue includes information such as the latest bearing types, bearing numbers, and technical data.

We are confident that this catalogue will help every people engaged in design and maintenance of machinery.

This catalogue also shows bearings intended for special purposes. If you have any inquiry for selection of bearings, please contact JTEKT. We are grateful for your patronage and look forward to continuing to serve you in the future.

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Technical data

Bearing specification tables

Other products

Supplementary table

1. Selection of bearing dimensions

1-1 Bearing service life

When bearings rotate under load, material flakes from the surfaces of inner and outer rings or rolling elements by fatigue arising from repeated contact stress.

This phenomenon is called flaking.

The total number of bearing rotations until flaking occurs is regarded as the bearing "(fatigue) service life".

"(Fatigue) service life" differs greatly depending upon bearing structures, dimensions, materials, and processing methods.

Since this phenomenon results from fatigue distribution in bearing materials themselves, differences in bearing service life should be statistically considered.

When a group of identical bearings are rotated under the same conditions, the total number of revolutions until 90 % of the bearings are left without flaking (i.e. a service life of 90 % reliability) is defined as the basic rating life. In operation at a constant speed, the basic rating life can be expressed in terms of time.

In actual operation, a bearing fails not only because of fatigue, but other factors as well, such as wear, seizure, creep, fretting, brinelling, cracking etc.

These bearing failures can be minimized by selecting the proper mounting method and lubricant, as well as the bearing most suitable for the application.

1-2 Calculation of service life

1-2-1 Basic dynamic load rating

The basic dynamic load rating (C) is either pure radial (for radial bearings) or central axial load (for thrust bearings) of constant magnitude in a constant direction, under which the basic rating life of 1 million revolutions can be obtained, when the inner ring rotates while the outer ring is stationary, or vice versa. The basic dynamic load rating, which represents the capacity of a bearing under rolling fatigue, is specified as **the basic dynamic radial load rating (C_r) for radial bearings, and basic dynamic axial load rating (C_a) for thrust bearings**. These load ratings are listed in the specification table.

These values are prescribed by ISO 281/1990, and are subject to change by conformance to the latest ISO standards.

1-2-2 Basic rating life

The basic rating life in relation to the basic dynamic load rating and dynamic equivalent load can be expressed using equation (1-1).

It is convenient to express the basic rating life in terms of time, using equation (1-2), when a bearing is used for operation at a constant speed.

$$\left(\begin{matrix}\text{Total}\\\text{revolutions}\end{matrix}\right)\quad L_{10} = \left(\frac{C}{P}\right)^p \quad \cdots\cdots\cdots\cdots\cdots\text{(1-1)}$$

$$\text{(Time)}\quad L_{10h} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^p \quad \cdots\cdots\cdots\text{(1-2)}$$

where :

L_{10} : basic rating life 10⁶ revolutions
L_{10h} : basic rating life h
P : dynamic equivalent load N ··························(refer to page 12)
C : basic dynamic load rating N
n : rotational speed min^{-1}
p : for ball bearings ········ $p = 3$
for roller bearings ······ $p = 10/3$

Accordingly, where the dynamic equivalent load is P, and rotational speed is n, equation (1-3) can be used to calculate the basic dynamic load rating C; the bearing size most suitable for a specified purpose can then be selected, referring to the bearing specification table.

$$C = P\left(L_{10h} \times \frac{60n}{10^6}\right)^{1/p} \quad \cdots\cdots\cdots\cdots\cdots\cdots\text{(1-3)}$$

[Reference]
The equations using a service life coefficient (f_h) and rotational speed coefficient (f_n) respectively, based on equation (1-2), are as follows :

$$L_{10h} = 500\, f_h^{\,p} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\text{(1-4)}$$

Coefficient of service life :

$$f_h = f_n\,\frac{C}{P} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\text{(1-5)}$$

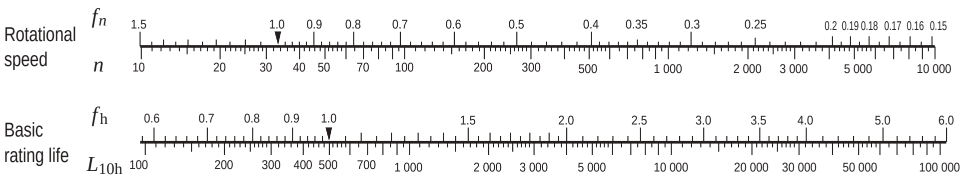
Coefficient of rotational speed :

$$f_n = \left(\frac{10^6}{500 \times 60n}\right)^{1/p}$$

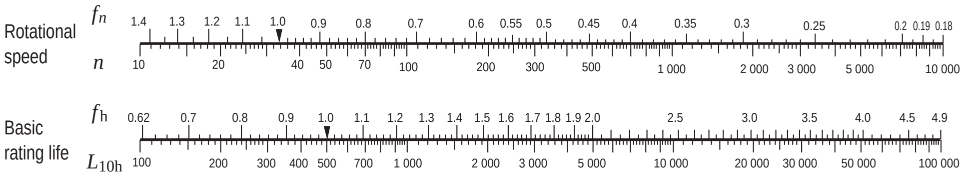
$$= (0.03n)^{-1/p} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\text{(1-6)}$$

For reference, the values of f_n, f_h, and L_{10h} can be easily obtained by employing the nomograph attached to this catalog, as an abbreviated method.

[Ball bearing]



[Roller bearing]



[Reference] Rotational speed (n) and its coefficients (f_n), and service life coefficient (f_h) and basic rating life (L_{10h})

1-2-3 Correction of basic dynamic load rating for high temperature use and dimension stabilizing treatment

In high temperature operation, bearing material hardness deteriorates, as material compositions are altered. As a result, the basic dynamic load rating is diminished. Once altered, material composition is not recovered, even if operating temperatures return to normal.

Therefore, for bearings used in high temperature operation, the basic dynamic load rating should be corrected by multiplying the basic dynamic load rating values specified in the bearing specification table by the temperature coefficient values in Table 1-1.

Table 1-1 Temperature coefficient values

Bearing temperature, °C	125	150	175	200	250
Temperature coefficient	1	1	0.95	0.90	0.75

Since normal heat treatment is not effective in maintaining the original bearing size in extended operation at 120 °C or higher, dimension stabilizing treatment is necessary. Dimension stabilizing treatment codes and their effective temperature ranges are described in Table 1-2.

Since dimension stabilizing treatment diminishes material hardness, the basic dynamic load rating may be reduced for some types of bearings.

Table 1-2 Dimension stabilizing treatment

Dimension stabilizing treatment code	Effective temperature range
S0	Over 100 °C, up to 150 °C
S1	150 °C 200 °C
S2	200 °C 250 °C

1-2-4 Modified rating life L_{nm}

The life of rolling bearings was standardized as a basic rating life in the 1960s, but in actual applications, sometimes the actual life and the basic rating life have been quite different due to the lubrication status and the influence of the usage environment. To make the calculated life closer to the actual life, a corrected rating life has been considered since the 1980s. In this corrected rating life, bearing characteristic factor a_2 (a correction factor for the case in which the characteristics related to the life are changed due to the bearing materials, manufacturing process, and design) and usage condition factor a_3 (a correction factor that takes into account usage conditions that have a direct influence on the bearing life, such as the lubrication) or factor a_{23} formed from the interdependence of these two factors, are considered with the basic rating life. These factors were handled differently by each bearing manufacturer, but they have been standardized as a modified rating life in **ISO 281** in 2007. In 2013, **JIS B 1518** (dynamic load ratings and rating life) was amended to conform to the **ISO**.

The basic rating life (L_{10}) shown in equation (1-1) is the (fatigue) life with a dependability of 90 % under normal usage conditions for rolling bearings that have standard factors such as internal design, materials, and manufacturing quality. **JIS B 1518**:2013 specifies a calculation method based on **ISO 281**:2007. To calculate accurate bearing life under a variety of operating conditions, it is necessary to consider elements such as the effect of changes in factors that can be anticipated when using different reliabilities and system approaches, and interactions between factors. Therefore, the specified calculation method considers additional stress due to the lubrication status, lubricant contamination, and fatigue load limit C_u (refer to p. 9) on the inside of the bearing. The life that uses this life modification factor a_{ISO}, which considers the above factors, is called modified rating life L_{nm} and is calculated with the following equation (1-7).

$$L_{nm} = a_1 \, a_{ISO} \, L_{10} \quad \cdots\cdots\cdots\cdots \text{(1-7)}$$

In this equation,

L_{nm} : Modified rating life 10^6 rotations
(This rating life has been modified for one of or a combination of the following: reliability of 90 % or higher, fatigue load limit, special bearing characteristics, lubrication contamination, and special operating conditions.)

L_{10} : Basic rating life 10^6 rotations
(reliability: 90 %)

a_1 : Life modification factor for reliability .... refer to section (1)

a_{ISO} : Life modification factor .... refer to section (2)

[Remark]

When bearing dimensions are to be selected given L_{nm} greater than 90 % in reliability, the strength of shaft and housing must be considered.

(1) Life modification factor for reliability a_1

The term "reliability" is defined as "for a group of apparently identical rolling bearings, operating under the same conditions, the percentage of the group that is expected to attain or exceed a specified life" in **ISO 281**:2007. Values of a_1 used to calculate a modified rating life with a reliability of 90 % or higher (a failure probability of 10 % or less) are shown in Table 1-3.

Table 1-3 Life modification factor for reliability a_1

Reliability, %	L_{nm}	a_1
90	L_{10m}	1
95	L_{5m}	0.64
96	L_{4m}	0.55
97	L_{3m}	0.47
98	L_{2m}	0.37
99	L_{1m}	0.25
99.2	$L_{0.8m}$	0.22
99.4	$L_{0.6m}$	0.19
99.6	$L_{0.4m}$	0.16
99.8	$L_{0.2m}$	0.12
99.9	$L_{0.1m}$	0.093
99.92	$L_{0.08m}$	0.087
99.94	$L_{0.06m}$	0.080
99.95	$L_{0.05m}$	0.077

(Citation from **JIS B 1518**:2013)

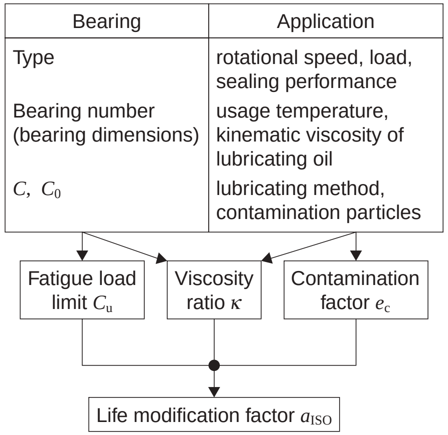
(2) Life modification factor a_{ISO}

a) System approach

The various influences on bearing life are dependent on each other. The system approach of calculating the modified life has been evaluated as a practical method for determining life modification factor a_{ISO} (ref. Fig. 1-1). Life modification factor a_{ISO} is calculated with the following equation (Fig. 1-8). A diagram is available for each bearing type (radial ball bearings, radial roller bearings, thrust ball bearings, and thrust roller bearings). (Each diagram (Figs. 1-2 to 1-5) is a citation from **JIS B 1518**:2013.)

Note that in practical use, this is set so that life modification factor $a_{ISO} \leqq 50$.

$$a_{ISO} = f\left(\frac{e_c \, C_u}{P}, \ \kappa\right) \quad \cdots\cdots\cdots\cdots \text{(1-8)}$$



Bearing	Application
Type	rotational speed, load, sealing performance
Bearing number (bearing dimensions)	usage temperature, kinematic viscosity of lubricating oil
C, C_0	lubricating method, contamination particles

Fig. 1-1 System approach

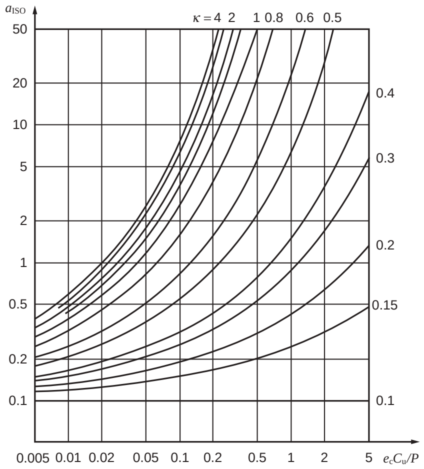


Fig. 1-2 **Life modification factor a_{ISO} (Radial ball bearings)**

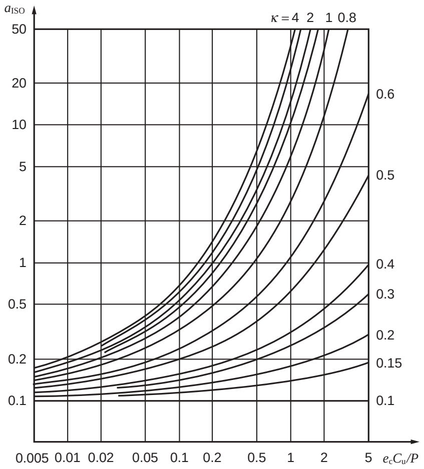


Fig. 1-3 **Life modification factor a_{ISO} (Radial roller bearings)**

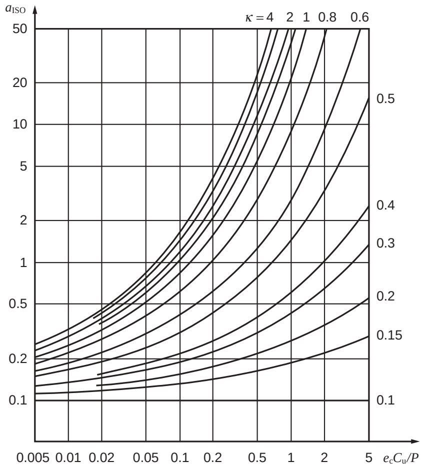


Fig. 1-4 **Life modification factor a_{ISO} (Thrust ball bearings)**

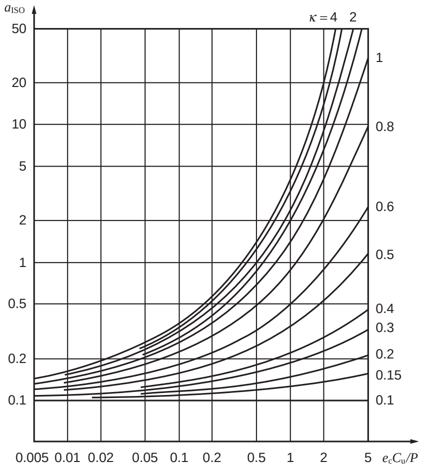


Fig. 1-5 **Life modification factor a_{ISO} (Thrust roller bearings)**

(Figs. 1-2 to 1-5 Citation from **JIS B 1518**:2013)

b) Fatigue load limit C_u

For regulated steel materials or alloy steel that has equivalent quality, the fatigue life is unlimited so long as the load condition does not exceed a certain value and so long as the lubrication conditions, lubrication cleanliness class, and other operating conditions are favorable. For general high-quality materials and bearings with high manufacturing quality, the fatigue stress limit is reached at a contact stress of approximately 1.5 GPa between the raceway and rolling elements. If one or both of the material quality and manufacturing quality are low, the fatigue stress limit will also be low.

The term “fatigue load limit” C_u is defined as “bearing load under which the fatigue stress limit is just reached in the most heavily loaded raceway contact” in **ISO 281**:2007. and is affected by factors such as the bearing type, size, and material.

For details on the fatigue load limits of special bearings and other bearings not listed in this catalog, contact JTEKT.

c) Contamination factor e_c

If solid particles in the contaminated lubricant are caught between the raceway and the rolling elements, indentations may form on one or both of the raceway and the rolling elements. These indentations will lead to localized increases in stress, which will decrease the life. This decrease in life attributable to the contamination of the lubricant can be calculated from the contamination level as contamination factor e_c.

D_{pw} shown in this table is the pitch diameter of ball/roller set, which is expressed simply as $D_{pw} = (D + d)/2$. (D: Outside diameter, d: Bore diameter)

For information such as details on special lubricating conditions or detailed investigations, contact JTEKT.

Table 1-4 Values of contamination factor e_c

Contamination level	e_c	
	$D_{pw} < 100$ mm	$D_{pw} \geqq 100$ mm
Extremely high cleanliness: The size of the particles is approximately equal to the thickness of the lubricant oil film, this is found in laboratory-level environments.	1	1
High cleanliness: The oil has been filtered by an extremely fine filter, this is found with standard grease-packed bearings and sealed bearings.	0.8 to 0.6	0.9 to 0.8
Standard cleanliness: The oil has been filtered by a fine filter, this is found with standard grease-packed bearings and shielded bearings.	0.6 to 0.5	0.8 to 0.6
Minimal contamination: The lubricant is slightly contaminated.	0.5 to 0.3	0.6 to 0.4
Normal contamination: This is found when no seal is used and a coarse filter is used in an environment in which wear debris and particles from the surrounding area penetrate into the lubricant.	0.3 to 0.1	0.4 to 0.2
High contamination: This is found when the surrounding environment is considerably contaminated and the bearing sealing is insufficient.	0.1 to 0	0.1 to 0
Extremely high contamination	0	0

(Table 1-4 Citation from **JIS B 1518**:2013)

d) Viscosity ratio κ

The lubricant forms an oil film on the roller contact surface, which separates the raceway and the rolling elements. The status of the lubricant oil film is expressed by viscosity ratio κ, the actual kinematic viscosity at the operating temperature ν divided by the reference kinematic viscosity ν_1 as shown in the following equation.

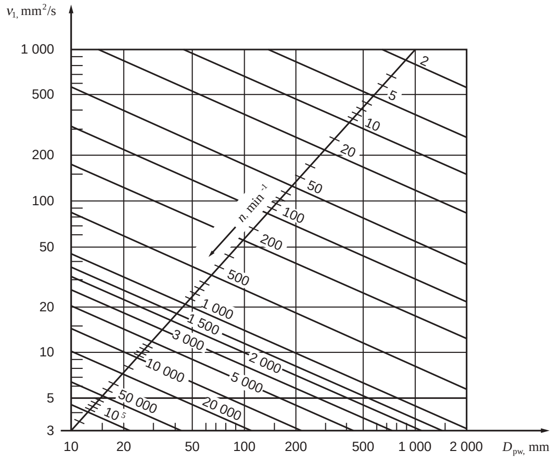
A κ greater than 4, equal to 4, or less than 0.1 is not applicable.

For details on lubricants such as grease and lubricants with extreme pressure additives, contact JTEKT.

$$\kappa = \frac{\nu}{\nu_1} \quad \cdots\cdots\cdots \text{(1-9)}$$

ν : Actual kinematic viscosity at the operating temperature; the viscosity of the lubricant at the operating temperature (refer to Fig. 5-3, page 65)

ν_1 : Reference kinematic viscosity; determined according to the speed and pitch diameter of ball/roller set D_{pw} of the bearing (ref. Fig. 1-6)



(Fig. 1-6 Citation from **JIS B 1518**:2013)

Fig. 1-6 Reference kinematic viscosity ν_1

1-3 Calculation of loads

Loads affecting bearings includes force exerted by the weight of the object the bearings support, transmission force of devices such as gears and belts, loads generated in equipment during operation etc.

Seldom can these kinds of load be determined by simple calculation, because the load is not always constant.

In many cases, the load fluctuates, and it is difficult to determine the frequency and magnitude of the fluctuation.

Therefore, loads are normally obtained by multiplying theoretical values with various coefficients obtained empirically.

1-3-1 Load coefficient

Even if radial and axial loads are obtained through general dynamic calculation, the actual load becomes greater than the calculated value due to vibration and impact during operation.

In many cases, the load is obtained by multiplying theoretical values by the load coefficient as shown below.

$$F = f_w \cdot F_c \quad \cdots\cdots\cdots \text{(1-10)}$$

where :

F : actual load N

F_c : calculated load N

f_w : load coefficient (refer to Table 1-5)

Table 1-5 Load coefficient f_w

Operating condition	Application example	f_w
Operation with little vibration or impact	Motors Machine tools Measuring instrument	1.0 – 1.2
Normal operation (slight impact)	Railway rolling stock Automobiles Paper manufacturing equipment Air blowers Compressors Agricultural equipment	1.2 – 2.0
Operation with severe vibration or impact	Rolling mills Crushers Construction equipment Shaker screens	2.0 – 3.0

1-4 Dynamic equivalent load

Bearings are used under various operating conditions; however, in most cases, bearings receive radial and axial load combined, while the load magnitude fluctuates during operation.

Therefore, it is impossible to directly compare the actual load and basic dynamic load rating.

The two are compared by replacing the loads applied to the shaft center with one of a constant magnitude and in a specific direction, that yields the same bearing service life as under actual load and rotational speed.

This theoretical load is referred to as the dynamic equivalent load (P).

1-4-1 Calculation of dynamic equivalent load

Dynamic equivalent loads for radial bearings and thrust bearings ($\alpha \neq 90°$) which receive a combined load of a constant magnitude in a specific direction can be calculated using the following equation.

$$P = XF_r + YF_a \quad \cdots\cdots (1\text{-}11)$$

where :

P : dynamic equivalent load N

for radial bearings,

P_r : dynamic equivalent radial load

for thrust bearings,

P_a : dynamic equivalent axial load

F_r : radial load N

F_a : axial load N

X : radial load factor

Y : axial load factor

(values of X and Y are listed in the bearing specification table.)

- When $F_a/F_r \leqq e$ for single-row radial bearings, it is taken that $X = 1$, and $Y = 0$. Hence, the dynamic equivalent load rating is $P_r = F_r$.

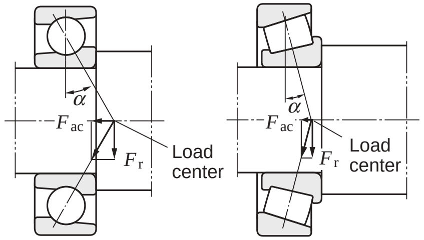
(Values of e, which designates the limit of F_a/F_r, are listed in the bearing specification table.)

- For single-row angular contact ball bearings and tapered roller bearings, axial component forces (F_{ac}) are generated as shown in Fig. 1-7, therefore a pair of bearings is arranged face-to-face or back-to-back.

  The axial component force can be calculated using the following equation.

$$F_{ac} = \frac{F_r}{2Y} \quad \cdots\cdots (1\text{-}12)$$

Table 1-6 describes the calculation of the dynamic equivalent load when radial loads and external axial loads (K_a) are applied to bearings.



(Load center position is listed in the bearing specification table.)

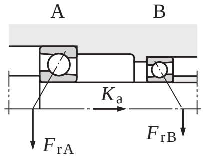
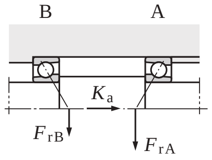
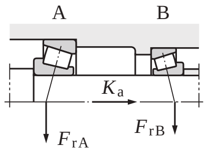
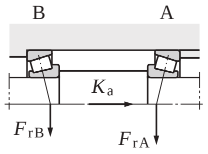
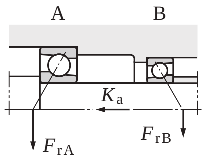
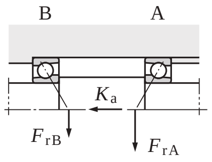
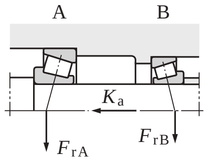
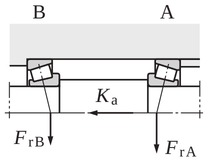
Fig. 1-7 Axial component force

- For thrust ball bearings with contact angle $\alpha = 90°$, to which an axial load is applied, $P_a = F_a$.
- The dynamic equivalent load of spherical thrust roller bearing can be calculated using the following equation.

$$P_a = F_a + 1.2\,F_r \quad \cdots\cdots (1\text{-}13)$$

where : $F_r/F_a \leqq 0.55$

Table 1-6 Dynamic equivalent load calculation : when a pair of single-row angular contact ball bearings or tapered roller bearings is arranged face-to-face or back-to-back.

Paired mounting		Loading condition	Bearing	Axial load	Dynamic equivalent load
Back-to-back arrangement	Face-to-face arrangement				
		$\frac{F_{rB}}{2Y_B} + K_a \geqq \frac{F_{rA}}{2Y_A}$	Bearing A	$\frac{F_{rB}}{2Y_B} + K_a$	$P_A = XF_{rA} + Y_A\left(\frac{F_{rB}}{2Y_B} + K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
			Bearing B	–	$P_B = F_{rB}$
		$\frac{F_{rB}}{2Y_B} + K_a < \frac{F_{rA}}{2Y_A}$	Bearing A	–	$P_A = F_{rA}$
			Bearing B	$\frac{F_{rA}}{2Y_A} - K_a$	$P_B = XF_{rB} + Y_B\left(\frac{F_{rA}}{2Y_A} - K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$
		$\frac{F_{rB}}{2Y_B} \leqq \frac{F_{rA}}{2Y_A} + K_a$	Bearing A	–	$P_A = F_{rA}$
			Bearing B	$\frac{F_{rA}}{2Y_A} + K_a$	$P_B = XF_{rB} + Y_B\left(\frac{F_{rA}}{2Y_A} + K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$
		$\frac{F_{rB}}{2Y_B} > \frac{F_{rA}}{2Y_A} + K_a$	Bearing A	$\frac{F_{rB}}{2Y_B} - K_a$	$P_A = XF_{rA} + Y_A\left(\frac{F_{rB}}{2Y_B} - K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
			Bearing B	–	$P_B = F_{rB}$

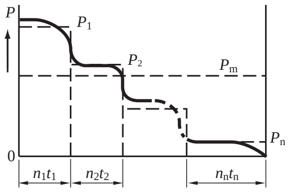
[Remarks] 1. These equations can be used when internal clearance and preload during operation are zero.
2. Radial load is treated as positive in the calculation, if it is applied in a direction opposite that shown in Fig. in Table 1-6.

1-4-2 Mean dynamic equivalent load

When load magnitude or direction varies, it is necessary to calculate the mean dynamic equivalent load, which provides the same length of bearing service life as that under the actual load fluctuation.

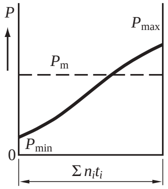
The mean dynamic equivalent load (P_m) under different load fluctuations is described using Graphs (1) to (4).

(1) Staged fluctuation



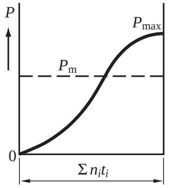
$$P_m = \sqrt[p]{\frac{P_1{}^p n_1t_1 + P_2{}^p n_2t_2 + \cdots + P_n{}^p n_nt_n}{n_1t_1 + n_2t_2 + \cdots\cdots + n_nt_n}} \quad \cdots\cdots\cdots (1\text{-}14)$$

(2) Stageless fluctuation



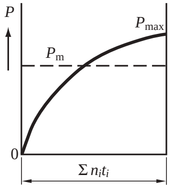
$$P_m = \frac{P_{min} + 2\,P_{max}}{3} \quad \cdots\cdots\cdots (1\text{-}15)$$

(3) Fluctuation forming sine curve



$$P_m = 0.68\,P_{max} \quad \cdots\cdots\cdots (1\text{-}16)$$

(4) Fluctuation forming sine curve
(upper half of sine curve)



$$P_m = 0.75\,P_{max} \quad \cdots\cdots\cdots (1\text{-}17)$$

Symbols for Graphs (1) to (4)

P_m : mean dynamic equivalent load N
P_1 : dynamic equivalent load applied for t_1 hours at rotational speed n_1 N
P_2 : dynamic equivalent load applied for t_2 hours at rotational speed n_2 N
⋮ ⋮ ⋮
P_n : dynamic equivalent load applied for t_n hours at rotational speed n_n N
P_{min} : minimum dynamic equivalent load N
P_{max} : maximum dynamic equivalent load N
Σn_it_i : total rotation in (t_1 to t_i) hours
p : for ball bearings ········· $p = 3$
for roller bearings ······ $p = 10/3$

[Reference] Mean rotational speed n_m can be calculated using the following equation :

$$n_m = \frac{n_1t_1 + n_2t_2 + \cdots\cdots\cdots + n_nt_n}{t_1 + t_2 + \cdots\cdots\cdots + t_n}$$

1-5 Basic static load rating and static equivalent load

1-5-1 Basic static load rating

Excessive static load or impact load even at very low rotation causes partial permanent deformation of the rolling element and raceway contacting surfaces. This permanent deformation increases with the load; if it exceeds a certain limit, smooth rotation will be hindered.

The basic static load rating is the static load which responds to the calculated contact stress shown below, at the contact center between the raceway and rolling elements which receive the maximum load.

- Self-aligning ball bearings ··· 4 600 MPa
- Other ball bearings ··············· 4 200 MPa
- Roller bearings ······················ 4 000 MPa

The total extent of contact stress-caused permanent deformation on surfaces of rolling elements and raceway will be approximately 0.000 1 times greater than the rolling element diameter.

The basic static load rating for radial bearings is specified as **the basic static radial load rating**, and for thrust bearings, as **the basic static axial load rating**. These load ratings are listed in the bearing specification table, using C_{0r} and C_{0a} respectively.

These values are prescribed by ISO 78/1987 and are subject to change by conformance to the latest ISO standards.

1-5-2 Static equivalent load

The static equivalent load is a theoretical load calculated such that, during rotation at very low speed or when bearings are stationary, the same contact stress as that imposed under actual loading condition is generated at the contact center between raceway and rolling element to which the maximum load is applied.

For radial bearings, radial load passing through the bearing center is used for the calculation; for thrust bearings, axial load in a direction along the bearing axis is used.

The static equivalent load can be calculated using the following equations.

[Radial bearings]
···The greater value obtained by the following two equations is used.

$$P_{0r} = X_0\,F_r + Y_0\,F_a \quad \cdots\cdots\cdots\cdots\cdots (1\text{-}18)$$

$$P_{0r} = F_r \quad \cdots\cdots\cdots\cdots\cdots (1\text{-}19)$$

[Thrust bearings]

($\alpha \neq 90°$)

$$P_{0a} = X_0\,F_r + F_a \quad \cdots\cdots\cdots\cdots\cdots (1\text{-}20)$$

[When $F_a < X_0\,F_r$,
the solution becomes less accurate.]

($\alpha = 90°$)

$$P_{0a} = F_a \quad \cdots\cdots\cdots\cdots\cdots (1\text{-}21)$$

where :
P_{0r} : static equivalent radial load N
P_{0a} : static equivalent axial load N
F_r : radial load N
F_a : axial load N
X_0 : static radial load factor
Y_0 : static axial load factor
(values of X_0 and Y_0 are listed in the bearing specification table.)

1-5-3 Safety coefficient

The allowable static equivalent load for a bearing is determined by the basic static load rating of the bearing; however, bearing service life, which is affected by permanent deformation, differs in accordance with the performance required of the bearing and operating conditions.

Therefore, a safety coefficient is designated, based on empirical data, so as to ensure safety in relation to basic static load rating.

$$f_s = \frac{C_0}{P_0} \quad \cdots\cdots\cdots\cdots \text{(1-22)}$$

where :
f_s : safety coefficient (ref. Table 1-7)
C_0 : basic static load rating N
P_0 : static equivalent load N

Table 1-7 Values of safety coefficient f_s

Operating condition		f_s (min.)	
		Ball bearing	**Roller bearing**
With bearing rotation	When high running accuracy is required	2	3
	Normal operation	1	1.5
	When impact load is applied	1.5	3
Without bearing rotation (occasional oscillation)	Normal operation	0.5	1
	When impact load or uneven distribution load is applied	1	2

[Remark] For spherical thrust roller bearings, $f_s \geqq 4$.

2. Bearing tolerances

Bearing tolerances and permissible values for the boundary dimensions and running accuracy of bearings are specified. These values are prescribed in JIS, ISO, ABMA, etc.

Bearing tolerances are classified into 6, 5, 4 etc., other than ordinary class 0. Class 0 bearings offer adequate performance for general applications, and bearings of class 5, 4, or higher are required for machine tools.

Table 2-1 shows the tolerance classes and JTEKT codes applied to the types of bearings shown in the dimensional tables.

Bearing tolerances of these bearings are shown in Tables 2-2 through 2-8. Table 2-9 shows the allowable limited values of chamfer dimensions, and Table 2-10 includes the tolerances for tapered bore.

Table 2-1 Tolerance class for each bearing type

Bearing type		Applied standards of tolerance class				Applied tolerance table
Deep groove ball bearing		JIS class 0	JIS class 6	JIS class 5	(JIS class 4)	Table 2-2
Angular contact ball bearing		JIS class 0	JIS class 6	JIS class 5	(JIS class 4)	
Cylindrical roller bearing		JIS class 0	JIS class 6	JIS class 5	(JIS class 4)	
Wide series cylindrical roller bearing		Equivalent to class 0	Equivalent to class 6	–	–	
Full complement cylindrical roller bearing		Equivalent to class 0	Equivalent to class 6	–	–	
Tapered roller bearing	Metric series (single-row)	JIS class 0, 6X	JIS class 6	JIS class 5	(JIS class 4)	Table 2-3
	Metric series (double or four-row)	BAS class 0	–	–	–	Table 2-4
	Metric series (J-series)	Class PK	Class PN	Class PC	(Class PB)	Table 2-6
	Inch series	ABMA Class 4	ABMA Class 2	ABMA Class 3	(ABMA Class 0)	Table 2-5
Spherical roller bearing		JIS class 0	–	–	–	Table 2-2
Thrust ball bearing		JIS class 0	JIS class 6	(JIS class 5)	–	Table 2-7
Metric series taperd roller thrust bearing		Equivalent to class 0	–	–	–	Table 2-8
Spherical thrust roller bearing		JIS class 0	–	–	–	

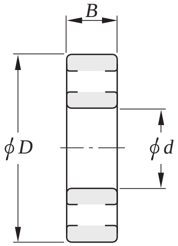
[Remarks] 1. Products of tolerance classes included in parentheses shown in the table above are required, contact JTEKT.
2. Thrust tapered roller bearings for screw down, cylindrical roller bearings for multistage rolling mill back-up roll, and bearings for tunneling machine are manufactured with the special tolerances appropriate for their operating conditions.

Table 2-2 (1) Radial bearing tolerances (tapered roller bearings excluded) = JIS B 1514 =

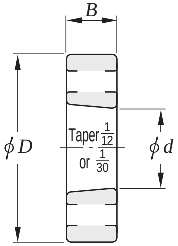
(1) Inner ring (bore diameter)

Unit : μm

Nominal bore diameter *d* mm		Single plane mean bore diameter deviation Δ_{dmp}								Single bore diameter deviation Δ_{ds} 1)		Single plane bore diameter variation V_{dsp}												Mean bore diameter variation V_{dmp}				Nominal bore diameter *d* mm	
												Diameter series 7, 8, 9				Diameter series 0, 1				Diameter series 2, 3, 4									
		class 0		class 6		class 5		class 4		class 4		class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4		
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.				max.				max.				max.				over	up to
30	**50**	0	−12	0	−10	0	−8	0	−6	0	−6	15	13	8	6	12	10	6	5	9	8	6	5	9	8	4	3	**30**	**50**
50	**80**	0	−15	0	−12	0	−9	0	−7	0	−7	19	15	9	7	19	15	7	5	11	9	7	5	11	9	5	3.5	**50**	**80**
80	**120**	0	−20	0	−15	0	−10	0	−8	0	−8	25	19	10	8	25	19	8	6	15	11	8	6	15	11	5	4	**80**	**120**
120	**150**	0	−25	0	−18	0	−13	0	−10	0	−10	31	23	13	10	31	23	10	8	19	14	10	8	19	14	7	5	**120**	**150**
150	**180**	0	−25	0	−18	0	−13	0	−10	0	−10	31	23	13	10	31	23	10	8	19	14	10	8	19	14	7	5	**150**	**180**
180	**250**	0	−30	0	−22	0	−15	0	−12	0	−12	38	28	15	12	38	28	12	9	23	17	12	9	23	17	8	6	**180**	**250**
250	**315**	0	−35	0	−25	0	−18	*0*	*−15*	*0*	*−15*	44	31	18	*15*	44	31	14	*11*	26	19	14	*11*	26	19	9	*8*	**250**	**315**
315	**400**	0	−40	0	−30	0	−23	*0*	*−18*	*0*	*−18*	50	38	23	*18*	50	38	18	*14*	30	23	18	*14*	30	23	12	*9*	**315**	**400**
400	**500**	0	−45	0	−35	*0*	*−28*	*0*	*−23*	*0*	*−23*	56	44	*28*	*23*	56	44	*21*	*17*	34	26	*21*	*17*	34	26	*14*	*12*	**400**	**500**
500	**630**	0	−50	0	−40	*0*	*−35*	–	–	–	–	63	50	*35*	–	63	50	*26*	–	38	30	*26*	–	38	30	*18*	–	**500**	**630**
630	**800**	0	−75	*0*	*−50*	*0*	*−45*	–	–	–	–	*94*	*63*	*45*	–	*94*	*63*	*34*	–	*56*	*38*	*34*	–	*56*	*38*	*23*	–	**630**	**800**
800	**1 000**	0	−100	*0*	*−60*	*0*	*−60*	–	–	–	–	*125*	*75*	*60*	–	*125*	*75*	*45*	–	*75*	*45*	*45*	–	*75*	*45*	*30*	–	**800**	**1 000**
1 000	**1 250**	0	−125	*0*	*−75*	*0*	*−75*	–	–	–	–	*156*	*94*	*75*	–	*156*	*94*	*56*	–	*94*	*56*	*56*	–	*94*	*56*	*38*	–	**1 000**	**1 250**
1 250	**1 600**	0	−160	–	–	–	–	–	–	–	–	*200*	–	–	–	*200*	–	–	–	*120*	–	–	–	*120*	–	–	–	**1 250**	**1 600**
1 600	**2 000**	0	−200	–	–	–	–	–	–	–	–	*250*	–	–	–	*250*	–	–	–	*150*	–	–	–	*150*	–	–	–	**1 600**	**2 000**



Cylindrical bore



Tapered bore

(2) Inner ring (running accuracy and width)

Unit : μm

Nominal bore diameter *d* mm		Radial runout of assembled bearing inner ring K_{ia}				S_d		S_{ia} 2)		Single inner ring width deviation Δ_{Bs}								Matched pair inner ring width deviation Δ_{Bs} 3)								Inner ring width variation V_{Bs}				Nominal bore diameter *d* mm	
		class 0	class 6	class 5	class 4	class 5	class 4	class 5	class 4	class 0		class 6		class 5		class 4		class 0 4)		class 6 4)		class 5 4)		class 4		class 0	class 6	class 5	class 4		
over	up to	max.				max.		max.		upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.				over	up to
30	**50**	15	10	5	4	8	4	8	4	0	−120	0	−120	0	−120	0	−120	0	−250	0	−250	0	−250	0	−250	20	20	5	3	**30**	**50**
50	**80**	20	10	5	4	8	5	8	5	0	−150	0	−150	0	−150	0	−150	0	−380	0	−380	0	−250	0	−250	25	25	6	4	**50**	**80**
80	**120**	25	13	6	5	9	5	9	5	0	−200	0	−200	0	−200	0	−200	0	−380	0	−380	0	−380	0	−380	25	25	7	4	**80**	**120**
120	**150**	30	18	8	6	10	6	10	7	0	−250	0	−250	0	−250	0	−250	0	−500	0	−500	0	−380	0	−380	30	30	8	5	**120**	**150**
150	**180**	30	18	8	6	10	6	10	7	0	−250	0	−250	0	−250	0	−250	0	−500	0	−500	0	−380	0	−380	30	30	8	5	**150**	**180**
180	**250**	40	20	10	8	11	7	13	8	0	−300	0	−300	0	−300	0	−300	0	−500	0	−500	0	−500	0	−500	30	30	10	6	**180**	**250**
250	**315**	50	25	13	*10*	13	*8*	15	*9*	0	−350	0	−350	0	−350	*0*	*−350*	0	−500	0	−500	0	−500	–	–	35	35	13	*8*	**250**	**315**
315	**400**	60	30	15	*13*	15	*9*	20	*12*	0	−400	0	−400	0	−400	*0*	*−400*	0	−630	0	−630	0	−630	–	–	40	40	15	*9*	**315**	**400**
400	**500**	65	35	*20*	*15*	*18*	*11*	*25*	*15*	0	−450	0	−450	*0*	*−450*	*0*	*−450*	–	–	–	–	–	–	–	–	50	45	*18*	*11*	**400**	**500**
500	**630**	70	40	*25*	–	*25*	–	*30*	–	0	−500	0	−500	*0*	*−500*	–	–	–	–	–	–	–	–	–	–	60	50	*20*	–	**500**	**630**
630	**800**	80	*50*	*30*	–	*30*	–	*35*	–	0	−750	*0*	*−750*	*0*	*−750*	–	–	–	–	–	–	–	–	–	–	70	*60*	*23*	–	**630**	**800**
800	**1 000**	90	*60*	*40*	–	*40*	–	*45*	–	0	−1 000	*0*	*−1 000*	*0*	*−1 000*	–	–	–	–	–	–	–	–	–	–	80	*60*	*35*	–	**800**	**1 000**
1 000	**1 250**	100	*70*	*50*	–	*50*	–	*60*	–	0	−1 250	*0*	*−1 250*	*0*	*−1 250*	–	–	–	–	–	–	–	–	–	–	100	*60*	*45*	–	**1 000**	**1 250**
1 250	**1 600**	120	–	–	–	–	–	–	–	0	−1 600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	120	–	–	–	**1 250**	**1 600**
1 600	**2 000**	140	–	–	–	–	–	–	–	0	−2 000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	140	–	–	–	**1 600**	**2 000**

S_d : Perpendicularity of inner ring face with respect to the bore S_{ia} : Axial runout of assembled bearing inner ring

[Notes] 1) These shall be applied to bearings of diameter series 0, 1, 2, 3 and 4.

2) These shall be applied to deep groove ball bearings and angular contact ball bearings.

3) These shall be appplied to individual bearing rings manufactured for matched pair or stack bearings.

4) Also applicable to the inner ring with tapered bore of $d \geqq 50$ mm.

[Remark] Values in Italics are prescribed in JTEKT standards.

Table 2-2 (2) Radial bearing tolerances (tapered roller bearings excluded)

(3) Outer ring (outside diameter)

Unit : µm

Nominal outside dia. D mm		Single plane mean outside diameter deviation Δ_{Dmp}								Single outside diameter deviation Δ_{Ds}[1]		Single plane outside diameter variation V_{Dsp}																Mean outside diameter variation V_{Dmp}				Nominal outside dia. D mm	
												Diameter series 7, 8, 9				Diameter series 0, 1				Diameter series 2, 3, 4				Shielded/sealed type Diameter series 2, 3, 4	Shielded/sealed type Diameter series 0, 1, 2, 3, 4						
		class 0		class 6		class 5		class 4		class 4[5]		class 0[2]	class 6[2]	class 5[5]	class 4[5]	Class 0[2]	Class 6[2]	Class 5[5]	Class 4[5]	Class 0[2]	Class 6[2]	Class 5[5]	Class 4[5]	Class 0[2]	Class 6[2]	Class 0[2]	Class 6[2]	Class 5	Class 4		
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.				max.				max.				max.		max.				over	up to
50	**80**	0	–13	0	–11	0	–9	0	–7	0	–7	16	14	9	7	13	11	7	5	10	8	7	5	20	16	10	8	5	3.5	**50**	**80**
80	**120**	0	–15	0	–13	0	–10	0	–8	0	–8	19	16	10	8	19	16	8	6	11	10	8	6	26	20	11	10	5	4	**80**	**120**
120	**150**	0	–18	0	–15	0	–11	0	–9	0	–9	23	19	11	9	23	19	8	7	14	11	8	7	30	25	14	11	6	5	**120**	**150**
150	**180**	0	–25	0	–18	0	–13	0	–10	0	–10	31	23	13	10	31	23	10	8	19	14	10	8	38	30	19	14	7	5	**150**	**180**
180	**250**	0	–30	0	–20	0	–15	0	–11	0	–11	38	25	15	11	38	25	11	8	23	15	11	8	–	–	23	15	8	6	**180**	**250**
250	**315**	0	–35	0	–25	0	–18	0	–13	0	–13	44	31	18	13	44	31	14	10	26	19	14	10	–	–	26	19	9	7	**250**	**315**
315	**400**	0	–40	0	–28	0	–20	0	–15	0	–15	50	35	20	15	50	35	15	11	30	21	15	11	–	–	30	21	10	8	**315**	**400**
400	**500**	0	–45	0	–33	0	–23	*0*	*–17*	*0*	*–17*	56	41	23	*17*	56	41	17	*13*	34	25	17	*13*	–	–	34	25	12	*9*	**400**	**500**
500	**630**	0	–50	0	–38	0	–28	*0*	*–20*	*0*	*–20*	63	48	28	*20*	63	48	21	*15*	38	29	21	*15*	–	–	38	29	14	*10*	**500**	**630**
630	**800**	0	–75	0	–45	0	–35	–	–	–	–	94	56	35	–	94	56	26	–	55	34	26	–	–	–	55	34	18	–	**630**	**800**
800	**1 000**	0	–100	0	–60	*0*	*–50*	–	–	–	–	125	75	*50*	–	125	75	*38*	–	75	45	*38*	–	–	–	75	45	*25*	–	**800**	**1 000**
1 000	**1 250**	0	–125	*0*	*–75*	*0*	*–63*	–	–	–	–	*156*	*94*	*63*	–	*156*	*94*	*47*	–	*94*	*56*	*47*	–	–	–	*94*	*56*	*31*	–	**1 000**	**1 250**
1 250	**1 600**	0	–160	*0*	*–90*	*0*	*–80*	–	–	–	–	*200*	*113*	*80*	–	*200*	*113*	*60*	–	*120*	*68*	*60*	–	–	–	*120*	*68*	*40*	–	**1 250**	**1 600**
1 600	**2 000**	0	–200	*0*	*–120*	–	–	–	–	–	–	*250*	*150*	–	–	*250*	*150*	–	–	*150*	*90*	–	–	–	–	*150*	*90*	–	–	**1 600**	**2 000**
2 000	**2 500**	0	–250	–	–	–	–	–	–	–	–	*313*	–	–	–	*313*	–	–	–	*188*	–	–	–	–	–	*188*	–	–	–	**2 000**	**2 500**

(4) Outer ring (running accuracy and width)

Unit : µm

Nominal outside dia. D mm		Radial runout of assembled bearing outer ring K_{ea}				S_D[4]		S_{ea}[3] [4]		Δ_{Cs}[3]		Outer ring width variation V_{Cs}[3]		
		class 0	class 6	class 5	class 4	class 5	class 4	class 5	class 4	classes 0, 6, 5, 4		classes 0, 6	class 5	class 4
over	up to	max.				max.		max.		upper	lower	max.		
50	**80**	25	13	8	5	8	4	10	5	Shall conform to the tolerance Δ_{Bs} on d of the same bearing		Shall conform to the tolerance V_{Bs} on d of the same bearing	6	3
80	**120**	35	18	10	6	9	5	11	6				8	4
120	**150**	40	20	11	7	10	5	13	7				8	5
150	**180**	45	23	13	8	10	5	14	8				8	5
180	**250**	50	25	15	10	11	7	15	10				10	7
250	**315**	60	30	18	11	13	8	18	10				11	7
315	**400**	70	35	20	13	13	10	20	13				13	8
400	**500**	80	40	23	*15*	15	*12*	23	*15*				15	*9*
500	**630**	100	50	25	*18*	18	*13*	25	*18*				18	*11*
630	**800**	120	60	30	–	20	–	30	–				20	–
800	**1 000**	140	75	*40*	–	*23*	–	*40*	–				*23*	–
1 000	**1 250**	160	*85*	*45*	–	*30*	–	*45*	–				*30*	–
1 250	**1 600**	190	*95*	*60*	–	*45*	–	*60*	–				*45*	–
1 600	**2 000**	220	*110*	–	–	–	–	–	–				–	–
2 000	**2 500**	250	–	–	–	–	–	–	–				–	–

S_D : Perpendicularity of outer ring outside surface with respect to the face

S_{ea} : Axial runout of assembled bearing outer ring

Δ_{Cs} : Deviation of a single outer ring width

[Notes]

1) These shall be applied to bearings of diameter series 0, 1, 2, 3 and 4.

2) Shall be applied when locating snap ring is not fitted.

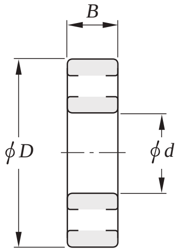
3) These shall be applied to deep groove ball bearings and angular contact ball bearings.

4) These shall not be applied to flanged bearings.

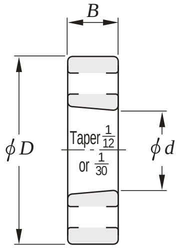
5) These shall not be applied to shielded bearings and sealed bearings.

[Remark]

Values in Italics are prescribed in JTEKT standards.



Cylindrical bore



Tapered bore

d : nominal bore diameter

D : nominal outside diameter

B : nominal assembled bearing width

Table 2-3 (1) Tolerances for metric series tapered roller bearings = JIS B 1514 =

(1) Inner ring

Unit : μm

Nominal bore diameter d mm		Single plane mean bore diameter deviation Δ_{dmp}						Single bore diameter deviation Δ_{ds}		Single plane bore diameter variation V_{dsp}				Mean bore diameter variation V_{dmp}			
		classes 0, 6X		classes 6, 5		class 4		class 4		classes 0, 6X	class 6	class 5	class 4	classes 0, 6X	class 6	class 5	class 4
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	max.				max.			
80	**120**	0	–20	0	–15[2]	0	–10	0	–10	20	15	11	8	15	11	8	5
120	**180**	0	–25	0	–18[2]	0	–13	0	–13	25	18	14	10	19	14	9	7
180	**250**	0	–30	0	–22[2]	0	–15	0	–15	30	22	17	11	23	16	11	8
250	**315**	0	–35	0	–25	0	–18	0	–18	35	*25*	19	12	26	*19*	13	9
315	**400**	0	–40	0	–30	–	–	–	–	40	*30*	23	–	30	*23*	15	–
400	**500**	0	–45	0	–35	–	–	–	–	45	*35*	28	–	34	*26*	17	–
500	**630**	0	–60	0	–40	–	–	–	–	60	*40*	35	–	40	*30*	20	–
630	**800**	0	–75	0	–50	–	–	–	–	75	*50*	45	–	45	*38*	25	–
800	**1 000**	0	–100	0	–60	–	–	–	–	100	*60*	60	–	55	*45*	30	–
1 000	**1 250**	0	–125	0	–75	–	–	–	–	125	*75*	*56*	–	*94*[1]	*56*	*38*	–
1 250	**1 600**	0	–160	0	–90	–	–	–	–	160	–	–	–	*120*[1]	–	–	–
1 600	**2 000**	0	–200	–	–	–	–	–	–	200	–	–	–	*150*[1]	–	–	–

Radial runout of assembled bearing inner ring K_{ia}				S_d		S_{ia}	Single inner ring width deviation Δ_{Bs}								Nominal bore diameter d mm	
classes 0, 6X	class 6	class 5	class 4	class 5	class 4	class 4	class 0		class 6X		class 6		classes 5, 4			
max.				max.		max.	upper	lower	upper	lower	upper	lower	upper	lower	over	up to
30	13	8	5	9	5	5	0	–200	0	–50	0	–200	0	–400	**80**	**120**
35	18	11	6	10	6	7	0	–250	0	–50	0	–250	0	–500	**120**	**180**
50	20	13	8	11	7	8	0	–300	0	–50	0	–300	0	–600	**180**	**250**
60	*30*	13	9	13	8	9	0	–350	0	–50	*0*	*–350*	0	–700	**250**	**315**
70	*35*	15	–	15	–	–	0	–400	0	–50	*0*	*–400*	0	–800[3]	**315**	**400**
80	*40*	20	–	17	–	–	0	–450	0	–50	*0*	*–450*	0	–900[3]	**400**	**500**
90	*50*	25	–	20	–	–	0	–500	–	–	*0*	*–500*	0	–1 100[3]	**500**	**630**
100	*60*	30	–	25	–	–	0	–750	–	–	*0*	*–750*	0	–1 600[3]	**630**	**800**
115	*75*	37	–	30	–	–	0	–1 000	–	–	*0*	*–1 000*	0	–2 000[3]	**800**	**1 000**
120[1]	*85*	*28*	–	*30*	–	–	0	–1 250	–	–	*0*	*–1 250*	*0*	*–2 500*[3]	**1 000**	**1 250**
120[1]	–	–	–	–	–	–	0	–1 600	–	–	–	–	–	–	**1 250**	**1 600**
140[1]	–	–	–	–	–	–	0	–2 000	–	–	–	–	–	–	**1 600**	**2 000**

S_d : Perpendicularity of inner ring face with respect to the bore, S_{ia} : Axial runout of assembled bearing inner ring

(2-1) Outer ring

Unit : μm

Nominal outside diameter D mm		Single plane mean outside diameter deviation Δ_{Dmp}						Single outside diameter deviation Δ_{Ds}		Single plane outside diameter variation V_{Dsp}				Mean outside diameter variation V_{Dmp}			
		classes 0, 6X		classes 6, 5		class 4		class 4		classes 0, 6X	class 6	class 5	class 4	classes 0, 6X	class 6	class 5	class 4
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	max.				max.			
80	**120**	0	–18	0	–13[2]	0	–10	0	–10	18	13	10	8	14	10	7	5
120	**150**	0	–20	0	–15[2]	0	–11	0	–11	20	15	11	8	15	11	8	6
150	**180**	0	–25	0	–18[2]	0	–13	0	–13	25	18	14	10	19	14	9	7
180	**250**	0	–30	0	–20[2]	0	–15	0	–15	30	20	15	11	23	15	10	8
250	**315**	0	–35	0	–25[2]	0	–18	0	–18	35	25	19	14	26	19	13	9
315	**400**	0	–40	0	–28[2]	0	–20	0	–20	40	28	22	15	30	21	14	10
400	**500**	0	–45	0	–33	–	–	–	–	45	*33*	26	–	34	*25*	17	–
500	**630**	0	–50	0	–38	–	–	–	–	60	*38*	30	–	38	*29*	20	–
630	**800**	0	–75	0	–45	–	–	–	–	80	*45*	38	–	55	*34*	25	–
800	**1 000**	0	–100	0	–60	–	–	–	–	100	*60*	50	–	75	*45*	30	–
1 000	**1 250**	0	–125	0	–80	–	–	–	–	130	*75*	65	–	90	*56*	38	–
1 250	**1 600**	0	–160	0	–100	–	–	–	–	170	*90*	90	–	100	*68*	50	–
1 600	**2 000**	0	–200	*0*	*–120*	–	–	–	–	*200*[1]	*120*	*90*	–	*150*[1]	*90*	*60*	–

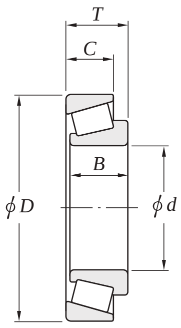
Radial runout of assembled bearing outer ring K_{ea}				S_D[4]		S_{ea}[4]	Nominal outside diameter D mm	
classes 0, 6X	class 6	class 5	class 4	class 5	class 4	class 4		
max.				max.		max.	over	up to
35	18	10	6	9	5	6	**80**	**120**
40	20	11	7	10	5	7	**120**	**150**
45	23	13	8	10	5	8	**150**	**180**
50	25	15	10	11	7	10	**180**	**250**
60	30	18	11	13	8	10	**250**	**315**
70	35	20	13	13	10	13	**315**	**400**
80	*40*	24	–	17	–	–	**400**	**500**
100	*50*	30	–	20	–	–	**500**	**630**
120	*60*	36	–	25	–	–	**630**	**800**
140	*75*	43	–	30	–	–	**800**	**1 000**
160	*85*	52	–	38	–	–	**1 000**	**1 250**
180	*95*	62	–	50	–	–	**1 250**	**1 600**
220[1]	*115*	*45*	–	*40*	–	–	**1 600**	**2 000**

S_D : Perpendicularity of outer ring outside surface with respect to the face
S_{ea} : Axial runout of assembled bearing outer ring

(2-2) Outer ring

Unit : μm

Nominal bore diameter d mm		Single outer ring width deviation Δ_{Cs}			
		class 6X[4]		classes 0, 6, 5, 4	
over	up to	upper	lower	upper	lower
80	**120**	0	–100	Shall comform to the tolerance Δ_{Bs} on d of the same bearing	
120	**180**	0	–100		
180	**250**	0	–100		
250	**315**	0	–100		
315	**400**	0	–100		
400	**500**	0	–100		
500	**630**	–	–		
630	**800**	–	–		
800	**1 000**	–	–		



d : nominal bore diameter
D : nominal outside diameter
B : nominal inner ring width
C : nominal outer ring width
T : nominal assembled bearing width

[Notes] 1) These shall be applied to bearing of tolerance class 0.
2) These shall be applied to bearing of tolerance class 6.
3) These shall be applied to bearing of tolerance class 5.
4) These shall not be applied to flanged bearings.

[Remark] Values in Italics are prescribed in JTEKT standards.

Table 2-3 (2) Tolerances for metric series tapered roller bearings

(3) Assembled bearing width and effective width

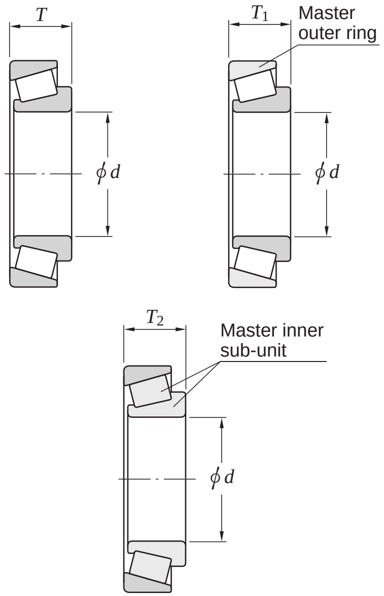
Unit : μm

Nominal bore diameter d mm		Actual bearing width deviation Δ_{Ts}								Actual effective inner sub-unit width deviation Δ_{T1s}					
		class 0		class 6X		class 6		classes 5, 4		class 0		class 6X		classes 5, 4	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
80	**120**	+200	−200	+100	0	+200	−200	+200	−200	+100	−100	+ 50	0	+100	−100
120	**180**	+350	−250	+150	0	+350	−250	+350	−250	+150	−150	+ 50	0	+150	−150
180	**250**	+350	−250	+150	0	+350	−250	+350	−250	+150	−150	+ 50	0	+150	−150
250	**315**	+350	−250	+200	0	*+350*	*−250*	+350	−250	+150	−150	+100	0	+150	−150
315	**400**	+400	−400	+200	0	*+400*	*−400*	+400	−400$^{1)}$	+200	−200	+100	0	+200	−200$^{1)}$
400	**500**	+450	−450	+200	0	*+400*	*−400*	+450	−450$^{1)}$	+225	−225	+100	0	+225	−225$^{1)}$
500	**630**	+500	−500	–	–	*+500*	*−500*	+500	−500$^{1)}$	–	–	–	–	–	–
630	**800**	+600	−600	–	–	*+600*	*−600*	+600	−600$^{1)}$	–	–	–	–	–	–
800	**1 000**	+750	−750	–	–	*+750*	*−750*	+750	−750$^{1)}$	–	–	–	–	–	–

Nominal bore diameter d mm		Actual effective outer ring width deviation Δ_{T2s}					
		class 0		class 6X		classes 5, 4	
over	up to	upper	lower	upper	lower	upper	lower
80	**120**	+100	−100	+ 50	0	+100	−100
120	**180**	+200	−100	+100	0	+200	−100
180	**250**	+200	−100	+100	0	+200	−100
250	**315**	+200	−100	+100	0	+200	−100
315	**400**	+200	−200	+100	0	+200	−200$^{1)}$
400	**500**	+225	−225	+100	0	+225	−225$^{1)}$
500	**630**	–	–	–	–	–	–
630	**800**	–	–	–	–	–	–
800	**1 000**	–	–	–	–	–	–

[Note] 1) These shall be applied to bearings of tolerance class 5.

[Remark] Values in Italics are prescribed in JTEKT standards.



d : nominal bore diameter
T : nominal assembled bearing width
T_1 : nominal effective width of inner sub-unit
T_2 : nominal effective width of outer ring

Table 2-4 Tolerances for metric series double-row and four-row tapered roller bearings (class 0)

= BAS 1002 =

(1) Inner ring, outer ring width and overall width

Unit : μm

Nominal bore diameter d mm		Single plane mean bore diameter deviation Δ_{dmp}		V_{dsp}	V_{dmp}	K_{ia}	Single outer ring or inner ring width deviation Δ_{Bs}, Δ_{Cs}		Actual overall inner rings / outer rings width deviation			
									Double-row Δ_{Ts}		Four-row Δ_{Ts}, Δ_{Ws}	
over	up to	upper	lower	max.	max.	max.	upper	lower	upper	lower	upper	lower
50	**80**	0	− 15	15	11	25	0	− 150	+ 300	− 300	–	–
80	**120**	0	− 20	20	15	30	0	− 200	+ 400	− 400	+ 500	− 500
120	**180**	0	− 25	25	19	35	0	− 250	+ 500	− 500	+ 600	− 600
180	**250**	0	− 30	30	23	50	0	− 300	+ 600	− 600	+ 750	− 750
250	**315**	0	− 35	35	26	60	0	− 350	+ 700	− 700	+ 900	− 900
315	**400**	0	− 40	40	30	70	0	− 400	+ 800	− 800	+1 000	−1 000
400	**500**	0	− 45	45	34	80	0	− 450	+ 900	− 900	+1 200	−1 200
500	**630**	0	− 60	60	40	90	0	− 500	+1 000	−1 000	+1 200	−1 200
630	**800**	0	− 75	75	45	100	0	− 750	+1 500	−1 500	–	–
800	**1 000**	0	−100	100	55	115	0	−1 000	+1 500	−1 500	–	–

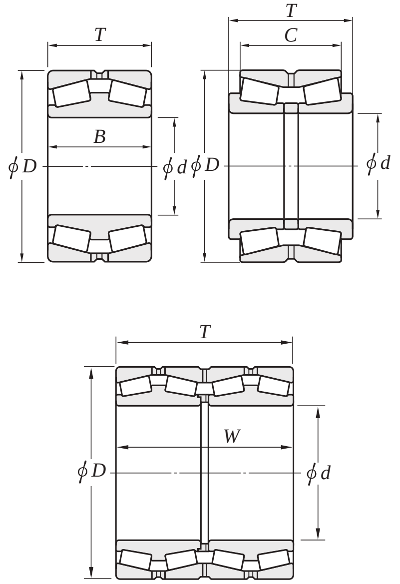
V_{dsp} : Single plane bore diameter variation, V_{dmp} : Mean bore diameter variation
K_{ia} : Radial runout of assembled bearing inner ring

(2) Outer ring

Unit : μm

Nominal outside diameter D mm		Single plane mean outside diameter deviation Δ_{Dmp}		V_{Dsp}	V_{Dmp}	K_{ea}
over	up to	upper	lower	max.	max.	max.
80	**120**	0	− 18	18	14	35
120	**150**	0	− 20	20	15	40
150	**180**	0	− 25	25	19	45
180	**250**	0	− 30	30	23	50
250	**315**	0	− 35	35	26	60
315	**400**	0	− 40	40	30	70
400	**500**	0	− 45	45	34	80
500	**630**	0	− 50	60	38	100
630	**800**	0	− 75	80	55	120
800	**1 000**	0	−100	100	75	140
1 000	**1 250**	0	−125	130	90	160
1 250	**1 600**	0	−160	170	100	180

V_{Dsp} : Single plane outside diameter variation
V_{Dmp} : Mean outside diameter variation
K_{ea} : Radial runout of assembled bearing outer ring



d : nominal bore diameter
D : nominal outside diameter
B : nominal double inner ring width
C : nominal double outer ring width
T, W : nominal overall width of outer rings (inner rings)

Table 2-5 Tolerances for inch series tapered roller bearings = ABMA 19 =

(1) Inner ring

Unit : μm

Applied bearing type	Nominal bore diameter d , mm (1/25.4)		Deviation of a single bore diameter Δ_{ds}							
			Class 4		Class 2		Class 3		Class 0	
	over	up to	upper	lower	upper	lower	upper	lower	upper	lower
All types	–	**76.2** (3.0)	+ 13	0	+13	0	+13	0	+13	0
	76.2 (3.0)	**266.7** (10.5)	+ 25	0	+25	0	+13	0	+13	0
	266.7 (10.5)	**304.8** (12.0)	+ 25	0	+25	0	+13	0	+13	0
	304.8 (12.0)	**609.6** (24.0)	+ 51	0	+51	0	+25	0	–	–
	609.6 (24.0)	**914.4** (36.0)	+ 76	0	–	–	+38	0	–	–
	914.4 (36.0)	**1 219.2** (48.0)	+102	0	–	–	+51	0	–	–
	1 219.2 (48.0)	–	+127	0	–	–	+76	0	–	–

(2) Outer ring

Unit : μm

Applied bearing type	Nominal outside diameter D , mm (1/25.4)		Deviation of a single outside diameter Δ_{Ds}							
			Class 4		Class 2		Class 3		Class 0	
	over	up to	upper	lower	upper	lower	upper	lower	upper	lower
All types	–	**266.7** (10.5)	+ 25	0	+25	0	+13	0	+13	0
	266.7 (10.5)	**304.8** (12.0)	+ 25	0	+25	0	+13	0	+13	0
	304.8 (12.0)	**609.6** (24.0)	+ 51	0	+51	0	+25	0	–	–
	609.6 (24.0)	**914.4** (36.0)	+ 76	0	+76	0	+38	0	–	–
	914.4 (36.0)	**1 219.2** (48.0)	+102	0	–	–	+51	0	–	–
	1 219.2 (48.0)	–	+127	0	–	–	+76	0	–	–

(3) Radial runout of assembled bearing inner ring / outer ring

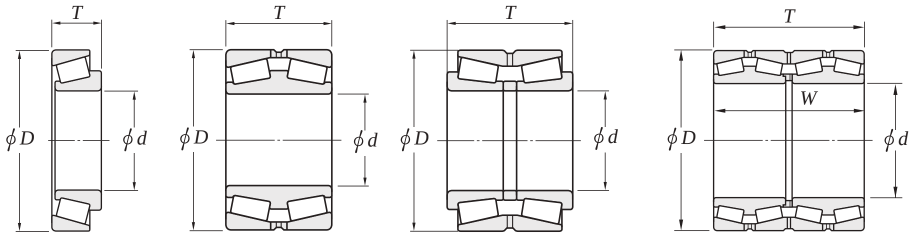
Unit : μm

Applied bearing type	Nominal outside diameter D , mm (1/25.4)		Radial runout of inner ring / outer ring K_{ia} , K_{ea}			
			Class 4	Class 2	Class 3	Class 0
	over	up to	max.	max.	max.	max.
All types	–	**266.7** (10.5)	51	38	8	4
	266.7 (10.5)	**304.8** (12.0)	51	38	8	4
	304.8 (12.0)	**609.6** (24.0)	51	38	18	–
	609.6 (24.0)	**914.4** (36.0)	76	51	51	–
	914.4 (36.0)	**1 219.2** (48.0)	76	–	76	–
	1 219.2 (48.0)	–	76	–	76	–

(4) Assembled bearing width and overall width

Unit : μm

Applied bearing type	Nominal bore diameter d, mm (1/25.4)		Nominal outside diameter D, mm (1/25.4)		Deviation of the actual bearing width and overall width of inner rings / outer rings Δ_{Ts}, Δ_{Ws}							
					Class 4		Class 2		Class 3		Class 0	
	over	up to	over	up to	upper	lower	upper	lower	upper	lower	upper	lower
Single-row	–	**101.6** (4.0)	–	–	+ 203	0	+ 203	0	+ 203	– 203	+ 203	– 203
	101.6 (4.0)	**266.7** (10.5)			+ 356	– 254	+ 203	0	+ 203	– 203	+ 203	– 203
	266.7 (10.5)	**304.8** (12.0)	–	–	+ 356	– 254	+ 203	0	+ 203	– 203	+ 203	– 203
	304.8 (12.0)	**609.6** (24.0)	–	**508.0** (20.0)	–	–	+ 381	– 381	+ 203	– 203	–	–
	304.8 (12.0)	**609.6** (24.0)	**508.0** (20.0)	–	–	–	+ 381	– 381	+ 381	– 381	–	–
	609.6 (24.0)		–	–	+ 381	– 381	–	–	+ 381	– 381	–	–
Double-row	–	**101.6** (4.0)	–	–	+ 406	0	+ 406	0	+ 406	– 406	+ 406	– 406
	101.6 (4.0)	**266.7** (10.5)	–	–	+ 711	– 508	+ 406	– 203	+ 406	– 406	+ 406	– 406
	266.7 (10.5)	**304.8** (12.0)	–	–	+ 711	– 508	+ 406	– 203	+ 406	– 406	+ 406	– 406
	304.8 (12.0)	**609.6** (24.0)	–	**508.0** (20.0)	–	–	+ 762	– 762	+ 406	– 406	–	–
	304.8 (12.0)	**609.6** (24.0)	**508.0** (20.0)	–	–	–	+ 762	– 762	+ 762	– 762	–	–
	609.6 (24.0)		–	–	+ 762	– 762	–	–	+ 762	– 762	–	–
Double-row (TNA type)	–	**127.0** (5.0)	–	–	–	–	+ 254	0	+ 254	0	–	–
	127.0 (5.0)		–	–	–	–	+ 762	0	+ 762	0	–	–
Four-row	Total dimensional range		–	–	+1 524	–1 524	+1 524	–1 524	+1 524	–1 524	+1 524	–1 524



d : nominal bore diameter
D : nominal outside diameter
T, W : nominal assembled bearing width and
nominal overall width of outer rings (inner rings)

Table 2-6 Tolerances for metric J series tapered roller bearings1)

(1) Bore diameter and width of inner ring and assembled bearing width

Unit : μm

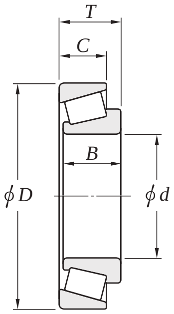
Nominal bore diameter d mm		Deviation of a single bore diameter Δ_{ds}								Deviation of a single inner ring width Δ_{Bs}									Deviation of the actual bearing width Δ_{Ts}								Nominal bore diameter d mm	
		Class PK		Class PN		Class PC		Class PB		Class PK		Class PN		Class PC		Class PB			Class PK		Class PN		Class PC		Class PB			
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower		upper	lower	upper	lower	upper	lower	upper	lower	over	up to
80	**120**	0	–20	0	–20	0	–15	0	–10	0	–150	0	–50	0	–300	0	–300		+200	–200	+100	0	+200	–200	+200	–200	**80**	**120**
120	**180**	0	–25	0	–25	0	–18	0	–13	0	–200	0	–50	0	–300	0	–300		+350	–250	+150	0	+350	–250	+200	–250	**120**	**180**
180	**250**	0	–30	0	–30	0	–22	0	–15	0	–200	0	–50	0	–350	0	–350		+350	–250	+150	0	+350	–250	+200	–300	**180**	**250**
250	**315**	0	–35	0	–35	0	–22	0	–15	0	–200	0	–50	0	–350	0	–350		+350	–250	+200	0	+350	–300	+200	–300	**250**	**315**

(2) Outside diameter and width of outer ring and radial runout of assembled bearing inner ring / outer ring

Unit : μm

Nominal outside diameter D mm		Deviation of a single outside diameter Δ_{Ds}								Deviation of a single outer ring width Δ_{Cs}									Radial runout of inner ring / outer ring K_{ia}, K_{ea}				Nominal outside diameter D mm	
		Class PK		Class PN		Class PC		Class PB		Class PK		Class PN		Class PC		Class PB			Class PK	Class PN	Class PC	Class PB		
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower		max.	max.	max.	max.	over	up to
120	**150**	0	–20	0	–20	0	–15	0	–11	0	–200	0	–100	0	–200	0	–200		40	40	7	4	**120**	**150**
150	**180**	0	–25	0	–25	0	–18	0	–13	0	–200	0	–100	0	–250	0	–250		45	45	8	4	**150**	**180**
180	**250**	0	–30	0	–30	0	–20	0	–15	0	–250	0	–100	0	–250	0	–250		50	50	10	5	**180**	**250**
250	**315**	0	–35	0	–35	0	–25	0	–18	0	–250	0	–100	0	–300	0	–300		60	60	11	5	**250**	**315**
315	**400**	0	–40	0	–40	0	–28	–	–	0	–250	0	–100	0	–300	–	–		70	70	13	–	**315**	**400**

[Note] 1) Bearings with supplementary code "J" attached at the front of bearing number.
Ex. JHM720249/JHM720210, and the like



d : nominal bore diameter
D : nominal outside diameter
B : nominal inner ring width
C : nominal outer ring width
T : nominal assembled bearing width

Table 2-7 Tolerances for thrust ball bearings = JIS B 1514 =

(1) Shaft washer

Unit : μm

Nominal bore diameter d mm		Single plane mean bore diameter deviation Δ_{dmp}		Single plane bore diameter variation V_{dsp}	Washer raceway to back face thickness variation S_i[1]			Deviation of the actual bearing height Δ_{Ts}	
		classes 0, 6, 5		classes 0, 6, 5	class 0	class 6	class 5	classes 0, 6, 5	
over	up to	upper	lower	max.	max.			upper	lower
80	120	0	− 20	15	15	8	4	*0*	*–150*
120	180	0	− 25	19	15	9	5	*0*	*–175*
180	250	0	− 30	23	20	10	5	*0*	*–200*
250	315	0	− 35	26	25	13	7	*0*	*–225*
315	400	0	− 40	30	30	15	7	*0*	*–300*
400	500	0	− 45	34	30	18	9	*0*	*–375*
500	630	0	− 50	38	35	21	11	*0*	*–450*
630	800	0	− 75	55	40	25	13	*0*	*–525*
800	1 000	0	−100	75	45	30	15	*0*	*–600*
1 000	1 250	0	−125	95	50	35	18	*0*	*–675*

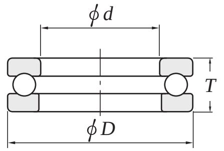
[Note] 1) Applies only to thrust ball bearings with 90° contact angle.
[Remark] Values in Italics are prescribed in JTEKT standards.

(2) Housing washer

Unit : μm

Nominal outside diameter D mm		Single plane mean outside diameter deviation Δ_{Dmp}		Single plane outside diameter variation V_{Dsp}	Washer raceway to back face thickness variation S_e[1) 2)]
		classes 0, 6, 5		classes 0, 6, 5	classes 0, 6, 5
over	up to	upper	lower	max.	max.
80	120	0	− 22	17	Shall conform to the tolerance S_i on d of the same bearing
120	180	0	− 25	19	
180	250	0	− 30	23	
250	315	0	− 35	26	
315	400	0	− 40	30	
400	500	0	− 45	34	
500	630	0	− 50	38	
630	800	0	− 75	55	
800	1 000	0	−100	75	
1 000	1 250	0	−125	95	
1 250	1 600	0	−160	120	

[Notes] 1) These shall be applied to washer with flat back face only.
2) Applies only to thrust ball bearings with 90° contact angle.



d : shaft washer nominal bore diameter
D : housing washer nominal outside diameter
T : nominal bearing height (single direction)

Table 2-8 Accuracies of spherical thrust roller bearings (class 0) = JIS B 1514 =

(1) Shaft washer

Unit : μm

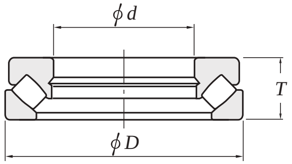
Nominal bore diameter d		Single plane mean bore diameter deviation Δ_{dmp}		Single plane bore diameter variation V_{dsp}	Refer.		
					S_d	Deviation of the actual bearing height Δ_{Ts}	
over	up to	upper	lower	max.	max.	upper	lower
80	120	0	− 20	15	*25*	*+200*	*–200*
120	180	0	− 25	19	*30*	*+250*	*–250*
180	250	0	− 30	23	*30*	*+300*	*–300*
250	315	0	− 35	26	*35*	*+350*	*–350*
315	400	0	− 40	30	*40*	*+400*	*–400*
400	500	0	− 45	34	*45*	*+450*	*–450*
500	630	0	− 50	38	*60*	*+500*	*–500*
630	800	0	− 75	55	*70*	*+550*	*–550*
800	1 000	0	−100	75	*80*	*+600*	*–600*
1 000	1 250	0	−125	95	*100*	*+650*	*–650*

S_d : Perpendicularity of inner ring face with respect to the bore
[Remark] Values in Italics are prescribed in JTEKT standards.

(2) Housing washer

Unit : μm

Nominal outside diameter D, mm		Single plane mean outside diameter deviation Δ_{Dmp}	
over	up to	upper	lower
120	180	0	− 25
180	250	0	− 30
250	315	0	− 35
315	400	0	− 40
400	500	0	− 45
500	630	0	− 50
630	800	0	− 75
800	1 000	0	−100



d : shaft washer nominal bore diameter
D : housing washer nominal outside diameter
T : nominal bearing height

Table 2-9 Permissible values for chamfer dimensions = JIS B 1514 =

(1) Radial bearing (tapered roller bearings excluded)

Unit : mm

$r_{\min}$ or $r_{1\min}$	Nominal bore diameter d mm		$r_{\max}$ or $r_{1\max}$	
	over	up to	Radial direction	Axial direction
0.6	–	40	1	2
	40	–	1.3	2
1	–	50	1.5	3
	50	–	1.9	3
1.1	–	120	2	3.5
	120	–	2.5	4
1.5	–	120	2.3	4
	120	–	3	5
2	–	80	3	4.5
	80	220	3.5	5
	220	–	3.8	6
2.1	–	280	4	6.5
	280	–	4.5	7
2.5	–	100	3.8	6
	100	280	4.5	6
	280	–	5	7
3	–	280	5	8
	280	–	5.5	8
4	–	–	6.5	9
5	–	–	8	10
6	–	–	10	13
7.5	–	–	12.5	17
9.5	–	–	15	19
12	–	–	18	24
15	–	–	21	30
19	–	–	25	38

[Remarks]

1. Value of $r_{\max}$ or $r_{1\max}$ in the axial direction of bearings with nominal width lower than 2 mm shall be the same as the value in radial direction.
2. There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{\min}$ or $r_{1\min}$ which contacts the inner ring side face and bore, or the outer ring side face and outside surface.

(2) Radial bearings with locating snap ring (snap ring groove side) and cylindrical roller bearings (separete thrust collar and loose rib side)

Unit : mm

$r_{1\min}$	Nominal bore dia. or nominal outside dia. d or D		$r_{1\max}$	
	over	up to	Radial direction	Axial direction
0.6	–	40	1	1.5
	40	–	1.3	1.5
1	–	50	1.5	2.2
	50	–	1.9	2.2
1.1	–	120	2	2.7
	120	–	2.5	2.7
1.5	–	120	2.3	3.5
	120	–	3	3.5
2	–	80	3	4
	80	220	3.5	4
	220	–	3.8	4
2.1	–	280	4	4.5
	280	–	4.5	4.5
2.5	–	100	3.8	5
	100	280	4.5	5
	280	–	5	5
3	–	280	5	5.5
	280	–	5.5	5.5
4	–	–	6.5	6.5
5	–	–	8	8
6	–	–	10	10

[Remark] There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{1\min}$ which contacts the inner ring side face and bore, or the outer ring side face and outside surface.

(3) Cylindrical roller bearings (non-rib side) and angular contact ball bearings (front face side)

Unit : mm

$r_{1\min}$	Nominal bore dia. or nominal outside dia. d or D		$r_{1\max}$	
	over	up to	Radial direction	Axial direction
0.6	–	40	1	2
	40	–	1.3	2
1	–	50	1.5	3
	50	–	1.9	3
1.1	–	120	2	3.5
	120	–	2.5	4
1.5	–	120	2.3	4
	120	–	3	5
2	–	80	3	4.5
	80	220	3.5	5
	220	–	3.8	6

[Remark] There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{1\min}$ which contacts the inner ring side face and bore, or the outer ring side face and outside surface.

(4) Metric series tapered roller bearing

Unit : mm

$r_{\min}$ or $r_{1\min}$	Nominal bore dia. or nominal outside dia. d or D, mm		$r_{\max}$ or $r_{1\max}$	
	over	up to	Radial direction	Axial direction
0.6	–	40	1.1	1.7
	40	–	1.3	2
1	–	50	1.6	2.5
	50	–	1.9	3
1.5	–	120	2.3	3
	120	250	2.8	3.5
	250	–	3.5	4
2	–	120	2.8	4
	120	250	3.5	4.5
	250	–	4	5
2.5	–	120	3.5	5
	120	250	4	5.5
	250	–	4.5	6
3	–	120	4	5.5
	120	250	4.5	6.5
	250	400	5	7
	400	–	5.5	7.5
4	–	120	5	7
	120	250	5.5	7.5
	250	400	6	8
	400	–	6.5	8.5
5	–	180	6.5	8
	180	–	7.5	9
6	–	180	7.5	10
	180	–	9	11
7.5	–	–	*12.5*	*17*
9.5	–	–	*15*	*19*

[Note] 1) Inner ring shall be included in division d, and outer ring, in division D.

[Remarks]

1. There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{\min}$ or $r_{1\min}$ which contacts the inner ring back face and bore, or the outer ring back face and outside surface.
2. Values in Italics are provided in JTEKT standards.

(5) Thrust bearing

Unit : mm

$r_{\min}$ or $r_{1\min}$	$r_{\max}$ or $r_{1\max}$
	Radial and axial direction
0.6	1.5
1	2.2
1.1	2.7
1.5	3.5
2	4
2.1	4.5
3	5.5
4	6.5
5	8
6	10
7.5	12.5
9.5	15
12	18
15	21
19	25

[Remark] There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{\min}$ or $r_{1\min}$ which contacts with the shaft washer back face and bore, or the housing washer back face and outside surface.

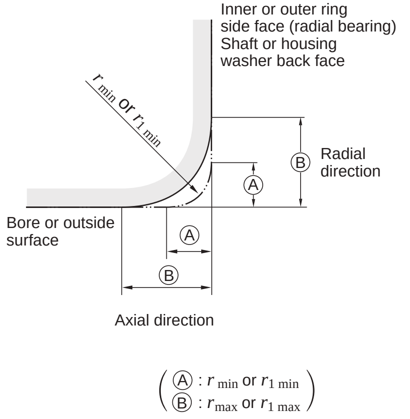
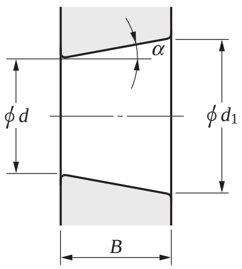
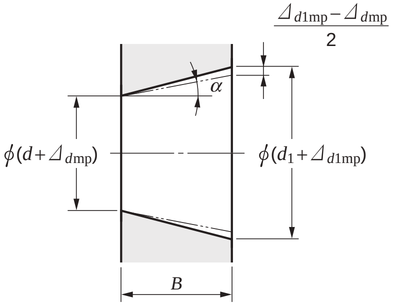


Table 2-10 Tolerances for tapered bores of radial bearings (class 0 ··· JIS B 1514)



Theoretical tapered bore



Tapered bore with single plane mean bore diameter deviation

(1) Basically tapered bore (taper 1:12) Unit : μm

Nominal bore diameter d, mm		Δ_{dmp}		$\Delta_{d1mp} - \Delta_{dmp}$		V_{dsp} 1)
over	up to	upper	lower	upper	lower	max.
30	**50**	+ 39	0	+ 25	0	16
50	**80**	+ 46	0	+ 30	0	19
80	**120**	+ 54	0	+ 35	0	22
120	**180**	+ 63	0	+ 40	0	40
180	**250**	+ 72	0	+ 46	0	46
250	**315**	+ 81	0	+ 52	0	52
315	**400**	+ 89	0	+ 57	0	57
400	**500**	+ 97	0	+ 63	0	63
500	**630**	+110	0	+ 70	0	70
630	**800**	+125	0	+ 80	0	–
800	**1 000**	+140	0	+ 90	0	–
1 000	**1 250**	+165	0	+105	0	–
1 250	**1 600**	+195	0	+125	0	–

(2) Basically tapered bore (taper 1:30) Unit : μm

Nominal bore diameter d, mm		Δ_{dmp}		$\Delta_{d1mp} - \Delta_{dmp}$		V_{dsp} 1)
over	up to	upper	lower	upper	lower	max.
50	**80**	+15	0	+30	0	19
80	**120**	+20	0	+35	0	22
120	**180**	+25	0	+40	0	40
180	**250**	+30	0	+46	0	46
250	**315**	+35	0	+52	0	52
315	**400**	+40	0	+57	0	57
400	**500**	+45	0	+63	0	63
500	**630**	+50	0	+70	0	70

[Note] 1) These shall be applied to all radial planes with tapered bore, not be applied to bearings of diameter series 7, 8.

[Remark] 1) Symbols of quantity d_1 : reference diameter at theoretical large end of tapered bore

$$d_1 = d + \frac{1}{12}B \quad \text{or} \quad d_1 = d + \frac{1}{30}B$$

Δ_{dmp} : single plane mean bore diameter deviation at theoretical small end of tapered bore

Δ_{d1mp} : single plane mean bore diameter deviation at theoretical large end of tapered bore

V_{dsp} : single plane bore diameter variation (a tolerance for the diameter variation given by a maximum value applying in any radial plane of the bore)

B : nominal inner ring width

α : $\frac{1}{2}$ of nominal tapered angle of tapered bore

(tapered ratio 1/12)	(tapered ratio 1/30)
α = 2°23′9.4″	α = 0°57′17.4″
= 2.385 94°	= 0.954 84°
= 0.041 643 rad	= 0.016 665 rad

3. Bearing fits

3-1 Purpose of fit

The purpose of fit is to securely fix the inner or outer ring to the shaft or housing, to preclude detrimental circumferential sliding on the fitting surface.

Such detrimental sliding (referred to as "creep") will cause abnormal heat generation, wear of the fitting surface, infiltration of abrasion metal particles into the bearing, vibration, and many other harmful effects, which cause a deterioration of bearing functions.

Therefore, it is necessary to fix the bearing ring which is rotating under load to the shaft or housing with interference.

3-2 Tolerance and fit for shaft & housing

For metric series bearings, tolerances for the shaft diameter and housing bore diameter are standardized in JIS B 0401 "limits and fits for engineering" (based on ISO 286 ; shown in Appendixes at the back of this catalog).

Bearing fits on the shaft and housing are determined based on the tolerances specified in the above standard.

Fig. 3-1 shows the relationship between tolerances for shaft and housing bore diameters and fits for bearings of class 0 tolerance.

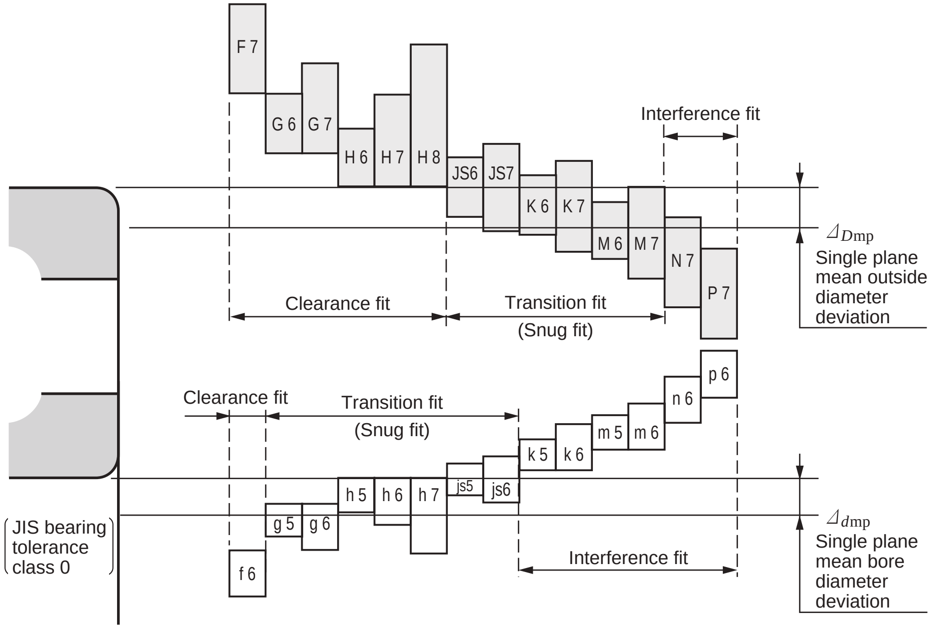


Fig. 3-1 Relationship between tolerances for shaft/housing bore diameters and fits (bearings of class 0 tolerance)

3-3 Fit selection

In selecting the proper fit, careful consideration should be given to bearing operating conditions.

Major specific considerations are :

- Load characteristics and magnitude
- Temperature distribution in operating
- Bearing internal clearance
- Surface finish, material and thickness of shaft and housing
- Mounting and dismounting methods
- Necessity to compensate for shaft thermal expansion at the fitting surface
- Bearing type and size

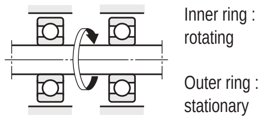
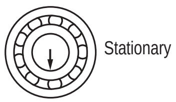
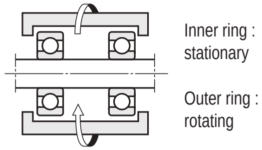
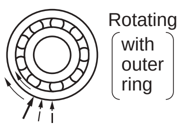
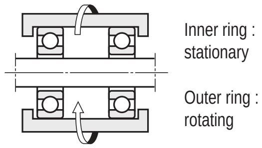
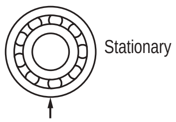
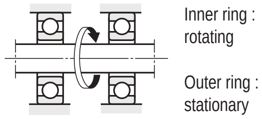
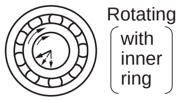
In view of these considerations, the following paragraphs explain the details of the important factors in fit selection.

1) Load characteristics

Load characteristics are classified into three types : rotating inner ring load; rotating outer ring load and indeterminate direction load.

Table 3-1 tabulates the relationship between these characteristics and fit.

Table 3-1 Load characteristics and fits

Rotation pattern	Direction of load	Loading conditions	Fit		Typical application
			Inner ring & shaft	Outer ring & housing	
		Rotating inner ring load Stationary outer ring load	Interference fit necessary (k, m, n, p, r)	Clearance fit acceptable (F, G, H, JS)	Spur gear boxes, motors
					Greatly unbalanced wheels
		Stationary inner ring load Rotating outer ring load	Clearance fit acceptable (f, g, h, js)	Interference fit necessary (K, M, N, P)	Running wheels & pulleys with stationary shaft
					Shaker screens (unbalanced vibration)
Indeterminate	Rotating or stationary	Indeterminate direction load	Interference fit	Interference fit	Cranks

2) Effect of load magnitude

When a radial load is applied, the inner ring will expand slightly. Since this expansion enlarges the circumference of the bore minutely, the initial interference is reduced.

The reduction can be calculated by the following equations :

[In the case of $F_r \leqq 0.25\, C_0$]

$$\Delta_{dF} = 0.08\sqrt{\frac{d}{B}\cdot F_r}\times 10^{-3} \quad \cdots\cdots (3\text{-}1)$$

[In the case of $F_r > 0.25\, C_0$]

$$\Delta_{dF} = 0.02\,\frac{F_r}{B}\times 10^{-3} \quad \cdots\cdots (3\text{-}2)$$

where :

Δ_{dF} : reduction of inner ring interference mm
d : nominal bore diameter of bearing mm
B : nominal inner ring width mm
F_r : radial load N
C_0 : basic static load rating N

Consequently, when the radial load, exceeds the C_0 value by more than 25 %, greater interference is needed.

Much greater interference is needed, when impact loads are expected.

3) Effect of fitting surface roughness

The effective interference obtained after fitting differs from calculated interference due to plastic deformation of the ring fitting surface. When the inner ring is fitted, the effective interference, subject to the effect of the fitting surface finish, can be approximated by the following equations :

[In the case of a ground shaft]

$$\Delta_{deff} \fallingdotseq \frac{d}{d+2}\,\Delta_d \quad \cdots\cdots (3\text{-}3)$$

[In the case of a turned shaft]

$$\Delta_{deff} \fallingdotseq \frac{d}{d+3}\,\Delta_d \quad \cdots\cdots (3\text{-}4)$$

where :

Δ_{deff} : effective interference mm
Δ_d : calculated interference mm
d : nominal bore diameter of bearing mm

4) Effect of temperature

A bearing generally has an operating temperature, higher than the ambient temperature. When the inner ring operates under load, its temperature generally becomes higher than that of the shaft and the effective interference decreases due to the greater thermal expansion of the inner ring.

If the assumed temperature difference between the bearing inside and surrounding housing is Δ_t, the temperature difference at the fitting surfaces of the inner ring and shaft will be approximately (0.10 to 0.15) $\times\, \Delta_t$.

The reduction of interference (Δ_{dt}) due to temperature difference is then expressed as follows :

$$\Delta_{dt} = (0.10 \text{ to } 0.15)\,\Delta_t\cdot\alpha\cdot d$$
$$\fallingdotseq 0.001\,5\,\Delta_t\cdot d\times 10^{-3} \quad \cdots\cdots (3\text{-}5)$$

where :

Δ_{dt} : reduction of interference due to temperature difference mm
Δ_t : temperature difference between the inside of the bearing and the surrounding housing °C
α : linear expansion coefficient of bearing steel ($\fallingdotseq 12.5\times 10^{-6}$) 1/°C
d : nominal bore diameter of bearing mm

Consequently, when a bearing is higher in temperature than the shaft, greater interference is required.

However, a difference in temperature or in the coefficient of expansion may sometimes increase the interference between outer ring and housing. Therefore, when clearance is provided to accommodate shaft thermal expansion, care should be taken.

5) Maximum stress due to fit

When a bearing is fitted with interference, the bearing ring will expand or contract, generating internal stress.

Should this stress be excessive, the bearing ring may fracture.

The maximum bearing fitting-generated stress is determined by the equation in Table 3-2.

In general, to avoid fracture, it is best to adjust the maximum interference to less than 1/1 000 of the shaft diameter, or the maximum stress (σ), determined by the equation in Table 3-2, should be less than 120 MPa.

6) Other considerations

When a high degree of accuracy is required, the tolerance of the shaft and housing must be improved. Since the housing is generally less easy to machine precisely than the shaft, it is advisable to use a clearance fit on the outer ring.

With hollow shafts or thin section housings, greater than normal interference is needed.

With split housings, on the other hand, smaller interference with outer ring is needed.

When the housing is made of aluminum or other light metal alloy, relatively greater than normal interference is needed.

In such a case, consult with JTEKT.

Fits recommended for radial bearings and thrust bearings are shown in Tables 3-3 through 3-6. Fits for rolling mill roll neck bearings are described in section 3-4.

Table 3-2 Maximum fitting-generated stress in bearings

Shaft & inner ring	Housing bore & outer ring
(In the case of hollow shaft) $\sigma = \frac{E}{2} \cdot \frac{\Delta_{\mathrm{deff}}}{d} \cdot \frac{\left(1 - \frac{d_0^2}{d^2}\right)\left(1 + \frac{d^2}{D_i^2}\right)}{\left(1 - \frac{d_0^2}{D_i^2}\right)}$	(In the case of $D_h \neq \infty$) $\sigma = E \cdot \frac{\Delta_{\mathrm{Deff}}}{D} \cdot \frac{\left(1 - \frac{D^2}{D_h^2}\right)}{\left(1 - \frac{D_e^2}{D_h^2}\right)}$
(In the case of solid shaft) $\sigma = \frac{E}{2} \cdot \frac{\Delta_{\mathrm{deff}}}{d} \cdot \left(1 + \frac{d^2}{D_i^2}\right)$	(In the case of $D_h = \infty$) $\sigma = E \cdot \frac{\Delta_{\mathrm{Deff}}}{D}$

where :

σ : maximum stress MPa

d : nominal bore diameter (shaft diameter) mm

D_i : raceway contact diameter of inner ring mm
- ball bearing …… $D_i \fallingdotseq 0.2 \ (D + 4d)$
- roller bearing … $D_i \fallingdotseq 0.25 \ (D + 3d)$

Δ_{deff} : effective interference of inner ring mm

d_0 : bore diameter of hollow shaft mm

D_e : raceway contact diameter of outer ring mm
- ball bearing …… $D_e \fallingdotseq 0.2 \ (4D + d)$
- roller bearing … $D_e \fallingdotseq 0.25 \ (3D + d)$

D : nominal outside diameter (bore diameter of housing) mm

Δ_{Deff} : effective interference of outer ring mm

D_h : outside diameter of housing mm

E : young's modulus 2.08×10^5 MPa

[Remark] The above equations are applicable when the shaft and housing are steel. When other materials are used, JTEKT should be consulted.

Table 3-3 (1) Recommended shaft fits for radial bearings (classes 0, 6X, 6)

Conditions 1)		Ball bearing		Cylindrical roller bearing Tapered roller bearing		Spherical roller bearing		Class of shaft tolerance range	Remarks	Applications (for reference)
		Shaft diameter (mm)								
		over	up to	over	up to	over	up to			
Cylindrical bore bearing (classes 0, 6X, 6)										
Rotating inner ring load or indeterminate direction load	Light load or fluctuating load $\left(\frac{P_r}{C_r} \leqq 0.06\right)$	18	100	–	40	–	–	js 6	For applications requiring high accuracy, js 5,k 5 and m 5 should be used in place of js 6, k 6 and m 6.	Electric appliances, machine tools, pumps, blowers, carriers etc.
		100	200	40	140	–	–	k 6		
		–	–	140	200	–	–	m 6		
	Normal load $\left(0.06 < \frac{P_r}{C_r} \leqq 0.12\right)$	18	100	–	40	–	40	k 5	For single-row tapered roller bearings and angular contact ball bearings, k 5 and m 5 may be replaced by k 6 and m 6, because internal clearance reduction due to fit need not be considered.	Electric motors, turbines, internal combustion engines, woodworking machines etc.
		100	140	40	100	40	65	m 5		
		140	200	100	140	65	100	m 6		
		200	280	140	200	100	140	n 6		
		–	–	200	400	140	280	p 6		
		–	–	–	–	280	500	r 6		
		–	–	–	–	500	–	r 7		
	Heavy load or impact load $\left(\frac{P_r}{C_r} > 0.12\right)$	–	–	50	140	50	100	n 6	Bearings with larger internal clearance than standard are required.	Railway rolling stock axle journals, traction motors
		–	–	140	200	100	140	p 6		
		–	–	200	–	140	500	r 6		
		–	–	–	–	500	–	r 7		
Stationary inner ring load	Inner ring needs to move smoothly on shaft.	All shaft diameters						g 6	For applications requiring high accuracy, g 5 should be used. For large size bearing, f 6 may be used for easier movement.	Stationary shaft wheels
	Inner ring does not need to move smoothly on shaft.	All shaft diameters						h 6	For applications requiring high accuracy, h 5 should be used.	Tension pulleys, rope sheaves etc.
Central axial load only		All shaft diameters						js 6	–	–
Tapered bore bearing (class 0) (with adapter or withdrawal sleeve)										
All loads		All shaft diameters						h 9 / IT 5 2)	For transmission shafts, h 10 / IT 7 2) may be applied.	

[Notes] 1) Light, normal, and heavy loads refer to those with dynamic equivalent radial loads (P_r) of 6 % or lower, over 6 % up to 12 % inclusive, and over 12 % respectively in relation to the basic dynamic radial load rating (C_r) of the bearing concerned.

2) IT 5 and IT 7 mean that shaft roundness tolerance, cylindricity tolerance, and other errors in terms of shape should be within the tolerance range of IT 5 and IT 7, respectively. For numerical values for standard tolerance grades IT 5 and IT 7, refer to supplementary table at end of this catalog.

[Remark] This table is applicable to solid steel shafts.

Table 3-3 (2) Recommended housing fits for radial bearings (classes 0, 6X, 6)

Conditions				Class of housing bore tolerance range	Remarks	Applications (for reference)
Housing	Load type etc.[1]		Outer ring axial displacement[2]			
One-piece or split type	Stationary outer ring load	All load types	Easily displaceable	H 7	G 7 may be applied when a large size bearing is used, or if the temperature difference is large between the outer ring and housing.	Ordinary bearing devices, railway rolling stock axle boxes, power transmission equipment etc.
		Light or normal load		H 8	–	
		High temperature at shaft and inner ring		G 7	F 7 may be applied when a large size bearing is used, or if the temperature difference is large between the outer ring and housing.	Drying cylinders etc.
One-piece type		Light or normal load, requiring high running accuracy	Not displaceable in principle	K 6	Mainly applied to roller bearings.	
			Displaceable	JS 6	Mainly applied to ball bearings.	
		Requiring low-noise rotation	Easily displaceable	H 6	–	
	Indeterminate direction load	Light or normal load	Normally displaceable	JS 7	For applications requiring high accuracy, JS 6 and K 6 should be used in place of JS 7 and K 7.	Electric motors, pumps, crankshaft main bearings etc.
		Normal or heavy load	Not displaceable in principle	K 7		
		High impact load	Not displaceable	M 7	–	Traction motors etc.
	Rotating outer ring load	Light or fluctuating load	Not displaceable	M 7	–	Conveyor rollers, ropeways, tension pulleys etc.
		Normal or heavy load		N 7	Mainly applied to ball bearings.	Wheel hubs with ball bearings etc.
		Thin section housing, heavy or high impact load		P 7	Mainly applied to roller bearings.	Wheel hubs with roller bearings, bearings for large end of connecting rods etc.

[Notes] 1) Loads are classified as stated in Note 1) to Table 3-3 (1).

2) Indicating distinction between applications of non-separable bearings permitting and not permitting axial displacement of the outer rings.

[Remarks] 1. This table is applicable to cast iron or steel housings.

2. If only central axial load is applied to the bearing, select such tolerance range class as to provide clearance in the radial direction for outer ring.

Table 3-4 Recommended shaft and housing fits for inch series tapered roller bearings (classes 4, 2)

(1) Fits for shaft

Load type		Nominal bore diameter d mm **(1/25.4)**		Deviation of a single bore diameter $\varDelta_{ds}$, µm		Dimensional tolerance of shaft diameter µm		Remarks
		over	up to	upper	lower	upper	lower	
Rotating inner ring load	Normal load	**76.2** (3.0)	**304.8** (12.0)	+25	0	+ 64	+ 38	
		304.8 (12.0)	**609.6** (24.0)	+51	0	+127	+ 76	
		609.6 (24.0)	**914.4** (36.0)	+76	0	+190	+114	
	Heavy load Impact load High speed rotation	**76.2** (3.0)	**304.8** (12.0)	+25	0	Should be such that average interference stands at 0.000 5 × d (mm)		Generally, bearing internal clearance should be larger than standard.
		304.8 (12.0)	**609.6** (24.0)	+51	0			
		609.6 (24.0)	**914.4** (36.0)	+76	0			
Rotating outer ring load	Normal load without impact	**76.2** (3.0)	**304.8** (12.0)	+25	0	+ 25	0	
		304.8 (12.0)	**609.6** (24.0)	+51	0	+ 51	0	
		609.6 (24.0)	**914.4** (36.0)	+76	0	+ 76	0	
	Normal load without impact	**76.2** (3.0)	**304.8** (12.0)	+25	0	0	− 25	Inner ring is displaceable in axial direction.
		304.8 (12.0)	**609.6** (24.0)	+51	0	0	− 51	
		609.6 (24.0)	**914.4** (36.0)	+76	0	0	− 76	
	Heavy load Impact load High speed rotation	**76.2** (3.0)	**304.8** (12.0)	+25	0	Should be such that average interference stands at 0.000 5 × d (mm)		Generally, bearing internal clearance should be larger than standard.
		304.8 (12.0)	**609.6** (24.0)	+51	0			
		609.6 (24.0)	**914.4** (36.0)	+76	0			

(2) Fits for housing

Load type		Nominal outside diameter D mm **(1/25.4)**		Deviation of a single outside diameter $\varDelta_{Ds}$, µm		Dimensional tolerance of housing bore diameter µm		Remarks
		over	up to	upper	lower	upper	lower	
Rotating inner ring load	Used for free or fixed side.	**76.2** (3.0)	**127.0** (5.0)	+ 25	0	+ 76	+ 51	Outer ring is easily displaceable in axial direction.
		127.0 (5.0)	**304.8** (12.0)	+ 25	0	+ 76	+ 51	
		304.8 (12.0)	**609.6** (24.0)	+ 51	0	+152	+105	
		609.6 (24.0)	**914.4** (36.0)	+ 76	0	+229	+152	
	Position of outer ring is adjustable (in axial direction).	**76.2** (3.0)	**127.0** (5.0)	+ 25	0	+ 25	0	Outer ring is displaceable in axial direction.
		127.0 (5.0)	**304.8** (12.0)	+ 25	0	+ 51	0	
		304.8 (12.0)	**609.6** (24.0)	+ 51	0	+ 76	+ 25	
		609.6 (24.0)	**914.4** (36.0)	+ 76	0	+127	+ 51	
	Position of outer ring is not adjustable (in axial direction).	**76.2** (3.0)	**127.0** (5.0)	+ 25	0	− 25	− 51	Outer ring is fixed in axial direction.
		127.0 (5.0)	**304.8** (12.0)	+ 25	0	− 25	− 51	
		304.8 (12.0)	**609.6** (24.0)	+ 51	0	− 25	− 76	
		609.6 (24.0)	**914.4** (36.0)	+ 76	0	− 25	−102	
Rotating outer ring load	Position of outer ring is not adjustable (in axial direction).	**76.2** (3.0)	**127.0** (5.0)	+ 25	0	− 25	− 51	Outer ring is fixed in axial direction.
		127.0 (5.0)	**304.8** (12.0)	+ 25	0	− 25	− 51	
		304.8 (12.0)	**609.6** (24.0)	+ 51	0	− 25	− 76	
		609.6 (24.0)	**914.4** (36.0)	+ 76	0	− 25	−102	

Table 3-5 Recommended shaft and housing fits for metric J series tapered roller bearings (classes PK, PN)

(1) Fits for shaft

Load type		Nominal bore diameter *d* mm		Class of shaft tolerance range	Remarks
		over	up to		
Rotating inner ring load	Normal load	10	120	m 6	
		120	500	n 6	
	Heavy load Impact load High speed rotation	10	120	n 6	Generally, bearing internal clearance should be larger than standard.
		120	180	p 6	
		180	250	r 6	
		250	500	r 7	
Rotating outer ring load	Normal load without impact	80	315	h 6 or g 6	
	Heavy load Impact load High speed rotation	10	120	n 6	Generally, bearing internal clearance should be larger than standard.
		120	180	p 6	
		180	250	r 6	
		250	500	r 7	

(2) Fits for housing

Load type		Nominal outside diameter *D* mm		Class of housing bore diameter tolerance range	Remarks
		over	up to		
Rotating inner ring load	Used for free or fixed side	18	315	G 7	Outer ring is easily displaceable in axial direction.
		315	400	F 6	
	Position of outer ring is adjustable (in axial direction)	18	400	J 7	Outer ring is displaceable in axial direction.
	Position of outer ring is not adjustable (in axial direction)	18	400	P 7	Outer ring is fixed in axial direction.
Rotating outer ring load	Position of outer ring is not adjustable (in axial direction)	18	120	R 7	Outer ring is fixed in axial direction.
		120	180		
		180	400		

Table 3-6 Recommended shaft and housing fits for thrust bearings (classes 0, 6)

(1) Fits for shaft

Load type		Shaft diameter, mm		Class of shaft tolerance range	Remarks
		over	up to		
Central axial load (generally for thrust bearings)		All shaft diameters		js 6	h 6 may also be used.
Combined load (spherical thrust roller bearing)	Stationary shaft washer load	All shaft diameters		js 6	–
	Rotating shaft washer load or indeterminate direction load	–	200	k 6	js 6, k 6 and m 6 may be used in place of k 6, m 6 and n 6, respectively.
		200	400	m 6	
		400	–	n 6	

(2) Fits for housing

Load type		Class of housing bore diameter tolerance range	Remarks
Central axial load (generally for thrust bearings)		–	Select such tolerance range class as provides clearance in the radial direction for housing washer.
		H 8	In case of thrust ball bearings requiring high accuracy.
Combined load (spherical thrust roller bearing)	Stationary housing washer load	H 7	–
	Indeterminate direction load or rotating housing washer load	K 7	In case of application under normal operating conditions.
		M 7	In case of comparably large radial load.

[Remark] This table is applicable to cast iron or steel housings.

3-4 Recommended fits for rolling mill roll neck bearing

A rolling mill roll neck bearing is subject to inner ring rotating load. Its inner ring always receives a load on its entire circumference, and a load is applied to the outer ring at only one location.

Thus, interference fit is required for the inner ring to prevent any creep, and clearance fit should be used for the outer ring, in principle. For easy attachment, clearance fit has been used for roll neck bearings (because recombination and replacement must be frequently done for roll grinding).

However, with more increase in rolling speed and rolling load, interference fit has been more commonly used to prevent danger of creep to be generated when clearance fit is used and improve in accuracy of products.

Clearance fit is used for the inner rings of deep groove ball bearings and angular ball bearings used as bearings receiving axial load. Between the outer ring and the chock, adequate clearance should be provided in order to prevent any radial load applied to the outer ring.

Tables 3-7 through 3-10 show the recommended fits for roll neck bearings.

When machining a roll neck or chock, its roundness must not exceed 50 % of the allowable tolerances shown in Tables 3-7 through 3-10. If its roundness is poor, fretting corrosion may frequently occur.

Table 3-7 Recommended fits for roll neck metric series four-row tapered roller bearing

Double cone and roll neck (shaft)						Cup and chock (housing)					
Nominal bore diameter *d*, mm		**Single plane mean bore diameter deviation** Δ_{dmp} μm		**Roll neck diameter deviation** μm		**Nominal outside diameter** *D*, mm		**Single plane mean outside diameter deviation** Δ_{Dmp} μm		**Chock bore diameter deviation** μm	
over	up to	upper	lower	upper	lower	over	up to	upper	lower	upper	lower
80	**120**	0	− 20	−120	−150	**120**	**150**	0	− 20	+ 57	+ 25
120	**180**	0	− 25	−150	−175	**150**	**180**	0	− 25	+100	+ 50
180	**250**	0	− 30	−175	−200	**180**	**250**	0	− 30	+120	+ 50
250	**315**	0	− 35	−210	−250	**250**	**315**	0	− 35	+115	+ 50
315	**400**	0	− 40	−240	−300	**315**	**400**	0	− 40	+110	+ 50
400	**500**	0	− 45	−245	−300	**400**	**500**	0	− 45	+105	+ 50
500	**630**	0	− 50	−250	−300	**500**	**630**	0	− 50	+100	+ 50
630	**800**	0	− 75	−325	−400	**630**	**800**	0	− 75	+150	+ 75
800	**1 000**	0	−100	−350	−425	**800**	**1 000**	0	−100	+150	+ 75
1 000	**1 250**	0	−125	−425	−500	**1 000**	**1 250**	0	−125	+175	+100
1 250	**1 600**	0	−160	−510	−600	**1 250**	**1 600**	0	−160	+215	+125
						1 600	**2 000**	0	−200	+250	+150

Table 3-8 Recommended fits for roll neck inch series four-row tapered roller bearing

Double cone and roll neck (shaft)						Cup and chock (housing)					
Nominal bore diameter *d* mm **(1/25.4)**		**Single bore diameter deviation** Δ_{ds} μm		**Roll neck diameter deviation** μm		**Nominal outside diameter** *D* mm **(1/25.4)**		**Single outside diameter deviation** Δ_{Ds} μm		**Chock bore diameter deviation** μm	
over	up to	upper	lower	upper	lower	over	up to	upper	lower	upper	lower
76.2 (3.0)	**101.6** (4.0)	+ 25	0	− 75	−100	–	**304.8** (12.0)	+ 25	0	+ 75	+ 50
101.6 (4.0)	**127.0** (5.0)	+ 25	0	−100	−125	**304.8** (12.0)	**609.6** (24.0)	+ 51	0	+150	+100
127.0 (5.0)	**152.4** (6.0)	+ 25	0	−125	−150	**609.6** (24.0)	**914.4** (36.0)	+ 76	0	+225	+150
152.4 (6.0)	**203.2** (8.0)	+ 25	0	−150	−175	**914.4** (36.0)	**1 219.2** (48.0)	+102	0	+300	+200
203.2 (8.0)	**304.8** (12.0)	+ 25	0	−175	−200	**1 219.2** (48.0)	**1 524.0** (60.0)	+127	0	+375	+250
304.8 (12.0)	**609.6** (24.0)	+ 51	0	−200	−250	**1 524.0** (60.0)		+127	0	+450	+300
609.6 (24.0)	**914.4** (36.0)	+ 76	0	−250	−325						
914.4 (36.0)	**1 219.2** (48.0)	+102	0	−300	−400						
1 219.2 (48.0)		+127	0	−375	−475						

Table 3-9 Recommended fits for roll neck four-row cylindrical roller bearing (inner ring interference fit)

Inner ring and roll neck (shaft)						Outer ring and chock (housing)					
Nominal bore diameter d, mm		Single plane mean bore diameter deviation Δ_{dmp} μm		Roll neck diameter deviation μm		Nominal outside diameter D, mm		Single plane mean outside diameter deviation Δ_{Dmp} μm		Chock bore diameter deviation μm	
over	up to	upper	lower	upper	lower	over	up to	upper	lower	upper	lower
80	**120**	0	− 20	+ 59	+ 37 (p6)	**120**	**150**	0	− 18	+ 40	0 (H7)
120	**180**	0	− 25	+ 68	+ 43 (p6)	**150**	**180**	0	− 25	+ 40	0 (H7)
180	**250**	0	− 30	+ 79	+ 50 (p6)	**180**	**250**	0	− 30	+ 46	0 (H7)
250	**280**	0	− 35	+126	+ 94 (r6)	**250**	**315**	0	− 35	+ 52	0 (H7)
280	**315**	0	− 35	+130	+ 98 (r6)						
315	**355**	0	− 40	+144	+108 (r6)	**315**	**400**	0	− 40	+ 75	+ 18 (G7)
355	**400**	0	− 40	+150	+114 (r6)						
400	**450**	0	− 45	+166	+126 (r6)	**400**	**500**	0	− 45	+ 83	+ 20 (G7)
450	**500**	0	− 45	+172	+132 (r6)						
500	**560**	0	− 50	+194	+150 (r6)	**500**	**630**	0	− 50	+ 92	+ 22 (G7)
560	**630**	0	− 50	+354	+310 (s6)						
630	**710**	0	− 75	+390	+340 (s6)	**630**	**800**	0	− 75	+160	+ 80 (F7)
710	**800**	0	− 75	+430	+380 (s6)						
800	**900**	0	−100	+486	+430 (s6)	**800**	**1 000**	0	−100	+176	+ 86 (F7)
900	**1 000**	0	−100	+526	+470 (s6)						
1 000	**1 120**	0	−125	+588	+520 (s6)	**1 000**	**1 250**	0	−125	+203	+ 98 (F7)
1 120	**1 250**	0	−125	+646	+580 (s6)						
						1 250	**1 400**	0	−160	+235	+110 (F7)
						1 400	**1 600**	0	−160	+345	+220 (E7)

[Note] The table above shows general values. JTEKT determines recommended fit on a case by case basis according to bearing materials and operating conditions to prevent the inner ring from creeping.
Consult with JTEKT when referring to this table.

Table 3-10 Recommended fits of bearing types for support of axial loading

Bearing type	Inner ring and roll neck (shaft)	Outer ring and chock (housing)	
		Mounted to chock	Mounted to sleeve
	Shaft tolerance range class	Chock bore tolerance range class	Sleeve bore tolerance range class
Deep groove ball bearing	e6 or f6	Nominal chock bore (mm) = Outer ring outer dia. + [0.5 to 1.0] H8	G7
Angular ball bearing			
Double row tapered roller bearing (bearings for support of axial loading) ··· TDIS type			
Thrust tapered roller bearing		G7	
Spherical thrust roller bearing			

[Remark] When installing a sleeve, clearance of 0.5 mm or more should be provided between the outer diameter of the sleeve and the bore of the chock.

4. Internal clearance

Bearing internal clearance is defined as the total distance either inner or outer ring can be moved when the other ring is fixed.

If movement is in the radial direction, it is called **radial internal clearance**; if in the axial direction, **axial internal clearance**. (Fig. 4-1)

Bearing performance depends greatly upon internal clearance during operation (also referred to as operating clearance); inappropriate clearance results in short rolling fatigue life and generation of heat, noise or vibration.

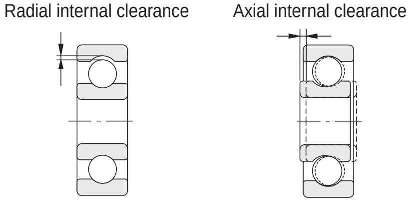


Fig. 4-1 Bearing internal clearance

[Refer.] Relation to radial intearnal clearance and axial internal clearance

(1) Deep groove ball bearing

$$\Delta_a = \sqrt{\Delta_r (4m_o - \Delta_r)} \quad \cdots\cdots (4\text{-}1)$$

(2) Double-row angular contact ball bearing

$$\Delta_a = 2\sqrt{m_o^2 - \left(m_o\cos\alpha - \frac{\Delta_r}{2}\right)^2} - 2m_o\sin\alpha \quad \cdots\cdots (4\text{-}2)$$

(3) Matched pair angular contact ball bearing

$$\Delta_a = 2m_o\sin\alpha - 2\sqrt{m_o^2 - \left(m_o\cos\alpha + \frac{\Delta_r}{2}\right)^2} \quad \cdots\cdots (4\text{-}3)$$

(4) Double/four-row and matched pair taperd roller bearing

$$\Delta_a = \Delta_r \cot\alpha \fallingdotseq \frac{1.5}{e}\Delta_r \quad \cdots\cdots (4\text{-}4)$$

where :

Δ_a : Axial internal clearance mm
Δ_r : Radial internal clearance mm
α : Nominal contact angle deg.
e : Limited value of F_a/F_r (shown in the bearing specification table)
m_o : $r_e + r_i - D_w$ mm
r_e : Outer ring raceway groove radius mm
r_i : Inner ring raceway groove radius mm
D_w : Ball diameter mm

The term **residual clearance** is defined as the original clearance decreased owing to expansion or contraction of a raceway due to fitting, when the bearing is mounted in the shaft and housing.

The term **effective clearance** is defined as the residual clearance decreased owing to dimensional change arising from temperature differentials within the bearing.

The term **operating clearance** is defined as the internal clearance present while a bearing mounted in a machine is rotating under a certain load, or, the effective clearance increased due to elastic deformation arising from bearing loads.

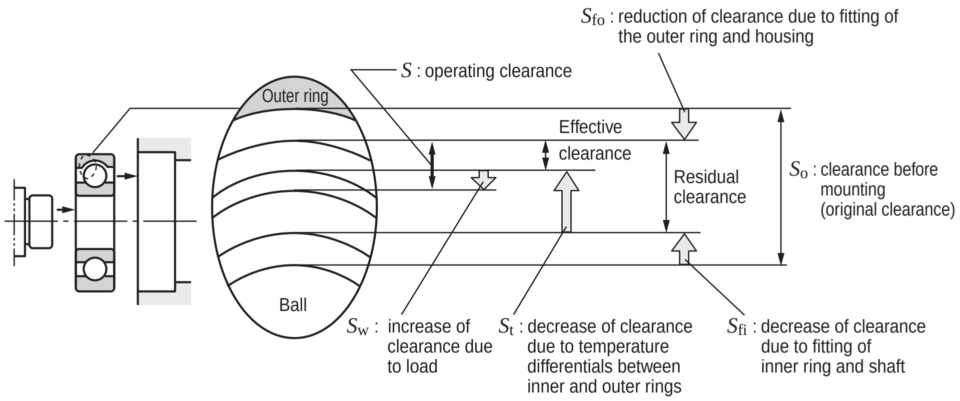
Operating clearance gives great influences on the performance and service life of bearings. Thus, it is recommended to select the operating clearance of a ball bearing so that the operating clearance is slightly positive, while the lower limited value of the operating clearance range of a roller bearing is slightly positive.

It is important to take specific operating conditions into consideration and select a clearance suitable for the conditions.

For example, when high rigidity is required, or when the noise must be minimized, the operating clearance must be reduced. On the other hand, when high operating temperature is expected, the operating clearance must be increased.

Table 4-1 shows how to determine the operating clearance in the case of shaft and housing made of steel. The standard values of bearing internal clearance before mounting are shown in Tables 4-2 through 4-6.

Table 4-1 How to determine operating clearance



Operating clearance (S)	$S = S_o - (S_f + S_{t1} + S_{t2}) + S_w{}^*$	* S_w (increase of clearance due to load) is generally small, and thus may be ignored, although there is a equation for determining the value.
Decrease of clearance due to fitting (S_f)	(In the case of hollow shaft) $S_{fi} = \Delta_{deff}\,\dfrac{d}{D_i}\cdot\dfrac{\left(1-\dfrac{d_0^2}{d^2}\right)}{\left(1-\dfrac{d_0^2}{D_i^2}\right)}$ (In the case of solid shaft) $S_{fi} = \Delta_{deff}\,\dfrac{d}{D_i}$	(In the case of $D_h \neq \infty$) $S_{fo} = \Delta_{Deff}\,\dfrac{D_e}{D}\cdot\dfrac{\left(1-\dfrac{D^2}{D_h^2}\right)}{\left(1-\dfrac{D_e^2}{D_h^2}\right)}$ (In the case of $D_h = \infty$) $S_{fo} = \Delta_{Deff}\,\dfrac{D_e}{D}$
Decrease of clearance due to temperature differentials between inner and outer rings (S_{t1})	The amount of decrease varies depending on the state of housing; however, generally the amount can be approximated by the following equation on the assumption that the outer ring will not expand : $S_{t1} = \alpha\,(D_i \cdot t_i - D_e \cdot t_e)$	where : $D_e = D_i + 2D_w$ Consequently, $S_{t1} + S_{t2}$ will be determined by the following equation : $S_{t1} + S_{t2} = \alpha \cdot D_i \cdot t_1 + 2\alpha \cdot D_w \cdot t_2$ Temperature differential between the inner and outer rings, t_1, can be expressed as follows : $t_1 = t_i - t_e$ Temperature differential between the rolling element and outer ring, t_2, can be expressed as follows : $t_2 = t_w - t_e$
Decrease of clearance due to temperature rise of rolling element (S_{t2})	$S_{t2} = 2\alpha \cdot D_w \cdot t_w$	

In Table 4-1,

S : operating clearance mm
S_o : clearance before mounting mm
S_f : decrease of clearance due to fitting mm
S_{fi} : expansion of inner ring raceway contact diameter mm
S_{fo} : contraction of outer ring raceway contact diameter mm
S_{t1} : decrease of clearance due to temperature differentials between inner and outer rings mm
S_{t2} : decrease of clearance due to temperature rise of the rolling elements mm
S_w : increase of clearance due to load mm
Δ_{deff} : effective interference of inner ring mm
d : nominal bore diameter (shaft diameter) mm
d_0 : bore diameter of hollow shaft mm
D_i : inner ring raceway contact diameter mm
ball bearing ······ $D_i \fallingdotseq 0.2\ (D + 4\,d)$
roller bearing ··· $D_i \fallingdotseq 0.25\ (D + 3\,d)$

Δ_{Deff} : effective interference of outer ring mm
D_h : outside diameter of housing mm
D_e : outer ring raceway contact diameter mm
ball bearing ······ $D_e \fallingdotseq 0.2\ (4D + d)$
roller bearing ··· $D_e \fallingdotseq 0.25\ (3D + d)$
D : nominal outside diameter mm
α : linear expansion coefficient of bearing steel (12.5×10^{-6}) 1/°C
D_w : average diameter of rolling elements mm
ball bearing ······ $D_w \fallingdotseq 0.3\ (D - d)$
roller bearing ··· $D_w \fallingdotseq 0.25\ (D - d)$
t_i : temperature rise of the inner ring °C
t_e : temperature rise of the outer ring °C
t_w : temperature rise of rolling elements °C

■Bearings are sometimes used with a non-steel shaft or housing.
In the automotive industry, a statistical method is often incorporated for selection of clearance.
In these cases, or when other special operating conditions are involved, JTEKT should be consulted.

Table 4-2 Radial internal clearance of deep groove ball bearings (cylindrical bore)

Unit : μm

Nominal bore diameter *d*, mm		Clearance									
		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
80	**100**	1	18	12	36	30	58	53	84	75	120
100	**120**	2	20	15	41	36	66	61	97	90	140
120	**140**	2	23	18	48	41	81	71	114	105	160
140	**160**	2	23	18	53	46	91	81	130	120	180
160	**180**	2	25	20	61	53	102	91	147	135	200
180	**200**	2	30	25	71	63	117	107	163	150	230
200	**225**	2	35	25	85	75	140	125	195	175	265
225	**250**	2	40	30	95	85	160	145	225	205	300
250	**280**	2	45	35	105	90	170	155	245	225	340
280	**315**	2	55	40	115	100	190	175	270	245	370
315	**355**	3	60	45	125	110	210	195	300	275	410
355	**400**	3	70	55	145	130	240	225	340	315	460
400	**450**	3	80	60	170	150	270	250	380	350	510
450	**500**	3	90	70	190	170	300	280	420	390	570
500	**560**	10	100	80	210	190	330	310	470	440	630
560	**630**	10	110	90	230	210	360	340	520	490	690
630	**710**	20	130	110	260	240	400	380	570	540	760
710	**800**	20	140	120	290	270	450	430	630	600	840
800	**900**	20	160	140	320	300	500	480	700	670	940
900	**1 000**	20	170	150	350	330	550	530	770	740	1 040
1 000	**1 120**	20	180	160	380	360	600	580	850	820	1 150
1 120	**1 250**	20	190	170	410	390	650	630	920	890	1 260
1 250	**1 400**	–	–	*180*	*440*	*420*	*700*	*680*	*1 000*	–	–

[Remark] Values in Italics are prescribed in JTEKT standards.

Table 4-3 (1) Axial internal clearance of matched pair angular contact ball bearings (measurement clearance)[1]

Unit : μm

Nominal bore diameter *d*, mm		Contact angle : 15°				Contact angle : 30°							
		C 2		C N		C 2		C N		C 3		C 4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
80	**100**	35	60	85	110	10	30	50	75	80	105	130	155
100	**120**	40	65	100	125	12	37	65	90	100	125	150	175
120	**140**	45	75	110	140	15	40	75	105	120	150	180	210
140	**160**	45	75	125	155	15	40	80	110	130	160	210	240
160	**180**	50	80	140	170	15	45	95	125	140	170	235	265
180	**200**	50	80	160	190	20	50	110	140	170	200	275	305

[Note] 1) Including increase of clearance caused by measurement load.

Table 4-3 (2) Axial internal clearance of matched pair angular contact ball bearings (measurement clearance)[1]

Unit : μm

Nominal bore diameter *d*, mm		Contact angle : 40°							
		C 2		C N		C 3		C 4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.
80	**100**	6	20	20	45	55	80	85	110
100	**120**	6	25	25	50	60	85	100	125
120	**140**	7	30	30	60	75	105	125	155
140	**160**	7	30	35	65	85	115	140	170
160	**180**	7	31	45	75	100	130	155	185
180	**200**	7	37	60	90	110	140	170	200

[Note] 1) Including increase of clearance caused by measurement load.

Table 4-4 Radial internal clearance of cylindrical roller bearings

(1) Cylindrical bore bearings

Unit : μm

Nominal bore diameter *d*, mm		Clearance									
		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
40	**50**	5	35	30	60	50	80	70	100	95	125
50	**65**	10	40	40	70	60	90	80	110	110	140
65	**80**	10	45	40	75	65	100	90	125	130	165
80	**100**	15	50	50	85	75	110	105	140	155	190
100	**120**	15	55	50	90	85	125	125	165	180	220
120	**140**	15	60	60	105	100	145	145	190	200	245
140	**160**	20	70	70	120	115	165	165	215	225	275
160	**180**	25	75	75	125	120	170	170	220	250	300
180	**200**	35	90	90	145	140	195	195	250	275	330
200	**225**	45	105	105	165	160	220	220	280	305	365
225	**250**	45	110	110	175	170	235	235	300	330	395
250	**280**	55	125	125	195	190	260	260	330	370	440
280	**315**	55	130	130	205	200	275	275	350	410	485
315	**355**	65	145	145	225	225	305	305	385	455	535
355	**400**	100	190	190	280	280	370	370	460	510	600
400	**450**	110	210	210	310	310	410	410	510	565	665
450	**500**	110	220	220	330	330	440	440	550	625	735
500	**560**	110	225	220	330	335	470	440	575	–	–
560	**630**	110	245	220	360	375	520	490	635	–	–
630	**710**	115	275	245	405	420	580	550	710	–	–
710	**800**	130	305	275	450	470	675	615	790	–	–
800	**900**	140	340	300	500	520	720	680	880	–	–
900	**1 000**	160	380	340	560	580	800	760	980	–	–

Table 4-4 Radial internal clearance of cylindrical roller bearings

(2) Tapered bore bearings

Unit : μm

Nominal bore diameter *d*, mm		Non-interchangeable clearance													
		C 9 NA1)		C 1 NA		C 2 NA		C N NA		C 3 NA		C 4 NA		C 5 NA	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
80	**100**	10	25	25	45	45	70	80	105	105	125	125	150	180	205
100	**120**	10	25	25	50	50	80	95	120	120	145	145	170	205	230
120	**140**	15	30	30	60	60	90	105	135	135	160	160	190	230	260
140	**160**	15	35	35	65	65	100	115	150	150	180	180	215	260	295
160	**180**	15	35	35	75	75	110	125	165	165	200	200	240	285	320
180	**200**	20	40	40	80	80	120	140	180	180	220	220	260	315	355
200	**225**	20	45	45	90	90	135	155	200	200	240	240	285	350	395
225	**250**	25	50	50	100	100	150	170	215	215	265	265	315	380	430
250	**280**	25	55	55	110	110	165	185	240	240	295	295	350	420	475
280	**315**	30	60	60	120	120	180	205	265	265	325	325	385	470	530
315	**355**	30	65	65	135	135	200	225	295	295	360	360	430	520	585
355	**400**	35	75	75	150	150	225	255	330	330	405	405	480	585	660
400	**450**	45	85	85	170	170	255	285	370	370	455	455	540	650	735
450	**500**	50	95	95	190	190	285	315	410	410	505	505	600	720	815
500	**560**	–	–	105	210	210	315	350	455	455	560	560	665	–	–
560	**630**	–	–	115	230	230	345	390	505	505	620	620	735	–	–
630	**710**	–	–	130	260	260	390	435	565	565	695	695	825	–	–
710	**800**	–	–	145	290	290	435	485	630	630	775	775	920	–	–
800	**900**	–	–	160	320	320	480	540	700	700	860	860	1 020	–	–
900	**1 000**	–	–	180	360	360	540	600	780	780	960	960	1 140	–	–

[Note] 1) Clearance C9NA should be applied to tapered cylindrical roller bearings of JIS tolerance classes 5 and 4.

Table 4-5 Radial internal clearance of double / four-row and matched pair tapered roller bearings

(1) Cylindrical bore bearings

Unit : μm

Nominal bore diameter *d*, mm		Clearance									
		C 1		C 2		C N		C 3		C 4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
80	**100**	0	20	20	45	45	70	70	100	100	130
100	**120**	0	25	25	50	50	80	80	110	110	150
120	**140**	0	30	30	60	60	90	90	120	120	170
140	**160**	0	30	30	65	65	100	100	140	140	190
160	**180**	0	35	35	70	70	110	110	150	150	210
180	**200**	0	40	40	80	80	120	120	170	170	230
200	**225**	0	40	40	90	90	140	140	190	190	260
225	**250**	0	50	50	100	100	150	150	210	210	290
250	**280**	0	50	50	110	110	170	170	230	230	320
280	**315**	0	60	60	120	120	180	180	250	250	350
315	**355**	0	70	70	140	140	210	210	280	280	390
355	**400**	0	70	70	150	150	230	230	310	310	440
400	**450**	0	80	80	170	170	260	260	350	350	490
450	**500**	0	90	90	190	190	290	290	390	390	540
500	**560**	0	100	100	210	210	320	320	430	430	590
560	**630**	0	110	110	230	230	350	350	480	480	660
630	**710**	0	130	130	260	260	400	400	540	540	740
710	**800**	0	140	140	290	290	450	450	610	610	830
800	**900**	0	160	160	330	330	500	500	670	670	920
900	**1 000**	0	180	180	370	370	550	550	730	730	990
1 000	**1 250**	0	200	200	420	420	610	610	790	790	1 050
1 250	**1 600**	0	220	220	460	460	650	650	850	850	1 100
1 600	**2 000**	0	240	240	480	480	680	680	900	900	1 150

(2) Tapered bore bearings

Unit : μm

Nominal bore diameter *d*, mm		Clearance									
		C 1		C 2		C N		C 3		C 4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
80	**100**	20	45	45	70	70	100	100	130	130	170
100	**120**	25	50	50	80	80	110	110	150	150	200
120	**140**	30	60	60	90	90	120	120	170	170	230
140	**160**	30	65	65	100	100	140	140	190	190	260
160	**180**	35	70	70	110	110	150	150	210	210	280
180	**200**	40	80	80	120	120	170	170	230	230	310
200	**225**	40	90	90	140	140	190	190	260	260	340
225	**250**	50	100	100	150	150	210	210	290	290	380
250	**280**	50	110	110	170	170	230	230	320	320	420
280	**315**	60	120	120	180	180	250	250	350	350	460
315	**355**	70	140	140	210	210	280	280	390	390	510
355	**400**	70	150	150	230	230	310	310	440	440	580
400	**450**	80	170	170	260	260	350	350	490	490	650
450	**500**	90	190	190	290	290	390	390	540	540	720
500	**560**	100	210	210	320	320	430	430	590	590	790
560	**630**	110	230	230	350	350	480	480	660	660	880
630	**710**	130	260	260	400	400	540	540	740	740	990
710	**800**	140	290	290	450	450	610	610	830	830	1 100
800	**900**	160	330	330	500	500	670	670	920	920	1 240

Table 4-6 Radial internal clearance of spherical roller bearings

(1) Cylindrical bore bearings

Unit : μm

Nominal bore diameter *d*, mm		Clearance									
		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
80	**100**	35	60	60	100	100	135	135	180	180	225
100	**120**	40	75	75	120	120	160	160	210	210	260
120	**140**	50	95	95	145	145	190	190	240	240	300
140	**160**	60	110	110	170	170	220	220	280	280	350
160	**180**	65	120	120	180	180	240	240	310	310	390
180	**200**	70	130	130	200	200	260	260	340	340	430
200	**225**	80	140	140	220	220	290	290	380	380	470
225	**250**	90	150	150	240	240	320	320	420	420	520
250	**280**	100	170	170	260	260	350	350	460	460	570
280	**315**	110	190	190	280	280	370	370	500	500	630
315	**355**	120	200	200	310	310	410	410	550	550	690
355	**400**	130	220	220	340	340	450	450	600	600	750
400	**450**	140	240	240	370	370	500	500	660	660	820
450	**500**	140	260	260	410	410	550	550	720	720	900
500	**560**	150	280	280	440	440	600	600	780	780	1 000
560	**630**	170	310	310	480	480	650	650	850	850	1 100
630	**710**	190	350	350	530	530	700	700	920	920	1 190
710	**800**	210	390	390	580	580	770	770	1 010	1 010	1 300
800	**900**	230	430	430	650	650	860	860	1 120	1 120	1 440
900	**1 000**	260	480	480	710	710	930	930	1 220	1 220	1 570
1 000	**1 120**	290	530	530	780	780	1 020	1 020	1 330	1 330	1 720
1 120	**1 250**	320	580	580	860	860	1 120	1 120	1 460	1 460	1 870
1 250	**1 400**	350	640	640	950	950	1 240	1 240	1 620	1 620	2 060
1 400	**1 600**	400	720	720	1 060	1 060	1 380	1 380	1 800	1 800	2 300
1 600	**1 800**	450	810	810	1 180	1 180	1 550	1 550	2 000	2 000	2 550

(2) Tapered bore bearings

Unit : μm

Nominal bore diameter *d*, mm		Clearance									
		C 2		C N		C 3		C 4		C 5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
80	**100**	55	80	80	110	110	140	140	180	180	230
100	**120**	65	100	100	135	135	170	170	220	220	280
120	**140**	80	120	120	160	160	200	200	260	260	330
140	**160**	90	130	130	180	180	230	230	300	300	380
160	**180**	100	140	140	200	200	260	260	340	340	430
180	**200**	110	160	160	220	220	290	290	370	370	470
200	**225**	120	180	180	250	250	320	320	410	410	520
225	**250**	140	200	200	270	270	350	350	450	450	570
250	**280**	150	220	220	300	300	390	390	490	490	620
280	**315**	170	240	240	330	330	430	430	540	540	680
315	**355**	190	270	270	360	360	470	470	590	590	740
355	**400**	210	300	300	400	400	520	520	650	650	820
400	**450**	230	330	330	440	440	570	570	720	720	910
450	**500**	260	370	370	490	490	630	630	790	790	1 000
500	**560**	290	410	410	540	540	680	680	870	870	1 100
560	**630**	320	460	460	600	600	760	760	980	980	1 230
630	**710**	350	510	510	670	670	850	850	1 090	1 090	1 360
710	**800**	390	570	570	750	750	960	960	1 220	1 220	1 500
800	**900**	440	640	640	840	840	1 070	1 070	1 370	1 370	1 690
900	**1 000**	490	710	710	930	930	1 190	1 190	1 520	1 520	1 860
1 000	**1 120**	530	770	770	1 030	1 030	1 300	1 300	1 670	1 670	2 050
1 120	**1 250**	570	830	830	1 120	1 120	1 420	1 420	1 830	1 830	2 250
1 250	**1 400**	620	910	910	1 230	1 230	1 560	1 560	2 000	2 000	2 450
1 400	**1 600**	680	1 000	1 000	1 350	1 350	1 720	1 720	2 200	2 200	2 700
1 600	**1 800**	750	1 110	1 110	1 500	1 500	1 920	1 920	2 400	2 400	2 950

5. Lubrication

Lubrication is one of the most important factors determining bearing performance. The suitability of the lubricant and lubrication method have a dominant influence on bearing life.

Functions of lubrication :

- To lubricate each part of the bearing, and to reduce friction and wear
- To carry away heat generated inside bearing due to friction and other causes
- To cover rolling contact surface with the proper oil film in order to prolong bearing fatigue life
- To prevent corrosion and contamination by dirt

Bearing lubrication is classified broadly into two categories: grease lubrication and oil lubrication. Table 5-1 makes a general comparison between the two.

Table 5-1 Comparison between grease and oil lubrication

Item	Grease	Oil
· Sealing device	Easy	Slightly complicated and special care required for maintenance
· Lubricating ability	Good	Excellent
· Rotation speed	Low/medium speed	Applicable at high speed as well
· Replacement of lubricant	Slightly troublesome	Easy
· Life of lubricant	Relatively short	Long
· Cooling effect	No cooling effect	Good (circulation is necessary)
· Filtration of dirt	Difficult	Easy

5-1 Grease lubrication

Grease lubrication is widely applied since there is no need for replenishment over a long period once grease is filled, and a relatively simple structure can suffice for the lubricant sealing device.

There are two methods of grease lubrication. One is the closed lubrication method, in which grease is filled in advance into shielded/sealed bearing; the other is the feeding method, in which the bearing and housing are filled with grease in proper quantities at first, and refilled at a regular interval via replenishment or replacement.

Devices with numerous grease inlets sometimes employ the centralized lubricating method, in which the inlets are connected via piping and supplied with grease collectively.

1) Amount of grease

In general, grease should fill approximately one-third to one-half the inside space, though this varies according to structure and inside space of housing.

It must be borne in mind that excessive grease will generate heat when churned, and will consequently alter, deteriorate, or soften.

When the bearing is operated at low speed, however, the inside space is sometimes filled with grease to two-thirds to full, in order to preclude infiltration of contaminants.

2) Replenishment/replacement of grease

The method of replenishing/replacing grease depends largely on the lubrication method. Whichever method may be utilized, care should be taken to use clean grease and to keep dirt or other foreign matter out of the housing.

In addition, it is desirable to refill with grease of the same brand as that filled at the start.

When grease is refilled, new grease must be injected inside bearing.

Fig. 5-1 gives one example of a feeding method.

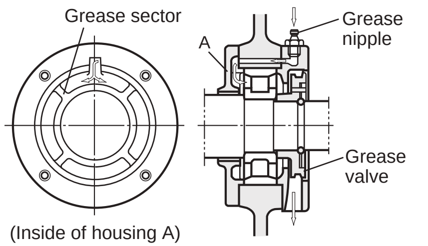


Fig. 5-1 Example of grease feeding method (using grease sector)

In the example, the inside of the housing is divided by grease sectors. Grease fills one sector, then flows into the bearing.

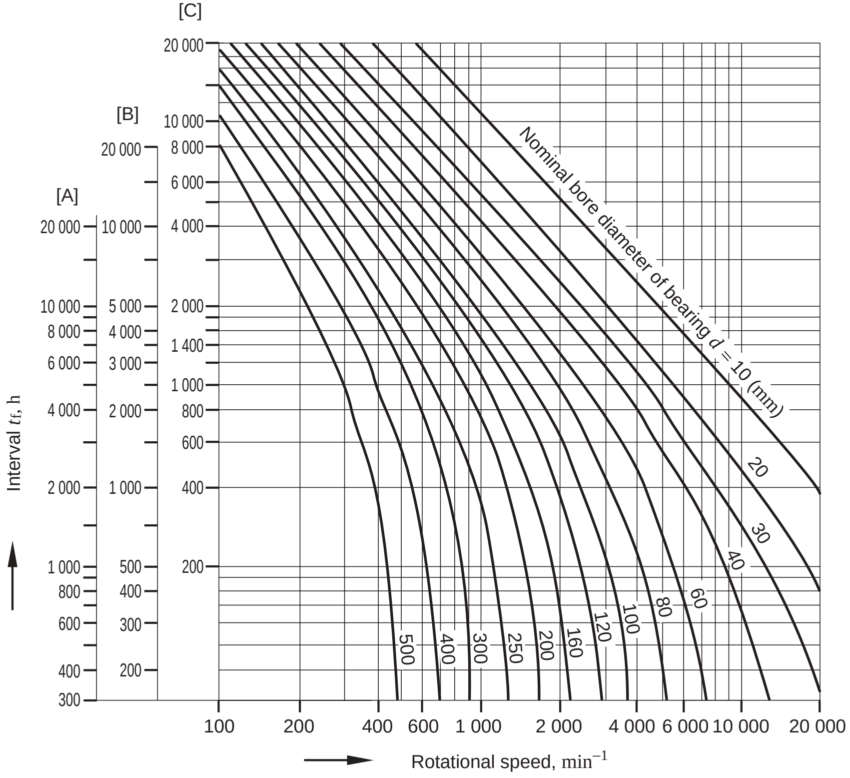
On the other hand, grease flowing back from the inside is forced out of the bearing by the centrifugal force of the grease valve.

When the grease valve is not used, it is necessary to enlarge the housing space on the discharge side to store old grease.

The housing is uncovered and the stored old grease is removed at regular intervals.

3) Grease feeding interval

In normal operation, grease life should be regarded roughly as shown in Fig. 5-2, and replenishment/replacement should be carried out accordingly.



[Notes] 1) [A] : radial ball bearing

[B] : cylindrical roller bearing, needle roller bearing

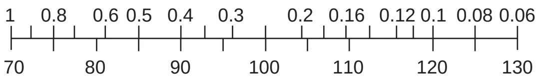
[C] : tapered roller bearing, spherical roller bearing, thrust ball bearing

2) Temperature correction

When the bearing operating temperature exceeds 70 °C, t_f' , obtained by multiplying t_f by correction coefficient a , found on the scale below, should be applied as the feeding interval.

$$t_f' = t_f \times a$$

Temperature correction coefficient a



Bearing operating temperature T °C

Fig. 5-2 Grease feeding interval

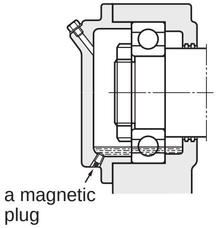
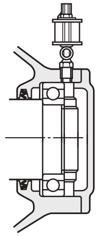
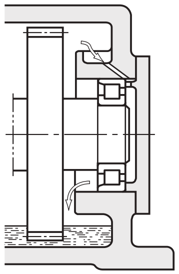
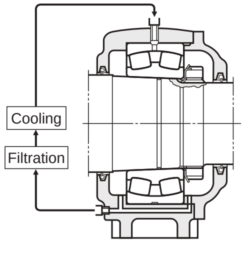
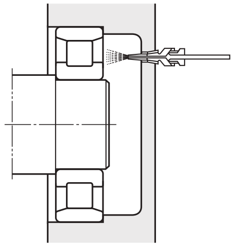
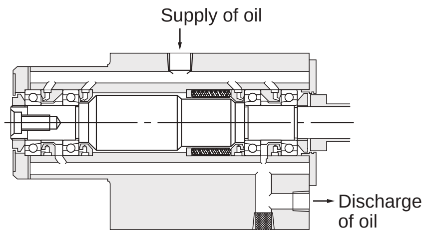
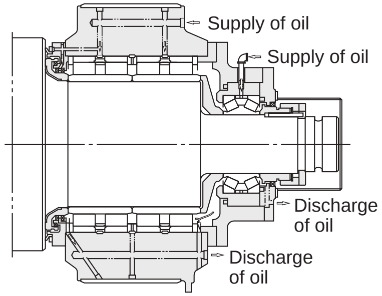
5-2 Oil lubrication

Oil lubrication is usable even at high speed rotation and somewhat high temperature, and is effective in reducing bearing vibration and noise.

Thus oil lubrication is used in many cases where grease lubrication does not work.

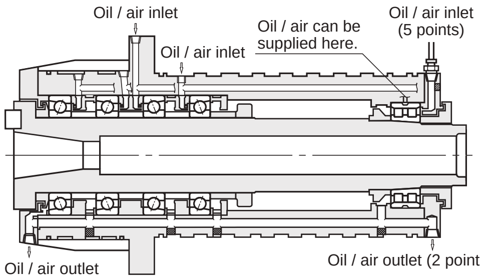
Table 5-2 shows major types and methods of oil lubrication.

Table 5-2 Type and method of oil lubrication

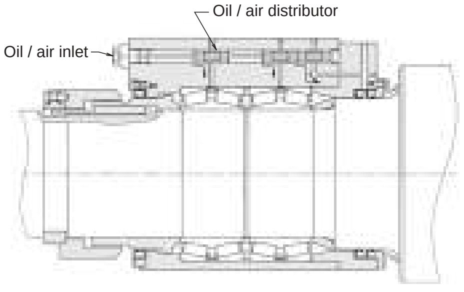
(1) Oil bath	● Simplest method of bearing immersion in oil for operation. ● Suitable for low/medium speed. ● Oil level gauge should be furnished to adjust the amount of oil. (In the case of horizontal shaft) About 50 % of the lowest rolling element should be immersed. (In the case of vertical shaft) About 70 to 80 % of the bearing should be immersed. ● It is better to use a magnetic plug to prevent wear iron particles from dispersing in oil.	
(2) Oil drip	● Oil is dripped with an oiling device, and the inside of the housing is filled with oil mist by the action of rotating parts. This method has a cooling effect. ● Applicable at relatively high speed and up to medium load. ● In general, 5 to 6 drops of oil are utilized per minute. (It is difficult to adjust the dripping in 1 mL/h or smaller amounts.) ● It is necessary to prevent too much oil from being accumulated at the bottom of housing.	
(3) Oil splash	● This type of lubrication method makes use of a gear or simple flinger attached to shaft in order to splash oil. This method can supply oil for bearings located away from the oil tank. ● Usable up to relatively high speed. ● It is necessary to keep oil level within a certain range. ● It is better to use a magnetic plug to prevent wear iron particles from dispersing in oil. It is also advisable to set up a shield or baffle board to prevent contaminants from entering the bearing.	
(4) Forced oil circulation	● This method employs a circulation-type oil supply system. Supplied oil lubricates inside of the bearing, is cooled and sent back to the tank through an oil escape pipe. The oil, after filtering and cooling, is pumped back. ● Widely used at high speeds and high temperature conditions. ● It is better to use an oil escape pipe approximately twice as thick as the oil supply pipe in order to prevent too much lubricant from gathering in housing. ● Required amount of oil : see Remark 1 (on page 60).	
(5) Oil jet lubrication	● This method uses a nozzle to jet oil at a constant pressure (0.1 to 0.5 MPa), and is highly effective in cooling. ● Suitable for high speed and heavy load. ● Generally, the nozzle (diameter 0.5 to 2 mm) is located 5 to 10 mm from the side of a bearing. When a large amount of heat is generated, 2 to 4 nozzles should be used. ● Since a large amount of oil is supplied in the jet lubrication method, old should be discharged with an oil pump to prevent excessive residual oil. ● Required amount of oil : see Remark 1 (on page 60).	
(6) Oil mist lubrication (spray lubrication)	● This method employs an oil mist generator to produce dry mist (air containing oil in the form of mist). The dry mist is continuously sent to the oil supplier, where the mist is turned into a wet mist (sticky oil drops) by a nozzle set up on the housing or bearing, and is then sprayed onto bearing. ● Required amount of mist : see Remark 2 (on page 61). ● This method provides and sustains the smallest amount of oil film necessary for lubrication, and has the advantages of preventing oil contamination, simplifying bearing maintenance, prolonging bearing fatigue life, reducing oil consumption etc.	(Example of grinding machine)  (Example of rolling mill) 

(7) Oil / air lubrication

- A proportioning pump sends forth a small quantity of oil, which is mixed with compressed air by a mixing valve. The admixture is supplied continuously and stably to the bearing.
- This method enables quantitative control of oil in extremely small amounts, always supplying new lubricating oil. It is thus suitable for machine tools and other applications requiring high speed.
- Compressed air and lubricating oil are supplied to the spindle, increasing the internal pressure and helping prevent dirt, cutting-liquid, etc. from entering. As well, this method allows the lubricating oil to flow through a feeding pipe, minimizing atmospheric pollution.



(Example of spindle unit incorporating oil / air lubrication system)



(Example of rolling mill roll neck bearing)

Remark 1 **Required oil supply in forced oil circulation ; oil jet lubrication methods**

$$G = \frac{1.88 \times 10^{-4}\,\mu \cdot d \cdot n \cdot P}{60\ \ c \cdot r \cdot \Delta_T}$$

where :

G : required oil supply L/min
μ : friction coefficient (see table at right)
d : nominal bore diameter mm
n : rotational speed min^{-1}
P : dynamic equivalent load of bearing N
c : specific heat of oil 1.88–2.09 kJ/kg·K
r : density of oil $\mathrm{g/cm^3}$
Δ_T : temperature rise of oil K

Values of friction coefficient μ

Bearing type	μ
Deep groove ball bearing	0.001 0 – 0.001 5
Angular contact ball bearing	0.001 2 – 0.002 0
Cylindrical roller bearing	0.000 8 – 0.001 2
Tapered roller bearing	0.001 7 – 0.002 5
Spherical roller bearing	0.002 0 – 0.002 5

The values obtained by the above equation show quantities of oil required to carry away all the generated heat, with heat release not taken into consideration.

In reality, the oil supplied is generally half to two-thirds of the calculated value.

Heat release varies widely according to the application and operating conditions.

To determine the optimum oil supply, it is advised to start operating with two-thirds of the calculated value, and then reduce the oil gradually while measuring the operating temperature of bearing, as well as the supplied and discharged oil.

Remark 2 **Notes on oil mist lubrication**

1) Required amount of mist (mist pressure : 5 kPa)

(In the case of a bearing) $Q = 0.11dR$

(In the case of two oil seals combined) $Q = 0.028d_1$

where :

Q : required amount of mist L/min
d : nominal bore diameter mm
R : number of rolling element rows
d_1 : inside diameter of oil seal mm

In the case of high speed ($d_{\mathrm{m}}n \geqq 400 \times 10^3$), it is necessary to increase the amount of oil and heighten the mist pressure.

2) Piping diameter and design of lubrication hole/groove

When the flow rate of mist in piping exceeds 5 m/s, oil mist suddenly condenses into an oil liquid.

Consequently, the piping diameter and dimensions of the lubrication hole/groove in the housing should be designed to keep the flow rate of mist, obtained by the following equation, from exceeding 5 m/s.

$$V = \frac{0.167Q}{A} \leqq 5$$

where :

V : flow rate of mist m/s
Q : amount of mist L/min
A : sectional area of piping or lubrication groove $\mathrm{cm^2}$

3) Mist oil

Oil used in oil mist lubrication should meet the following requirements.

- ability to turn into mist
- has high extreme pressure resistance
- good heat/oxidation stability
- rust-resistant
- unlikely to generate sludge
- superior demulsifier

Oil mist lubrication has a number of advantages for high speed rotation bearings. Its performance, however, is largely affected by surrounding structures and bearing operating conditions.

If contemplating the use of this method, please contact with JTEKT for advice based on JTEKT long experience with oil mist lubrication.

Remark 3 **Required oil supply in oil / air lubrication (Rolling mill roll neck bearing)**

Horizontal roll $Q = \dfrac{0.085dR}{A}$

Vertical roll $Q = \dfrac{0.170dR}{A}$

where :

Q : Required oil supply $\mathrm{cm^3/h}$
d : Nominal bore diameter mm
R : Number of rolling element rows
A : Coefficient (low speed : 10, high speed : 5)

5-3 Lubricant

5-3-1 Grease

Grease is made by mixing and dispersing a solid of high oil-affinity (called a thickener) with lubricant oil (as a base), and transforming it into a semi-solid state.

As well, a variety of additives can be added to improve specific performance.

(1) Base oil

Mineral oil is usually used as the base oil for grease. When low temperature fluidity, high temperature stability, or other special performance is required, diester oil, silicon oil, polyglycolic oil, fluorinated oil, or other synthetic oil is often used.

Generally, grease with a low viscosity base oil is suitable for applications at low temperature or high rotation speed; grease with high viscosity base oils are suitable for applications at high temperature or under heavy load.

(2) Thickener

Most greases use a metallic soap base such as lithium, sodium, or calcium as thickeners. For some applications, however, non-soap base thickeners (inorganic substances such as bentone, silica gel, and organic substances such as urea compounds, fluorine compounds) are also used.

In general, the mechanical stability, bearing operating temperature range, water resistance, and other characteristics of grease are determined by the thickener.

(Lithium soap base grease)
Superior in heat resistance, water resistance and mechanical stability.
(Calcium soap base grease)
Superior in water resistance; inferior in heat resistance.
(Sodium soap base grease)
Superior in heat resistance; inferior in water resistance.
(Non-soap base grease)
Superior in heat resistance.

(3) Additives

Various additives are selectively used to serve the respective purposes of grease applications.

- Extreme pressure agents
  When bearings must tolerate heavy or impact loads.
- Oxidation inhibitors
  When grease is not refilled for a long period.
  Structure stabilizers, rust preventives, and corrosion inhibitors are also used.

(4) Consistency

Consistency, which indicates grease hardness, is expressed as a figure obtained, in accordance with ASTM (JIS), by multiplication by 10 the depth (in mm) to which the cone-shaped metallic plunger penetrates into the grease at 25 °C by deadweight in 5 seconds. The softer the grease, the higher the figure.

Table 5-4 shows the relationships between the NLGI scales and ASTM (JIS) penetration indexes, service conditions of grease.

(NLGI : National Lubricating Grease Institute)

Table 5-4 Grease consistency

NLGI scale	ASTM (JIS) penetration index (25 °C, 60 mixing operations)	Service conditions/ applications
0	355 – 385	For centralized lubricating
1	310 – 340	For centralized lubricating, at low temperature
2	265 – 295	For general use
3	220 – 250	For general use, at high temperature
4	175 – 205	For special applications

(5) Mixing of different greases

Since mixing of different greases changes their properties, greases of different brands should not be mixed.

If mixing cannot be avoided, greases containing the same thickener should be used. Even if the mixed greases contain the same thickener, however, mixing may still produce adverse effects, due to difference in additives or other factors.

Thus it is necessary to check the effects of a mixture in advance, through testing or other methods.

Table 5-3 Characteristics of respective greases

	Lithium grease			Calcium grease (cup grease)	Sodium grease (fiber grease)	Complex base grease		Non-soap base grease		
Thickener	Lithium soap			Calcium soap	Sodium soap	Lithium complex soap	Calcium complex soap	Bentone	Urea compounds	Fluorine compounds
Base oil	Mineral oil	Synthetic oil (diester oil)	Synthetic oil (silicon oil)	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral/ synthetic oil	Synthetic oil
Dropping point (°C)	170 to 190	170 to 230	220 to 260	80 to 100	160 to 180	250 or higher	200 to 280	–	240 or higher	250 or higher
Operating temperature range (°C)	– 30 to + 120	– 50 to + 130	– 50 to + 180	– 10 to + 70	0 to + 110	– 30 to + 150	– 10 to + 130	– 10 to + 150	– 30 to + 150	– 40 to + 250
Rotation speed range	Medium to high	High	Low to medium	Low to medium	Low to high	Low to high	Low to medium	Medium to high	Low to high	Low to medium
Mechanical stability	Excellent	Good to excellent	Good	Fair to good	Good to excellent	Good to excellent	Good	Good	Good to excellent	Good
Water resistance	Good	Good	Good	Good	Bad	Good to excellent	Good	Good	Good to excellent	Good
Pressure resistance	Good	Fair	Bad to fair	Fair	Good to excellent	Good	Good	Good to excellent	Good to excellent	Good
Remarks	Most widely usable for various rolling bearings.	Superior low temperature and friction characteristics. Suitable for bearings for measuring instruments and extra-small ball bearings for small electric motors.	Superior high and low temperature characteristics.	Suitable for applications at low rotation speed and under light load. Not applicable at high temperature.	Liable to emulsify in the presence of water. Used at relatively high temperature.	Superior mechanical stability and heat resistance. Used at relatively high temperature.	Superior pressure resistance when extreme pressure agent is added. Used in bearings for rolling mills.	Suitable for applications at high temperature and under relatively heavy load.	Superior water resistance, oxidation stability, and heat stability. Suitable for applications at high temperature and high speed.	Superior chemical resistance and solvent resistance. Usable at up to 250 °C.

5-3-2 Lubricating oil

For lubrication, bearings usually employ highly refined mineral oils, which have superior oxidation stability, rust-preventive effect, and high film strength.

With bearing diversification, however, various synthetic oils have been put into use.

These synthetic oils contain various additives (oxidation inhibitors, rust preventives, antifoaming agents, etc.) to improve specific properties. Table 5-5 shows the characteristics of lubricating oils.

Mineral lubricating oils are classified by applications in JIS and MIL.

Table 5-5 Characteristics of lubricating oils

Type of lubricating oil	Highly refined mineral oil	Major synthetic oils				
		Diester oil	Silicon oil	Polyglycolic oil	Polyphenyl ether oil	Fluorinated oil
Operating temperature range (°C)	− 40 to + 220	− 55 to + 150	− 70 to + 350	− 30 to + 150	0 to + 330	− 20 to + 300
Lubricity	Excellent	Excellent	Fair	Good	Good	Excellent
Oxidation stability	Good	Good	Fair	Fair	Excellent	Excellent
Radioactivity resistance	Bad	Bad	Bad to fair	Bad	Excellent	–

[Selection of lubricating oil]

The most important criterion in selecting a lubricating oil is whether the oil provides proper viscosity at the bearing operating temperature.

Standard values of proper kinematic viscosity can be obtained through selection by bearing type according to Table 5-6 first, then through selection by bearing operating conditions according to Table 5-7.

When lubricating oil viscosity is too low, the oil film will be insufficient. On the other hand, when the viscosity is too high, heat will be generated due to viscous resistance.

In general, the heavier the load and the higher the operating temperature, the higher the lubricating oil viscosity should be ; whereas, the higher the rotation speed, the lower the viscosity should be.

Fig. 5-3 illustrates the relationship between lubricating oil viscosity and temperature.

Table 5-6 Proper kinematic viscosity by bearing type

Bearing type	Proper kinematic viscosity at operating temperature
Ball bearing Cylindrical roller bearing	13 mm^2/s or higher
Tapered roller bearing Spherical roller bearing	20 mm^2/s or higher
Spherical thrust roller bearing	32 mm^2/s or higher

Table 5-7 Proper kinematic viscosities by bearing operating conditions

Operating temperature	$d_m n$ value	Proper kinematic viscosity (expressed in the ISO viscosity grade or the SAE No.)			
		Light/normal load		Heavy/impact load	
−30 ~ 0 °C	All rotation speeds	ISO VG 15, 22, 46	(Refrigerating machine oil)	–	
0 ~ 60 °C	300 000 or lower	ISO VG 46	(Bearing oil Turbine oil)	ISO VG 68 SAE 30	(Bearing oil Turbine oil)
	300 000 to 600 000	ISO VG 32	(Bearing oil Turbine oil)	ISO VG 68	(Bearing oil Turbine oil)
	600 000 or higher	ISO VG 7, 10, 22	(Bearing oil)	–	
60 ~ 100 °C	300 000 or lower	ISO VG 68	(Bearing oil)	ISO VG 68, 100 SAE 30	(Bearing oil)
	300 000 to 600 000	ISO VG 32, 46	(Bearing oil Turbine oil)	ISO VG 68	(Bearing oil Turbine oil)
	600 000 or higher	ISO VG 22, 32, 46	(Bearing oil Turbine oil Machine oil)	–	
100 ~ 150 °C	300 000 or lower	ISO VG 68, 100 SAE 30, 40	(Bearing oil)	ISO VG 100 ~ 460	(Bearing oil Gear oil)
	300 000 to 600 000	ISO VG 68 SAE 30	(Bearing oil Turbine oil)	ISO VG 68, 100 SAE 30, 40	(Bearing oil)

[Remarks] 1. $d_m n = \dfrac{D+d}{2} \times n$ ·········{D : nominal outside diameter (mm), d : nominal bore diameter (mm), n : rotational speed (min^{-1})}

2. Refer to refrigerating machine oil (JIS K 2211), turbine oil (JIS K 2213), gear oil (JIS K 2219), machine oil (JIS K 2238) and bearing oil (JIS K 2239).

3. Please contact with JTEKT if the bearing operating temperature is under −30 °C or over 150 °C .

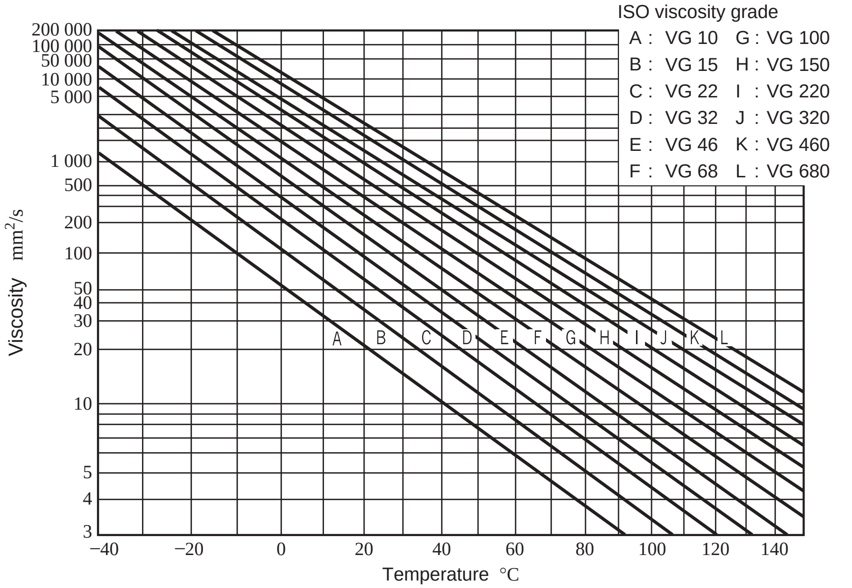


Fig. 5-3 Relationship between lubricating oil viscosity and temperature (viscosity index : 100)

6. Bearing materials

Bearing materials include steel for bearing rings and rolling elements, as well as steel sheet, steel, copper alloy and synthetic resins for cages.

These bearing materials should possess the following characteristics :

1) High elasticity, durable under high partial contact stress. 2) High strength against rolling contact fatigue due to large repetitive contact load. 3) Strong hardness	Bearing rings Rolling elements
4) High abrasion resistance 5) High toughness against impact load 6) Excellent dimensional stability	Bearing rings Rolling elements Cages

6-1 Bearing rings and rolling elements materials

1) High carbon chromium bearing steel

High carbon chromium bearing steel specified in JIS is used as a general material in bearing rings (inner rings, outer rings) and rolling elements (balls, rollers).

Their chemical composition classified by steel type is given in Table 6-1.

Among these steel types, SUJ 2 is generally used. SUJ 3, which contains additional Mn and Si, possesses high hardenability and is commonly used for thick section bearings.

SUJ 5 has increased hardenability, because it was developed by adding Mo to SUJ 3.

For small and medium size bearings, SUJ 2 and SUJ 3 are used, and for large size and extra-large size bearings with thick sections, SUJ 5 is widely used.

Generally, these materials are processed into the specified shape and then undergo hardening and annealing treatment until they attain a hardness of 57 to 64 HRC.

2) Case carburizing bearing steel (case hardened steel)

When a bearing receives heavy impact loads, the surface of the bearing should be hard and the inside soft.

Such materials should possess a proper amount of carbon, dense structure, and carburizing case depth on their surface, while having proper hardness and fine structure internally.

For this purpose, chromium steel and nickel-chromium-molybdenum steel are used as materials.

Typical steel materials are shown in Table 6-2.

These materials also undergo vacuum degassing in order to reduce non-metallic inclusions and oxygen content which leads to higher reliability.

3) Others

For special applications, the following materials are used, according to operational conditions.

(When very high reliability is required)
- high refining steel ··· developed by JTEKT
- vacuum arc remelted steel
- electro slag remelted steel

(When heat resistance is required)
- high speed steel for high temperature bearings ··· refer to Table 6-3

(When high corrosion resistance is required)
- stainless steel ··· refer to Table 6-4

(When high heat, corrosion, and chemical resistance are required)
- ceramics

Table 6-1 Chemical composition of high carbon chromium bearing steel

Standard	Code	Chemical composition (%)						
		C	Si	Mn	P	S	Cr	Mo
JIS G 4805	SUJ 2	0.95 ~ 1.10	0.15 ~ 0.35	Not more than 0.50	Not more than 0.025	Not more than 0.025	1.30 ~ 1.60	Not more than 0.08
	SUJ 3		0.40 ~ 0.70	0.90 ~ 1.15			0.90 ~ 1.20	Not more than 0.08
	SUJ 5		0.40 ~ 0.70	0.90 ~ 1.15			0.90 ~ 1.20	0.10 ~ 0.25
SAE J 404	52100	0.98 ~ 1.10	0.15 ~ 0.35	0.25 ~ 0.45	Not more than 0.025	Not more than 0.025	1.30 ~ 1.60	Not more than 0.06

[Remark] As for bearings which are induction hardened, carbon steel with a high carbon content of 0.55 to 0.65 % is used in addition to those listed in this table.

Table 6-2 Chemical composition of case carburizing bearing steel

Standard	Code	Chemical composition (%)						
		C	Si	Mn	P	S	Ni	Cr	Mo
JIS G 4053	SCr 415	0.13 ~ 0.18	0.15 ~ 0.35	0.60 ~ 0.90	Not more than 0.030	Not more than 0.030	Not more than 0.25	0.90 ~ 1.20	–
	SCr 420	0.18 ~ 0.23		0.60 ~ 0.90			Not more than 0.25	0.90 ~ 1.20	–
	SCM 420	0.18 ~ 0.23		0.60 ~ 0.90			Not more than 0.25	0.90 ~ 1.20	0.15 ~ 0.25
	SNCM 220	0.17 ~ 0.23		0.60 ~ 0.90			0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25
	SNCM 420	0.17 ~ 0.23		0.40 ~ 0.70			1.60 ~ 2.00	0.40 ~ 0.60	0.15 ~ 0.30
	SNCM 815	0.12 ~ 0.18		0.30 ~ 0.60			4.00 ~ 4.50	0.70 ~ 1.00	0.15 ~ 0.30
SAE J 404	5120	0.17 ~ 0.22	0.15 ~ 0.35	0.70 ~ 0.90	Not more than 0.035	Not more than 0.040	–	0.70 ~ 0.90	–
	8620	0.18 ~ 0.23		0.70 ~ 0.90			0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25
	4320	0.17 ~ 0.22	0.15 ~ 0.30	0.45 ~ 0.65			1.65 ~ 2.00	0.40 ~ 0.60	0.20 ~ 0.30

Table 6-3 Chemical composition of high speed steel for high temperature bearings

Standard	Code	Chemical composition (%)											
		C	Si	Mn	P	S	Cr	Mo	V	Ni	Cu	Co	W
AISI	M 50	0.77 ~ 0.85	Not more than 0.25	Not more than 0.35	Not more than 0.015	Not more than 0.015	3.75 ~ 4.25	4.00 ~ 4.50	0.90 ~ 1.10	Not more than 0.15	Not more than 0.10	Not more than 0.25	Not more than 0.25

Table 6-4 Chemical composition of stainless steel

Standard	Code	Chemical composition (%)						
		C	Si	Mn	P	S	Cr	Mo
JIS G 4303	SUS 440 C	0.95 ~ 1.20	Not more than 1.00	Not more than 1.00	Not more than 0.040	Not more than 0.030	16.00 ~ 18.00	Less than 0.75

6-2 Materials used for cages

Since the characteristics of materials used for cages greatly influence the performance and reliability of rolling bearings, the choice of materials is of great importance.

It is necessary to select cage materials in accordance with required shape, ease of lubrication, strength, and abrasion resistance.

Typical materials used for metallic cages are shown in Tables 6-5 and 6-6.

In addition, phenolic resin machined cages and other synthetic resin molded cages are often used.

Materials typically used for molded cages are polyacetal, polyamide (Nylon 6.6, Nylon 4.6), and polymer containing fluorine, which are strengthened with glass and carbon fibers.

Table 6-5 Chemical compositions of pressed cage steel sheet (A) and machined cage carbon steel (B)

	Standard	Code	Chemical composition (%)						
			C	Si	Mn	P	S	Ni	Cr
(A)	JIS G 3141	SPCC	Not more than 0.15	–	Not more than 1.00	Not more than 0.100	Not more than 0.035	–	–
	JIS G 3131	SPHC	Not more than 0.12	–	Not more than 0.60	Not more than 0.045	Not more than 0.035	–	–
	BAS 361	SPB 2	0.13 ~ 0.20	Not more than 0.04	0.25 ~ 0.60	Not more than 0.030	Not more than 0.030	–	–
	JIS G 4305	SUS 304	Not more than 0.08	Not more than 1.00	Not more than 2.00	Not more than 0.045	Not more than 0.030	8.00 ~ 10.50	18.00 ~ 20.00
(B)	JIS G 4051	S 25 C	0.22 ~ 0.28	0.15 ~ 0.35	0.30 ~ 0.60	Not more than 0.030	Not more than 0.035	Not more than 0.20	Not more than 0.20

Table 6-6 Chemical composition of high-tensile brass casting of machined cages

(%)

Standard	Code	Cu	Zn	Mn	Fe	Al	Impurity			
							Sn	Ni	Pb	Si
JIS H 5120	CAC 301 (HBsC*)	55 ~ 60	33 ~ 42	0.1 ~ 1.5	0.5 ~ 1.5	0.5 ~ 1.5	Not more than 1.0	Not more than 1.0	Not more than 0.4	Not more than 1.0

* : Material with HBsC is used.

7. Examples of failures

Table 7-1 (1) Bearing failures, causes and countermeasures

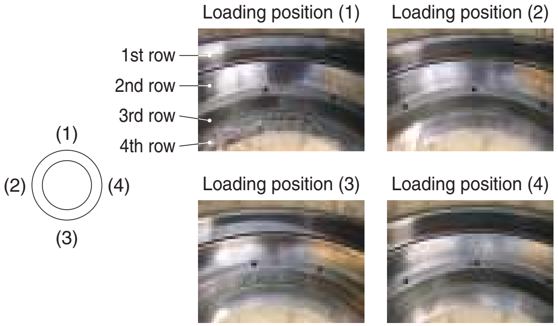
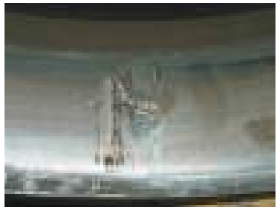
Failures	Characteristics	Damages		Causes	Countermeasures
(1) Flaking	 Flaking caused by excessive axial load Inner ring of four-row tapered roller bearing	Flaking on bearing raceway surface generated on only rows receiving axial load		1) Crossed work rolls causing excessive axial load · Roll neck diameter is smaller than the standard one. · Chock side liner is worn. · Inaccuracy of mill stand. · Rigidity of the chock is poor. · Corrosion on liner or clearance generated between the liner and the chock. · Failure of the keeper plate.	1) Keep the correct locations of the chock and work roll.
	 Outer ring raceway of four-row tapered roller bearing	Flaking generated and developed from raceway end face		1) Looseness of chock cover/excessive axial clearance (As the axial clearance is increased, the loading range becomes narrower, partial load acts, and edge load is generated on the outer ring raceway.) 2) Excessive axial clearance is generated because of the mixed use of other bearing spacer or outer ring.	1) Adjust shims, select thickness of shims, measure a gap, and tighten bolts correctly. 2) Use parts of the same number.
	Flaking caused by improper mounting  Outer ring raceway of four-row tapered roller bearing	Flaking on raceway surface with slanted contact		1) It occurs when the chock is fixed inappropriately and slantingly. · Failure of keeper plate Removal, looseness, damage, deformation, bend, unequal tightening, unequal wear, improper parallelism · Damaged, deformed, or bent chock flange	1) Find the cause of damage by periodic inspection of the chock and stand.
	 Flaking at corroded start point Outer ring raceway of four-row tapered roller bearing	Flaking on raceway surface started from corroded (rusted) portion		1) After the bearing was used, it has been left for a long period with moisture mixed in grease. 2) Improper rust preventive treatment after the bearing was washed. 3) Worn or damaged seal lips 4) Corrosion on the raceway is generated due to the clearance between the roll neck and the sleeve, and flaking occurs with rust.	1) Improve seal maintenance and sealing method. Periodically check for wear or damage on the seal lips. 2) Fit the “O” ring between the roll neck and the sleeve. 3) Immediately after the bearing is removed from the chock, change grease. 4) After washing the bearing, remove kerosene and water completely.

Table 7-1 (2) Bearing failures, causes and countermeasures

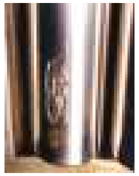
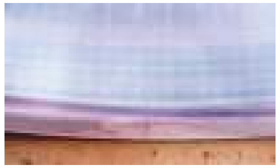
Failures	Characteristics	Damages		Causes	Countermeasures
(1) Flaking	 Flaking on nicks (scratch) start point Rolling contact surface of four-row cylindrical roller bearing	Flaking on rolling contact surface with nicks start point		1) Inappropriate handling · Mounting / dismounting bearing to / from chock · Replacing roll	1) Proper handling jig (use of a copper hammer) 2) Prevention of impact load when replacing roll (use of soft material) 3) Improvement in mounting method 4) Change in raceway chamfering
	 Outer ring raceway of double-row cylindrical roller bearing  Inner ring raceway of double-row cylindrical roller bearing  Inner ring raceway of double-row cylindrical roller bearing	Flaking on raceway surface		1) Low viscosity lubrication (improper lubrication) 2) Ingress of dusts and foreign matters	1) Improvement in viscosity of oil and oil type 2) Improvement in seal maintenance and sealing method Periodic check of wear or damage of seal lip 3) Check of oil filter
(2) Cracking Chipping	 Inner ring side face of four-row tapered roller bearing	Minute crack on inner ring side face		1) Fix the inner ring and the roll with a fillet ring (thrust collar). 2) Clearance between the fillet ring (thrust collar) and the inner ring is excessively small. 3) Area of the side face of nut/slinger contacting the inner ring side face is too small, the side face is worn due to inner ring creep, causing heat.	1) Keep the clearance between the inner ring and the fillet ring (thrust collar) (from 0.5 mm to 1.5 mm). 2) Keep the area of the side of fillet ring (thrust collar) (to reduce pressure on the side face). 3) Apply and supply grease of adequate amount.
	 Rolling contact surface of four-row cylindrical roller bearing	Cracking on rolling elements		1) Application of load greater than bearing load rating (Load resistance of roller by use of pin type cage) 2) Secondary factor in case of damaged pin of cage (For a reversible mill, pins are broken due to fatigue caused by rapid acceleration and deceleration) 3) Other factors · Ingress of water due to faulty sealing · Increase of axial clearance of bearing, causing application of partial and excessive load	1) Optimal design of bearing considering load and operating conditions (Examination of optimal cage type) 2) Reviewing sealing method and design of strength of cover

Table 7-1 (3) Bearing failures, causes and countermeasures

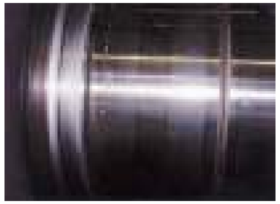
Failures	Characteristics	Damages		Causes	Countermeasures
(2) Cracking Chipping	 Outer ring outside surface of double-row cylindrical roller bearing  Outer ring side face of double-row cylindrical roller bearing  Outer ring outside of double-row cylindrical roller bearing	Crack on outer ring		1) Impact load acting due to accidents of rolling mill (for example, plate being caught in, ingress of dusts) 2) Rolling load acting unevenly due to uneven overall thickness of bearing in the shaft, causing excessive load to a thick section bearing (for multi-roll mill, BUR bearing)	1) Change to outer ring material or heat treated material hard to be cracked. 2) Appropriate overall thickness control of bearings in a shaft
	 Inner ring raceway of four-row cylindrical roller bearing  Inner ring raceway of four-row cylindrical roller bearing	Grinding burn or crack on inner ring raceway surface		1) After fitting an inner ring into the roll neck, grinding burn occurs during grinding with the inner ring and the roll. 2) Crack occurs because rollers rolling on the raceway surface of which strength (hardness) is decreased due to grinding burn.	1) Reviewing grinding conditions Grain size of grinding stone, grinding stone cutting amount, cutting pressure, grinding fluid amount, etc.
	 Outer ring outside surface of double-row cylindrical roller bearing	Grinding burn or crack on outer ring outside surface		1) Grinding burn occurs when re-grinding the outer ring of a multi-roll mill bearing. 2) Crack occurs because the outer ring of which strength (hardness) is decreased by grinding burn contacts with the intermediate roll.	

Table 7-1 (4) Bearing failures, causes and countermeasures

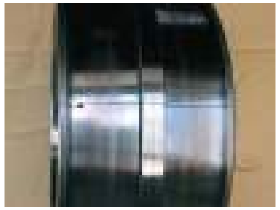
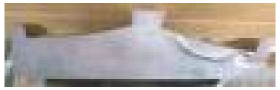
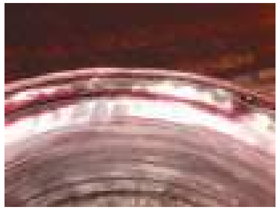
Failures	Characteristics	Damages		Causes	Countermeasures
(2) Cracking Chipping	 Inner ring of spherical roller bearing  Fractured section of inner ring	Axial crack occurs on bore surface of inner ring and raceway surface.		1) Excessive interference between inner ring and shaft 2) Great fit stress due to excessive difference in temperature of inner ring and that of shaft	1) Appropriate fit conditions of inner ring and shaft 2) Appropriate difference in temperature by checking load, rotation, and temperature conditions. (appropriate fit)
	 Inner ring bore surface of four-row tapered roller bearing	Circumferential crack occurs on bore surface and raceway surface of inner ring.		1) Step wear occurs on the shaft (roll neck), and the inner ring overrides the shaft, causing great bore surface stress	1) Provide circumferential groove for the roll neck. 2) When using a bearing with different chamfers for a roll, make the chamfers identical.
	 Outer ring raceway of double-row tapered roller bearing  Fractured section of outer ring	Axial crack occurs on outside surface and raceway surface of outer ring.		1) Excessive axial load 2) Axial clearance between the bearing and roll is great, and excessive axial load is applied.	1) Check for axial load. 2) Check the wear condition of counterpart components. 3) Reviewing thickness of the outer ring
	 Inner ring raceway of spherical thrust roller bearing  Assembly of tapered roller bearing	Crack occurs on inner ring back face rib.		1) Excessive axial load 2) Low holding shoulder diameter on the inner ring back face rib	1) Reviewing operating conditions 2) Reviewing dimensions of counterpart collar (Dimensions allowing backup of inner ring back face rib)

Table 7-1 (5) Bearing failures, causes and countermeasures

Failures	Characteristics	Damages		Causes	Countermeasures
(3) Brinelling Nicks	 Outer ring raceway surface of four-row tapered roller bearing	1) Brinelling (Nicks) on raceway and rolling contact surfaces (scratch)		1) Nicks occur on the raceway and rollers because of improper handling. · Mounting / dismounting bearing to / from chock · Replacing roll	1) Proper handling jig (use of a copper hammer) 2) Application of grease to raceway surface of inner and outer rings (Apply oil if the bearing is the oil lubricated type) 3) Prevention of impact load when replacing roll (Use of soft material) 4) Roll bending compared to bearing static load rating 5) Improvement in mounting method 6) Change in raceway chamfering 7) Check for excessive load on the slant chamfer of the raceway surface
	 Rolling contact surface of four-row cylindrical roller bearing	2) Brinelling on raceway surface at the same interval as rolling element spacing		2) Great bending load is applied to the roll neck. (Especially, when faulty rolling occurs)	
(4) Scratch Scuffing	 Roller end face of double-row cylindrical roller bearing  Outer ring rib of double-row cylindrical roller bearing  Roller large end face of double-row tapered roller bearing	Scuffing on roller end face and rib of the raceway		1) Improper lubrication, ingress of foreign matters 2) Abnormal axial load caused by improper mounting or control of bearing overall thickness 3) Excessive axial load 4) Excessive preload	1) Selection of appropriate oil type and supply of adequate lubricant 2) Reviewing bearing mounting location 3) Reviewing bearing overall thickness control 4) Reviewing operating conditions 5) Checking preload

Table 7-1 (6) Bearing failures, causes and countermeasures

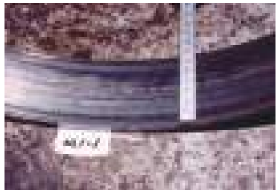
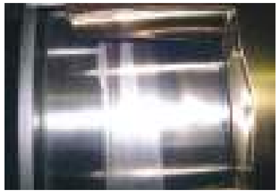
Failures	Characteristics	Damages		Causes	Countermeasures
(5) Smearing	 Outer ring raceway surface of four-row tapered roller bearing  Outer ring raceway surface of spherical roller bearing  Outer ring raceway surface of spherical roller bearing  Rolling element surface of spherical roller bearing	Smearing on raceway or rolling contact surface		1) Improper lubrication 2) Slip of rolling elements (high speed, light load) 3) Ingress of foreign matters during maintenance	1) Selection of appropriate oil type and supply of adequate lubricant 2) Setup of appropriate preload 3) Prevention of ingress of foreign matters
(6) Corrosion Rust	Corrosion  Outer ring of four-row tapered roller bearing  Outer ring of four-row tapered roller bearing	Rust, corrosion on the raceway surface at the same interval as rolling element spacing		1) Worn or damaged seal lips 2) Ingress of water or corrosive materials into clearance between roll neck and sleeve	1) Improve seal maintenance and sealing method. Periodically check for wear or damage on the seal lips. 2) Fit the "O" ring between the roll neck and the sleeve.
	Rust  Outer ring of four-row tapered roller bearing	Rust on partial or entire surface of bearing		1) After the bearing was used, it has been left for a long period with moisture mixed in grease. 2) Improper rust preventive treatment after the bearing was washed.	1) Immediately after the bearing is removed from the chock, change grease. 2) After washing the bearing, remove kerosene and water completely.

Table 7-1 (7) Bearing failures, causes and countermeasures

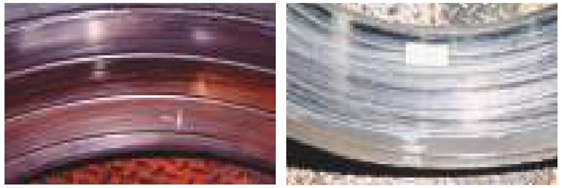
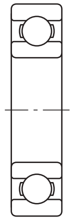
Failures	Characteristics	Damages		Causes	Countermeasures
(7) Creeping	 Scuffing on rolling mill roll neck  Inner ring bore surface of four-row tapered roller bearing	Wear, discoloration, and scuffing due to slip of fit surface		1) Insufficient grease or oil between the inner ring bore surface and the roll neck outside surface (When creep occurs between the inner ring and the roll neck, because of loose fit of them.)	1) Provide the spiral groove for bore surface of inner ring 2) When mounting the bearing, apply grease with molybdenum disulfide or EP grease. (Apply oil if the bearing is the oil lubricated type)
(8) Seizure	 Rolling contact surface of double-row tapered roller bearing  Roller large end face of double-row tapered roller bearing  Inner ring of double-row tapered roller bearing	Discoloration, deformation, and melting caused by heat of bearing		1) Improper lubrication (insufficient or degraded lubricant) 2) Ingress of water due to faulty sealing 3) Excessive axial load 4) Heat generated by creep of inner ring 5) Ingress of dusts or foreign matters 6) Excessively small bearing internal clearance	1) Reviewing sealing type and conditions 2) Reviewing lubricating method and lubricant, and checking lubricated condition 3) Check for axial load 4) Reviewing bearing (type, size, etc.) 5) Reviewing clearance 6) Confirming operating conditions

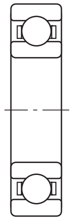
Table 7-1 (8) Bearing failures, causes and countermeasures

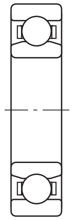
Failures	Characteristics	Damages		Causes	Countermeasures
(9) Failure in lubrication	 Inner ring assembly of four-row tapered roller bearing	Grease including large quantity of water mixed in		1) Operated at high temperature ⇒ Grease is carbonized. 2) Ingress of water due to improper sealing or wear or damage of seal lip (In this example, 20% or more of water is mixed in grease.)	1) Find the cause of high temperature. (If the temperature cannot be lowered, review the possibility of change to high temperature grease.) 2) Checking wear or damage of seal lip Find the cause of and countermeasure against the improper sealing.
	 Inner ring assembly of double-row tapered roller bearing  Outer ring of double-row tapered roller bearing	Foreign matter attachment and corrosion occur because of ingress of a great deal of foreign matters (scale and water for rolling).		1) Ingress of water due to improper sealing or wear or damage of seal lip	1) Checking wear or damage of seal lip Find the cause of and countermeasure against the improper sealing.
	 Four-row tapered roller bearing	Seizure and adhesion of raceway, roller, and cage		1) Varied factors including improper lubrication, improper operation, and ingress of foreign matters occur, causing damages.	1) Checking improper operation 2) Checking lubricating conditions 3) Checking degradation of peripheral parts
	 Outer ring assembly of four-row cylindrical roller bearing  Outer ring assembly of four-row cylindrical roller bearing	Looseness and breaking of pin		1) Abnormal load due to vibration occurs. 2) End of cage's service life because of use for a long period	1) Checking abnormal vibration 2) Replace if it has been used for a long period.

Bearing specification tables

Deep groove ball bearings


Design 1


Design 2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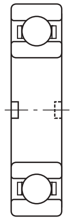
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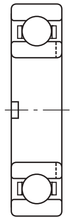

Design 5

- Deep groove ball bearings can accommodate radial load and axial load in both directions.
- Suitable for operation at high speed, with low vibration.

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512.
Tolerances	As specified in JIS B 1514, class 0 or 6 (refer to Table 2-2 on page 18.)
Allowable misalignment	0.002 3 rad (8') – 0.003 4 rad (12')
Radial internal clearance	(refer to Table 4-2 on page 50)
Standard cages	Pressed cage (design 1) or machined cage (design 2 to 5).
Equivalent radial load	**Dynamic equivalent radial load** $P_r = XF_r + YF_a$ **Static equivalent radial load** $P_{0r} = 0.6F_r + 0.5F_a$ $\left(\text{when the value of } P_{0r} < F_r,\ P_{0r} = F_r\right)$

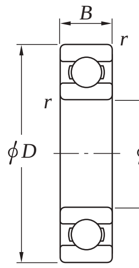
$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Factor f_0 is shown in the bearing specification table.

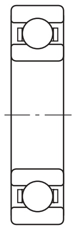
Single-row deep groove ball bearings

Koyo

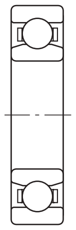
d 100 ~ 130 mm



Design 1



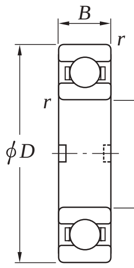
Design 2



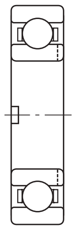
Design 3

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Bearing No.	De-sign	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_u	f_0			d_a min.	D_a max.	r_a max.	
100	125	13	1	24.5	21.2	1.05	16.0	**6820**	1	105	120	1	0.309
	140	20	1.1	56.2	41.9	2.05	16.2	**6920**	2	106.5	133.5	1	0.960
	150	16	1	53.0	42.1	1.95	16.5	**16020**	1	105	145	1	0.910
	150	24	1.5	75.2	54.2	2.70	15.9	**6020**	1	108	142	1.5	1.25
	180	34	2.1	153	93.1	5.15	14.4	**6220**	1	111	169	2	3.14
	215	47	3	216	141	10.9	13.2	**6320**	1	113	202	2.5	7.00
105	145	20	1.1	58.1	44.8	2.10	16.4	**6921**	2	111.5	138.5	1	1.00
	160	18	1	52.3	42.2	1.90	16.5	**16021**	1	110	155	1	1.20
	160	26	2	90.4	65.8	3.20	15.8	**6021**	1	114	151	2	1.59
	190	36	2.1	166	105	5.70	14.4	**6221**	1	116	179	2	3.70
	225	49	3	230	153	11.7	13.2	**6321**	1	118	212	2.5	8.05
110	140	16	1	35.1	30.7	1.40	16.1	**6822**	1	115	135	1	0.606
	150	20	1.1	59.9	47.8	2.20	16.4	**6922**	2	116.5	143.5	1	1.04
	170	19	1	71.8	56.7	2.55	16.3	**16022**	1	115	165	1	1.46
	170	28	2	103	73.0	3.55	15.6	**6022**	1	119	161	2	1.96
	200	38	2.1	180	117	6.20	14.4	**6222**	1	121	189	2	4.36
	240	50	3	257	180	13.3	13.2	**6322**	1	123	227	2.5	9.54
120	150	16	1	36.2	33.0	1.45	16.0	**6824**	1	125	145	1	0.655
	165	22	1.1	71.6	56.9	2.50	16.4	**6924**	2	126.5	158.5	1	1.41
	180	19	1	79.0	63.3	2.75	16.4	**16024**	1	125	175	1	1.80
	180	28	2	106	79.3	3.60	15.9	**6024**	1	129	171	2	2.07
	215	40	2.1	194	131	6.65	14.4	**6224**	1	131	204	2	5.15
	260	55	3	258	185	12.6	13.5	**6324**	1	133	247	2.5	12.5
130	165	18	1.1	46.1	41.2	1.75	16.1	**6826**	1	136.5	158.5	1	0.939
	180	24	1.5	86.9	67.4	3.00	16.3	**6926**	2	138	172	1.5	1.86
	200	22	1.1	89.1	74.8	3.05	11.2	**16026**	1	136.5	193.5	1	2.69
	200	33	2	133	101	4.45	15.8	**6026**	1	139	191	2	3.16
	230	40	3	209	146	9.15	14.5	**6226**	1	143	217	2.5	5.82
	280	58	4	287	214	14.1	13.6	**6326**	1	146	264	3	15.1

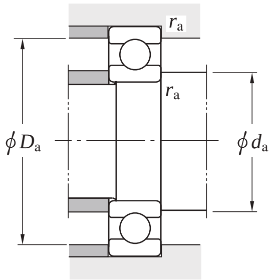
d 140 ~ (180) mm



Design 4



Design 5

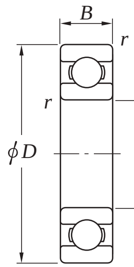


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Bearing No.	De-sign	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_u	f_0			d_a min.	D_a max.	r_a max.	
140	175	18	1.1	47.8	44.4	1.85	16.0	**6828**	1	146.5	168.5	1	1.00
	190	24	1.5	89.1	74.8	3.05	16.5	**6928**	2	148	182	1.5	1.98
	210	22	1.1	82.2	71.1	2.80	16.5	**16028**	1	146.5	203.5	1	2.86
	210	33	2	137	109	4.55	15.9	**6028**	1	149	201	2	3.55
	250	42	3	208	150	8.65	14.8	**6228**	1	153	237	2.5	7.45
	300	62	4	316	246	15.6	13.6	**6328**	1	156	284	3	19.4
150	190	20	1.1	59.7	54.9	2.20	16.1	**6830**	1	156.5	183.5	1	1.40
	210	28	2	117	94.3	3.75	16.2	**6930**	2	159	201	2	3.05
	225	24	1.1	114	99.3	3.70	16.6	**16030**	2	156.5	218.5	1	3.58
	225	35	2.1	157	126	5.10	16.0	**6030**	1	161	214	2	4.22
	230	35	2.1	156	116	4.75	15.8	**306891A**	2	161	219	2	5.50
	270	45	3	220	168	9.05	15.1	**6230**	1	163	257	2.5	9.41
	320	65	4	343	284	16.6	13.9	**6330**	2	166	304	3	26.2
160	200	20	1.1	60.5	56.9	2.20	16.1	**6832**	1	166.5	193.5	1	1.45
	220	28	2	120	101	3.85	16.4	**6932**	2	169	211	2	3.20
	229.5	33	2	124	108	3.95	16.5	**SB322333A**	2	169	220.5	2	4.2
	240	25	1.5	124	108	3.95	16.5	**16032**	2	168	232	1.5	4.25
	240	38	2.1	171	135	5.30	15.9	**6032**	1	171	229	2	5.22
	290	48	3	231	186	9.45	15.4	**6232**	2	173	277	2.5	14.3
	340	68	4	347	286	16.4	13.9	**6332**	2	176	324	3	29.0
170	215	22	1.1	74.8	70.5	2.60	16.1	**6834**	1	176.5	208.5	1	1.90
	230	28	2	124	108	3.95	16.5	**6934**	2	179	221	2	3.35
	249.5	38	2	169	137	5.15	16.1	**SB342538**	2	179	240.5	2	6.00
	260	28	1.5	142	127	4.45	16.5	**16034**	2	178	252	1.5	5.75
	260	42	2.1	201	161	6.20	15.8	**6034**	1	181	249	2	6.80
	310	52	4	265	223	11.1	15.3	**6234**	2	186	294	3	17.5
	360	72	4	408	355	20.5	13.6	**6334**	2	186	344	3	38.6
180	225	22	1.1	75.8	73.1	2.65	16.1	**6836**	1	186.5	218.5	1	2.00

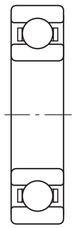
Single-row deep groove ball bearings

Koyo

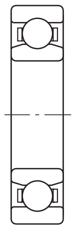
d (180) ~ (220) mm



Design 1



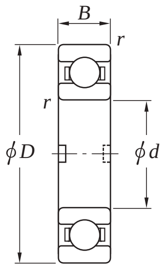
Design 2



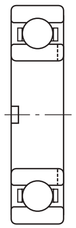
Design 3

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Bearing No.	De-sign	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0			d_a min.	D_a max.	r_a max.	
180	250	33	2	153	129	4.70	16.3	**6936**	2	189	241	2	4.90
	259.5	33	2	142	127	4.45	16.5	**306840**	2	189	250.5	2	6.10
	265	33	2	175	147	5.30	16.2	**SB3627**	2	189	256	2	6.20
	280	31	2	169	148	5.15	16.4	**16036**	2	189	271	2	7.55
	280	46	2.1	227	194	7.15	15.8	**6036**	2	191	269	2	10.3
	320	52	4	284	241	12.0	15.1	**6236**	2	196	304	3	18.3
	380	75	4	443	407	22.1	13.9	**6336**	2	196	364	3	44.7
190	240	24	1.5	91.4	88.1	3.10	16.1	**6838**	1	198	232	1.5	2.60
	259.5	33	2	141	127	4.35	16.6	**SB382633**	2	199	250.5	2	5.10
	260	33	2	158	138	4.85	16.4	**6938**	2	199	251	2	5.20
	269.5	33	2	174	148	5.25	16.3	**306627A**	2	199	260.5	2	6.50
	290	31	2	173	158	5.20	16.6	**16038**	2	199	281	2	7.85
	290	46	2.1	235	201	7.35	15.8	**6038**	2	201	279	2	10.8
	340	55	4	319	281	13.7	15.0	**6238**	2	206	324	3	23.0
	400	78	5	443	415	21.3	14.1	**6338**	2	210	380	4	51.5
200	250	24	1.5	97.6	93.6	3.20	16.1	**6840**	2	208	242	1.5	2.70
	279.5	38	2.1	179	158	5.35	16.4	**360278**	2	211	268.5	2	7.40
	280	38	2.1	196	168	5.80	16.2	**6940**	2	211	269	2	7.30
	289.5	38	2.1	206	176	6.10	16.1	**306841**	2	211	278.5	2	8.90
	310	34	2	201	180	5.95	16.4	**16040**	2	209	301	2	10.1
	310	51	2.1	272	243	11.3	15.6	**6040**	2	211	299	2	14.0
	360	58	4	336	311	14.4	15.2	**6240**	2	216	344	3	28.2
	420	80	5	513	506	25.5	14.0	**6340**	2	220	400	4	58.0
210	299.5	38	2.1	213	189	6.35	16.2	**SB4230**	2	221	288.5	2	8.80
220	270	24	1.5	101	101	3.35	16.0	**6844**	2	228	262	1.5	3.00
	300	38	2.1	201	180	5.85	16.4	**6944**	2	231	289	2	7.90
	309.5	38	2.1	188	178	5.65	16.5	**306867**	2	231	298.5	2	9.40
	319.5	46	2.1	241	220	7.30	16.1	**SB4432A**	2	231	308.5	2	11.9

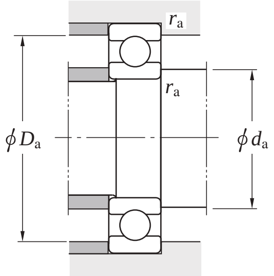
d (220) ~ (280) mm



Design 4



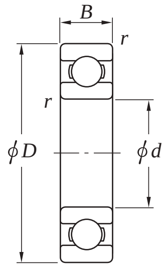
Design 5



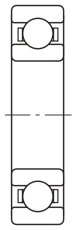
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Bearing No.	De-sign	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0			d_a min.	D_a max.	r_a max.	
220	340	37	2.1	225	217	6.65	16.5	**16044**	2	231	329	2	13.2
	340	56	3	294	271	12.0	15.6	**6044**	2	233	327	2.5	18.3
	400	65	4	389	376	16.8	15.1	**6244**	2	236	384	3	37.0
	460	88	5	542	539	26.7	13.8	**6344**	2	240	440	4	71.6
230	329.5	40	2.1	229	213	6.75	16.3	**306842A**	2	241	318.5	2	11.9
	339.5	45	3	279	267	11.1	16	**SB4634**	2	243	326.5	2.5	13.6
240	300	28	2	135	135	4.25	16.1	**6848**	2	249	291	2	4.50
	320	38	2.1	205	192	5.95	16.5	**6948**	2	251	309	2	8.50
	329.5	40	2.1	217	205	6.30	16.5	**SB4833**	2	251	318.5	2	9.80
	360	37	2.1	230	228	6.75	16.5	**16048**	2	251	349	2	14.1
	360	56	3	305	296	12.3	15.9	**6048**	2	253	347	2.5	19.7
	440	72	4	424	431	18.2	15.2	**6248**	2	256	424	3	51.0
	500	95	5	587	624	28.2	14.2	**6348**	2	260	480	4	93.3
250	340	42	2.1	210	202	6.05	16.5	**SB5034A**	2	261	329	2	10.8
	349.5	46	2.1	246	238	7.25	16.4	**SB5035**	2	261	338.5	2	13.1
260	320	28	2	141	146	4.40	16.0	**6852**	2	269	311	2	4.80
	360	46	2.1	266	263	10.2	16.3	**6952**	2	271	349	2	14.4
	369.5	46	2.1	287	289	11.2	16.2	**306862**	2	271	358.5	2	16.0
	379.5	56	3	316	321	12.6	16.1	**SB5238**	2	273	366.5	2.5	20.3
	400	44	3	295	310	11.5	16.4	**16052**	2	273	387	2.5	21.6
	400	65	4	364	377	15.0	15.8	**6052**	2	276	384	3	29.3
	480	80	5	502	541	22.2	15.1	**6252**	2	280	460	4	68.2
270	379.5	46	2.1	285	290	11.0	16.3	**SB5438**	2	281	368.5	2	15.8
280	350	33	2	179	183	5.35	16.1	**6856**	2	289	341	2	7.40
	380	46	2.1	273	283	10.5	16.5	**6956**	2	291	369	2	15.1
	389.5	46	2.1	295	310	11.5	16.4	**306861A**	2	291	378.5	2	18.0
	420	44	3	302	331	11.7	14.7	**16056**	2	293	407	2.5	22.9

Single-row deep groove ball bearings

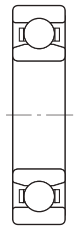
d (280) ~ 340 mm



Design 1



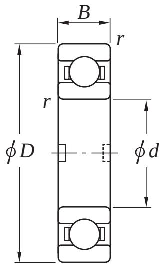
Design 2



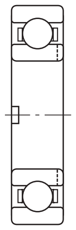
Design 3

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Bearing No.	De-sign	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0			d_a min.	D_a max.	r_a max.	
280	420	65	4	377	408	15.5	16.0	**6056**	2	296	404	3	31.0
	500	80	5	529	599	23.2	15.3	**6256**	2	300	480	4	71.8
290	400	52	4	293	311	11.3	16.5	**SB5840**	2	306	384	3	19.6
	409.5	56	3	324	347	12.8	16.3	**SB5841**	2	303	396.5	2.5	22.2
	419.5	60	4	346	377	13.8	16.2	**SB584260**	2	306	403.5	3	26.5
300	380	38	2.1	224	230	6.45	16.2	**6860**	2	311	369	2	10.5
	419.5	56	3	323	349	12.5	16.4	**SB604256**	2	313	406.5	2.5	22.9
	420	56	3	345	377	13.7	16.2	**6960**	2	313	407	2.5	24.1
	429.5	56	3	322	350	12.4	16.4	**SB6043**	2	313	416.5	2.5	26.7
	460	50	4	355	405	14.0	16.4	**16060**	2	316	447	3	32.2
	460	74	4	444	482	18.4	15.6	**6060**	2	316	444	3	44.0
310	429.5	60	4	344	379	13.5	16.3	**SB624360**	2	326	413.5	3	25.3
320	400	38	2.1	227	239	6.50	16.1	**6864**	2	331	389	2	11.0
	440	56	3	356	404	14.1	16.4	**6964**	2	333	427	2.5	25.5
	449.5	56	3	364	411	14.3	16.3	**SB6445A**	2	333	436.5	2.5	26.4
	480	50	4	364	432	14.3	16.5	**16064**	2	336	467	3	33.9
	480	74	4	441	487	17.8	15.7	**6064**	2	336	464	3	46.0
330	459.5	56	3	377	439	15.0	16.4	**SB6646**	2	343	446.5	2.5	28.4
340	420	38	2.1	231	249	6.60	16.1	**6868**	2	351	409	2	11.5
	449.5	56	3	352	407	13.7	16.5	**SB684556**	2	353	436.5	2.5	22.9
	460	56	3	352	407	13.7	16.5	**6968**	2	353	447	2.5	26.8
	479.5	65	3	413	480	16.5	16.2	**SB6848**	2	353	466.5	2.5	35.5
	489.5	60	5	412	481	16.3	16.2	**SB6849**	2	360	469.5	4	36.4
	520	57	4	419	512	16.8	16.4	**16068**	2	356	507	3	46.8
	520	82	5	552	661	23.7	15.6	**6068**	2	360	500	4	61.8
	540	90	5	578	679	24.8	15.4	**SB6854**	2	360	520	4	77.2
	620	92	6	639	817	27.7	15.6	**6268**	2	364	596	5	131
	710	118	7.5	880	1 160	41.7	14.7	**6368**	2	372	678	6	238

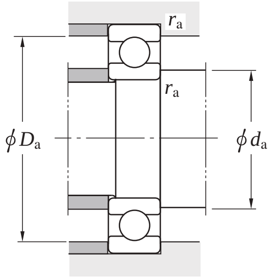
d 360 ~ (460) mm



Design 4



Design 5

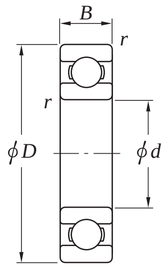


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Bearing No.	De-sign	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0			d_a min.	D_a max.	r_a max.	
360	440	38	2.1	240	268	6.95	16.0	**6872**	2	371	429	2	12.0
	480	56	3	362	432	14.0	16.5	**6972**	2	373	467	2.5	28.2
	509.5	70	5	455	550	18.4	16.2	**SB725170**	2	380	489	4	42.7
	540	57	4	431	546	17.2	16.5	**16072**	2	376	527	3	49.0
	540	82	5	548	668	23.0	15.7	**6072**	2	380	520	4	64.7
	550	85	5	547	669	22.9	15.8	**SB7255**	2	380	530	4	71.9
380	480	46	2.1	305	359	8.95	16.2	**6876**	2	391	469	2	20.0
	520	65	4	440	552	17.6	16.4	**6976**	2	396	504	3	40.8
	560	82	5	572	725	24.1	15.9	**6076**	2	400	540	4	67.6
400	500	46	2.1	311	374	9.10	16.1	**6880**	2	411	489	2	20.5
	540	65	4	453	588	18.1	16.5	**6980**	2	416	524	3	42.7
	600	63	5	447	587	17.5	16.5	**16080**	2	420	580	4	65.0
	600	90	5	635	824	27.0	15.7	**6080**	2	420	580	4	87.7
	720	130	6	785	1 080	34.2	15.5	**SB8072A**	4	424	696	5	232
420	520	46	2.1	316	389	9.25	16.1	**6884**	2	431	509	2	21.5
	560	65	4	449	588	17.7	16.5	**6984**	2	436	544	3	43.5
	620	90	5	663	894	28.3	15.8	**6084**	2	440	600	4	91.2
430	600	75	4	510	678	20.2	16.4	**SB8660**	2	446	584	3	64.6
440	540	46	2.1	321	404	9.40	16.0	**6888**	2	451	529	2	22.5
	600	74	4	529	676	21.4	16.4	**6988**	2	456	584	3	61.3
	619	75	4	527	724	21.1	16.5	**SB8862A**	2	456	603	3	70.3
	650	67	5	508	710	20.2	16.5	**16088**	2	460	630	4	81.7
	650	94	6	658	902	27.5	16	**6088**	2	464	626	5	105
450	630	75	4	509	711	20.3	16.5	**SB9063**	2	466	614	3	72
460	580	56	3	393	517	11.7	16.2	**6892**	2	473	567	2.5	35.0
	620	74	4	509	711	20.3	16.5	**6992**	2	476	604	3	61.7
	659	80	4	605	854	24.6	16.3	**SB9266**	2	476	643	3	90

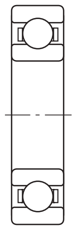
Single-row deep groove ball bearings

Koyo

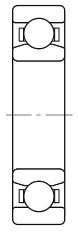
d (460) ~ (670) mm



Design 1



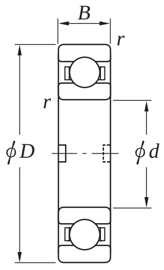
Design 2



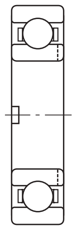
Design 3

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Bearing No.	De-sign	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0			d_a min.	D_a max.	r_a max.	
460	680	71	5	539	767	21.4	16.5	**16092**	2	480	660	4	91.2
	680	100	6	722	1 000	30.4	15.8	**6092**	2	484	656	5	124
480	600	56	3	401	539	12.0	16.1	**6896**	2	493	587	2.5	36.5
	700	100	6	754	1 090	32.0	15.9	**6096**	2	504	676	5	127
500	620	56	3	409	561	12.2	16.1	**68/500**	2	513	607	2.5	37.5
	670	78	5	556	807	22.2	16.5	**69/500**	2	520	650	4	75.2
	720	100	6	749	1 100	31.3	16.0	**60/500**	2	524	696	5	128
520	679.5	78	3	571	848	23.0	16.4	**SB520-1**	2	533	666.5	2.5	72.2
530	650	56	3	414	581	12.4	16.0	**68/530**	2	543	637	2.5	39.5
	710	82	5	640	975	26.0	16.6	**69/530**	2	550	690	4	89.2
	760	100	6	777	1 180	32.4	16.2	**SB530**	2	554	736	5	144
560	680	56	3	420	602	12.5	16.0	**68/560**	2	573	667	2.5	42.0
	820	115	6	954	1 520	41.4	15.9	**60/560**	2	584	796	5	199
570	799	115	6	801	1 280	33.3	16.3	**SB570**	2	594	775	5	172
590	820	105	6	796	1 280	32.7	16.4	**SB590A**	2	614	796	5	166
600	730	60	3	471	707	14.2	16.0	**68/600**	2	613	717	2.5	52.0
	800	90	5	668	1 200	26.9	16.4	**69/600**	2	620	780	4	127
610	720	55	3	378	559	14.4	15.7	**SB610D**	2	623	707	2.5	38.8
	730	54	3	377	559	14.3	15.7	**SB610A**	3	623	717	2.5	42.3
	849.5	100	6	823	1 370	34.0	16.5	**SB610C**	2	634	825.5	5	172
	869	120	5	907	1 520	38.2	16.3	**SB610B**	5	630	849	4	221
630	780	69	4	558	875	17.0	16.1	**68/630**	2	646	767	3	69.0
	920	128	7.5	1 050	1 770	45.0	16.0	**60/630**	2	662	888	6	276
670	820	69	4	565	908	17.2	16.0	**68/670**	2	686	807	3	76.9

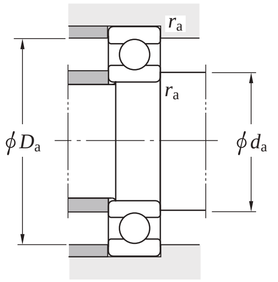
d (670) ~ 1 000 mm



Design 4



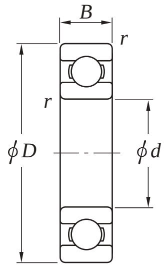
Design 5



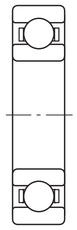
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Bearing No.	De-sign	Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	f_0			d_a min.	D_a max.	r_a max.	
670	980	136	7.5	1 090	1 920	46.4	16.2	**60/670**	2	702	948	6	337
700	979	150	6	1 050	1 900	44.4	16.4	**SB700**	5	724	955	5	326
710	870	74	4	619	1 030	19.0	16.0	**68/710**	2	726	854	3	93.8
	1 030	140	7.5	1 270	2 310	55.7	16.0	**60/710**	2	742	998	6	394
	1 080	160	7.5	1 320	2 490	58.2	16.1	**SB710**	2	742	1 048	6	524
730	900	78	5	595	1 010	23.5	15.9	**SB730**	3	750	880	4	105
750	920	78	5	642	1 110	19.9	15.9	**68/750**	2	770	900	4	111
	1 090	150	7.5	1 320	2 500	57.6	16.1	**60/750**	2	782	1 058	6	473
800	980	82	5	730	1 310	22.6	16.0	**68/800**	2	820	960	4	127
	1 150	155	7.5	1 360	2 690	59.2	16.3	**60/800**	2	832	1 118	6	533
830	1 080	115	6	994	1 900	40.8	16.3	**SB830**	4	854	1 056	5	275
850	1 030	82	5	738	1 350	22.8	15.9	**68/850**	2	870	1 010	4	135
	1 120	118	6	1 130	2 240	47.4	16.4	**69/850**	2	874	1 096	5	315
	1 178	160	7.5	1 350	2 710	57.7	16.4	**SB850A**	2	882	1 146	6	524
880	1 130	115	6	1 010	1 980	41.5	16.2	**SB880**	2	904	1 106	5	265
900	1 090	85	5	764	1 450	23.8	15.9	**68/900**	2	920	1 070	4	162
	1 180	122	6	1 110	2 220	45.9	16.3	**69/900**	2	924	1 156	5	347
920	1 180	120	6	1 030	2 070	42.4	16.2	**SB920**	2	944	1 156	5	320
930	1 010	40	2.1	273	494	8.70	14.3	**SB930A**	2	946	994	2	31
950	1 150	90	5	876	1 740	27.7	15.9	**68/950**	2	970	1 130	4	190
	1 250	132	7.5	1 240	2 580	51.8	16.3	**69/950**	2	982	1 218	6	431
1 000	1 220	100	6	987	2 030	31.4	16.0	**68/1000**	2	1 024	1 196	5	245
	1 380	190	7.5	1 460	3 220	62.2	16.4	**SB1000**	2	1 032	1 348	6	837

Single-row deep groove ball bearings

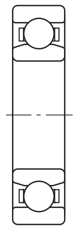
d 1 060 ~ 1 420 mm



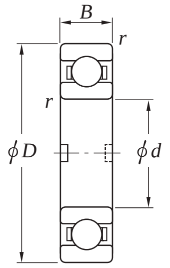
Design 1



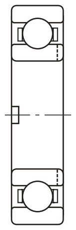
Design 2



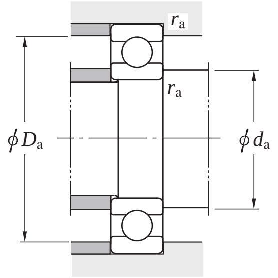
Design 3



Design 4



Design 5

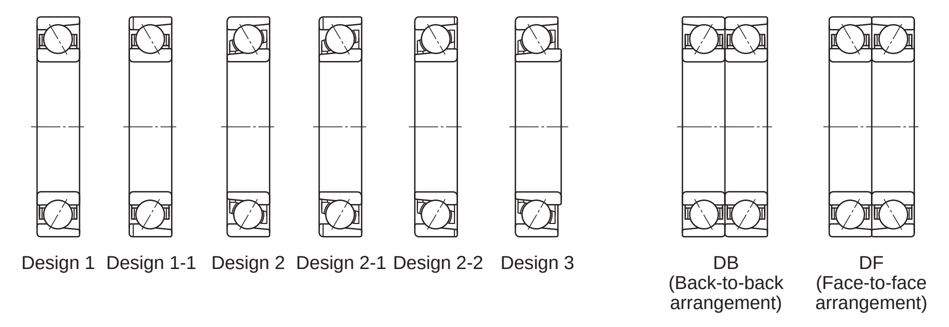


Boundary dimensions (mm) d	D	B	r min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Bearing No.	De-sign	Mounting dimensions (mm) d_a min.	D_a max.	r_a max.	(Refer.) Mass (kg)
1 060	1 280	100	6	998	2 100	31.7	15.9	**68/1060**	2	1 084	1 256	5	251
1 090	1 350	122	7.5	1 110	2 410	45.9	16	**SB1090**	2	1 122	1 318	6	376
1 100	1 200	50	2.1	395	744	12.1	14.2	**SB1100A**	2	1 116	1 184	2	56
1 120	1 360	106	6	834	1 790	26.2	15.6	**68/1120**	2	1 144	1 336	5	319
1 200	1 450	112	7.5	1 140	2 580	47.1	15.8	**SB1200**	2	1 232	1 418	6	363
1 240	1 510	122	7.5	1 260	2 930	52.5	15.9	**SB1240**	2	1 272	1 478	6	446
1 320	1 600	122	6	1 300	3 130	42.4	15.9	**68/1320**	2	1 344	1 576	5	504
1 400	1 700	132	7.5	1 310	3 510	42.4	15.8	**68/1400**	2	1 432	1 668	6	621
1 420	1 800	150	9.5	1 440	3 630	60.1	15.8	**SB1400B**	2	1 460	1 760	8	915

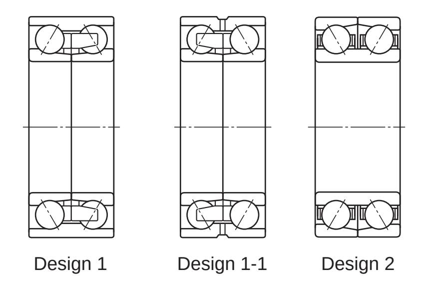
Angular contact ball bearings

Koyo®

■ Single-row, matched pair (page 104)



■ Double-row (page 116)



- Single-row bearings can accommodate radial load and axial load in one direction.
- DB and DF matched pair bearings and double-row bearings can accommodate radial load and axial load in both directions.
- Two or more single-row angular contact ball bearings are often combined in order to increase the load rating or rigidity. In this case, two types of arrangements, back-to-back arrangement (DB) and face-to-face arrangement (DF), are available. If the load rating of a single-row angular contact ball bearing is insufficient, use the tandem arrangement (DT).

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512-1995.
Tolerances	As specified in JIS B 1514, class 0 or 6. (refer to Table 2-2 on page 18.)
Contact angle (α)	The standard contact angles are 15°, 30° and 40°. Bearings with a smaller contact angle are more suitable for applications involving high-speed rotation. Those with a larger contact angle feature superior axial load resistance. (The standard contact angles of single-row and matched pair angular contact ball bearings) 15°······supplementary code C 30°······supplementary code A or no indication 40°······supplementary code B [Note] Contact angles of double-row angular contact ball bearings are shown in specification tables.
Allowable misalignment	Single-row······0.000 6 rad (2') : Matched pair, double-row······misalignment not allowed
Internal clearance	(refer to Table 4-3 on pages 50 and 51)
Standard cages	Machined cage

Equivalent radial load

Single-row and matched pair angular contact ball bearings

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$	e	Single-row and tandem (DT) arrangement				Back-to-back (DB) and face-to-face (DF) arrangement			
			$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$		$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
			X	Y	X	Y	X	Y	X	Y
$\alpha = 15°$	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
$\alpha = 30°$	–	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
$\alpha = 40°$	–	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93

For i, use 2 for DB & DF and 1 for single & DT.
Factor f_0 is shown in the bearing specification table.

Static equivalent radial load

$P_{0r} = X_0F_r + Y_0F_a$

In reference to single-row and tandem arrangement bearings, when $P_{0r} < F_r$, $P_{0r} = F_r$

Contact angle	Single-row and tandem (DT) arrangement		Back-to-back (DB) and face-to-face (DF) arrangement	
	X_0	Y_0	X_0	Y_0
$\alpha = 15°$	0.5	0.46	1	0.92
$\alpha = 30°$	0.5	0.33	1	0.66
$\alpha = 40°$	0.5	0.26	1	0.52

Double-row angular contact ball bearings

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
$\alpha = 30°$	0.80	1	0.78	0.63	1.24
$\alpha = 32°$	0.86	1	0.73	0.62	1.17

Static equivalent radial load

$P_{0r} = X_0F_r + Y_0F_a$

Contact angle	X_0	Y_0
$\alpha = 30°$	1	0.66
$\alpha = 32°$	1	0.63

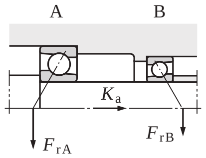
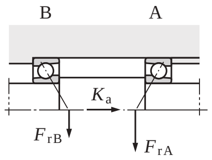
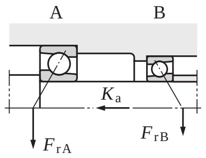
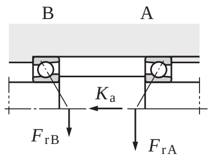
Dynamic equivalent load calculation : when a pair of single-row angular contact ball bearings is arranged face-to-face or back-to-back.

While radial loads F_{rA} and F_{rB} are applied to bearings A and B, axial load K_a externally acts in the directions shown in the figures below.

[Remark]

When radial load is applied to a single-row angular contact ball bearing, axial load generated as an axial component of force acts on another bearing. The axial load can be obtained by the following equation.

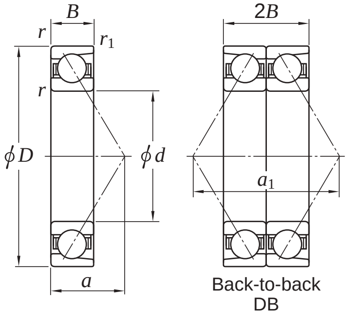
$$F_a = \frac{F_r}{2Y}$$

Paired mounting	Loading condition	Bearing	Axial load	Dynamic equivalent load
Back-to-back arrangement  Face-to-face arrangement  	$\frac{F_{rB}}{2Y_B} + K_a \geqq \frac{F_{rA}}{2Y_A}$	Bearing A	$\frac{F_{rB}}{2Y_B} + K_a$	$P_A = XF_{rA} + Y_A \left(\frac{F_{rB}}{2Y_B} + K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
		Bearing B	–	$P_B = F_{rB}$
	$\frac{F_{rB}}{2Y_B} + K_a < \frac{F_{rA}}{2Y_A}$	Bearing A	–	$P_A = F_{rA}$
		Bearing B	$\frac{F_{rA}}{2Y_A} - K_a$	$P_B = XF_{rB} + Y_B \left(\frac{F_{rA}}{2Y_A} - K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$
Back-to-back arrangement  Face-to-face arrangement  	$\frac{F_{rB}}{2Y_B} \leqq \frac{F_{rA}}{2Y_A} + K_a$	Bearing A	–	$P_A = F_{rA}$
		Bearing B	$\frac{F_{rA}}{2Y_A} + K_a$	$P_B = XF_{rB} + Y_B \left(\frac{F_{rA}}{2Y_A} + K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$
	$\frac{F_{rB}}{2Y_B} > \frac{F_{rA}}{2Y_A} + K_a$	Bearing A	$\frac{F_{rB}}{2Y_B} - K_a$	$P_A = XF_{rA} + Y_A \left(\frac{F_{rB}}{2Y_B} - K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
		Bearing B	–	$P_B = F_{rB}$

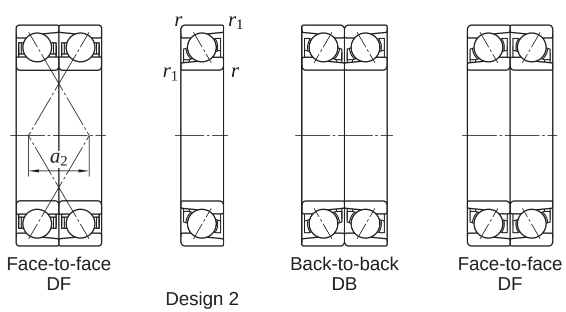
[Remarks] 1. These equations can be used when internal clearance and preload during operation are zero.
2. Radial load is treated as positive in the calculation, if it is applied in a direction opposite that shown in Fig. above

Single-row, matched pair angular contact ball bearings

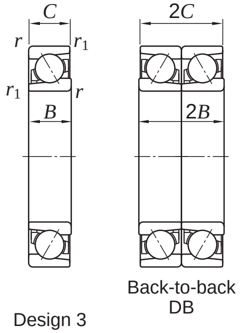
d 100 ~ (130) mm



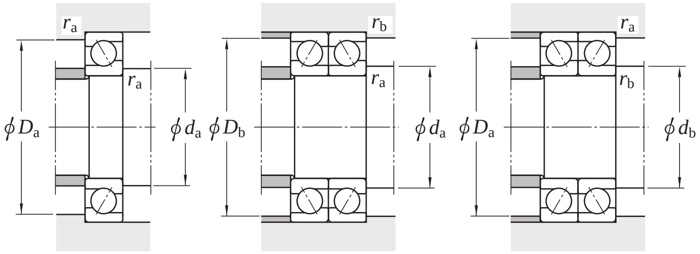
Design 1



Design 2



Design 3

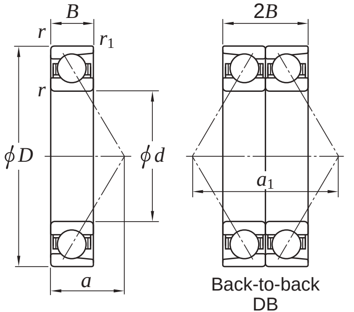


Boundary dimensions (mm)						Basic load ratings (kN) Single row		Basic load ratings (kN) Matched pair		Fatigue load limit (kN) C_u		Bearing No.			De-sign	Load center (mm)			Mounting dimensions (mm)						(Refer.) Mass Single row (kg)
d	D	B	C	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(Single row)	(Matched pair)	Single row	Back-to-back DB	Face-to-face DF		a	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
100	150	24	—	1.5	1	85.5	70.6	139	141	3.35	6.75	**7020**	**7020DB**	**7020DF**	1	48.1	96.2	48.2	108.5	—	141.5	144.5	1.5	1	1.37
	150	24	—	1.5	1	76.5	63.6	124	127	2.95	5.90	**7020B**	**7020BDB**	**7020BDF**	1	64.4	128.9	80.9	108.5	—	141.5	144.5	1.5	1	1.37
	180	34	—	2.1	1.1	171	117	279	235	6.10	12.2	**7220**	**7220DB**	**7220DF**	1	57.7	115.4	47.4	112	—	168	173	2	1	3.32
	180	34	—	2.1	1.1	155	107	252	214	5.25	10.5	**7220B**	**7220BDB**	**7220BDF**	1	76.2	152.3	84.3	112	—	168	173	2	1	3.32
	215	47	—	3	1.1	229	161	373	323	6.60	13.2	**7320**	**7320DB**	**7320DF**	1	69.4	138.8	44.8	114	—	201	208	2.5	1	7.53
	215	47	—	3	1.1	210	148	342	297	6.10	12.2	**7320B**	**7320BDB**	**7320BDF**	1	90.2	180.4	86.4	114	—	201	208	2.5	1	7.53
105	160	26	—	2	1	99.7	81.9	162	164	3.80	7.60	**7021**	**7021DB**	**7021DF**	1	51.8	103.7	51.7	115	—	150	154.5	2	1	1.73
	190	36	—	2.1	1.1	187	132	303	265	6.70	13.4	**7221**	**7221DB**	**7221DF**	1	61.0	122.1	50.1	117	—	178	183	2	1	3.95
	190	36	—	2.1	1.1	169	121	275	241	5.80	11.6	**7221B**	**7221BDB**	**7221BDF**	1	80.5	161.0	89.0	117	—	178	183	2	1	3.95
	225	49	—	3	1.1	260	193	422	386	7.75	15.5	**7321**	**7321DB**	**7321DF**	1	72.1	144.3	46.3	119	—	211	218	2.5	1	8.62
	225	49	—	3	1.1	238	177	387	355	7.15	14.3	**7321B**	**7321BDB**	**7321BDF**	1	93.7	187.5	89.5	119	—	211	218	2.5	1	8.62
110	170	28	—	2	1	115	92.8	187	186	4.30	8.55	**7022**	**7022DB**	**7022DF**	1	54.4	108.9	52.9	120	—	160	164.5	2	1	2.14
	170	28	—	2	1	103	83.7	167	167	3.75	7.45	**7022B**	**7022BDB**	**7022BDF**	1	72.7	145.5	89.5	120	—	160	164.5	2	1	2.14
	200	38	—	2.1	1.1	202	148	329	297	7.30	14.6	**7222**	**7222DB**	**7222DF**	1	64.3	128.7	52.7	122	—	188	193	2	1	4.65
	200	38	—	2.1	1.1	183	135	298	270	6.35	12.7	**7222B**	**7222BDB**	**7222BDF**	1	84.9	169.7	93.7	122	—	188	193	2	1	4.65
	240	50	—	3	1.1	290	226	472	452	8.75	17.5	**7322**	**7322DB**	**7322DF**	1	76.4	152.7	52.7	124	—	226	233	2.5	1	10.1
	240	50	—	3	1.1	266	208	433	416	8.05	16.1	**7322B**	**7322BDB**	**7322BDF**	1	99.6	199.3	99.3	124	—	226	233	2.5	1	10.1
120	180	28	—	2	1	121	103	196	206	4.50	9.00	**7024**	**7024DB**	**7024DF**	1	57.3	114.6	58.6	130	—	170	174.5	2	1	2.27
	180	28	—	2	1	108	93.0	176	186	3.95	7.85	**7024B**	**7024BDB**	**7024BDF**	1	76.9	153.9	97.9	130	—	170	174.5	2	1	2.27
	215	40	—	2.1	1.1	218	166	354	332	7.85	15.7	**7224**	**7224DB**	**7224DF**	1	68.5	137.0	57.0	132	—	203	208	2	1	5.49
	215	40	—	2.1	1.1	197	151	321	302	6.80	13.6	**7224B**	**7224BDB**	**7224BDF**	1	90.3	180.5	100.5	132	—	203	208	2	1	5.49
	260	55	—	3	1.1	308	252	500	504	9.45	18.9	**7324**	**7324DB**	**7324DF**	1	82.3	164.7	54.7	134	—	246	253	2.5	1	12.6
	260	55	—	3	1.1	282	231	457	462	8.65	17.3	**7324B**	**7324BDB**	**7324BDF**	1	107.2	214.4	104.4	134	—	246	253	2.5	1	12.6
130	200	33	—	2	1	147	125	238	251	5.25	10.5	**7026**	**7026DB**	**7026DF**	1	64.1	128.3	62.3	140	—	190	194.5	2	1	3.43
	200	33	—	2	1	131	113	213	226	4.60	9.20	**7026B**	**7026BDB**	**7026BDF**	1	85.7	171.5	105.5	140	—	190	194.5	2	1	3.43
	230	40	—	3	1.1	245	198	398	395	7.60	15.2	**7226**	**7226DB**	**7226DF**	1	72.0	143.9	63.9	144	—	216	223	2.5	1	6.21
	230	40	—	3	1.1	222	180	360	360	6.95	13.9	**7226B**	**7226BDB**	**7226BDF**	1	95.5	191.0	111.0	144	—	216	223	2.5	1	6.21
	280	58	—	4	1.5	376	329	611	659	11.8	23.7	**7326**	**7326DB**	**7326DF**	1	88.8	177.5	61.5	148	—	262	271.5	3	1.5	15.4

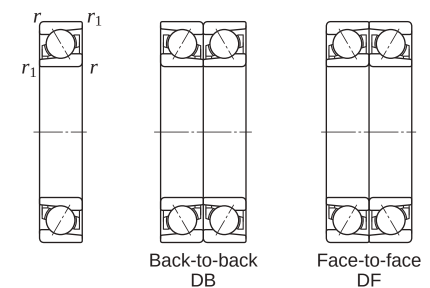
[Remark] a_1, a_2 : Load center spread

Single-row, matched pair angular contact ball bearings

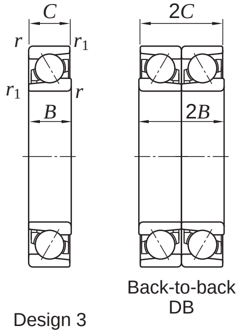
d (130) ~ (160) mm



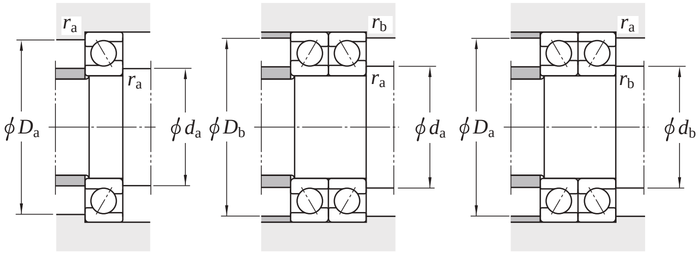
Design 1



Design 2



Design 3

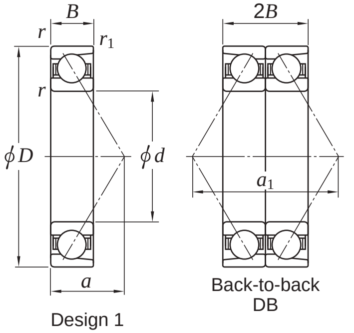


Boundary dimensions (mm)						Basic load ratings (kN)				Fatigue load limit (kN) C_u		Bearing No.			De-sign	Load center (mm)			Mounting dimensions (mm)						(Refer.) Mass Single row (kg)
						Single row		Matched pair				Single row	Back-to-back DB	Face-to-face DF											
d	D	B	C	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(Single row)	(Matched pair)					a	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
130	280	58	—	4	1.5	312	268	507	536	9.70	19.4	**7326B**	**7326BDB**	**7326BDF**	1	115.0	230.0	114.0	148	—	262	271.5	3	1.5	15.4
140	190	24	—	1.5	1	99.7	93.0	162	186	3.75	7.50	**7928**	**7928DB**	**7928DF**	1	59.6	119.3	71.3	148.5	—	181.5	184.5	1.5	0.8	1.90
	190	24	—	1.5	1	88.8	81.0	144	163	3.25	6.55	**7928B**	**7928BDB**	**7928BDF**	1	81.2	162.5	114.5	148.5	—	181.5	184.5	1.5	0.8	1.80
	210	33	—	2	1	150	133	243	265	5.30	10.6	**7028**	**7028DB**	**7028DF**	1	67.0	134.1	68.1	150	—	200	204.5	2	1	3.64
	210	33	—	2	1	134	119	217	237	4.65	9.25	**7028B**	**7028BDB**	**7028BDF**	1	89.9	179.8	113.8	150	—	200	204.5	2	1	3.64
	250	42	—	3	1.1	273	234	443	468	8.65	17.3	**7228**	**7228DB**	**7228DF**	1	77.3	154.6	70.6	154	—	236	243	2.5	1	7.76
	250	42	—	3	1.1	247	213	401	426	7.85	15.7	**7228B**	**7228BDB**	**7228BDF**	1	102.8	205.6	121.6	154	—	236	243	2.5	1	7.76
	300	62	—	4	1.5	411	374	668	748	13.0	26.1	**7328**	**7328DB**	**7328DF**	1	94.5	189.0	65.0	158	—	282	291.5	3	1.5	18.8
	300	62	—	4	1.5	378	344	613	688	12.0	24.0	**7328B**	**7328BDB**	**7328BDF**	1	123.3	246.6	122.6	158	—	282	291.5	3	1.5	18.8
145	220	38	—	2.1	1.1	167	146	271	292	5.60	11.2	**AC2922**	**AC2922DB**	**AC2922DF**	1	71.7	143.4	67.4	157	—	208	213	2	1	4.82
150	210	28	—	2	1	134	125	218	250	4.80	9.60	**7930**	**7930DB**	**7930DF**	1	66.0	131.9	75.9	160	—	200	204.5	2	1	2.90
	210	28	—	2	1	120	109	194	218	4.20	8.40	**7930B**	**7930BDB**	**7930BDF**	1	89.5	179.0	123.0	160	—	200	204.5	2	1	2.90
	210	25	28	2	1	120	109	194	218	4.20	8.40	**AC3021B**	**AC3021BDB**	—	3	88	176	—	160	—	200	204.5	2	1	2.73
	225	35	—	2.1	1.1	171	154	278	308	5.95	11.9	**7030**	**7030DB**	**7030DF**	1	72.1	144.2	74.2	162	—	213	218	2	1	4.43
	225	35	—	2.1	1.1	153	138	249	275	5.20	10.4	**7030B**	**7030BDB**	**7030BDF**	1	96.2	192.3	122.3	162	—	213	218	2	1	4.43
	229.9	35	—	2.1	2.1	164	143	267	287	5.35	10.7	**AC302335B**	**AC302335BDB**	—	2	97.2	194.4	—	162	—	217.9	217.9	2	2	4.70
	270	45	—	3	1.1	310	280	504	560	9.95	19.9	**7230**	**7230DB**	**7230DF**	1	83.1	166.3	76.3	164	—	256	263	2.5	1	9.75
	270	45	—	3	1.1	281	254	456	509	9.05	18.1	**7230B**	**7230BDB**	**7230BDF**	1	110.6	221.2	131.2	164	—	256	263	2.5	1	9.75
	320	65	—	4	1.5	434	414	706	829	14.0	27.9	**7330**	**7330DB**	**7330DF**	1	100.3	200.7	70.7	168	—	302	311.5	3	1.5	22.4
	320	65	—	4	1.5	397	380	645	760	12.8	25.6	**7330B**	**7330BDB**	**7330BDF**	1	131.1	262.2	132.2	168	—	302	311.5	3	1.5	22.4
160	215	28	25	2	1.5	107	102	174	204	3.85	7.70	**AC3222B**	**AC3222BDB**	—	3	91.2	182.3	—	170	—	205	208	2	1.5	2.60
	220	28	—	2	1	136	129	221	259	4.85	9.70	**7932**	**7932DB**	**7932DF**	1	68.9	137.7	81.7	170	—	210	214.5	2	1	3.00
	220	28	—	2	1	121	113	197	226	4.25	8.45	**7932B**	**7932BDB**	**7932BDF**	1	93.7	187.4	131.4	170	—	210	214.5	2	1	3.00
	229.5	33	—	2	1	138	128	224	256	4.75	9.45	**AC322333B**	**AC322333BDB**	**AC322333BDF**	2	98.3	196.6	130.6	170	165.5	219.5	224	2	1	4.40
	240	38	—	2.1	1.1	194	176	315	353	6.65	13.3	**7032**	**7032DB**	**7032DF**	1	76.8	153.5	77.5	172	—	228	233	2	1	5.45
	240	38	—	2.1	1.1	173	158	282	316	5.80	11.6	**7032B**	**7032BDB**	**7032BDF**	1	102.9	205.8	129.8	172	—	228	233	2	1	5.45
	290	48	—	3	1.1	288	263	468	525	9.05	18.1	**7232**	**7232DB**	**7232DF**	1	89.0	177.9	81.9	174	—	276	283	2.5	1	12.1

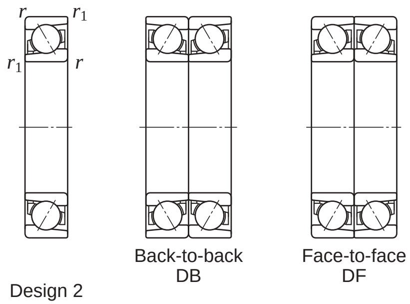
[Remark] a_1, a_2 : Load center spread

Single-row, matched pair angular contact ball bearings

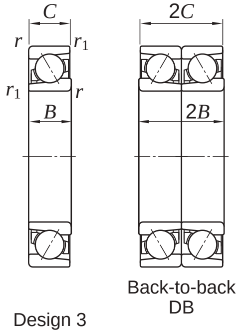
d (160) ~ (190) mm



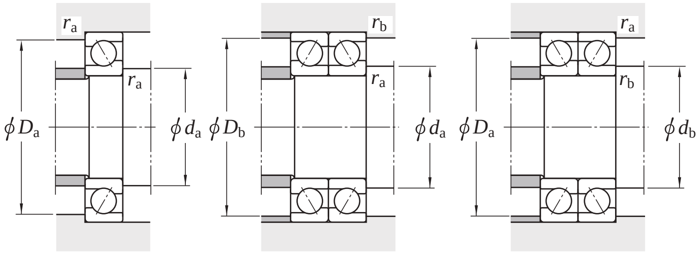
Design 1



Design 2



Design 3



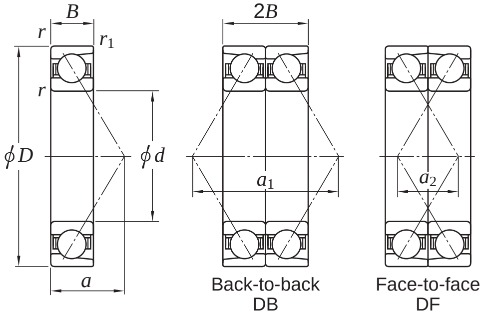
Boundary dimensions (mm)						Basic load ratings (kN)				Fatigue load limit (kN)		Bearing No.			De-sign	Load center (mm)			Mounting dimensions (mm)						(Refer.) Mass
						Single row		Matched pair		C_u															
d	D	B	C	r min.	r_1 1) min.	C_r	C_{0r}	C_r	C_{0r}	(Single row)	(Matched pair)	Single row	Back-to-back DB	Face-to-face DF		a	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	Single row (kg)
160	290	48	—	3	1.1	297	279	482	557	9.60	19.2	**7232B**	**7232BDB**	**7232BDF**	1	118.4	236.8	140.8	174	—	276	283	2.5	1	12.1
	340	68	—	4	1.5	456	455	741	909	14.9	29.7	**7332**	**7332DB**	**7332DF**	1	106.2	212.3	76.3	178	—	322	331.5	3	1.5	26.4
	340	68	—	4	1.5	415	416	675	831	13.6	27.2	**7332B**	**7332BDB**	**7332BDF**	1	138.9	277.8	141.8	178	—	322	331.5	3	1.5	26.4
170	230	28	—	2	1	142	139	230	278	5.10	10.2	**7934**	**7934DB**	**7934DF**	1	71.7	143.5	87.5	180	—	220	224.5	2	1	3.20
	230	28	—	2	1	126	122	205	243	4.45	8.85	**7934B**	**7934BDB**	**7934BDF**	1	97.9	195.8	139.8	180	—	220	224.5	2	1	3.20
	249.5	38	—	2	1	198	186	321	371	6.60	13.2	**AC342538**	**AC342538DB**	**AC342538DF**	1	79.6	159.3	83.3	180	—	239.5	244	2	1	5.80
	249.5	38	—	2	1	177	165	287	329	5.85	11.7	**AC342538B**	**AC342538BDB**	**AC342538BDF**	2	107.1	214.2	138.2	180	175.5	239.5	244	2	1	6.10
	260	42	—	2.1	1.1	232	214	377	429	7.90	15.8	**7034**	**7034DB**	**7034DF**	1	83.1	166.2	82.2	182	—	248	253	2	1	7.58
	260	42	—	2.1	1.1	208	193	338	386	6.90	13.8	**7034B**	**7034BDB**	**7034BDF**	1	111.2	222.4	138.4	182	—	248	253	2	1	7.77
	310	52	—	4	1.5	340	331	552	661	11.0	22.0	**7234**	**7234DB**	**7234DF**	1	95.3	190.6	86.6	188	—	292	301.5	3	1.5	15.1
	310	52	—	4	1.5	306	300	497	600	10.0	20.0	**7234B**	**7234BDB**	**7234BDF**	1	126.7	253.4	149.4	188	—	292	301.5	3	1.5	15.1
	360	72	—	4	1.5	486	485	789	969	15.4	30.7	**7334**	**7334DB**	**7334DF**	1	112.5	225.0	81.0	188	—	342	351.5	3	1.5	31.2
	360	72	—	4	1.5	444	444	721	888	14.1	28.2	**7334B**	**7334BDB**	**7334BDF**	1	147.2	294.4	150.4	188	—	342	351.5	3	1.5	31.2
175	235	30	27	2	1	118	115	191	230	4.15	8.30	**AC3524B**	**AC3524BDB**	—	3	101.0	202.0	—	185	—	225	229.5	2	1	6.40
180	250	33	—	2	1	181	177	294	353	6.25	12.5	**7936**	**7936DB**	**7936DF**	1	78.6	157.2	91.2	190	—	240	244.5	2	1	4.80
	250	33	—	2	1	161	154	262	309	5.45	10.9	**7936B**	**7936BDB**	**7936BDF**	1	106.7	213.4	147.4	190	—	240	244.5	2	1	4.70
	259.5	33	—	2	1	180	176	292	353	6.15	12.3	**AC3626**	**AC3626DB**	**AC3626DF**	1	80.0	160.0	94.0	190	—	249.5	254	2	1	5.60
	259.5	33	—	2	1	160	154	261	308	5.35	10.7	**AC3626B**	**AC3626BDB**	**AC3626BDF**	1	108.8	217.6	151.6	190	—	249.5	254	2	1	5.70
	265	33	—	2	2	179	171	291	341	5.90	11.8	**AC3627B**	**AC3627BDB**	—	2	110.1	220.1	—	190	—	255	255	2	2	6.3
	280	46	—	2.1	1.1	265	253	430	506	9.15	18.3	**7036**	**7036DB**	**7036DF**	1	89.4	178.8	86.8	192	—	268	273	2	1	10.1
	280	46	—	2.1	1.1	237	228	385	457	7.95	15.9	**7036B**	**7036BDB**	**7036BDF**	1	119.5	239.0	147.0	192	—	268	273	2	1	10.2
	320	52	—	4	1.5	367	362	596	724	11.8	23.7	**7236**	**7236DB**	**7236DF**	1	98.2	196.3	92.3	198	—	302	311.5	3	1.5	15.7
	320	52	—	4	1.5	331	329	538	657	10.7	21.5	**7236B**	**7236BDB**	**7236BDF**	1	130.9	261.8	157.8	198	—	302	311.5	3	1.5	15.7
	380	75	—	4	1.5	466	488	757	976	15.1	30.1	**7336B**	**7336BDB**	**7336BDF**	1	155.0	309.9	159.9	198	—	362	371.5	3	1.5	40.0
190	255	33	29	2	1.1	137	136	222	272	4.70	9.40	**AC382633B**	**AC382633BDB**	—	3	109.8	219.7	—	200	—	245	248	2	1	4.30
	259.5	35	—	2	SP	148	147	240	295	5.10	10.2	**AC382635AB**	**AC382635ABDB**	**AC382635ABDF**	2	111.9	223.8	153.8	200	200	249.5	249	2	1	5.00
	260	33	—	2	1	179	176	291	352	6.05	12.1	**7938**	**7938DB**	**7938DF**	1	81.5	162.9	96.9	200	—	250	254.5	2	1	5.00

[Note] 1) SP indicates the specially chamfered form.

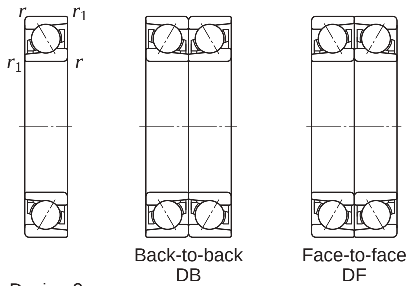
[Remark] a_1, a_2 : Load center spread

Single-row, matched pair angular contact ball bearings

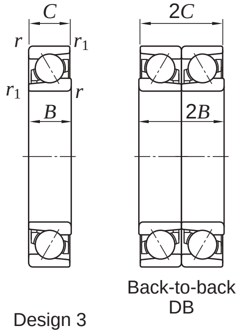
d (190) ~ 230 mm



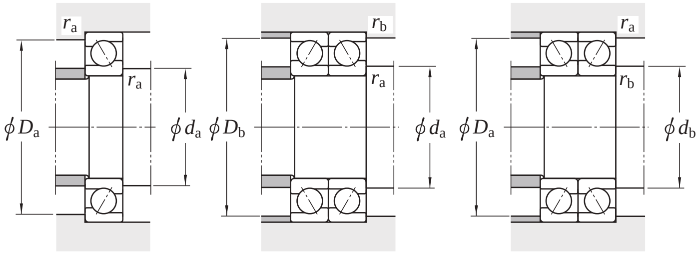
Design 1



Design 2



Design 3



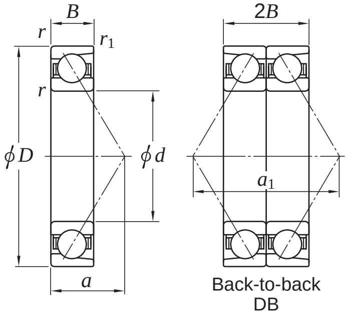
Boundary dimensions (mm)						Basic load ratings (kN)				Fatigue load limit (kN) C_u		Bearing No.			De-sign	Load center (mm)			Mounting dimensions (mm)						(Refer.) Mass Single row (kg)
						Single row		Matched pair																	
d	D	B	C	r min.	r_1 [1] min.	C_r	C_{0r}	C_r	C_{0r}	(Single row)	(Matched pair)	Single row	Back-to-back DB	Face-to-face DF		a	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
190	269.5	33	—	2	SP	183	177	297	354	6.05	12.1	**AC382733B**	**AC382733BDB**	**AC382733BDF**	2	113.0	226.0	160.0	200	196	259.5	263	2	1	6.00
	290	46	—	2.1	1.1	271	268	441	535	9.35	18.7	**7038**	**7038DB**	**7038DF**	1	92.3	184.6	92.6	202	—	278	283	2	1	10.8
	290	46	—	2.1	1.1	243	241	395	483	8.15	16.3	**7038B**	**7038BDB**	**7038BDF**	1	123.7	247.4	155.4	202	—	278	283	2	1	10.8
	340	55	—	4	1.5	379	390	616	779	12.4	24.7	**7238**	**7238DB**	**7238DF**	1	104.0	208.0	98.0	208	—	322	331.5	3	1.5	18.8
	340	55	—	4	1.5	341	353	555	706	11.2	22.4	**7238B**	**7238BDB**	**7238BDF**	1	138.7	277.4	167.4	208	—	322	331.5	3	1.5	18.8
	400	78	—	5	2	514	548	835	1 100	16.5	33.0	**7338B**	**7338BDB**	**7338BDF**	1	162.8	325.5	169.5	212	—	378	390	4	2	45.5
200	279.5	38	—	2.1	1.1	201	194	326	388	6.45	12.9	**AC4028B**	**AC4028BDB**	**AC4028BDF**	2	119.7	239.4	163.4	212	207	267.5	272.5	2	1	6.90
	280	38	—	2.1	1.1	231	231	376	463	7.70	15.4	**7940**	**7940DB**	**7940DF**	1	88.3	176.6	100.6	212	—	268	273	2	1	7.00
	280	38	—	2.1	1.1	201	194	326	388	6.45	12.9	**7940B**	**7940BDB**	**7940BDF**	1	119.7	239.4	163.4	212	—	268	273	2	1	7.00
	289.5	38	—	2.1	1.1	214	211	348	421	6.95	13.9	**AC4029B**	**AC4029BDB**	**AC4029BDF**	2	121.8	243.6	167.6	212	207	277.5	282.5	2	1	8.1
	310	46	—	3	1.1	274	274	445	547	8.85	17.7	**AC403146B**	**AC402146BDB**	**AC403146BDF**	2	130.0	260.0	168	214	214	296	303	2.5	1	13.1
	310	51	—	2.1	1.1	304	309	495	618	10.0	20.0	**7040**	**7040DB**	**7040DF**	1	99.1	198.3	96.3	212	—	298	303	2	1	12.7
	310	51	—	2.1	1.1	273	279	443	558	9.05	18.1	**7040B**	**7040BDB**	**7040BDF**	1	132.5	265.0	163.0	212	—	298	303	2	1	12.7
	360	58	—	4	1.5	405	423	658	847	13.1	26.2	**7240**	**7240DB**	**7240DF**	1	109.8	219.7	103.7	218	—	342	351.5	3	1.5	22.4
	360	58	—	4	1.5	365	384	593	768	11.9	23.7	**7240B**	**7240BDB**	**7240BDF**	1	146.5	292.9	176.9	218	—	342	351.5	3	1.5	22.4
	420	80	—	5	2	593	658	964	1 320	19.3	38.6	**7340**	**7340DB**	**7340DF**	1	129.5	259.0	99.0	222	—	398	410	4	2	52.0
	420	80	—	5	2	541	602	878	1 200	17.7	35.3	**7340B**	**7340BDB**	**7340BDF**	1	170.1	340.1	180.1	222	—	398	410	4	2	52.0
210	299.5	38	—	2.1	1.1	261	268	425	536	8.65	17.3	**AC4230**	**AC4230DB**	**AC4230DF**	1	92.6	185.2	109.2	222	—	287.5	292.5	2	1	8.60
220	300	35	38	2.1	1.1	200	203	324	405	6.50	13.0	**AC4430B**	**AC4430BDB**	—	3	126.6	253.2	—	232	—	288	293	2	1	7.4
	309.5	38	—	2.1	1.1	223	227	361	454	7.20	14.4	**AC443138B**	**AC443138BDB**	**AC443138BDF**	2	130.2	260.4	184.4	232	227	297.5	302.5	2	1	8.90
	319.5	46	—	2.1	1.1	265	281	431	562	8.85	17.7	**AC443246B**	**AC443246BDB**	**AC443246BDF**	2	136.3	272.6	180.6	232	227	307.5	312.5	2	1	12.0
	340	56	—	3	1.1	334	353	543	705	10.9	21.8	**7044**	**7044DB**	**7044DF**	1	108.9	217.8	105.8	234	—	326	333	2.5	1	18.5
	340	56	—	3	1.1	299	318	486	636	9.80	19.6	**7044B**	**7044BDB**	**7044BDF**	1	145.5	290.9	178.9	234	—	326	333	2.5	1	18.9
	400	65	—	4	1.5	469	515	762	1 030	15.1	30.2	**7244**	**7244DB**	**7244DF**	1	122.0	244.0	114	238	—	382	391.5	3	1.5	35.2
	460	88.5	—	5	2	678	795	1 100	1 590	22.3	44.6	**AC4446**	**AC4446DB**	**AC4446DF**	1	142.1	284.3	108.3	242	—	438	450	4	2	37.5
230	320	40	—	2.1	1.1	226	235	368	471	7.35	14.7	**AC4632B**	**AC4632BDB**	**AC4632BDF**	1	135.4	270.8	190.8	242	—	308	313	2	1	9.6
	339.5	45	—	3	1.1	284	310	461	619	9.45	18.9	**AC4634B**	**AC4634BDB**	**AC4634BDF**	2	142.1	284.1	194.1	244	237	325.5	332.5	2.5	1	13.9

[Note] 1) SP indicates the specially chamfered form.

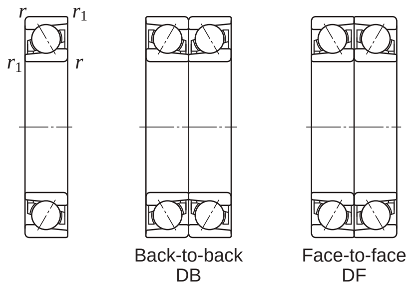
[Remark] a_1, a_2 : Load center spread

Single-row, matched pair angular contact ball bearings

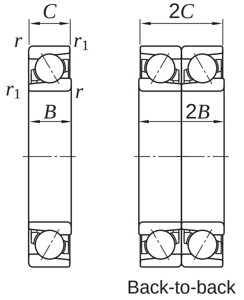
d 240 ~ 300 mm



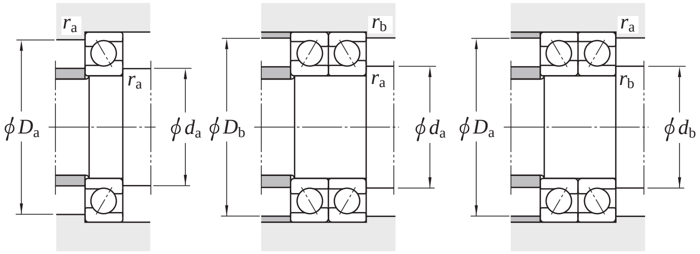
Design 1



Design 2



Design 3



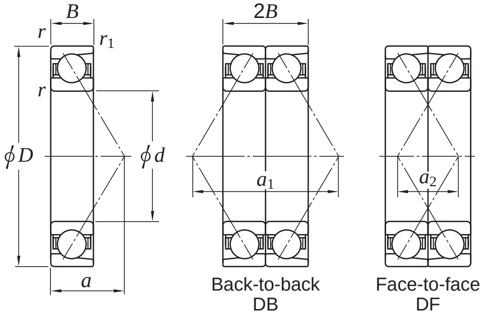
Boundary dimensions (mm) *d*	*D*	*B*	*C*	*r* min.	r_1 [1] min.	Basic load ratings (kN) Single row C_r	Single row C_{0r}	Matched pair C_r	Matched pair C_{0r}	Fatigue load limit (kN) C_u (Single row)	C_u (Matched pair)	Bearing No. Single row	Back-to-back DB	Face-to-face DF	De-sign	Load center (mm) *a*	a_1	a_2	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	(Refer.) Mass Single row (kg)
240	320	38	—	2.1	1.1	241	255	391	510	7.85	15.7	**7948**	**7948DB**	**7948DF**	1	99.8	199.7	123.7	252	—	308	313	2	1	8.00
	320	38	—	2.1	1.1	214	223	348	446	6.90	13.8	**7948B**	**7948BDB**	**7948BDF**	1	136.5	272.9	196.9	252	—	308	313	2	1	8.00
	329.5	40	—	2.1	1.1	247	265	401	529	8.10	16.2	**AC4833B**	**AC4833BDB**	**AC4833BDF**	2	139.6	279.1	199.1	252	247	317.5	322.5	2	1	9.80
	360	56	—	3	1.1	364	375	591	751	12.3	24.6	**7048**	**7048DB**	**7048DF**	1	114.6	229.2	117.2	254	—	346	353	2.5	1	19.7
	360	56	—	3	1.1	325	338	528	677	11.1	22.2	**7048B**	**7048BDB**	**7048BDF**	1	153.9	307.7	195.7	254	—	346	353	2.5	1	20.1
250	340	35	38	2.1	1.5	216	230	351	460	6.90	13.8	**AC5034B**	**AC5034BDB**	—	3	141.3	282.5	—	262	—	328	331.5	2	1.5	9.6
	349.5	46	—	2.1	1.1	275	303	446	606	9.05	18.1	**AC503546B**	**AC503546BDB**	**AC503546BDF**	2	148.9	297.7	205.7	262	—	337.5	342.5	2	1	13.2
260	360	46	—	2.1	1.1	314	360	510	720	10.6	21.1	**7952**	**7952DB**	**7952DF**	1	112.5	225.1	133.1	272	—	348	353	2	1	13.8
	360	46	—	2.1	1.1	280	315	455	629	9.25	18.5	**7952B**	**7952BDB**	**7952BDF**	1	153.1	306.1	214.1	272	—	348	353	2	1	13.9
	369.5	46	—	2.1	2.1	308	353	501	706	10.3	20.6	**AC523746B**	**AC523746BDB**	**AC523746BDF**	2	155.2	310.3	218.3	272	272	357.5	357.5	2	2	15.5
	379.5	56	—	3	1.1	330	387	536	774	11.2	22.4	**AC5238B**	**AC5238BDB**	**AC5238BDF**	2	162.3	324.5	212.5	274	267	365.5	372.5	2.5	1	20.6
	400	65	—	4	1.5	407	478	661	956	13.6	27.1	**7052**	**7052DB**	**7052DF**	1	128.4	256.7	126.7	278	—	382	391.5	3	1.5	28.7
	400	65	—	4	1.5	364	431	592	862	12.2	24.4	**7052B**	**7052BDB**	**7052BDF**	1	171.0	341.9	211.9	278	—	382	391.5	3	1.5	29.3
270	379.5	46	—	2.1	1.1	315	367	511	735	10.5	21.1	**AC5438B**	**AC5438BDB**	**AC5438BDF**	2	159.4	318.7	226.7	282	277	367.5	372.5	2	1	24.3
280	380	46	—	2.1	1.1	318	372	516	744	10.6	21.2	**7956**	**7956DB**	**7956DF**	1	118.3	236.6	144.6	292	—	368	373	2	1	14.2
	380	46	—	2.1	1.1	283	325	460	651	9.25	18.5	**7956B**	**7956BDB**	**7956BDF**	1	161.5	322.9	230.9	292	—	368	373	2	1	14.7
	389.5	46	—	2.1	SP	321	381	522	763	10.8	21.5	**AC563946AB**	**AC563946ABDB**	**AC563946ABDF**	2	163.5	327.1	235.1	292	287	377.5	382	2	1	16.5
	400	52	—	4	1.5	335	401	544	803	11.2	22.5	**AC5640B**	**AC5640BDB**	**AC5640BDF**	1	228.6	457.2	353.2	298	—	382	391.5	3	1.5	20.5
	420	65	—	4	1.5	415	507	675	1 010	14.0	27.9	**7056**	**7056DB**	**7056DF**	1	133.5	267.1	137.1	298	—	402	411.5	3	1.5	30.4
	420	65	—	4	1.5	384	453	623	906	13.1	26.2	**7056B**	**7056BDB**	**7056BDF**	1	179.3	358.7	228.7	298	—	402	411.5	3	1.5	31.0
285	380	46	—	3	1.1	257	296	418	592	8.40	16.8	**AC5738**	**AC5738DB**	**AC5738DF**	1	119.0	238.0	146.0	299	—	366	373	2.5	1	14.1
	380	46	—	2	2	255	291	414	582	8.25	16.5	**AC5738B**	**AC5738BDB**	**AC5738BDF**	2	162.7	325.4	233.4	295	—	370	370	2	2	14.2
290	409.5	56	—	3	1.1	357	438	579	875	12.1	24.2	**AC584156B**	**AC584156BDB**	**AC584156BDF**	2	174.8	349.7	237.7	304	297	395.5	402.5	2.5	1	22.5
	419.5	60	—	4	1.5	365	455	593	910	12.5	25.0	**AC5842B**	**AC5842BDB**	**AC5842BDF**	2	178.9	357.9	237.9	308	298.5	401.5	411	3	1.5	26.5
300	419.5	56	—	3	1.1	354	436	576	873	11.9	23.8	**AC604245B**	**AC604256BDB**	**AC604256BDF**	2	179	358.1	246.1	314	307	405.5	412.5	2.5	1	23
	460	74	—	4	1.5	478	613	776	1 230	16.3	32.5	**7060B**	**7060BDB**	**7060BDF**	1	196.4	392.9	244.9	318	—	442	451.5	3	1.5	44.9

[Note] 1) SP indicates the specially chamfered form.

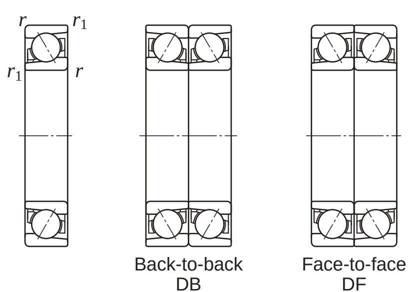
[Remark] a_1, a_2 : Load center spread

Single-row, matched pair angular contact ball bearings

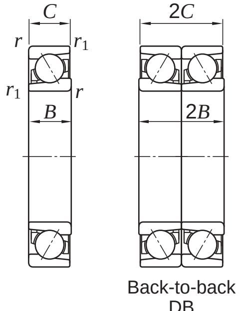
d 310 ~ 670 mm



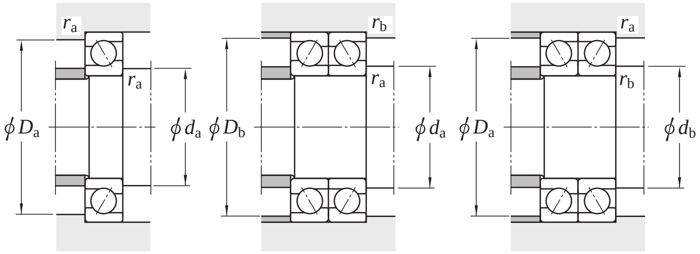
Design 1



Design 2



Design 3

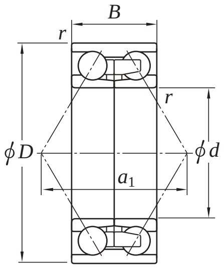


Boundary dimensions (mm)						Basic load ratings (kN)				Fatigue load limit (kN) C_u		Bearing No.			De-sign	Load center (mm)			Mounting dimensions (mm)						(Refer.) Mass Single row (kg)
						Single row		Matched pair																	
d	D	B	C	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	(Single row)	(Matched pair)	Single row	Back-to-back DB	Face-to-face DF		a	a_1	a_2	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	
310	429.5	60	—	4	1.5	352	435	572	870	11.7	23.4	**AC624360B**	**AC624360BDB**	**AC624360BDF**	2	185.2	370.5	250.5	328	318.5	411.5	421	3	1.5	24.5
320	449.5	56	—	3	1.1	398	513	646	1 030	13.5	27.0	**AC644556B**	**AC644556BDB**	**AC644556BDF**	2	189.5	379.1	267.1	334	327	435.5	442.5	2.5	1	27.4
340	479.5	65	—	3	1.1	442	595	718	1 190	15.2	30.4	**AC6848B**	**AC6848BDB**	**AC6848BDF**	2	204.5	409.0	279.0	354	347	465.5	472.5	2.5	1	35.7
350	559.5	86	—	4	1.5	659	952	1 070	1 900	23.1	46.1	**AC7056B**	**AC7056BDB**	**AC7056BDF**	2	233.9	467.8	295.8	368	358.5	541.5	551	3	1.5	81.6
360	509.5	70	—	5	2	475	656	771	1 310	16.2	32.5	**AC7251B**	**AC7251BDB**	**AC7251BDF**	1	217.5	435	295	382	—	487.5	499.5	4	2	42.9
	539.5	82	—	4	1.5	577	824	937	1 650	20.1	40.1	**AC725482B**	**AC725482BDB**	**AC725482BDF**	2	229.8	459.6	295.6	378	368.5	521.5	531	3	1.5	63.5
380	480	46	—	2.1	1.1	316	416	513	833	10.4	20.7	**7876B**	**7876BDB**	**7876BDF**	1	203.4	406.8	314.8	392	—	468	473	2	1	18.8
	519.5	65	—	4	1.5	424	590	689	1 180	14.4	28.7	**AC7652AB**	**AC7652ABDB**	**AC7652ABDF**	2	221.3	442.6	312.6	398	388.5	501.5	511	3	1.5	39.2
	540	82	—	4	1.1	520	747	845	1 490	18.0	36.0	**AC7654B**	**AC7654BDB**	**AC7654BDF**	1	234.0	468.0	304.0	398	—	522	533	3	1	58.3
400	559.5	70	—	4	1.5	503	734	817	1 470	17.3	34.6	**AC8056B**	**AC8056BDB**	**AC8056BDF**	2	236.4	472.8	332.8	418	408.5	541.5	551	3	1.5	52.1
420	559.5	65	—	4	1.5	469	683	762	1 370	15.9	31.9	**AC8456B**	**AC8456BDB**	**AC8456BDF**	2	238.1	476.2	346.2	438	428.5	541.5	551	3	1.5	55.9
500	620	56	—	3	1.1	475	740	771	1 480	16.2	32.3	**78/500**	**78/500DB**	**78/500DF**	1	189.7	379.4	267.4	514	—	606	613	2.5	1	35.5
530	780	112	—	6	3	1 010	1 810	1 640	3 620	36.6	73.1	**70/530**	**70/530DB**	**70/530DF**	1	245.1	490.2	266.2	558	—	752	766	5	2.5	174
560	750	85	—	5	2	676	1 170	1 100	2 330	23.5	47.1	**79/560B**	**79/560BDB**	**79/560BDF**	1	231.6	463.2	293.2	582	—	728	740	4	2	102
670	900	103	—	6	3	879	1 680	1 430	3 370	31.1	62.1	**79/670B**	**79/670BDB**	**79/670BDF**	1	380.8	761.7	555.7	698	—	872	886	5	2.5	178

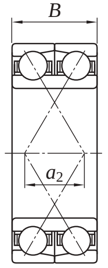
[Remark] a_1, a_2 : Load center spread

Double-row angular contact ball bearings

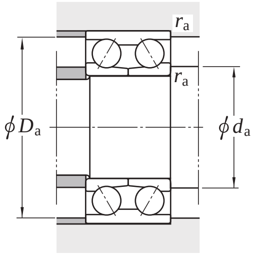
d 120 ~ 280 mm



Design 1



Design 2



Boundary dimensions (mm)				**Basic load ratings** (kN)		**Fatigue load limit** (kN)	**Bearing No.** 1)	**De-sign**	**Load center spread** (mm)	**Mounting dimensions** (mm)			(Refer.) **Mass** (kg)
d	D	B	r min.	C_r	C_{0r}	C_u	Open		a_1, a_2	d_a min.	D_a max.	r_a max.	
120	190	66	2	209	213	8.85	**2AC2419B**	1	163.1	130	180	2	6.90
140	210	66	2	231	249	6.60	**305275-1**	1	142.4	150	200	2	7.80
150	225	73	2.1	269	293	11.1	**305333-1**	1	145.0	162	213	2	10.0
	230	70	2.1	269	294	11.0	**305283-1**	1	144.7	162	218	2	10.0
160	239.5	76	2.1	315	352	12.9	**305183/1D**	2	77.7	172	227	2	11.1
170	260	84	2.1	338	386	13.6	**305180-1**	2	138.8	182	248	2	13.0
180	259.5	66	2	265	326	11.3	**305262-1**	1	160.0	190	249.5	2	11.0
	280	92	2.1	385	457	15.6	**305172B-1**	2	147.4	192	268	2	17.0
190	269.5	66	2.1	262	324	11.0	**305338A-1**	1	165.8	202	257.5	2	12.0
	290	92	2.1	427	510	17.0	**305178**	1	184.6	202	278	2	21.5
200	279.5	76	2.1	321	388	12.9	**305424**	2	100.6	212	267.5	2	14.0
	279.5	76	2.1	321	388	12.9	**305428-1**	1	176.6	212	267.5	2	14.0
	289.5	76	2.1	390	479	15.8	**305263-1**	1	179.5	212	277.5	2	16.5
220	309.5	76	2.1	347	448	14.2	**305272-1**	1	191.0	230	299.5	2	22.0
	319.5	92	2.1	431	562	17.7	**2AC4432B-1**	1	230.6	232	307.5	2	24.0
230	329.5	80	2.1	421	559	17.3	**305264-1**	1	201.7	242	317.5	2	22.0
260	369.5	92	2.1	535	765	22.3	**305270-1**	1	227.9	272	357.5	2	31.0
280	389.5	92	2.1	508	744	21.0	**305269-1**	1	239.4	292	377.5	2	33.0

[Note] 1) Bearing No.305275-1 and 305262-1 indicate nominal contact angle of 32°. Bearing No. 2AC2419B, 305180-1, 305172B-1, and 2AC4432B-1 indicate nominal contact angle of 40°, and nominal contact angle of other bearings is 30°.

[Remark] 1) Some of these bearings have lubrication grooves or lubrication holes on their outer rings.

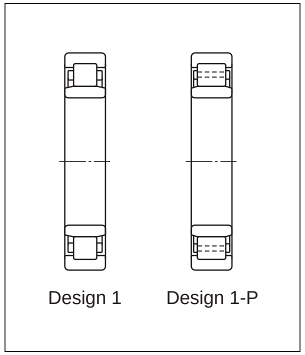
Cylindrical roller bearings

- Cylindrical roller bearings feature high radial load capacity because the rollers and raceway are in linear contact. These bearings are suitable for applications that involve heavy radial and impact loading.
- They are appropriate for high-speed applications in that they can be machined very accurately due to their structure.
- The NU and N types exhibit their best performance when used as free side bearings since they adjust to the shaft's axial movement, to a certain extent, relative to the housing position.
- The NJ and NF types carry axial load in one direction, while the NUP type can carry a certain degree of axial load in both directions.

- Double-row cylindrical roller bearings come in two types : with a cylindrical bore, and with a tapered bore. As for those with a tapered bore, the specified amount of clearance can be obtained by adjusting the press-in distance.
  Some bearings have lubrication holes and lubrication grooves on the outer ring. They are identified by supplementary code "W".

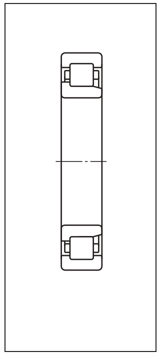
■ Single-row (page 124)

NU type

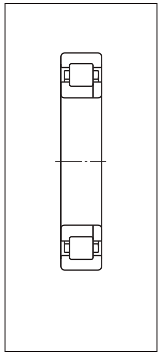


Design 1　Design 1-P

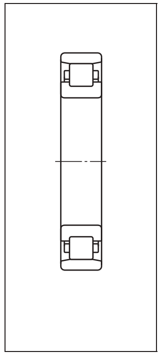
NJ type



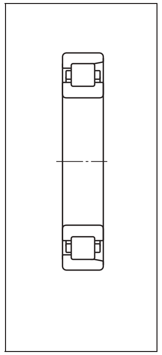
NUP type



N type

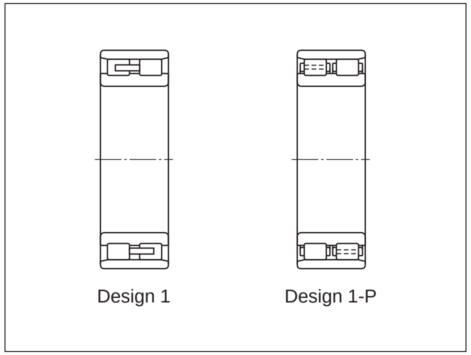


NF type



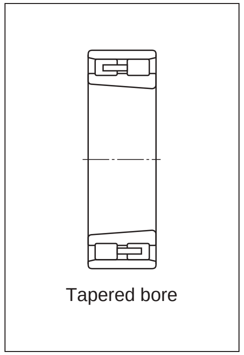
■ Double-row (page 138)

NN type



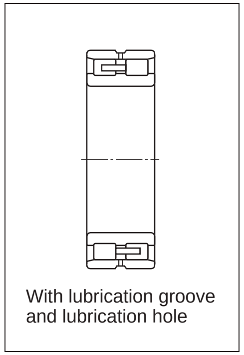
Design 1　Design 1-P

NN ··· K type



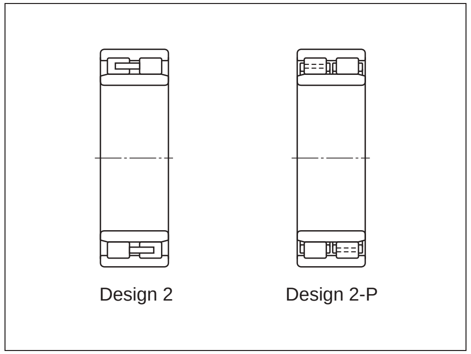
Tapered bore

NN ··· W type



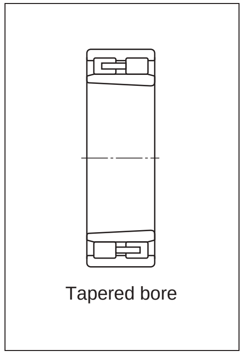
With lubrication groove and lubrication hole

NNU type



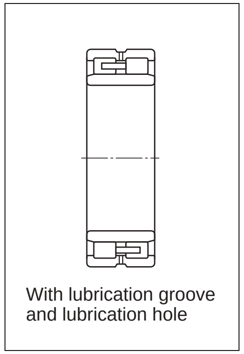
Design 2　Design 2-P

NNU ··· K type



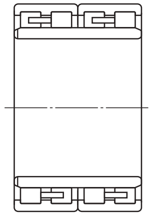
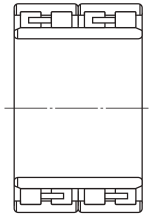
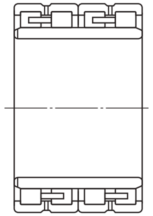
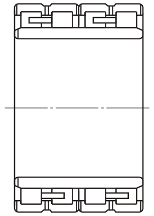
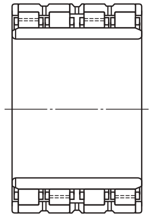
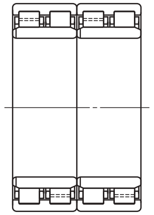
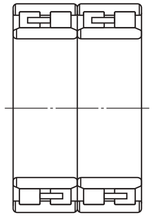
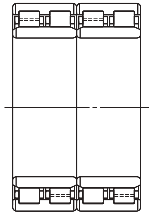
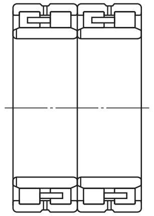
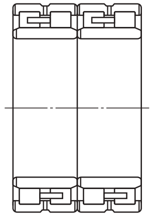
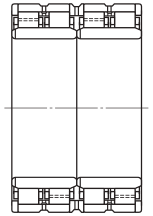
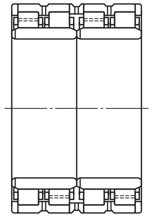
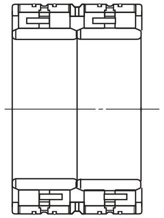
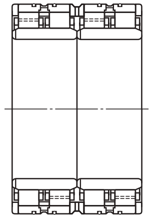
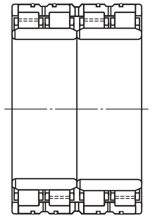
Tapered bore

NNU ··· W type



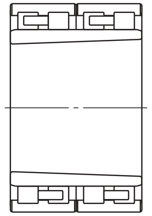
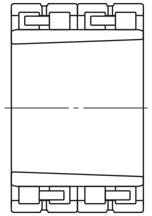
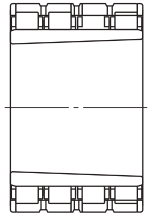
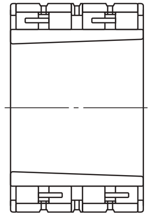
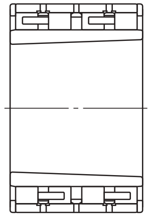
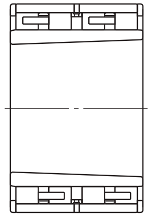
With lubrication groove and lubrication hole

■ Four-row ··· Cylindrical bore (page 146)

	Outer ring with rib		Outer ring with loose rib
One inner ring	 Design 1-1  Design 1-2  Design 1-3  Design 1-4		 Design 1-6P
Two inner rings	 Design 2-1P  Design 2-2  Design 2-2P  Design 2-3  Design 2-4		 Design 2-5P  Design 2-6P
Oil mist lubrication			 Design 3-1  Design 3-1P  Design 3-2P

- Four-row cylindrical roller bearings, having superior resistance to radial load, are suitable for use at a high-speed.
- Since the inner ring raceway surface and the roll can be finished simultaneously after the inner ring is mounted on the roll neck (the inner ring raceway surface is grounded by a roll grinding machine, and then, the roll barrel is finished based on the grounded surface), rolling accuracy is improved. Additionally, residual clearance of the bearing can be adjusted freely.
- Some four-row cylindrical roller bearings have nozzle holes and O-rings for oil mist lubrication.

■ Four-row ··· Tapered bore (page 172)

 Design 1-1  Design 1-2		 Design 1-3P  Design 1-4  Design 2-2  Design 2-3

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512.
Tolerances	As specified in JIS B 1514. • Single-row, double-row and four-row cylindrical bore bearings···Classes 0, 6 and 5 • Four-row tapered bore bearings···Classes 0 and 6 (refer to Table 2-2 on page 18)

Tolerances of roller set bore diameter F_w and roller set outside diameter E_w of interchangeable bearings

Unit : μm

Nominal bore diameter d (mm)		Roller set bore diameter deviation Δ_{Fw}		Roller set outside diameter deviation Δ_{Ew}	
over	up to	upper	lower	upper	lower
50	120	+ 20	0	0	− 20
120	200	+ 25	0	0	− 25
200	250	+ 30	0	0	− 30
250	315	+ 35	0	0	− 35
315	400	+ 40	0	0	− 40
400	500	+ 45	0	0	− 45
500	600	+ 50	0	0	− 50
600	700	+ 55	0	0	− 55
700	800	+ 60	0	0	− 60
800	900	+ 70	0	0	− 70
900	1 000	+ 80	0	0	− 80
1 000	1 250	+ 90	0	0	− 90
1 250	1 600	+100	0	0	−100
1 600	2 000	+120	0	0	−120
2 000	2 500	+150	0	0	−150

[Remark] Interchangeable bearings have an inner ring with rollers that can be matched with the outer ring, or an outer ring with rollers that can be matched with the inner ring, without affecting performance in the bearing that has the same bearing number in one category.

Allowable misalignment	Allowable misalignment of single-row cylindrical roller bearings depends on bearing type and specification. General values are as follows : 1) When P_r / C_r is approx. 10% under load of normal use ············0.000 6 rad (2') − 0.000 9 rad (3') 2) When P_r / C_r is approx. 6% under load lighter than 1) ···0.001 2 rad (4') When very large allowable misalignment is required, consult with JTEKT.
Radial internal clearance	(refer to Table 4-4 on pages 51 and 52)

Standard cages	Machined cage or pin type cage
Equivalent radial load	**Dynamic equivalent radial load** ······· $P_r = F_r$ **Static equivalent radial load** ············· $P_{0r} = F_r$

Allowable axial load

Cylindrical roller bearings with ribs, including loose rib, on both inner and outer rings accommodate axial load to a certain extent.
In such cases, axial load capacity is controlled by the condition of roller end faces, forms of rib or loose rib, lubrication, rotational speed etc.
For certain special uses, a design is available to accommodate very heavy axial loads. In general, axial loads allowable for cylindrical roller bearings can be calculated using the following equation, which are based on empirical data.

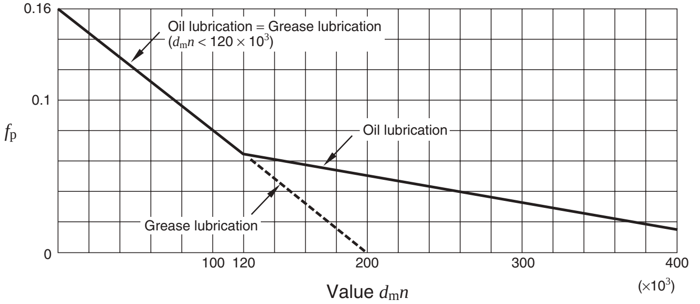
$$F_{ap} = 9.8\, f_a \cdot f_b \cdot f_p \cdot d_m^2$$

where :

F_{ap} : maximum allowable axial load N
f_a : coefficient determined from loading condition (see below)
f_b : coefficient determined from bearing diameter series (see below)
f_p : coefficient for rib surface pressure (see below)
d_m : mean value of bore diameter d and outside diameter D ··· $\left(\frac{d+D}{2}\right)$ mm

Loading condition	f_a
Continuous loading	1
Intermittent loading	2
Instantaneous loading	3

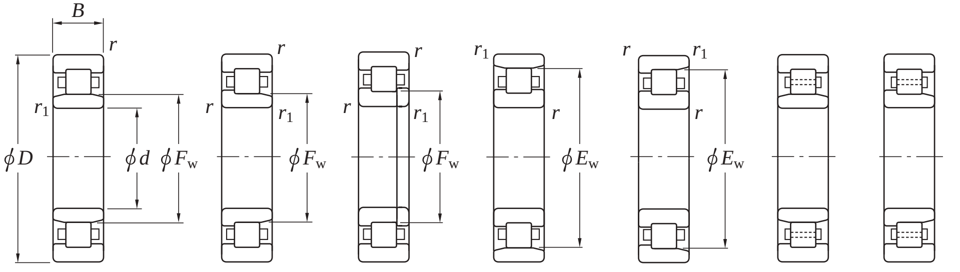
Diameter series	f_b
8	0.4
9	0.6
0	0.7
2	0.8
3	1.0
4	1.2



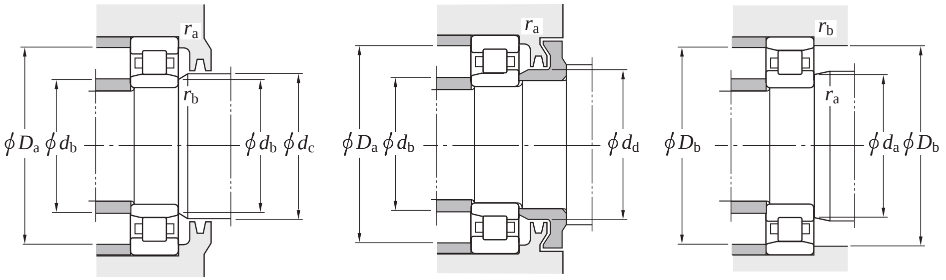
Relationship between coefficient f_p and value $d_m n$ (n : rotational speed, $\min^{-1}$)

Single-row cylindrical roller bearings

d 100 ~ (120) mm



NU type Design 1 · NJ type Design 2 · NUP type Design 3 · N type Design 4 · NF type Design 5 · Design 1-P · Design 2-P

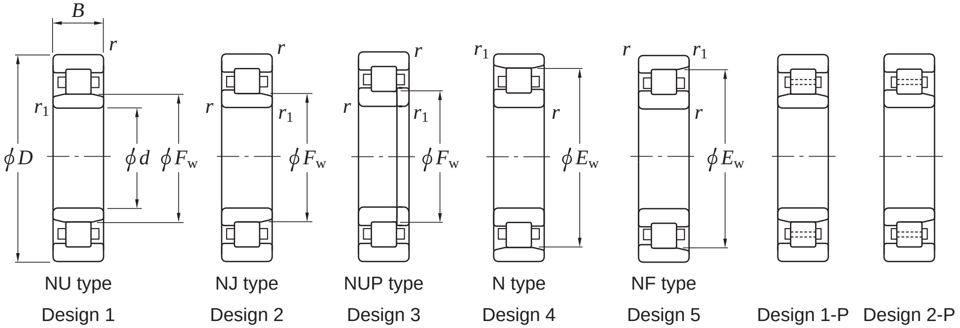


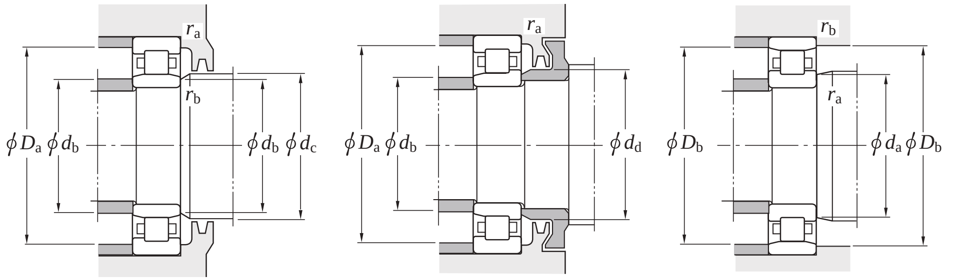
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u			d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
100	150	24	1.5	1.1	113	—	114	120	15.8	**NU1020**	1, 3	108	106.5	111	116	—	142	—	—	1.5	1	1.46
	180	34	2.1	2.1	—	160	229	217	28.1	**N220**	4, 5	111	—	—	—	130	169	169	164	2	2	(3.38)
	180	34	2.1	2.1	119	—	312	306	43.0	**NU220R**	1~3	111	111	117	122	130	169	—	—	2	2	3.52
	180	46	2.1	2.1	120	—	322	338	47.3	**NU2220**	1~3	111	111	117	122	130	169	—	—	2	2	4.67
	180	46	2.1	2.1	119	—	417	444	60.7	**NU2220R**	1~3	111	111	117	122	130	169	—	—	2	2	4.82
	180	60.3	2.1	2.1	120	—	409	459	61.9	**NU3220**	1	111	111	117	122	—	169	—	—	2	2	6.62
	215	47	3	3	—	185.5	373	337	47.2	**N320**	4, 5	113	—	—	—	143	202	202	190	2.5	2.5	(7.59)
	215	47	3	3	127.5	—	474	424	58.7	**NU320R**	1~3	113	113	125	132	143	202	—	—	2.5	2.5	7.75
	215	73	3	3	129.5	—	544	548	74.1	**NU2320**	1~3	113	113	125	132	143	202	—	—	2.5	2.5	11.9
	215	73	3	3	127.5	—	713	717	94.7	**NU2320R**	1~3	113	113	125	132	143	202	—	—	2.5	2.5	12.1
	215	82.6	3	3	129.5	—	663	706	93.2	**NU3320**	1	113	113	125	132	—	202	—	—	2.5	2.5	15.0
105	160	26	2	1.1	119.5	—	136	149	19.6	**NU1021**	1, 3	114	111.5	118	122	—	151	—	—	2	1	1.85
	190	36	2.1	2.1	—	168.8	251	241	34.1	**N221**	4, 5	116	—	—	—	137	179	179	173	2	2	(4.44)
	225	49	3	3	—	195	451	417	57.2	**N321**	4, 5	118	—	—	—	149	212	212	199	2.5	2.5	(8.68)
	225	77	3	3	135	—	711	750	97.3	**NU2321**	1, 3	118	118	131	138	—	212	—	—	2.5	2.5	15.6
110	170	28	2	1.1	125	—	168	171	21.7	**NU1022**	1, 3	119	116.5	124	128	—	161	—	—	2	1	2.31
	200	38	2.1	2.1	—	178.5	300	290	40.1	**N222**	4, 5	121	—	—	—	144	189	189	182	2	2	(5.24)
	200	38	2.1	2.1	132.5	—	366	365	51.1	**NU222R**	1~3	121	121	130	135	144	189	—	—	2	2	4.90
	200	53	2.1	2.1	132.5	—	416	442	58.8	**NU2222**	1~3	121	121	130	135	144	189	—	—	2	2	6.93
	200	53	2.1	2.1	132.5	—	479	517	69.9	**NU2222R**	1~3	121	121	130	135	144	189	—	—	2	2	6.93
	200	69.8	2.1	2.1	132.5	—	533	607	80.6	**NU3222**	1	121	121	130	135	—	189	—	—	2	2	9.55
	240	50	3	3	—	207	502	467	62.9	**N322**	4, 5	123	—	—	—	158	227	227	211	2.5	2.5	(10.4)
	240	50	3	3	143	—	564	525	70.0	**NU322R**	1~3	123	123	140	145	158	227	—	—	2.5	2.5	10.7
	240	80	3	3	143	—	755	789	102	**NU2322**	1~3	123	123	140	145	158	227	—	—	2.5	2.5	18.8
	240	80	3	3	143	—	843	880	112	**NU2322R**	1~3	123	123	140	145	158	227	—	—	2.5	2.5	18.8
120	165	27	1.1	1.1	131.5	—	146	188	23.1	**NU2924**	1	126.5	126.5	130	134	—	158.5	—	—	1	1	1.72
	180	28	2	1.1	135	—	173	181	22.6	**NU1024**	1, 3	129	126.5	134	138	—	171	—	—	2	1	2.47

[Note] 1) For bearings other than NU type bearings (NJ, NUP, N, and NF types), use NJ, NUP, N, and NF for bearing number instead of supplementary code NU. For example, bearing number of a N type bearing having the same dimensions as NU230 is N230.
When "4, 5" is on "Design" column, refer to bearing numbers of N type bearings. When two or more numbers for bearings other than that are on "Design" columns, refer to bearing numbers of NU type bearings.

Single-row cylindrical roller bearings

d (120) ~ (140) mm





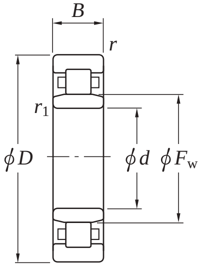
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u			d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
120	215	40	2.1	2.1	—	191.5	325	318	42.9	**N224**	4, 5	131	—	—	—	156	204	204	196	2	2	(6.31)
	215	40	2.1	2.1	143.5	—	419	421	57.6	**NU224R**	1~3	131	131	141	146	156	204	—	—	2	2	5.85
	215	58	2.1	2.1	143.5	—	456	492	65.3	**NU2224**	1~3	131	131	141	146	156	204	—	—	2	2	8.56
	215	58	2.1	2.1	143.5	—	565	619	80.9	**NU2224R**	1~3	131	131	141	146	156	204	—	—	2	2	8.56
	215	76	2.1	2.1	143.5	—	596	695	89.2	**NU3224**	1	131	131	141	146	—	204	—	—	2	2	11.9
	260	55	3	3	—	226	596	551	72.7	**N324**	4, 5	133	—	—	—	171	247	247	230	2.5	2.5	(13.1)
	260	55	3	3	154	—	660	610	79.8	**NU324R**	1~3	133	133	151	156	171	247	—	—	2.5	2.5	13.4
	260	86	3	3	154	—	886	918	116	**NU2324**	1~3	133	133	151	156	171	247	—	—	2.5	2.5	23.1
130	180	30	1.5	1.5	142	—	191	243	30.1	**NU2926**	2	138	138	140	145	150	172	—	—	1.5	1.5	2.27
	200	33	2	1.1	148	—	215	238	29.5	**NU1026**	1, 3	139	136.5	146	151	—	191	—	—	2	1	3.77
	230	40	3	3	—	204	353	362	47.9	**N226**	4, 5	143	—	—	—	168	217	217	208	2.5	2.5	(7.21)
	230	40	3	3	153.5	—	454	453	61.0	**NU226R**	1~3	143	143	151	158	168	217	—	—	2.5	2.5	6.60
	230	64	3	3	156	—	495	560	72.8	**NU2226**	1~3	143	143	151	158	168	217	—	—	2.5	2.5	11.2
	230	64	3	3	153.5	—	662	737	95.8	**NU2226R**	1~3	143	143	151	158	168	217	—	—	2.5	2.5	11.2
	230	80	3	3	156	—	689	857	107	**NU3226**	1	143	143	151	158	—	217	—	—	2.5	2.5	14.1
	280	58	4	4	—	243	699	667	85.7	**N326**	4, 5	146	—	—	—	184	264	264	247	3	3	(16.4)
	280	58	4	4	167	—	771	736	94.1	**NU326R**	1~3	146	146	164	169	184	264	—	—	3	3	16.7
	280	93	4	4	167	—	1 050	1 130	138	**NU2326**	1~3	146	146	164	169	184	264	—	—	3	3	29.1
	280	93	4	4	167	—	1 150	1 230	150	**NU2326R**	1~3	146	146	164	169	186	264	—	—	3	3	29.1
	280	112	4	4	167	—	1 170	1 290	158	**NU3326**	1	146	146	164	169	—	264	—	—	3	3	34.6
140	190	30	1.5	1.5	152	—	207	275	32.4	**NU2928**	2	148	148	151	155	161	182	—	—	1.5	1.5	2.49
	210	33	2	1.1	158	—	220	250	30.5	**NU1028**	1, 3	149	146.5	156	161	—	201	—	—	2	1	4.00
	250	42	3	3	—	221	406	421	55.5	**N228**	4, 5	153	—	—	—	182	237	237	228	2.5	2.5	(8.78)
	250	42	3	3	169	—	491	514	67.5	**NU228R**	1~3	153	153	166	171	182	237	—	—	2.5	2.5	8.50
	250	68	3	3	169	—	583	671	84.3	**NU2228**	1~3	153	153	166	171	182	237	—	—	2.5	2.5	14.3
	250	68	3	3	169	—	716	835	106	**NU2228R**	1~3	153	153	166	171	182	237	—	—	2.5	2.5	14.3
	300	62	4	4	—	260	771	746	93.8	**N328**	4, 5	156	—	—	—	198	284	284	264	3	3	(21.8)
	300	62	4	4	180	—	829	797	99.4	**NU328R**	1~3	156	156	176	182	198	284	—	—	3	3	21.8

[Note] 1) For bearings other than NU type bearings (NJ, NUP, N, and NF types), use NJ, NUP, N, and NF for bearing number instead of supplementary code NU. For example, bearing number of a N type bearing having the same dimensions as NU230 is N230.
When "4, 5" is on "Design" column, refer to bearing numbers of N type bearings. When two or more numbers for bearings other than that are on "Design" columns, refer to bearing numbers of NU type bearings.

Single-row cylindrical roller bearings

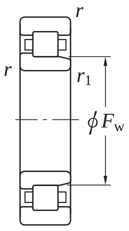
Koyo

d (140) ~ (170) mm



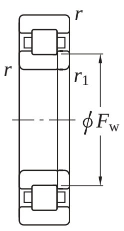
NU type

Design 1



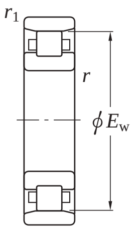
NJ type

Design 2



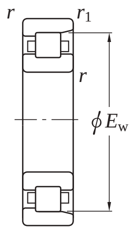
NUP type

Design 3



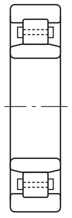
N type

Design 4

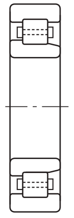


NF type

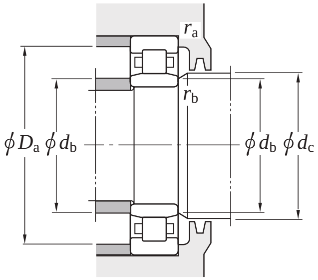
Design 5

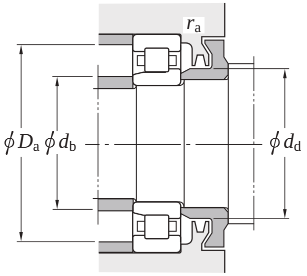


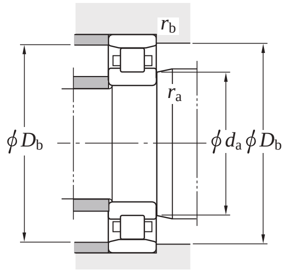
Design 1-P



Design 2-P





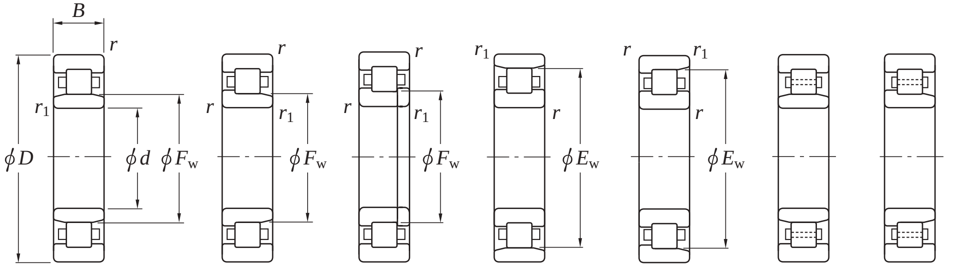


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u			d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
140	300	102	4	4	180	—	1 150	1 250	150	**NU2328**	1~3	156	156	176	182	198	284	—	—	3	3	36.8
	300	102	4	4	180	—	1 270	1 380	167	**NU2328R**	1~3	156	156	176	182	200	284	—	—	3	3	36.8
150	225	35	2.1	1.5	169.5	—	252	281	32.8	**NU1030**	1, 3	161	158	167	173	—	214	—	—	2	1.5	4.83
	270	45	3	3	—	238	468	492	63.4	**N230**	4, 5	163	—	—	—	196	257	257	245	2.5	2.5	(11.1)
	270	45	3	3	182	—	560	594	75.8	**NU230R**	1~3	163	163	179	184	196	257	—	—	2.5	2.5	10.7
	270	73	3	3	182	—	683	800	99.7	**NU2230**	1~3	163	163	179	184	196	257	—	—	2.5	2.5	18.7
	270	73	3	3	182	—	828	982	120	**NU2230R**	1~3	163	163	179	184	196	257	—	—	2.5	2.5	18.7
	320	65	4	4	—	277	829	807	99.1	**N330**	4, 5	166	—	—	—	213	304	304	281	3	3	(25.6)
	320	65	4	4	193	—	948	922	115	**NU330R**	1~3	166	166	190	195	213	304	—	—	3	3	27.0
	320	108	4	4	193	—	1 270	1 400	167	**NU2330**	1~3	166	166	190	195	213	304	—	—	3	3	44.7
	320	108	4	4	193	—	1 450	1 600	187	**NU2330R**	1~3	166	166	190	195	213	304	—	—	3	3	44.7
	320	128	4	4	193	—	1 610	1 890	217	**NU3330**	1	166	166	190	195	—	304	—	—	3	3	51.4
160	220	28	2	2	175	—	187	228	25.9	**NU1932**	2, 3	169	169	173	178	184	211	—	—	2	2	3.08
	220	36	2	2	175	—	249	330	42.5	**NU2932**	2	169	169	173	178	184	211	—	—	2	2	4.05
	240	38	2.1	1.5	180	—	297	330	42.8	**NU1032**	1, 3	171	168	178	184	—	229	—	—	2	1.5	5.93
	270	86	2.1	2.1	187	—	854	1 070	129	**NU3132**	3	171	171	183	190	—	259	—	—	2	2	20.6
	290	48	3	3	—	255	535	568	71.3	**N232**	4, 5	173	—	—	—	210	277	277	262	2.5	2.5	(13.9)
	290	48	3	3	195	—	624	666	83.3	**NU232R**	1~3	173	173	192	197	210	277	—	—	2.5	2.5	14.8
	290	80	3	3	195	—	790	939	113	**NU2232**	1~3	173	173	192	197	210	277	—	—	2.5	2.5	23.6
	290	80	3	3	193	—	1 010	1 190	141	**NU2232R**	1~3	173	173	192	197	210	277	—	—	2.5	2.5	23.6
	340	68	4	4	—	292	872	876	106	**N332**	4, 5	176	—	—	—	228	324	324	296	3	3	(30.2)
	340	68	4	4	204	—	1 070	1 050	128	**NU332R**	1~3	176	176	200	211	228	324	—	—	3	3	32.0
	340	114	4	4	208	—	1 340	1 520	178	**NU2332**	1~3	176	176	200	211	228	324	—	—	3	3	53.1
	340	114	4	4	204	—	1 640	1 820	212	**NU2332R**	1~3	176	176	200	211	228	324	—	—	3	3	53.1
	340	136	4	4	208	—	1 590	1 890	216	**NU3332**	1	176	176	200	211	—	324	—	—	3	3	61.5
170	260	42	2.1	2.1	193	—	347	400	50.5	**NU1034**	1, 3	181	181	190	197	—	249	—	—	2	2	7.90
	260	67	2.1	2.1	196	—	578	824	98.9	**NU3034**	1	181	181	193	199	—	249	—	—	2	2	13.0

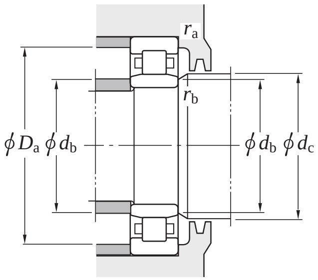
[Note] 1) For bearings other than NU type bearings (NJ, NUP, N, and NF types), use NJ, NUP, N, and NF for bearing number instead of supplementary code NU. For example, bearing number of a N type bearing having the same dimensions as NU230 is N230.
When "4, 5" is on "Design" column, refer to bearing numbers of N type bearings. When two or more numbers for bearings other than that are on "Design" columns, refer to bearing numbers of NU type bearings.

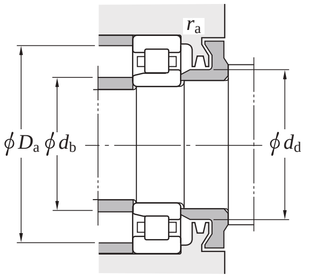
Single-row cylindrical roller bearings

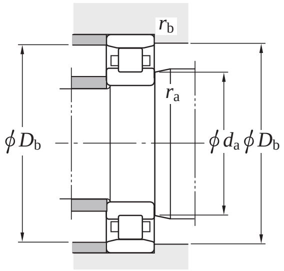
d (170) ~ (200) mm



NU type Design 1 | NJ type Design 2 | NUP type Design 3 | N type Design 4 | NF type Design 5 | Design 1-P | Design 2-P





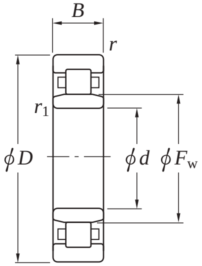


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	De-sign	Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u			d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
170	310	52	4	4	—	272	596	637	78.4	**N234**	4, 5	186	—	—	—	223	294	294	280	3	3	(17.2)
	310	86	4	4	208	—	896	1 080	127	**NU2234**	1~3	186	186	204	211	223	294	—	—	3	3	29.2
	310	86	4	4	205	—	1 210	1 410	166	**NU2234R**	1~3	186	186	204	211	223	294	—	—	3	3	29.2
	360	72	4	4	220	310	997	1 010	122	**NU334**	1~5	186	186	216	223	241	344	344	314	3	3	38.6
	360	120	4	4	220	—	1 530	1 750	199	**NU2334**	1~3	186	186	216	223	241	344	—	—	3	3	62.6
180	280	46	2.1	2.1	205	—	447	503	63.2	**NU1036**	1, 3	191	191	203	209	—	269	—	—	2	2	10.5
	320	52	4	4	—	282	618	677	82.2	**N236**	4, 5	196	—	—	—	233	304	304	290	3	3	(18.0)
	320	52	4	4	217	—	783	852	104	**NU236R**	1~3	196	196	214	221	233	304	—	—	3	3	19.3
	320	86	4	4	218	—	929	1 140	133	**NU2236**	1~3	196	196	214	221	233	304	—	—	3	3	30.4
	320	86	4	4	215	—	1 260	1 510	175	**NU2236R**	1~3	196	196	214	221	233	304	—	—	3	3	30.4
	320	112	4	4	218	—	1 250	1 680	190	**NU3236**	1	196	196	214	221	—	304	—	—	3	3	38.4
	380	75	4	4	232	328	1 130	1 150	136	**NU336**	1~5	196	196	227	235	255	364	364	332	3	3	42.6
	380	126	4	4	232	—	1 690	1 940	220	**NU2336**	1~3	196	196	227	235	255	364	—	—	3	3	73.0
	380	150	4	4	232	—	2 070	2 520	276	**NU3336**	1	196	196	227	235	—	364	—	—	3	3	84.4
190	290	46	2.1	2.1	215	—	460	530	65.7	**NU1038**	1, 3	201	201	213	219	—	279	—	—	2	2	10.9
	340	55	4	4	—	299	694	768	91.3	**N238**	4, 5	206	—	—	—	247	324	324	310	3	3	(21.5)
	340	55	4	4	230	—	869	954	114	**NU238R**	1~3	206	206	227	234	247	324	—	—	3	3	23.3
	340	92	4	4	231	—	1 040	1 290	146	**NU2238**	1~3	206	206	227	234	247	324	—	—	3	3	37.0
	340	120	4	4	231	—	1 420	1 930	216	**NU3238**	1	206	206	227	234	—	324	—	—	3	3	46.8
	400	78	5	5	245	345	1 220	1 260	146	**NU338**	1~5	210	210	240	248	268	380	380	349	4	4	49.9
	400	132	5	5	245	—	1 900	2 220	245	**NU2338**	1~3	210	210	240	248	268	380	—	—	4	4	84.7
	400	155	5	5	245	—	2 340	2 910	316	**NU3338**	1	210	210	240	248	—	380	—	—	4	4	96.5
200	310	51	2.1	2.1	229	—	487	582	71.0	**NU1040**	1, 3	211	211	226	233	—	299	—	—	2	2	14.1
	360	58	4	4	—	316	775	865	102	**N240**	4, 5	216	—	—	—	261	344	344	328	3	3	(25.7)
	360	58	4	4	243	—	958	1 060	124	**NU240R**	1~3	216	216	240	247	261	344	—	—	3	3	27.2
	360	98	4	4	244	—	1 190	1 490	169	**NU2240**	1~3	216	216	240	247	261	344	—	—	3	3	44.4
	360	98	4	4	241	—	1 530	1 870	211	**NU2240R**	1~3	216	216	240	247	261	344	—	—	3	3	44.4

[Note] 1) For bearings other than NU type bearings (NJ, NUP, N, and NF types), use NJ, NUP, N, and NF for bearing number instead of supplementary code NU. For example, bearing number of a N type bearing having the same dimensions as NU230 is N230.
When "4, 5" is on "Design" column, refer to bearing numbers of N type bearings. When two or more numbers for bearings other than that are on "Design" columns, refer to bearing numbers of NU type bearings.

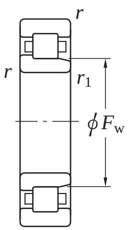
Single-row cylindrical roller bearings

d (200) ~ (280) mm



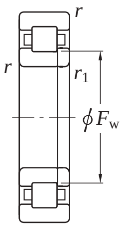
NU type

Design 1



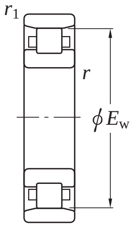
NJ type

Design 2



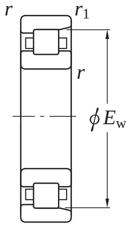
NUP type

Design 3



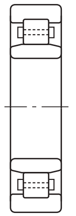
N type

Design 4

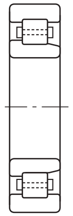


NF type

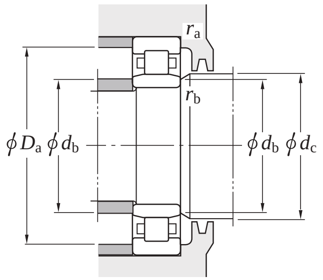
Design 5

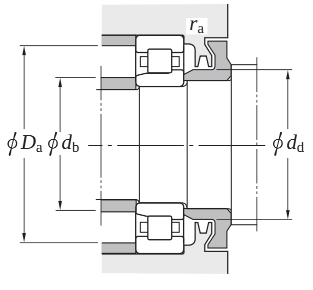


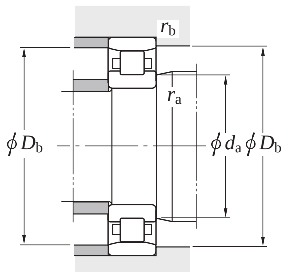
Design 1-P



Design 2-P





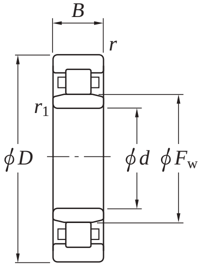


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u			d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
200	420	80	5	5	260	360	1 220	1 270	145	**NU340**	1~5	220	220	254	263	283	400	400	364	4	4	56.2
	420	138	5	5	260	—	1 890	2 240	244	**NU2340**	1~3	220	220	254	263	283	400	—	—	4	4	97.4
	420	165	5	5	260	—	2 330	2 930	314	**NU3340**	1	220	220	250	258	—	400	—	—	4	4	113
220	340	56	3	3	250	—	637	748	88.1	**NU1044**	1, 3	233	233	248	254	—	327	—	—	2.5	2.5	18.5
	370	120	4	4	261	—	1 550	2 140	233	**NU3144**	1	236	236	255	264	—	354	354	—	3	3	53.2
	400	65	4	4	270	350	949	1 080	123	**NU244**	1~5	236	236	266	273	289	384	384	362	3	3	38.5
	400	108	4	4	270	—	1 420	1 810	196	**NU2244**	1, 2	236	236	266	273	289	384	—	—	3	3	60.9
	400	144	4	4	270	—	2 040	2 880	308	**NU3244**	1	236	236	266	273	—	384	—	—	3	3	78.8
	460	88	5	5	284	396	1 490	1 570	176	**NU344**	1~5	240	240	279	287	309	440	440	400	4	4	74.4
	460	145	5	5	284	—	2 260	2 690	287	**NU2344**	1, 3	240	240	276	287	—	440	—	—	4	4	119
	460	180	5	5	284	—	2 660	3 300	347	**NU3344**	1	240	240	279	287	—	440	—	—	4	4	148
240	360	56	3	3	270	—	673	822	95.0	**NU1048**	1, 3	253	253	268	275	—	347	—	—	2.5	2.5	20.1
	360	92	3	3	276	—	970	1 450	156	**NU3048**	1	253	253	270	279	—	347	347	—	2.5	2.5	33.0
	440	72	4	4	295	385	1 170	1 340	150	**NU248**	1~5	256	256	293	298	316	424	424	397	3	3	52.1
	440	120	4	4	295	—	1 790	2 320	246	**NU2248**	1, 2	256	256	293	298	316	424	—	—	3	3	82.5
	440	160	4	4	295	—	2 450	3 460	358	**NU3248**	1	256	256	293	298	—	424	—	—	3	3	107
	500	95	5	5	310	430	1 790	1 950	211	**NU348**	1~5	260	260	305	313	337	480	480	434	4	4	94.6
	500	155	5	5	310	—	2 710	3 320	346	**NU2348**	1, 3	260	260	303	313	—	480	—	—	4	4	152
260	360	46	2.1	2.1	285	—	566	777	88.8	**NU1952**	1	271	271	282	288	—	349	349	339	2	2	13.9
	360	60	2.1	2.1	285	—	700	1 020	114	**NU2952**	1	271	271	282	288	—	349	349	339	2	2	18.4
	400	65	4	4	296	—	819	979	110	**NU1052**	1, 3	276	276	292	300	—	384	—	—	3	3	29.2
	480	80	5	5	320	420	1 380	1 580	171	**NU252**	1~5	280	280	318	323	343	460	460	432	4	4	69.0
	480	130	5	5	320	—	2 240	2 950	305	**NU2252**	1, 2	280	280	318	323	343	460	—	—	4	4	107
	480	174	5	5	320	—	2 680	3 680	373	**NU3252**	1	280	280	318	323	—	460	—	—	4	4	139
280	350	52	2	2	298	—	536	968	104	**NU3856**	1	289	289	295	301	—	341	341	—	2	2	11.5
	380	46	2.1	2.1	305	—	508	689	78.2	**NU1956**	1	291	291	302	308	—	369	369	339	2	2	14.7
	420	65	4	4	316	—	841	1 030	114	**NU1056**	1, 3	296	296	313	320	—	404	—	—	3	3	35.2

[Note] 1) For bearings other than NU type bearings (NJ, NUP, N, and NF types), use NJ, NUP, N, and NF for bearing number instead of supplementary code NU. For example, bearing number of a N type bearing having the same dimensions as NU230 is N230.
When two or more numbers for bearings other than that are on "Design" columns, refer to bearing numbers of NU type bearings.

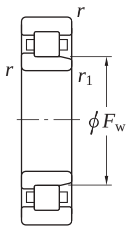
Single-row cylindrical roller bearings

d (280) ~ 480 mm



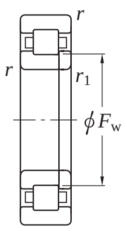
NU type

Design 1



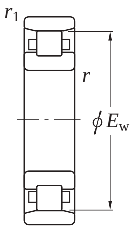
NJ type

Design 2



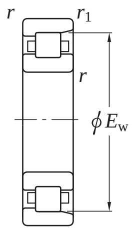
NUP type

Design 3



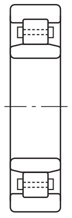
N type

Design 4

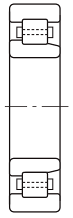


NF type

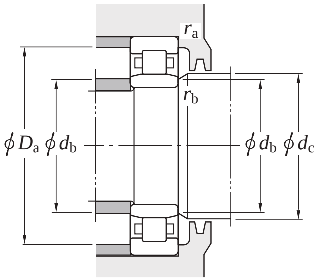
Design 5

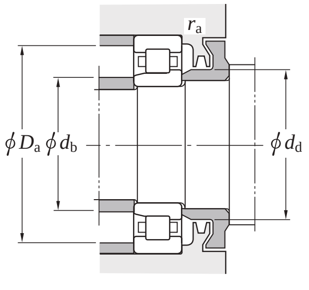


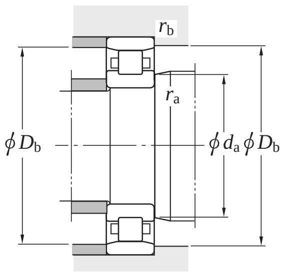
Design 1-P



Design 2-P





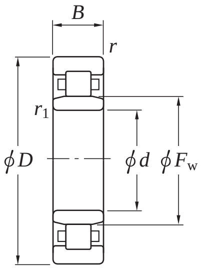


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)										(Refer.) Mass NU (N) (kg)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u			d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	
280	500	80	5	5	340	440	1 430	1 680	179	**NU256**	1~5	300	300	336	343	365	480	480	452	4	4	72.7
300	380	60	2.1	2.1	322	—	682	1 300	134	**NU3860**	1	311	311	319	325	—	369	369	—	2	2	16.6
	420	56	3	3	332	—	635	873	96.0	**NU1960**	1, 2	313	313	328	335	—	407	407	—	2.5	2.5	23.3
	460	74	4	4	340	—	1 120	1 380	147	**NU1060**	1, 3	316	316	337	344	—	444	—	—	3	3	44.1
	540	85	5	5	364	476	1 690	1 960	206	**NU260**	1~5	320	320	361	368	392	520	520	487	4	4	90.7
320	480	74	4	4	360	—	1 150	1 450	152	**NU1064**	1, 3	336	336	356	365	—	464	—	—	3	3	48.4
	580	92	5	5	390	510	1 920	2 270	232	**NU264**	1~5	340	340	386	393	419	560	560	522	4	4	114
	670	112	7.5	7.5	425	—	2 460	2 880	287	**NU364**	1	352	352	419	428	—	638	638	575	6	6	199
340	420	60	2.1	2.1	362	—	784	1 500	150	**NU3868**	1	351	351	359	365	—	409	409	—	2	2	18.1
	460	56	3	3	370	—	756	1 080	114	**NU1968**	1	353	353	366	373	—	447	447	434	2.5	2.5	25.7
	460	72	3	3	372	—	999	1 620	168	**NU2968**	1, 3	353	353	368	375	—	447	447	432	2.5	2.5	34.7
	520	82	5	5	385	—	1 370	1 750	183	**NU1068**	1~3	360	360	381	390	—	500	—	—	4	4	64.1
360	440	38	2.1	2.1	380	—	426	692	66.3	**NU1872**	1	371	371	378	383	—	429	429	424	2	2	11.7
	480	56	3	3	392	—	708	1 060	111	**NU1972**	1	373	373	388	395	—	467	467	—	2.5	2.5	27.3
	480	72	3	3	393	—	1 060	1 820	182	**NU2972**	1	373	373	390	396	—	467	467	451	2.5	2.5	37.2
	540	82	5	5	405	—	1 410	1 830	189	**NU1072**	1, 3	380	380	401	410	—	520	—	—	4	4	67.1
	540	134	5	5	413	—	2 470	4 180	396	**NU3072**	1	380	380	407	416	—	520	520	—	4	4	111
380	480	75	2.1	2.1	405	—	1 070	1 970	193	**NU3876**	1	391	391	401	408	—	469	469	—	2	2	32.3
	560	82	5	5	425	—	1 440	1 920	195	**NU1076**	1, 3	400	400	421	430	—	540	—	—	4	4	70.1
400	600	90	5	5	450	—	1 760	2 310	229	**NU1080**	1, 3	420	420	446	455	—	580	—	—	4	4	91.0
	600	148	5	5	450	—	2 830	4 370	407	**NU3080**	1	420	420	443	453	—	580	580	—	4	4	148
420	620	90	5	5	470	—	1 750	2 320	228	**NU1084**	1, 3	440	440	466	475	—	600	—	—	4	4	94.6
460	620	74	4	4	500	—	1 320	1 990	193	**NU1992**	1	476	476	495	503	—	604	604	585	3	3	60.8
480	650	78	5	5	525	—	1 410	2 200	211	**NU1996**	1	500	500	520	529	—	630	630	—	4	4	72.7

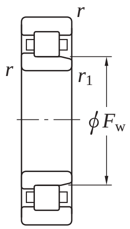
[Note] 1) For bearings other than NU type bearings (NJ, NUP, N, and NF types), use NJ, NUP, N, and NF for bearing number instead of supplementary code NU. For example, bearing number of a N type bearing having the same dimensions as NU230 is N230.
When two or more numbers for bearings other than that are on "Design" columns, refer to bearing numbers of NU type bearings.

Single-row cylindrical roller bearings

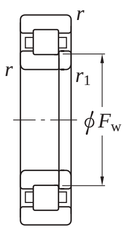
d 500 ~ 850 mm



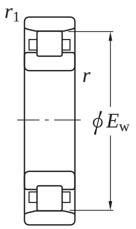
NU type
Design 1



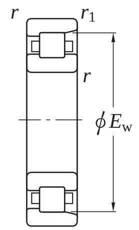
NJ type
Design 2



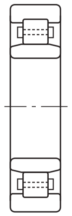
NUP type
Design 3

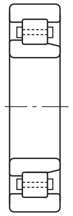


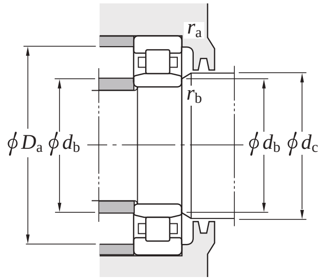
N type
Design 4

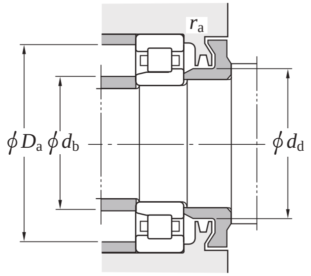


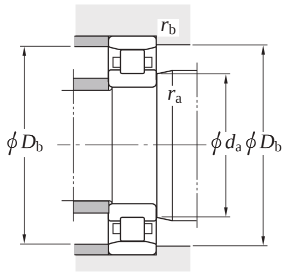
NF type
Design 5


Design 1-P


Design 2-P





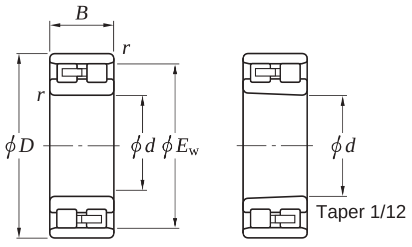


Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	De-sign	Mounting dimensions (mm)										(Refer.) Mass NU (N)
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	C_u			d_a min.	d_b min.	d_b max.	d_c min.	d_d min.	D_a max.	D_b max.	D_b min.	r_a max.	r_b max.	(kg)
500	620	56	3	3	534	—	884	1 560	147	**NU18/500**	1	513	513	531	537	—	607	607	594	2.5	2.5	37.3
	620	90	3	3	534	—	1 520	3 140	281	**NU38/500**	1	513	513	530	537	—	607	607	—	2.5	2.5	61.8
	670	78	5	5	546	—	1 840	3 160	294	**NU19/500**	1-P	520	520	542	550	—	650	650	—	4	4	78.5
	670	100	5	5	546	—	2 430	4 500	408	**NU29/500**	1-P	520	520	542	550	—	650	650	—	4	4	101
	720	100	6	6	556	—	2 850	4 440	412	**NU10/500**	1-P	524	524	551	560	—	696	—	674	5	5	141
530	710	82	5	5	575	—	1 650	2 560	241	**NU19/530**	2	550	550	570	579	—	690	690	673	4	4	86.9
	710	106	5	5	577	—	2 710	4 850	438	**NU29/530**	1-P	550	550	572	561	—	690	690	—	4	4	118
560	750	85	5	5	613	—	1 990	3 260	293	**NU19/560**	1	580	580	609	617	—	730	730	—	4	4	105
	750	112	5	5	613	—	3 130	5 870	514	**NU29/560**	2-P	580	580	607	617	—	730	730	—	4	4	140
600	800	90	5	5	652	—	2 470	4 170	369	**NU19/600**	1-P	620	620	647	656	—	780	780	—	4	4	126
630	780	88	4	4	671	—	1 900	3 690	317	**NU28/630**	1	646	646	665	675	—	764	764	—	3	3	91.8
	850	100	6	6	689	—	3 070	5 240	457	**NU19/630**	1-P	654	654	684	693	—	826	826	—	5	5	165
670	820	69	4	4	708	—	1 920	3 750	329	**NU18/670**	1-P, 2-P	686	686	705	712	—	804	804	—	3	3	76.6
850	1 030	106	5	5	900	—	2 660	5 960	468	**NU28/850**	1	870	870	894	905	—	1 010	1 010	—	4	4	175
	1 120	118	6	6	917	—	4 540	8 190	659	**NU19/850**	1-P	874	874	911	921	—	1 096	1 096	1 061	5	5	310

[Note] 1) For bearings other than NU type bearings (NJ, NUP, N, and NF types), use NJ, NUP, N, and NF for bearing number instead of supplementary code NU. For example, bearing number of a N type bearing having the same dimensions as NU230 is N230.
When two or more numbers for bearings other than that are on "Design" columns, refer to bearing numbers of NU type bearings.

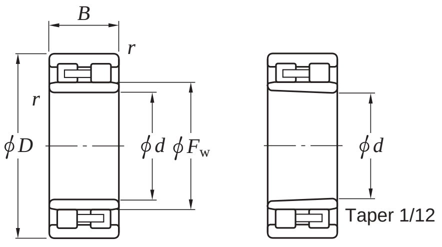
Double-row cylindrical roller bearings

d 100 ~ 200 mm



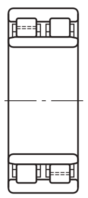
Cylindrical bore Tapered bore

Design 1 (NN type)

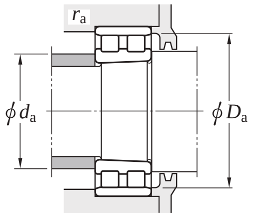


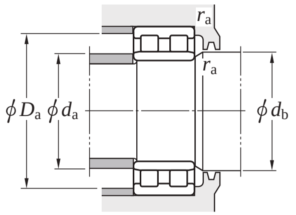
Cylindrical bore Tapered bore

Design 2 (NNU type)



Design 2-P (NNU type)



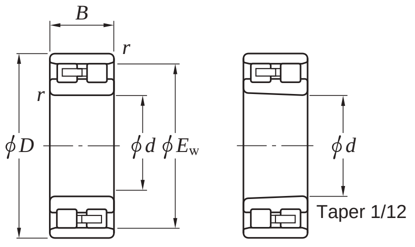


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		De-sign	Mounting dimensions (mm)						(Refer.) Mass (kg)
d	*D*	*B*	*r* min.	F_w	E_w	C_r	C_{0r}	C_u	NN Cylindrical bore	NNU Cylindrical bore		d_a min.	d_a max.	d_b min.	D_a max.	D_a min.	r_a max.	Cylindrical bore
100	140	40	1.1	113	—	139	258	32.9	—	**NNU4920**	2	106.5	111	115	133.5	—	1	1.95
	150	37	1.5	—	137	157	265	33.3	**NN3020**	—	1	108	—	—	142	139	1.5	2.28
105	160	41	2	—	146	197	322	42.5	**NN3021**	—	1	114	—	—	151	148	2	2.88
110	150	40	1.1	123	—	163	326	42.4	—	**NNU4922**	2	116.5	121	125	143.5	—	1	2.10
	170	45	2	—	155	221	361	47.9	**NN3022**	—	1	119	—	—	161	157	2	3.65
120	165	45	1.1	134.5	—	187	373	47.6	—	**NNU4924**	2	126.5	132	137	158.5	—	1	2.90
	180	46	2	—	165	232	392	51.1	**NN3024**	—	1	129	—	—	171	167	2	4.00
130	180	50	1.5	146	—	216	428	50.2	—	**NNU4926**	2	138	143.5	148	172	—	1.5	3.90
	200	52	2	—	182	283	476	57.7	**NN3026**	—	1	139	—	—	191	183	2	5.94
140	190	50	1.5	156	—	222	456	52.5	—	**NNU4928**	2	148	153.5	158	182	—	1.5	4.15
	210	53	2	—	192	297	516	61.5	**NN3028**	—	1	149	—	—	201	194	2	6.41
150	210	60	2	168.5	—	343	692	80.7	—	**NNU4930**	2	159	166	171	201	—	2	6.50
	225	56	2.1	—	206	334	587	70.1	**NN3030**	—	1	161	—	—	214	208	2	7.74
160	220	60	2	178.5	—	340	695	79.8	—	**NNU4932**	2	169	176	182	211	—	2	6.95
	240	60	2.1	—	219	398	695	79.6	**NN3032**	—	1	171	—	—	229	221	2	9.38
170	230	60	2	188.5	—	361	763	86.4	—	**NNU4934**	2	179	186	192	221	—	2	7.20
	260	67	2.1	—	236	471	824	105	**NN3034**	—	1	181	—	—	249	238	2	12.8
180	280	74	2.1	—	255	561	958	118	**NN3036**	—	1	191	—	—	269	257	2	16.8
190	260	69	2	210	—	465	996	119	—	**NNU4938**	2	199	207	215	251	—	2	11.0
	290	75	2.1	—	265	598	1 020	128	**NN3038**	—	1	201	—	—	279	267	2	17.6
200	280	80	2.1	223	—	509	1 050	125	—	**NNU4940**	2	211	219.5	228	269	—	2	15.4
	310	82	2.1	—	282	631	1 120	137	**NN3040**	—	1	211	—	—	299	285	2	22.5
	340	112	3	—	304	960	1 640	194	**NN3140**	—	1	213	—	—	327	307	2.5	41.3

[Remark] The bearing number of the tapered bore type bearing is suffixed by K.

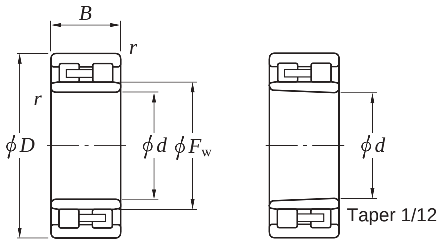
Double-row cylindrical roller bearings

d 220 ~ 410 mm



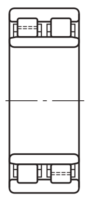
Cylindrical bore　Tapered bore

Design 1 (NN type)

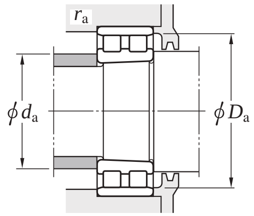


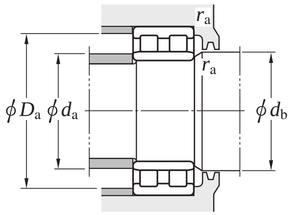
Cylindrical bore　Tapered bore

Design 2 (NNU type)



Design 2-P (NNU type)



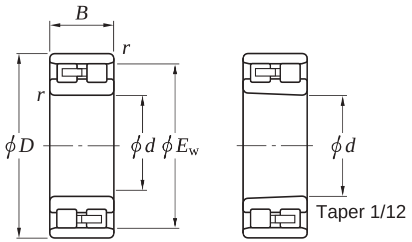


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		De-sign	Mounting dimensions (mm)						(Refer.) Mass (kg)
d	D	B	r min.	F_w	E_w	C_r	C_{0r}	C_u	NN Cylindrical bore	NNU Cylindrical bore		d_a min.	d_a max.	d_b min.	D_a max.	D_a min.	r_a max.	Cylindrical bore
220	300	80	2.1	244	—	561	1 220	145	—	**NNU4944**	2	231	241	248	289	—	2	16.7
	370	120	4	263	—	1 110	1 950	223	—	**NNU3144**	2	236	260	268	354	—	3	52.5
240	320	80	2.1	263	—	588	1 340	155	—	**NNU4948**	2	251	260	269	309	—	2	18.0
	360	92	3	—	330	864	1 590	184	**NN3048**	—	1	253	—	—	347	333	2.5	32.8
	400	128	4	286	—	1 270	2 290	257	—	**NNU3148**	2	256	282	291	384	—	3	65.3
260	360	100	2.1	287	—	941	2 050	228	—	**NNU4952**	2	271	284	296	349	—	2	31.4
280	380	100	2.1	308	—	976	2 200	239	—	**NNU4956**	2	291	305	316	369	—	2	33.1
	420	106	4	—	384	1 090	2 010	220	**NN3056**	—	1	296	—	—	404	387	3	51.2
300	420	118	3	339	—	1 170	2 720	285	—	**NNU4960**	2	313	335	343	407	—	2.5	51.9
	460	118	4	—	418	1 290	2 460	266	**NN3060**	—	1	316	—	—	444	421	3	70.8
320	480	121	4	—	438	1 350	2 670	283	**NN3064**	—	1	336	—	—	464	442	3	76.4
	480	160	4	362	—	1 970	4 040	414	—	**NNU4064**	2	336	358	367	464	—	3	99.9
340	460	118	3	372	—	1 270	2 930	301	—	**NNU4968**	2	353	368	383	447	—	2.5	56.8
	520	180	5	387	—	2 370	4 810	486	—	**NNU4068**	2	360	383	393	500	—	4	136
360	480	118	3	390	—	1 340	3 050	314	—	**NNU4972**	2	373	387	394	467	—	2.5	58.2
	540	134	5	—	493	1 560	3 090	315	**NN3072**	—	1	380	—	—	520	497	4	107
	540	180	5	407	—	2 430	5 050	503	—	**NNU4072**	2	380	403	413	520	—	4	142
	540	266	5	407	—	3 930	9 410	903	—	**72NNU54266**	2-P	380	403	413	520	—	4	219
	600	192	5	—	538	2 820	5 400	534	**NN3172**	—	1	380	—	—	580	543	4	218
380	570	300	4	423	—	4 970	11 700	1 100	—	**76NNU57300**	2-P	396	417	425	554	—	3	271
400	600	148	5	—	548	2 030	4 140	414	**NN3080**	—	1	420	—	—	580	552	4	146
	600	170	5	452	—	2 930	6 200	611	—	**80NNU60170**	2-P	420	447	458	580	—	4	172
	600	200	5	453	—	2 970	6 280	608	—	**NNU4080**	2	420	448	459	580	—	4	195
410	600	220	5	470	—	3 700	9 060	856	—	**82DC60220**	2-P	430	465	476	580	—	4	214

[Remark] The bearing number of the tapered bore type bearing is suffixed by K.

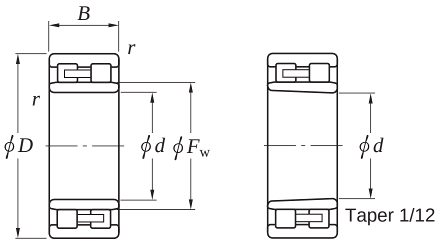
Double-row cylindrical roller bearings

d 420 ~ (670) mm



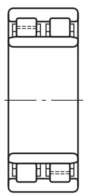
Cylindrical bore   Tapered bore

Design 1 (NN type)

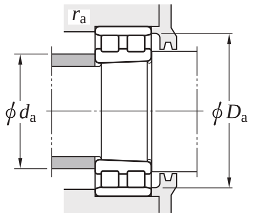


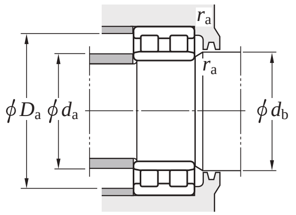
Cylindrical bore   Tapered bore

Design 2 (NN type)



Design 2-P (NNU type)



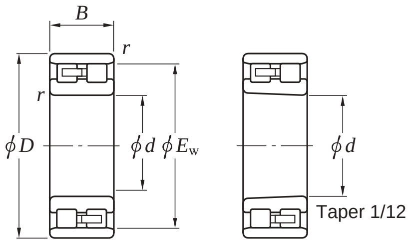


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)						(Refer.) Mass (kg)
d	D	B	r min.	F_w	E_w	C_r	C_{0r}	C_u	NN Cylindrical bore	NNU Cylindrical bore		d_a min.	d_a max.	d_b min.	D_a max.	D_a min.	r_a max.	Cylindrical bore
420	560	140	4	460	—	1 670	4 290	413	—	**NNU4984**	2	436	457	465	544	—	3	96.7
	600	220	5	470	—	3 700	9 060	856	—	**84DC60220**	2-P	440	465	476	580	—	4	204
	620	150	5	—	570	2 310	4 570	449	**NN3084**	—	1	440	—	—	600	574	4	154
	620	200	5	473	—	3 050	6 570	629	—	**NNU4084-1**	2	440	468	479	600	—	4	203
430	750	280	7.5	515	—	6 040	12 100	1 110	—	**86DC75280**	2-P	462	508	521	718	—	6	539
440	600	160	4	487	—	2 060	5 000	477	—	**NNU4988**	2	456	483	492	584	—	3	133
	620	225	4	487	—	3 950	9 980	921	—	**88DC62225**	2-P	456	483	492	604	—	3	220
	650	212	6	493	—	3 430	7 530	707	—	**NNU4088A**	2	464	488	501	—	—	5	240
	650	230	6	495	—	4 030	9 320	875	—	**88NNU65230**	2-P	464	489	502	626	—	5	265
460	620	160	4	502	—	2 250	5 440	516	—	**NNU4992**	2	476	498	507	604	—	3	136
480	680	280	6	527	—	5 160	12 900	1 150	—	**96NNU68280**	2-P	504	521	531	656	—	5	325
500	670	170	5	545	—	2 940	7 660	706	—	**100DC67170A**	2-P	520	541	551	650	—	4	171
	680	210	5	547	—	3 810	9 870	891	—	**100NNU68210**	2-P	520	542	552	660	—	4	225
	720	270	8	556	—	4 740	11 400	1 040	—	**100DC72270A**	2-P	532	551	565	688	—	6	353
	720	300	7	556	—	5 580	14 100	1 260	—	**100DC72300B**	2-P	532	551	561	688	—	5.5	405
508	749.3	355.6	6	566	—	7 350	18 300	1 600	—	**102DC75356**	2-P	532	560	573	725	—	5	540
560	735	170	5	604.6	—	3 040	7 730	694	—	**112DC74170**	2-P	580	598	609	715	—	4	194
	750	190	5	613	—	3 190	7 940	714	—	**NNU49/560**	2	580	608	619	730	—	4	233
600	800	200	5	652	—	3 500	8 630	762	—	**NNU49/600**	2	620	647	658	780	—	4	272
	870	200	6	—	801	3 940	8 450	746	**NN30/600**	—	1	624	—	—	846	807	5	388
630	780	150	4	671	—	2 430	6 800	591	—	**NNU48/630**	2	646	667	676	764	—	3	154
640	890	320	6	705	—	7 330	19 900	1 650	—	**128DC89320**	2-P	664	699	713	866	—	5	625
670	900	230	6	732	—	5 270	14 100	1 190	—	**NNU49/670**	2-P	694	726	740	876	—	5	420

[Remark] The bearing number of the tapered bore type bearing is suffixed by K.

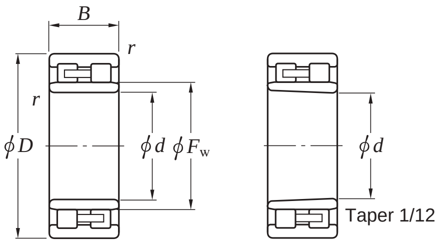
Double-row cylindrical roller bearings

d (670) ~ 710 mm



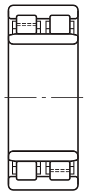
Cylindrical bore Tapered bore

Design 1 (NN type)

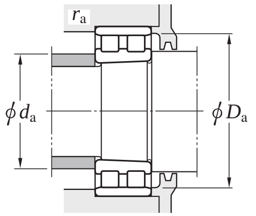


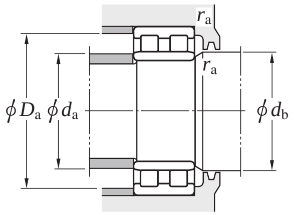
Cylindrical bore Tapered bore

Design 2 (NN type)



Design 2-P (NNU type)



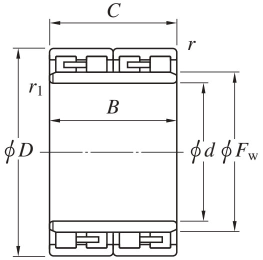


Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		De-sign		Mounting dimensions (mm)						(Refer.) Mass (kg)
d	*D*	*B*	*r* min.	F_w	E_w	C_r	C_{0r}	C_u	NN Cylindrical bore	NNU Cylindrical bore			d_a min.	max.	d_b min.	D_a max.	min.	r_a max.	Cylindrical bore
670	920	330	6	738	—	7 370	20 800	1 700	—	**134NNU92330**	2-P		694	732	746	896	—	5	662
710	950	243	6	775	—	5 890	16 200	1 350	—	**NNU49/710**	2-P		734	769	783	926	—	5	491

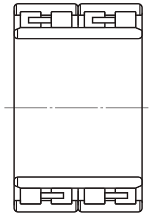
[Remark] The bearing number of the tapered bore type bearing is suffixed by K.

Four-row cylindrical roller bearings

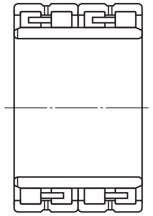
d 100 ~ (160) mm



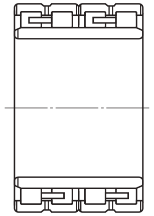
Design 1-1



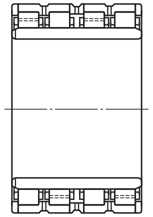
Design 1-2



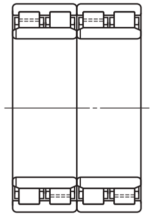
Design 1-3



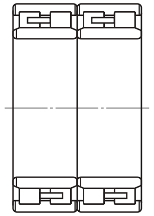
Design 1-4



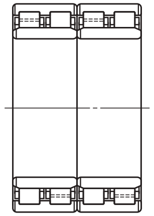
Design 1-6P



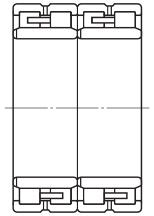
Design 2-1P



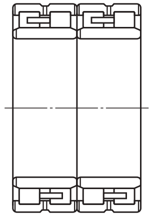
Design 2-2



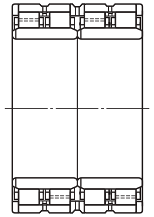
Design 2-2P



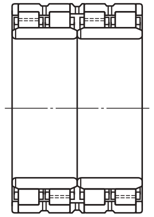
Design 2-3



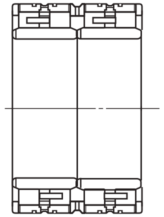
Design 2-4



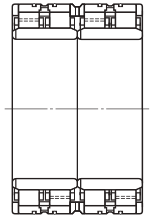
Design 2-5P



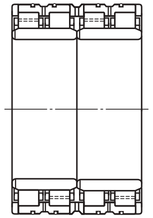
Design 2-6P



Design 3-1



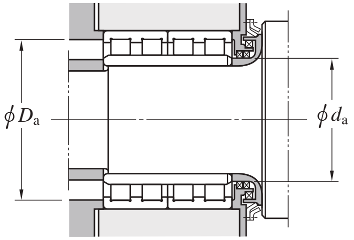
Design 3-1P



Design 3-2P

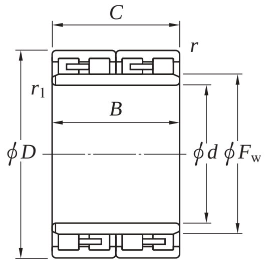
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 min.	C_r	C_{0r}	C_u				d_a min.	D_a max.	D_a min.	r_a [1)] max.	r_b [1)] max.	
100	140	120	120	110	1.1	1.1	607	945	134	**20FC14120**		2-2	107	133	131	1	1	5.6
110	170	90	90	127	2	2	538	692	92.0	**22FC1790**		1-2	120	160	155	2	2	7.4
	180	120	120	128	2	2	798	971	123	**22FC18120**		2-2	119	170	164	2	1.5	12
115	165	90	90	132.5	1.1	1.1	498	751	90.3	**23FC1690**		1-1	122	158	154	1	1	6.5
120	165	87	87	134.5	1.1	1.1	468	745	95.2	**24FC1787**		1-2	127	158	154	1	1	5.6
	180	105	105	135	2	1.1	613	796	96.7	**4CR120**		1-2	127	170	165	2	1	9.3
127	174.65	150.812	150.812	139.5	1.1	1.1	789	1 300	170	**25FC17150**		2-2	134	167	163	1	1	10.5
	203.2	127	127	147	2	2	930	1 180	160	**25FC20127**		1-3	137	193	185	2	2	15.4
130	200	104	104	150	2	2	711	953	115	**26FC20104**		1-2	140	190	182	2	2	11.8
	200	125	125	149	2	2	946	1 310	176	**26FC20125**		1-2	140	190	183	2	2	14.4
140	190	119	119	154	1.5	1.5	707	1 160	136	**28FC19119W**		1-3	149	181	178	1.5	1.5	9.6
	210	116	116	158	2	2	848	1 120	131	**28FC21116**		1-2	150	200	194	2	2	13.5
145	210	155	155	166	1.1	1.1	1 060	1 710	223	**29FC21155**		1-2	152	203	196	1	1	17.8
	225	156	156	169	2	2	1 150	1 680	219	**313924**		1-2	155	215	205	2	2	22.9
150	200	120	120	162	2	2	840	1 400	180	**30FC20120**		1-2	160	190	188	2	2	10.1
	210	120	120	168.5	2	2	859	1 380	161	**30FC21120**		2-2	160	200	196	2	2	12.8
	210	150	150	165	2	2	1 090	1 780	231	**30FC21150**		1-2	160	200	195	2	2	15.9
	220	150	150	170	2	2	1 110	1 760	229	**30FC22150**		1-2	160	210	202	2	2	19.2
	220	150	150	168	2	2	1 110	1 760	229	**30FC22150A**		1-2	160	210	200	2	2	19.5
	230	156	156	174	2	2	1 210	1 810	238	**313891-1**		1-2	160	220	210	2	2	23.8
160	220	180	180	177	2	2	1 210	2 170	271	**32FC22180**		1-2	170	210	205	2	2	20.5
	230	130	130	180	2.1	2.1	1 090	1 740	217	**314190**		1-2	172	218	212	2	2	17.7
	230	168	168	182	1.1	1.1	1 300	2 210	273	**32FC23170**		1-2	167	223	214	1	1	22.8
	230	168	168	180	2	2	1 310	2 200	273	**32FC23170A**		1-2	170	220	212	2	2	23.1

[Note] 1) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

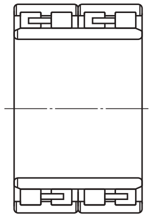


Four-row cylindrical roller bearings

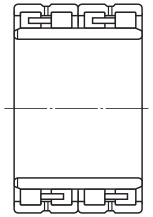
d (160) ~ (200) mm



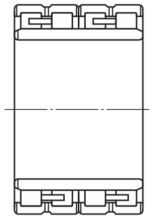
Design 1-1



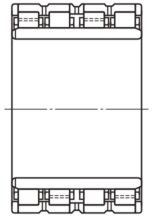
Design 1-2



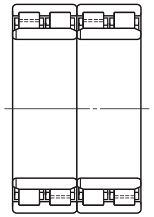
Design 1-3



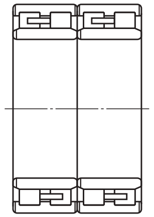
Design 1-4



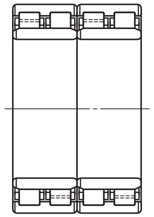
Design 1-6P



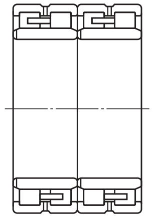
Design 2-1P



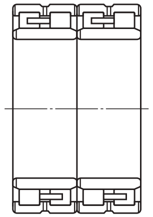
Design 2-2



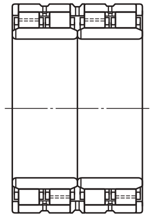
Design 2-2P



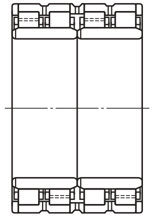
Design 2-3



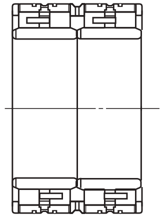
Design 2-4



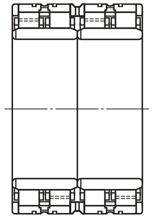
Design 2-5P



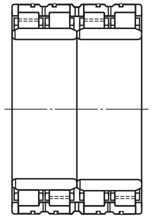
Design 2-6P



Design 3-1



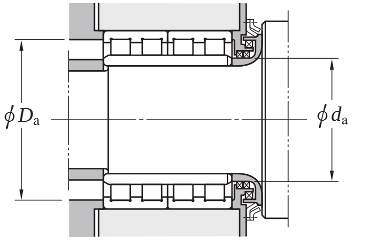
Design 3-1P



Design 3-2P

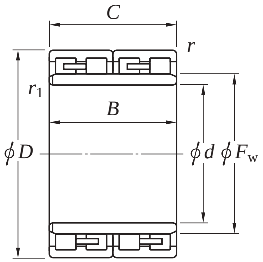
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 min.	C_r	C_{0r}	C_u			d_a min.	D_a max.	D_a min.	r_a 1) max.	r_b 1) max.	
160	230	168	168	179	2	2	1 400	2 210	276	**32FC23170B**	1-4	170	220	215	2	2	22.6
	230	180	180	177	2	2	1 430	2 270	282	**32FC23180A**	1-2	170	220	213	2	2	24.1
	240	120	120	183	2.1	2.1	831	1 140	128	**32FC24120W**	1-3	172	228	219	2	2	18.5
	240	170	170	183	2.1	2.1	1 480	2 220	279	**32FC24170**	1-2	172	228	223	2	2	26.8
170	230	120	120	187	2	2	976	1 680	208	**34FC23120**	1-2	180	220	215	2	2	14.4
	240	156	156	190	2	2	1 220	2 050	256	**34FC24156A**	1-2	180	230	222	2	2	22.4
	240	156	156	189	2	2	1 320	2 100	264	**34FC24156B**	1-2	180	230	225	2	2	21.8
	240	190	190	187	1.5	1.5	1 580	2 620	317	**34FC24190**	1-2	179	231	223	1.5	1.5	26.9
	250	168	168	192	2.1	2.1	1 470	2 230	277	**34FC25168**	1-2	182	238	232	2	2	27.6
	250	170	170	192	2.1	2.1	1 470	2 230	277	**34FC25170**	1-2	182	238	232	2	2	27.8
	260	150	150	195	2.1	2.1	1 380	2 000	253	**34FC26150**	1-2	182	248	237	2	2	28.8
178	258.75	150	150	199	1.5	1.5	1 370	2 070	261	**36FC26150**	1-2	187	250	239	1.5	1.5	25.8
180	250	156	156	200	2	2	1 310	1 980	271	**36FC25156A**	1-2	190	240	234	2	2	23.3
	260	168	168	202	2.1	2.1	1 440	2 390	291	**313812W**	1-4	192	248	238	2	2	29.7
	260	168	168	202	2.1	2.1	1 540	2 420	297	**36FC26168**	1-2	192	248	242	2	2	29.3
	265	180	180	203	2	2	1 630	2 600	313	**36FC27180**	1-2	190	255	243	2	2	33.6
190	260	168	168	212	2.1	2.1	1 430	2 600	309	**38FC26168-1**	1-2	202	248	244	2	2	26.5
	270	170	170	212	2	2	1 430	2 310	283	**38FC27170**	1-2	200	260	250	2	2	30.8
	270	170	170	213	2	2	1 430	2 310	283	**38FC27170A**	1-2	200	260	251	2	2	31.0
	270	200	200	212	2	2	1 840	3 080	368	**314199**	1-2	200	260	252	2	2	36.1
	280	200	200	214	2.1	2.1	1 940	3 100	370	**38FC28200**	1-2	202	268	258	2	2	42
	290	190	190	215	2.1	2.1	1 950	2 860	340	**38FC29190**	1-2	202	278	265	2	2	44.9
195	300	226	226	220	2.1	2.1	2 460	3 690	430	**39FC30226**	1-2	207	288	274	2	2	57.9
200	270	170	170	222	2	2.1	1 480	2 780	324	**314553**	1-2	212	260	254	2	2	28.0
	280	152	152	222	2.1	2.1	1 380	2 150	265	**40FC28152BW**	1-3	212	268	262	2	2	28.0

[Note] 1) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

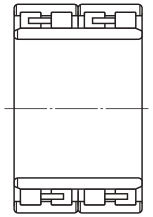


Four-row cylindrical roller bearings

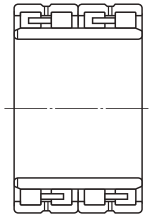
d (200) ~ (240) mm



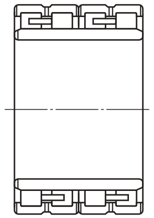
Design 1-1



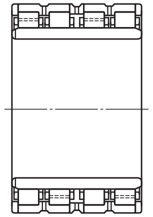
Design 1-2



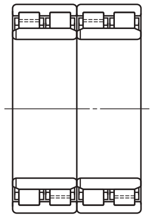
Design 1-3



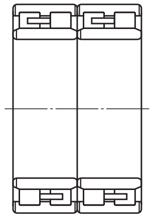
Design 1-4



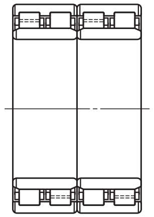
Design 1-6P



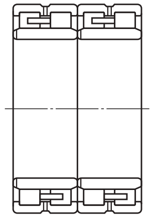
Design 2-1P



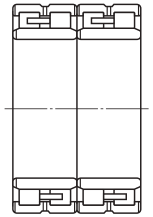
Design 2-2



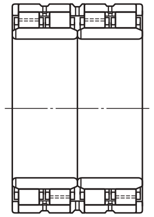
Design 2-2P



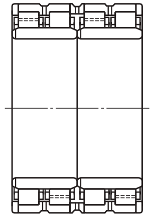
Design 2-3



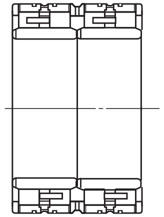
Design 2-4



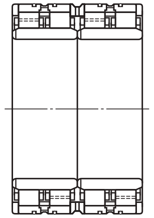
Design 2-5P



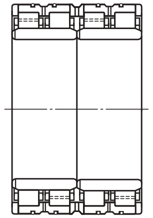
Design 2-6P



Design 3-1



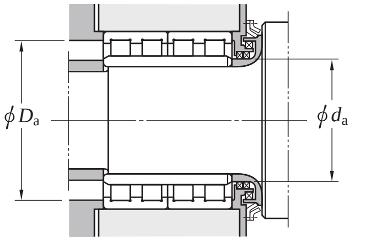
Design 3-1P



Design 3-2P

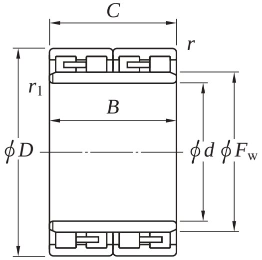
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 min.	C_r	C_{0r}	C_u			d_a min.	D_a max.	D_a min.	r_a 1) max.	r_b 1) max.	
200	280	170	170	222	2.1	2.1	1 600	2 620	313	**40FC28170**	1-2	212	268	262	2	2	31.7
	280	188	188	222	2.1	2.1	1 690	2 810	331	**40FC28188**	1-2	212	268	262	2	2	35.0
	280	190	190	223	3	3	1 820	3 100	359	**40FC28190A**	1-2	214	266	263	2.5	2.5	36.0
	280	200	200	222	2	2	1 820	3 090	365	**313893-1**	1-2	210	270	262	2	2	37.7
	280	200	200	224	2.1	2.1	1 820	3 330	388	**40FC28200**	1-2	212	268	260	2	2	38.7
	290	192	192	226	2.1	2.1	1 840	3 030	350	**313811**	1-2	212	278	268	2	2	42.0
	310	160	160	232	2.1	2.1	1 590	2 240	274	**40FC31160**	1-1	212	298	282	2	2	44.6
	310	206	206	227	2.1	2.1	2 260	3 240	387	**40FC31206**	1-2	212	298	283	2	2	56.6
206	299.97	170	170	229	2	2	1 840	2 780	333	**41FC30170**	1-2	216	289	277	2	2	39.2
210	290	192	192	236	2.1	2.1	1 820	3 270	372	**42FC29192**	1-2	222	278	274	2	2	38.1
	300	210	210	234	2.1	2.1	2 080	3 490	407	**42FC30210**	1-2	222	288	278	2	2	47.3
220	300	150	150	240	2.1	2.1	1 510	2 500	298	**44FC30150W**	1-3	232	288	280	2	2	30.7
	310	192	192	247	2.1	2.1	1 910	3 270	369	**313837-1**	1-2	232	298	289	2	2	45.5
	310	192	192	246	2	2	2 050	3 420	398	**313837A**	1-2	230	300	291	2	2	44.9
	310	192	192	245	3	2.1	1 820	2 980	349	**44FC31192W**	1-3	232	296	289	2.5	2	43.9
	310	225	225	244	2.1	2.1	2 360	4 160	467	**44FC31225A**	1-2	232	298	288	2	2	53.5
	320	210	210	246	2.1	2.1	2 200	3 490	406	**44FC32210**	1-2	232	308	296	2	2	55.4
	320	210	210	248	2.1	2.1	2 270	3 740	430	**44FC32210-1**	1-4	232	308	296	2	2	56.7
	340	180	180	256	3	3	1 890	2 750	326	**44FC34180A**	1-4	234	326	310	2.5	2.5	59.0
230	330	206	206	260	2.1	2.1	2 360	3 980	450	**313824A**	1-2	242	318	308	2	2	57.5
	340	260	260	261	3	3	2 890	4 900	549	**46FC34260**	1-2	244	326	313	2.5	2.5	81.2
237	339.67	200	200	264	2	2	2 310	3 780	432	**47FC34200**	1-2	247	329	314	2	2	58.0
240	330	220	220	270	3	3	2 220	4 250	471	**312943/1YD**	1-4	254	316	310	2.5	2.5	55.5
	330	220	220	264	2.1	2.1	2 300	4 120	462	**48FC33220**	1-2	252	318	308	2	2	54.3
	330	220	220	268	3	3	2 210	4 070	454	**48FC33220BW**	1-4	254	316	310	2.5	2.5	55.5
	330	250	250	263	2.1	2.1	2 700	4 910	546	**48FC33250W**	1-3	252	318	309	2	2	63.7

[Note] 1) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

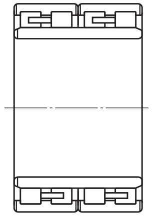


Four-row cylindrical roller bearings

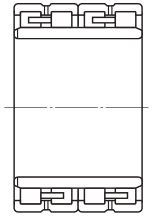
d (240) ~ (290) mm



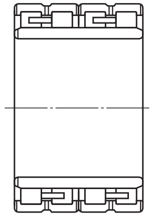
Design 1-1



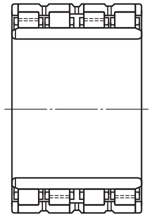
Design 1-2



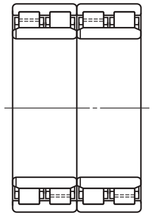
Design 1-3



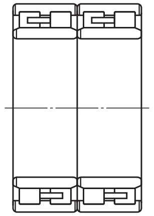
Design 1-4



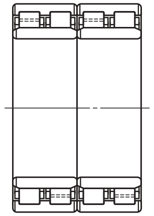
Design 1-6P



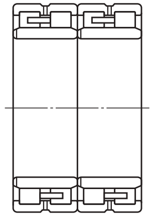
Design 2-1P



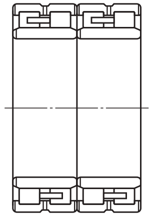
Design 2-2



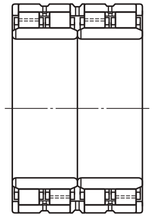
Design 2-2P



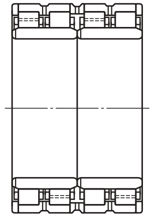
Design 2-3



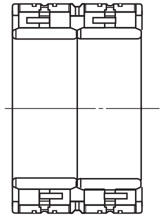
Design 2-4



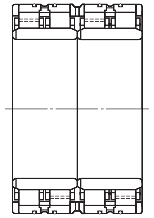
Design 2-5P



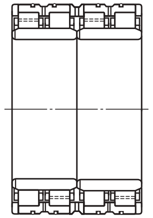
Design 2-6P



Design 3-1

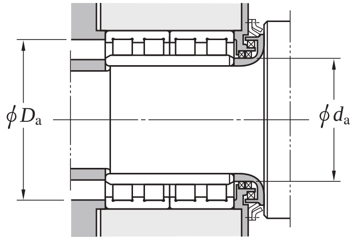


Design 3-1P



Design 3-2P

Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 min.	C_r	C_{0r}	C_u				d_a min.	D_a max.	D_a min.	r_a[1] max.	r_b[1] max.	
240	340	200	200	266	3	3	2 350	3 780	432	**48FC34200**		1-2	254	326	318	2.5	2.5	56.3
	340	220	220	268	3	3	2 510	4 240	472	**48FC34220**		1-2	254	326	318	2.5	2.5	63.4
250	350	220	220	278	3	3	2 420	4 200	467	**50FC35220**		1-2	264	336	326	2.5	2.5	64.6
260	355	260	260	286	2.1	2.1	2 860	5 440	591	**52FC35260**		2-2	272	343	332	2	2	75.0
	360	192	192	287	2.1	2.1	2 190	3 740	416	**52FC36192W**		1-3	272	348	335	2	2	59.8
	360	200	200	287	2.1	2.1	2 360	4 110	456	**52FC36200**		1-2	272	348	335	2	2	62.0
	360	230	230	292.5	2.1	2.1	2 680	4 900	528	**52FC36230CW**		1-4	272	348	340	2	2	69.7
	360	230	230	292	2.1	2.1	2 520	4 790	515	**52FC36230D**		1-2	272	348	336	2	2	72.6
	360	260	260	287	2.1	2.1	2 880	5 320	579	**52FC36260**		2-2	272	348	335	2	2	80.0
	368	268	268	288	2.1	2.1	3 430	5 990	645	**52FC37268W**		1-4	272	356	344	2	2	89.9
	370	220	220	292	3	3	2 500	4 330	476	**313823**		1-2	274	356	342	2.5	2.5	76.0
	370	220	220	290	3	3	2 730	4 480	497	**313823A**		1-2	274	356	346	2.5	2.5	75.0
	370	260	260	290	2.1	2.1	3 310	5 740	623	**52FC37260**		1-2	272	358	346	2	2	88.5
265	370	234	234	292	1.5	1.5	2 870	4 910	536	**53FC37234A**		1-2	274	361	346	1.5	1.5	76.3
	370	234	234	300	1.5	1.5	2 830	5 290	579	**53FC37234B**		2-2	274	361	348	1.5	1.5	78.5
270	380	230	230	298	2.1	2.1	2 910	4 910	535	**54FC38230**		1-2	282	368	354	2	2	80.0
280	380	170	170	306	2.1	2.1	2 130	3 590	398	**56FC38170W**		1-3	292	368	356	2	2	55.0
	390	220	220	312	3	3	2 590	4 640	501	**313822**		1-2	294	376	362	2.5	2.5	81.8
	390	220	220	308	3	3	2 730	4 670	508	**313822A**		1-2	294	376	362	2.5	2.5	79.7
	390	220	220	306	3	2.1	3 160	5 350	575	**313822C**		1-2	292	376	364	2.5	2	79.7
	390	220	220	312	3	3	2 910	5 100	547	**313822D**		1-2	294	376	366	2.5	2.5	80.1
	390	240	240	312	3	3	3 070	5 620	608	**56FC39240**		1-2	294	376	364	2.5	2.5	88.1
	390	275	275	309	2.1	2.1	3 360	6 110	647	**56FC39275B**		1-2	292	378	363	2	2	100
	390	275	275	308	3	2.1	3 810	6 850	719	**56FC39275J**		2-4	292	376	366	2.5	2	102
	410	300	300	314	3	3	4 680	8 400	895	**56FC41300**		2-6P	294	396	378	2.5	2.5	137
290	390	234	234	320	3	3	2 880	5 500	575	**58FC39234**		1-2	304	376	368	2.5	2.5	80.0

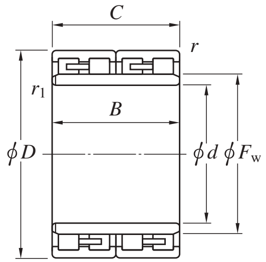


[Note] 1) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

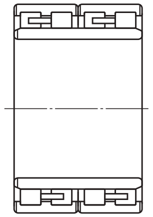
Four-row cylindrical roller bearings

Koyo

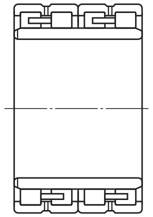
d (290) ~ (340) mm



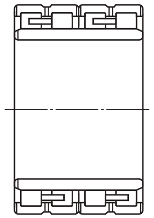
Design 1-1



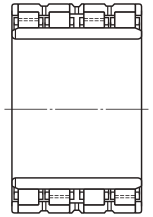
Design 1-2



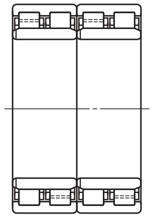
Design 1-3



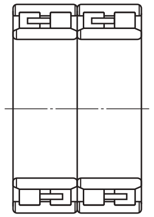
Design 1-4



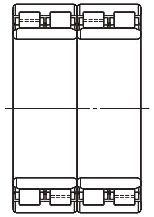
Design 1-6P



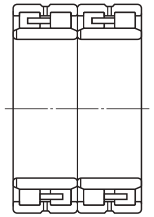
Design 2-1P



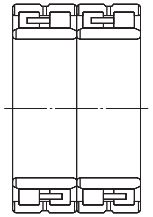
Design 2-2



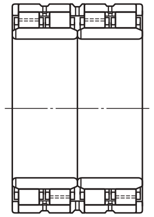
Design 2-2P



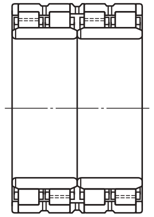
Design 2-3



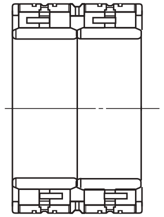
Design 2-4



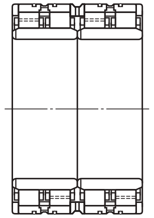
Design 2-5P



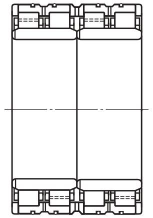
Design 2-6P



Design 3-1

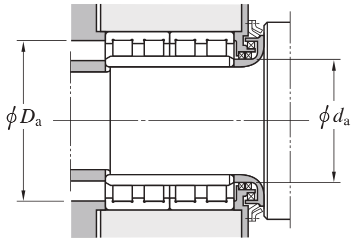


Design 3-1P



Design 3-2P

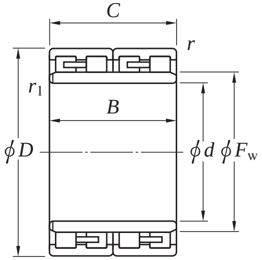
Boundary dimensions (mm)							**Basic load ratings** (kN)		**Fatigue load limit** (kN)	**Bearing No.**	**Design**	**Mounting dimensions** (mm)					(Refer.) **Mass** (kg)
d	D	B	C	F_w	r min.	r_1 min.	C_r	C_{0r}	C_u			d_a min.	D_a max.	D_a min.	r_a [1)] max.	r_b [1)] max.	
290	400	180	180	320	3	3	2 350	4 010	434	**58FC40180W**	1-2	304	386	372	2.5	2.5	68.3
	410	240	240	320	3	3	3 270	5 540	589	**58FC41240**	1-2	304	396	380	2.5	2.5	99.0
	420	300	300	327	3	3	3 880	6 960	722	**58FC42300**	1-2	304	406	387	2.5	2.5	138
300	400	300	300	328	3	3	3 650	7 310	746	**60FC40300A**	1-2	314	386	378	2.5	2.5	103
	420	218	218	332	3	3	2 940	5 010	537	**60FC42218**	1-1	314	406	390	2.5	2.5	93.0
	420	240	240	332	3	3	3 330	5 750	606	**60FC42240**	1-1	314	406	392	2.5	2.5	102
	420	300	300	332	3	3	4 220	7 840	817	**4CR300**	3-2P	314	406	392	2.5	2.5	125
	420	300	300	331	1.5	1.5	4 280	7 750	805	**60FC42300DW**	2-4	309	411	395	1.5	1.5	127
	420	300	300	332	2	2	4 700	8 690	896	**60FC42300L-2**	2-6P	310	410	395	2	2	129
	420	300	300	332	3	3	4 070	7 270	749	**60FC42300W**	2-3	314	406	394	2.5	2.5	127
310	420	300	300	338	3	3	3 870	7 370	754	**62FC42300**	1-2	324	406	394	2.5	2.5	119
	430	240	240	344.5	3	3	3 310	5 770	602	**62FC43240**	1-2	324	416	404	2.5	2.5	105
	440	240	240	341	3	3	3 530	5 730	604	**62FC44240**	1-2	324	426	409	2.5	2.5	113
320	440	230	230	351	3	3	3 170	5 490	574	**64FC44230/240**	1-2	334	426	411	2.5	2.5	103
	450	240	240	358	3	3	3 380	5 740	603	**4CR320**	1-2	334	436	422	2.5	2.5	119
	450	240	240	355	3	3	3 390	5 730	604	**64FC45240**	1-2	334	436	419	2.5	2.5	117
	450	240	240	358	3	3	3 470	5 930	623	**64FC45240CW**	1-4	334	436	422	2.5	2.5	118
	460	340	340	360	3	3	4 840	8 730	890	**64FC46340A**	1-4	334	446	428	2.5	2.5	187
	480	290	290	361	4	4	5 120	8 450	883	**64FC48290**	2-6P	338	462	441	3	3	189
	480	350	350	364	2.1	2.1	6 290	11 000	1 120	**314274A**	2-6P	332	468	444	2	2	227
330	440	200	200	358	3	3	2 920	5 220	553	**66FC44200AW**	1-3	344	426	414	2.5	2.5	83.4
	440	200	200	360	3	5	2 570	4 670	490	**66FC44200W**	1-3	352	426	412	2.5	4	83.0
	460	340	340	364	2.1	2.1	4 840	9 150	926	**66FC46340**	1-2	342	448	428	2	2	172
	460	340	340	368	4	4	5 090	9 800	978	**66FC46340B**	1-2	348	442	432	3	3	176
	460	380	380	364	2.1	2.1	5 490	10 800	1 070	**66FC46380W**	1-4	342	448	428	2	2	195
340	445	250	250	367	2.1	4	3 140	6 110	626	**68FC45250W**	1-3	358	433	419	2	3	100
	450	250	250	368	2.1	2.1	3 430	6 480	672	**68FC45250BW**	1-3	352	438	424	2	2	106



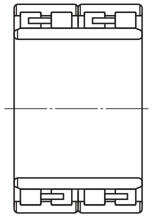
[Note] 1) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

Four-row cylindrical roller bearings

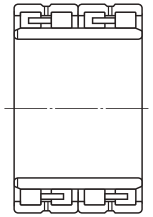
d (340) ~ 390 mm



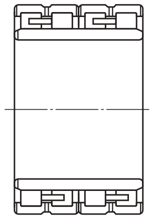
Design 1-1



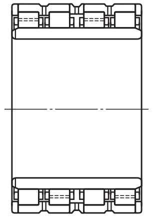
Design 1-2



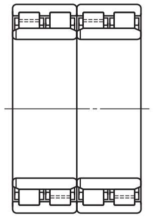
Design 1-3



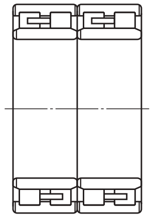
Design 1-4



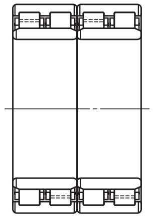
Design 1-6P



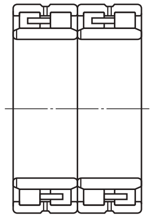
Design 2-1P



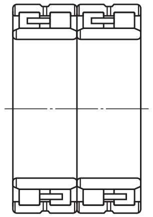
Design 2-2



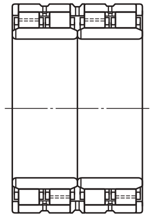
Design 2-2P



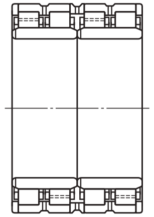
Design 2-3



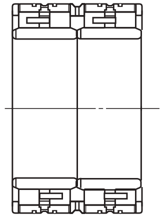
Design 2-4



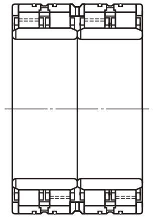
Design 2-5P



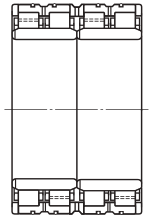
Design 2-6P



Design 3-1



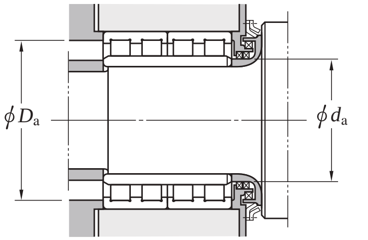
Design 3-1P



Design 3-2P

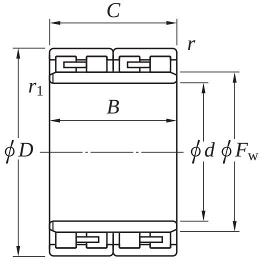
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 [1)] min.	C_r	C_{0r}	C_u				d_a min.	D_a max.	D_a min.	r_a [2)] max.	r_b [2)] max.	
340	480	350	350	378	4	SP	5 740	11 100	1 100	**68FC48350-2**		2-4	354	462	446	3	2	211
	480	350	350	378	3	SP	5 990	11 500	1 150	**68FC48350D**		3-2P	354	466	448	2.5	2	201
	480	350	350	376	4	4	6 070	11 400	1 150	**68FC48350L**		3-2P	358	462	448	3	3	201
	480	385	350	378	2.1	SP	5 990	11 500	1 150	**68FC48350N**		2-6P	358	468	448	2	3	209
	490	300	300	380	5	5	4 390	7 690	784	**68FC49300**		1-2	362	468	450	4	4	187
	490	300	300	379	5	5	4 610	7 850	797	**68FC49300A**		1-2	362	468	453	4	4	182
343.052	457.098	254	254	374	3	3	3 300	6 190	632	**69FC46254W**		1-4	358	443	430	2.5	2.5	112
350	500	460	460	388	2	2	8 230	16 500	1 610	**70FC50460**		2-6P	360	490	464	2	2	296
360	480	290	290	392	3	3	4 330	8 510	842	**72FC48290**		1-2	374	466	452	2.5	2.5	145
	500	250	250	394	3	3	4 390	7 340	756	**72FC50250**		2-2	374	486	470	2.5	2.5	145
	510	370	370	400	4	4	5 750	11 000	1 090	**72FC51370**		1-2	378	492	470	3	3	241
	520	380	380	405	2	5	7 270	13 700	1 350	**72FC52380**		2-6P	382	510	485	2	4	270
370	520	380	380	409	5	5	6 660	13 200	1 300	**74FC52380**		2-6P	392	498	481	4	4	257
	520	400	400	413	5	5	5 930	11 900	1 150	**74FC52400W**		2-4	392	498	481	4	4	268
	540	400	400	415	4	4	6 500	11 500	1 130	**74FC54400A**		1-2	388	522	499	3	3	311
375	545	400	400	417	4	4	7 920	14 500	1 410	**75FC55400**		3-2P	393	527	505	3	3	315
380	520	280	280	417	4	4	4 660	8 550	850	**76FC52280**		1-2	398	502	487	3	3	173
	520	290	290	418	4	4	4 700	8 840	878	**76FC52290**		1-2	398	502	486	3	3	181
	540	300	300	421	3	3	5 820	10 100	1 010	**76FC54300**		2-6P	394	526	505	2.5	2.5	222
	540	340	340	422	4	4	5 760	10 300	1 010	**76FC54340W**		3-1	398	522	502	3	3	256
	540	360	360	422	4	4	6 870	12 900	1 260	**76FC54360**		2-6P	398	522	502	3	3	266
	540	400	380	422	4	4	7 530	14 300	1 400	**76FC54380**		2-6P	398	522	504	3	3	287
	540	400	400	422	4	4	7 560	14 600	1 410	**76FC54400BW**		2-6P	398	522	502	3	3	298
	540	400	400	422	4	4	7 560	14 600	1 410	**76FC54400DW**		3-2P	398	522	502	3	3	298
390	550	400	400	434	5	SP	6 430	12 400	1 190	**78FC55400AW**		2-3	410	528	510	4	4	296

[Notes] 1) SP indicates the specially chamfered form.
2) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

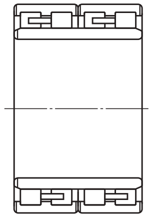


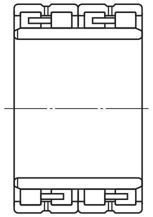
Four-row cylindrical roller bearings

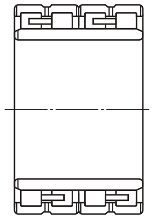
d 400 ~ 444.5 mm

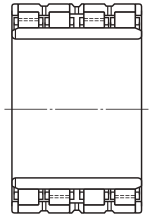


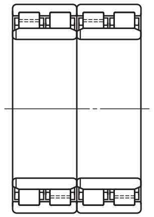
Design 1-1


Design 1-2


Design 1-3


Design 1-4


Design 1-6P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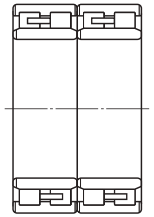
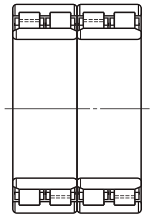
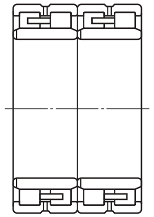
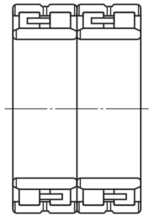

Design 2-2

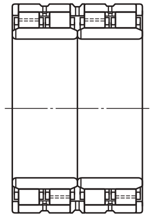

Design 2-2P

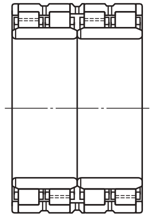

Design 2-3

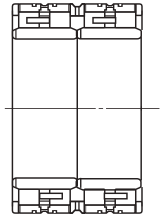

Design 2-4

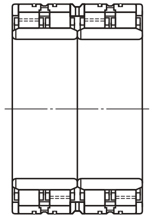
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	*D*	*B*	*C*	F_w	*r* min.	r_1 min.	C_r	C_{0r}	C_u				d_a min.	D_a max.	D_a min.	r_a 1) max.	r_b 1) max.	
400	520	250	250	432	4	4	3 650	7 050	698	**80FC52250W**		1-3	418	502	492	3	3	133
	560	360	360	441	5	5	6 980	13 400	1 290	**80FC56360**		2-6P	422	538	521	4	4	277
	560	410	410	445	5	5	7 930	15 800	1 500	**4CR400**		3-2P	422	538	525	4	4	310
	560	410	410	445	2	5	8 100	16 300	1 540	**80FC56410**		2-6P	422	550	525	2	4	315
	600	380	380	450	5	5	8 310	14 300	1 400	**80FC60380**		2-6P	422	578	552	4	4	388
406.4	609.6	304.8	304.8	460	5	5	5 500	8 750	868	**81FC6130W**		1-4	429	587	556	4	4	307
410	546	400	400	448	5	5	6 260	13 000	1 240	**82FC55400**		2-2	432	524	516	4	4	256
	600	440	440	460	5	5	10 100	18 800	1 780	**82FC60440**		2-6P	432	578	560	4	4	432
418.5	600	410	410	470	5	5	8 300	15 700	1 500	**84FC60410A**		2-6P	441	578	560	4	4	385
419	592	350	350	462	4	4	7 120	12 900	1 250	**84FC59350**		1-6P	437	574	552	3	3	304
420	560	280	280	457	4	4	4 900	9 410	913	**84FC56280**		1-1	438	542	527	3	3	189
	560	400	400	458	4	4	6 080	12 700	1 200	**84FC56400**		2-4	438	542	526	3	3	270
	580	320	320	463	4	4	5 960	11 000	1 070	**84FC58320**		2-4	438	562	543	3	3	249
	600	440	440	470	5	5	9 080	17 700	1 670	**4CR420A**		3-1P	442	578	560	4	4	420
430	591	420	420	472	5	5	8 200	16 800	1 570	**86FC59420**		2-2P	452	569	552	4	4	345
	591	420	420	476	4	4	8 150	17 400	1 610	**86FC59420-2**		2-6P	448	573	552	3	3	349
	591	420	420	476	4	4	7 390	14 700	1 380	**86FC59420A-1**		1-3	448	573	552	3	3	340
	600	450	450	475	5	5	9 350	19 300	1 800	**86FC60450**		2-6P	452	578	559	4	4	405
440	590	270	270	482	4	4	4 530	8 460	830	**88FC59270W**		1-3	458	572	554	3	3	207
	620	450	450	487	4	4	9 900	20 000	1 840	**4CR440**		3-1P	458	602	577	3	3	440
	620	450	450	487	4	4	9 900	20 000	1 840	**88FC62450AW**		2-6P	458	602	577	3	3	440
	640	420	420	492	5	5	9 810	18 400	1 740	**88FC64420**		2-6P	462	618	592	4	4	470
	720	452	452	512	6	6	10 800	16 600	1 590	**88FC72452**		1-6P	468	692	652	5	5	740
444.5	660.4	323.85	323.85	500	4	4	7 590	12 600	1 210	**89FC66324**		1-6P	463	642	608	3	3	400

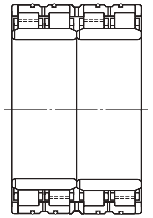
[Note] 1) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension *r*.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

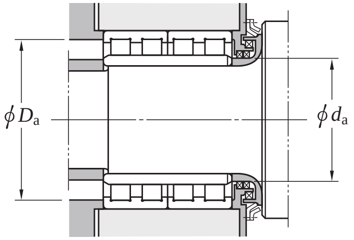

Design 2-5P


Design 2-6P


Design 3-1

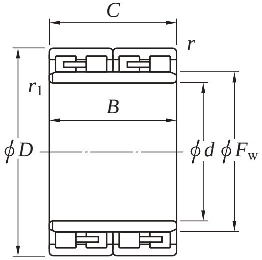

Design 3-1P


Design 3-2P

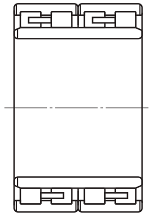


Four-row cylindrical roller bearings

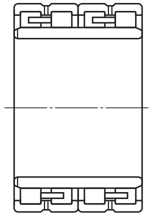
d 445 ~ 500 mm



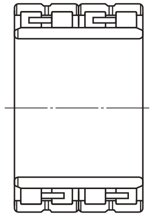
Design 1-1



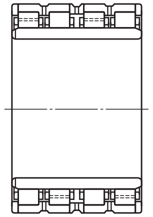
Design 1-2



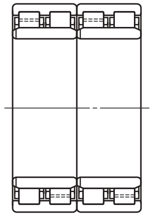
Design 1-3



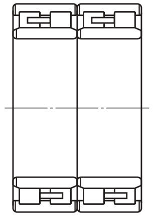
Design 1-4



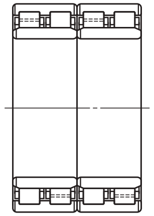
Design 1-6P



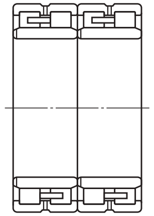
Design 2-1P



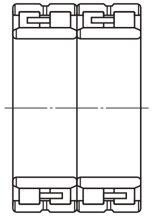
Design 2-2



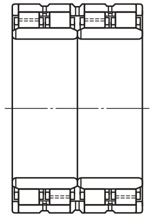
Design 2-2P



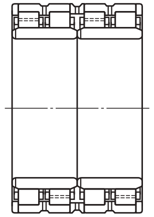
Design 2-3



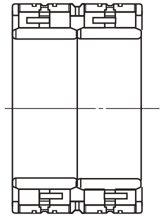
Design 2-4



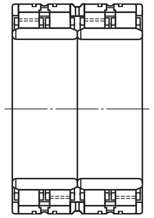
Design 2-5P



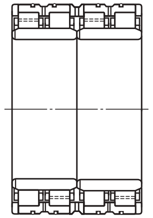
Design 2-6P



Design 3-1



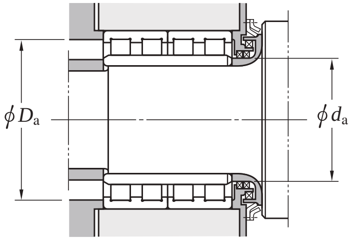
Design 3-1P



Design 3-2P

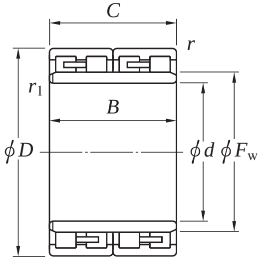
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r [1) min.	r_1 [1) min.	C_r	C_{0r}	C_u			d_a min.	D_a max.	D_a min.	r_a [2) max.	r_b [2) max.	
445	635	375	375	496	4	4	7 820	14 600	1 390	**4CR445**	3-1P	463	617	588	3	3	385
450	630	450	450	500	4	4	8 540	16 600	1 540	**90FC63450A**	2-2	468	612	590	3	3	433
460	600	400	400	497	4	SP	6 630	14 300	1 320	**92FC60400**	2-4	478	582	567	3	3	287
	620	400	400	504	4	4	8 560	18 200	1 660	**4CR460C**	3-1P	478	602	584	3	3	350
	620	400	400	502	4	4	8 140	17 000	1 580	**92FC62400BW**	1-6P	478	602	582	3	3	350
	620	400	400	502	4	4	7 380	14 800	1 370	**92FC62400D**	1-4	478	602	583	3	3	340
	650	470	470	509	6	6	11 300	22 200	2 050	**92FC65470W**	1-6P	488	622	609	5	5	494
	660	500	500	512	4	4	11 700	23 300	2 130	**4CR460**	3-1P	478	642	612	3	3	590
	660	500	500	510	5	5	12 000	23 400	2 140	**92FC66500**	2-6P	482	638	614	4	4	573
	680	400	400	504	4	4	9 940	16 600	1 590	**4CR460D**	3-1P	478	662	624	3	3	510
480	650	450	450	525	5	5	10 600	22 400	2 040	**96FC65450B**	2-6P	502	628	615	4	4	440
	650	460	460	526	5	5	9 660	20 800	1 890	**96FC65460**	2-6P	502	628	610	4	4	443
	680	460	460	532	5	5	10 800	21 300	1 950	**96FC68460**	2-6P	502	658	632	4	4	545
	680	500	500	534	5	5	10 800	22 000	1 990	**4CR480**	3-1P	502	658	630	4	4	580
	680	500	500	534	5	5	10 800	22 000	1 990	**4CR480B**	3-2P	502	658	630	4	4	580
	680	500	500	532	5	5	12 000	24 300	2 190	**96FC68500A**	2-6P	502	658	632	4	4	595
495	615	360	360	530	SP	SP	5 060	12 000	1 100	**99FC62360**	2-4	511	597	586	3	3	235
500	670	450	450	540	5	SP	10 600	22 500	2 020	**100FC67450A-3**	2-6P	522	648	630	4	4	451
	680	420	405	550	5	5	8 380	17 600	1 610	**100FC68405**	2-6P	522	658	634	4	4	442
	680	450	450	542.5	4	4	11 300	23 100	2 110	**100FC68450**	2-6P	518	662	639	3	3	495
	690	510	510	550	5	5	11 700	24 600	2 200	**100FC69510A**	3-2P	522	668	646	4	4	562
	710	480	480	558	6	6	12 200	24 800	2 220	**100FC71480**	2-6P	528	682	662	5	5	631
	720	400	400	558	5	6	10 400	18 900	1 750	**100FC72400**	1-6P	528	698	672	4	5	549
	720	530	530	560	6	6	13 600	26 500	2 370	**100FC72530**	2-6P	528	692	674	5	5	725
	720	530	530	568	5	4	13 700	28 900	2 580	**100FC72530C**	2-6P	518	698	672	4	3	742
	720	530	530	560	6	6	13 600	26 500	2 370	**100FC72530W**	3-2P	528	692	674	5	5	725

[Notes] 1) SP indicates the specially chamfered form.
2) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

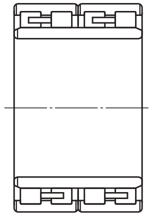


Four-row cylindrical roller bearings

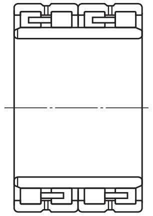
d 510 ~ (600) mm



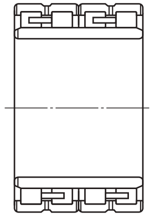
Design 1-1



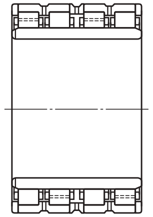
Design 1-2



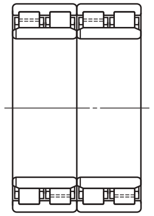
Design 1-3



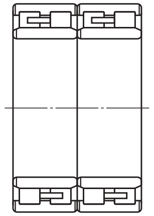
Design 1-4



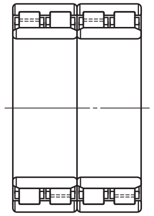
Design 1-6P



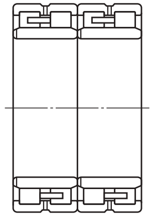
Design 2-1P



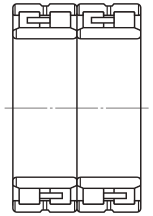
Design 2-2



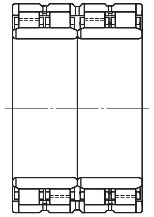
Design 2-2P



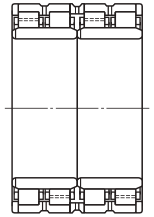
Design 2-3



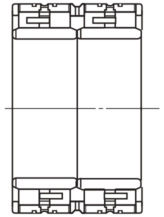
Design 2-4



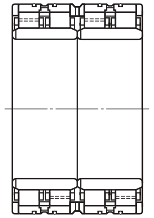
Design 2-5P



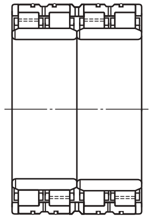
Design 2-6P



Design 3-1

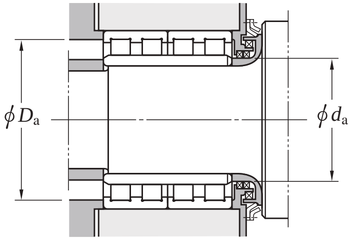


Design 3-1P



Design 3-2P

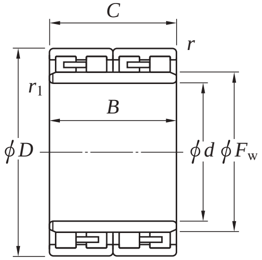
Boundary dimensions (mm)							**Basic load ratings** (kN)		**Fatigue load limit** (kN)	**Bearing No.**	**Design**	**Mounting dimensions** (mm)					(Refer.) **Mass** (kg)
d	*D*	*B*	*C*	F_w	*r* min.	r_1 1) min.	C_r	C_{0r}	C_u			d_a min.	D_a max.	D_a min.	r_a 2) max.	r_b 2) max.	
510	670	320	320	554	5	5	6 950	14 300	1 310	**102FC67320**	1-6P	532	648	634	4	4	305
	670	450	450	550	5	5	10 400	23 400	2 100	**102FC67450**	2-6P	532	648	634	4	4	433
520	680	450	450	562	5	5	9 760	22 300	1 980	**104FC68450W**	2-6P	542	658	642	4	4	435
	735	535	535	574.5	5	5	13 200	27 200	2 400	**104FC74535**	2-5P	542	713	680	4	4	738
	735	535	535	574.5	5	5	13 400	27 500	2 420	**104FC74535C**	3-2P	542	713	682	4	4	735
530	760	520	520	589	6	SP	14 400	28 800	2 520	**106FC76520A**	2-6P	548	732	705	5	2.5	810
	780	570	570	595	6	6	15 600	30 600	2 710	**106FC78570**	2-6P	558	752	719	5	5	957
	780	570	570	595	6	6	15 600	30 600	2 710	**106FC78570B**	3-2P	558	752	719	5	5	960
536.17	762.03	558.8	558.8	598	5	SP	14 200	29 100	2 530	**107FC76559AW**	2-6P	559	740	710	4	4	825
545	810	580	580	614	6	6	16 500	32 100	2 820	**4CR545**	3-1P	573	782	744	5	5	1 090
550	740	510	510	600	6	6	13 000	28 100	2 440	**110FC74510**	2-6P	578	712	700	5	5	635
560	780	570	570	616	5	2.1	15 500	33 100	2 870	**112FC78570**	2-6P	572	758	727	4	2	865
	800	600	600	620	7.5	7.5	16 300	33 400	2 890	**112FC80600**	2-6P	596	764	740	6	6	1 010
	820	600	600	625	6	6	18 400	36 300	3 130	**112FC82600**	2-6P	588	792	759	5	5	1 120
570	800	514	514	626	6	6	14 600	29 200	2 550	**114FC80514A**	2-6P	598	772	746	5	5	829
	815	594	594	628	6	6	16 400	32 100	2 810	**114FC81594**	2-6P	598	787	758	5	5	1 010
571.1	812.97	594	594	636	6	6	16 800	35 100	3 010	**114FC81594A**	2-6P	600	784	756	5	5	1 030
590	820	590	590	649	6	SP	16 400	35 100	3 010	**118FC82590**	2-6P	621	792	765	5	5	990
600	820	575	575	660	5	5	16 300	36 000	3 060	**120FC82575B**	2-6P	622	798	772	4	4	925
	820	575	575	660	5	5	16 300	36 000	3 060	**120FC82575C**	3-2P	622	798	772	4	4	920
	850	600	600	664	4	4	18 300	38 100	3 230	**120FC85600**	3-2P	618	832	792	3	3	1 120
	870	578	540	672	6	SP	16 600	32 300	2 770	**120FC87540A**	2-6P	628	842	808	5	5	1 120
	870	640	640	672	6	6	19 600	40 000	3 360	**120FC87640**	2-6P	628	842	808	5	5	1 320
	870	640	640	669	5	5	19 600	40 000	3 360	**4CR600**	3-1P	622	848	805	4	4	1 310



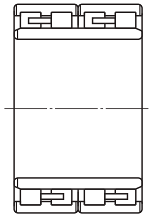
[Notes] 1) SP indicates the specially chamfered form.
2) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

Four-row cylindrical roller bearings

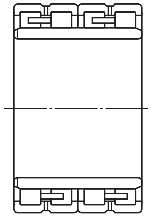
d (600) ~ 730 mm



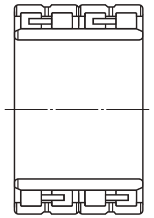
Design 1-1



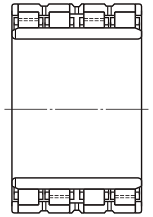
Design 1-2



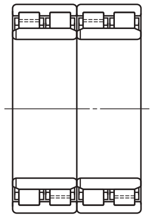
Design 1-3



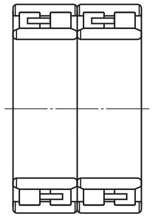
Design 1-4



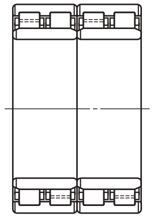
Design 1-6P



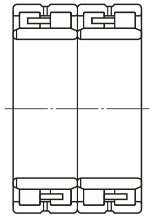
Design 2-1P



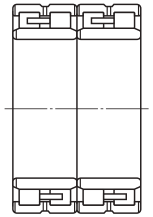
Design 2-2



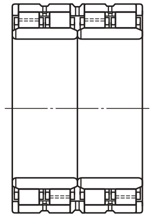
Design 2-2P



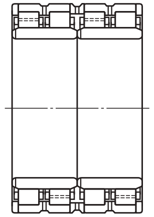
Design 2-3



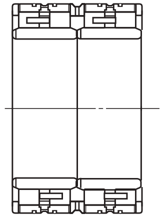
Design 2-4



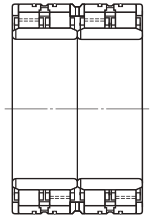
Design 2-5P



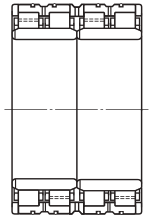
Design 2-6P



Design 3-1



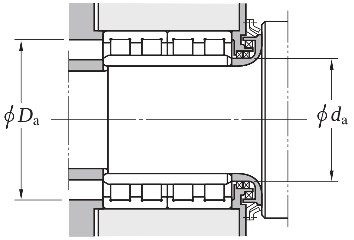
Design 3-1P



Design 3-2P

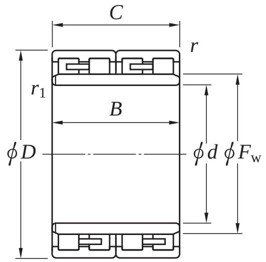
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 [1)] min.	C_r	C_{0r}	C_u			d_a min.	D_a max.	D_a min.	r_a [2)] max.	r_b [2)] max.	
600	870	640	640	682	4	4	19 400	40 800	3 410	**4CR600A**	2-6P	618	852	812	3	3	1 330
	870	640	640	669	5	5	19 600	40 000	3 360	**4CR600B**	2-6P	622	848	805	4	4	1 310
610	850	570	570	670	6	6	16 500	34 900	2 990	**122FC85570**	2-6P	638	822	790	5	5	1 040
	870	660	660	680	6	6	19 000	40 300	3 360	**122FC87660**	2-6P	638	842	808	5	5	1 310
630	800	360	360	675	5	5	8 600	19 500	1 700	**126FC80360**	2-6P	652	778	759	4	4	440
640	880	600	600	700	6	6	18 800	40 800	3 400	**128FC88600**	2-5P	668	852	824	5	5	1 130
650	920	670	670	723	7.5	7.5	21 000	45 500	3 770	**130FC92670**	2-6P	686	884	855	6	6	1 450
	920	670	670	724	7.5	7.5	21 000	45 500	3 770	**130FC92670A**	2-6P	686	884	856	6	6	1 480
	920	690	690	724	7.5	7.5	21 000	45 500	3 770	**130FC92690**	2-6P	686	884	856	6	6	1 490
660	820	440	440	708	4	4	9 090	22 700	1 910	**132FC82440W**	2-4	678	802	784	3	3	513
	889.75	670	670	718	6	6	19 600	46 900	3 840	**132FC89670**	2-6P	688	861	830	5	5	1 240
665	968.6	732	732	734.5	6	SP	26 600	53 300	4 350	**133FC97732**	2-6P	693	940	899	5	5	1 870
680	1 020	680	680	775	5	SP	25 200	49 200	4 070	**4CR680D**	3-2P	719	998	946	4	8	2 040
690	980	715	715	767.5	7.5	7.5	22 900	48 800	3 990	**138FC98715**	2-6P	726	944	911	6	6	1 660
	980	750	750	766	6	7.5	24 100	52 300	4 240	**138FC98750**	3-2P	726	952	910	5	6	1 860
	980	750	750	766	6	7.5	24 100	52 300	4 240	**138FC98750A**	2-6P	726	952	910	5	6	1 860
700	980	700	700	774	6	6	22 300	48 200	3 940	**140FC98700**	2-6P	728	952	914	5	5	1 680
	980	700	700	774	6	6	22 300	48 200	3 940	**140FC98700A**	3-2P	728	952	914	5	5	1 680
	980	700	700	766	4	4	24 100	51 300	4 180	**140FC98700C**	2-6P	718	962	914	3	3	1 710
	1 000	710	710	770	4	4	23 700	47 400	3 920	**140FC100710W**	2-6P	718	982	930	3	3	1 810
710	929.9	645	635	767	5	5	19 400	47 000	3 810	**142FC93635**	2-6P	732	907	879	4	4	1 170
730	1 030	750	750	809	6	6	27 100	59 500	4 700	**146FC103750**	2-6P	758	1 002	961	5	5	2 060
	1 050	693	670	804	6	6	26 000	51 200	4 200	**146FC105670**	2-6P	758	1 022	978	5	5	1 980

[Notes] 1) SP indicates the specially chamfered form.
2) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

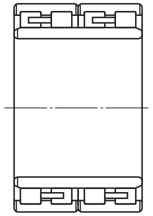


Four-row cylindrical roller bearings

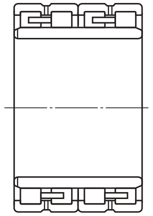
d 750 ~ (850) mm



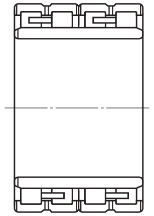
Design 1-1



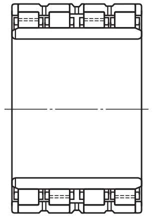
Design 1-2



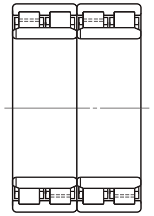
Design 1-3



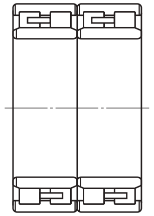
Design 1-4



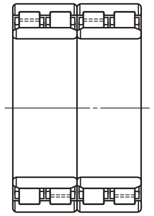
Design 1-6P



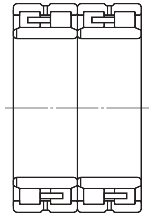
Design 2-1P



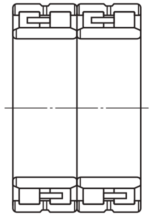
Design 2-2



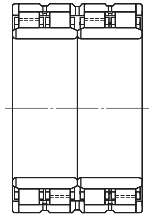
Design 2-2P



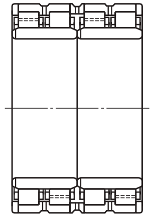
Design 2-3



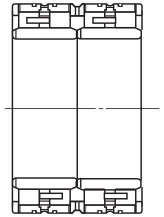
Design 2-4



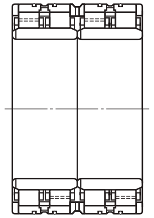
Design 2-5P



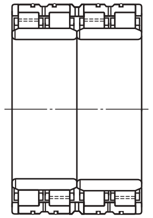
Design 2-6P



Design 3-1



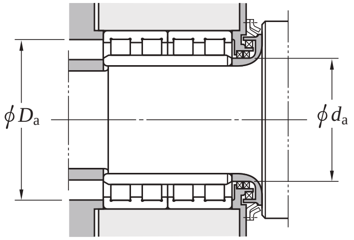
Design 3-1P



Design 3-2P

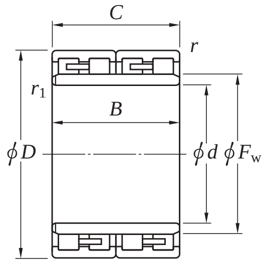
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 min.	C_r	C_{0r}	C_u				d_a min.	D_a max.	D_a min.	r_a 1) max.	r_b 1) max.	
750	1 000	670	670	813	6	6	22 900	54 200	4 300	**150FC100670**		2-6P	778	972	941	5	5	1 520
	1 020	630	620	816	6	6	22 000	48 300	3 880	**150FC102620**		2-1P	778	992	956	5	5	1 550
755	1 070	750	750	837	7.5	7.5	28 000	60 300	4 740	**151FC107750A**		3-2P	791	1 034	997	6	6	2 240
760	1 015	700	700	832	7.5	7.5	22 400	54 200	4 270	**152FC102700**		2-5P	796	979	956	6	6	1 590
	1 030	750	750	828	7.5	7.5	25 700	61 100	4 760	**152FC103750**		2-6P	796	994	962	6	6	1 870
	1 079.5	787	787	846	7.5	7.5	28 400	61 700	4 810	**152FC108787B**		2-6P	796	1 043	1 006	6	6	2 380
	1 079.5	787	787	846	7.5	7.5	29 800	65 700	5 210	**152FC108787D**		3-2P	796	1 043	1 006	6	6	2 420
	1 080	805	790	847	6	6	28 400	61 700	4 810	**4CR760**		3-1P	788	1 052	1 007	5	5	2 440
761.425	1 079.602	787.4	787.4	846	7.5	7.5	29 800	65 700	5 210	**152FC108787C**		2-6P	798	1 043	1 006	6	6	2 420
765	1 010	718	708	827	6	6	23 900	58 000	4 540	**153FC101708A**		2-6P	793	982	953	5	5	1 610
	1 065	662	652	840	6	6	24 100	51 700	4 180	**153FC107652**		2-6P	793	1 037	992	5	5	1 870
770	1 075	770	770	847	7.5	6	29 000	63 500	4 950	**154FC108770**		3-2P	798	1 039	1 007	6	5	2 240
	1 075	770	770	847	7.5	6	29 000	63 500	4 950	**154FC108770A**		2-6P	798	1 039	1 007	6	5	2 250
	1 080	650	650	845	6	6	25 200	52 000	4 210	**154FC108650**		2-6P	798	1 052	1 010	5	5	1 930
780	1 070	780	780	852	6	6	28 500	65 100	5 140	**156FC107780A**		2-6P	808	1 042	1 002	5	5	2 140
790	1 015.9	610	610	850	6	6	19 400	48 800	3 830	**158FC102610**		2-6P	818	987	962	5	5	1 290
800	1 080	750	750	880	6	6	23 000	55 000	4 310	**160FC108750**		2-6P	828	1 052	1 010	5	5	2 020
820	1 130	650	650	891	6	6	25 800	53 700	4 310	**164FC113650**		2-6P	848	1 102	1 059	5	5	2 030
	1 130	800	800	903	7.5	7.5	29 300	66 900	5 110	**164FC113800A**		3-2P	856	1 094	1 059	6	6	2 510
	1 130	800	800	903	7.5	7.5	29 300	66 900	5 110	**164FC113800D**		2-6P	856	1 094	1 059	6	6	2 510
840	1 160	840	840	920	7.5	7.5	33 100	76 000	5 830	**168FC116840B**		2-6P	876	1 124	1 084	6	6	2 800
850	1 150	840	840	928	6	6	32 000	77 700	5 900	**170FC115840**		2-6P	878	1 122	1 078	5	5	2 620
	1 180	650	650	945	7.5	7.5	23 900	51 300	4 050	**170FC118650**		2-5P	886	1 144	1 105	6	6	2 190

[Note] 1) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

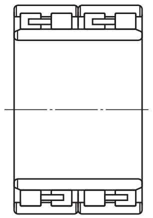


Four-row cylindrical roller bearings

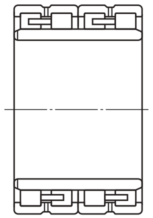
d (850) ~ 1 000 mm



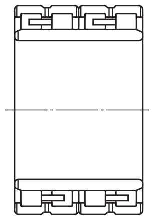
Design 1-1



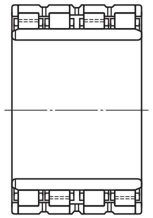
Design 1-2



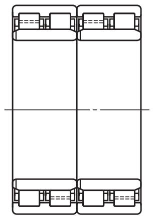
Design 1-3



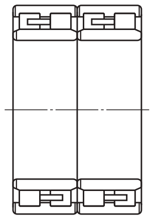
Design 1-4



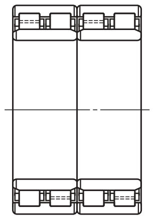
Design 1-6P



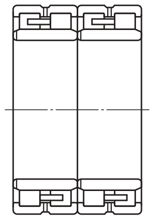
Design 2-1P



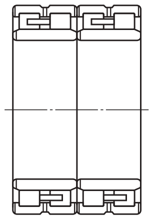
Design 2-2



Design 2-2P



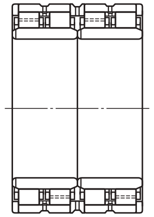
Design 2-3



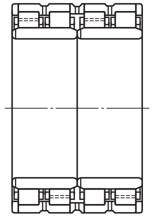
Design 2-4

Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 1) min.	C_r	C_{0r}	C_u			d_a min.	D_a max.	D_a min.	r_a 2) max.	r_b 2) max.	
850	1 180	850	850	940	7.5	7.5	31 800	72 700	5 610	**170FC118850**	3-2P	886	1 144	1 104	6	6	2 900
	1 180	850	850	940	7.5	7.5	31 800	72 700	5 610	**170FC118850B**	2-6P	886	1 144	1 104	6	6	2 900
	1 180	875	850	940	7.5	7.5	31 800	72 700	5 610	**4CR850A**	3-1P	886	1 144	1 104	6	6	2 930
855	1 094.9	665	655	918	6	6	22 600	58 000	4 480	**171FC109655**	2-6P	883	1 066	1 038	5	5	1 580
	1 178	714	704	928.5	6	6	29 600	62 900	4 920	**171FC118704**	2-6P	883	1 150	1 104	5	5	2 410
860	1 140	750	750	938	7.5	7.5	26 000	63 800	4 870	**172FC114750**	2-6P	896	1 104	1 074	6	6	2 080
	1 160	780	780	932	6	6	31 000	72 600	5 610	**172FC116780**	2-6P	888	1 132	1 088	5	5	2 470
862.98	1 219.302	876.3	889	956	7.5	7.5	37 500	84 600	6 370	**173FC122889B**	2-6P	899	1 183	1 136	6	6	3 450
	1 219.302	889	889	960	7.5	7.5	33 100	74 400	5 680	**173FC122889**	2-6P	899	1 183	1 132	6	6	3 360
870	1 145	705	685	940	6	6	26 800	63 700	4 900	**174FC115685B**	2-6P	898	1 117	1 085	5	5	1 980
	1 181.1	750	750	942	9.5	SP	30 800	68 600	5 250	**174FC118750**	3-2P	906	1 137	1 110	8	6	2 470
880	1 140	800	800	946	6	6	29 600	77 400	5 830	**176FC114800**	2-6P	908	1 112	1 078	5	5	2 210
	1 230	850	850	970	7.5	7.5	36 300	82 100	6 220	**176FC123850A**	2-6P	916	1 194	1 148	6	6	3 280
900	1 220	840	840	981	7.5	7.5	35 000	83 100	6 240	**180FC122840**	2-6P	936	1 184	1 146	6	6	2 980
	1 220	840	840	989	7.5	7.5	34 600	83 300	6 240	**180FC122840A**	2-6P	936	1 184	1 150	6	6	2 980
	1 230	895	870	990	7.5	7.5	33 000	77 500	5 850	**180FC123870**	2-6P	936	1 194	1 154	6	6	3 170
	1 230	895	870	990	7.5	7.5	33 000	77 500	5 850	**180FC123870A**	3-1P	936	1 194	1 154	6	6	3 160
	1 280	930	930	1 000	7.5	7.5	40 200	90 300	6 730	**180FC128930**	2-6P	936	1 244	1 190	6	6	4 050
	1 280	1 050	840	1 000	7.5	7.5	36 200	79 100	6 050	**180FC128840**	1-6P	936	1 244	1 190	6	6	3 890
920	1 280	815	800	1 010	7.5	7.5	36 000	79 900	6 090	**184FC128800**	3-2P	956	1 244	1 196	6	6	3 280
	1 280	865	850	1 015	7.5	7.5	34 600	77 500	5 890	**4CR920**	3-1P	956	1 244	1 195	6	6	3 460
	1 300	975	950	1 019	7.5	7.5	40 800	92 600	6 840	**4CR920A**	3-2P	956	1 264	1 209	6	6	4 180
950	1 300	965	950	1 036	7.5	7.5	40 900	96 900	7 090	**4CR950A**	3-1P	986	1 264	1 216	6	6	3 900
	1 330	950	950	1 053	9.5	9.5	41 800	97 200	7 110	**190FC133950**	2-6P	994	1 286	1 241	8	8	4 330
1 000	1 360	1 025	1 000	1 092	7.5	7.5	45 200	111 000	7 880	**200FC136100**	2-6P	1 036	1 324	1 276	6	6	4 480

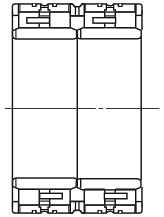
[Notes] 1) SP indicates the specially chamfered form.
2) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.



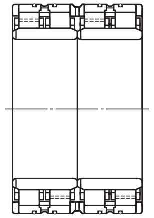
Design 2-5P



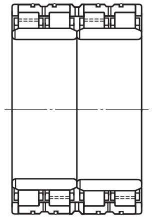
Design 2-6P



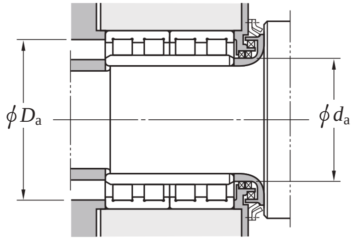
Design 3-1



Design 3-1P

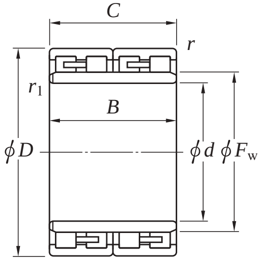


Design 3-2P

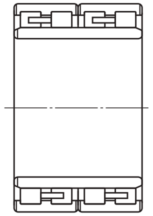


Four-row cylindrical roller bearings

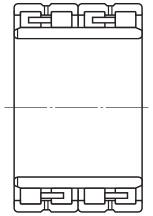
d 1 200 ~ 1 480 mm



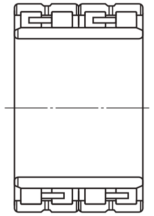
Design 1-1



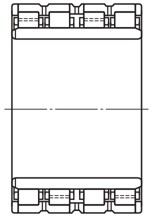
Design 1-2



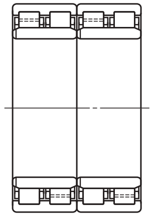
Design 1-3



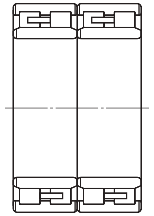
Design 1-4



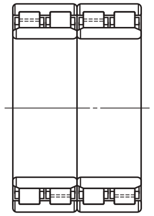
Design 1-6P



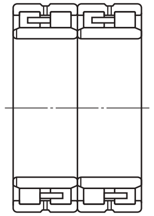
Design 2-1P



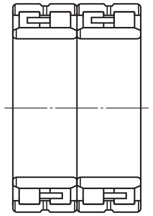
Design 2-2



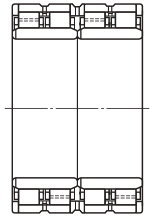
Design 2-2P



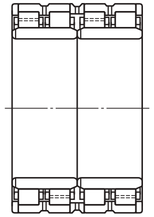
Design 2-3



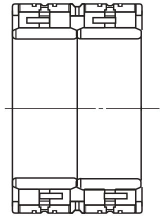
Design 2-4



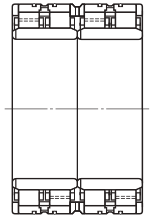
Design 2-5P



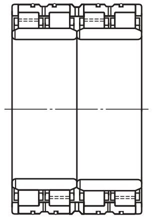
Design 2-6P



Design 3-1



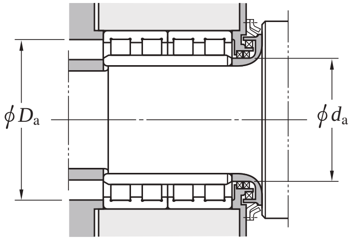
Design 3-1P



Design 3-2P

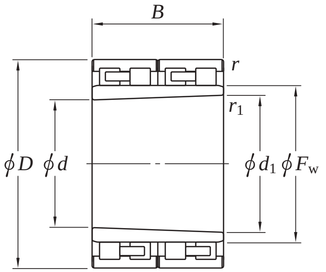
Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)					(Refer.) Mass (kg)
d	D	B	C	F_w	r min.	r_1 min.	C_r	C_{0r}	C_u				d_a min.	D_a max.	D_a min.	r_a [1)] max.	r_b [1)] max.	
1 200	1 509.85	1 027.5	1 005	1 278	7.5	7.5	45 900	131 000	8 870	**240FC151101**		2-6P	1 236	1 473	1 438	6	6	4 390
1 250	1 600	890	860	1 338	7.5	7.5	43 500	113 000	7 840	**250FC160860A**		2-6P	1 306	1 566	1 524	6	6	4 200
1 300	1 655	890	880	1 391	7.5	7.5	45 100	121 000	8 290	**260FC165880**		2-6P	1 336	1 619	1 571	6	6	4 830
1 349.04	1 745	1 010	1 000	1 446	7.5	7.5	55 300	146 000	9 680	**270FC175110**		2-6P	1 386	1 709	1 651	6	6	6 450
1 480	1 849.74	1 100	1 100	1 574	7.5	7.5	59 500	174 000	11 100	**296FC185110**		2-6P	1 516	1 813	1 764	6	6	7 170

[Note] 1) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

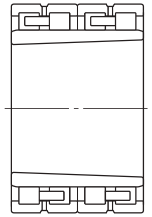


Four-row cylindrical roller bearings (tapered bore)

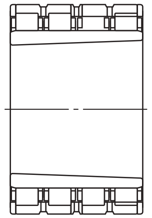
d 151.5 ~ 855 mm



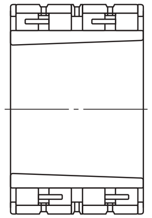
Design 1-1



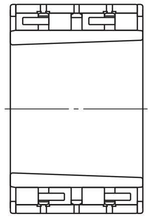
Design 1-2



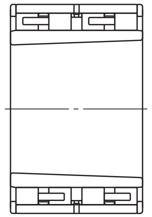
Design 1-3P



Design 1-4



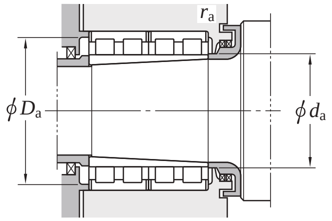
Design 2-2



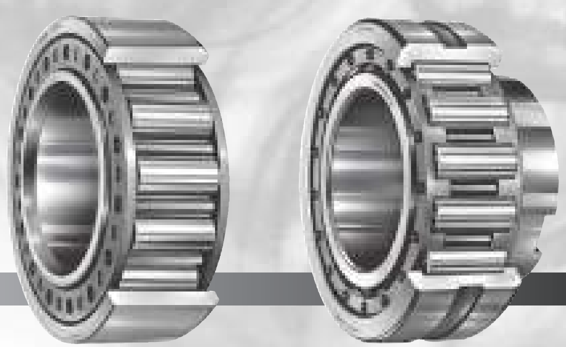
Design 2-3

Boundary dimensions (mm)							Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)					Mass (kg)
d	d_1	D	B	F_w	r [1) min.	r_1 min.	C_r	C_{0r}	C_u				d_a min.	D_a max.	D_a min.	r_a [2) max.	r_b [2) max.	
151.5	165.5	230	168	180	2	2	1 310	2 200	273	**32FC23170AK**		1-1	176	212	220	2	2	24
181.5	195.5	260	168	209	1.1	1.1	1 400	2 530	301	**314023A**		1-1	203	241	253	1	1	27.7
320.833	350	490	350	385	SP	2	5 910	11 100	1 100	**70FC49350WK**		1-2	360	457	480	2	2	226
356.666	389.999	550	400	431.902	2	2	7 530	14 700	1 420	**71FC55400BK**		1-4	400	511	540	2	2	336
358.83	388.83	520	360	422	5	3	5 330	10 900	1 040	**467412**		2-3	407.8	486	501	4	2.5	243
412.5	450	630	450	500	4	4	8 540	16 600	1 540	**90FC63450KW**		1-2	468	590	612	3	3	490
640.833	700	1 000	710	770	4	4	23 700	47 400	3 920	**140FC100710K**		1-3P	720	930	980	3	3	1 790
650.833	710	1 020	710	785	4	4	24 200	49 100	4 030	**142FC102710K**		1-3P	730	945	1 000	3	3	2 140
855	880	1 180	750	946	9.5	7.5	29 100	66 100	5 060	**176FC118750AK**		1-3P	911	1 106	1 145	8	6	2 480

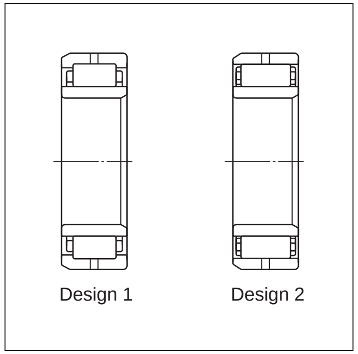
[Notes] 1) SP indicates the specially chamfered form.
2) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r.
r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.



Wide series cylindrical roller bearings

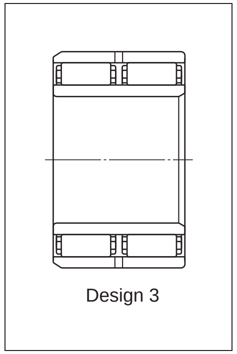


■ 99, W99, SW99 series



Design 1 Design 2

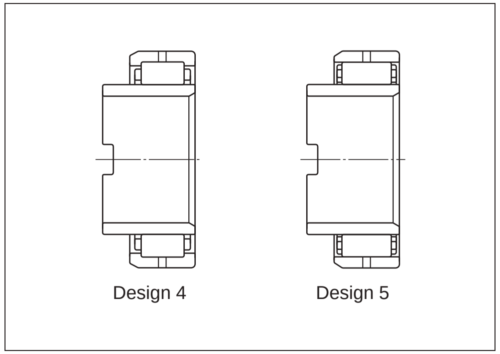
■ D99 series



Design 3

- This type has high radial load capacity, and so, is suited to heavy duty applications or where shock loading is expected.
- Outer ring is available either with or without ribs, either of which is provided with two lubrication holes.
  Some bearings have four lubrication holes.

■ T99 series ······ For line shaft



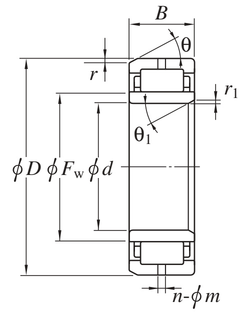
Design 4 Design 5

- This is a type equivalent to the above bearing except for extended inner ring provided with a key way.
- Applicable to such applications where large axial movement of the inner ring is involved, and mainly used for line shafts of rolling mill table rollers.

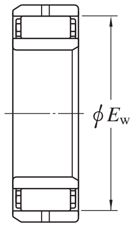
Tolerances	Consult with JTEKT, as bearings are manufactured at special tolerance corresponding to each application of bearing. Tolerances generally correspond to class 0 or class 6 specified in JIS B 1514 (See Table 2-2 given on page 18).
Radial internal clearance	(Refer to Table 4-4 on page 51 and 52)
Equivalent radial load	**Dynamic equivalent radial load** ··· $P_r = F_r$ **Static equivalent radial load** ········· $P_{0r} = F_r$

Wide series cylindrical roller bearings

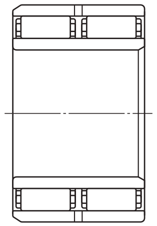
d 50 ~ (150) mm



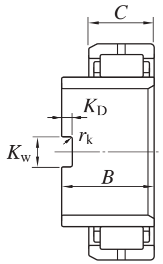
Design 1



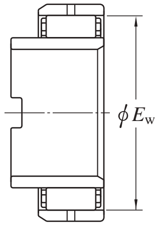
Design 2



Design 3

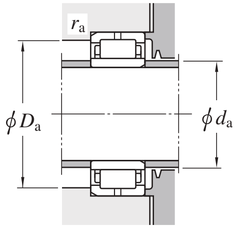


Design 4



Design 5

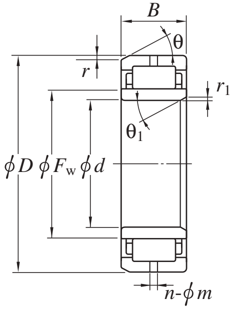
[Note]
θ = 30°
θ_1 = 30° (Design 1, 2, 3)
θ_1 = 45° (Design 4, 5)



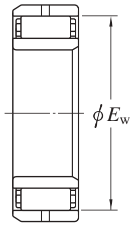
Boundary dimensions (mm)								Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Lubrication hole	Key way dimensions (mm)			Mounting dimensions (mm)			Mass (kg)
d	D	B	C	F_w	E_w	r min.	r_1 min.	C_r	C_{0r}	C_u			n-ϕm (qty-mm)	K_w	K_D	r_k	d_a min.	D_a max.	r_a max.	
50	90	44.450	—	60.325	—	2.0	2.0	148	167	24.2	**W99210NU**	1	2-8	—	—	—	58	82	1	1.17
55	100	46.025	—	66.635	89.635	2.0	2.5	183	199	29.3	**W99211**	2	2-8	—	—	—	64	92	1.5	1.64
60	110	49.200	—	73.025	—	2.4	2.4	216	237	34.7	**W99212NU**	1	2-8	—	—	—	69	101	1.5	2.02
70	125	60.325	—	84.138	109.538	2.8	2.8	303	381	55.6	**W99214**	2	2-9.5	—	—	—	80	115	1.5	3.19
75	130	66.675	—	88.881	114.281	2.8	2.8	328	428	61.8	**W99215**	2	2-9.5	—	—	—	85	120	1.5	3.69
80	140	66.675	—	95.250	—	3.2	3.2	349	437	62.1	**W99216NU**	1	2-11.1	—	—	—	91	129	2	4.29
100	180	58.740	—	120	—	4	4	425	483	64.8	**99220NU**	1	2-14	—	—	—	112	168	2.5	6.41
	180	82.550	—	120.650	—	4	4	568	701	92.9	**W99220NU**	1	2-14	—	—	—	112	168	2.5	9.37
101.600	180	110	58.740	120	—	4	3	425	483	64.8	**T99220NU-1**	4	2-14	20	10	1.5	113	167	2	7.59
110	200	65.088	—	133.500	—	R2.1	R2.1	478	579	77.1	**99222NU**	1	2-14	—	—	—	122	188	2	9.07
	200	88.900	—	132.500	—	4	4	664	802	103	**W99222NU**	1	2-14	—	—	—	123	187	2.5	11.9
114.300	200	111.125	88.900	133.350	—	4	3	663	803	103	**TW99222NU**	4	2-14	28.97	9.53	2	126	187	2	11.9
125.413	230	117.475	79.375	153.988	—	4.8	3	700	838	106	**T99226NU**	4	2-14	25.8	9.53	2	137	215	2	16.4
130	230	79.375	—	153.988	—	4.8	4	700	838	106	**99226NU**	1	2-14	—	—	—	143	215	2.5	13.9
	230	107.950	—	153.988	—	4.8	4	883	1 130	140	**W99226NU**	1	2-14	—	—	—	143	215	2.5	18.9
138.113	250	130.175	120.650	168.275	—	5.6	3	1 130	1 540	184	**TXW99228NU**	4	2-14	35.32	9.5	2	150	233	2	26.0
140	250	82.550	—	168.275	—	5.6	5.6	792	968	119	**99228NU**	1	2-14.3	—	—	—	157	233	3	17.2
	250	82.550	—	168.275	222.251	5.6	5.6	872	1 100	136	**99228**	2	2-14.3	—	—	—	157	233	3	17.2
	250	120.650	—	168.275	—	5.6	5.6	1 130	1 540	184	**W99228NU**	1	2-14	—	—	—	157	233	3	25.2
	250	120.650	—	168.275	222.251	5.6	5.6	1 260	1 770	211	**W99228**	2	2-14	—	—	—	157	233	3	25.2
150	270	88.900	—	179.388	—	5.6	5.6	852	1 000	121	**99230NU**	1	2-16	—	—	—	167	253	3	21.5
	270	120.650	—	179.388	—	5.6	5.6	1 080	1 350	160	**W99230NU**	1	2-16	—	—	—	167	253	3	29.6

Wide series cylindrical roller bearings

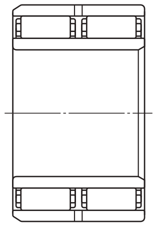
d (150) ~ 200 mm



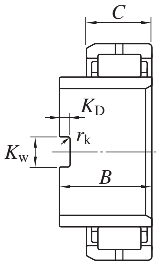
Design 1



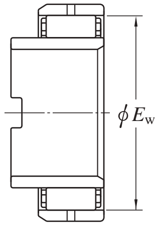
Design 2



Design 3

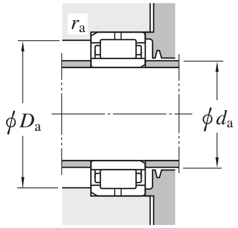


Design 4



Design 5

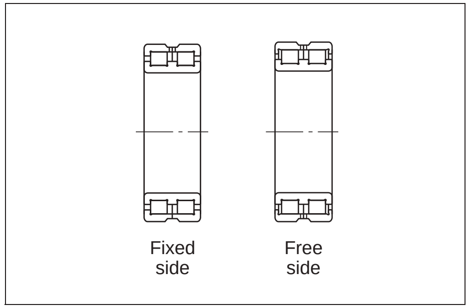
[Note]
θ = 30°
θ_1 = 30° (Design 1, 2, 3)
θ_1 = 45° (Design 4, 5)



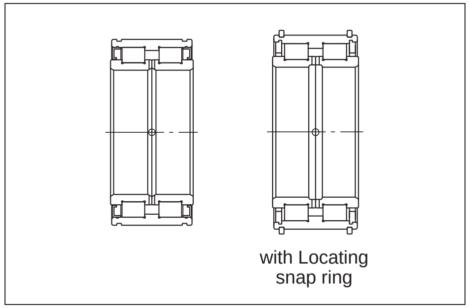
Boundary dimensions (mm)								Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Lubrication hole	Key way dimensions (mm)			Mounting dimensions (mm)			Mass (kg)
d	*D*	*B*	*C*	F_w	E_w	*r* min.	r_1 min.	C_r	C_{0r}	C_u				*n*-φ*m* (qty-mm)	K_w	K_D	r_k	d_a min.	D_a max.	r_a max.	
150	270	120.650	—	179.388	239.714	5.6	5.6	1 230	1 600	190	**W99230**		2	2-16	—	—	—	167	253	3	29.6
150.813	270	136.525	88.900	179.388	—	5.6	4.06	852	1 000	121	**T99230NU**		4	2-16	35.32	11.51	3	164	253	2.5	23.5
160	290	123.825	—	193.675	257.175	6.4	6.4	1 500	2 060	238	**W99232**		2	2-16	—	—	—	178	272	4	35.3
	290	247.650	—	193.675	257.175	6.4	6.4	2 490	3 960	459	**D99232**		3	2-16	—	—	—	178	272	4	70.6
163.513	290	139.700	123.825	193.675	257.175	6.4	4	1 500	2 060	238	**TW99232**		5	2-16	38.497	11.509	2	177	272	2.5	35.6
180	320	149.225	—	215.106	—	6.35	6.35	1 600	2 160	243	**W99236NU**		1	2-17.5	—	—	—	198	302	4	50.9
200	340	174.625	—	234.950	—	6.4	6.4	2 090	3 120	335	**SW99240NU**		1	4-17.5	—	—	—	218	322	4	64.9

Full complement cylindrical roller bearings

■ Double-row, open type (page 182)



■ Double-row, shielded type ······ for crane sheave (page 186)



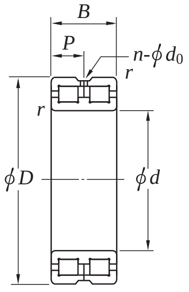
- Since full complement type cylindrical roller bearings can incorporate more rollers than bearings with cage, the load rating can be increased.
- Bearings on the fixed side is capable of withstanding radial load and axial load in both directions.
- The shielded bearing is specially designed for crane sheave ;
  - ○ Prelubricated with high quality grease.
  - ○ Shield plates are located. (The rubber seal can be employed according to the operating conditions.)
  - ○ The bearing surfaces are coated with phosphate to prevent rusting.

<table>
<tr><td>Bowndary dimensions</td><td>As specified in JIS B 1512.</td></tr>
<tr><td>Tolerances</td><td>As specified in JIS B 1514, class 0 or 6. (refer to Table 2-2 on page 18.)</td></tr>
<tr><td>Recommended fits and radial internal clearance</td><td>• Recommended fits: refer to Table 3-3 on pages 39 and 40.
■ Fits and clearance of full complement type cylindrical roller bearings for use with crane sheaves with the rotating outer ring load
<table>
<tr><th colspan="2">Condition</th><th>Shaft tolerance class</th><th>Housing bore tolerance class</th></tr>
<tr><td>Rotating outer ring load</td><td>Light or fluctuating load
Normal or heavy load
Heavy load on thin section housing</td><td>g 6 or h 6</td><td>M 7
N 7
P 7</td></tr>
</table>
Refer to Table 4-4 on pages 51 and 52.
As for the nominal bore dia. up to 140 mm shielded type (DC5000 series), the corresponding CN clearance are shown below.
<table>
<tr><th colspan="2">Nominal bore dia. <i>d</i> (mm)</th><th colspan="2">CN clearance (μm)</th></tr>
<tr><th>over</th><th>up to</th><th>min.</th><th>max.</th></tr>
<tr><td>30</td><td>40</td><td>35</td><td>70</td></tr>
<tr><td>40</td><td>50</td><td>40</td><td>75</td></tr>
<tr><td>50</td><td>65</td><td>45</td><td>90</td></tr>
<tr><td>65</td><td>80</td><td>55</td><td>105</td></tr>
<tr><td>80</td><td>100</td><td>65</td><td>115</td></tr>
<tr><td>100</td><td>120</td><td>80</td><td>120</td></tr>
<tr><td>120</td><td>140</td><td>90</td><td>130</td></tr>
</table></td></tr>
<tr><td>Allowable axial load</td><td>The above fixed side bearings whose inner and outer rings have ribs can accommodate a certain magnitude of axial load. As for the equation to calculate allowable axial load in this case, refer to page 123.</td></tr>
<tr><td>Equivalent radial load</td><td>Dynamic equivalent radial load ······ $P_r = F_r$
Static equivalent radial load ············ $P_{0r} = F_r$</td></tr>
</table>

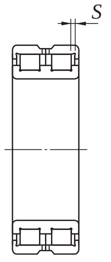
Full complement cylindrical roller bearings

Double-row, open type

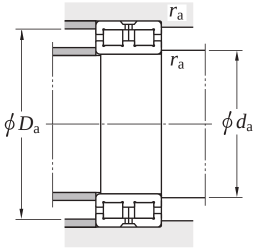
d 50 ~ (200) mm



Fixed side



Free side



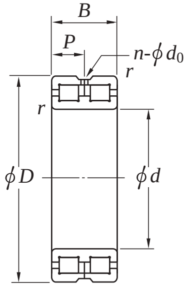
Boundary dimensions (mm)				S 1)	Basic load ratings (kN)		Fatigue load limit	Bearing No.		Lubrication holes (mm)			Mounting dimensions (mm)			Mass
d	D	B	r min.	(mm)	C_r	C_{0r}	(kN) C_u	Fixed side	Free side	P	n qty	d_0	d_a min.	D_a max.	r_a max.	(kg)
50	72	22	0.6	1	61.6	82.9	14.3	**DC4910AVW**	**DC4910VW**	11	4	2	55	67	0.6	0.30
60	85	25	1	1	91.0	136	23.4	**DC4912AVW**	**DC4912VW**	12.5	4	2	66	79	1	0.46
70	100	30	1	1	131	193	27.0	**DC4914AVW**	**DC4914VW**	15	4	2	76	94	1	0.78
80	110	30	1	1	141	218	30.5	**DC4916AVW**	**DC4916VW**	15	4	2	86	104	1	0.88
90	125	35	1.1	1.5	188	301	39.3	**DC4918AVW**	**DC4918VW**	17.5	4	2.5	97	118	1	1.35
100	140	40	1.1	2	243	400	53.3	**DC4920AVW**	**DC4920VW**	20	4	2.5	107	133	1	1.95
110	150	40	1.1	2	252	431	56.4	**DC4922AVW**	**DC4922VW**	20	4	2.5	117	143	1	2.15
120	165	45	1.1	3	283	479	61.3	**DC4924AVW**	**DC4924VW**	22.5	4	3	127	158	1	2.95
130	180	50	1.5	4	345	560	66.2	**DC4926AVW**	**DC4926VW**	25	4	3	138.5	171.5	1.5	3.95
140	190	50	1.5	4	355	589	68.7	**DC4928AVW**	**DC4928VW**	25	4	3	148.5	181.5	1.5	4.20
150	190	40	1.1	2	293	575	69.4	**DC4830AVW**	**DC4830VW**	20	4	3	157	183	1	2.90
	210	60	2	4	509	842	98.3	**DC4930AVW**	**DC4930VW**	30	6	4	160	200	2	6.65
160	200	40	1.1	2	304	616	73.0	**DC4832AVW**	**DC4832VW**	20	4	3	167	193	1	3.05
	220	60	2	4	535	895	103	**DC4932AVW**	**DC4932VW**	30	6	4	170	210	2	7.00
170	215	45	1.1	3	337	655	77.0	**DC4834AVW**	**DC4834VW**	22.5	4	3	177	208	1	4.10
	230	60	2	4	550	944	107	**DC4934AVW**	**DC4934VW**	30	6	4	180	220	2	7.35
180	225	45	1.1	3	346	690	80.0	**DC4836AVW**	**DC4836VW**	22.5	4	4	187	218	1	4.30
	250	69	2	4	686	1 140	140	**DC4936AVW**	**DC4936VW**	34.5	6	4	190	240	2	10.7
190	240	50	1.5	4	411	782	84.3	**DC4838AVW**	**DC4838VW**	25	4	4	198.5	231.5	1.5	5.65
	260	69	2	4	694	1 200	145	**DC4938AVW**	**DC4938VW**	34.5	6	5	200	250	2	11.2
200	250	50	1.5	4	423	826	87.8	**DC4840AVW**	**DC4840VW**	25	4	4	208.5	241.5	1.5	5.90

[Note] 1) Effective movement of the bearing on the free side in an axial direction.

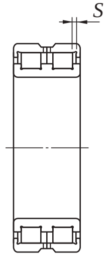
Full complement cylindrical roller bearings

Double-row, open type

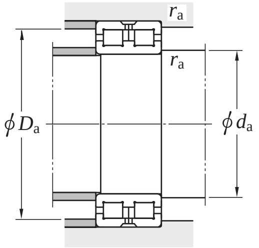
d (200) ~ 400 mm



Fixed side



Free side

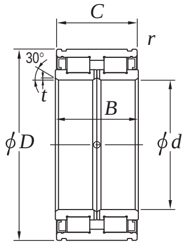


Boundary dimensions (mm)				S [1]	Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.			Lubrication holes (mm)			Mounting dimensions (mm)			Mass (kg)
d	D	B	r min.	(mm)	C_r	C_{0r}	C_u	Fixed side	Free side		P	n qty	d_0	d_a min.	D_a max.	r_a max.	
200	280	80	2.1	5	834	1 500	182	**DC4940AVW**	**DC4940VW**		40	6	6	212	268	2	15.7
220	270	50	1.5	4	445	971	102	**DC4844AVW**	**DC4844VW**		25	6	4	228.5	261.5	1.5	6.40
	300	80	2.1	5	884	1 600	190	**DC4944AVW**	**DC4944VW**		40	6	6	232	288	2	17.1
240	300	60	2	4	639	1 330	139	**DC4848AVW**	**DC4848VW**		30	6	5	250	290	2	10.2
	320	80	2.1	5	918	1 720	201	**DC4948AVW**	**DC4948VW**		40	6	6	252	308	2	18.4
260	320	60	2	4	667	1 450	148	**DC4852AVW**	**DC4852VW**		30	6	5	270	310	2	11.0
	360	100	2.1	6	1 340	2 520	275	**DC4952AVW**	**DC4952VW**		50	8	6	272	348	2	32.0
280	350	69	2	4	832	1 720	189	**DC4856AVW**	**DC4856VW**		34.5	6	5	290	340	2	16.0
	380	100	2.1	6	1 410	2 700	290	**DC4956AVW**	**DC4956VW**		50	8	6	292	368	2	33.9
300	380	80	2.1	6	1 010	2 160	237	**DC4860AVW**	**DC4860VW**		40	8	6	312	368	2	23.0
	420	118	3	6	1 950	3 710	399	**DC4960AVW**	**DC4960VW**		59	8	8	314	406	2.5	53.0
320	400	80	2.1	6	1 040	2 310	249	**DC4864AVW**	**DC4864VW**		40	8	6	332	388	2	24.3
340	420	80	2.1	6	1 070	2 430	258	**DC4868AVW**	**DC4868VW**		40	8	6	352	408	2	25.6
	460	118	3	6	2 080	4 150	432	**DC4968AVW**	**DC4968VW**		59	8	8	354	446	2.5	59.0
360	440	80	2.1	6	1 100	2 580	270	**DC4872AVW**	**DC4872VW**		40	8	6	372	428	2	27.0
	480	118	3	6	2 120	4 390	450	**DC4972AVW**	**DC4972VW**		59	8	8	374	466	2.5	62.0
380	480	100	2.1	6	1 650	3 570	355	**DC4876AVW**	**DC4876VW**		50	8	6	392	468	2	45.3
	520	140	4	7	2 870	5 600	553	**DC4976AVW**	**DC4976VW**		70	8	8	398	502	3	92.3
400	540	140	4	7	2 980	5 990	582	**DC4980AVW**	**DC4980VW**		70	8	8	418	522	3	96.4

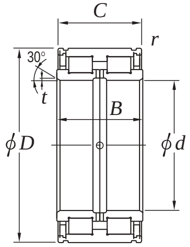
[Note] 1) Effective movement of the bearing on the free side in an axial direction.

Double-row, shielded type

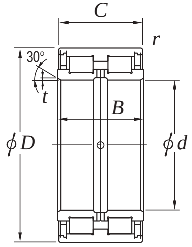
d 40 ~ 150 mm



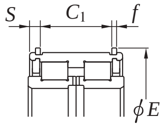
Design 1



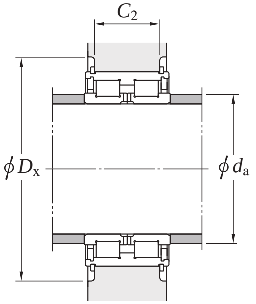
Design 2



Design 3



With locating snap rings



Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		De-sign	Locating snap ring specifications (mm)				Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	B	C	t	r min.	C_r	C_{0r}	C_u	Without locating snap rings	With locating snap rings		C_1 1)	S	E	f	d_a min.	D_x min.	C_2 2)	
40	68	38	37	0.9	0.6	110	125	15.9	**DC5008N**	**DC5008NR**	1	28	4.5	71.8	2	46	80	28	0.55
45	75	40	39	0.9	0.6	119	144	18.5	**DC5009N**	**DC5009NR**	1	30	4.5	78.8	2	51	87	30	0.70
50	80	40	39	0.9	0.6	125	158	20.2	**DC5010N**	**DC5010NR**	1	30	4.5	83.8	2	56	92	30	0.75
55	90	46	45	1.2	0.6	148	193	25.6	**DC5011N**	**DC5011NR**	1	34	5.5	94.8	2.5	63	104	34	1.19
60	95	46	45	1.2	0.6	154	208	27.7	**DC5012N**	**DC5012NR**	1	34	5.5	99.8	2.5	68	109	34	1.27
65	100	46	45	1.2	0.6	160	224	29.7	**DC5013N**	**DC5013NR**	1	34	5.5	104.8	2.5	73	114	34	1.30
70	110	54	53	1.2	0.6	214	284	40.4	**DC5014N**	**DC5014NR**	1	42	5.5	114.5	2.5	78	124	42	1.94
75	115	54	53	1.2	0.6	223	309	43.7	**DC5015N**	**DC5015NR**	1	42	5.5	119.5	2.5	83	129	42	2.11
80	125	60	59	1.2	0.6	314	427	56.3	**DC5016N**	**DC5016NR**	1	48	5.5	129.5	2.5	88	146	48	2.65
85	130	60	59	1.2	0.6	321	446	58.1	**DC5017N**	**DC5017NR**	1	48	5.5	134.5	2.5	93	155	48	2.80
90	140	67	66	1.4	0.6	381	539	71.4	**DC5018N**	**DC5018NR**	1	54	6	145.4	2.5	100	165	54	3.70
95	145	67	66	1.4	0.6	390	564	73.5	**DC5019N**	**DC5019NR**	1	54	6	150.4	2.5	105	175	54	3.90
100	150	67	66	1.4	0.6	398	583	75.6	**DC5020N**	**DC5020NR**	1	54	6	155.4	2.5	110	180	54	4.05
110	170	80	79	1.7	1	480	696	97.4	**DC5022N**	**DC5022NR**	1	65	7	175.4	2.5	122	200	65	6.50
120	180	80	79	1.7	1	500	750	103	**DC5024N**	**DC5024NR**	1	65	7	188.4	3	132	210	65	6.95
130	200	95	94	1.7	1	671	1 000	135	**DC5026N**	**DC5026NR**	1	77	8.5	208.4	3	142	230	77	10.5
140	210	95	94	1.7	1	678	1 070	142	**DC5028N**	**DC5028NR**	1	77	8.5	218.4	3	152	245	77	11.0
150	225	100	99	2	1	857	1 400	177	**DC5030N**	**DC5030NR**	2	81	9	233	3	178.5	244	81	13.9

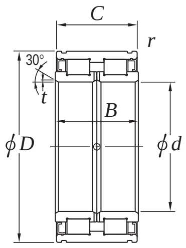
[Notes] 1) Dimensional tolerance of C_1 is +0.4/0 when bore diameter is not more than 170 mm, while +0.6/0 when bore diameter is over 170 mm.

2) Dimensional tolerance of C_2 is −0.1/−0.5 when bore diameter is not more than 170 mm, while −0.1/−0.7 when bore diameter is over 170 mm.

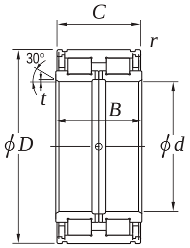
Full complement cylindrical roller bearings for crane sheaves

Double-row, shielded type

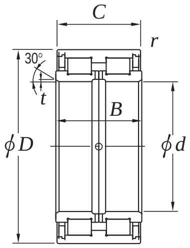
d 160 ~ 380 mm



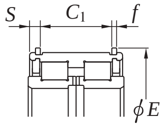
Design 1



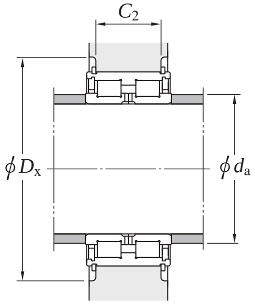
Design 2



Design 3



With locating snap rings



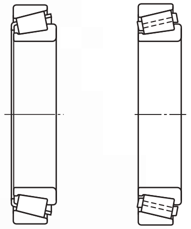
Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		De-sign	Locating snap ring specifications (mm)				Mounting dimensions (mm)			(Refer.) Mass (kg)
d	*D*	*B*	*C*	*t*	*r* min.	C_r	C_{0r}	C_u	Without locating snap rings	With locating snap rings		C_1 1)	*S*	*E*	*f*	d_a min.	D_x min.	C_2 2)	
160	240	109	108	2	1.1	987	1 640	205	**DC5032N**	**DC5032NR**	2	89	9.5	248	3	190	259	89	17.2
170	260	122	121	2	1.1	1 230	2 020	243	**DC5034N**	**DC5034NR**	2	99	11	270	4	204	286	99	23.1
180	280	136	135	2	1.1	1 450	2 440	292	**DC5036N**	**DC5036NR**	2	110	12.5	290	4	217.5	306	110	30.8
190	290	136	135	2	1.1	1 480	2 530	300	**DC5038N**	**DC5038NR**	2	110	12.5	300	4	225	316	110	32.4
200	310	150	149	2	1.1	1 750	2 980	341	**DC5040N**	**DC5040NR**	2	120	14.5	320	4	240	336	120	41.7
220	340	160	159	2.5	1.1	2 040	3 590	396	**DC5044N**	**DC5044NR**	2	130	14.5	356	6	266.5	380	130	53.5
240	360	160	159	2.5	1.1	2 120	3 850	417	**DC5048N**	**DC5048NR**	2	130	14.5	376	6	284.5	400	130	57.3
260	400	190	189	3	1.5	2 810	4 980	528	**DC5052N**	**DC5052NR**	2	154	17.5	416	7	312.5	444	154	87.2
280	420	190	189	3	1.5	2 920	5 350	557	**DC5056N**	**DC5056NR**	2	154	17.5	436	7	334.5	464	154	93.0
300	460	218	216	3	1.5	3 590	6 610	672	**DC5060**	—	3	—	—	—	—	361	—	—	134
320	480	218	216	3	1.5	3 710	6 930	696	**DC5064**	—	3	—	—	—	—	378.5	—	—	140
340	520	243	241	3.5	2	4 510	8 420	828	**DC5068**	—	3	—	—	—	—	413	—	—	189
380	560	243	241	3.5	2	4 790	9 020	887	**DC5076**	—	3	—	—	—	—	441	—	—	207

[Notes] 1) Dimensional tolerance of C_1 is +0.4/0 when bore diameter is not more than 170 mm, while +0.6/0 when bore diameter is over 170 mm.

2) Dimensional tolerance of C_2 is −0.1/−0.5 when bore diameter is not more than 170 mm, while −0.1/−0.7 when bore diameter is over 170 mm.

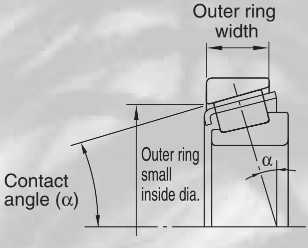
Tapered roller bearings

■ Single-row
(page 196)



Design 1 Design 1-P

- Able to carry radial and axial load in one direction simultaneously. Combined radial and axial load can be also accommodated. Suitable for heavy load and impact load.
- The larger the contact angle (α) is, the greater the bearing resistance to axial load.
  {Steep angle type ··· α ≧ 25° (constant *e* ≧ 0.67)}
- Koyo tapered roller bearings whose bearing numbers are suffixed by "J" are precision ground in accordance with the ISO 355 (Sub-unit, Metric Series) specifying the outer ring width and small inside diameter as well as the contact angle, so that outer rings and inner ring assembly (inner ring, rollers and cage assembly) of these bearings are internationally interchangeable.



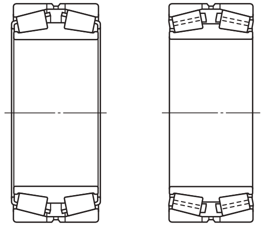
ISO sub-unit specifications

[Note] When supplementary code "J" is added as a prefix (not a suffix) to bearing numbers (e.g. JHM720249/ JHM720210), the bearings are not designed according to ISO 355.
Such bearings are called "J series metric tapered roller bearings," and are produced according to special tolerances.

Koyo®

■ Double-row (Face to face)

TDI type (page 234)

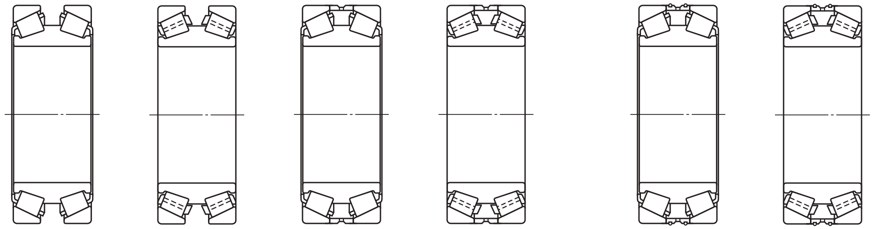


Design 1 Design 1-P

- The TDI type bearing is made up of two single-row outer rings and one double inner ring, and is generally provided with an outer ring spacer.
  The bearing with outer ring spacer is handy for mounting, as its end play has been pre-adjusted for each application.
- The spacer is provided with an lubrication groove and several lubrication holes.
- Used for roll neck of medium-duty rolling mills, speed reducers, etc.

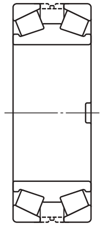
TDIS type ······ For axial suport (page 254)

(For oil mist lubrication)



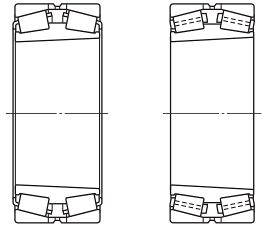
Design 1 Design 1-P Design 2 Design 2-P Design 3 Design 3-P

- The TDIS type bearing is of the same construction as the TDI type, except that it has larger contact angle so that it can accommodate heavier axial load.
- Used for applications where the axial load is greater than the radial load or where only the axial load is applied.
  The bearing with the key way on the inner ring is mainly used for rollling mill roll necks. The bearing may be also used with preload without using the outer ring spacer.
- The bearing having lubrication holes and O-rings on its outer ring is used for oil mist lubrication.



(Example of key way)

TDIT type ······ Tapered bore (page 264)

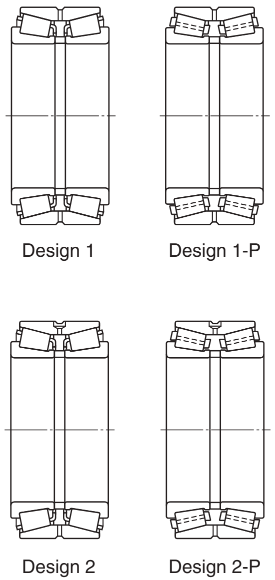


Design 1 Design 1-P

- Where the interference fit is necessary, and needs to be removed frequently, the use of TDIT type is convenient.
  It is also possible to mount the bearing on the shaft by using an adaptor sleeve.
- Used for roll neck of light or medium-duty rolling mills and roll neck of calendar mills.
- The use of a hydraulic unit will facilitate bearing mounting/dismounting.
- The roll neck taper needs to be matched to the bore diameter of bearing by using taper gauge, sign bar gauge, etc.

■ Double-row (Back to back)

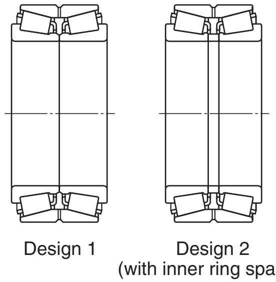
TDO, TDOS type (page 268)



- The TDO type bearing is made up of one double outer ring, two single-row inner rings and one inner ring spacer. The outer ring is provided with several lubrication holes.
- The inner ring spacer has been adjusted to provide an end play suitable to each application. It is also possible to freely adjust the end play for use by removing the inner ring spacer, however, it requires time and labor.
- Suitable to case where moment may act. Used for speed reducer, winding machine, etc.

- The steep angle type (TDOS type) having large contact angle has increased axial load capacity, and is widely used for worm shaft of medium, heavy duty applications, thrust bearing of reducers etc.

TNA type (page 314)



- The TNA type bearing has different assembled width tolerance from the TDO type, specially selected for the TNA type.

[Reference] Features of bearing with pin type cage

(1) Load rating can be increased.
The pin type cage accommodates a larger number of rollers, thus making it possible to increase the load rating of bearing.

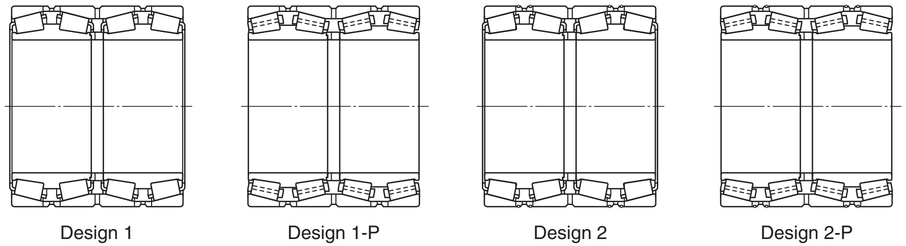
(2) Reduced friction resistance
Friction coefficient of pin type cage is reduced, as contact area of roller and cage is limited.

(3) Easy mounting/dismounting
The pin type cage is provided with a tap hole for lifting.
The use of tap hole will facilitate the work.
Use ISO metric thread for lifting tap screw.

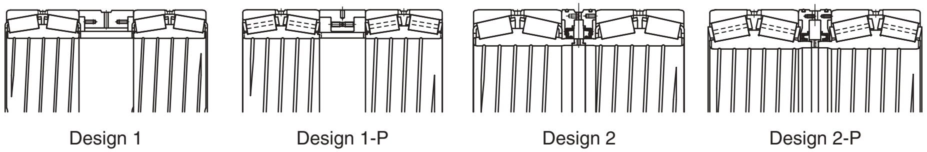
■ Four-row

TQO type (page 318)

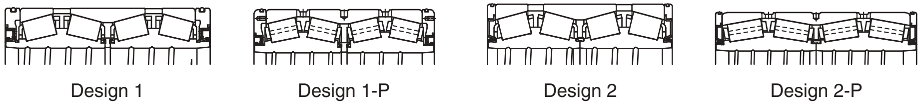
(For oil mist lubrication)



45D type (page 352)



Sealed type (page 356)



- The four-row tapered roller bearing with cylindrical bore is designed to maximize the load capacity with minimum space, and is widely used for roll neck of lower, medium speed rolling mills.
- The bearing of this type is made up of one double outer ring, two single-row outer rings, two double inner rings and inner ring spacer/outer ring spacer.
  Since each component is not interchangeable, it is necessary to assemble each component as specified with care taken to the matching marks marked on the bearing.
- Since the internal clearance has been pre-adjusted, the bearing can be used with ease without any necessity of readjustment.
- Since the bearing needs to be removed frequently and is clearance-fitted to the roll neck, the inner ring spacer is hardened to avoid wear.
  The lubrication grooves are provided on both sides of the inner ring spacer to allow the lubricant to be readily passed to the roll neck. The lubrication groove and lubrication holes are provided at the outside diameter of double outer ring and outer ring spacer.
- The bearing provided with lubrication holes and O-rings on the outer ring is used for oil mist lubrication.
- Sealed type four-row tapered roller bearings have oil seals on their side faces and in between inner rings, and O-rings on their outside surfaces to achieve the purposes below.
  - Reduction in frequency of disassembly, washing, and reassembly
  - Improvement in working environment of disassembly, washing, and reassembly
  - Reduction in grease consumption
  - Improvement in ambient surrounding rolling mills
- Design 2 shows the compact oil seal type to increase the load rating of a four-row tapered roller bearing. The intermediate seal in the Design 2 has advantages below.
  - Compact
  - Easy disassembly, washing, and reassembly

[Applicable tolerance for tapered roller bearings]

Type of tapered roller bearings			Applicable tolerance*
Single-row	**Metric series**	32900JR, 32000JR, 33000JR, 33100JR 30200JR, 32200JR, 33200JR, 30300JR 31300JR, 32300JR	Class 0, class 6, class 6X, or class 5 of JIS B 1514 (Refer to Table 2-3 on page 22)
	Inch series	(56418/56650, HM125943/HM125910 etc.)	Class 4, class 2 or class 3 of ABMA 19 (Refer to Table 2-5 on page 26)
	Metric J series	(JHM720249/JHM720210 etc.)	Class PK, class PN or class PC (Refer to Table 2-6 on page 28)
Double-row · Four-row	**Metric series**	45200, 45300, 46200(A), 46300(A) 46T30200JR, 46T32200JR, 46T30300JR, 46T32300JR 37200, 47200, 47300	Class 0 of BAS 1002 (Refer to Table 2-4 on page 25)
	Inch series	(LM377449D/LM377410, 67388/67322D EE127094D/127138/127139D etc.)	Class 4 of ABMA 19 (Refer to Table 2-5 on page 26)
	The others	45T···, 46T···, 47T···, 2TR···, 4TR···	Special tolerances for required are used in many cases. Consult with JTEKT.

* Consult with JTEKT if a higher tolerance class than that shown in this table is necessary.

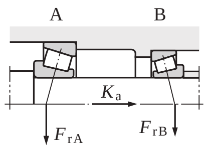
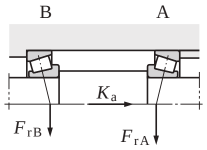
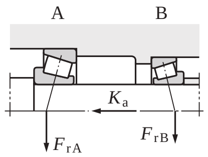
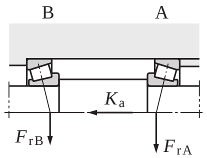
Allowable misalignment	Single-row tapered roller bearings : 0.000 9 rad (3') (If the misalignment exceeds this angle size, JTEKT is ready to design special bearings to order.)		
Radial internal clearance	(refer to Table 4-5 on page 53) ······ Radial internal clearance of double-row and four-row tapered roller bearings		
Standard cage	Pressed cage or pin type cage		
Equivalent radial load	**Single-row**	**Dynamic equivalent radial load**	$\left(\text{when } \frac{F_a}{F_r} \leqq e\right)$ $P_r = F_r$ $\left(\text{when } \frac{F_a}{F_r} > e\right)$ $P_r = 0.4F_r + Y_1F_a$
		Static equivalent radial load	$P_{0r} = 0.5F_r + Y_0F_a$ when $P_{0r} < F_r$, $P_{0r} = F_r$
[Note] Refer to the bearing specification table for the values of axial load factors Y_1, Y_2, Y_3 and Y_0 and constant e.	**Double-row · four-row**	**Dynamic equivalent radial load**	$\left(\text{when } \frac{F_a}{F_r} \leqq e\right)$ $P_r = F_r + Y_2F_a$ $\left(\text{when } \frac{F_a}{F_r} > e\right)$ $P_r = 0.67F_r + Y_3F_a$
		Static equivalent radial load	$P_{0r} = F_r + Y_0F_a$

Dynamic equivalent load calculation : when a pair of single-row tapered roller bearings is arranged face-to-face or back-to-back.

While radial loads F_{rA} and F_{rB} are applied to bearings A and B, axial load K_a externally acts in the directions shown in the figures below.

[Remark]
When radial load is applied to a single-row tapered roller bearing, axial load generated as an axial component of force acts on another bearing. The axial load can be obtained by the following equation.

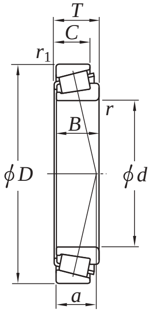
$$F_a = \frac{F_r}{2Y_1}$$

Paired mounting	Loading condition	Bearing	Axial load	Dynamic equivalent load
Back-to-back arrangement 	$\frac{F_{rB}}{2Y_B} + K_a \geqq \frac{F_{rA}}{2Y_A}$	Bearing A	$\frac{F_{rB}}{2Y_B} + K_a$	$P_A = XF_{rA} + Y_A\left(\frac{F_{rB}}{2Y_B} + K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
		Bearing B	–	$P_B = F_{rB}$
Face-to-face arrangement 	$\frac{F_{rB}}{2Y_B} + K_a < \frac{F_{rA}}{2Y_A}$	Bearing A	–	$P_A = F_{rA}$
		Bearing B	$\frac{F_{rA}}{2Y_A} - K_a$	$P_B = XF_{rB} + Y_B\left(\frac{F_{rA}}{2Y_A} - K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$
Back-to-back arrangement 	$\frac{F_{rB}}{2Y_B} \leqq \frac{F_{rA}}{2Y_A} + K_a$	Bearing A	–	$P_A = F_{rA}$
		Bearing B	$\frac{F_{rA}}{2Y_A} + K_a$	$P_B = XF_{rB} + Y_B\left(\frac{F_{rA}}{2Y_A} + K_a\right)$ $P_B = F_{rB}$, where $P_B < F_{rB}$
Face-to-face arrangement 	$\frac{F_{rB}}{2Y_B} > \frac{F_{rA}}{2Y_A} + K_a$	Bearing A	$\frac{F_{rB}}{2Y_B} - K_a$	$P_A = XF_{rA} + Y_A\left(\frac{F_{rB}}{2Y_B} - K_a\right)$ $P_A = F_{rA}$, where $P_A < F_{rA}$
		Bearing B	–	$P_B = F_{rB}$

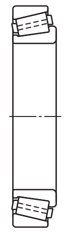
[Remarks] 1. These equations can be used when internal clearance and preload during operation are zero.
2. Radial load is treated as positive in the calculation, if it is applied in a direction opposite that shown in Fig. above table.

Single-row tapered roller bearings

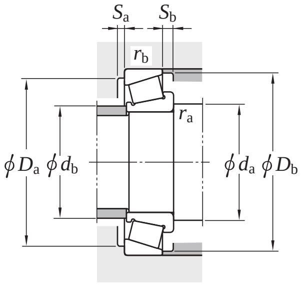
d 100 ~ (105) mm



Design 1



Design 1-P

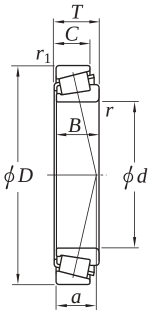


Boundary dimensions												Bearing No. 1)	Design	Basic load ratings (kN)		Fatigue load limit	Load center	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass
d		D		T		B		C		r	r_1			C_r	C_{0r}	(kN) C_u	(mm) a	d_a	d_b	D_a		D_b	S_a	S_b	r_a	r_b	e	Y_1	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.							min.	max.	max.	min.	min.	min.	min.	max.	max.				
100	—	140	—	25	—	25	—	20	—	1.5	1.5	**32920JR**	1	158	217	32.0	24.0	109	108	131	128	135	5	5	1.5	1.5	0.33	1.82	1.00	1.19
	—	150	—	32	—	32	—	24	—	2	1.5	**32020JR**	1	233	298	43.8	32.6	110	109	141	134	144	6	8	2	1.5	0.46	1.31	0.72	1.95
	—	150	—	39	—	39	—	32.5	—	2	1.5	**33020JR**	1	290	397	59.0	28.6	110	108	141	135	143	7	6.5	2	1.5	0.29	2.09	1.15	2.40
100.000	3.9370	155.000	6.1024	36.000	1.4173	35.000	1.3780	28.000	1.1024	3.0	2.5	**JM720249/JM720210**	1	256	328	47.7	35.6	110	110	146	139	148	5.9	8	3.0	2.5	0.47	1.27	0.70	2.40
	3.9370	160.000	6.2992	41.000	1.6142	40.000	1.5748	32.000	1.2598	3.0	2.5	**JHM720249/JHM720210**	1	298	378	54.6	38.3	110	111	151	143	153	6.4	9	3.0	2.5	0.47	1.28	0.70	3.08
100	—	165	—	52	—	52	—	40	—	2.5	2	**33120JR**	1	408	523	67.4	40.1	112	111	155	142	159	8	12	2	2	0.41	1.48	0.81	4.29
	—	180	—	37	—	34	—	29	—	3	2.5	**30220JR**	1	323	338	49.1	36.8	114	116	168	157	168	5	8	2.5	2	0.42	1.43	0.79	3.83
	—	180	—	49	—	46	—	39	—	3	2.5	**32220JR**	1	435	495	63.9	42.1	114	114	168	154	171	5	10	2.5	2	0.42	1.43	0.79	5.21
	—	180	—	63	—	63	—	48	—	3	2.5	**33220JR**	1	540	680	85.8	45.7	114	112	168	151	172	10	15	2.5	2	0.40	1.48	0.82	6.92
100.000	3.9370	200.000	7.8740	52.761	2.0772	49.213	1.9375	34.925	1.3750	3.6	3.2	**98394X/98788**	1	433	471	58.8	54.7	112	123	189	170	185	4.8	17.8	3.6	3.2	0.63	0.95	0.52	6.91
100	—	215	—	56.5	—	51	—	35	—	4	3	**31320JR**	1	465	459	56.4	67.7	118	120	201	183	202	6	17.5	3	2.5	0.83	0.73	0.40	8.72
100.012	3.9375	157.162	6.1875	36.512	1.4375	36.116	1.4219	26.195	1.0313	3.6	3.2	**52393/52618**	1	227	288	41.7	36.0	113	115	145	142	150	5	10.3	3.6	3.2	0.47	1.26	0.69	2.43
101.600	4.0000	146.050	5.7500	21.433	0.8438	21.433	0.8438	16.670	0.6563	1.6	1.6	**L521945R/L521910**	1	108	167	23.5	26.2	110	119	137	134	138	4	4.8	1.6	1.6	0.39	1.53	0.84	1.17
	4.0000	157.162	6.1875	36.512	1.4375	36.116	1.4219	26.195	1.0313	3.6	3.2	**52400/52618**	1	227	288	41.7	36.0	114	115	145	142	150	5	10.3	3.6	3.2	0.47	1.26	0.69	2.36
	4.0000	161.925	6.3750	36.513	1.4375	36.116	1.4219	26.195	1.0313	3.6	3.2	**52400/52637**	1	227	288	41.7	36.0	114	115	150	142	150	5	10.3	3.6	3.2	0.47	1.26	0.69	2.60
	4.0000	168.275	6.6250	41.275	1.6250	41.275	1.6250	30.162	1.1875	3.6	3.2	**687/672**	1	282	349	50.4	38.6	114	115	156	146	156	4.7	11.1	3.6	3.2	0.47	1.28	0.70	3.37
	4.0000	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	3.6	3.2	**780/772**	1	362	438	56.6	39.5	114	120	169	156	165	4.2	9.5	3.6	3.2	0.39	1.56	0.86	5.01
	4.0000	190.500	7.5000	57.150	2.2500	57.531	2.2650	46.038	1.8125	7.9	3.2	**HH221449/HH221410**	1	549	602	76.9	42.5	123	119	179	168	178	5.9	11.1	7.9	3.2	0.33	1.79	0.99	6.93
	4.0000	200.000	7.8740	52.761	2.0772	49.212	1.9375	34.925	1.3750	3.6	3.2	**98400/98788**	1	433	471	58.8	54.5	114	123	188	170	185	4.8	17.8	3.6	3.2	0.63	0.95	0.52	6.83
	4.0000	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	3.2	**941/932**	1	563	674	84.1	47.6	121	135	201	181	192	4	12.7	7.1	3.2	0.33	1.84	1.01	11.1
	4.0000	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	3.2	**HH224335/HH224310**	1	641	699	87.1	47.6	121	134	201	189	201	7	12.7	7.1	3.2	0.33	1.84	1.01	10.8
104.775	4.1250	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	3.6	3.2	**782/772**	1	362	438	56.6	39.5	117	120	169	156	165	4.2	9.5	3.6	3.2	0.39	1.56	0.86	4.82
	4.1250	180.975	7.1250	47.625	1.8750	48.006	1.8900	38.100	1.5000	6.4	3.2	**786/772**	1	362	438	56.6	39.5	123	120	169	156	165	4.2	9.5	6.4	3.2	0.39	1.56	0.86	4.80
	4.1250	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	3.2	**71412/71750**	1	381	483	60.9	40.9	117	131	179	167	177	6.4	12.7	3.6	3.2	0.42	1.44	0.79	5.68
105	—	145	—	25	—	25	—	20	—	1.5	1.5	**32921JR**	1	160	224	32.6	25.1	114	113	136	133	140	5	5	1.5	1.5	0.34	1.75	0.96	1.23

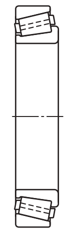
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

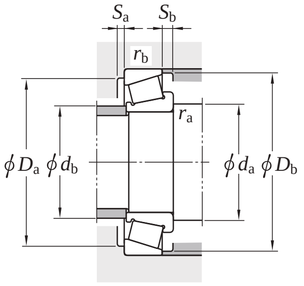
d (105) ~ (114.300) mm



Design 1



Design 1-P

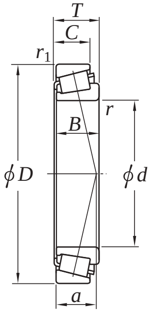


Boundary dimensions												Bearing No. 1)	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	*C* mm	1/25.4	*r* min.	r_1 min.			C_r	C_{0r}	C_u	*a*	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	*e*	Y_1	Y_0	
105	—	160	—	35	—	35	—	26	—	2.5	2	**32021JR**	1	270	344	49.9	34.5	117	116	150	143	154	6	9	2	2	0.44	1.35	0.74	2.45
	—	160	—	43	—	43	—	34	—	2.5	2	**33021JR**	1	335	461	67.4	30.9	117	116	150	145	153	7	9	2	2	0.28	2.12	1.17	3.08
	—	190	—	39	—	36	—	30	—	3	2.5	**30221JR**	1	360	380	52.3	39.0	119	122	178	165	178	6	9	2.5	2	0.42	1.43	0.79	4.49
	—	190	—	53	—	50	—	43	—	3	2.5	**32221JR**	1	490	567	73.0	44.8	119	120	178	161	180	6	10	2.5	2	0.42	1.43	0.79	6.37
	—	225	—	58	—	53	—	36	—	4	3	**31321JR**	1	495	489	59.4	70.3	123	126	211	193	211	6	18	3	2.5	0.83	0.73	0.40	9.72
106.362	4.1875	165.100	6.5000	36.513	1.4375	36.513	1.4375	26.988	1.0625	3.6	3.2	**56418/56650**	1	231	300	42.9	38.5	119	120	153	148	157	5.5	9.5	3.6	3.2	0.50	1.21	0.66	2.65
107.950	4.2500	158.750	6.2500	23.020	0.9063	21.438	0.8440	15.875	0.6250	3.6	3.2	**37425/37625**	1	130	169	23.9	36.5	121	121	147	141	148	4.3	7.1	3.6	3.2	0.61	0.99	0.54	1.38
	4.2500	161.925	6.3750	34.925	1.3750	34.925	1.3750	26.988	1.0625	3.6	3.2	**48190/48120**	1	216	293	41.8	39.1	121	120	150	145	154	4.2	7.9	3.6	3.2	0.51	1.19	0.65	2.39
	4.2500	165.100	6.5000	36.513	1.4375	36.513	1.4375	26.988	1.0625	3.6	3.2	**56425/56650**	1	231	300	42.9	38.5	121	120	153	148	157	5.5	9.5	3.6	3.2	0.50	1.21	0.66	2.57
	4.2500	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	3.2	**71425/71750**	1	381	483	60.9	40.9	121	131	179	167	177	6.4	12.7	3.6	3.2	0.42	1.44	0.79	5.48
	4.2500	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.9	3.2	**HH224340/HH224310**	1	641	699	87.1	47.6	129	134	201	189	201	7	12.7	7.9	3.2	0.33	1.84	1.01	10.2
109.987	4.3302	159.987	6.2987	34.925	1.3750	34.925	1.3750	26.988	1.0625	7.9	3.2	**LM522548/LM522510**	1	231	319	45.8	32.9	131	121	148	146	153	5.5	7.9	7.9	3.2	0.40	1.50	0.82	2.30
	4.3302	159.987	6.2987	34.925	1.3750	34.925	1.3750	26.988	1.0625	3.6	3.2	**LM522549/LM522510**	1	231	319	45.8	32.9	123	121	148	146	153	5.5	7.9	3.6	3.2	0.40	1.50	0.82	2.33
110	—	150	—	25	—	25	—	20	—	1.5	1.5	**32922JR**	1	162	231	33.3	26.3	119	118	141	138	145	5	5	1.5	1.5	0.36	1.69	0.93	1.28
110.000	4.3307	165.000	6.4961	35.000	1.3780	35.000	1.3780	26.500	1.0433	3.0	2.5	**JM822049/JM822010**	1	245	325	46.3	38.1	121	121	155	148	157	4.8	8.5	3.0	2.5	0.50	1.21	0.66	2.44
110	—	170	—	38	—	38	—	29	—	2.5	2	**32022JR**	1	312	395	56.7	36.1	122	122	160	152	163	7	9	2	2	0.43	1.39	0.77	3.12
	—	170	—	47	—	47	—	37	—	2.5	2	**33022JR**	1	360	502	64.9	33.4	122	123	160	152	161	7	10	2	2	0.29	2.09	1.15	3.81
110.000	4.3307	180.000	7.0866	47.000	1.8504	46.000	1.8110	38.000	1.4961	3.0	2.5	**JHM522649/JHM522610**	1	385	487	62.3	40.6	121	125	170	160	171	6	9	3.0	2.5	0.41	1.48	0.81	4.57
110	—	180	—	56	—	56	—	43	—	2.5	2	**33122JR**	1	464	634	78.6	44.5	122	121	170	155	174	9	13	2	2	0.42	1.43	0.79	5.52
	—	200	—	41	—	38	—	32	—	3	2.5	**30222JR**	1	405	434	58.1	40.8	124	129	188	174	188	6	9	2.5	2	0.42	1.43	0.79	5.33
	—	200	—	56	—	53	—	46	—	3	2.5	**32222JR**	1	547	640	80.4	46.7	124	126	188	170	190	6	10	2.5	2	0.42	1.43	0.79	7.45
	—	240	—	54.5	—	50	—	42	—	4	3	**30322JR**	1	601	590	75.2	46.3	128	141	226	206	222	8	12.5	3	2.5	0.35	1.74	0.96	11.4
114.300	4.5000	180.975	7.1250	34.925	1.3750	31.750	1.2500	25.400	1.0000	3.6	3.2	**68450/68712**	1	216	247	35.1	40.6	127	131	169	161	169	2.5	9.5	3.6	3.2	0.50	1.21	0.66	2.92
	4.5000	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	3.6	3.2	**71450/71750**	1	381	483	60.9	40.9	127	131	179	167	177	6.4	12.7	3.6	3.2	0.42	1.44	0.79	5.05

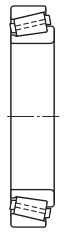
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

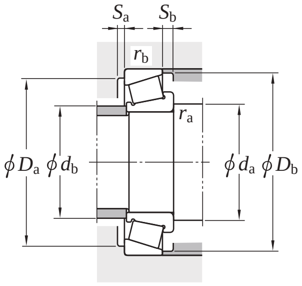
d (114.300) ~ (127.000) mm



Design 1



Design 1-P

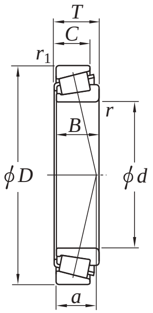


Boundary dimensions												Bearing No. 1)	De-sign	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	*C* mm	1/25.4	*r* min.	r_1 min.			C_r	C_{0r}	C_u	*a*	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	*e*	Y_1	Y_0	
114.300	4.5000	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	3.2	**HH224346/HH224310**	1	641	699	87.1	47.6	134	134	201	189	201	7	12.7	7.1	3.2	0.33	1.84	1.01	9.67
	4.5000	228.600	9.0000	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	3.2	**97450/97900**	1	408	459	55.5	65.6	127	144	217	193	212	5	15.9	3.6	3.2	0.74	0.81	0.45	9.17
	4.5000	228.600	9.0000	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	3.2	**HM926740/HM926710**	1	540	651	77.1	67.9	127	148	217	200	218	7	15.9	3.6	3.2	0.74	0.81	0.45	10.0
	4.5000	273.050	10.7500	82.550	3.2500	82.550	3.2500	53.975	2.1250	6.4	6.4	**HH926744/HH926710**	1	885	898	104	76.1	133	151	255	230	252	7	28.6	6.4	6.4	0.63	0.95	0.52	21.9
114.976	4.5266	212.725	8.3750	66.675	2.6250	66.675	2.6250	53.975	2.1250	7.1	3.2	**HH224349/HH224310**	1	641	699	87.1	47.6	135	134	201	189	201	7	12.7	7.1	3.2	0.33	1.84	1.01	9.61
115.087	4.5310	190.500	7.5000	47.625	1.8750	49.212	1.9375	34.925	1.3750	7.9	3.2	**71455/71750**	1	381	483	60.9	40.9	136	131	179	167	177	6.4	12.7	7.9	3.2	0.42	1.44	0.79	4.97
117.475	4.6250	179.975	7.0856	34.925	1.3750	31.750	1.2500	25.400	1.0000	3.6	0.8	**68462/68709**	1	216	247	35.1	40.7	130	131	173	161	169	2.5	9.5	3.6	0.8	0.50	1.21	0.66	2.73
	4.6250	180.975	7.1250	34.925	1.3750	31.750	1.2500	25.400	1.0000	3.6	3.2	**68462/68712**	1	216	247	35.1	40.6	130	131	169	161	169	2.5	9.5	3.6	3.2	0.50	1.21	0.66	2.78
120	—	165	—	29	—	29	—	23	—	1.5	1.5	**32924JR**	1	215	298	42.5	29.4	129	128	156	152	160	6	6	1.5	1.5	0.35	1.72	0.95	1.77
	—	180	—	38	—	38	—	29	—	2.5	2	**32024JR**	1	325	427	60.0	38.8	132	131	170	161	173	7	9	2	2	0.46	1.31	0.72	3.34
	—	180	—	48	—	48	—	38	—	2.5	2	**33024JR**	1	375	540	68.5	36.2	132	132	170	160	171	6	10	2	2	0.31	1.97	1.08	4.16
	—	200	—	62	—	62	—	48	—	2.5	2	**33124JR**	1	581	785	96.1	47.8	132	133	190	172	192	9	14	2	2	0.40	1.51	0.83	7.73
	—	215	—	43.5	—	40	—	34	—	3	2.5	**30224JR**	1	435	473	61.7	44.2	134	140	203	187	203	6	9.5	2.5	2	0.44	1.38	0.76	6.36
	—	215	—	61.5	—	58	—	50	—	3	2.5	**32224JR**	1	589	691	84.0	51.6	134	136	203	181	204	7	11.5	2.5	2	0.44	1.38	0.76	9.04
120.000	4.7244	230.000	9.0551	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	3.2	**97472X/97905X**	1	408	459	55.5	65.6	133	144	218	193	212	5	15.9	3.6	3.2	0.74	0.81	0.45	8.91
120	—	260	—	68	—	62	—	42	—	4	3	**31324JR**	1	657	665	77.8	81.9	138	145	246	221	244	6	21	3	2.5	0.83	0.73	0.40	15.4
120.650	4.7500	234.950	9.2500	63.500	2.5000	63.500	2.5000	49.213	1.9375	6.4	3.2	**95475/95925**	1	656	826	100	49.9	139	155	223	204	216	8	14.3	6.4	3.2	0.37	1.62	0.89	12.3
123.825	4.8750	182.563	7.1875	39.688	1.5625	38.100	1.5000	33.338	1.3125	3.6	3.2	**48286/48220**	1	284	429	59.8	34.1	136	141	171	166	173	3.8	6.4	3.6	3.2	0.31	1.97	1.08	3.42
125.298	4.9330	228.600	9.0000	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	3.2	**HM926745/HM926710**	1	540	651	77.1	68.1	138	148	217	200	218	7	15.9	3.6	3.2	0.74	0.81	0.45	9.23
127.000	5.0000	182.563	7.1875	39.688	1.5625	38.100	1.5000	33.338	1.3125	3.6	3.2	**48290/48220**	1	284	429	59.8	34.1	140	141	171	166	173	3.8	6.4	3.6	3.2	0.31	1.97	1.08	3.24
	5.0000	196.850	7.7500	46.038	1.8125	46.038	1.8125	38.100	1.5000	3.6	3.2	**67388/67322**	1	390	561	68.7	39.7	140	148	185	180	188	5	7.9	3.6	3.2	0.34	1.74	0.96	5.05
	5.0000	203.200	8.0000	46.038	1.8125	46.038	1.8125	38.100	1.5000	3.6	3.2	**67388/67320**	1	390	561	68.7	39.7	140	148	191	180	188	5	7.9	3.6	3.2	0.34	1.74	0.96	5.64
	5.0000	215.900	8.5000	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	3.2	**74500/74850**	1	403	549	66.1	49.7	140	156	204	193	204	5	12.7	3.6	3.2	0.49	1.23	0.68	6.83

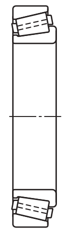
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

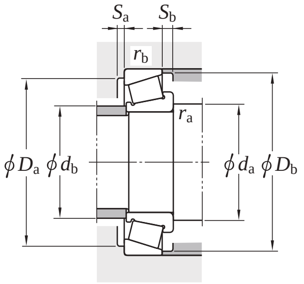
d (127.000) ~ (139.700) mm



Design 1



Design 1-P

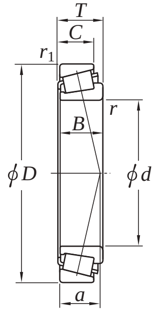


Boundary dimensions												Bearing No. 1)	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	*C* mm	1/25.4	*r* min.	r_1 min.			C_r	C_{0r}	C_u	*a*	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	*e*	Y_1	Y_0	
127.000	5.0000	228.600	9.0000	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	3.2	**HM926747/HM926710**	1	540	651	77.1	68.1	140	148	217	200	218	7	15.9	3.6	3.2	0.74	0.81	0.45	9.10
	5.0000	234.950	9.2500	63.500	2.5000	63.500	2.5000	49.213	1.9375	6.4	3.2	**95500/95925**	1	656	826	100	49.9	145	155	223	204	216	8	14.3	6.4	3.2	0.37	1.62	0.89	11.7
	5.0000	254.000	10.0000	77.788	3.0625	82.550	3.2500	61.912	2.4375	9.5	6.4	**HH228349/HH228310**	1	895	1 050	125	54.3	151	158	236	219	233	9	15.9	9.5	6.4	0.32	1.87	1.03	17.8
	5.0000	304.800	12.0000	88.900	3.5000	82.550	3.2500	57.150	2.2500	6.4	6.4	**HH932132/HH932110**	1	987	1 060	119	92.1	145	178	287	259	287	7	31.8	6.4	6.4	0.73	0.82	0.45	29.5
127.792	5.0312	228.600	9.0000	53.975	2.1250	49.428	1.9460	38.100	1.5000	3.6	3.2	**HM926749/HM926710**	1	540	651	77.1	68.1	140	148	217	200	218	7	15.9	3.6	3.2	0.74	0.81	0.45	9.04
128.588	5.0625	206.375	8.1250	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.2	3.2	**799/792**	1	409	548	67.2	45.7	140	146	195	183	194	6	12.7	3.2	3.2	0.46	1.31	0.72	5.82
130	—	180	—	32	—	32	—	25	—	2	1.5	**32926JR**	1	251	368	51.2	31.4	140	141	171	165	174	6	7	2	1.5	0.34	1.77	0.97	2.42
	—	200	—	45	—	45	—	34	—	2.5	2	**32026JR**	1	428	563	77.4	42.9	142	144	190	178	192	8	11	2	2	0.43	1.38	0.76	5.04
	—	200	—	55	—	55	—	43	—	2.5	2	**33026JR**	1	489	705	85.8	42.5	142	143	190	178	192	8	12	2	2	0.34	1.76	0.97	6.19
130.000	5.1181	206.375	8.1250	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	3.2	**797/792**	1	409	548	67.2	45.7	143	146	195	183	194	6	12.7	3.6	3.2	0.46	1.31	0.72	5.71
130	—	230	—	43.75	—	40	—	34	—	4	3	**30226JR**	1	472	511	65.7	46.2	148	152	216	203	218	7	9.5	3	2.5	0.44	1.38	0.76	7.24
	—	230	—	67.75	—	64	—	54	—	4	3	**32226JR**	1	693	830	99.9	56.0	148	146	216	193	219	7	13.5	3	2.5	0.44	1.38	0.76	11.5
	—	280	—	63.75	—	58	—	49	—	5	4	**30326JR**	1	823	834	102	54.0	152	164	262	239	255	8	14.5	4	3	0.35	1.74	0.96	18.1
	—	280	—	72	—	66	—	44	—	5	4	**31326JR**	1	734	748	85.7	87.3	152	155	262	236	261	7	23	4	3	0.83	0.73	0.40	18.9
133.350	5.2500	177.008	6.9688	25.400	1.0000	26.195	1.0313	20.638	0.8125	1.6	1.6	**L327249/L327210**	1	176	278	38.2	29.1	142	145	168	164	169	5.4	4.8	1.6	1.6	0.35	1.72	0.95	1.69
	5.2500	190.500	7.5000	39.688	1.5625	39.688	1.5625	33.338	1.3125	3.6	3.2	**48385/48320**	1	295	472	64.6	35.9	146	150	179	174	181	4.7	6.4	3.6	3.2	0.32	1.87	1.03	3.58
	5.2500	196.850	7.7500	46.038	1.8125	46.038	1.8125	38.100	1.5000	7.9	3.2	**67391/67322**	1	390	561	68.7	39.7	155	148	185	180	188	5	7.9	7.9	3.2	0.34	1.74	0.96	4.55
	5.2500	215.900	8.5000	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	3.2	**74525/74850**	1	403	549	66.1	49.7	146	156	204	193	204	5	12.7	3.6	3.2	0.49	1.23	0.68	6.35
	5.2500	234.950	9.2500	63.500	2.5000	63.500	2.5000	49.213	1.9375	9.5	3.2	**95525/95925**	1	656	826	100	49.9	158	155	223	204	216	8	14.3	9.5	3.2	0.37	1.62	0.89	11.0
136.525	5.3750	190.500	7.5000	39.688	1.5625	39.688	1.5625	33.338	1.3125	3.6	3.2	**48393/48320**	1	295	472	64.6	35.9	149	150	179	174	181	4.7	6.4	3.6	3.2	0.32	1.87	1.03	3.37
	5.3750	228.600	9.0000	57.150	2.2500	57.150	2.2500	44.450	1.7500	3.6	3.2	**896/892**	1	552	730	87.3	50.6	149	158	217	201	214	6	12.7	3.6	3.2	0.42	1.43	0.78	8.98
139.700	5.5000	215.900	8.5000	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	3.2	**74550/74850**	1	403	549	66.1	49.7	152	156	204	193	204	5	12.7	3.6	3.2	0.49	1.23	0.68	5.84
	5.5000	215.900	8.5000	47.625	1.8750	47.625	1.8750	34.925	1.3750	6.4	3.2	**74550A/74850**	1	403	549	66.1	49.7	158	156	204	193	204	5	12.7	6.4	3.2	0.49	1.23	0.68	5.82
	5.5000	228.600	9.0000	57.150	2.2500	57.150	2.2500	44.450	1.7500	3.6	3.2	**898/892**	1	552	730	87.3	50.6	152	158	217	201	214	6	12.7	3.6	3.2	0.42	1.43	0.78	8.68

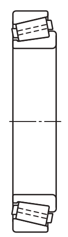
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

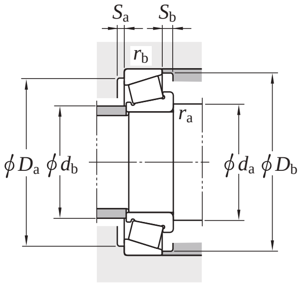
d (139.700) ~ (150) mm



Design 1



Design 1-P

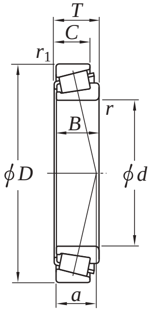


Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*B* mm	*B* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	Bearing No. 1)	Design	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Load center (mm) *a*	Mounting dimensions (mm) d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	Constant *e*	Axial load factors Y_1	Axial load factors Y_0	(Refer.) Mass (kg)
139.700	5.5000	228.600	9.0000	57.150	2.2500	57.150	2.2500	44.450	1.7500	6.4	3.2	**898A/892**	1	552	730	87.3	50.6	158	158	217	201	214	6	12.7	6.4	3.2	0.42	1.43	0.78	8.66
	5.5000	236.538	9.3125	57.150	2.2500	56.642	2.2300	44.450	1.7500	3.6	3.2	**HM231132/HM231110**	1	628	832	98.8	45.2	152	168	225	213	222	8	12.7	3.6	3.2	0.32	1.88	1.04	10.1
	5.5000	254.000	10.0000	66.675	2.6250	66.675	2.6250	47.625	1.8750	7.1	3.2	**99550/99100**	1	690	913	107	55.0	159	174	242	223	236	8	19.1	7.1	3.2	0.41	1.47	0.81	14.1
	5.5000	295.275	11.6250	82.550	3.2500	87.313	3.4375	57.150	2.2500	9.5	6.4	**HH231649/HH231615**	1	1 020	1 090	130	56.3	164	176	277	252	264	11	25.4	9.5	6.4	0.32	1.88	1.04	24.9
140	—	190	—	32	—	32	—	25	—	2	1.5	**32928JR**	1	258	390	53.2	33.6	150	150	181	174	184	6	7	2	1.5	0.36	1.67	0.92	2.57
	—	210	—	45	—	45	—	34	—	2.5	2	**32028JR**	1	435	585	79.2	45.6	152	153	200	187	202	8	11	2	2	0.46	1.31	0.72	5.28
	—	210	—	56	—	56	—	44	—	2.5	2	**33028JR**	1	510	758	90.9	45.6	152	152	200	186	202	7	12	2	2	0.36	1.67	0.92	6.61
140.000	5.5118	215.000	8.4646	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	3.2	**74551X/74846X**	1	403	549	66.1	49.7	153	156	203	193	204	5	12.7	3.6	3.2	0.49	1.23	0.68	5.74
140	—	250	—	71.75	—	68	—	58	—	4	3	**32228JR**	1	796	961	112	60.0	158	158	236	210	238	9	13.5	3	2.5	0.44	1.38	0.76	14.7
	—	300	—	77	—	70	—	47	—	5	4	**31328JR**	1	841	865	99.1	93.8	162	167	282	254	280	8	26	4	3	0.83	0.73	0.40	23.3
142.875	5.6250	193.675	7.6250	28.575	1.1250	28.575	1.1250	23.020	0.9063	1.6	1.6	**36686/36620**	1	234	375	50.6	33.7	152	158	185	179	185	5.5	5.6	1.6	1.6	0.37	1.63	0.90	2.41
	5.6250	200.025	7.8750	41.275	1.6250	39.688	1.5625	34.130	1.3437	3.6	3.3	**48685/48620**	1	307	491	66.5	38.4	156	157	188	182	190	4	7.1	3.6	3.3	0.34	1.78	0.98	3.84
	5.6250	222.250	8.7500	34.925	1.3750	31.623	1.2450	23.813	0.9375	3.6	3.2	**73562/73875**	1	263	302	40.8	41.9	156	163	210	197	204	4	11.1	3.6	3.2	0.44	1.37	0.75	4.15
	5.6250	241.300	9.5000	57.150	2.2500	56.642	2.2300	44.450	1.7500	3.6	3.2	**HM231136/HM231115**	1	628	832	98.8	45.2	156	168	229	213	222	8	12.7	3.6	3.2	0.32	1.88	1.04	10.4
146.050	5.7500	193.675	7.6250	28.575	1.1250	28.575	1.1250	23.020	0.9063	1.6	1.6	**36690/36620**	1	234	375	50.6	33.7	155	158	185	179	185	5.5	5.6	1.6	1.6	0.37	1.63	0.90	2.25
	5.7500	193.675	7.6250	28.575	1.1250	28.575	1.1250	23.020	0.9063	4.8	1.6	**36691/36620**	1	234	375	50.6	33.7	161	158	185	179	185	5.5	5.6	4.8	1.6	0.37	1.63	0.90	2.23
	5.7500	236.538	9.3125	57.150	2.2500	56.642	2.2300	44.450	1.7500	3.6	3.2	**HM231140/HM231110**	1	628	832	98.8	45.2	159	168	225	213	222	8	12.7	3.6	3.2	0.32	1.88	1.04	9.45
	5.7500	241.300	9.5000	57.150	2.2500	56.642	2.2300	44.450	1.7500	3.6	3.2	**82576/82950**	1	527	728	85.3	53.4	159	169	229	211	224	7	12.7	3.6	3.2	0.44	1.36	0.75	10.0
	5.7500	268.288	10.5625	74.613	2.9375	74.613	2.9375	57.150	2.2500	6.4	6.4	**EE107057/107105**	1	825	1 050	120	59.4	164	178	250	234	249	8	17.5	6.4	6.4	0.39	1.55	0.85	17.9
	5.7500	304.800	12.0000	88.900	3.5000	82.550	3.2500	57.150	2.2500	6.4	6.4	**HH932145/HH932110**	1	987	1 060	119	92.1	164	178	287	259	287	7	31.8	6.4	6.4	0.73	0.82	0.45	26.9
149.225	5.8750	236.538	9.3125	57.150	2.2500	56.642	2.2300	44.450	1.7500	3.6	3.2	**82587/82931**	1	527	728	85.3	53.4	162	169	225	211	224	7	12.7	3.6	3.2	0.44	1.36	0.75	9.07
	5.8750	236.538	9.3125	57.150	2.2500	56.642	2.2300	44.450	1.7500	6.4	3.2	**HM231148/HM231110**	1	628	832	98.8	45.2	167	168	225	213	222	8	12.7	6.4	3.2	0.32	1.88	1.04	9.10
	5.8750	236.538	9.3125	57.150	2.2500	56.642	2.2300	44.450	1.7500	3.6	3.2	**HM231149/HM231110**	1	628	832	98.8	45.2	162	168	225	213	222	8	12.7	3.6	3.2	0.32	1.88	1.04	9.13
150	—	210	—	38	—	38	—	30	—	2.5	2	**32930JR**	1	358	536	72.1	36.1	162	163	200	194	202	7	8	2	2	0.33	1.83	1.01	3.96
	—	225	—	48	—	48	—	36	—	3	2.5	**32030JR**	1	492	668	79.6	48.8	164	164	213	200	216	8	12	2.5	2	0.46	1.31	0.72	6.41

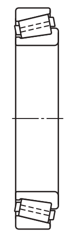
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

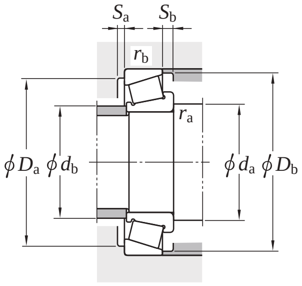
d (150) ~ 168.275 mm



Design 1



Design 1-P

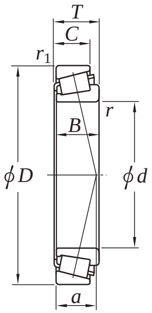


Boundary dimensions												Bearing No. [1]	De-sign	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d		*D*		*T*		*B*		*C*		*r*	*r*1			C_r	C_{0r}	C_u	*a*	d_a	d_b	D_a		D_b	S_a	S_b	r_a	r_b	*e*	Y_1	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.							min.	max.	max.	min.	min.	min.	min.	max.	max.				
150	—	225	—	59	—	59	—	46	—	3	2.5	**33030JR**	1	575	869	101	47.8	164	164	213	200	217	8	13	2.5	2	0.36	1.65	0.90	8.09
	—	270	—	77	—	73	—	60	—	4	3	**32230JR**	1	881	1 070	122	65.2	168	170	256	226	254	8	17	3	2.5	0.44	1.38	0.76	18.2
	—	320	—	82	—	75	—	50	—	5	4	**31330JR**	1	952	989	110	100.1	172	179	302	272	301	9	27	4	3	0.83	0.73	0.40	28.0
152.400	6.0000	254.000	10.0000	66.675	2.6250	66.675	2.6250	47.625	1.8750	7.1	3.2	**99600/99100**	1	690	913	107	55.0	172	174	242	223	236	8	19.1	7.1	3.2	0.41	1.47	0.81	12.6
	6.0000	254.000	10.0000	66.675	2.6250	71.438	2.8125	47.625	1.8750	1.6	3.2	**99603/99100**	1	690	913	107	55.0	161	174	242	223	236	8	19.1	1.6	3.2	0.41	1.47	0.81	12.8
	6.0000	268.288	10.5625	74.613	2.9375	74.613	2.9375	57.150	2.2500	6.4	6.4	**EE107060/107105**	1	825	1 050	120	59.4	171	178	250	234	249	8	17.5	6.4	6.4	0.39	1.55	0.85	17.1
	6.0000	269.799	10.6220	74.612	2.9375	74.613	2.9375	57.150	2.2500	6.4	6.4	**EE107060/107107**	1	825	1 050	120	59.4	171	178	252	234	249	8	17.5	6.4	6.4	0.39	1.55	0.85	17.4
	6.0000	307.975	12.1250	88.900	3.5000	93.663	3.6875	61.913	2.4375	9.5	6.7	**EE450601/451212**	1	993	1 150	134	61.4	177	193	289	261	274	7	27	9.5	6.7	0.33	1.84	1.01	28.1
	6.0000	307.975	12.1250	88.900	3.5000	93.663	3.6875	66.675	2.6250	9.5	6.7	**HH234048/HH234010**	1	1 270	1 450	165	63.3	177	191	289	270	285	8	22.2	9.5	6.7	0.33	1.84	1.01	29.4
	6.0000	317.500	12.5000	88.900	3.5000	93.663	3.6875	66.675	2.6250	9.5	6.7	**HH234048/HH234018**	1	1 270	1 450	165	63.3	177	191	299	270	285	8	22.2	9.5	6.7	0.33	1.84	1.01	31.9
155.575	6.1250	330.200	13.0000	85.725	3.3750	79.375	3.1250	53.975	2.1250	6.4	6.4	**H936340/H936310**	1	1 080	1 210	131	103.8	174	196	312	281	311	6	31.8	6.4	6.4	0.81	0.74	0.41	31.4
160	—	220	—	38	—	38	—	30	—	2.5	2	**32932JR**	1	368	568	75.2	38.4	172	173	210	204	212	7	8	2	2	0.35	1.73	0.95	4.19
	—	240	—	51	—	51	—	38	—	3	2.5	**32032JR**	1	553	758	90.3	52.1	174	175	228	213	231	8	13	2.5	2	0.46	1.31	0.72	7.75
	—	290	—	84	—	80	—	67	—	4	3	**32232JR**	1	994	1 210	137	70.3	178	182	276	242	274	10	17	3	2.5	0.44	1.38	0.76	23.2
160.325	6.3120	288.925	11.3750	63.500	2.5000	63.500	2.5000	47.625	1.8750	7.1	3.2	**HM237532/HM237510**	1	788	973	111	52.2	180	203	277	260	270	8	15.9	7.1	3.2	0.32	1.88	1.04	17.0
161.925	6.3750	374.650	14.7500	87.313	3.4375	79.375	3.1250	60.325	2.3750	6.4	3.2	**EE117063/117148**	1	1 100	1 220	132	103.7	180	218	363	308	337	7	27	6.4	3.2	0.73	0.82	0.45	43.7
165.100	6.5000	247.650	9.7500	47.625	1.8750	47.625	1.8750	38.100	1.5000	3.6	3.2	**67780/67720**	1	432	701	79.8	52.3	178	193	236	226	237	5	9.5	3.6	3.2	0.44	1.36	0.75	7.92
	6.5000	254.000	10.0000	46.038	1.8125	46.038	1.8125	33.338	1.3125	4.8	3.2	**M235145/M235113**	1	476	620	81.0	41.5	180	191	242	232	239	7	12.7	4.8	3.2	0.32	1.88	1.04	7.87
	6.5000	288.925	11.3750	63.500	2.5000	63.500	2.5000	47.625	1.8750	7.1	3.2	**HM237535/HM237510**	1	788	973	111	52.2	185	203	277	260	270	8	15.9	7.1	3.2	0.32	1.88	1.04	16.4
	6.5000	289.975	11.4163	63.500	2.5000	63.500	2.5000	48.000	1.8898	7.1	3	**HM237535/HM237513**	1	788	973	111	52.2	185	203	279	260	270	8	15.5	7.1	3	0.32	1.88	1.04	16.6
	6.5000	336.550	13.2500	92.075	3.6250	95.250	3.7500	69.850	2.7500	3.2	6.4	**HH437549/HH437510**	1	1 310	1 630	177	70.7	177	215	318	290	307	12	22.2	3.2	6.4	0.37	1.62	0.89	38.5
	6.5000	360.000	14.1732	92.075	3.6250	88.897	3.4999	63.500	2.5000	9.5	3.2	**EE420651/421417**	1	1 180	1 460	159	75.6	190	243	348	317	334	6	28.6	9.5	3.2	0.40	1.49	0.82	42.9
168.275	6.6250	247.650	9.7500	47.625	1.8750	47.625	1.8750	38.100	1.5000	3.6	3.2	**67782/67720**	1	432	701	79.8	52.3	181	193	236	226	237	5	9.5	3.6	3.2	0.44	1.36	0.75	7.61
	6.6250	330.200	13.0000	85.725	3.3750	79.375	3.1250	53.975	2.1250	6.4	6.4	**H936349/H936310**	1	1 080	1 210	131	103.8	187	196	312	281	311	6	31.8	6.4	6.4	0.81	0.74	0.41	29.5
	6.6250	342.900	13.5000	85.725	3.3750	79.375	3.1250	53.975	2.1250	6.4	6.4	**H936349/H936316**	1	1 080	1 210	131	103.8	187	196	325	281	311	6	31.8	6.4	6.4	0.81	0.74	0.41	32.3

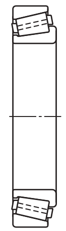
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

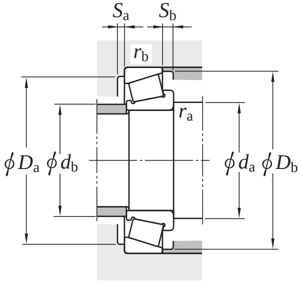
d 170 ~ (177.800) mm



Design 1



Design 1-P

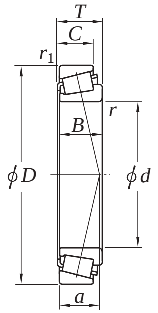


Boundary dimensions												Bearing No. [1]	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*B* mm	*B* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.			C_r	C_{0r}	C_u	*a*	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	*e*	Y_1	Y_0	
170	—	230	—	38	—	38	—	30	—	2.5	2	**32934JR**	1	370	606	78.8	42.0	182	183	220	213	222	7	8	2	2	0.38	1.57	0.86	4.49
170.000	6.6929	230.000	9.0551	39.000	1.5354	38.000	1.4961	31.000	1.2205	3.0	2.5	**JHM534149/JHM534110**	1	363	558	72.8	43.6	181	184	220	214	222	7	8	3.0	2.5	0.38	1.57	0.86	4.46
	6.6929	240.000	9.4488	46.000	1.8110	44.500	1.7520	37.000	1.4567	3.0	2.5	**JM734449/JM734410**	1	443	666	77.1	50.6	181	184	230	220	231	7	9	3.0	2.5	0.44	1.37	0.75	6.31
	6.6929	254.000	10.0000	46.038	1.8125	46.038	1.8125	33.338	1.3125	4.8	3.2	**86669/86100**	1	422	531	69.4	44.9	185	189	242	230	238	6	12.7	4.8	3.2	0.37	1.63	0.90	7.01
	6.6929	254.000	10.0000	46.038	1.8125	46.038	1.8125	33.338	1.3125	4.8	3.2	**M235149/M235113**	1	476	620	81.0	41.5	185	191	242	232	239	7	12.7	4.8	3.2	0.32	1.88	1.04	7.41
170	—	260	—	57	—	57	—	43	—	3	2.5	**32034JR**	1	661	905	105	55.8	184	187	248	230	249	10	14	2.5	2	0.44	1.35	0.74	10.5
170.000	6.6929	266.700	10.5000	46.038	1.8125	46.038	1.8125	33.338	1.3125	4.8	1.6	**86669/86105**	1	422	531	69.4	44.9	185	189	258	230	238	6	12.7	4.8	1.6	0.37	1.63	0.90	8.36
171.450	6.7500	288.925	11.3750	63.500	2.5000	63.500	2.5000	47.625	1.8750	7.1	3.2	**94675/94113A**	1	691	960	108	63.2	191	204	277	255	269	8	15.9	7.1	3.2	0.47	1.28	0.70	16.2
	6.7500	298.450	11.7500	63.500	2.5000	63.500	2.5000	47.625	1.8750	7.1	3.2	**94675/94118**	1	691	960	108	63.2	191	204	287	255	269	8	15.9	7.1	3.2	0.47	1.28	0.70	17.8
174.625	6.8750	247.650	9.7500	47.625	1.8750	47.625	1.8750	38.100	1.5000	3.6	3.2	**67787/67720**	1	432	701	79.8	52.3	187	193	236	226	237	5	9.5	3.6	3.2	0.44	1.36	0.75	6.98
	6.8750	288.925	11.3750	63.500	2.5000	63.500	2.5000	47.625	1.8750	7.1	3.2	**94687/94113**	1	691	960	108	63.2	194	204	277	255	269	8	15.9	7.1	3.2	0.47	1.28	0.70	15.8
	6.8750	288.925	11.3750	63.500	2.5000	63.500	2.5000	47.625	1.8750	7.1	3.2	**HM237542/HM237510**	1	788	973	111	52.2	194	203	277	260	270	8	15.9	7.1	3.2	0.32	1.88	1.04	15.1
	6.8750	311.150	12.2500	82.550	3.2500	82.550	3.2500	65.088	2.5625	6.4	6.4	**H238148/H238110**	1	1 080	1 340	151	64.3	193	207	293	273	287	8	17.5	6.4	6.4	0.33	1.82	1.00	25.3
177.800	7.0000	227.013	8.9375	30.163	1.1875	30.163	1.1875	23.020	0.9063	1.6	1.6	**36990/36920**	1	222	402	51.2	43.0	186	191	218	212	219	6	7.1	1.6	1.6	0.44	1.36	0.75	2.85
	7.0000	247.650	9.7500	47.625	1.8750	47.625	1.8750	38.100	1.5000	3.6	3.2	**67790/67720**	1	432	701	79.8	52.3	190	193	236	226	237	5	9.5	3.6	3.2	0.44	1.36	0.75	6.65
	7.0000	247.650	9.7500	47.625	1.8750	47.625	1.8750	38.100	1.5000	10.4	3.2	**67791/67720**	1	432	701	79.8	52.3	204	193	236	226	237	5	9.5	10.4	3.2	0.44	1.36	0.75	6.56
	7.0000	260.350	10.2500	53.975	2.1250	53.975	2.1250	41.275	1.6250	3.6	3.2	**M236849/M236810**	1	554	821	95.7	48.4	190	199	249	237	246	5	12.7	3.6	3.2	0.33	1.80	0.99	8.94
	7.0000	285.750	11.2500	63.500	2.5000	63.500	2.5000	41.275	1.6250	6.4	3.2	**EE91702/91112**	1	557	716	82.3	58.8	196	205	274	251	263	4	22.2	6.4	3.2	0.43	1.39	0.77	13.4
	7.0000	288.925	11.3750	63.500	2.5000	63.500	2.5000	47.625	1.8750	7.1	3.2	**94700/94113**	1	691	960	108	63.2	197	204	277	255	269	8	15.9	7.1	3.2	0.47	1.28	0.70	15.3
	7.0000	288.925	11.3750	63.500	2.5000	63.500	2.5000	47.625	1.8750	7.1	3.2	**HM237545/HM237510**	1	788	973	111	52.2	197	203	277	260	270	8	15.9	7.1	3.2	0.32	1.88	1.04	14.7
	7.0000	319.964	12.5970	88.900	3.5000	85.725	3.3750	65.088	2.5625	3.6	4.8	**EE222070/222126**	1	938	1 220	136	72.9	190	216	305	280	297	4	23.8	3.6	4.8	0.40	1.49	0.82	28.0
	7.0000	319.964	12.5970	88.900	3.5000	85.725	3.3750	65.088	2.5625	3.6	4.8	**H239640/H239610**	1	1 070	1 270	142	66.1	190	214	305	286	300	5	23.8	3.6	4.8	0.32	1.88	1.04	26.9
	7.0000	320.675	12.6250	88.900	3.5000	85.725	3.3750	65.088	2.5625	3.6	4.8	**EE222070/222128**	1	938	1 220	136	72.9	190	216	306	280	297	4	23.8	3.6	4.8	0.40	1.49	0.82	28.2
	7.0000	327.025	12.8750	90.488	3.5625	92.075	3.6250	63.500	2.5000	6.4	6.4	**EE470078/470128**	1	1 090	1 430	159	68.3	196	225	309	289	305	7	27	6.4	6.4	0.37	1.63	0.90	31.1
	7.0000	336.550	13.2500	90.488	3.5625	92.075	3.6250	63.500	2.5000	13.5	6.4	**EE470073/470132**	1	1 090	1 430	159	68.3	210	225	318	289	305	7	27	13.5	6.4	0.37	1.63	0.90	33.4

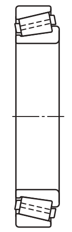
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

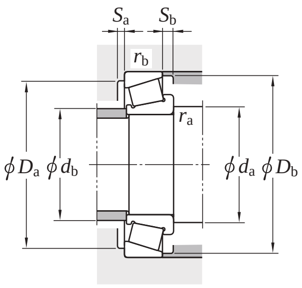
d (177.800) ~ (190.500) mm



Design 1



Design 1-P

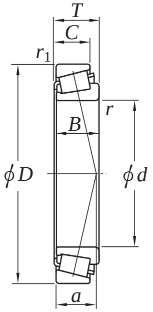


Boundary dimensions												Bearing No. 1)	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	B mm	B 1/25.4	C mm	C 1/25.4	r min.	r_1 min.			C_r	C_{0r}	C_u	a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
177.800	7.0000	360.000	14.1732	92.075	3.6250	88.897	3.4999	63.500	2.5000	12.7	3.2	**EE420701/421417**	1	1 180	1 460	159	75.6	209	243	348	317	334	6	28.6	12.7	3.2	0.40	1.49	0.82	40.5
	7.0000	365.049	14.3720	92.075	3.6250	88.897	3.4999	63.500	2.5000	12.7	3.2	**EE420701/421437**	1	1 180	1 460	159	75.6	209	243	353	317	334	6	28.6	12.7	3.2	0.40	1.49	0.82	41.9
	7.0000	428.625	16.8750	106.362	4.1875	95.250	3.7500	61.912	2.4375	6.4	6.4	**EE350701/351687**	1	1 340	1 390	145	118.7	196	238	410	350	381	9	44.5	6.4	6.4	0.76	0.79	0.44	64.6
179.975	7.0856	317.500	12.5000	63.500	2.5000	63.500	2.5000	46.038	1.8125	3.6	3.2	**93708/93125**	1	757	1 130	122	71.4	193	227	306	278	294	7	17.5	3.6	3.2	0.52	1.15	0.63	20.8
180	—	250	—	45	—	45	—	34	—	2.5	2	**32936JR**	1	447	735	93.4	53.5	192	193	240	225	241	8	11	2	2	0.48	1.25	0.69	6.64
180.000	7.0866	250.000	9.8425	47.000	1.8504	45.000	1.7717	37.000	1.4567	3.0	2.5	**JM736149/JM736110**	1	456	705	81.7	55.2	191	193	240	230	242	7	10	3.0	2.5	0.48	1.25	0.69	6.56
180	—	280	—	64	—	64	—	48	—	3	2.5	**32036JR**	1	810	1 100	127	59.5	194	199	268	247	268	10	16	2.5	2	0.42	1.42	0.78	14.1
	—	320	—	57	—	52	—	43	—	5	4	**30236JR**	1	771	870	102	63.6	202	211	302	278	297	9	14	4	3	0.45	1.33	0.73	18.3
	—	320	—	91	—	86	—	71	—	5	4	**32236JR**	1	1 200	1 520	164	77.8	202	204	302	267	303	10	20	4	3	0.45	1.33	0.73	29.9
184.150	7.2500	266.700	10.5000	47.625	1.8750	46.833	1.8438	38.100	1.5000	3.6	3.2	**67883/67820**	1	425	703	78.2	57.8	197	211	255	245	257	6	9.5	3.6	3.2	0.48	1.26	0.69	8.55
	7.2500	279.997	11.0235	46.525	1.8317	46.833	1.8438	36.000	1.4173	3.6	3.2	**67883/67830**	1	425	703	78.2	56.7	197	211	268	245	256	7	10.5	3.6	3.2	0.48	1.26	0.69	10.0
187.325	7.3750	269.875	10.6250	55.563	2.1875	55.563	2.1875	42.863	1.6875	3.6	3.2	**M238849/M238810**	1	514	805	91.6	49.9	200	209	258	245	255	5	12.7	3.6	3.2	0.33	1.80	0.99	9.66
	7.3750	319.964	12.5970	88.900	3.5000	85.725	3.3750	65.088	2.5625	5.6	4.8	**H239649/H239610**	1	1 070	1 270	142	66.1	204	214	305	286	300	5	23.8	5.6	4.8	0.32	1.88	1.04	25.1
	7.3750	320.675	12.6250	88.900	3.5000	85.725	3.3750	65.088	2.5625	5.6	4.8	**H239649/H239612**	1	1 070	1 270	142	66.1	204	214	306	286	300	5	23.8	5.6	4.8	0.32	1.88	1.04	25.3
190	—	260	—	45	—	45	—	34	—	2.5	2	**32938JR**	1	459	789	88.6	55.0	202	204	250	235	252	8	11	2	2	0.48	1.26	0.69	6.89
190.000	7.4803	260.000	10.2362	46.000	1.8110	44.000	1.7323	36.500	1.4370	3.0	2.5	**JM738249/JM738210**	1	461	723	81.4	56.0	201	203	250	240	251	7	9.5	3.0	2.5	0.48	1.26	0.69	6.89
190	—	290	—	64	—	64	—	48	—	3	2.5	**32038JR**	1	823	1 170	131	62.9	204	209	278	257	279	10	16	2.5	2	0.44	1.36	0.75	14.7
	—	340	—	60	—	55	—	46	—	5	4	**30238JR**	1	912	1 030	118	66.4	212	225	322	298	318	12	13	4	3	0.44	1.38	0.76	21.9
	—	340	—	97	—	92	—	75	—	5	4	**32238JR**	1	1 370	1 740	187	81.9	212	216	322	286	323	12	22	4	3	0.44	1.38	0.76	36.6
190.500	7.5000	266.700	10.5000	47.625	1.8750	46.833	1.8438	38.100	1.5000	3.6	3.2	**67885/67820**	1	425	703	78.2	57.8	203	211	255	245	257	6	9.5	3.6	3.2	0.48	1.26	0.69	7.88
	7.5000	282.575	11.1250	50.800	2.0000	47.625	1.8750	36.512	1.4375	3.6	3.2	**87750/87111**	1	513	726	91.2	55.7	203	215	271	256	266	3	14.3	3.6	3.2	0.42	1.44	0.79	9.67
	7.5000	317.500	12.5000	63.500	2.5000	63.500	2.5000	46.038	1.8125	4.3	3.2	**93750/93125**	1	757	1 130	122	71.4	205	227	306	278	294	7	17.5	4.3	3.2	0.52	1.15	0.63	19.3
	7.5000	317.500	12.5000	68.263	2.6875	63.500	2.5000	50.800	2.0000	4.3	3.2	**93750/93126**	1	757	1 130	122	76.2	205	227	306	276	294	2	17.5	4.3	3.2	0.52	1.15	0.63	20.3

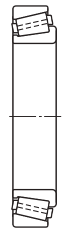
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

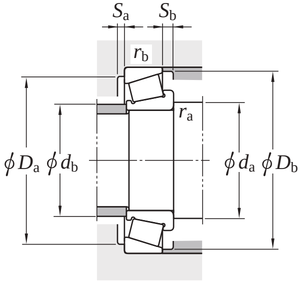
d (190.500) ~ (203.200) mm



Design 1



Design 1-P

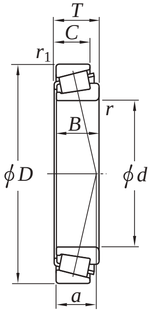


Boundary dimensions												Bearing No. 1)	De-sign	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d		*D*		*T*		*B*		*C*		*r*	*r*1			*C*r	*C*0r	*C*u	*a*	*d*a	*d*b	*D*a		*D*b	*S*a	*S*b	*r*a	*r*b	*e*	*Y*1	*Y*0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.							min.	max.	max.	min.	min.	min.	min.	max.	max.				
190.500	7.5000	336.550	13.2500	98.425	3.8750	95.250	3.7500	73.025	2.8750	6.4	6.4	**HH840249/HH840210**	1	1 200	1 710	177	93.5	209	217	318	288	316	8	25.4	6.4	6.4	0.58	1.04	0.57	35.8
	7.5000	368.300	14.5000	92.075	3.6250	88.897	3.4999	63.500	2.5000	6.4	3.2	**EE420751/421450**	1	1 180	1 460	159	75.6	209	243	356	317	334	6	28.6	6.4	3.2	0.40	1.49	0.82	40.4
	7.5000	428.625	16.8750	106.363	4.1875	95.250	3.7500	61.913	2.4375	6.4	6.4	**EE350750/351687**	1	1 340	1 390	145	118.7	209	238	410	350	381	9	44.5	6.4	6.4	0.76	0.79	0.44	62.0
193.675	7.6250	282.575	11.1250	50.800	2.0000	47.625	1.8750	36.512	1.4375	3.6	3.2	**87762/87111**	1	513	726	91.2	55.7	206	215	271	256	266	3	14.3	3.6	3.2	0.42	1.44	0.79	9.32
196.850	7.7500	254.000	10.0000	28.575	1.1250	27.783	1.0938	21.433	0.8438	1.6	1.6	**L540049/L540010**	1	236	387	48.2	43.1	206	214	245	238	243	4	7.1	1.6	1.6	0.40	1.51	0.83	3.35
	7.7500	257.175	10.1250	39.688	1.5625	39.688	1.5625	30.163	1.1875	3.6	3.2	**LM739749/LM739710**	1	336	632	78.6	50.6	210	211	245	238	247	6	9.5	3.6	3.2	0.45	1.34	0.74	5.27
	7.7500	266.700	10.5000	39.688	1.5625	39.688	1.5625	30.163	1.1875	3.6	3.2	**LM739749/LM739719**	1	336	632	78.6	50.6	210	211	255	238	247	6	9.5	3.6	3.2	0.45	1.34	0.74	6.18
	7.7500	317.500	12.5000	63.500	2.5000	63.500	2.5000	46.038	1.8125	4.3	3.2	**93775/93125**	1	757	1 130	122	71.4	211	227	306	278	294	7	17.5	4.3	3.2	0.52	1.15	0.63	18.4
	7.7500	317.500	12.5000	68.263	2.6875	63.500	2.5000	50.800	2.0000	4.3	3.2	**93775/93126**	1	757	1 130	122	76.2	211	227	306	276	294	2	17.5	4.3	3.2	0.52	1.15	0.63	19.3
200	—	280	—	51	—	51	—	39	—	3	2.5	**32940JR**	1	608	958	109	53.6	214	216	268	257	271	9	12	2.5	2	0.39	1.52	0.84	9.44
200.000	7.8740	300.000	11.8110	65.000	2.5591	62.000	2.4409	51.000	2.0079	3.6	2.5	**JHM840449/JHM840410**	1	773	1 140	124	72.1	213	218	290	270	288	6	14	3.6	2.5	0.52	1.15	0.63	15.0
200	—	310	—	70	—	70	—	53	—	3	2.5	**32040JR**	1	949	1 340	146	66.9	214	221	298	273	297	11	17	2.5	2	0.43	1.39	0.77	19.1
	—	360	—	64	—	58	—	48	—	5	4	**30240JR**	1	991	1 120	126	70.3	222	238	342	315	336	12	15	4	3	0.44	1.38	0.76	26.4
	—	360	—	104	—	98	—	82	—	5	4	**32240JR**	1	1 550	1 880	200	84.6	222	225	342	302	340	11	22	4	3	0.41	1.48	0.81	44.2
200.025	7.8750	276.225	10.8750	42.863	1.6875	46.038	1.8125	34.133	1.3438	3.6	3.2	**LM241147/LM241110**	1	469	715	89.7	46.3	214	222	263	257	264	4	8.7	3.6	3.2	0.32	1.88	1.04	7.57
	7.8750	292.100	11.5000	57.945	2.2813	57.945	2.2813	46.038	1.8125	3.6	3.2	**M241543/M241510**	1	683	1 030	115	52.6	214	223	279	267	277	7	11.9	3.6	3.2	0.33	1.80	0.99	12.1
	7.8750	317.500	12.5000	63.500	2.5000	63.500	2.5000	46.038	1.8125	4.3	3.2	**93787/93125**	1	757	1 130	122	71.4	215	227	305	278	294	7	17.5	4.3	3.2	0.52	1.15	0.63	17.9
	7.8750	355.600	14.0000	69.850	2.7500	69.850	2.7500	49.213	1.9375	6.7	1.6	**EE130787/131400**	1	913	1 310	140	59.9	220	263	346	319	330	9	20.6	6.7	1.6	0.33	1.82	1.00	28.7
	7.8750	384.175	15.1250	112.713	4.4375	112.712	4.4375	90.488	3.5625	6.4	6.4	**H247535/H247510**	1-P	1 820	2 680	271	83.8	219	265	365	341	361	8	22.2	6.4	6.4	0.33	1.80	0.99	60.5
	7.8750	393.700	15.5000	111.125	4.3750	111.125	4.3750	84.138	3.3125	6.4	6.4	**HH144642/HH144614**	1	1 710	2 260	236	76.2	219	257	374	338	355	9	27	6.4	6.4	0.30	2.02	1.11	59.2
203.200	8.0000	276.225	10.8750	42.863	1.6875	42.863	1.6875	34.133	1.3438	3.6	3.2	**LM241149/LM241110**	1	469	715	89.7	46.3	217	222	263	257	264	4	8.7	3.6	3.2	0.32	1.88	1.04	7.08
	8.0000	279.400	11.0000	46.038	1.8125	46.038	1.8125	36.513	1.4375	3.6	3.2	**67983/67919**	1	437	707	77.6	61.6	217	222	267	259	271	7	9.5	3.6	3.2	0.51	1.18	0.65	8.04
	8.0000	282.575	11.1250	46.038	1.8125	46.038	1.8125	36.513	1.4375	3.6	3.2	**67983/67920**	1	437	707	77.6	61.6	217	222	270	259	271	7	9.5	3.6	3.2	0.51	1.18	0.65	8.43
	8.0000	292.100	11.5000	57.945	2.2813	57.945	2.2813	46.038	1.8125	3.6	3.2	**M241547/M241510**	1	683	1 030	115	52.6	217	223	279	267	277	7	11.9	3.6	3.2	0.33	1.80	0.99	11.7

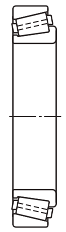
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

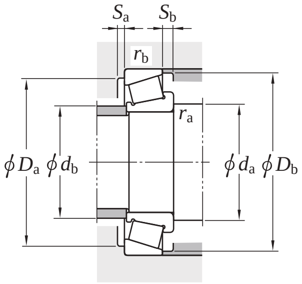
d (203.200) ~ 220.663 mm



Design 1



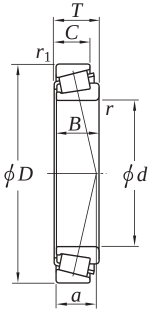
Design 1-P



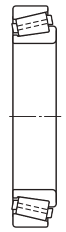
Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*B* mm	*B* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	Bearing No. 1)	Design	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Load center (mm) *a*	Mounting dimensions (mm) d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	Constant *e*	Axial load factors Y_1	Y_0	(Refer.) Mass (kg)
203.200	8.0000	317.500	12.5000	53.975	2.1250	53.975	2.1250	34.925	1.3750	4	3.2	**EE132083/132125**	1	550	724	83.2	48.4	218	238	305	285	292	7	19.1	4	3.2	0.31	1.91	1.05	13.9
	8.0000	317.500	12.5000	63.500	2.5000	63.500	2.5000	46.038	1.8125	4.3	3.2	**93800/93125**	1	757	1 130	122	71.4	218	227	305	278	294	7	17.5	4.3	3.2	0.52	1.15	0.63	17.4
	8.0000	317.500	12.5000	63.500	2.5000	63.500	2.5000	46.038	1.8125	7.9	3.2	**93800A/93125**	1	757	1 130	122	71.4	225	227	305	278	294	7	17.5	7.9	3.2	0.52	1.15	0.63	17.3
	8.0000	360.000	14.1732	92.075	3.6250	88.897	3.4999	63.500	2.5000	3.2	3.2	**EE420801/421417**	1	1 180	1 460	159	75.6	216	243	347	317	334	6	28.6	3.2	3.2	0.40	1.49	0.82	35.4
	8.0000	368.300	14.5000	92.075	3.6250	88.897	3.4999	63.500	2.5000	3.2	3.2	**EE420801/421450**	1	1 180	1 460	159	75.6	216	243	355	317	334	6	28.6	3.2	3.2	0.40	1.49	0.82	37.8
	8.0000	406.400	16.0000	92.075	3.6250	85.725	3.3750	57.150	2.2500	6.4	6.4	**EE114080/114160**	1	1 190	1 460	152	119.8	222	253	387	337	367	6	34.9	6.4	6.4	0.79	0.76	0.42	48.5
	8.0000	482.600	19.0000	117.475	4.6250	95.250	3.7500	73.025	2.8750	6.4	6.4	**EE380080/380190**	1-P	1 810	2 060	209	152.8	222	273	463	385	427	1	44.5	6.4	6.4	0.87	0.69	0.38	93.5
203.987	8.0310	276.225	10.8750	42.863	1.6875	46.038	1.8125	34.132	1.3438	3.6	3.2	**LM241148/LM241111**	1	469	715	89.7	46.3	218	222	263	257	264	4	8.7	3.6	3.2	0.32	1.88	1.04	7.12
204.788	8.0625	292.100	11.5000	57.945	2.2813	57.945	2.2813	46.038	1.8125	3.6	3.2	**M241549/M241510**	1	683	1 030	115	52.6	218	223	279	267	277	7	11.9	3.6	3.2	0.33	1.80	0.99	11.5
206.375	8.1250	282.575	11.1250	46.038	1.8125	46.038	1.8125	36.513	1.4375	3.6	3.2	**67985/67920**	1	437	707	77.6	61.6	220	222	270	259	271	7	9.5	3.6	3.2	0.51	1.18	0.65	8.07
	8.1250	317.500	12.5000	53.975	2.1250	53.975	2.1250	34.925	1.3750	4	3.2	**EE132084/132125**	1	550	724	83.2	48.4	221	238	305	285	292	7	19.1	4	3.2	0.31	1.91	1.05	13.4
	8.1250	319.088	12.5625	53.975	2.1250	53.975	2.1250	34.925	1.3750	4	3.2	**EE132084/132127**	1	550	724	83.2	48.4	221	238	306	285	292	7	19.1	4	3.2	0.31	1.91	1.05	13.6
	8.1250	336.550	13.2500	98.425	3.8750	100.013	3.9375	77.788	3.0625	3.2	3.2	**H242649/H242610**	1	1 300	1 900	200	73.8	219	236	324	300	317	9	20.6	3.2	3.2	0.33	1.80	0.99	33.1
209.550	8.2500	317.500	12.5000	63.500	2.5000	63.500	2.5000	46.038	1.8125	4.3	3.2	**93825/93125**	1	757	1 130	122	71.4	225	227	305	278	294	7	17.5	4.3	3.2	0.52	1.15	0.63	16.4
	8.2500	317.500	12.5000	63.500	2.5000	63.500	2.5000	46.038	1.8125	12.7	3.2	**93825A/93125**	1	757	1 130	122	71.4	241	227	305	278	294	7	17.5	12.7	3.2	0.52	1.15	0.63	16.2
	8.2500	333.375	13.1250	69.850	2.7500	69.850	2.7500	52.388	2.0625	6.4	6.4	**HM743345/HM743310**	1	942	1 330	144	71.9	229	243	314	301	316	7	17.5	6.4	6.4	0.44	1.37	0.75	22.2
	8.2500	355.600	14.0000	68.263	2.6875	66.675	2.6250	47.625	1.8750	7.1	3.2	**96825/96140**	1	823	1 320	139	84.9	230	259	343	312	331	8	20.6	7.1	3.2	0.59	1.02	0.56	26.9
215.900	8.5000	288.925	11.3750	46.038	1.8125	46.038	1.8125	34.925	1.3750	3.6	3.2	**LM742749/LM742714**	1	447	781	95.2	60.7	230	232	276	265	276	6	11.1	3.6	3.2	0.48	1.25	0.69	7.94
	8.5000	360.000	14.1732	82.550	3.2500	79.372	3.1249	63.500	2.5000	1.6	3.2	**EE420850/421417**	1	1 180	1 460	159	75.7	226	243	347	317	334	6	19.1	1.6	3.2	0.40	1.49	0.82	30.9
220	—	300	—	51	—	51	—	39	—	3	2.5	**32944JR**	1	621	1 010	112	58.6	234	234	288	275	290	9	12	2.5	2	0.43	1.41	0.78	10.1
	—	340	—	76	—	76	—	57	—	4	3	**32044JR**	1	1 120	1 620	175	72.8	238	243	326	300	326	12	19	3	2.5	0.43	1.39	0.77	25.2
	—	400	—	72	—	65	—	54	—	5	4	**30244JR**	1	1 260	1 440	160	76.5	242	263	382	344	371	14	17	4	3	0.44	1.43	0.79	35.9
220.663	8.6875	314.325	12.3750	61.913	2.4375	61.913	2.4375	49.213	1.9375	6.4	3.2	**M244249/M244210**	1	768	1 220	135	58.0	240	243	301	288	299	5	12.7	6.4	3.2	0.33	1.80	0.99	14.5

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

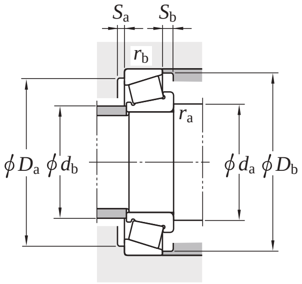
d 220.878 ~ 240 mm



Design 1



Design 1-P

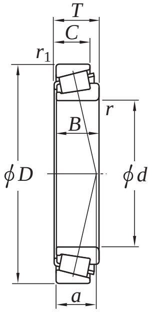


Boundary dimensions												Bearing No. [1]	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	*C* mm	1/25.4	*r* min.	r_1 min.			C_r	C_{0r}	C_u	*a*	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	*e*	Y_1	Y_0	
220.878	8.6960	317.500	12.5000	47.625	1.8750	52.388	2.0625	36.513	1.4375	3.2	3.2	**LM245833/LM245810**	1	611	928	103	50.5	234	253	305	296	304	8	11.1	3.2	3.2	0.33	1.80	0.99	12.3
223.838	8.8125	295.275	11.6250	46.038	1.8125	46.038	1.8125	34.925	1.3750	3.6	3.2	**LM844049/LM844010**	1	451	792	95.6	63.1	237	239	282	273	285	6	11.1	3.6	3.2	0.50	1.20	0.66	8.01
225.425	8.8750	355.600	14.0000	69.850	2.7500	69.850	2.7500	49.213	1.9375	6.7	1.6	**EE130889/131400**	1	913	1 310	140	59.9	245	263	346	319	330	9	20.6	6.7	1.6	0.33	1.82	1.00	24.1
	8.8750	400.050	15.7500	88.900	3.5000	87.313	3.4375	63.500	2.5000	1.6	3.2	**EE430888/431575**	1	1 240	1 600	169	82.6	235	267	387	344	363	8	25.4	1.6	3.2	0.44	1.37	0.75	42.5
228.600	9.0000	355.600	14.0000	68.263	2.6875	66.675	2.6250	47.625	1.8750	7.1	3.2	**96900/96140**	1	823	1 320	139	84.9	249	259	343	312	331	8	20.6	7.1	3.2	0.59	1.02	0.56	23.5
	9.0000	355.600	14.0000	69.850	2.7500	69.850	2.7500	49.213	1.9375	6.7	1.6	**EE130902/131400**	1	913	1 310	140	59.9	248	263	346	319	330	9	20.6	6.7	1.6	0.33	1.82	1.00	23.5
	9.0000	355.600	14.0000	69.850	2.7500	69.850	2.7500	50.800	2.0000	6.4	6.4	**HM746646/HM746610**	1	969	1 370	148	77.0	248	261	336	322	338	8	19.1	6.4	6.4	0.47	1.27	0.70	24.0
	9.0000	358.775	14.1250	71.438	2.8125	71.438	2.8125	53.975	2.1250	3.6	3.2	**M249732/M249710**	1	968	1 590	166	64.4	242	279	346	330	342	8	17.5	3.6	3.2	0.33	1.80	0.99	26.6
	9.0000	400.050	15.7500	88.900	3.5000	87.313	3.4375	63.500	2.5000	10.4	3.2	**EE430900/431575**	1	1 240	1 600	169	82.6	256	267	387	344	363	8	25.4	10.4	3.2	0.44	1.37	0.75	41.6
	9.0000	425.450	16.7500	101.600	4.0000	95.250	3.7500	76.200	3.0000	7.1	6.4	**EE700091/700167**	1	1 480	1 980	205	81.1	249	285	406	364	381	6	25.4	7.1	6.4	0.33	1.80	0.99	58.7
	9.0000	508.000	20.0000	117.475	4.6250	95.250	3.7500	73.025	2.8750	6.4	6.4	**EE390090/390200**	1	1 550	1 800	178	168.1	248	303	489	410	455	1	44.5	6.4	6.4	0.94	0.64	0.35	97.1
231.775	9.1250	295.275	11.6250	33.338	1.3125	31.750	1.2500	23.813	0.9375	3.6	3.2	**544091/544116**	1	307	491	59.4	50.1	245	248	282	277	283	4	9.5	3.6	3.2	0.40	1.49	0.82	4.84
	9.1250	300.038	11.8125	33.338	1.3125	31.750	1.2500	23.813	0.9375	3.6	3.2	**544091/544118**	1	307	491	59.4	50.1	245	248	287	277	283	4	9.5	3.6	3.2	0.40	1.49	0.82	5.25
	9.1250	377.825	14.8750	79.375	3.1250	80.963	3.1875	58.738	2.3125	3.2	3.2	**HM647448/HM647411**	1	1 210	1 630	172	77.6	245	266	365	336	353	10	20.6	3.2	3.2	0.43	1.40	0.77	32.9
234.950	9.2500	314.325	12.3750	49.213	1.9375	49.213	1.9375	36.513	1.4375	3.6	3.2	**LM545849/LM545810**	1	606	981	106	57.5	249	253	301	293	303	9	12.7	3.6	3.2	0.40	1.51	0.83	10.2
	9.2500	317.500	12.5000	49.213	1.9375	49.213	1.9375	36.513	1.4375	3.6	3.2	**LM545849/LM545812**	1	606	981	106	57.5	249	253	305	293	303	9	12.7	3.6	3.2	0.40	1.51	0.83	10.6
	9.2500	327.025	12.8750	52.388	2.0625	52.388	2.0625	36.513	1.4375	6.4	3.2	**8575/8520**	1	584	930	100	60.0	254	259	314	299	309	7	15.9	6.4	3.2	0.41	1.48	0.81	12.2
	9.2500	328.625	12.9380	52.388	2.0625	52.388	2.0625	36.513	1.4375	6.4	3.2	**8575/8522**	1	584	930	100	60.0	254	259	316	299	309	7	15.9	6.4	3.2	0.41	1.48	0.81	12.4
	9.2500	381.000	15.0000	74.613	2.9375	74.613	2.9375	57.150	2.2500	6.4	3.2	**M252330/M252310**	1	1 070	1 670	174	69.0	254	295	368	350	363	6	17.5	6.4	3.2	0.33	1.80	0.99	32.5
	9.2500	384.175	15.1250	112.713	4.4375	112.712	4.4375	90.488	3.5625	6.4	6.4	**H247549/H247510**	1-P	1 820	2 680	271	83.8	254	265	365	341	361	8	22.2	6.4	6.4	0.33	1.80	0.99	50.0
237.330	9.3437	336.550	13.2500	65.088	2.5625	65.088	2.5625	50.800	2.0000	6.4	3.2	**M246949/M246910**	1	887	1 380	150	59.9	257	259	324	309	320	8	14.3	6.4	3.2	0.33	1.80	0.99	17.1
	9.3437	358.775	14.1250	71.438	2.8125	71.438	2.8125	53.975	2.1250	6.4	3.2	**M249736/M249710**	1	968	1 590	166	64.4	257	279	346	330	342	8	17.5	6.4	3.2	0.33	1.80	0.99	24.8
240	—	320	—	51	—	51	—	39	—	3	2.5	**32948JR**	1	645	1 090	119	64.5	254	254	308	294	311	9	12	2.5	2	0.46	1.31	0.72	10.9
	—	360	—	76	—	76	—	57	—	4	3	**32048JR**	1	1 160	1 720	180	78.5	258	261	346	318	346	12	19	3	2.5	0.46	1.31	0.72	26.8

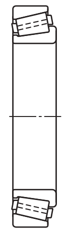
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

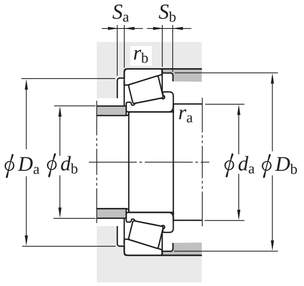
d 241.300 ~ 255.600 mm



Design 1



Design 1-P



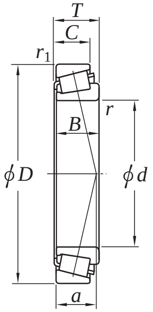
Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*B* mm	*B* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	Bearing No. 1)	Design	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Load center (mm) *a*	Mounting dimensions (mm) d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	Constant *e*	Axial load factors Y_1	Axial load factors Y_0	(Refer.) Mass (kg)
241.300	9.5000	327.025	12.8750	52.388	2.0625	52.388	2.0625	36.513	1.4375	6.4	3.2	**8578/8520**	1	584	930	100	60.0	261	259	314	299	309	7	15.9	6.4	3.2	0.41	1.48	0.81	11.2
	9.5000	444.500	17.5000	101.600	4.0000	100.013	3.9375	76.200	3.0000	6.4	4.8	**EE923095/923175**	1	1 610	1 980	204	84.4	261	298	428	389	406	7	25.4	6.4	4.8	0.34	1.78	0.98	62.1
	9.5000	488.950	19.2500	120.650	4.7500	120.650	4.7500	92.075	3.6250	6.4	6.4	**EE295950/295193**	1	2 100	2 790	276	92.7	261	328	470	427	446	8	28.6	6.4	6.4	0.31	1.94	1.07	100
	9.5000	508.000	20.0000	117.475	4.6250	95.250	3.7500	73.025	2.8750	6.4	6.4	**EE390095/390200**	1	1 550	1 800	178	168.1	261	303	489	410	455	1	44.5	6.4	6.4	0.94	0.64	0.35	93.7
243.683	9.5938	315.913	12.4375	31.750	1.2500	31.750	1.2500	22.225	0.8750	3.6	3.2	**LL648434/LL648415**	1	303	549	64.6	54.0	257	268	303	295	301	6	9.5	3.6	3.2	0.43	1.39	0.77	6.00
244.475	9.6250	381.000	15.0000	79.375	3.1250	76.200	3.0000	57.150	2.2500	6.4	4.8	**EE126097/126150**	1	988	1 470	153	88.5	264	276	365	336	356	5	22.2	6.4	4.8	0.52	1.16	0.64	30.6
247.650	9.7500	304.800	12.0000	22.225	0.8750	22.225	0.8750	15.875	0.6250	1.6	1.6	**28880/28820**	1	195	322	37.8	38.8	257	262	295	285	288	6	6.4	1.6	1.6	0.32	1.85	1.02	3.05
	9.7500	346.075	13.6250	63.500	2.5000	63.500	2.5000	50.800	2.0000	6.4	6.4	**M348449/M348410**	1	909	1 440	154	61.7	267	268	327	319	330	9	12.7	6.4	6.4	0.34	1.75	0.96	17.4
	9.7500	355.600	14.0000	50.800	2.0000	50.800	2.0000	33.338	1.3125	6.4	3.2	**EE170975/171400**	1	635	924	102	56.1	267	280	343	327	335	10	17.5	6.4	3.2	0.36	1.65	0.91	15.1
	9.7500	368.300	14.5000	50.800	2.0000	50.800	2.0000	33.338	1.3125	6.4	3.2	**EE170975/171450**	1	635	924	102	56.1	267	280	355	327	335	10	17.5	6.4	3.2	0.36	1.65	0.91	17.0
	9.7500	381.000	15.0000	74.613	2.9375	74.613	2.9375	57.150	2.2500	6.4	3.2	**M252337/M252310**	1	1 070	1 670	174	69.0	267	295	368	350	363	6	17.5	6.4	3.2	0.33	1.80	0.99	29.7
	9.7500	406.400	16.0000	115.888	4.5625	117.475	4.6250	93.663	3.6875	6.4	6.4	**HH249949/HH249910**	1-P	2 040	3 120	306	86.3	267	282	387	361	382	11	22.2	6.4	6.4	0.33	1.80	0.99	58.6
	9.7500	444.500	17.5000	104.775	4.1250	103.188	4.0625	76.200	3.0000	6.4	4.8	**EE115097/115175**	1	1 950	2 460	255	85.3	267	296	428	394	412	10	28.6	6.4	4.8	0.35	1.73	0.95	65.0
249.250	9.8130	381.000	15.0000	79.375	3.1250	76.200	3.0000	57.150	2.2500	6.4	4.8	**EE126098/126150**	1	988	1 470	153	88.5	269	276	365	336	356	5	22.2	6.4	4.8	0.52	1.16	0.64	29.5
254.000	10.0000	315.913	12.4375	31.750	1.2500	31.750	1.2500	22.225	0.8750	3.6	4.8	**LL648449/LL648416**	1	303	549	64.6	54.0	268	268	300	295	301	6	9.5	3.6	4.8	0.43	1.39	0.77	4.99
	10.0000	358.775	14.1250	71.438	2.8125	71.438	2.8125	53.975	2.1250	3.6	3.2	**M249749/M249710**	1	968	1 590	166	64.4	268	279	346	330	342	8	17.5	3.6	3.2	0.33	1.80	0.99	21.3
	10.0000	365.125	14.3750	58.738	2.3125	58.738	2.3125	42.863	1.6875	6.4	6.4	**EE134100/134143**	1	708	1 070	116	63.7	273	286	346	334	345	8	15.9	6.4	6.4	0.37	1.60	0.88	18.2
	10.0000	368.300	14.5000	58.738	2.3125	58.738	2.3125	42.863	1.6875	6.4	6.4	**EE134100/134145**	1	708	1 070	116	63.7	273	286	349	334	345	8	15.9	6.4	6.4	0.37	1.60	0.88	18.8
	10.0000	393.700	15.5000	73.817	2.9062	69.850	2.7500	50.005	1.9687	6.4	6.4	**EE275100/275155**	1	921	1 540	157	75.4	273	314	374	364	377	5	23.8	6.4	6.4	0.40	1.49	0.82	31.1
	10.0000	403.225	15.8750	69.850	2.7500	69.850	2.7500	46.038	1.8125	6.4	6.4	**EE275100/275158**	1	921	1 540	157	71.5	273	314	384	365	377	9	23.8	6.4	6.4	0.40	1.49	0.82	32.5
	10.0000	422.275	16.6250	86.121	3.3906	79.771	3.1406	66.675	2.6250	6.7	3.2	**HM252343/HM252310**	1	1 270	1 680	177	78.7	274	309	409	384	399	1	19.4	6.7	3.2	0.33	1.80	0.99	42.7
	10.0000	495.300	19.5000	141.288	5.5625	141.288	5.5625	114.300	4.5000	6.4	6.4	**HH258232/HH258210**	1-P	2 930	4 670	429	108.1	273	346	476	441	467	8	27	6.4	6.4	0.33	1.80	0.99	128
	10.0000	533.400	21.0000	133.350	5.2500	120.650	4.7500	77.788	3.0625	6.4	6.4	**HH953749/HH953710**	1-P	2 230	2 800	262	180.8	273	324	510	446	495	4	55.6	6.4	6.4	0.94	0.64	0.35	127
255.600	10.0630	342.900	13.5000	57.150	2.2500	63.500	2.5000	44.450	1.7500	1.6	3.2	**M349547/M349510**	1	764	1 280	135	60.1	265	276	330	320	330	6	12.7	1.6	3.2	0.35	1.73	0.95	14.1

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

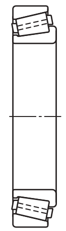
Single-row tapered roller bearings

Koyo

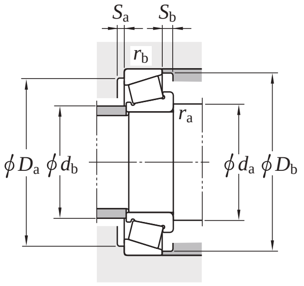
d 257.175 ~ (285.750) mm



Design 1



Design 1-P

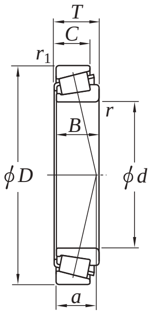


Boundary dimensions												Bearing No. 1)	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*B* mm	*B* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.			C_r	C_{0r}	C_u	*a*	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	*e*	Y_1	Y_0	
257.175	10.1250	342.900	13.5000	57.150	2.2500	57.150	2.2500	44.450	1.7500	6.4	3.2	**M349549/M349510**	1	764	1 280	135	60.1	276	276	330	320	330	6	12.7	6.4	3.2	0.35	1.73	0.95	13.3
	10.1250	358.775	14.1250	71.438	2.8125	76.200	3.0000	53.975	2.1250	1.6	3.2	**M249747/M249710**	1	968	1 590	166	64.4	267	279	346	330	342	8	17.5	1.6	3.2	0.33	1.80	0.99	21
258.763	10.1875	400.050	15.7500	69.850	2.7500	67.470	2.6563	46.038	1.8125	9.5	6.4	**EE221018/221575**	1	953	1 280	137	71.2	284	295	381	359	371	6	23.8	9.5	6.4	0.39	1.52	0.84	26.7
260	—	360	—	63.5	—	63.5	—	48	—	3	2.5	**32952JR**	1	926	1 550	163	69.6	274	279	348	328	347	11	15.5	2.5	2	0.41	1.48	0.81	18.9
	—	400	—	87	—	87	—	65	—	5	4	**32052JR**	1	1 470	2 170	221	85.0	282	287	382	352	383	14	22	4	3	0.43	1.38	0.76	39.5
260.350	10.2500	365.125	14.3750	58.738	2.3125	58.738	2.3125	42.863	1.6875	6.4	6.4	**EE134102/134143**	1	708	1 070	116	63.7	280	286	346	334	345	8	15.9	6.4	6.4	0.37	1.60	0.88	17.1
	10.2500	419.100	16.5000	85.725	3.3750	84.138	3.3125	61.913	2.4375	6.4	3.2	**EE435102/435165**	1	1 230	1 760	181	106.0	280	296	406	369	394	6	23.8	6.4	3.2	0.60	0.99	0.55	42.3
	10.2500	422.275	16.6250	86.121	3.3906	79.771	3.1406	66.675	2.6250	6.7	3.2	**HM252348/HM252310**	1	1 270	1 680	177	78.7	280	309	409	384	399	1	19.4	6.7	3.2	0.33	1.80	0.99	41.2
263.525	10.3750	325.438	12.8125	28.575	1.1250	28.575	1.1250	25.400	1.0000	1.6	1.6	**38880/38820**	1	272	507	58.8	48.6	273	281	316	306	312	6	3.2	1.6	1.6	0.37	1.64	0.90	5.08
264.975	10.4321	355.600	14.0000	57.150	2.2500	62.000	2.4409	44.450	1.7500	3.6	3.2	**LM451347/LM451310**	1	757	1 280	134	62.3	279	287	343	332	342	8	12.7	3.6	3.2	0.36	1.67	0.92	15.3
266.700	10.5000	325.438	12.8125	28.575	1.1250	28.575	1.1250	25.400	1.0000	1.6	1.6	**38885/38820**	1	272	507	58.8	48.6	276	281	316	306	312	6	3.2	1.6	1.6	0.37	1.64	0.90	4.79
	10.5000	355.600	14.0000	57.150	2.2500	57.150	2.2500	44.450	1.7500	3.6	3.2	**LM451349/LM451310**	1	757	1 280	134	62.3	280	287	343	332	342	8	12.7	3.6	3.2	0.36	1.67	0.92	14.7
	10.5000	393.700	15.5000	73.817	2.9062	69.850	2.7500	50.005	1.9687	6.4	6.4	**EE275105/275155**	1	921	1 540	157	75.4	286	314	374	364	377	5	23.8	6.4	6.4	0.40	1.49	0.82	28.3
	10.5000	444.500	17.5000	120.650	4.7500	117.475	4.6250	88.900	3.5000	6.4	6.4	**H852849/H852810**	1	1 890	2 820	266	121.3	286	300	425	390	424	9	31.8	6.4	6.4	0.58	1.04	0.57	71.2
269.875	10.6250	381.000	15.0000	74.613	2.9375	74.613	2.9375	57.150	2.2500	6.4	3.2	**M252349/M252310**	1	1 070	1 670	174	69.0	289	295	368	350	363	6	17.5	6.4	3.2	0.33	1.80	0.99	24.5
276.225	10.8750	352.425	13.8750	36.513	1.4375	34.925	1.3750	23.813	0.9375	3.6	3.2	**L853049/L853010**	1	389	653	75.2	71.2	290	295	340	329	337	7	12.7	3.6	3.2	0.54	1.11	0.61	7.53
279.400	11.0000	469.900	18.5000	95.250	3.7500	93.663	3.6875	69.850	2.7500	9.5	3.2	**EE722110/722185**	1	1 540	2 190	219	87.2	305	332	457	412	430	7	25.4	9.5	3.2	0.38	1.59	0.88	60.7
	11.0000	488.950	19.2500	120.650	4.7500	120.650	4.7500	92.075	3.6250	1.2	6.4	**EE295110/295193**	1	2 100	2 790	276	92.7	288	328	470	427	446	8	28.6	1.2	6.4	0.31	1.94	1.07	85.5
280	—	380	—	63.5	—	63.5	—	48	—	3	2.5	**32956JR**	1	949	1 630	168	75.1	294	298	368	347	368	11	15.5	2.5	2	0.43	1.39	0.76	20.1
	—	420	—	87	—	87	—	65	—	5	4	**32056JR**	1	1 510	2 280	230	91.1	302	305	402	370	402	14	22	4	3	0.46	1.31	0.72	41.7
285.750	11.2500	358.775	14.1250	33.338	1.3125	31.750	1.2500	22.225	0.8750	3.6	3.2	**545112/545141**	1	301	537	60.9	65.8	299	308	346	337	344	6	11.1	3.6	3.2	0.49	1.23	0.68	6.75

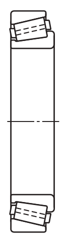
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

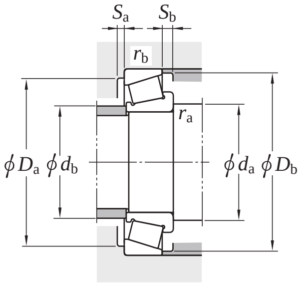
d (285.750) ~ 340 mm



Design 1



Design 1-P

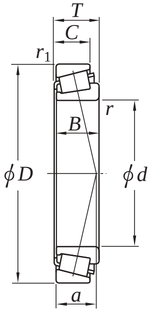


Boundary dimensions												Bearing No. 1)	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d		*D*		*T*		*B*		*C*		*r*	r_1			C_r	C_{0r}	C_u	*a*	d_a	d_b	D_a		D_b	S_a	S_b	r_a	r_b	*e*	Y_1	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.							min.	max.	max.	min.	min.	min.	min.	max.	max.				
285.750	11.2500	380.898	14.9960	65.088	2.5625	65.088	2.5625	49.213	1.9375	3.6	3.2	**LM654649/LM654610**	1	831	1 410	143	75.9	299	307	368	356	370	7	15.9	3.6	3.2	0.43	1.39	0.77	18.9
288.925	11.3750	406.400	16.0000	77.788	3.0625	77.788	3.0625	60.325	2.3750	6.4	3.2	**M255449/M255410**	1	1 260	2 210	223	73.2	308	318	394	373	387	8	17.5	6.4	3.2	0.34	1.77	0.98	30.9
292.100	11.5000	374.650	14.7500	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	3.2	**L555249/L555210**	1	587	971	111	64.7	306	309	362	351	360	8	12.7	3.6	3.2	0.40	1.49	0.82	11.5
298.450	11.7500	444.500	17.5000	63.500	2.5000	61.913	2.4375	39.688	1.5625	7.9	1.6	**EE291175/291750**	1	902	1 380	144	70.0	321	346	435	403	413	11	23.8	7.9	1.6	0.38	1.59	0.87	30.4
300	—	420	—	76	—	76	—	57	—	4	3	**32960JR**	1	1 320	2 210	223	79.9	318	324	406	383	405	12	19	3	2.5	0.39	1.52	0.84	32.4
	—	460	—	100	—	100	—	74	—	5	4	**32060JR**	1	1 800	2 660	263	97.9	322	329	442	404	439	15	26	4	3	0.43	1.38	0.76	57.5
300.038	11.8125	422.275	16.6250	82.550	3.2500	82.550	3.2500	63.500	2.5000	6.4	3.2	**HM256849/HM256810**	1	1 240	2 010	204	76.4	320	328	408	388	402	7	19.1	6.4	3.2	0.34	1.78	0.98	33.6
304.800	12.0000	393.700	15.5000	50.800	2.0000	50.800	2.0000	38.100	1.5000	6.4	3.2	**L357049/L357010**	1	658	1 180	133	64.8	325	329	380	369	378	5	12.7	6.4	3.2	0.36	1.67	0.92	14.6
	12.0000	406.400	16.0000	63.500	2.5000	63.500	2.5000	47.625	1.8750	6.4	3.2	**LM757049/LM757010**	1	935	1 580	159	79.6	325	324	393	376	390	8	15.9	6.4	3.2	0.44	1.36	0.75	21.2
	12.0000	444.500	17.5000	63.500	2.5000	61.913	2.4375	39.688	1.5625	7.9	1.6	**EE291201/291750**	1	902	1 380	144	70.0	328	346	434	403	413	11	23.8	7.9	1.6	0.38	1.59	0.87	29.0
	12.0000	495.300	19.5000	95.250	3.7500	92.075	3.6250	69.850	2.7500	16	6.4	**EE724120/724195**	1	1 600	2 340	231	95.2	344	359	475	438	457	6	25.4	16	6.4	0.40	1.49	0.82	64.8
317.500	12.5000	444.500	17.5000	63.500	2.5000	61.913	2.4375	39.688	1.5625	7.9	1.6	**EE291250/291750**	1	902	1 380	144	70.0	341	346	434	403	413	11	23.8	7.9	1.6	0.38	1.59	0.87	26.0
	12.5000	447.675	17.6250	85.725	3.3750	85.725	3.3750	68.263	2.6875	3.6	3.2	**HM259049/HM259010**	1	1 400	2 390	233	80.8	332	346	434	410	427	8	17.5	3.6	3.2	0.33	1.79	0.99	40.2
	12.5000	622.300	24.5000	147.638	5.8125	131.763	5.1875	82.550	3.2500	14.3	12.7	**H961649/H961610**	1-P	2 790	3 490	316	210.5	354	390	585	530	580	7	65.1	14.3	12.7	0.94	0.64	0.35	179
320	—	440	—	76	—	76	—	57	—	4	3	**32964JR**	1	1 330	2 270	226	85.0	338	342	426	401	426	12	19	3	2.5	0.42	1.44	0.79	34.0
	—	480	—	100	—	100	—	74	—	5	4	**32064JR**	1	1 900	2 810	273	103.0	342	344	462	418	461	16	26	4	3	0.46	1.31	0.72	58.7
323.850	12.7500	381.000	15.0000	28.575	1.1250	28.575	1.1250	20.638	0.8125	3.6	3.3	**LL758744/LL758715**	1	275	570	62.5	64.8	339	340	367	363	369	5	7.9	3.6	3.3	0.44	1.36	0.75	5.15
330.200	13.0000	415.925	16.3750	47.625	1.8750	47.625	1.8750	34.925	1.3750	3.6	3.2	**L860049/L860010**	1	568	1 080	119	82.8	345	351	402	389	401	6	12.7	3.6	3.2	0.50	1.20	0.66	13.8
333.375	13.1250	469.900	18.5000	90.488	3.5625	90.488	3.5625	71.438	2.8125	6.4	3.2	**HM261049/HM261010**	1	1 520	2 580	249	84.3	354	365	456	430	446	8	19.1	6.4	3.2	0.33	1.79	0.99	46.2
340	—	460	—	76	—	76	—	57	—	4	3	**32968JR**	1	1 340	2 340	229	90.5	358	361	446	420	446	12	19	3	2.5	0.44	1.37	0.75	35.6

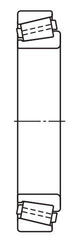
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

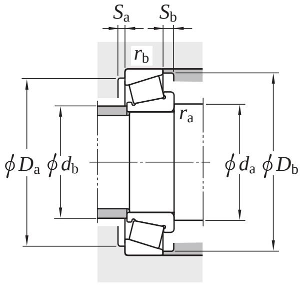
d 342.900 ~ (381.000) mm



Design 1



Design 1-P

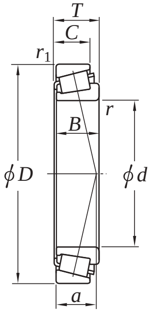


Boundary dimensions												Bearing No. [1]	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d		*D*		*T*		*B*		*C*		*r*	r_1			C_r	C_{0r}	C_u	*a*	d_a	d_b	D_a		D_b	S_a	S_b	r_a	r_b	*e*	Y_1	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.							min.	max.	max.	min.	min.	min.	min.	max.	max.				
342.900	13.5000	450.850	17.7500	66.675	2.6250	66.675	2.6250	52.388	2.0625	8.5	3.6	**LM361649/LM361610**	1	1 060	1 980	195	76.2	367	370	436	420	433	9	14.3	8.5	3.6	0.35	1.70	0.94	27.8
	13.5000	457.098	17.9960	66.675	2.6250	63.500	2.5000	46.038	1.8125	3.2	3.2	**LM961548/LM961510**	1	914	1 670	159	122.3	357	366	443	420	442	8	20.6	3.2	3.2	0.71	0.84	0.46	28.2
	13.5000	533.400	21.0000	76.200	3.0000	76.200	3.0000	50.800	2.0000	4.8	3.2	**EE971354/972100**	1	1 370	1 790	181	79.4	360	397	520	482	493	8	25.4	4.8	3.2	0.33	1.80	0.99	53.8
346.075	13.6250	482.600	19.0000	60.325	2.3750	55.563	2.1875	38.100	1.5000	7.1	6.4	**EE161363/161900**	1	769	1 250	124	93.7	368	388	462	440	453	7	22.2	7.1	6.4	0.50	1.20	0.66	29.4
	13.6250	482.600	19.0000	66.675	2.6250	63.500	2.5000	44.450	1.7500	6.7	6.7	**EE203136/203190**	1	906	1 430	144	86.6	367	386	462	442	454	6	22.2	6.7	6.7	0.42	1.44	0.79	32.4
	13.6250	488.950	19.2500	95.250	3.7500	95.250	3.7500	74.613	2.9375	6.4	3.2	**HM262749/HM262710**	1	1 690	2 900	276	88.5	366	382	475	450	466	8	20.6	6.4	3.2	0.33	1.79	0.99	53.3
349.250	13.7500	501.650	19.7500	90.488	3.5625	84.138	3.3125	69.850	2.7500	6.4	3.2	**EE333137/333197**	1	1 600	2 550	250	95.2	370	391	488	465	482	7	20.6	6.4	3.2	0.37	1.60	0.88	53.0
354.013	13.9375	469.900	18.5000	60.325	2.3750	55.563	2.1875	38.100	1.5000	7.1	6.4	**EE161394/161850**	1	769	1 250	124	93.7	376	388	450	440	453	7	22.2	7.1	6.4	0.50	1.20	0.66	24.7
	13.9375	488.950	19.2500	60.325	2.3750	55.563	2.1875	38.100	1.5000	7.1	6.4	**EE161394/161925**	1	769	1 250	124	93.7	376	388	469	440	453	7	22.2	7.1	6.4	0.50	1.20	0.66	28.9
355.600	14.0000	444.500	17.5000	60.325	2.3750	60.325	2.3750	47.625	1.8750	3.6	3.2	**L163149/L163110**	1	811	1 720	166	67.0	370	379	431	417	427	8	12.7	3.6	3.2	0.31	1.95	1.07	20.3
	14.0000	469.900	18.5000	60.325	2.3750	55.563	2.1875	38.100	1.5000	7.1	6.4	**EE161400/161850**	1	769	1 250	124	93.7	377	388	450	440	453	7	22.2	7.1	6.4	0.50	1.20	0.66	24.3
	14.0000	482.600	19.0000	60.325	2.3750	55.563	2.1875	38.100	1.5000	7.1	6.4	**EE161400/161900**	1	769	1 250	124	93.7	377	388	462	440	453	7	22.2	7.1	6.4	0.50	1.20	0.66	27.1
	14.0000	488.950	19.2500	60.325	2.3750	55.563	2.1875	38.100	1.5000	7.1	6.4	**EE161400/161925**	1	769	1 250	124	93.7	377	388	469	440	453	7	22.2	7.1	6.4	0.50	1.20	0.66	28.5
	14.0000	501.650	19.7500	74.613	2.9375	66.675	2.6250	50.800	2.0000	6.4	3.2	**EE231400/231975**	1	989	1 640	161	97.3	376	409	488	465	480	2	23.8	6.4	3.2	0.44	1.36	0.75	40.5
	14.0000	501.650	19.7500	90.488	3.5625	84.138	3.3125	69.850	2.7500	6.4	3.2	**EE333140/333197**	1	1 600	2 550	250	95.2	376	391	488	465	482	7	20.6	6.4	3.2	0.37	1.60	0.88	50.7
360	—	480	—	76	—	76	—	57	—	4	3	**32972JR**	1	1 350	2 400	231	96.2	378	379	466	438	466	12	19	3	2.5	0.46	1.31	0.72	37.1
368.249	14.4980	523.875	20.6250	101.600	4.0000	101.600	4.0000	79.375	3.1250	6.4	6.4	**HM265049/HM265010**	1-P	1 990	3 390	322	94.0	388	408	500	483	500	7	22.2	6.4	6.4	0.33	1.80	0.99	56.6
368.300	14.5000	596.900	23.5000	95.250	3.7500	92.075	3.6250	60.325	2.3750	9.5	6.4	**EE181453/182350**	1	1 820	2 330	234	104.3	395	431	575	535	545	11	34.9	9.5	6.4	0.42	1.44	0.79	83.0
	14.5000	609.600	24.0000	142.875	5.6250	139.700	5.5000	111.125	4.3750	7.9	6.4	**EE321145/321240**	1	3 160	4 530	406	121.4	392	427	585	545	570	7	31.8	7.9	6.4	0.36	1.69	0.93	152
371.475	14.6250	501.650	19.7500	74.613	2.9375	66.675	2.6250	50.800	2.0000	6.4	3.2	**EE231462/231975**	1	989	1 640	161	97.3	392	409	488	465	480	2	23.8	6.4	3.2	0.44	1.36	0.75	35.8
	14.6250	514.350	20.2500	74.613	2.9375	66.675	2.6250	50.800	2.0000	6.4	3.2	**EE231462/232025**	1	989	1 640	161	97.3	392	409	500	465	480	2	23.8	6.4	3.2	0.44	1.36	0.75	39.8
381.000	15.0000	479.425	18.8750	49.213	1.9375	47.625	1.8750	34.925	1.3750	6.4	3.2	**L865547/L865512**	1	746	1 280	128	91.4	401	405	466	454	465	8	14.3	6.4	3.2	0.49	1.23	0.68	18.9
	15.0000	508.000	20.0000	63.500	2.5000	58.738	2.3125	38.100	1.5000	6.4	3.2	**EE192150/192200**	1	865	1 490	144	101.9	401	412	494	466	479	9	25.4	6.4	3.2	0.53	1.13	0.62	30.0

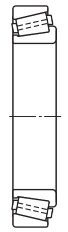
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

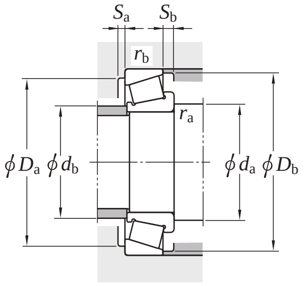
d (381.000) ~ 430.213 mm



Design 1



Design 1-P



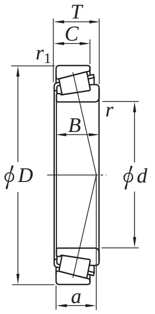
Boundary dimensions												Bearing No. 1)	Design	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Constant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	D mm	1/25.4	T mm	1/25.4	B mm	1/25.4	C mm	1/25.4	r min.	r_1 min.			C_r	C_{0r}	C_u	a	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
381.000	15.0000	522.288	20.5625	85.725	3.3750	84.138	3.3125	61.913	2.4375	6.4	3.2	**LM565949/LM565910**	1	1 460	2 590	247	92.8	401	414	505	480	496	10	23.8	6.4	3.2	0.38	1.56	0.86	50.0
	15.0000	523.875	20.6250	85.725	3.3750	84.138	3.3125	61.913	2.4375	6.4	3.2	**LM565949/LM565912**	1	1 460	2 590	247	92.8	401	414	510	480	496	10	23.8	6.4	3.2	0.38	1.56	0.86	50.7
	15.0000	546.100	21.5000	104.775	4.1250	104.775	4.1250	82.550	3.2500	6.4	6.4	**HM266446/HM266410**	1-P	2 390	4 210	386	97.6	401	421	525	505	515	10	22.2	6.4	6.4	0.33	1.80	0.99	79.5
384.175	15.1250	546.100	21.5000	104.775	4.1250	104.775	4.1250	82.550	3.2500	6.4	6.4	**HM266448/HM266410**	1-P	2 390	4 210	386	97.6	404	421	525	505	515	10	22.2	6.4	6.4	0.33	1.80	0.99	78.0
385.763	15.1875	514.350	20.2500	82.550	3.2500	82.550	3.2500	63.500	2.5000	6.4	3.2	**LM665949/LM665910**	1	1 510	2 710	258	98.2	406	411	500	477	494	9	19.1	6.4	3.2	0.42	1.43	0.79	44.6
393.700	15.5000	546.100	21.5000	76.200	3.0000	61.120	2.4063	55.562	2.1875	6.4	6.4	**EE234154/234215**	1	1 090	1 910	178	113.3	414	441	525	497	510	1	20.6	6.4	6.4	0.48	1.26	0.69	46.4
396.875	15.6250	546.100	21.5000	76.200	3.0000	61.120	2.4063	55.562	2.1875	6.4	6.4	**EE234156/234215**	1	1 090	1 910	178	113.3	417	441	525	497	510	1	20.6	6.4	6.4	0.48	1.26	0.69	45.5
	15.6250	558.800	22.0000	65.088	2.5625	61.120	2.4063	44.450	1.7500	6.4	6.4	**EE234156/234220**	1	1 090	1 910	178	102.2	417	441	535	505	510	10	20.6	6.4	6.4	0.48	1.26	0.69	44.9
406.400	16.0000	508.000	20.0000	61.913	2.4375	61.913	2.4375	47.625	1.8750	3.2	3.2	**L467549/L467510**	1	1 070	2 130	202	82.1	421	428	493	477	489	9	14.3	3.2	3.2	0.37	1.64	0.90	27.2
	16.0000	546.100	21.5000	76.200	3.0000	61.120	2.4063	55.562	2.1875	6.4	6.4	**EE234160/234215**	1	1 090	1 910	178	113.3	428	441	520	497	510	1	20.6	6.4	6.4	0.48	1.26	0.69	—
	16.0000	546.100	21.5000	87.313	3.4375	87.313	3.4375	68.263	2.6875	6.4	6.4	**M667944/M667911**	1	1 660	2 870	271	105.1	428	438	520	510	525	8	19.1	6.4	6.4	0.42	1.44	0.79	53.7
	16.0000	558.800	22.0000	65.088	2.5625	61.120	2.4063	44.450	1.7500	6.4	6.4	**EE234160/234220**	1	1 090	1 910	178	102.2	428	441	535	505	510	10	20.6	6.4	6.4	0.48	1.26	0.69	42.0
	16.0000	574.675	22.6250	76.200	3.0000	67.866	2.6719	50.800	2.0000	6.7	3.2	**EE285160/285226**	1	1 190	1 940	183	114.9	428	450	560	520	530	5	25.4	6.7	3.2	0.50	1.20	0.66	53.3
	16.0000	590.550	23.2500	107.950	4.2500	107.950	4.2500	80.963	3.1875	9.5	6.4	**EE833160X/833232**	1	2 240	3 540	329	100.0	434	453	565	545	560	9	27	9.5	6.4	0.32	1.85	1.02	89.7
	16.0000	609.524	23.9970	82.550	3.2500	79.375	3.1250	60.325	2.3750	7.9	6.4	**EE736160/736238**	1	1 900	3 030	283	95.9	431	477	585	565	570	8	22.2	7.9	6.4	0.35	1.73	0.95	76.2
	16.0000	609.600	24.0000	92.075	3.6250	84.138	3.3125	60.325	2.3750	6.7	6.4	**EE911600/912400**	1	1 790	2 640	251	105.6	428	466	585	555	570	5	31.8	6.7	6.4	0.38	1.57	0.86	80.1
	16.0000	673.100	26.5000	88.900	3.5000	87.833	3.4580	60.325	2.3750	6.4	3.2	**EE571602/572650**	1	1 850	2 620	247	111.7	428	505	655	610	620	8	28.6	6.4	3.2	0.40	1.49	0.82	109
409.575	16.1250	546.100	21.5000	87.313	3.4375	87.312	3.4375	68.263	2.6875	6.4	6.4	**M667947/M667911**	1	1 660	2 870	271	105.1	431	438	520	510	525	8	19.1	6.4	6.4	0.42	1.44	0.79	52.4
	16.1250	546.100	21.5000	87.313	3.4375	87.313	3.4375	66.675	2.6250	6.4	6.4	**M667948/M667910**	1	1 660	2 870	271	105.1	431	438	520	510	525	8	20.6	6.4	6.4	0.42	1.44	0.79	52.2
411.163	16.1875	609.600	24.0000	92.075	3.6250	84.138	3.3125	60.325	2.3750	6.7	6.4	**EE911618/912400**	1	1 790	2 640	251	105.6	433	466	585	555	570	5	31.8	6.7	6.4	0.38	1.57	0.86	78.1
415.925	16.3750	590.550	23.2500	114.300	4.5000	114.300	4.5000	88.900	3.5000	6.4	6.4	**M268749/M268710**	1-P	2 480	4 470	401	103.7	437	460	565	545	560	9	25.4	6.4	6.4	0.33	1.80	0.99	96.1
430.213	16.9375	603.250	23.7500	76.200	3.0000	73.025	2.8750	50.800	2.0000	6.4	6.4	**EE241693/242375**	1	1 220	1 880	180	122.8	451	473	580	545	560	2	25.4	6.4	6.4	0.53	1.14	0.63	54.0

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

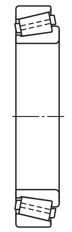
Single-row tapered roller bearings

Koyo

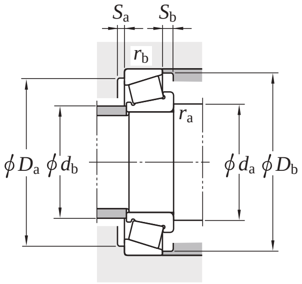
d 431.800 ~ 488.950 mm



Design 1



Design 1-P

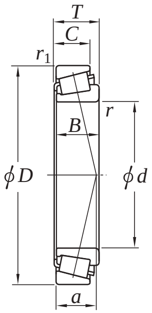


Boundary dimensions												Bearing No. 1)	De-sign	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d		*D*		*T*		*B*		*C*		*r*	r_1			C_r	C_{0r}	C_u	*a*	d_a	d_b	D_a		D_b	S_a	S_b	r_a	r_b	*e*	Y_1	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.							min.	max.	max.	min.	min.	min.	min.	max.	max.				
431.800	17.0000	571.500	22.5000	74.613	2.9375	74.613	2.9375	52.388	2.0625	3.2	3.2	**LM869448/LM869410**	1	1 230	2 140	202	124.4	447	468	555	535	550	7	22.2	3.2	3.2	0.55	1.10	0.60	47.1
	17.0000	571.500	22.5000	76.200	3.0000	73.025	2.8750	57.150	2.2500	3.2	3.2	**EE239170/239225A**	1	1 230	2 150	200	99.7	447	470	555	535	540	2	19.1	3.2	3.2	0.38	1.57	0.86	46.8
	17.0000	603.250	23.7500	76.200	3.0000	73.025	2.8750	50.800	2.0000	6.4	6.4	**EE241701/242375**	1	1 220	1 880	180	122.8	453	473	580	545	560	2	25.4	6.4	6.4	0.53	1.14	0.63	53.4
	17.0000	673.100	26.5000	88.900	3.5000	87.833	3.4580	60.325	2.3750	6.4	3.2	**EE571703/572650**	1	1 850	2 620	247	111.7	453	505	655	610	620	8	28.6	6.4	3.2	0.40	1.49	0.82	97.4
441.325	17.3750	660.400	26.0000	91.280	3.5937	85.725	3.3750	62.705	2.4687	10.4	6.4	**EE737173/737260**	1	1 690	2 630	241	109.5	471	510	635	600	610	7	28.6	10.4	6.4	0.37	1.60	0.88	95.5
447.675	17.6250	552.450	21.7500	44.450	1.7500	44.450	1.7500	31.750	1.2500	3.2	3.2	**80176/80217**	1	798	1 520	147	72.4	463	481	535	525	530	10	12.7	3.2	3.2	0.32	1.88	1.04	21.0
	17.6250	565.150	22.2500	44.450	1.7500	44.450	1.7500	31.750	1.2500	3.2	3.2	**80176/80222**	1	798	1 520	147	72.4	463	481	550	525	530	10	12.7	3.2	3.2	0.32	1.88	1.04	23.8
	17.6250	635.000	25.0000	120.650	4.7500	120.650	4.7500	95.250	3.7500	6.4	6.4	**M270749/M270710**	1-P	2 870	5 250	458	113.8	469	495	610	585	600	8	25.4	6.4	6.4	0.33	1.80	0.99	118
450.850	17.7500	603.250	23.7500	85.725	3.3750	84.138	3.3125	60.325	2.3750	6.4	3.2	**LM770945/LM770910**	1	1 730	3 170	290	116.0	472	493	585	565	580	10	25.4	6.4	3.2	0.45	1.32	0.73	63.4
456.692	17.9800	660.400	26.0000	92.075	3.6250	91.262	3.5930	63.500	2.5000	6.4	6.4	**EE737179X/737262**	1	1 690	2 630	241	110.3	478	510	635	600	610	6	28.6	6.4	6.4	0.37	1.60	0.88	90.5
456.794	17.9840	761.873	29.9950	142.875	5.6250	142.875	5.6250	101.600	4.0000	16	6.4	**EE425179A/425299**	1-P	3 990	5 610	479	154.5	497	530	740	685	710	8	41.3	16	6.4	0.44	1.35	0.74	242
457.200	18.0000	573.088	22.5625	74.613	2.9375	74.613	2.9375	57.150	2.2500	6.4	6.4	**L570649/L570610**	1	1 380	2 930	263	100.4	478	484	550	540	550	10	17.5	6.4	6.4	0.40	1.49	0.82	42.7
	18.0000	596.900	23.5000	76.200	3.0000	73.025	2.8750	53.975	2.1250	9.5	3.2	**EE244180/244235**	1	1 410	2 620	243	103.1	485	492	580	555	570	7	22.2	9.5	3.2	0.40	1.48	0.82	50.1
	18.0000	615.950	24.2500	85.725	3.3750	85.725	3.3750	66.675	2.6250	6.4	6.4	**LM272235/LM272210**	1	1 770	3 560	320	98.4	478	515	590	585	590	8	19.1	6.4	6.4	0.33	1.80	0.99	71.8
476.250	18.7500	565.150	22.2500	41.275	1.6250	41.275	1.6250	31.750	1.2500	3.2	3.2	**LL771948/LL771911**	1	653	1 530	153	99.3	491	499	550	535	540	8	9.5	3.2	3.2	0.47	1.28	0.70	18.4
479.425	18.8750	679.450	26.7500	128.588	5.0625	128.588	5.0625	101.600	4.0000	6.4	6.4	**M272749/M272710**	1-P	3 100	5 550	476	122.2	500	530	655	630	645	7	27	6.4	6.4	0.33	1.80	0.99	140
482.600	19.0000	615.950	24.2500	85.725	3.3750	85.725	3.3750	66.675	2.6250	6.4	6.4	**LM272249/LM272210**	1	1 770	3 560	320	98.4	505	515	590	585	590	8	19.1	6.4	6.4	0.33	1.80	0.99	59.3
	19.0000	634.873	24.9950	80.963	3.1875	80.963	3.1875	63.500	2.5000	6.4	3.2	**EE243190/243250**	1	1 660	3 290	292	100.0	505	530	620	595	605	9	17.5	6.4	3.2	0.34	1.75	0.96	66.3
488.671	19.2390	660.400	26.0000	93.663	3.6875	94.458	3.7188	69.850	2.7500	6.4	6.4	**EE640191/640260**	1-P	2 260	3 960	357	98.4	510	530	635	615	630	11	23.8	6.4	6.4	0.31	1.95	1.07	86.9
488.950	19.2500	634.873	24.9950	84.138	3.3125	84.138	3.3125	61.913	2.4375	6.4	3.2	**LM772748/LM772710**	1	1 800	3 420	307	124.5	510	515	620	595	610	9	22.2	6.4	3.2	0.47	1.27	0.70	63.7
	19.2500	660.400	26.0000	93.663	3.6875	94.458	3.7188	69.850	2.7500	6.4	6.4	**EE640192/640260**	1-P	2 260	3 960	357	98.4	510	530	635	615	630	11	23.8	6.4	6.4	0.31	1.95	1.07	86.8

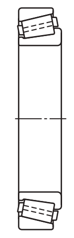
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

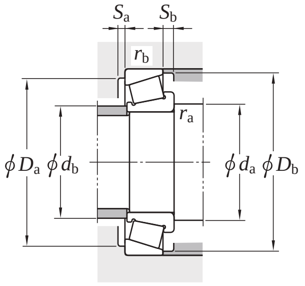
d **489.026 ~ 759.924 mm**



Design 1



Design 1-P

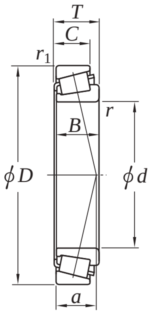


Boundary dimensions												Bearing No. 1)	De-sign	Basic load ratings (kN)		Fatigue load limit (kN)	Load center (mm)	Mounting dimensions (mm)									Con-stant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	*C* mm	1/25.4	*r* min.	r_1 min.			C_r	C_{0r}	C_u	*a*	d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	*e*	Y_1	Y_0	
489.026	19.2530	634.873	24.9950	80.963	3.1875	80.963	3.1875	63.500	2.5000	6.4	3.2	**EE243192/243250**	1	1 660	3 290	292	100.0	510	530	620	595	605	9	17.5	6.4	3.2	0.34	1.75	0.96	63.2
498.475	19.6250	634.873	24.9950	80.963	3.1875	80.963	3.1875	63.500	2.5000	6.4	3.2	**EE243196/243250**	1	1 660	3 290	292	100.0	520	530	620	595	605	9	17.5	6.4	3.2	0.34	1.75	0.96	58.6
501.650	19.7500	711.200	28.0000	136.525	5.3750	136.525	5.3750	106.363	4.1875	6.4	6.4	**M274149/M274110**	1-P	3 590	6 410	551	126.8	525	550	685	655	675	10	30.2	6.4	6.4	0.33	1.80	0.99	164
520.700	20.5000	736.600	29.0000	88.900	3.5000	81.758	3.2188	53.975	2.1250	6.4	3.2	**EE982051/982900**	1-P	1 840	2 580	238	136.4	545	570	720	675	690	5	34.9	6.4	3.2	0.48	1.26	0.69	97.5
536.575	21.1250	761.873	29.9950	146.050	5.7500	146.050	5.7500	114.300	4.5000	6.4	6.4	**M276449/M276410**	1-P	4 120	7 190	595	135.7	560	580	740	700	720	9	31.8	6.4	6.4	0.33	1.80	0.99	202
539.750	21.2500	635.000	25.0000	50.800	2.0000	50.800	2.0000	38.100	1.5000	6.4	6.4	**LL575349/LL575310**	1	943	1 970	175	101.4	565	560	610	610	620	9	12.7	6.4	6.4	0.41	1.48	0.81	25.7
549.097	21.6180	692.150	27.2500	80.963	3.1875	80.962	3.1875	61.913	2.4375	6.4	6.4	**L476548/L476510**	1	1 760	3 700	325	113.6	570	580	670	650	660	9	19.1	6.4	6.4	0.38	1.59	0.88	67.7
549.275	21.6250	692.150	27.2500	80.963	3.1875	80.963	3.1875	61.913	2.4375	6.4	6.4	**L476549/L476510**	1	1 760	3 700	325	113.6	575	580	670	650	660	9	19.1	6.4	6.4	0.38	1.59	0.88	67.5
558.800	22.0000	736.600	29.0000	88.108	3.4688	88.108	3.4688	63.500	2.5000	6.4	6.4	**EE843220/843290**	1-P	2 170	4 020	357	110.7	580	610	710	695	705	9	24.6	6.4	6.4	0.34	1.75	0.96	94.2
584.200	23.0000	685.800	27.0000	49.213	1.9375	49.213	1.9375	34.925	1.3750	3.6	3.2	**LL778149/LL778110**	1	908	1 930	172	113.8	600	610	670	660	665	10	14.3	3.6	3.2	0.44	1.36	0.75	29.4
607.720	23.9260	787.400	31.0000	93.663	3.6875	93.663	3.6875	69.850	2.7500	6.4	6.4	**EE649239/649310**	1-P	2 480	4 970	420	126.9	630	650	760	740	750	12	23.8	6.4	6.4	0.37	1.61	0.89	113
609.600	24.0000	762.000	30.0000	95.250	3.7500	92.075	3.6250	71.438	2.8125	6.4	6.4	**L879947/L879910**	1	2 140	4 510	379	153.0	635	640	735	720	740	9	23.8	6.4	6.4	0.49	1.23	0.67	91.2
	24.0000	787.400	31.0000	93.663	3.6875	93.663	3.6875	69.850	2.7500	6.4	6.4	**EE649240/649310**	1-P	2 480	4 970	420	126.9	635	650	760	740	750	12	23.8	6.4	6.4	0.37	1.61	0.89	112
	24.0000	812.800	32.0000	82.550	3.2500	82.550	3.2500	60.325	2.3750	6.4	6.4	**EE743240/743320**	1-P	2 390	4 290	371	112.7	635	660	790	755	765	12	22.2	6.4	6.4	0.33	1.83	1.01	112
660.400	26.0000	854.075	33.6250	85.725	3.3750	85.468	3.3649	60.325	2.3750	9.5	6.4	**EE749260/749336**	1-P	2 280	4 000	345	125.1	690	705	830	800	810	8	25.4	9.5	6.4	0.35	1.71	0.94	111
685.800	27.0000	876.300	34.5000	93.663	3.6875	92.075	3.6250	69.850	2.7500	6.4	6.4	**EE655270/655345**	1-P	2 570	5 390	440	149.1	710	735	850	830	840	9	23.8	6.4	6.4	0.42	1.44	0.79	132
749.300	29.5000	990.600	39.0000	159.500	6.2795	160.338	6.3125	123.000	4.8425	6.4	6.4	**LM283649/LM283610**	1-P	5 730	11 900	890	261.4	775	800	960	930	950	12	36.5	6.4	6.4	0.32	1.88	1.04	327
759.924	29.9183	889.000	35.0000	88.900	3.5000	88.900	3.5000	71.999	2.8346	3.2	3.2	**L183448/L183410**	1	2 330	5 630	451	123.1	780	785	870	860	870	11	16.9	3.2	3.2	0.31	1.97	1.08	90.5

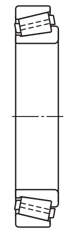
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Single-row tapered roller bearings

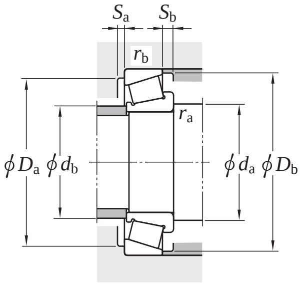
d 762.000 ~ 1 092.200 mm



Design 1



Design 1-P



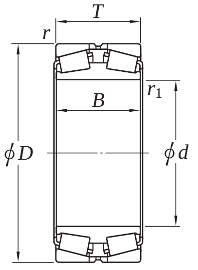
Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*B* mm	*B* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	Bearing No. [1]	De-sign	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Load center (mm) *a*	Mounting dimensions (mm) d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	r_a max.	r_b max.	Con-stant *e*	Axial load factors Y_1	Y_0	(Refer.) Mass (kg)
762.000	30.0000	889.000	35.0000	88.900	3.5000	88.900	3.5000	71.999	2.8346	3.2	3.2	**L183449/L183410**	1	2 330	5 630	451	123.1	780	785	870	860	870	11	16.9	3.2	3.2	0.31	1.97	1.08	88.8
	30.0000	965.200	38.0000	93.663	3.6875	80.963	3.1875	66.675	2.6250	6.4	3.2	**EE752300/752380**	1-P	2 290	4 790	392	159.7	785	820	940	910	920	1	27	6.4	3.2	0.40	1.49	0.82	143
1 092.200	43.0000	1 320.800	52.0000	95.250	3.7500	88.900	3.5000	69.850	2.7500	6.4	6.4	**EE776430/776520**	1-P	3 330	7 140	540	170.5	1 120	1 140	1 290	1 260	1 280	10	25.4	6.4	6.4	0.57	1.05	0.58	240

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

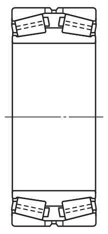
Double-row tapered roller bearings

TDI type

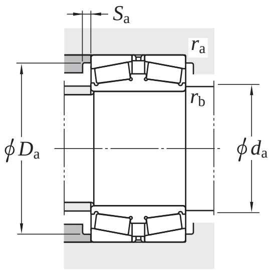
d 100 ~ 150 mm



Design 1



Design 1-P



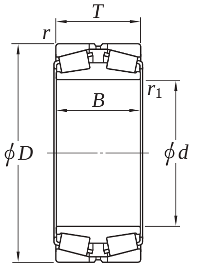
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d		*D*		*T*		*B*		*r*	*r*1	C_r	C_{0r}	C_u			d_a	D_a		S_a	r_a	r_b	*e*	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
100	—	165	—	52	—	52	—	2	2.5	298	384	55.9	**45320**	1	119	155	148	3.9	2	2	0.35	1.95	2.90	1.91	4.26
110	—	180	—	56	—	56	—	2	2.5	378	505	72.2	**45322**	1	128	170	160	4	2	2	0.35	1.95	2.90	1.91	5.40
120	—	180	—	46	—	46	—	2	2.5	286	424	59.4	**45224**	1	138	170	163	4	2	2	0.26	2.55	3.80	2.50	4.08
	—	200	—	62	—	62	—	2	2.5	444	598	83.4	**45324**	1	142	190	178	4	2	2	0.35	1.95	2.90	1.91	7.92
127.000	5.0000	182.563	7.1875	76.200	3.0000	76.200	3.0000	3.2	1.6	487	858	120	**48290D/48220**	1	141	171	167	3.8	3.2	1.6	0.31	2.21	3.29	2.16	6.57
	5.0000	234.950	9.2500	152.400	6.0000	139.700	5.5000	3.2	5.2	1 120	1 650	200	**95499D/95925**	1	151	223	205	8	3.2	5.2	0.37	1.83	2.72	1.79	27.1
	5.0000	254.000	10.0000	171.450	6.7500	161.925	6.3750	6.4	3.2	1 480	2 010	240	**EE153053D/153100**	1	154	236	218	11	6.4	3.2	0.32	2.10	3.13	2.05	39.2
130	—	200	—	52	—	52	—	2	2.5	376	548	75.6	**45226**	1	152	190	179	4	2	2	0.27	2.47	3.67	2.41	5.96
	—	210	—	64	—	64	—	2	2.5	476	657	90.3	**45326**	1	153	200	185	4	2	2	0.36	1.87	2.79	1.83	8.41
130.005	5.1183	215.900	8.5000	123.825	4.8750	123.825	4.8750	3.2	1.6	691	1 100	132	**74510D/74850**	1	154	204	194	5	3.2	1.6	0.49	1.38	2.06	1.35	17.3
133.350	5.2500	196.850	7.7500	92.075	3.6250	92.075	3.6250	3.2	1.6	669	1 120	137	**67390D/67322**	1	146	185	181	5	3.2	1.6	0.34	1.96	2.92	1.92	9.46
	5.2500	203.200	8.0000	92.075	3.6250	92.075	3.6250	3.2	1.6	669	1 120	137	**67390D/67320**	1	146	191	181	5	3.2	1.6	0.34	1.96	2.92	1.92	10.9
136.525	5.3750	190.500	7.5000	77.788	3.0625	77.788	3.0625	3.2	1.6	505	944	129	**48393D/48320**	1	150	179	175	4.7	3.2	1.6	0.32	2.10	3.13	2.06	6.87
	5.3750	225.425	8.8750	120.650	4.7500	120.650	4.7500	3.2	1.6	1 020	1 610	194	**H228649D/H228610**	1	156	214	202	6	3.2	1.6	0.33	2.03	3.02	1.98	19.4
139.700	5.5000	200.025	7.8750	75.408	2.9688	77.788	3.0625	3.3	0.8	527	982	133	**48680D/48620**	1	155	188	183	4	3.3	0.8	0.34	2.01	2.99	1.96	8.01
140	—	210	—	53	—	53	—	2	2.5	390	564	76.9	**45228**	1	159	200	188	4	2	2	0.27	2.47	3.67	2.41	6.45
	—	225	—	68	—	68	—	2.5	3	611	807	103	**45328**	1	160	213	210	4	2	2.5	0.40	1.68	2.50	1.64	10.0
	—	250	—	88	—	88	—	3	4	769	915	117	**45T282509**	1	166	236	224	7.5	2.5	3	0.43	1.57	2.34	1.53	16.0
149.225	5.8750	254.000	10.0000	120.650	4.7500	120.650	4.7500	3.2	1.6	1 180	1 830	215	**99587D/99100**	1	172	242	224	8	3.2	1.6	0.41	1.66	2.47	1.62	26.0
150	—	225	—	56	—	56	—	2.5	3	445	686	91.6	**45230**	1	174	213	203	4	2	2.5	0.26	2.55	3.80	2.50	7.87
	—	225	—	75	—	75	—	2.5	1	640	965	129	**45T302308**	1	167	213	206	6.5	2	0.8	0.40	1.68	2.50	1.64	9.78
	—	250	—	80	—	80	—	2.5	3	684	955	120	**45330**	1	179	238	220	4	2	2.5	0.35	1.95	2.90	1.91	15.5
	—	250	—	100	—	100	—	2.5	3	966	1 510	182	**45T302510A**	1	179	238	226	6.5	2	2.5	0.40	1.68	2.50	1.64	20.0

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

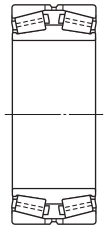
Double-row tapered roller bearings

TDI type

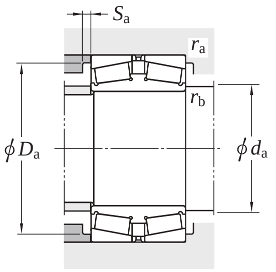
d 152.400 ~ (190) mm



Design 1



Design 1-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d		*D*		*T*		*B*		*r*	r_1	C_r	C_{0r}	C_u			d_a	D_a		S_a	r_a	r_b	*e*	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
152.400	6.0000	222.250	8.7500	84.138	3.3125	84.138	3.3125	1.6	1.6	678	1 190	159	**M231649D/M231610**	1	168	214	202	6	1.6	1.6	0.33	2.03	3.02	1.98	11.0
	6.0000	254.000	10.0000	133.350	5.2500	133.350	5.2500	3.2	1.6	1 180	1 830	215	**99600D/99100**	1	172	242	224	8	3.2	1.6	0.41	1.66	2.47	1.62	27.2
	6.0000	254.000	10.0000	158.750	6.2500	158.750	6.2500	3.2	1.6	1 180	1 830	215	**99603D/99100**	1	172	242	224	8	3.2	1.6	0.41	1.66	2.47	1.62	31.1
160	—	240	—	60	—	60	—	2.5	3	488	705	93.1	**45232**	1	184	228	217	5	2	2.5	0.24	2.79	4.15	2.73	9.22
	—	240	—	110	—	110	—	2.5	3	946	1 530	179	**45T322411**	1	176	228	220	6	2	2.5	0.33	2.03	3.02	1.98	16.7
	—	270	—	86	—	86	—	2.5	3	832	1 100	146	**45332**	1	193	258	237	4	2	2.5	0.35	1.95	2.90	1.91	19.8
170	—	260	—	67	—	67	—	2.5	3	654	956	124	**45234**	1	195	248	233	5	2	2.5	0.31	2.21	3.29	2.16	12.4
	—	280	—	88	—	88	—	2.5	3	834	1 210	145	**45334**	1	201	268	247	5	2	2.5	0.33	2.03	3.02	1.98	21.6
177.800	7.0000	247.650	9.7500	90.488	3.5625	90.488	3.5625	3.2	1.6	741	1 400	160	**67790D/67720**	1	190	236	227	5	3.2	1.6	0.44	1.54	2.29	1.50	13.3
	7.0000	279.400	11.0000	112.713	4.4375	112.710	4.4374	3.2	1.6	1 040	1 640	187	**82680D/82620**	1	197	268	252	7	3.2	1.6	0.52	1.29	1.92	1.26	25.1
	7.0000	285.750	11.2500	106.363	4.1875	106.360	4.1874	3.2	1.6	956	1 430	165	**EE91700D/91112**	1	201	274	252	4	3.2	1.6	0.43	1.57	2.34	1.53	26.0
	7.0000	288.925	11.3750	123.825	4.8750	123.825	4.8750	3.2	1.6	1 180	1 920	216	**94706D/94113**	1	201	277	255	8	3.2	1.6	0.47	1.44	2.15	1.41	32.1
	7.0000	288.925	11.3750	123.825	4.8750	123.825	4.8750	3.2	1.6	1 430	1 950	245	**HM237546D/HM237510**	1	201	277	261	8	3.2	1.6	0.32	2.12	3.15	2.07	30.8
	7.0000	288.925	11.3750	158.750	6.2500	158.750	6.2500	3.2	1.6	1 430	1 950	245	**HM237546DD/HM237510**	1	201	277.5	261	8	3.2	1.6	0.32	2.12	3.15	2.07	37.0
	7.0000	304.800	12.0000	114.300	4.5000	109.438	4.3086	3.2	3.2	1 220	1 690	199	**EE280700D/281200**	1	208	293	272	7	3.2	3.2	0.36	1.87	2.79	1.83	33.1
180	—	254	—	90	—	90	—	2.5	3	715	1 270	163	**45T362509**	1	199	242	234	6	2	2.5	0.33	2.03	3.02	1.98	14.0
	—	280	—	74	—	74	—	2.5	3	722	1 050	125	**45236**	1	208	268	250	5	2	2.5	0.28	2.43	3.61	2.37	16.8
	—	300	—	96	—	96	—	3	4	992	1 370	162	**45336**	1	210	286	263	5	2.5	3	0.35	1.95	2.90	1.91	26.5
	—	330	—	190	—	190	—	5	1.5	2 110	3 260	344	**45T363319**	1	202	308	286	6	4	1.5	0.58	1.17	1.75	1.15	71.8
187.325	7.3750	269.875	10.6250	101.600	4.0000	101.600	4.0000	3.2	1.6	880	1 610	183	**M238849D/M238810**	1	207	258	246	5	3.2	1.6	0.33	2.03	3.02	1.98	19.0
	7.3750	319.964	12.5970	161.925	6.3750	168.275	6.6250	4.8	3.2	1 610	2 450	271	**EE222074D/222126**	1	212	305	281	4	4.8	3.2	0.40	1.68	2.50	1.64	53.8
	7.3750	319.964	12.5970	161.925	6.3750	168.275	6.6250	4.8	3.2	1 830	2 530	285	**H239649D/H239610**	1	212	305	287	5	4.8	3.2	0.32	2.12	3.15	2.07	51.4
	7.3750	320.675	12.6250	161.925	6.3750	168.275	6.6250	4.8	3.2	1 610	2 450	271	**EE222074D/222128**	1	212	306	281	4	4.8	3.2	0.40	1.68	2.50	1.64	54.3
	7.3750	320.675	12.6250	161.925	6.3750	168.275	6.6250	4.8	3.2	1 830	2 530	285	**H239649D/H239612**	1	212	306	287	5	4.8	3.2	0.32	2.12	3.15	2.07	51.9
190	—	290	—	75	—	75	—	2.5	3	751	1 130	133	**45238**	1	219	278	260	5	2	2.5	0.26	2.55	3.80	2.50	17.7
	—	300	—	140	—	140	—	2.5	1.5	737	2 110	137	**45T383014**	1	207	288	268	7	2	1	0.62	1.09	1.62	1.06	35.9

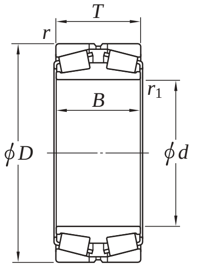
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Double-row tapered roller bearings

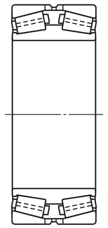
Koyo

TDI type

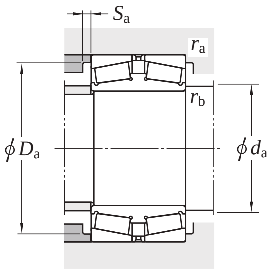
d (190) ~ 220 mm



Design 1



Design 1-P



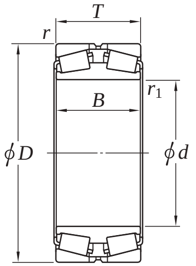
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	(kg)
190	—	320	—	104	—	104	—	3	4	1 130	1 590	183	**45338**	1	224	306	280	5	2.5	3	0.35	1.95	2.90	1.91	34.0
190.500	7.5000	365.049	14.3720	152.400	6.0000	158.750	6.2500	3.2	3.2	2 020	2 920	319	**EE420750D/421437**	1	239	353	317	6	3.2	3.2	0.40	1.68	2.50	1.64	77.2
	7.5000	368.300	14.5000	152.400	6.0000	158.750	6.2500	3.2	3.2	2 020	2 920	319	**EE420750D/421450**	1	239	356	317	6	3.2	3.2	0.40	1.68	2.50	1.64	79.4
199.975	7.8730	317.500	12.5000	133.350	5.2500	133.350	5.2500	3.2	6.4	1 300	2 270	244	**93788D/93125**	1	223	306	279	7	3.2	6.4	0.52	1.29	1.92	1.26	40.1
200	—	310	—	82	—	82	—	2.5	3	913	1 410	166	**45240**	1	234	298	280	5	2	2.5	0.26	2.55	3.80	2.50	22.9
	—	340	—	112	—	112	—	3	4	1 250	1 840	208	**45340**	1	244	326	300	5	2.5	3	0.35	1.95	2.90	1.91	41.9
	—	340	—	150	—	150	—	3	1.5	1 820	2 950	320	**45T403415**	1	233	326	301	9.5	2.5	1.5	0.43	1.57	2.34	1.53	57.7
203.200	8.0000	317.500	12.5000	123.825	4.8750	123.825	4.8750	3.2	1.6	1 300	2 270	244	**93800D/93125**	1	223	305	278	7	3.2	1.6	0.52	1.29	1.92	1.26	36.5
	8.0000	317.500	12.5000	133.350	5.2500	133.350	5.2500	3.2	6.4	1 300	2 270	244	**93801D/93125**	1	223	305	279	7	3.2	6.4	0.52	1.29	1.92	1.26	39.1
	8.0000	365.049	14.3720	152.400	6.0000	158.750	6.2500	3.2	3.2	2 020	2 920	319	**EE420800D/421437**	1	239	352	317	6	3.2	3.2	0.40	1.68	2.50	1.64	72.5
	8.0000	368.300	14.5000	152.400	6.0000	158.750	6.2500	3.2	3.2	2 020	2 920	319	**EE420800D/421450**	1	239	355	317	6	3.2	3.2	0.40	1.68	2.50	1.64	74.8
206.375	8.1250	282.575	11.1250	87.313	3.4375	87.313	3.4375	3.2	0.8	749	1 410	155	**67985D/67920**	1	220	270	260	7	3.2	0.8	0.51	1.33	1.97	1.30	16.1
	8.1250	336.550	13.2500	184.150	7.2500	180.975	7.1250	3.2	1.6	2 230	3 800	400	**H242649D/H242610**	1	233	324	301	9	3.2	1.6	0.33	2.03	3.02	1.98	65.1
215.900	8.5000	285.750	11.2500	85.725	3.3750	85.725	3.3750	3.2	0.8	766	1 560	190	**LM742749D/LM742710**	1	228	273	266	6	3.2	0.8	0.48	1.40	2.09	1.37	14.9
	8.5000	288.925	11.3750	85.725	3.3750	85.750	3.3760	3.2	0.8	766	1 560	190	**LM742749D/LM742714**	1	228	276	266	6	3.2	0.8	0.48	1.40	2.09	1.37	15.8
216.103	8.5080	330.200	13.0000	127.000	5.0000	130.175	5.1250	3.2	1.6	1 430	2 360	255	**9974D/9920**	1	237	317	301	7	3.2	1.6	0.55	1.22	1.82	1.19	38.8
	8.5080	330.200	13.0000	142.875	5.6250	152.400	6.0000	3.2	3.2	1 430	2 360	255	**9977D/9920**	1	239	317	301	7	3.2	3.2	0.55	1.22	1.82	1.19	43.3
218.000	—	314.325	—	115.888	—	115.888	—	3.2	1.6	1 400	2 550	281	**45T443112**	1	240	304	289	9	3.2	1.6	0.33	2.03	3.02	1.98	30.0
219.075	8.6250	358.775	14.1250	200.025	7.8750	196.850	7.7500	6.4	1.6	2 660	4 580	469	**H244849D/H244810**	1	245	340	320	9	6.4	1.6	0.33	2.03	3.02	1.98	80.9
220	—	320	—	76.2	—	76.2	—	2.5	3	976	1 570	182	**45T443208**	1	246	308	293	8.5	2	2.5	0.28	2.45	3.64	2.39	21.2
	—	340	—	90	—	90	—	3	4	933	1 460	167	**45244**	1	259	326	306	5	2.5	3	0.28	2.43	3.61	2.37	28.5
	—	370	—	120	—	120	—	4	5	1 400	2 060	226	**45344**	1	263	352	324	5	3	4	0.35	1.95	2.90	1.91	50.8
	—	400	—	254	—	250	—	4	1.5	3 880	5 970	591	**45T444025**	1-P	252	391	355	13	3	1.5	0.40	1.68	2.50	1.64	139

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

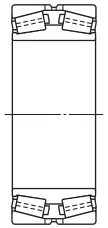
Double-row tapered roller bearings

TDI type

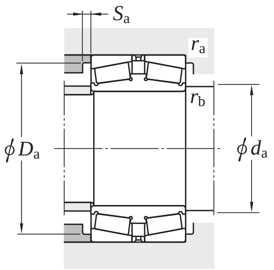
d 220.663 ~ 254.000 mm



Design 1



Design 1-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. 1)	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	*r* 2) min.	r_1 2) min.	C_r	C_{0r}	(kN) C_u			d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
220.663	8.6875	314.325	12.3750	115.888	4.5625	115.888	4.5625	3.2	1.6	1 320	2 450	269	**M244249D/M244210**	1	241	301	289	5	3.2	1.6	0.33	2.03	3.02	1.98	29.0
228.6	—	431.8	—	177.8	—	177.8	—	6	6	2 980	4 280	447	**45T464318D**	1-P	280	403	377	10	5	5	0.40	1.68	2.50	1.64	123
228.600	9.0000	400.050	15.7500	139.700	5.5000	139.700	5.5000	3.2	3.2	1 960	2 950	318	**EE529091D/529157**	1	277	387	352	6	3.2	3.2	0.31	2.19	3.25	2.14	76.3
230	—	350	—	90	—	90	—	3	4	991	1 560	177	**45246**	1	267	336	318	6	2.5	3	0.28	2.43	3.61	2.37	30.6
234.950	9.2500	327.025	12.8750	93.663	3.6875	93.663	3.6875	3.2	1.6	1 000	1 860	200	**8576D/8520**	1	256	314	300	7	3.2	1.6	0.41	1.66	2.47	1.62	24.2
	9.2500	384.175	15.1250	209.550	8.2500	209.550	8.2500	6.4	1.6	3 120	5 370	542	**H247549D/H247510**	1-P	262	365	342	8	6.4	1.6	0.33	2.03	3.02	1.98	99.3
235	—	375	—	170	—	170	—	4	1.5	1 800	4 020	283	**45T484012**	1	268	366	338	8	3	1.5	0.33	2.03	3.02	1.98	73.7
240	—	360	—	92	—	92	—	3	4	1 150	1 790	200	**45248**	1	271	346	325	5	2.5	3	0.32	2.12	3.15	2.07	32.2
	—	400	—	128	—	128	—	4	5	1 650	2 470	265	**45348**	1	286	382	354	5	3	4	0.35	1.95	2.90	1.91	65.4
	—	395	—	124	—	124	—	4	5	1 800	2 700	283	**45T484012**	1	283	373	358	10	3	4	0.40	1.68	2.50	1.64	60.3
241.300	9.5000	355.524	13.9970	109.525	4.3120	109.525	4.3120	SP	SP	1 190	2 050	224	**45T483611**	1	267	336	319	6	2.5	2	0.35	1.91	2.84	1.86	37.0
	9.5000	355.600	14.0000	92.862	3.6560	92.710	3.6500	3.2	1.6	1 090	1 850	203	**EE170951D/171400**	1	278	343	328	10	3.2	1.6	0.36	1.86	2.77	1.82	32.6
	9.5000	368.300	14.5000	92.862	3.6560	92.710	3.6500	3.2	1.6	1 090	1 850	203	**EE170951D/171450**	1	278	355	328	10	3.2	1.6	0.36	1.86	2.77	1.82	37.8
241.478	9.5070	349.148	13.7460	107.950	4.2500	107.950	4.2500	3.2	1.6	1 190	2 050	224	**EE127097D/127135**	1	268	336	320	7	3.2	1.6	0.35	1.91	2.84	1.86	34.0
244.475	9.6250	327.025	12.8750	92.075	3.6250	92.075	3.6250	3.2	1.6	985	1 890	203	**LM247748D/LM247710**	1	265	314	306	7	3.2	1.6	0.32	2.10	3.13	2.06	21.5
	9.6250	381.000	15.0000	146.050	5.7500	146.050	5.7500	4.8	3.2	1 690	2 930	306	**EE126096D/126150**	1	269	365	337	5	4.8	3.2	0.52	1.31	1.95	1.28	62.2
247.650	9.7500	400.050	15.7500	114.300	4.5000	119.060	4.6874	6.4	1.6	1 630	2 570	274	**EE220975D/221575**	1	292	381	360	6	6.4	1.6	0.39	1.71	2.54	1.67	56.4
	9.7500	406.400	16.0000	219.075	8.6250	215.900	8.5000	6.4	3.2	3 490	6 250	612	**HH249949D/HH249910**	1-P	279	387	362	11	6.4	3.2	0.33	2.03	3.02	1.98	116
254.000	10.0000	355.600	14.0000	92.862	3.6560	92.710	3.6500	3.2	1.6	1 090	1 850	203	**EE171000D/171400**	1	278	343	328	10	3.2	1.6	0.36	1.86	2.77	1.82	29.1
	10.0000	358.775	14.1250	130.175	5.1250	130.175	5.1250	3.2	3.2	1 660	3 170	333	**M249748D/M249710**	1	277	346	330.1	8	3.2	3.2	0.33	2.03	3.02	1.98	42.1
	10.0000	368.300	14.5000	92.862	3.6560	92.710	3.6500	3.2	1.6	1 090	1 850	203	**EE171000D/171450**	1	278	355	328	10	3.2	1.6	0.36	1.86	2.77	1.82	34.2
	10.0000	444.500	17.5000	133.350	5.2500	133.350	5.2500	6.4	3.2	1 850	2 770	294	**EE822101D/822175**	1	311	425	393	7	6.4	3.2	0.42	1.62	2.42	1.59	86.9

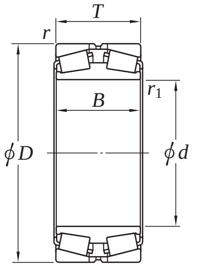
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

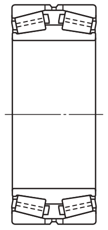
Double-row tapered roller bearings

TDI type

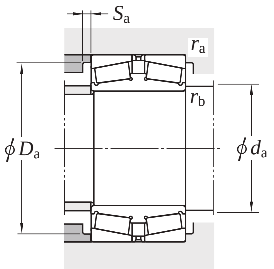
d 260 ~ 299.974 mm



Design 1



Design 1-P



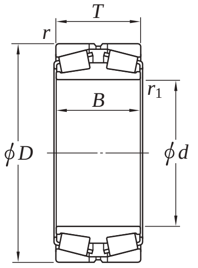
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d		D		T		B		r	r_1	C_r	C_{0r}	C_u			d_a	D_a		S_a	r_a	r_b	e	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
260	—	400	—	104	—	104	—	4	5	1 320	2 120	227	**45252**	1	302	382	360	6	3	4	0.25	2.74	4.08	2.68	48.1
	—	400	—	150	—	150	—	4	5	2 050	3 540	371	**45T524015**	1	294	382	361	9	3	4	0.33	2.03	3.02	1.98	70.0
	—	420	—	170	—	170	—	4	5	2 700	4 260	440	**45T524217**	1	297	402	381.5	11.5	3	4	0.33	2.03	3.02	1.98	92.5
	—	440	—	144	—	144	—	4	5	2 180	3 440	357	**45352**	1	313	422	386	6	3	4	0.35	1.95	2.90	1.91	92.2
260.350	10.2500	365.125	14.3750	107.950	4.2500	107.950	4.2500	6.4	3.2	1 210	2 150	231	**EE134102D/134143**	1	283	346	334.7	8	6.4	3.2	0.37	1.80	2.69	1.76	34.4
	10.2500	400.050	15.7500	114.300	4.5000	119.060	4.6874	6.4	6.4	1 630	2 570	274	**EE221025D/221575**	1	292	381	360	6	6.4	6.4	0.39	1.71	2.54	1.67	51.8
	10.2500	422.275	16.6250	139.700	5.5000	152.400	6.0000	3.2	3.6	2 180	3 360	355	**HM252347D/HM252310**	1	306	409	385	1	3.2	3.6	0.33	2.03	3.02	1.98	78.8
	10.2500	422.275	16.6250	152.400	6.0000	155.575	6.1250	3.2	6.4	2 180	3 360	355	**HM252348D/HM252310**	1	304	409	385	1	3.2	6.4	0.33	2.03	3.02	1.98	81.5
	10.2500	431.724	16.9970	152.400	6.0000	148.433	5.8438	3.6	6.4	2 180	3 360	355	**HM252348D/HM252315**	1	304	418	385	4	3.6	6.4	0.33	2.03	3.02	1.98	87.1
266.700	10.5000	355.600	14.0000	109.538	4.3125	107.950	4.2500	3.2	1.6	1 300	2 550	267	**LM451349D/LM451310**	1	285	343	332	8	3.2	1.6	0.36	1.87	2.79	1.83	29.5
	10.5000	393.700	15.5000	130.175	5.1250	130.175	5.1250	6.4	3.2	1 590	3 090	325	**EE275106D/275155**	1	309	374	365	5	6.4	3.2	0.40	1.68	2.50	1.64	55.3
269.875	10.6250	381.000	15.0000	136.525	5.3750	136.525	5.3750	3.2	3.2	1 840	3 350	349	**M252349D/M252310**	1	291	368	351	6	3.2	3.2	0.33	2.03	3.02	1.98	48.4
276.225	10.8750	393.700	15.5000	130.175	5.1250	130.175	5.1250	6.4	1.6	1 590	3 090	325	**EE275109D/275155**	1	309	374	365	5	6.4	1.6	0.40	1.68	2.50	1.64	51.2
	10.8750	406.400	16.0000	130.175	5.1250	122.240	4.8126	6.4	1.6	1 590	3 090	325	**EE275109D/275160**	1	309	387	366	9	6.4	1.6	0.40	1.68	2.50	1.64	57.2
279.400	11.0000	393.700	15.5000	127.000	5.0000	127.000	5.0000	6.4	1.6	1 510	2 780	287	**EE135111D/135155**	1	305	374	361	9	6.4	1.6	0.38	1.77	2.64	1.73	48.9
	11.0000	457.200	18.0000	244.475	9.6250	244.475	9.6250	6.4	1.6	4 150	7 540	713	**HH255149D/HH255110**	1	315	438	407	11	6.4	1.6	0.33	2.03	3.02	1.98	166
279.578	11.0070	380.898	14.9960	117.475	4.6250	117.475	4.6250	3.2	1.6	1 420	2 820	286	**LM654644D/LM654610**	1	303	368	357	7	3.2	1.6	0.43	1.57	2.34	1.53	38.9
280	—	420	—	106	—	106	—	4	5	1 490	2 470	265	**45256**	1	321	402	370	6	3	4	0.25	2.69	4.00	2.63	51.9
285.750	11.2500	380.898	14.9960	117.475	4.6250	117.475	4.6250	3.2	1.6	1 420	2 820	286	**LM654648D/LM654610**	1	303	368	357	7	3.2	1.6	0.43	1.57	2.34	1.53	36.4
288.925	11.3750	406.400	16.0000	144.463	5.6875	144.463	5.6875	3.2	3.2	2 160	4 420	445	**M255449D/M255410**	1	316	394	374	8	3.2	3.2	0.34	2.00	2.97	1.95	61.4
292.100	11.5000	422.275	16.6250	130.175	5.1250	130.175	5.1250	3.2	6.4	1 980	3 410	358	**EE330116D/330166**	1	321	409	388	7	3.2	6.4	0.32	2.11	3.14	2.06	59.9
299.974	11.8100	438.048	17.2460	134.938	5.3125	133.350	5.2500	4.8	3.2	1 690	3 230	325	**EE129119D/129172**	1	339	422	401	7	4.8	3.2	0.40	1.68	2.50	1.64	68.7

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

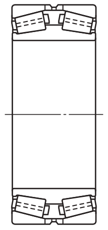
Double-row tapered roller bearings

TDI type

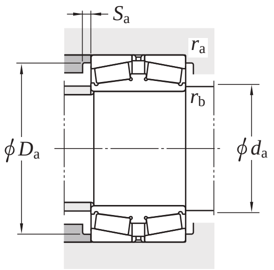
d 300 ~ 346.075 mm



Design 1



Design 1-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. 1)	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	r 2) min.	r_1 2) min.	C_r	C_{0r}	(kN) C_u			d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	(kg)
300	—	460	—	118	—	118	—	4	5	1 870	3 150	325	**45260**	1	350	442	418	6	3	4	0.25	2.74	4.08	2.68	78.5
	—	500	—	160	—	160	—	5	6	2 670	4 240	431	**45360**	1	356	478	440	6	4	5	0.35	1.95	2.90	1.91	129
300.038	11.8125	422.275	16.6250	150.813	5.9375	150.813	5.9375	3.2	3.2	2 130	4 030	409	**HM256849D/HM256810**	1	324	408	389	7	3.2	3.2	0.34	2.00	2.98	1.96	66.2
303.213	11.9375	495.300	19.5000	263.525	10.3750	263.525	10.3750	6.4	3.2	5 020	9 340	858	**HH258249D/HH258210**	1-P	342	475	442	8	6.4	3.2	0.33	2.03	3.02	1.98	207
304.648	11.9940	438.048	17.2460	131.763	5.1875	131.763	5.1875	3.2	3.2	1 890	3 450	350	**EE329117D/329172**	1	337	424	400	10	3.2	3.2	0.33	2.04	3.04	2.00	65.9
304.800	12.0000	419.100	16.5000	130.175	5.1250	130.175	5.1250	6.4	1.6	1 770	3 480	350	**M257149D/M257110**	1	331	399	388	7	6.4	1.6	0.33	2.03	3.02	1.98	53.8
	12.0000	444.500	17.5000	107.950	4.2500	111.125	4.3750	1.6	7.9	1 550	2 760	288	**EE291200D/291750**	1	344	434	404	11	1.6	7.9	0.38	1.79	2.66	1.75	58.7
	12.0000	495.300	19.5000	165.100	6.5000	171.450	6.7500	6.4	3.2	2 740	4 680	461	**EE724121D/724195**	1	355	475	439	6	6.4	3.2	0.40	1.68	2.50	1.64	130
304.902	12.0040	412.648	16.2460	128.588	5.0625	128.588	5.0625	3.2	3.2	1 870	3 340	373	**M257248D/M257210**	1	330	399	386	6	3.2	3.2	0.32	2.12	3.15	2.07	48.8
305.003	12.0080	438.048	17.2460	134.938	5.3125	133.350	5.2500	4.8	3.2	1 690	3 230	325	**EE129123D/129172**	1	339	421	401	7	4.8	3.2	0.40	1.68	2.50	1.64	66.2
305.054	12.0100	499.948	19.6830	200.000	7.8740	200.000	7.8740	6.4	3.2	3 530	5 820	565	**HM858548D/HM858511**	1	343	480	447	10	6.4	3.2	0.49	1.36	2.03	1.33	157
317.500	12.5000	447.675	17.6250	158.750	6.2500	158.750	6.2500	3.3	1.6	2 400	4 770	465	**HM259049D/HM259010**	1	346	434	412	10	3.3	1.6	0.33	2.02	3.00	1.97	80.2
320	—	450	—	110	—	110	—	3	4	1 590	2 760	283	**45T644511**	1-P	352	436	416	5	2.5	3	0.38	1.77	2.64	1.73	54.1
	—	480	—	121	—	121	—	4	5	1 830	3 180	322	**45264**	1	368	462	434	6	3	4	0.26	2.55	3.80	2.50	77.8
	—	540	—	176	—	176	—	5	6	3 380	5 280	528	**45364R**	1	378	518	474	6	4	5	0.32	2.12	3.15	2.07	167
333.375	13.1250	469.900	18.5000	166.688	6.5625	166.688	6.5625	3.2	3.2	2 900	5 680	548	**HM261049D/HM261010**	1-P	360	456	433	8	3.2	3.2	0.33	2.02	3.00	1.97	92.8
340	—	580	—	190	—	190	—	5	6	3 790	5 470	537	**45368**	1	401	558	515	6	4	5	0.32	2.12	3.15	2.07	202
342.900	13.5000	533.400	21.0000	146.050	5.7500	139.690	5.4996	3.2	3.2	2 350	3 580	362	**EE971355D/972100**	1	392	520	483	8	3.2	3.2	0.33	2.03	3.02	1.98	113
343.052	13.5060	457.098	17.9960	120.650	4.7500	120.650	4.7500	SP	SP	1 780	3 470	340	**45T694612**	1	363	438	425	7	2	0.8	0.47	1.43	2.12	1.40	40.0
346.075	13.6250	488.950	19.2500	174.625	6.8750	174.625	6.8750	3.2	3.2	2 890	5 800	553	**HM262749D/HM262710**	1	378	475	450	8	3.2	3.2	0.33	2.02	3.00	1.97	105

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

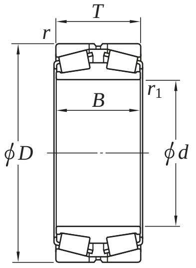
2) SP indicates the specially chamfered form.

Double-row tapered roller bearings

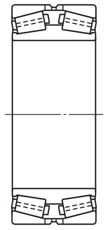
Koyo

TDI type

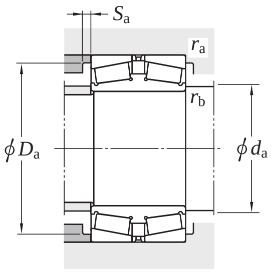
d **347.663 ~ 419.227 mm**



Design 1



Design 1-P



Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*B* mm	*B* 1/25.4	*r* [2] min.	r_1 [2] min.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Bearing No. [1]	Design	Mounting dimensions (mm) d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	Constant *e*	Axial load factors Y_2	Y_3	Y_0	(Refer.) Mass (kg)
347.663	13.6875	469.900	18.5000	138.113	5.4375	138.113	5.4375	3.2	3.2	2 240	4 520	439	**M262449D/M262410**	1	374	456	437	9	3.2	3.2	0.33	2.03	3.02	1.98	70.0
355.600	14.0000	444.500	17.5000	114.300	4.5000	112.713	4.4375	3.2	1.6	1 390	3 450	332	**L163149D/L163110**	1	377	431	418	8	3.2	1.6	0.31	2.20	3.27	2.15	40.7
	14.0000	482.600	19.0000	128.588	5.0625	133.350	5.2500	3.2	1.6	1 910	3 510	346	**LM763449D/LM763410**	1	381	469	451	4	3.2	1.6	0.47	1.43	2.14	1.40	67.7
	14.0000	501.650	19.7500	111.125	4.3750	127.000	5.0000	3.2	3.2	1 700	3 280	322	**EE231401D/231975**	1	405	488	466	2	3.2	3.2	0.44	1.53	2.28	1.50	75.3
360	—	540	—	134	—	134	—	5	6	2 370	3 910	393	**45272**	1	408	518	488	11	4	5	0.32	2.12	3.15	2.07	101
	—	600	—	192	—	192	—	5	6	4 230	6 750	648	**45372**	1-P	419	578	528	10	4	5	0.32	2.12	3.15	2.07	228
368.300	14.5000	523.875	20.6250	185.738	7.3125	185.738	7.3125	6.4	3.2	3 420	6 780	644	**HM265049D/HM265010**	1-P	403	500	484	7	6.4	3.2	0.33	2.03	3.02	1.98	110
	14.5000	609.600	24.0000	279.400	11.0000	254.000	10.0000	6.4	3.2	5 420	9 060	813	**EE321146D/321240**	1	416	585	545	7	6.4	3.2	0.36	1.90	2.83	1.86	303
374.574	14.7470	546.100	21.5000	193.675	7.6250	193.675	7.6250	6.4	3.2	4 090	8 430	773	**HM266445D/HM266410**	1-P	418	525	505	10	6.4	3.2	0.33	2.03	3.02	1.98	163
380	—	560	—	135	—	135	—	5	6	2 300	3 790	371	**45276**	1	428	538	510	6	4	5	0.27	2.47	3.67	2.41	112
	—	570	—	200	—	200	—	4	1.5	4 020	7 560	697	**45T765720**	1-P	418	552	520	11.5	3	1.5	0.47	1.43	2.12	1.40	183
	—	620	—	194	—	194	—	5	6	3 860	6 360	606	**45376**	1	445	598	545	6	4	5	0.32	2.12	3.15	2.07	234
384.175	15.1250	546.100	21.5000	193.675	7.6250	193.675	7.6250	6.4	3.2	4 090	8 430	773	**HM266449D/HM266410**	1-P	418	525	505	10	6.4	3.2	0.33	2.03	3.02	1.98	155
393.700	15.5000	546.100	21.5000	120.650	4.7500	141.288	5.5625	6.4	3.2	1 860	3 810	357	**EE234157D/234215**	1	437	525	497.6	1	6.4	3.2	0.48	1.42	2.11	1.39	96.0
	15.5000	546.100	21.5000	138.113	5.4375	138.113	5.4375	6.4	1.6	2 300	4 700	445	**LM767745D/LM767710**	1	435	525	510	9	6.4	1.6	0.48	1.42	2.11	1.39	99.0
400	—	600	—	148	—	148	—	5	6	3 020	4 960	478	**45280**	1	452	578	545	6	4	5	0.33	2.03	3.02	1.98	143
	—	650	—	200	—	200	—	6	6	4 840	7 810	735	**45380**	1-P	458	622	580	11	5	5	0.39	1.74	2.59	1.70	265
400.000	15.7480	650.000	25.5906	250.000	9.8425	250.000	9.8425	SP	SP	5 860	9 790	868	**45T806525**	1-P	460	620	585	13	5	5	0.39	1.74	2.59	1.70	328
406.400	16.0000	546.100	21.5000	120.650	4.7500	141.288	5.5625	6.4	1.6	1 860	3 810	357	**EE234161D/234215**	1	437	520	497.6	1	6.4	1.6	0.48	1.42	2.11	1.39	88.6
	16.0000	546.100	21.5000	138.113	5.4375	138.113	5.4375	6.4	1.6	2 300	4 700	445	**LM767749D/LM767710**	1	435	520	510	9	6.4	1.6	0.48	1.42	2.11	1.39	90.5
415.925	16.3750	590.550	23.2500	209.550	8.2500	209.550	8.2500	6.4	3.2	4 240	8 930	803	**M268749D/M268710**	1-P	456	565	545	9	6.4	3.2	0.33	2.03	3.02	1.98	189
419.227	16.5050	736.448	28.9940	406.400	16.0000	406.400	16.0000	6.4	6.4	10 900	19 000	1 540	**EE323166D/323290**	1-P	480.1	710	655	9	6.4	6.4	0.37	1.80	2.69	1.76	752

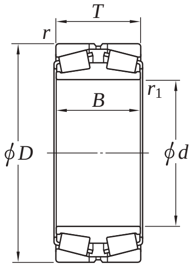
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

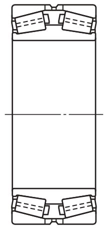
Double-row tapered roller bearings

TDI type

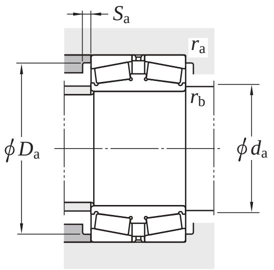
d 420 ~ 501.650 mm



Design 1



Design 1-P



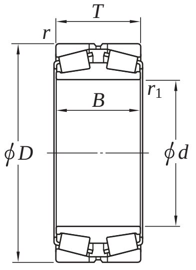
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d		*D*		*T*		*B*		*r*	*r*$_1$	*C*$_r$	*C*$_{0r}$	(kN) *C*$_u$			*d*$_a$	*D*$_a$		*S*$_a$	*r*$_a$	*r*$_b$	*e*	*Y*$_2$	*Y*$_3$	*Y*$_0$	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
420	—	700	—	224	—	224	—	6	6	5 430	8 380	777	**45384**	1-P	488	672	623	7	5	5	0.39	1.74	2.59	1.70	352
431.800	17.0000	635.000	25.0000	173.038	6.8125	173.038	6.8125	6.4	6.4	3 960	6 870	647	**EE931170D/931250**	1-P	482	610	585	8	6.4	6.4	0.32	2.10	3.13	2.06	189
431.902	17.0040	685.698	26.9960	253.873	9.9950	254.000	10.0000	6.4	3.2	6 420	11 600	1 000	**EE328172D/328269**	1-P	484	660	620	11	6.4	3.2	0.40	1.68	2.50	1.64	370
432.003	17.0080	609.524	23.9970	152.400	6.0000	152.400	6.0000	6.4	3.6	3 260	6 060	567	**EE736173D/736238**	1	473	585	565	8	6.4	3.6	0.35	1.95	2.90	1.91	135
440	—	650	—	157	—	157	—	6	6	3 190	5 500	512	**45288**	1	500	622	592	10	5	5	0.28	2.43	3.61	2.37	182
	—	720	—	226	—	226	—	6	6	5 750	9 130	834	**45388**	1-P	506	692	642	7	5	5	0.39	1.74	2.59	1.70	367
447.675	17.6250	635.000	25.0000	223.838	8.8125	223.838	8.8125	6.4	3.2	4 920	10 500	917	**M270748D/M270710**	1-P	491	610	585	8	6.4	3.2	0.33	2.03	3.02	1.98	234
	17.6250	635.000	25.0000	223.838	8.8125	223.838	8.8125	6.4	3.2	4 920	10 500	917	**M270749D/M270710**	1-P	491	610	585	8	6.4	3.2	0.33	2.03	3.02	1.98	234
457.200	18.0000	596.900	23.5000	130.175	5.1250	133.350	5.2500	3.2	1.6	2 410	5 230	486	**EE244181D/244235**	1	488	580	555	7	3.2	1.6	0.40	1.67	2.48	1.63	98.1
	18.0000	596.900	23.5000	133.350	5.2500	136.525	5.3750	3.2	1.6	2 420	5 110	476	**L770849D/L770810**	1	488	580	560	7	3.2	1.6	0.47	1.43	2.12	1.40	99.9
	18.0000	660.400	26.0000	155.575	6.1250	155.572	6.1249	6.4	3.2	2 900	5 260	482	**EE737179D/737260**	1	500	635	600	7	6.4	3.2	0.37	1.80	2.69	1.76	175
460	—	680	—	163	—	163	—	6	6	3 480	5 660	531	**45292**	1	510	652	616	6	5	5	0.39	1.74	2.59	1.70	197
479.425	18.8750	679.450	26.7500	238.125	9.3750	238.125	9.3750	6.4	3.2	5 200	10 800	924	**57567**	1	520	655	630	7	6.4	3.2	0.33	2.03	3.02	1.98	267
	18.8750	679.450	26.7500	238.125	9.3750	238.125	9.3750	6.4	3.2	5 310	11 100	952	**M272749D/M272710**	1-P	520	655	630	7	6.4	3.2	0.33	2.03	3.02	1.98	277
480	—	700	—	165	—	165	—	6	6	3 830	6 710	614	**45296**	1-P	531	672	625	6	5	5	0.40	1.68	2.50	1.64	215
482.600	19.0000	615.950	24.2500	158.750	6.2500	158.750	6.2500	6.4	3.2	3 040	7 110	639	**LM272249D/LM272210**	1	510	590	585	8	6.4	3.2	0.33	2.03	3.02	1.98	117
489.026	19.2530	634.873	24.9950	153.988	6.0625	153.988	6.0625	3.2	3.2	3 090	6 840	613	**LM772749D/LM772710**	1	510	620	595	9	3.2	3.2	0.47	1.43	2.12	1.40	126
500	—	720	—	167	—	167	—	6	6	4 300	7 350	681	**452/500**	1-P	545	692	645	8	5	5	0.39	1.74	2.59	1.70	222
	—	870	—	385	—	385	—	10	3.5	12 000	21 900	1 720	**2TR500-4**	1-P	518	826	765	9	8	3	0.33	2.03	3.02	1.98	1 030
501.65	—	711.2	—	250.825	—	250.825	—	6.4	3.2	5 890	12 400	1 040	**2TR502**	1	515	683	656	10	6.4	3.2	0.33	2.03	3.02	1.98	322
501.650	19.7500	711.200	28.0000	250.825	9.8750	250.825	9.8750	6.4	3.2	6 150	12 800	1 100	**M274149D/M274110**	1-P	545	685	655	10	6.4	3.2	0.33	2.03	3.02	1.98	323

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

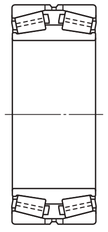
Double-row tapered roller bearings

TDI type

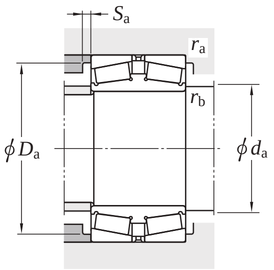
d 508.000 ~ 670 mm



Design 1



Design 1-P



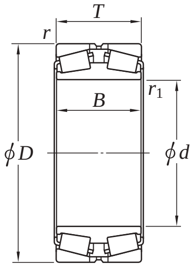
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d		*D*		*T*		*B*		*r*	r_1	C_r	C_{0r}	(kN) C_u			d_a	D_a		S_a	r_a	r_b	*e*	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
508.000	20.0000	762.000	30.0000	219.075	8.6250	219.075	8.6250	6.4	6.4	5 690	9 970	888	**EE531201D/531300**	1-P	560	740	695	11	6.4	6.4	0.38	1.78	2.65	1.74	354
	20.0000	838.200	33.0000	266.700	10.5000	266.700	10.5000	9.5	6.4	7 160	11 700	1 000	**EE426201D/426330**	1-P	580	810	755	7	9.5	6.4	0.48	1.41	2.10	1.38	585
510	—	655	—	184	—	184	—	6.4	1.5	3 970	9 590	829	**2TR510-6**	1	518	627	621	9	6.4	1.5	0.33	2.03	3.02	1.98	160
519.113	20.4375	736.600	29.0000	258.763	10.1875	258.763	10.1875	6.4	3.2	6 630	13 600	1 140	**M275349D/M275310**	1-P	560	710	680	10	6.4	3.2	0.33	2.03	3.02	1.98	361
520	—	735	—	260	—	260	—	5	6	6 630	13 600	1 140	**2TR520C**	1-P	548	713	681	11	4	5	0.33	2.03	3.02	1.98	356
530	—	780	—	185	—	185	—	6	6	5 100	8 870	788	**452/530**	1-P	591	752	710	8	5	5	0.39	1.74	2.59	1.70	306
	—	870	—	272	—	272	—	7.5	7.5	8 700	14 400	1 200	**453/530**	1-P	612	834	774	8	6	6	0.39	1.74	2.59	1.70	655
536.575	21.1250	761.873	29.9950	269.875	10.6250	269.875	10.6250	6.4	3.2	7 050	14 400	1 190	**M276449D/M276410**	1-P	575	740	700	9	6.4	3.2	0.33	2.03	3.02	1.98	401
540	—	710	—	140	—	150	—	4	5	3 310	6 620	599	**2TR540**	1-P	558	688	667	6	3	4	0.40	1.68	2.50	1.64	152
555.625	—	698.5	—	165.1	—	165.1	—	6.4	3.2	3 580	8 510	737	**2TR555**	1-P	569	670	662	10	6.4	3.2	0.33	2.03	3.02	1.98	151
558.800	22.0000	736.600	29.0000	196.850	7.7500	196.850	7.7500	6.4	3.2	4 500	9 870	854	**LM377449D/LM377410**	1-P	595	710	690	9	6.4	3.2	0.35	1.95	2.90	1.91	227
571.500	22.5000	812.800	32.0000	285.750	11.2500	285.750	11.2500	6.4	3.2	8 150	17 500	1 400	**M278749D/M278710**	1-P	620	790	750	11	6.4	3.2	0.33	2.03	3.02	1.98	497
595.313	23.4375	844.550	33.2500	296.863	11.6875	296.863	11.6875	6.4	3.2	8 500	18 500	1 460	**M280049D/M280010**	1-P	650	820	785	7	6.4	3.2	0.33	2.03	3.02	1.98	549
600	—	870	—	200	—	200	—	6	6	5 450	9 510	830	**452/600**	1-P	663	842	792	8	5	5	0.37	1.80	2.69	1.76	396
609.600	24.0000	787.400	31.0000	171.450	6.7500	171.450	6.7500	6.4	3.2	4 260	9 940	840	**EE649241D/649310**	1-P	645	760	740	12	6.4	3.2	0.37	1.82	2.70	1.78	223
630	—	1 030	—	315	—	315	—	7.5	7.5	11 500	19 400	1 540	**453/630**	1-P	733	994	915	8	6	6	0.39	1.74	2.59	1.70	1 060
635.000	25.0000	901.700	35.5000	317.500	12.5000	317.500	12.5000	6.4	3.2	9 370	19 900	1 540	**M281049D/M281010**	1-P	690	870	840	7	6.4	3.2	0.33	2.03	3.02	1.98	651
635	—	939.8	—	304.8	—	304.8	—	6.5	4	9 890	19 800	1 540	**2TR635D**	1-P	653	911	863	16	5	3	0.33	2.03	3.02	1.98	763
670	—	980	—	230	—	230	—	7.5	7.5	7 640	13 800	1 150	**452/670**	1-P	746	944	895	8	6	6	0.39	1.74	2.59	1.70	595

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

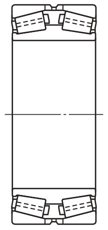
Double-row tapered roller bearings

TDI type

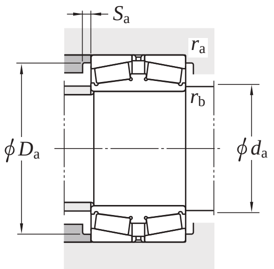
d 685.800 ~ 939.800 mm



Design 1



Design 1-P



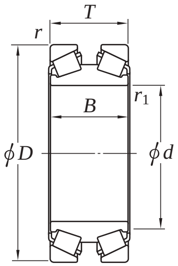
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*B* mm	1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
685.800	27.0000	876.300	34.5000	168.275	6.6250	171.450	6.7500	6.4	3.2	4 400	10 800	880	**EE655271D/655345**	1-P	730	850	830	9	6.4	3.2	0.42	1.62	2.42	1.59	261
690	—	980	—	355	—	355	—	6	6	11 800	26 100	1 940	**2TR690A**	1-P	718	952	902	10	5	5	0.35	1.95	2.90	1.91	887
711.200	28.0000	914.400	36.0000	149.225	5.8750	149.225	5.8750	6.4	3.2	3 780	8 930	747	**EE755281D/755360**	1-P	770	890	870	8	6.4	3.2	0.38	1.78	2.65	1.74	256
714.375	28.1250	1 016.000	40.0000	339.725	13.3750	339.725	13.3750	6.4	3.2	12 200	26 100	1 940	**M383240D/M383210**	1-P	775	990	940	14	6.4	3.2	0.35	1.92	2.86	1.88	924
730.250	28.7500	1 035.050	40.7500	365.125	14.3750	365.125	14.3750	6.4	3.2	12 300	27 100	2 000	**M283449D/M283410**	1-P	790	1 010	960	10	6.4	3.2	0.33	2.03	3.02	1.98	1 000
749.300	29.5000	990.600	39.0000	293.000	11.5354	293.000	11.5354	6.4	3.2	9 820	23 900	1 780	**LM283649D/LM283610**	1-P	800	960	930	12	6.4	3.2	0.32	2.12	3.15	2.07	643
762.000	30.0000	1 079.500	42.5000	381.000	15.0000	381.000	15.0000	12.7	4.8	13 900	31 300	2 270	**M284249D/M284210**	1-P	830	1 040	1 000	11	12.7	4.8	0.33	2.03	3.02	1.98	1 140
800	—	1 100	—	300	—	300	—	6	3	9 550	21 700	1 570	**2TR800A**	1-P	814	1 072	1 016	12	5	2.5	0.80	0.85	1.26	0.83	863
810	—	1 280	—	430	—	430	—	9.5	4	18 500	38 600	2 670	**2TR810A**	1-P	828	1 236	1 166	21	8	3	0.41	1.66	2.47	1.62	2 250
825.500	32.5000	1 168.400	46.0000	409.575	16.1250	409.575	16.1250	12.7	4.8	16 300	36 200	2 550	**M285848D/M285810**	1-P	890	1 130	1 090	15	12.7	4.8	0.33	2.03	3.02	1.98	1 440
863.600	34.0000	1 130.300	44.5000	323.850	12.7500	323.850	12.7500	12.7	4.8	12 000	29 800	2 130	**LM286249D/LM286210**	1-P	920	1 090	1 070	15	12.7	4.8	0.32	2.08	3.10	2.04	896
	34.0000	1 219.200	48.0000	425.450	16.7500	438.150	17.2500	12.7	4.8	17 900	42 300	2 910	**EE547341D/547480**	1-P	940	1 180	1 130	9	12.7	4.8	0.33	2.03	3.02	1.98	1 660
939.800	37.0000	1 333.500	52.5000	463.550	18.2500	463.550	18.2500	12.7	4.8	21 000	47 700	3 210	**LM287849D/LM287810**	1-P	1 020	1 290	1 240	15	12.7	4.8	0.33	2.03	3.02	1.98	2 130

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

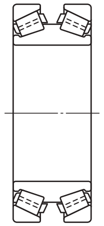
Double-row tapered roller bearings for axial support

TDIS type

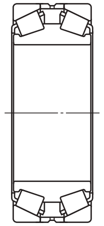
d **100 ~ 260.35 mm**



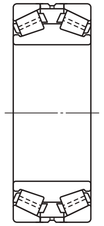
Design 1



Design 1-P

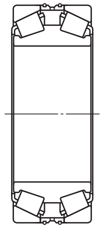


Design 2

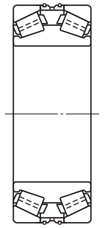


Design 2-P

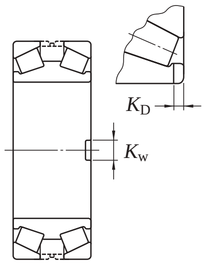
For oil mist lubrication



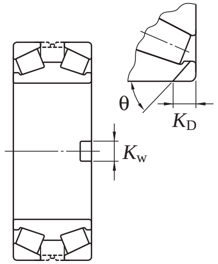
Design 3



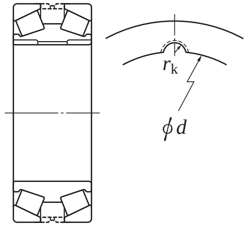
Design 3-P



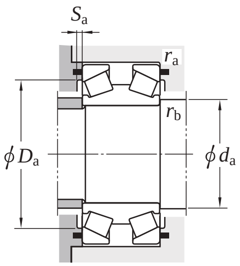
Face key way : A



Face key way : B



Bore key way : C



Boundary dimensions (mm)						Basic load ratings (kN) Radial		Axial		Fatigue load limit (kN)		Bearing No. [1]	De-sign	Con-stant	Axial load factors			Face key way					Bore key way	Mounting dimensions (mm)						Mass (kg)
d	D	T	B	r min.	r_1 [3] min.	C_r	C_{0r}	C_a	C_{0a}	C_u (Radial)	C_u (Axial)			e	Y_2	Y_3	Y_0	Type	K_w (mm)	K_D (mm)	θ (deg)	qty×Position[2]	R_k (mm)	d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	
100	215	110	105	3	1	807	925	647	1 130	114	139	**45T202211**	2	0.81	0.84	1.25	0.82	B	20	18	45	2×2	—	119	184	163	5	2.5	1	18.3
	249.1	120	120	3	2.5	898	1 040	805	1 430	127	174	**45T202512**	2	0.9	0.75	1.12	0.73	—	—	—	—	—	—	127	202	178	4.5	2.5	2	30
110	240	118	118	3	1	911	1 040	738	1 290	127	157	**45T222412**	2	0.81	0.83	1.23	0.81	—	—	—	—	—	—	129	204	180	6	2.5	1	25.2
125	305	180	167	6.4	6	1 690	2 120	1 230	2 330	239	263	**45T253018**	2	0.73	0.93	1.38	0.91	—	—	—	—	—	—	173	261	233	8.5	5	5	65
	305	180	180	6.4	6	1 690	2 120	1 230	2 330	239	263	**45T253018-1**	2	0.73	0.93	1.38	0.91	A	30.2	11	—	1×2	—	164	257	227	2	5	5	66
160	342.9	160	160	3.3	SP	1 860	2 410	1 500	2 940	261	320	**45T323416-2**	1	0.81	0.83	1.24	0.82	B	30	25	45	2×2	—	190	282	253	5	3	2.5	66
170	360	160	144	4	5	1 680	2 100	1 820	3 440	225	371	**45T303616-1**	2	1.09	0.62	0.92	0.61	B	30	25	45	1×2	—	200	301	266	5	3	4	80
	360	160	144	4	2.5	1 680	2 100	1 820	3 440	225	371	**45T343616A**	2	1.09	0.62	0.92	0.61	—	—	—	—	—	—	201	301	266	5.5	3	2	70
180	320	104	104	4	1.5	992	1 350	814	1 690	153	191	**45T363210**	2	0.83	0.82	1.22	0.8	—	—	—	—	—	—	212	278	259	7.5	3	1.5	35
190	320	104	104	3	4	987	1 400	783	1 690	160	194	**45T383210**	2	0.8	0.85	1.26	0.83	—	—	—	—	—	—	212	281	262	5	2.5	3	30
	320	104	104	3	4	987	1 400	783	1 690	160	194	**45T383210A**	1	0.8	0.85	1.26	0.83	B	40	15	45	1×2	—	212	281	262	5	2.5	3	33
	320	114	114	4	2.5	1 110	1 570	954	2 070	175	229	**45T383211A**	2	0.87	0.78	1.16	0.76	A	38	10	—	1×2	—	216	282	260	6	3	2	33
190.09	265	58	58	2.5	1.5	411	662	368	910	82.0	112	**45T382706**	1	0.9	0.75	1.12	0.73	A	8.5	4	—	1×2	—	210	242	231	4	2	1.5	9
200	360	170	170	4	1.5	1 570	2 300	1 510	3 380	243	355	**45T403617-1**	2	0.96	0.7	1.04	0.68	A	30	17	—	2×2	—	230	307	270	—	3	1.5	65
	380	180	180	4	SP	2 230	3 240	1 770	3 900	336	406	**45T403818**	2-P	0.8	0.85	1.26	0.83	B	30	25	45	1×2	—	236	328	294	5.5	3	3	94
	380	180	180	4	SP	2 230	3 240	1 770	3 900	336	406	**45T403818-1**	2-P	0.8	0.85	1.26	0.83	B	30	25	45	2×2	—	236	328	294	5.5	3	3	94
220	360	120	120	3	4	1 250	1 920	1 080	2 530	210	275	**45T443612/DP**	2	0.87	0.78	1.16	0.76	B	40	25	45	1×2	—	250	317	294	6.5	2.5	3	47
228.6	431.8	177.8	177.8	6	SP	2 440	3 400	2 140	4 530	348	467	**45T464318A-1**	2-P	0.88	0.76	1.14	0.75	A	35	15	—	1×2	—	259	377	342	8.5	5	5	115
240	460	140	140	5	6	1 760	2 570	1 520	3 380	267	350	**45T484614**	2-P	0.87	0.78	1.16	0.76	A	50	15	—	2×2	—	293	389	364	3	4	5	95
260	459	155	155	4	5	1 980	2 780	1 700	3 650	289	379	**45T524616**	2-P	0.87	0.78	1.16	0.76	A	32.1	15	—	2×2	—	292	400	370	5.5	3	4	95
260.35	419.1	158.75	155.575	3.2	3.2	2 210	3 710	1 320	3 370	378	344	**45T524216**	2	0.6	1.12	1.67	1.1	B	40.2	18	45	1×2	—	291	374	349	7.5	3	3	85

[Notes] 1) Since there are many bearings of special tolerances for specific applications, consult with JTEKT for details of tolerances.

2) [×1]···one face, [×2]···both face.

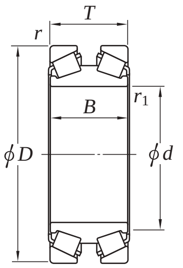
3) SP indicates the specially chamfered form.

Double-row tapered roller bearings for axial support

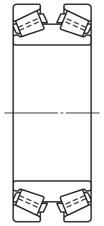
TDIS type

d **273.05 ~ 320 mm**

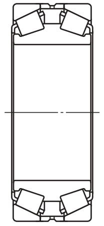
For oil mist lubrication



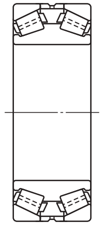
Design 1



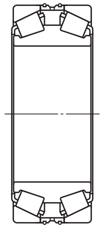
Design 1-P



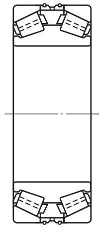
Design 2



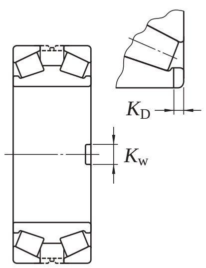
Design 2-P



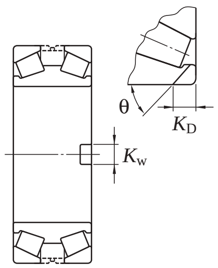
Design 3



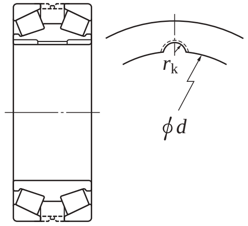
Design 3-P



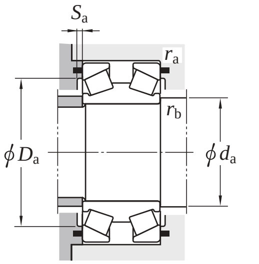
Face key way : A



Face key way : B



Bore key way : C



Boundary dimensions (mm)						Basic load ratings (kN) Radial		Basic load ratings (kN) Axial		Fatigue load limit (kN)		Bearing No. 1)	Design	Constant	Axial load factors			Face key way					Bore key way	Mounting dimensions (mm)						Mass (kg)
d	*D*	*T*	*B*	*r* min.	r_1 3) min.	C_r	C_{0r}	C_a	C_{0a}	C_u (Radial)	C_u (Axial)			*e*	Y_2	Y_3	Y_0	Type	K_w (mm)	K_D (mm)	θ (deg)	qty×Position2)	R_k (mm)	d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	
273.05	393.7	130.175	130.175	6.4	1.6	1 480	2 760	1 030	2 930	281	298	**45T553913**	2	0.7	0.97	1.44	0.94	—	—	—	—	—	—	292	359	337	7.5	5	1.5	45
279.4	482.6	177.8	177.8	4.8	4.8	2 660	3 980	2 110	4 800	399	482	**45T564818B**	1-P	0.8	0.85	1.26	0.83	A	40	12	—	1×2	—	310	424	392	6.5	4	4	130
280	410	110	110	3	4	1 230	2 050	1 060	2 700	214	280	**45T564111**	2	0.87	0.78	1.16	0.76	—	—	—	—	—	—	308	371	350	5.5	2.5	3	48
285	380	92	92	2.5	1	952	1 820	820	2 400	192	252	**45T573809B**	1	0.87	0.78	1.16	0.76	B	32	13	45	1×2	—	303	352	334	5	2	1	28
298	419.5	120	120	4	2.5	1 370	2 440	1 180	3 210	250	328	**45T604212-1**	2	0.87	0.78	1.16	0.76	—	—	—	—	—	—	319	383	360	5	3	2	49
300	440	105	105	4	4	1 340	2 300	1 150	3 030	236	310	**45T604411M**	1-P	0.87	0.78	1.16	0.76	B	32.1	22.225	45	1×2	—	324	398	378	7.5	3	3	50
	440	105	105	3	4	1 220	2 480	1 050	3 260	248	326	**45T604411N-1/DP1**	2-P	0.87	0.78	1.16	0.76	B+C	32.131	22.225	45	—	6.477	334	395	374	6	2.5	3	57
	480	180	180	2.5	SP	2 230	4 300	1 920	5 650	408	535	**45T604818**	1	0.87	0.78	1.16	0.76	—	—	—	—	—	—	330	403	365	1	2	2.5	132
	500	160	160	5	SP	2 310	3 420	1 990	4 490	344	451	**45T605016**	1	0.87	0.78	1.16	0.76	B	52	25	45	1×2	—	327	439	410	7	4	5	110
	500	190	190	5	6	2 920	4 720	2 220	5 490	460	533	**45T605019**	1-P	0.76	0.88	1.31	0.86	B	50	30	45	1×2	—	339	440	405	3	4	5	142
	500	200	200	5	SP	2 920	4 720	2 220	5 490	460	533	**45T605020-3**	2-P	0.76	0.88	1.31	0.86	B	50	35	45	1×2	—	339	441	400	—	4	4	155
	520	180	180	5	SP	2 850	4 790	2 450	5 560	460	604	**45T605218**	1	0.87	0.78	1.16	0.86	B	50	30	45	2×2	—	340	443	408	8	4	4	151
	570	290	290	6	SP	4 790	8 280	4 130	10 900	721	946	**45T605729**	2-P	0.87	0.78	1.16	0.76	B	50	35	45	1×2	—	332	479	418	0.5	5	3	347
305	480	200	200	4	SP	2 580	4 670	2 220	6 140	441	578	**45T614820-1**	2	0.87	0.78	1.16	0.76	B	40	28	45	1×2	—	337	420	377	—	3	2.5	136
	500	200	200	5	6	2 920	4 720	2 220	5 490	460	533	**45T615020**	1-P	0.76	0.88	1.31	0.86	C	—	—	—	—	8.05	339	441	400	—	4	5	150
	500	200	200	5	6	2 920	4 720	2 220	5 490	460	533	**45T615020-1**	1-P	0.76	0.88	1.31	0.86	B	50.9	35	45	2×2	—	339	441	400	—	4	5	150
	500	200	200	5	6	2 920	4 720	2 220	5 490	460	533	**45T615020B**	1-P	0.76	0.88	1.31	0.86	B+C	50.9	35	45	1×2	8.05	339	441	400	—	4	5	150
	500	200	200	5	SP	2 920	4 720	2 220	5 490	460	533	**45T615020D-2**	1-P	0.76	0.88	1.31	0.86	C	51.3	35	45	1×2	8.05	339	441	400	—	4	4	146
	560	200	200	10	6.5	2 720	4 370	2 950	7 160	412	681	**45T615620B**	1	1.09	0.62	0.92	0.61	B	50.7	39.7	45	2×2	—	373	482	436	—	8	5	146
	560	200	200	20	6.5	2 720	4 370	2 950	7 160	412	681	**45T615620D**	1	1.09	0.62	0.92	0.61	A	50.8	19.05	—	2×2	—	373	482	436	—	10	5	146
318	449.5	120	120	4	2.5	1 370	2 420	1 430	3 850	246	391	**45T644512**	2	1.05	0.64	0.96	0.63	B	20	8.5	—	1×2	—	342	408	381	5.5	3	2	50
320	480	160	160	2.5	SP	2 030	4 090	1 750	5 380	391	514	**45T644816A**	1	0.87	0.78	1.16	0.76	B	51.3	22	45	2×1	—	349	419	386	5	2	2.5	101
	540	176	176	5	SP	2 860	4 810	2 460	6 330	464	608	**45T645418**	2-P	0.87	0.78	1.16	0.76	B	40	35	45	1×2	—	363	476	442	6.5	4	4	166
	560	200	200	4	2.5	3 790	6 040	2 060	4 990	586	485	**45T645620**	1-P	0.55	1.24	1.84	1.21	B	50	30	45	1×2	—	374	491	464	9.5	3	2	204

[Notes] 1) Since there are many bearings of special tolerances for specific applications, consult with JTEKT for details of tolerances.

2) [×1]···one face, [×2]···both face.

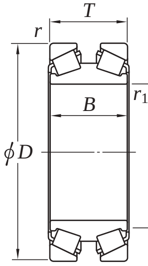
3) SP indicates the specially chamfered form.

Double-row tapered roller bearings for axial support

Koyo

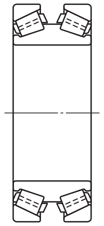
TDIS type

d 330 ~ (400) mm

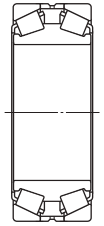


Design 1

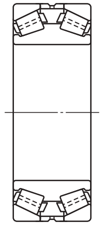
For oil mist lubrication



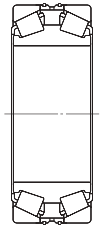
Design 1-P



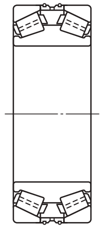
Design 2



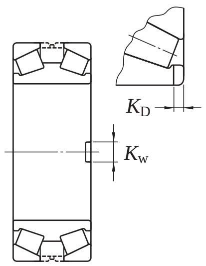
Design 2-P



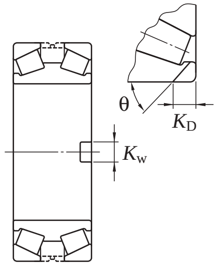
Design 3



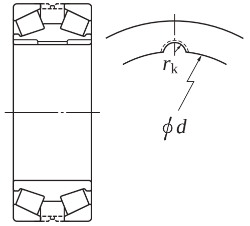
Design 3-P



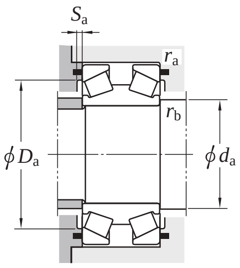
Face key way : A



Face key way : B



Bore key way : C



Boundary dimensions (mm)						Basic load ratings (kN) Radial		Axial		Fatigue load limit (kN)		Bearing No. [1]	Design	Constant	Axial load factors			Face key way					Bore key way	Mounting dimensions (mm)						Mass (kg)
d	D	T	B	r [3] min.	r_1 [3] min.	C_r	C_{0r}	C_a	C_{0a}	C_u (Radial)	C_u (Axial)			e	Y_2	Y_3	Y_0	Type	K_w (mm)	K_D (mm)	θ (deg)	qty×Position [2]	R_k (mm)	d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	
330	459	120	120	4	5	1 320	2 370	1 370	3 770	235	374	**45T664612**	2	1.05	0.64	0.96	0.63	A	32.1	12	—	2×2	—	354	421	393	5.5	3	4	55
340	550	135	135	5	2	2 140	3 520	1 490	3 750	346	367	**45T685514**	2	0.7	0.97	1.44	0.94	B+C	36	26	45	1×2	9	390	483	463	7	4	2	123
	590	192	192	SP	SP	3 700	5 870	2 580	6 240	559	592	**45T685919-1**	1-P	0.7	0.97	1.44	0.94	B	50	30	45	1×2	—	392	518	488	10	1	4	209
345	550	270	200	6	4	3 040	5 740	2 620	7 550	529	694	**45T695520**	1	0.87	0.78	1.16	0.76	A	32	16	—	1×2	—	373	482	440	2	5	3	176
350	590	192	192	5	SP	3 540	5 590	3 050	7 360	529	694	**45T705919A-1**	1-P	0.87	0.78	1.16	0.76	A	32	12	—	1×2	—	398	522	486	9	4	5	200
	590	192	192	5	SP	3 180	6 570	3 450	10 800	577	952	**45T705919D**	1-P	1.09	0.62	0.92	0.61	A	32	12	—	1×2	—	401	520	470	11.5	4	5	227
	619	200	200	6	6	3 700	5 580	3 190	7 340	527	692	**45T706220**	2-P	0.87	0.78	1.16	0.76	A	50	20	—	2×2	—	396	539	502	4.5	5	5	260
360	570	148	148	5	6	2 410	3 900	1 680	4 150	385	408	**45T725715**	1	0.7	0.97	1.44	0.94	B	50	23	45	1×2	—	394	498	472	7	4	5	131
365.6	514.35	140	140	4	SP	1 740	3 730	1 500	4 910	348	456	**45T735114A**	1	0.87	0.78	1.16	0.76	B	40	20	45	2×2	—	394	457	428	5.5	3	2.5	89
374.65	501.65	130.175	120.65	6	3.3	1 590	3 160	1 370	4 160	303	397	**45T755013A**	1	0.87	0.78	1.16	0.76	B	50	10	—	1×2	—	399	463	436	2.5	5	3	67
380	550	205	255	SP	SP	3 570	7 340	1 940	6 070	665	550	**45T765526**	3-P	0.55	1.24	1.84	1.21	A	32	15	—	1×2	—	391	499	470	7.5	1	4	182
	560	190	190	2	2	3 580	7 220	1 950	5 970	661	547	**45T765619**	1-P	0.55	1.24	1.84	1.21	B	32	12	60	1×2	—	415	509	482	10.5	2	2	187
	560	200	200	4	4	3 440	7 020	2 070	6 440	641	588	**45T765620**	1-P	0.61	1.11	1.66	1.09	B	40.1	21	45	1×2	—	416	505	473	4	3	3	167
	570	200	200	4	SP	3 480	6 620	2 420	7 040	608	644	**45T765720A**	2-P	0.7	0.97	1.44	0.94	A	32	11.7	—	1×2	—	406	513	478	1.5	3	3	178
	650	240	240	6	5	4 810	8 260	3 820	9 950	723	874	**45T766524**	2-P	0.8	0.85	1.26	0.83	B	50	15	45	—	—	442	572	528	9.5	5	4	290
	650	240	240	6	SP	4 810	8 260	3 820	9 950	723	874	**45T766524-2**	2-P	0.8	0.85	1.26	0.83	B	50.5	40	45	2×2	—	442	572	528	9.5	5	5	335
381	695	280	280	6	SP	6 010	9 970	5 180	13 100	843	1 110	**45T767028A**	2-P	0.87	0.78	1.16	0.76	B	50	45	45	2×2	—	448	602	547	10	5	5	479
390	548	180	180	4	SP	2 570	5 540	2 220	7 290	496	650	**45T765518**	1	0.87	0.78	1.16	0.76	B	51.3	16	45	1×2	—	418	495	457	3	3	2.5	169
	562	180	180	4.5	SP	2 650	5 530	2 280	7 280	496	651	**45T785618**	1	0.87	0.78	1.16	0.76	A	32	11.7	—	2×2	—	420	501	463	4.5	4	2.5	145
	570	180	180	2.5	SP	2 650	5 530	2 280	7 280	496	651	**45T785718A**	1	0.87	0.78	1.16	0.76	B	51.3	22	45	2×2	—	420	501	463	4.5	2	2.5	149
	600	200	200	5	6	3 260	6 070	2 810	7 990	550	722	**45T786020**	2-P	0.87	0.78	1.16	0.76	—	—	—	—	—	7.5	424	539	500	2.5	4	5	202
400	600	148	148	5	6	2 280	4 040	1 770	4 750	379	448	**45T806015A**	1	0.78	0.86	1.29	0.85	B	50	25	45	1×2	—	432	531	505	9.5	4	5	131
	650	200	200	6	6	3 670	6 500	3 160	8 560	583	764	**45T806520D**	1	0.87	0.78	1.16	0.76	A	50.8	19	—	2×2	—	465	582	542	4.5	5	5	243
	650	240	240	6	SP	4 720	8 390	4 070	11 000	735	965	**2TR400L**	1-P	0.87	0.78	1.16	0.76	B	64.3	32	45	1×2	—	437	580	534	5.5	5	2	296

[Notes] 1) Since there are many bearings of special tolerances for specific applications, consult with JTEKT for details of tolerances.

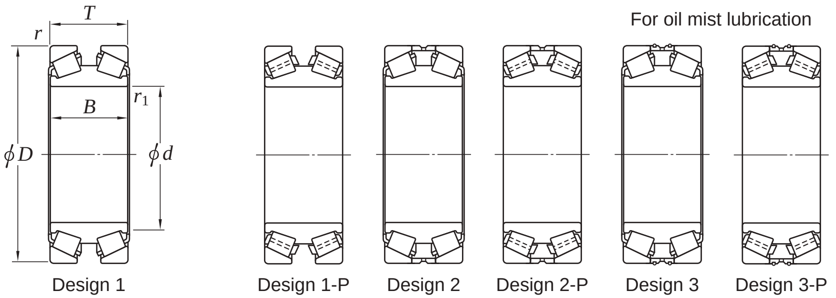
2) [×1]···one face, [×2]···both face.

3) SP indicates the specially chamfered form.

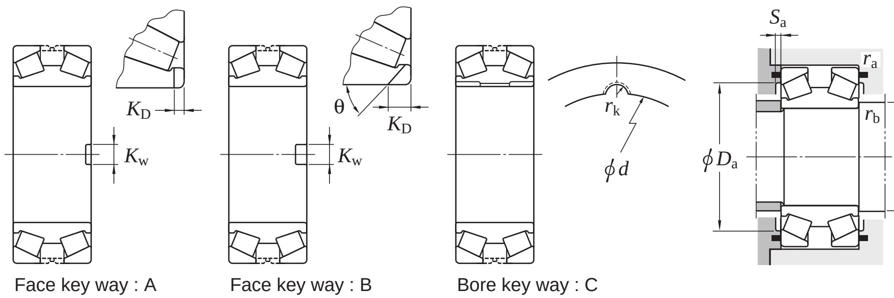
Double-row tapered roller bearings for axial support

TDIS type

d (400) ~ 510 mm



Design 1　Design 1-P　Design 2　Design 2-P　Design 3　Design 3-P



Face key way : A　Face key way : B　Bore key way : C

Boundary dimensions (mm)						Basic load ratings (kN) Radial		Axial		Fatigue load limit (kN) C_u		Bearing No. [1]	De-sign	Con-stant	Axial load factors			Face key way					Bore key way	Mounting dimensions (mm)						Mass (kg)
d	D	T	B	r [3] min.	r_1 [3] min.	C_r	C_{0r}	C_a	C_{0a}	(Radial)	(Axial)			e	Y_2	Y_3	Y_0	Type	K_w (mm)	K_D (mm)	θ (deg)	qty×Position [2]	R_k (mm)	d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	
400	650	240	240	6	SP	4 720	8 390	4 070	11 000	735	965	**2TR400L-4/DP**	3-P	0.87	0.78	1.16	0.76	B	64.3	32	45	1×2	—	437	580	534	5.5	5	2	308
406.4	546.1	138.112	138.112	6.4	SP	1 870	3 920	1 610	5 160	368	482	**45T815514**	1	0.87	0.78	1.16	0.76	A	50	11	—	1×2	—	436	502	474	5	5	3	89
410	580	160	160	4	7	2 730	5 430	2 350	7 140	530	267	**45T825816A-1**	2	0.87	0.78	1.16	0.76	A	50.8	10	—	1×2	—	434	532	500	9	3	5	133
430	535	84	84	3	SP	1 040	2 270	896	2 990	224	293	**45T865408**	2	0.87	0.78	1.16	0.76	B	20	15	45	1×2	—	456	503	486	5	2.5	2	42
	600	200	200	4	3	3 830	8 230	1 800	5 880	734	526	**45T866020**	1-P	0.47	1.43	2.12	1.4	A	50	19	45	1×2	—	466	552	527	6.5	3	2.5	172
440	650	155	155	6	SP	2 770	5 110	2 390	6 720	467	613	**45T886516A**	2	0.87	0.78	1.16	0.76	SP	50	15	45	1×2	—	484	593	564	8	5	4	172
445	620	160	160	4	2.5	2 660	5 060	2 290	6 650	467	612	**45T896216**	1-P	0.87	0.78	1.16	0.76	B	51.3	31.75	45	1×2	—	476	566	536	3.5	3	2	136
450	820	300	300	7.5	7.5	6 280	10 000	6 560	15 900	842	1 340	**45T908230U**	1-P	1.05	0.64	0.96	0.63	A	40	25	—	1×2	—	540	713	650	2.5	6	6	610
	830	320	320	7.5	7.5	7 000	10 900	7 310	17 200	895	1 420	**45T908332-1**	1-P	1.05	0.64	0.96	0.63	B	60	55	45	2×2	—	501	706	636	1	6	6	691
460	619	150	150	4	4	2 290	4 640	2 390	7 370	420	669	**45T926215**	2	1.05	0.64	0.96	0.63	A	50	15	—	2×2	—	486	569	536	4	3	3	125
470	700	270	270	5	SP	3 740	7 850	3 620	11 500	664	981	**45T947027A**	2	0.97	0.69	1.03	0.68	B	50	35	45	1×2	—	518	607	544	—	4	3	358
	720	216	216	6	6	4 130	7 360	4 480	12 100	650	1 070	**45T947222/DP**	3-P	1.09	0.62	0.92	0.61	B	63.6	30	45	1×2	—	515	646	600	7	5	5	309
482	655	170	160	4	4	2 370	5 270	2 040	6 930	463	608	**45T966616-1**	1	0.87	0.78	1.16	0.76	B	40	20	45	2×2	—	518	590	554	—	3	3	157
482.6	733.5	190	190	SP	SP	4 030	8 000	3 270	9 880	696	859	**45T977319**	1-P	0.81	0.83	1.23	0.81	B	64.2	44.45	45	1×2	—	547	669	635	7.5	2	2	283
	733.501	200	200.025	6.4	6.4	3 690	7 100	4 000	11 600	611	1 010	**45T977320C**	1-P	1.09	0.62	0.92	0.61	B+C	50.8	38.1	45	2×2	8.05	513	651	603	5	5	5	283
	733.501	200	200.025	17.5	6.4	3 690	7 100	4 000	11 600	611	1 010	**45T977320D**	1-P	1.09	0.62	0.92	0.61	A	50.8	19.05	—	2×2	—	513	651	603	5	10	5	280
	733.501	200	200.025	17.5	6.4	3 690	7 100	4 000	11 600	611	1 010	**45T977320J**	1-P	1.09	0.62	0.92	0.61	A	50.8	19.05	—	1×2	—	513	651	603	5	10	5	280
500	820	256	256	7.5	7.5	6 210	11 700	4 720	13 600	972	1 130	**2TR500-3**	2-P	0.76	0.88	1.31	0.86	B	50.8	38.1	45	2×2	—	561	718	672	9.5	6	6	559
	900	400	400	7.5	5	10 300	19 500	10 800	30 900	1 420	2 270	**2TR500J**	1-P	1.05	0.64	0.96	0.63	B	50	40	45	1×2	—	560	774	680	11	6	6	1 090
509.998	733.5	200.02	200.02	5	6	4 030	8 000	3 270	9 880	696	859	**2TR510L-1**	1-P	0.81	0.83	1.23	0.81	B	50.8	38.1	45	2×2	—	560	667	630	3.5	4	5	261
510	800	285	285	6	SP	6 730	12 300	5 340	14 800	995	1 200	**2TR510-2**	1-P	0.8	0.85	1.26	0.83	B	70.2	44.45	45	1×2	—	570	716	662	7	6	6	506

[Notes] 1) Since there are many bearings of special tolerances for specific applications, consult with JTEKT for details of tolerances.

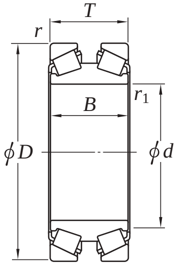
2) [×1]···one face, [×2]···both face.

3) SP indicates the specially chamfered form.

Double-row tapered roller bearings for axial support

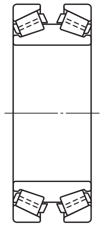
TDIS type

d 600 ~ 900 mm

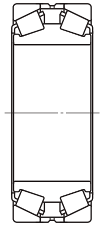


Design 1

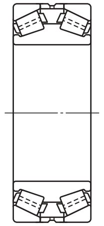
For oil mist lubrication



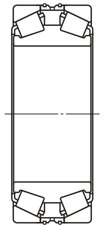
Design 1-P



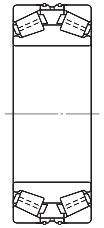
Design 2



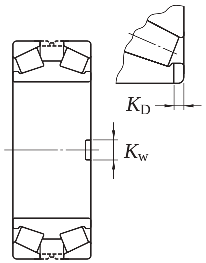
Design 2-P



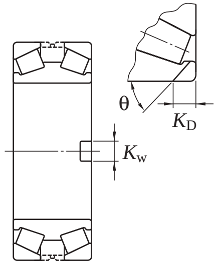
Design 3



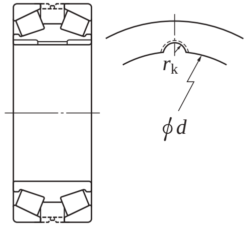
Design 3-P



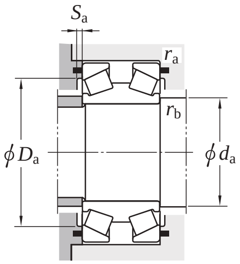
Face key way : A



Face key way : B



Bore key way : C



Boundary dimensions (mm)						Basic load ratings (kN) Radial		Axial		Fatigue load limit (kN)		Bearing No. 1)	Design	Constant	Axial load factors			Face key way					Bore key way	Mounting dimensions (mm)						Mass (kg)
d	D	T	B	r 3) min.	r_1 3) min.	C_r	C_{0r}	C_a	C_{0a}	C_u (Radial)	C_u (Axial)			e	Y_2	Y_3	Y_0	Type	K_w (mm)	K_D (mm)	θ (deg)	qty×Position 2)	R_k (mm)	d_a max.	D_a max.	D_a min.	S_a min.	r_a max.	r_b max.	
600	1 000	350	350	7.5	SP	10 600	18 500	8 020	21 500	1 410	1 640	**2TR600-2**	2-P	0.76	0.88	1.31	0.86	C	—	—	—	—	1.5	690	886	825	7.5	6	8	1 110
620	1 020	360	360	7.5	SP	10 600	19 800	9 100	26 100	1 480	1 940	**2TR620**	1-P	0.87	0.78	1.16	0.76	B	90	65	45	1×2	—	708	901	832	5	6	5	1 140
630	789	150	150	4	5	2 480	6 180	2 140	8 140	518	680	**2TR630B**	2-P	0.87	0.78	1.16	0.76	—	—	—	—	—	—	660	736	706	5	3	4	169
635	940	260	260	5.4	3.2	5 710	10 600	6 660	19 000	871	1 550	**2TR635B-1**	1-P	1.17	0.58	0.86	0.56	B	70.3	51	45	1×2	—	674	852	793	—	5	3	477
660	814	176.212	176.212	6.4	SP	3 280	8 780	2 280	9 340	709	752	**2TR660C**	1	0.7	0.97	1.44	0.94	B	50	20	45	1×2	—	686	766	735	5	5	2.5	196
685.8	939.8	228.6	235	SP	SP	6 160	12 800	4 690	14 900	1 030	1 190	**2TR686A**	1-P	0.76	0.88	1.31	0.86	B	63.6	38.5	45	1×2	—	730	868	827	8.5	1	3	455
	939.8	227.81	234.95	6.4	SP	5 500	13 000	4 740	17 200	1 020	1 340	**2TR686C**	1-P	0.87	0.78	1.16	0.76	B	80	38.1	45	2×2	—	745	865	819	6.5	5	3	464
717.55	1 000	200	200	6	SP	5 110	12 400	4 400	16 300	981	1 290	**2TR718**	1-P	0.87	0.78	1.16	0.76	B	70.3	44.5	45	1×2	—	800	914	874	9	5	5	482
780	1 000	200	200	5	2	5 130	12 800	4 070	15 400	1 010	1 220	**2TR780A**	1-P	0.8	0.85	1.26	0.83	B	90	35	45	1×2	—	830	937	900	8	4	2	381
900	1 220	300	300	12	3	9 950	23 200	8 580	30 500	1 640	2 150	**2TR900-1**	1-P	0.87	0.78	1.16	0.76	B	89.5	51	45	1×2	—	955	1 129	1 070	14	8	2.5	1 020

[Notes] 1) Since there are many bearings of special tolerances for specific applications, consult with JTEKT for details of tolerances.

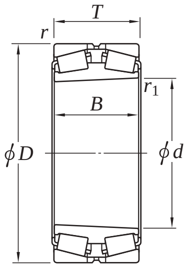
2) [×1]···one face, [×2]···both face.

3) SP indicates the specially chamfered form.

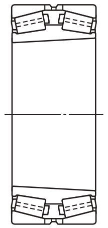
Double-row tapered roller bearings (Tapered bore)

TDIT type

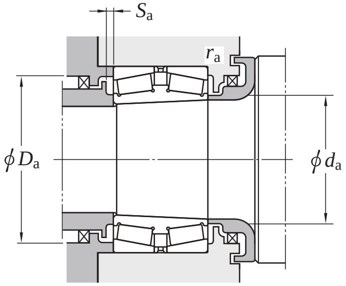
d 127.000 ~ 280.000 mm



Design 1



Design 1-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1)]	Design	Mounting dimensions (mm)						Constant	Axial load factors			Mass (kg)
d mm	1/25.4	D mm	1/25.4	T mm	1/25.4	B mm	1/25.4	r min.	r_1 min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	S_a min.	r_a [2)] max.	r_b [2)] max.	e	Y_2	Y_3	Y_0	
127.000	5.0000	182.563	7.1875	76.200	3.0000	76.200	3.0000	3.2	1.6	487	858	120	**48290TD/48220**	1	141	171	166	3.8	3.2	1.6	0.31	2.21	3.29	2.16	6.57
133.350	5.2500	196.850	7.7500	92.075	3.6250	92.075	3.6250	3.2	1.6	669	1 120	137	**67390TD/67322**	1	146	185	180	5	3.2	1.6	0.34	1.96	2.92	1.92	9.46
136.525	5.3750	215.900	8.5000	123.825	4.8750	123.825	4.8750	3.2	1.6	691	1 100	132	**74539TD/74850**	1	154	204	193	5	3.2	1.6	0.49	1.38	2.06	1.35	15.9
142.875	5.6250	200.025	7.8750	77.788	3.0625	74.613	2.9375	3.3	0.8	527	982	133	**48685TD/48620**	1	156	188	182	4	3.3	0.8	0.34	2.01	2.99	1.96	7.58
147.638	5.8125	241.300	9.5000	133.351	5.2500	132.334	5.2100	3.2	1.6	904	1 460	171	**82581TD/82950**	1	166	229	211	7	3.2	1.6	0.44	1.53	2.27	1.49	23.6
152.400	6.0000	254.000	10.0000	120.650	4.7500	120.650	4.7500	3.2	1.6	1 180	1 830	215	**99600TD/99100**	1	172	242	223	8	3.2	1.6	0.41	1.66	2.47	1.62	25.3
165.100	6.5000	269.875	10.6250	146.050	5.7500	146.050	5.7500	3.2	1.6	1 430	2 220	252	**H234649TD/H234610**	1	187	258	243	5	3.2	1.6	0.33	2.03	3.02	1.98	32.2
180.975	7.1250	288.925	11.3750	158.750	6.2500	158.750	6.2500	3.2	1.6	1 180	1 920	216	**94713TD/94113**	1	201	277	255	8	3.2	1.6	0.47	1.44	2.15	1.41	38.0
	7.1250	288.925	11.3750	158.750	6.2500	158.750	6.2500	3.2	1.6	1 430	1 950	245	**HM237549TD/HM237510**	1	201	277	260	8	3.2	1.6	0.32	2.12	3.15	2.07	35.9
190.500	7.5000	365.049	14.3720	158.750	6.2500	152.400	6.0000	3.2	3.2	2 020	2 920	319	**EE420750TD/421437**	1	239	353	317	6	3.2	3.2	0.40	1.68	2.50	1.64	77.2
198.438	7.8125	282.575	11.1250	87.313	3.4375	87.313	3.4375	3.2	0.8	749	1 410	155	**67980TD/67920**	1	220	271	259	7	3.2	0.8	0.51	1.33	1.97	1.30	17.8
209.550	8.2500	317.500	12.5000	184.150	7.2500	184.150	7.2500	3.2	1.6	1 300	2 270	244	**93826TD/93125**	1	223	306	278	7	3.2	1.6	0.52	1.29	1.92	1.26	48.3
219.075	8.6250	358.775	14.1250	196.850	7.7500	200.025	7.8750	6.4	1.6	2 660	4 580	469	**H244848TD/H244810**	1	245	340	319	9	6.4	1.6	0.33	2.03	3.02	1.98	80.9
222.250	8.7500	355.600	14.0000	127.000	5.0000	130.175	5.1250	3.2	1.6	1 410	2 630	278	**96876TD/96140**	1	253	343	312	8	3.2	1.6	0.59	1.14	1.70	1.12	50.9
252.413	9.9375	358.775	14.1250	130.175	5.1250	139.700	5.5000	3.2	1.6	1 660	3 170	333	**M249746TD/M249710**	1	275	346	330	8	3.2	1.6	0.33	2.03	3.02	1.98	43.5
263.525	10.3750	400.050	15.7500	196.848	7.7499	192.088	7.5625	6.4	1.6	1 630	2 570	274	**EE221039TD/221575**	1	292	381	359	6	6.4	1.6	0.39	1.71	2.54	1.67	76.7
266.700	10.5000	355.600	14.0000	107.950	4.2500	109.538	4.3125	3.2	1.6	1 300	2 550	267	**LM451349TD/LM451310**	1	285	343	332	8	3.2	1.6	0.36	1.87	2.79	1.83	29.5
280.000	11.0236	406.400	16.0000	206.375	8.1250	206.375	8.1250	3.2	3.2	1 650	2 950	307	**EE128113TD/128160**	1	308	394	368	7	3.2	3.2	0.39	1.75	2.61	1.71	81.4

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

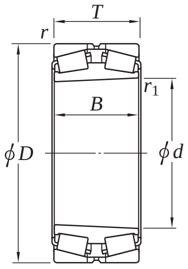
2) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension r. r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

Double-row tapered roller bearings (Tapered bore)

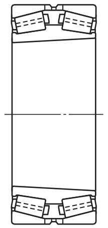
Koyo

TDIT type

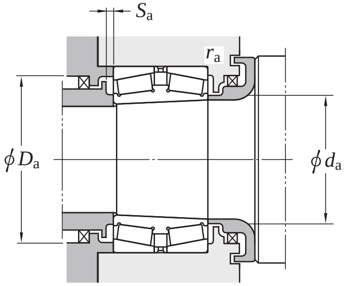
d 288.925 ~ 519.113 mm



Design 1



Design 1-P



Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*B* mm	*B* 1/25.4	*r* min.	r_1 min.	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Bearing No. [1]	Design	Mounting dimensions (mm) d_a max.	D_a max.	D_a min.	S_a min.	r_a [2] max.	r_b [2] max.	Constant *e*	Axial load factors Y_2	Y_3	Y_0	Mass (kg)
288.925	11.3750	406.400	16.0000	144.463	5.6875	144.463	5.6875	3.2	3.2	2 160	4 420	445	**M255449TD/M255410**	1	316	394	373	8	3.2	3.2	0.34	2.00	2.97	1.95	61.4
303.213	11.9375	495.300	19.5000	263.525	10.3750	263.525	10.3750	6.4	3.2	5 020	9 340	858	**HH258249TD/HH258210**	1-P	342	476	441	8	6.4	3.2	0.33	2.03	3.02	1.98	207
333.375	13.1250	469.900	18.5000	166.688	6.5625	166.688	6.5625	3.2	3.2	2 900	5 680	548	**HM261049TD/HM261010**	1-P	360	456	432	8	3.2	3.2	0.33	2.02	3.00	1.97	92.8
	13.1250	523.875	20.6250	185.738	7.3125	185.738	7.3125	6.4	3.2	3 420	6 780	644	**HM265032TD/HM265010**	1-P	403	500	483	7	6.4	3.2	0.33	2.03	3.02	1.98	138
344.091	13.5469	488.950	19.2500	174.625	6.8750	184.150	7.2500	3.2	3.2	2 890	5 800	553	**HM262746TD/HM262710**	1	376	475	450	8	3.2	3.2	0.33	2.02	3.00	1.97	108
346.075	13.6250	488.950	19.2500	174.625	6.8750	174.625	6.8750	3.2	3.2	2 890	5 800	553	**HM262749TD/HM262710**	1	378	475	450	8	3.2	3.2	0.33	2.02	3.00	1.97	105
368.300	14.5000	523.875	20.6250	185.738	7.3125	185.738	7.3125	6.4	3.2	3 420	6 780	644	**HM265049TD/HM265010**	1-P	403	500	483	7	6.4	3.2	0.33	2.03	3.02	1.98	110
384.175	15.1250	546.100	21.5000	193.675	7.6250	193.675	7.6250	6.4	3.2	4 090	8 430	773	**HM266449TD/HM266410**	1-P	418	525	505	10	6.4	3.2	0.33	2.03	3.02	1.98	155
406.400	16.0000	590.550	23.2500	209.550	8.2500	209.550	8.2500	6.4	3.2	4 240	8 930	803	**M268743TD/M268710**	1-P	456	570	545	9	6.4	3.2	0.33	2.03	3.02	1.98	199
415.925	16.3750	590.550	23.2500	209.550	8.2500	209.550	8.2500	6.4	3.2	4 240	8 930	803	**M268749TD/M268710**	1-P	456	570	545	9	6.4	3.2	0.33	2.03	3.02	1.98	189
447.675	17.6250	635.000	25.0000	223.838	8.8125	223.838	8.8125	6.4	3.2	4 920	10 500	917	**M270749TD/M270710**	1-P	491	610	585	8	6.4	3.2	0.33	2.03	3.02	1.98	234
479.425	18.8750	679.450	26.7500	238.125	9.3750	238.125	9.3750	6.4	3.2	5 310	11 100	952	**M272749TD/M272710**	1-P	520	655	630	7	6.4	3.2	0.33	2.03	3.02	1.98	277
501.650	19.7500	711.200	28.0000	250.825	9.8750	250.825	9.8750	6.4	3.2	6 150	12 800	1 100	**M274149TD/M274110**	1-P	545	690	655	10	6.4	3.2	0.33	2.03	3.02	1.98	323
519.113	20.4375	736.600	29.0000	258.763	10.1875	258.763	10.1875	6.4	3.2	6 630	13 600	1 140	**M275349TD/M275310**	1-P	560	710	680	10	6.4	3.2	0.33	2.03	3.02	1.98	361

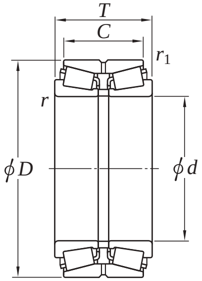
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) r_a indicates housing chamfer dimension corresponding to outer ring chamfer dimension *r*. r_b indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension r_1.

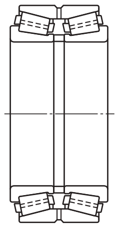
Double-row tapered roller bearings

TDO, TDOS type

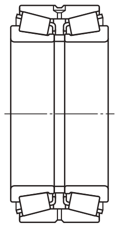
d 100 ~ (120) mm



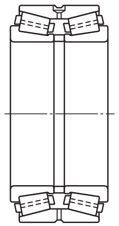
Design 1



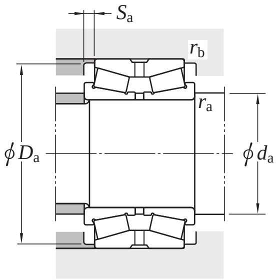
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d		*D*		*T*		*C*		r [2]	r_1 [2]	C_r	C_{0r}	(kN) C_u			d_a	D_a	S_a	r_a	r_b [2]	*e*	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
100	—	150	—	46	—	37	—	2	0.6	226	293	42.6	**46220A**	1	110	142	4.5	2	0.6	0.35	1.95	2.90	1.91	2.53
	—	165	—	52	—	46	—	2.5	0.6	249	305	44.1	**46320**	1	112	154	3	2	0.6	0.35	1.95	2.90	1.91	4.03
	—	165	—	65	—	52	—	2.5	0.6	333	443	64.7	**46320A**	1	112	153	6.5	2	0.6	0.35	1.95	2.90	1.91	4.97
	—	180	—	83	—	67	—	2.5	1	554	676	98.2	**46T30220JR/67**	1	114	168	8	2.5	1	0.42	1.61	2.39	1.57	8.33
	—	180	—	107	—	87	—	2.5	1	745	990	128	**46T32220JR/87**	1	114	171	10	2.5	1	0.42	1.61	2.39	1.57	11.1
	—	200	—	116	—	80	—	4	SP	743	941	118	**46T202012**	1	118	186	18	3	SP	0.63	1.07	1.59	1.04	15
100.000	3.9370	304.800	12.0000	184.160	7.2504	127.000	5.0000	SP	SP	1 490	1 630	187	**46T203018**	1	117	285	28	4	2	0.80	0.85	1.26	0.83	70.0
105.000	4.1339	190.000	7.4803	88.000	3.4646	70.000	2.7559	SP	SP	530	632	84.0	**46T211909**	1	117	178	9	2	0.8	0.42	1.60	2.38	1.56	9.68
105	—	190	—	88	—	70	—	2.5	1	618	761	105	**46T30221JR/70**	1	119	178	9	2.5	1	0.42	1.61	2.39	1.57	9.87
	—	190	—	115	—	95	—	2.5	1	840	1 130	146	**46T32221JR/95**	1	119	180	10	2.5	1	0.42	1.61	2.39	1.57	13.5
110	—	170	—	45	—	40	—	2.5	0.6	219	304	42.5	**46222**	1	122	158	2.5	2	0.6	0.35	1.95	2.90	1.91	3.58
	—	180	—	56	—	50	—	2.5	0.6	308	388	55.3	**46322**	1	122	168	3	2	0.6	0.35	1.95	2.90	1.91	5.13
	—	180	—	70	—	56	—	2.5	0.6	391	533	76.1	**46322A**	1	122	168	7	2	0.6	0.35	1.92	2.86	1.88	6.43
	—	180	—	94	—	72	—	2	0.6	504	761	107	**46T221810**	1	120	171	11	2	0.6	0.52	1.31	1.95	1.28	8.82
	—	180	—	125	—	100	—	2.5	0.6	676	1 070	136	**46T221813-1**	1	122	165	12.5	2	0.6	0.26	2.55	3.80	2.50	11.6
	—	200	—	92	—	74	—	2.5	1	695	868	116	**46T30222JR/74**	1	124	188	9	2.5	1	0.42	1.61	2.39	1.57	11.6
	—	200	—	121	—	101	—	2.5	1	938	1 280	161	**46T32222JR/101**	1	124	190	10	2.5	1	0.42	1.61	2.39	1.57	15.9
	—	220	—	145	—	115	—	3	1	1 130	1 430	180	**46T222215**	1	124	206	15	2.5	1	0.33	2.03	3.02	1.98	23.8
115	—	190	—	106	—	80	—	4	1.5	654	965	122	**46T231911**	1	133	177	13	3	1.5	0.42	1.62	2.42	1.59	10.7
	—	230	—	116	—	84	—	3	SP	792	1 060	127	**46T232312**	1	129	219	16	2.5	1	0.73	0.92	1.37	0.90	20.9
120	—	180	—	46	—	41	—	2.5	0.6	232	317	43.6	**46224**	1	132	170	2.5	2	0.6	0.35	1.95	2.90	1.91	3.81
	—	180	—	58	—	46	—	2.5	0.6	309	460	64.4	**46224A**	1	132	169	6	2	0.6	0.35	1.95	2.90	1.91	4.66
	—	200	—	62	—	55	—	2.5	0.6	367	470	65.7	**46324**	1	132	184	3.5	2	0.6	0.35	1.95	2.90	1.91	7.28
	—	200	—	78	—	62	—	2.5	0.6	486	672	93.9	**46324A**	1	132	185	8	2	0.6	0.35	1.95	2.90	1.91	9.14
	—	200	—	100	—	84	—	2.5	0.6	670	1 010	125	**46324AS**	1	132	190	8	2	0.6	0.35	1.95	2.90	1.91	12.0

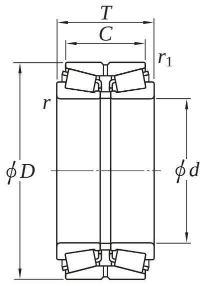
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

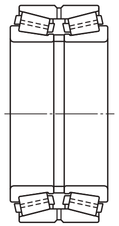
Double-row tapered roller bearings

TDO, TDOS type

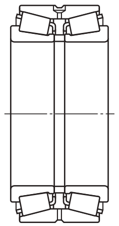
d (120) ~ (130) mm



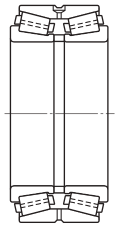
Design 1



Design 1-P



Design 2



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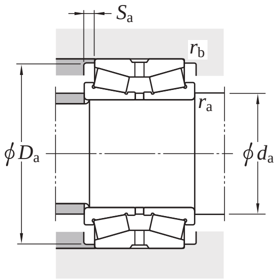


Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. 1)	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d		*D*		*T*		*C*		r 2)	r_1 2)	C_r	C_{0r}	(kN) C_u			d_a	D_a	S_a	r_a	r_b 2)	*e*	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
120	—	215	—	97	—	78	—	2.5	1	745	945	123	**46T30224JR/78**	1	134	203	9.5	2.5	1	0.44	1.55	2.31	1.52	13.9
	—	215	—	132	—	109	—	2.5	1	1 010	1 380	168	**46T32224JR/109**	1	134	204	11.5	2.5	1	0.44	1.55	2.31	1.52	19.8
125	—	180	—	85	—	75	—	3	0.6	487	858	120	**46T251809**	1	139	174	5	2.5	0.6	0.31	2.21	3.29	2.16	6.8
	—	230	—	116	—	84	—	4	SP	792	1 060	127	**46T252312**	1	143	219	16	3	1	0.73	0.92	1.37	0.90	19.5
	—	235	—	142	—	114	—	SP	SP	1 120	1 650	200	**46T252414**	1	137.2	217	14	2	SP	0.37	1.83	2.72	1.79	26.2
	—	235	—	145	—	115	—	4	1.5	1 120	1 650	200	**46T252415**	1	143	217	15	3	1.5	0.37	1.83	2.72	1.79	26.4
127.000	5.0000	169.975	6.6919	58.738	2.3125	49.213	1.9375	1.6	1	282	501	69.6	**L225849/L225812D**	1	136	162	4.8	1.6	1	0.33	2.03	3.02	1.98	3.45
	5.0000	182.563	7.1875	85.725	3.3750	73.025	2.8750	3.6	0.8	487	858	120	**48290/48220D**	1	140	174	6.4	3.6	0.8	0.31	2.21	3.29	2.16	6.95
	5.0000	196.850	7.7500	101.600	4.0000	85.725	3.3750	3.6	0.8	669	1 120	137	**67388/67322D**	1	140	189	7.9	3.6	0.8	0.34	1.96	2.92	1.92	10.9
	5.0000	200.025	7.8750	101.600	4.0000	85.725	3.3750	3.6	0.8	669	1 120	137	**67388/67325D**	1	140	189	7.9	3.6	0.8	0.34	1.96	2.92	1.92	11.6
	5.0000	215.900	8.5000	106.363	4.1875	80.963	3.1875	3.6	1.6	691	1 100	132	**74500/74851D**	1	140	205	12.7	3.6	1.6	0.49	1.38	2.06	1.35	15.0
	5.0000	228.600	9.0000	115.888	4.5625	84.138	3.3125	3.6	2.4	700	918	111	**97500/97901D**	1	140	213	15.9	3.6	2.4	0.74	0.92	1.36	0.90	17.8
	5.0000	228.600	9.0000	115.888	4.5625	84.138	3.3125	3.6	2.4	925	1 300	154	**HM926747/HM926710D**	1	140	219	15.9	3.6	2.4	0.74	0.92	1.36	0.90	19.6
	5.0000	234.950	9.2500	142.875	5.6250	114.300	4.5000	6.4	1.6	1 120	1 650	200	**95500/95927D**	1	145	217	14.3	6.4	1.6	0.37	1.83	2.72	1.79	25.8
127.792	5.0312	228.600	9.0000	115.888	4.5625	84.138	3.3125	3.6	2.4	925	1 300	154	**HM926749/HM926710D**	1	140	219	15.9	3.6	2.4	0.74	0.92	1.36	0.90	19.5
128.588	5.0625	206.375	8.1250	107.950	4.2500	82.550	3.2500	3.2	0.8	702	1 100	134	**799/792D**	1	140	195	12.7	3.2	0.8	0.46	1.47	2.19	1.44	12.9
130	—	180	—	69	—	55	—	2	0.6	404	663	92.1	**46T261807**	1	140	174.9	7	2	0.6	0.33	2.03	3.02	1.98	4.77
	—	200	—	52	—	46	—	2.5	0.6	299	425	57.8	**46226**	1	142	187	3	2	0.6	0.35	1.95	2.90	1.91	5.57
	—	200	—	65	—	52	—	2.5	0.6	400	618	85.0	**46226A**	1	142	185	6.5	2	0.6	0.35	1.95	2.90	1.91	7.06
130.000	5.1181	206.375	8.1250	107.950	4.2500	82.550	3.2500	3.6	0.8	702	1 100	134	**797/792D**	1	143	195	12.7	3.6	0.8	0.46	1.47	2.19	1.44	12.7
130	—	210	—	64	—	57	—	2.5	0.6	404	535	73.6	**46326**	1	142	196	3.5	2	0.6	0.36	1.87	2.79	1.83	7.81
	—	210	—	80	—	64	—	2.5	0.6	513	723	99.3	**46326A**	1	142	198	8	2	0.6	0.36	1.87	2.79	1.83	9.57
	—	210	—	109	—	90	—	2.5	0.6	813	1 190	149	**46T262111**	1	142	198	9.5	2	0.6	0.26	2.55	3.80	2.50	13.4
	—	214	—	115	—	98	—	2.5	1	838	1 220	152	**46T262112**	1	142	204	8.5	2	1	0.33	2.03	3.02	1.98	15
	—	230	—	98	—	78.5	—	3	1	809	1 020	131	**46T30226JR/78.5**	1	148	218	9.5	3	1	0.44	1.55	2.31	1.52	15.7

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

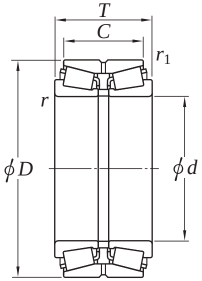
2) SP indicates the specially chamfered form.

Double-row tapered roller bearings

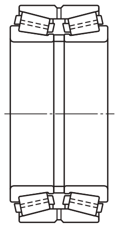
Koyo

TDO, TDOS type

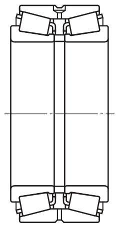
d (130) ~ (140) mm



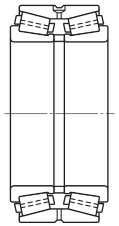
Design 1



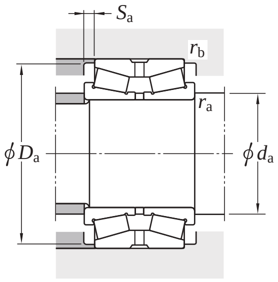
Design 1-P



Design 2



Design 2-P



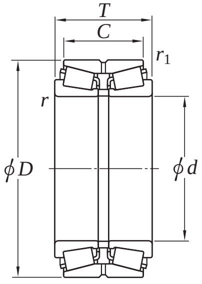
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	C mm	C 1/25.4	r min.	r_1 min.	C_r	C_{0r}	C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
130	—	230	—	149	—	120	—	4	1	1 160	1 650	199	**46T262315A**	1	148	222	14.5	3	1	0.43	1.57	2.34	1.53	24.2
	—	280	—	137	—	107.5	—	4	1.5	1 410	1 670	203	**46T30326JR/107.5**	1	152	255	15	4	1.5	0.35	1.96	2.91	1.91	38.1
130.175	5.1250	196.850	7.7500	101.600	4.0000	85.725	3.3750	3.6	0.8	669	1 120	137	**67389/67322D**	1	143	189	7.9	3.6	0.8	0.34	1.96	2.92	1.92	10.4
	5.1250	206.375	8.1250	107.950	4.2500	82.550	3.2500	3.6	0.8	702	1 100	134	**799A/792D**	1	143	195	12.7	3.6	0.8	0.46	1.47	2.19	1.44	12.6
133	—	216	—	106	—	81	—	3	1	691	1 100	132	**46T2622**	1	147	205	12.5	2.5	1	0.49	1.38	2.06	1.35	14.1
133.350	5.2500	177.008	6.9688	57.150	2.2500	47.625	1.8750	1.6	0.8	302	557	76.4	**L327249/L327210D**	1	142	169	4.8	1.6	0.8	0.35	1.94	2.89	1.90	3.63
	5.2500	190.500	7.5000	85.725	3.3750	73.025	2.8750	3.6	0.8	505	944	129	**48385/48320D**	1	146	182	6.4	3.6	0.8	0.32	2.10	3.13	2.06	7.63
	5.2500	196.850	7.7500	101.600	4.0000	85.725	3.3750	3.6	0.8	669	1 120	137	**67390/67322D**	1	146	189	7.9	3.6	0.8	0.34	1.96	2.92	1.92	9.88
	5.2500	196.850	7.7500	101.600	4.0000	85.725	3.3750	7.9	0.8	669	1 120	137	**67391/67322D**	1	155	189	7.9	7.9	0.8	0.34	1.96	2.92	1.92	9.81
	5.2500	200.025	7.8750	101.600	4.0000	85.725	3.3750	3.6	0.8	669	1 120	137	**67390/67325D**	1	146	189	7.9	3.6	0.8	0.34	1.96	2.92	1.92	10.5
	5.2500	215.900	8.5000	106.363	4.1875	80.963	3.1875	3.6	1.6	691	1 100	132	**74525/74851D**	1	146	205	12.7	3.6	1.6	0.49	1.38	2.06	1.35	13.9
	5.2500	234.950	9.2500	142.875	5.6250	114.300	4.5000	9.5	1.6	1 120	1 650	200	**95525/95927D**	1	158	217	14.3	9.5	1.6	0.37	1.83	2.72	1.79	24.3
	5.2500	234.950	9.2500	142.875	5.6250	114.300	4.5000	4.7	1.6	1 120	1 650	200	**95528/95927D**	1	148	217	14.3	4.7	1.6	0.37	1.83	2.72	1.79	24.4
136.525	5.3750	190.500	7.5000	85.725	3.3750	73.025	2.8750	3.6	0.8	505	944	129	**48393/48320D**	1	149	182	6.4	3.6	0.8	0.32	2.10	3.13	2.06	7.18
	5.3750	215.900	8.5000	106.363	4.1875	80.963	3.1875	3.6	1.6	691	1 100	132	**74537/74851D**	1	149	205	12.7	3.6	1.6	0.49	1.38	2.06	1.35	13.4
	5.3750	228.600	9.0000	123.825	4.8750	98.425	3.8750	3.6	1.6	947	1 460	175	**896/892D**	1	149	215	12.7	3.6	1.6	0.42	1.60	2.39	1.57	19.2
139.700	5.5000	215.900	8.5000	106.363	4.1875	80.963	3.1875	3.6	1.6	691	1 100	132	**74550/74851D**	1	152	205	12.7	3.6	1.6	0.49	1.38	2.06	1.35	12.8
	5.5000	215.900	8.5000	106.363	4.1875	80.963	3.1875	6.4	1.6	691	1 100	132	**74550A/74851D**	1	158	205	12.7	6.4	1.6	0.49	1.38	2.06	1.35	12.8
	5.5000	228.600	9.0000	123.825	4.8750	98.425	3.8750	3.6	1.6	947	1 460	175	**898/892D**	1	152	215	12.7	3.6	1.6	0.42	1.60	2.39	1.57	18.5
	5.5000	228.600	9.0000	123.825	4.8750	98.425	3.8750	6.4	1.6	947	1 460	175	**898A/892D**	1	158	215	12.7	6.4	1.6	0.42	1.60	2.39	1.57	18.5
	5.5000	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	904	1 460	171	**82550/82932D**	1	152	225	12.7	3.6	1.6	0.44	1.53	2.27	1.49	22.6
	5.5000	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	1 080	1 660	198	**HM231132/HM231111D**	1	152	223	12.7	3.6	1.6	0.32	2.12	3.15	2.07	22.5
	5.5000	254.000	10.0000	149.225	5.8750	111.125	4.3750	7.1	1.6	1 180	1 830	215	**99550/99102D**	1	159	237	19.1	7.1	1.6	0.41	1.66	2.47	1.62	31.1
	5.5000	307.975	12.1250	200.025	7.8750	155.575	6.1250	9.5	2.4	2 180	2 900	331	**HH234031/HH234011D**	1	164	285	22.2	9.5	2.4	0.33	2.07	3.08	2.02	68.3
140	—	210	—	53	—	47	—	2.5	0.6	299	404	54.5	**46228**	1	152	196	3	2	0.6	0.33	2.03	3.02	1.98	5.85

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

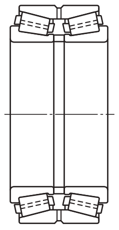
Double-row tapered roller bearings

TDO, TDOS type

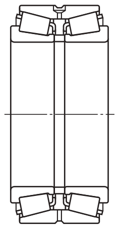
d (140) ~ (150) mm



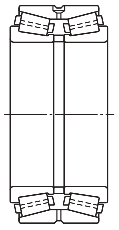
Design 1



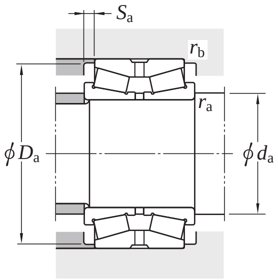
Design 1-P



Design 2



Design 2-P



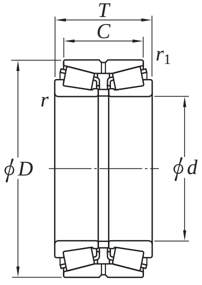
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d		*D*		*T*		*C*		*r*	r_1	C_r	C_{0r}	(kN) C_u			d_a	D_a	S_a	r_a	r_b	*e*	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
140	—	210	—	66	—	53	—	2.5	0.6	452	639	86.9	**46228A**	1	152	199	6.5	2	0.6	0.47	1.43	2.12	1.40	7.18
	—	225	—	68	—	61	—	3	1	423	564	76.1	**46328**	1	154	210	3.5	2.5	1	0.35	1.95	2.90	1.91	9.56
	—	225	—	85	—	68	—	3	1	597	836	113	**46328A**	1	154	212	8	2.5	1	0.35	1.95	2.90	1.91	11.8
	—	230	—	120	—	94	—	4	1	865	1 360	162	**46T282312**	1	158	212	13	3	1	0.42	1.60	2.38	1.56	18.7
	—	230	—	140	—	110	—	3	1	1 010	1 480	177	**46T282314**	1	154	218	15	2.5	1	0.35	1.95	2.90	1.91	20.3
	—	240	—	132	—	106	—	4	1.5	904	1 460	171	**46T282413**	1	158	225	13	3	1.5	0.44	1.53	2.27	1.49	23.6
	—	250	—	153	—	125.5	—	3	1	1 360	1 920	224	**46T32228JR/125.5**	1	158	238	14	3	1	0.44	1.55	2.31	1.52	30.2
	—	270	—	170	—	125	—	4	1	885	2 130	132	**46T282717**	1	158	253	22.5	3	1	0.44	1.55	2.31	1.52	41.5
142.875	5.6250	200.025	7.8750	87.315	3.4376	73.025	2.8750	7.9	0.8	527	982	133	**48684/48620D**	1	164	191	7.1	7.9	0.8	0.34	2.01	2.99	1.96	7.98
	5.6250	200.025	7.8750	87.315	3.4376	73.025	2.8750	3.6	0.8	527	982	133	**48685/48620D**	1	156	191	7.1	3.6	0.8	0.34	2.01	2.99	1.96	8.06
	5.6250	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	904	1 460	171	**82562/82932D**	1	156	225	12.7	3.6	1.6	0.44	1.53	2.27	1.49	21.9
146.050	5.7500	193.675	7.6250	65.085	2.5624	53.975	2.1250	1.6	0.8	402	750	101	**36690/36620D**	1	155	186	5.6	1.6	0.8	0.37	1.83	2.73	1.79	4.96
	5.7500	193.675	7.6250	65.085	2.5624	53.975	2.1250	4.8	0.8	402	750	101	**36691/36620D**	1	161	186	5.6	4.8	0.8	0.37	1.83	2.73	1.79	4.93
	5.7500	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	904	1 460	171	**82576/82932D**	1	159	225	12.7	3.6	1.6	0.44	1.53	2.27	1.49	21.1
	5.7500	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	1 080	1 660	198	**HM231140/HM231111D**	1	159	223	12.7	3.6	1.6	0.32	2.12	3.15	2.07	21.0
	5.7500	254.000	10.0000	149.225	5.8750	111.125	4.3750	7.1	1.6	1 180	1 830	215	**99575/99102D**	1	166	237	19.1	7.1	1.6	0.41	1.66	2.47	1.62	29.4
	5.7500	268.288	10.5625	160.338	6.3125	125.413	4.9375	6.4	1.6	1 410	2 090	239	**EE107057/107105D**	1	164	249	17.5	6.4	1.6	0.39	1.74	2.59	1.70	38.1
	5.7500	304.800	12.0000	135.733	5.3438	97.633	3.8438	3.2	1.6	1 280	1 600	195	**EE750576/751204D**	1-P	158	268	19.1	3.2	1.6	0.33	2.03	3.02	1.98	43.2
149.225	5.8750	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	904	1 460	171	**82587/82932D**	1	162	225	12.7	3.6	1.6	0.44	1.53	2.27	1.49	20.4
	5.8750	236.538	9.3125	131.763	5.1875	106.363	4.1875	6.4	1.6	1 080	1 660	198	**HM231148/HM231111D**	1	167	223	12.7	6.4	1.6	0.32	2.12	3.15	2.07	20.2
	5.8750	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	1 080	1 660	198	**HM231149/HM231111D**	1	162	223	12.7	3.6	1.6	0.32	2.12	3.15	2.07	20.3
150	—	225	—	56	—	50	—	3	1	348	476	63.2	**46230**	1	164	213	3	2.5	1	0.33	2.03	3.02	1.98	7.09
	—	225	—	70	—	56	—	3	1	472	703	94.1	**46230A**	1	164	213	7	2.5	1	0.33	2.03	3.02	1.98	8.82
	—	245	—	108	—	80	—	4	1.5	694	989	131	**46T302511**	1	168	227	14	3	1.5	0.35	1.93	2.88	1.89	17.2
	—	250	—	80	—	71	—	3	1	587	786	98.4	**46330**	1	164	233	4.5	2.5	1	0.35	1.95	2.90	1.91	14.6
	—	250	—	100	—	80	—	3	1	748	1 070	132	**46330A**	1	164	234	10	2.5	1	0.35	1.95	2.90	1.91	17.6
	—	250	—	137	—	112	—	3	1	1 030	1 510	177	**46T302514A**	1	164	238	12.5	2.5	1	0.41	1.66	2.47	1.62	24.3

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

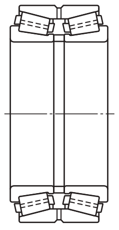
Double-row tapered roller bearings

TDO, TDOS type

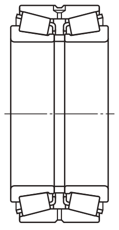
d (150) ~ 160.325 mm



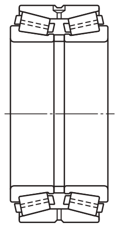
Design 1



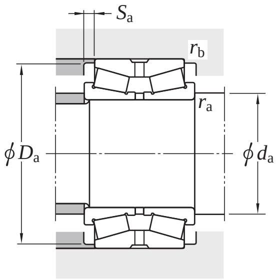
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d		D		T		C		r	r_1 [2]	C_r	C_{0r}	(kN) C_u			d_a	D_a	S_a	r_a	r_b [2]	e	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
150	—	250	—	140	—	115	—	3	SP	1 030	1 510	177	**46T302514B**	1	164	239	12	2.5	SP	0.41	1.66	2.47	1.62	28.0
	—	250	—	142	—	112	—	3	SP	1 030	1 510	177	**46T302514**	1	164	237	15	2.5	SP	0.41	1.66	2.47	1.62	25.1
	—	250	—	145	—	115	—	4	1.5	1 030	1 510	177	**46T302515**	1	168	239	15	3	1.5	0.41	1.66	2.47	1.62	25.7
	—	260	—	150	—	115	—	4	1.5	1 190	1 740	203	**46T302615**	1	168	246	17.5	3	1.5	0.43	1.57	2.34	1.53	30.4
	—	270	—	109	—	87	—	3	1	1 040	1 330	162	**46T30230JR/87**	1	168	255	11	3	1	0.44	1.55	2.31	1.52	24.6
	—	270	—	164	—	130	—	3	1	885	2 130	132	**46T32230JR/130**	1	168	254	17	3	1	0.44	1.55	2.31	1.52	38
	—	280	—	160	—	104	—	4	1	1 300	1 730	197	**46T302816**	1	168	265	28	3	1	0.81	0.83	1.23	0.81	38.7
150.813	5.9375	244.475	9.6250	107.950	4.2500	79.375	3.1250	3.6	1.6	694	989	131	**81593/81963D**	1	163	227	14.3	3.6	1.6	0.35	1.93	2.88	1.89	16.7
152.400	6.0000	222.250	8.7500	100.010	3.9374	76.200	3.0000	3.6	0.8	678	1 190	159	**M231649/M231610D**	1	165	210	11.9	3.6	0.8	0.33	2.03	3.02	1.98	11.9
	6.0000	244.475	9.6250	107.950	4.2500	79.375	3.1250	3.6	1.6	694	989	131	**81600/81963D**	1	165	227	14.3	3.6	1.6	0.35	1.93	2.88	1.89	16.4
	6.0000	254.000	10.0000	149.225	5.8750	111.125	4.3750	7.1	1.6	1 180	1 830	215	**99600/99102D**	1	172	237	19.1	7.1	1.6	0.41	1.66	2.47	1.62	27.7
	6.0000	268.288	10.5625	160.338	6.3125	125.413	4.9375	6.4	1.6	1 410	2 090	239	**EE107060/107105D**	1	171	249	17.5	6.4	1.6	0.39	1.74	2.59	1.70	36.2
	6.0000	307.975	12.1250	200.025	7.8750	146.050	5.7500	9.5	2.4	1 700	2 300	268	**EE450601/451215D**	1	177	275	27	9.5	2.4	0.33	2.07	3.09	2.03	61.6
	6.0000	307.975	12.1250	200.025	7.8750	155.575	6.1250	9.5	2.4	2 180	2 900	331	**HH234048/HH234011D**	1	177	285	22.2	9.5	2.4	0.33	2.07	3.08	2.02	63.7
155	—	330	—	180	—	120	—	6	1.5	1 860	2 410	261	**46T313318A**	1	183	315	30	5	1.5	0.81	0.83	1.24	0.82	70.0
158.750	6.2500	225.425	8.8750	85.725	3.3750	69.850	2.7500	3.6	0.8	554	1 140	148	**46780R/46720D**	1	171	215	7.9	3.6	0.8	0.38	1.76	2.62	1.72	10.7
160	—	240	—	60	—	53	—	3	1	405	565	74.0	**46232**	1	174	228	3.5	2.5	1	0.33	2.03	3.02	1.98	8.71
	—	240	—	75	—	60	—	3	1	508	756	99.6	**46232A**	1	174	226	7.5	2.5	1	0.33	2.03	3.02	1.98	10.6
	—	270	—	86	—	76	—	3	1	695	950	115	**46332**	1	174	252	5	2.5	1	0.35	1.95	2.90	1.91	18.8
	—	270	—	108	—	86	—	3	1	871	1 270	150	**46332A**	1	174	252	11	2.5	1	0.35	1.95	2.90	1.91	23.1
	—	270	—	149	—	120	—	3	1	1 300	1 970	228	**46T322715**	1	174	257	14.5	2.5	1	0.40	1.70	2.53	1.66	32.4
	—	280	—	150	—	125	—	4	1	1 370	2 000	231	**46T322815**	1	178	262	12.5	3	1	0.32	2.12	3.15	2.07	36.2
	—	290	—	178	—	144	—	3	1	1 700	2 420	273	**46T32232JR/144**	1	178	274	17	3	1	0.44	1.55	2.31	1.52	47.6
160.325	6.3120	288.925	11.3750	142.875	5.6250	111.125	4.3750	7.1	1.6	1 350	1 950	223	**HM237532/HM237510D**	1	180	271	15.9	7.1	1.6	0.32	2.12	3.15	2.07	37.2

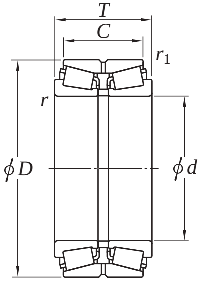
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

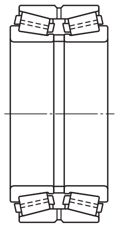
Double-row tapered roller bearings

TDO, TDOS type

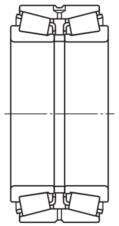
d 165 ~ 175 mm



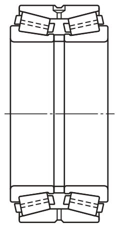
Design 1



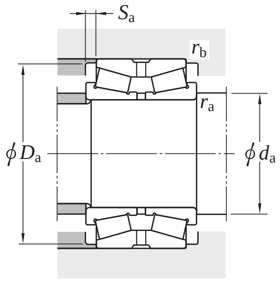
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d		*D*		*T*		*C*		*r* [2]	r_1 [2]	C_r	C_{0r}	C_u			d_a	D_a	S_a	r_a	r_b	*e*	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
165	—	290	—	143	—	113	—	SP	1.5	1 180	1 950	216	**46T332914**	1	185	273	15	4	1.5	0.32	2.12	3.15	2.07	40.0
	—	290	—	150	—	125	—	6	1	1 470	2 140	249	**46T332915**	1	193	269	12.5	5	1	0.32	2.12	3.15	2.07	40.1
165.100	6.5000	215.900	8.5000	58.740	2.3126	47.625	1.8750	1.6	0.8	331	600	78.1	**L433749/L433710D**	1	174	207	5.6	1.6	0.8	0.36	1.85	2.76	1.81	5.06
	6.5000	225.425	8.8750	85.725	3.3750	69.850	2.7500	3.6	0.8	554	1 140	148	**46790R/46720D**	1	177.3	215	7.9	3.6	0.8	0.38	1.76	2.62	1.72	9.64
	6.5000	247.650	9.7500	103.188	4.0625	84.138	3.3125	3.6	0.8	741	1 400	160	**67780/67720D**	1	178	238	9.5	3.6	0.8	0.44	1.54	2.29	1.50	16.9
	6.5000	254.000	10.0000	101.600	4.0000	76.200	3.0000	4.8	1.6	815	1 240	162	**M235145/M235113D**	1	180	240	12.7	4.8	1.6	0.32	2.12	3.15	2.07	17.0
	6.5000	288.925	11.3750	142.875	5.6250	111.125	4.3750	7.1	1.6	1 180	1 920	216	**94649/94114D**	1	185	270	15.9	7.1	1.6	0.47	1.44	2.15	1.41	37.7
	6.5000	288.925	11.3750	142.875	5.6250	111.125	4.3750	7.1	1.6	1 430	2 090	245	**HM237535/HM237510D**	1	185	271	15.9	7.1	1.6	0.32	2.12	3.15	2.07	35.9
	6.5000	288.925	11.3750	146.050	5.7500	114.300	4.5000	7.1	1.6	1 430	2 090	245	**HM237535/ HM237511XD**	1	185	271	15.9	7.1	1.6	0.32	2.12	3.15	2.07	36.5
168.275	6.6250	247.650	9.7500	103.188	4.0625	84.138	3.3125	3.6	0.8	741	1 400	160	**67782/67720D**	1	181	238	9.5	3.6	0.8	0.44	1.54	2.29	1.50	16.3
	6.6250	250.000	9.8425	103.190	4.0626	84.140	3.3126	SP	SP	880	1 410	185	**46T342510**	1	180.3	236	9.5	2	0.5	0.33	2.03	3.02	1.98	16.1
	6.6250	360.000	14.1732	190.000	7.4803	130.000	5.1181	SP	SP	2 020	2 570	280	**46T343619**	1	186.1	339	30	4	1	0.80	0.85	1.26	0.83	83.9
170.000	6.6929	254.000	10.0000	101.600	4.0000	76.200	3.0000	4.8	1.6	815	1 240	162	**M235149/M235113D**	1	185	240	12.7	4.8	1.6	0.32	2.12	3.15	2.07	16.0
170	—	260	—	67	—	60	—	3	1	480	642	83.4	**46234**	1	184	243	3.5	2.5	1	0.33	2.03	3.02	1.98	11.4
	—	260	—	84	—	67	—	3	1	629	969	125	**46234A**	1	184	244	8.5	2.5	1	0.33	2.03	3.02	1.98	14.7
	—	280	—	88	—	78	—	3	1	754	1 050	125	**46334**	1	184	263	5	2.5	1	0.33	2.06	3.06	2.01	19.8
	—	280	—	110	—	88	—	3	1	938	1 390	163	**46334A**	1	184	260	11	2.5	1	0.33	2.06	3.06	2.01	24.7
	—	310	—	195	—	150	—	5	1.5	2 020	2 790	316	**46T343120-1**	1	192	292	22.5	4	1.5	0.33	2.03	3.02	1.98	58.1
171.450	6.7500	288.925	11.3750	142.875	5.6250	111.125	4.3750	7.1	1.6	1 180	1 920	216	**94675/94114D**	1	191	270	15.9	7.1	1.6	0.47	1.44	2.15	1.41	35.9
174.625	6.8750	247.650	9.7500	103.188	4.0625	84.138	3.3125	7.9	0.8	741	1 400	160	**67786/67720D**	1	196	238	9.5	7.9	0.8	0.44	1.54	2.29	1.50	14.8
	6.8750	247.650	9.7500	103.188	4.0625	84.138	3.3125	3.6	0.8	741	1 400	160	**67787/67720D**	1	187	238	9.5	3.6	0.8	0.44	1.54	2.29	1.50	14.9
	6.8750	288.925	11.3750	142.875	5.6250	111.125	4.3750	7.1	1.6	1 180	1 920	216	**94687/94114D**	1	194	270	15.9	7.1	1.6	0.47	1.44	2.15	1.41	34.9
	6.8750	288.925	11.3750	142.875	5.6250	111.125	4.3750	7.1	1.6	1 350	1 950	223	**HM237542/HM237510D**	1	194	271	15.9	7.1	1.6	0.32	2.12	3.15	2.07	33.1
175	—	320	—	180	—	140	—	5	1.5	1 830	2 530	285	**46T3532**	1	197	301	20	4	1.5	0.32	2.12	3.15	2.07	56.7

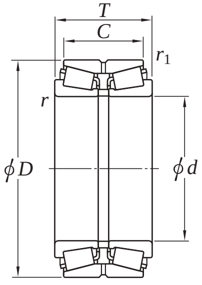
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

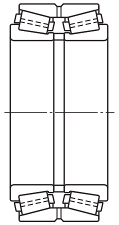
Double-row tapered roller bearings

TDO, TDOS type

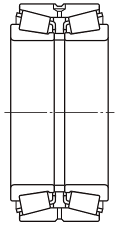
d 177.800 ~ (187.325) mm



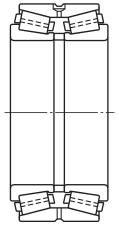
Design 1



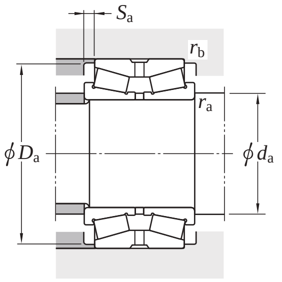
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design[3]	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d		D		T		C		r [2]	r_1 [2]	C_r	C_{0r}	C_u			d_a	D_a	S_a	r_a	r_b [2]	e	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
177.800	7.0000	227.013	8.9375	66.672	2.6249	52.388	2.0625	1.6	0.8	381	805	102	**36990/36920D**	1	186	220	7.1	1.6	0.8	0.44	1.53	2.28	1.50	6.18
	7.0000	247.650	9.7500	103.188	4.0625	84.138	3.3125	3.6	0.8	741	1 400	160	**67790/67720D**	1	190	238	9.5	3.6	0.8	0.44	1.54	2.29	1.50	14.2
	7.0000	247.650	9.7500	103.188	4.0625	84.138	3.3125	10.4	0.8	741	1 400	160	**67791/67720D**	1	204	238	9.5	10.4	0.8	0.44	1.54	2.29	1.50	14.0
	7.0000	269.875	10.6250	119.063	4.6875	93.663	3.6875	3.6	1.6	880	1 610	183	**M238840/M238810D**	1	190	255	12.7	3.6	1.6	0.33	2.03	3.02	1.98	23.0
	7.0000	285.750	11.2500	136.525	5.3750	92.075	3.6250	6.4	1.6	956	1 430	165	**EE91702/91113XD**	1*	196	264	22.2	6.4	1.6	0.43	1.57	2.34	1.53	28.5
	7.0000	288.925	11.3750	142.875	5.6250	111.125	4.3750	7.1	1.6	1 180	1 920	216	**94700/94114D**	1	197	270	15.9	7.1	1.6	0.47	1.44	2.15	1.41	33.9
	7.0000	288.925	11.3750	142.875	5.6250	111.125	4.3750	7.1	1.6	1 350	1 950	223	**HM237545/HM237510D**	1	197	271	15.9	7.1	1.6	0.32	2.12	3.15	2.07	32.1
	7.0000	288.925	11.3750	146.050	5.7500	114.300	4.5000	7.1	1.6	1 350	1 950	223	**HM237545/HM237511XD**	1*	197	271	15.9	7.1	1.6	0.32	2.12	3.15	2.07	32.7
	7.0000	304.800	12.0000	147.838	5.8204	98.425	3.8750	6.4	1.6	1 220	1 600	199	**EE280702/281201D**	1	196	282	24.7	6.4	1.6	0.36	1.87	2.79	1.83	37.2
	7.0000	320.675	12.6250	185.738	7.3125	138.112	5.4375	3.6	1.6	1 610	2 450	271	**EE222070/222127D**	1	190	298	23.8	3.6	1.6	0.40	1.68	2.50	1.64	59.0
	7.0000	320.675	12.6250	185.738	7.3125	138.113	5.4375	3.6	1.6	1 830	2 530	285	**H239640/H239612D**	1	190	301	23.8	3.6	1.6	0.32	2.12	3.15	2.07	56.6
179.975	7.0856	317.500	12.5000	146.050	5.7500	111.125	4.3750	3.6	1.6	1 300	2 270	244	**93708/93127D**	1	193	295	17.5	3.6	1.6	0.52	1.29	1.92	1.26	47.2
	7.0856	319.976	12.5975	146.050	5.7500	111.125	4.3750	3.6	1.6	1 300	2 270	244	**93708/93128XD**	1*	193	295	17.5	3.6	1.6	0.52	1.29	1.92	1.26	48.3
180	—	280	—	74	—	66	—	3	1	582	801	98.9	**46236**	1	194	263	4	2.5	1	0.33	2.03	3.02	1.98	15.5
	—	280	—	93	—	74	—	3	1	732	1 080	131	**46236A**	1	194	261	9.5	2.5	1	0.33	2.03	3.02	1.98	19.0
	—	300	—	96	—	85	—	4	1.5	872	1 240	149	**46336**	1	198	277	5.5	3	1.5	0.33	2.06	3.06	2.01	25.8
	—	300	—	120	—	96	—	4	1.5	1 080	1 630	190	**46336A**	1	198	279	12	3	1.5	0.33	2.06	3.06	2.01	31.3
	—	300	—	163	—	134	—	4	1	1 520	2 240	255	**46T363016**	1	198	282	14.5	3	1	0.33	2.03	3.02	1.98	42.2
	—	320	—	127	—	99	—	4	1.5	1 330	1 740	202	**46T30236JR/99**	1	202	297	14	4	1.5	0.45	1.5	2.23	1.47	40.1
	—	320	—	192	—	152	—	4	1.5	2 060	3 030	328	**46T32236JR/152**	1	202	303	20	4	1.5	0.45	1.5	2.23	1.47	62.5
	—	340	—	170	—	140	—	5	1.5	1 920	2 530	285	**46T363417**	1	202	314	15	4	1.5	0.32	2.12	3.15	2.07	63.2
184.150	7.2500	266.700	10.5000	103.188	4.0625	84.138	3.3125	3.6	0.8	769	1 520	169	**67883/67820D**	1	197	257	9.5	3.6	0.8	0.48	1.41	2.11	1.38	18.7
184.15	—	288.925	—	142.88	—	111.12	—	SP	SP	1 220	1 920	214	**46T372914**	1	203.2	276	15.9	4	SP	0.40	1.68	2.50	1.64	31.7
187.325	7.3750	266.700	10.5000	103.188	4.0625	84.138	3.3125	3.6	0.8	769	1 520	169	**67884/67820D**	1	200	257	9.5	3.6	0.8	0.48	1.41	2.11	1.38	18.0
	7.3750	269.875	10.6250	119.063	4.6875	93.663	3.6875	3.6	1.6	880	1 610	183	**M238849/M238810D**	1	200	255	12.7	3.6	1.6	0.33	2.03	3.02	1.98	20.4
	7.3750	282.575	11.1250	107.950	4.2500	79.375	3.1250	3.6	1.6	880	1 450	182	**87737/87112D**	1	200	267	14.3	3.6	1.6	0.42	1.62	2.42	1.59	21.4

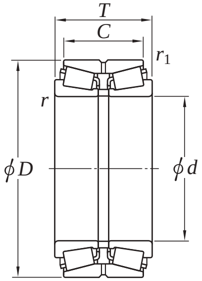
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.
3) * means no lubrication holes or grooves on double outer ring.

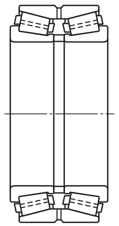
Double-row tapered roller bearings

TDO, TDOS type

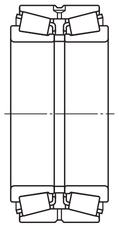
d (187.325) ~ 200 mm



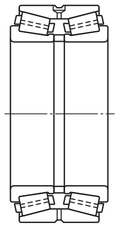
Design 1



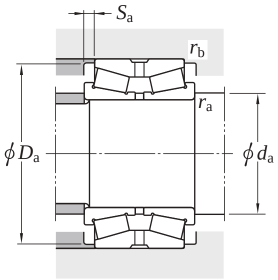
Design 1-P



Design 2



Design 2-P



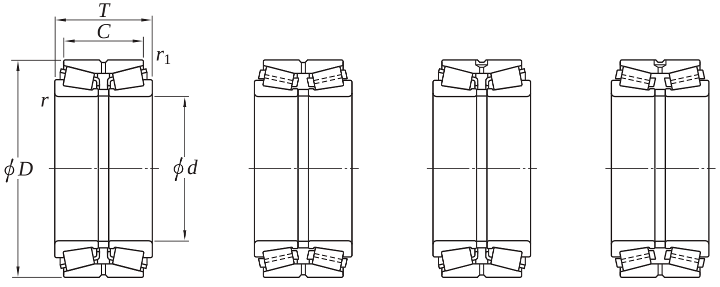
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	(kg)
187.325	7.3750	320.675	12.6250	185.738	7.3125	138.113	5.4375	5.6	1.6	1 830	2 530	285	**H239649/H239612D**	1	204	301	23.8	5.6	1.6	0.32	2.12	3.15	2.07	52.6
190	—	290	—	75	—	67	—	3	1	610	866	106	**46238**	1	204	272	4	2.5	1	0.32	2.12	3.15	2.07	16.5
	—	290	—	94	—	75	—	3	1	793	1 170	140	**46238A**	1	204	274	9.5	2.5	1	0.33	2.03	3.02	1.98	20.0
	—	320	—	104	—	92	—	4	1.5	1 020	1 450	168	**46338**	1	208	298	6	3	1.5	0.35	1.95	2.90	1.91	31.9
	—	320	—	130	—	104	—	4	1.5	1 230	1 860	212	**46338A**	1	208	298	13	3	1.5	0.35	1.95	2.90	1.91	39.0
	—	320	—	171	—	134	—	4	1	1 870	2 800	314	**46T383217C**	2	208	301	18.5	3	1	0.32	2.12	3.15	2.07	51.0
	—	340	—	133	—	105	—	4	1.5	1 560	2 060	235	**46T30238JR/105**	1	212	318	14	4	1.5	0.44	1.55	2.31	1.52	47.8
	—	340	—	204	—	160	—	4	1.5	2 340	3 480	373	**46T32238JR/160**	1	212	323	22	4	1.5	0.44	1.55	2.31	1.52	75.1
190.500	7.5000	266.700	10.5000	103.188	4.0625	84.138	3.3125	3.6	0.8	769	1 520	169	**67885/67820D**	1	203	257	9.5	3.6	0.8	0.48	1.41	2.11	1.38	17.2
	7.5000	282.575	11.1250	107.950	4.2500	79.375	3.1250	3.6	1.6	880	1 450	182	**87750/87112D**	1	203	267	14.3	3.6	1.6	0.42	1.62	2.42	1.59	20.7
	7.5000	317.500	12.5000	146.050	5.7500	111.125	4.3750	4.3	1.6	1 300	2 270	244	**93750/93127D**	1	205	295	17.5	4.3	1.6	0.52	1.29	1.92	1.26	43.8
	7.5000	368.300	14.5000	193.675	7.6250	136.525	5.3750	6.4	1.6	2 020	2 920	319	**EE420751/421451D**	1	209	334	28.6	6.4	1.6	0.40	1.68	2.50	1.64	85.2
193.675	7.6250	282.575	11.1250	107.950	4.2500	79.375	3.1250	3.6	1.6	880	1 450	182	**87762/87112D**	1	206	267	14.3	3.6	1.6	0.42	1.62	2.42	1.59	19.8
196.850	7.7500	254.000	10.0000	61.910	2.4374	47.625	1.8750	1.6	0.8	404	773	96.5	**L540049/L540010D**	1	206	244	7.1	1.6	0.8	0.40	1.70	2.53	1.66	7.12
	7.7500	257.175	10.1250	85.725	3.3750	66.675	2.6250	3.6	0.8	576	1 260	157	**LM739749/LM739710D**	1	210	247	9.5	3.6	0.8	0.45	1.51	2.25	1.48	11.2
200	—	310	—	82	—	73	—	3	1	716	1 040	123	**46240**	1	214	288	4.5	2.5	1	0.32	2.12	3.15	2.07	21.4
	—	310	—	103	—	82	—	3	1	893	1 380	160	**46240A**	1	214	289	10.5	2.5	1	0.32	2.12	3.15	2.07	26.3
	—	310	—	152	—	123	—	3	1	1 630	2 670	293	**46T403115**	1	214	298	14.5	2.5	1	0.43	1.57	2.34	1.53	39.9
	—	310	—	170	—	140	—	3	1	1 550	2 730	297	**46T4031**	1	214	292	15	2.5	1	0.33	2.03	3.02	1.98	44.9
	—	320	—	146	—	110	—	5	1.5	1 300	2 270	244	**46T403215**	1	222	295	18	4	1.5	0.52	1.29	1.92	1.26	41.5
	—	330	—	180	—	140	—	4	1.5	1 680	2 690	295	**46T403318**	1	218	307	20	3	1.5	0.36	1.87	2.79	1.83	56
	—	340	—	112	—	100	—	4	1.5	1 100	1 580	180	**46340**	1	218	316	6	3	1.5	0.35	1.95	2.90	1.91	39.6
	—	340	—	140	—	112	—	4	1.5	1 350	2 040	226	**46340A**	1	218	319	14	3	1.5	0.35	1.95	2.90	1.91	48.2
	—	356	—	152	—	111	—	6	1.5	1 560	2 610	280	**46T403615**	1	209	333	20	5	1.5	0.33	2.04	3.04	2.00	61.6
	—	360	—	142	—	110	—	4	1.5	1 700	2 240	252	**46T30240JR/110**	1	222	336	16	4	1.5	0.44	1.55	2.31	1.52	56.5

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

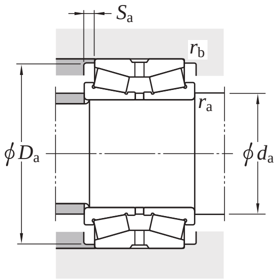
Double-row tapered roller bearings

TDO, TDOS type

d **200.025 ~ (220) mm**



Design 1 Design 1-P Design 2 Design 2-P



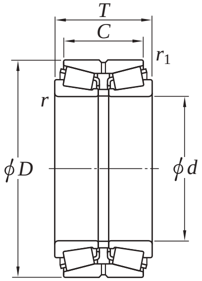
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	C mm	C 1/25.4	r 2) min.	r_1 2) min.	C_r	C_{0r}	C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
200.025	7.8750	317.500	12.5000	146.050	5.7500	111.125	4.3750	4.3	1.6	1 300	2 270	244	**93787/93127D**	1	215	294.5	17.5	4.3	1.6	0.52	1.29	1.92	1.26	40.5
	7.8750	355.600	14.0000	152.400	6.0000	111.125	4.3750	6.7	1.6	1 560	2 610	280	**EE130787/131401D**	1	220	330	20.6	6.7	1.6	0.33	2.04	3.04	2.00	61.8
	7.8750	384.175	15.1250	238.125	9.3750	193.675	7.6250	6.4	1.6	3 120	5 370	542	**H247535/H247510D**	1-P	219	362	22.2	6.4	1.6	0.33	2.03	3.02	1.98	126
203.200	8.0000	276.225	10.8750	90.485	3.5624	73.025	2.8750	3.6	0.8	804	1 430	179	**LM241149/LM241110D**	1	217	265	8.7	3.6	0.8	0.32	2.12	3.15	2.07	14.7
	8.0000	282.575	11.1250	101.600	4.0000	82.550	3.2500	3.6	0.8	749	1 410	155	**67983/67920D**	1	217	272	9.5	3.6	0.8	0.51	1.33	1.97	1.30	18.3
	8.0000	292.100	11.5000	125.415	4.9376	101.600	4.0000	3.6	1.6	1 170	2 050	230	**M241547/M241510D**	1	217	278	11.9	3.6	1.6	0.33	2.03	3.02	1.98	24.9
	8.0000	317.500	12.5000	146.050	5.7500	111.125	4.3750	4.3	1.6	1 300	2 270	244	**93800/93127D**	1	218	295	17.5	4.3	1.6	0.52	1.29	1.92	1.26	39.3
	8.0000	317.500	12.5000	146.050	5.7500	111.125	4.3750	7.9	1.6	1 300	2 270	244	**93800A/93127D**	1	225	295	17.5	7.9	1.6	0.52	1.29	1.92	1.26	39.2
	8.0000	368.300	14.5000	193.675	7.6250	136.525	5.3750	3.2	1.6	2 020	2 920	319	**EE420801/421451D**	1	216	334	28.6	3.2	1.6	0.40	1.68	2.50	1.64	79.4
	8.0000	406.400	16.0000	196.850	7.7500	127.000	5.0000	6.4	3.2	2 050	2 920	303	**EE114080/114161D**	1	222	368	34.9	6.4	3.2	0.79	0.85	1.27	0.83	105
204.788	8.0625	292.100	11.5000	125.415	4.9376	101.600	4.0000	3.6	1.6	1 170	2 050	230	**M241549/M241510D**	1	218	278	11.9	3.6	1.6	0.33	2.03	3.02	1.98	24.4
206.375	8.1250	282.575	11.1250	101.600	4.0000	82.550	3.2500	3.6	0.8	749	1 410	155	**67985/67920D**	1	220	271.5	9.5	3.6	0.8	0.51	1.33	1.97	1.30	17.5
	8.1250	317.500	12.5000	127.000	5.0000	88.900	3.5000	4	1.6	944	1 450	166	**EE132084/132126D**	1	221	293	19.1	4	1.6	0.31	2.15	3.21	2.11	30.9
	8.1250	336.550	13.2500	211.138	8.3125	169.863	6.6875	3.2	1.6	2 230	3 800	400	**H242649/H242610DC**	2	219	318	20.6	3.2	1.6	0.33	2.03	3.02	1.98	69.7
209.550	8.2500	282.575	11.1250	101.600	4.0000	82.550	3.2500	3.6	0.8	749	1 410	155	**67989/67920D**	1	223	272	9.5	3.6	0.8	0.51	1.33	1.97	1.30	16.7
	8.2500	317.500	12.5000	146.050	5.7500	111.125	4.3750	4.3	1.6	1 300	2 270	244	**93825/93127D**	1	225	295	17.5	4.3	1.6	0.52	1.29	1.92	1.26	37.0
	8.2500	333.375	13.1250	149.225	5.8750	114.300	4.5000	6.4	1.6	1 520	2 480	265	**HM743345/HM743310D**	1	229	316	17.5	6.4	1.6	0.44	1.54	2.29	1.50	45.9
210	—	300	—	110	—	85	—	1	1	942	1 550	177	**46T423011**	1	224	287	12.5	1	1	0.38	1.78	2.64	1.74	21.8
212.725	8.3750	285.750	11.2500	98.425	3.8750	76.200	3.0000	3.6	0.8	766	1 560	190	**LM742745/LM742710D**	1	226	277	11.1	3.6	0.8	0.48	1.40	2.09	1.37	16.8
215.900	8.5000	285.750	11.2500	98.425	3.8750	76.200	3.0000	3.6	0.8	766	1 560	190	**LM742749/LM742710D**	1	230	277	11.1	3.6	0.8	0.48	1.40	2.09	1.37	15.9
	8.5000	406.400	16.0000	195.263	7.6875	147.638	5.8125	6.4	1.6	2 420	3 480	370	**EE820085/820161D**	1	235	372	23.8	6.4	1.6	0.39	1.71	2.55	1.67	103
219.075	8.6250	358.775	14.1250	196.850	7.7500	181.440	7.1433	SP	SP	2 080	3 590	376	**46T443620**	2	237.9	338	7.7	4	1	0.33	2.03	3.02	1.98	78.3
220	—	340	—	90	—	80	—	4	1.5	849	1 240	142	**46244**	1	238	319	5	3	1.5	0.32	2.12	3.15	2.07	27.8
	—	340	—	113	—	90	—	4	1.5	1 040	1 620	183	**46244A**	1	238	318	11.5	3	1.5	0.32	2.12	3.15	2.07	34.2

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

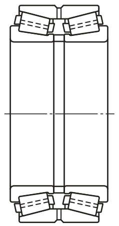
2) SP indicates the specially chamfered form.

TDO, TDOS type

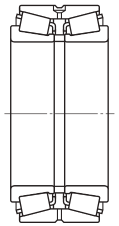
d (220) ~ 234.950 mm



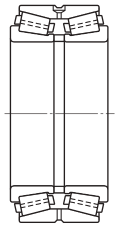
Design 1



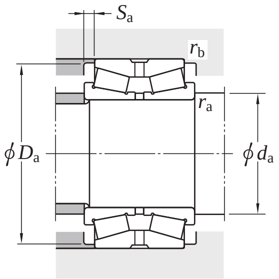
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d mm	1/25.4	D mm	1/25.4	T mm	1/25.4	C mm	1/25.4	r [2] min.	r_1 [2] min.	C_r	C_{0r}	(kN) C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	(kg)
220	—	370	—	120	—	107	—	5	1.5	1 260	1 810	202	**46344**	1	242	346	6.5	4	1.5	0.35	1.95	2.90	1.91	49.1
	—	370	—	150	—	120	—	5	1.5	1 600	2 470	272	**46344A**	1	242	343	15	4	1.5	0.35	1.95	2.90	1.91	60.1
	—	400	—	150	—	114	—	4	1.5	2 170	2 880	320	**46T30244JR/114**	1	242	371	18	4	1.5	0.42	1.61	2.39	1.57	75.8
220.663	8.6875	314.325	12.3750	131.763	5.1875	106.363	4.1875	6.4	1.6	1 320	2 450	269	**M244249/M244210D**	1	240	299	12.7	6.4	1.6	0.33	2.03	3.02	1.98	30.5
225.425	8.8750	355.600	14.0000	152.400	6.0000	111.125	4.3750	6.7	1.6	1 560	2 610	280	**EE130889/131401D**	1	245	330	20.6	6.7	1.6	0.33	2.04	3.04	2.00	51.8
228.397	8.9920	431.800	17.0000	196.850	7.7500	111.125	4.3750	6.4	3.2	2 140	2 890	304	**EE113089/113171D**	1-P	248	397	42.9	6.4	3.2	0.88	0.76	1.14	0.75	111
228.460	8.9945	431.800	17.0000	196.850	7.7500	111.125	4.3750	6.4	3.2	2 140	2 890	304	**EE113091/113171D**	1-P	248	397	42.9	6.4	3.2	0.88	0.76	1.14	0.75	111
228.600	9.0000	327.025	12.8750	114.300	4.5000	82.550	3.2500	6.4	1.6	1 000	1 860	200	**8573/8520D**	1	248	310	15.9	6.4	1.6	0.41	1.66	2.47	1.62	28.2
	9.0000	355.600	14.0000	152.400	6.0000	111.125	4.3750	7.1	1.6	1 410	2 630	278	**96900/96140D**	1	249	332	20.6	7.1	1.6	0.59	1.14	1.70	1.12	52.3
	9.0000	355.600	14.0000	152.400	6.0000	111.125	4.3750	6.7	1.6	1 560	2 610	280	**EE130902/131401D**	1	248	330	20.6	6.7	1.6	0.33	2.04	3.04	2.00	50.4
	9.0000	355.600	14.0000	152.400	6.0000	114.300	4.5000	6.4	1.6	1 660	2 740	295	**HM746646/HM746610D**	1	248	339	19.1	6.4	1.6	0.47	1.43	2.12	1.40	51.5
	9.0000	358.775	14.1250	152.400	6.0000	117.475	4.6250	3.6	1.6	1 660	3 170	333	**M249732/M249710D**	1	242	343	17.5	3.6	1.6	0.33	2.03	3.02	1.98	56.4
	9.0000	400.050	15.7500	187.325	7.3750	136.525	5.3750	10.4	1.6	2 130	3 210	338	**EE430900/431576D**	1	256	374	25.4	10.4	1.6	0.44	1.54	2.29	1.50	87.4
	9.0000	425.450	16.7500	209.550	8.2500	158.750	6.2500	7.1	1.6	2 530	3 950	411	**EE700091/700168D**	1	249	382	25.4	7.1	1.6	0.33	2.03	3.02	1.98	123
	9.0000	488.950	19.2500	345.000	13.5827	220.000	8.6614	SP	SP	4 560	7 010	614	**46T464935B**	1-P	246.6	465	62.5	4	1	0.94	0.72	1.07	0.70	298
230	—	380	—	200	—	160	—	4	1	2 440	4 070	430	**46T463820**	1	248	354	20	3	1	0.26	2.55	3.80	2.50	86.1
	—	410	—	180	—	120	—	5	1.5	2 210	3 060	340	**46T464118**	1	252	381	30	4	1.5	0.55	1.23	1.82	1.20	89.5
	—	420	—	200	—	160	—	5	1.5	2 460	3 630	380	**46T464220**	2	252	391	20	4	1.5	0.47	1.43	2.12	1.40	114
	—	430	—	215	—	130	—	6	1.5	2 580	3 700	373	**46T464322A**	1-P	258	410	42.5	5	1.5	0.94	0.72	1.07	0.70	126
231.775	9.1250	358.775	14.1250	152.400	6.0000	117.475	4.6250	6.4	1.6	1 660	3 170	333	**M249734/M249710D**	1	251	343	17.5	6.4	1.6	0.33	2.03	3.02	1.98	55.0
234.950	9.2500	327.025	12.8750	114.300	4.5000	82.550	3.2500	6.4	1.6	1 000	1 860	200	**8575/8520D**	1	254	310	15.9	6.4	1.6	0.41	1.66	2.47	1.62	26.2
	9.2500	355.600	14.0000	152.400	6.0000	111.125	4.3750	7.1	1.6	1 410	2 630	278	**96925/96140D**	1	256	332	20.6	7.1	1.6	0.59	1.14	1.70	1.12	49.5
	9.2500	384.175	15.1250	238.125	9.3750	193.675	7.6250	6.4	1.6	3 120	5 370	542	**H247548/H247510D**	1-P	254	362	22.2	6.4	1.6	0.33	2.03	3.02	1.98	104
	9.2500	384.175	15.1250	238.125	9.3750	193.675	7.6250	6.4	1.6	3 120	5 370	542	**H247549/H247510D**	1-P	254	362	22.2	6.4	1.6	0.33	2.03	3.02	1.98	104

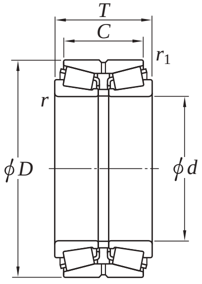
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

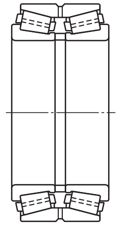
Double-row tapered roller bearings

TDO, TDOS type

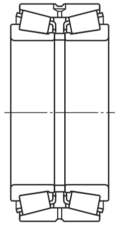
d 237.330 ~ (254.000) mm



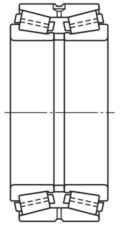
Design 1



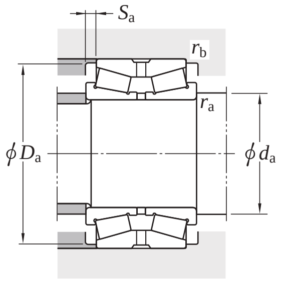
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d		*D*		*T*		*C*		*r* [2]	*r*$_1$ [2]	C_r	C_{0r}	(kN) C_u			d_a	D_a	S_a	r_a	r_b [2]	*e*	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
237.330	9.3437	358.775	14.1250	152.400	6.0000	117.475	4.6250	6.4	1.6	1 660	3 170	333	**M249736/M249710D**	1	257	343	17.5	6.4	1.6	0.33	2.03	3.02	1.98	52.6
240	—	360	—	92	—	82	—	4	1.5	962	1 430	159	**46248**	1	258	338	5	3	1.5	0.32	2.12	3.15	2.07	29.6
	—	360	—	115	—	92	—	4	1.5	1 240	1 980	216	**46248A**	1	258	341	11.5	3	1.5	0.32	2.12	3.15	2.07	36.9
	—	360	—	170	—	142	—	4	1	1 630	3 090	321	**46T483617**	2	258	345	14	3	1	0.33	2.03	3.02	1.98	57.3
	—	400	—	128	—	114	—	5	1.5	1 490	2 180	241	**46348**	1	262	377	7	4	1.5	0.35	1.95	2.90	1.91	59.0
	—	400	—	160	—	128	—	5	1.5	1 940	3 060	325	**46348A**	1	262	373	16	4	1.5	0.35	1.95	2.90	1.91	76.2
	—	400	—	209	—	168	—	5	1.5	2 760	4 370	456	**46T484021**	1	262	378	20.5	4	1.5	0.33	2.03	3.02	1.98	98.5
	—	407	—	216	—	185	—	SP	SP	2 950	4 810	494	**46T484122**	1	258.8	385	15.5	4	SP	0.33	2.03	3.02	1.98	111
	—	440	—	274	—	224	—	5	1.5	4 210	6 850	665	**46T484427**	1	249	412	25	4	1.5	0.33	2.03	3.02	1.98	179
241.300	9.5000	327.025	12.8750	114.300	4.5000	82.550	3.2500	6.4	1.6	1 000	1 860	200	**8578/8520D**	1	261	310	15.9	6.4	1.6	0.41	1.66	2.47	1.62	24.1
	9.5000	349.148	13.7460	127.000	5.0000	101.600	4.0000	6.4	1.6	1 190	2 050	224	**EE127095/127136D**	1	261	330	12.7	6.4	1.6	0.35	1.91	2.84	1.86	36.4
	9.5000	355.498	13.9960	127.000	5.0000	101.600	4.0000	6.4	1.6	1 190	2 050	224	**EE127095/127139D**	1	261	330	12.7	6.4	1.6	0.35	1.91	2.84	1.86	39.1
	9.5000	368.300	14.5000	120.650	4.7500	85.725	3.3750	6.4	1.6	1 090	1 850	203	**EE170950/171451D**	1	261	336	17.5	6.4	1.6	0.36	1.86	2.77	1.82	41.7
	9.5000	393.700	15.5000	157.163	6.1875	109.538	4.3125	6.4	1.6	1 590	3 090	325	**EE275095/275156D**	1	261	378	23.8	6.4	1.6	0.40	1.68	2.50	1.64	73.3
	9.5000	406.400	16.0000	155.575	6.1250	107.950	4.2500	6.4	1.6	1 590	3 090	325	**EE275095/275161D**	1	261	378	23.8	6.4	1.6	0.40	1.68	2.50	1.64	79.3
	9.5000	406.400	16.0000	215.900	8.5000	184.150	7.2500	6.4	1.6	2 950	4 810	494	**H249148/H249111D**	1	261	385	15.9	6.4	1.6	0.33	2.03	3.02	1.98	110
	9.5000	444.500	17.5000	209.550	8.2500	158.750	6.2500	6.4	1.6	2 750	3 960	408	**EE923095/923176D**	1	261	407	25.4	6.4	1.6	0.34	2.01	2.99	1.96	128
	9.5000	488.950	19.2500	254.000	10.0000	196.850	7.7500	6.4	1.6	3 610	5 570	553	**EE295950/295192D**	1	261	446	28.6	6.4	1.6	0.31	2.18	3.24	2.13	209
244.475	9.6250	380.898	14.9960	171.450	6.7500	127.000	5.0000	6.4	1.6	1 690	2 930	306	**EE126097/126149D**	1	264	357	22.2	6.4	1.6	0.52	1.31	1.95	1.28	65.9
	9.6250	381.000	15.0000	171.450	6.7500	127.000	5.0000	6.4	1.6	1 690	2 930	306	**EE126097/126151D**	1	264	357	22.2	6.4	1.6	0.52	1.31	1.95	1.28	66.0
247.650	9.7500	368.300	14.5000	120.650	4.7500	85.725	3.3750	6.4	1.6	1 090	1 850	203	**EE170975/171451D**	1	267	336	17.5	6.4	1.6	0.36	1.86	2.77	1.82	39.4
	9.7500	406.400	16.0000	247.650	9.7500	203.200	8.0000	6.4	1.6	3 490	6 250	612	**HH249949/HH249910D**	1-P	267	383	22.2	6.4	1.6	0.33	2.03	3.02	1.98	123
249.250	9.8130	380.898	14.9960	171.450	6.7500	127.000	5.0000	6.4	1.6	1 690	2 930	306	**EE126098/126149D**	1	269	357	22.2	6.4	1.6	0.52	1.31	1.95	1.28	63.5
	9.8130	381.000	15.0000	171.450	6.7500	127.000	5.0000	6.4	1.6	1 690	2 930	306	**EE126098/126151D**	1	269	357	22.2	6.4	1.6	0.52	1.31	1.95	1.28	63.5
254.000	10.0000	347.663	13.6875	101.600	4.0000	69.850	2.7500	3.6	1.6	1 010	1 690	192	**LM249748/LM249710D**	1	268	332	15.9	3.6	1.6	0.33	2.03	3.02	1.98	24.1

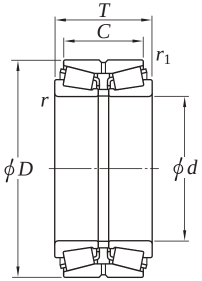
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

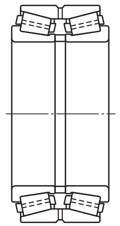
Double-row tapered roller bearings

TDO, TDOS type

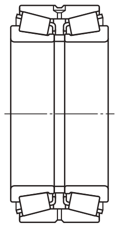
d (254.000) ~ 260.350 mm



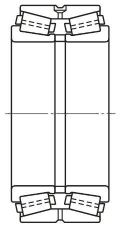
Design 1



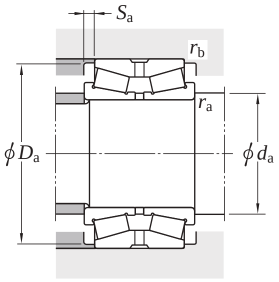
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
254.000	10.0000	358.775	14.1250	152.400	6.0000	117.475	4.6250	3.6	1.6	1 660	3 170	333	**M249749/M249710D**	1	268	343	17.5	3.6	1.6	0.33	2.03	3.02	1.98	45.0
	10.0000	365.125	14.3750	130.175	5.1250	98.425	3.8750	6.4	1.6	1 210	2 150	231	**EE134100/134144D**	1	273	346	15.9	6.4	1.6	0.37	1.80	2.69	1.76	39.8
	10.0000	393.700	15.5000	157.163	6.1875	109.538	4.3125	6.4	1.6	1 590	3 090	325	**EE275100/275156D**	1	273	378	23.8	6.4	1.6	0.40	1.68	2.50	1.64	67.3
	10.0000	406.400	16.0000	155.575	6.1250	107.950	4.2500	6.4	1.6	1 590	3 090	325	**EE275100/275161D**	1	273	378	23.8	6.4	1.6	0.40	1.68	2.50	1.64	73.4
	10.0000	422.275	16.6250	173.038	6.8125	128.588	5.0625	6.7	1.6	2 180	3 360	355	**HM252343/HM252311D**	1	274	398	22.2	6.7	1.6	0.33	2.03	3.02	1.98	87.0
	10.0000	422.275	16.6250	173.038	6.8125	128.588	5.0625	6.7	1.6	2 180	3 360	355	**HM252344/HM252311D**	1	274	398	22.2	6.7	1.6	0.33	2.03	3.02	1.98	87.0
	10.0000	422.275	16.6250	178.592	7.0312	139.700	5.5000	6.7	1.6	2 180	3 360	355	**HM252343/HM252310D**	1	274	400	19.4	6.7	1.6	0.33	2.03	3.02	1.98	89.8
	10.0000	422.275	16.6250	178.592	7.0312	139.700	5.5000	6.7	1.6	2 180	3 360	355	**HM252344/HM252310D**	1	274	400	19.4	6.7	1.6	0.33	2.03	3.02	1.98	89.8
	10.0000	431.724	16.9970	173.038	6.8125	128.588	5.0625	6.7	1.6	2 180	3 360	355	**HM252343/HM252315D**	1	274	398	22.2	6.7	1.6	0.33	2.03	3.02	1.98	93.3
	10.0000	431.724	16.9970	173.038	6.8125	128.588	5.0625	6.7	1.6	2 180	3 360	355	**HM252344/HM252315D**	1	274	398	22.2	6.7	1.6	0.33	2.03	3.02	1.98	93.3
	10.0000	533.400	21.0000	276.225	10.8750	165.100	6.5000	6.4	1.6	3 820	5 600	524	**HH953749/HH953710D**	1-P	273	496	55.6	6.4	1.6	0.94	0.72	1.07	0.70	267
260	—	400	—	104	—	92	—	5	1.5	1 170	1 830	200	**46252**	1	282	373	6	4	1.5	0.33	2.03	3.02	1.98	44.6
	—	400	—	130	—	104	—	5	1.5	1 520	2 480	265	**46252A**	1	282	376	13	4	1.5	0.32	2.12	3.15	2.07	54.8
	—	400	—	146	—	108	—	6	1.5	1 630	2 570	274	**46T524015**	1	288	374	19	5	1.5	0.39	1.71	2.54	1.67	65.0
	—	400	—	185	—	146	—	5	1.5	2 250	3 690	390	**46T524019**	1	282	378.4	19.5	4	1.5	0.29	2.32	3.45	2.26	77.1
	—	440	—	144	—	128	—	5	1.5	1 900	2 880	302	**46352**	1	282	410	8	4	1.5	0.35	1.95	2.90	1.91	83.8
	—	440	—	172	—	145	—	5	1.5	2 220	3 170	337	**46T524417**	1	282	414	13.5	4	1.5	0.43	1.59	2.36	1.55	97
	—	440	—	180	—	144	—	5	1.5	2 430	3 960	408	**46352A**	1	282	409	18	4	1.5	0.35	1.95	2.90	1.91	105
	—	440	—	224	—	180	—	5	1.5	3 380	5 350	547	**46T524422**	1	282	409	22	4	1.5	0.24	2.84	4.23	2.78	130
	—	530	—	275	—	163.9	—	6	1.5	3 500	4 910	462	**46T525328**	1-P	288	506	55	5	1.5	1.18	0.57	0.85	0.56	255
260.350	10.2500	365.125	14.3750	130.175	5.1250	98.425	3.8750	6.4	1.6	1 210	2 150	231	**EE134102/134144D**	1	280	355	15.9	6.4	1.6	0.37	1.80	2.69	1.76	37.2
	10.2500	400.050	15.7500	155.575	6.1250	107.950	4.2500	9.5	1.6	1 630	2 570	274	**EE221026/221576D**	1	286	372	23.8	9.5	1.6	0.39	1.71	2.54	1.67	58.4
	10.2500	422.275	16.6250	173.038	6.8125	128.588	5.0625	6.7	1.6	2 180	3 360	355	**HM252348/HM252311D**	1	280	398	22.2	6.7	1.6	0.33	2.03	3.02	1.98	83.6
	10.2500	422.275	16.6250	178.592	7.0312	139.700	5.5000	6.7	1.6	2 180	3 360	355	**HM252348/HM252310D**	1	280	400	19.4	6.7	1.6	0.33	2.03	3.02	1.98	86.3
	10.2500	422.275	16.6250	178.592	7.0312	139.700	5.5000	6.7	1.6	2 180	3 360	355	**HM252349/HM252310D**	1	280	400	19.4	6.7	1.6	0.33	2.03	3.02	1.98	86.3
	10.2500	431.724	16.9970	173.038	6.8125	128.588	5.0625	6.7	1.6	2 180	3 360	355	**HM252348/HM252315D**	1	280	398	22.2	6.7	1.6	0.33	2.03	3.02	1.98	89.9
	10.2500	431.724	16.9970	173.038	6.8125	128.588	5.0625	6.7	1.6	2 180	3 360	355	**HM252349/HM252315D**	1	280	398	22.2	6.7	1.6	0.33	2.03	3.02	1.98	89.9
	10.2500	488.950	19.2500	254.000	10.0000	196.850	7.7500	6.4	1.6	3 610	5 570	553	**EE295102/295192D**	1	280	446	28.6	6.4	1.6	0.31	2.18	3.24	2.13	194

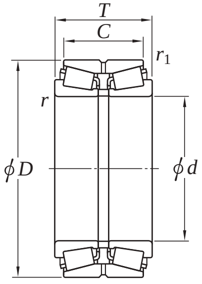
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Double-row tapered roller bearings

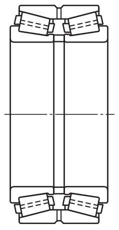
Koyo

TDO, TDOS type

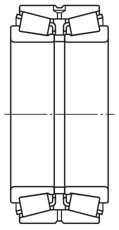
d 263.525 ~ 280.192 mm



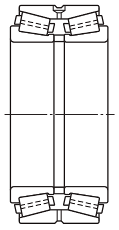
Design 1



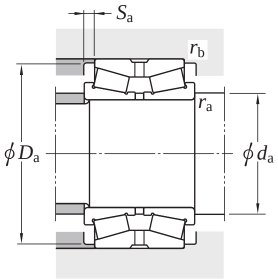
Design 1-P



Design 2



Design 2-P



Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	*r* 2) min.	*r*1 2) min.	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Bearing No. 1)	Design	Mounting dimensions (mm) d_a min.	D_a min.	S_a min.	r_a max.	r_b 2) max.	Constant *e*	Axial load factors Y_2	Y_3	Y_0	(Refer.) Mass (kg)
263.525	10.3750	355.600	14.0000	127.000	5.0000	101.600	4.0000	3.6	1.6	1 300	2 550	267	**LM451345/LM451310D**	1	277	343	12.7	3.6	1.6	0.36	1.87	2.79	1.83	33.1
266.700	10.5000	355.600	14.0000	127.000	5.0000	101.600	4.0000	3.6	1.6	1 300	2 550	267	**LM451349/LM451310D**	1	280	343	12.7	3.6	1.6	0.36	1.87	2.79	1.83	31.8
	10.5000	357.200	14.0630	127.000	5.0000	101.600	4.0000	3.6	1.6	1 300	2 550	267	**LM451349/LM451312D**	1	280	343	12.7	3.6	1.6	0.36	1.87	2.79	1.83	32.5
	10.5000	393.700	15.5000	157.163	6.1875	109.538	4.3125	6.4	1.6	1 590	3 090	325	**EE275105/275156D**	1	286	378	23.8	6.4	1.5	0.40	1.68	2.50	1.64	60.9
	10.5000	406.400	16.0000	155.575	6.1250	107.950	4.2500	6.4	1.6	1 590	3 090	325	**EE275105/275161D**	1	286	378	23.8	6.4	1.6	0.40	1.68	2.50	1.64	67.1
	10.5000	422.275	16.6250	178.598	7.0314	139.700	5.5000	6.7	1.6	2 110	3 420	352	**EE551050/551663D**	1	287	390	19.4	6.7	1.6	0.33	2.03	3.02	1.98	82.6
	10.5000	431.724	16.9970	173.038	6.8125	128.588	5.0625	6.7	1.6	2 110	3 420	352	**EE551050/551701D**	1	287	389	22.2	6.7	1.6	0.33	2.03	3.02	1.98	85.9
269.875	10.6250	381.000	15.0000	158.750	6.2500	123.825	4.8750	6.4	1.6	1 840	3 350	349	**M252349/M252310D**	1	289	364	17.5	6.4	1.6	0.33	2.03	3.02	1.98	51.4
273.050	10.7500	393.700	15.5000	157.163	6.1875	109.538	4.3125	6.4	1.6	1 590	3 090	325	**EE275108/275156D**	1	292	378	23.8	6.4	1.6	0.40	1.68	2.50	1.64	57.6
	10.7500	406.400	16.0000	155.575	6.1250	107.950	4.2500	6.4	1.6	1 590	3 090	325	**EE275108/275161D**	1	292	378	23.8	6.4	1.6	0.40	1.68	2.50	1.64	63.8
279.400	11.0000	469.900	18.5000	200.025	7.8750	149.225	5.8750	9.5	1.6	2 650	4 370	437	**EE722110/722186D**	1	305	431	25.4	9.5	1.6	0.38	1.79	2.67	1.75	127
	11.0000	488.950	19.2500	254.000	10.0000	196.850	7.7500	1.2	1.6	3 610	5 570	553	**EE295110/295192D**	1	288	446	28.6	1.2	1.6	0.31	2.18	3.24	2.13	178
279.982	11.0229	380.898	14.9960	139.700	5.5000	107.950	4.2500	3.6	1.6	1 420	2 820	286	**LM654642/LM654610D**	1	294	371	15.9	3.6	1.6	0.43	1.57	2.34	1.53	42.7
280	—	400	—	150	—	120	—	SP	SP	1 650	2 950	307	**46T564015**	1	302	386	15	4	SP	0.39	1.75	2.61	1.71	66.0
280.000	11.0236	406.400	16.0000	149.225	5.8750	117.475	4.6250	6.4	1.6	1 650	2 950	307	**EE128112/128160D**	1	299	383	15.9	6.4	1.6	0.39	1.75	2.61	1.71	58.8
	11.0236	406.400	16.0000	149.225	5.8750	117.475	4.6250	6.4	1.6	1 650	2 950	307	**EE128114/128160D**	1	299	383	15.9	6.4	1.6	0.39	1.75	2.61	1.71	58.8
280	—	420	—	106	—	94	—	5	1.5	1 260	1 970	213	**46256**	1	302	395	6	4	1.5	0.33	2.03	3.02	1.98	46.9
	—	420	—	133	—	106	—	5	1.5	1 570	2 610	277	**46256A**	1	302	394	13.5	4	1.5	0.33	2.03	3.02	1.98	58.9
	—	460	—	146	—	130	—	6	2	1 950	2 930	308	**46356**	1	308	430	8	5	2	0.35	1.95	2.90	1.91	90.0
	—	460	—	183	—	146	—	6	2	2 470	3 940	407	**46356A**	1	308	434	18.5	5	2	0.35	1.95	2.90	1.91	111
	—	500	—	195	—	145	—	6	1.5	3 140	4 520	465	**46T565020-1**	1-P	308	461	25	5	1.5	0.40	1.68	2.50	1.64	150
280.192	11.0312	406.400	16.0000	120.650	4.7500	85.725	3.3750	6.7	1.6	1 120	1 980	209	**EE101103/101601D**	1	300	375	17.5	6.7	1.6	0.41	1.66	2.47	1.62	45.5
	11.0312	406.400	16.0000	149.225	5.8750	117.475	4.6250	6.7	1.6	1 650	2 950	307	**EE128111/128160D**	1	300	383	15.9	6.7	1.6	0.39	1.75	2.61	1.71	58.6

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

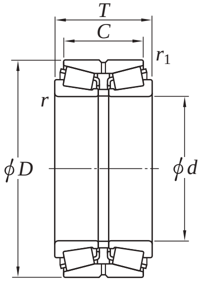
2) SP indicates the specially chamfered form.

Double-row tapered roller bearings

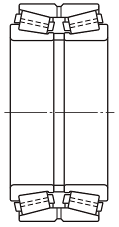
Koyo

TDO, TDOS type

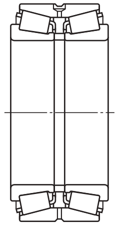
d 285.750 ~ 304.800 mm



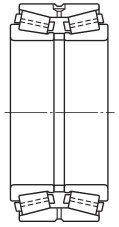
Design 1



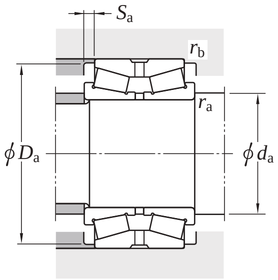
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d		*D*		*T*		*C*		*r* [2]	r_1	C_r	C_{0r}	(kN) C_u			d_a	D_a	S_a	r_a	r_b	*e*	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
285.750	11.2500	358.775	14.1250	76.200	3.0000	53.975	2.1250	3.6	1.6	516	1 070	122	**545112/545142D**	1	299	345	11.1	3.6	1.6	0.49	1.38	2.06	1.35	15.5
	11.2500	380.898	14.9960	139.700	5.5000	107.950	4.2500	3.6	1.6	1 420	2 820	286	**LM654649/LM654610D**	1	299	371	15.9	3.6	1.6	0.43	1.57	2.34	1.53	39.9
	11.2500	501.650	19.7500	203.200	8.0000	120.650	4.7500	6.4	3.2	2 440	3 460	345	**EE147112/147198D**	1	305	467	41.3	6.4	3.2	0.83	0.81	1.20	0.79	142
288.925	11.3750	406.400	16.0000	165.100	6.5000	130.175	5.1250	6.4	1.6	2 160	4 420	445	**M255449/M255410D**	1	308	388	17.5	6.4	1.6	0.34	2.00	2.97	1.95	64.7
290	—	400	—	120	—	90	—	5	1.5	1 490	2 600	274	**46T584012**	1	312	385	15	4	1.5	0.42	1.61	2.40	1.58	40.1
	—	405	—	165	—	130	—	SP	1	1 860	3 750	375	**46T584117**	2	309	388	17.5	4	1	0.34	2.00	2.97	1.95	61.2
292.100	11.5000	374.650	14.7500	104.775	4.1250	79.375	3.1250	3.6	1.6	1 010	1 940	222	**L555249/L555210D**	1	306	361	12.7	3.6	1.6	0.40	1.68	2.50	1.64	25.6
	11.5000	469.900	18.5000	200.025	7.8750	149.225	5.8750	9.5	1.6	2 650	4 370	437	**EE722115/722186D**	1	318	431	25.4	9.5	1.6	0.38	1.79	2.67	1.75	118
	11.5000	558.800	22.0000	298.450	11.7500	222.250	8.7500	6.4	1.6	5 060	8 000	746	**EE790114/790223D**	1-P	311	515	38.1	6.4	1.6	0.40	1.71	2.54	1.67	307
298.450	11.7500	444.500	17.5000	146.050	5.7500	98.425	3.8750	7.9	1.6	1 550	2 760	288	**EE291175/291751D**	1	321	414	23.8	7.9	1.6	0.38	1.79	2.66	1.75	69.3
300	—	440	—	139	—	100	—	4	0.6	1 710	2 870	300	**46T604414**	1	318	412	19.5	3	0.6	0.37	1.80	2.69	1.76	63.8
	—	460	—	118	—	105	—	5	1.5	1 630	2 400	254	**46260**	1	322	436	6.5	4	1.5	0.32	2.12	3.15	2.07	64.6
	—	460	—	148	—	118	—	5	1.5	2 050	3 230	331	**46260A**	1	322	433	15	4	1.5	0.32	2.12	3.15	2.07	80.2
	—	500	—	160	—	142	—	6	2	2 320	3 540	366	**46360**	1	328	469	9	5	2	0.35	1.95	2.90	1.91	116
	—	500	—	200	—	160	—	6	2	2 860	4 630	463	**46360A**	1	328	466	20	5	2	0.35	1.95	2.90	1.91	144
	—	500	—	200	—	160	—	6	1.5	3 140	4 650	474	**46360D**	1	328	475	20	5	1.5	0.40	1.68	2.50	1.64	139
300.038	11.8125	422.275	16.6250	174.625	6.8750	136.525	5.3750	6.4	1.6	2 130	4 030	409	**HM256849/HM256810D**	1	320	403	19.1	6.4	1.6	0.34	2.00	2.98	1.96	70.1
304.800	12.0000	393.700	15.5000	107.950	4.2500	82.550	3.2500	6.4	1.6	1 130	2 360	266	**L357049/L357010D**	1	325	379	12.7	6.4	1.6	0.36	1.88	2.80	1.84	30.7
	12.0000	412.750	16.2500	123.825	4.8750	92.075	3.6250	6.4	1.6	1 280	2 410	250	**EE109120/109163D**	1	325	394	15.9	6.4	1.6	0.43	1.58	2.35	1.55	42.1
	12.0000	444.500	17.5000	146.050	5.7500	98.425	3.8750	7.9	1.6	1 550	2 760	288	**EE291201/291751D**	1	328	414	23.8	7.9	1.6	0.38	1.79	2.66	1.75	65.9
	12.0000	495.300	19.5000	162.245	6.3876	120.650	4.7500	6.4	1.6	2 360	3 840	393	**EE941205/941951D**	1	315	463	20.8	6.4	1.6	0.40	1.68	2.50	1.64	112
	12.0000	495.300	19.5000	168.595	6.6376	127.000	5.0000	6.4	1.6	2 360	3 840	393	**EE941205/941953D**	1	315	463	20.8	6.4	1.6	0.40	1.68	2.50	1.64	117
	12.0000	495.300	19.5000	196.850	7.7500	146.050	5.7500	16	1.6	2 740	4 680	461	**EE724119/724196D**	1	344	458	25.4	16	1.6	0.40	1.68	2.50	1.64	135
	12.0000	495.300	19.5000	196.850	7.7500	146.050	5.7500	16	1.6	2 740	4 680	461	**EE724120/724196D**	1	344	458	25.4	16	1.6	0.40	1.68	2.50	1.64	135
	12.0000	558.800	22.0000	298.450	11.7500	222.250	8.7500	1.2	1.6	5 060	8 000	746	**EE790120/790223D**	1-P	315	515	38.1	1.2	1.6	0.40	1.71	2.54	1.67	293

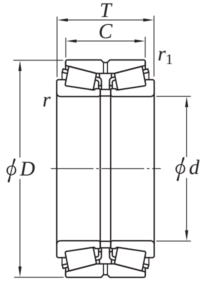
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

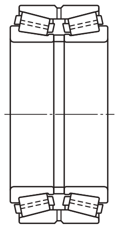
Double-row tapered roller bearings

TDO, TDOS type

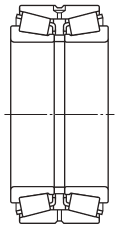
d 310 ~ (340) mm



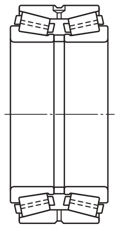
Design 1



Design 1-P



Design 2



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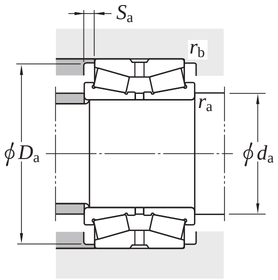


Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	r [2] min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	(kg)
310	—	470	—	200	—	149	—	SP	1.5	2 740	4 810	481	**46T624720**	1	336	445	25.5	5	1.5	0.38	1.76	2.62	1.72	113
311.150	12.2500	558.800	22.0000	190.500	7.5000	111.125	4.3750	9.5	3.2	2 360	3 490	346	**EE148122/148221D**	1	338	505	39.7	9.5	3.2	0.88	0.77	1.15	0.75	171
317.500	12.5000	444.500	17.5000	146.050	5.7500	98.425	3.8750	7.9	1.6	1 550	2 760	288	**EE291250/291751D**	1	341	414	23.8	7.9	1.6	0.38	1.79	2.66	1.75	58.9
	12.5000	447.675	17.6250	180.975	7.1250	146.050	5.7500	3.6	1.6	2 400	4 770	465	**HM259049./HM259010D.**	1	328	428	17.5	3.6	1.6	0.33	2.02	3.00	1.97	83.0
317.5	—	558.8	—	254	—	174	—	6	1.5	3 900	6 050	568	**46T645625A**	1-P	345.5	538	40	5	1.5	0.81	0.83	1.23	0.81	231
317.500	12.5000	622.300	24.5000	304.800	12.0000	174.625	6.8750	14.3	3.2	4 780	6 990	632	**H961649/H961610D**	1-P	354	585	65.1	14.3	3.2	0.94	0.72	1.07	0.70	378
320	—	480	—	121	—	108	—	5	1.5	1 800	2 700	283	**46264**	1	342	452	6.5	4	1.5	0.32	2.12	3.15	2.07	71.6
	—	480	—	151	—	121	—	5	1.5	2 060	3 410	342	**46264A**	1	342	454	15	4	1.5	0.32	2.12	3.15	2.07	87.7
	—	480	—	215	—	163	—	5	1.5	3 250	5 610	547	**46T644822AC**	2	342	460	26	4	1.5	0.46	1.47	2.19	1.44	123
	—	540	—	176	—	157	—	6	2	2 880	4 570	457	**46364**	1	348	502	9.5	5	2	0.35	1.95	2.90	1.91	154
	—	540	—	220	—	176	—	6	2	3 280	5 390	528	**46364A**	1	348	497	22	5	2	0.35	1.95	2.90	1.91	190
	—	550	—	240	—	180	—	5	2.5	4 140	6 420	630	**46T645524AC**	2	342	514	30	4	2	0.40	1.68	2.50	1.64	221
329.870	12.9870	533.400	21.0000	165.100	6.5000	114.300	4.5000	4.8	1.6	2 350	3 580	362	**EE971298/972102D**	1	346.5	494	25.4	4.8	1.6	0.33	2.03	3.02	1.98	124
	12.9870	546.100	21.5000	177.800	7.0000	152.400	6.0000	4.8	3.2	2 350	3 580	362	**EE971298/972151D**	1	347	500	12.7	4.8	3.2	0.33	2.03	3.02	1.98	150
330	—	500	—	190	—	150	—	6	1.5	2 800	4 720	467	**46T665019**	1	358	473	20	5	1.5	0.39	1.74	2.59	1.70	120
330.200	13.0000	482.600	19.0000	133.350	5.2500	88.900	3.5000	7.1	1.6	1 320	2 500	247	**EE161300/161901D**	1	352	454	22.2	7.1	1.6	0.50	1.35	2.01	1.32	74.8
	13.0000	482.600	19.0000	177.800	7.0000	127.000	5.0000	6.4	1.6	2 320	4 100	404	**EE526130/526191D**	1	350	454	25.4	6.4	1.6	0.39	1.73	2.57	1.69	96.4
	13.0000	482.600	19.0000	177.800	7.0000	127.000	5.0000	3.2	1.6	2 320	4 100	404	**EE526132/526191D**	1	344	454	25.4	3.2	1.6	0.39	1.73	2.57	1.69	96.5
330.25	—	528	—	292	—	210	—	5	1.5	4 620	8 280	758	**46T665329**	1	353	507	41	4	1.5	0.43	1.57	2.34	1.53	223
333.375	13.1250	469.900	18.5000	190.500	7.5000	152.400	6.0000	6.4	1.6	2 900	5 680	548	**HM261049/HM261010D**	1-P	354	449	19.1	6.4	1.6	0.33	2.02	3.00	1.97	97.6
340	—	500	—	150	—	120	—	6	2	2 230	3 630	367	**46T685015**	1-P	368	476	15	5	2	0.42	1.62	2.42	1.59	91.4
	—	500	—	249.225	—	203.2	—	5	1	3 340	6 450	610	**46T6850**	1	362	477	23	4	1	0.33	2.03	3.02	1.98	155
	—	520	—	133	—	118	—	6	2	1 940	3 070	314	**46268**	1	368	489	7.5	5	2	0.32	2.12	3.15	2.07	95.3

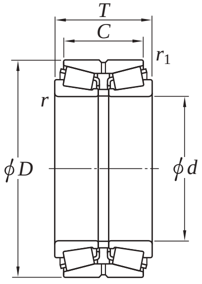
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

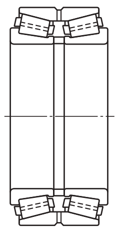
Double-row tapered roller bearings

TDO, TDOS type

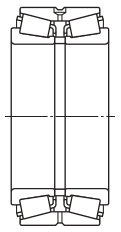
d (340) ~ 368.249 mm



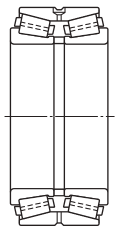
Design 1



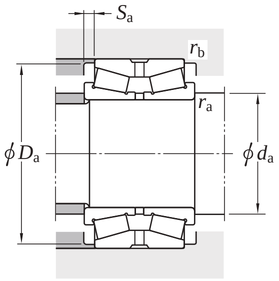
Design 1-P



Design 2



Design 2-P

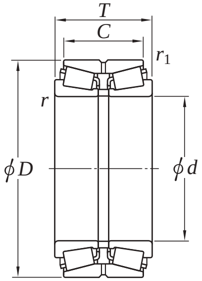


Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	(kg)
340	—	520	—	165	—	133	—	6	2	2 420	4 060	406	**46268A**	1	368	491	16	5	2	0.32	2.12	3.15	2.07	117
	—	580	—	190	—	169	—	6	2	2 980	4 620	454	**46368**	1	368	539	10.5	5	2	0.35	1.95	2.90	1.91	198
	—	580	—	238	—	190	—	6	2	3 820	6 340	606	**46368A**	1	368	543	24	5	2	0.35	1.95	2.90	1.91	244
	—	580	—	241	—	170	—	6	1.5	4 370	6 890	660	**46T685824**	1	368	540	35.5	5	1.5	0.43	1.57	2.34	1.53	237
	—	580	—	305	—	241	—	6	1.5	5 530	10 100	874	**46T685831C**	2-P	368	544	32	5	1.5	0.46	1.47	2.19	1.44	319
342.900	13.5000	533.400	21.0000	165.100	6.5000	114.300	4.5000	4.8	1.6	2 350	3 580	362	**EE971354/972102D**	1	360	494	25.4	4.8	1.6	0.33	2.03	3.02	1.98	115
	13.5000	546.100	21.5000	177.800	7.0000	152.400	6.0000	4.8	3.2	2 350	3 580	362	**EE971354/972151D**	1	360	500	12.7	4.8	3.2	0.33	2.03	3.02	1.98	141
346.075	13.6250	482.600	19.0000	133.350	5.2500	88.900	3.5000	7.1	1.6	1 320	2 500	247	**EE161363/161901D**	1	368	454	22.2	7.1	1.6	0.50	1.35	2.01	1.32	66.1
	13.6250	488.950	19.2500	200.025	7.8750	158.750	6.2500	6.4	1.6	2 890	5 800	553	**HM262749/HM262710D**	1	366	467	20.6	6.4	1.6	0.33	2.02	3.00	1.97	111
349.250	13.7500	514.350	20.2500	193.675	7.6250	152.400	6.0000	6.4	1.6	2 740	5 070	499	**EE333137/333203D**	1	370	483	20.6	6.4	1.6	0.37	1.80	2.69	1.76	126
355	—	515	—	194	—	152.4	—	6.4	1.5	2 740	5 110	499	**46T715219C**	2	383	478	20.8	5	1.5	0.37	1.84	2.74	1.80	121
355.600	14.0000	444.500	17.5000	136.525	5.3750	111.125	4.3750	3.6	1.6	1 390	3 450	332	**L163149/L163110D**	1	370	428	12.7	3.6	1.6	0.31	2.20	3.27	2.15	45.0
	14.0000	482.600	19.0000	133.350	5.2500	88.900	3.5000	7.1	1.6	1 320	2 500	247	**EE161400/161901D**	1	377	454	22.2	7.1	1.6	0.50	1.35	2.01	1.32	60.7
	14.0000	501.650	19.7500	155.575	6.1250	107.950	4.2500	6.4	1.6	1 700	3 280	322	**EE231400/231976D**	1	376	481	23.8	6.4	1.6	0.44	1.53	2.28	1.50	87.2
	14.0000	514.350	20.2500	155.575	6.1250	107.950	4.2500	6.4	1.6	1 700	3 280	322	**EE231400/232026D**	1	376	481	23.8	6.4	1.6	0.44	1.53	2.28	1.50	95.7
	14.0000	514.350	20.2500	193.675	7.6250	152.400	6.0000	6.4	1.6	2 740	5 070	499	**EE333140/333203D**	1	376	483	20.6	6.4	1.6	0.37	1.80	2.69	1.76	120
360	—	540	—	134	—	120	—	6	2	2 070	3 290	332	**46272**	1	388	510	7	5	2	0.32	2.12	3.15	2.07	93.0
	—	540	—	169	—	134	—	6	2	2 530	4 230	419	**46272A**	1	388	512	17.5	5	2	0.32	2.12	3.15	2.07	124
	—	540	—	184	—	140	—	6	1.5	3 020	4 980	487	**46T725418**	1	388	510	22	5	1.5	0.29	2.32	3.45	2.26	131
	—	590	—	320	—	260	—	6	1.5	6 190	11 500	1 010	**46T725932**	1	388	556	30	5	1.5	0.35	1.95	2.90	1.91	328
	—	600	—	192	—	171	—	6	2	3 140	4 880	473	**46372**	1	388	557	10.5	5	2	0.35	1.95	2.90	1.91	206
	—	600	—	240	—	192	—	6	2	4 590	7 230	689	**46372A**	1-P	388	568	24	5	2	0.39	1.74	2.59	1.70	254
368.249	14.4980	523.875	20.6250	214.313	8.4375	169.863	6.6875	6.4	1.6	3 590	7 060	663	**46T745221**	1	388	505	22.2	6.4	1.6	0.33	2.03	3.02	1.98	138
	14.4980	523.875	20.6250	214.313	8.4375	169.863	6.6875	6.4	1.6	3 420	6 780	644	**HM265049/HM265010D**	1-P	388	505	22.2	6.4	1.6	0.33	2.03	3.02	1.98	119

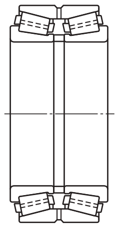
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

TDO, TDOS type

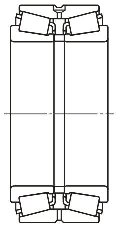
d 368.300 ~ (400) mm



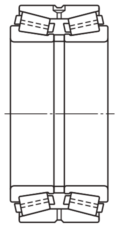
Design 1



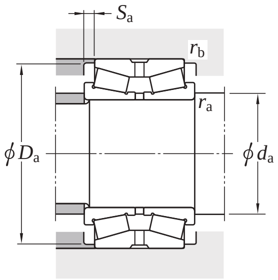
Design 1-P



Design 2



Design 2-P



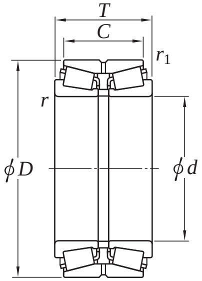
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d mm	1/25.4	D mm	1/25.4	T mm	1/25.4	C mm	1/25.4	r [2] min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	(kg)
368.300	14.5000	596.900	23.5000	203.200	8.0000	133.350	5.2500	9.5	2.4	3 410	5 410	526	**EE181453/182351D**	1-P	395	555	34.9	9.5	2.4	0.41	1.63	2.42	1.59	203
370	—	680	—	280	—	188	—	6	2.5	4 890	8 610	749	**46T746828AC**	2-P	398	630	46	5	2	0.87	0.78	1.16	0.76	422
371.475	14.6250	501.650	19.7500	155.575	6.1250	107.950	4.2500	6.4	1.6	1 700	3 280	322	**EE231462/231976D**	1	392	481	23.8	6.4	1.6	0.44	1.53	2.28	1.50	76.2
	14.6250	514.350	20.2500	155.575	6.1250	107.950	4.2500	6.4	1.6	1 700	3 280	322	**EE231462/232026D**	1	392	481	23.8	6.4	1.6	0.44	1.53	2.28	1.50	84.7
380	—	520	—	149	—	112	—	5	1.5	2 180	3 990	391	**46T765215**	1	402	493	18.5	4	1.5	0.29	2.32	3.45	2.26	82
	—	560	—	135	—	122	—	6	2	2 190	3 560	355	**46276**	1	408	530	6.5	5	2	0.32	2.12	3.15	2.07	100
	—	560	—	171	—	135	—	6	2	2 810	4 670	456	**46276A**	1	408	531	18	5	2	0.39	1.74	2.59	1.70	129
	—	620	—	194	—	173	—	6	2	3 380	5 220	500	**46376**	1	408	582	10.5	5	2	0.39	1.74	2.59	1.70	215
	—	620	—	241	—	170	—	6	1.5	4 330	7 080	669	**46T766224**	1	408	575	35.5	5	1.5	0.46	1.47	2.19	1.44	255
	—	620	—	243	—	194	—	6	2	4 390	7 360	683	**46376A**	1	408	587	24.5	5	2	0.35	1.95	2.90	1.91	265
381.000	15.0000	508.000	20.0000	139.700	5.5000	88.900	3.5000	6.4	1.6	1 480	2 980	288	**EE192150/192201D**	1	401	480	25.4	6.4	1.6	0.53	1.27	1.89	1.24	66.7
	15.0000	546.100	21.5000	222.250	8.7500	177.800	7.0000	6.4	1.6	4 090	8 430	773	**HM266447/HM266410D**	1-P	401	520	22.2	6.4	1.6	0.33	2.03	3.02	1.98	166
	15.0000	590.550	23.2500	244.475	9.6250	193.675	7.6250	6.4	1.6	4 240	8 930	803	**M268730/M268710D**	1-P	401	565	25.4	6.4	1.6	0.33	2.03	3.02	1.98	244
384.175	15.1250	546.100	21.5000	222.250	8.7500	177.800	7.0000	6.4	1.6	4 090	8 430	773	**HM266449/HM266410D**	1-P	404	520	22.2	6.4	1.6	0.33	2.03	3.02	1.98	163
385	—	550	—	220	—	180	—	SP	1.5	4 090	8 430	773	**46T775522**	1-P	408	524	20	4	1.5	0.33	2.03	3.02	1.98	170
390	—	630	—	254	—	170	—	6	1.5	4 340	7 490	672	**46T786325**	1-P	418	601	42	5	1.5	0.76	0.88	1.31	0.86	290
393.700	15.5000	539.750	21.2500	142.875	5.6250	101.600	4.0000	6.4	1.6	1 860	3 810	357	**EE234154/234213D**	1	414	515	20.6	6.4	1.6	0.48	1.42	2.11	1.39	89.0
	15.5000	546.100	21.5000	158.750	6.2500	117.475	4.6250	6.4	1.6	1 860	3 810	357	**EE234154/234216D**	1	414	515	20.6	6.4	1.6	0.48	1.42	2.11	1.39	102
396.875	15.6250	539.750	21.2500	142.875	5.6250	101.600	4.0000	6.4	1.6	1 860	3 810	357	**EE234156/234213D**	1	417	515	20.6	6.4	1.6	0.48	1.42	2.11	1.39	86.8
	15.6250	546.100	21.5000	158.750	6.2500	117.475	4.6250	6.4	1.6	1 860	3 810	357	**EE234156/234216D**	1	417	515	20.6	6.4	1.6	0.48	1.42	2.11	1.39	100
400	—	540	—	140	—	100	—	6	1.5	1 860	3 840	369	**46T805414**	1	428	510	20	5	1.5	0.48	1.42	2.11	1.39	81.8
	—	600	—	148	—	132	—	6	2	2 350	3 720	366	**46280**	1	428	560	8	5	2	0.32	2.12	3.15	2.07	135
	—	600	—	185	—	148	—	6	2	3 030	5 150	491	**46280A**	1	428	563	18.5	5	2	0.32	2.12	3.15	2.07	167

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

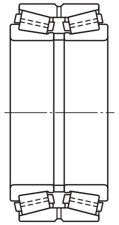
2) SP indicates the specially chamfered form.

TDO, TDOS type

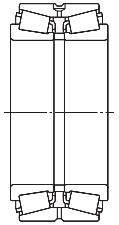
d (400) ~ (431.800) mm



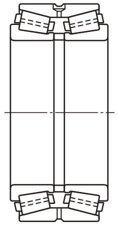
Design 1



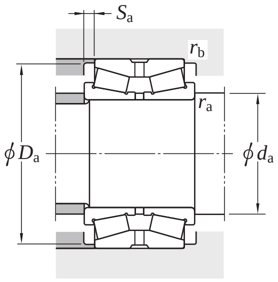
Design 1-P



Design 2



Design 2-P



Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	*r* [2] min.	r_1 [2] min.	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Bearing No. [1]	Design	Mounting dimensions (mm) d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	Constant *e*	Axial load factors Y_2	Y_3	Y_0	(Refer.) Mass (kg)
400	—	600	—	205	—	150	—	6	1.5	3 550	6 270	593	**46T806021**	1	428	560	27.5	5	1.5	0.40	1.68	2.50	1.64	187
	—	650	—	200	—	178	—	6	3	3 740	5 920	565	**46380**	1	428	605	11	5	2.5	0.35	1.95	2.90	1.91	243
	—	650	—	250	—	200	—	6	3	5 110	8 850	811	**46380A**	1-P	428	610	25	5	2.5	0.35	1.95	2.90	1.91	306
	—	650	—	280	—	180	—	6	2.5	4 890	8 610	749	**46T806528AC**	2-P	428	625	50	5	2	0.87	0.78	1.16	0.76	335
406.400	16.0000	539.750	21.2500	142.875	5.6250	101.600	4.0000	6.4	1.6	1 860	3 810	357	**EE234160/234213D**	1	428	515	20.6	6.4	1.6	0.48	1.42	2.11	1.39	80.2
	16.0000	546.100	21.5000	158.750	6.2500	117.475	4.6250	6.4	1.6	1 860	3 810	357	**EE234160/234216D**	1	428	515	20.6	6.4	1.6	0.48	1.42	2.11	1.39	92.6
	16.0000	574.675	22.6250	157.163	6.1875	106.363	4.1875	6.7	1.6	2 040	3 880	367	**EE285160/285228D**	1	428	535	25.4	6.7	1.6	0.50	1.35	2.01	1.32	113
	16.0000	574.675	22.6250	175.000	6.8898	118.000	4.6457	SP	SP	2 530	4 620	439	**46T815718**	1-P	426.4	550	28.5	4	2	0.70	0.97	1.44	0.94	126
	16.0000	590.550	23.2500	228.600	9.0000	174.625	6.8750	9.5	1.6	3 830	7 070	658	**EE833160X/833233D**	1	434	560	27	9.5	1.6	0.32	2.08	3.10	2.04	188
	16.0000	609.524	23.9970	177.800	7.0000	133.350	5.2500	7.9	1.6	3 260	6 060	567	**EE736160/736239D**	1	431	575	22.2	4	7.9	0.35	1.95	2.90	1.91	164
	16.0000	609.600	24.0000	187.325	7.3750	123.825	4.8750	6.7	1.6	3 060	5 280	503	**EE911600/912401D**	1	428	570	31.8	6.7	1.6	0.38	1.76	2.62	1.72	167
	16.0000	673.100	26.5000	192.639	7.5842	127.000	5.0000	6.4	1.6	3 170	5 240	494	**EE571602/572651D**	1	428	620	32.8	6.4	1.6	0.40	1.68	2.50	1.64	232
	16.0000	673.100	26.5000	192.639	7.5842	152.400	6.0000	6.4	1.6	3 170	5 240	494	**EE571602/572653D**	1	428	630	20.1	6.4	1.6	0.40	1.68	2.50	1.64	242
409.575	16.1250	546.100	21.5000	185.738	7.3125	147.638	5.8125	6.4	1.6	2 850	5 740	541	**M667948/M667911D**	1	431	530	19.1	6.4	1.6	0.42	1.62	2.42	1.59	110
415.925	16.3750	590.550	23.2500	244.475	9.6250	193.675	7.6250	6.4	1.6	4 240	8 930	803	**M268749/M268710D**	1-P	437	565	25.4	6.4	1.6	0.33	2.03	3.02	1.98	203
420	—	620	—	150	—	134	—	6	2	2 520	4 130	399	**46284**	1	448	590	8	5	2	0.33	2.03	3.02	1.98	142
	—	620	—	188	—	150	—	6	2	3 390	5 660	534	**46284A**	1	448	589	19	5	2	0.39	1.74	2.59	1.70	176
	—	620	—	190	—	125	—	6	1.5	2 580	4 380	415	**46T846219**	1	448	583	32	5	1.5	0.35	1.95	2.91	1.91	184
	—	622.3	—	240	—	135	—	7.5	1.5	3 380	5 920	542	**46T846224**	1	456	605	52.5	6	1.5	0.87	0.78	1.16	0.76	214
	—	700	—	224	—	200	—	6	3	4 650	6 880	647	**46384**	1	448	656	12	5	2.5	0.39	1.74	2.59	1.70	325
	—	700	—	274	—	200	—	6	2.5	6 050	9 570	873	**46T847027**	1-P	448	650	37	5	2	0.32	2.12	3.15	2.07	386
	—	700	—	280	—	224	—	6	3	6 040	9 620	861	**46384A**	1-P	448	659	28	5	2.5	0.39	1.74	2.59	1.70	400
430.213	16.9375	603.250	23.7500	159.639	6.2850	104.775	4.1250	6.4	1.6	2 090	3 770	361	**EE241693/242377D**	1	451	565	27.4	6.4	1.6	0.53	1.28	1.91	1.26	113
431.800	17.0000	571.500	22.5000	155.575	6.1250	111.125	4.3750	3.2	1.6	2 110	4 270	405	**LM869448/LM869410D**	1	447	555	22.2	3.2	1.6	0.55	1.24	1.84	1.21	97.3
	17.0000	603.250	23.7500	159.639	6.2850	104.775	4.1250	6.4	1.6	2 090	3 770	361	**EE241701/242377D**	1	453	565	27.4	6.4	1.6	0.53	1.28	1.91	1.26	112

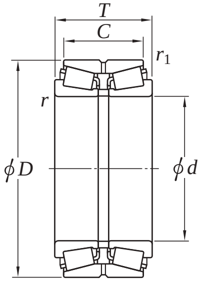
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

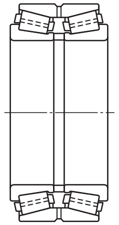
Double-row tapered roller bearings

TDO, TDOS type

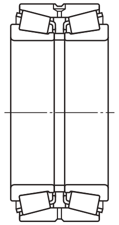
d (431.800) ~ 482.600 mm



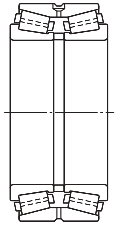
Design 1



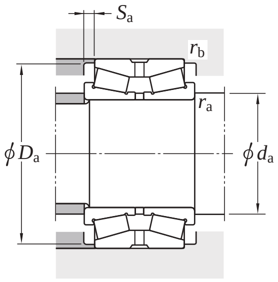
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	*r* [2] min.	*r*$_1$ [2] min.	C_r	C_{0r}	C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
431.800	17.0000	673.100	26.5000	192.639	7.5842	127.000	5.0000	6.4	1.6	3 170	5 240	494	**EE571703/572651D**	1	453	620	32.8	6.4	1.6	0.40	1.68	2.50	1.64	207
	17.0000	673.100	26.5000	192.639	7.5842	152.400	6.0000	6.4	1.6	3 170	5 240	494	**EE571703/572653D**	1	453	630	20.1	6.4	1.6	0.40	1.68	2.50	1.64	217
440	—	650	—	157	—	140	—	6	3	2 840	4 430	423	**46288**	1	468	622	8.5	5	2.5	0.33	2.03	3.02	1.98	156
	—	650	—	196	—	157	—	6	3	3 770	6 370	600	**46288A**	1	468	620	19.5	5	2.5	0.39	1.74	2.59	1.70	198
	—	720	—	283	—	226	—	6	3	6 210	10 100	893	**46388A**	1-P	468	679	28.5	5	2.5	0.40	1.68	2.51	1.65	418
441.325	17.3750	660.400	26.0000	195.263	7.6875	138.113	5.4375	10.4	1.6	2 900	5 260	482	**EE737173/737261D**	1	471	615	28.6	10.4	1.6	0.37	1.80	2.69	1.76	207
447.675	17.6250	635.000	25.0000	257.175	10.1250	206.375	8.1250	6.4	1.6	4 920	10 500	917	**M270749/M270710D**	1-P	469	605	25.4	6.4	1.6	0.33	2.03	3.02	1.98	247
457.200	18.0000	596.900	23.5000	165.100	6.5000	120.650	4.7500	9.5	1.6	2 410	5 230	486	**EE244180/244236D**	1	485	570	22.2	9.5	1.6	0.40	1.67	2.48	1.63	108
	18.0000	605.000	23.8189	165.100	6.5000	120.650	4.7500	SP	SP	2 410	5 230	486	**46T916117**	2-P	489	575	22	6	0.8	0.40	1.67	2.48	1.63	130
460	—	680	—	163	—	145	—	6	3	3 130	5 340	507	**46292**	1-P	488	637	9	5	2.5	0.37	1.83	2.72	1.78	196
	—	680	—	204	—	163	—	6	3	4 040	6 850	635	**46292A**	1-P	488	646	20.5	5	2.5	0.39	1.74	2.59	1.70	232
	—	680	—	229	—	175	—	6	2.5	4 300	7 390	679	**46T926823**	1	488	645	27	5	2	0.32	2.12	3.15	2.07	251
	—	760	—	240	—	214	—	7.5	4	5 460	9 000	817	**46392**	1-P	496	710	13	6	3	0.39	1.74	2.59	1.70	424
	—	760	—	300	—	240	—	7.5	4	7 130	11 600	1 010	**46392A**	1-P	496	718	30	6	3	0.39	1.74	2.59	1.70	506
479.425	18.8750	679.450	26.7500	276.225	10.8750	222.250	8.7500	6.4	1.6	5 940	12 700	1 070	**46T966828**	2-P	490	649	27	6.4	1.6	0.33	2.03	3.02	1.98	309
	18.8750	679.450	26.7500	276.225	10.8750	222.250	8.7500	6.4	1.6	5 310	11 100	952	**M272749/M272710D**	1-P	500	650	27	6.4	1.6	0.33	2.03	3.02	1.98	296
480	—	615	—	120	—	94	—	3	1	1 830	3 620	343	**46T966212**	1	494	590	13	2.5	1	0.35	1.95	2.90	1.91	80.1
	—	700	—	165	—	147	—	6	3	3 180	5 300	494	**46296**	1	508	672	9	5	2.5	0.33	2.03	3.02	1.98	186
	—	700	—	206	—	165	—	6	3	4 040	7 230	666	**46296A**	1	508	666	20.5	5	2.5	0.33	2.03	3.02	1.98	240
	—	700	—	275	—	200	—	6	3	3 160	10 300	475	**46T967028**	1-P	508	676	37	5	2.5	0.55	1.24	1.84	1.21	350
	—	790	—	248	—	221	—	7.5	4	5 820	8 920	810	**46396**	1-P	516	742	13.5	6	3	0.39	1.74	2.59	1.70	457
	—	790	—	310	—	248	—	7.5	4	7 530	12 400	1 060	**46396A**	1-P	516	749	31	6	3	0.39	1.74	2.59	1.70	560
482.600	19.0000	615.950	24.2500	184.150	7.2500	146.050	5.7500	6.4	1.6	3 040	7 110	639	**LM272249/LM272210D**	1	505	595	19.1	6.4	1.6	0.33	2.03	3.02	1.98	125
	19.0000	634.873	24.9950	177.800	7.0000	142.875	5.6250	6.4	1.6	2 840	6 590	585	**EE243190/243251D**	1	505	610	17.5	6.4	1.6	0.34	1.97	2.93	1.93	143

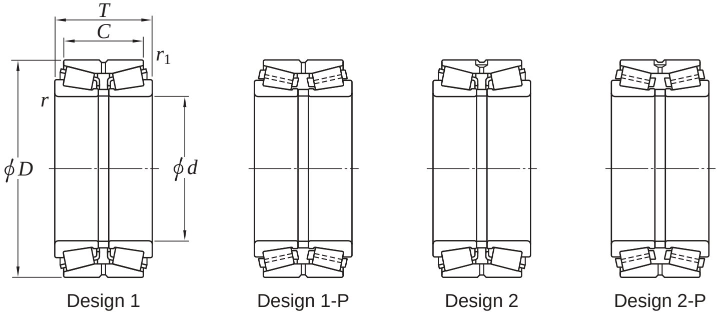
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

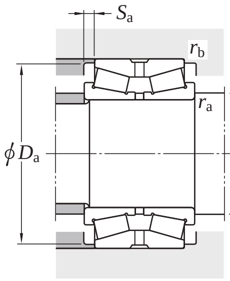
2) SP indicates the specially chamfered form.

Double-row tapered roller bearings

TDO, TDOS type

d 488.671 ~ 546.100 mm





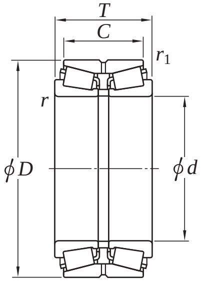
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
488.671	19.2390	660.400	26.0000	206.375	8.1250	158.750	6.2500	6.4	1.6	3 870	7 910	713	**EE640191/640261D**	1-P	510	630	23.8	6.4	1.6	0.31	2.20	3.27	2.15	186
488.950	19.2500	634.873	24.9950	180.975	7.1250	136.525	5.3750	6.4	1.6	3 090	6 840	613	**LM772748/LM772710D**	1	510	615	22.2	6.4	1.6	0.47	1.43	2.12	1.40	135
	19.2500	660.400	26.0000	206.375	8.1250	158.750	6.2500	6.4	1.6	3 870	7 910	713	**EE640192/640261D**	1-P	510	630	23.8	6.4	1.6	0.31	2.20	3.27	2.15	186
489.026	19.2530	634.873	24.9950	177.800	7.0000	142.875	5.6250	6.4	1.6	2 840	6 590	585	**EE243192/243251D**	1	510	610	17.5	6.4	1.6	0.34	1.97	2.93	1.93	136
490	—	640	—	179	—	144	—	7.5	2	3 050	6 480	581	**46T986418**	1	526	615	17.5	6	2	0.37	1.80	2.69	1.76	139
498.475	19.6250	634.873	24.9950	177.800	7.0000	142.875	5.6250	6.4	1.6	2 840	6 590	585	**EE243196/243251D**	1	520	610	17.5	6.4	1.6	0.34	1.97	2.93	1.93	126
500	—	720	—	167	—	149	—	6	3	3 230	5 690	529	**462/500**	1-P	528	679	9	5	2.5	0.40	1.71	2.54	1.67	210
	—	720	—	209	—	167	—	6	3	4 390	7 850	712	**462/500A**	1-P	528	690	21	5	2.5	0.42	1.62	2.41	1.58	258
	—	830	—	264	—	235	—	7.5	4	6 570	10 900	955	**463/500**	1-P	536	776	14.5	6	3	0.39	1.74	2.59	1.70	559
	—	830	—	330	—	264	—	7.5	4	8 510	14 000	1 170	**463/500A**	1-P	536	784	33	6	3	0.39	1.74	2.59	1.70	669
506	—	636	—	187	—	147	—	7	2	3 010	7 110	632	**2TR506**	1	542	620	20	6	2	0.35	1.95	2.90	1.91	126
508.000	20.0000	736.600	29.0000	186.502	7.3426	114.300	4.5000	6.4	1.6	3 160	5 150	475	**EE982003/982901D**	1-P	530	690	36.1	6.4	1.6	0.48	1.42	2.11	1.39	220
515	—	720	—	140	—	180	—	6	3	3 550	6 550	600	**2TR515C3**	1-P	540	682	20	5	2.5	0.39	1.74	2.59	1.70	204
520.700	20.5000	736.600	29.0000	186.502	7.3426	114.300	4.5000	6.4	1.6	3 160	5 150	475	**EE982051/982901D**	1-P	545	690	36.1	6.4	1.6	0.48	1.42	2.11	1.39	205
530	—	780	—	185	—	163	—	6	3	3 820	6 860	619	**2TR530D**	2-P	550	732	11	5	2.5	0.47	1.43	2.12	1.40	283
	—	780	—	185	—	163	—	6	3	4 310	7 070	643	**462/530**	1-P	558	744	11	5	2.5	0.39	1.74	2.59	1.70	280
	—	780	—	231	—	185	—	6	3	5 500	9 980	882	**462/530A**	1-P	558	746	23	5	2.5	0.39	1.74	2.59	1.70	351
533.400	21.0000	812.800	32.0000	269.875	10.6250	187.325	7.3750	9.5	3.2	5 680	11 000	947	**EE626210/626321D**	1-P	565	760	41.3	9.5	3.2	0.44	1.54	2.29	1.50	459
536.575	21.1250	761.873	29.9950	311.15	12.2500	247.65	9.7500	6.4	1.6	7 060	14 400	1 190	**M276449/10CD**	2-P	555	726	32	6.4	1.6	0.33	2.03	3.02	1.98	424
546.100	21.5000	736.600	29.0000	165.100	6.5000	114.300	4.5000	6.4	3.2	3 030	6 100	550	**EE542215/542291D**	1-P	570	705	25.4	6.4	3.2	0.51	1.33	1.97	1.30	181

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

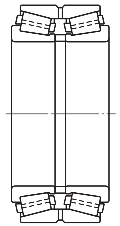
Double-row tapered roller bearings

TDO, TDOS type

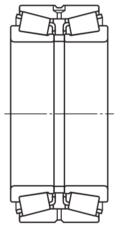
d 558.800 ~ (609.600) mm



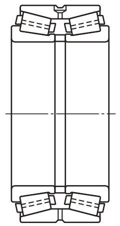
Design 1



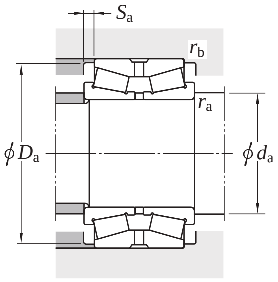
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d		D		T		C		r 2)	r_1 2)	C_r	C_{0r}	C_u			d_a	D_a	S_a	r_a	r_b	e	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						min.	min.	min.	max.	max.					
558.800	22.0000	736.600	29.0000	165.100	6.5000	114.300	4.5000	6.4	3.2	3 030	6 100	550	**EE542220/542291D**	1-P	580	705	25.4	6.4	3.2	0.51	1.33	1.97	1.30	167
	22.0000	736.600	29.0000	187.328	7.3751	138.113	5.4375	6.4	1.6	3 710	8 050	714	**EE843220/843291D**	1-P	580	710	24.6	6.4	1.6	0.34	1.97	2.93	1.93	198
	22.0000	736.600	29.0000	225.425	8.8750	160	6.2992	6.4	1.6	4 050	9 180	776	**2TR559**	1-P	580	720	32.7	6.4	1.6	0.70	0.97	1.44	0.94	239
	22.0000	736.600	29.0000	225.425	8.8750	177.800	7.0000	6.4	1.6	4 500	9 870	854	**LM377449/LM377410D**	1-P	580	710	23.8	6.4	1.6	0.35	1.95	2.90	1.91	240
	22.0000	742.950	29.2500	187.328	7.3751	138.113	5.4375	6.4	1.6	3 710	8 050	714	**EE843220/843292D**	1-P	580	710	24.6	6.4	1.6	0.34	1.97	2.93	1.93	206
560	—	735	—	225	—	180	—	6	1.5	4 500	9 870	854	**46T117423**	2-P	588	710	22.5	5	1.5	0.35	1.95	2.90	1.91	236
560.000	22.0472	740.000	29.1339	190.000	7.4803	140.000	5.5118	SP	SP	3 710	8 050	714	**2TR560B**	1-P	585	715	25	4	0.8	0.34	1.97	2.93	1.93	220
560	—	820	—	195	—	173	—	6	3	4 280	7 940	702	**2TR560L**	2-P	595	768	11	5	2.5	0.39	1.74	2.59	1.70	336
	—	820	—	195	—	173	—	6	3	4 650	7 990	710	**462/560**	1-P	588	779	11	5	2.5	0.39	1.74	2.59	1.70	330
	—	820	—	244	—	195	—	6	3	5 970	11 000	960	**462/560A**	1-P	588	774	24.5	5	2.5	0.33	2.03	3.02	1.98	410
	—	920	—	280	—	246	—	7.5	4	7 530	11 700	1 010	**463/560**	1-P	596	863	17	6	3	0.39	1.74	2.59	1.70	694
	—	920	—	350	—	280	—	7.5	4	9 830	16 400	1 330	**463/560A**	1-P	596	869	35	6	3	0.39	1.74	2.59	1.70	856
571.500	22.5000	812.800	32.0000	333.375	13.1250	263.525	10.3750	6.4	1.6	8 150	17 500	1 400	**M278749/10D**	1-P	600	778	35	6.4	1.6	0.33	2.03	3.02	1.98	526
580	—	800	—	300	—	235	—	7	3	7 210	15 400	1 250	**2TR580A**	1-P	608	768	32.5	6	2.5	0.33	2.03	3.02	1.98	425
590	—	990	—	400	—	270	—	7.5	2.5	11 200	19 000	1 470	**2TR590**	1-P	626	940	65	6	2	0.70	0.97	1.44	0.94	1 140
600	—	870	—	200	—	176	—	6	3	4 930	8 290	726	**462/600**	1-P	628	833	12	5	2.5	0.39	1.74	2.59	1.70	369
	—	870	—	250	—	200	—	6	3	6 680	12 600	1 070	**462/600A**	1-P	628	826	25	5	2.5	0.33	2.03	3.02	1.98	466
	—	870	—	269	—	198	—	6	2.5	7 080	13 500	1 130	**2TR600J**	1-P	628	830	35.5	5	2	0.40	1.68	2.50	1.64	494
	—	980	—	300	—	264	—	7.5	4	8 740	13 900	1 170	**463/600**	1-P	636	920	18	6	3	0.37	1.80	2.69	1.76	850
602.945	23.7380	787.400	31.0000	206.375	8.1250	158.750	6.2500	6.4	1.6	4 260	9 940	840	**EE649237/649311D**	1-P	625	755	23.8	6.4	1.6	0.37	1.82	2.70	1.78	252
	23.7380	793.750	31.2500	206.375	8.1250	158.750	6.2500	6.4	1.6	4 260	9 940	840	**EE649237/649313D**	1-P	625	755	23.8	6.4	1.6	0.37	1.82	2.70	1.78	261
609.600	24.0000	787.400	31.0000	206.375	8.1250	158.750	6.2500	6.4	1.6	4 260	9 940	840	**EE649240/649311D**	1-P	635	755	23.8	6.4	1.6	0.37	1.82	2.70	1.78	241
	24.0000	793.750	31.2500	206.375	8.1250	158.750	6.2500	6.4	1.6	4 260	9 940	840	**EE649240/649313D**	1-P	635	755	23.8	6.4	1.6	0.37	1.82	2.70	1.78	251

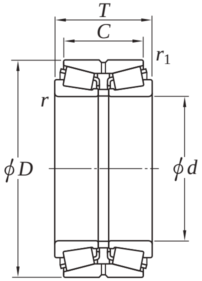
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

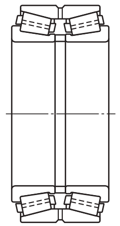
Double-row tapered roller bearings

TDO, TDOS type

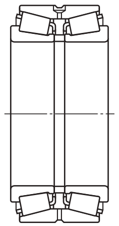
d (609.600) ~ 850 mm



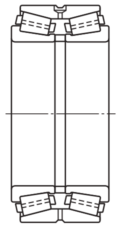
Design 1



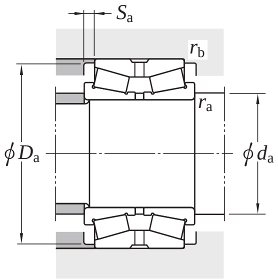
Design 1-P



Design 2



Design 2-P



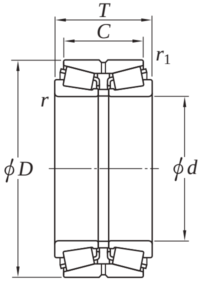
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. 1)	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*C* mm	1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	(kg)
609.600	24.0000	812.800	32.0000	190.500	7.5000	146.050	5.7500	6.4	3.2	4 100	8 590	743	**EE743240/743321D**	1-P	635	770	22.2	6.4	3.2	0.33	2.06	3.06	2.01	250
630	—	800	—	180	—	140	—	6	2	3 720	8 310	708	**2TR630**	1-P	658	775	20	5	2	0.37	1.80	2.69	1.76	210
	—	920	—	212	—	186	—	7.5	4	5 630	9 550	830	**462/630**	1-P	666	878	13	6	3	0.39	1.74	2.59	1.70	446
	—	920	—	265	—	212	—	7.5	4	7 350	13 800	1 150	**462/630A**	1-P	666	874	26.5	6	3	0.33	2.03	3.02	1.98	556
	—	1 030	—	389	—	315	—	7.5	4	12 300	21 600	1 660	**463/630A**	1-P	666	978	37	6	3	0.39	1.74	2.59	1.70	1 210
670	—	880	—	185	—	130	—	6	2	4 160	8 780	745	**2TR670A**	1-P	700	843	27.5	5	2	0.45	1.50	2.23	1.46	270
	—	980	—	230	—	202	—	7.5	4	6 090	11 500	966	**462/670**	1-P	706	931	14	6	3	0.39	1.74	2.59	1.70	568
	—	980	—	288	—	230	—	7.5	4	8 400	15 900	1 280	**462/670A**	1-P	706	938	29	6	3	0.39	1.74	2.59	1.70	689
682.625	26.8750	965.200	38.0000	396.875	15.6250	311.15	12.2500	9.5	1.6	11 500	25 400	1 910	**2TR683-1**	2-P	710	926	42.8	9.5	1.6	0.33	2.03	3.02	1.98	886
685.800	27.0000	876.300	34.5000	200.025	7.8750	152.400	6.0000	6.4	1.6	4 400	10 800	880	**EE655270/655346D**	1-P	710	850	23.8	6.4	1.6	0.42	1.62	2.42	1.59	280
710	—	1 030	—	236	—	208	—	7.5	4	6 580	12 300	1 020	**462/710**	1-P	746	968	14	6	3	0.39	1.74	2.59	1.70	623
	—	1 030	—	295	—	236	—	7.5	4	8 930	16 600	1 330	**462/710A**	1-P	746	983	29.5	6	3	0.37	1.80	2.69	1.76	748
	—	1 150	—	393	—	345	—	9.5	5	13 700	24 600	1 800	**463/710A**	1-P	754	1 098	24	8	4	0.39	1.74	2.59	1.70	1 530
711.200	28.0000	914.400	36.0000	190.500	7.5000	139.700	5.5000	6.4	1.6	3 780	8 930	747	**EE755280/755361D**	1-P	735	880	25.4	6.4	1.6	0.38	1.78	2.65	1.74	290
723.900	28.5000	914.400	36.0000	187.325	7.3750	139.700	5.5000	3.2	1.6	3 780	8 930	747	**EE755285/755361D**	1-P	745	880	23.8	3.2	1.6	0.38	1.78	2.65	1.74	266
749.300	29.5000	990.600	39.0000	338.000	13.3071	265.000	10.4331	6.4	3.2	9 820	23 900	1 780	**LM283649/LM283610D**	1-P	775	960	36.5	6.4	3.2	0.32	2.12	3.15	2.07	681
780	—	1 150	—	330	—	210	—	7.5	2.5	9 520	18 500	1 420	**2TR780**	1-P	816	1 090	60	6	2	0.70	0.97	1.44	0.94	1 050
800	—	1 150	—	258	—	227	—	7.5	4	8 030	15 500	1 250	**462/800**	1-P	836	1 104	15.5	6	3	0.39	1.74	2.59	1.70	845
	—	1 150	—	323	—	258	—	7.5	4	10 800	21 100	1 610	**462/800A**	1-P	836	1 098	32.5	6	3	0.33	2.03	3.02	1.98	1 020
812.800	32.0000	1 016.000	40.0000	190.500	7.5000	146.050	5.7500	6.4	1.6	4 680	10 500	846	**EE762320/762401D**	1-P	840	980	22.2	6.4	1.6	0.43	1.59	2.36	1.55	321
850	—	1 120	—	266	—	190	—	6	2.5	7 930	17 100	1 340	**2TR850D**	1-P	878	1 080	38	5	2	0.46	1.47	2.19	1.44	641

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

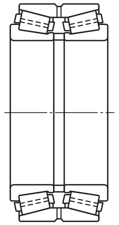
Double-row tapered roller bearings

TDO, TDOS type

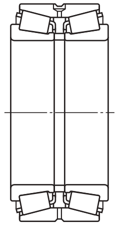
d 950 ~ 1 450 mm



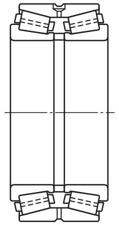
Design 1



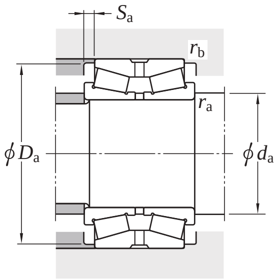
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)					Constant	Axial load factors			(Refer.) Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	C mm	C 1/25.4	r 2) min.	r_1 min.	C_r	C_{0r}	C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
950	—	1 250	—	272	—	174	—	SP	3	7 860	17 500	1 250	**2TR950B**	1-P	986	1 200	49	12	2.5	0.73	0.92	1.37	0.90	786
	—	1 250	—	298	—	220	—	7.5	3	9 600	21 900	1 640	**2TR950**	1-P	986	1 190	39	6	2.5	0.33	2.03	3.02	1.98	896
	—	1 280	—	280	—	246	—	7.5	4	9 670	20 600	1 570	**2TR950J**	1-P	986	1 220	17	6	3	0.33	2.03	3.02	1.98	986
1 270.000	50.0000	1 435.100	56.5000	146.050	5.7500	101.600	4.0000	6.4	3.2	3 650	11 800	841	**LL889049/LL889010D**	1	1 300	1 410	22.2	6.4	3.2	0.57	1.18	1.76	1.16	296
1 370	—	1 605	—	210	—	150	—	7.5	4	6 580	18 900	1 340	**2TR1370B**	1-P	1 406	1 560	30	6	3	0.55	1.24	1.84	1.21	660
1 450	—	1 770	—	290	—	170	—	6	2.5	9 690	25 200	1 740	**2TR1450**	1-P	1 486	1 703	60	5	2	0.61	1.11	1.66	1.09	1 260

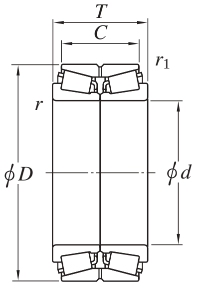
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

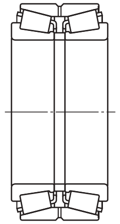
Double-row tapered roller bearings

TNA type

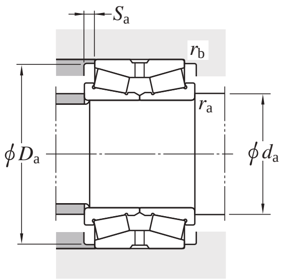
d 101.600 ~ 174.625 mm



Design 1



Design 2



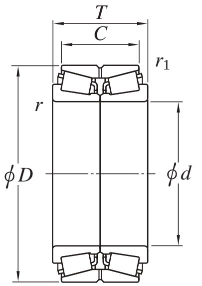
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)					Constant	Axial load factors			Mass
d		*D*		*T*		*C*		*r*	r_1	C_r	C_{0r}	(kN)			d_a	D_a	S_a	r_a	r_b	*e*	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.			C_u			min.	min.	min.	max.	max.					
101.600	4.0000	168.275	6.6250	92.075	3.6250	69.850	2.7500	3.6	0.8	484	698	101	**NA691/672D**	2	120	156	11.2	3.6	0.8	0.47	1.43	2.14	1.40	7.36
104.775	4.1250	180.975	7.1250	104.775	4.1250	85.725	3.3750	3.6	1.6	620	876	113	**NA782/774D**	2	123	165	9.6	3.6	1.6	0.39	1.75	2.61	1.71	10.5
114.300	4.5000	190.500	7.5000	106.363	4.1875	80.963	3.1875	3.6	1.6	654	965	122	**NA71450/751D**	2	133	177	12.7	3.6	1.6	0.42	1.62	2.42	1.59	11.0
	4.5000	212.725	8.3750	142.875	5.6250	117.475	4.6250	3.6	1.6	965	1 350	168	**NA938//932D**	1	133	192	12.7	3.6	1.6	0.33	2.07	3.09	2.03	21.2
115	—	210	—	143	—	118	—	4	1.5	1 100	1 400	174	**46T232114**	1	133	201	12.5	3	1.5	0.33	2.07	3.09	2.03	19.4
127.000	5.0000	182.563	7.1875	85.725	3.3750	73.025	2.8750	3.6	0.8	487	858	120	**NA48291/48220D**	2	145	173	6.4	3.6	0.8	0.31	2.21	3.29	2.16	6.99
	5.0000	206.375	8.1250	107.950	4.2500	82.550	3.2500	3.6	0.8	702	1 100	134	**NA798/792D**	2	145	194	12.7	3.6	0.8	0.46	1.47	2.19	1.44	13.2
	5.0000	234.950	9.2500	142.875	5.6250	114.300	4.5000	3.6	1.6	1 120	1 650	200	**NA95500//95927D**	1	145	216	14.3	3.6	1.6	0.37	1.83	2.72	1.79	25.6
133.350	5.2500	215.900	8.5000	106.363	4.1875	80.963	3.1875	3.6	1.6	691	1 100	132	**NA74525//74851D**	1	152	204	12.7	3.6	1.6	0.49	1.38	2.06	1.35	14.0
136.525	5.3750	190.500	7.5000	85.725	3.3750	73.025	2.8750	3.6	0.8	505	944	129	**NA48390//48320D**	1	155	181	6.4	3.6	0.8	0.32	2.10	3.13	2.06	7.20
139.700	5.5000	244.475	9.6250	107.950	4.2500	79.375	3.1250	3.6	1.6	694	989	131	**NA81550/81963D**	2	158	226	14.3	3.6	1.6	0.35	1.93	2.88	1.89	18.8
142.875	5.6250	200.025	7.8750	93.665	3.6876	73.025	2.8750	3.6	0.8	527	982	133	**NA48686/48620D**	2	161	190	10.3	3.6	0.8	0.34	2.01	2.99	1.96	8.43
146.050	5.7500	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	904	1 460	171	**NA82576/82932D**	2	164	224	12.7	3.6	1.6	0.44	1.53	2.27	1.49	21.1
	5.7500	241.300	9.5000	131.763	5.1875	106.363	4.1875	3.6	1.6	904	1 460	171	**NA82576/82951D**	2	164	224	12.7	3.6	1.6	0.44	1.53	2.27	1.49	22.6
149.225	5.8750	236.538	9.3125	131.763	5.1875	106.363	4.1875	3.6	1.6	1 080	1 660	198	**HM231149NA/HM231111D**	2	168	222	12.7	3.6	1.6	0.32	2.12	3.15	2.07	20.4
152.400	6.0000	244.475	9.6250	107.950	4.2500	79.375	3.1250	3.6	1.6	694	989	131	**NA81600/81963D**	2	171	226	14.3	3.6	1.6	0.35	1.93	2.88	1.89	16.4
	6.0000	254.000	10.0000	149.225	5.8750	111.125	4.3750	3.6	1.6	1 180	1 830	215	**NA99600/99102D**	2	171	236	19.1	3.6	1.6	0.41	1.66	2.47	1.62	27.8
165.100	6.5000	288.925	11.3750	142.875	5.6250	111.125	4.3750	3.6	1.6	1 350	1 950	223	**HM237536NA/HM237510D**	2	184	270	15.9	3.6	1.6	0.32	2.12	3.15	2.07	36.1
165.496	6.5156	225.425	8.8750	95.250	3.7500	69.850	2.7500	3.6	0.8	554	1 140	148	**NA46791R/46720D**	2	184	215	12.7	3.6	0.8	0.38	1.76	2.62	1.72	10.3
174.625	6.8750	247.650	9.7500	103.188	4.0625	84.138	3.3125	3.6	0.8	741	1 400	160	**NA67787//67720D**	1	193	237	9.5	3.6	0.8	0.44	1.54	2.29	1.50	14.9

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

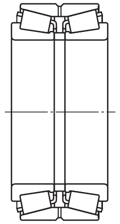
Double-row tapered roller bearings

TNA type

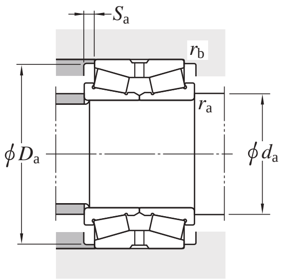
d 177.800 ~ 406.400 mm



Design 1



Design 2



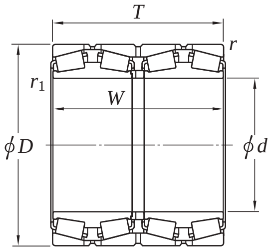
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. 1)	Design	Mounting dimensions (mm)					Constant	Axial load factors			Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*C* mm	*C* 1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a min.	D_a min.	S_a min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
177.800	7.0000	247.650	9.7500	103.188	4.0625	84.138	3.3125	3.6	0.8	741	1 400	160	**NA67790/67720D**	2	196	237	9.5	3.6	0.8	0.44	1.54	2.29	1.50	14.2
	7.0000	282.575	11.1250	107.950	4.2500	79.375	3.1250	3.6	1.6	880	1 450	182	**NA87700//87112D**	1	196	266	14.3	3.6	1.6	0.42	1.62	2.42	1.59	23.5
	7.0000	288.925	11.3750	142.875	5.6250	111.125	4.3750	5.6	1.6	1 180	1 920	216	**NA94700//94114D**	1	206	269	15.9	5.6	1.6	0.47	1.44	2.15	1.41	33.3
187.325	7.3750	320.675	12.6250	185.738	7.3125	138.113	5.4375	5.6	1.6	1 830	2 530	285	**H239649NA/H239612D**	2	216	300	23.8	5.6	1.6	0.32	2.12	3.15	2.07	52.7
190.500	7.5000	266.700	10.5000	109.538	4.3125	84.138	3.3125	3.6	0.8	728	1 410	156	**NA67885SW//20D**	1	209	257	12.7	3.6	0.8	0.48	1.42	2.11	1.38	17.5
203.200	8.0000	317.500	12.5000	120.650	4.7500	88.900	3.5000	6.4	1.6	944	1 450	166	**NA132083//132126D**	1	232	292	15.9	6.4	1.6	0.31	2.15	3.21	2.11	30.6
	8.0000	317.500	12.5000	146.050	5.7500	111.125	4.3750	5.6	1.6	1 300	2 270	244	**NA93800/93127D**	2	232	294	17.5	5.6	1.6	0.52	1.29	1.92	1.26	39.3
228.600	9.0000	355.600	14.0000	146.050	5.7500	111.125	4.3750	6.4	1.6	1 560	2 610	280	**NA130902/131401D**	2	257	330	17.5	6.4	1.6	0.33	2.04	3.04	2.00	49.4
241.300	9.5000	368.300	14.5000	120.650	4.7500	85.725	3.3750	6.4	1.6	1 090	1 850	203	**NA170950//171451D**	1	270	335	17.5	6.4	1.6	0.36	1.86	2.77	1.82	41.8
244.475	9.6250	349.148	13.7460	133.350	5.2500	101.600	4.0000	6.4	1.6	1 190	2 050	224	**NA127096/127136D**	2	273	329	15.9	6.4	1.6	0.35	1.91	2.84	1.86	36.3
254.000	10.0000	422.275	16.6250	173.038	6.8125	128.588	5.0625	6.4	1.6	2 180	3 360	355	**HM252343NA/HM252311D**	2	282	397	22.2	6.4	1.6	0.33	2.03	3.02	1.98	87.2
	10.0000	431.724	16.9970	173.038	6.8125	128.588	5.0625	6.4	1.6	2 180	3 360	355	**HM252344NA/HM252315D**	2	282	397	22.2	6.4	1.6	0.33	2.03	3.02	1.98	93.5
	10.0000	431.724	16.9970	173.038	6.8125	128.588	5.0625	6.4	1.6	2 110	3 420	352	**NA551002/551701D**	2	282	388	22.2	6.4	1.6	0.33	2.03	3.02	1.98	93.0
260.350	10.2500	400.050	15.7500	146.050	5.7500	107.950	4.2500	6.4	1.6	1 630	2 570	274	**NA221026/221576D**	2	289	371	19.1	6.4	1.6	0.39	1.71	2.54	1.67	56.7
	10.2500	422.275	16.6250	173.038	6.8125	128.588	5.0625	6.4	1.6	2 180	3 360	355	**HM252349NA/HM252311D**	2	289	397	22.2	1.6	1.6	0.33	2.03	3.02	1.98	87.3
	10.2500	431.724	16.9970	173.038	6.8125	128.588	5.0625	6.4	1.6	2 180	3 360	355	**HM252349NA/HM252315D**	2	289	397	22.2	1.6	1.6	0.33	2.03	3.02	1.98	93.6
304.800	12.0000	444.500	17.5000	139.700	5.5000	98.425	3.8750	6.4	1.6	1 550	2 760	288	**NA291201//291751D**	1	333	413	20.6	6.4	1.6	0.38	1.79	2.66	1.75	63.8
355.600	14.0000	501.650	19.7500	146.050	5.7500	107.950	4.2500	6.4	1.6	1 700	3 280	322	**NA231400//231976D**	1	384	480	19.1	6.4	1.6	0.44	1.53	2.28	1.50	82.2
400	—	590	—	185	—	123	—	6	1.5	3 010	5 110	496	**46T8059NA-1**	1	428	558	31	5	1.5	0.32	2.12	3.15	2.07	148
406.400	16.0000	574.675	22.6250	157.163	6.1875	106.363	4.1875	6.4	1.6	2 040	3 880	367	**NA285160//285228D**	1	435	535	25.4	6.4	1.6	0.50	1.35	2.01	1.32	112

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Four-row tapered roller bearings

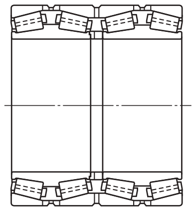
TQO type

d 65 ~ 133.350 mm

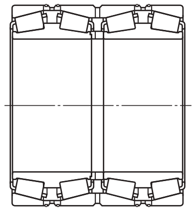


Design 1

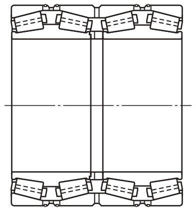
For oil mist lubrication



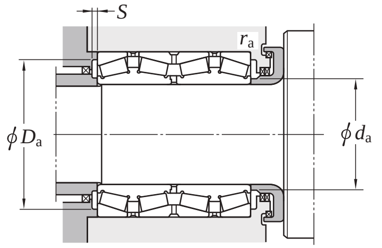
Design 1-P



Design 2



Design 2-P

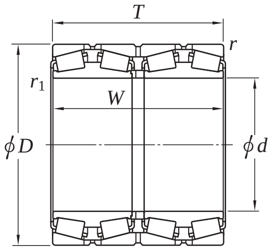


Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d		D		T		W		r	r_1	C_r	C_{0r}	C_u			d_a	D_a		S	r_a	r_b	e	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
65	—	100	—	98	—	98	—	1.5	0.3	388	550	82.3	**47T131010**	1	73	91.5	87	3.6	1.5	0.3	0.46	1.47	2.19	1.44	2.82
80	—	115	—	88	—	88	—	1.5	1.5	331	543	81.3	**47T1611**	1	91	106.5	102	3.4	1.5	1.5	0.33	2.03	3.02	1.98	2.99
95	—	130	—	100	—	100	—	1.5	1.5	433	729	107	**47T191310**	1	104	121.5	117	3.5	1.5	1.5	0.33	2.03	3.02	1.98	3.83
100	—	140	—	104	—	104	—	2	2.5	423	661	96.9	**37220**	1	112	130	125	3.8	2	2	0.28	2.37	3.53	2.32	4.6
	—	140	—	104	—	104	—	2	1	508	852	124	**37220A**	1	110	130	125	4.1	2	1	0.40	1.68	2.50	1.64	4.8
	—	170	—	155	—	155	—	2	2.5	989	1 470	213	**47T2017**	1	119	160	149	5.7	2	2	0.35	1.95	2.90	1.91	14.7
105	—	160	—	150	—	150	—	1.5	1	940	1 420	208	**47T211615**	1	118	151.5	146	5.9	1.5	1	0.33	2.03	3.02	1.98	10.6
110	—	155	—	114	—	114	—	2	2.5	594	955	138	**37222**	1	121	145	140	4.8	2	2	0.33	2.03	3.02	1.98	6.45
	—	160	—	115	—	115	—	1.5	1	687	1 030	148	**47T221612**	1	121	151.5	146	5.2	1.5	1	0.43	1.57	2.34	1.53	7.63
	—	180	—	154	—	154	—	2	2.5	1 110	1 530	218	**47T221815**	1	127	170	162	5.9	2	2	0.39	1.74	2.59	1.70	15.4
	—	180	—	170	—	170	—	1	1	1 240	1 770	254	**47T221817**	1	126	174.5	162	6.5	1	1	0.33	2.03	3.02	1.98	17
115	—	155	—	115	—	115	—	1.5	0.6	548	1 020	143	**47T231612A**	1	126	146.5	142	3.4	1.5	0.6	0.40	1.68	2.50	1.64	6.12
	—	160	—	120	—	120	—	1.5	0.6	701	1 160	166	**47T231612**	1	124	151.5	147	5.7	1.5	0.6	0.35	1.95	2.90	1.91	7.2
120	—	170	—	124	—	124	—	2	2.5	590	943	133	**37224**	1	135	160	155	4.1	2	2	0.28	2.37	3.53	2.32	8.56
	—	170	—	130	—	130	—	1.5	2	739	1 290	180	**47T241713**	1	133	161.5	155	4.4	1.5	2	0.40	1.68	2.50	1.64	9.38
	—	200	—	132	—	132	—	2	2.5	888	1 200	167	**47324**	1	143	190	178	5.7	2	2	0.35	1.95	2.90	1.91	16.5
	—	210	—	174	—	174	—	2.5	3	1 390	1 770	235	**47T242117**	1	143	198	188	4	2	2.5	0.33	2.03	3.02	1.98	24.5
120.650	4.7500	161.925	6.3750	106.365	4.1876	106.365	4.1876	1.6	1.6	404	771	105	**L624549D/514/514D**	1	130	153	147	5.1	1.6	1.6	0.43	1.56	2.32	1.52	6.24
	4.7500	166.688	6.5625	152.414	6.0006	152.400	6.0000	3.3	1.6	795	1 460	206	**LM124449D/410/410D**	1	132	155	150	2.3	3.3	1.6	0.29	2.30	3.42	2.25	9.84
	4.7500	174.625	6.8750	139.703	5.5001	141.288	5.5625	1.6	0.8	893	1 450	205	**M224749D/710/710D**	1	133	166	159	4.9	1.6	0.8	0.33	2.03	3.02	1.98	11.1
127.000	5.0000	182.563	7.1875	158.750	6.2500	158.750	6.2500	3.2	1.6	974	1 720	239	**48290D/20/20D**	1	140	171	166	3.7	3.2	1.6	0.31	2.21	3.29	2.16	13.6
130	—	184	—	134	—	134	—	2	2.5	807	1 330	184	**37226**	1	143	174	169	4.3	2	2	0.33	2.03	3.02	1.98	11
133.350	5.2500	196.850	7.7500	193.675	7.6250	193.675	7.6250	3.2	1.6	1 340	2 240	275	**67390D/22/22D**	1	148	185	180	5.6	3.2	1.6	0.34	1.96	2.92	1.92	19.8

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

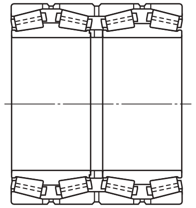
TQO type

d 135 ~ 170 mm

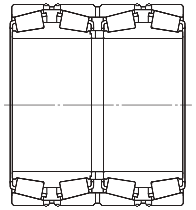


Design 1

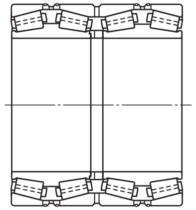
For oil mist lubrication



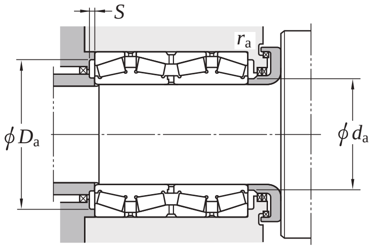
Design 1-P



Design 2



Design 2-P



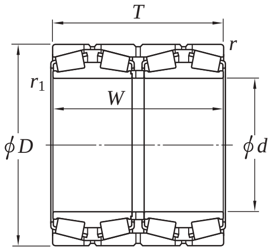
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. 1)	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d		D		T		W		r	r_1	C_r	C_{0r}	(kN) C_u			d_a	D_a		S	r_a	r_b	e	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
135	—	180	—	160	—	160	—	1.5	1	700	1 290	177	**47T271816**	1	146	171.5	166	1.4	1.5	1	0.33	2.03	3.02	1.98	10.7
	—	195	—	160	—	160	—	1.5	0.6	1 180	1 930	266	**47T272016**	1	147	186.5	179	3.9	1.5	0.6	0.33	2.03	3.02	1.98	15.4
136.525	5.3750	190.500	7.5000	161.925	6.3750	161.925	6.3750	3.2	1.6	1 010	1 890	258	**47T271916**	2	150	179	174	4.8	3.2	1.6	0.32	2.10	3.13	2.06	14.3
	5.3750	190.500	7.5000	161.925	6.3750	161.925	6.3750	3.2	1.6	1 010	1 890	258	**48393D/20/20D**	1	150	179	174	4.8	3.2	1.6	0.32	2.10	3.13	2.06	14.3
139.700	5.5000	200.025	7.8750	160.340	6.3126	157.166	6.1876	3.3	0.8	1 050	1 960	266	**48680D/20/20D**	1	157	187	182	4	3.3	0.8	0.34	2.01	2.99	1.96	16.6
140	—	198	—	144	—	144	—	2	2.5	963	1 650	225	**37228**	1	157	188	183	5.3	2	2	0.28	2.43	3.61	2.37	13.6
	—	210	—	114	—	114	—	2	2.5	781	1 130	154	**47228**	1	160	200	190	6	2	2	0.27	2.47	3.67	2.41	13.7
	—	225	—	145	—	145	—	2.5	3	1 220	1 610	205	**47328**	1	161	213	203	6.5	2	2.5	0.40	1.68	2.50	1.64	21.2
145	—	195	—	130	—	130	—	1.5	0.6	804	1 550	208	**47T292013**	1	158	186.5	177	5.1	1.5	0.6	0.40	1.68	2.50	1.64	11.1
150	—	210	—	190	—	190	—	2	0.6	1 240	2 270	269	**47T302119**	1	163	200	190	5	2	0.6	0.39	1.74	2.59	1.70	20.2
	—	212	—	155	—	155	—	2.5	3	968	1 640	220	**37230**	1	168	200	190	6	2	2.5	0.28	2.37	3.53	2.32	16.7
152.400	6.0000	222.250	8.7500	174.625	6.8750	174.625	6.8750	1.6	1.6	1 360	2 390	318	**M231649D/610/610D**	1	168	213	201	6	1.6	1.6	0.33	2.03	3.02	1.98	22.8
160	—	226	—	165	—	165	—	2.5	3	1 090	1 870	247	**37232**	1	178	214	204	6	2	2.5	0.28	2.37	3.53	2.32	20.1
	—	250	—	145	—	145	—	2.5	3	1 370	1 870	232	**47T322515**	1	182	238	226	6.5	2	2.5	0.33	2.03	3.02	1.98	25.4
	—	265	—	173	—	173	—	2.5	1	1 660	2 400	293	**47T322717**	1	193	253	241	7	2	1	0.35	1.95	2.90	1.91	37.6
165.100	6.5000	225.425	8.8750	168.275	6.6250	165.100	6.5000	3.2	0.8	1 090	2 140	279	**46791D/20/21D**	1	180	213	203	4.5	3.2	0.8	0.38	1.77	2.63	1.73	19.7
168.275	6.6250	247.650	9.7500	192.088	7.5625	192.088	7.5625	3.2	1.6	1 480	2 800	319	**67782D/20/21D**	1	189	236	226	5	3.2	1.6	0.44	1.54	2.29	1.50	31.7
170	—	230	—	175	—	175	—	2	1	1 280	2 370	308	**47T342318**	1	183	220	210	6	2	1	0.40	1.68	2.50	1.64	19.9
	—	240	—	175	—	175	—	2.5	3	1 270	2 310	299	**37234A**	1	189	228	218	5	2	2.5	0.33	2.03	3.02	1.98	24.2
	—	240	—	175	—	175	—	2.5	1.5	1 410	2 340	306	**47T342418A**	2	184	228	218	7.5	2	1.5	0.40	1.68	2.50	1.64	24.7
	—	260	—	160	—	160	—	2.5	3	1 390	1 900	230	**47T342616**	1	194	248	238	6	2	2.5	0.35	1.95	2.90	1.91	28.5
	—	280	—	181	—	181	—	2.5	3	1 670	2 420	291	**47334/181**	1	202	268	250	6	2	2.5	0.33	2.03	3.02	1.98	44
	—	280	—	185	—	185	—	2.5	3	1 670	2 420	291	**47334**	1	202	268	250	6	2	2.5	0.33	2.03	3.02	1.98	44.8

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

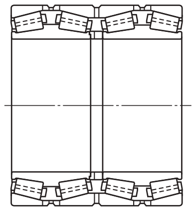
Four-row tapered roller bearings

TQO type

d 177.800 ~ 205 mm

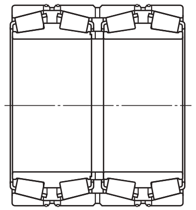


Design 1

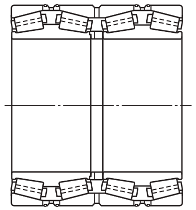


Design 1-P

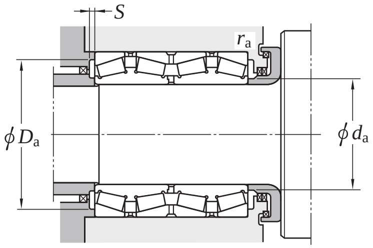
For oil mist lubrication



Design 2



Design 2-P



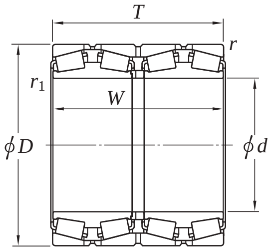
Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*W* mm	*W* 1/25.4	*r* min.	*r*₁ min.	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Bearing No. 1)	Design	Mounting dimensions (mm) d_a max.	D_a max.	D_a min.	S min.	r_a max.	r_b max.	Constant e	Axial load factors Y_2	Y_3	Y_0	(Refer.) Mass (kg)
177.800	7.0000	247.650	9.7500	192.088	7.5625	192.088	7.5625	3.2	1.6	1 480	2 800	319	**67791D/20/21D**	1	189	235	225	5	3.2	1.6	0.44	1.54	2.29	1.50	28.4
	7.0000	279.400	11.0000	234.948	9.2499	234.950	9.2500	3.2	1.6	2 080	3 290	373	**82681D/20/20D**	1	197	267	251	6.5	3.2	1.6	0.52	1.29	1.92	1.26	52.5
	7.0000	285.750	11.2500	222.245	8.7498	222.500	8.7598	3.2	1.6	1 910	2 860	329	**EE91700D/112/113XD**	1	201	273	251	3.5	3.2	1.6	0.43	1.57	2.34	1.53	53.7
180	—	250	—	185	—	185	—	2.5	3	1 430	2 550	326	**47T362519**	1	198	238	228	6	2	2.5	0.33	2.03	3.02	1.98	26.9
	—	254	—	185	—	185	—	2.5	3	1 430	2 550	326	**37236**	1	198	242	232	6	2	2.5	0.33	2.03	3.02	1.98	29.1
	—	260	—	160	—	160	—	2.5	1	1 370	2 090	269	**47T362616**	1	198	248	238	5	2	1	0.37	1.80	2.69	1.76	26.4
	—	260	—	200	—	200	—	2	2.5	1 740	2 950	342	**47T362620**	1	200	250	240	4.5	2	2	0.31	2.15	3.20	2.10	33.6
	—	280	—	181	—	181	—	2.5	3	1 900	2 830	336	**47T362818A**	1	204	268	253	8	2	2.5	0.33	2.03	3.02	1.98	40.8
	—	300	—	202	—	202	—	3	4	1 980	2 750	325	**47336**	1	211	286	267	5.5	2.5	3	0.35	1.95	2.90	1.91	54.9
	—	300	—	280	—	280	—	3	4	3 020	4 430	506	**47T363028**	1	211	286	270	6	2.5	3	0.33	2.03	3.02	1.98	78.4
187	—	270	—	210	—	210	—	2.5	1	2 080	3 570	409	**47T372721B**	1	205	258	248	8	2	1	0.33	2.03	3.02	1.98	39.1
187.325	7.3750	269.875	10.6250	211.138	8.3125	211.138	8.3125	3.2	1.6	1 760	3 220	367	**M238849D/810/810D**	1	206	257	245	5	3.2	1.6	0.33	2.03	3.02	1.98	39.5
190	—	268	—	196	—	196	—	2.5	3	1 510	2 760	311	**37238**	1	210	256	246	6	2	2.5	0.33	2.03	3.02	1.98	33.4
	—	270	—	160	—	160	—	2.5	1	1 470	2 370	300	**47T382716**	1	208	258	248	7	2	1	0.40	1.68	2.50	1.64	28.3
190.000	7.4803	270.000	10.6299	190.000	7.4803	190.000	7.4803	3.2	1.6	1 460	2 810	313	**4TR3827**	1	208	257	244	6	3.2	1.6	0.48	1.42	2.11	1.38	34.7
190.500	7.5000	266.700	10.5000	188.913	7.4375	187.325	7.3750	3.2	1.6	1 460	2 810	313	**67885D/67820/67820D**	1	208.5	255.3	245.1	6	3.2	1.6	0.48	1.42	2.11	1.38	32.4
198.438	7.8125	284.163	11.1875	225.425	8.8750	225.425	8.8750	3.2	1.6	2 180	3 780	426	**M240648D/611/611D**	1	215	271	260	5	3.2	1.6	0.33	2.03	3.02	1.98	44.7
200	—	280	—	206	—	206	—	2.5	1.5	2 080	3 830	435	**47T402821**	1	216	268	258	6.5	2	1.5	0.39	1.71	2.54	1.67	39.7
	—	282	—	206	—	206	—	2.5	3	1 870	3 380	381	**37240**	1	223	270	260	5.5	2	2.5	0.28	2.43	3.61	2.37	39.6
	—	340	—	234	—	234	—	3	4	2 930	4 150	473	**47T403423**	1	234	326	302	6	2.5	4	0.40	1.68	2.50	1.64	86
203.200	8.0000	317.500	12.5000	209.550	8.2500	215.900	8.5000	3.2	3.2	1 890	2 900	333	**EE132082D/125/126D**	1	235	304	284	7	3.2	3.2	0.31	2.15	3.21	2.11	61
	8.0000	317.500	12.5000	266.700	10.5000	266.700	10.5000	3.2	1.6	2 590	4 540	489	**93800D/125/127D**	1	223	304	278	6.5	3.2	1.6	0.52	1.29	1.92	1.26	78.8
205	—	320	—	205	—	205	—	3	4	2 180	3 030	350	**47T413221**	1	230	306	292	7.5	2.5	3	0.46	1.46	2.17	1.42	58.9

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

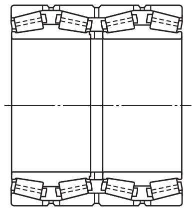
Four-row tapered roller bearings

TQO type

d 206.375 ~ 235 mm

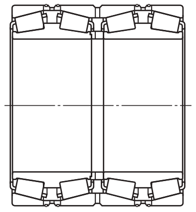


Design 1

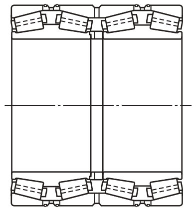


Design 1-P

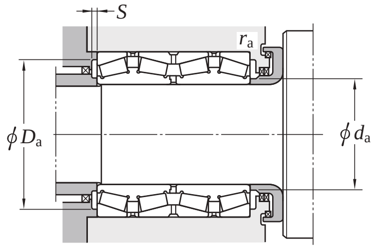
For oil mist lubrication



Design 2



Design 2-P



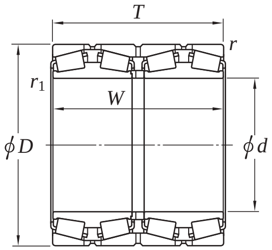
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*W* mm	*W* 1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	*S* min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
206.375	8.1250	282.575	11.1250	184.150	7.2500	184.150	7.2500	3.2	0.8	1 500	2 830	310	**67985D/20/20D**	1	219	270	259	7	3.2	0.8	0.51	1.33	1.97	1.30	33.9
	8.1250	282.575	11.1250	190.500	7.5000	190.500	7.5000	3.2	0.8	1 500	2 830	310	**67986D/20/21D**	1	222	270	259	7	3.2	0.8	0.51	1.33	1.97	1.30	34.8
	8.1250	282.575	11.1250	210.000	8.2677	210.000	8.2677	3.2	0.8	1 730	3 010	374	**47T412821A**	1	219	270	260	3.5	3.2	0.8	0.43	1.57	2.34	1.53	36.2
215.090	8.4681	311.150	12.2500	228.600	9.0000	228.600	9.0000	3.2	1.6	2 190	4 040	440	**47T433123**	1	233	297	278	7	3.2	1.6	0.40	1.68	2.50	1.64	57.5
215.900	8.5000	288.925	11.3750	177.800	7.0000	177.800	7.0000	3.2	0.8	1 530	3 120	381	**LM742749D/714/714D**	1	229	276	265	5.5	3.2	0.8	0.48	1.40	2.09	1.37	32.8
	8.5000	336.550	13.2500	266.700	10.5000	266.700	10.5000	3.2	6.4	3 060	4 760	514	**47T433427**	1	238	323	304	6.5	3.2	6.4	0.50	1.34	2.00	1.32	85.1
216.103	8.5080	330.200	13.0000	269.875	10.6250	263.525	10.3750	3.2	1.6	3 140	5 120	559	**47T433327**	1	237	316	300	7	3.2	1.6	0.46	1.47	2.19	1.44	81.6
220	—	300	—	230	—	230	—	2.5	3	2 190	4 040	440	**47T443023**	1	231	288	278	6.5	2	2.5	0.40	1.68	2.50	1.64	45.1
	—	310	—	226	—	226	—	3	4	2 110	3 880	425	**37244**	1	242	296	285	6	2.5	3	0.33	2.03	3.02	1.98	52
	—	320	—	201	—	201	—	3	3	2 080	3 760	412	**47T443220**	1	247	306	290	5.5	2.5	2.5	0.33	2.03	3.02	1.98	52.4
	—	320	—	250	—	250	—	2.5	3	2 410	4 230	455	**47T443225**	1	244	308	293	6.5	2	2.5	0.35	1.95	2.90	1.91	64.7
	—	330	—	260	—	260	—	3	1	2 940	5 070	555	**47T443326A**	1	243	316	299	9	2.5	1	0.40	1.68	2.50	1.64	78.4
	—	330	—	260	—	260	—	3	1	2 920	4 860	518	**47T443326B**	2	238	316	300	8	2.5	1	0.55	1.24	1.84	1.21	77.5
	—	340	—	190	—	190	—	3	4	1 870	2 910	334	**47244**	1	260	326	308	6	2.5	3	0.28	2.43	3.61	2.37	62.2
	—	340	—	280	—	280	—	3	1	3 420	5 580	609	**47T443428-1**	1	247	326	308	10	2.5	1	0.33	2.03	3.02	1.98	95.1
	—	340	—	305	—	305	—	3	4	3 650	5 940	641	**47T443431**	1	244	326	307	8	2.5	3	0.35	1.95	2.90	1.91	99.6
220.662	8.6875	314.325	12.3750	290.000	11.4173	290.000	11.4173	3.2	1.6	2 880	5 050	549	**47T443129A**	1	240	300	289	4.5	3.2	1.6	0.33	2.03	3.02	1.98	70
220.663	8.6875	314.325	12.3750	239.713	9.4375	239.713	9.4375	3.2	1.6	2 630	4 890	538	**M244249D/210/210D**	1	241	300	288	5	3.2	1.6	0.33	2.03	3.02	1.98	59
225	—	320	—	230	—	230	—	2	2.5	2 090	3 730	407	**4TR225A**	1	246	310	293	5	2	2	0.37	1.80	2.69	1.76	57
228.600	9.0000	311.150	12.2500	200.025	7.8750	200.025	7.8750	3.2	1.6	2 080	3 760	412	**LM245149D/110/110D**	1	247	297	287	5.5	3.2	1.6	0.33	2.03	3.02	1.98	41.8
230	—	315	—	190	—	190	—	2	2.5	1 890	3 470	421	**47T463119**	1	248	305	290	7.5	2	2	0.37	1.80	2.69	1.76	43
234.950	9.2500	327.025	12.8750	196.850	7.7500	196.850	7.7500	3.2	1.6	2 000	3 720	401	**8576D/20/20D**	1	255	313	299	5.5	3.2	1.6	0.41	1.66	2.47	1.62	50.1
235	—	325	—	240	—	240	—	2.5	1.5	2 750	5 310	576	**47T473324**	1	254	313	301	8.5	2	1.5	0.33	2.03	3.02	1.98	60.5

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

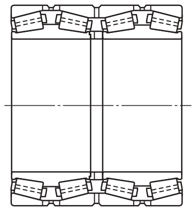
TQO type

d 240 ~ (260) mm

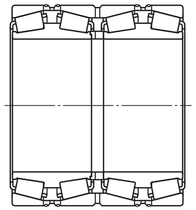
For oil mist lubrication



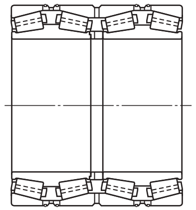
Design 1



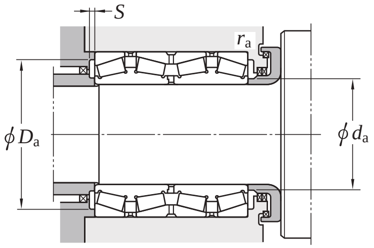
Design 1-P



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*W* mm	*W* 1/25.4	*r* min.	r_1 [2] min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	*S* min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
240	—	320	—	250	—	250	—	2	1	2 350	4 760	507	**47T483225B**	1	257	310	299	7.5	2	1	0.33	2.03	3.02	1.98	54.2
	—	338	—	248	—	248	—	3	4	2 960	5 360	580	**37248**	1	259	324	312	8.5	2.5	3	0.39	1.74	2.59	1.70	68.4
	—	338	—	248	—	248	—	3	4	2 960	5 360	580	**37248/DP1**	2	259	324	312	8.5	2.5	3	0.39	1.74	2.59	1.70	68.4
	—	360	—	194	—	194	—	3	4	2 290	3 580	399	**47248**	1	272	346	327	8.5	2.5	3	0.32	2.12	3.15	2.07	66.5
	—	360	—	214	—	214	—	3	2.5	2 720	4 340	470	**47T483621**	1	268	346	328	9	2.5	2.5	0.40	1.68	2.50	1.64	75.4
	—	360	—	308.5	—	308.5	—	3	2.5	4 170	7 400	787	**47T483631A**	1	268	346	329	9.5	2.5	2.5	0.26	2.55	3.80	2.50	112
	—	365	—	290	—	290	—	2	SP	3 610	5 930	628	**47T483729**	1	265	355	333	9	2	0.8	0.46	1.47	2.19	1.44	108
	—	410	—	270	—	270	—	4	2.5	4 040	5 520	595	**47T484127A**	1	281	392	369	8.5	3	2	0.40	1.68	2.50	1.64	144
241.478	9.5070	349.148	13.7460	228.600	9.0000	228.600	9.0000	3.2	1.6	2 750	4 920	529	**47T483523A**	1	267	335	319	8.5	3.2	1.6	0.35	1.91	2.84	1.86	72.9
	9.5070	349.148	13.7460	228.600	9.0000	228.600	9.0000	3.2	1.6	2 380	4 100	447	**EE127097D/135/136D**	1	267	335	319	5.5	3.2	1.6	0.35	1.91	2.84	1.86	70.4
244.475	9.6250	327.025	12.8750	193.675	7.6250	193.675	7.6250	3.2	1.6	1 840	3 500	414	**47T493319**	1	259	313	303	5.5	3.2	1.6	0.55	1.24	1.84	1.21	44.4
	9.6250	327.025	12.8750	193.675	7.6250	193.675	7.6250	3.2	1.6	1 970	3 780	406	**LM247748D/710/710D**	1	265	313	305	7.5	3.2	1.6	0.32	2.10	3.13	2.06	44.4
	9.6250	381.000	15.0000	304.800	12.0000	304.800	12.0000	4.8	3.2	3 390	5 870	611	**EE126096D/150/151D**	1	269	364	336	6	4.8	3.2	0.52	1.31	1.95	1.28	129
247.650	9.7500	400.050	15.7500	253.995	9.9998	249.235	9.8124	6.4	1.6	3 270	5 140	548	**EE220975D/1575/1576D**	1	292	379	359	7.5	6.4	1.6	0.39	1.71	2.54	1.67	123
250	—	350	—	240	—	240	—	2.5	1	2 730	4 970	529	**47T503524**	1	270	338	324	6	2	1	0.40	1.68	2.50	1.64	70
	—	365	—	270	—	270	—	3	1.5	3 320	6 340	665	**47T503627**	1	277	351	330	8	2.5	1.5	0.33	2.03	3.02	1.98	96.7
254.000	10.0000	358.775	14.1250	147.000	5.7874	147.000	5.7874	3.2	1.6	1 650	2 910	341	**47T513615**	1	290	345	331	7	3.2	1.6	0.33	2.03	3.02	1.98	46.9
	10.0000	358.775	14.1250	269.875	10.6250	269.875	10.6250	3.2	1.6	3 320	6 340	665	**47T513627A**	2	277	345	330	8	3.2	1.6	0.33	2.03	3.02	1.98	85.8
	10.0000	358.775	14.1250	269.875	10.6250	269.875	10.6250	3.2	1.6	3 290	6 030	633	**47T513627B**	1	272	345	331	7.5	3.2	1.6	0.46	1.47	2.19	1.44	85.5
	10.0000	358.775	14.1250	269.875	10.6250	269.875	10.6250	3.2	1.6	3 290	6 030	633	**47T513627C**	2	272	345	331	7.5	3.2	1.6	0.46	1.47	2.19	1.44	86.1
	10.0000	358.775	14.1250	269.875	10.6250	269.875	10.6250	3.2	3.2	3 320	6 340	665	**M249748D/710/710D**	1	277	345	330	8	3.2	3.2	0.33	2.03	3.02	1.98	86
260	—	360	—	272	—	272	—	3	1	3 640	7 020	724	**47T523627A**	1	280	346	335	9	2.5	1	0.33	2.03	3.02	1.98	83.6
	—	368	—	268	—	268	—	4	5	3 140	6 020	634	**37252**	1	286	350	338	6	3	4	0.33	2.03	3.02	1.98	88.4
	—	400	—	220	—	220	—	4	1.5	3 000	4 520	489	**47T524022**	1	295	382	364	7.5	3	1.5	0.40	1.68	2.50	1.64	98.5
	—	400	—	255	—	255	—	7.5	5	3 290	5 400	570	**47T524026**	1	296	400	360	9	6	4	0.39	1.72	2.56	1.68	113
	—	400	—	320	—	320	—	4	5	4 100	7 070	743	**47T524032**	1	294	382	361	8.5	3	4	0.33	2.03	3.02	1.98	145

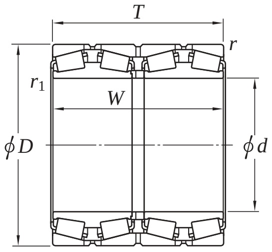
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

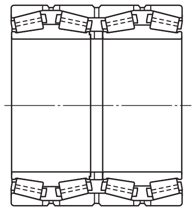
Four-row tapered roller bearings

TQO type

d (260) ~ 288.925 mm

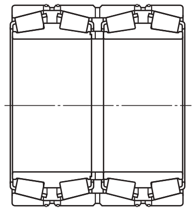


Design 1

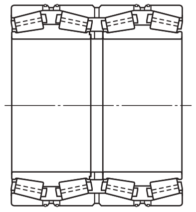


Design 1-P

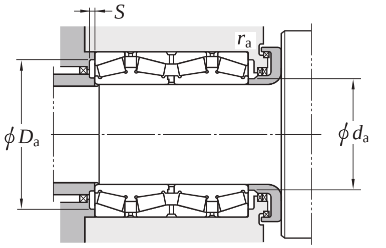
For oil mist lubrication



Design 2



Design 2-P



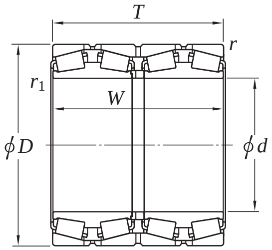
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1)]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*W* mm	*W* 1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a max.	D_a max.	D_a min.	*S* min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	(kg)
260	—	440	—	300	—	300	—	4	5	4 370	6 880	715	**47352**	1	311	422	392	10	3	4	0.35	1.95	2.90	1.91	188
260.350	10.2500	422.275	16.6250	317.500	12.5000	314.325	12.3750	3.2	6.4	4 360	6 720	710	**HM252348D/310/310D**	1	304	407	384	1	3.2	6.4	0.33	2.03	3.02	1.98	167
266.700	10.5000	335.600	13.2126	228.600	9.0000	230.188	9.0625	3.2	1.6	2 330	5 260	552	**47T533423**	1	281	322	312	7	3.2	1.6	0.28	2.43	3.61	2.37	46.4
	10.5000	355.600	14.0000	228.600	9.0000	230.188	9.0625	3.2	1.6	2 790	5 690	590	**47T533623B**	1	285	342	332	8	3.2	1.6	0.36	1.87	2.79	1.83	62.7
	10.5000	355.600	14.0000	228.600	9.0000	230.188	9.0625	3.2	1.6	2 480	4 830	507	**76589D/20/20D**	1	285	342	331	7	3.2	1.6	0.37	1.83	2.73	1.79	59.8
	10.5000	393.700	15.5000	269.878	10.6251	269.878	10.6251	6.4	1.6	3 750	6 460	681	**47T533927-1**	1	294	373	361	8.5	6.4	1.6	0.40	1.68	2.50	1.64	112
269.875	10.6250	381.000	15.0000	282.575	11.1250	282.575	11.1250	3.2	3.2	3 670	6 690	697	**M252349D/310/310D**	1	291	367	350	6	3.2	3.2	0.33	2.03	3.02	1.98	98.4
270	—	364	—	260	—	260	—	3	1.5	2 970	5 720	590	**47T543626**	1	285	350	338	4.5	2.5	1.5	0.42	1.59	2.37	1.56	72.8
	—	410	—	222	—	222	—	4	5	2 820	4 380	474	**47254**	1	308	392	372	6.5	3	4	0.27	2.51	3.74	2.45	100
276.225	10.8750	393.700	15.5000	269.878	10.6251	269.878	10.6251	6.4	1.6	3 420	5 830	607	**47T553927**	1	299	373	363	4.5	6.4	1.6	0.40	1.68	2.50	1.64	101
279.400	11.0000	393.700	15.5000	269.875	10.6250	269.875	10.6250	6.4	1.6	3 340	5 990	622	**47T563927A**	2	305	373	363	9.5	6.4	1.6	0.40	1.68	2.50	1.64	101
	11.0000	393.700	15.5000	269.875	10.6250	269.875	10.6250	6.4	1.6	3 340	5 990	622	**47T563927B**	1	305	373	363	9.5	6.4	1.6	0.40	1.68	2.50	1.64	101
	11.0000	410.000	16.1417	310.000	12.2047	310.000	12.2047	6.4	1.6	3 910	7 290	745	**47T564131**	2	308	389	374	8	6.4	1.6	0.40	1.68	2.50	1.64	140
279.578	11.0070	380.898	14.9960	244.475	9.6250	244.475	9.6250	3.2	1.6	2 850	5 650	571	**LM654644D/610/610D**	1	303	367	356	6.5	3.2	1.6	0.43	1.57	2.34	1.53	80.4
280	—	380	—	290	—	290	—	2	2	3 520	6 940	710	**47T563829**	1	300	370	354	6	2	2	0.33	2.03	3.02	1.98	91.8
	—	380	—	290	—	290	—	2	1	3 520	6 940	710	**47T563829A**	2	300	370	354	6	2	1	0.33	2.03	3.02	1.98	92.1
	—	395	—	288	—	288	—	4	2	3 610	6 900	702	**37256X**	1	303	377	363	8	3	2	0.40	1.68	2.50	1.64	110
	—	395	—	288	—	288	—	4	2	3 610	6 900	702	**47T564029A**	2	303	377	363	8	3	2	0.40	1.68	2.50	1.64	110
	—	420	—	225	—	225	—	4	5	2 990	4 950	530	**47256**	1	322	402	382	8.5	3	4	0.25	2.69	4.00	2.63	104
	—	460	—	324	—	324	—	5	6	5 410	8 230	842	**47T564632**	1-P	321	438	415	10.5	4	5	0.46	1.47	2.19	1.44	214
280.268	11.0342	379.887	14.9562	244.475	9.6250	244.475	9.6250	3.2	1.6	2 850	5 650	571	**47T563824**	1	303	366	355	6.5	3.2	1.6	0.43	1.57	2.34	1.53	80
285.750	11.2500	380.898	14.9960	244.475	9.6250	244.475	9.6250	3.2	1.6	2 850	5 650	571	**LM654648D/610/610D**	1	303	367	356	6.5	3.2	1.6	0.43	1.57	2.34	1.53	75.6
288.925	11.3750	406.400	16.0000	298.450	11.7500	298.450	11.7500	3.2	3.2	4 310	8 840	890	**M255449D/410/410D**	1	316	392	373	9	3.2	3.2	0.34	2.00	2.97	1.95	127

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

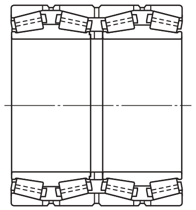
Four-row tapered roller bearings

TQO type

d 292.100 ~ (320) mm

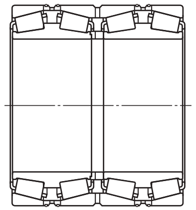


Design 1

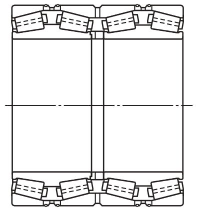


Design 1-P

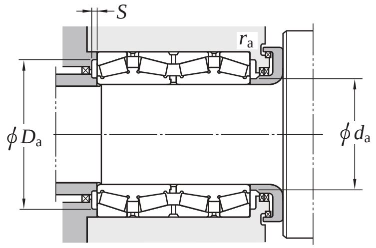
For oil mist lubrication



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d		D		T		W		r	r_1 [2]	C_r	C_{0r}	(kN) C_u			d_a	D_a		S	r_a	r_b	e	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
292.100	11.5000	422.275	16.6250	269.875	10.6250	269.875	10.6250	3.2	6.4	3 970	6 830	716	**EE330116D/166/167D**	1	321	407	387	7.5	3.2	6.4	0.32	2.11	3.14	2.06	124
300	—	420	—	310	—	310	—	3	1	4 250	8 050	818	**47T604231**	1	325	406	388	8.5	2.5	1	0.34	2.00	2.98	1.96	132
	—	424	—	310	—	310	—	4	5	3 500	6 570	660	**37260**	1	334	406	391	6	3	4	0.28	2.37	3.53	2.32	134
	—	430	—	300	—	300	—	3	4	4 150	7 630	768	**47T604330**	1	328	416	393	10	2.5	3	0.35	1.95	2.90	1.91	141
	—	430	—	310	—	310	—	3	2.5	4 410	8 420	846	**47T604331**	1	332	416	399	10	2.5	2	0.40	1.68	2.50	1.64	146
	—	460	—	248	—	248	—	4	1.5	3 840	6 300	651	**47T604625**	1	342	442	416	8.5	3	1.5	0.40	1.68	2.50	1.64	149
	—	460	—	360	—	360	—	4	5	5 390	9 550	948	**47T604636**	1	339	442	416	9	3	4	0.33	2.03	3.02	1.98	220
	—	470	—	270	—	270	—	4	5	4 400	6 440	669	**47T604727A**	1	338	452	426	8	3	4	0.40	1.68	2.50	1.64	165
	—	470	—	292	—	292	—	4	SP	5 000	7 870	815	**47T604729B**	1-P	341	452	428	8.5	3	2	0.40	1.68	2.50	1.64	193
	—	470	—	292	—	292	—	4	1.5	5 190	8 210	847	**47T604729C**	1-P	343	452	428	9.5	3	1.5	0.33	2.03	3.02	1.98	198
	—	500	—	350	—	350	—	4	2.5	6 280	9 290	948	**47T605035**	1	346	482	451	8	3	2	0.40	1.68	2.50	1.64	270
300.038	11.8125	422.275	16.6250	311.150	12.2500	311.150	12.2500	3.2	3.2	4 250	8 050	818	**HM256849D/810/810D**	1	325	407	388	7	3.2	3.2	0.34	2.00	2.98	1.96	136
304.648	11.9940	438.048	17.2460	279.400	11.0000	280.990	11.0626	4.8	3.2	4 040	6 980	716	**47T614428C**	2	331	420	403	7	4.8	3.2	0.47	1.44	2.15	1.41	133
	11.9940	438.048	17.2460	279.400	11.0000	280.990	11.0626	4.8	3.2	4 040	6 980	716	**M757448D/410/410D**	1	331	420	403	7	4.8	3.2	0.47	1.44	2.15	1.41	132
304.800	12.0000	419.100	16.5000	269.875	10.6250	269.875	10.6250	6.4	1.6	3 540	6 950	699	**M257149D/110/110D**	1	331	398	387	7	6.4	1.6	0.33	2.03	3.02	1.98	110
	12.0000	482.600	19.0000	377.825	14.8750	365.125	14.3750	6.4	3.2	6 060	9 800	986	**47T614838A**	1-P	343	461	437	1	6.4	3.2	0.47	1.43	2.12	1.40	250
	12.0000	495.300	19.5000	349.250	13.7500	342.900	13.5000	6.4	3.2	5 480	9 370	922	**EE724121D/195/196D**	1	355	474	438	7	6.4	3.2	0.40	1.68	2.50	1.64	267
304.902	12.0040	412.648	16.2460	266.700	10.5000	266.700	10.5000	3.2	3.2	3 740	7 280	746	**M257248D/210/210D**	1	328	398	383	7	3.2	3.2	0.32	2.12	3.15	2.07	101
310	—	430	—	310	—	310	—	3	3	4 410	8 420	846	**47T624331A**	1	332	416	399	10	2.5	2.5	0.40	1.68	2.50	1.64	135
	—	460	—	325	—	325	—	4	5	5 260	9 500	951	**47T6246A**	1	346	442	421	12	3	4	0.32	2.12	3.15	2.07	188
317.500	12.5000	422.275	16.6250	269.875	10.6250	269.875	10.6250	3.2	1.6	3 660	7 450	747	**LM258649D/610/610D**	1	341	407	392	8.5	3.2	1.6	0.32	2.12	3.15	2.07	104
	12.5000	447.675	17.6250	327.025	12.8750	327.025	12.8750	6.4	1.6	5 160	9 820	976	**47T644533J**	1-P	341	426	411	7.5	6.4	1.6	0.33	2.02	3.00	1.97	161
	12.5000	447.675	17.6250	327.025	12.8750	327.025	12.8750	6.4	1.6	5 360	10 100	995	**47T644533L**	1	344	426	411	11.5	6.4	1.6	0.33	2.03	3.02	1.98	161
320	—	440	—	335	—	335	—	2	2.5	4 500	8 750	877	**47T644434**	1	341	430	408	5.5	2	2	0.40	1.68	2.50	1.64	149
	—	460	—	325	—	325	—	4	2.5	5 050	9 420	933	**47T644633**	1	349	442	424	10	3	2.5	0.42	1.62	2.42	1.59	175

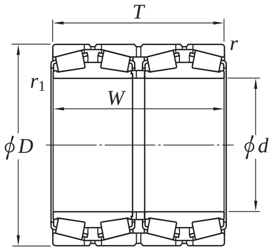
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

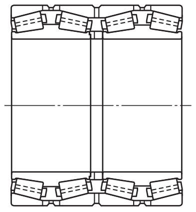
Four-row tapered roller bearings

TQO type

d (320) ~ 355.600 mm

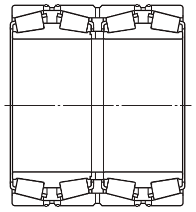


Design 1

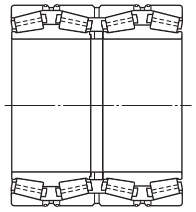


Design 1-P

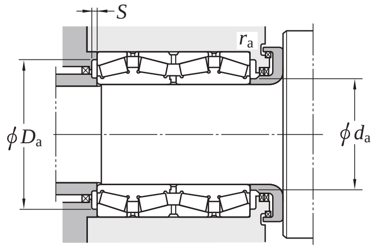
For oil mist lubrication



Design 2



Design 2-P



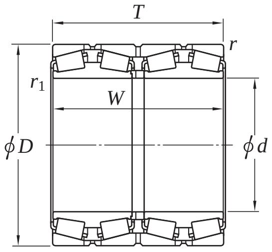
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*W* mm	1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	*S* min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
320	—	460	—	338	—	338	—	4	5	4 380	8 590	843	**37264**	1	356	442	421	8.5	3	4	0.33	2.03	3.02	1.98	183
	—	480	—	254	—	254	—	4	2.5	4 260	6 940	709	**47T644825**	1-P	358	462	437	9	3	2	0.40	1.68	2.50	1.64	161
	—	480	—	260	—	260	—	4	5	4 210	6 890	696	**47T644826**	1	359	462	437	11.5	3	5	0.40	1.68	2.50	1.64	165
	—	480	—	360	—	360	—	4	1	6 230	11 000	1 070	**47T644836-1**	1-P	352	462	442	9	3	1	0.47	1.43	2.12	1.40	229
	—	500	—	380	—	380	—	4	1.5	6 970	11 900	1 180	**47T645038**	1-P	363	482	454	11.5	3	1.5	0.33	2.03	3.02	1.98	284
	—	540	—	364	—	364	—	5	6	6 770	10 600	1 060	**47364**	1	376	518	479	8.5	4	5	0.32	2.12	3.15	2.07	340
325	—	430	—	230	—	230	—	3	1	3 010	5 800	592	**47T654323**	1	347	416	401	8.5	2.5	1	0.40	1.68	2.50	1.64	88.5
327	—	445	—	230	—	230	—	3	1	3 280	6 080	621	**47T654523**	1	353	431	413	9	2.5	1	0.40	1.68	2.50	1.64	102
330.200	13.0000	444.500	17.5000	301.625	11.8750	301.625	11.8750	3.2	3.2	4 440	9 260	920	**47T664430**	1	357	430	414	10	3.2	3.2	0.26	2.55	3.80	2.50	134
	13.0000	508.000	20.0000	307.975	12.1250	307.975	12.1250	6.4	1.6	5 440	8 500	862	**47T665131A**	1	372	486	462	8	6.4	1.6	0.33	2.03	3.02	1.98	219
335.000	13.1890	460.000	18.1102	342.900	13.5000	342.900	13.5000	3.2	1.6	4 960	9 390	922	**47T674634/DP**	2	361	445	428	7.5	3.2	1.6	0.40	1.68	2.50	1.64	165
337.375	13.2825	469.900	18.5000	342.900	13.5000	342.900	13.5000	3.2	1.6	5 800	11 400	1 100	**HM261049D/010/010D**	1-P	360	455	432	9	3.2	1.6	0.33	2.02	3.01	1.97	190
340	—	480	—	350	—	350	—	5	6	5 890	11 700	1 130	**37268A**	1-P	371	458	443	9.5	4	6	0.33	2.03	3.02	1.98	198
	—	520	—	278	—	278	—	5	6	5 070	8 110	824	**47T685228**	1	384	498	473	9	4	6	0.40	1.68	2.50	1.64	212
	—	520	—	323	—	323	—	5	6	5 510	8 930	881	**47T685232**	1	381	498	473	10	4	5	0.40	1.68	2.50	1.64	242
343.052	13.5060	457.098	17.9960	254.000	10.0000	254.000	10.0000	3.2	1.6	3 560	6 950	680	**47T694625**	1	363	442	425	6	3.2	1.6	0.47	1.43	2.12	1.40	111
	13.5060	457.098	17.9960	254.000	10.0000	254.000	10.0000	3.2	1.6	3 560	6 950	680	**47T694625/DP3**	2	363	442	425	6	3.2	1.6	0.47	1.43	2.12	1.40	111
346.075	13.6250	488.950	19.2500	358.775	14.1250	358.775	14.1250	3.2	3.2	5 790	11 600	1 110	**HM262749D/10/10D**	1	378	474	449	8	3.2	3.2	0.33	2.02	3.00	1.97	214
347.663	13.6875	469.900	18.5000	292.100	11.5000	292.100	11.5000	3.2	3.2	4 490	9 040	879	**M262449D/10/10D**	1	374	455	436	10	3.2	3.2	0.33	2.03	3.02	1.98	145
355	—	490	—	316	—	316	—	2	2.5	5 200	10 000	982	**47T714932**	1	385	480	455	12.5	2	2	0.33	2.03	3.02	1.98	180
355.600	14.0000	482.600	19.0000	269.875	10.6250	265.113	10.4375	3.2	1.6	4 240	7 860	795	**47T714827-1**	1	386	468	450	8	3.2	1.6	0.26	2.55	3.80	2.50	139
	14.0000	482.600	19.0000	269.875	10.6250	265.112	10.4375	3.2	1.6	3 820	7 020	692	**LM763449D/410/410D**	1	381	468	450	3.5	3.2	1.6	0.47	1.43	2.14	1.40	136
	14.0000	488.950	19.2500	317.500	12.5000	317.500	12.5000	3.2	1.6	5 470	10 900	1 060	**M263349D/310/310D**	1-P	383	474	452	7.5	3.2	1.6	0.33	2.03	3.02	1.98	182

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

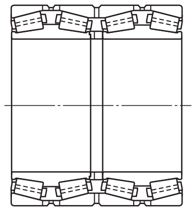
Four-row tapered roller bearings

TQO type

d 360 ~ 380 mm

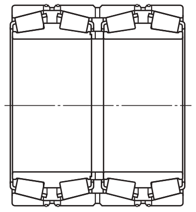


Design 1

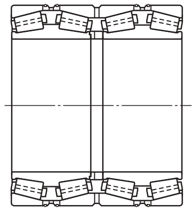


Design 1-P

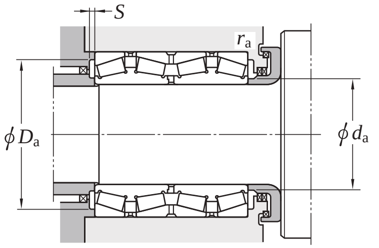
For oil mist lubrication



Design 2



Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	W mm	W 1/25.4	r min.	r_1 min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	S min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
360	—	480	—	375	—	375	—	3	4	4 900	9 910	962	**47T724838A**	1	383	466	446	3.5	2.5	3	0.40	1.68	2.50	1.64	177
	—	480	—	375	—	375	—	3	1	5 240	11 100	1 050	**47T724838C**	1	381	466	448	5	2.5	1	0.33	2.03	3.02	1.98	183
	—	508	—	370	—	370	—	5	6	6 070	11 500	1 100	**47T725137**	1	392	486	471	7	4	6	0.33	2.03	3.02	1.98	232
	—	520	—	370	—	370	—	5	6	6 170	11 400	1 090	**47T725237**	1	395	498	476	8.5	4	5	0.33	2.03	3.02	1.98	259
	—	520	—	410	—	410	—	5	6	7 480	14 300	1 350	**47T725241**	1-P	395	498	479	8.5	4	5	0.33	2.03	3.02	1.98	292
	—	540	—	280	—	280	—	5	6	4 740	7 820	786	**47272**	1	406	518	490	10	4	5	0.32	2.12	3.15	2.07	221
	—	540	—	280	—	280	—	5	6	4 710	8 000	777	**47T725428**	1	402	518	489	10.5	4	5	0.55	1.24	1.84	1.21	224
	—	540	—	460	—	460	—	4	5	8 070	15 800	1 450	**47T7254**	1	408	522	492	9.5	3	4	0.27	2.47	3.67	2.41	373
368.300	14.5000	523.875	20.6250	382.588	15.0625	382.588	15.0625	6.4	3.2	6 930	13 600	1 300	**47T745238B**	1-P	404	502	483	9	6.4	3.2	0.29	2.32	3.45	2.26	269
	14.5000	523.875	20.6250	382.588	15.0625	382.588	15.0625	3.2	1.6	7 050	14 100	1 320	**47T745238D**	1	403	508	483	7.5	3.2	1.6	0.33	2.03	3.02	1.98	265
	14.5000	523.875	20.6250	382.588	15.0625	382.588	15.0625	6.4	3.2	7 420	14 500	1 360	**47T745238J**	1-P	401	502	485	10.5	6.4	3.2	0.33	2.03	3.02	1.98	268
	14.5000	523.875	20.6250	382.588	15.0625	382.588	15.0625	6.4	3.2	6 840	13 600	1 290	**HM265049D/010/010D**	1-P	403	502	483	7	6.4	3.2	0.33	2.03	3.02	1.98	269
	14.5000	563.000	22.1654	382.588	15.0625	382.588	15.0625	6.4	3.2	7 920	13 600	1 320	**47T745638**	1-P	417	541	516	10.5	6.4	3.2	0.29	2.32	3.45	2.26	344
370	—	516	—	346	—	346	—	4	1.5	6 110	11 700	1 120	**47T745235**	1-P	398	498	479	9	3	1.5	0.40	1.68	2.50	1.64	216
374.650	14.7500	501.650	19.7500	260.350	10.2500	260.350	10.2500	3.2	1.6	3 680	7 750	737	**47T745026**	1	399	486	459	7	3.2	1.6	0.43	1.56	2.32	1.52	145
380	—	520	—	360	—	360	—	5	6	5 760	12 200	1 140	**47T765236**	1	417	498	484	11	4	5	0.32	2.12	3.15	2.07	225
	—	520	—	400	—	400	—	4	2.5	6 270	13 000	1 200	**47T765240**	1	404	502	482	9.5	3	2	0.40	1.68	2.50	1.64	248
	—	536	—	390	—	390	—	5	6	6 740	12 900	1 220	**37276**	1	415	514	496	7.5	4	5	0.40	1.68	2.50	1.64	268
	—	560	—	282	—	282	—	5	6	4 600	7 580	741	**47276**	1	429	538	511	9	4	5	0.27	2.47	3.67	2.41	232
	—	560	—	285	—	285	—	4	5	5 760	10 000	983	**47T765629**	1-P	428	542	513	11	3	4	0.27	2.47	3.67	2.41	246
	—	560	—	285	—	285	—	4	5	5 540	9 240	919	**47T765629A**	1	427	542	515	11	3	5	0.27	2.47	3.67	2.41	244
	—	560	—	325	—	325	—	5	6	6 680	11 900	1 150	**47T765633A**	1-P	427	538	514	11	4	5	0.27	2.47	3.67	2.41	278
	—	560	—	360	—	390	—	4	1.5	6 650	11 800	1 120	**47T765639**	1	422	542	514	9	3	1.5	0.35	1.95	2.90	1.91	307
	—	560	—	370	—	370	—	5	6	7 400	13 600	1 300	**47T765637**	1-P	423	538	515	10	4	5	0.33	2.03	3.02	1.98	312
	—	580	—	500	—	500	—	5	6	9 290	17 500	1 570	**47T765850**	1	427	558	529	10.5	4	5	0.33	2.03	3.02	1.98	478
	—	620	—	400	—	400	—	5	6	7 710	12 700	1 210	**47376**	1	445	598	552	6.5	4	5	0.32	2.12	3.15	2.07	476
	—	620	—	418.5	—	418.5	—	5	6	8 900	14 000	1 330	**47T766242**	1-P	435	598	561	10	4	5	0.46	1.47	2.19	1.44	499

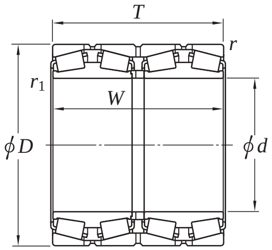
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Four-row tapered roller bearings

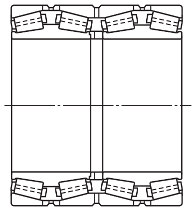
TQO type

d 384.175 ~ (431.800) mm

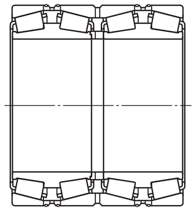
For oil mist lubrication



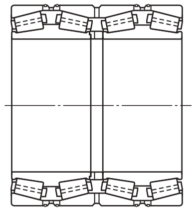
Design 1



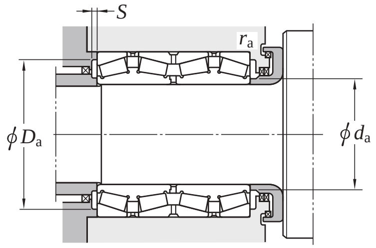
Design 1-P



Design 2



Design 2-P

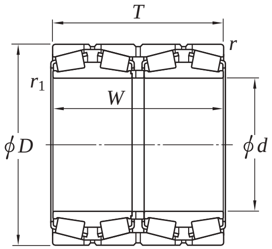


Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d		*D*		*T*		*W*		*r*	r_1	C_r	C_{0r}	(kN) C_u			d_a	D_a		*S*	r_a	r_b	*e*	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
384.175	15.1250	546.100	21.5000	400.050	15.7500	400.050	15.7500	6.4	3.2	8 180	16 900	1 550	**HM266449D/410/410D**	1-P	418	524	502	10.5	6.4	3.2	0.33	2.03	3.02	1.98	315
	15.1250	546.100	21.5000	470.000	18.5039	470.000	18.5039	6.4	3.2	7 790	16 200	1 460	**47T775547**	1	418	524	503	7.5	6.4	3.2	0.33	2.03	3.02	1.98	360
390	—	510	—	350	—	350	—	3	1.5	5 380	11 700	1 090	**47T785135A**	1	413	496	478	10.5	2.5	1.5	0.33	2.03	3.02	1.98	186
	—	510	—	350	—	350	—	3	1	5 190	11 200	1 050	**47T785135B**	1	415	496	479	5.5	2.5	1	0.29	2.32	3.45	2.26	183
395	—	545	—	288.7	—	270.3	—	7.5	5	4 160	7 680	744	**47T795529**	1	433	509	494	3	6	4	0.43	1.57	2.34	1.53	190
400	—	560	—	380	—	380	—	4	1.5	7 480	15 200	1 410	**47T805638A**	1-P	435	542	519	10	3	1.5	0.33	2.03	3.02	1.98	296
	—	564	—	412	—	412	—	4	2.5	8 110	16 500	1 500	**47T805641**	1-P	432	546	522	9	3	2.5	0.40	1.68	2.50	1.64	329
	—	590	—	304	—	304	—	4	1.5	5 960	10 200	997	**47T805930A**	1-P	449	572	540	7.5	3	1.5	0.33	2.03	3.02	1.98	289
	—	600	—	308	—	308	—	5	6	6 040	9 930	956	**47280**	1	452	578	548	9	4	5	0.33	2.03	3.02	1.98	310
406.400	16.0000	546.100	21.5000	288.925	11.3750	288.925	11.3750	6.4	1.6	4 950	9 540	906	**47T815529**	1	435	524	509	9.5	6.4	1.6	0.47	1.43	2.12	1.40	184
	16.0000	546.100	21.5000	330.000	12.9921	330.000	12.9921	6.4	3.2	6 000	12 400	1 160	**47T815533B**	1-P	434	524	509	8.5	6.4	3.2	0.40	1.68	2.50	1.64	214
	16.0000	562.000	22.1260	381.000	15.0000	381.000	15.0000	6.4	3.2	7 510	15 000	1 390	**47T815638**	1	439	540	524	9.5	6.4	3.2	0.33	2.03	3.02	1.98	284
	16.0000	565.150	22.2500	381.000	15.0000	381.000	15.0000	6.4	3.2	7 510	15 000	1 390	**M267949D/910/910XD**	1	438.3	544	524	9.5	6.4	3.2	0.33	2.03	3.02	1.98	291
409.575	16.1250	546.100	21.5000	334.963	13.1875	334.963	13.1875	6.4	1.6	5 710	11 500	1 080	**M667947D/911/911D**	1	432	524	509	8.5	6.4	1.6	0.42	1.62	2.42	1.59	213
415.925	16.3750	590.550	23.2500	434.975	17.1250	434.975	17.1250	6.4	3.2	8 840	18 800	1 680	**47T835943A**	1-P	455	568	543	10	6.4	3.2	0.33	2.03	3.02	1.98	391
420	—	560	—	370	—	370	—	5	6	6 200	13 600	1 240	**47T845637**	1	459	538	527	12	4	5	0.32	2.12	3.15	2.07	252
	—	560	—	437	—	437	—	4	1.5	7 020	14 900	1 380	**47T845644**	1	450	542	526	4	3	1.5	0.26	2.55	3.80	2.50	283
	—	592	—	432	—	432	—	5	6	7 540	15 700	1 410	**37284**	1	460	570	544	7.5	4	5	0.33	2.03	3.02	1.98	374
	—	650	—	460	—	460	—	6	6	10 800	18 300	1 660	**47T846546**	1	468	622	595	8.5	5	5	0.40	1.68	2.50	1.64	558
430	—	570	—	336	—	336	—	4	1.5	5 990	12 500	1 150	**47T865734C**	1	460	552	536	10	3	1.5	0.36	1.87	2.79	1.83	232
	—	570	—	380	—	380	—	4	1.5	7 060	15 900	1 440	**47T865738**	1	463	552	534	10.5	3	1.5	0.26	2.55	3.80	2.50	269
431.800	17.0000	571.500	22.5000	336.550	13.2500	336.550	13.2500	6.4	1.6	6 340	13 500	1 240	**47T865734**	1-P	460	549	534	10	6.4	1.6	0.36	1.87	2.79	1.83	232
	17.0000	571.500	22.5000	336.550	13.2500	336.550	13.2500	6.4	1.6	5 380	11 300	1 040	**LM769349D/310/310D**	1	463	549	534	7	6.4	1.6	0.48	1.41	2.10	1.38	231

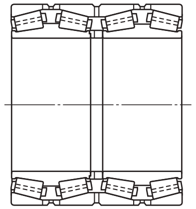
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

TQO type

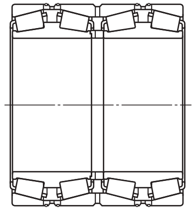
d (431.800) ~ 479.425 mm

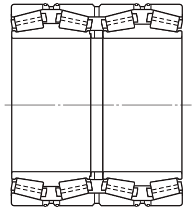


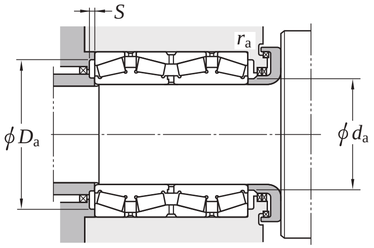
Design 1


Design 1-P

For oil mist lubrication


Design 2


Design 2-P



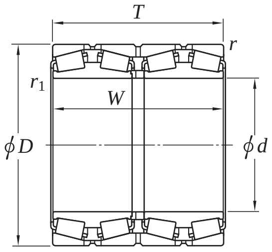
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d		*D*		*T*		*W*		*r*	r_1	C_r	C_{0r}	C_u			d_a	D_a		*S*	r_a	r_b	*e*	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.						max.	max.	min.	min.	max.	max.					
431.800	17.0000	635.000	25.0000	355.600	14.0000	355.600	14.0000	6.4	6.4	7 910	13 700	1 290	**EE931170D/250/251XD**	1-P	481	612	586	8	6.4	6.4	0.32	2.10	3.13	2.06	385
432.003	17.0080	609.524	23.9970	317.500	12.5000	317.500	12.5000	6.4	3.6	6 520	12 100	1 130	**EE736173D/238/239D**	1-P	474	586	562	9	6.4	3.6	0.35	1.94	2.89	1.90	291
440	—	580	—	420	—	420	—	4	1.5	7 150	15 400	1 420	**47T885842**	1-P	467	562	544	1.5	3	1.5	0.26	2.55	3.80	2.50	288
	—	620	—	454	—	454	—	6	6	8 900	17 500	1 560	**37288**	1	482	592	576	9	5	5	0.40	1.68	2.50	1.64	417
	—	620	—	454	—	454	—	4	5	9 530	19 800	1 730	**47T886246**	1-P	474	602	573	10.5	3	5	0.40	1.68	2.50	1.64	436
	—	635	—	430	—	430	—	5	6	9 470	18 000	1 630	**47T886443**	1-P	485	613	587	9.5	4	5	0.33	2.03	3.02	1.98	450
	—	635	—	470	—	470	—	5	2.5	10 700	20 900	1 840	**47T886447**	1-P	483	613	588	10.5	4	2	0.33	2.03	3.02	1.98	500
	—	650	—	326	—	326	—	6	6	6 370	11 000	1 020	**47288**	1-P	500	622	595	11	5	5	0.28	2.43	3.61	2.37	361
	—	650	—	334	—	334	—	6	6	6 880	12 200	1 130	**47288A**	1	500	622	595	9.5	5	5	0.28	2.43	3.61	2.37	375
	—	660	—	450	—	450	—	5	2	10 900	19 000	1 720	**47T886645**	1	489	638	610	9.5	4	2	0.32	2.12	3.15	2.07	532
447.675	17.6250	635.000	25.0000	463.550	18.2500	463.550	18.2500	6.4	3.2	9 840	21 000	1 830	**M270749D/710/710D**	1-P	491	612	584	8	6.4	3.2	0.33	2.03	3.02	1.98	472
449.949	17.7145	594.949	23.4232	368.000	14.4882	368.000	14.4882	5	2.5	7 470	16 200	1 470	**M270449D/10/10D**	1-P	478	573	557	9	5	2	0.33	2.03	3.02	1.98	278
450	—	580	—	450	—	450	—	6	1.5	6 440	14 600	1 320	**47T905845**	1	475	552	537	2	5	1.5	0.26	2.55	3.80	2.50	286
457.200	18.0000	596.900	23.5000	279.400	11.0000	276.225	10.8750	3.2	1.6	5 350	11 400	1 050	**47T916028A**	1-P	485	581	560	8.5	3.2	1.6	0.47	1.43	2.12	1.40	307
	18.0000	660.400	26.0000	323.847	12.7499	323.850	12.7500	6.4	3.2	7 140	12 700	1 180	**EE737179D/260/261D**	1-P	501	637	603	9	6.4	3.2	0.37	1.80	2.69	1.76	365
460	—	586	—	280	—	280	—	3	1	4 650	9 810	915	**47T925928**	1	483	572	555	10.5	2.5	1	0.44	1.52	2.26	1.49	177
	—	615	—	360	—	360	—	3	1	6 260	13 300	1 210	**47T926236**	1	490	601	572	8	2.5	1	0.47	1.43	2.12	1.40	292
	—	625	—	421	—	421	—	4	1.5	8 640	18 800	1 670	**47T926342**	1-P	495	607	582	8	3	1.5	0.33	2.03	3.02	1.98	386
	—	650	—	474	—	474	—	6	6	9 420	19 400	1 690	**37292**	1	500	622	598	8	5	5	0.33	2.03	3.02	1.98	495
	—	680	—	375	—	375	—	5	2	8 150	15 200	1 370	**47T926838**	1	515	658	618	10.5	4	2	0.36	1.87	2.79	1.83	475
	—	730	—	440	—	440	—	6	3	10 900	17 700	1 610	**47T927344**	1-P	519	702	662	13	5	2.5	0.47	1.43	2.12	1.40	710
475.000	18.7008	600.000	23.6220	368.000	14.4882	368.000	14.4882	4.8	1.6	6 240	15 100	1 350	**47T956037A**	1	501	581	566	10.5	4.8	1.6	0.26	2.55	3.80	2.50	246
479.425	18.8750	679.450	26.7500	495.300	19.5000	495.300	19.5000	6.4	3.2	12 100	25 400	2 150	**47T966850**	1-P	523	656	641	12.5	6.4	3.2	0.33	2.03	3.02	1.98	591
	18.8750	679.450	26.7500	495.300	19.5000	495.300	19.5000	6.4	3.2	10 600	22 200	1 900	**M272749D/710/710D**	1-P	524	656	627	7.5	6.4	3.2	0.33	2.03	3.02	1.98	575

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

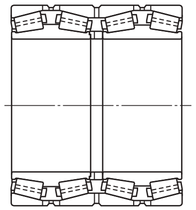
Four-row tapered roller bearings

TQO type

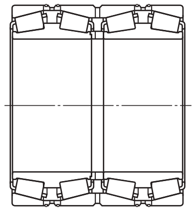
d 480 ~ (508.000) mm

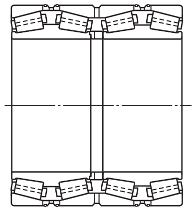


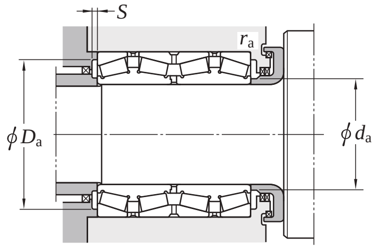
Design 1


Design 1-P

For oil mist lubrication


Design 2


Design 2-P



Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	W mm	W 1/25.4	r min.	r_1 [2] min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	S min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
480	—	678	—	494	—	494	—	6	6	11 500	23 300	2 000	**37296**	1-P	520	650	629	9.5	5	5	0.33	2.03	3.02	1.98	563
	—	700	—	390	—	390	—	5	6	9 270	16 800	1 520	**47T967039**	1-P	536	678	647	11	4	6	0.33	2.03	3.02	1.98	508
480.000	18.8976	700.000	27.5591	420.000	16.5354	420.000	16.5354	6.4	3.2	10 100	18 800	1 680	**47T967042C**	1	531	677	644	10.5	6.4	3.2	0.35	1.95	2.90	1.91	540
482.600	19.0000	615.950	24.2500	330.200	13.0000	330.200	13.0000	6.4	6.4	6 060	13 400	1 220	**47T976233**	2-P	512	593	573	6	6.4	6.4	0.44	1.54	2.30	1.51	240
	19.0000	615.950	24.2500	330.200	13.0000	330.200	13.0000	6.4	6.4	6 060	13 400	1 220	**4TR19A**	1-P	512	593	573	6.5	6.4	6.4	0.44	1.54	2.30	1.51	240
	19.0000	615.950	24.2500	330.200	13.0000	330.200	13.0000	6.4	4.8	6 610	15 000	1 340	**4TR19B**	1-P	509	593	573	10.5	6.4	4.8	0.33	2.03	3.02	1.98	243
	19.0000	615.950	24.2500	330.200	13.0000	330.200	13.0000	6.4	3.2	6 540	15 000	1 330	**4TR19D**	1	508	593	573	10	6.4	3.2	0.36	1.87	2.79	1.83	240
	19.0000	615.950	24.2500	420.000	16.5354	420.000	16.5354	4	2.5	7 290	16 700	1 480	**47T976242**	1	508	597	577	6	4	2.5	0.26	2.55	3.80	2.50	296
	19.0000	647.700	25.5000	417.512	16.4375	417.512	16.4375	6.4	3.2	9 230	20 300	1 770	**47T976542A**	2-P	514	624	603	9.5	6.4	3.2	0.33	2.03	3.02	1.98	397
	19.0000	647.700	25.5000	417.512	16.4375	417.512	16.4375	6.4	3.2	9 230	20 300	1 770	**M272647D/610/610D**	1-P	514	624	604	9.5	6.4	3.2	0.33	2.03	3.02	1.98	395
488.950	19.2500	622.300	24.5000	365.125	14.3750	365.125	14.3750	3.6	3.6	6 210	13 900	1 240	**47T986236**	1	516	605	585	7.5	3.6	3.6	0.33	2.03	3.02	1.98	262
	19.2500	660.400	26.0000	361.950	14.2500	365.125	14.3750	6.4	7.9	7 750	15 800	1 430	**EE640193D/260/261D**	1-P	527	637	616	11	6.4	7.9	0.31	2.20	3.27	2.15	357
489.026	19.2530	634.873	24.9950	320.675	12.6250	320.675	12.6250	3.2	3.2	5 680	13 200	1 170	**EE243193D/250/251D**	1	526	618	595	9.5	3.2	3.2	0.34	1.97	2.93	1.93	263
	19.2530	634.873	24.9950	320.675	12.6250	320.675	12.6250	3.2	3.2	6 180	13 700	1 230	**LM772749D/710/710D**	1	513	618	594	9.5	3.2	3.2	0.47	1.43	2.12	1.40	261
490	—	625	—	385	—	385	—	4	1.5	7 140	17 200	1 510	**47T986339A**	1	520	607	587	9.5	3	1.5	0.28	2.43	3.61	2.37	290
	—	625	—	385	—	385	—	4	1.5	6 950	16 600	1 460	**47T986339B**	1	517	607	587	4.5	3	1.5	0.32	2.12	3.15	2.07	285
500	—	640	—	450	—	450	—	4	1.5	8 820	20 300	1 770	**4TR500M**	2-P	527	622	602	10.5	3	1.5	0.24	2.84	4.23	2.78	352
	—	670	—	515	—	515	—	5	6	11 400	25 700	2 160	**4TR500B**	1-P	530	648	626	11	4	5	0.32	2.12	3.15	2.07	510
	—	705	—	515	—	515	—	6	SP	11 900	24 500	2 070	**372/500**	1-P	544	677	651	8.5	5	6	0.37	1.80	2.69	1.76	641
	—	710	—	430	—	425	—	5	3	10 200	20 000	1 750	**4TR500T**	1	547	688	658	12	4	3	0.37	1.80	2.69	1.76	528
	—	720	—	400	—	400	—	6	6	10 000	18 700	1 680	**4TR500J**	1-P	552	692	663	12.5	5	5	0.33	2.03	3.02	1.98	547
	—	760	—	420	—	420	—	2	6	11 000	19 300	1 730	**4TR500Q**	1-P	566	750	696	11.5	2	6	0.39	1.74	2.59	1.70	698
501.650	19.7500	673.100	26.5000	387.350	15.2500	400.050	15.7500	6.4	3.2	8 340	17 300	1 550	**EE641198D/265/266D**	1-P	538	650	628	9.5	6.4	3.2	0.31	2.15	3.20	2.10	386
	19.7500	711.200	28.0000	520.700	20.5000	520.700	20.5000	6.4	3.2	12 300	26 400	2 210	**M274149D/110/110D**	1-P	549	687	656	10.5	6.4	3.2	0.33	2.03	3.02	1.98	673
508.000	20.0000	716.000	28.1890	528.000	20.7874	528.000	20.7874	8	3.2	12 700	26 300	2 200	**4TR508**	1-P	549	689	664	9.5	8	3.2	0.35	1.95	2.90	1.91	679

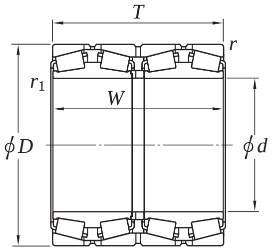
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

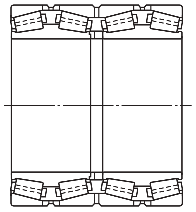
Four-row tapered roller bearings

TQO type

d (508.000) ~ 558.750 mm

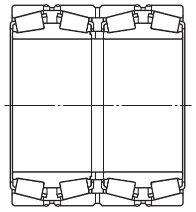


Design 1

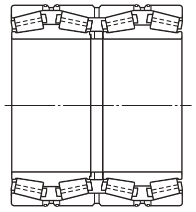


Design 1-P

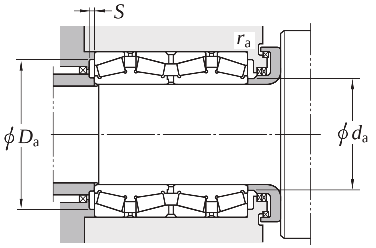
For oil mist lubrication



Design 2



Design 2-P



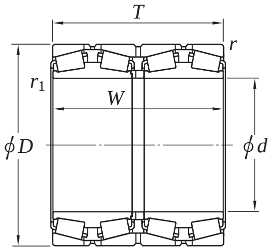
Boundary dimensions *d* mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*W* mm	*W* 1/25.4	*r* min.	r_1 [2] min.	Basic load ratings (kN) C_r	Basic load ratings (kN) C_{0r}	Fatigue load limit (kN) C_u	Bearing No. [1]	Design	Mounting dimensions (mm) d_a max.	D_a max.	D_a min.	*S* min.	r_a max.	r_b max.	Constant *e*	Axial load factors Y_2	Y_3	Y_0	(Refer.) Mass (kg)
508.000	20.0000	762.000	30.0000	463.550	18.2500	463.550	18.2500	6.4	6.4	11 400	19 900	1 780	**EE531201D/300/301XD**	1-P	564	738	696	11.5	6.4	6.4	0.38	1.78	2.65	1.74	736
509.948	20.0767	654.924	25.7844	379.000	14.9213	377.000	14.8425	6.4	1.6	7 260	16 700	1 460	**4TR510A**	1-P	534	632	612	7	6.4	1.6	0.41	1.64	2.44	1.60	315
510	—	655	—	379	—	377	—	5	2.5	8 190	18 600	1 650	**4TR510L**	1-P	540	633	613	9	4	2.5	0.26	2.55	3.80	2.50	320
	—	730	—	520	—	520	—	5	6	13 100	27 300	2 280	**4TR510Q**	1-P	559	708	674	13	4	6	0.33	2.03	3.02	1.98	728
514.350	20.2500	673.100	26.5000	422.275	16.6250	422.275	16.6250	6.4	3.2	9 000	20 100	1 730	**4TR514A**	1	545	650	630	11	6.4	3.2	0.33	2.03	3.02	1.98	392
	20.2500	673.100	26.5000	422.275	16.6250	422.275	16.6250	6.4	3.2	8 930	20 300	1 760	**LM274449D/410/410D**	1-P	547	650	630	9	6.4	3.2	0.33	2.03	3.02	1.98	399
519.113	20.4375	736.600	29.0000	536.575	21.1250	536.575	21.1250	6.4	3.2	13 300	27 200	2 270	**M275349D/310/310D**	1-P	562	712	681	10.5	6.4	3.2	0.33	2.03	3.02	1.98	743
520	—	735	—	535	—	535	—	5	2.5	13 300	27 200	2 270	**4TR520**	1-P	564	713	681	11.5	4	2.5	0.33	2.03	3.02	1.98	726
520.700	20.5000	711.200	28.0000	400.050	15.7500	400.050	15.7500	6.4	3.2	8 750	17 500	1 550	**LM275349D/10/10D**	1-P	562	687	663	7	6.4	3.2	0.33	2.03	3.02	1.98	438
530	—	730	—	540	—	535	—	5	SP	12 700	27 900	2 310	**4TR530-1**	1-P	570	708	677	9	4	3	0.34	1.96	2.92	1.92	686
	—	730	—	540	—	535	—	4	SP	11 800	25 000	2 090	**4TR530-2**	1	567	712	677	6	3	3	0.34	1.96	2.92	1.92	669
	—	750	—	480	—	480	—	6	6	12 400	24 700	2 110	**4TR530B**	1-P	584	722	695	11.5	5	5	0.32	2.12	3.15	2.07	680
	—	750	—	480	—	480	—	5	2	12 100	24 100	2 040	**4TR530C**	1	579	728	695	9.5	4	2	0.32	2.12	3.15	2.07	673
535	—	750	—	560	—	560	—	5	6	13 900	29 400	2 420	**4TR535**	1-P	579	728	695	10.5	4	5	0.33	2.02	3.01	1.98	761
	—	760	—	560	—	560	—	6	6	14 100	28 800	2 380	**372/535**	1-P	587	732	703	10	5	5	0.33	2.02	3.01	1.98	815
536.575	21.1250	761.873	29.9950	558.800	22.0000	558.800	22.0000	6.4	3.2	14 100	28 800	2 380	**M276449D/410/410D**	1-P	578	738	700	9	6.4	3.2	0.33	2.03	3.02	1.98	820
540	—	690	—	400	—	400	—	5	2.5	8 420	19 800	1 700	**4TR540**	1-P	566	668	648	10.5	4	2	0.40	1.68	2.50	1.64	369
	—	760	—	560	—	560	—	5	6	14 200	30 600	2 500	**4TR540A**	1-P	587	738	704	10.5	4	6	0.33	2.03	3.02	1.98	808
550	—	685	—	350	—	350	—	4	1.5	6 630	16 100	1 390	**4TR550C**	1	579	667	647	8	3	1.5	0.29	2.32	3.45	2.26	287
555.625	21.8750	698.500	27.5000	349.250	13.7500	349.250	13.7500	6.4	3.2	7 160	17 000	1 470	**4TR555**	1-P	586	675	655	9.5	6.4	3.2	0.33	2.03	3.02	1.98	312
558.750	21.9980	965.300	38.0039	495.300	19.5000	495.300	19.5000	7.5	7.5	15 700	25 700	2 200	**4TR559B**	1-P	685	934	855	11.5	7.5	7.5	0.33	2.03	3.02	1.98	1 570

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

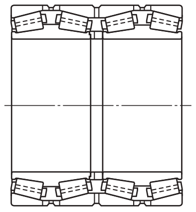
2) SP indicates the specially chamfered form.

TQO type

d 558.800 ~ 609.600 mm

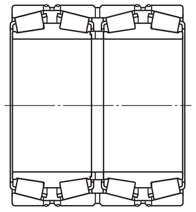


Design 1

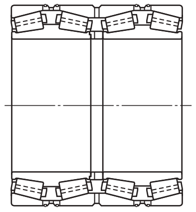


Design 1-P

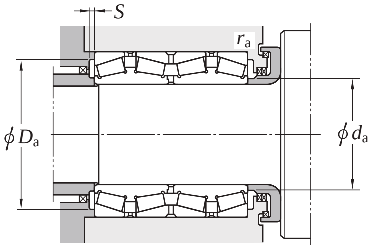
For oil mist lubrication



Design 2



Design 2-P

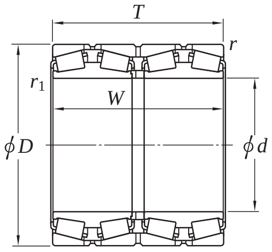


Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*W* mm	1/25.4	*r* min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a max.	D_a max.	D_a min.	*S* min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	(kg)
558.800	22.0000	736.600	29.0000	322.263	12.6875	322.263	12.6875	6.4	3.2	7 430	16 100	1 430	**EE843221D/290/291D**	1-P	607	712	692	9.5	6.4	3.2	0.34	1.97	2.93	1.93	371
	22.0000	736.600	29.0000	409.575	16.1250	409.575	16.1250	6.4	3.2	8 670	18 800	1 630	**4TR559J**	1	598	712	691	10	6.4	3.2	0.35	1.95	2.90	1.91	463
	22.0000	736.600	29.0000	409.575	16.1250	409.575	16.1250	6.4	3.2	9 600	21 500	1 850	**4TR559N**	1-P	594	712	689	10.5	6.4	3.2	0.35	1.95	2.90	1.91	477
	22.0000	736.600	29.0000	430.000	16.9291	430.000	16.9291	6.4	3.2	10 100	22 200	1 880	**4TR559**	1	593	712	690	12	6.4	3.2	0.35	1.95	2.90	1.91	497
	22.0000	736.600	29.0000	450.000	17.7165	450.000	17.7165	4	3	10 300	23 100	1 950	**4TR559A**	1-P	594	717	692	9	4	3	0.35	1.95	2.90	1.91	525
	22.0000	736.600	29.0000	457.200	18.0000	455.612	17.9375	6.4	3.2	11 200	25 500	2 120	**LM277149DA/110/110D**	1-P	595	712	692	11.5	6.4	3.2	0.33	2.03	3.02	1.98	521
560	—	805	—	590	—	590	—	6	6	16 200	33 700	2 720	**372/560**	1-P	614	777	744	10.5	5	5	0.33	2.03	3.02	1.98	1 000
	—	920	—	620	—	620	—	7.5	7.5	19 200	32 800	2 660	**4TR560**	1-P	643	884	823	12	6	6	0.40	1.68	2.50	1.64	1 650
570	—	780	—	515	—	515	—	5	2.5	12 600	27 400	2 240	**4TR570A**	1-P	618	758	726	10	4	2	0.42	1.61	2.39	1.57	737
	—	810	—	590	—	590	—	5	2	16 300	35 000	2 790	**4TR570C**	1-P	625	788	751	14	4	2	0.33	2.03	3.02	1.98	1 000
571.500	22.5000	812.800	32.0000	593.725	23.3750	593.725	23.3750	6.4	3.2	16 300	35 000	2 790	**4TR572**	2-P	625	789	751	13	6.4	3.2	0.33	2.03	3.02	1.98	1 020
	22.5000	812.800	32.0000	593.725	23.3750	593.725	23.3750	6.4	3.2	16 300	35 000	2 790	**M278749D/710/710D**	1-P	625	789	751	14	6.4	3.2	0.33	2.03	3.02	1.98	1 020
580	—	770	—	510	—	510	—	4	1.5	12 800	29 600	2 410	**4TR580**	1-P	618	752	723	12	3	1.5	0.33	2.03	3.02	1.98	671
584.200	23.0000	730.250	28.7500	349.250	13.7500	342.900	13.5000	3.2	1.6	7 000	17 300	1 460	**4TR584**	1-P	613	712	692	6.5	3.2	1.6	0.43	1.57	2.34	1.53	326
	23.0000	762.000	30.0000	401.638	15.8125	396.875	15.6250	6.4	3.2	9 190	20 800	1 770	**LM778549D/510/510D**	1-P	617	738	715	8.5	6.4	3.2	0.47	1.43	2.12	1.40	468
585.788	23.0625	771.525	30.3750	479.425	18.8750	479.425	18.8750	6.4	3.2	11 400	25 600	2 120	**LM278849D/810/810D**	1-P	622	747	725	11	6.4	3.2	0.33	2.03	3.02	1.98	599
595.312	23.4375	844.550	33.2500	615.950	24.2500	615.950	24.2500	6.4	3.2	17 000	36 900	2 910	**M280049D/010/010D**	1-P	651	820	780	8	6.4	3.2	0.33	2.03	3.02	1.98	1 130
600	—	855	—	620	—	620	—	5	6	17 600	37 900	2 970	**4TR600B**	1-P	658	833	792	13	4	5	0.33	2.03	3.02	1.98	1 160
603.250	23.7500	857.250	33.7500	622.300	24.5000	622.300	24.5000	6.4	3.2	18 100	38 500	3 020	**M280249D/210/210XD**	1-P	652	833	788	12	6.4	3.2	0.33	2.03	3.02	1.98	1 170
609.600	24.0000	787.400	31.0000	361.950	14.2500	361.950	14.2500	6.4	3.2	8 520	19 900	1 680	**4TR610A**	2-P	650	763	739	13	6.4	3.2	0.37	1.82	2.70	1.78	455
	24.0000	787.400	31.0000	361.950	14.2500	361.950	14.2500	6.4	3.2	8 520	19 900	1 680	**EE649241D/310/311D**	1-P	650	763	739	13	6.4	3.2	0.37	1.82	2.70	1.78	459
	24.0000	813.562	32.0300	479.425	18.8750	479.425	18.8750	6.4	3.2	11 700	27 100	2 210	**4TR609**	1-P	657	789	759	9	6.4	3.2	0.33	2.03	3.02	1.98	710
	24.0000	817.400	32.1811	361.950	14.2500	361.950	14.2500	6.4	3.2	9 120	18 200	1 590	**4TR610**	1-P	660	793	766	7	6.4	3.2	0.33	2.03	3.02	1.98	531

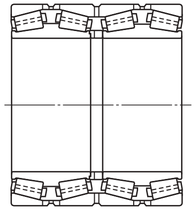
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

TQO type

d 620 ~ 685.800 mm

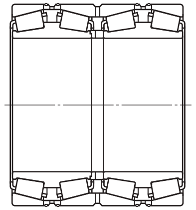


Design 1

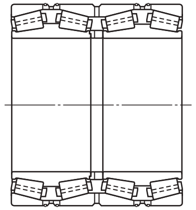


Design 1-P

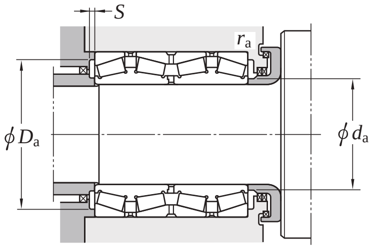
For oil mist lubrication



Design 2



Design 2-P



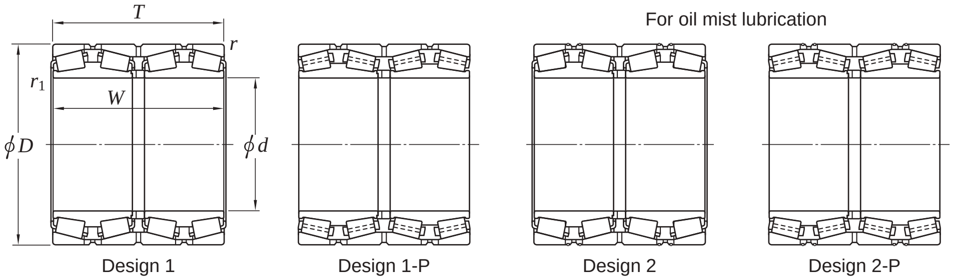
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	W mm	W 1/25.4	r min.	r_1 min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	S min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	
620	—	800	—	365	—	365	—	5	2.5	9 510	21 000	1 790	**4TR620**	1-P	661	778	756	14	4	2	0.32	2.12	3.15	2.07	474
630	—	920	—	457.15	—	457.15	—	6	3	14 400	26 200	2 230	**4TR630B**	1-P	698	892	846	11.5	5	2.5	0.33	2.03	3.02	1.98	1 050
635	—	900	—	660	—	660	—	6	6	18 700	39 700	3 080	**4TR635**	1-P	690	872	832	7	5	5	0.33	2.03	3.02	1.98	1 350
635.000	25.0000	901.700	35.5000	654.050	25.7500	654.050	25.7500	6.4	3.2	18 700	39 700	3 080	**M281049D/010/010XD**	1-P	691	877	833	7	6.4	3.2	0.33	2.03	3.02	1.98	1 360
646.112	25.4375	857.250	33.7500	542.925	21.3750	542.925	21.3750	6.4	3.2	14 300	34 100	2 680	**LM281049D/10/10D**	1-P	690	833	801	13	6.4	3.2	0.33	2.03	3.02	1.98	881
649.924	25.5876	914.898	36.0196	674.000	26.5354	672.000	26.4567	6	3.6	20 000	43 800	3 360	**M281349D/10/10D**	1-P	703	891	844	12	6	3.6	0.33	2.03	3.02	1.98	1 430
650	—	1 030	—	558.5	—	558.5	—	12	7.5	20 000	36 200	2 900	**47T130103**	1-P	749	986	925	10.5	10	6	0.32	2.12	3.15	2.07	1 850
657.225	25.8750	933.450	36.7500	676.275	26.6250	676.275	26.6250	6.4	3.3	21 600	46 000	3 510	**M281649D/610/610D**	1-P	713	909	864	9.5	6.4	3.3	0.33	2.03	3.02	1.98	1 530
660	—	855	—	320	—	320	—	4	5	7 930	18 000	1 510	**4TR660D**	1-P	705	837	799	11.5	3	4	0.47	1.43	2.12	1.40	481
660.400	26.0000 26.0000	812.800 812.800	32.0000 32.0000	365.125 365.125	14.3750 14.3750	365.125 365.125	14.3750 14.3750	6.4 6.4	3.2 3.2	8 600 8 600	21 100 21 100	1 750 1 750	**4TR660C** **L281149D/110/110D**	2-P 1-P	691 691	789 789	775 775	8 8	6.4 6.4	3.2 3.2	0.33 0.33	2.03 2.03	3.02 3.02	1.98 1.98	402 405
670	—	960	—	700	—	700	—	7.5	5	22 300	48 100	3 630	**4TR670**	1-P	732	924	884	13	6	4	0.33	2.03	3.02	1.98	1 710
676	—	910	—	620	—	620	—	5	2	18 200	43 300	3 310	**4TR676**	1-P	724	888	849	13.5	4	2	0.33	2.03	3.02	1.98	1 180
679.450	26.7500	901.700	35.5000	552.450	21.7500	552.450	21.7500	6.4	3.2	16 000	36 100	2 820	**LM281849D/810/810D**	1-P	724	877	847	11.5	6.4	3.2	0.33	2.03	3.02	1.98	973
680	—	870	—	460	—	460	—	4	2.5	11 400	27 400	2 190	**47T13608746**	1-P	710	852	820	9	3	2.5	0.50	1.34	2.00	1.32	677
680.000	26.7717	970.000	38.1890	740.000	29.1339	740.000	29.1339	6.4	3.2	23 600	52 800	3 930	**4TR680B**	1-P	743	946	896	9	6.4	3.2	0.33	2.03	3.02	1.98	1 790
680	—	1 020	—	555	—	555	—	6	3	19 200	36 700	2 910	**4TR680C**	1-P	771	992	934	14.5	5	2.5	0.32	2.12	3.15	2.07	1 650
685.800	27.0000 27.0000	876.300 876.300	34.5000 34.5000	355.600 355.600	14.0000 14.0000	352.425 352.425	13.8750 13.8750	6.4 6.4	3.2 3.2	9 280 9 280	23 100 23 100	1 880 1 880	**4TR686A** **4TR686D**	1-P 2-P	734 734	852 852	824 823	11 11	6.4 6.4	3.2 3.2	0.42 0.42	1.62 1.62	2.42 2.42	1.59 1.59	554 555

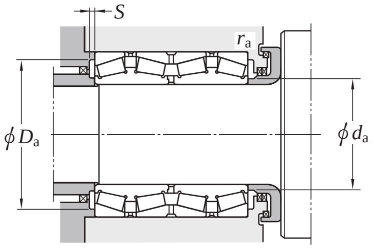
[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

Four-row tapered roller bearings

TQO type

d 708.025 ~ (863.600) mm





Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. 1)	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*W* mm	*W* 1/25.4	*r* min.	r_1 2) min.	C_r	C_{0r}	C_u			d_a max.	D_a max.	D_a min.	*S* min.	r_a max.	r_b max.	*e*	Y_2	Y_3	Y_0	
708.025	27.8750	930.275	36.6250	565.150	22.2500	565.150	22.2500	6.4	3.2	17 200	40 300	3 100	**4TR708B**	1-P	753	906	878	11	6.4	3.2	0.33	2.03	3.02	1.98	1 050
710.000	27.9528	900.000	35.4331	410.000	16.1417	410.000	16.1417	6	3	11 500	27 300	2 230	**4TR710**	1-P	750	877	853	11.5	6	2.5	0.35	1.95	2.90	1.91	636
711.200	28.0000 28.0000	914.400 914.400	36.0000 36.0000	317.500 355.600	12.5000 14.0000	317.500 355.600	12.5000 14.0000	6.4 6.4	6.4 3.2	8 550 9 840	18 800 21 200	1 580 1 780	**4TR711** **47T1429136**	1-P 1-P	774 753	890 890	868 860	11.5 10.5	6.4 6.4	6.4 3.2	0.38 0.38	1.78 1.78	2.65 2.65	1.74 1.74	538 598
714.375	28.1250	1 016.000	40.0000	704.850	27.7500	704.850	27.7500	6.4	3.2	24 400	52 200	3 880	**M383240D/210/210D**	1-P	776	992	940	14.5	6.4	3.2	0.35	1.92	2.86	1.88	1 900
717.550	28.2500	946.150	37.2500	565.150	22.2500	565.150	22.2500	6.4	3.2	17 000	39 500	3 030	**LM282847D/810/810D**	1-P	764	922	890	12.5	6.4	3.2	0.33	2.03	3.02	1.98	1 090
730	—	1 035	—	755	—	755	—	5	2.5	24 600	54 300	4 000	**4TR730**	1-P	795	1 013	955	11	4	2	0.33	2.03	3.02	1.98	2 080
730.250	28.7500	1 035.050	40.7500	755.650	29.7500	755.650	29.7500	6.4	3.2	24 600	54 300	4 000	**M283449D/410/410D**	1-P	795	1 011	955	11	6.4	3.2	0.33	2.03	3.02	1.98	2 080
749.300	29.5000	990.600	39.0000	605.000	23.8189	605.000	23.8189	6.4	3.2	19 600	47 700	3 560	**LM283649D/610/610D**	1-P	801	966	929	13	6.4	3.2	0.32	2.12	3.15	2.07	1 320
750.000	29.5276	950.000	37.4016	410.000	16.1417	410.000	16.1417	4	2.5	12 100	29 000	2 320	**4TR750**	1-P	791	929	900	11.5	4	2	0.40	1.68	2.50	1.68	705
750	—	1 130	—	690	—	690	—	7.5	7.5	24 400	45 800	3 450	**4TR750A**	1-P	821	1 094	1 023	13	6	6	0.46	1.47	2.19	1.44	2 500
760	—	1 080	—	630	—	630	—	6	3	22 300	46 300	3 470	**4TR760**	1-P	829	1 052	999	17.5	5	2.5	0.40	1.68	2.50	1.64	1 900
762.000	30.0000 30.0000	1 066.800 1 079.500	42.0000 42.5000	736.600 787.400	29.0000 31.0000	723.900 787.400	28.5000 31.0000	12.7 12.7	SP 4.8	24 900 27 900	55 900 62 700	4 070 4 530	**4TR762** **M284249D/210/210XD**	1-P 1-P	829 831	1 030 1 043	986 998	6 11	12.7 12.7	6.4 4.8	0.33 0.33	2.03 2.03	3.02 3.02	1.98 1.98	2 070 2 360
785.000	30.9055	1 040.000	40.9449	560.000	22.0472	560.000	22.0472	7.5	5	19 200	44 400	3 350	**4TR785B**	1-P	846	1 009	978	13	7.5	5	0.26	2.55	3.80	2.50	1 340
800	—	1 120	—	820	—	820	—	7.5	6	30 200	70 200	4 970	**4TR800**	1-P	869	1 084	1 038	13.5	6	5	0.33	2.03	3.02	1.98	2 590
825.500	32.5000	1 168.400	46.0000	844.550	33.2500	844.550	33.2500	12.7	4.8	32 500	72 300	5 110	**M285848D/10/10D**	1-P	897	1 132	1 083	15.5	12.7	4.8	0.33	2.03	3.02	1.98	2 980
840	—	1 170	—	840	—	840	—	7.5	7.5	32 100	74 600	5 220	**4TR840**	1-P	911	1 134	1 089	16	6	6	0.33	2.03	3.02	1.98	2 880
863.600	34.0000	1 130.300	44.5000	669.925	26.3750	669.925	26.3750	12.7	4.8	23 900	59 600	4 250	**LM286249D/210/210D**	1-P	920	1 093	1 063	15	12.7	4.8	0.32	2.08	3.10	2.04	1 840

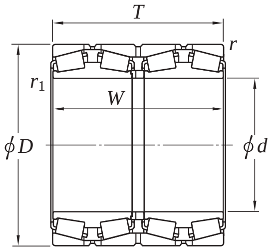
[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

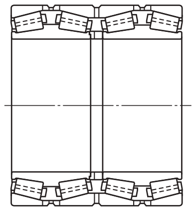
Four-row tapered roller bearings

TQO type

d (863.600) ~ 1 020 mm

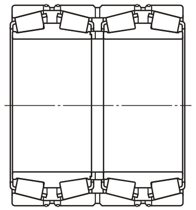


Design 1

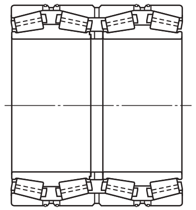


Design 1-P

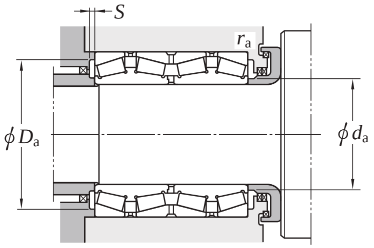
For oil mist lubrication



Design 2



Design 2-P



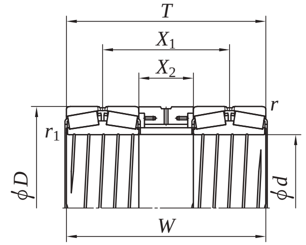
Boundary dimensions										Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)						Constant	Axial load factors			(Refer.) Mass
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	W mm	W 1/25.4	r min.	r_1 min.	C_r	C_{0r}	(kN) C_u			d_a max.	D_a max.	D_a min.	S min.	r_a max.	r_b max.	e	Y_2	Y_3	Y_0	(kg)
863.600	34.0000	1 219.200	48.0000	889.000	35.0000	876.300	34.5000	12.7	4.8	35 700	84 600	5 820	**EE547341D/480/481D**	1-P	947	1 182	1 130	9	12.7	4.8	0.33	2.03	3.02	1.98	3 390
938.213	36.9375	1 270.000	50.0000	825.500	32.5000	825.500	32.5000	12.7	4.8	33 500	79 800	5 480	**LM287649D/610/610D**	1-P	1 007	1 233	1 187	17.5	12.7	4.8	0.33	2.03	3.02	1.98	3 130
939.800	37.0000	1 333.500	52.5000	952.500	37.5000	952.500	37.5000	12.7	4.8	42 000	95 400	6 420	**LM287849D/810/810D**	1-P	1 022	1 297	1 235	15.5	12.7	4.8	0.33	2.03	3.02	1.98	4 380
1 020	—	1 570	—	900	—	900	—	7.5	7.5	45 800	98 800	6 540	**4TR1020**	1-P	1 172	1 534	1 413	21	6	6	0.33	2.03	3.02	1.98	6 890

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

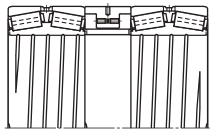
Four-row tapered roller bearings

45D type

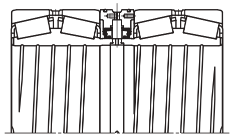
d 346.075 ~ 509.948 mm



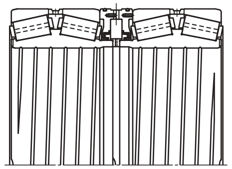
Design 1



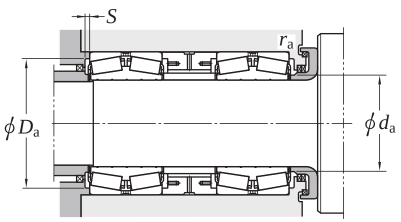
Design 1-P



Design 2



Design 2-P



Boundary dimensions												Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No. [1]	Design	Mounting dimensions (mm)						Con-stant	Axial load factors			(Refer.) Mass (kg)
d		*D*		*T*		*W*		X_1	X_2	*r* [2]	r_1 [2]	C_r	C_{0r}	C_u			d_a	D_a		*S*	r_a	r_b	*e*	Y_2	Y_3	Y_0	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	mm	min.	min.						max.	max.	min.	min.	max.	max.					
346.075	13.6250	488.950	19.2500	417.000	16.4173	417.000	16.4173	242.375	67.750	3.2	3.2	5 790	11 600	1 110	**45D694942**	2	378	478	449	8	3.2	3.2	0.33	2.02	3	1.97	240
360	—	450	—	350	—	350	—	225	100	2	1.5	3 340	7 460	721	**45D724535**	1	380	440	425	5.5	2	1.5	0.29	2.32	3.45	2.26	109
380	—	530	—	540	—	540	—	340	140	4	3	6 900	13 800	1 310	**45D765354**	1-P	412	512	488	11	3	2.5	0.26	2.55	3.8	2.5	323
384.175	15.1250	546.100	21.5000	514.350	20.2500	514.350	20.2500	320.675	127.000	6.4	3.2	8 180	16 900	1 550	**45D775551**	1-P	418	529	502	10.5	6.4	3.2	0.33	2.03	3.02	1.98	386
385.762	15.1875	514.350	20.2500	317.500	12.5000	317.500	12.5000	164.500	11.500	3.2	3.2	5 480	11 000	1 060	**45D775132**	1	415	503	483	9	3.2	3.2	0.26	2.55	3.8	2.5	180
400	—	530	—	370	—	370	—	202	34	3	1	6 150	12 900	1 200	**45D805337**	1	428	516	497	11.5	2.5	1	0.26	2.55	3.8	2.5	213
406.400	16.0000	562.000	22.1260	381.000	15.0000	381.000	15.0000	196.924	12.700	6.4	3.2	7 510	15 000	1 390	**45D815638**	1	439	545	524	9.5	6.4	3.2	0.33	2.03	3.02	1.98	286
409.575	16.1250	540.000	21.2598	410.000	16.1417	410.000	16.1417	235.000	60.000	3	2	6 300	14 000	1 300	**45D825441**	1	439	528	507	11	3	2	0.26	2.55	3.8	2.5	255
	16.1250	546.100	21.5000	400.000	15.7480	400.000	15.7480	238.075	76.150	6.4	1.6	5 710	11 500	1 080	**45D825540**	1-P	432	529	511	8.5	6.4	1.6	0.42	1.62	2.42	1.59	228
430	—	575	—	500	—	500	—	295	90	SP	2	7 080	14 900	1 370	**45D865850**	2	460	575	539	4.5	5	2	0.26	2.55	3.8	2.5	350
431.800	17.0000	571.500	22.5000	400.000	15.7480	400.000	15.7480	238.075	76.150	6.4	3	5 990	12 500	1 150	**45D865740**	1-P	460	554	536	10.5	6.4	3	0.36	1.87	2.79	1.83	281
460	—	586	—	500	—	500	—	325	150	3	3	6 650	15 500	1 390	**45D925950**	1	487	572	555	11.5	2.5	2.5	0.26	2.55	3.8	2.5	319
	—	680	—	390	—	390	—	225	60	5	1.5	7 540	13 700	1 270	**45D926839**	1	518	658	619	11.5	4	1.5	0.36	1.87	2.79	1.83	429
480	—	700	—	470	—	470	—	267	64	5	1.5	10 100	18 800	1 680	**45D967047**	2	531	678	644	11	4	1.5	0.35	1.95	2.9	1.91	599
482	—	632	—	520	—	520	—	320	120	1.5	1.5	8 540	18 800	1 670	**45D966352A**	1-P	510	623.5	593	7	2	1.5	0.26	2.55	3.8	2.5	416
482.600	19.0000	615.950	24.2500	425.000	16.7323	425.000	16.7323	237.000	49.000	4	1.5	7 290	16 700	1 480	**45D976243**	1	510	601	585	11	4	1.5	0.26	2.55	3.8	2.5	292
	19.0000	615.950	24.2500	488.750	19.2421	488.750	19.2421	300.750	112.750	4	SP	7 290	16 700	1 480	**45D976249**	2	500	601	585	11	4	2	0.26	2.55	3.8	2.5	329
	19.0000	615.950	24.2500	500.000	19.6850	500.000	19.6850	314.250	182.500	6.4	6.4	6 060	13 400	1 220	**45D976250A**	1-P	512	599	583	6.5	6.4	6.4	0.44	1.54	2.3	1.51	358
486	—	654.924	—	500	—	500	—	315.5	131	3	3	8 200	17 000	1 530	**45D976550-1**	1-P	523	640	610	11	2.5	2.5	0.28	2.43	3.61	2.37	455
509.948	20.0767	654.924	25.7844	500.000	19.6850	500.000	19.6850	310.000	120.000	3	1.5	8 090	19 000	1 670	**4TR510C**	1-P	539	642	617	10	3	1.5	0.28	2.43	3.61	2.37	405

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

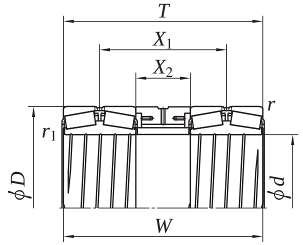
2) SP indicates the specially chamfered form.

Four-row tapered roller bearings

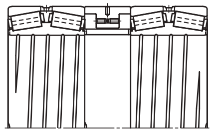
Koyo

45D type

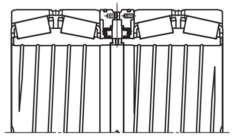
d 510 ~ 685.800 mm



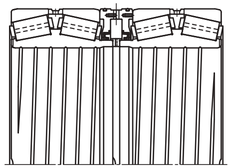
Design 1



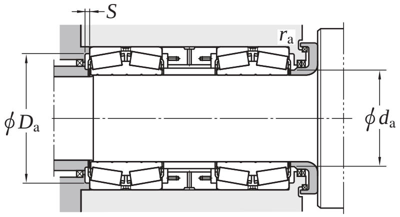
Design 1-P



Design 2



Design 2-P



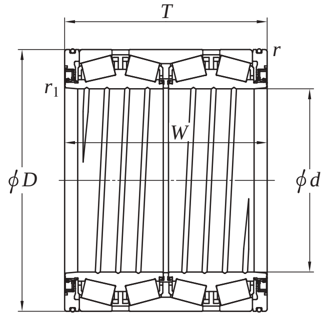
Boundary dimensions												Basic load ratings (kN)		Fatigue load limit	Bearing No. [1]	Design	Mounting dimensions (mm)						Con-stant	Axial load factors			(Refer.) Mass
d		D		T		W		X_1	X_2	r [2]	r_1	C_r	C_{0r}	(kN)			d_a	D_a		S	r_a [2]	r_b	e	Y_2	Y_3	Y_0	(kg)
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	mm	min.	min.			C_u			max.	max.	min.	min.	max.	max.					
510	—	655	—	379	—	377	—	199.5	12	5	2	8 190	18 600	1 650	**4TR510L-2**	1-P	540	633	619	9	4	2	0.26	2.55	3.8	2.5	320
558.800	22.0000	736.600	29.0000	514.000	20.2362	514.000	20.2362	293.337	72.674	6.4	3.2	11 200	25 500	2 120	**4TR559P-1**	1-P	595	719	693	11.5	6.4	3.2	0.33	2.03	3.02	1.98	576
609.600	24.0000	813.562	32.0300	548.000	21.5748	548.000	21.5748	317.000	86.000	SP	6.4	12 700	28 500	2 320	**4TR610D**	2-P	653	792	764	11.5	SP	6.4	0.33	2.03	3.02	1.98	776
685.800	27.0000	876.300	34.5000	580.000	22.8346	580.000	22.8346	340.000	100.000	6.4	3.2	13 800	34 900	2 740	**4TR686J**	1-P	730	859	829	14	6.4	3.2	0.26	2.55	3.8	2.5	875

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 194 for details of applicable tolerance standards.

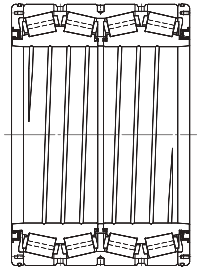
2) SP indicates the specially chamfered form.

Sealed type four-row tapered roller bearings

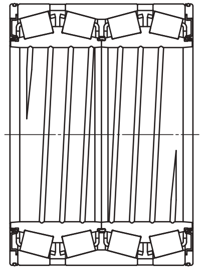
d 75 ~ 234.950 mm



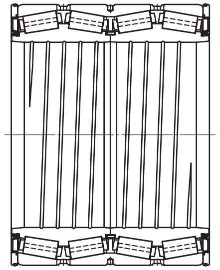
Design 1



Design 1-P



Design 2



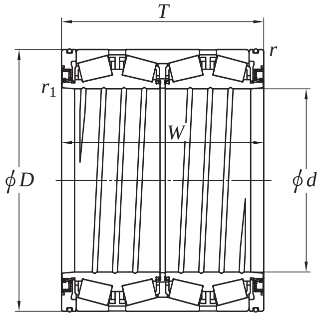
Design 2-P

Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Con-stant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*W* mm	1/25.4	r [1] min.	r_1 [1] min.	C_r	C_{0r}	C_u			*e*	Y_2	Y_3	
75	—	120	—	150	—	150	—	2	1	533	764	119	**47TS151215**	1	0.33	2.03	3.02	6.4
	—	135	—	180	—	187	—	1.5	1.5	572	776	114	**47TS151418**	1	0.87	0.78	1.16	10.7
140	—	198	—	174	—	174	—	4	1	1 010	1 630	222	**47TS282017**	1	0.47	1.43	2.12	16.3
150	—	210	—	240	—	240	—	1.5	0.5	1 240	2 270	269	**47TS302124**	1	0.39	1.74	2.59	23.5
170	—	240	—	175	—	175	—	2.5	1.5	1 230	1 990	261	**47TS342418**	1	0.26	2.55	3.8	23.9
	—	250	—	230	—	230	—	2.5	1.5	1 710	2 860	336	**47TS342523**	1	0.26	2.55	3.8	37.7
190.500	7.5000	266.700	10.5000	188.913	7.4375	187.325	7.3750	3.2	1	1 320	2 270	287	**47TS382719A**	1	0.46	1.47	2.19	27.6
195	—	270	—	250	—	250	—	2.5	1	1 780	3 550	401	**47TS392725-1**	1	0.4	1.68	2.5	43.6
200	—	300	—	300	—	300	—	4	1.6	2 840	4 900	546	**47TS403030**	1	0.26	2.55	3.8	73.5
203.200	8.0000	317.500	12.5000	266.700	10.5000	266.700	10.5000	5	1.6	2 590	4 010	453	**47TS413227**	1	0.4	1.68	2.5	76.8
206.375	8.1250	282.575	11.1250	190.500	7.5000	190.500	7.5000	3.2	1	1 370	2 240	278	**47TS412819**	1	0.51	1.33	1.97	33.5
	8.1250	282.575	11.1250	240.000	9.4488	210.000	8.2677	3	1	1 820	3 380	382	**47TS412824**	1	0.43	1.57	2.34	39.6
215.900	8.5000	288.925	11.3750	177.800	7.0000	177.800	7.0000	3.2	1	1 320	2 350	289	**47TS432918**	1	0.4	1.68	2.5	30.6
220	—	295	—	315	—	315	—	SP	SP	1 930	3 910	429	**47TS443032A**	1	0.4	1.68	2.5	55.8
	—	320	—	290	—	290	—	3	2	2 750	4 700	508	**47TS443229B**	1	0.39	1.74	2.59	73.9
	—	330	—	260	—	260	—	5	2.5	2 640	4 220	475	**47TS443326**	1	0.4	1.68	2.5	79.5
220.663	8.6875	314.325	12.3750	239.713	9.4375	239.713	9.4375	3.2	3	2 100	3 410	386	**47TS443124**	1	0.33	2.03	3.02	51.9
	8.6875	314.325	12.3750	330.000	12.9921	330.000	12.9921	3.2	3	2 960	5 650	612	**47TS443133**	1	0.26	2.55	3.8	79.2
225	—	320	—	230	—	230	—	3	1.5	2 040	3 350	376	**47TS453223A**	1	0.47	1.43	2.12	56.9
228.600	9.0000	311.150	12.2500	200.025	7.8750	200.025	7.8750	3.2	SP	1 670	2 850	274	**47TS463120-1**	1	0.4	1.68	2.5	41.3
234.950	9.2500	327.025	12.8750	196.850	7.7500	196.850	7.7500	3.2	1	1 860	3 310	397	**47TS473320A**	2	0.4	1.68	2.5	48.1

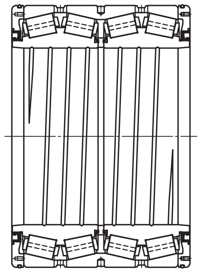
[Note] 1) SP indicates the specially chamfered from.

Sealed type four-row tapered roller bearings

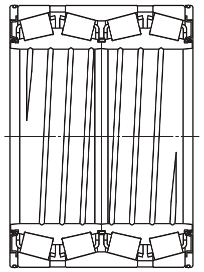
d 240 ~ 279.578 mm



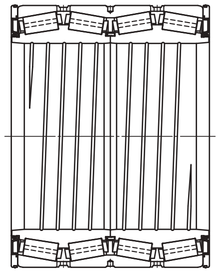
Design 1



Design 1-P



Design 2



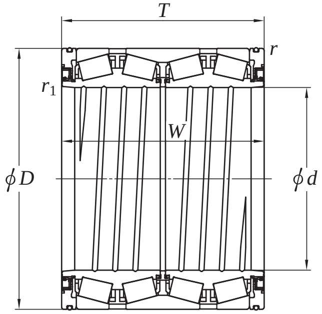
Design 2-P

Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Con-stant	Axial load factors		(Refer.) Mass (kg)
d mm	*d* 1/25.4	*D* mm	*D* 1/25.4	*T* mm	*T* 1/25.4	*W* mm	*W* 1/25.4	*r* min.	r_1 [1)] min.	C_r	C_{0r}	C_u			*e*	Y_2	Y_3	
240	—	320	—	294	—	294	—	4	1	2 350	4 760	507	**47TS483229-1**	1	0.33	2.03	3.02	63.6
	—	338	—	248	—	248	—	3	1.5	2 370	4 120	442	**47TS483425B**	1	0.47	1.43	2.12	66
	—	338	—	290	—	290	—	3	1	2 960	5 360	580	**47TS483429**	1	0.39	1.74	2.59	78
	—	338	—	320	—	320	—	3	1	3 040	5 890	625	**47TS483432**	1	0.28	2.43	3.61	87.3
	—	338	—	340	—	340	—	3	1	3 070	5 930	620	**47TS483434A**	1	0.4	1.68	2.5	88
241.478	9.5070	349.148	13.7460	228.600	9.0000	228.600	9.0000	3.2	SP	2 510	4 110	450	**47TS483523A**	2	0.35	1.91	2.84	67.5
244.475	9.6250	327.025	12.8750	193.675	7.6250	193.675	7.6250	5	1.5	1 600	2 790	334	**47TS493319**	1	0.33	2.03	3.02	41.5
	9.6250	381.000	15.0000	304.800	12.0000	304.800	12.0000	5	1.6	3 400	5 240	558	**47TS493830**	1	0.47	1.43	2.12	124
245	—	345	—	310	—	310	—	3	1.5	3 150	6 020	631	**47TS493531-2**	1	0.4	1.68	2.5	89.9
250	—	365	—	270	—	270	—	3	1.5	2 830	4 730	513	**47TS503727A-1**	1	0.4	1.68	2.5	94.2
254.000	10.0000	358.775	14.1250	269.875	10.6250	269.875	10.6250	3.2	1.6	2 670	4 760	504	**47TS513627A-1**	1	0.55	1.24	1.84	82
	10.0000	358.775	14.1250	269.875	10.6250	269.875	10.6250	3.2	1.5	3 150	6 010	633	**47TS513627B**	2	0.4	1.68	2.5	85
260	—	365	—	340	—	340	—	3.5	1.6	3 510	6 530	674	**47TS523734-5**	1	0.4	1.68	2.5	110
	—	370	—	354	—	354	—	4	1.5	3 880	7 410	778	**47TS523735**	1	0.26	2.55	3.8	120
266.700	10.5000	355.600	14.0000	228.600	9.0000	230.188	9.0625	3.2	1.6	2 430	4 880	515	**47TS533623B**	2	0.36	1.87	2.79	60
275	—	385	—	340	—	340	—	3	1.5	3 720	7 400	372	**47TS553934**	1	0.4	1.68	2.5	121
276.225	10.8750	393.700	15.5000	269.875	10.6250	269.875	10.6250	3.2	1.6	2 940	5 040	535	**47TS553927-4**	1	0.47	1.43	2.12	100
	10.8750	393.700	15.5000	269.875	10.6250	269.875	10.6250	3.2	SP	3 460	6 510	678	**47TS553927A**	2	0.4	1.68	2.5	105
279.400	11.0000	393.700	15.5000	269.875	10.6250	269.875	10.6250	3.2	1.6	2 940	5 040	535	**47TS563927**	1	0.47	1.43	2.12	99.5
	11.0000	393.700	15.5000	269.875	10.6250	269.875	10.6250	3.2	SP	3 460	6 510	678	**47TS563927B**	2	0.4	1.68	2.5	101
	11.0000	393.700	15.5000	320.000	12.5984	320.000	12.5984	3.2	1.5	3 610	6 900	702	**47TS563932-2**	1	0.4	1.68	2.5	124
279.578	11.0070	380.898	14.9960	244.475	9.6250	244.475	9.6250	3.2	SP	2 830	5 360	559	**47TS563824**	2	0.4	1.68	2.5	78.3

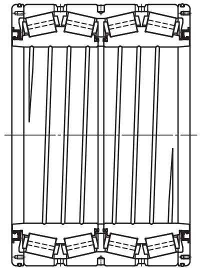
[Note] 1) SP indicates the specially chamfered from.

Sealed type four-row tapered roller bearings

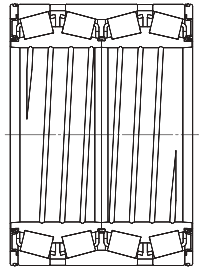
d 280 ~ 317.500 mm



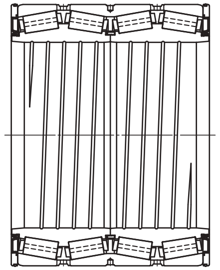
Design 1



Design 1-P



Design 2



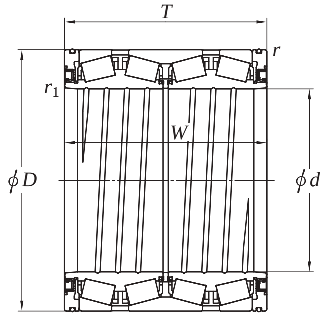
Design 2-P

Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Con-stant	Axial load factors		(Refer.) Mass (kg)
d		*D*		*T*		*W*		*r*	r_1 1)									
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.	C_r	C_{0r}	C_u			*e*	Y_2	Y_3	
280	—	380	—	290	—	290	—	3.2	SP	3 400	6 940	706	**47TS563829A**	2	0.33	2.03	3.02	93.8
	—	395	—	290	—	290	—	3	2.5	3 310	5 940	614	**47TS564029**	1	0.4	1.68	2.5	110
	—	395	—	340	—	340	—	3	1.5	3 700	7 110	719	**47TS564034A**	1	0.4	1.68	2.5	130
	—	410	—	268	—	268	—	5.4	1.6	2 810	4 510	483	**47TS564127**	1	0.33	2.03	3.02	118
	—	412	—	340	—	340	—	4	2	4 200	7 220	751	**47TS564134**	1	0.28	2.43	3.61	154
	—	430	—	350	—	350	—	3.5	1.5	4 950	8 190	850	**47TS564335**	1	0.4	1.68	2.5	178
285	—	400	—	340	—	340	—	3	1.5	3 990	7 610	777	**47TS574034**	1	0.4	1.68	2.5	131
285.750	11.2500	380.898	14.9960	244.475	9.6250	244.475	9.6250	3.2	1	2 500	4 600	479	**47TS573824A**	1	0.43	1.57	2.34	73.2
290	—	400	—	346	—	346	—	4	1.5	3 830	7 860	792	**47TS584035**	1	0.4	1.68	2.5	128
	—	400	—	420	—	420	—	4	1.5	3 830	7 860	792	**47TS584042C**	1	0.4	1.68	2.5	155
	—	420	—	380	—	380	—	3	1.2	4 560	8 260	840	**47TS584238**	1	0.4	1.68	2.5	175
	—	450	—	415	—	415	—	4	1.5	5 610	9 460	938	**47TS584542**	1	0.47	1.43	2.12	238
300	—	400	—	254	—	254	—	4	5	2 770	5 300	546	**47TS604025**	1	0.28	2.43	3.61	84.6
	—	420	—	310	—	310	—	4	3.5	3 620	6 670	686	**47TS604231**	1	0.4	1.68	2.5	128
304.648	11.9940	438.048	17.2460	279.400	11.0000	280.990	11.0626	4	1.6	3 230	5 380	566	**47TS614428B-10**	1	0.47	1.44	2.15	135
	11.9940	438.048	17.2460	279.400	11.0000	279.400	11.0000	3.2	1.6	3 930	6 860	694	**47TS614428C-1**	2	0.4	1.68	2.5	135
304.800	12.0000	419.100	16.5000	269.875	10.6250	269.875	10.6250	6.4	2	3 120	5 420	573	**47TS614227**	1	0.33	2.03	3.02	100
	12.0000	501.650	19.7500	336.550	13.2500	296.550	11.6752	4	4	5 380	8 570	875	**47TS615034**	1-P	0.33	2.03	3.02	257
304.902	12.0040	412.648	16.2460	266.700	10.5000	266.700	10.5000	3.2	0.8	3 430	6 820	699	**47TS614127D**	2	0.39	1.74	2.59	99.5
310	—	430	—	310	—	310	—	3	1	3 770	6 880	706	**47TS624331-4**	1	0.4	1.68	2.5	131
	—	430	—	350	—	350	—	3.5	1.5	4 110	7 870	777	**47TS624335A**	1	0.4	1.68	2.5	148
	—	430	—	350	—	350	—	3.5	SP	4 110	7 870	777	**47TS624335B-2**	1	0.4	1.68	2.5	148
	—	457.098	—	390	—	390	—	4	1.5	5 260	9 500	951	**47TS624639**	1	0.32	2.12	3.15	220
317.500	12.5000	447.675	17.6250	367.000	14.4488	367.000	14.4488	4	1.6	4 610	8 500	839	**47TS644537-1**	1	0.4	1.68	2.5	176

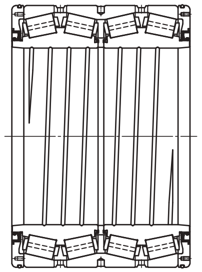
[Note] 1) SP indicates the specially chamfered from.

Sealed type four-row tapered roller bearings

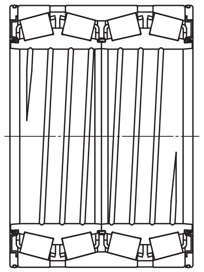
d 320 ~ 410 mm



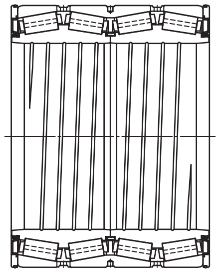
Design 1



Design 1-P



Design 2



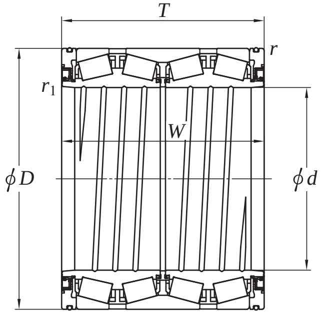
Design 2-P

Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Con-stant	Axial load factors		(Refer.) Mass (kg)
d		*D*		*T*		*W*		*r* [1)]	r_1 [1)]									
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4	min.	min.	C_r	C_{0r}	C_u			*e*	Y_2	Y_3	
320	—	440	—	335	—	335	—	4	1	3 930	7 330	736	**47TS644434**	1	0.4	1.68	2.5	146
	—	480	—	360	—	360	—	4	1.5	5 290	8 800	876	**47TS644836B**	1-P	0.47	1.43	2.12	220
	—	480	—	420	—	420	—	4	1.5	6 880	12 100	1 200	**47TS644842**	1-P	0.26	2.55	3.8	262
330.302	13.0040	438.023	17.2450	254.000	10.0000	247.650	9.7500	3.2	1.6	2 740	4 960	511	**47TS664425**	1	0.46	1.47	2.19	95.8
335.000	13.1890	460.000	18.1102	342.900	13.5000	342.900	13.5000	3.3	1.5	4 680	9 290	920	**47TS674634A**	1	0.4	1.68	2.5	167
342.875	13.4990	488.900	19.2480	410.000	16.1417	410.000	16.1417	4	2	5 790	11 600	1 110	**47TS684941**	1	0.33	2.02	3	233
342.875	—	560	—	500	—	500	—	5	2.5	9 060	15 000	1 430	**47TS685650**	1-P	0.33	2.03	3.02	495
343.052	13.5060	457.098	17.9960	254.000	10.0000	254.000	10.0000	3.2	0.8	3 590	7 030	695	**47TS694625D-1**	2	0.4	1.68	2.5	110
	13.5060	457.098	17.9960	299.000	11.7717	299.000	11.7717	3.2	SP	4 150	9 010	868	**47TS694630B**	2	0.4	1.68	2.5	135
346.075	13.6250	488.950	19.2500	358.775	14.1250	358.775	14.1250	4	2	4 740	8 310	828	**47TS694936**	1	0.33	2.03	3.02	210
350	—	480	—	420	—	420	—	SP	1.5	4 630	9 100	894	**45DS704842C**	1-P	0.4	1.68	2.5	217
355	—	490	—	316	—	316	—	2	1.6	4 430	7 920	782	**47TS714932**	1	0.33	2.03	3.02	169
355.600	14.0000	482.600	19.0000	269.875	10.6250	265.112	10.4375	3.2	1.5	3 350	6 090	608	**47TS714827**	1-P	0.47	1.43	2.12	134
360	—	480	—	375	—	375	—	3	1	5 150	10 600	1 020	**47TS724838A**	1	0.4	1.68	2.5	181
374.650	14.7500	501.650	19.7500	260.350	10.2500	250.825	9.8750	3.2	1.6	3 900	7 470	739	**47TS755026A**	2	0.33	2.03	3.02	136
380	—	580	—	370	—	370	—	3	SP	7 140	12 300	1 180	**47TS765837**	1-P	0.33	2.03	3.02	353
395	—	545	—	360	—	360	—	6	1.6	4 730	8 930	858	**47TS795536A**	1	0.47	1.43	2.12	242
406.400	16.0000	546.100	21.5000	288.925	11.3750	288.925	11.3750	6.4	1	4 530	8 190	796	**47TS815529D-2**	2-P	0.47	1.43	2.12	195
	16.0000	546.100	21.5000	330.000	12.9921	330.000	12.9921	4	1.5	5 380	10 500	997	**47TS815533A**	2-P	0.43	1.57	2.34	204
	16.0000	546.100	21.5000	357.400	14.0709	357.400	14.0709	3.2	1.6	4 950	9 540	906	**47TS815536A**	1	0.47	1.43	2.12	220
410	—	546	—	400	—	400	—	4	1.5	5 780	12 000	1 130	**47TS825540**	1	0.26	2.55	3.8	255

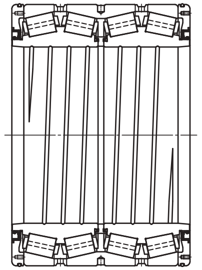
[Note] 1) SP indicates the specially chamfered from.

Sealed type four-row tapered roller bearings

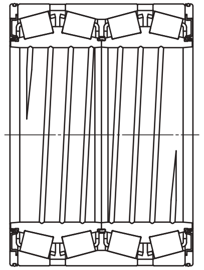
d 415.925 ~ 482.600 mm



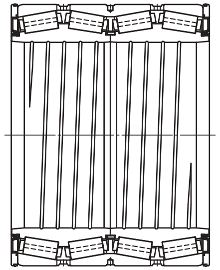
Design 1



Design 1-P



Design 2



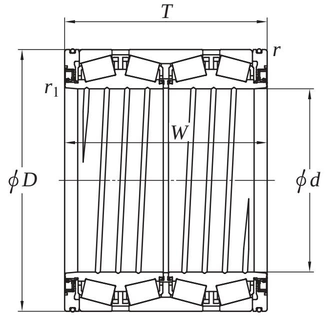
Design 2-P

Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Con-stant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*W* mm	1/25.4	*r* 1) min.	*r*1 1) min.	C_r	C_{0r}	C_u			*e*	Y_2	Y_3	
415.925	16.3750	590.550	23.2500	434.975	17.1250	434.975	17.1250	4	1.5	8 000	15 600	1 440	**47TS835944A**	2-P	0.4	1.68	2.5	377
420	—	560	—	437	—	437	—	4	3	7 020	14 900	1 380	**47TS845644**	1	0.26	2.55	3.8	298
	—	574	—	480	—	480	—	3	1.6	8 420	17 800	1 610	**47TS845748**	1-P	0.28	2.43	3.61	352
	—	620	—	395	—	320	—	SP	SP	6 460	11 600	1 090	**47TS846240**	1-P	0.47	1.43	2.12	390
430	—	575	—	380	—	380	—	3.2	SP	6 510	14 300	1 310	**47TS865838A**	2-P	0.26	2.55	3.8	276
431.800	17.0000	571.500	22.5000	336.550	13.2500	336.550	13.2500	3.2	1.5	5 560	11 600	1 090	**47TS865734A**	2	0.4	1.68	2.5	229
440	—	590	—	480	—	480	—	4	SP	8 580	18 700	1 670	**47TS885948A-3**	2-P	0.26	2.55	3.8	362
	—	620	—	454	—	454	—	4	1.5	8 240	16 100	1 490	**47TS886245-1**	1-P	0.33	2.03	3.02	430
	—	635	—	470	—	413	—	5	2	8 610	15 700	1 450	**47TS886447**	1	0.33	2.03	3.02	461
450	—	595	—	420	—	420	—	5	1.5	7 630	16 300	1 490	**47TS906042**	1-P	0.26	2.55	3.8	308
457.200	18.0000	596.900	23.5000	279.400	11.0000	276.225	10.8750	3.2	1.6	4 710	9 520	1 670	**47TS916028C**	2-P	0.47	1.43	2.12	191
	18.0000	596.900	23.5000	279.400	11.0000	276.225	10.8750	3.2	1.6	4 140	8 180	770	**47TS916028D**	2-P	0.7	0.97	1.44	187
460	—	620	—	470	—	470	—	4	1.5	8 810	19 300	1 710	**47TS926247**	1-P	0.26	2.55	3.8	412
479.425	18.8750	679.450	26.7500	495.300	19.5000	495.300	19.5000	6.4	2	10 100	19 600	1 750	**47TS966850**	1-P	0.33	2.03	3.02	562
480.000	18.8976	647.700	25.5000	417.512	16.4375	417.512	16.4375	6.4	SP	8 350	17 400	1 570	**47TS966542**	1-P	0.33	2.03	3.02	391
480	—	700	—	470	—	470	—	5	1.5	10 100	18 800	1 700	**47TS967047**	1-P	0.32	2.12	3.15	621
482.600	19.0000	615.950	24.2500	330.200	13.0000	330.200	13.0000	6.4	1.6	5 410	11 700	1 080	**4TRS19B**	1-P	0.44	1.54	2.3	240
	19.0000	615.950	24.2500	330.200	13.0000	330.200	13.0000	3.2	1.6	5 480	11 800	475	**4TRS19C**	2	0.4	1.68	2.5	229
	19.0000	615.950	24.2500	330.200	13.0000	330.200	13.0000	3.2	1.6	5 660	12 400	1 130	**4TRS19D**	2-P	0.4	1.68	2.5	239
	19.0000	615.950	24.2500	385.000	15.1575	385.000	15.1575	6.4	1.6	6 610	15 000	1 340	**47TS976239**	1-P	0.33	2.03	3.02	278
	19.0000	615.950	24.2500	420.000	16.5354	420.000	16.5354	6.4	1.6	6 390	14 500	646	**47TS976242**	1	0.33	2.03	3.02	302
	19.0000	615.950	24.2500	425.000	16.7323	425.000	16.7323	6.4	1.6	6 390	14 500	646	**47TS976243**	1	0.33	2.03	3.02	306
	19.0000	647.700	25.5000	417.512	16.4375	417.512	16.4375	6.4	1.6	8 350	17 400	1 570	**47TS976542A**	1-P	0.33	2.03	3.02	382

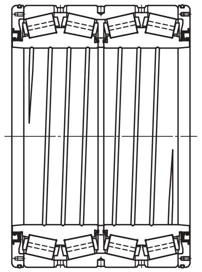
[Note] 1) SP indicates the specially chamfered from.

Sealed type four-row tapered roller bearings

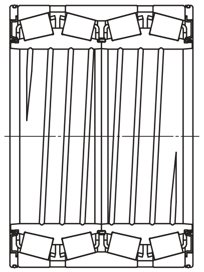
d 488.950 ~ 711.200 mm



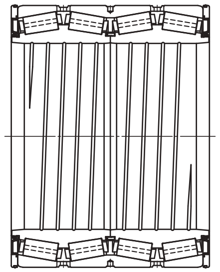
Design 1



Design 1-P



Design 2



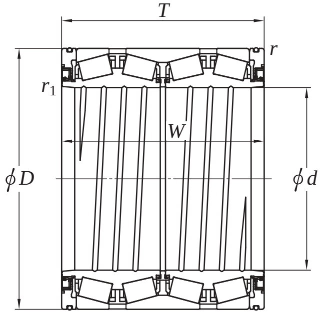
Design 2-P

Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Con-stant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	*D* mm	1/25.4	*T* mm	1/25.4	*W* mm	1/25.4	*r* min.	r_1 [1)] min.	C_r	C_{0r}	C_u			*e*	Y_2	Y_3	
488.950	19.2500	622.300	24.5000	365.125	14.3750	365.125	14.3750	6.4	1.5	5 420	12 200	1 110	**47TS986236**	1	0.4	1.68	2.5	270
492	—	655	—	480	—	480	—	5	1.5	9 310	21 200	1 830	**47TS986648**	1-P	0.33	2.03	3.02	449
509.948	20.0767	654.924	25.7844	379.000	14.9213	377.000	14.8425	6.4	1.5	6 730	15 200	1 350	**4TRS510B**	1-P	0.41	1.64	2.44	320
530	—	715	—	590	—	590	—	5	1.5	12 900	28 900	2 390	**4TRS530A**	1-P	0.26	2.55	3.8	664
558.800	22.0000	736.600	29.0000	372.263	14.6560	372.263	14.6560	7	SP	7 430	16 100	714	**4TRS559J**	1-P	0.34	1.97	2.93	425
	22.0000	736.600	29.0000	409.575	16.1250	409.575	16.1250	6	1.5	8 570	18 600	1 610	**4TRS559C**	1-P	0.35	1.95	2.9	475
	22.0000	736.600	29.0000	450.000	17.7165	450.000	17.7165	6	1.5	8 990	19 700	427	**4TRS559A**	1-P	0.35	1.95	2.9	507
	22.0000	736.600	29.0000	480.000	18.8976	480.000	18.8976	6	1.5	9 970	22 700	1 910	**4TRS559B**	1-P	0.4	1.68	2.5	547
	22.0000	736.600	29.0000	500.000	19.6850	500.000	19.6850	6	1.6	10 300	23 100	1 950	**4TRS559**	1-P	0.35	1.95	2.9	560
585.788	23.0625	771.525	30.3750	479.425	18.8750	479.425	18.8750	6.4	1.5	10 900	24 400	2 050	**4TRS586A**	1-P	0.33	2.03	3.02	613
595.312	23.4375	844.550	33.2500	615.950	24.2500	615.950	24.2500	6.4	3.6	15 900	32 200	2 610	**4TRS595B**	1-P	0.33	2.03	3.02	1 120
600	—	870	—	700	—	700	—	5	4	18 900	39 400	3 080	**4TRS600A**	1-P	0.33	2.03	3.02	1 370
609.600	24.0000	787.400	31.0000	361.950	14.2500	361.950	14.2500	6.4	3.2	7 420	14 900	1 310	**4TRS610**	1-P	0.4	1.68	2.5	430
	24.0000	813.562	32.0300	540.000	21.2598	540.000	21.2598	6.4	1.5	12 700	28 500	2 320	**4TRS610A**	1-P	0.33	2.03	3.02	775
679.450	26.7500	901.700	35.5000	552.450	21.7500	552.450	21.7500	6.4	3	13 900	30 600	2 450	**4TRS679**	1-P	0.33	2.03	3.02	951
685.800	27.0000	876.300	34.5000	355.600	14.0000	352.425	13.8750	6.4	3.2	7 690	16 300	1 400	**4TRS686A**	1-P	0.42	1.62	2.42	520
704.850	27.7500	914.400	36.0000	552.450	21.7500	552.450	21.7500	6.4	3.2	14 100	33 400	2 630	**4TRS705**	1-P	0.33	2.03	3.02	940
711.200	28.0000	914.400	36.0000	317.500	12.5000	317.500	12.5000	3.2	SP	7 620	16 700	1 420	**4TRS711N**	2-P	0.46	1.47	2.19	507
	28.0000	914.400	36.0000	387.350	15.2500	387.350	15.2500	6.4	3.2	8 980	19 400	1 620	**4TRS711A**	1-P	0.38	1.78	2.65	615
	28.0000	914.400	36.0000	410.000	16.1417	410.000	16.1417	6.4	3.2	9 550	20 500	1 730	**4TRS711**	1-P	0.44	1.54	2.29	670
	28.0000	914.400	36.0000	420.000	16.5354	420.000	16.5354	6.4	3.2	9 870	22 200	1 840	**4TRS711L**	1-P	0.4	1.68	2.5	678

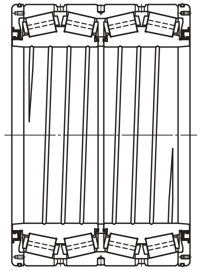
[Note] 1) SP indicates the specially chamfered from.

Sealed type four-row tapered roller bearings

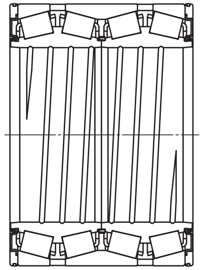
d 800 mm



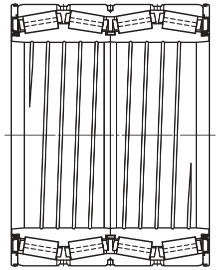
Design 1



Design 1-P



Design 2

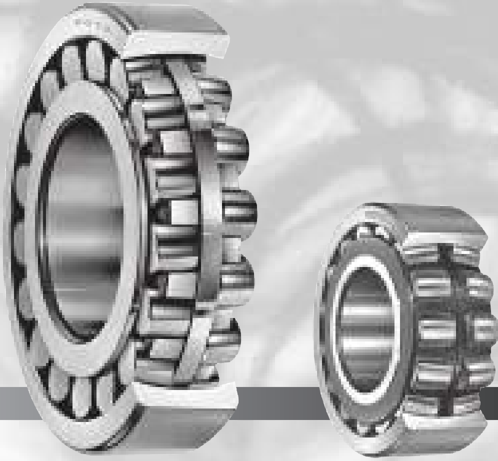


Design 2-P

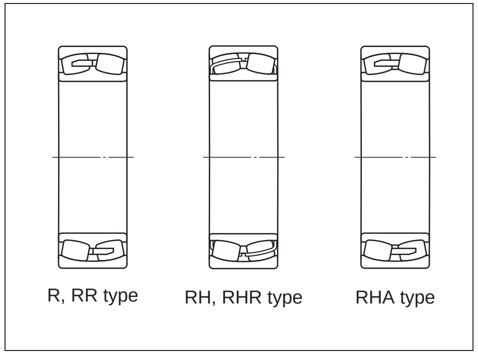
Boundary dimensions										Basic load ratings (kN)			Fatigue load limit (kN)	Bearing No.	Design	Con-stant	Axial load factors		(Refer.) Mass (kg)
d mm	1/25.4	D mm	1/25.4	T mm	1/25.4	W mm	1/25.4	r min.	r_1 min.	C_r	C_{0r}		C_u			e	Y_2	Y_3	
800	—	1 130	—	780	—	780	—	6	1.5	27 400	58 800		4 290	**4TRS800**	1-P	0.26	2.55	3.8	2 520

Spherical roller bearings

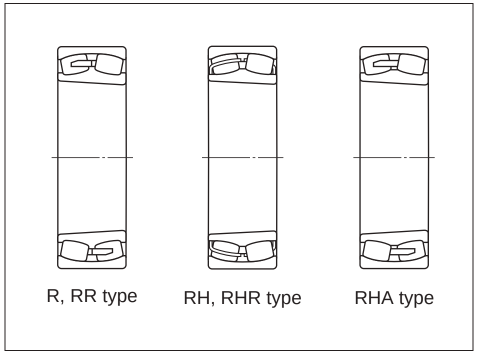
- Spherical roller bearings feature a large load rating capacity. This type of bearing is suitable for low- or medium-speed applications which involve heavy or impact loading.
- The spherical roller bearing is self-aligning, insensitive to misalignment of the shaft relative to the housing, and to shaft bending.
- Bearing with tapered bore can be easily mounted/dismounted by using an adapter assembly or withdrawal sleeve.
  1) 240 and
  241 series ············· 1 : 30 (supplementary code K30)
  2) Others ···················· 1 : 12 (supplementary code K)



■ Cylindrical bore



■ Tapered bore



	R, RR type	RH, RHR type	RHA type
Roller	Convex asymmetrical roller	Convex symmetrical roller	Convex symmetrical roller
Cage	Copper alloy prong type machined cage	Pressed steel cage	Copper alloy integral type machined cage
Inner ring (with or without rib)	With center rib	Without center rib (floating guide ring)	Without center rib (floating guide ring)
	With ribs on both sides (to prevent rollers from falling)	Without ribs on both sides	With ribs on both sides (to prevent rollers from falling)
Characteristics	Superior to RH, RHR and RHA types in high-speed performance.	The load rating capacity is larger than that of R and RR type. (There are some exceptional cases due to different interior specifications.)	

- Outer rings can be provided with lubrication holes, a lubrication groove and an anti-rotation pin hole.

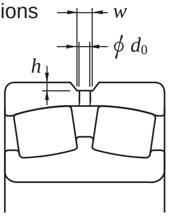
Supplementary code		Number of lubrication holes	Hole layout
With lubrication holes and lubrication groove	With lubrication holes, lubrication groove and anti-rotation pin hole		
W33	**W3N**	3[1]	3 equally spaced positions[1]
W33A	W3NA	4	4 equally spaced positions
–	W3NB	5	6 equally spaced positions[2]
W33C	W3NC	6	6 equally spaced positions
–	W3ND	7	8 equally spaced positions[2]
W33T	–	8	8 equally spaced positions

[Notes] 1) Also 4 or 6 holes are provided.
2) One hole is used for the antirotation pin.
[Remark] Boldfaced codes indicate JTEKT standards.

- Inner rings can also be provided with lubrication holes and a lubrication groove.

Supplementary code	Inner ring		Outer ring	
	Number of lubrication holes	Lubrication groove	Number of lubrication holes	Lubrication groove
W513	3	–	3	○
W518	3	–	3	–
W26	3	–	–	–

■ Lubrication hole and lubrication groove dimensions (W33, W33A, W33C, W33T)



Unit : mm

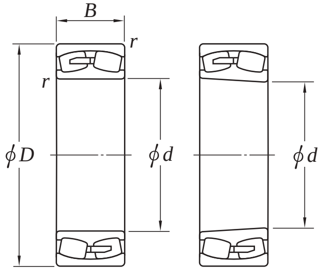
Bore diameter number	Nominal bore diameter d	23900			23000			24000			23100			24100			22200			23200			21300			22300		
		d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h
20	100	–	–	–	4	5	1	–	–	–	5	6	1.4	–	–	–	5	6	1.2	5	8	1.2	4	6	1.2	6	8	2
22	110	–	–	–	5	7	1	–	–	–	5	6	1.4	6	8	1.5	5	7	1.5	6	8	1.7	4	6	1.2	6	8	2
24	120	–	–	–	5	7	1	5	6	1.4	5	6	1.4	6	8	1.5	5	7	1.5	6	10	1.7	–	–	–	8	10	2.5
26	130	–	–	–	5	7	1.2	6	8	1.5	5	6	1.5	6	8	1.5	5	7	1.5	6	10	1.7	–	–	–	8	12	2.5
28	140	4	5	1	5	7	1.2	6	8	1.5	6	8	1.5	8	10	2	6	8	1.8	8	10	2.5	–	–	–	12	14	3
30	150	5	7	1	5	8	1.2	6	8	1.5	6	10	1.5	8	10	2	6	10	1.8	8	10	2.5	–	–	–	12	14	3
32	160	5	7	1.2	5	8	1.2	6	8	1.5	8	12	2	10	12	2	10	12	2.5	10	12	2.5	–	–	–	12	14	3
34	170	5	7	1.2	6	10	1.5	8	10	2	8	12	2	10	12	2	12	14	3	10	12	2.5	–	–	–	12	14	3
36	180	6	7	1.3	8	12	1.5	10	12	2.5	10	12	2.5	10	12	2	12	14	3	10	12	2.5	–	–	–	14	16.5	4
38	190	5	7	1.2	10	12	2.5	10	12	2.5	10	12	2.5	10	12	2	12	14	3	12	14	3	–	–	–	14	16.5	4
40	200	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	–	–	–	14	16.5	4
44	220	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	–	–	–	14	16.5	4
48	240	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
52	260	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
56	280	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
60	300	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
64	320	10	12	2.5	12	14	3	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
68	340	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
72	360	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
76	380	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
80	400	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
84	420	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
88	440	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
92	460	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
96	480	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	–	–	–
/500	500	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	5	–	–	–	14	16.5	4	–	–	–	–	–	–
/530	530	14	16.5	4	14	16.5	4	16	20	5	14	16.5	4	16	20	5	–	–	–	14	16.5	4	–	–	–	–	–	–
/560	560	14	16.5	4	14	16.5	4	16	20	5	14	16.5	4	16	20	5	–	–	–	14	16.5	4	–	–	–	–	–	–
/600	600	14	16.5	4	14	16.5	4	16	20	5	16	20	5	16	20	5	–	–	–	16	20	5	–	–	–	–	–	–
/630	630	14	16.5	4	14	16.5	4	16	20	5	16	20	5	16	20	5	–	–	–	16	20	5	–	–	–	–	–	–
/670	670	14	16.5	4	14	16.5	4	16	20	5	16	20	5	25	30	7	–	–	–	–	–	–	–	–	–	–	–	–
/710	710	14	16.5	4	14	16.5	4	16	20	5	16	20	5	25	30	7	–	–	–	–	–	–	–	–	–	–	–	–
/750	750	15	20	4	15	20	4	16	20	5	16	20	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/800	800	15	20	4	15	20	4	16	20	5	16	20	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/850	850	15	20	4	15	20	4	20	25	5	20	25	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/900	900	16	20	5	15	20	5	20	25	5	20	25	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/950	950	16	20	5	16	20	5	20	25	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/1 000	1 000	16	20	5	16	20	5	20	25	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/1 060	1 060	16	20	5	16	20	5	20	25	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/1 120	1 120	16	20	5	–	–	–	20	25	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/1 180	1 180	16	20	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/1 250	1 250	16	20	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/1 320	1 320	20	25	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
/1 400	1 400	20	25	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512.
Tolerances	As specified in JIS B 1514, class 0. (refer to Table 2-2 on page 18.) Refer to Table 2-10 on page 34 for the tolerance of tapered bores.
Allowable aligning angle	23800R ········ 0.017 rad (1°) 23900R ········ 0.026 rad (1.5°) 23000R, RH, RHA ····· 0.026 rad (1.5°) 24000R, RH, RHA ····· 0.035 rad (2°) 23100R, RH, RHA ····· 0.026 rad (1.5°) 24100R, RH, RHA ········ 0.044 rad (2.5°) 22200R, RR, RH, RHR, RHA ······ 0.026 rad (1.5°) 23200R, RH, RHA ········ 0.044 rad (2.5°) 21300R, RH ········ 0.017 rad (1°) 22300R, RR, RH, RHR, RHA ······ 0.035 rad (2°)
Radial internal clearance	(Refer to Table 4-6 on page 54.)
Equivalent radial load	**Dynamic equivalent radial load** $\left(\text{When } \frac{F_a}{F_r} \leqq e\right)$ $P_r = F_r + Y_1 F_a$ $\left(\text{When } \frac{F_a}{F_r} > e\right)$ $P_r = 0.67 F_r + Y_2 F_a$ [Note] Refer to the specification table for the values of axial load factors Y_1, Y_2 and Y_0 and of constant e. **Static equivalent radial load** $P_{0r} = F_r + Y_0 F_a$

Spherical roller bearings

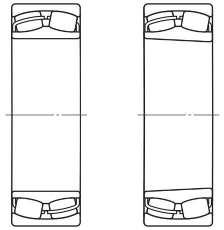
Koyo

d 100 ~ (140) mm



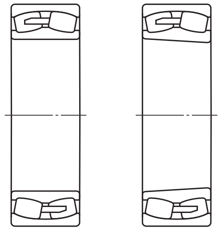
Cylindrical bore Tapered bore

R, RR



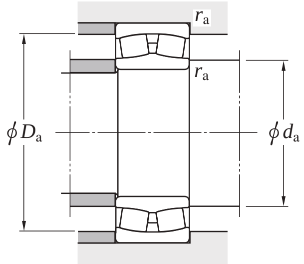
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA



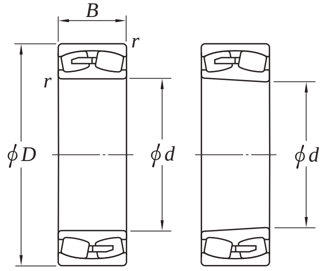
Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit	Bearing No.		Mounting dimensions (mm)			Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	(kN) C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
100	150	37	1.5	262	332	33.7	**23020RH**	**23020RHK**	117	141	1.5	0.22	3.01	4.48	2.94	2.34	2.27
	180	46	2.1	470	481	47.6	**22220RHR**	**22220RHRK**	112	168	2	0.25	2.74	4.08	2.68	5.11	5.00
	180	60.3	2.1	533	629	53.5	**23220RH**	**23220RHK**	112	168	2	0.32	2.09	3.11	2.04	6.85	6.66
	215	47	3	519	524	40.2	**21320RH**	**21320RHK**	114	201	2.5	0.22	3.02	4.49	2.95	8.79	8.68
	215	73	3	875	877	63.9	**22320RHR**	**22320RHRK**	114	201	2.5	0.35	1.95	2.90	1.91	13.2	12.9
110	170	45	2	377	486	48.4	**23022RH**	**23022RHK**	120	160	2	0.24	2.84	4.23	2.78	3.85	3.74
	180	56	2	484	605	53.7	**23122RH**	**23122RHK**	120	170	2	0.29	2.36	3.51	2.31	5.72	5.54
	180	69	2	569	778	63.4	**24122RH**	**24122RHK30**	120	170	2	0.37	1.84	2.74	1.80	6.98	6.87
	200	53	2.1	612	642	58.7	**22222RHR**	**22222RHRK**	122	188	2	0.26	2.64	3.93	2.58	7.37	7.21
	200	69.8	2.1	672	792	65.4	**23222RH**	**23222RHK**	122	188	2	0.34	1.99	2.96	1.94	9.76	9.48
	240	50	3	604	616	46.0	**21322RH**	**21322RHK**	124	226	2.5	0.21	3.19	4.75	3.12	11.8	11.7
	240	80	3	1 040	1 040	77.7	**22322RHR**	**22322RHRK**	124	226	2.5	0.33	2.03	3.02	1.98	18.1	17.7
120	180	46	2	394	524	51.6	**23024RH**	**23024RHK**	130	170	2	0.23	2.95	4.40	2.89	4.20	4.07
	180	60	2	484	709	61.8	**24024RH**	**24024RHK30**	130	170	2	0.30	2.23	3.32	2.18	5.43	5.34
	200	62	2	571	714	61.2	**23124RH**	**23124RHK**	130	190	2	0.29	2.34	3.49	2.29	7.98	7.74
	200	80	2	733	1 020	78.6	**24124RH**	**24124RHK30**	130	190	2	0.38	1.75	2.61	1.72	10.2	10.0
	215	58	2.1	706	764	67.2	**22224RHR**	**22224RHRK**	132	203	2	0.26	2.60	3.87	2.54	9.31	9.10
	215	76	2.1	772	956	78.9	**23224RH**	**23224RHK**	132	203	2	0.34	1.97	2.94	1.93	12.2	11.8
	260	86	3	1 120	1 130	87.2	**22324RHR**	**22324RHRK**	134	246	2.5	0.33	2.03	3.02	1.98	22.8	22.3
130	200	52	2	509	674	63.6	**23026RH**	**23026RHK**	140	190	2	0.24	2.87	4.27	2.80	6.15	5.97
	200	69	2	625	914	77.3	**24026RH**	**24026RHK30**	140	190	2	0.32	2.14	3.18	2.09	8.03	7.90
	210	64	2	621	799	68.4	**23126RH**	**23126RHK**	140	200	2	0.28	2.42	3.61	2.37	8.71	8.44
	210	80	2	754	1 080	91.8	**24126RH**	**24126RHK30**	140	200	2	0.36	1.90	2.83	1.86	10.8	10.6
	230	64	3	821	914	74.4	**22226RHR**	**22226RHRK**	144	216	2.5	0.26	2.55	3.80	2.50	11.6	11.3
	230	80	3	880	1 090	89.4	**23226RH**	**23226RHK**	144	216	2.5	0.33	2.05	3.05	2.00	14.4	14.0
	280	93	4	1 310	1 340	98.6	**22326RHR**	**22326RHRK**	148	262	3	0.33	2.03	3.02	1.98	28.5	27.9
140	210	53	2	530	723	67.9	**23028RH**	**23028RHK**	150	200	2	0.23	2.98	4.44	2.92	6.62	6.42

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

Spherical roller bearings

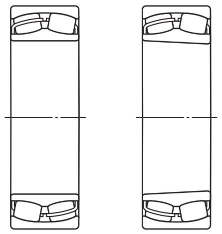
Koyo

d (140) ~ (170) mm



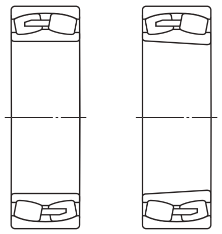
Cylindrical bore Tapered bore

R, RR



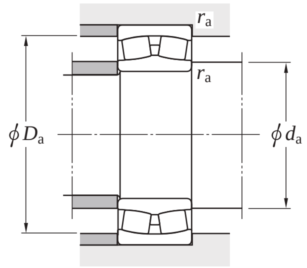
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA

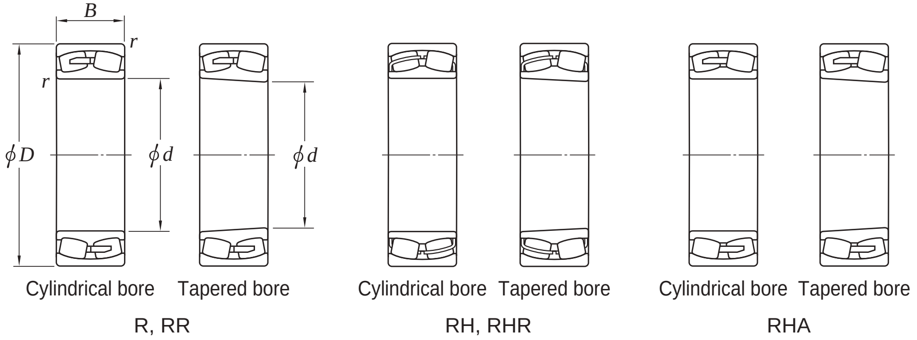


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	*D*	*B*	*r* (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	*e*	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
140	210	69	2	640	957	81.7	**24028RH**	**24028RHK30**	150	200	2	0.30	2.28	3.39	2.23	8.49	8.35
	225	68	2.1	710	940	79.6	**23128RH**	**23128RHK**	152	213	2	0.28	2.45	3.65	2.40	10.6	10.3
	225	85	2.1	853	1 220	90.7	**24128RH**	**24128RHK30**	152	213	2	0.36	1.89	2.82	1.85	13.1	12.9
	250	68	3	947	1 030	85.2	**22228RHR**	**22228RHRK**	154	236	2.5	0.26	2.60	3.87	2.54	14.5	14.2
	250	88	3	1 020	1 290	103	**23228RH**	**23228RHK**	154	236	2.5	0.34	1.99	2.96	1.95	19.0	18.4
	300	102	4	1 470	1 570	105	**22328RH**	**22328RHK**	158	282	3	0.35	1.95	2.90	1.90	35.7	34.9
150	210	45	2	418	622	62.5	**23930R**	**23930RK**	160	200	2	0.20	3.44	5.12	3.36	5.09	4.93
	225	56	2.1	579	797	76.3	**23030RH**	**23030RHK**	162	213	2	0.22	3.04	4.53	2.97	8.01	7.77
	225	75	2.1	724	1 100	90.3	**24030RH**	**24030RHK30**	162	213	2	0.30	2.23	3.32	2.18	10.6	10.4
	250	80	2.1	902	1 230	102	**23130RH**	**23130RHK**	162	238	2	0.30	2.24	3.34	2.19	16.4	15.9
	250	100	2.1	1 110	1 590	116	**24130RH**	**24130RHK30**	162	238	2	0.38	1.77	2.64	1.73	19.9	19.6
	270	73	3	1 080	1 200	102	**22230RHR**	**22230RHRK**	164	256	2.5	0.25	2.69	4.00	2.63	18.9	18.5
	270	96	3	1 200	1 540	121	**23230RH**	**23230RHK**	164	256	2.5	0.34	1.96	2.93	1.92	24.5	23.8
	320	108	4	1 540	1 600	175	**22330R**	**22330RK**	168	302	3	0.38	1.78	2.64	1.74	43.6	42.7
	320	108	4	1 620	1 740	121	**22330RHA**	**22330RHAK**	168	302	3	0.35	1.93	2.87	1.88	40.3	39.4
160	220	45	2	426	649	65.4	**23932R**	**23932RK**	170	210	2	0.19	3.60	5.37	3.52	5.37	5.20
	240	60	2.1	667	924	86.0	**23032RH**	**23032RHK**	172	228	2	0.22	3.01	4.48	2.94	9.74	9.44
	240	80	2.1	829	1 270	103	**24032RH**	**24032RHK30**	172	228	2	0.30	2.24	3.34	2.19	12.9	12.7
	270	86	2.1	1 070	1 430	117	**23132RH**	**23132RHK**	172	258	2	0.30	2.22	3.30	2.17	20.8	20.2
	270	109	2.1	1 270	1 720	145	**24132RR**	**24132RRK30**	172	258	2	0.39	1.72	2.56	1.68	25.9	25.5
	290	80	3	1 110	1 270	127	**22232R**	**22232RK**	174	276	2.5	0.28	2.40	3.57	2.35	23.4	22.9
	290	80	3	1 120	1 320	97.1	**22232RHA**	**22232RHAK**	174	276	2.5	0.27	2.49	3.71	2.44	21.9	21.4
	290	104	3	1 290	1 650	163	**23232R**	**23232RK**	174	276	2.5	0.38	1.79	2.66	1.75	31.0	30.1
	290	104	3	1 370	1 780	139	**23232RHA**	**23232RHAK**	174	276	2.5	0.36	1.87	2.78	1.83	29.4	28.5
	340	114	4	1 720	1 790	188	**22332R**	**22332RK**	178	322	3	0.38	1.76	2.62	1.72	51.9	51.0
	340	114	4	1 780	1 940	135	**22332RHA**	**22332RHAK**	178	322	3	0.35	1.94	2.89	1.90	48.0	47.1
170	230	45	2	441	691	69.6	**23934R**	**23934RK**	180	220	2	0.18	3.78	5.63	3.70	5.67	5.49
	260	67	2.1	795	1 090	97.9	**23034RH**	**23034RHK**	182	248	2	0.23	2.90	4.31	2.83	13.2	12.8

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

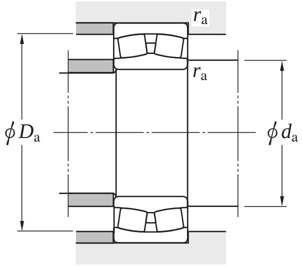
Spherical roller bearings

d (170) ~ (190) mm



Cylindrical bore Tapered bore Cylindrical bore Tapered bore Cylindrical bore Tapered bore

R, RR RH, RHR RHA

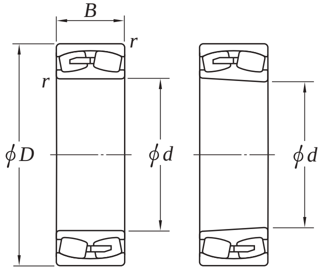


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Constant	Axial load factors			(Refer.) Mass (kg)	
d	*D*	*B*	*r* (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	*e*	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
170	260	90	2.1	1 010	1 540	120	**24034RH**	**24034RHK30**	182	248	2	0.32	2.11	3.15	2.07	17.5	17.2
	280	88	2.1	1 150	1 550	124	**23134RH**	**23134RHK**	182	268	2	0.29	2.30	3.43	2.25	21.9	21.2
	280	109	2.1	1 320	1 820	154	**24134RR**	**24134RRK30**	182	268	2	0.37	1.80	2.68	1.76	27.2	26.8
	310	86	4	1 190	1 390	141	**22234R**	**22234RK**	188	292	3	0.29	2.29	3.41	2.24	29.0	28.4
	310	86	4	1 260	1 490	109	**22234RHA**	**22234RHAK**	188	292	3	0.28	2.45	3.64	2.39	27.1	26.5
	310	110	4	1 560	1 920	127	**23234RR**	**23234RRK**	188	292	3	0.37	1.85	2.75	1.80	37.2	36.1
	310	110	4	1 520	1 940	147	**23234RHA**	**23234RHAK**	188	292	3	0.36	1.89	2.82	1.85	35.6	34.6
	360	120	4	1 830	1 920	206	**22334R**	**22334RK**	188	342	3	0.38	1.77	2.64	1.73	62.0	60.8
	360	120	4	1 990	2 200	150	**22334RHA**	**22334RHAK**	188	342	3	0.35	1.95	2.91	1.91	57.3	56.1
180	250	52	2	599	939	88.9	**23936R**	**23936RK**	190	240	2	0.19	3.55	5.29	3.48	8.22	7.97
	280	74	2.1	966	1 330	118	**23036RH**	**23036RHK**	192	268	2	0.24	2.84	4.23	2.78	17.4	16.9
	280	100	2.1	1 170	1 710	138	**24036RR**	**24036RRK30**	192	268	2	0.34	2.00	2.98	1.96	23.4	23.0
	300	96	3	1 260	1 800	165	**23136R**	**23136RK**	194	286	2.5	0.33	2.04	3.04	2.00	28.4	27.5
	300	96	3	1 330	1 790	139	**23136RHA**	**23136RHAK**	194	286	2.5	0.31	2.19	3.25	2.14	26.5	25.6
	300	118	3	1 530	2 120	176	**24136RR**	**24136RRK30**	194	286	2.5	0.38	1.78	2.65	1.74	34.4	33.9
	300	118	3	1 510	2 240	155	**24136RHA**	**24136RHAK30**	194	286	2.5	0.38	1.79	2.66	1.75	31.8	31.2
	320	86	4	1 220	1 450	165	**22236R**	**22236RK**	198	302	3	0.28	2.37	3.53	2.32	30.5	29.8
	320	86	4	1 320	1 610	118	**22236RHA**	**22236RHAK**	198	302	3	0.26	2.55	3.80	2.50	28.5	27.8
	320	112	4	1 640	2 100	134	**23236RR**	**23236RRK**	198	302	3	0.36	1.87	2.78	1.83	39.8	38.6
	320	112	4	1 660	2 170	166	**23236RHA**	**23236RHAK**	198	302	3	0.34	1.97	2.93	1.92	37.7	36.5
	380	126	4	2 180	2 360	263	**22336R**	**22336RK**	198	362	3	0.36	1.89	2.81	1.84	71.4	69.9
	380	126	4	2 180	2 410	163	**22336RHA**	**22336RHAK**	198	362	3	0.34	1.97	2.94	1.93	66.0	64.5
190	260	52	2	608	969	90.7	**23938R**	**23938RK**	200	250	2	0.18	3.69	5.50	3.61	8.40	8.10
	290	75	2.1	923	1 370	132	**23038R**	**23038RK**	202	278	2	0.25	2.67	3.97	2.61	18.8	18.2
	290	75	2.1	992	1 430	115	**23038RHA**	**23038RHAK**	202	278	2	0.25	2.75	4.10	2.69	17.2	16.6
	290	100	2.1	1 240	1 840	161	**24038RR**	**24038RRK30**	202	278	2	0.33	2.06	3.07	2.02	24.5	24.1
	290	100	2.1	1 230	1 920	152	**24038RHA**	**24038RHAK30**	202	278	2	0.32	2.14	3.19	2.09	22.4	22.0
	320	104	3	1 370	2 000	162	**23138R**	**23138RK**	204	306	2.5	0.34	1.96	2.92	1.92	35.5	34.4
	320	104	3	1 520	2 080	161	**23138RHA**	**23138RHAK**	204	306	2.5	0.31	2.14	3.19	2.10	33.2	32.1

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

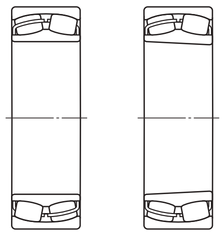
Spherical roller bearings

d (190) ~ (220) mm



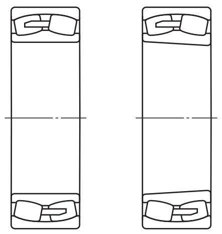
Cylindrical bore Tapered bore

R, RR



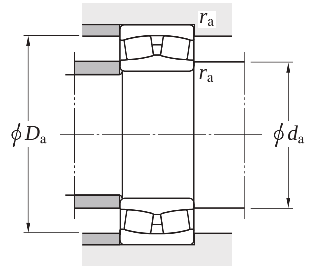
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA

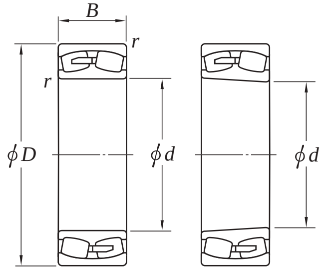


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
190	320	128	3	1 750	2 470	198	**24138RR**	**24138RRK30**	204	306	2.5	0.39	1.74	2.59	1.70	43.0	42.4
	320	128	3	1 770	2 630	179	**24138RHA**	**24138RHAK30**	204	306	2.5	0.38	1.76	2.63	1.72	40.1	39.5
	340	92	4	1 390	1 730	172	**22238R**	**22238RK**	208	322	3	0.29	2.29	3.41	2.24	37.4	36.6
	340	92	4	1 420	1 770	128	**22238RHA**	**22238RHAK**	208	322	3	0.27	2.52	3.76	2.46	34.9	34.1
	340	120	4	1 830	2 370	160	**23238RR**	**23238RRK**	208	322	3	0.36	1.86	2.76	1.81	48.5	47.1
	340	120	4	1 870	2 470	185	**23238RHA**	**23238RHAK**	208	322	3	0.35	1.94	2.89	1.90	44.9	43.5
	400	132	5	2 380	2 610	258	**22338R**	**22338RK**	212	378	4	0.38	1.79	2.66	1.75	84.1	82.4
	400	132	5	2 430	2 810	192	**22338RHA**	**22338RHAK**	212	378	4	0.34	1.99	2.97	1.95	77.7	76.0
200	280	60	2.1	753	1 190	109	**23940R**	**23940RK**	212	268	2	0.20	3.44	5.13	3.37	12.0	11.6
	310	82	2.1	1 120	1 670	155	**23040R**	**23040RK**	212	298	2	0.26	2.62	3.90	2.56	24.1	23.4
	310	82	2.1	1 180	1 680	133	**23040RHA**	**23040RHAK**	212	298	2	0.25	2.68	3.99	2.62	22.0	21.3
	310	109	2.1	1 430	2 110	180	**24040RR**	**24040RRK30**	212	298	2	0.33	2.02	3.00	1.97	31.2	30.7
	310	109	2.1	1 440	2 230	173	**24040RHA**	**24040RHAK30**	212	298	2	0.33	2.06	3.07	2.02	28.5	28.0
	340	112	3	1 740	2 350	186	**23140RR**	**23140RRK**	214	326	2.5	0.33	2.04	3.03	1.99	43.3	42.0
	340	112	3	1 730	2 340	178	**23140RHA**	**23140RHAK**	214	326	2.5	0.32	2.10	3.13	2.06	40.8	39.5
	340	140	3	2 030	2 820	222	**24140RR**	**24140RRK30**	214	326	2.5	0.40	1.68	2.49	1.64	53.3	52.5
	340	140	3	2 000	2 970	196	**24140RHA**	**24140RHAK30**	214	326	2.5	0.41	1.65	2.46	1.62	49.5	48.7
	360	98	4	1 620	2 050	138	**22240RR**	**22240RRK**	218	342	3	0.30	2.26	3.36	2.21	45.0	44.0
	360	98	4	1 630	2 030	146	**22240RHA**	**22240RHAK**	218	342	3	0.27	2.50	3.72	2.45	42.0	41.0
	360	128	4	1 950	2 610	228	**23240R**	**23240RK**	218	342	3	0.38	1.79	2.67	1.75	58.1	56.4
	360	128	4	2 080	2 780	209	**23240RHA**	**23240RHAK**	218	342	3	0.35	1.92	2.86	1.88	55.1	53.4
	420	138	5	2 510	2 750	288	**22340R**	**22340RK**	222	398	4	0.38	1.80	2.68	1.76	95.4	93.5
	420	138	5	2 570	2 920	193	**22340RHA**	**22340RHAK**	222	398	4	0.34	1.99	2.97	1.95	88.1	86.2
220	300	60	2.1	792	1 300	119	**23944R**	**23944RK**	232	288	2	0.18	3.70	5.50	3.61	13.0	12.6
	340	90	3	1 230	1 890	173	**23044R**	**23044RK**	234	326	2.5	0.26	2.55	3.80	2.50	31.5	30.6
	340	90	3	1 370	1 950	148	**23044RHA**	**23044RHAK**	234	326	2.5	0.25	2.69	4.01	2.63	28.8	27.9
	340	118	3	1 660	2 480	208	**24044RR**	**24044RRK30**	234	326	2.5	0.33	2.04	3.04	2.00	40.5	39.8
	340	118	3	1 680	2 630	199	**24044RHA**	**24044RHAK30**	234	326	2.5	0.33	2.08	3.09	2.03	37.0	36.4
	370	120	4	1 810	2 700	205	**23144R**	**23144RK**	238	352	3	0.34	2.00	2.98	1.96	54.8	53.2

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

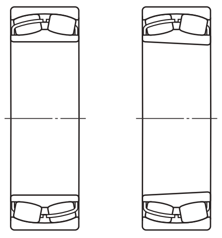
Spherical roller bearings

d (220) ~ (260) mm



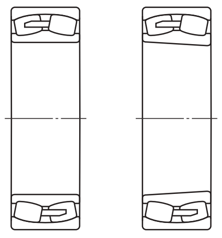
Cylindrical bore Tapered bore

R, RR



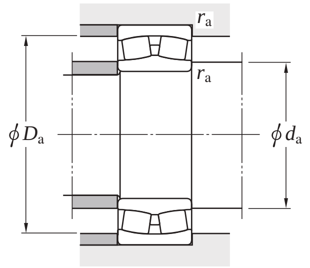
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA

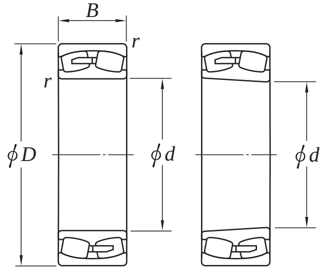


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
220	370	120	4	2 000	2 790	208	**23144RHA**	**23144RHAK**	238	352	3	0.31	2.15	3.20	2.10	51.2	49.6
	370	150	4	2 360	3 390	258	**24144RR**	**24144RRK30**	238	352	3	0.39	1.71	2.55	1.67	67.3	66.2
	370	150	4	2 330	3 550	229	**24144RHA**	**24144RHAK30**	238	352	3	0.40	1.69	2.52	1.65	62.0	61.0
	400	108	4	2 000	2 410	257	**22244RR**	**22244RRK**	238	382	3	0.28	2.40	3.57	2.34	60.3	59.0
	400	108	4	1 980	2 440	168	**22244RHA**	**22244RHAK**	238	382	3	0.27	2.52	3.76	2.47	58.8	57.5
	400	144	4	2 350	3 200	259	**23244R**	**23244RK**	238	382	3	0.39	1.71	2.55	1.68	81.6	79.2
	400	144	4	2 520	3 350	239	**23244RHA**	**23244RHAK**	238	382	3	0.36	1.89	2.81	1.85	77.4	75.0
	460	145	5	2 980	3 380	359	**22344R**	**22344RK**	242	438	4	0.34	2.00	2.99	1.96	124	122
	460	145	5	2 960	3 470	226	**22344RHA**	**22344RHAK**	242	438	4	0.32	2.08	3.09	2.03	115	113
240	320	60	2.1	814	1 380	128	**23948R**	**23948RK**	252	308	2	0.17	3.95	5.88	3.86	14.0	13.5
	360	92	3	1 480	2 190	161	**23048RR**	**23048RRK**	254	346	2.5	0.25	2.73	4.07	2.67	33.9	32.9
	360	92	3	1 470	2 180	166	**23048RHA**	**23048RHAK**	254	346	2.5	0.24	2.83	4.21	2.77	31.9	30.9
	360	118	3	1 750	2 710	228	**24048RR**	**24048RRK30**	254	346	2.5	0.31	2.20	3.27	2.15	43.5	42.9
	360	118	3	1 750	2 840	215	**24048RHA**	**24048RHAK30**	254	346	2.5	0.30	2.24	3.33	2.19	39.6	39.0
	400	128	4	2 280	3 220	213	**23148RR**	**23148RRK**	258	382	3	0.32	2.11	3.14	2.06	67.2	65.1
	400	128	4	2 270	3 200	233	**23148RHA**	**23148RHAK**	258	382	3	0.31	2.19	3.25	2.14	63.1	61.1
	400	160	4	2 640	3 850	287	**24148RR**	**24148RRK30**	258	382	3	0.39	1.75	2.60	1.71	82.7	81.4
	400	160	4	2 670	4 130	262	**24148RHA**	**24148RHAK30**	258	382	3	0.39	1.72	2.56	1.68	76.6	75.3
	440	120	4	2 390	2 940	295	**22248R**	**22248RK**	258	422	3	0.29	2.35	3.50	2.30	85.0	83.2
	440	120	4	2 400	2 990	202	**22248RHA**	**22248RHAK**	258	422	3	0.27	2.49	3.71	2.43	79.4	77.6
	440	160	4	3 050	3 970	310	**23248RR**	**23248RRK**	258	422	3	0.38	1.78	2.64	1.74	110	107
	440	160	4	3 080	4 130	289	**23248RHA**	**23248RHAK**	258	422	3	0.36	1.87	2.78	1.83	104	101
	500	155	5	3 360	4 200	347	**22348R**	**22348RK**	262	478	4	0.35	1.94	2.89	1.90	157	154
	500	155	5	3 400	3 990	255	**22348RHA**	**22348RHAK**	262	478	4	0.32	2.12	3.16	2.07	145	142
260	360	75	2.1	1 140	1 880	160	**23952R**	**23952RK**	272	348	2	0.19	3.54	5.27	3.46	24.0	23.3
	400	104	4	1 670	2 570	212	**23052R**	**23052RK**	278	382	3	0.25	2.65	3.95	2.59	50.7	49.3
	400	104	4	1 850	2 720	201	**23052RHA**	**23052RHAK**	278	382	3	0.25	2.75	4.10	2.69	46.3	44.9
	400	140	4	2 280	3 570	282	**24052RR**	**24052RRK30**	278	382	3	0.33	2.02	3.01	1.98	66.3	65.2
	400	140	4	2 270	3 670	265	**24052RHA**	**24052RHAK30**	278	382	3	0.33	2.06	3.07	2.02	60.3	59.4

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

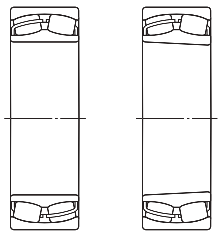
Spherical roller bearings

d (260) ~ (300) mm



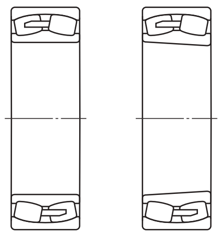
Cylindrical bore Tapered bore

R, RR



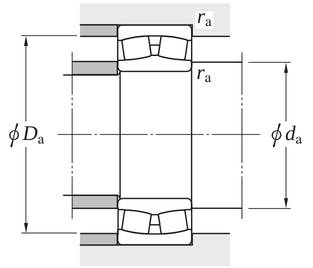
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA

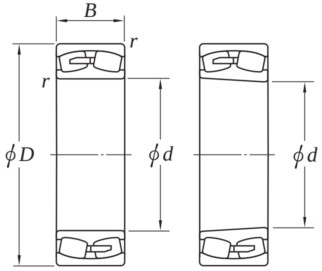


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
260	440	144	4	2 760	3 850	231	**23152RR**	**23152RRK**	278	422	3	0.33	2.05	3.06	2.01	92.2	89.4
	440	144	4	2 790	4 000	285	**23152RHA**	**23152RHAK**	278	422	3	0.32	2.12	3.16	2.08	87.4	84.6
	440	180	4	3 250	4 700	345	**24152RR**	**24152RRK30**	278	422	3	0.40	1.69	2.51	1.65	114	112
	440	180	4	3 210	4 950	309	**24152RHA**	**24152RHAK30**	278	422	3	0.41	1.66	2.47	1.62	106	105
	480	130	5	2 800	3 460	347	**22252R**	**22252RK**	282	458	4	0.28	2.40	3.57	2.35	110	108
	480	130	5	2 790	3 430	226	**22252RHA**	**22252RHAK**	282	458	4	0.27	2.50	3.72	2.44	103	101
	480	174	5	3 440	4 640	326	**23252R**	**23252RK**	282	458	4	0.40	1.69	2.51	1.65	144	140
	480	174	5	3 590	4 900	280	**23252RHA**	**23252RHAK**	282	458	4	0.36	1.87	2.78	1.83	137	133
	540	165	6	3 540	4 380	363	**22352R**	**22352RK**	288	512	5	0.35	1.94	2.89	1.90	196	192
	540	165	6	3 900	4 620	290	**22352RHA**	**22352RHAK**	288	512	5	0.31	2.15	3.21	2.11	181	177
280	380	75	2.1	1 160	1 960	165	**23956R**	**23956RK**	292	368	2	0.18	3.74	5.57	3.66	26.0	25.2
	420	106	4	1 790	2 860	235	**23056R**	**23056RK**	298	402	3	0.25	2.74	4.08	2.68	54.5	52.9
	420	106	4	1 940	2 950	218	**23056RHA**	**23056RHAK**	298	402	3	0.24	2.87	4.27	2.80	49.8	48.2
	420	140	4	2 370	3 780	291	**24056RR**	**24056RRK30**	298	402	3	0.31	2.15	3.21	2.11	70.2	69.1
	420	140	4	2 390	4 000	287	**24056RHA**	**24056RHAK30**	298	402	3	0.31	2.20	3.28	2.15	64.0	62.9
	460	146	5	2 910	4 160	250	**23156RR**	**23156RRK**	302	438	4	0.32	2.14	3.18	2.09	98.8	95.7
	460	146	5	2 940	4 290	304	**23156RHA**	**23156RHAK**	302	438	4	0.30	2.22	3.30	2.17	93.4	90.3
	460	180	5	3 390	5 140	370	**24156RR**	**24156RRK30**	302	438	4	0.38	1.79	2.67	1.75	122	120
	460	180	5	3 320	5 240	322	**24156RHA**	**24156RHAK30**	302	438	4	0.38	1.76	2.62	1.72	113	112
	500	130	5	2 640	3 380	308	**22256R**	**22256RK**	302	478	4	0.28	2.42	3.60	2.37	114	112
	500	130	5	2 900	3 670	240	**22256RHA**	**22256RHAK**	302	478	4	0.26	2.64	3.93	2.58	106	104
	500	176	5	3 370	4 910	323	**23256R**	**23256RK**	302	478	4	0.37	1.83	2.72	1.79	153	149
	500	176	5	3 770	5 300	365	**23256RHA**	**23256RHAK**	302	478	4	0.35	1.95	2.91	1.91	145	141
	580	175	6	3 930	4 910	407	**22356R**	**22356RK**	308	552	5	0.34	1.98	2.95	1.93	229	225
	580	175	6	4 390	5 260	325	**22356RHA**	**22356RHAK**	308	552	5	0.31	2.19	3.25	2.14	212	208
300	420	90	3	1 610	2 610	220	**23960R**	**23960RK**	314	406	2.5	0.20	3.42	5.09	3.34	40.0	38.8
	460	118	4	2 190	3 480	286	**23060R**	**23060RK**	318	442	3	0.25	2.69	4.00	2.63	75.8	73.7
	460	118	4	2 370	3 700	255	**23060RHA**	**23060RHAK**	318	442	3	0.24	2.79	4.16	2.73	68.9	66.8
	460	160	4	2 950	4 690	354	**24060RR**	**24060RRK30**	318	442	3	0.33	2.04	3.04	2.00	99.5	97.9

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

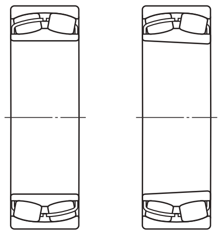
Spherical roller bearings

d (300) ~ (340) mm



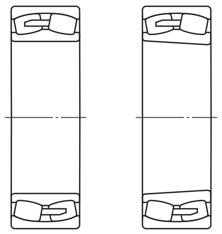
Cylindrical bore Tapered bore

R, RR



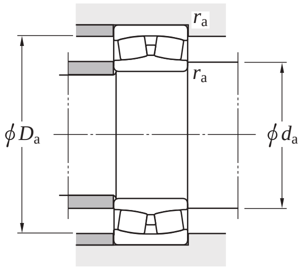
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA

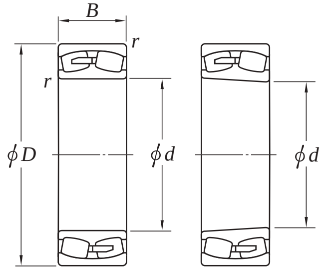


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
300	460	160	4	2 950	4 910	350	**24060RHA**	**24060RHAK30**	318	442	3	0.32	2.09	3.11	2.04	90.7	89.1
	500	160	5	3 450	5 030	351	**23160RR**	**23160RRK**	322	478	4	0.32	2.09	3.11	2.04	131	127
	500	160	5	3 430	4 970	345	**23160RHA**	**23160RHAK**	322	478	4	0.31	2.18	3.25	2.13	123	119
	500	200	5	4 160	6 280	433	**24160RR**	**24160RRK30**	322	478	4	0.40	1.67	2.49	1.63	162	160
	500	200	5	4 030	6 420	385	**24160RHA**	**24160RHAK30**	322	478	4	0.39	1.72	2.56	1.68	150	148
	540	140	5	3 360	4 330	412	**22260R**	**22260RK**	322	518	4	0.27	2.48	3.69	2.43	145	142
	540	140	5	3 320	4 360	284	**22260RHA**	**22260RHAK**	322	518	4	0.26	2.62	3.90	2.56	135	132
	540	192	5	4 300	5 910	401	**23260R**	**23260RK**	322	518	4	0.37	1.83	2.72	1.79	197	192
	540	192	5	4 440	6 310	429	**23260RHA**	**23260RHAK**	322	518	4	0.35	1.93	2.88	1.89	187	182
	620	185	7.5	4 890	5 430	555	**22360R**	**22360RK**	336	584	6	0.32	2.09	3.10	2.04	289	284
320	440	90	3	1 670	2 870	233	**23964R**	**23964RK**	334	426	2.5	0.19	3.61	5.38	3.53	43.0	41.7
	480	121	4	2 290	3 740	295	**23064R**	**23064RK**	338	462	3	0.24	2.76	4.11	2.70	81.2	78.8
	480	121	4	2 490	3 850	278	**23064RHA**	**23064RHAK**	338	462	3	0.24	2.87	4.27	2.80	74.5	72.1
	480	160	4	3 020	4 920	382	**24064RR**	**24064RRK30**	338	462	3	0.31	2.16	3.22	2.11	105	103
	480	160	4	3 060	5 230	363	**24064RHA**	**24064RHAK30**	338	462	3	0.31	2.21	3.29	2.16	93.4	91.4
	540	176	5	3 650	5 700	366	**23164R**	**23164RK**	342	518	4	0.33	2.04	3.04	2.00	171	166
	540	176	5	4 040	5 960	404	**23164RHA**	**23164RHAK**	342	518	4	0.32	2.13	3.17	2.08	160	155
	540	218	5	4 680	6 950	486	**24164RR**	**24164RRK30**	342	518	4	0.39	1.72	2.56	1.68	208	205
	540	218	5	4 550	7 190	429	**24164RHA**	**24164RHAK30**	342	518	4	0.40	1.70	2.52	1.66	199	196
	580	150	5	3 420	4 540	385	**22264R**	**22264RK**	342	558	4	0.28	2.41	3.59	2.35	175	171
	580	208	5	4 550	6 550	496	**23264R**	**23264RK**	342	558	4	0.38	1.76	2.62	1.72	249	242
	580	208	5	5 020	7 030	464	**23264RHA**	**23264RHAK**	342	558	4	0.36	1.90	2.83	1.86	236	229
340	460	90	3	1 680	2 980	242	**23968R**	**23968RK**	354	446	2.5	0.18	3.82	5.69	3.74	45.0	43.6
	520	133	5	2 670	4 330	353	**23068R**	**23068RK**	362	498	4	0.25	2.69	4.00	2.63	108	105
	520	133	5	2 930	4 470	312	**23068RHA**	**23068RHAK**	362	498	4	0.24	2.80	4.18	2.74	98.7	95.7
	520	180	5	3 680	5 970	432	**24068RR**	**24068RRK30**	362	498	4	0.33	2.06	3.06	2.01	142	140
	520	180	5	3 720	6 330	430	**24068RHA**	**24068RHAK30**	362	498	4	0.32	2.11	3.14	2.06	130	128
	580	190	5	4 130	6 430	472	**23168R**	**23168RK**	362	558	4	0.34	1.97	2.93	1.93	216	210
	580	190	5	4 620	6 720	449	**23168RHA**	**23168RHAK**	362	558	4	0.32	2.11	3.14	2.06	202	196

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

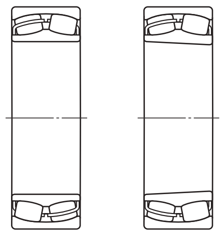
Spherical roller bearings

d (340) ~ 380 mm



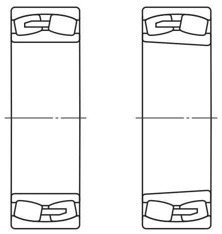
Cylindrical bore Tapered bore

R, RR



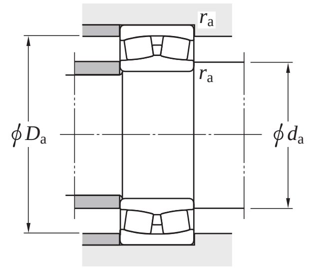
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA

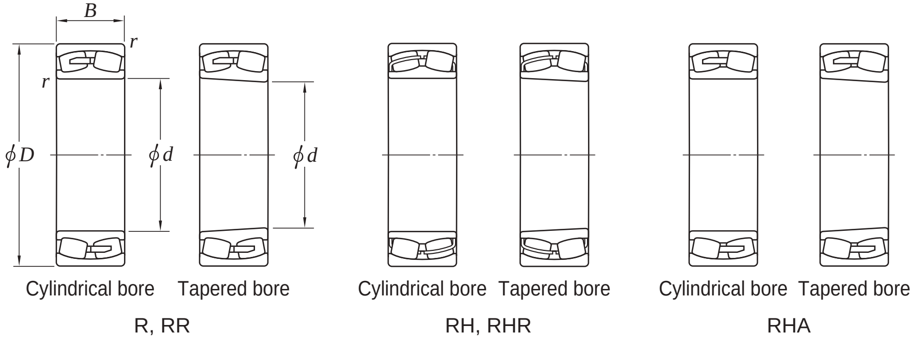


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	*D*	*B*	*r* (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	*e*	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
340	580	243	5	5 570	8 400	564	**24168RR**	**24168RRK30**	362	558	4	0.41	1.64	2.45	1.61	270	266
	580	243	5	5 490	8 810	449	**24168RHA**	**24168RHAK30**	362	558	4	0.42	1.61	2.39	1.57	259	255
	620	165	6	4 430	5 430	551	**22268R**	**22268RK**	368	592	5	0.28	2.43	3.61	2.37	221	216
	620	224	6	5 130	7 560	526	**23268R**	**23268RK**	368	592	5	0.38	1.77	2.63	1.73	306	297
	620	224	6	5 690	8 030	517	**23268RHA**	**23268RHAK**	368	592	5	0.36	1.88	2.81	1.84	290	281
360	480	90	3	1 710	3 060	248	**23972R**	**23972RK**	374	466	2.5	0.17	3.95	5.88	3.86	46.5	45.0
	540	134	5	2 860	4 800	375	**23072R**	**23072RK**	382	518	4	0.24	2.76	4.11	2.70	115	111
	540	134	5	3 040	4 770	334	**23072RHA**	**23072RHAK**	382	518	4	0.23	2.92	4.34	2.85	105	101
	540	180	5	3 810	6 300	465	**24072RR**	**24072RRK30**	382	518	4	0.31	2.15	3.21	2.11	149	147
	540	180	5	3 810	6 620	446	**24072RHA**	**24072RHAK30**	382	518	4	0.30	2.22	3.30	2.17	135	133
	600	192	5	4 740	7 040	459	**23172R**	**23172RK**	382	578	4	0.33	2.07	3.09	2.03	228	221
	600	192	5	4 830	7 210	474	**23172RHA**	**23172RHAK**	382	578	4	0.31	2.19	3.25	2.14	213	206
	600	243	5	5 080	7 690	437	**24172R**	**24172RK30**	382	578	4	0.39	1.74	2.59	1.70	287	283
	600	243	5	5 580	9 180	517	**24172RHA**	**24172RHAK30**	382	578	4	0.40	1.69	2.51	1.65	274	270
	650	170	6	4 710	5 830	583	**22272R**	**22272RK**	388	622	5	0.27	2.47	3.68	2.42	248	243
	650	232	6	6 080	8 810	548	**23272R**	**23272RK**	388	622	5	0.37	1.83	2.72	1.79	346	336
	650	232	6	6 220	9 050	591	**23272RHA**	**23272RHAK**	388	622	5	0.35	1.92	2.85	1.87	328	318
380	520	106	4	2 220	3 940	295	**23976R**	**23976RK**	398	502	3	0.19	3.62	5.39	3.54	70.0	67.9
	560	135	5	2 910	4 970	355	**23076R**	**23076RK**	402	538	4	0.24	2.79	4.16	2.73	122	118
	560	135	5	3 160	5 080	354	**23076RHA**	**23076RHAK**	402	538	4	0.22	3.03	4.51	2.96	112	108
	560	180	5	3 900	6 590	486	**24076RR**	**24076RRK30**	402	538	4	0.30	2.26	3.36	2.21	156	154
	560	180	5	3 900	6 910	454	**24076RHA**	**24076RHAK30**	402	538	4	0.29	2.32	3.45	2.27	142	139
	620	194	5	4 520	7 320	442	**23176R**	**23176RK**	402	598	4	0.31	2.18	3.24	2.13	240	233
	620	194	5	5 030	7 700	503	**23176RHA**	**23176RHAK**	402	598	4	0.30	2.26	3.36	2.21	224	217
	620	243	5	5 300	8 220	467	**24176R**	**24176RK30**	402	598	4	0.38	1.78	2.65	1.74	302	297
	620	243	5	5 870	9 840	561	**24176RHA**	**24176RHAK30**	402	598	4	0.38	1.78	2.65	1.74	288	283
	680	240	6	6 510	9 500	590	**23276R**	**23276RK**	408	652	5	0.36	1.85	2.76	1.81	386	375
	680	240	6	6 660	9 760	622	**23276RHA**	**23276RHAK**	408	652	5	0.35	1.94	2.89	1.90	365	354

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

Spherical roller bearings

d 400 ~ (440) mm



Cylindrical bore Tapered bore

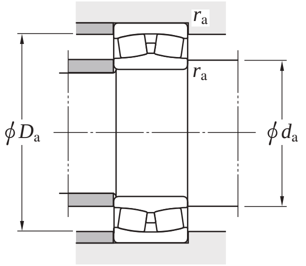
R, RR

Cylindrical bore Tapered bore

RH, RHR

Cylindrical bore Tapered bore

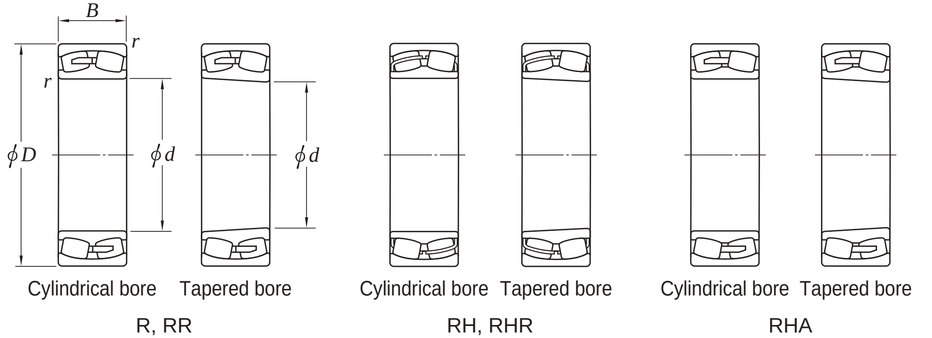
RHA



Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
400	540	106	4	2 350	4 300	320	**23980R**	**23980RK**	418	522	3	0.18	3.76	5.59	3.67	73.0	70.7
	600	148	5	3 390	5 790	408	**23080R**	**23080RK**	422	578	4	0.24	2.84	4.23	2.78	155	151
	600	148	5	3 690	5 860	398	**23080RHA**	**23080RHAK**	422	578	4	0.23	2.94	4.37	2.87	142	138
	600	200	5	4 820	8 110	444	**24080R**	**24080RK30**	422	578	4	0.32	2.09	3.12	2.05	206	203
	600	200	5	4 620	8 140	535	**24080RHA**	**24080RHAK30**	422	578	4	0.31	2.21	3.29	2.16	192	189
	650	200	6	4 730	7 780	521	**23180R**	**23180RK**	428	622	5	0.31	2.19	3.25	2.14	273	265
	650	200	6	5 410	8 300	542	**23180RHA**	**23180RHAK**	428	622	5	0.29	2.30	3.43	2.25	255	247
	650	250	6	5 840	9 140	499	**24180R**	**24180RK30**	428	622	5	0.37	1.82	2.70	1.78	338	333
	650	250	6	6 290	10 600	600	**24180RHA**	**24180RHAK30**	428	622	5	0.37	1.82	2.71	1.78	322	317
	720	256	6	6 540	9 850	590	**23280R**	**23280RK**	428	692	5	0.37	1.80	2.69	1.76	468	454
	720	256	6	7 320	10 600	665	**23280RHA**	**23280RHAK**	428	692	5	0.35	1.92	2.86	1.88	441	427
420	560	106	4	2 330	4 320	331	**23984R**	**23984RK**	438	542	3	0.17	3.91	5.82	3.82	76.0	73.6
	620	150	5	3 500	6 120	412	**23084R**	**23084RK**	442	598	4	0.23	2.90	4.31	2.83	164	159
	620	150	5	3 820	6 230	425	**23084RHA**	**23084RHAK**	442	598	4	0.22	3.02	4.49	2.95	150	145
	620	200	5	4 510	7 600	438	**24084R**	**24084RK30**	442	598	4	0.30	2.23	3.32	2.18	212	209
	620	200	5	4 730	8 490	555	**24084RHA**	**24084RHAK30**	442	598	4	0.29	2.31	3.44	2.26	198	195
	700	224	6	5 620	9 110	583	**23184R**	**23184RK**	448	672	5	0.33	2.03	3.02	1.98	363	352
	700	224	6	6 330	9 630	616	**23184RHA**	**23184RHAK**	448	672	5	0.31	2.19	3.25	2.14	339	328
	700	280	6	6 840	10 600	574	**24184R**	**24184RK30**	448	672	5	0.40	1.71	2.54	1.67	445	438
	700	280	6	7 420	12 400	685	**24184RHA**	**24184RHAK30**	448	672	5	0.39	1.72	2.56	1.68	425	418
	760	272	7.5	8 130	11 500	754	**23284R**	**23284RK**	456	724	6	0.37	1.84	2.74	1.80	556	540
	760	272	7.5	8 230	11 900	735	**23284RHA**	**23284RHAK**	456	724	6	0.36	1.90	2.83	1.86	525	508
440	600	118	4	2 910	5 330	387	**23988R**	**23988RK**	458	582	3	0.18	3.75	5.58	3.66	101	97.8
	650	157	6	3 790	6 540	455	**23088R**	**23088RK**	468	622	5	0.24	2.76	4.11	2.70	188	183
	650	157	6	4 230	6 910	465	**23088RHA**	**23088RHAK**	468	622	5	0.22	3.04	4.53	2.97	172	167
	650	212	6	4 910	8 320	475	**24088R**	**24088RK30**	468	622	5	0.29	2.35	3.50	2.30	247	243
	650	212	6	5 290	9 560	618	**24088RHA**	**24088RHAK30**	468	622	5	0.30	2.28	3.39	2.23	231	227
	720	226	6	5 800	9 600	591	**23188R**	**23188RK**	468	692	5	0.33	2.08	3.09	2.03	378	366
	720	226	6	6 590	10 300	655	**23188RHA**	**23188RHAK**	468	692	5	0.30	2.25	3.34	2.20	353	341

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

d (440) ~ (500) mm



Cylindrical bore Tapered bore

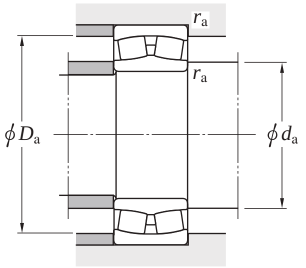
R, RR

Cylindrical bore Tapered bore

RH, RHR

Cylindrical bore Tapered bore

RHA

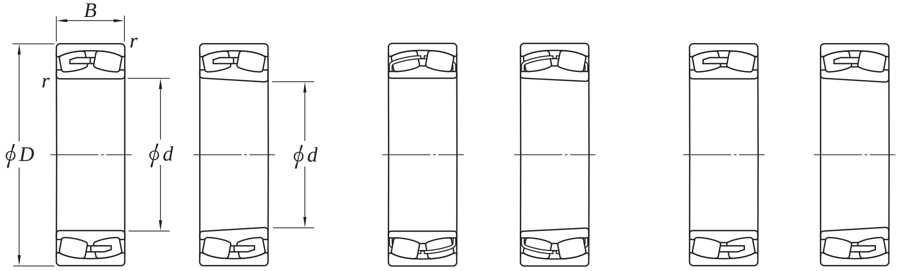


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Con-stant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
440	720	280	6	7 080	11 200	589	**24188R**	**24188RK30**	468	692	5	0.38	1.76	2.62	1.72	460	453
	720	280	6	7 540	12 900	707	**24188RHA**	**24188RHAK30**	468	692	5	0.38	1.79	2.67	1.75	439	432
	790	280	7.5	8 580	12 300	793	**23288R**	**23288RK**	476	754	6	0.36	1.86	2.77	1.82	613	595
	790	280	7.5	8 670	12 700	776	**23288RHA**	**23288RHAK**	476	754	6	0.35	1.93	2.88	1.89	580	562
460	600	90	3	1 800	3 660	306	**23896R**	**23896RK**	476	586	2.5	0.13	5.06	7.53	4.95	60.4	58.4
	620	118	4	2 890	5 350	404	**23992R**	**23992RK**	478	602	3	0.17	3.89	5.79	3.80	107	104
	680	163	6	4 060	7 170	480	**23092R**	**23092RK**	488	652	5	0.23	2.92	4.34	2.85	215	209
	680	163	6	4 520	7 430	497	**23092RHA**	**23092RHAK**	488	652	5	0.22	3.04	4.53	2.97	197	191
	680	218	6	5 740	10 100	536	**24092R**	**24092RK30**	488	652	5	0.30	2.23	3.32	2.18	277	272
	680	218	6	5 660	10 300	656	**24092RHA**	**24092RHAK30**	488	652	5	0.29	2.33	3.46	2.27	259	254
	760	240	7.5	6 510	10 800	648	**23192R**	**23192RK**	496	724	6	0.33	2.07	3.09	2.03	450	436
	760	240	7.5	7 240	11 200	697	**23192RHA**	**23192RHAK**	496	724	6	0.30	2.22	3.31	2.17	420	406
	760	300	7.5	7 320	12 200	597	**24192R**	**24192RK30**	496	724	6	0.35	1.95	2.90	1.91	550	541
	760	300	7.5	8 390	14 200	746	**24192RHA**	**24192RHAK30**	496	724	6	0.38	1.75	2.61	1.72	525	516
	830	296	7.5	9 520	13 700	867	**23292R**	**23292RK**	496	794	6	0.36	1.85	2.76	1.81	720	699
	830	296	7.5	9 600	14 200	856	**23292RHA**	**23292RHAK**	496	794	6	0.35	1.92	2.85	1.87	679	658
480	650	128	5	3 290	6 130	446	**23996R**	**23996RK**	502	628	4	0.18	3.75	5.59	3.67	123	119
	700	165	6	4 190	7 540	505	**23096R**	**23096RK**	508	672	5	0.22	3.01	4.47	2.94	225	218
	700	165	6	4 670	7 860	532	**23096RHA**	**23096RHAK**	508	672	5	0.22	3.12	4.64	3.05	206	199
	700	218	6	5 540	9 650	514	**24096R**	**24096RK30**	508	672	5	0.29	2.32	3.45	2.26	287	282
	700	218	6	5 800	10 700	492	**24096RHA**	**24096RHAK30**	508	672	5	0.28	2.41	3.59	2.35	268	263
	790	248	7.5	6 840	11 500	698	**23196R**	**23196RK**	516	754	6	0.32	2.09	3.12	2.05	503	488
	790	248	7.5	7 740	12 000	638	**23196RHA**	**23196RHAK**	516	754	6	0.30	2.24	3.34	2.19	470	455
	790	308	7.5	8 730	14 800	707	**24196R**	**24196RK30**	516	754	6	0.39	1.74	2.59	1.70	606	597
	790	308	7.5	9 880	15 900	792	**24196RHA**	**24196RHAK30**	516	754	6	0.38	1.78	2.65	1.74	580	568
	870	310	7.5	10 500	15 100	953	**23296R**	**23296RK**	516	834	6	0.36	1.85	2.75	1.81	831	807
	870	310	7.5	10 600	15 700	791	**23296RHA**	**23296RHAK**	516	834	6	0.35	1.91	2.85	1.87	785	761
500	670	128	5	3 330	6 310	447	**239/500R**	**239/500RK**	522	648	4	0.17	3.87	5.76	3.79	131	127

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

Spherical roller bearings

d (500) ~ 600 mm



Cylindrical bore Tapered bore

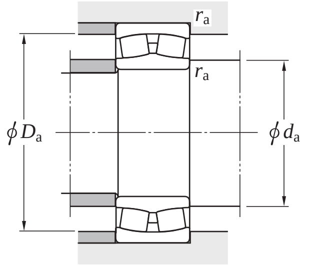
R, RR

Cylindrical bore Tapered bore

RH, RHR

Cylindrical bore Tapered bore

RHA

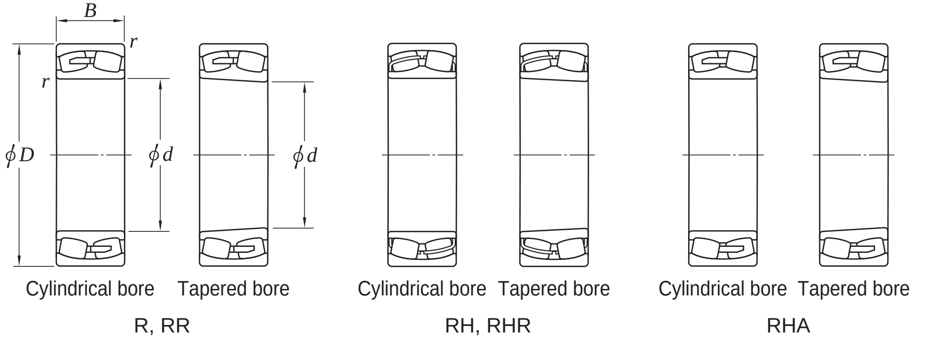


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
500	720	167	6	4 490	8 090	561	**230/500R**	**230/500RK**	528	692	5	0.23	2.94	4.37	2.87	235	228
	720	218	6	5 620	10 300	545	**240/500R**	**240/500RK30**	528	692	5	0.28	2.39	3.56	2.34	297	292
	830	264	7.5	7 750	13 000	708	**231/500R**	**231/500RK**	536	794	6	0.33	2.05	3.05	2.00	595	577
	830	325	7.5	9 350	15 900	763	**241/500R**	**241/500RK30**	536	794	6	0.36	1.85	2.76	1.81	712	701
	920	336	7.5	11 000	16 700	908	**232/500R**	**232/500RK**	536	884	6	0.39	1.74	2.59	1.70	1 020	992
530	710	136	5	3 720	7 120	508	**239/530R**	**239/530RK**	552	688	4	0.17	3.86	5.75	3.78	157	152
	780	185	6	5 130	9 050	624	**230/530R**	**230/530RK**	558	752	5	0.24	2.84	4.23	2.78	314	304
	780	185	6	5 710	9 600	620	**230/530RHA**	**230/530RHAK**	558	752	5	0.22	3.08	4.59	3.02	307	297
	780	250	6	6 620	11 700	616	**240/530R**	**240/530RK30**	558	752	5	0.30	2.26	3.36	2.21	414	408
	870	272	7.5	9 010	14 200	874	**231/530R**	**231/530RK**	566	834	6	0.32	2.14	3.18	2.09	661	641
	870	335	7.5	10 300	17 200	847	**241/530R**	**241/530RK30**	566	834	6	0.38	1.78	2.65	1.74	796	784
	980	355	9.5	13 100	18 900	1 160	**232/530R**	**232/530RK**	574	936	8	0.37	1.82	2.71	1.78	1 230	1 200
560	680	90	3	2 050	4 470	366	**238/560R**	**238/560RK**	574	666	2	0.12	5.70	8.48	5.57	70.0	67.0
	750	140	5	3 880	7 350	528	**239/560R**	**239/560RK**	582	728	4	0.17	3.96	5.90	3.87	182	176
	750	140	5	3 900	7 470	517	**239/560RHA**	**239/560RHAK**	582	728	4	0.16	4.35	6.48	4.26	178	172
	820	195	6	5 690	10 300	678	**230/560R**	**230/560RK**	588	792	5	0.24	2.83	4.21	2.77	353	342
	820	258	6	7 280	12 800	693	**240/560R**	**240/560RK30**	588	792	5	0.29	2.34	3.49	2.29	468	460
	920	280	7.5	9 800	15 500	963	**231/560R**	**231/560RK**	596	884	6	0.31	2.20	3.27	2.15	763	740
	920	355	7.5	10 800	17 500	865	**241/560R**	**241/560RK30**	596	884	6	0.39	1.75	2.60	1.71	945	930
	1 030	365	9.5	14 000	20 300	1 240	**232/560R**	**232/560RK**	604	986	8	0.36	1.86	2.77	1.82	1 390	1 350
	1 030	365	9.5	14 400	21 900	970	**232/560RR**	**232/560RRK**	604	986	8	0.36	1.86	2.77	1.82	1 400	1 360
600	800	150	5	4 420	8 550	592	**239/600R**	**239/600RK**	622	778	4	0.17	3.94	5.87	3.86	218	211
	870	200	6	6 890	11 900	722	**230/600RR**	**230/600RRK**	628	842	5	0.22	3.08	4.59	3.02	405	393
	870	200	6	6 830	12 300	789	**230/600RRHA**	**230/600RRHAK**	628	842	5	0.21	3.24	4.83	3.17	406	394
	870	272	6	8 130	15 000	758	**240/600R**	**240/600RK30**	628	842	5	0.30	2.27	3.38	2.22	546	538
	980	300	7.5	11 400	18 400	1 100	**231/600R**	**231/600RK**	636	944	6	0.31	2.18	3.25	2.13	917	888
	980	375	7.5	12 400	20 600	963	**241/600R**	**241/600RK30**	636	944	6	0.38	1.77	2.63	1.73	1 120	1 100
	1 090	388	9.5	16 100	24 000	1 410	**232/600R**	**232/600RK**	644	1 046	8	0.36	1.85	2.76	1.81	1 640	1 590

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

Spherical roller bearings

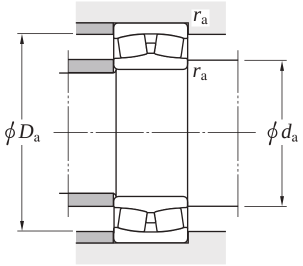
d 630 ~ 800 mm



Cylindrical bore Tapered bore
R, RR

Cylindrical bore Tapered bore
RH, RHR

Cylindrical bore Tapered bore
RHA

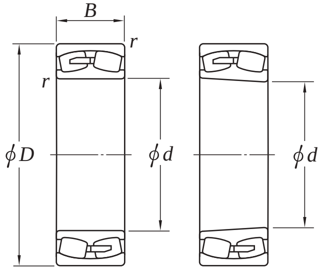


Boundary dimensions (mm) d	D	B	r (Refer.)	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Bearing No. Cylindrical bore	Tapered bore	Mounting dimensions (mm) d_a min.	D_a max.	r_a max.	Constant e	Axial load factors Y_1	Y_2	Y_0	(Refer.) Mass (kg) Cylindrical bore	Tapered bore
630	850	165	6	5 060	9 680	657	**239/630R**	**239/630RK**	658	822	5	0.18	3.81	5.67	3.73	277	268
	920	212	7.5	7 530	13 000	813	**230/630RHA**	**230/630RHAK**	666	884	6	0.21	3.19	4.75	3.12	484	469
	920	290	7.5	9 030	16 600	832	**240/630R**	**240/630RK30**	666	884	6	0.29	2.30	3.42	2.25	659	650
	920	290	7.5	9 490	17 600	1 080	**240/630RHA**	**240/630RHAK30**	666	884	6	0.28	2.37	3.53	2.32	654	643
	1 030	315	7.5	12 100	19 500	1 150	**231/630R**	**231/630RK**	666	994	6	0.31	2.19	3.26	2.14	1 070	1 040
	1 030	400	7.5	14 600	25 000	1 160	**241/630R**	**241/630RK30**	666	994	6	0.38	1.75	2.61	1.72	1 330	1 310
	1 150	412	12	18 000	27 100	1 560	**232/630R**	**232/630RK**	684	1 096	10	0.37	1.84	2.74	1.80	1 940	1 880
670	900	170	6	5 540	10 800	730	**239/670R**	**239/670RK**	698	872	5	0.17	3.92	5.83	3.83	317	308
	980	230	7.5	8 610	15 500	978	**230/670R**	**230/670RK**	706	944	6	0.22	3.01	4.47	2.94	609	589
	980	308	7.5	10 900	20 400	983	**240/670R**	**240/670RK30**	706	944	6	0.3	2.28	3.39	2.23	813	800
	1 090	336	7.5	13 300	21 800	1 250	**231/670R**	**231/670RK**	706	1 054	6	0.31	2.17	3.23	2.12	1 270	1 240
	1 090	412	7.5	14 700	24 800	766	**241/670R**	**241/670RK30**	706	1 054	6	0.37	1.83	2.73	1.79	1 520	1 500
710	950	180	6	6 440	12 900	849	**239/710R**	**239/710RK**	738	922	5	0.17	3.89	5.79	3.80	365	353
	1 030	236	7.5	9 000	16 300	1 020	**230/710R**	**230/710RK**	746	994	6	0.22	3.05	4.54	2.98	681	657
	1 030	315	7.5	11 700	22 000	1 320	**240/710RHA**	**240/710RHAK**	746	994	8	0.28	2.41	3.59	2.35	886	871
	1 150	345	9.5	14 900	24 800	1 420	**231/710R**	**231/710RK**	754	1 106	8	0.30	2.22	3.30	2.17	1 440	1 400
	1 150	438	9.5	18 200	32 200	1 420	**241/710R**	**241/710RK30**	754	1 106	8	0.36	1.88	2.80	1.84	1 790	1 760
750	1 000	185	6	6 590	13 100	867	**239/750R**	**239/750RK**	778	972	5	0.17	4.00	5.95	3.91	410	396
	1 090	250	7.5	9 680	17 500	1 130	**230/750R**	**230/750RK**	786	1 054	6	0.22	3.14	4.67	3.07	809	781
	1 090	250	7.5	10 300	18 600	1 130	**230/750RHA**	**230/750RHAK**	786	1 054	6	0.21	3.20	4.76	3.12	799	775
	1 090	335	7.5	12 100	23 400	1 110	**240/750R**	**240/750RK30**	786	1 054	6	0.28	2.39	3.55	2.33	1 060	1 040
	1 220	365	9.5	16 700	28 000	1 590	**231/750R**	**231/750RK**	794	1 176	8	0.30	2.22	3.31	2.17	1 720	1 670
800	1 060	195	6	7 420	15 200	974	**239/800R**	**239/800RK**	828	1 032	5	0.17	4.02	5.99	3.93	480	464
	1 060	195	6	7 310	14 900	956	**239/800RHA**	**239/800RHAK**	828	1 032	5	0.15	4.47	6.65	4.37	480	464
	1 150	258	7.5	10 800	20 100	1 240	**230/800R**	**230/800RK**	836	1 114	6	0.21	3.15	4.69	3.08	909	876
	1 150	345	7.5	14 100	27 500	1 290	**240/800R**	**240/800RK30**	836	1 114	6	0.28	2.44	3.64	2.39	1 190	1 170
	1 280	375	9.5	17 400	29 400	1 640	**231/800R**	**231/800RK**	844	1 236	8	0.29	2.34	3.48	2.29	1 910	1 850

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

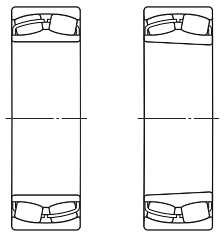
Spherical roller bearings

d 850 ~ 1 400 mm



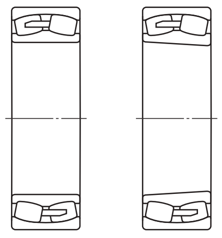
Cylindrical bore Tapered bore

R, RR



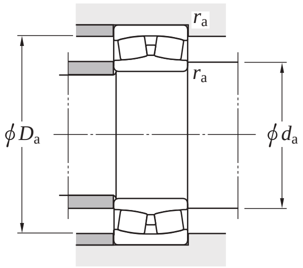
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA

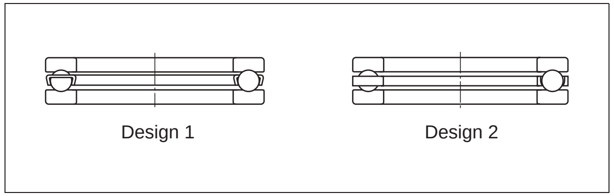


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Mounting dimensions (mm)			Constant	Axial load factors			(Refer.) Mass (kg)	
d	D	B	r (Refer.)	C_r	C_{0r}	C_u	Cylindrical bore	Tapered bore	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
850	1 120	200	6	8 020	16 700	1 070	**239/850R**	**239/850RK**	878	1 092	5	0.16	4.14	6.17	4.05	545	528
	1 220	272	7.5	12 000	22 600	1 360	**230/850R**	**230/850RK**	886	1 184	6	0.21	3.17	4.72	3.10	1 080	1 050
	1 220	365	7.5	14 700	29 000	1 300	**240/850R**	**240/850RK30**	886	1 184	6	0.28	2.34	3.61	2.37	1 410	1 390
	1 360	400	12	20 200	34 200	1 920	**231/850R**	**231/850RK**	904	1 306	10	0.30	2.26	3.37	2.21	2 290	2 220
900	1 180	206	6	8 580	18 100	1 160	**239/900R**	**239/900RK**	928	1 152	5	0.16	4.24	6.32	4.15	610	590
	1 280	280	7.5	12 900	24 800	1 450	**230/900R**	**230/900RK**	936	1 244	6	0.21	3.20	4.77	3.13	1 200	1 160
	1 280	375	7.5	17 000	34 100	1 660	**240/900RHA**	**240/900RHAK**	936	1 244	8	0.26	2.61	3.89	2.56	1 560	1 540
	1 420	412	12	21 200	37 200	2 100	**231/900R**	**231/900RK**	954	1 366	10	0.29	2.29	3.42	2.24	2 530	2 450
950	1 250	224	7.5	9 750	20 700	1 280	**239/950R**	**239/950RK**	986	1 214	6	0.16	4.15	6.18	4.06	755	731
	1 360	300	7.5	14 400	27 700	1 610	**230/950R**	**230/950RK**	986	1 324	6	0.21	3.20	4.77	3.13	1 470	1 420
	1 360	412	7.5	19 800	41 000	1 910	**240/950RHA**	**240/950RHAK**	986	1 324	8	0.27	2.51	3.74	2.46	1 980	1 950
1 000	1 220	165	6	5 820	13 600	947	**238/1000R**	**238/1000RK**	1 028	1 192	5	0.12	5.65	8.42	5.53	410	396
	1 320	236	7.5	10 300	21 500	1 320	**239/1000R**	**239/1000RK**	1 036	1 284	6	0.16	4.14	6.16	4.05	895	866
	1 420	308	7.5	15 400	30 000	1 740	**230/1000R**	**230/1000RK**	1 036	1 384	6	0.21	3.26	4.85	3.18	1 620	1 570
	1 420	412	7.5	20 300	41 800	1 810	**240/1000R**	**240/1000RK30**	1 036	1 384	6	0.26	2.57	3.82	2.51	2 120	2 090
1 060	1 280	165	6	6 080	14 500	1 010	**238/1060R**	**238/1060RK**	1 088	1 252	5	0.11	6.33	9.42	6.19	435	420
	1 400	250	7.5	11 900	25 300	1 540	**239/1060R**	**239/1060RK**	1 096	1 364	6	0.16	4.14	6.17	4.05	1 040	1 010
	1 500	438	9.5	21 400	43 800	1 900	**240/1060R**	**240/1060RK30**	1 104	1 456	8	0.27	2.51	3.74	2.46	2 490	2 450
1 120	1 460	250	7.5	12 400	26 600	1 640	**239/1120R**	**239/1120RK**	1 156	1 424	6	0.16	4.34	6.47	4.25	1 150	1 110
	1 580	345	9.5	19 000	37 200	2 090	**230/1120R**	**230/1120RK**	1 164	1 536	8	0.21	3.28	4.88	3.21	2 190	2 120
	1 580	462	9.5	23 900	49 400	2 100	**240/1120R**	**240/1120RK30**	1 164	1 536	8	0.28	2.45	3.65	2.40	2 900	2 860
1 180	1 540	272	7.5	13 600	29 800	1 730	**239/1180R**	**239/1180RK**	1 216	1 504	6	0.16	4.22	6.29	4.13	1 330	1 280
1 250	1 630	280	7.5	15 200	33 800	1 970	**239/1250R**	**239/1250RK**	1 286	1 594	6	0.16	4.31	6.41	4.21	1 600	1 550
1 400	1 820	315	9.5	18 300	41 400	2 340	**239/1400R**	**239/1400RK**	1 444	1 776	8	0.16	4.32	6.43	4.22	2 230	2 160

[Remark] For bearings with lubrication holes and lubrication grooves on the outer ring, refer to page 371 and 372.

Thrust ball bearings

■ Single direction

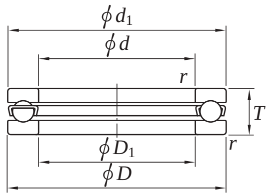


- Axial load can be accommodated in one direction.
- Although it is designed to carry high axial load, is not suitable for high-speed operation.
- The rolling elements normally contacts the shaft washer (or housing washer) with contact angle 90°.

Boundary dimensions	As specified in JIS B 1512.
Tolerances	As specified in JIS B 1514, class 0 or 6. (refer to Table 2-7 on page 30.)
Allowable misalignment	Misalignment not allowed.
Amount of preload for thrust ball bearings	When a thrust ball bearing is rotated at high speed, balls slide on raceway due to centrifugal force and the gyro moment, which often causes the raceway to suffer from smearing or other defects. To eliminate such sliding, it is necessary to mount the bearing without clearance, and apply an axial load (preload) larger than the minimum necessary axial load determined by the following equation. $F_{a\,min} = 5.1\left(\frac{n}{1\,000}\right)^2 \cdot \left(\frac{C_{0a}}{1\,000}\right)^2 \times 10^{-3}$ ...... (contact angle : 90°) where : $F_{a\,min}$: minimum necessary axial load N n : rotational speed min^{-1} C_{0a} : static axial load rating N When an axial load from the outside is lower than 0.001 3 C_{0a}, there is no adverse effect on the bearing, as long as lubrication is satisfactory. Generally, deep groove and angular contact ball bearings are recommended for applications when a portion of rotation under axial load is present at high speed.
Standard cages	Pressed cage (Design 1) or machined cage (Design 2)
Equivalent axial load	**Dynamic equivalent axial load** ...... $P_a = F_a$ **Static equivalent axial load** .... $P_{0a} = F_a$

Single direction thrust ball bearings

d 100 ~ (160) mm

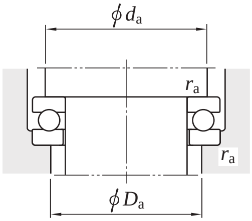


Design 1

Design 2

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Dimensions (mm)		Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u			d_1 max.	D_1 min.	d_a min.	D_a max.	r_a max.	
100	135	25	1	106	268	11.2	**51120**	1	135	102	121	114	1	0.990
	150	38	1.1	183	410	16.6	**51220**	1	150	103	130	120	1	2.36
	170	55	1.5	296	595	23.2	**51320**	1	170	103	142	128	1.5	5.11
	210	85	3	460	983	35.7	**51420**	2	205	103	165	145	2.5	14.6
110	145	25	1	109	288	11.5	**51122**	1	145	112	131	124	1	1.08
	160	38	1.1	191	450	17.6	**51222**	1	160	113	140	130	1	2.57
	190	63	2	334	704	25.9	**51322**	2	187	113	158	142	2	7.72
	230	95	3	474	1 070	37.1	**51422**	2	225	113	181	159	2.5	19.8
120	155	25	1	111	305	11.9	**51124**	1	155	122	141	134	1	1.16
	170	39	1.1	192	470	17.7	**51224**	1	170	123	150	140	1	2.86
	210	70	2.1	389	869	30.5	**51324**	2	205	123	173	157	2	10.6
	250	102	4	601	1 460	48.5	**51424**	2	245	123	196	174	3	25.0
130	170	30	1	130	350	13.0	**51126**	1	170	132	154	146	1	1.87
	190	45	1.5	254	620	22.2	**51226**	1	187	133	166	154	1.5	4.09
	225	75	2.1	413	958	32.5	**51326**	2	220	134	186	169	2	13.0
	270	110	4	623	1 540	49.0	**51426**	2	265	134	212	188	3	31.4
140	180	31	1	133	375	13.5	**51128**	1	178	142	164	156	1	2.02
	200	46	1.5	234	650	19.6	**51228**	1	197	143	176	164	1.5	4.46
	240	80	2.1	458	1 130	36.9	**51328**	1	235	144	199	181	2	15.5
	280	112	4	650	1 680	52.2	**51428**	2	275	144	222	198	3	33.9
150	190	31	1	137	400	13.9	**51130**	1	188	152	174	166	1	2.15
	215	50	1.5	266	652	21.8	**51230**	2	212	153	189	176	1.5	5.64
	250	80	2.1	451	1 130	36.0	**51330**	2	245	154	209	191	2	16.3
	300	120	4	711	1 910	57.4	**51430**	2	295	154	238	212	3	41.6
160	200	31	1	140	425	14.4	**51132**	1	198	162	184	176	1	2.28
	225	51	1.5	279	718	23.4	**51232**	2	222	163	199	186	1.5	6.53

d (160) ~ (320) mm

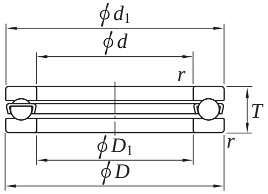


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Dimensions (mm)		Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u			d_1 max.	D_1 min.	d_a min.	D_a max.	r_a max.	
160	270	87	3	512	1 340	41.3	**51332**	2	265	164	225	205	2.5	21.0
	320	130	5	852	2 410	70.3	**51432**	2	315	164	254	226	4	51.2
170	215	34	1.1	168	510	16.7	**51134**	1	213	172	197	188	1	3.25
	240	55	1.5	326	834	26.3	**51234**	2	237	173	212	198	1.5	8.12
	280	87	3	579	1 570	47.4	**51334**	2	275	174	235	215	2.5	22.0
	340	135	5	943	2 730	77.2	**51434**	2	335	174	270	240	4	60.0
180	225	34	1.1	168	525	16.7	**51136**	1	222	183	207	198	1	3.39
	250	56	1.5	332	874	26.9	**51236**	2	247	183	222	208	1.5	8.68
	300	95	3	578	1 580	46.2	**51336**	2	295	184	251	229	2.5	28.1
190	240	37	1.1	213	655	20.2	**51138**	1	237	193	220	210	1	3.95
	270	62	2	385	1 060	31.4	**51238**	2	267	194	238	222	2	11.7
	320	105	4	679	1 950	55.3	**51338**	2	315	195	266	244	3	36.0
200	250	37	1.1	215	675	20.4	**51140**	1	247	203	230	220	1	4.13
	280	62	2	392	1 110	32.2	**51240**	2	277	204	248	232	2	12.2
	340	110	4	745	2 220	61.1	**51340**	2	335	205	282	258	3	42.9
220	270	37	1.1	221	740	21.3	**51144**	1	267	223	250	240	1	4.50
	300	63	2	428	1 310	36.6	**51244**	2	297	224	268	252	2	13.5
240	300	45	1.5	301	1 020	28.0	**51148**	2	297	243	276	264	1.5	7.38
	340	78	2.1	553	1 800	47.8	**51248**	2	335	244	299	281	2	23.1
260	320	45	1.5	289	990	26.2	**51152**	2	317	263	296	284	1.5	7.93
	360	79	2.1	556	1 880	48.1	**51252**	2	355	264	319	301	2	25.0
280	350	53	1.5	411	1 430	36.4	**51156**	2	347	283	322	308	1.5	12.0
300	380	62	2	454	1 610	39.4	**51160**	2	376	304	348	332	2	17.5
	420	95	3	713	2 600	61.9	**51260**	2	415	304	371	349	2.5	42.5
320	400	63	2	474	1 760	41.9	**51164**	2	396	324	368	352	2	19.0

Single direction thrust ball bearings

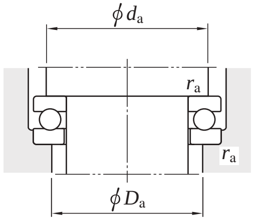
Koyo

d **(320) ~ 530 mm**



Design 1

Design 2



Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	De-sign	Dimensions (mm)		Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u			d_1 max.	D_1 min.	d_a min.	D_a max.	r_a max.	
320	440	95	3	721	2 710	62.9	**51264**	2	435	325	391	369	2.5	45.0
340	420	64	2	483	1 860	43.1	**51168**	2	416	344	388	372	2	20.5
	460	96	3	730	2 830	63.8	**51268**	2	455	345	411	389	2.5	48.0
360	440	65	2	493	1 960	44.3	**51172**	2	436	364	408	392	2	21.5
	500	110	4	876	3 500	76.1	**51272**	2	495	365	443	417	3	70.0
380	460	65	2	494	2 010	44.3	**51176**	2	456	384	428	412	2	23.0
	520	112	4	889	3 650	77.8	**51276**	2	515	385	463	437	3	74.0
400	480	65	2	503	2 110	45.4	**51180**	2	476	404	448	432	2	24.0
	540	112	4	903	3 810	79.4	**51280**	2	535	405	483	457	3	78.0
420	500	65	2	512	2 210	46.6	**51184**	2	495	424	468	452	2	25.0
	580	130	5	1 020	4 420	89.4	**51284**	2	575	425	515	485	4	111
440	540	80	2.1	652	2 930	59.7	**51188**	2	535	444	499	481	2	41.5
	600	130	5	1 040	4 620	91.6	**51288**	2	595	445	535	505	4	115
460	560	80	2.1	633	2 850	57.1	**51192**	2	555	464	519	501	2	43.0
	620	130	5	1 060	4 830	93.8	**51292**	2	615	465	555	525	4	120
480	580	80	2.1	570	2 610	51.1	**51196**	2	575	484	539	521	2	44.0
500	600	80	2.1	683	3 300	63.6	**511/500**	2	595	505	559	541	2	46.0
530	640	85	3	729	3 570	66.8	**511/530**	2	635	535	595	575	2.5	57.5

Tapered roller thrust bearings

Koyo®

- Tapered roller thrust bearings come in three types, single direction type, double direction type, and screw-down spindle type (single direction full complement type). They suitable for extremely heavy axial load and impact load.
- The housing washer and shaft washer raceways are so designed that the extension lines of both raceways intersect at one point on the bearing centerline axis which promotes geometrically true rolling motion of the rolling elements.
- The contact areas between the rib provided for shaft washer and/or housing washer and the spherically ground roller large end face are designed so that the rollers can be guided securely, and proper oil film is formed.

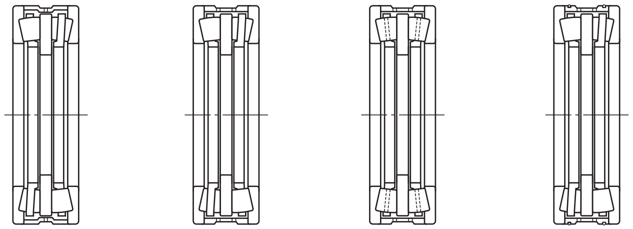
■ Single direction (page 410)

Design 1 Design 2 (Full complement) Design 3

- Bearings having ribs for both shaft and housing washers are suitable for the locations where the bearings can be securely fixed in radial direction, and mainly used for crane hook and swivel of oil excavator.
- If extremely heavy axial load is required, use the full complement type bearings (Design 2).
- Bearings having flat housing washer raceway (Design 3) allow some misalignment of shaft (against housing hole) during rotation.

■ Double direction (page 414)

(For oil mist lubrication)

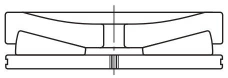


Design 1 Design 2 Design 2-P Design 3

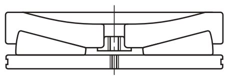
- The bearing of this type can support axial load in both directions, and is mainly used to support the axial load on roll neck of rolling mills.
- Since the shaft washer is treated with a clearance fit to the shaft, the shaft washer must be tightened and fixed securely with a sleeve.
- The axial clearance is commonly adjusted by means of spacer. The bearing without spacer is pre-loaded by spring, etc. for use.
- Some bearings have lubrication holes and O-rings on the spacer for oil mist lubrication.

■ For screw down spindles (Single direction full complement)

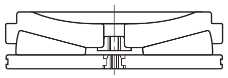
THR ··· Type (page 418)



Design 1

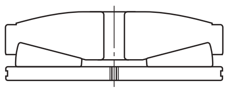


Design 2

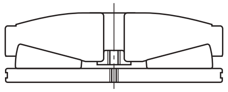


Design 3

THR ··· X Type (page 420)



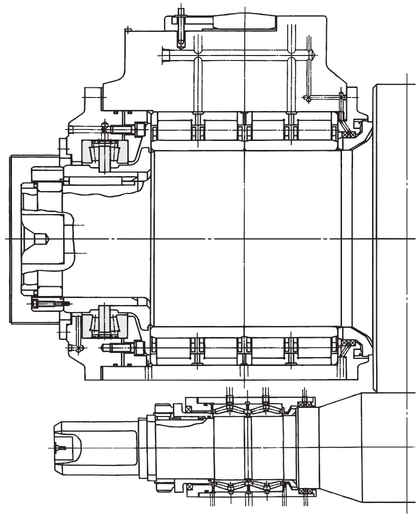
Design 4



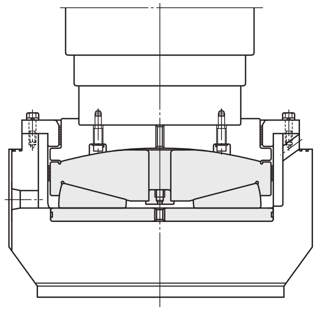
Design 5

- The bearings, suitable for low-speed and heavy load, have been designed for screw down spindles.
- The shaft washer surface is ground to convex or concave spherical surface to suit the profiles of the shaft end faces of screw-down spindles.
- Since the spherical shaft washer surface supports screw-down spindles, some misalignment of screw-down spindles during rotation is allowable.
  Some spindle runout is also allowable, since the housing washer raceway is designed flat.
- The bearings can be handled easily, as the shaft washer has the lifting hole in the center (some bearings have lifting nuts in the lifting holes: Design 2, 3, 5), and the housing washer also has lifting tapped hole.
- In many cases, housing washer is fixed to the housing with full dog point set screws. Thus, the outside surface is equipped with a groove to receive the tip of the set screws.

Boundary dimensions	Custom-manufactured to dimensions required for specific equipment.
Tolerances	Consult with JTEKT, as special tolerances are adopted for specific application. Generally equivalent to class 0 specified in JIS (refer to Table 2-8 on page 31).
Misalignment	No misalignment is allowable.
Standard cage	Machined cage
Equivalent load	**Dynamic equivalent load** ······ $P_{\mathrm{a}} = F_{\mathrm{a}}$ **Static equivalent load** ············ $P_{0\mathrm{a}} = F_{\mathrm{a}}$



Mounting example of double direction tapered roller thrust bearing on the rolling mill roll neck

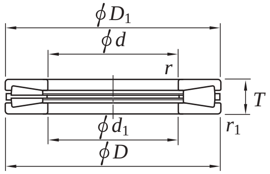


Mounting example of tapered roller thrust bearing for screw down spindle

Single direction tapered roller thrust bearings

Koyo

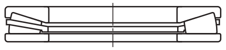
d 114.3 ~ 340 mm



Design 1

Design 1-1

Design 2



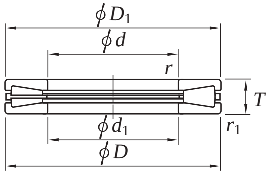
Design 3

Boundary dimensions										Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Max. fillet radius (mm)		Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	D_1 mm	d_1 mm	r 1)	r_1 1)	C_a	C_{0a}	C_u			Shaft r_a	Housing r_b	
114.3	—	250	—	53.975	—	250	114.3	4	4	1 200	3 960	333	**THR2325**	1	—	—	14.0
115	—	280	—	70	—	280	117	6	6	1 620	5 160	413	**T232807**	1	—	—	24.0
152.400	6.0000	317.500	12.5000	69.850	2.7500	317.500	152.400	6.4	6.4	1 900	6 530	520	**T611**	1	4	4	31.0
152.4	—	317.5	—	69.85	—	317.5	152.7	6.4	6.4	1 880	6 290	501	**THR303207A**	3	—	—	29.0
174.625	6.8750	358.775	14.1250	82.550	3.2500	358.775	174.625	6.4	6.4	2 440	8 570	644	**T691**	1	4	4	45.0
	6.8750	358.775	14.1250	82.550	3.2500	358.775	174.625	6.4	6.4	3 060	11 600	850	**T691V**	2	4	4	46.0
177.800	7.0000	368.300	14.5000	82.550	3.2500	368.300	177.800	7.9	7.9	2 580	9 150	677	**T711**	1	5	5	48.0
180	—	360	—	109	—	358	190	6	6	2 810	7 690	627	**THR363611**	3	—	—	47.0
203.200	8.0000	419.100	16.5000	92.075	3.6250	419.100	203.200	9.5	9.5	3 240	11 600	839	**T811**	1	6	6	69.0
203.2	—	419.1	—	92.075	—	416.7	203.2	9.5	9.5	3 200	11 200	810	**THR404292**	3	—	—	68.0
228.600	9.0000	482.600	19.0000	104.775	4.1250	482.600	228.600	SP	11.2	4 240	16 300	1 080	**T911**	1-1	7	7	107
234.950	9.2500	546.100	21.5000	127.000	5.0000	546.100	234.950	15.9	15.9	6 950	28 400	1 740	**T921V**	2	11	11	175
241	—	404	—	110	—	404	241	5	5	2 750	8 140	656	**THR484011**	3	3	3	62.0
254	—	539.75	—	117.48	—	539.75	254	11.1	11.1	5 170	20 200	1 290	**THR515412**	3	—	—	143
279.400	11.0000	603.250	23.7500	136.520	5.3748	603.250	279.400	SP	11.1	6 900	26 800	1 680	**T1120**	1-1	7	7	210
	11.0000	603.250	23.7500	136.520	5.3748	603.250	279.700	11.1	11.1	8 910	37 900	2 220	**T1120V**	2	7	7	220
290	—	395	—	80	—	395	291	SP	SP	1 500	4 780	412	**THR584008**	3	2.5	2.5	30.0
300	—	663.5	—	165	—	658	306	12	12	7 970	30 000	1 810	**THR6066**	3	—	—	312
340	—	460	—	96	—	460	340	4	4	1 890	6 960	555	**THR684610**	3	—	—	53.6

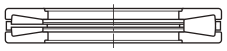
[Note] 1) SP indicates the specially chamfered form.

Single direction tapered roller thrust bearings

d 406.4 ~ 830 mm

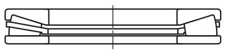


Design 1



Design 1-1

Design 2



Design 3

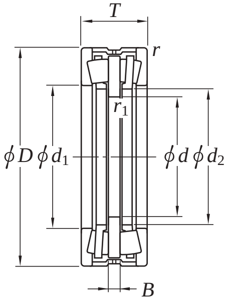
Boundary dimensions										Basic load ratings (kN)			Fatigue load limit (kN)	Bearing No.	Design	Max. fillet radius (mm)		Mass (kg)
d mm	d 1/25.4	D mm	D 1/25.4	T mm	T 1/25.4	D_1 mm	d_1 mm	r 1)	r_1 1)	C_a	C_{0a}		C_u			Shaft r_a	Housing r_b	
406.4	—	711.2	—	146.05	—	711.2	406.4	SP	9.7	8 090	32 500		2 050	**T16021**	1-1	—	—	256
609.6	—	812.8	—	101.6	—	812.8	609.6	SP	SP	5 500	27 300		1 760	**THR610**	3	—	—	152
749.3	—	955.975	—	127	—	952.5	749.8	5.1	5.1	6 990	30 500		1 980	**THR749**	3	2	2	230
830	—	1 010	—	80	—	1 010	830	5	5	3 490	20 300		1 240	**THR830**	1	—	—	136

[Note] 1) SP indicates the specially chamfered form.

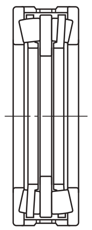
Double direction tapered roller thrust bearings

Koyo

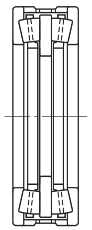
d 160 ~ (420) mm



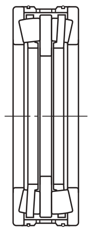
Design 1



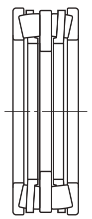
Design 2



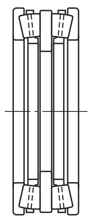
Design 2-P



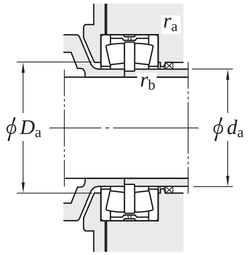
Design 3



Design 4



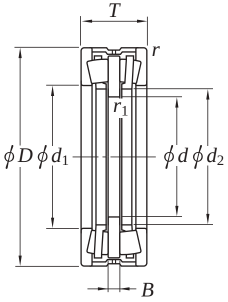
Design 4-P



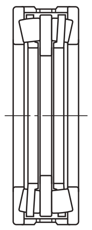
Boundary dimensions (mm)								Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Design	Mounting dimensions (mm)				Mass (kg)
d	*D*	*T*	*B*	d_1	d_2	*r*	r_1	C_a	C_{0a}	C_u			d_a min.	D_a max.	r_a max.	r_b max.	
160	280	130	50	190	190	2	1.5	823	2 950	286	**2THR322813**	1	184	196	1	1	33.0
170	240	84	20	184	182	4	1.5	402	1 310	133	**2THR342408A**	2	179	192	2.5	0.8	12.0
	240	84	20	184	182	4	1.5	420	1 400	142	**2THR342408B**	2	176	190	3	1	12.0
180	280	90	20	210	205	2	1	800	2 710	250	**2THR362809A**	4	199	216	1	0.5	19.0
	400	200	50	210	210	3	1	3 060	9 620	729	**2THR364020**	2	204	216	2	0.5	130
200	430	231	100	260	254	4	1.5	2 410	9 470	722	**2THR404323-2**	2	245	266	3	1	170
220	300	96	26	240	232	2	1	677	2 350	225	**2THR443010**	1	226	246	1	0.5	19.0
	300	96	22	240	232	2	1	677	2 350	225	**2THR443010A**	1	226	246	1	0.5	18.0
	340	130	39	250	245.6	2	1	1 150	3 870	344	**2THR443413**	4	239.6	256	1	0.5	40.0
	372	195	75	254	246	4	1.5	1 890	6 280	511	**2THR443720**	4	240	260	3	1	85.0
250	380	100	22	275	270	2	1.1	1 130	4 840	389	**2THR503810C**	1	264	281	1	0.5	40.0
260	360	92	20	285	276	2	1	904	3 630	330	**2THR52369**	2	270	291	1	0.5	25.0
	360	92	20	285	276	2	1	904	3 630	330	**2THR52369/DP**	3	270	291	1	0.5	25.0
291	520	266	118	349	349	12	2	2 660	10 800	811	**2THR585227**	2	343	357	10.5	1.5	245
320	470	130	30	350	340	3	1	1 640	6 080	498	**2THR644713**	2	334	358	1.5	0.5	70.0
350	490	130	30	390	380	3	1	1 610	6 200	503	**2THR704913A**	1	374	398	1.5	0.5	70.0
	490	130	30	390	380	3	1	1 610	6 200	503	**2THR704913A/DP**	3	374	398	1.5	0.5	70.0
	490	130	30	390	380	4	2	1 610	6 200	503	**2THR704913A/DP1**	3	375	398	2.5	1	70.0
351	670	308	120	435	430	12	3	4 330	19 500	1 320	**2THR706731**	1	424	443	10	2	505
	670	319	131	435	430	12	3	4 330	19 500	1 320	**2THR706732**	1	424	443	10	2	505
380	560	130	32	430	416	3	1.5	1 960	8 860	660	**2THR765613**	2	410	438	1.5	0.5	110
	560	130	32	430	416	3	1.5	1 960	8 860	660	**2THR765613A**	3	410	438	1.5	0.5	110
	560	130	32	430	416	4	2.5	1 960	8 860	660	**2THR765613A/DP**	3	410	438	2.5	1.5	100
420	620	170	35	465	455	3	1.5	3 220	14 000	1 030	**2THR846217**	2-P	449	473	1.5	0.5	160

Double direction tapered roller thrust bearings

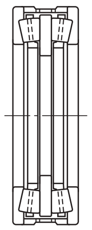
d (420) ~ 550 mm



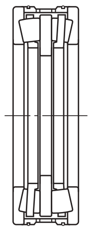
Design 1



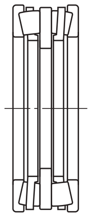
Design 2



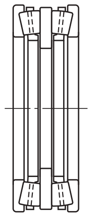
Design 2-P



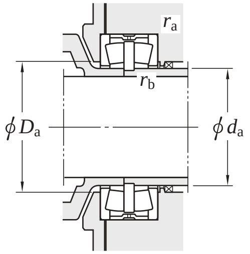
Design 3



Design 4



Design 4-P

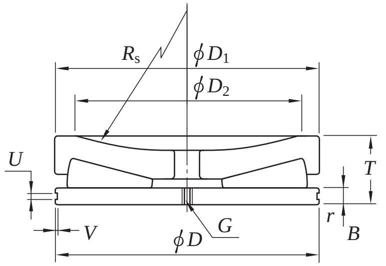


Boundary dimensions (mm)								Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.		Design	Mounting dimensions (mm)				Mass (kg)
d	D	T	B	d_1	d_2	r	r_1	C_a	C_{0a}	C_u				d_a min.	D_a max.	r_a max.	r_b max.	
420	650	235	85	496	486	4	1.5	3 460	14 500	1 040	**2THR846524**		2-P	480	504	2	1	260
440	650	240	90	492.5	485	7	1.5	3 590	15 200	1 070	**2THR886524**		4	479	502	5	0.5	270
470	720	200	40	535	516	5	3	4 370	19 700	1 380	**2THR947220**		2-P	508	545	3	2	270
482	680	250	90	535	524	7	2	3 860	16 000	1 140	**2THR966825**		4-P	516	545	5	1	280
520	860	382	168	625	610	20	2	6 530	32 800	2 080	**2THR520**		2-P	602	635	15	1	850
550	760	230	50	610	590	5	2	3 630	15 000	1 080	**2THR550**		2-P	580	622	3	1	290

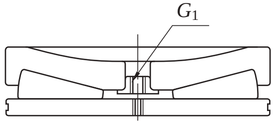
Tapered roller thrust bearings for screw down spindle

THR···type (Full complement)

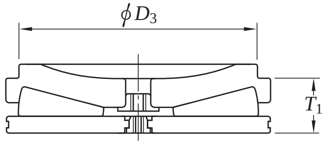
D 149.225 ~ 641.350 mm



Design 1



Design 2



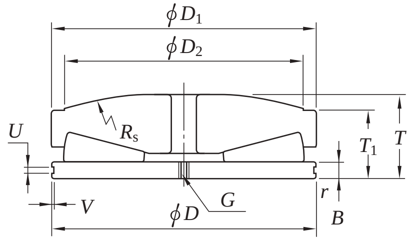
Design 3

Boundary dimensions									Basic load ratings (kN)	Bearing No.		Design	Dimensions (mm)								Mass (kg)
D		D_1		D_2		*T*		*r*	C_{0a}				R_s	*B*	D_3	T_1	*U*	*V*	*G*	G_1	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4														
149.225	5.8750	146.863	5.7820	127.0	5.0000	47.625	1.8750	1.6	2 190	**THR149**		1	228.6	12.700	—	—	4.8	1.2	M12	—	6.00
174.625	6.8750	172.263	6.7820	152.4	6.0000	52.375	2.0620	1.6	2 860	**THR175**		2	230.0	12.700	—	—	4.8	1.2	M12	M16	8.00
203.200	8.0000	200.838	7.9070	177.8	7.0000	65.075	2.5620	1.6	3 970	**THR203**		1	254.0	15.875	—	—	6.35	1.2	M12	—	14.0
266.700	10.5000	264.338	10.4070	228.6	9.0000	80.963	3.1875	1.6	7 490	**THR267-2**		1	250	19.050	—	—	7.9	2.0	M20	—	30.0
320.675	12.6250	318.313	12.5320	279.4	11.0000	95.250	3.7500	1.6	11 700	**THR321**		1	381.0	22.225	—	—	10.3	2.4	M20	—	50.0
377.825	14.8750	375.463	14.7820	330.2	13.0000	111.125	4.3750	1.6	15 600	**THR378**		2	457.2	25.400	—	—	10.3	2.4	M24	M42	80.0
409.575	16.1250	407.162	16.0300	330.2	13.0000	139.700	5.5000	3.2	18 700	**THR410A**		2	508.0	28.575	—	—	10.3	2.4	M24	M30	120
	16.1250	407.213	16.0320	355.5	13.9961	122.225	4.8120	3.2	18 700	**THR410**		2	508.0	28.575	—	—	10.3	2.4	M24	M30	120
438.150	17.2500	435.788	17.1570	381.0	15.0000	130.175	5.1250	3.2	21 500	**THR438**		2	568.0	31.750	—	—	13.5	3.2	M24	M24	130
495.300	19.5000	492.938	19.4070	431.8	17.0000	146.050	5.7500	3.2	28 000	**THR495A**		2	558.8	34.925	—	—	12.7	3.175	M24	M24	190
524.000	20.6299	520.000	20.4724	457.2	18.0000	152.400	6.0000	3.2	32 700	**THR524**		1	635.0	34.925	—	—	13.5	3.2	(W1)	—	220
551.637	21.7180	539.750	21.2500	406.4	16.0000	158.750	6.2500	1	32 900	**THR550A**		3	635.0	25.400	495.3	117.064	10.31	2.39	M24	M30	230
	21.7180	539.750	21.2500	406.4	16.0000	158.750	6.2500	1.5	32 900	**THR550A-1**		2	635.0	25.400	495.3	117.064	10.31	2.39	M24	M30	250
	21.7180	539.750	21.2500	434.975	17.1250	158.750	6.2500	1.5	32 900	**THR550**		3	635.0	25.400	495.3	115.888	9.525	2.54	M24	M30	250
581.025	22.8750	578.663	22.7820	508.0	20.0000	168.275	6.6250	3.2	38 400	**THR581**		2	711.2	38.100	—	—	13.5	3.2	M24	M42	300
609.600	24.0000	609.600	24.0000	436.0	17.1654	177.800	7.0000	3.2	44 600	**THR610A**		2	635.0	38.100	—	—	13.5	3.2	M24	M30	350
	24.0000	607.240	23.9071	—	—	177.800	7.0000	3.2	44 600	**THR610D**		2	—	38.100	—	—	13.5	3.2	M24	M30	390
	24.0000	609.600	24.0000	436.0	17.1654	177.800	7.0000	3.2	44 600	**THR610M**		3	635.0	38.100	560.0	87.800	13.5	3.2	M24	M30	340
615.200	24.2205	607.000	23.8976	—	—	161.800	6.3701	3	44 600	**THR615**		2	—	38.100	—	—	13.0	3.5	M24	M30	330
641.350	25.2500	638.988	25.1570	558.8	22.0000	184.150	7.2500	3.2	49 400	**THR641**		2	762.0	38.100	—	—	13.5	3.2	M24	M30	400

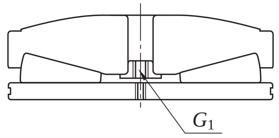
Tapered roller thrust bearings for screw down spindle

THR···X type (Full complement)

D 149.225 ~ 520.000 mm



Design 1



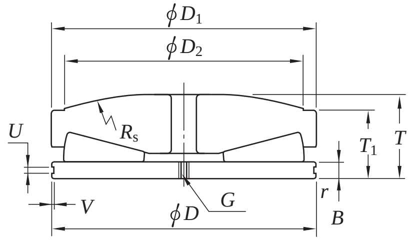
Design 2

Boundary dimensions									Basic load ratings (kN)	Bearing No.		Design	Dimensions (mm)							Mass (kg)
D mm	*D* 1/25.4	D_1 mm	D_1 1/25.4	D_2 mm	D_2 1/25.4	*T* mm	*T* 1/25.4	*r*	C_{0a}				*B*	T_1	R_s	*U*	*V*	*G*	G_1	
149.225	5.8750	146.863	5.7820	127.0	5.0000	54.528	2.1468	1.6	2 190	**THR149X**		1	12.700	47.625	457.2	4.8	1.2	M12	—	6.00
174.625	6.8750	172.263	6.7820	152.4	6.0000	60.702	2.3898	1.6	2 860	**THR175X**		2	12.700	52.375	457.2	4.8	1.2	M12	M16	10.0
	6.8750	172.263	6.7820	152.4	6.0000	61.001	2.4016	1.6	2 860	**THR175X-1**		1	12.700	52.388	800.0	4.8	1.2	W 1/2	—	10.0
	6.8750	174.549	6.8720	152.4	6.0000	60.708	2.3901	1.6	2 860	**THR175X-2**		2	12.700	52.375	457.0	4.8	1.2	M12	M16	10.0
203.200	8.0000	200.838	7.9070	177.8	7.0000	74.729	2.9421	1.6	3 970	**THR203X**		1	15.875	65.075	508.0	6.35	1.2	M12	—	16.0
	8.0000	200.838	7.9070	177.8	7.0000	74.729	2.9421	1.6	3 970	**THR203X-1**		2	15.875	65.075	508.0	6.35	1.2	M12	M8	16.0
266.700	10.5000	264.338	10.4070	228.6	9.0000	93.491	3.6807	1.6	7 730	**THR267X**		1	19.050	80.963	609.6	7.9	2.0	M20	—	35.0
	10.5000	264.338	10.4070	228.6	9.0000	93.491	3.6807	1.6	7 730	**THR267X-2**		2	19.050	80.963	609.6	7.9	2	M20	M30	35.0
275.000	10.8268	270.000	10.6299	234.0	9.2126	98.994	3.8974	3.0	4 250	**THR275X**		1	20.000	85.000	609.6	—	—	—	—	40.0
320.675	12.6250	318.313	12.5320	279.4	11.0000	109.922	4.3276	1.6	11 700	**THR321AX**		2	22.225	95.250	762.0	10.3	2.4	M36	M42	60.0
	12.6250	318.313	12.5320	279.4	11.0000	109.922	4.3276	1.6	11 700	**THR321BX**		2	22.225	95.250	762.0	—	—	M36	M42	60.0
	12.6250	318.313	12.5320	279.4	11.0000	110.382	4.3457	1.6	11 700	**THR321X**		1	22.225	95.250	762.0	10.3	2.4	M20	—	60.0
377.825	14.8750	375.463	14.7820	330.2	13.0000	127.639	5.0252	1.6	15 600	**THR378X**		2	25.400	111.125	914.4	10.3	2.4	M24	M42	95.0
409.575	16.1250	407.213	16.0320	355.6	14.0000	139.979	5.5110	3.2	18 700	**THR410X**		2	28.575	122.225	1 016.0	10.3	2.4	M24	M30	120
438.150	17.2500	435.788	17.1570	381.0	15.0000	149.442	5.8835	3.2	21 500	**THR438X**		2	31.750	130.175	1 016.0	13.5	3.2	M12	M24	150
	17.2500	435.788	17.1570	381.0	15.0000	149.882	5.9009	3.2	21 500	**THR438X-4**		2	31.750	130.175	1 066.8	—	—	M12	M24	150
482.600	19.0000	480.210	18.9059	432.0	17.0079	144.065	5.6719	3.2	24 600	**THR483XC**		2	38.100	130.180	1 905.0	13.5	3.2	M24	M30	180
490.220	19.3000	492.938	19.4070	431.8	17.0000	169.440	6.6709	3.2	28 000	**THR495X-1**		1	34.925	146.050	1 066.8	12.7	3.2	M24	—	220
	19.3000	492.938	19.4070	431.8	17.0000	169.440	6.6709	3.2	28 000	**THR495X-2**		2	34.925	146.050	1 066.8	12.7	3.2	M24	M30	220
495.300	19.5000	492.938	19.4070	431.8	17.0000	169.440	6.6709	3.2	28 000	**THR495X**		1	34.925	146.050	1 066.8	13.5	3.3	M24	—	220
	19.5000	492.938	19.4070	431.8	17.0000	169.440	6.6709	3.3	28 000	**THR495X-3**		2	34.925	146.050	1 066.8	13.5	3.3	M24	M30	240
514.350	20.2500	521.386	20.5270	403.2	15.8740	188.712	7.4296	1.6	32 700	**THR521X**		2	34.925	154.813	635.0	—	—	W1	W1-1/4	250
520.000	20.4724	521.513	20.5320	457.2	18.0000	174.783	6.8812	3.2	32 700	**THR524X-1**		1	34.925	152.400	1 270.0	12.7	3.2	M24	—	250

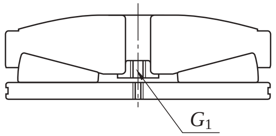
Tapered roller thrust bearings for screw down spindle

THR···X type (Full complement)

D 523.875 ~ 900.000 mm



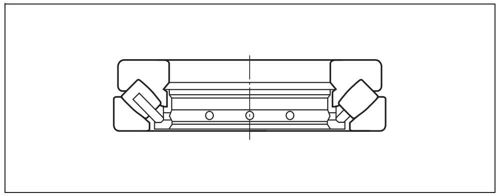
Design 1



Design 2

Boundary dimensions									Basic load ratings (kN)	Bearing No.		Design	Dimensions (mm)							Mass (kg)
D		D_1		D_2		T		r	C_{0a}				B	T_1	R_s	U	V	G	G_1	
mm	1/25.4	mm	1/25.4	mm	1/25.4	mm	1/25.4													
523.875	20.6250	521.513	20.5320	457.2	18.0000	174.783	6.8812	3.2	32 700	**THR524X**		1	34.925	152.400	1 270.0	13.5	3.2	M24	—	250
533.400	21.0000	531.010	20.9059	457.2	18.0000	177.169	6.9752	1.6	32 700	**THR533X**		2	31.750	161.920	1 981.2	9.5	6	M24	M36	270
555.625	21.8750	553.260	21.7819	482.6	19.0000	189.438	7.4582	3.2	36 300	**THR556AX**		2	38.100	165.100	1 295.4	12.7	3.2	1-8UNC	1*1/4-7UNC	305
	21.8750	553.260	21.7819	482.6	19.0000	189.438	7.4582	3.2	36 300	**THR556BX**		2	38.100	165.100	1 270	—	—	M24	M36	310
	21.8750	553.260	21.7819	482.6	19.0000	189.438	7.4582	3.2	36 300	**THR556D-2X**		2	38.100	165.100	1 270	11	6.7	M24	M36	320
	21.8750	553.260	21.7819	482.6	19.0000	189.438	7.4582	3.2	36 300	**THR556X-1**		2	38.100	165.100	1 295.4	12.7	3.2	M24	M36	305
581.025	22.8750	578.663	22.7820	508.0	20.0000	192.511	7.5792	3.2	38 400	**THR581X**		2	38.100	168.275	1 422.4	13.5	3.2	M24	M42	340
	22.8750	578.663	22.7820	508.0	20.0000	196.650	7.7421	3.2	38 400	**THR581X-3**		2	38.100	168.275	1 308.1	13.5	3.2	M24	M42	350
609.600	24.0000	607.238	23.9070	533.4	21.0000	202.831	7.9855	3.2	44 600	**THR610X**		2	38.100	177.800	1 524.0	13.5	3.2	M24	M30	390
	24.0000	607.238	23.9070	533.4	21.0000	202.831	7.9855	3.2	44 600	**THR610X-1**		2	38.100	177.800	1 524.0	13.5	3.2	M30	M42	390
641.350	25.2500	638.988	25.1570	553.8	21.8031	211.492	8.3265	3.2	49 400	**THR641X**		2	38.100	184.150	1 524.0	13.5	3.2	M24	M30	450
	25.2500	638.988	25.1570	558.8	22.0000	211.854	8.3407	3	49 400	**THR641CX**		2	38.100	184.150	1 524.0	—	—	M24	M42	460
710.000	27.9528	710.000	27.9528	630.0	24.8031	259.107	10.2011	3.5	54 900	**THR710XA**		2	40.000	200.000	1 400.0	—	—	M24	M48	680
800.000	31.4961	798.000	31.4173	720.0	28.3465	260.268	10.2468	5	71 800	**THR800X**		2	50.000	214.000	1 524.0	—	—	M30	M30	870
	31.4961	840.000	33.0709	740.0	29.1339	265.000	10.4331	7	77 800	**THR840X**		2	50.000	221.000	1 800.0	—	—	M36	M48	940
847.600	33.3701	841.000	33.1102	650.0	25.5906	248.000	9.7638	5	77 800	**THR848X**		2	43.000	212.000	1 652.0	—	—	M42	M42	930
	33.3701	841.000	33.1102	650.0	25.5906	248.000	9.7638	5	77 800	**THR848X-1**		2	43.000	212.000	1 652.0	—	—	M36	M42	890
900.000	35.4331	900.000	35.4331	870.0	34.2520	228.739	9.0055	2	81 100	**THR900X**		2	40.000	177.840	1 800.0	11.0	7.5	M24	M48	970
	35.4331	930.000	36.6142	820.0	32.2835	275.000	10.8268	5	98 200	**THR930XB**		2	60.000	223.000	1 800.0	—	—	M36	M48	1 170

Spherical thrust roller bearings

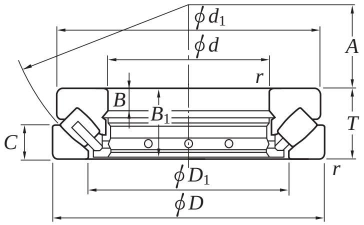


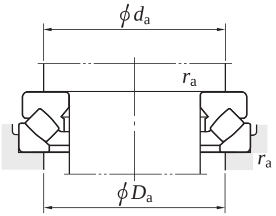
- Spherical thrust roller bearings are designed to carry high axial loads. They can also support radial load if magnitude is no more than 55 % of the axial load being carried.
- Having a spherical housing washer raceway surface, these bearings are self-alignings.
- These bearings are not suitable for high-speed rotation. In general, they are used with oil lubrication.

Boundary dimensions	As specified in JIS B 1512.
Tolerances	As specified in JIS B 1514, class 0. (refer to Table 2-8 on page 31.)
Allowable aligning angle	0.035 – 0.052 rad (2° – 3°) in general, depending on bearing series.
Amount of preload for spherical thrust roller bearings	Spherical thrust roller bearings sometimes suffer from scuffing, smearing, or other defects due to sliding which occurs between the roller and raceway surface under normal operation. To eliminate such sliding, it is necessary to mount the bearing without clearance, and apply an axial load (preload) larger than the minimum necessary axial load determined by the following equation. (the higher value determined by the two equations should be taken) $F_{a\,min} = \frac{C_{0a}}{2\,000}$ $F_{a\,min} = 1.8F_r + 1.33\left(\frac{n}{1\,000}\right)^2 \cdot \left(\frac{C_{0a}}{1\,000}\right)^2 \times 10^{-4}$ where : $F_{a\,min}$: minimum necessary axial load N F_r : radial load N n : rotational speed min^{-1} C_{0a} : static axial load rating N
Standard cage	Machined cage
Equivalent axial load	**Dynamic equivalent axial load** ······ $P_a = 1.2\,F_r + F_a$ **Static equivalent axial load** ············ $P_{0a} \doteqdot 2.7\,F_r + F_a$ (Note : $F_r / F_a \leqq 0.55$)

Spherical thrust roller bearings

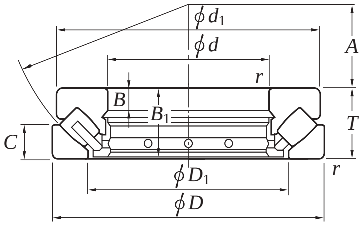
d 100 ~ (220) mm

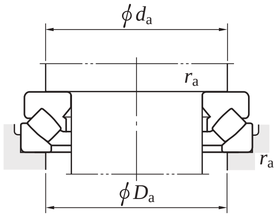




Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Dimensions (mm)						Mounting dimensions (mm)			(Refer.) Mass (kg)
d	*D*	*T*	*r* min.	C_a	C_{0a}	C_u		d_1	D_1	*B*	B_1	*C*	*A*	d_a min.	D_a max.	r_a max.	
100	170	42	1.5	481	1 270	118	**29320R**	163	129	14	40	20.8	58	130	150	1.5	3.91
	210	67	3	911	2 220	166	**29420R**	200	146	24	64	32	62	150	175	2.5	11.2
110	190	48	2	628	1 690	147	**29322R**	182	143	16	45.5	23	64	145	165	2	5.67
	230	73	3	1 120	2 810	203	**29422R**	220	162	26	69	35	69	165	190	2.5	14.7
120	210	54	2.1	759	2 030	182	**29324R**	200	159	18	51	26	70	160	180	2	7.90
	250	78	4	1 300	3 270	241	**29424R**	236	174	29	74	37	74	180	205	3	18.5
130	225	58	2.1	894	2 440	209	**29326R**	215	171	19	55	28	76	170	195	2	9.45
	270	85	4	1 490	3 870	270	**29426R**	255	189	31	81	41	81	195	225	3	23.5
140	240	60	2.1	898	2 470	206	**29328R**	230	183	20	57	29	82	185	205	2	11.1
	280	85	4	1 560	4 080	289	**29428R**	268	199	31	81	41	86	205	235	3	24.8
150	250	60	2.1	965	2 740	233	**29330R**	240	194	20	57	29	87	195	215	2	11.7
	300	90	4	1 730	4 620	334	**29430R**	285	214	32	86	44	92	220	250	3	28.3
160	270	67	3	1 150	3 280	272	**29332R**	260	208	23	64	32	92	210	235	2.5	15.6
	320	95	5	1 990	5 370	375	**29432R**	306	229	34	91	45	99	230	265	4	36.3
170	280	67	3	1 190	3 450	286	**29334R**	270	216	23	64	32	96	220	245	2.5	16.3
	340	103	5	2 120	5 880	389	**29434R**	324	243	37	99	50	104	245	285	4	44.2
180	300	73	3	1 380	4 000	330	**29336R**	290	232	25	69	35	103	235	260	2.5	20.7
	360	109	5	2 450	6 590	447	**29436R**	342	255	39	105	52	110	260	300	4	52.1
190	320	78	4	1 570	4 610	369	**29338R**	308	246	27	74	38	110	250	275	3	25.4
	380	115	5	2 790	7 690	504	**29438R**	360	271	41	111	55	117	275	320	4	61.4
200	280	48	2	641	2 270	151	**29240**	271	236	15	45	24	108	235	255	2	8.90
	340	85	4	1 810	5 340	415	**29340R**	325	261	29	81	41	116	265	295	3	31.5
	400	122	5	3 060	8 470	575	**29440R**	380	286	43	117	59	122	290	335	4	72.1
220	300	48	2	670	2 340	148	**29244**	292	254	15	45	24	117	260	275	2	9.5
	360	85	4	1 840	5 590	439	**29344R**	345	280	29	81	41	125	285	315	3	33.8

d (220) ~ (400) mm

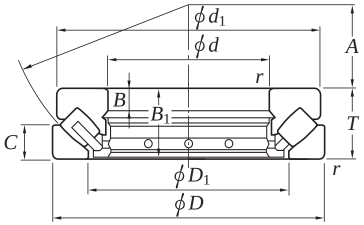


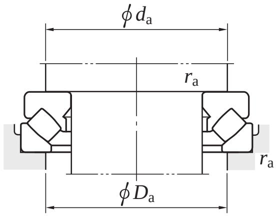


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Dimensions (mm)						Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u		d_1	D_1	B	B_1	C	A	d_a min.	D_a max.	r_a max.	
220	420	122	6	3 160	8 990	619	**29444R**	400	308	43	117	58	132	310	355	5	76.9
240	340	60	2.1	1 030	3 670	233	**29248**	330	283	19	57	30	130	285	305	2	16.9
	380	85	4	1 790	5 330	99.0	**29348A**	365	300	29	81	41	135	300	330	3	35.5
	440	122	6	3 260	9 510	659	**29448R**	420	326	43	117	59	142	330	375	5	81.4
260	360	60	2.1	1 050	3 720	240	**29252**	350	302	19	57	30	139	305	325	2	18.5
	420	95	5	1 960	6 040	389	**29352**	405	329	32	91	45	148	330	365	4	49.1
	480	132	6	3 760	11 100	764	**29452R**	460	357	48	127	64	154	360	405	5	106
280	380	60	2.1	1 030	4 020	225	**29256**	370	323	19	57	30	150	325	345	2	19.0
	440	95	5	2 200	6 870	439	**29356**	423	348	32	91	46	158	350	390	4	53.2
	520	145	6	4 560	13 600	907	**29456R**	495	387	52	140	68	166	390	440	5	138
300	420	73	3	1 330	4 880	302	**29260**	405	353	21	69	38	162	355	380	2.5	30.5
	480	109	5	2 470	7 780	496	**29360**	460	379	37	105	50	168	380	420	4	74.9
	540	145	6	4 670	14 200	925	**29460R**	515	402	52	140	70	175	410	460	5	144
320	440	73	3	1 780	6 480	321	**29264R**	430	372	21	69	38	172	375	400	2.5	32.7
	500	109	5	2 890	9 380	573	**29364**	482	399	37	105	53	180	400	440	4	78.0
	580	155	7.5	5 190	16 100	1 040	**29464R**	555	435	55	149	75	191	435	495	6	179
340	460	73	3	1 800	6 420	307	**29268R**	445	395	21	69	37	183	395	420	2.5	34.7
	540	122	5	3 810	12 700	890	**29368R**	520	428	41	117	59	192	430	470	4	106
	620	170	7.5	6 190	19 400	1 210	**29468R**	590	462	61	164	82	201	465	530	6	224
360	500	85	4	1 650	6 080	332	**29272**	485	423	25	81	44	194	420	455	3	51.8
	560	122	5	3 890	13 200	923	**29372R**	540	448	41	117	59	202	450	495	4	110
	640	170	7.5	6 440	20 600	1 300	**29472R**	610	480	61	164	82	210	485	550	6	235
380	520	85	4	1 750	6 610	343	**29276**	505	441	27	81	42	202	440	475	3	52.8
	600	132	6	4 430	15 000	1 030	**29376R**	580	477	44	127	63	216	480	525	5	140
	670	175	7.5	6 780	22 000	1 300	**29476R**	640	504	63	168	85	230	510	575	6	264
400	540	85	4	1 980	7 610	377	**29280**	526	460	27	81	42	212	460	490	3	55.3
	620	132	6	4 630	16 100	1 080	**29380R**	596	494	44	127	64	225	500	550	5	144

Spherical thrust roller bearings

d (400) ~ 710 mm

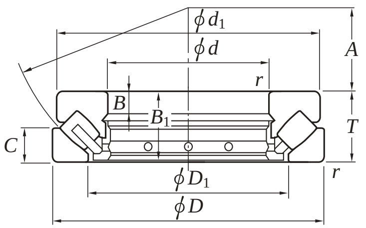


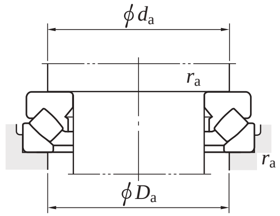


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Dimensions (mm)						Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u		d_1	D_1	B	B_1	C	A	d_a min.	D_a max.	r_a max.	
400	710	185	7.5	7 750	25 300	1 530	**29480R**	680	534	67	178	89	236	540	610	6	315
420	580	95	5	2 310	8 740	463	**29284**	564	489	30	91	46	225	490	525	4	75.4
	650	140	6	5 070	17 700	1 160	**29384R**	626	520	48	135	68	235	525	575	5	169
	730	185	7.5	7 960	26 500	1 630	**29484R**	700	556	67	178	89	244	560	630	6	329
440	600	95	5	2 340	8 970	441	**29288**	585	508	30	91	49	235	510	545	4	77.9
	680	145	6	5 360	18 800	1 250	**29388R**	655	548	49	140	70	245	550	600	5	190
	780	206	9.5	9 100	30 000	1 800	**29488R**	745	588	74	199	100	260	595	670	8	423
460	620	95	5	2 460	9 620	440	**29292**	605	530	30	91	46	245	530	570	4	81.0
	710	150	6	4 580	15 800	875	**29392**	685	567	51	144	72	257	575	630	5	213
	800	206	9.5	9 360	31 600	1 870	**29492R**	765	608	74	199	100	272	615	690	8	438
480	650	103	5	2 880	11 600	531	**29296**	635	556	33	99	55	259	555	595	4	95.9
	850	224	9.5	10 900	36 300	2 100	**29496R**	810	638	81	216	108	280	645	730	8	547
500	870	224	9.5	10 800	36 400	2 120	**294/500R**	830	661	81	216	107	290	670	750	8	561
530	710	109	5	3 090	15 500	577	**292/530**	692	610	35	105	56	287	615	650	4	122
	800	160	7.5	5 390	20 000	967	**293/530**	772	648	54	154	76	295	650	715	6	280
	920	236	9.5	11 800	40 000	1 780	**294/530R**	880	700	87	228	114	309	705	795	8	663
560	750	115	5	3 460	13 900	657	**292/560**	732	644	37	111	60	302	645	690	4	145
	850	175	7.5	6 070	29 100	1 070	**293/560**	822	690	60	168	85	310	695	760	6	355
	980	250	12	12 400	40 500	1 810	**294/560**	940	729	90	242	120	328	750	835	10	793
600	800	122	5	3 690	15 500	649	**292/600**	780	688	39	117	65	321	690	735	4	171
	1 030	258	12	12 200	41 600	1 950	**294/600**	990	785	92	248	127	347	790	890	10	887
630	1 090	280	12	13 300	44 500	2 220	**294/630**	1 040	830	100	270	136	365	835	940	10	1 070
710	950	145	6	5 290	22 500	910	**292/710**	930	815	46	140	75	380	820	870	5	290
	1 220	308	15	16 700	58 300	2 590	**294/710**	1 165	925	113	298	150	415	930	1 050	12	1 580

Spherical thrust roller bearings

d 800 ~ 1 060 mm



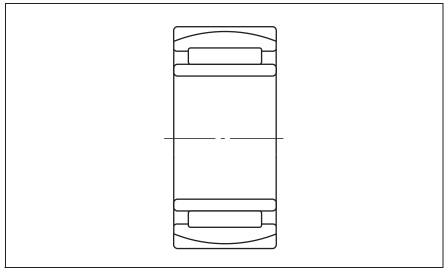


Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Dimensions (mm)							Mounting dimensions (mm)			(Refer.) Mass (kg)
d	D	T	r min.	C_a	C_{0a}	C_u		d_1	D_1	B	B_1	C	A		d_a min.	D_a max.	r_a max.	
800	1 180	230	9.5	11 500	45 700	1 860	**293/800**	1 146	965	78	222	112	440		975	1 055	8	850
1 060	1 400	206	9.5	11 100	52 000	864	**292/1060**	1 370	1 208	66	199	108	566		1 210	1 285	8	850

Bearings for continuous casting machines

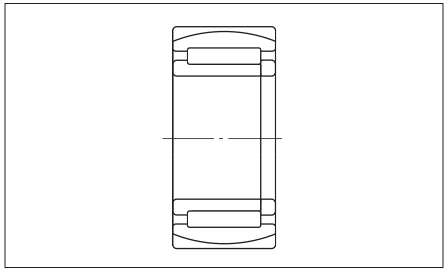
- In continuous casting machines, roll support bearings are used under heavy loads and at extremely low speed.
  In addition, the operating conditions are severe, resulting in exposure to splashing water and scales.
- SCP bearings for fixed side and SC bearings for free side are used for end of rolls.
- HSC bearing units with half-round outer ring is used for the intermediate support section of beetle-shape rolls, such as driving rolls.
- JTEKT bearings for continuous casting machines are designed based on a full complement cylindrical roller bearing, with reference to maximized static load ratings. Crowning are set up on rolling surface of its rollers, according to the size of loads, which contributes to solve stress concentration at specific location.
- The bearing has the self-aligning mechanism to absorb roll bending and misalignment due to heavy load.

■ SC bearings (free side)
(page 436)



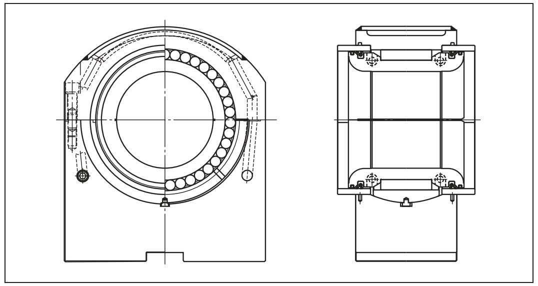
- To accommodate thermal contraction and expansion of roll, the inner ring of this bearing are designed to move smoothly in the axial direction.

■ SCP bearings (fixed side)
(page 436)



- The bearing has been developed for the purpose of improvement in short service life of spherical roller bearings most commonly used for continuous casting machines.
- The ribs provided for the inner and outer rings and loose rib allow accommodation of axial loads generated by thermal contraction and expansion of rolls.

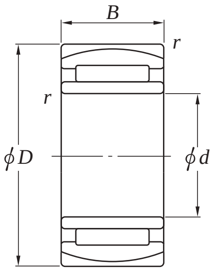
■ HSC bearing units with half-round outer ring (page 442)



- To accommodate thermal contraction and expansion of roll, the inner ring and roller of this bearing are designed to move smoothly in the axial direction.
- This unit has unique structure, with a half-round outer ring placed on the loaded side only.
- This special half-round outer ring and compact seal design realizes a 15 % increase in static load rating over that of conventional products.
- The unique jacket design adjusts the flow of water and enables a high cooling efficiency, equivalent to that of conventional products with a lower water flow rate of 55 %.

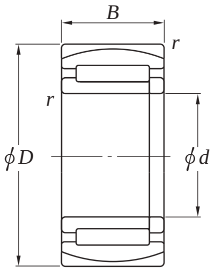
Bearings for continuous casting machines

d 50 ~ (110) mm



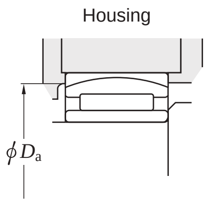
Design 1

SC bearings (free side)



Design 2

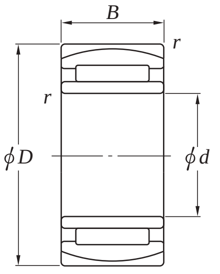
SCP bearings (fixed side)



Boundary dimensions (mm)				Acceptable roll heat expansion (mm)	Basic load ratings (kN)		Bearing No.	Corresponding spherical roller bearing			Mass (kg)	Mounting dimensions (mm) D_a		Design
d	*D*	*B*	*r* min.		C_r	C_{0r}		Bearing No.	Basic load ratings (kN) C_r	C_{0r}		min.	max.	
50	110	40	2	±4.5	164	254	**SC101140VA**	22310RHR	204	237	2.1	96	99	1
55	90	32	1.1	±3.5	89.9	202	**SC119032VA**	—	—	—	0.9	81	82	1
	100	25	1.5	±4	95.9	143	**SC111025VA**	22211RHR	124	144	0.9	93	93	1
65	120	31	1.5	±4	118	206	**SC131231V-1A**	22213RHR	178	211	1.7	110	111	1
	140	48	2.1	±5.5	238	393	**SC131448VA**	22313RHR	305	360	4.0	123	127	1
70	125	31	1.5	±6	126	213	**SC141331VA**	22214RHR	187	222	1.8	116	117	1
	150	51	2.1	±7.5	273	406	**SC141551VA**	22314RHR	348	413	4.7	132	137	1
75	130	31	1.5	±5	148	237	**SC151331VA**	22215RHR	193	236	1.9	120	121	1
85	150	65	3	±8	280	621	**SC171565VA**	24217RHB	370	558	5.4	129	137	1
	150	65	3	—	280	621	**SCP171565VA**	24217RHB	370	558	5.5	129	137	2
90	160	40	2	±4.5	240	427	**SC181640-1VA**	22218RHR	298	381	3.8	147	149	1
	160	40	2	—	194	400	**SCP181640V-1A**	22218RHR	298	381	3.9	147	149	2
	160	52.4	2	±5.5	309	555	**SC181652VA**	23218RH	336	482	4.9	144	148	1
	160	52.4	1.1	—	271	566	**SCP181652V-2A**	23218RH	336	482	5.1	144	148	2
	160	45/48	2	±5.5	249	507	**SC181645/48V-1A**	—	—	—	4.4	147	150	1
100	150	50	1.5	±6	232	543	**SC201550VA**	—	—	—	3.4	137	139	1
	150	50	1.5	—	232	543	**SCP201550VA**	—	—	—	3.4	137	139	2
	165	52	2	±5.5	279	600	**SC201752V-1A**	23120RH	328	510	4.8	149	153	1
105	160	56	2	±9	242	594	**SC211656VA**	24021RHA	317	550	4.4	144	149	1
110	170	45	2	±5.5	260	523	**SC221745V-3A**	23022RH	300	486	4.0	158	160	1
	170	45	2	—	260	523	**SCP221745V-3A**	23022RH	300	486	4.1	158	160	2
	170	60	2	±8	279	722	**SC221760V-1A**	24022RH	375	647	5.5	152	157	1
	170	64	2	±10	279	722	**SC221764VA**	—	—	—	5.8	151	157	1
	180	56	2	±7.5	296	667	**SC221856V-8A**	23122RH	385	605	6.1	162	167	1
	180	69	2	±9	355	842	**SC221869V-3A**	24122RH	469	778	7.6	157	164	1

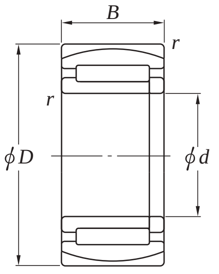
Bearings for continuous casting machines

d (110) ~ (150) mm



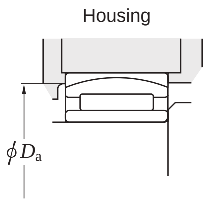
Design 1

SC bearings (free side)



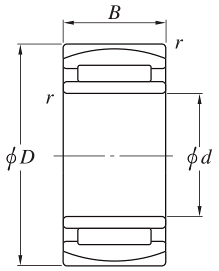
Design 2

SCP bearings (fixed side)



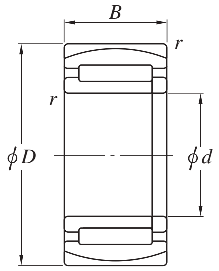
Boundary dimensions (mm)				Acceptable roll heat expansion (mm)	Basic load ratings (kN)		Bearing No.		Corresponding spherical roller bearing			Mass (kg)	Mounting dimensions (mm)		Design
d	*D*	*B*	*r* min.		C_r	C_{0r}			Bearing No.	Basic load ratings (kN) C_r	C_{0r}		D_a min.	max.	
110	180	69	2	—	355	842	**SCP221869V-3A**		24122RH	469	778	7.8	157	164	2
	200	53	2.1	—	333	626	**SCP222053VA**		22222RHR	491	642	8.2	182	187	2
120	180	46	2	±6	231	588	**SC241846V-2A**		23024RH	314	524	4.5	168	170	1
	180	46	2	—	231	588	**SCP241846V-2A**		23024RH	314	524	4.6	168	170	2
	180	54	2	±12	246	516	**SC241854VA**		—	—	—	5.0	165	169	1
	180	58	2	±8	274	726	**SC241858V-1A**		—	—	—	5.7	164	168	1
	180	60	2	±9	274	726	**SC241860V-1A**		24024RH	397	709	5.8	163	168	1
	180	56/46	2	±10	279	626	**SC241856/46VA**		—	—	—	5.2	165	169	1
	200	80	2	±9.5	521	1 120	**SC242080VA**		24124RH	605	1 020	11.1	174	183	1
	200	80	2	—	431	1 040	**SCP242080V-3A**		24124RH	605	1 020	12.0	174	183	2
130	200	52	2	—	295	701	**SCP262052V-1A**		23026RH	404	674	6.7	186	189	2
	200	69	2	±9	381	969	**SC262069V-1A**		24026RH	512	914	8.7	179	186	1
	200	69	2	—	381	969	**SCP262069V-1A**		24026RH	512	914	8.9	179	186	2
	200	79/69	2	±11	443	1 090	**SC262079/69VA**		—	—	—	9.6	177	185	1
	210	64	2	±10	408	882	**SC262164VA**		23126RH	494	799	9.2	190	196	1
	210	80	2	±11.5	448	1 120	**SC262180V-2A**		24126RH	620	1 080	11.9	184	193	1
	210	80	2	—	448	1 120	**SCP262180V-2A**		24126RH	620	1 080	12.2	184	193	2
	230	64	3	±9	442	950	**SC262364V-2A**		22226RHR	658	914	12.5	209	215	1
140	210	53	2	±6	331	834	**SC282153V-1A**		23028RH	422	723	7.1	195	199	1
	210	53	2	—	331	834	**SCP282153V-1A**		23028RH	422	723	7.2	195	199	2
	210	69	2	±9.5	431	1 010	**SC282169RVA**		24028RH	524	957	8.8	191	196	1
	210	69	2	—	431	1 010	**SCP282169RVA**		24028RH	524	957	9.3	191	196	2
	225	68	2.1	±7	512	1 150	**SC282368RVA**		23128RH	565	940	11.1	204	210	1
	225	68	2.1	—	465	1 020	**SCP282368V-1A**		23128RH	565	940	11.6	204	210	2
	225	85	2.1	±11.5	521	1 300	**SC282385V-1A**		24128RH	702	1 220	14.4	199	208	1
	225	85	2.1	—	521	1 300	**SCP282385V-1A**		24128RH	702	1 220	14.8	199	208	2
150	225	75	2.1	±9	492	1 220	**SC302375V-6A**		24030RH	593	1 100	11.4	203	209	1
	225	75	2.1	—	492	1 220	**SCP302375V-6A**		24030RH	593	1 100	11.8	203	209	2

d (150) ~ 220 mm



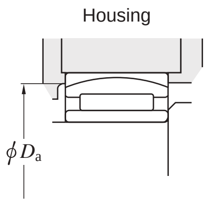
Design 1

SC bearings (free side)



Design 2

SCP bearings (fixed side)

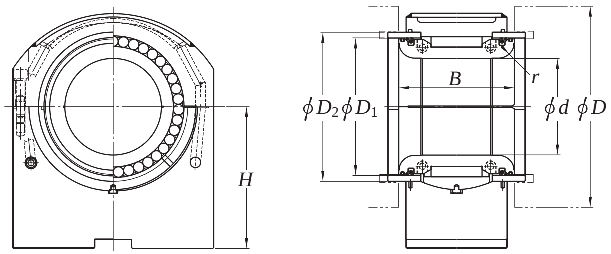


Boundary dimensions (mm)				Acceptable roll heat expansion	Basic load ratings (kN)		Bearing No.		Corresponding spherical roller bearing			Mass	Mounting dimensions (mm)		Design
d	D	B	r min.	(mm)	C_r	C_{0r}			Bearing No.	Basic load ratings (kN) C_r	C_{0r}	(kg)	D_a min.	max.	
150	250	100	2.1	±14	666	1 650	**SC3025100V-1A**		24130RH	915	1 590	21.9	218	230	1
	270	96	3	±12	806	1 670	**SC302796VA**		23230RH	959	1 540	26.2	236	247	1
160	240	80	2.1	±13	542	1 280	**SC322480-2VA**		24032RH	679	1 270	13.6	216	225	1
	270	109	2.1	±13.5	867	1 980	**SC3227109VA**		24132RH	1 070	1 890	28.0	233	247	1
	340	114	4	±15	1 230	2 300	**SC3234114VA**		22332RHA	1 420	1 940	55.3	303	316	1
170	260	90	2.1	±14	622	1 560	**SC342690V-1A**		24034RH	828	1 540	18.7	232	241	1
	260	90	2.1	—	622	1 560	**SCP342690V-1A**		24034RH	828	1 540	19.1	232	241	2
	310	110	4	±14	1 010	2 180	**SC3431110VA**		23234RHA	1 210	1 940	40.1	270	285	1
180	280	100	2.1	±14	743	1 890	**SC3628100V-1A**		24036RH	984	1 830	25.0	248	260	1
	320	112	4	±15	950	2 350	**SC3632112V-1A**		23236RHA	1 320	2 170	43.5	280	295	1
	320	112	4	—	950	2 350	**SCP3632112V-1A**		23236RHA	1 320	2 170	44.1	280	295	2
190	290	75	2.1	—	595	1 530	**SCP382975V-1A**		23038RHA	789	1 430	20.3	268	274	2
	290	100	2.1	±14	768	2 030	**SC3829100V-1A**		24038RHA	1 010	1 920	26.1	259	269	1
	290	100	2.1	—	768	2 030	**SCP3829100V-1A**		24038RHA	1 010	1 920	26.8	259	269	2
	320	104	3	±12	1 030	2 270	**SC3832104VA**		23138RHA	1 210	2 080	37.2	288	298	1
	320	128	4	±15.5	1 120	2 790	**SC3832128VA**		24138RHA	1 460	2 630	46.7	278	293	1
	320	128	4	—	1 120	2 790	**SCP3832128VA**		24138RHA	1 460	2 630	47.8	278	293	2
	340	120	4	±16	1 110	2 720	**SC3834120V-1A**		23238RHA	1 490	2 470	53.0	301	315	1
200	310	82	2.1	—	692	1 810	**SCP403182VA**		23040RHA	940	1 680	25.9	282	291	2
	310	109	2.1	±11	978	2 550	**SC403111RVA**		24040RHA	1 180	2 230	33.5	273	286	1
	340	112	3	±16	1 080	2 490	**SC4034112V-1A**		23140RHA	1 380	2 340	46.0	304	317	1
	340	140	3	±19	1 350	3 090	**SC4034140VA**		24140RHA	1 660	2 970	56.1	292	313	1
220	370	150	4	±19	1 540	3 750	**SC4437150VA**		24144RHA	1 920	3 550	72.3	320	340	1

HSC bearing units with half-round outer ring for continuous casting machines

Koyo

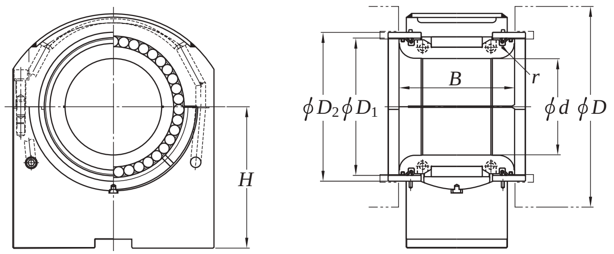
D 195 ~ (260) mm



Roll outside dia.	Boundary dimensions (mm)						Housing unit No.	Seal type		Bearing No.	Acceptable roll heat expansion	Basic load ratings (kN)	
D	*d*	*B*	*H*	D_1	D_2	*r*		Recovery type	Non-recovery type		(mm)	C_r	C_{0r}
195	100	145	175	133	143	C8	PBA391H	—	○	**HSC2017-1C3**	±7	373	876
220	110	139	225	155	168	18	PBA399H	○	—	**HSC2219-7C3**	±9	402	876
	110	139	225	155	168	18	PBA360H	○	—	**HSC2219-6C3**	±9	433	966
225	100	169	132	140	150	15	PBA328H	—	○	**HSC2019C3**	±8	603	1 250
230	110	113	185	160	173	13	PBA171H	—	○	**HSC2219-3C3**	±8	337	619
	110	113	185	160	173	13	PBA171H	○	—	**HSC2219-8C3**	±8	337	619
	110	141	246	160	173	18	PBA171AXH	—	○	**HSC2219-1C3**	±8	528	1 120
	110	148	351	160	173	13	PBA171AH	—	○	**HSC2219C3**	±8	421	846
	110	148	351	160	173	13	PBA171AH	○	—	**HSC2219-9C3**	±8	421	846
	110	150	190	160	173	15	PBA208H	—	○	**HSC2219-2C3**	±8	554	1 190
	110	150	190	160	173	15	PBA208H	○	—	**HSC2219-11C3**	±8	554	1 190
	110	154	180	160	173	20	PBA368H	—	○	**HSC2219-4C3**	±8	554	1 190
	110	154	180	160	173	20	PBA404H	○	—	**HSC2220C3**	±9	575	1 270
235	140	145	175	175	186.5	C8	PBA339H	—	○	**HSC2821C3**	±5	431	1 160
240	115	202	251	160	175	15	PBA316H	—	○	**HSC2321C3**	±10	745	1 550
	115	202	251	160	175	15	PBA316H	○	—	**HSC2321-2C3**	±10	745	1 550
	120	173	230	165	180	15	PBA396H	○	—	**HSC2421-2C3**	±9	673	1 510
250	120	151	190	172	185	20	PBA411H	○	—	**HSC2421-6C3**	±9	576	1 310
	120	153	185	175	190	20	PBA336H	—	○	**HSC2421C3**	±8	651	1 380
	120	153	145	175	190	20	PBA336AH	—	○	**HSC2421C3**	±8	651	1 380
	120	154	175	170	188	20	PBA378H	○	—	**HSC2421-1C3**	±10	578	1 190
	120	154	190	175	190	20	PBA251H-2	○	—	**HSC2421-4C3**	±9	605	1 400
	120	154	180	175	190	20	PBA251H	—	○	**HSC2421-3C3**	±9	605	1 400
	120	154	180	170	185	20	PBA407H	○	—	**HSC2421-5C3**	±9	605	1 400
255	125	174	180	180	195	20	PBA410H	○	—	**HSC2522C3**	±9	793	1 740
260	120	154	180	170	188	20	PBA379H	○	—	**HSC2421-1C3**	±10	578	1 190

HSC bearing units with half-round outer ring for continuous casting machines

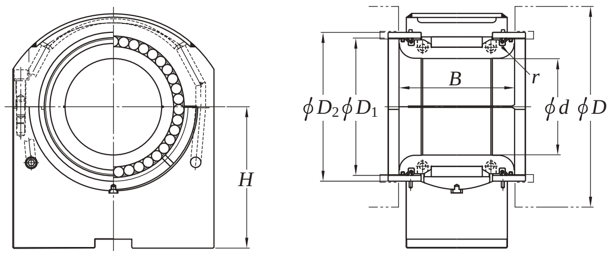
D (260) ~ 320 mm



Roll outside dia.	Boundary dimensions (mm)						Housing unit No.	Seal type		Bearing No.	Acceptable roll heat expansion (mm)	Basic load ratings (kN)	
D	d	B	H	D_1	D_2	r		Recovery type	Non-recovery type			C_r	C_{0r}
260	130	157	180	185	200	20	PBA412H	○	—	**HSC2622-2C3**	±9	623	1 480
265	140	175	242.5	190	205	20	PBA397H	○	—	**HSC2823-2C3**	±9	699	1 640
	140	191	250	190	205	20	PBA355H	—	○	**HSC2823-1C3**	±7	721	1 710
270	130	154	190	185	200	20	PBA252H	—	○	**HSC2622C3**	±9	623	1 480
	140	126	205	199	212	16	PBA176H	—	○	**HSC2823C3**	±8	505	992
	140	126	205	199	212	16	PBA176H	○	—	**HSC2823-3C3**	±8	505	992
	140	174	205	199	212	20	PBA207H	—	○	**HSC2824-1C3**	±8	863	1 980
	140	174	205	199	212	20	PBA207H	○	—	**HSC2824-4C3**	±8	863	1 980
275	150	163	175	190	203.5	C10	PBA389H	—	○	**HSC3024C3**	±7	711	1 800
280	130	174	205	185	200	20	PBA337H	—	○	**HSC2624C3**	±8	846	1 910
	130	174	160	185	200	20	PBA337AH	—	○	**HSC2624C3**	±8	846	1 910
	145	196	260	200	215	20	PBA356H	—	○	**HSC2925-1C3**	±6	840	1 930
290	140	139	215	208	223	16	PBA177H	—	○	**HSC2825C3**	±8	863	1 980
	140	139	215	208	223	16	PBA177H	○	—	**HSC2825-1C3**	±8	863	1 980
	145	178	215	208	223	20	PBA206H	—	○	**HSC2925C3**	±8	967	2 260
	145	178	215	208	223	20	PBA206H	○	—	**HSC2925-2C3**	±8	967	2 260
295	145	208	270	200	215	20	PBA357H	—	○	**HSC2926C3**	±6	880	2 260
305	150	169	205	205	220	20	PBA408H	○	—	**HSC3025C3**	±8.5	855	1 990
310	140	184	215	205	220	20	PBA338H	—	○	**HSC2827C3**	±8	1 000	2 210
	140	184	175	205	220	20	PBA338AH	—	○	**HSC2827C3**	±8	1 000	2 210
320	150	187	220	220	235	20	PBA380H	—	○	**HSC3028C3**	±9	1 040	2 370
	160	150	291	240	255	18	PBA178H	—	○	**HSC3228C3**	±8	816	1 680
	160	150	291	240	255	18	PBA178H	○	—	**HSC3228-2C3**	±8	816	1 680
	160	199	270	215	230	20	PBA398H	○	—	**HSC3227C3**	±9	1 000	2 410
	165	228	280	230	245	25	PBA358H	—	○	**HSC3328C3**	±6	1 030	2 550

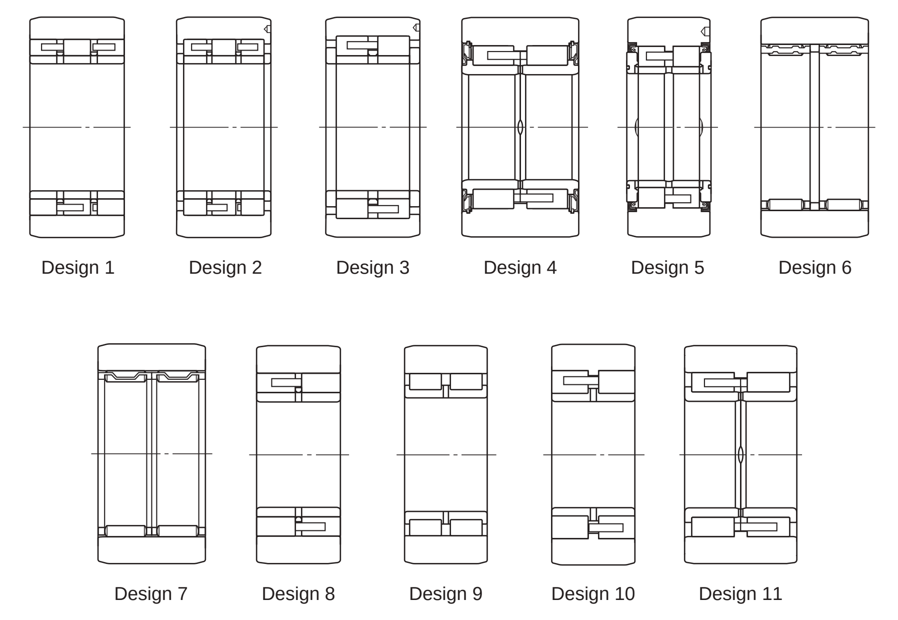
HSC bearing units with half-round outer ring for continuous casting machines

D 340 ~ 370 mm

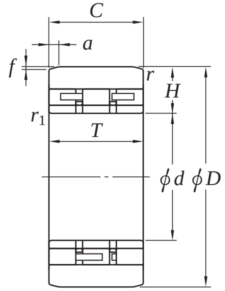


Roll outside dia.	Boundary dimensions (mm)						Housing unit No.		Seal type		Bearing No.	Acceptable roll heat expansion	Basic load ratings (kN)	
D	d	B	H	D_1	D_2	r			Recovery type	Non-recovery type		(mm)	C_r	C_{0r}
340	180	235	280	245	260	25	PBA359H		—	○	**HSC3630C3**	±6	1 140	2 720
370	190	233	280	326	336	20	PBA324H		—	○	**HSC3834C3**	±7	1 540	3 540

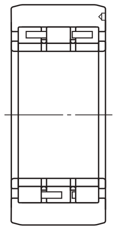
Cylindrical roller bearings for the backing shafts of multi-roll mills



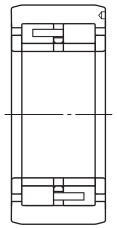
- Since the bearing is used as the back up roll in multi-roll mills, the outer ring is designed thicker than ordinary bearings.
- Since high accuracy is required for these bearings under high pressure, they are designed to have high load rating and accuracy.
- Since several bearings are mounted on a shaft, radial runout of outer ring and variations of bearing section height per unit after assembly are minimized.
- Even if the outside surface of bearing's outer ring gets rough due to foreign matters caught in, the bearing can be used again by grinding.
- Bearings installed on the backing shaft come in cylindrical roller bearing and long cylindrical roller bearing. Either of both type bearings is used appropriately depending on the characteristics of rolling mills. Above all, the cylindrical roller bearing is most commonly used.
- **These bearings are commonly used for the backing shafts of multi-roll mills.**



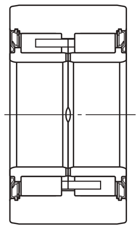
Design 1



Design 2



Design 3



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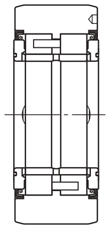

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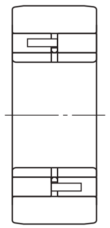
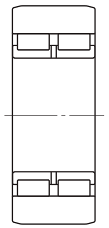
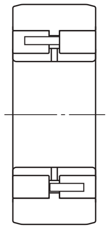


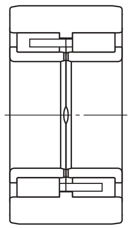
Design 6



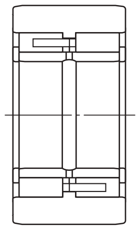
Design 7



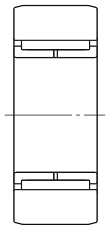
Design 8



Design 9



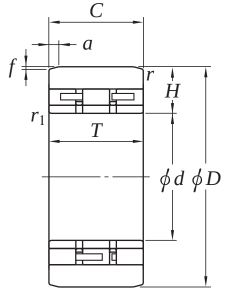
Design 10



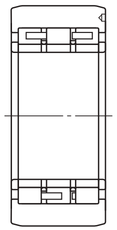
Design 11

Boundary dimensions (mm)						**Basic load ratings** (kN)		**Fatigue load limit** (kN)	**Bearing No.**	**Design**	**Bearing section height at the time of manufacture** (mm)	**Mass** (kg)	**Compatible rolling mill model**	**Number of bearings used**
d	*D*	*T*	*C*	*r*	*r*$_1$	*C*$_r$	*C*$_{0r}$	*C*$_u$			*H*			
31.75	76.2	46.23	45.85	0.8	1.5	121	183	31.5	**06DC0846A**	7	22.200	1.27	ZR34	40
54.999	120	25.999	25.999	1.6	1.6	99.3	138	18.8	**11N1226V**	11	32.4672	1.69	ZR24	24, 56
55	120	52.197	52	1.6	1.6	254	341	45.9	**11DC1252**	7	32.483	3.27	ZR24	40
70	160	90	90	1.5	1.5	434	546	81.2	**14DC1690LDS-1**	9	44.977	10.1	ZR33	40
	160.070	90	90	1.5	1.5	475	667	101	**14DC1690ADS**	1	45.000	10.5	ZR33	32, 48, 72
90	190	100	100	3	3	593	770	109	**18DC19100NDS**	9	49.980	14.7	ZR25	48
99.995	225	120	120	1.5	1.5	780	995	135	**20DC23120KDS-2**	4	62.474	26.0	ZR23	32, 40, 48
100	225	100	100	3	1.5	683	838	114	**20DC23100NDS-1**	9	62.480	21.7	ZR23	40
	225.021	80	80	1.5	1.5	759	991	136	**20DC23080DS**	6	62.474	18.2	ZR23	12(36)
	225.021	120	120	1.5	1.5	1 020	1 440	199	**20DC23120MDS**	1	62.474	27.2	ZR23	32
130	300	160	159.5	4	3.5	1 660	2 340	297	**26DC30160DS**	1	84.9617	64.8	ZR22	40, 48
	300	172.644	172.644	4	3.5	1 950	2 900	363	**26DC30170MDS**	1	84.955	72.6	ZR22	40, 48
	300	172.644	172.644	4	3.5	1 650	2 210	275	**26DC30170KDS-3**	4	84.955	70.0	ZR22	40, 48
179.984	406.430	223.960	217	4	0.5	2 940	4 500	515	**36DC41217DS+DP**	1	113.155	161	ZR21	40, 48
	406.430	224.250	220	4	3	2 430	3 530	405	**36DC41224KDS**	4	113.181	160	ZR21	32, 48
180	406.420	171.040	171.040	4	4	2 580	3 810	450	**36DC41171DS**	1	113.155	130	ZR21	48, 56
	406.420	171.040	171.040	4	1	2 390	3 340	389	**36DC41171ADS**	10	113.155	124	ZR21	48, 56
	406.420	171.040	171.040	4	3	2 090	2 960	346	**36DC41171KDS**	4	113.155	125	ZR21	48
	406.420	224.250	224	4	3	2 860	4 230	480	**36DC41224QDS**	9	113.155	162	ZR21	40, 48
50	120	80	80	1.5	1.5	335	379	56.4	**10DC1280DS**	3	34.976	5.15	12-ROLL MILL	32
	120	85	85	1.5	1.5	379	427	63.2	**10DC1285DS**	3	34.984	5.4	12-ROLL MILL	32
60	160	95	95	1.5	2	498	589	88.3	**12DC1695DS**	3	46.484	11.5	12-ROLL MILL	20(32)
65	170	100	100	2	2	498	597	89.6	**13DC17100DS**	3	52.480	13.5	12-ROLL MILL	10(34)

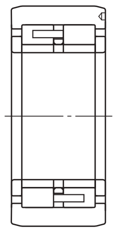
Cylindrical roller bearings for the backing shafts of multi-roll mills



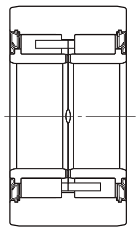
Design 1



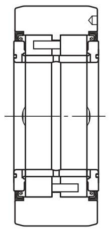
Design 2



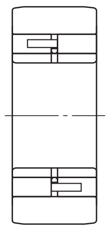
Design 3



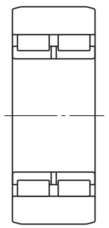
Design 4



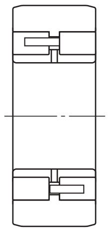
Design 5



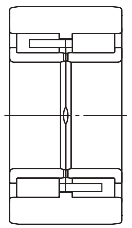
Design 6



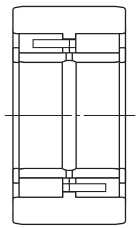
Design 7



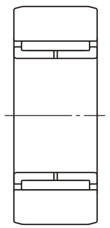
Design 8



Design 9



Design 10



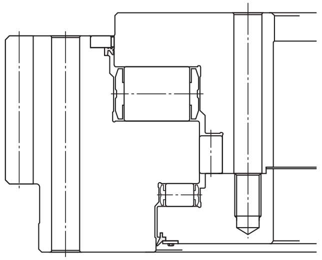
Design 11

Boundary dimensions (mm)						**Basic load ratings** (kN)		**Fatigue load limit** (kN)	**Bearing No.**	**Design**	**Bearing section height at the time of manufacture** (mm)	**Mass** (kg)	**Compatible rolling mill model**	**Number of bearings used**
d	D	T	C	r	r_1	C_r	C_{0r}	C_u			H			
90	230	100	100	2	3	802	982	133	**18DC23100DS**	3	69.980	24.2	12-ROLL MILL	24(34)
	260	125	125	2	2	1 150	1 520	197	**18DC26125DS**	3	84.970	41.3	12-ROLL MILL	34
100	260	95	95	2	2	871	1 060	143	**20DC2695DS**	3	79.970	30.2	12-ROLL MILL	32
	260	105	105	2	2	975	787	161	**20DC26105DS**	3	79.970	33.5	12-ROLL MILL	32
	260	130	130	2	2	1 190	1 580	204	**20DC26130DS**	3	79.970	41.5	12-ROLL MILL	32
110	280	165	165	2	2	1 390	1 880	250	**22DC28165DS**	2	84.965	60.2	12-ROLL MILL	10(34)
120	280	165	165	2	3	1 380	1 940	244	**24DC28165DS**	3	79.965	57.7	12-ROLL MILL	14(38)
	350	165	165	2	3	1 710	2 220	273	**24DC35165ADS**	10	114.965	98.3	12-ROLL MILL	24(34)
130	350	175	175	2	3	1 750	2 300	281	**26DC35175DS**	10	109.965	101	12-ROLL MILL	24(38)
62	155	90	90	1	2	445	529	78.3	**12DC1690DS**	3	46.484	9.97	20-ROLL MILL	8(44)
	155	110	110	1	2	505	622	95.6	**12DC16110DS**	2	46.484	12.2	20-ROLL MILL	36(44)
90	220	95	95	2	2	664	795	112	**18DC2295DS**	3	64.982	20.9	20-ROLL MILL	40
	220	130	130	2	2	873	1 130	158	**18DC22130ADS**	2	64.982	28.7	20-ROLL MILL	32, 40
115	260	140	140	3	2	1 220	1 690	225	**23DC26140DS**	2	72.470	41.9	20-ROLL MILL	40
65	165	70	70	1.5	2	531	586	90.1	**13DC1770DS**	8	49.982	8.83	20-ROLL MILL	40
90	220	94	94	2	1.5	860	997	138	**18DC2294DS**	8	64.976	21.2	20-ROLL MILL	40
	220	96	94	3	3	618	700	101	**18DC2294/96DS**	5	65.000	21.0	20-ROLL MILL	64
130	300.020	130	129	2	3	1 300	1 740	215	**26DC30130DS**	3	85.010	52.2	20-ROLL MILL	56
	300.020	130	129	4	3.5	1 340	1 620	206	**26DC30130BDS**	5	85.010	51.8	20-ROLL MILL	—
	300.020	132	129	2	3	1 430	1 830	231	**26DC30132ADS**	3	85.010	53.8	20-ROLL MILL	72

Slewing rim bearings for tunnel-boring machine

- These bearings are designed to support the main cutters of tunnel-boring machines.

■ DTR···T (triple-row combined roller type) (page 456)

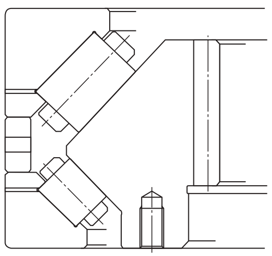


The DTR···T slewing rim bearing is a triple-row combined cylindrical roller bearing. This bearing is provided with various features required to support the main cutters of tunnel-boring machines, including superior impact resistance, high load ratings, and excellent sealing performance. When used with forced oil circulation, this bearing is provided with oil supply and oil drain ports.

As the sealing mechanism of this bearing, a labyrinth, dust seal, or pressure-resistant seal featuring high sealing performance (resistant to a static pressure of 0.3 MPa) can be selected, depending on the lubrication method used.

For convenience of transportation, DTR···T bearings with the bearing rings split cylindrically into two or four parts are also available (SP/DTR···T).

■ 2TR··· (double-row tapered roller type) (page 464)



The 2TR··· slewing rim bearing is a double-row tapered roller bearing. To ensure high axial load ratings, this bearing features a large contact angle. Large-sized rollers are provided on the axial load-accommodating side.

The bearing ring on the non-gear side is made from bearing steel. It is treated through normal hardening, so therefore does not have any "soft zone," which an induction-hardened bearing may have, thus eliminating limits in determining the location of the non-gear-side bearing ring on machines or equipment.

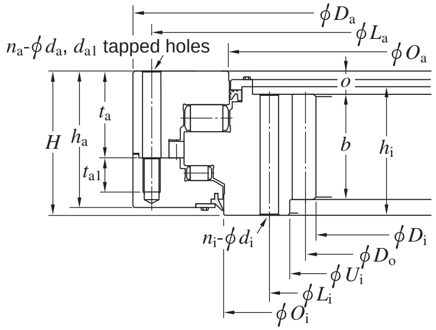
The 2TR··· bearing was developed to support the main cutters (oil bath lubrication) of tunnel-boring machines.

Slewing rim bearings for tunnel-boring machine

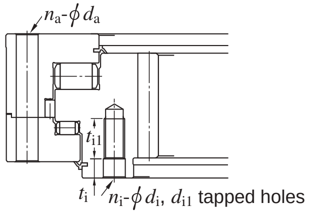
Koyo

DTR···T type (With internal gear)

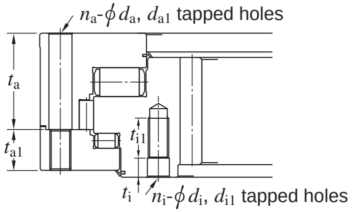
D_a 2 550 ~ 5 200 mm



Design 1



Design 2



Design 3

Bearing No.	Design	Outside dia.	Bore dia.	Height	Gear data (pressure angle 20°)			Dimensions							Mounting-hole of outer ring						Mounting-hole of inner ring						Roller PCD	Basic static axial load rating	Gear specifications		(Refer.) Mass (kg)
		D_a	D_i	H	D_o	Module	No. of tooth	b	h_a	h_i	o	O_a	O_i	U_i	L_a	Qty. n_a	d_a	t_a	d_{a1}	t_{a1}	L_i	Qty. n_i	d_i	t_i	d_{i1}	t_{i1}		C_{0a} (kN)	Addendum modification coefficient	Induction hardened tooth flanks and bottoms	
DTR2096TBGS	1 1)	2 550	2 096	240	2 128	16	133	190	175	210	30	2 298	2 324	2 180	2 500	48	ϕ24	110	M22	45	2 230	48	ϕ24	—	—	—	2 357	20 900	—	○	2 150
DTR2156TBGS-1	1 2)	2 595	2 156	240	2 184	14	156	190	175	210	30	2 384	2 383	2 230	2 545	48	ϕ24	120	M22	40	2 285	48	ϕ24	—	—	—	2 428	19 000	—	○	2 140
DTR2176TBGS	1 1)	2 630	2 176	240	2 208	16	138	190	175	210	30	2 378	2 404	2 260	2 580	48	ϕ24	110	M22	45	2 310	48	ϕ24	—	—	—	2 437	21 400	—	○	2 200
DTR2160TBGS	1	2 660	2 160	220	2 192	16	137	160	195	190	30	2 420	2 425	2 240	2 600	60	ϕ26	123	M24	50	2 300	60	ϕ26	—	—	—	2 474	20 200	—	○	2 480
DTR2240TBGS	1 1)	2 705	2 240	240	2 272	16	142	190	175	210	30	2 451	2 477	2 325	2 655	60	ϕ24	110	M22	45	2 380	60	ϕ24	—	—	—	2 510	22 300	—	○	2 360
DTR2296ATBGS-1	1 2)	2 735	2 296	200	2 324	16	142	190	175	210	30	2 451	2 477	2 325	2 655	60	ϕ24	110	M22	45	2 380	60	ϕ24	—	—	—	2 550	29 500	—	○	2 360
DTR2208TBG	1	2 855	2 208	275	2 240	16	140	150	265	240	35	2 512	2 575	2 295	2 790	48	ϕ33	175	M30	50	2 350	48	ϕ33	—	—	—	2 595	35 000	—	○	4 470
DTR2674TBGS	2	3 025	2 674	245	2 702	14	193	160	230	215	30	2 855	2 920	2 750	3 140	48	ϕ33	—	—	—	2 810	48	ϕ33	30	M30	60	2 940	39 500	—	○	3 790
DTR2816TBGS	1	3 460	2 816	260	2 848	16	178	160	245	230	30	3 125	3 180	2 900	3 400	60	ϕ30	155	M27	50	2 960	72	ϕ30	—	—	—	3 210	43 500	—	○	5 240
DTR2960TBGS-1	1	3 645	2 960	300	3 000	20	150	225	270	265	35	3 300	3 320	3 065	3 570	48	ϕ39	165	M36	60	3 140	60	ϕ39	—	—	—	3 375	50 300	—	○	6 570
DTR3080TBGS	3	3 750	3 080	295	3 120	20	156	220	280	245	50	3 310	3 415	3 180	3 660	72	ϕ45	197	M42	83	3 260	72	—	—	M42	85	3 419	63 500	—	○	6 540
DTR3240ATBGS-1	1	3 925	3 240	300	3 280	20	164	225	270	265	35	3 580	3 600	3 345	3 850	48	ϕ39	165	M36	60	3 420	60	ϕ39	—	—	—	3 655	53 000	—	○	7 120
DTR3250TBGS	1	3 925	3 250	300	3 280	20	164	225	270	265	35	3 570	3 610	3 355	3 850	48	ϕ39	165	M36	60	3 430	60	ϕ39	—	—	—	3 655	53 000	0.25	○	6 970
DTR3834BTBGS	3	4 480	3 834	305	3 870	18	215	200	280	275	30	4 050	4 155	3 925	4 400	60	ϕ39	197	M36×3	83	4 000	60	ϕ39	40	M36×3	80	4 159	78 600	—	○	8 120
DTR3996TBGS-1	3	4 700	3 996	348	4 032	18	224	210	328	296	52	4 215	4 330	4 085	4 615	88	ϕ39	225	M36	103	4 175	88	ϕ39	50	M36	75	4 335	92 100	—	○	10 500
DTR4176ATBGS	1	5 200	4 176	380	4 224	24	176	290	345	340	40	4 560	4 755	4 300	5 080	100	ϕ48	230	M45	75	4 395	100	ϕ48	—	—	—	4 733	159 000	—	○	6 970

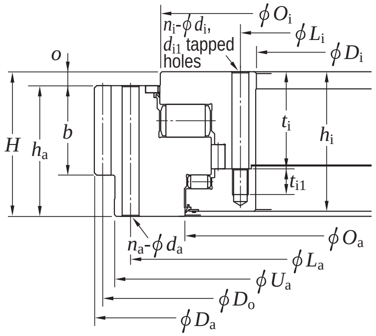
[Notes] 1) Without oil seals.
2) With seal upper side only.

Slewing rim bearings for tunnel-boring machine

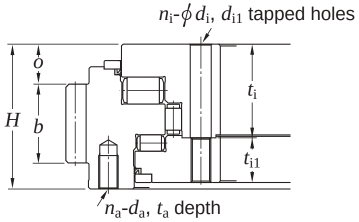
Koyo

DTR···T type (With external gear)

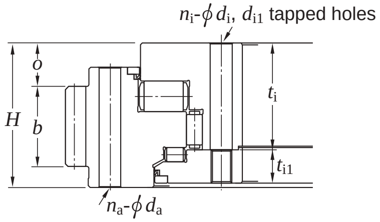
D_a 2 688 ~ 4 550 mm



Design 1



Design 2



Design 3

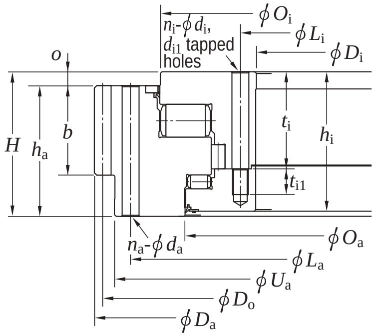
Bearing No.	De-sign	Outside dia.	Bore dia.	Height	Gear data (pressure angle 20°)			Dimensions							Mounting-hole of outer ring				Mounting-hole of inner ring						Roller PCD	Basic static axial load rating	Gear specifications		(Refer.) Mass (kg)
		D_a	D_i	H	D_o	Module	No. of tooth	b	h_a	h_i	o	O_a	O_i	U_a	L_a	Qty. n_a	d_a	t_a	L_i	Qty. n_i	d_i	t_i	d_{i1}	t_{i1}		C_{0a} (kN)	Addendum modification coefficient	Induction hardened tooth flanks and bottoms	
DTR2060TAGS	1	2 688	2 060	260	2 656	16	166	160	230	245	30	2 340	2 395	2 610	2 550	60	ϕ30	—	2 120	60	ϕ30	155	M27	50	2 310	31 100	—	○	3 780
DTR2150TAGS	1	2 830	2 150	300	2 800	20	140	180	240	285	60	2 480	2 540	2 730	2 650	48	ϕ39	—	2 235	48	ϕ39	178	M36	70	2 445	39 500	0.25	○	4 670
DTR2045TAGS	1	2 880	2 045	310	2 840	20	142	225	275	300	35	2 375	2 567	2 774	2 700	44	ϕ42	—	2 125	40	ϕ42	195	M39	70	2 420	79 700	—	○	6 320
DTR2020ATAG	1	2 950	2 020	400	2 900	25	116	270	355	375	45	2 420	2 550	2 825	2 720	64	ϕ48	—	2 120	48	ϕ48	265	M45	70	2 430	53 100	—	○	8 700
DTR2350TAGS-1	1	3 030	2 350	295	3 000	20	150	180	235	280	60	2 649	2 745	2 930	2 860	48	ϕ39	—	2 425	48	ϕ39	197	M36	83	2 645	47 700	0.25	○	4 980
DTR2510CTAGS	1	3 256	2 510	335	3 212	22	146	225	295	310	40	2 860	2 902	3 134	3 060	52	ϕ48	—	2 590	42	ϕ48	197	M45	70	2 820	50 700	—	○	6 660
DTR2475TAGS-1	1	3 275	2 475	355	3 225	25	129	270	315	345	40	2 850	2 905	3 134	3 060	52	ϕ48	—	2 555	42	ϕ48	225	M45	70	2 813	56 700	—	○	7 800
DTR2475TAGS-2	1	3 328	2 475	380	3 264	32	102	295	340	345	40	2 850	2 905	3 134	3 060	52	ϕ48	—	2 555	42	ϕ48	225	M45	70	2 813	56 700	—	○	8 570
DTR2735TAGS	1	3 490	2 735	350	3 460	20	173	190	290	335	60	3 087	3 185	3 390	3 315	64	ϕ39	—	2 810	64	ϕ39	215	M36	70	3 062	62 600	0.25	○	7 700
DTR2760TAGS-1	1	3 636	2 760	415	3 600	24	150	240	335	400	80	3 150	3 305	3 515	3 440	80	ϕ39	—	2 845	80	ϕ39	282	M36	75	3 155	81 500	0.25	○	10 900
DTR2870TAGS-8	1	3 696	2 870	365	3 648	24	152	290	325	350	40	3 240	3 305	3 534	3 460	72	ϕ48	—	2 960	60	ϕ48	248	M45	65	3 205	66 100	—	○	9 390
DTR2990TAG-1	2	3 740	2 990	350	3 696	22	168	190	295	335	60	3 410	3 470	3 630	3 535	48	M48	80	3 085	48	ϕ52	228	M48	107	3 365	60 500	—	○	8 380
DTR3460TAGS	1[1)]	3 984	3 460	245	3 920	14	280	190	215	245	30	3 722	3 735	3 865	3 815	48	ϕ33	—	3 515	48	ϕ33	140	M30	50	3 663	40 600	—	○	4 350
DTR3400TAGS	1	4 250	3 400	365	4 200	25	168	290	325	350	40	3 770	3 873	4 120	4 030	100	ϕ48	—	3 490	80	ϕ48	248	M45	65	3 745	84 600	—	○	11 300
DTR3330TAGS-3	1	4 268	3 330	435	4 224	22	192	290	395	415	40	3 810	3 893	4 140	4 050	100	ϕ48	—	3 420	80	ϕ48	287	M45	85	3 745	99 600	—	○	14 800
DTR3205TAGS-1	1	4 464	3 205	550	4 416	24	184	400	500	480	50	3 650	4 042	4 340	4 230	100	ϕ62	—	3 295	80	ϕ48	320	M45	85	3 755	200 000	—	○	25 600
DTR3450TAG	1	4 500	3 450	540	4 450	25	178	250	460	520	80	3 990	4 083	4 350	4 265	108	ϕ48	—	3 540	91	ϕ48	360	M45×3	110	3 905	128 000	—	○	21 000
DTR3600ATAGS-1	1	4 550	3 600	435	4 500	25	180	300	390	415	45	4 080	4 163	4 410	4 320	100	ϕ48	—	3 690	80	ϕ48	287	M45	85	4 015	107 000	—	○	16 100

[Note] 1) Without oil seals.

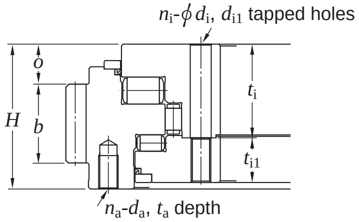
Slewing rim bearings for tunnel-boring machine

DTR···T type (With external gear)

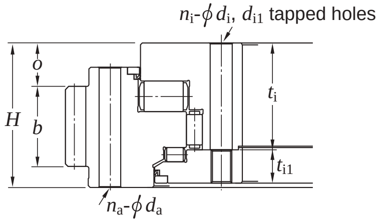
D_a **4 851 ~ 7 200 mm**



Design 1



Design 2



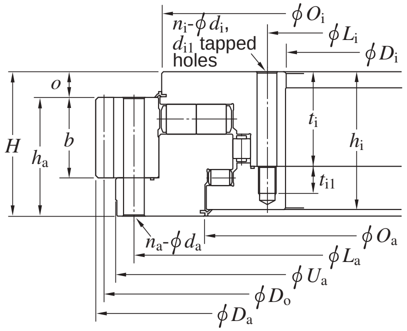
Design 3

Bearing No.	De-sign	Outside dia.	Bore dia.	Height	Gear data (pressure angle 20°)			Dimensions							Mounting-hole of outer ring				Mounting-hole of inner ring						Roller PCD	Basic static axial load rating	Gear specifications		(Refer.) Mass (kg)
		D_a	D_i	H	D_o	Module	No. of tooth	b	h_a	h_i	o	O_a	O_i	U_a	L_a	Qty. n_a	d_a	t_a	L_i	Qty. n_i	d_i	t_i	d_{i1}	t_{i1}		C_{0a} (kN)	Addendum modification coefficient	Induction hardened tooth flanks and bottoms	
DTR3915TAGS	1	4 851	3 915	420	4 818	22	219	260	350	405	70	4 327	4 480	4 735	4 640	120	ϕ45	—	4 010	96	ϕ48	282	M45	75	4 330	113 000	0.25	○	16 500
DTR4075TAGS	1	4 851	4 075	365	4 818	22	219	260	295	345	70	4 440	4 538	4 740	4 650	96	ϕ45	—	4 160	96	ϕ45	225	M42	80	4 415	92 100	0.25	○	11 800
DTR4210TAG-2	3	5 202.4	4 210	400	5 152	28	184	224	335	390	119	4 710	4 780	5 070	4 950	60	ϕ60	—	4 330	72	ϕ60	297	M56	93	4 652	114 000	—	○	17 500
DTR4555ATAGS	1	5 500	4 555	420	5 456	22	248	260	380	405	40	4 975	5 117	5 385	5 290	120	ϕ48	—	4 650	96	ϕ48	282	M45	75	4 970	131 000	—	○	19 400
DTR4600TAG	1	5 544	4 600	420	5 500	22	250	260	380	405	40	5 075	5 160	5 430	5 335	96	ϕ48	—	4 695	96	ϕ48	282	M45	75	5 020	123 000	—	○	19 700
DTR4510TAG-1	1	5 550	4 510	440	5 500	25	220	320	390	430	50	5 035	5 140	5 420	5 310	100	ϕ60	—	4 620	100	ϕ60	300	M56	85	4 993	135 000	—	○	22 200
DTR5850TAG	1	7 200	5 850	535	7 140	30	238	300	455	515	80	6 415	6 713	7 045	6 930	120	ϕ62	—	5 960	120	ϕ62	375	M56	85	6 475	345 000	—	○	46 000

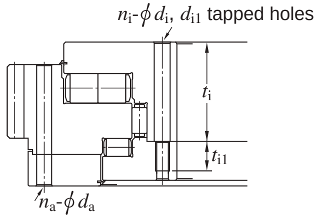
Slewing rim bearings for tunnel-boring machine

SP/DTR···T type (Splitted race and with external gear)

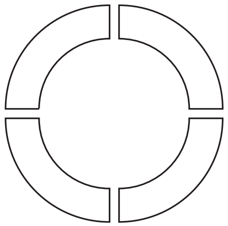
D_a 2 950 ~ 7 140 mm



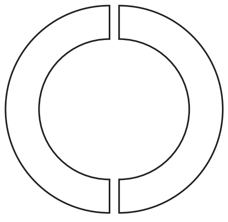
Design 1 (quarter split type)



Design 2 (double split type)



quarter split type



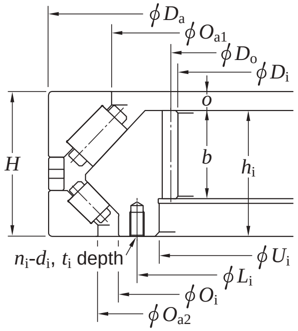
double split type

Bearing No.	De-sign	Outside dia.	Bore dia.	Height	Gear data (pressure angle 20°)			Dimensions							Mounting-hole of outer ring			Mounting-hole of inner ring						Roller PCD	Basic static axial load rating	Gear specifications Induction hardened tooth flanks and bottoms	(Refer.) Mass (kg)
		D_a	D_i	H	D_o	Module	No. of tooth	b	h_a	h_i	o	O_a	O_i	U_a	L_a	Qty. n_a	d_a	L_i	Qty. n_i	d_i	t_i	d_{i1}	t_{i1}		C_{0a} (kN)		
SP/DTR2020ATAG	1	2 950	2 020	400	2 900	25	116	270	355	375	45	2 420	2 550	2 825	2 720	64	ϕ50	2 120	48	ϕ50	265	M45	70	2 430	47 200	○	8 700
SP/DTR4430TAG	1	5 550	4 430	410	5 500	25	220	250	360	390	50	4 925	5 140	5 420	5 310	80	ϕ62	4 550	80	ϕ62	280	M56	110	4 955	159 000	○	22 300
SP/DTR4860TAG	1	6 050	4 860	450	6 000	25	240	250	370	430	80	5 370	5 640	5 920	5 810	80	ϕ62	4 980	80	ϕ62	295	M56	85	5 420	222 000	○	28 000
SP/DTR5060TAG	1	6 250	5 060	450	6 200	25	248	250	370	430	80	5 570	5 840	6 120	6 010	80	ϕ62	5 180	80	ϕ62	295	M56	85	5 620	232 000	○	29 100
SP/DTR5060TAG-2	1	6 250	5 060	450	6 200	25	248	285	405	430	45	5 570	5 840	6 120	6 010	80	ϕ62	5 180	72	ϕ62	300	M56	85	5 620	232 000	○	30 000
SP/DTR5060TAG-1	1	6 300	5 060	450	6 240	30	208	250	370	430	80	5 570	5 840	6 120	6 010	96	ϕ62	5 180	72	ϕ62	300	M56	85	5 620	232 000	○	29 700
SP/DTR5790TAG	1	7 140	5 790	535	7 080	30	236	300	455	515	80	6 340	6 685	6 985	6 870	120	ϕ62	5 900	96	ϕ62	235	M56	85	6 415	319 000	○	45 600

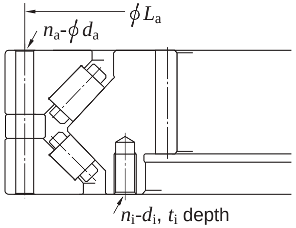
Slewing rim bearings for tunnel-boring machine

2TR···type (with internal gear)

D_a 2 580 ~ 3 800 mm



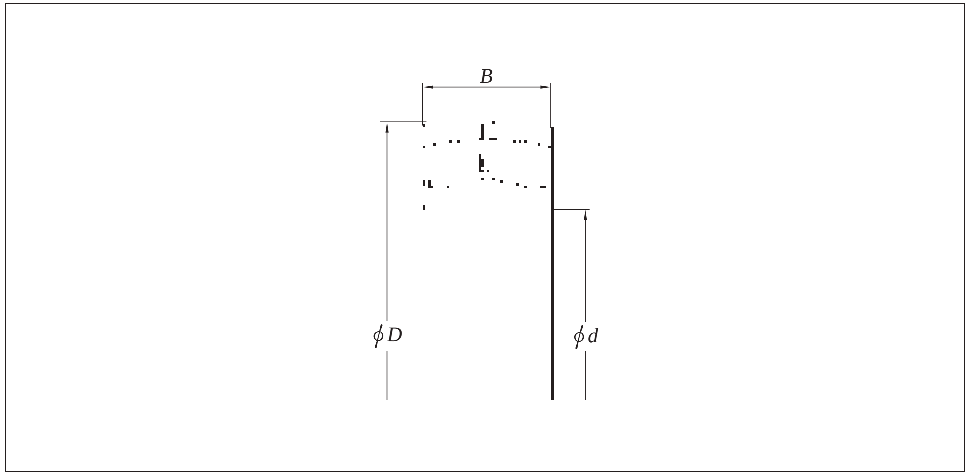
Design 1

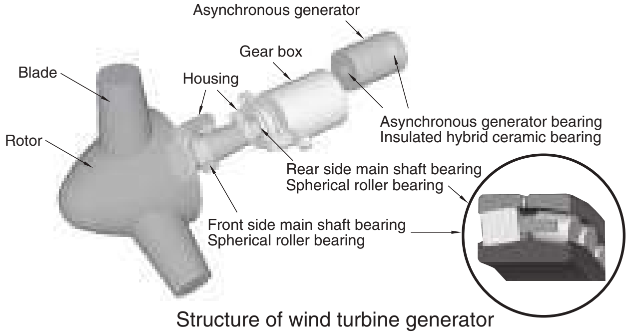


Design 2

Bearing No.	Design	Outside dia.	Bore dia.	Outer ring width	Gear data (pressure angle 20°)			Dimensions								Mounting-hole of outer ring			Mounting-hole of inner ring				Basic static axial load rating	Gear specifications Induction hardened tooth flanks and bottoms	(Refer.) Mass (kg)
		D_a	D_i	H	D_o	Module	No. of tooth	b	h_i	o	O_{a1}	O_{a2}	O_i	U_i		L_a	Qty. n_a	d_a	L_i	Qty. n_i	d_i	t_i	C_{0a} (kN)		
2TR2048-1CS	1	2 580	2 048	320	2 080	16	130	160	260	60	2 320	2 385	2 310	2 140		—	—	—	2 230	48	M30×3	50	13 600	○	3 530
2TR2376CS	2	2 800	2 376	180	2 400	12	200	130	180	—	2 582	2 605	2 550	2 450		2 750	84	ϕ23.5	2 500	84	M27	50	7 200	○	1 920
2TR2448-1CS	1	2 980	2 448	330	2 480	16	155	160	265	65	2 710	2 770	2 700	2 540		—	—	—	2 630	60	M30×3	50	15 200	○	4 240
2TR2450CS	1	2 980	2 464	330	2 492	14	178	160	265	65	2 710	2 770	2 700	2 540		—	—	—	2 630	60	M30×3	50	15 200	○	4 200
2TR3000ACS	2	3 500	2 996	210	3 024	14	216	160	210	-10	3 256	3 266	3 210	3 070		3 455	96	ϕ23	3 140	96	M33×3	50	10 000	○	3 300
2TR3180-1CS	1	3 797	3 180	330	3 220	20	161	220	285	45	3 516	3 580	3 488	3 305		—	—	—	3 405	96	M36×3	60	20 300	○	6 390
2TR3216CS	1	3 800	3 216	330	3 248	16	203	200	285	45	3 516	3 580	3 488	3 305		—	—	—	3 405	96	M33×3	55	20 300	○	6 200

Spherical roller bearing for wind turbine generator main shaft





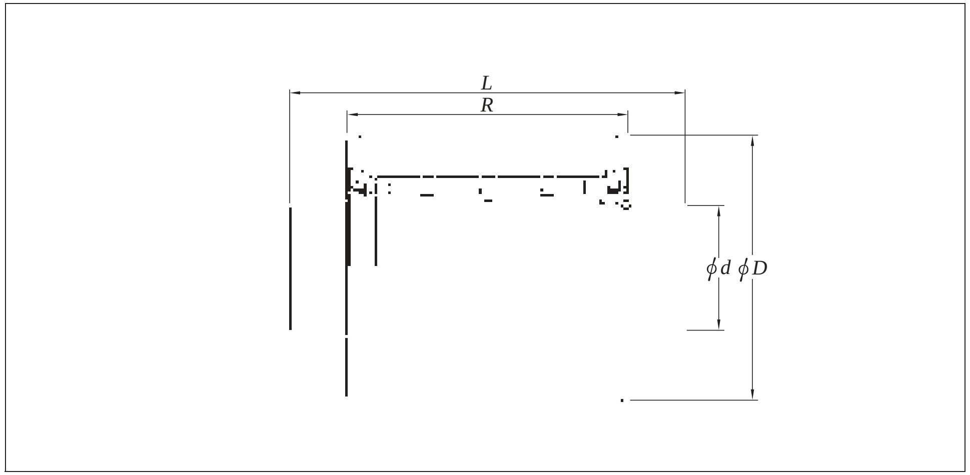
Structure of wind turbine generator

Features of spherical roller bearing for wind turbine generator main shaft

- The bearing, featuring superior radial load rating, can accommodate radial load and axial load in both directions.
- Optimization of raceway profile allows stable rotation performance.
- It absorbs misaligement in mounting and deflection. (Allowable aligning angle : 1° or more)

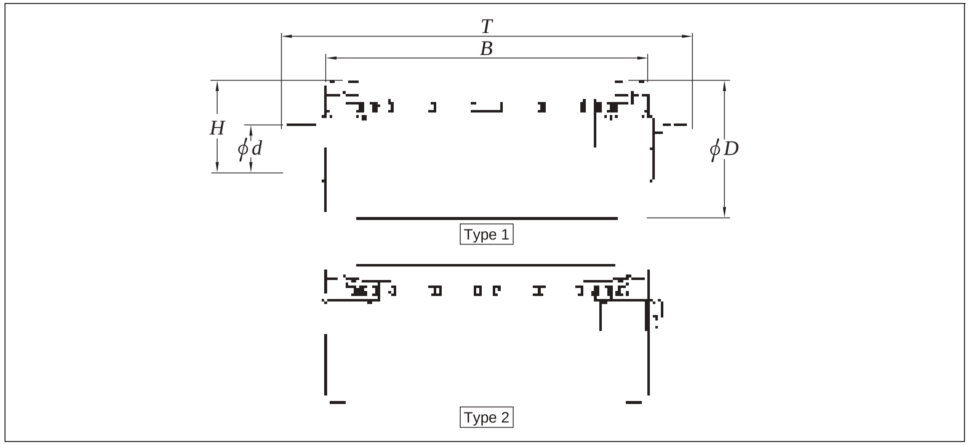
Bearing No.	**Boundary dimensions** (mm)		
	d	*D*	*B*
24156	280	460	180
23060	300	460	118
23160	300	500	160
23064	320	480	121
24064	320	480	160
23188	440	720	226
24188	440	720	280
24096	480	700	218
230/530	530	780	185
230/560	560	820	195
240/600	600	870	272
230/630	630	920	212
240/630	630	920	290
240/710	710	1 030	315
230/750	750	1 090	250
230/850	850	1 220	272
240/900	900	1 280	375
240/950	950	1 360	412

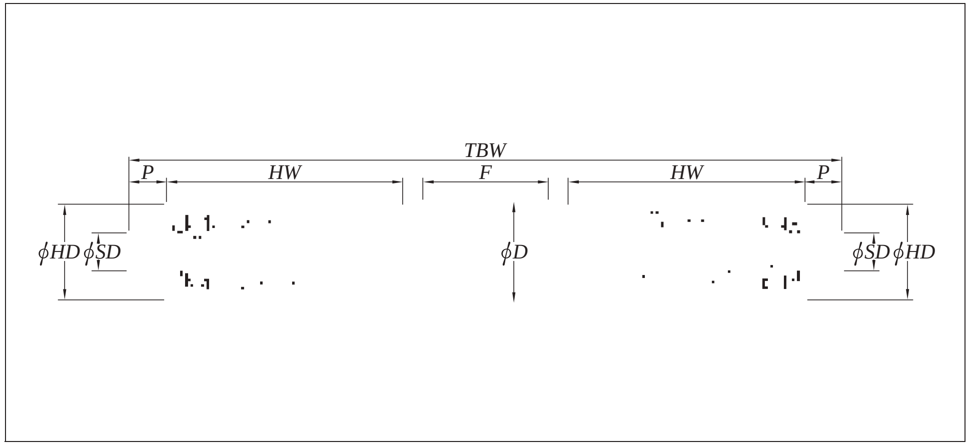
Back-up roll units for hot leveler



Boundary dimensions (mm)				**Bearing No.**	**Basic load ratings** (kN)		**Mass** (kg)
D	*d*	*R*	*L*		C_r	C_{0r}	
190	75	191	280	**RM783C**	591	964	42
200	90	230	310	**RM962A**	830	1 590	55
255	120	300	410	**RM876B**	1 440	2 890	120
310	130	370	480	**RM1004**	2 200	4 450	209
320	150	277	380	**RM782H**	1 760	3 340	171
412	180	295	420	**RM736D**	2 810	5 540	309
442	185	320	460	**RM821C**	2 910	5 350	374

Back-up roll units for tension leveler

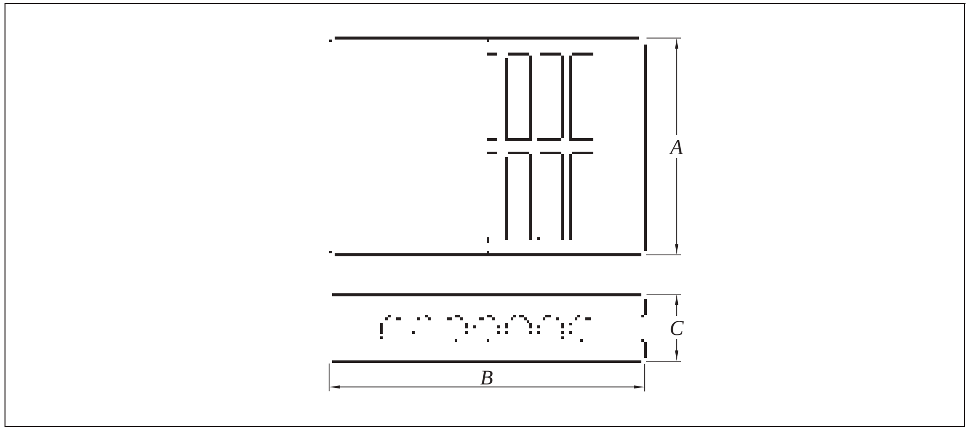




Boundary dimensions (mm)					Bearing No.	Basic load ratings (kN)		Types
D	*B*	*d*	*T*	*H*		C_r	C_{0r}	
47	115	20	145	33.5	**TLW47115**	58.5	113	2
50	80	24	106	37	**TLD50080**	42	70.5	1
	115	20	153	35	**TLD50115**	75.8	120	1
	180	20	218	35	**TLD50180**	75.8	120	1
51	150	22	191	36.5	**TLD51150**	75.8	120	1
	240	22	281	36.5	**TLD51240**	75.8	120	1
53	128	24	178	38.5	**TLW53128**	53.3	122	2
	218	24	268	38.5	**TLW53218**	53.3	122	2
63	163	22.2	204	42.5	**TLD63163**	92.6	187	1
	240	22	281	42.5	**TLW63240**	92.6	187	2
	275	22.2	316	42.5	**TLD63275**	92.6	187	1
	352	22	393	42.5	**TLW63352**	92.6	187	2
65	155	24	205	44.5	**TLW65155A**	92.6	187	2
	204	24	243	44.5	**TLD65204**	92.6	187	1
	258	24	308	44.5	**TLW65258A**	92.6	187	2
	275	24	314	44.5	**TLD65275**	92.6	187	1
75	155	30	205	52.5	**TLW75155E**	147	253	2
	170	30	215	52.5	**TLD75170A**	147	253	1
	258	30	308	52.5	**TLW75258E**	147	253	2
	265	30	310	52.5	**TLD75265A**	147	253	1
90	170	31	218	60.5	**TLW90170**	149	227	2
	280	31	328	60.5	**TLW90280**	149	227	2
130	285	69.5	348	99.75	**TLW130285E**	154	349	2
	450	69.5	513	99.75	**TLW130450E**	154	349	2

Boundary dimensions (mm)							Bearing No.	Mass (kg)
D	*F*	*SD*	*HW*	*P*	*TBW*	*HD*		
30	1 250	8	92	10	1 466	26	**WTL301250S08B**	7.5
	1 500	8	92	10	1 716	26	**WTL301500S08A**	8.9
38	1 250	12	70	10	1 410	29	**WTL381250AS12F**	11.5
	1 500	12	92	10	1 716	32	**WTL381500S12**	14.2
40	1 250	12	80	10	1 482	29	**WTL401250AS12E**	13.1
	1 500	12	92	10	1 716	32	**WTL401500AS12D-1**	15.6
46	1 900	15	94	14.75	2 133.5	38	**WTL461900S15**	26.0
50	1 250	12	92	10	1 466	32	**WTL501250S12D**	20.2
	1 500	12	92	10	1 716	32	**WTL501500AS12D-1**	23.3
52	1 900	15	94	14.75	2 133.5	38	**WTL521900S15B-1**	32.5
60	1 250	12	80	10	1 482	29	**WTL601250S12E**	28.6
	1 500	25	110	15	1 810	56	**WTL601500S25**	36.5
	1 900	15	94	14.75	2 133.5	38	**WTL601900S15B-1**	43.0
80	1 250	12	92	10	1 466	32	**WTL801250S12D**	49.7
	1 500	12	92	10	1 716	32	**WTL801500S12D-1**	58.8
100	1 250	12	92	10	1 466	32	**WTL1001250S12D**	77.1
	1 500	12	92	10	1 716	32	**WTL1001500S12**	92.3

Ladder bearing for converter



Ladder bearings smoothly absorb (let off) thermal expansion of the trunnion ring during operation.

Boundary dimensions (mm)			Bearing No.	Basic static load rating (kN)	Converter capacity (ton)
A	*B*	*C*		C_{0r}	
83	340	90	**THP83X340B**	2 570	60
280	420	95	**THP280X420**	11 800	200
300	400	80	**THP300X400B**	6 690	150
400	400	85	**THP400X400**	14 900	200

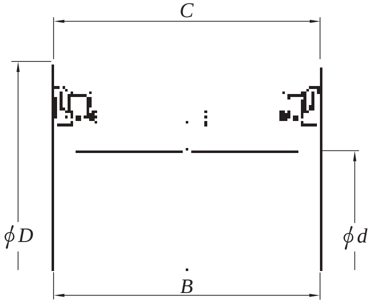
Trunnion split bearing for converter

In integral type bearings, if they are required to be replaced at fixed side, all the tilting units surrounding the bearings must be removed, and exceedingly major replacement work has been required.
Use of split bearing enables easy handling of bearings and easy maintenance in the future.

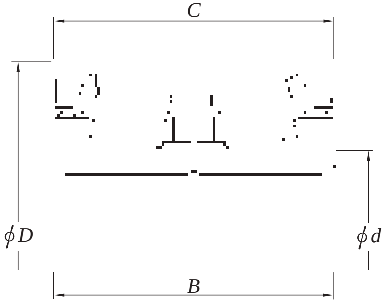
Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)		Converter capacity (ton)
Bore diameter	Outside diameter	Inner ring width	Outer ring width		C_r	C_{0r}	
420	620	150	94	**SP/92532W33CC3**	2 130	4 060	160
750	1 090	395	250	**SP/SR750W33-1C3**	7 950	18 200	—
1 250	1 750	610	390	**SP/SR1250W33-1C3**	18 800	48 100	—
1 396	1 700	168+10	90	**SP/SC1400CS780**	2 780	8 620	—

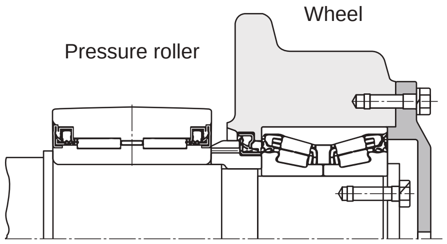
Sealed bearing for sintered equipment

· Bearing for pressure roller
Sealed type double-row cylindrical roller bearing



· Wheel bearing
Sealed type double-row tapered roller bearing





Bearing for pressure roller

- Special seals are provided on both sides to prevent ingress of sintered dusts.
- Special heat resistant grease withstanding high temperature and long use is adopted.
- High load rating full complement type.
- Thickness is optimized to secure strength of outer ring.
- Internal clearance of bearing is optimized.

Wheel bearing

- The seal mechanism prevents ingress of foreign matters into bearings.
- Special heat resistant grease withstanding high temperature and long use is adopted.
- Crowning is optimized to accommodate heavy load.
- Internal clearance of bearing is optimized.
- Bearing with the inner ring having locating snap ring to improve retrofitting performance is also available.

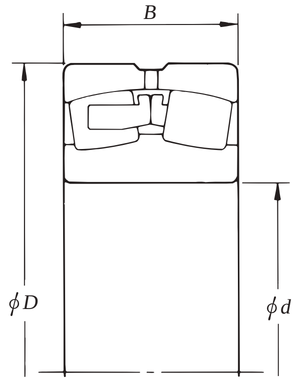
Bearing for pressure roller

Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)	
d	D	B	C		C_r	C_{0r}
120	210	132	132	**24DCS21132V**	449	1 400
130	210	150	150	**26DCS21150V**	540	1 830
160	250	140	140	**32DCS25140BV**	922	2 120

Wheel bearing

Boundary dimensions (mm)				Bearing No.	Basic load ratings (kN)	
d	D	B	C		C_r	C_{0r}
90	160	78	78	**46T181608A-1RS-1**	350	522
100	180	100	100	**46T201810RS-5**	443	676
110	200	90	90	**46T222009BRS**	477	704

Spherical roller bearings for shaker screens



22326ROVSW502
C_r = 948 kN
C_{0r} = 1 200 kN

Features of the bearings for shaker screens

(1) Considering lubricant flow under vibration and lubricating status of sliding surface, outer ring guided cage in special profile is used.
(2) The cage is made of high-tensile brass casting for sufficient strength and resistance to wear.
(3) While the bearing is rotated, peripheral speed difference occurs to the double row rollers. To prevent damages to cage including wear and breakage, separate and non-incorporated, prong type machined cage is used.
(4) For smooth rolling motion of rollers, asymmetrical rollers having cone center are adopted.
(5) Especially, bearing outside diameter tolerance is held to a small allowable variation.
(6) C3 or C4 bearing internal clearance is used.

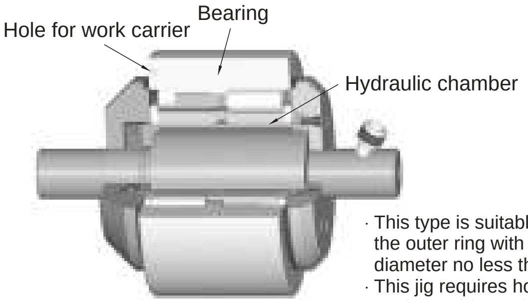
Bearing No.	Boundary dimensions (mm)		
	d	D	B
22320RROVSW502	100	215	73
22322RROVSW502	110	240	80
22324RROVSW502	120	260	86
22326RROVSW502	130	280	93
22328ROVSW502	140	300	102
22330ROVSW502	150	320	108

Bearing No.	Boundary dimensions (mm)		
	d	D	B
22332ROVSW502	160	340	114
22334ROVSW502	170	360	120
22336ROVSW502	180	380	126
22338ROVSW502	190	400	132
22340ROVSW502	200	420	138

- Bearing number of spherical roller bearings (mainly 223 series) should be followed by "R (RR) OVS W502".

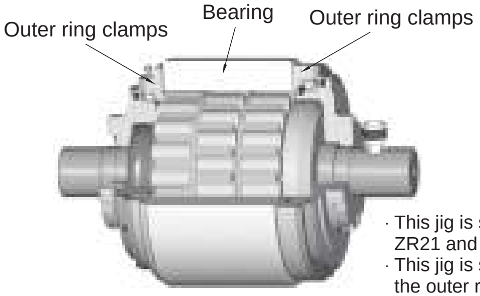
Regrinding jigs for bearings for backing shafts

TYPE 1



- This type is suitable to bearings with the outer ring with ribs and with a bore diameter no less than 70 mm.
- This jig requires holes for work carrier on the end face of the outer ring.

TYPE 2

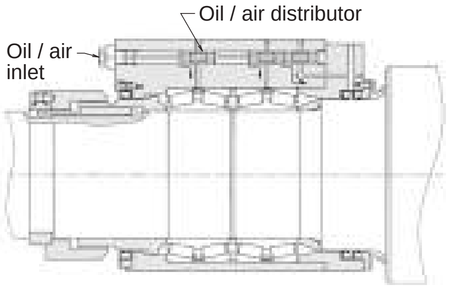


- This jig is suitable with bearings for ZR21 and ZR22 types.
- This jig is suitable with bearings with the outer ring without ribs.

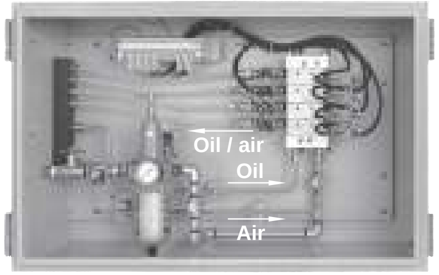
- The regrinding jig grinds the outside surfaces of bearings used on the backing shafts of multi-roll mills with high precision.
- The jig hydraulically grinds the outside surface while turning the outer ring and retaining the inner ring stationary, while it completely nullifies any clearance on the fitting surface between the jig and bearing and the internal clearance of the bearing, minimizing radial runout.
- The jig grinds bearing assemblies without need of disassembly, causing improvement in workability of installation and removal.

Oil / air lubricator for steel making and rolling equipment

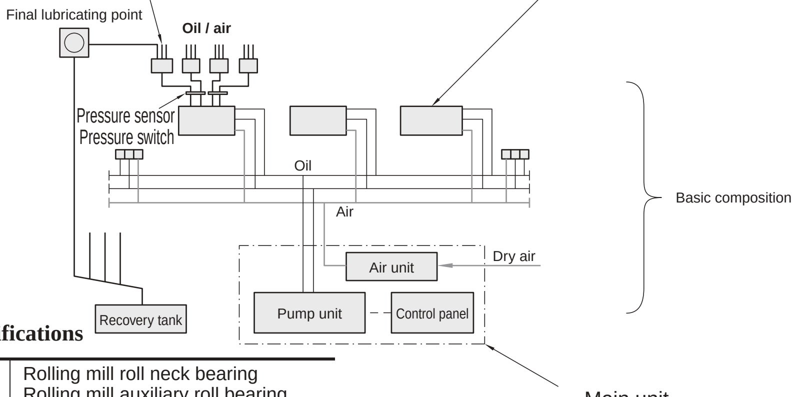
High sealing performance	Elimination of ingress of foreign matters by pressure in chock (housing)
High reliability of lubrication	Superior lubricating performance by using oil of high viscosity and synthetic oil
Clean working environment	Clean environment by recovering oil



Oil / air distributor



Mixing panel



Main unit

Main specifications

Lubricated object	Rolling mill roll neck bearing Rolling mill auxiliary roll bearing Continuous casting machine guide roll bearing Feed roll bearing, etc.
Tank capacity	From 250 to 2 000 ℓ
Number of lubricating points	1 000 points or more are available
Alarm unit	Respective sections in main unit End of oil and air piping
Lubricated oil q'ty	$Q = 0.085 \cdot d \cdot R/A$ Q : Lubricated oil q'ty cm^3/hour d : Bearing bore diameter mm R : Bearing row number A : Speed coefficient (normally $A = 5$)

Supplementary table 1 (1) SI units and conversion factors

Mass	SI units	Other units 1)	Conversion into SI units	Conversion from SI units
Angle	rad [radian(s)]	° [degree(s)] * ′ [minute(s)] * ″ [second(s)] *	1° = π /180 rad 1′ = π /10 800 rad 1″ = π /648 000 rad	1 rad = 57.295 78°
Length	m [meter(s)]	Å [Angstrom unit] μ [micron(s)] in [inch(es)] ft [foot(feet)] yd [yard(s)] mile [mile(s)]	1 Å = 10^{-10} m = 0.1 nm = 100 pm 1 μ = 1 μm 1 in = 25.4 mm 1 ft = 12 in = 0.304 8 m 1 yd = 3 ft = 0.914 4 m 1 mile = 5 280 ft = 1 609.344 m	1 m = 10^{10} Å 1 m = 39.37 in 1 m = 3.280 8 ft 1 m = 1.093 6 yd 1 km = 0.621 4 mile
Area	m^2	a [are(s)] ha [hectare(s)] acre [acre(s)]	1 a = 100 m^2 1 ha = 10^4 m^2 1 acre = 4 840 yd^2 = 4 046.86 m^2	 1 km^2 = 247.1 acre
Volume	m^3	ℓ, L [liter(s)] * cc [cubic centimeters] gal(US) [gallon(s)] floz(US) [fluid ounce(s)] barrel(US) [barrels(US)]	1 ℓ = 1 dm^3 = 10^{-3} m^3 1 cc = 1 cm^3 = 10^{-6} m^3 1 gal(US) = 231 in^3 = 3.785 41 dm^3 1 floz(US) = 29.573 5 cm^3 1 barrel(US) = 158.987 dm^3	1 m^3 = 10^3 ℓ 1 m^3 = 10^6 cc 1 m^3 = 264.17 gal 1 m^3 = 33 814 floz 1 m^3 = 6.289 8 barrel
Time	s [second(s)]	min [minute(s)] * h [hour(s)] * d [day(s)] *		
Angular velocity	rad / s			
Velocity	m / s	kn [knot(s)] m / h *	1 kn = 1 852 m / h	1 km / h = 0.539 96 kn
Acceleration	m / s^2	G	1 G = 9.806 65 m / s^2	1 m / s^2 = 0.101 97 G
Frequency	Hz [hertz]	c / s [cycle(s)/second]	1 c / s = 1s $^{-1}$ = 1 Hz	
Rotational frequency	s^{-1}	rpm [revolutions per minute] min^{-1} * r / min	1 rpm = 1 / 60 s^{-1}	1 s^{-1} = 60 rpm
Mass	kg [kilogram(s)]	t [ton(s)] * lb [pound(s)] gr [grain(s)] oz [ounce(s)] ton (UK) [ton(s)(UK)] ton (US) [ton(s)(US)] car [carat(s)]	1 t = 10^3 kg 1 lb = 0.453 592 37 kg 1 gr = 64.798 91 mg 1 oz = 1/16 lb = 28.349 5 g 1 ton(UK) = 1 016.05 kg 1 ton(US) = 907.185 kg 1 car = 200 mg	 1 kg = 2.204 6 lb 1 g = 15.432 4 gr 1 kg = 35.274 0 oz 1 t = 0.984 2 ton(UK) 1 t = 1.102 3 ton(US) 1 g = 5 car

[Note] * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 1 (2) SI units and conversion factors

Mass	SI units	Other units 1)	Conversion into SI units	Conversion from SI units
Density	kg / m^3			
Linear density	kg / m			
Momentum	kg·m / s			
Moment of momentum, angular momentum	kg·m^2 / s			
Moment of inertia	kg·m^2			
Force	N [newton(s)]	dyn [dyne(s)] kgf [kilogram-force] gf [gram-force] tf [ton-force] lbf [pound-force]	1 dyn = 10^{-5} N 1 kgf = 9.806 65 N 1 gf = $9.806\,65\times10^{-3}$ N 1 tf = $9.806\,65\times10^{3}$ N 1 lbf = 4.448 22 N	1 N = 10^5 dyn 1 N = 0.101 97 kgf 1 N = 0.224 809 lbf
Moment of force	N·m [Newton meter(s)]	gf·cm kgf·cm kgf·m tf·m lbf·ft	1 gf·cm = $9.806\,65\times10^{-5}$ N·m 1 kgf·cm = $9.806\,65\times10^{-2}$ N·m 1 kgf·m = 9.806 65 N·m 1 tf·m = $9.806\,65\times10^{3}$ N·m 1 lbf·ft = 1.355 82 N·m	 1 N·m = 0.101 97 kgf·m 1 N·m = 0.737 56 lbf·ft
Pressure, Normal stress	Pa [Pascal(s)] or N / m^2 {1 Pa = 1 N / m^2}	gf / cm^2 kgf / mm^2 kgf / m^2 lbf / in^2 bar [bar(s)] at [engineering air pressure] mH_2O, mAq [meter water column] atm [atmosphere] mHg [meter merury column] Torr [torr]	1 gf/cm^2 = $9.806\,65\times10$ Pa 1 kgf/mm^2 = $9.806\,65\times10^{6}$ Pa 1 kgf/m^2 = 9.806 65 Pa 1 lbf/in^2 = 6 894.76 Pa 1 bar = 10^5 Pa 1 at = 1 kgf/cm^2 = $9.806\,65\times10^{4}$ Pa 1 mH_2O = $9.806\,65\times10^{3}$ Pa 1 atm = 101 325 Pa 1 mHg = $\frac{101\,325}{0.76}$ Pa 1 Torr = 1 mmHg = 133.322 Pa	 1 MPa = 0.101 97 kgf / mm^2 1 Pa = 0.101 97 kgf / m^2 1 Pa = 0.145×10^{-3} lbf / in^2 1 Pa = 10^{-2} mbar 1 Pa = $7.500\,6\times10^{-3}$ Torr
Viscosity	Pa·s [pascal second]	P [poise] kgf·s / m^2	10^{-2} P = 1 cP = 1 mPa·s 1 kgf·s / m^2 = 9.806 65 Pa·s	 1 Pa·s = 0.101 97 kgf·s / m^2
Kinematic viscosity	m^2 / s	St [stokes]	10^{-2} St = 1 cSt = 1 mm^2 / s	
Surface tension	N / m			

Supplementary table 1 (3) SI units and conversion factors

Mass	SI units	Other units [1)	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J=1 N·m}	eV [electron volt(s)] * erg [erg(s)] kgf·m lbf·ft	1 eV = (1.602 189 2± 0.000 004 6)×10^{-19} J 1 erg = 10^{-7} J 1 kgf·m = 9.806 65 J 1 lbf·ft = 1.355 82 J	1 J = 10^{7} erg 1 J = 0.101 97 kgf·m 1 J = 0.737 56 lbf·ft
Power	W [watt(s)]	erg / s [ergs per second] kgf·m / s PS [French horse-power] HP [horse-power (British)] lbf·ft / s	1 erg / s = 10^{-7} W 1 kgf·m / s = 9.806 65 W 1 PS = 75 kgf·m / s = 735.5 W 1 HP = 550 lbf·ft / s = 745.7 W 1 lbf·ft / s = 1.355 82 W	1 W = 0.101 97 kgf·m / s 1 W = 0.001 36 PS 1 W = 0.001 34 HP
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	℃ [Celsius(s)] {t ℃ = (t + 273.15) K}	℉ [degree(s) Fahrenheit]	t ℉ = $\frac{5}{9}$ (t – 32) ℃	t ℃ = ($\frac{9}{5}$t + 32) ℉
Linear expansion coefficient	K^{-1}	$℃^{-1}$ [per degree]		
Heat	J [joule(s)] {1 J=1 N·m}	erg [erg(s)] kgf·m cal_{IT} [I. T. calories]	1 erg = 10^{-7} J 1 cal_{IT} = 4.186 8 J 1 $Mcal_{IT}$ = 1.163 kW·h	1 J = 10^{7} erg 1 J = 0.238 85 cal_{IT} 1 kW·h = 0.86 × 10^{6} cal_{IT}
Thermal conductivity	W / (m·K)	W / (m·℃) cal / (s·m·℃)	1 W / (m·℃) = 1 W / (m·K) 1 cal / (s·m·℃) = 4.186 05 W / (m·K)	
Coefficient of heat transfer	W / (m^2·K)	W / (m^2·℃) cal / (s·m^2·℃)	1 W / (m^2·℃) = 1 W / (m^2·K) 1 cal / (s·m^2·℃) = 4.186 05 W / (m^2·K)	
Heat capacity	J / K	J / ℃	1 J / ℃ = 1 J / K	
Massic heat capacity	J / (kg·K)	J / (kg·℃)		

[Note] * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 2 Inch/millimeter conversion

Inch		Inches										
		0	1	2	3	4	5	6	7	8	9	10
		mm										
0	0	**0**	**25.4000**	**50.8000**	**76.2000**	**101.6000**	**127.0000**	**152.4000**	**177.8000**	**203.2000**	**228.6000**	**254.0000**
1/64	0.015625	0.3969	25.7969	51.1969	76.5969	101.9969	127.3969	152.7969	178.1969	203.5969	228.9969	254.3969
1/32	0.03125	0.7938	26.1938	51.5938	76.9938	102.3938	127.7938	153.1938	178.5938	203.9938	229.3938	254.7938
3/64	0.046875	1.1906	26.5906	51.9906	77.3906	102.7906	128.1906	153.5906	178.9906	204.3906	229.7906	255.1906
1/16	0.0625	1.5875	26.9875	52.3875	77.7875	103.1875	128.5875	153.9875	179.3875	204.7875	230.1875	255.5875
5/64	0.078125	1.9844	27.3844	52.7844	78.1844	103.5844	128.9844	154.3844	179.7844	205.1844	230.5844	255.9844
3/32	0.09375	2.3812	27.7812	53.1812	78.5812	103.9812	129.3812	154.7812	180.1812	205.5812	230.9812	256.3812
7/64	0.109375	2.7781	28.1781	53.5781	78.9781	104.3781	129.7781	155.1781	180.5781	205.9781	231.3781	256.7781
1/8	0.125	**3.1750**	**28.5750**	**53.9750**	**79.3750**	**104.7750**	**130.1750**	**155.5750**	**180.9750**	**206.3750**	**231.7750**	**257.1750**
9/64	0.140625	3.5719	28.9719	54.3719	79.7719	105.1719	130.5719	155.9719	181.3719	206.7719	232.1719	257.5719
5/32	0.15625	3.9688	29.3688	54.7688	80.1688	105.5688	130.9688	156.3688	181.7688	207.1688	232.5688	257.9688
11/64	0.171875	4.3656	29.7656	55.1656	80.5656	105.9656	131.3656	156.7656	182.1656	207.5656	232.9656	258.3656
3/16	0.1875	4.7625	30.1625	55.5625	80.9625	106.3625	131.7625	157.1625	182.5625	207.9625	233.3625	258.7625
13/64	0.203125	5.1594	30.5594	55.9594	81.3594	106.7594	132.1594	157.5594	182.9594	208.3594	233.7594	259.1594
7/32	0.21875	5.5562	30.9562	56.3562	81.7562	107.1562	132.5562	157.9562	183.3562	208.7562	234.1562	259.5562
15/64	0.234375	5.9531	31.3531	56.7531	82.1531	107.5531	132.9531	158.3531	183.7531	209.1531	234.5531	259.9531
1/4	0.25	**6.3500**	**31.7500**	**57.1500**	**82.5500**	**107.9500**	**133.3500**	**158.7500**	**184.1500**	**209.5500**	**234.9500**	**260.3500**
17/64	0.265625	6.7469	32.1469	57.5469	82.9469	108.3469	133.7469	159.1469	184.5469	209.9469	235.3469	260.7469
9/32	0.28125	7.1438	32.5438	57.9438	83.3438	108.7438	134.1438	159.5438	184.9438	210.3438	235.7438	261.1438
19/64	0.296875	7.5406	32.9406	58.3406	83.7406	109.1406	134.5406	159.9406	185.3406	210.7406	236.1406	261.5406
5/16	0.3125	7.9375	33.3375	58.7375	84.1375	109.5375	134.9375	160.3375	185.7375	211.1375	236.5375	261.9375
21/64	0.328125	8.3344	33.7344	59.1344	84.5344	109.9344	135.3344	160.7344	186.1344	211.5344	236.9344	262.3344
11/32	0.34375	8.7312	34.1312	59.5312	84.9312	110.3312	135.7312	161.1312	186.5312	211.9312	237.3312	262.7312
23/64	0.359375	9.1281	34.5281	59.9281	85.3281	110.7281	136.1281	161.5281	186.9281	212.3281	237.7281	263.1281
3/8	0.375	**9.5250**	**34.9250**	**60.3250**	**85.7250**	**111.1250**	**136.5250**	**161.9250**	**187.3250**	**212.7250**	**238.1250**	**263.5250**
25/64	0.390625	9.9219	35.3219	60.7219	86.1219	111.5219	136.9219	162.3219	187.7219	213.1219	238.5219	263.9219
13/32	0.40625	10.3188	35.7188	61.1188	86.5188	111.9188	137.3188	162.7188	188.1188	213.5188	238.9188	264.3188
27/64	0.421875	10.7156	36.1156	61.5156	86.9156	112.3156	137.7156	163.1156	188.5156	213.9156	239.3156	264.7156
7/16	0.4375	11.1125	36.5125	61.9125	87.3125	112.7125	138.1125	163.5125	188.9125	214.3125	239.7125	265.1125
29/64	0.453125	11.5094	36.9094	62.3094	87.7094	113.1094	138.5094	163.9094	189.3094	214.7094	240.1094	265.5094
15/32	0.46875	11.9062	37.3062	62.7062	88.1062	113.5062	138.9062	164.3062	189.7062	215.1062	240.5062	265.9062
31/64	0.484375	12.3031	37.7031	63.1031	88.5031	113.9031	139.3031	164.7031	190.1031	215.5031	240.9031	266.3031
1/2	0.5	**12.7000**	**38.1000**	**63.5000**	**88.9000**	**114.3000**	**139.7000**	**165.1000**	**190.5000**	**215.9000**	**241.3000**	**266.7000**
33/64	0.515625	13.0969	38.4969	63.8969	89.2969	114.6969	140.0969	165.4969	190.8969	216.2969	241.6969	267.0969
17/32	0.53125	13.4938	38.8938	64.2938	89.6938	115.0938	140.4938	165.8938	191.2938	216.6938	242.0938	267.4938
35/64	0.546875	13.8906	39.2906	64.6906	90.0906	115.4906	140.8906	166.2906	191.6906	217.0906	242.4906	267.8906
9/16	0.5625	14.2875	39.6875	65.0875	90.4875	115.8875	141.2875	166.6875	192.0875	217.4875	242.8875	268.2875
37/64	0.578125	14.6844	40.0844	65.4844	90.8844	116.2844	141.6844	167.0844	192.4844	217.8844	243.2844	268.6844
19/32	0.59375	15.0812	40.4812	65.8812	91.2812	116.6812	142.0812	167.4812	192.8812	218.2812	243.6812	269.0812
39/64	0.609375	15.4781	40.8781	66.2781	91.6781	117.0781	142.4781	167.8781	193.2781	218.6781	244.0781	269.4781
5/8	0.625	**15.8750**	**41.2750**	**66.6750**	**92.0750**	**117.4750**	**142.8750**	**168.2750**	**193.6750**	**219.0750**	**244.4750**	**269.8750**
41/64	0.640625	16.2719	41.6719	67.0719	92.4719	117.8719	143.2719	168.6719	194.0719	219.4719	244.8719	270.2719
21/32	0.65625	16.6688	42.0688	67.4688	92.8688	118.2688	143.6688	169.0688	194.4688	219.8688	245.2688	270.6688
43/64	0.671875	17.0656	42.4656	67.8656	93.2656	118.6656	144.0656	169.4656	194.8656	220.2656	245.6656	271.0656
11/16	0.6875	17.4625	42.8625	68.2625	93.6625	119.0625	144.4625	169.8625	195.2625	220.6625	246.0625	271.4625
45/64	0.703125	17.8594	43.2594	68.6594	94.0594	119.4594	144.8594	170.2594	195.6594	221.0594	246.4594	271.8594
23/32	0.71875	18.2562	43.6562	69.0562	94.4562	119.8562	145.2562	170.6562	196.0562	221.4562	246.8562	272.2562
47/64	0.734375	18.6531	44.0531	69.4531	94.8531	120.2531	145.6531	171.0531	196.4531	221.8531	247.2531	272.6531
3/4	0.75	**19.0500**	**44.4500**	**69.8500**	**95.2500**	**120.6500**	**146.0500**	**171.4500**	**196.8500**	**222.2500**	**247.6500**	**273.0500**
49/64	0.765625	19.4469	44.8469	70.2469	95.6469	121.0469	146.4469	171.8469	197.2469	222.6469	248.0469	273.4469
25/32	0.78125	19.8438	45.2438	70.6438	96.0438	121.4438	146.8438	172.2438	197.6438	223.0438	248.4438	273.8438
51/64	0.796875	20.2406	45.6406	71.0406	96.4406	121.8406	147.2406	172.6406	198.0406	223.4406	248.8406	274.2406
13/16	0.8125	20.6375	46.0375	71.4375	96.8375	122.2375	147.6375	173.0375	198.4375	223.8375	249.2375	274.6375
53/64	0.828125	21.0344	46.4344	71.8344	97.2344	122.6344	148.0344	173.4344	198.8344	224.2344	249.6344	275.0344
27/32	0.84375	21.4312	46.8312	72.2312	97.6312	123.0312	148.4312	173.8312	199.2312	224.6312	250.0312	275.4312
55/64	0.859375	21.8281	47.2281	72.6281	98.0281	123.4281	148.8281	174.2281	199.6281	225.0281	250.4281	275.8281
7/8	0.875	**22.2250**	**47.6250**	**73.0250**	**98.4250**	**123.8250**	**149.2250**	**174.6250**	**200.0250**	**225.4250**	**250.8250**	**276.2250**
57/64	0.890625	22.6219	48.0219	73.4219	98.8219	124.2219	149.6219	175.0219	200.4219	225.8219	251.2219	276.6219
29/32	0.90625	23.0188	48.4188	73.8188	99.2188	124.6188	150.0188	175.4188	200.8188	226.2188	251.6188	277.0188
59/64	0.921875	23.4156	48.8156	74.2156	99.6156	125.0156	150.4156	175.8156	201.2156	226.6156	252.0156	277.4156
15/16	0.9375	23.8125	49.2125	74.6125	100.0125	125.4125	150.8125	176.2125	201.6125	227.0125	252.4125	277.8125
61/64	0.953125	24.2094	49.6094	75.0094	100.4094	125.8094	151.2094	176.6094	202.0094	227.4094	252.8094	278.2094
31/32	0.96875	24.6062	50.0062	75.4062	100.8062	126.2062	151.6062	177.0062	202.4062	227.8062	253.2062	278.6062
63/64	0.984375	25.0031	50.4031	75.8031	101.2031	126.6031	152.0031	177.4031	202.8031	228.2031	253.6031	279.0031

Supplementary table 3 Steel hardness conversion

Rockwell	Vicker's	Brinell		Rockwell		Shore
C-scale 1 471.0 N (150 kgf)		**Standard ball**	**Tungsten carbide ball**	**A-scale** 588.4 N (60 kgf)	**B-scale** 980.7 N (100 kgf)	
68	940			85.6		97
67	900			85.0		95
66	865			84.5		92
65	832		739	83.9		91
64	800		722	83.4		88
63	772		705	82.8		87
62	746		688	82.3		85
61	720		670	81.8		83
60	697		654	81.2		81
59	674		634	80.7		80
58	653		615	80.1		78
57	633		595	79.6		76
56	613		577	79.0		75
55	595	–	560	78.5		74
54	577	–	543	78.0		72
53	560	–	525	77.4		71
52	544	500	512	76.8		69
51	528	487	496	76.3		68
50	513	475	481	75.9		67
49	498	464	469	75.2		66
48	484	451	455	74.7		64
47	471	442	443	74.1		63
46	458	432	432	73.6		62
45	446	421		73.1		60
44	434	409		72.5		58
43	423	400		72.0		57
42	412	390		71.5		56
41	402	381		70.9		55
40	392	371		70.4	–	54
39	382	362		69.9	–	52
38	372	353		69.4	–	51
37	363	344		68.9	–	50
36	354	336		68.4	(109.0)	49
35	345	327		67.9	(108.5)	48
34	336	319		67.4	(108.0)	47
33	327	311		66.8	(107.5)	46
32	318	301		66.3	(107.0)	44
31	310	294		65.8	(106.0)	43
30	302	286		65.3	(105.5)	42
29	294	279		64.7	(104.5)	41
28	286	271		64.3	(104.0)	41
27	279	264		63.8	(103.0)	40
26	272	258		63.3	(102.5)	38
25	266	253		62.8	(101.5)	38
24	260	247		62.4	(101.0)	37
23	254	243		62.0	100.0	36
22	248	237		61.5	99.0	35
21	243	231		61.0	98.5	35
20	238	226		60.5	97.8	34
(18)	230	219		–	96.7	33
(16)	222	212		–	95.5	32
(14)	213	203		–	93.9	31
(12)	204	194		–	92.3	29
(10)	196	187			90.7	28
(8)	188	179			89.5	27
(6)	180	171			87.1	26
(4)	173	165			85.5	25
(2)	166	158			83.5	24
(0)	160	152			81.7	24

Supplementary table 4 Viscosity conversion

Kinematic viscosity mm^2/s	**Saybolt** SUS (second)		**Redwood** R (second)		**Engler** E (degree)
	100 ℉	210 ℉	50 ℃	100 ℃	
2	32.6	32.8	30.8	31.2	1.14
3	36.0	36.3	33.3	33.7	1.22
4	39.1	39.4	35.9	36.5	1.31
5	42.3	42.6	38.5	39.1	1.40
6	45.5	45.8	41.1	41.7	1.48
7	48.7	49.0	43.7	44.3	1.56
8	52.0	52.4	46.3	47.0	1.65
9	55.4	55.8	49.1	50.0	1.75
10	58.8	59.2	52.1	52.9	1.84
11	62.3	62.7	55.1	56.0	1.93
12	65.9	66.4	58.2	59.1	2.02
13	69.6	70.1	61.4	62.3	2.12
14	73.4	73.9	64.7	65.6	2.22
15	77.2	77.7	68.0	69.1	2.32
16	81.1	81.7	71.5	72.6	2.43
17	85.1	85.7	75.0	76.1	2.54
18	89.2	89.8	78.6	79.7	2.64
19	93.3	94.0	82.1	83.6	2.76
20	97.5	98.2	85.8	87.4	2.87
21	102	102	89.5	91.3	2.98
22	106	107	93.3	95.1	3.10
23	110	111	97.1	98.9	3.22
24	115	115	101	103	3.34
25	119	120	105	107	3.46
26	123	124	109	111	3.58
27	128	129	112	115	3.70
28	132	133	116	119	3.82
29	137	138	120	123	3.95
30	141	142	124	127	4.07
31	145	146	128	131	4.20
32	150	150	132	135	4.32
33	154	155	136	139	4.45
34	159	160	140	143	4.57
35	163	164	144	147	4.70
36	168	170	148	151	4.83
37	172	173	153	155	4.96
38	177	178	156	159	5.08
39	181	183	160	164	5.21
40	186	187	164	168	5.34
41	190	192	168	172	5.47
42	195	196	172	176	5.59
43	199	201	176	180	5.72
44	204	205	180	185	5.85
45	208	210	184	189	5.98
46	213	215	188	193	6.11
47	218	219	193	197	6.24
48	222	224	197	202	6.37
49	227	228	201	206	6.50
50	231	233	205	210	6.63
55	254	256	225	231	7.24
60	277	279	245	252	7.90
65	300	302	266	273	8.55
70	323	326	286	294	9.21
75	346	349	306	315	9.89
80	371	373	326	336	10.5
85	394	397	347	357	11.2
90	417	420	367	378	11.8
95	440	443	387	399	12.5
100	464	467	408	420	13.2
120	556	560	490	504	15.8
140	649	653	571	588	18.4
160	742	747	653	672	21.1
180	834	840	734	757	23.7
200	927	933	816	841	26.3
250	1 159	1 167	1 020	1 051	32.9
300	1 391	1 400	1 224	1 241	39.5

[Remark] 1 mm^2 / s = 1 cSt (centi stokes)

Supplementary table 5 Shaft tolerances (deviation from nominal dimensions)

Unit : µm (Refer.)

Nominal shaft dia. (mm)		Deviation classes of shaft dia.																											Nominal shaft dia. (mm)		$\varDelta_{dmp}$1) of bearing (class 0)
over	up to	d 6	e 6	f 6	g 5	g 6	h 5	h 6	h 7	h 8	h 9	h 10	js 5	js 6	js 7	j 5	j 6	k 5	k 6	k 7	m 5	m 6	m 7	n 5	n 6	p 6	r 6	r 7	over	up to	
30	50	−80 −96	−50 −66	−25 −41	−9 −20	−9 −25	0 −11	0 −16	0 −25	0 −39	0 −62	0 −100	±5.5	±8	±12.5	+6 −5	+11 −5	+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+34 +9	+28 +17	+33 +17	+42 +26	+50 +34	+59 +34	30	50	0 −12
50	80	−100 −119	−60 −79	−30 −49	−10 −23	−10 −29	0 −13	0 −19	0 −30	0 −46	0 −74	0 −120	±6.5	±9.5	±15	+6 −7	+12 −7	+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+41 +11	+33 +20	+39 +20	+51 +32	+60 +41	+71 +41	50	65	0 −15
																											+62 +43	+73 +43	65	80	
80	120	−120 −142	−72 −94	−36 −58	−12 −27	−12 −34	0 −15	0 −22	0 −35	0 −54	0 −87	0 −140	±7.5	±11	±17.5	+6 −9	+13 −9	+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+48 +13	+38 +23	+45 +23	+59 +37	+73 +51	+86 +51	80	100	0 −20
																											+76 +54	+89 +54	100	120	
120	180	−145 −170	−85 −110	−43 −68	−14 −32	−14 −39	0 −18	0 −25	0 −40	0 −63	0 −100	0 −160	±9	±12.5	±20	+7 −11	+14 −11	+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+55 +15	+45 +27	+52 +27	+68 +43	+88 +63	+103 +63	120	140	0 −25
																											+90 +65	+105 +65	140	160	
																											+93 +68	+108 +68	160	180	
180	250	−170 −199	−100 −129	−50 −79	−15 −35	−15 −44	0 −20	0 −29	0 −46	0 −72	0 −115	0 −185	±10	±14.5	±23	+7 −13	+16 −13	+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+63 +17	+51 +31	+60 +31	+79 +50	+106 +77	+123 +77	180	200	0 −30
																											+109 +80	+126 +80	200	225	
																											+113 +84	+130 +84	225	250	
250	315	−190 −222	−110 −142	−56 −88	−17 −40	−17 −49	0 −23	0 −32	0 −52	0 −81	0 −130	0 −210	±11.5	±16	±26	+7 −16	±16	+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+72 +20	+57 +34	+66 +34	+88 +56	+126 +94	+146 +94	250	280	0 −35
																											+130 +98	+150 +98	280	315	
315	400	−210 −246	−125 −161	−62 −98	−18 −43	−18 −54	0 −25	0 −36	0 −57	0 −89	0 −140	0 −230	±12.5	±18	±28.5	+7 −18	±18	+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+78 +21	+62 +37	+73 +37	+98 +62	+144 +108	+165 +108	315	355	0 −40
																											+150 +114	+171 +114	355	400	
400	500	−230 −270	−135 −175	−68 −108	−20 −47	−20 −60	0 −27	0 −40	0 −63	0 −97	0 −155	0 −250	±13.5	±20	±31.5	+7 −20	±20	+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+86 +23	+67 +40	+80 +40	+108 +68	+166 +126	+189 +126	400	450	0 −45
																											+172 +132	+195 +132	450	500	
500	630	−260 −304	−145 −189	−76 −120	−22 −54	−22 −66	0 −32	0 −44	0 −70	0 −110	0 −175	0 −280	±16	±22	±35	–	–	+32 0	+44 0	+70 0	+58 +26	+70 +26	+96 +26	+76 +44	+88 +44	+122 +78	+194 +150	+220 +150	500	560	0 −50
																											+199 +155	+225 +155	560	630	
630	800	−290 −340	−160 −210	−80 −130	−24 −60	−24 −74	0 −36	0 −50	0 −80	0 −125	0 −200	0 −320	±18	±25	±40	–	–	+36 0	+50 0	+80 0	+66 +30	+80 +30	+110 +30	+86 +50	+100 +50	+138 +88	+225 +175	+255 +175	630	710	0 −75
																											+235 +185	+265 +185	710	800	
800	1 000	−320 −376	−170 −226	−86 −142	−26 −66	−26 −82	0 −40	0 −56	0 −90	0 −140	0 −230	0 −360	±20	±28	±45	–	–	+40 0	+56 0	+90 0	+74 +34	+90 +34	+124 +34	+96 +56	+112 +56	+156 +100	+266 +210	+300 +210	800	900	0 −100
																											+276 +220	+310 +220	900	1 000	
1 000	1 250	−350 −416	−195 −261	−98 −164	−28 −75	−28 −94	0 −47	0 −66	0 −105	0 −165	0 −260	0 −420	±23.5	±33	±52.5	–	–	+47 0	+66 0	+105 0	+87 +40	+106 +40	+145 +40	+113 +66	+132 +66	+186 +120	+316 +250	+355 +250	1 000	1 120	0 −125
																											+326 +260	+365 +260	1 120	1 250	
1 250	1 600	−390 −468	−220 −298	−110 −188	−30 −85	−30 −108	0 −55	0 −78	0 −125	0 −195	0 −310	0 −500	±27.5	±39	±62.5	–	–	+55 0	+78 0	+125 0	+103 +48	+126 +48	+173 +48	+133 +78	+156 +78	+218 +140	+378 +300	+425 +300	1 250	1 400	0 −160
																											+408 +330	+455 +330	1 400	1 600	
1 600	2 000	−430 −522	−240 −332	−120 −212	−32 −97	−32 −124	0 −65	0 −92	0 −150	0 −230	0 −370	0 −600	±32.5	±46	±75	–	–	+65 0	+92 0	+150 0	+123 +58	+150 +58	+208 +58	+157 +92	+184 +92	+262 +170	+462 +370	+520 +370	1 600	1 800	0 −200
																											+492 +400	+550 +400	1 800	2 000	

[Note] 1) $\varDelta_{dmp}$: single plane mean bore diameter deviation

Supplementary table 6 Housing bore tolerances (deviation from nominal dimensions)

Unit : μm (Refer.)

Nominal Bore dia. (mm)		Deviation classes of housing bore																											Nominal Bore dia. (mm)		$\varDelta_{Dmp}$ 1) of bearing (class 0)
over	up to	E 6	F 6	F 7	G 6	G 7	H 6	H 7	H 8	H 9	H 10	JS 5	JS 6	JS 7	J 6	J 7	K 5	K 6	K 7	M 5	M 6	M 7	N 5	N 6	N 7	P 6	P 7	R 7	over	up to	
50	80	+79 +60	+49 +30	+60 +30	+29 +10	+40 +10	+19 0	+30 0	+46 0	+74 0	+120 0	±6.5	±9.5	±15	+13 −6	+18 −12	+3 −10	+4 −15	+9 −21	−6 −19	−5 −24	0 −30	−15 −28	−14 −33	−9 −39	−26 −45	−21 −51	−30 −60	50	65	0 −13
																												−32 −62	65	80	
80	120	+94 +72	+58 +36	+71 +36	+34 +12	+47 +12	+22 0	+35 0	+54 0	+87 0	+140 0	±7.5	±11	±17.5	+16 −6	+22 −13	+2 −13	+4 −18	+10 −25	−8 −23	−6 −28	0 −35	−18 −33	−16 −38	−10 −45	−30 −52	−24 −59	−38 −73	80	100	0 −15
																												−41 −76	100	120	
120	180	+110 +85	+68 +43	+83 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+100 0	+160 0	±9	±12.5	±20	+18 −7	+26 −14	+3 −15	+4 −21	+12 −28	−9 −27	−8 −33	0 −40	−21 −39	−20 −45	−12 −52	−36 −61	−28 −68	−48 −88	120	140	(up to 150) 0 −18 (over to 150) 0 −25
																												−50 −90	140	160	
																												−53 −93	160	180	
180	250	+129 +100	+79 +50	+96 +50	+44 +15	+61 +15	+29 0	+46 0	+72 0	+115 0	+185 0	±10	±14.5	±23	+22 −7	+30 −16	+2 −18	+5 −24	+13 −33	−11 −31	−8 −37	0 −46	−25 −45	−22 −51	−14 −60	−41 −70	−33 −79	−60 −106	180	200	0 −30
																												−63 −109	200	225	
																												−67 −113	225	250	
250	315	+142 +110	+88 +56	+108 +56	+49 +17	+69 +17	+32 0	+52 0	+81 0	+130 0	+210 0	±11.5	±16	±26	+25 −7	+36 −16	+3 −20	+5 −27	+16 −36	−13 −36	−9 −41	0 −52	−27 −50	−25 −57	−14 −66	−47 −79	−36 −88	−74 −126	250	280	0 −35
																												−78 −130	280	315	
315	400	+161 +125	+98 +62	+119 +62	+54 +18	+75 +18	+36 0	+57 0	+89 0	+140 0	+230 0	±12.5	±18	±28.5	+29 −7	+39 −18	+3 −22	+7 −29	+17 −40	−14 −39	−10 −46	0 −57	−30 −55	−26 −62	−16 −73	−51 −87	−41 −98	−87 −144	315	355	0 −40
																												−93 −150	355	400	
400	500	+175 +135	+108 +68	+131 +68	+60 +20	+83 +20	+40 0	+63 0	+97 0	+155 0	+250 0	±13.5	±20	±31.5	+33 −7	+43 −20	+2 −25	+8 −32	+18 −45	−16 −43	−10 −50	0 −63	−33 −60	−27 −67	−17 −80	−55 −95	−45 −108	−103 −166	400	450	0 −45
																												−109 −172	450	500	
500	630	+189 +145	+120 +76	+146 +76	+66 +22	+92 +22	+44 0	+70 0	+110 0	+175 0	+280 0	±16	±22	±35	–	–	0 −32	0 −44	0 −70	−26 −58	−26 −70	−26 −96	−44 −76	−44 −88	−44 −114	−78 −122	−78 −148	−150 −220	500	560	0 −50
																												−155 −225	560	630	
630	800	+210 +160	+130 +80	+160 +80	+74 +24	+104 +24	+50 0	+80 0	+125 0	+200 0	+320 0	±18	±25	±40	–	–	0 −36	0 −50	0 −80	−30 −66	−30 −80	−30 −110	−50 −86	−50 −100	−50 −130	−88 −138	−88 −168	−175 −255	630	710	0 −75
																												−185 −265	710	800	
800	1 000	+226 +170	+142 +86	+176 +86	+82 +26	+116 +26	+56 0	+90 0	+140 0	+230 0	+360 0	±20	±28	±45	–	–	0 −40	0 −56	0 −90	−34 −74	−34 −90	−34 −124	−56 −96	−56 −112	−56 −146	−100 −156	−100 −190	−210 −300	800	900	0 −100
																												−220 −310	900	1 000	
1 000	1 250	+261 +195	+164 +98	+203 +98	+94 +28	+133 +28	+66 0	+105 0	+165 0	+260 0	+420 0	±23.5	±33	±52.5	–	–	0 −47	0 −66	0 −105	−40 −87	−40 −106	−40 −145	−66 −113	−66 −132	−66 −171	−120 −186	−120 −225	−250 −355	1 000	1 120	0 −125
																												−260 −365	1 120	1 250	
1 250	1 600	+298 +220	+188 +110	+235 +110	+108 +30	+155 +30	+78 0	+125 0	+195 0	+310 0	+500 0	±27.5	±39	±62.5	–	–	0 −55	0 −78	0 −125	−48 −103	−48 −126	−48 −173	−78 −133	−78 −156	−78 −203	−140 −218	−140 −265	−300 −425	1 250	1 400	0 −160
																												−330 −455	1 400	1 600	
1 600	2 000	+332 +240	+212 +120	+270 +120	+124 +32	+182 +32	+92 0	+150 0	+230 0	+370 0	+600 0	±32.5	±46	±75	–	–	0 −65	0 −92	0 −150	−58 −123	−58 −150	−58 −208	−92 −157	−92 −184	−92 −242	−170 −262	−170 −320	−370 −520	1 600	1 800	0 −200
																												−400 −550	1 800	2 000	
2 000	2 500	+370 +260	+240 +130	+305 +130	+144 +34	+209 +34	+110 0	+175 0	+280 0	+440 0	+700 0	±39	±55	±87.5	–	–	0 −78	0 −110	0 −175	−68 −146	−68 −178	−68 −243	−110 −188	−110 −220	−110 −285	−195 −305	−195 −370	−440 −615	2 000	2 240	0 −250
																												−460 −635	2 240	2 500	

[Note] 1) $\varDelta_{Dmp}$: single plane mean outside diameter deviation

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CAT.NO.B2023E-1

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JHS Series RZ-type Spherical Roller Bearings

Long life
Max. 2times
(compared to our existing products)

High speed
Limiting speed
Max. 25%UP
(compared to our existing products)

High axial load performance
Max. 20%UP
(compared to our existing products)

High temperature
up to 200℃

JHS Series RZ-type Spherical Roller Bearings

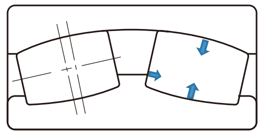
Features

RZ-type Spherical Roller Bearings are the newest in our line of JHS Series Spherical Roller Bearings, joining the popular R and RH types satisfying our customers' needs to date. The bearings have an optimal internal design, excellent roller position stability and a standardized dimension stabilizing treatment that enable high-speed rotation, enhanced axial load performance, a long life and the ability to be used in high-temperature applications.

R-type

Features High speed / High performance for axial load

Structure
- ● Asymmetrical roller
- ● With center guide rib

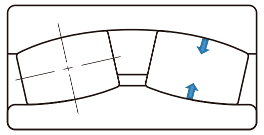


Roller load: Balanced using three-point support

RH-type

Features High performance for radial load

Structure
- ● Symmetrical roller
- ● Without center guide rib (floating guide ring)



Roller load: Balanced using two-point support

Optimal internal design

Dynamic load rating/static load rating increased through design optimization

RZ-type compared to existing products

Dynamic load rating

Max. 1.15 times
(compared to our existing products)

Static load rating

Max. 1.30 times
(compared to our existing products)

Roller position stabilized

Controls roller behavior using optimized raceway curvature

High temperature

Dimension stabilizing adopted as standard treatment, realizing applicability in temperatures as high as 200°C and expanding use to a wider variety of environments.

RZ-type

Features Developed bearings have not only maximized load ratings like the RH-type, but also high speed / high performance characteristics for the axial load, like the R-type.

Structure
- ● Symmetrical roller
  - ・Roller maximized / Number of rollers increased
  - ・Roller position stabilized
- ● Without center guide rib (floating guide ring)

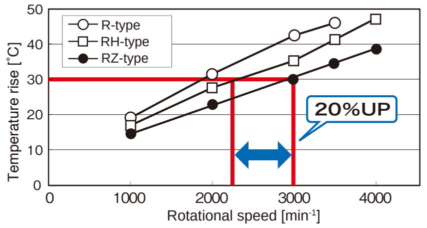
Long life

Max. 2times
(compared to our existing products)

High speed

Limiting speed

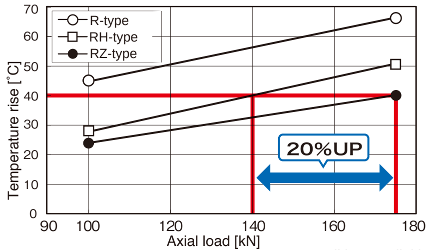
Max. 25%UP
(compared to our existing products)



Condition: Load is stable

High axial load performance

Max. 20%UP
(compared to our existing products)

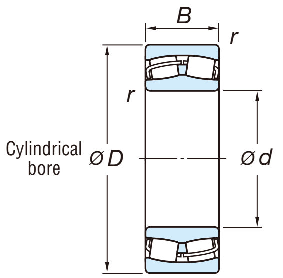


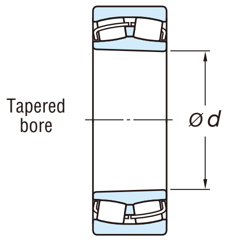
Condition: Radial load is stable

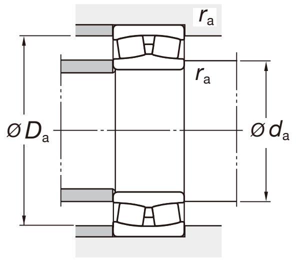
High temperature

up to 200℃

Dimensions tables of JHS Series RZ-type Spherical Roller Bearings
(ø*d*25～180mm)



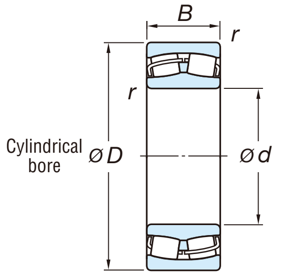


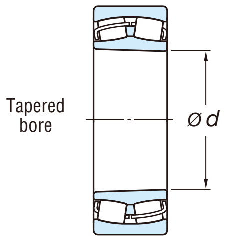


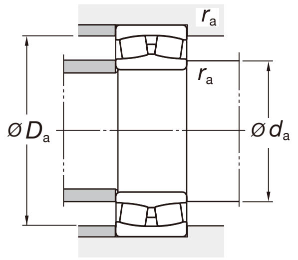
ø*d*25～95mm

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing no.		Mounting dimensions (mm)					Constant	Axial load facters			（Refer）Mass (kg)	
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	*e*	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
25	52	18	1	56.8	48.1	3.90	9 600	12 800	22205RZ	22205RZK	31	31	46	46	1	0.35	1.91	2.85	1.87	0.188	0.184
30	62	20	1	76.6	65.9	5.30	8 100	10 900	22206RZ	22206RZK	36	36.5	56	55.5	1	0.33	2.04	3.04	2.00	0.296	0.29
	72	19	1.1	74.2	62.7	4.80	7 200	9 600	21306RZ	21306RZK	37	41.5	65	61.5	1	0.27	2.49	3.71	2.43	0.43	0.424
35	72	23	1.1	100	88.7	7.75	6 900	9 200	22207RZ	22207RZK	42	42.5	65	64	1	0.32	2.09	3.11	2.04	0.459	0.449
	80	21	1.5	86.8	75.8	5.90	6 200	8 300	21307RZ	21307RZK	43.5	46.5	71.5	68.5	1.5	0.27	2.49	3.71	2.43	0.572	0.564
40	80	23	1.1	114	102	9.55	6 200	8 300	22208RZ	22208RZK	47	49	73	72.5	1	0.28	2.37	3.53	2.32	0.602	0.591
	90	23	1.5	105	95.5	7.55	5 600	7 600	21308RZ	21308RZK	48.5	53.5	81.5	77	1.5	0.26	2.55	3.80	2.50	0.781	0.77
	90	33	1.5	170	152	11.8	5 600	7 600	22308RZ	22308RZK	48.5	51	81.5	78.5	1.5	0.37	1.83	2.72	1.79	1.08	1.06
45	85	23	1.1	119	110	10.2	5 800	7 700	22209RZ	22209RZK	52	53.5	78	77.5	1	0.26	2.55	3.80	2.50	0.602	0.59
	100	25	1.5	132	124	9.95	5 000	6 700	21309RZ	21309RZK	53.5	60	91.5	86	1.5	0.26	2.62	3.90	2.56	1.05	1.04
	100	36	1.5	208	183	13.8	5 100	6 700	22309RZ	22309RZK	53.5	55.5	91.5	87	1.5	0.37	1.83	2.72	1.79	1.42	1.39
50	90	23	1.1	128	122	12.7	5 400	7 200	22210RZ	22210RZK	57	58.5	83	82.5	1	0.24	2.79	4.15	2.73	0.648	0.634
	110	27	2	157	151	12.0	4 500	6 100	21310RZ	21310RZK	60	67	100	94.5	2	0.25	2.71	4.04	2.65	1.37	1.35
	110	40	2	255	237	17.5	4 500	6 200	22310RZ	22310RZK	60	62.5	100	95.5	2	0.36	1.85	2.76	1.81	1.92	1.88
55	100	25	1.5	154	144	15.0	4 700	6 300	22211RZ	22211RZK	63.5	64	91.5	91.5	1.5	0.24	2.84	4.23	2.78	0.867	0.849
	120	29	2	180	165	13.0	4 100	5 600	21311RZ	21311RZK	65	71.5	110	101.5	2	0.25	2.71	4.03	2.65	1.69	1.67
	120	43	2	296	264	21.1	4 100	5 500	22311RZ	22311RZK	65	66	110	104	2	0.36	1.85	2.76	1.81	2.4	2.35
60	110	28	1.5	190	181	18.7	4 300	5 800	22212RZ	22212RZK	68.5	70	101.5	100	1.5	0.25	2.74	4.08	2.68	1.19	1.17
	130	31	2.1	210	193	15.1	3 900	5 100	21312RZ	21312RZK	72	77.5	118	110	2	0.24	2.78	4.14	2.72	2.11	2.08
	130	46	2.1	354	334	24.9	3 900	5 100	22312RZ	22312RZK	72	73.5	118	113	2	0.36	1.86	2.77	1.82	3.06	2.99
65	120	31	1.5	222	211	20.7	4 000	5 200	22213RZ	22213RZK	73.5	76	111.5	109	1.5	0.25	2.69	4.00	2.63	1.55	1.52
	140	33	2.1	242	232	19.8	3 600	4 700	21313RZ	21313RZK	77	85.5	128	119	2	0.24	2.83	4.21	2.76	2.62	2.58
	140	48	2.1	382	360	30.8	3 600	4 700	22313RZ	22313RZK	77	79.5	128	122	2	0.34	1.98	2.94	1.93	3.66	3.58
70	125	31	1.5	233	222	24.4	3 700	5 000	22214RZ	22214RZK	78.5	80	116.5	114	1.5	0.24	2.87	4.27	2.80	1.64	1.61
	150	35	2.1	268	260	21.6	3 300	4 400	21314RZ	21314RZK	82	91	138	126.5	2	0.24	2.84	4.23	2.78	3.19	3.15
	150	51	2.1	435	413	35.0	3 300	4 400	22314RZ	22314RZK	82	85.5	138	131	2	0.34	1.98	2.94	1.93	4.45	4.36
75	130	31	1.5	241	236	28.2	3 600	4 700	22215RZ	22215RZK	83.5	85.5	121.5	119	1.5	0.22	3.07	4.57	3.00	1.73	1.69
	160	37	2.1	306	298	24.3	3 000	4 100	21315RZ	21315RZK	87	98	148	138	2	0.24	2.87	4.27	2.80	3.81	3.76
	160	55	2.1	492	473	38.4	3 000	4 100	22315RZ	22315RZK	87	91	148	139.5	2	0.35	1.95	2.90	1.91	5.45	5.33
80	140	33	2	271	271	30.5	3 300	4 400	22216RZ	22216RZK	90	92	130	128	2	0.22	3.07	4.57	3.00	2.17	2.13
	140	44.4	2	305	342	31.2	3 300	4 400	23216RZ	23216RZK	90	93	130	124	2	0.29	2.35	3.50	2.30	2.95	2.86
	170	39	2.1	344	339	27.5	2 900	3 900	21316RZ	21316RZK	92	104	158	146	2	0.23	2.88	4.29	2.82	4.53	4.47
	170	58	2.1	539	521	41.7	2 900	3 900	22316RZ	22316RZK	92	97	158	148	2	0.35	1.95	2.90	1.91	6.44	6.3
85	150	36	2	322	324	35.7	3 000	4 100	22217RZ	22217RZK	95	97	140	137	2	0.22	3.01	4.48	2.94	2.75	2.69
	150	49.2	2	358	410	36.2	3 000	4 100	23217RZ	23217RZK	95	99	140	134	2	0.30	2.25	3.34	2.20	3.78	3.67
	180	41	3	374	372	29.6	2 800	3 600	21317RZ	21317RZK	99	109	166	154	2.5	0.23	2.89	4.33	2.83	5.32	5.25
	180	60	3	601	586	47.8	2 800	3 600	22317RZ	22317RZK	99	103	166	157	2.5	0.33	2.02	3.00	1.97	7.47	7.31
90	160	40	2	372	381	39.2	2 900	3 900	22218RZ	22218RZK	100	104	150	145	2	0.24	2.79	4.15	2.73	3.5	3.43
	160	52.4	2	421	482	42.9	2 900	3 900	23218RZ	23218RZK	100	103	150	141	2	0.32	2.14	3.19	2.09	4.63	4.5
	190	43	3	413	416	32.9	2 600	3 400	21318RZ	21318RZK	104	116	176	162	2.5	0.23	2.91	4.30	2.84	6.2	6.11
	190	64	3	672	662	50.5	2 600	3 400	22318RZ	22318RZK	104	108	176	166	2.5	0.34	2.00	2.98	1.96	8.82	8.63
95	170	43	2.1	417	422	42.7	2 800	3 600	22219RZ	22219RZK	107	109	158	154	2	0.24	2.76	4.11	2.70	4.24	4.15
	170	55.6	2.1	457	516	43.9	2 800	3 600	23219RZ	23219RZK	107	110	158	150	2	0.30	2.25	3.34	2.20	5.5	5.35
	200	45	3	452	461	36.3	2 500	3 200	21319RZ	21319RZK	109	123	186	171	2.5	0.23	2.92	4.35	2.86	7.16	7.06
	200	67	3	733	726	55.6	2 500	3 200	22319RZ	22319RZK	109	114	186	174	2.5	0.33	2.02	3.00	1.97	10.2	9.98

Dimensions tables of JHS Series RZ-type Spherical Roller Bearings
(ø*d*25～180mm)







ø*d*100～180mm

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Bearing no.		Mounting dimensions (mm)					Constant	Axial load facters			(Refer) Mass (kg)	
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	*e*	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
100	150	37	1.5	262	332	33.7	2 900	3 900	23020RZ	23020RZK	109	110	141	138	1.5	0.22	3.01	4.48	2.94	2.34	2.27
	165	52	2	412	510	48.5	2 800	3 600	23120RZ	23120RZK	110	114	155	147	2	0.29	2.33	3.47	2.28	4.52	4.38
	180	46	2.1	470	481	47.6	2 600	3 400	22220RZ	22220RZK	112	115	168	163	2	0.25	2.74	4.08	2.68	5.11	5
	180	60.3	2.1	533	629	53.5	2 600	3 400	23220RZ	23220RZK	112	116	168	157	2	0.32	2.09	3.11	2.04	6.85	6.66
	215	47	3	519	524	40.2	2 200	3 000	21320RZ	21320RZK	114	131	201	184	2.5	0.22	3.02	4.49	2.95	8.79	8.68
	215	73	3	875	877	63.9	2 200	3 000	22320RZ	22320RZK	114	121	201	187	2.5	0.35	1.95	2.90	1.91	13.2	12.9
110	170	45	2	377	486	48.4	2 600	3 400	23022RZ	23022RZK	120	123	160	156	2	0.24	2.84	4.23	2.78	3.85	3.74
	170	60	2	472	647	58.6	2 600	3 600	24022RZ	24022RZK30	120	120	160	151	2	0.32	2.08	3.10	2.04	5.07	4.99
	180	56	2	484	605	53.7	2 500	3 300	23122RZ	23122RZK	120	125	170	161	2	0.29	2.36	3.51	2.31	5.72	5.54
	180	69	2	569	778	63.4	2 500	3 300	24122RZ	24122RZK30	120	120	170	154	2	0.37	1.84	2.74	1.80	6.98	6.87
	200	53	2.1	612	642	58.7	2 300	3 000	22222RZ	22222RZK	122	127	188	180	2	0.26	2.64	3.93	2.58	7.37	7.21
	200	69.8	2.1	672	792	65.4	2 300	3 000	23222RZ	23222RZK	122	127	188	173	2	0.34	1.99	2.96	1.94	9.76	9.48
	240	50	3	604	616	46.0	1 900	2 600	21322RZ	21322RZK	124	147	226	205	2.5	0.21	3.19	4.75	3.12	11.8	11.7
	240	80	3	1 040	1 040	77.7	1 900	2 600	22322RZ	22322RZK	124	136	226	208	2.5	0.33	2.03	3.02	1.98	18.1	17.7
120	180	46	2	394	524	51.6	2 300	3 200	23024RZ	23024RZK	130	132	170	165	2	0.23	2.95	4.40	2.89	4.2	4.07
	180	60	2	484	709	61.8	2 300	3 200	24024RZ	24024RZK30	130	130	170	160	2	0.30	2.23	3.32	2.18	5.43	5.34
	200	62	2	571	714	61.2	2 200	3 000	23124RZ	23124RZK	130	137	190	176	2	0.29	2.34	3.49	2.29	7.98	7.74
	200	80	2	733	1 020	78.6	2 200	3 000	24124RZ	24124RZK	130	133	190	172	2	0.38	1.75	2.61	1.72	10.2	10
	215	58	2.1	706	764	67.2	2 100	2 800	22224RZ	22224RZK	132	138	203	193	2	0.26	2.60	3.87	2.54	9.31	9.1
	215	76	2.1	772	956	78.9	2 100	2 900	23224RZ	23224RZK	132	139	203	185	2	0.34	1.97	2.94	1.93	12.2	11.8
	260	86	3	1 120	1 130	87.2	1 800	2 500	22324RZ	22324RZK	134	149	246	228	2.5	0.33	2.03	3.02	1.98	22.8	22.3
130	200	52	2	509	674	63.6	2 200	2 900	23026RZ	23026RZK	140	145	190	182	2	0.24	2.87	4.27	2.80	6.15	5.97
	200	69	2	625	914	77.3	2 200	2 900	24026RZ	24026RZK	140	143	190	177	2	0.32	2.14	3.18	2.09	8.03	7.9
	210	64	2	621	799	68.4	2 100	2 800	23126RZ	23126RZK	140	147	200	187	2	0.28	2.42	3.61	2.37	8.71	8.44
	210	80	2	754	1 080	91.8	2 100	2 800	24126RZ	24126RZK30	140	145	200	184	2	0.36	1.90	2.83	1.86	10.8	10.6
	230	64	3	821	914	74.4	1 900	2 600	22226RZ	22226RZK	144	148	216	206	2.5	0.26	2.55	3.80	2.50	11.6	11.3
	230	80	3	880	1 090	89.4	1 900	2 600	23226RZ	23226RZK	144	151	216	201	2.5	0.33	2.05	3.05	2.00	14.4	14
	280	93	4	1 310	1 340	98.6	1 700	2 200	22326RZ	22326RZK	148	160	262	245	3	0.33	2.03	3.02	1.98	28.5	27.9
140	210	53	2	530	723	67.9	2 100	2 800	23028RZ	23028RZK	150	155	200	192	2	0.23	2.98	4.44	2.92	6.62	6.42
	210	69	2	640	957	81.7	2 100	2 800	24028RZ	24028RZK30	150	153	200	188	2	0.30	2.28	3.39	2.23	8.49	8.35
	225	68	2.1	710	940	79.6	1 900	2 600	23128RZ	23128RZK	152	158	213	201	2	0.28	2.45	3.65	2.40	10.6	10.3
	225	85	2.1	853	1 170	90.7	1 900	2 600	24128RZ	24128RZK30	152	153	213	194	2	0.36	1.89	2.82	1.85	13.1	12.9
	250	68	3	947	1 030	85.2	1 800	2 300	22228RZ	22228RZK	154	158	236	224	2.5	0.26	2.60	3.87	2.54	14.5	14.2
	250	88	3	1 020	1 290	103	1 800	2 300	23228RZ	23228RZK	154	161	236	214	2.5	0.34	1.99	2.96	1.95	19	18.4
	300	102	4	1 470	1 570	105	1 500	2 100	22328RZ	22328RZK	158	172	282	255	3	0.35	1.95	2.90	1.90	35.7	34.9
150	225	56	2.1	579	797	76.3	1 900	2 500	23030RZ	23030RZK	162	166	213	205	2	0.22	3.04	4.53	2.97	8.01	7.77
	225	75	2.1	724	1 100	90.3	1 900	2 500	24030RZ	24030RZK30	162	163	213	199	2	0.30	2.23	3.32	2.18	10.6	10.4
	250	80	2.1	902	1 230	102	1 800	2 300	23130RZ	23130RZK	162	171	238	216	2	0.30	2.24	3.34	2.19	16.4	15.9
	250	100	2.1	1 100	1 590	116	1 800	2 300	24130RZ	24130RZK30	162	166	238	213	2	0.38	1.77	2.64	1.73	19.9	19.6
	270	73	3	1 080	1 200	102	1 700	2 200	22230RZ	22230RZK	164	172	256	243	2.5	0.25	2.69	4.00	2.63	18.9	18.5
	270	96	3	1 200	1 540	121	1 700	2 200	23230RZ	23230RZK	164	173	256	230	2.5	0.34	1.96	2.93	1.92	24.5	23.8
160	240	60	2.1	667	924	86.0	1 800	2 300	23032RZ	23032RZK	172	177	228	219	2	0.22	3.01	4.48	2.94	9.74	9.44
	240	80	2.1	829	1 270	103	1 800	2 300	24032RZ	24032RZK30	172	175	228	215	2	0.30	2.24	3.34	2.19	12.9	12.7
	270	86	2.1	1 070	1 430	117	1 700	2 200	23132RZ	23132RZK	172	182	258	234	2	0.30	2.22	3.30	2.17	20.8	20.2
170	260	67	2.1	795	1 090	97.9	1 700	2 200	23034RZ	23034RZK	182	189	248	236	2	0.23	2.90	4.31	2.83	13.2	12.8
	260	90	2.1	1 010	1 540	120	1 700	2 200	24034RZ	24034RZK	182	184	248	227	2	0.32	2.11	3.15	2.07	17.5	17.2
	280	88	2.1	1 150	1 550	124	1 500	2 100	23134RZ	23134RZK	182	194	268	249	2	0.29	2.30	3.43	2.25	21.9	21.2
180	280	74	2.1	966	1 330	118	1 500	1 900	23036RZ	23036RZK	192	202	268	253	2	0.24	2.84	4.23	2.78	17.4	16.9

Koyo®

JHS Series RZ-type Spherical Roller Bearings

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VEGETABLE OIL INK

JTEKT

CAT.NO.B2023E-1
Printed in Japan '17.02-15BCH('14.10)

Needle Roller Bearings

JTEKT CORPORATION

CAT. NO. B2020E-1

Bearing Size Chart

Radial Needle Roller and Cage Assemblies

Metric Series

Single-Row, Double-Row···B-1-8: K, RF, RFN; RS, R, RP; RV, V, VS; K ... ZW, WRF; WR, WRS; WRP

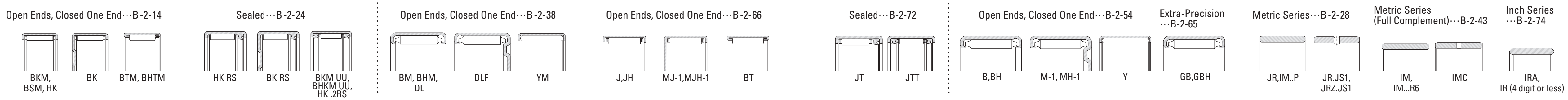
Inch Series

Single-Row···B-1-58: WJ, WJC

Assemblies for Crank Pin End Applications···B-1-47: K.BE; BE, GS; VE, VS P

Assemblies for Wrist Pin End Applications···B-1-52: K.SE; R P; RE, UR P

Drawn Cup Needle Roller Bearings



Metric Series (Caged)

Open Ends, Closed One End···B-2-14: BKM, BSM, HK; BK; BTM, BHTM

Sealed···B-2-24: HK RS; BK RS; BKM UU, BHKM UU, HK .2RS

(Full Complement)

Open Ends, Closed One End···B-2-38: BM, BHM, DL; DLF; YM

Inch Series (Caged)

Open Ends, Closed One End···B-2-66: J,JH; MJ-1,MJH-1; BT

Sealed···B-2-72: JT; JTT

(Full Complement)

Open Ends, Closed One End···B-2-54: B,BH; M-1, MH-1; Y

Extra-Precision···B-2-65: GB,GBH

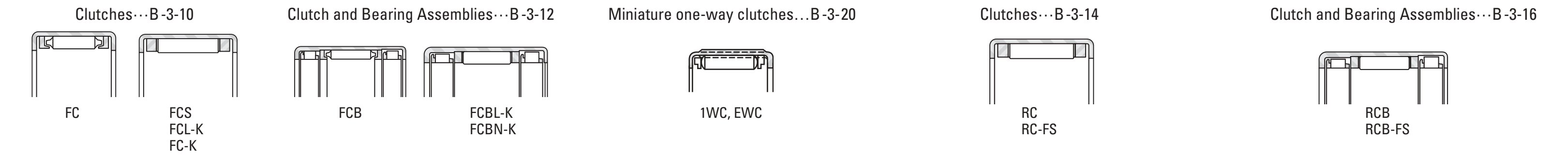
Inner Rings

Metric Series···B-2-28: JR,IM..P; JR.JS1, JRZ.JS1

Metric Series (Full Complement)···B-2-43: IM, IM...R6; IMC

Inch Series···B-2-74: IRA, IR (4 digit or less)

Drawn Cup Roller Clutches



Metric Series

Clutches···B-3-10: FC; FCS, FCL-K, FC-K

Clutch and Bearing Assemblies···B-3-12: FCB; FCBL-K, FCBN-K

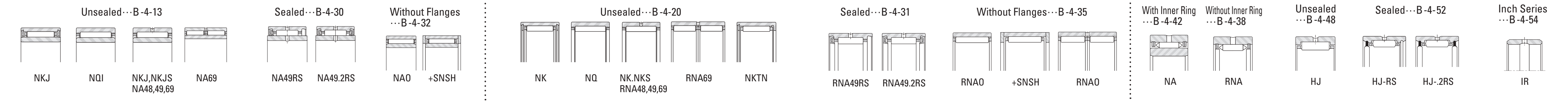
Miniature one-way clutches...B-3-20: 1WC, EWC

Inch Series

Clutches···B-3-14: RC, RC-FS

Clutch and Bearing Assemblies···B-3-16: RCB, RCB-FS

Heavy-Duty Needle Roller Bearings



Metric Series (Caged, With Inner Ring)

Unsealed···B-4-13: NKJ; NQI; NKJ,NKJS, NA48,49,69; NA69

Sealed···B-4-30: NA49RS; NA49.2RS

Without Flanges···B-4-32: NAO; +SNSH

(Without Inner Ring)

Unsealed···B-4-20: NK; NQ; NK.NKS, RNA48,49,69; RNA69; NKTN

Sealed···B-4-31: RNA49RS; RNA49.2RS

Without Flanges···B-4-35: RNAO; +SNSH; RNAO

(Full Complement)

With Inner Ring···B-4-42: NA

Without Inner Ring···B-4-38: RNA

Inch Series(Without Inner Ring)

Unsealed···B-4-48: HJ

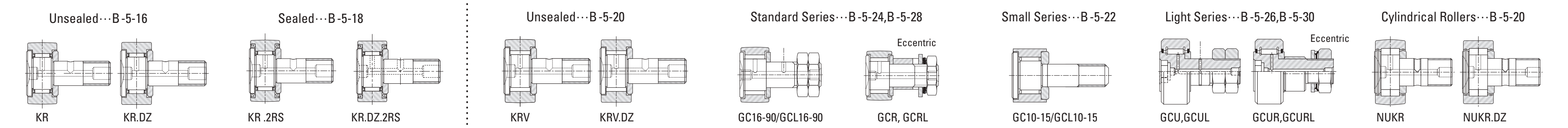
Sealed···B-4-52: HJ-RS; HJ-.2RS

Inner Rings

Inch Series···B-4-54: IR

Track Rollers

Stud-Type



Metric Series (Caged)

Unsealed···B-5-16: KR; KR.DZ

Sealed···B-5-18: KR .2RS; KR.DZ.2RS

(Full Complement)

Unsealed···B-5-20: KRV; KRV.DZ

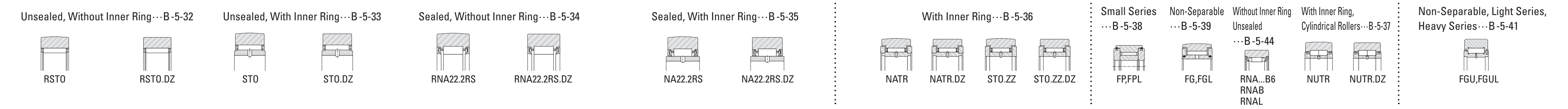
Standard Series···B-5-24,B-5-28: GC16-90/GCL16-90; Eccentric GCR, GCRL

Small Series···B-5-22: GC10-15/GCL10-15

Light Series···B-5-26,B-5-30: GCU,GCUL; Eccentric GCUR,GCURL

Cylindrical Rollers···B-5-20: NUKR; NUKR.DZ

Yoke-Type



Metric Series (Caged, Without End Washers)

Unsealed, Without Inner Ring···B-5-32: RSTO; RSTO.DZ

Unsealed, With Inner Ring···B-5-33: STO; STO.DZ

Sealed, Without Inner Ring···B-5-34: RNA22.2RS; RNA22.2RS.DZ

Sealed, With Inner Ring···B-5-35: NA22.2RS; NA22.2RS.DZ

(Caged, With End Washers)

With Inner Ring···B-5-36: NATR; NATR.DZ; STO.ZZ; STO.ZZ.DZ

(Full Complement, With End Washers)

Small Series···B-5-38: FP,FPL

Non-Separable···B-5-39: FG,FGL

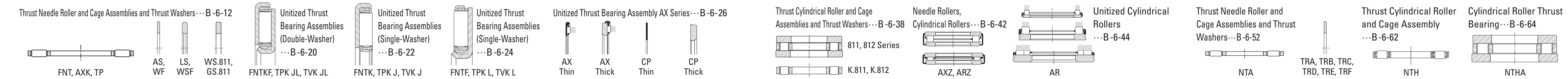
Without Inner Ring Unsealed···B-5-44: RNA...B6, RNAB, RNAL

With Inner Ring, Cylindrical Rollers···B-5-37: NUTR; NUTR.DZ

(Full Complement, With Metal Seals)

Non-Separable, Light Series, Heavy Series···B-5-41: FGU,FGUL

Thrust Bearings, Assemblies, Washers



Metric Series

Thrust Needle Roller and Cage Assemblies and Thrust Washers···B-6-12: FNT, AXK, TP; AS, WF; LS, WSF; WS.811, GS.811

Unitized Thrust Bearing Assemblies (Double-Washer)···B-6-20: FNTKF, TPK JL, TVK JL

Unitized Thrust Bearing Assemblies (Single-Washer)···B-6-22: FNTK, TPK J, TVK J

Unitized Thrust Bearing Assemblies (Single-Washer)···B-6-24: FNTF, TPK L, TVK L

Unitized Thrust Bearing Assembly AX Series···B-6-26: AX Thin; AX Thick; CP Thin; CP Thick

Thrust Cylindrical Roller and Cage Assemblies and Thrust Washers···B-6-38: 811, 812 Series; K.811, K.812

Needle Rollers, Cylindrical Rollers···B-6-42: AXZ, ARZ

Unitized Cylindrical Rollers···B-6-44: AR

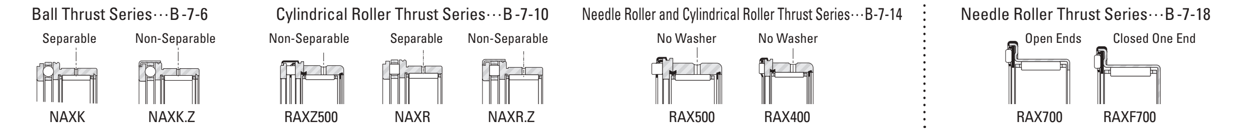
Inch Series

Thrust Needle Roller and Cage Assemblies and Thrust Washers···B-6-52: NTA; TRA, TRB, TRC, TRD, TRE, TRF

Thrust Cylindrical Roller and Cage Assembly···B-6-62: NTH

Cylindrical Roller Thrust Bearing···B-6-64: NTHA

Combined Needle Roller Bearings



Metric Series (Heavy-Duty, Without Inner Ring)

Ball Thrust Series···B-7-6: Separable NAXK; Non-Separable NAXK.Z

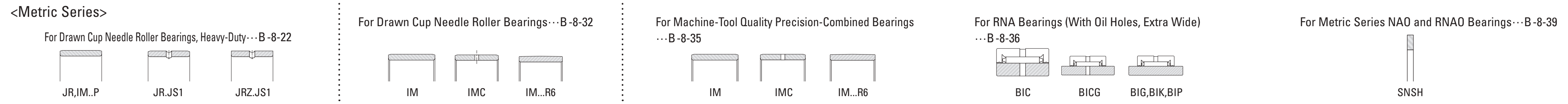
Cylindrical Roller Thrust Series···B-7-10: Non-Separable RAXZ500; Separable NAXR; Non-Separable NAXR.Z

Needle Roller and Cylindrical Roller Thrust Series···B-7-14: No Washer RAX500; No Washer RAX400

(Drawn Cup, Without Inner Ring)

Needle Roller Thrust Series···B-7-18: Open Ends RAX700; Closed One End RAXF700

Needle Rollers, Accessories



Inner Rings (Caged)

<Metric Series>

For Drawn Cup Needle Roller Bearings, Heavy-Duty···B-8-22: JR,IM..P; JR.JS1; JRZ.JS1

(Full Complement)

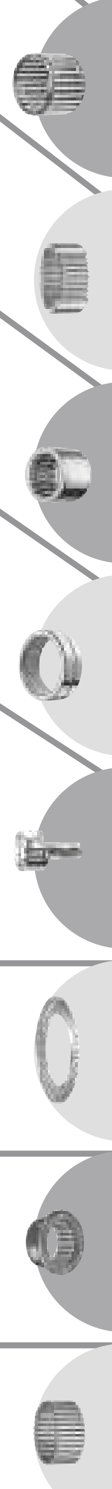
For Drawn Cup Needle Roller Bearings···B-8-32: IM; IMC; IM...R6

For Machine-Tool Quality Precision-Combined Bearings···B-8-35: IM; IMC; IM...R6

For RNA Bearings (With Oil Holes, Extra Wide)···B-8-36: BIC; BICG; BIG,BIK,BIP

End Washer

For Metric Series NAO and RNAO Bearings···B-8-39: SNSH



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NEEDLE ROLLER BEARINGS

1866 1900 1930 1960 1990 2010 **2013**

Corporate History

- 1866 Torrington is founded
- 1867 Dürkopp-Werke Bielefeld is founded
- 1921 Koyo Seiko Co., Ltd. is founded
- 1930 Nadella is founded
- 1962 FAG purchases Dürkopp-Werke AG
- 1963 New needle bearing plant is built in Tokyo
- 1962 Utsunomiya Kiki Co., Ltd. joins the group
- 1984 SNR (Nadella business partner) and Torrington commence joint venture
- 1993 Torrington purchases needle bearing business from FAG
- 2001 Torrington purchases Nadella business from SNR
- 2003 The Timken Company purchases Torrington
- 2006 JTEKT Corporation is born
- 2010 JTEKT purchases needle bearing business from The Timken Company
- 2013 JTEKT is integrated into the **Koyo** brand

Bearing Trends and Market Needs

Smaller → Improvement in seizure resistance → Longer life → Reduced torque and noise, compact and lightweight, usability with less diluted lubricant

Transition of Products

1866
Foundation of Torrington

Founded as manufacturer of sewing machine needles and machinery to produce same

Early model swaging machine for uniform needle blanks


invention
No. U.S.43,772
(1864)
Hopson & Brooks
IMPROVEMENT IN POINTING WIRE FOR PINS

This invention is the origin of the extra-precision rollers now produced by JTEKT.

1920
80% market share of automobile wire wheel parts

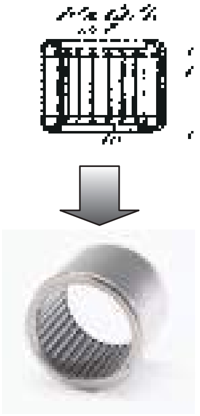
More than 60% of automobiles, including those made by Cadillac, adopt wire wheels. Torrington acquires 80% market share of wire wheel spokes and nipples.

As a result, one in every two U.S.-manufactured automobiles use Torrington spokes and nipples.

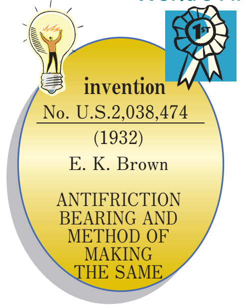
Radial Needle Bearings

1932
Development of the world's first drawn cup needle bearing

< Space-saving and lightweight >

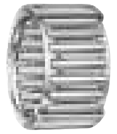


World's First


invention
No. U.S.2,038,474
(1932)
E. K. Brown
ANTIFRICTION BEARING AND METHOD OF MAKING THE SAME

1957
Development of caged drawn cup needle bearing

< Improved lubrication and support for higher speeds >



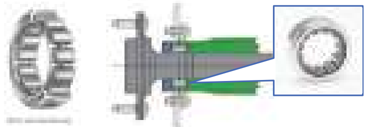
Increased lubricant retention capability

Separated rollers using cages

1968
Development of thick-wall drawn cup bearing

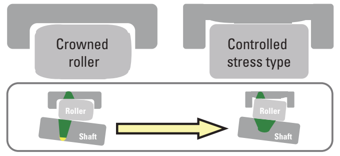
< High capacity >

Applications in axles, transmissions, pumps and motors



1996
Development of controlled stress thick-wall drawn cup needle bearing

< Longer life > Cup bore is profiled.



Reduced contact pressure on cup and shaft

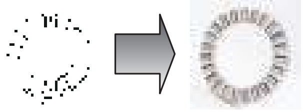
Thrust Needle Bearings

1955
Development of the world's first thrust needle bearing: contribution to the progress of AT development

< Lower torque and improved durability >

World's First

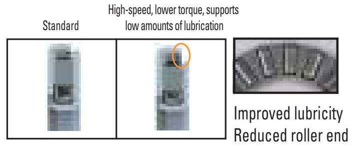

invention
No. U.S. 2,724,625
(1955)
R. H. White
NEEDLE ROLLER THRUST BEARING



Development of the thrust needle bearing solved problems in early automatic transmissions.

< Higher speed, lower torque, and supports thin film lubricant >
Optimization of washer and cage shapes

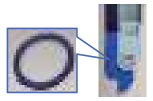
2008
Development of thrust needle bearing for high-speed applications



Improved lubricity
Reduced roller end wear

2011
Development of noise-reduced thrust needle bearing

< Noise reduction >



Vibration-resistant

Custom-shaped resin is installed on the back side of the thrust washer.

Planetary Gear Shafts

1971
Development of induction-hardened planetary gear shaft

2001
Cold forging hole processing of planetary gear shaft

< Improved installation capability >

< Weight savings, material waste reduction, and cost effective >

Regarding the Publishing of this Needle Roller Bearing Catalog

Thank you very much for your patronage of **Koyo** brand products.

In terms of environmental friendliness, there has been a rapidly increasing demand for smaller, lighter products, as well as lower friction, higher reliability, and higher functionality in many different industrial fields.

Our needle roller bearings are the optimal solution to all such requirements.

In 2010, as part of JTEKT's continual process for improvement in the needle roller bearing business, we integrated the technology of Torrington, a company with a long history in the United States and Europe, into the Koyo brand of traditional needle roller bearings.
In 2013, the Koyo brand will take the next step in this line of business to pursue stronger distribution and production structures and further technological development with the aim to accommodate our customers' needs on a global scale.

On this occasion, JTEKT has fully renewed its needle roller bearing catalog, which we present here.

We believe that this new catalog will prove useful in your selection and use of our needle roller bearings.

We look forward to your continued patronage.

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NEEDLE ROLLER BEARING APPLICATIONS

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ENGINEERING

B

NEEDLE ROLLER BEARINGS

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SUPPLEMENTARY TABLES, INDEX

PRODUCT BREADTH

DRAWN CUP NEEDLE ROLLER BEARINGS, available in 3 mm to 139.7 mm bore ($^1/_8$ to 5 $^1/_2$ in), are designed to support radial loads and reduce friction between rotating components. The low cross section of the drawn cup bearing provides maximum load-carrying capability with minimum space required.

DRAWN CUP ROLLER CLUTCHES AND BEARING ASSEMBLIES, available in 3 to 35 mm bore ($^1/_8$ to 1$^3/_8$ in), are designed to transmit torque between the shaft and housing in one direction and allow free overrun in the opposite direction. When transmitting torque, either the shaft or the housing can be the input member.

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES, available in 3 mm to 165 mm bore ($^1/_8$ to 6 $^1/_2$ in), consist of a complement of needle rollers held in place by a cage. With no inner or outer ring, the low cross section provides maximum load-carrying capability within the smallest envelope. The mating shaft and housing are normally used as inner and outer raceways.

NEEDLE ROLLER THRUST BEALINGS, available in 5 mm to 160 mm ($^3/_{16}$ to 6 $^1/_4$ in) bore, consist of a complement of needle rollers held in place by a cage.

Needle roller thrust bealings are complements of small diameter needle rollers arranged in a spoke-like configuration. Needle rollers are equally spaced by means of a cage whose web section separates the rollers and provides guidance to keep them tracking in an orbital path. The purpose of these assemblies is to transmit a thrust load between two relatively rotating objects while greatly reducing friction.

Needle roller thrust bealings also can be unitized with lipped washers which service as raceway surfaces for the needle rollers. Washers can be supplied separately or can be mechanically unitized to the needle roller thrust assemblies for ease of handling.

HEAVY-DUTY NEEDLE ROLLER BEARINGS, available in 5 mm to 335 mm bore ($^3/_{16}$ to 13 $^3/_{16}$ in), consist of a machined and ground channel-shaped outer ring with a complement of needle rollers retained and guided by a cage. The thick outer ring provides maximum load capacity and shock resistance with a relatively small radial cross section.

TRACK ROLLERS/CAM FOLLOWERS, available in 10 mm to 300 mm O.D. ($^3/_8$ to 11$^{13}/_{16}$ in), are characterized by their thick-walled outer rings that run directly on a track. The thick outer rings permit high load-carrying capability while minimizing distortion and bending stresses.

ENGINE BEARINGS include a full line of advanced bearing assemblies for automotive engine valve trains. These assemblies help reduce friction and optimize performance in both overhead valve and overhead cam engines. They include roller rocker arms for overhead valve (pushrod) engines, roller finger followers for overhead cam engines, valve lifter rollers for overhead valve and overhead cam engines.

PRECISION NEEDLE ROLLERS have multiple uses in a variety of industries including automotive, truck, farm and construction equipment, two-cycle engines, outboard engines and consumer durables. Needle rollers are mainly used as bearing rolling elements to transmit torque and reduce friction. They also can serve as precision shafts or as precision locating pins.

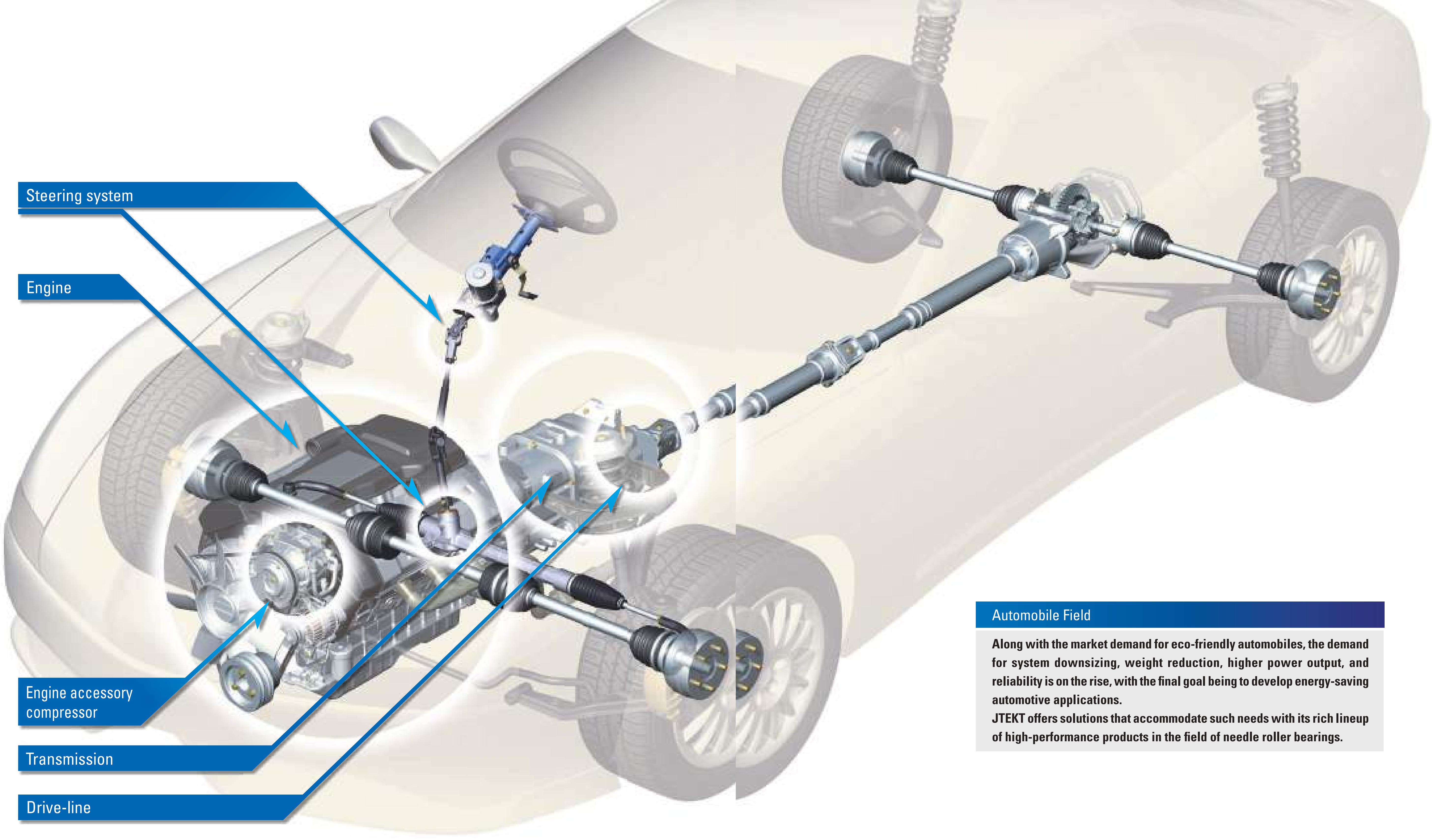
PLANETARY GEAR SHAFTS have multiple uses in a variety of industries including automotive, truck and farm and construction equipment. The shafts are used in planetary gear sets, differentials and engine valve trains.

PRECISION PINS AND SHAFTS are crafted from the highest quality steel within a TS16949/ISO9000/AS9100-certified manufacturing facility. Pins and shafts come in a larger variety of configurations and materials and flexible product volumes. These pins and shafts are found in applications such as gasoline fuel systems components, diesel systems components, aerospace rollers and precision rollers (DFAR-compliant), planet pins, racing applications, rollers for bearing assemblies, gear shafts and steering column pins.

APPLICATIONS

NEEDLE ROLLER BEARING APPLICATIONS

JTEKT Supports Driving and the Environment



Automobile Field

Along with the market demand for eco-friendly automobiles, the demand for system downsizing, weight reduction, higher power output, and reliability is on the rise, with the final goal being to develop energy-saving automotive applications.
JTEKT offers solutions that accommodate such needs with its rich lineup of high-performance products in the field of needle roller bearings.

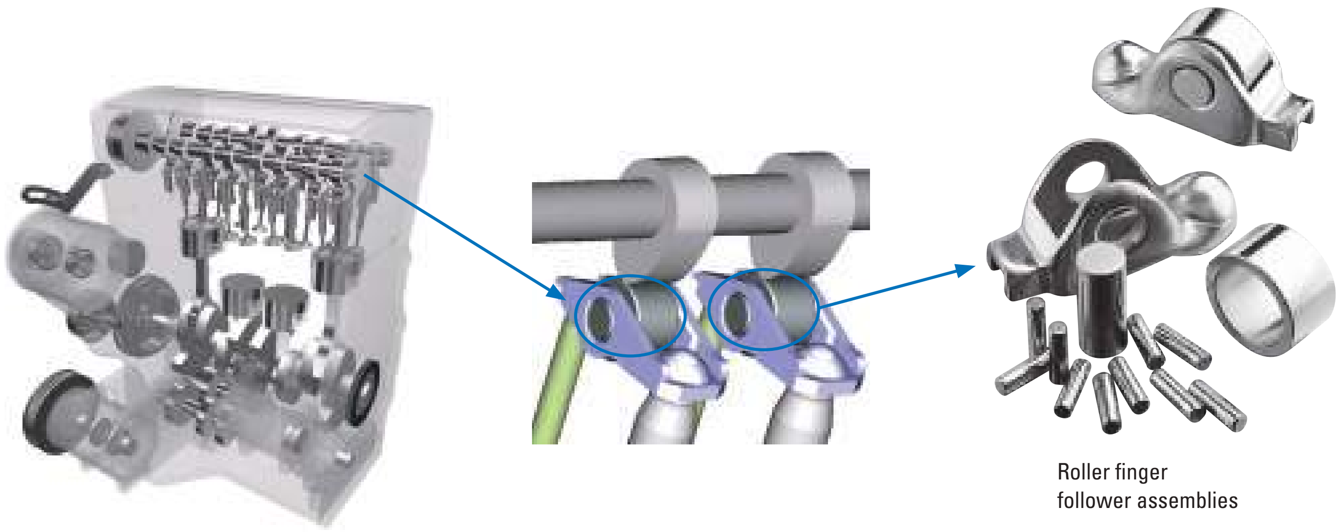
ENGINE

Valve Train Components

JTEKT's needle roller bearings for rocker arms contribute to reductions in energy used by engines and to improvements in engine reliability.

Bearing Features

- Low torque
- Wear resistance



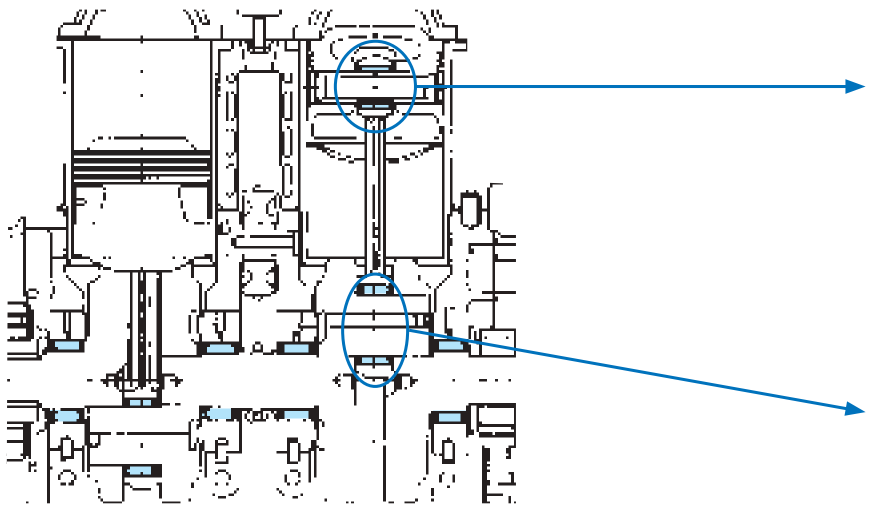
Roller finger follower assemblies

Piston and Crank Components

JTEKT's needle roller bearings for connecting rod applications respond to the need for reductions in energy used by engines and to demanding lubrication requirements, contributing to greater reliability.

Bearing Features

- Durability
- Improvement in seizure resistance
- Supports higher loads



Engines for motorcycles and boats

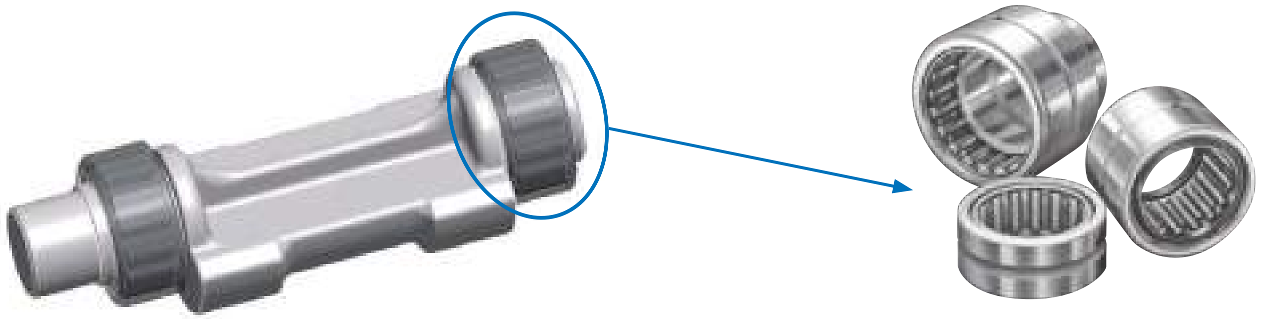
Radial needle roller and cage assemblies

Balance Shaft Components

JTEKT's needle roller bearings for balance shafts contribute to improved lubrication methods, reduced friction, and improved reliability under vibration conditions.

Bearing Features

- High reliability
- Vibration resistance



Heavy-duty needle roller bearings

ENGINE ACCESSORIES

Compressor Components

JTEKT's needle roller bearings for compressors contribute to support for thin film lubricants, improved efficiency, and improved reliability.

Bearing Features

- Wear resistance
- Low torque
- Improved lubricity

Thrust bearings

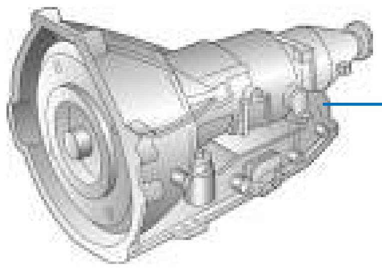
TRANSMISSION

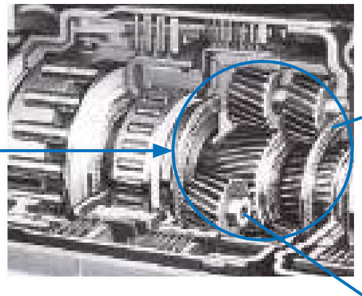
JTEKT's needle roller bearings for transmissions contribute to reductions in the size and weight of the transmission, improved power and fuel efficiency, support for low-viscosity lubricants, and improved reliability.

Bearing Features

- Supports higher loads
- Longer life in oil with foreign material
- Low torque

Automatic Transmissions

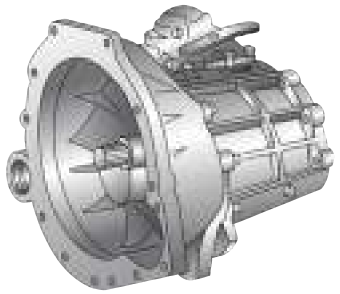


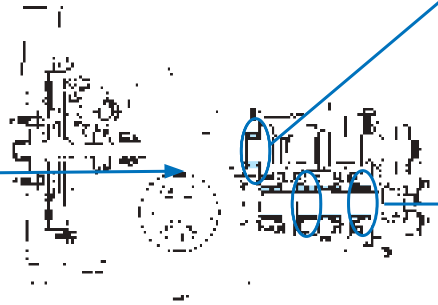


Thrust bearings

Radial needle roller and cage assemblies

Manual Transmissions





Split polymer caged radial assemblies

STEERING SYSTEMS

JTEKT's needle roller bearings for steering systems realize smooth steering capability with high reliability and quiet running by drawing on our experience in producing safe steering system components.

Bearing Features

- High reliability
- Reduced noise
- High rigidity

Intermediate Steering Shafts

Drawn cup needle roller bearings

Pinion Shafts

Bearing Features

- High reliability
- Reduced noise

Drawn cup needle roller bearings

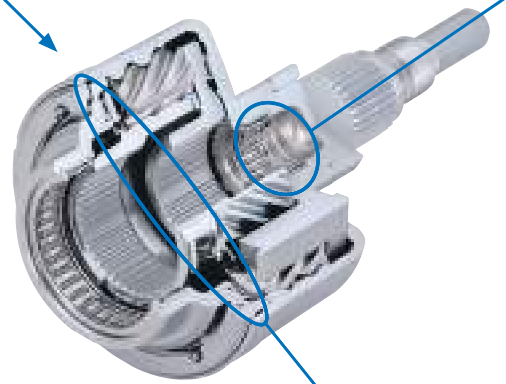
DRIVE-LINES

Torque Sensing LSD

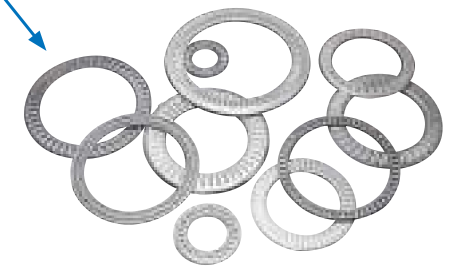
JTEKT's needle roller bearings for torque sensing LSDs contribute to downsizing and weight reduction, higher efficiency, and improved reliability.

Bearing Features

- Alleviates misalignment
- Supports higher loads



Drawn cup needle roller bearings



Thrust bearings

INDUSTRIAL MACHINERY FIELD

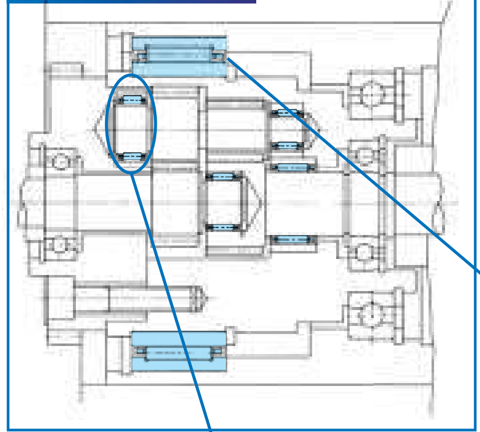
Construction equipment and agricultural machinery are used in dimanding environments and therefore require high durability. JTEKT offers high-performance needle roller bearings that respond to energy-saving requirements and high reliability needs.

Construction Equipment

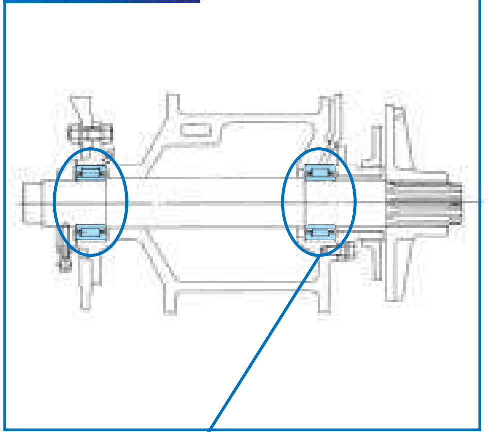
Bearing Features

- High reliability

Planetary Gear Reducer



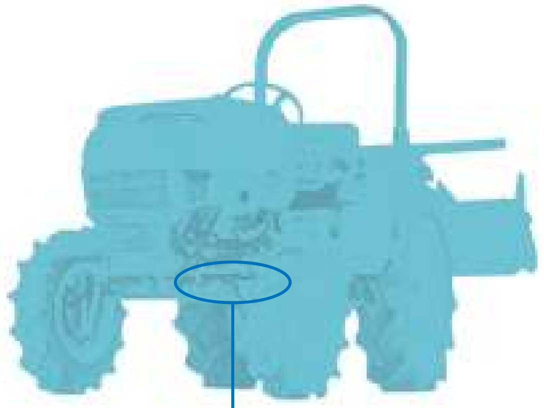
Wheel Drum



Radial needle roller and cage assemblies

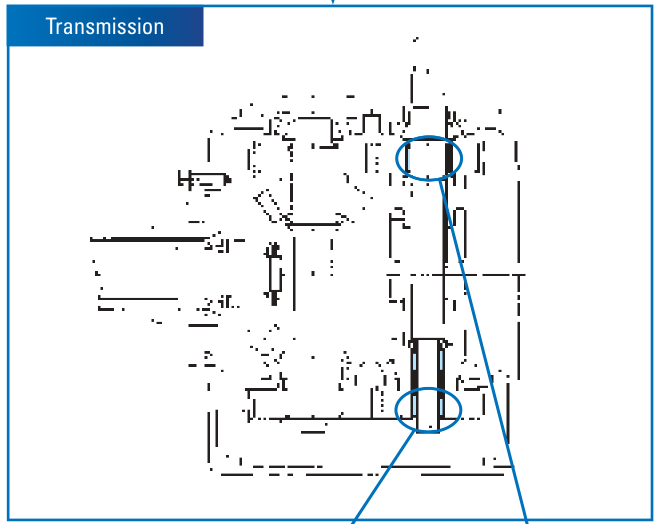
Heavy-duty needle roller bearings

Agricultural Machinery



Bearing Features

- High reliability



Radial needle roller and cage assemblies

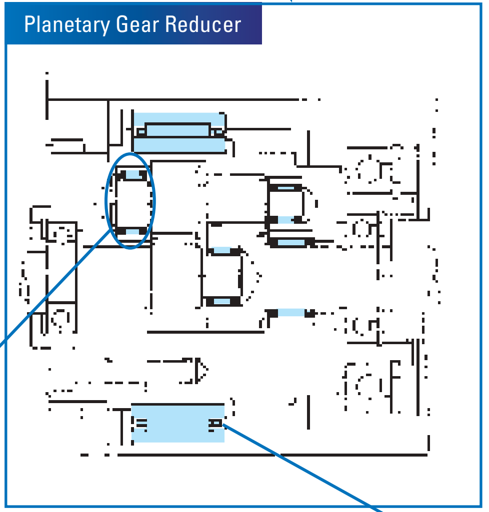
WIND POWER GENERATION

**Bearings used in wind power generators require long service lives.
JTEKT offers high-performance needle roller bearings that support high reliability and demanding environmental conditions.**

Wind Power Generation

Bearing Features

- Long service life
- Reduced noise



Radial needle roller and cage assemblies

Heavy-duty needle roller bearings

NOTES

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BEARING TYPES

NEEDLE ROLLER BEARINGS

Needle roller bearings are an economical alternative for applications requiring minimal space to carry a given load at a desired speed. Needle roller bearings can be an ideal choice because of their ability to handle a given level of speed and load capacity, yet have the smallest cross section of all roller bearing types.

We offer both metric and inch nominal bearings in popular designs such as: radial caged needle rollers, drawn cup needle roller bearings, machined ring, track rollers, thrust bearings, combined bearings, and drawn cup roller clutches.

Most of these bearing types can be operated directly on a machined shaft of suitable quality, or with a matching inner ring where this requirement cannot be conventionally satisfied.

Radial Needle Roller and Cage Assemblies

Radial needle roller and cage assemblies have a steel cage that provides both inward and outward retention for the needle rollers. The designs provide maximum cage strength consistent with the inherently high load ratings of needle roller bearings. Accurate guidance of the needle rollers by the cage bars allows for operation at high speeds. Also available are needle roller and cage assemblies using molded, one-piece glass-reinforced engineered polymer cages. Needle roller and cage assemblies are manufactured with either one or two rows of needle rollers.

Drawn Cup Bearings

The outer ring in the form of a cup is accurately drawn and no subsequent machining is performed to build the outer raceway. Drawn cup needle roller bearings are available in open ends or single, closed-end designs. They also are available with one or two integral seals. Other options include a single lubricating hole and matching inner ring.

Heavy-Duty Needle Roller Bearings

These bearings are available in a wide range of inch and metric sizes plus an array of design features including: integral seals, side flanges (or separate end washers), inner rings, oil holes and single or double caged sets (or full complement) of rollers.

Track Rollers

Track rollers listed in this catalog are designed with outer rings of large radial cross section to withstand heavy rolling and shock loads on track-type or cam-controlled equipment. The outside diameters of the outer rings are either profiled or cylindrical. Profiled track rollers are designed to alleviate uneven bearing loading resulting from deflection, bending or misalignment in mounting. Stud-type track rollers are available with or without lip contact seals, or with shields. Yoke-type track rollers are designed for straddle mounting. Each yoke-type is available with either radial needle roller and cage assemblies, or with a single (or double) full complement row of cylindrical or needle rollers.

Thrust Bearing Assemblies And Washers

Thrust needle roller and cage assemblies are available in a variety of inch or metric sizes. All types have very small cross sections. If the back up surfaces cannot be used as raceways, hardened washers are available. Thrust bearings are available with needle rollers or heavier cylindrical rollers for high load-carrying capacity.

Combined (Radial and Thrust) Bearings

Combined bearings consist of a radial bearing (needle roller bearing) and a thrust bearing (ball or roller bearing). Some combined bearings are constructed similar to drawn cups, but with an added thrust bearing component. Like other needle roller bearings, these combined bearings can be matched with an optional inner ring or thrust washer as the opposing raceway.

NEEDLE ROLLER BEARING SELECTION

Because of the possible combinations of roller complement orientation, bearing cross section thickness and raceway construction needle roller bearings should be given extra consideration for roller bearing applications selection. The table below should be used as a general guideline for the application of needle roller bearings.

Table A-1. Needle roller bearing capability comparison based on suitable oil lubrication

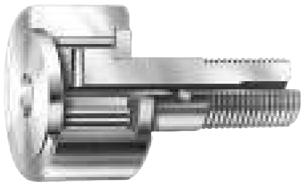
Bearing type/ design capability	Radial needle roller and cage assembly	Drawn cup needle roller bearing caged	Drawn cup roller bearing full complement	Needle roller bearing and inner ring	Track roller	Thrust needle roller and cage assembly	Needle rollers	Combination bearing radial/thrust
Radial load	High	Moderate	High	High	Moderate	None	Very high	High
Axial load	None	None	None	None	Low	Very high	None	High
Limiting speed	Very high	High	Moderate	Very high	Moderate	High	Moderate	Moderate
Slope tolerance	Moderate	Moderate	Very low	Moderate	Moderate(1)	Low	Very low	Low
Grease life	High	High	Low	High	Moderate	Low	Low	Low
Friction	Very low	Very low	Moderate	Very low	Low(2)	Low	Moderate	Moderate
Precision	Very high	Moderate	Moderate	High	High	High	Very high	High
Cross section	Very low	Low	Low	Moderate	High	Very low	Very low	High
Cost	Low	Low	Low	High	High	Moderate	Very low	Very high

(1) "Moderate" for full complement track rollers
(2) "Low" for full complement track rollers

Radial needle roller and cage assembly

Drawn cup needle roller

Heavy-duty needle roller



Track roller

Thrust needle roller and cage assembly

Combined radial/thrust

Drawn cup roller clutch

BEARING REACTIONS, EQUIVALENT LOADS AND BEARING LIFE

DEFINITION OF LOAD RATINGS

Basic Dynamic Load Rating

The "basic dynamic load rating" (Cr) for a radial roller bearing is that calculated, constant, radial load, which a group of apparently identical bearings with stationary outer ring can theoretically endure for a rating life of one million revolutions of the inner ring. For a thrust roller bearing (Ca) is that calculated, constant, centric thrust load, which a group of apparently identical bearings can theoretically endure for a rating life of one million revolutions of one of the bearing washers. The basic dynamic load rating is a reference value only, the base value of one million revolutions has been chosen for ease of calculation. Since applied loading as great as the basic dynamic load tends to cause local plastic deformation of the rolling surfaces, it is not anticipated that such heavy loading would normally be applied.

Basic Static Load Rating

Basic static load rating for a radial roller bearing suitably manufactured from a good quality hardened alloy steel, the static radial load rating (C_{or}) is that uniformly distributed static radial bearing load, which produces a maximum contact stress of 4000 megapascals (580,000 psi) acting at the center of contact of the most heavily loaded rolling element. The static axial load rating (C_{oa}) is that uniformly distributed static centric axial load, which produces a maximum contact stress of 4000 megapascals (580,000 psi) acting at the center of contact of each rolling element.

Note: For a contact stress of 4000 megapascals (580,000 psi) a total permanent deformation of roller and raceway occurs, which is appoximately 0.0001 of the roller diameter.

EQUIVALENT DYNAMIC RADIAL BEARING LOADS (P_R)

To calculate the L_{10} life, it is necessary to calculate a dynamic equivalent radial load, designated by P_r. The dynamic equivalent radial load is defined as a single radial load that, if applied to the bearing, will result in the same life as the combined loading under which the bearing operates.

$$P_r = XF_r + YF_a$$

Where:

L_{10} = Basic rating life
P_r = Dynamic equivalent radial load
F_r = Applied radial load
F_a = Applied axial load
X = Radial load factor
Y = Axial load factor

Radial needle roller bearings are designed to carry radial load with zero thrust load under normal conditions. With the thrust load equal to zero, equivalent radial load (P_r) is equal to the design radial load (F_r). Your representative should be consulted on any applications where thrust load is involved (as the resulting increase in internal friction may require cooling to prevent increased operating temperatures).

STATIC RADIAL AND/OR AXIAL EQUIVALENT LOADS

The static equivalent radial and/or axial loading is dependent on the bearing type selected. For bearings designed to accommodate only radial or thrust loading, the static equivalent load is equal to the applied load.

For all bearings, the maximum contact stress can be approximated using the static equivalent load and the static rating.

For roller bearings:

$$\sigma_0 = 4000 \text{ x } \left(\frac{P_0}{C_0}\right)^{1/2} \text{ MPa}$$

$$\sigma_0 = 580 \text{ x } \left(\frac{P_0}{C_0}\right)^{1/2} \text{ ksi}$$

Because radial needle roller bearings are not designed to accept thrust loading, their equation to determine static radial equivalent load is:

$$P_{0r} = F_r$$

Thrust needle roller bearings are not designed to accept radial loading, so their equation to determine static thrust equivalent load is:

$$P_{0a} = F_a$$

The determination of the static load safety factor (f_0) serves to ascertain that a bearing with adequate static load rating has been selected.

$$f_0 = \frac{C_0}{P_0}$$

Where:

f_0 = Static load safety factor
C_0 = Basic static load rating (kN or lbf)
P_0 = Maximum applied static load (kN or lbf)

f_0 is a safety factor against permanent deformation of the contact areas of the rolling elements and raceways. Higher f_0 values are required for particulary smooth operation. The following values are generally suggested.

f_0 = 1.5 ... 3.0 for smooth operation
f_0 = 1.0 ... 2.0 for less smooth operation

For drawn cup needle roller bearings, f_0 should be ≥ 3.

MINIMUM BEARING LOAD

Slippage can occur if loads are too light and, if accompanied by inadequate lubrication, can cause damage to the bearings. The minimum load for bearings with cage is $P_r/C_r = 0.02$, for full-complement bearings $P_r/C_r = 0.04$ (P_r is the dynamic load and C_r is the basic dynamic load rating).

Thrust needle roller bearings also have an added design requirement such that the minimum thrust load is satisfied to prevent the rollers from skidding on the raceway. The equation for the thrust loading force is different for needle rollers versus cylindrical rollers as noted:

(Needle rollers) $F_{a\ min.} = C_{0a}/2200$ kN
(Cylindrical rollers) $F_{a\ min.} = 0.1C_{0a}/2200$ kN

MAXIMUM BEARING LOAD

The load/life relationship is applicable to a wide range of bearing loads. However, high loading may cause stress concentrations in the roller-raceway contacts. Therefore, for most applications, the maximum applied load should not be greater than one-third of the basic dynamic load rating [$P \leq C/3$] in order for the basic rating life calculation to be valid.

MEAN DYNAMIC EQUIVALENT LOAD

When load magnitude or direction varies, it is necessary to calculate the mean dynamic equivalent load, which provides the same length of bearing service life as that under the actual load fluctuation. If the load and the rotational speed change in levels, as shown in Fig. A-1, the following equation can be used to calculate the mean dynamic equivalent load.

$$P_m = \sqrt[10/3]{\frac{P_1^{10/3} n_1 t_1 + P_2^{10/3} n_2 t_2 + \cdots\cdots + P_n^{10/3} n_n t_n}{n_1 t_1 + n_2 t_2 + \cdots\cdots\cdots + n_n t_n}}$$

In this equation,

P_m : Mean dynamic equivalent load N
P_1 : The load applied at rotational speed n_1 and for t_1 hours N
⋮ ⋮ ⋮
P_n : The load applied at rotational speed n_n and for t_n hours N

What's more, the following equation can be used to calculate the mean rotational speed n_m.

$$n_m = \frac{n_1 t_1 + n_2 t_2 + \cdots\cdots + n_n t_n}{t_1 + t_2 + \cdots\cdots\cdots\cdots t_n}$$

When the load changes steadily, as shown in Fig. A-2, the following equation can be used to calculate an approximation of the mean dynamic equivalent load.

$$P_m = \frac{P_{min.} + 2\,P_{max.}}{3}$$

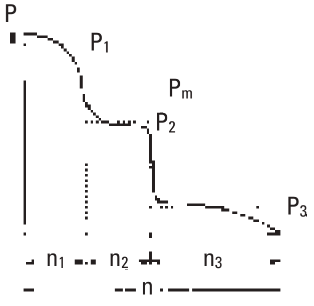


Fig. A-1

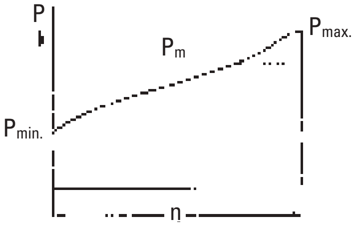


Fig. A-2

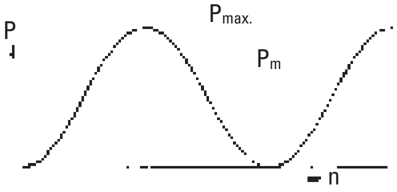


Fig. A-3

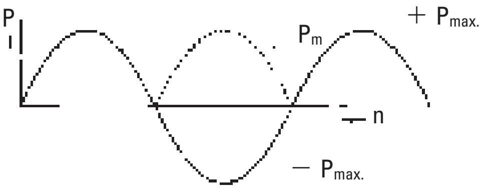


Fig. A-4

In this equation,

$P_{min.}$: The minimum dynamic equivalent load N
$P_{max.}$: The maximum dynamic equivalent load N

When the load changes like a sine wave between 0 and P_{max}, as shown in Fig. A-3, the following equation can be used to calculate an approximation of the mean dynamic equivalent load.

$$P_m \fallingdotseq 0.68\,P_{max.}$$

When the load changes between 0 and $P_{max.}$ in only the upper half of the sine wave, as shown in Fig. A-4, the following equation can be used to calculate an approximation of the mean dynamic equivalent load.

$$P_m \fallingdotseq 0.75\,P_{max.}$$

BEARING LIFE

Even if rolling bearings are rotated under ideal conditions, contact stress is continuously and repeatedly applied to the raceway surfaces of inner and outer rings or rolling contact surfaces of rolling elements, and material flakes from the raceway surfaces and rolling contact surfaces due to fatigue of material. The total number of bearing rotations (or total operating period at a constant speed) until flaking occurs is regarded as the bearing service life.

Even if bearings of the same dimensions, structure, material, and processing method are operated under the same rotating conditions, their service lives are considerably varied.

Since this phenomenon results from fatigue distribution in bearing materials themselves, differences in bearing service life should be statistically considered. When a group of identical bearings are rotated under the same conditions, the total number of revolutions until 90 % of the bearings are left without flaking (i.e. a service life of 90 % reliability) is defined as the basic rating life. Or in operating at a constant speed, it can be expressed by the total number of bearing rotations.

In practical service, however, a bearing fails not only because of fatigue, but other coefficients as well, such as wear, seizure, creep, fretting, brinelling, cracking etc. These bearing failures can be minimized by selecting the proper mounting method and lubricant, as well as the bearing most suitable for the application.

BEARING LIFE EQUATIONS

Basic Rating Life

Generally, the relationship between the basic dynamic load rating, dynamic equivalent load, and basic rating life of needle roller bearings is expressed as follows.

$$L_{10} = \left(\frac{C}{P}\right)^{10/3}$$

Where,

L_{10} : Basic rating life 10^6 rotations
C : Basic dynamic load rating N
P : Dynamic equivalent load N

It is common for the life being expressed in terms of time to be useful when the bearing is rotating at a constant speed.

In this situation, the life can be obtained with the following equation.

$$L_{10h} = \left(\frac{C}{P}\right)^{10/3} \frac{10^6}{60n}$$

Where,

L_{10h} : Basic rating life h
n : Rotational speed min^{-1}

Accordingly, where the dynamic equivalent load is P and rotational speed is n, the following equation can be used to calculate the basic dynamic load rating C, which is required to meet the design life. The bearing size most suitable for a specified purpose can then be selected by referring to the bearing specification table.

$$C = P\left(L_{10h} \times \frac{60n}{10^6}\right)^{3/10}$$

Modified Rating Life

The life of rolling bearings was standardized as a basic rating life in the 1960s, but in actual applications, sometimes the actual life and the basic rating life have been quite different due to the lubrication status and the influence of the usage environment. To make the calculated life closer to the actual life, a corrected rating life has been considered since the 1980s. In this corrected rating life, bearing characteristic factor a_2 (a correction factor for the case in which the characteristics related to the life are changed due to the bearing materials, manufacturing process, and design) and usage condition factor a_3 (a correction factor that takes into account usage conditions that have a direct influence on the bearing life, such as the lubrication) or factor a_{23} formed from the interdependence of these two factors, are considered with the basic rating life. These factors were handled differently by each bearing manufacturer, but they have been standardized as a modified rating life in **ISO 281** in 2007. In 2013, **JIS B 1518** (dynamic load ratings and rating life) was amended to conform to the **ISO**.

The basic rating life (L_{10}) shown in equation is the (fatigue) life with a dependability of 90 % under normal usage conditions for rolling bearings that have standard factors such as internal design, materials, and manufacturing quality. **JIS B 1518**:2013 specifies a calculation method based on **ISO 281**:2007. To calculate accurate bearing life under a variety of operating conditions, it is necessary to consider elements such as the effect of changes in factors that can be anticipated when using different reliabilities and system approaches, and interactions between factors. Therefore, the specified calculation method considers additional stress due to the lubrication status, lubricant contamination, and fatigue load limit C_u (refer to p. A-9) on the inside of the bearing. The life that uses this life modification factor a_{ISO}, which considers the above factors, is called modified rating life L_{nm} and is calculated with the following equation.

$$L_{nm} = a_1\, a_{ISO}\, L_{10}$$

In this equation,

L_{nm} : Modified rating life 10^6 rotations
(This rating life has been modified for one of or a combination of the following: reliability of 90 % or higher, fatigue load limit, special bearing characteristics, lubrication contamination, and special operating conditions.)
L_{10} : Basic rating life 10^6 rotations (reliability: 90 %)
a_1 : Life modification factor for reliability ··············· Refer to section (1)
a_{ISO} : Life modification factor ··············· Refer to section (2)

[Remark]
When bearing dimensions are to be selected given L_{nm} greater than 90 % in reliability, the strength of shaft and housing must be considered.

(1) Life modification factor for reliability a_1

The term "reliability" is defined as "for a group of apparently identical rolling bearings, operating under the same conditions, the percentage of the group that is expected to attain or exceed a specified life" in **ISO 281**:2007. Values of a_1 used to calculate a modified rating life with a reliability of 90 % or higher (a failure probability of 10 % or less) are shown in Table A-2.

Table A-2. Life modification factor for reliability a_1

Reliability, %	L_{nm}	a_1
90	L_{10m}	1
95	L_{5m}	0.64
96	L_{4m}	0.55
97	L_{3m}	0.47
98	L_{2m}	0.37
99	L_{1m}	0.25
99.2	$L_{0.8m}$	0.22
99.4	$L_{0.6m}$	0.19
99.6	$L_{0.4m}$	0.16
99.8	$L_{0.2m}$	0.12
99.9	$L_{0.1m}$	0.093
99.92	$L_{0.08m}$	0.087
99.94	$L_{0.06m}$	0.080
99.95	$L_{0.05m}$	0.077

(Citation from **JIS B 1518**:2013)

(2) Life modification factor a_{ISO}

a) System approach

The various influences on bearing life are dependent on each other. The system approach of calculating the modified life has been evaluated as a practical method for determining life modification factor a_{ISO} (ref. Fig. A-5). Life modification factor a_{ISO} is calculated with the following equation. A diagram is available for each bearing type (radial ball bearings, radial roller bearings, thrust ball bearings, and thrust roller bearings). (Each diagram (Figs. A-6 to A-9) is a citation from **JIS B 1518**:2013.)

Note that in practical use, this is set so that life modification factor $a_{ISO} \leq 50$.

$$a_{ISO} = f\left(\frac{e_c\, C_u}{P},\ \kappa\right)$$

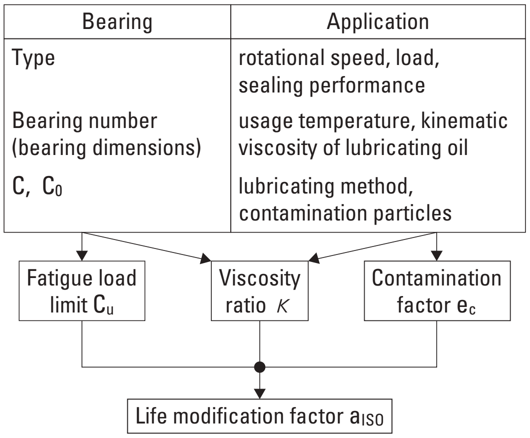


Fig. A-5. System approach

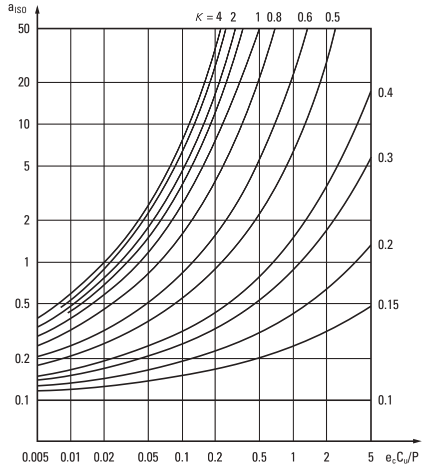


Fig. A-6. Life modification factor a_{ISO} (Radial ball bearings)

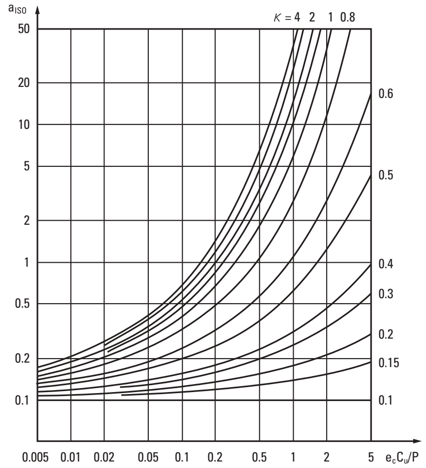


Fig. A-7. Life modification factor a_{ISO} (Radial roller bearings)

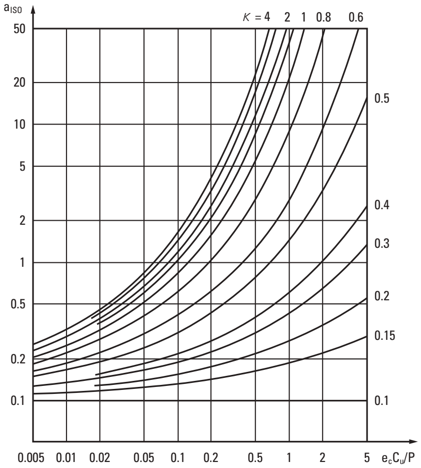


Fig. A-8. Life modification factor a_{ISO} (Thrust ball bearings)

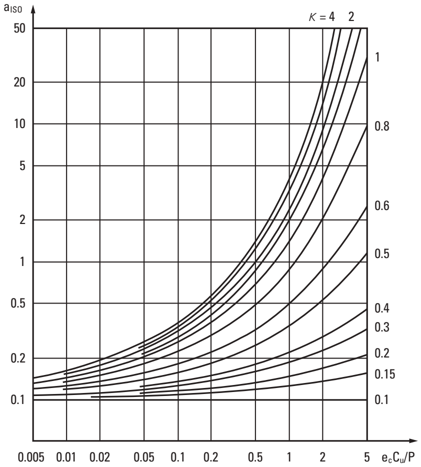


Fig. A-9. Life modification factor a_{ISO} (Thrust roller bearings)

(Figs. A-6 to A-9. Citation from **JIS B 1518**:2013)

b) Fatigue load limit C_u

For regulated steel materials or alloy steel that has equivalent quality, the fatigue life is unlimited so long as the load condition does not exceed a certain value and so long as the lubrication conditions, lubrication cleanliness class, and other operating conditions are favorable. For general high-quality materials and bearings with high manufacturing quality, the fatigue stress limit is reached at a contact stress of approximately 1.5 GPa between the raceway and rolling elements. If one or both of the material quality and manufacturing quality are low, the fatigue stress limit will also be low.

The term "fatigue load limit" C_u is defined as "bearing load under which the fatigue stress limit is just reached in the most heavily loaded raceway contact" in **ISO 281**:2007. and is affected by factors such as the bearing type, size, and material.

For details on the fatigue load limits of special bearings and other bearings not listed in this catalog, contact JTEKT.

c) Contamination factor e_c

If solid particles in the contaminated lubricant are caught between the raceway and the rolling elements, indentations may form on one or both of the raceway and the rolling elements. These indentations will lead to localized increases in stress, which will decrease the life. This decrease in life attributable to the contamination of the lubricant can be calculated from the contamination level as contamination factor e_c.

D_{pw} shown in Table A-3 is the pitch diameter of ball/roller set, which is expressed simply as $D_{pw} = (D + d)/2$. (D: Outside diameter, d: Bore diameter)

For information such as details on special lubricating conditions or detailed investigations, contact JTEKT.

Table A-3. Values of contamination factor e_c

Contamination level	e_c	
	D_{pw} < 100 mm	D_{pw} ≥ 100 mm
Extremely high cleanliness: The size of the particles is approximately equal to the thickness of the lubricant oil film, this is found in laboratory-level environments.	1	1
High cleanliness: The oil has been filtered by an extremely fine filter, this is found with standard grease-packed bearings and sealed bearings.	0.8 to 0.6	0.9 to 0.8
Standard cleanliness: The oil has been filtered by a fine filter, this is found with standard grease-packed bearings and shielded bearings.	0.6 to 0.5	0.8 to 0.6
Minimal contamination: The lubricant is slightly contaminated.	0.5 to 0.3	0.6 to 0.4
Normal contamination: This is found when no seal is used and a coarse filter is used in an environment in which wear debris and particles from the surrounding area penetrate into the lubricant.	0.3 to 0.1	0.4 to 0.2
High contamination: This is found when the surrounding environment is considerably contaminated and the bearing sealing is insufficient.	0.1 to 0	0.1 to 0
Extremely high contamination	0	0

(Table A-3. Citation from **JIS B 1518**:2013)

d) Viscosity ratio κ

The lubricant forms an oil film on the roller contact surface, which separates the raceway and the rolling elements. The status of the lubricant oil film is expressed by viscosity ratio κ, the actual kinematic viscosity at the operating temperature ν divided by the reference kinematic viscosity ν_1 as shown in the following equation.

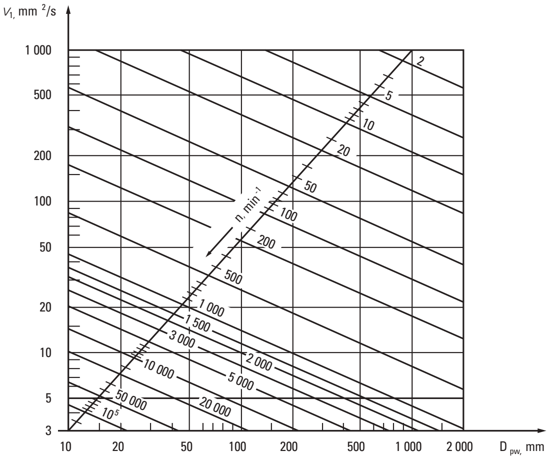
A κ greater than 4, equal to 4, or less than 0.1 is not applicable.

For details on lubricants such as grease and lubricants with extreme pressure additives, contact JTEKT.

$$\kappa = \frac{\nu}{\nu_1}$$

ν : Actual kinematic viscosity at the operating temperature; the viscosity of the lubricant at the operating temperature (refer to Fig. A-14, p. A-22)

ν_1 : Reference kinematic viscosity; determined according to the speed and pitch diameter of ball/roller set D_{pw} of the bearing (ref. Fig. A-10)



(Fig. A-10. Citation from **JIS B 1518**:2013)

Fig. A-10. Reference kinematic viscosity ν_1

Basic Dynamic Load Rating Correction Due to Temperature

During high-temperature operation, the bearing metal hardness deteriorates as the material compositions are altered. As a result, the basic dynamic load rating is diminished. Once altered, material composition does not recover, even if the operating temperature is returned to normal. Therefore, for bearings used in high temperature operations, the basic dynamic load rating must be corrected by multiplying the basic dynamic load rating values specified in the bearing specification table by the temperature coefficient values in Table A-4.

Table A-4. Temperature coefficient values

Bearing temperature, °C	125	150	175	200	250
Temperature coefficient	1	1	0.95	0.90	0.75

Hardness rating factors

Dynamic and static load ratings are based on a minimum raceway hardness equivalent to 58 HRC (HV 653). If the raceway hardness is lower, the effective load ratings will be decreased. The following factors may be used to estimate life when raceway hardness is lower than 58 HRC. Thorough validation is recommended.

Table A-5. Basic dynamic load rating coefficients

Hardness (HRC)	Coefficient
58	1
57	0.94
56	0.89
55	0.85
54	0.80
53	0.75
52	0.68
51	0.60
50	0.50
49	0.44
48	0.40
47	0.37
46	0.34
45	0.31
40	0.20

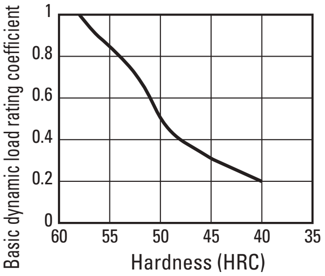


Fig. A-11. Relationship between basic dynamic load rating coefficient and hardness

Table A-6. Basic static load rating coefficients

Hardness (HRC)	Coefficient
58	1
57	0.94
56	0.88
55	0.83
54	0.78
53	0.73
52	0.68
51	0.65
50	0.61
49	0.57
48	0.53
47	0.50
46	0.47
45	0.44
40	0.32

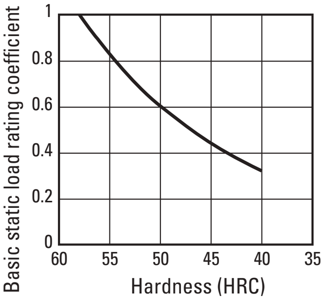


Fig. A-12. Relationship between basic static load rating coefficient and hardness

Service life of bearing system comprising two or more bearings

Even for systems which comprise two or more bearings, if one bearing is damaged, the entire system malfunctions.

Where all bearings used in an application are regarded as one system, the service life of the bearing system can be calculated using the following equation,

$$\frac{1}{L^e} = \frac{1}{L_1{}^e} + \frac{1}{L_2{}^e} + \frac{1}{L_3{}^e} + \cdots\cdots\cdots$$

---

where :

L : rating life of system

L_1 , L_2 , L_3······ : rating life of each bearing

e : constant

e = 10/9······ball bearing

e = 9/8······roller bearing

The mean value is for a system

using both ball and roller bearings.

[Example]

When a shaft is supported by two roller bearings whose service lives are 50 000 hours and 30 000 hours respectively, the rating life of the bearing system supporting this shaft is calculated as follows :

$$\frac{1}{L^{9/8}} = \frac{1}{50\,000^{9/8}} + \frac{1}{30\,000^{9/8}}$$

$L ≒ 20\,000$ h

This fact is very important in estimating bearing service life for applications using two or more bearings.

MOUNTING DESIGNS

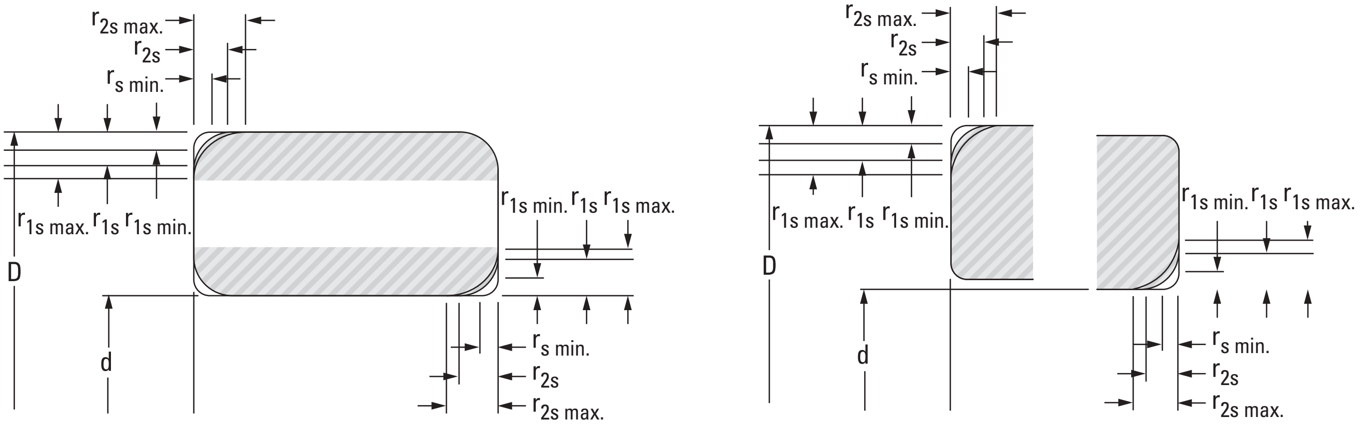
METRIC SERIES NEEDLE ROLLER BEARINGS (EXCEPT DRAWN CUP NEEDLE ROLLER BEARINGS)

Metric series needle roller bearings are available with Radial Internal Clearance (RIC) designations per either of the following tables: per “ISO/ABMA ‘C’ Clearance.” Non-standard values also are available by special request. Standard radial internal clearance values are listed in the following tables based on bore size. The clearance required for a given application depends on the desired operating precision, rotational speed of the bearing and the fitting practice used. Most applications use a normal or C0 (Standard) clearance. Typically, larger clearance reduces the operating zone of the bearing, increases the maximum roller load and reduces the bearing’s expected life.

Table A-7. Metric series needle roller bearing radial internal clearance limits

Bore		RIC							
		C2		C0 (Standard)		C3		C4	
over	incl.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
- -	**30.000** 1.1811	**0.025** 0.0010	**0.000** 0.0000	**0.045** 0.0018	**0.020** 0.0008	**0.060** 0.0024	**0.035** 0.0014	**0.075** 0.0030	**0.050** 0.0020
30.000 1.1811	**40.000** 1.5748	**0.030** 0.0012	**0.005** 0.0002	**0.050** 0.0020	**0.025** 0.0010	**0.070** 0.0028	**0.045** 0.0018	**0.085** 0.0033	**0.060** 0.0024
40.000 1.5748	**50.000** 1.9685	**0.035** 0.0014	**0.005** 0.0002	**0.060** 0.0024	**0.030** 0.0012	**0.080** 0.0031	**0.050** 0.0020	**0.100** 0.0039	**0.070** 0.0028
50.000 1.9685	**65.000** 2.5591	**0.040** 0.0016	**0.010** 0.0004	**0.070** 0.0028	**0.040** 0.0016	**0.090** 0.0035	**0.060** 0.0024	**0.110** 0.0043	**0.080** 0.0031
65.000 2.5591	**80.000** 3.1496	**0.045** 0.0018	**0.010** 0.0004	**0.075** 0.0030	**0.040** 0.0016	**0.100** 0.0039	**0.065** 0.0026	**0.125** 0.0049	**0.090** 0.0035
80.000 3.1496	**100.000** 3.9370	**0.050** 0.0020	**0.015** 0.0006	**0.085** 0.0033	**0.050** 0.0020	**0.110** 0.0043	**0.075** 0.0030	**0.140** 0.0055	**0.105** 0.0041
100.000 3.9370	**120.000** 4.7244	**0.055** 0.0022	**0.015** 0.0006	**0.090** 0.0035	**0.050** 0.0020	**0.125** 0.0049	**0.085** 0.0033	**0.165** 0.0065	**0.125** 0.0049
120.000 4.7244	**140.000** 5.5118	**0.060** 0.0024	**0.015** 0.0006	**0.105** 0.0041	**0.060** 0.0024	**0.145** 0.0057	**0.100** 0.0039	**0.190** 0.0075	**0.145** 0.0057
140.000 5.5118	**160.000** 6.2992	**0.070** 0.0028	**0.020** 0.0008	**0.120** 0.0047	**0.070** 0.0028	**0.165** 0.0065	**0.115** 0.0045	**0.215** 0.0085	**0.165** 0.0065
160.000 6.2992	**180.000** 7.0866	**0.075** 0.0030	**0.025** 0.0010	**0.125** 0.0049	**0.075** 0.0030	**0.170** 0.0067	**0.120** 0.0047	**0.220** 0.0087	**0.170** 0.0067
180.000 7.0866	**200.000** 7.8740	**0.090** 0.0035	**0.035** 0.0014	**0.145** 0.0057	**0.090** 0.0035	**0.195** 0.0077	**0.140** 0.0055	**0.250** 0.0098	**0.195** 0.0077
200.000 7.8740	**225.000** 8.8583	**0.105** 0.0041	**0.045** 0.0018	**0.165** 0.0065	**0.105** 0.0041	**0.220** 0.0087	**0.160** 0.0063	**0.280** 0.0110	**0.220** 0.0087
225.000 8.8583	**250.000** 9.8425	**0.110** 0.0043	**0.045** 0.0018	**0.175** 0.0069	**0.110** 0.0043	**0.235** 0.0093	**0.170** 0.0067	**0.300** 0.0118	**0.235** 0.0093
250.000 9.8425	**280.000** 11.0236	**0.125** 0.0049	**0.055** 0.0022	**0.195** 0.0077	**0.125** 0.0049	**0.260** 0.0102	**0.190** 0.0075	**0.330** 0.0130	**0.260** 0.0102
280.000 11.0236	**315.000** 12.4016	**0.130** 0.0051	**0.055** 0.0022	**0.205** 0.0081	**0.130** 0.0051	**0.275** 0.0108	**0.200** 0.0079	**0.350** 0.0138	**0.275** 0.0108
315.000 12.4016	**355.000** 13.9764	**0.145** 0.0057	**0.065** 0.0026	**0.225** 0.0089	**0.145** 0.0057	**0.305** 0.0120	**0.225** 0.0089	**0.385** 0.0152	**0.305** 0.0120
355.000 13.9764	**400.000** 15.7480	**0.190** 0.0075	**0.100** 0.0039	**0.280** 0.0110	**0.190** 0.0075	**0.370** 0.0146	**0.280** 0.0110	**0.460** 0.0181	**0.370** 0.0146
400.000 15.7480	**450.000** 17.7165	**0.210** 0.0083	**0.110** 0.0043	**0.310** 0.0122	**0.210** 0.0083	**0.410** 0.0161	**0.310** 0.0122	**0.510** 0.0201	**0.410** 0.0161
450.000 17.7165	**500.000** 19.6850	**0.220** 0.0087	**0.110** 0.0043	**0.330** 0.0130	**0.220** 0.0087	**0.440** 0.0173	**0.330** 0.0130	**0.550** 0.0217	**0.440** 0.0173

METRIC SERIES BEARING CHAMFER DIMENSIONS



Radial Bearings

Thrust Bearings

Table A-8. Chamfer dimensions of radial bearings metric series

$r_{s\,min.}$	d Nominal bore dia.		$r_{1s\,max.}$	$r_{2s\,max.}$
	>	≤		
mm in	mm in		mm in	mm in
0.150 0.0059	**all** all		**0.300** 0.0118	**0.600** 0.0236
0.200 0.0079	**all** all		**0.500** 0.0197	**0.800** 0.0315
0.300 0.0118	–	**40.000** 1.5748	**0.600** 0.0236	**1.000** 0.0394
	40.000 1.5748	–	**0.800** 0.0315	**1.000** 0.0394
0.600 0.0236	–	**40.000** 1.5748	**1.000** 0.0394	**2.000** 0.0787
	40.000 1.5748	–	**1.300** 0.0512	**2.000** 0.0787
1.000 0.0394	–	**50.000** 1.9685	**1.500** 0.0591	**3.000** 0.1181
	50.000 1.9685	–	**1.900** 0.0748	**3.000** 0.1181
1.100 0.0433	–	**120.000** 4.7244	**2.000** 0.0787	**3.500** 0.1378
	120.000 4.7244	–	**2.500** 0.0984	**4.000** 0.1575
1.500 0.0591	–	**120.000** 4.7244	**2.300** 0.09055	**4.000** 0.1575
	120.000 4.7244	–	**3.000** 0.1181	**5.000** 0.19685
2.000 0.0787	–	**80.000** 3.1496	**3.000** 0.1181	**4.500** 0.1772
	80.000 3.1496	**220.000** 8.6614	**3.500** 0.1378	**5.000** 0.19685
	220.000 8.6614	–	**3.800** 0.1496	**6.000** 0.2362
2.100 0.0827	–	**280.000** 11.0236	**4.000** 0.1575	**6.500** 0.2559
	280.000 11.0236	–	**4.500** 0.1772	**7.000** 0.2756

Table A-9. Chamfer dimensions of thrust bearings metric series

$r_{s\,min.}$	$r_{1s\,max.}$	$r_{2s\,max.}$
mm in	mm in	mm in
0.300 0.0118	**0.800** 0.0315	**0.800** 0.0315
0.600 0.0236	**1.500** 0.0591	**1.500** 0.0591
1.000 0.0394	**2.200** 0.0866	**2.200** 0.0866
1.100 0.0433	**2.700** 0.1063	**2.700** 0.1063
1.500 0.0591	**3.500** 0.1378	**3.500** 0.1378
2.000 0.0787	**4.000** 0.1575	**4.000** 0.1575

ABMA / ISO Symbols

d	Bearing bore diameter, nominal and shaft-piloted washer bore diameter, nominal.
D	Bearing outside diameter, nominal and housing-piloted washer outside diameter, nominal.
$r_{s\,min.}$	Smallest permissible single chamfer dimension (minimum limit).
$r_{1s\,max.}$	Largest permissible single chamfer dimension in a radial direction.
$r_{2s\,max.}$	Largest permissible single chamfer dimension in an axial direction.

SHAFT DESIGNS

BEARINGS WITHOUT INNER RINGS

When the shaft is used as the inner raceway for needle roller bearings it must have a hardness of 58 HRC or higher and a wave-free finish in order to realize the full load-carrying capability of the bearing.

1. **Metallurgy** – either case-hardening or through-hardening grades of good bearing-quality steel are satisfactory for raceways.

   To realize full bearing capacity, the raceway area must be at least surface hard with a reasonable core strength. During the carburizing or induction-hardening of case hardened steel, not only must the surface hardness requirement of 58 HRC or higher be met, but the basic concept is that the case depth with a hardness of HV 550 (52.3 HRC) must be 0.4 mm or higher. However, if the roller diameter is smaller than 4 mm, a case depth of (0.1 × Dw) mm or higher is recommended.
   (Dw:roller diameter)
2. **Strength** – the shaft must be of sufficient strength to keep the operating deflections within the limits outlined.
3. **Tolerance** – the suggested shaft diameter tolerances for each type of needle roller bearing are indicated in the appropriate section of this catalog.
4. **Variation of mean shaft diameter (taper)** – within the range of the bearing width, 5 μm or less per 25 mm or one-half the diameter tolerance or less (whichever is smaller).
5. **Deviation from circular form** – the radial deviation from true circular form of the raceway should not exceed 2.5 μm for diameters up to and including 25 mm. For raceways greater than 25 mm, the allowable radial deviation should not exceed 2.5 μm multiplied by a factor of the raceway diameter divided by 25.
6. **High frequency lobing** – the lobing that occurs 10 or more times around the circumference of a shaft and exceeds 0.4 μm from peak to valley is called chatter. Chatter usually causes undesirable noise and reduces fatigue life.
7. **Shaft slope** – Operating conditions which cause misalignment (shaft deflection, inaccuracy of shaft and housing, mounting errors) can affect bearing performance. For needle roller bearings, Table A-10 shows misalignment limitations based on bearing width.

Table A-10. Misalignment limitations

Bearing width		Maximum slope (mm/mm)	
mm	in.	Caged	Full complement
<25.4	<1	0.0015	0.0010
25.4 – 50.8	1 – 2	0.0010	0.0005
>50.8	>2	0.0005	0.0005

8. **Surface finish** – In addition to a wave-free finish, the raceway surface roughness of $R_a \le 0.2$ μm must be maintained for the bearing to utilize its full load rating. The raceway area also must be free of nicks, burrs, scratches and dents. Oil holes are permissible in the raceway area, but care must be taken to blend the edges gently into the raceway, and if possible, the hole should be located in the unloaded zone of the raceway.

   Care also must be taken to prevent grind reliefs, fillets, etc., from extending into the raceway area. If the rollers overhang a grind relief or step on the shaft, there will be high stress concentration with resultant early damage.
9. **End chamfer** – for the most effective assembly of the shaft into a bearing, the end of the shaft should have a large chamfer or rounding. This should help in preventing damage to the roller complement, scratching of the raceway surface, and nicking of the shaft end.
10. **Sealing surface** – in some instances, bearings have integral or immediately adjacent seals that operate on the surface ground for the bearing raceway. Here, particular attention should be paid to the pattern of the shaft finish. In no instance should there be a “lead,” or spiral effect, as often occurs with through-feed centerless grinding. Such a “lead” may pump lubricant past the seal.

BEARINGS WITH INNER RINGS

When it is undesirable or impractical to prepare the shaft to be used as a raceway, inner rings are available as listed in the tabular pages. If the shaft is not used directly as a raceway, the following design specifications must be met:

1. **Strength** – the shaft must be of sufficient strength to keep the operating deflections within the limits outlined.
2. **Tolerance** – the suggested shaft diameter tolerances for each type of needle roller bearing are indicated in the appropriate section of the catalog.
3. **Variation of mean shaft raceway diameter (taper) and deviation from circular form of the raceway** – should not exceed one-half the shaft diameter tolerance.
4. **Surface finish** – the surface finish should not exceed a roughness of Ra 0.8 μm.
5. **Locating shoulders or steps** – locating shoulders or steps in the shaft must be held to close concentricity with the bearing seat to prevent imbalance and resultant vibrations.

Table A-11. Shaft designs summary

	Shaft	
	Raceway surface	**Fitting surface**
Out-of-roundness	Shaft dia. ≤ 25 mm: 2.5 μm or less Shaft dia. > 25 mm: 2.5 μm × (shaft dia./25 mm) or less	One-half of shaft dia. tolerance or less
Variation of mean dia. (taper)	5 μm or less per 25 mm within the range of bearing width, or one-half of shaft dia. tolerance or less (whichever is smaller)	One-half of shaft dia. tolerance or less
Surface roughness	0.2a or less	0.8a or less
Hardness	58 HRC or harder[1]	–

1) During the carburizing or induction-hardening of case hardened steel, not only must the surface hardness requirement of 58 HRC or higher be met, but the basic concept is that the case depth with a hardness of HV 550 (52.3 HRC) must be 0.4 mm or higher. However, if DW is smaller than 4 mm, a case depth of (0.1 × Dw) mm or higher is recommended. (Dw: roller dia.)

HOUSING DESIGNS

BEARINGS WITH OUTER RINGS

For bearings with outer rings, the function of the housing is to locate and support the outer ring. The following specifications must be met:

1. **Strength** – housings should be designed so that the radial loads placed on the bearings will cause a minimum of deflection or distortion of the housing.
2. **Variation of mean housing diameter (taper)** – within the width of the outer ring, 13 µm or one-half the diameter tolerance (whichever is smaller) or less.
3. **Deviation from circular form** – the housing bore should be round within one-half the housing bore tolerance.
4. **Parallelism** – when possible, line bore housings that are common to one shaft to obtain parallelism of the housing bores and the shaft axis.
5. **Surface finish** – The surface finish should not exceed R_a 1.6 µm.
6. **End chamfer** – to permit easy introduction of the bearing into the housing, the end of the housing should have a generous chamfer.

Only heavy-duty needle roller bearings can be installed into housings with a transition fit or a clearance fit. The outer ring should be a transition fit in the housing when it rotates relative to the load. The outer ring may be a clearance fit in the housing when it is stationary relative to the load. In either case, locate the bearings by shoulders, or other locating devices, to prevent axial movement.

Since only the heavy-duty needle roller bearing does not require an interference fit in the housing to round and size it properly, a split housing may be used if desired. Dowels should be used to maintain proper register of the housing sections.

Drawn cup needle roller bearings have a thin case-hardened outer ring that is out-of-round from the hardening operation. For proper mounting it must always be pressed into the housing. Split housings will not round and size a drawn cup bearing. When split housings must be used, the bearing should first be mounted in a cylindrical sleeve.

The housing should be of sufficient tensile strength and section to round and size the bearing. It must be designed for minimum distortion under load. Steel or cast iron housings are preferred.

Housing bores in low tensile strength materials such as aluminum, magnesium, phenolics, etc., should be reduced to provide more interference fit. Thin section cast iron and steel housings may also require reduced bores. Consult your representative for suggestions when working with these lower strength housings.

The housing should be through-bored if possible. When shouldered housing bores are unavoidable, the bearing should be located far enough from the shoulder to avoid the danger of crushing the end of the drawn cup during installation.

When the drawn cup bearing is mounted close to the housing face, care should be taken to mount the bearing at least 0.250 mm (0.0100 in) within the housing face to protect the bearing lip.

BEARINGS WITHOUT OUTER RINGS

In many cases, such as with gear bores, it is desirable to have the housing bore serve as the outer raceway for radial needle roller and cage assemblies or loose needle roller complements. In those instances, as for shafts used as raceways, the housing bore must have a hardness of 58 HRC or harder and a surface roughness Ra ≤ 0.2 µm so that the full load-carrying capacity of the bearing is realized.

1. **Strength** – the housing must be of sufficient cross section to maintain proper roundness and running clearance under maximum load.
2. **Metallurgical** – material selection, hardness and case depth should be consistent with the requirements for inner raceways given in the shaft design.
3. **Variation of mean housing raceway diameter (taper)** – within the range of the bearing width, 5 µm or less per 25 mm or one-half the housing bore diameter tolerance or less (whichever is smaller). In addition, the bore diameter must never be smaller at both ends than in the center [sway-back].
4. **Deviation from circular form** – the raceway out-of-roundness should not exceed one-half the bore tolerance.
5. **Surface finish** – In addition to a wave-free finish, the raceway surface roughness of Ra ≤ 0.2 µm must be maintained for the bearing to utilize its full load rating. The raceway area also must be free of nicks, burrs, scratches and dents.
6. **Grind reliefs** – care must be exercised to ensure that grind reliefs, fillets, etc., do not extend to the raceway. Oil holes in the raceway area are permissible, but the edges must be blended smoothly with the raceway and, if possible, the hole should be located in the unloaded zone of the raceway.

Table A-12. Housing designs summary

	Housing bore	
	Raceway surface	**Fitting surface**
Out-of-roundness	One-half of bore tolerance or less	One-half of bore tolerance or less
Variation of mean dia. (taper)	5 µm or less per 25 mm within the range of outer ring width, or one-half of bore tolerance or less (whichever is smaller)	13 µm or less within the range of outer ring width, or one-half of bore tolerance or less (whichever is smaller)
Surface roughness	0.2a or less	1.6a or less
Hardness	58 HRC or harder1)	–

1) During the carburizing or induction-hardening of case hardened steel, not only must the surface hardness requirement of 58 HRC or higher be met, but the basic concept is that the case depth with a hardness of HV 550 (52.3 HRC) must be 0.4 mm or higher. However, if DW is smaller than 4 mm, a case depth of (0.1 × Dw) mm or higher is recommended. (Dw: roller dia.)

FITS

The purpose of fit is to securely fix the inner or outer ring to the shaft or housing, to preclude detrimental circumferential sliding on the fitting surface.

Such detrimental sliding (referred to as "creep") will cause abnormal heat generation, wear of the fitting surface, infiltration of abrasion metal particles into the bearing, vibration, and many other harmful effects, which cause a deterioration of bearing functions.

FIT SELECTION

In selecting the proper fit, careful consideration should be given to bearing operating conditions.
Major specific considerations are :

- Direction of load
- Load characteristics and magnitude
- Temperature distribution in operating
- Bearing internal clearance
- Surface finish, material and thickness of shaft and housing
- Mounting and dismounting methods
- Necessity to compensate for shaft thermal expansion at the fitting surface
- Bearing type and size

In view of these considerations, the following paragraphs explain the details of the important factors in fit selection.

1. Direction of load

Direction of load classified into three types : rotating inner ring load; rotating outer ring load and indeterminate direction load.
Table A-13 tabulates the relationship between these characteristics and fit.

Table A-13. Direction of Load and Fits

Direction of load		Rotating Ring		Type of load	Fit	
		Inner ring	outer ring		Inner ring	outer ring
Rotating inner ring load	Inner ring : Circumferential load Outer ring : Point load	Rotating	Stationary	Rotating load	Tight	Loose
Rotating outer ring load	Inner ring : Point load Outer ring : Circumferential load	Stationary	Rotating	Rotating load	Loose	Tight
Indetermi-nate direction load	Inner ring : Circumferential load Outer ring : Oscillating load	Rotating Stationary	Stationary Rotating	Stationary load > Rotating load Stationary load < Rotating load	Tight	Slightly tight
	Inner ring : Oscillating load Outer ring : Circumferential load	Rotating Stationary	Stationary Rotating	Stationary load > Rotating load Stationary load < Rotating load	Slightly tight	Tight

2. Effect of load characteristic and magnitude

When a radial load is applied, the inner ring will expand slightly. Since this expansion enlarges the circumference of the bore minutely, the initial interference is reduced.

The reduction can be calculated by the following equations :

[in the case of $F_r \leqq 0.25\,C_0$]

$$\Delta_{dF} = 0.08\sqrt{\frac{d}{B}}\cdot F_r \times 10^{-3}$$

[in the case of $F_r > 0.25\,C_0$]

$$\Delta_{dF} = 0.02\,\frac{F_r}{B} \times 10^{-3}$$

where :

Δ_{dF} : Reduction of inner ring interference mm
d : Nominal bore diameter of bearing mm
B : Nominal inner ring width mm
F_r : Radial load N
C_0 : Basic static load rating N

When the radial load exceeds the C_0 value by 25%, greater interference is needed. When impact loads are expected, much greater interference is needed.

3. Effect of fitting surface roughness

The effective interference obtained after fitting differs from calculated interference due to plastic deformation of the ring fitting surface. When the inner ring is fitted, the effective interference, subject to the effect of the fitting surface finish, can be approximated by the following equations :

[In the case of a ground shaft]

$$\Delta_{deff} \fallingdotseq \frac{d}{d+2}\,\Delta_d$$

[In the case of a turned shaft]

$$\Delta_{deff} \fallingdotseq \frac{d}{d+3}\,\Delta_d$$

where :

Δ_{deff} : Effective interference mm
Δ_d : Calculated interference mm
d : Nominal bore diameter of bearing mm

4. Effect of temperature

A bearing generally has an operating temperature that is higher than the ambient temperature. When the inner ring operates under load, its temperature generally becomes higher than that of the shaft and the effective interference decreases due to the greater thermal expansion of the inner ring.

If the temperature difference between the bearing inside and surrounding housing is ⊿t, the temperature difference between the fitting surfaces of the inner ring and shaft will be approximately (0.10 to 0.15) × ⊿t. The reduction of interference (⊿dt) due to the temperature difference is then expressed as follows:

$$\varDelta_{dt} = (0.10 \sim 0.15)\ \varDelta_t \cdot \alpha \cdot d$$
$$\fallingdotseq 0.001\,5\ \varDelta_t \cdot d \times 10^{-3}$$

In this equation,

$\varDelta_{dt}$: Reduction of interference due to temperature difference mm

$\varDelta_t$: Temperature difference between the inside of the bearing and the surrounding housing °C

α : Linear expansion coefficient of bearing steel (approximately equal to 12.5×10^{-6}) 1/°C

d : Nominal bore diameter of bearing mm

Consequently, when a bearing is higher in temperature than the shaft, greater interference is required.

However, a difference in temperature or in the coefficient of expansion may sometimes increase the interference between the outer ring and housing. Therefore, care should be taken when clearance is provided to accommodate shaft thermal expansion.

5. Maximum stress due to fit

When a bearing is fitted with interference, the bearing ring will expand or contract, generating internal stress.

Should this stress be excessive, the bearing ring may fracture.

The maximum bearing fitting-generated stress is determined by the equation in Table A-14.

In general, to avoid fracture, it is best to adjust the maximum interference to less than 1/1 000 of the shaft diameter, or the maximum stress (σ), determined by the equation in Table A-14, should be less than 120 MPa.

Table A-14 does not apply to drawn cup needle roller bearings.

Recommended Fits

Recommended fits are listed in each bearing section and within the tabular pages.

Table A-14. Maximum fitting-generated stress in bearings

Shaft & inner ring	Housing bore & outer ring
(In the case of hollow shaft)	**(In the case of $D_h \neq \infty$)**
$\sigma = \frac{E}{2} \cdot \frac{\varDelta_{deff}}{d} \cdot \frac{\left(1 - \frac{d_0^2}{d^2}\right)\left(1 + \frac{d^2}{D_i^2}\right)}{\left(1 - \frac{d_0^2}{D_i^2}\right)}$	$\sigma = E \cdot \frac{\varDelta_{Deff}}{D} \cdot \frac{\left(1 - \frac{D^2}{D_h^2}\right)}{\left(1 - \frac{D_e^2}{D_h^2}\right)}$
(In the case of solid shaft)	**(In the case of $D_h = \infty$)**
$\sigma = \frac{E}{2} \cdot \frac{\varDelta_{deff}}{d} \cdot \left(1 + \frac{d^2}{D_i^2}\right)$	$\sigma = E \cdot \frac{\varDelta_{Deff}}{D}$

where :

σ : Maximum stress MPa

d : Nominal bore diameter (shaft diameter) mm

D_i : Raceway contact diameter of inner ring roller bearing … $D_i \fallingdotseq 0.25\,(D + 3d)$ mm

$\varDelta_{deff}$: Effective interference of inner ring mm

d_0 : Bore diameter of hollow shaft mm

D_e : Raceway contact diameter of outer ring roller bearing … $De \fallingdotseq 0.25\,(3D + d)$ mm

D : Nominal outside diameter (bore diameter of housing) mm

$\varDelta_{Deff}$: Effective interference of outer ring mm

D_h : Outside diameter of housing mm

E : Young's modulus = 2.08×10^5 MPa

[Remark] The above equations are applicable when the shaft and housing are steel.
When other materials are used, JTEKT should be consulted.

CLEARANCE

Bearing internal clearance is defined as the clearance between the bearing ring and the rolling elements. The total distance either inner or outer ring can be moved when the specified measuring load is applied to the ring in radial direction and the other ring is fixed is defined as radial internal clearance.

The term "residual clearance" is also defined as the original clearance decreased owing to expansion or contraction of a raceway due to fitting, when the bearing is mounted in the shaft and housing.

The term "effective clearance" is defined as the residual clearance decreased owing to dimensional change arising from temperature differentials within the bearing.

The term "operating clearance" is defined as the internal clearance present while a bearing mounted in a machine is rotating under a certain load, or, the effective clearance increased due to elastic deformation arising from bearing loads.

The operating clearance is closely related to bearing performance and life. It is therefore desirable to select a clearance with a lower limit value on the positive side of zero.

When selecting the clearance, fitting conditions, temperature conditions, and tolerance of mounting dimensions must all be taken into account.

The operating clearance can be obtained from the equation in Table A-15.

These calculations can be used for machined ring needle roller bearings but not for drawn cup needle roller bearings.

For the drawn cup needle roller bearings refer to page B-2-7.

Table A-15. Operating clearance

Operating clearance (S)	$S=S_o-(S_f+S_{t1}+S_{t2})+S_w$*	* [S_w (increase of clearance due to load) is generally small, and thus may be ignored, although there is a equation for determining the value.]
Decrease of clearance due to fitting (S_f)	**(In the case of hollow shaft)** $S_{fi}=\Delta_{deff}\,\frac{d}{D_i}\cdot\frac{\left(1-\frac{{d_0}^2}{d^2}\right)}{\left(1-\frac{{d_0}^2}{{D_i}^2}\right)}$ **(In the case of solid shaft)** $S_{fi}=\Delta_{deff}\,\frac{d}{D_i}$	**(In the case of $D_h\neq\infty$)** $S_{fo}=\Delta_{Deff}\,\frac{D_e}{D}\cdot\frac{\left(1-\frac{D^2}{{D_h}^2}\right)}{\left(1-\frac{{D_e}^2}{{D_h}^2}\right)}$ **(In the case of $D_h=\infty$)** $S_{fo}=\Delta_{Deff}\,\frac{D_e}{D}$
Decrease of clearance due to temperature differentials between inner and outer rings (S_{t1})	The amount of decrease varies depending on the state of housing; however, generally the amount can be approximated by the following equation on the assumption that the outer ring will not expand : $S_{t1}=\alpha(D_i\cdot t_i-D_e\cdot t_e)$	where : $D_e=D_i+2D_w$ Consequently, $S_{t1}+S_{t2}$ will be determined by the following equation : $S_{t1}+S_{t2}=\alpha\cdot D_i\cdot t_1+2\alpha\cdot D_w\cdot t_2$ (Temperature differential between the inner and outer rings, t1, can be expressed as follows : $t_1=t_i-t_e$ Temperature differential between the rolling element and outer ring, t2, can be expressed as follows : $t_2=t_w-t_e$)
Decrease of clearance due to temperature rise of rolling element (S_{t2})	$S_{t2}=2\alpha\cdot D_w\cdot t_w$	

In Table A-15,

S :	Operating clearance	mm
S_o :	Clearance before mounting	mm
S_f :	Decrease of clearance due to fitting	mm
S_{fi} :	Expansion of inner ring raceway contact diameter	mm
S_{fo} :	Contraction of outer ring raceway contact diameter	mm
S_{t1} :	Decrease of clearance due to temperature differentials between inner and outer rings	mm
S_{t2} :	Decrease of clearance due to temperature rise of the rolling elements	mm
S_w :	Increase of clearance due to load	mm
Δ_{deff} :	Effective interference of inner ring	mm
d :	Nominal bore diameter (shaft diameter)	mm
d_0 :	Bore diameter of hollow shaft	mm
D_i :	Inner ring raceway contact diameter roller bearing … $D_i≒0.25(D+3d)$	mm

Δ_{Deff} :	Effective interference of outer ring	mm
D_h :	Outside diameter of housing	mm
D_e :	Outer ring raceway contact diameter roller bearing … $D_e≒0.25(3D+d)$	mm
D :	Nominal outside diameter	mm
α :	Linear expansion coeffi cient of bearing steel (12.5×10^{-6})	1/°C
D_w :	Average diameter of rolling elements roller bearing … $D_w≒0.25(D-d)$	mm
t_i :	Temperature rise of the inner ring	°C
t_e :	Temperature rise of the outer ring	°C
t_w :	Temperature rise of rolling elements	°C

■ Bearings are sometimes used with a non-steel shaft or housing.
In the automotive industry, a statistical method is often incorporated for selection of clearance.
In these cases, or when other special operating conditions are involved, JTEKT should be consulted.

LUBRICATION

PURPOSE OF LUBRICATION

Lubrication is one of the most important factors determining bearing performance. Since the suitability of the lubricant and lubrication method have a dominant influence on bearing life, the most suitable lubricant should be selected according to operating conditions.

Functions of lubrication :

- To lubricate each part of the bearing, and to reduce friction and wear
- To carry away heat generated inside bearing due to friction and other causes
- To cover rolling contact surface with the proper oil film in order to prolong bearing fatigue life
- To prevent corrosion and contamination by dirt

Although the same general rules for ball bearings and roller bearings can also be applied to needle roller bearing lubrication, the following points should also be considered :

- The space in the bearing is very small; thus, only a little lubricant can be retained.
- The bearing is relatively wide, so circulating the lubricant through the bearing is difficult.
- In the case of full complement type sliding contact between rollers may arise.
- Rollers may skew during rotation.
- Often used in the application where oscillating motion is present.

Accordingly, these points must be given sufficient consideration when selecting the lubricant and method of lubrication.

LUBRICANT

Bearing lubrication is classified broadly into two categories : grease lubrication and oil lubrication. Table A-16 makes a general comparison between the two.

Table A-16. Comparison between grease and oil lubrication

Item	Grease	Oil
Sealing device	Easy	Slightly complicated and special care required for maintenance
Lubricating ability	Good	Excellent
Rotation speed	Low/medium speed	Applicable at high speed as well
Replacement of lubricant	Slightly troublesome	Easy
Life of lubricant	Relatively short	Long
Cooling effect	No cooling effect	Good (circulation is necessary)
Filtration of dirt	Difficult	Easy

GREASE LUBRICATION

Grease is made by mixing and dispersing a solid of high oil-affinity (called a thickener) with lubricant oil (as a base), and transforming it into a semi-solid state.

As well, a variety of additives can be added to improve specific performance.

Many types of grease are marketed in various combinations of thickener, base oil and additives according to the purposes. So, it is very important to select proper types of grease.

The characteristics of various greases are shown in Table A-17.

Table A-17. Characteristics of respective greases

	Lithium grease			Calcium grease (cup grease)	Sodium grease (fiber grease)	Complex base grease		Non-soap base grease		
Thickener	Lithium soap			Calcium soap	Sodium soap	Lithium complex soap	Calcium complex soap	Bentone	Urea compounds	Fluorine compounds
Base oil	Mineral oil	Synthetic oil (diester oil)	Synthetic oil (silicon oil)	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral/ synthetic oil	Synthetic oil
Dropping point (°C)	170 to 190	170 to 230	220 to 260	80 to 100	160 to 180	250 or higher	200 to 280	–	240 or higher	250 or higher
Operating temperature range (°C)	–30 to +120	–50 to +130	–50 to +180	–10 to +70	0 to +110	–30 to +150	–10 to +130	–10 to +150	–30 to +150	–40 to +250
Rotation speed range	Medium to high	High	Low to medium	Low to medium	Low to high	Low to high	Low to medium	Medium to high	Low to high	Low to medium
Mechanical stability	Excellent	Good to excellent	Good	Fair to good	Good to excellent	Good to excellent	Good	Good	Good to excellent	Good
Water resistance	Good	Good	Good	Good	Bad	Good to excellent	Good	Good	Good to excellent	Good
Pressure resistance	Good	Fair	Bad to fair	Fair	Good to excellent	Good	Good	Good to excellent	Good to excellent	Good
Remarks	Most widely usable for various rolling bearings.	Superior low temperature and friction characteristics.	Superior high and low temperature characteristics.	Suitable for applications at low rotation speed and under light load. Not applicable at high temperature.	Liable to emulsify in the presence of water. Used at relatively high temperature.	Superior mechanical stability and heat resistance. Used at relatively high temperature.	Superior pressure resistance when extreme pressure agent is added.	Suitable for applications at high temperature and under relatively heavy load.	Superior water resistance, oxidation stability, and heat stability. Suitable for applications at high temperature and high speed.	Superior chemical resistance and solvent resistance. Usable at up to 250 °C.

(1) Base oil

Mineral oil is usually used as the base oil for grease.

When low temperature fluidity, high temperature stability, or other special performance is required, diester oil, silicon oil, polyglycolic oil, fluorinated oil, or other synthetic oil is often used.

Generally, grease with a low viscosity base oil is suitable for applications at low temperature or high rotation speed; grease with high viscosity base oils are suitable for applications at high temperature or under heavy load.

(2) Thickener

Most greases use a metallic soap base such as lithium, sodium, or calcium as thickeners. For some applications, however, non-soap base thickeners (inorganic substances such as bentone, silica gel, and organic substances such as urea compounds, fluorine compounds) are also used.

In general, the mechanical stability, bearing operating temperature range, water resistance, and other characteristics of grease are determined by the thickener.

(Lithium soap base grease)
Superior in heat resistance, water resistance and mechanical stability.

(Calcium soap base grease)
Superior in water resistance; inferior in heat resistance.

(Sodium soap base grease)
Superior in heat resistance; inferior in water resistance.

(Non-soap base grease)
Superior in heat resistance.

(3) Additives

Various additives are selectively used to serve the respective purposes of grease applications.

- Extreme pressure agents
  When bearings must tolerate heavy or impact loads.
- Oxidation inhibitors
  When grease is not refilled for a long period.

Structure stabilizers, rust preventives, and corrosion inhibitors are also used.

(4) Consistency

Consistency, which indicates grease hardness, is expressed as a figure obtained, in accordance with ASTM (JIS), by multiplication by 10 the depth (in mm) to which the cone-shaped metallic plunger penetrates into the grease at 25 °C by deadweight in 5 seconds. The softer the grease, the higher the figure.

Table A-18 shows the relationships between the NLGI scales and ASTM (JIS) penetration indexes, service conditions of grease.

(NLGI : National Lubricating Grease Institute)

It is imperative that the bearing operating temperature is always within the temperature range specified for the grease used. Although softer greases provide better lubrication, they are more likely to be churned. Since grease churning tends to cause temperature rise and leakage, this characteristic should be taken into account when selecting grease consistency. For ordinary operating conditions, greases of NLGI No. 0 to 3 are commonly used. When the bearing operating speed is higher, a somewhat harder grease with high mechanical stability should be selected.

Table A-18. Grease consistency and service conditions

ASTM (JIS) penetration index (25 °C, 60 mixing operations)	NLGI scale	Service conditions/applications
355 - 385	0	For centralized lubricating
310 - 340	1	For centralized lubricating, at low temperature
265 - 295	2	For general use
220 - 250	3	For general use, at high temperature
175 - 205	4	For special applications

[Note] The larger the penetration index, the softer is the grease.

(5) Mixing of different greases

Since mixing of different greases changes their properties, greases of different brands should not be mixed.

If mixing cannot be avoided, greases containing the same thickener should be used. Even if the mixed greases contain the same thickener, however, mixing may still produce adverse effects, due to difference in additives or other factors.

Thus it is necessary to check the effects of a mixture in advance, through testing or other methods.

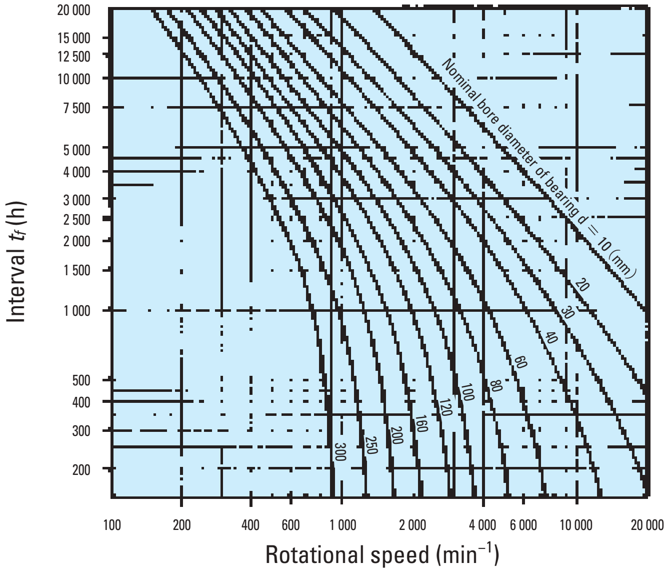
REPLENISHMENT/REPLACEMENT OF GREASE

The method of replenishing/replacing grease depends largely on the lubrication method. Whichever method may be utilized, care should be taken to use clean grease and to keep dirt or other foreign matter out of the housing.

When grease is refilled, new grease must be injected inside bearing.

In case of high speed operation or a small air space, because it is necessary to replenish grease often, a grease inlet should be provided as near the bearing as possible so that the deteriorated grease may be replaced by new grease.

Under normal operating conditions, grease life may be approximated by the graphs shown in Fig. A-13. It is recommended you use this diagram as a guide for replenishment and replacement of grease.



■ Temperature correction

When the bearing operating temperature exceeds 70 °C, t_f', obtained by multiplying t_f by correction coefficient a, found on the scale below, should be applied as the feeding interval.

$$t_f' = t_f \cdot a$$

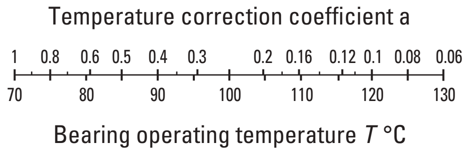


Fig. A-13 Grease feeding interval

⚠ WARNING

Mixing grease types can cause the lubricant to become ineffective, hich can result in equipment failure, creating a risk of serious bodily harm.

LUBRICATING OIL

The most commonly used bearing lubricating oil is super refined mineral oil, which has excellent oxidation stability and rust inhibition as well as high film strength. However, as bearings are being used in a variety of applications, a wide variety of synthetic oils are being used. What's more, a variety of additives (such as oxidation inhibitors, rust inhibitors, and anti-foam agents) are being used to improve the specific properties of these synthetic oils. Table A-19 shows the properties of various lubricating oils.

Table A-19. Properties of various lubricating oils

Lubricating oil type	Super refined mineral oil	Major synthetic oils				
		Diester oil	Silicon oil	Polyglycolic oil	Polyphenyl ether oil	Fluorinated oil
Bearing operating temperature range (˚C)	**–40 to +220**	**–55 to +150**	**–70 to +350**	**–30 to +150**	**0 to +330**	**–20 to +300**
Lubricating ability	Excellent	Excellent	Fair	Good	Good	Excellent
Oxidation stability	Good	Good	Fair	Fair	Excellent	Excellent
Radiation resistance	Bad	Bad	Bad to fair	Bad	Excellent	–

LUBRICATING OIL SELECTION

The most important thing to consider when selecting a lubricating oil is to select an oil that has a viscosity that is appropriate for the operating temperature of the bearing.

Use Table A-20 to select the proper kinematic viscosity for your bearing operating conditions. Use this value as a guideline.

If the viscosity of the lubricating oil is too low, an insufficient oil film will form. If the viscosity of the lubricating oil is too high, heat will be generated due to viscous resistance.

Generally, the larger the load or the higher the operating temperature, the higher the viscosity of the used lubricating oil and the higher the rotational speed, the lower the viscosity of the used lubricating oil.

The relationship between the lubricating oil viscosity and temperature is shown in Fig. A-14.

Table A-20. Proper kinematic viscosities by bearing operating conditions

Operating temperature	$d_m n$ value	Proper kinematic viscosity (expressed in the ISO viscosity grade or the SAE No.)			
		Light/normal load		Heavy/impact load	
–30 to 0°C	All rotation speeds	ISO VG 15, 22, 46	(Refrigerating Machine oil)	——	
0 to 60°C	300 000 or lower	ISO VG 46	(Bearing oil Turbine oil)	ISO VG 68 SAE 30	(Bearing oil Turbine oil)
	300 000 to 600 000	ISO VG 32	(Bearing oil Turbine oil)	ISO VG 68	(Bearing oil Turbine oil)
	600 000 or higher	ISO VG 7, 10, 22	(Bearing oil)	——	
60 to 100°C	300 000 or lower	ISO VG 68	(Bearing oil)	ISO VG 68, 100 SAE 30	(Bearing oil)
	300 000 to 600 000	ISO VG 32, 46	(Bearing oil Turbine oil)	ISO VG 68	(Bearing oil Turbine oil)
	600 000 or higher	ISO VG 22, 32, 46	(Bearing oil Turbine oil Machine oil)	——	
100 to 150°C	300 000 or lower	ISO VG 68, 100 SAE 30, 40	(Bearing oil)	ISO VG 100 to 460	(Bearing oil Gear oil)
	300 000 to 600 000	ISO VG 68 SAE 30	(Bearing oil Turbine oil)	ISO VG 68, 100 SAE 30, 40	(Bearing oil)

[Remarks] 1. $d_m n = \frac{D+d}{2} \times n$......... {$D$: nominal outside diameter (mm), d : nominal bore diameter (mm), n : rotational speed (min^{-1})}

2. Please contact with JTEKT if the bearing operating temperature is under –30 °C or over 150 °C.

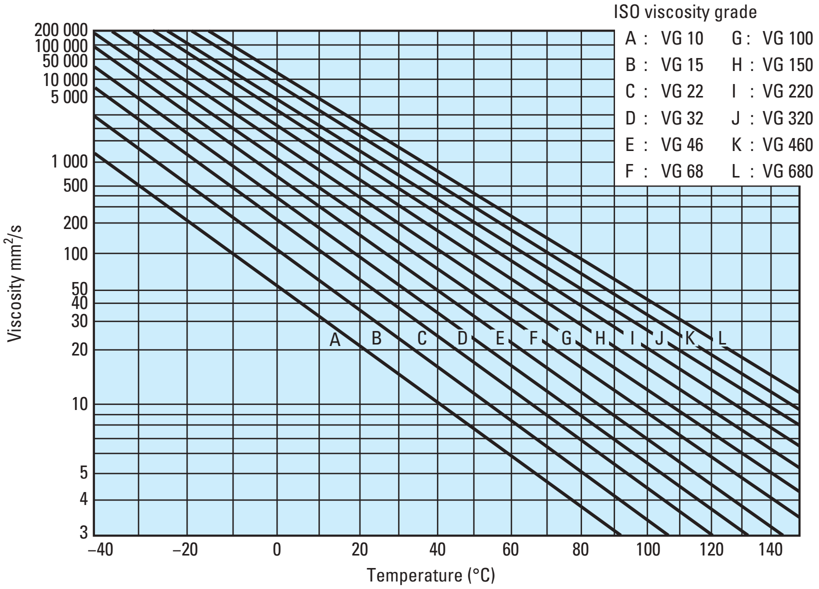


Fig. A-14. Relationship between lubricating oil viscosity and temperature (viscosity index : 100)

CLASSIFICATION

There are several classifications of oils based on viscosity grades. The most familiar are the Society of Automotive Engineers (SAE) classifications for automotive engine and gear oils. The American Society for Testing and Materials (ASTM) and the International Organization for Standardization (ISO) have adopted standard viscosity grades for industrial fluids. Fig. A-15 shows the viscosity comparisons of ISO/ASTM with SAE classification systems at 40°C (104˚F).

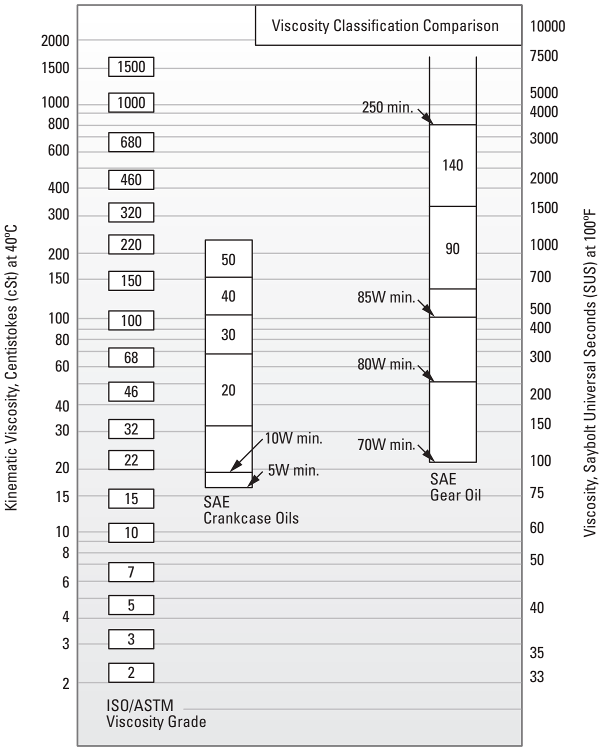


Fig. A-15. Viscosity classification comparison between ISO/ASTM grades (ISO 3448/ASTM D2442) and SAE grades (SAE J 300-80 for crankcase oils, SAE J 306-81 for axle and manual transmission oils)

OIL LUBRICATION METHOD

Oil lubrication is usable even with high speed rotation and at somewhat high temperatures and is effective in reducing bearing vibration and noise. Therefore, oil lubrication is used in many cases where grease lubrication does not work.

The main types and methods of oil lubrication are shown in Table A-21.

Table A-21. Types and methods of oil lubrication

Oil bath	• This is the simplest method. Bearings are soaked in oil before operation. • This method is applicable for low and medium rotational speeds. • Attaching an oil level gauge makes it possible to adjust the oil amount. • For horizontal shafts, approximately half of the rolling element in the lowest position is immersed. For vertical shafts, approximately 70 to 80% of the bearings are immersed. • Using magnetic lids is advantageous as it prevents iron powder generated by friction from being dispersed in the oil.
Oil drip	• An oiler is used to drip the oil, and the rotating parts are operated to fill the inside of the housing with an oil mist, which also has a cooling effect. • This method can be used with up to relatively high speeds and medium-sized loads. • The most common example of this method uses five to six drops of oil per minute. (It is difficult to adjust the amount of oil used to 1 mL/h or less.) • Ensure that oil does not accumulate in the bottom of the housing.
Oil splash	• A simple flinger or gears are attached to the shaft to supply the oil to its destination by means of flinging or splashing operations. This method can be used to supply oil even to bearings that are far away from the oil tank. • This method can be used with up to relatively high speeds. • The oil level must be maintained within a certain range. • Using magnetic lids is advantageous as it prevents iron powder generated by friction from being dispersed in the oil. What's more, to prevent the intrusion of foreign materials into the bearing, it is advisable to use a shield board or baffle.
Forced oil circulation	• This method uses an oil circulation system. After the supplied oil lubricates and cools the inside of the bearing, the oil passes through the oil return pipe to the tank. The oil is filtered and cooled and is then forcibly supplied once more by way of a pump. • This method is used a great deal under high rotational speed and high temperature conditions. • To prevent the lubricating oil from accumulating inside the housing, it is advisable to make the oil return pipe approximately twice as thick as the oil supply pipe.
Oil jet	• In this method, oil is sprayed from nozzles at a constant pressure (approximately 0.1 to 0.5 MPa). This method provides a large cooling effect. • This method is applicable for high rotational speeds and heavy loads. • Generally, the nozzle diameters are between 0.5 and 2 mm, and nozzles are installed in positions between 5 and 10 mm from the sides of the bearings. It is advisable to use between 2 and 4 nozzles for situations in which a large amount of heat is generated. • The oil jet method supplies a large quantity of oil, so it is advisable to use an oil discharge pump to forcibly discharge oil in order to prevent against the stagnation of unnecessary oil.
Oil mist lubrication (fog lubrication)	• In this method, dry mist (air that contains oil in mist form) obtained from an oil mist generator is continuously sent to the location where oil is to be applied to the bearing. The dry mist is then changed to wet mist (oil drops that can easily be affixed to a surface) by the nozzles attached to the housing or bearing, and the oil is then applied to the bearing. • This method forms and retains the minimum necessary oil film for lubrication, which provides benefits such as prevention of oil pollution, simplification of bearing maintenance, extension of bearing fatigue life, and reduction of oil consumption.
Oil and air lubrication	• In this method, a metering piston is used to eject a minuscule amount of oil, a mixing valve is used to mix the oil with compressed air, and the oil and air mixture is then applied to the bearing continuously and stably. • It's possible to perform metering management of the minuscule amount of oil, so new lubricating oil can always be supplied. Therefore, this method is applicable to usages with high rotational speeds such as machine tool main spindles. • The spindle's internal pressure rises because compressed air is supplied together with the lubricating oil. Therefore, this method is also effective at preventing the intrusion of external materials such as debris and cutting fluid. What's more, the lubricating oil flows through the oil supply pipe, so this method results in an extremely small amount of air pollution.

LIMITING SPEEDS

In addition to the bearing load ratings, the tabular pages also list the limiting speed values which are the maximum speeds at which the bearings may operate. These speeds have been calculated for unsealed and sealed bearings of conventional design, tolerances and internal clearances, properly mounted with low applied loads using normal splash, drip feed or other methods of lubrication which will provide adequate cooling of the bearings. A bearing may operate at a speed higher than the listed limiting speed with the use of a clean, good quality oil and after prior consultation with JTEKT's Engineering Department. With high speeds and high acceleration rates, the ratio of P/C should not fall below 0.02 to prevent skidding of the rolling elements.

Also the bearing should not be subjected to uneven stress distribution due to the effects of misalignment between the bearing housings, deformation of the shaft or housing.

Speeds Inadequate for Elastohydrodynamic Lubricating Film

International Standard ISO 281 which covers calculation of dynamic load ratings and rating life states that at exceptionally low rotational speeds (i.e. the product of speed and pitch diameter (D_{pw}) in mm is less than 10000) the generated lubricant film is unlikely to be adequate to separate the rolling element/raceway contacts. At such operating conditions it may be inappropriate to calculate the bearing life although practical improvement in life, may be achieved with the use of lubricants of higher kinematic viscosity or containing EP additives.

BEARING TOLERANCES, INCH AND METRIC

TOLERANCES OF NEEDLE ROLLER BEARINGS

The tolerances given in the following table apply to the rings of needle roller radial bearing types whose rings are precision finished.

TOLERANCE TERMS, SYMBOLS AND DEFINITIONS
Axes, planes etc.

Inner ring axis: Axis of the cylinder inscribed in a basically cylindrical bore. The inner ring axis is also the bearing axis.

Outer ring axis: Axis of the cylinder circumscribed around a basically cylindrical outside surface.

Radial plane: Plane perpendicular to the bearing or ring axis. It is, however, acceptable to consider radial planes referred to in the definitions as being parallel with the plane tangential to the reference face of a ring or the back face of a thrust bearing washer.

Radial direction: Direction through the bearing or ring axis in a radial plane.

Axial plane: Plane containing the bearing or ring axis.

Axial direction: Direction parallel with the bearing or ring axis. It is, however, acceptable to consider axial directions referred to in the definitions as being perpendicular to the plane tangential to the reference face of a ring or the back face of a thrust bearing washer.

Reference face: Face designated by the manufacturer of the bearings and that may be used as the reference face in measurements.

The reference face for measurement is generally taken as the unmarked face. In case of symmetrical rings, when it is not possible to identify the reference face, the tolerances are deemed to comply relative to either face, but not to both.

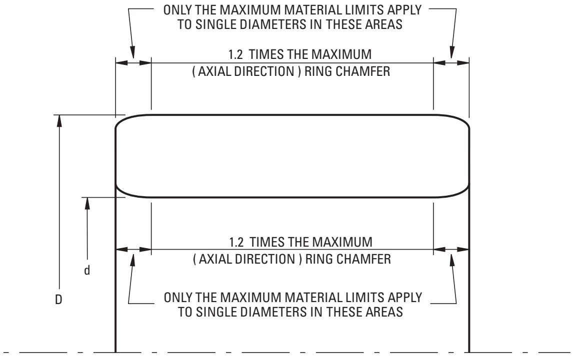
Outer ring flange back face: That side of an outer ring flange that is intended to support axial load.

Middle of raceway: Point or line on a raceway surface halfway between the two edges of the raceway.

Raceway contact diameter: Diameter of the theoretical circle through the nominal points of contact between the rolling elements and the raceway.

NOTE: For roller bearings, the nominal point of contact is generally at the middle of the roller.

Diameter deviation near ring faces: In radial planes, when nearer to the face of a ring than 1.2 times the maximum (axial direction) ring chamfer, only the maximum material limits apply.



ABMA / ISO Symbols - Inner Ring

Δd_{mp}	Single plane mean bore diameter deviation from basic bore diameter, e.g., bore tolerance for a basically tapered bore, Δd_{mp} refers only to the theoretical small bore end of the bore.
V_{dsp}	Difference between the largest and the smallest of the single bore diameters in a single radial plane.
V_{dmp}	Difference between the largest and smallest of the mean bore diameters in a single radial plane of an individual ring.

ABMA / ISO Symbols - Outer Ring

ΔD_{mp}	Single plane mean outside diameter deviation from basic outside diameter, e.g., O.D. tolerance.
V_{Dsp}	Difference between the largest and smallest of the single outside diameters in a single radial plane.

The following tables provide standard ISO tolerance information. They are provided for general use and are referenced throughout this catalog.

ISO Tolerances for Holes – Metric

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		B10		B11		B12		C9		C10		C11	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.188**	**0.140**	**0.215**	**0.140**	**0.260**	**0.140**	**0.100**	**0.070**	**0.118**	**0.070**	**0.145**	**0.070**
6	**10**	**0.208**	**0.150**	**0.240**	**0.150**	**0.300**	**0.150**	**0.116**	**0.080**	**0.138**	**0.080**	**0.170**	**0.080**
10	**18**	**0.220**	**0.150**	**0.260**	**0.150**	**0.330**	**0.150**	**0.138**	**0.095**	**0.165**	**0.095**	**0.205**	**0.095**
18	**30**	**0.244**	**0.160**	**0.290**	**0.160**	**0.370**	**0.160**	**0.162**	**0.110**	**0.194**	**0.110**	**0.240**	**0.110**
30	**40**	**0.270**	**0.170**	**0.330**	**0.170**	**0.420**	**0.170**	**0.182**	**0.120**	**0.220**	**0.120**	**0.280**	**0.120**
40	**50**	**0.280**	**0.180**	**0.340**	**0.180**	**0.430**	**0.180**	**0.192**	**0.130**	**0.230**	**0.130**	**0.290**	**0.130**
50	**65**	**0.310**	**0.190**	**0.380**	**0.190**	**0.490**	**0.190**	**0.214**	**0.140**	**0.260**	**0.140**	**0.330**	**0.140**
65	**80**	**0.320**	**0.200**	**0.390**	**0.200**	**0.500**	**0.200**	**0.224**	**0.150**	**0.270**	**0.150**	**0.340**	**0.150**
80	**100**	**0.360**	**0.220**	**0.440**	**0.220**	**0.570**	**0.220**	**0.257**	**0.170**	**0.310**	**0.170**	**0.390**	**0.170**
100	**120**	**0.380**	**0.240**	**0.460**	**0.240**	**0.590**	**0.240**	**0.267**	**0.180**	**0.320**	**0.180**	**0.400**	**0.180**
120	**140**	**0.420**	**0.260**	**0.510**	**0.260**	**0.660**	**0.260**	**0.300**	**0.200**	**0.360**	**0.200**	**0.450**	**0.200**
140	**160**	**0.440**	**0.280**	**0.530**	**0.280**	**0.680**	**0.280**	**0.310**	**0.210**	**0.370**	**0.210**	**0.460**	**0.210**
160	**180**	**0.470**	**0.310**	**0.560**	**0.310**	**0.710**	**0.310**	**0.330**	**0.230**	**0.390**	**0.230**	**0.480**	**0.230**
180	**200**	**0.525**	**0.340**	**0.630**	**0.340**	**0.800**	**0.340**	**0.355**	**0.240**	**0.425**	**0.240**	**0.530**	**0.240**
200	**225**	**0.565**	**0.380**	**0.670**	**0.380**	**0.840**	**0.380**	**0.375**	**0.260**	**0.445**	**0.260**	**0.550**	**0.260**
225	**250**	**0.605**	**0.420**	**0.710**	**0.420**	**0.880**	**0.420**	**0.395**	**0.280**	**0.465**	**0.280**	**0.570**	**0.280**
250	**280**	**0.690**	**0.480**	**0.800**	**0.480**	**1.000**	**0.480**	**0.430**	**0.300**	**0.510**	**0.300**	**0.620**	**0.300**
280	**315**	**0.750**	**0.540**	**0.860**	**0.540**	**1.060**	**0.540**	**0.460**	**0.330**	**0.540**	**0.330**	**0.650**	**0.330**
315	**355**	**0.830**	**0.600**	**0.960**	**0.600**	**1.170**	**0.600**	**0.500**	**0.360**	**0.590**	**0.360**	**0.720**	**0.360**
355	**400**	**0.910**	**0.680**	**1.040**	**0.680**	**1.250**	**0.680**	**0.540**	**0.400**	**0.630**	**0.400**	**0.760**	**0.400**
400	**450**	**1.010**	**0.760**	**1.160**	**0.760**	**1.390**	**0.760**	**0.595**	**0.440**	**0.690**	**0.440**	**0.840**	**0.440**
450	**500**	**1.090**	**0.840**	**1.240**	**0.840**	**1.470**	**0.840**	**0.635**	**0.480**	**0.730**	**0.480**	**0.880**	**0.480**

Diameters **mm**		Deviations **mm**									
		E9		E10		E11		E12		E13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.050**	**0.020**	**0.068**	**0.020**	**0.095**	**0.020**	**0.140**	**0.020**	**0.200**	**0.020**
6	**10**	**0.061**	**0.025**	**0.083**	**0.025**	**0.115**	**0.025**	**0.175**	**0.025**	**0.245**	**0.025**
10	**18**	**0.075**	**0.032**	**0.102**	**0.032**	**0.142**	**0.032**	**0.212**	**0.032**	**0.302**	**0.032**
18	**30**	**0.092**	**0.040**	**0.124**	**0.040**	**0.170**	**0.040**	**0.250**	**0.040**	**0.370**	**0.040**
30	**50**	**0.112**	**0.050**	**0.150**	**0.050**	**0.210**	**0.050**	**0.300**	**0.050**	**0.440**	**0.050**
50	**80**	**0.134**	**0.060**	**0.180**	**0.060**	**0.250**	**0.060**	**0.360**	**0.060**	**0.520**	**0.060**
80	**120**	**0.159**	**0.072**	**0.212**	**0.072**	**0.292**	**0.072**	**0.422**	**0.072**	**0.612**	**0.072**
120	**180**	**0.185**	**0.085**	**0.245**	**0.085**	**0.335**	**0.085**	**0.485**	**0.085**	**0.715**	**0.085**
180	**250**	**0.215**	**0.100**	**0.285**	**0.100**	**0.390**	**0.100**	**0.560**	**0.100**	**0.820**	**0.100**
250	**315**	**0.240**	**0.110**	**0.320**	**0.110**	**0.430**	**0.110**	**0.630**	**0.110**	**0.920**	**0.110**
315	**400**	**0.265**	**0.125**	**0.355**	**0.125**	**0.485**	**0.125**	**0.695**	**0.125**	**1.015**	**0.125**
400	**500**	**0.290**	**0.135**	**0.385**	**0.135**	**0.535**	**0.135**	**0.765**	**0.135**	**1.105**	**0.135**

Diameters **mm**		Deviations **mm**							
		F5		F6		F7		F8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.015**	**0.010**	**0.018**	**0.010**	**0.022**	**0.010**	**0.028**	**0.010**
6	**10**	**0.019**	**0.013**	**0.022**	**0.013**	**0.028**	**0.013**	**0.035**	**0.013**
10	**18**	**0.024**	**0.016**	**0.027**	**0.016**	**0.034**	**0.016**	**0.043**	**0.016**
18	**30**	**0.029**	**0.020**	**0.033**	**0.020**	**0.041**	**0.020**	**0.053**	**0.020**
30	**50**	**0.036**	**0.025**	**0.041**	**0.025**	**0.050**	**0.025**	**0.064**	**0.025**
50	**80**	**0.043**	**0.030**	**0.049**	**0.030**	**0.060**	**0.030**	**0.076**	**0.030**
80	**120**	**0.051**	**0.036**	**0.058**	**0.036**	**0.071**	**0.036**	**0.090**	**0.036**
120	**180**	**0.061**	**0.043**	**0.068**	**0.043**	**0.083**	**0.043**	**0.106**	**0.043**
180	**250**	**0.070**	**0.050**	**0.079**	**0.050**	**0.096**	**0.050**	**0.122**	**0.050**
250	**315**	**0.079**	**0.056**	**0.088**	**0.056**	**0.108**	**0.056**	**0.137**	**0.056**
315	**400**	**0.087**	**0.062**	**0.098**	**0.062**	**0.119**	**0.062**	**0.151**	**0.062**
400	**500**	**0.095**	**0.068**	**0.108**	**0.068**	**0.131**	**0.068**	**0.165**	**0.068**

ISO Tolerances for Holes – Metric

Diameter **mm**		Deviations **mm**					
		G5		G6		G7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.009**	**0.004**	**0.012**	**0.004**	**0.016**	**0.004**
6	**10**	**0.011**	**0.005**	**0.014**	**0.005**	**0.020**	**0.005**
10	**18**	**0.014**	**0.006**	**0.017**	**0.006**	**0.024**	**0.006**
18	**30**	**0.016**	**0.007**	**0.020**	**0.007**	**0.028**	**0.007**
30	**50**	**0.020**	**0.009**	**0.025**	**0.009**	**0.034**	**0.009**
50	**80**	**0.023**	**0.010**	**0.029**	**0.010**	**0.040**	**0.010**
80	**120**	**0.027**	**0.012**	**0.034**	**0.012**	**0.047**	**0.012**
120	**180**	**0.032**	**0.014**	**0.039**	**0.014**	**0.054**	**0.014**
180	**250**	**0.035**	**0.015**	**0.044**	**0.015**	**0.061**	**0.015**
250	**315**	**0.040**	**0.017**	**0.049**	**0.017**	**0.069**	**0.017**
315	**400**	**0.043**	**0.018**	**0.054**	**0.018**	**0.075**	**0.018**
400	**500**	**0.047**	**0.020**	**0.060**	**0.020**	**0.083**	**0.020**

Diameters **mm**		Deviations **mm**									
		H4		H5		H6		H7		H8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.004**	**0.000**	**0.005**	**0.000**	**0.008**	**0.000**	**0.012**	**0.000**	**0.018**	**0.000**
6	**10**	**0.004**	**0.000**	**0.006**	**0.000**	**0.009**	**0.000**	**0.015**	**0.000**	**0.022**	**0.000**
10	**18**	**0.005**	**0.000**	**0.008**	**0.000**	**0.011**	**0.000**	**0.018**	**0.000**	**0.027**	**0.000**
18	**30**	**0.006**	**0.000**	**0.009**	**0.000**	**0.013**	**0.000**	**0.021**	**0.000**	**0.033**	**0.000**
30	**50**	**0.007**	**0.000**	**0.011**	**0.000**	**0.016**	**0.000**	**0.025**	**0.000**	**0.039**	**0.000**
50	**80**	**0.008**	**0.000**	**0.013**	**0.000**	**0.019**	**0.000**	**0.030**	**0.000**	**0.046**	**0.000**
80	**120**	**0.010**	**0.000**	**0.015**	**0.000**	**0.022**	**0.000**	**0.035**	**0.000**	**0.054**	**0.000**
120	**180**	**0.012**	**0.000**	**0.018**	**0.000**	**0.025**	**0.000**	**0.040**	**0.000**	**0.063**	**0.000**
180	**250**	**0.014**	**0.000**	**0.020**	**0.000**	**0.029**	**0.000**	**0.046**	**0.000**	**0.072**	**0.000**
250	**315**	**0.016**	**0.000**	**0.023**	**0.000**	**0.032**	**0.000**	**0.052**	**0.000**	**0.081**	**0.000**
315	**400**	**0.018**	**0.000**	**0.025**	**0.000**	**0.036**	**0.000**	**0.057**	**0.000**	**0.089**	**0.000**
400	**500**	**0.020**	**0.000**	**0.027**	**0.000**	**0.040**	**0.000**	**0.063**	**0.000**	**0.097**	**0.000**

Diameters **mm**		Deviations **mm**							
		H9		H10		H11		H12	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.030**	**0.000**	**0.048**	**0.000**	**0.075**	**0.000**	**0.120**	**0.000**
6	**10**	**0.036**	**0.000**	**0.058**	**0.000**	**0.090**	**0.000**	**0.150**	**0.000**
10	**18**	**0.043**	**0.000**	**0.070**	**0.000**	**0.110**	**0.000**	**0.180**	**0.000**
18	**30**	**0.052**	**0.000**	**0.084**	**0.000**	**0.130**	**0.000**	**0.210**	**0.000**
30	**50**	**0.062**	**0.000**	**0.100**	**0.000**	**0.160**	**0.000**	**0.250**	**0.000**
50	**80**	**0.074**	**0.000**	**0.120**	**0.000**	**0.190**	**0.000**	**0.300**	**0.000**
80	**120**	**0.087**	**0.000**	**0.140**	**0.000**	**0.220**	**0.000**	**0.350**	**0.000**
120	**180**	**0.100**	**0.000**	**0.160**	**0.000**	**0.250**	**0.000**	**0.400**	**0.000**
180	**250**	**0.115**	**0.000**	**0.185**	**0.000**	**0.290**	**0.000**	**0.460**	**0.000**
250	**315**	**0.130**	**0.000**	**0.210**	**0.000**	**0.320**	**0.000**	**0.520**	**0.000**
315	**400**	**0.140**	**0.000**	**0.230**	**0.000**	**0.360**	**0.000**	**0.570**	**0.000**
400	**500**	**0.155**	**0.000**	**0.250**	**0.000**	**0.400**	**0.000**	**0.630**	**0.000**

ISO Tolerances for Holes – Metric

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		J6		J7		J8		K6		K7		K8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.005**	**-0.003**	**0.006**	**-0.006**	**0.010**	**-0.008**	**0.002**	**-0.006**	**0.003**	**-0.009**	**0.005**	**-0.013**
6	**10**	**0.005**	**-0.004**	**0.008**	**-0.007**	**0.012**	**-0.010**	**0.002**	**-0.007**	**0.005**	**-0.010**	**0.006**	**-0.016**
10	**18**	**0.006**	**-0.005**	**0.010**	**-0.008**	**0.015**	**-0.012**	**0.002**	**-0.009**	**0.006**	**-0.012**	**0.008**	**-0.019**
18	**30**	**0.008**	**-0.005**	**0.012**	**-0.009**	**0.020**	**-0.013**	**0.002**	**-0.011**	**0.006**	**-0.015**	**0.010**	**-0.023**
30	**50**	**0.010**	**-0.006**	**0.014**	**-0.011**	**0.024**	**-0.015**	**0.003**	**-0.013**	**0.007**	**-0.018**	**0.012**	**-0.027**
50	**80**	**0.013**	**-0.006**	**0.018**	**-0.012**	**0.028**	**-0.018**	**0.004**	**-0.015**	**0.009**	**-0.021**	**0.014**	**-0.032**
80	**120**	**0.016**	**-0.006**	**0.022**	**-0.013**	**0.034**	**-0.020**	**0.004**	**-0.018**	**0.010**	**-0.025**	**0.016**	**-0.038**
120	**180**	**0.018**	**-0.007**	**0.026**	**-0.014**	**0.041**	**-0.022**	**0.004**	**-0.021**	**0.012**	**-0.028**	**0.020**	**-0.043**
180	**250**	**0.022**	**-0.007**	**0.030**	**-0.016**	**0.047**	**-0.025**	**0.005**	**-0.024**	**0.013**	**-0.033**	**0.022**	**-0.050**
250	**315**	**0.025**	**-0.007**	**0.036**	**-0.016**	**0.055**	**-0.026**	**0.005**	**-0.027**	**0.016**	**-0.036**	**0.025**	**-0.056**
315	**400**	**0.029**	**-0.007**	**0.039**	**-0.018**	**0.060**	**-0.029**	**0.007**	**-0.029**	**0.017**	**-0.040**	**0.028**	**-0.061**
400	**500**	**0.033**	**-0.007**	**0.043**	**-0.020**	**0.066**	**-0.031**	**0.008**	**-0.032**	**0.018**	**-0.045**	**0.029**	**-0.068**

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		M5		M6		M7		N6		N7		N8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**-0.003**	**-0.008**	**-0.001**	**-0.009**	**0.000**	**-0.012**	**-0.005**	**-0.013**	**-0.004**	**-0.016**	**-0.002**	**-0.020**
6	**10**	**-0.004**	**-0.010**	**-0.003**	**-0.012**	**0.000**	**-0.015**	**-0.007**	**-0.016**	**-0.004**	**-0.019**	**-0.003**	**-0.025**
10	**18**	**-0.004**	**-0.012**	**-0.004**	**-0.015**	**0.000**	**-0.018**	**-0.009**	**-0.020**	**-0.005**	**-0.023**	**-0.003**	**-0.030**
18	**30**	**-0.005**	**-0.014**	**-0.004**	**-0.017**	**0.000**	**-0.021**	**-0.011**	**-0.024**	**-0.007**	**-0.028**	**-0.003**	**-0.036**
30	**50**	**-0.005**	**-0.016**	**-0.004**	**-0.020**	**0.000**	**-0.025**	**-0.012**	**-0.028**	**-0.008**	**-0.033**	**-0.003**	**-0.042**
50	**80**	**-0.006**	**-0.019**	**-0.005**	**-0.024**	**0.000**	**-0.030**	**-0.014**	**-0.033**	**-0.009**	**-0.039**	**-0.004**	**-0.050**
80	**120**	**-0.008**	**-0.023**	**-0.006**	**-0.028**	**0.000**	**-0.035**	**-0.016**	**-0.038**	**-0.010**	**-0.045**	**-0.004**	**-0.058**
120	**180**	**-0.009**	**-0.027**	**-0.008**	**-0.033**	**0.000**	**-0.040**	**-0.020**	**-0.045**	**-0.012**	**-0.052**	**-0.004**	**-0.067**
180	**250**	**-0.011**	**-0.031**	**-0.008**	**-0.037**	**0.000**	**-0.046**	**-0.022**	**-0.051**	**-0.014**	**-0.060**	**-0.005**	**-0.077**
250	**315**	**-0.013**	**-0.036**	**-0.009**	**-0.041**	**0.000**	**-0.052**	**-0.025**	**-0.057**	**-0.014**	**-0.066**	**-0.005**	**-0.086**
315	**400**	**-0.014**	**-0.039**	**-0.010**	**-0.046**	**0.000**	**-0.057**	**-0.026**	**-0.062**	**-0.016**	**-0.073**	**-0.005**	**-0.094**
400	**500**	**-0.016**	**-0.043**	**-0.010**	**-0.050**	**0.000**	**-0.063**	**-0.027**	**-0.067**	**-0.017**	**-0.080**	**-0.006**	**-0.103**

Diameters **mm**		Deviations **mm**				Deviations **mm**					
		P6		P7		R6		R7		R8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**-0.009**	**-0.017**	**-0.008**	**-0.020**	**-0.012**	**-0.020**	**-0.011**	**-0.023**	**-0.015**	**-0.033**
6	**10**	**-0.012**	**-0.021**	**-0.009**	**-0.024**	**-0.016**	**-0.025**	**-0.013**	**-0.028**	**-0.019**	**-0.041**
10	**18**	**-0.015**	**-0.026**	**-0.011**	**-0.029**	**-0.020**	**-0.031**	**-0.016**	**-0.034**	**-0.023**	**-0.050**
18	**30**	**-0.018**	**-0.031**	**-0.014**	**-0.035**	**-0.024**	**-0.037**	**-0.020**	**-0.041**	**-0.028**	**-0.061**
30	**50**	**-0.021**	**-0.037**	**-0.017**	**-0.042**	**-0.029**	**-0.045**	**-0.025**	**-0.050**	**-0.034**	**-0.073**
50	**65**	**-0.026**	**-0.045**	**-0.021**	**-0.051**	**-0.035**	**-0.054**	**-0.030**	**-0.060**	**-0.041**	**-0.087**
65	**80**	**-0.026**	**-0.045**	**-0.021**	**-0.051**	**-0.037**	**-0.056**	**-0.032**	**-0.062**	**-0.043**	**-0.089**
80	**100**	**-0.030**	**-0.052**	**-0.024**	**-0.059**	**-0.044**	**-0.066**	**-0.038**	**-0.073**	**-0.051**	**-0.105**
100	**120**	**-0.030**	**-0.052**	**-0.024**	**-0.059**	**-0.047**	**-0.069**	**-0.041**	**-0.076**	**-0.054**	**-0.108**
120	**140**	**-0.037**	**-0.061**	**-0.028**	**-0.068**	**-0.056**	**-0.081**	**-0.048**	**-0.088**	**-0.063**	**-0.126**
140	**160**	**-0.036**	**-0.061**	**-0.028**	**-0.068**	**-0.058**	**-0.083**	**-0.050**	**-0.090**	**-0.065**	**-0.128**
160	**180**	**-0.036**	**-0.061**	**-0.028**	**-0.068**	**-0.061**	**-0.086**	**-0.053**	**-0.093**	**-0.068**	**-0.131**
180	**200**	**-0.041**	**-0.070**	**-0.033**	**-0.079**	**-0.068**	**-0.097**	**-0.060**	**-0.106**	**-0.077**	**-0.149**
200	**225**	**-0.041**	**-0.070**	**-0.033**	**-0.079**	**-0.071**	**-0.100**	**-0.063**	**-0.109**	**-0.080**	**-0.152**
225	**250**	**-0.041**	**-0.070**	**-0.033**	**-0.079**	**-0.075**	**-0.104**	**-0.067**	**-0.113**	**-0.084**	**-0.156**
250	**280**	**-0.047**	**-0.079**	**-0.036**	**-0.088**	**-0.085**	**-0.117**	**-0.074**	**-0.126**	**-0.094**	**-0.175**
280	**315**	**-0.047**	**-0.079**	**-0.036**	**-0.088**	**-0.089**	**-0.121**	**-0.078**	**-0.130**	**-0.098**	**-0.179**
315	**355**	**-0.051**	**-0.087**	**-0.041**	**-0.098**	**-0.097**	**-0.133**	**-0.087**	**-0.144**	**-0.108**	**-0.197**
355	**400**	**-0.051**	**-0.087**	**-0.041**	**-0.098**	**-0.103**	**-0.139**	**-0.093**	**-0.150**	**-0.114**	**-0.203**
400	**450**	**-0.055**	**-0.095**	**-0.045**	**-0.108**	**-0.113**	**-0.153**	**-0.103**	**-0.166**	**-0.126**	**-0.223**
450	**500**	**-0.055**	**-0.095**	**-0.045**	**-0.108**	**-0.119**	**-0.159**	**-0.109**	**-0.172**	**-0.132**	**-0.229**

ISO Tolerances for Shafts – Metric

Diameters **mm**		Deviations **mm**							
		a10		a11		a12		a13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	-0.270	-0.310	-0.270	-0.330	-0.270	-0.370	-0.270	-0.410
3	6	-0.270	-0.318	-0.270	-0.345	-0.270	-0.390	-0.270	-0.450
6	10	-0.280	-0.338	-0.280	-0.370	-0.280	-0.430	-0.280	-0.500
10	18	-0.290	-0.360	-0.290	-0.400	-0.290	-0.470	-0.290	-0.560
18	30	-0.300	-0.384	-0.300	-0.430	-0.300	-0.510	-0.300	-0.630
30	40	-0.310	-0.410	-0.310	-0.470	-0.310	-0.560	-0.310	-0.700
40	50	-0.320	-0.420	-0.320	-0.480	-0.320	-0.570	-0.320	-0.710
50	65	-0.340	-0.460	-0.340	-0.530	-0.340	-0.640	-0.340	-0.800
65	80	-0.360	-0.480	-0.360	-0.550	-0.360	-0.660	-0.360	-0.820
80	100	-0.380	-0.520	-0.380	-0.600	-0.380	-0.730	-0.380	-0.920
100	120	-0.410	-0.550	-0.410	-0.630	-0.410	-0.760	-0.410	-0.950
120	140	-0.460	-0.620	-0.460	-0.710	-0.460	-0.860	-0.460	-1.090
140	160	-0.520	-0.680	-0.520	-0.770	-0.520	-0.920	-0.520	-1.150
160	180	-0.580	-0.740	-0.580	-0.830	-0.580	-0.980	-0.580	-1.210
180	200	-0.660	-0.845	-0.660	-0.950	-0.660	-1.120	-0.660	-1.380
200	225	-0.740	-0.925	-0.740	-1.030	-0.740	-1.200	-0.740	-1.460
225	250	-0.820	-1.005	-0.820	-1.110	-0.820	-1.280	-0.820	-1.540
250	280	-0.920	-1.130	-0.920	-1.240	-0.920	-1.440	-0.920	-1.730
280	315	-1.050	-1.260	-1.050	-1.370	-1.050	-1.570	-1.050	-1.860
315	355	-1.200	-1.430	-1.200	-1.560	-1.200	-1.770	-1.200	-2.090
355	400	-1.350	-1.580	-1.350	-1.710	-1.350	-1.920	-1.350	-2.240

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		c11		c12		c13		e11		e12		e13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	-0.060	-0.120	-0.060	-0.160	-0.060	-0.200	-0.014	-0.074	-0.014	-0.114	-0.014	-0.154
3	6	-0.070	-0.145	-0.070	-0.190	-0.070	-0.250	-0.020	-0.095	-0.020	-0.140	-0.020	-0.200
6	10	-0.080	-0.170	-0.080	-0.230	-0.080	-0.300	-0.025	-0.115	-0.025	-0.175	-0.025	-0.245
10	18	-0.095	-0.205	-0.095	-0.275	-0.095	-0.365	-0.032	-0.142	-0.032	-0.212	-0.032	-0.302
18	30	-0.110	-0.240	-0.110	-0.320	-0.110	-0.440	-0.040	-0.170	-0.040	-0.250	-0.040	-0.370
30	40	-0.120	-0.280	-0.120	-0.370	-0.120	-0.510	-0.050	-0.210	-0.050	-0.300	-0.050	-0.440
40	50	-0.130	-0.290	-0.130	-0.380	-0.130	-0.520	-0.050	-0.210	-0.050	-0.300	-0.050	-0.440
50	65	-0.140	-0.330	-0.140	-0.440	-0.140	-0.600	-0.060	-0.250	-0.060	-0.360	-0.060	-0.520
65	80	-0.150	-0.340	-0.150	-0.450	-0.150	-0.610	-0.060	-0.250	-0.060	-0.360	-0.060	-0.520
80	100	-0.170	-0.390	-0.170	-0.520	-0.170	-0.710	-0.072	-0.292	-0.072	-0.422	-0.072	-0.612
100	120	-0.180	-0.400	-0.180	-0.530	-0.180	-0.720	-0.072	-0.292	-0.072	-0.422	-0.072	-0.612
120	140	-0.200	-0.450	-0.200	-0.600	-0.200	-0.830	-0.085	-0.335	-0.085	-0.485	-0.085	-0.715
140	160	-0.210	-0.460	-0.210	-0.610	-0.210	-0.840	-0.085	-0.335	-0.085	-0.485	-0.085	-0.715
160	180	-0.230	-0.480	-0.230	-0.630	-0.230	-0.860	-0.085	-0.335	-0.085	-0.485	-0.085	-0.715
180	200	-0.240	-0.530	-0.240	-0.700	-0.240	-0.960	-0.100	-0.390	-0.100	-0.560	-0.100	-0.820
200	225	-0.260	-0.550	-0.260	-0.720	-0.260	-0.980	-0.100	-0.390	-0.100	-0.560	-0.100	-0.820
225	250	-0.280	-0.570	-0.280	-0.740	-0.280	-1.000	-0.100	-0.390	-0.100	-0.560	-0.100	-0.820
250	280	-0.300	-0.620	-0.300	-0.820	-0.300	-1.110	-0.110	-0.430	-0.110	-0.630	-0.110	-0.920
280	315	-0.330	-0.650	-0.330	-0.850	-0.330	-1.140	-0.110	-0.430	-0.110	-0.630	-0.110	-0.920
315	355	-0.360	-0.720	-0.360	-0.930	-0.360	-1.250	-0.125	-0.485	-0.125	-0.695	-0.125	-1.015
355	400	-0.400	-0.760	-0.400	-0.970	-0.400	-1.290	-0.125	-0.485	-0.125	-0.695	-0.125	-1.015

ISO Tolerances for Shafts – Metric

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		f5		f6		f7		g5		g6		g7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	**3**	**-0.006**	**-0.010**	**-0.006**	**-0.012**	**-0.006**	**-0.016**	**-0.002**	**-0.006**	**-0.002**	**-0.008**	**-0.002**	**-0.012**
3	**6**	**-0.010**	**-0.015**	**-0.010**	**-0.018**	**-0.010**	**-0.022**	**-0.004**	**-0.009**	**-0.004**	**-0.012**	**-0.004**	**-0.016**
6	**10**	**-0.013**	**-0.019**	**-0.013**	**-0.022**	**-0.013**	**-0.028**	**-0.005**	**-0.011**	**-0.005**	**-0.014**	**-0.005**	**-0.020**
10	**18**	**-0.016**	**-0.024**	**-0.016**	**-0.027**	**-0.016**	**-0.034**	**-0.006**	**-0.014**	**-0.006**	**-0.017**	**-0.006**	**-0.024**
18	**30**	**-0.020**	**-0.029**	**-0.020**	**-0.033**	**-0.020**	**-0.041**	**-0.007**	**-0.016**	**-0.007**	**-0.020**	**-0.007**	**-0.028**
30	**50**	**-0.025**	**-0.036**	**-0.025**	**-0.041**	**-0.025**	**-0.050**	**-0.009**	**-0.020**	**-0.009**	**-0.025**	**-0.009**	**-0.034**
50	**80**	**-0.030**	**-0.043**	**-0.030**	**-0.049**	**-0.030**	**-0.060**	**-0.010**	**-0.023**	**-0.010**	**-0.029**	**-0.010**	**-0.040**
80	**120**	**-0.036**	**-0.051**	**-0.036**	**-0.058**	**-0.036**	**-0.071**	**-0.012**	**-0.027**	**-0.012**	**-0.034**	**-0.012**	**-0.047**
120	**180**	**-0.043**	**-0.061**	**-0.043**	**-0.068**	**-0.043**	**-0.083**	**-0.014**	**-0.032**	**-0.014**	**-0.039**	**-0.014**	**-0.054**
180	**250**	**-0.050**	**-0.070**	**-0.050**	**-0.079**	**-0.050**	**-0.096**	**-0.015**	**-0.035**	**-0.015**	**-0.044**	**-0.015**	**-0.061**
250	**315**	**-0.056**	**-0.079**	**-0.056**	**-0.088**	**-0.056**	**-0.108**	**-0.017**	**-0.040**	**-0.017**	**-0.049**	**-0.017**	**-0.069**
315	**400**	**-0.062**	**-0.087**	**-0.062**	**-0.098**	**-0.062**	**-0.119**	**-0.018**	**-0.043**	**-0.018**	**-0.054**	**-0.018**	**-0.075**

Diameters **mm**		Deviations **mm**									
		h4		h5		h6		h7		h8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	**3**	**0.000**	**-0.003**	**0.000**	**-0.004**	**0.000**	**-0.006**	**0.000**	**-0.010**	**0.000**	**-0.014**
3	**6**	**0.000**	**-0.004**	**0.000**	**-0.005**	**0.000**	**-0.008**	**0.000**	**-0.012**	**0.000**	**-0.018**
6	**10**	**0.000**	**-0.004**	**0.000**	**-0.006**	**0.000**	**-0.009**	**0.000**	**-0.015**	**0.000**	**-0.022**
10	**18**	**0.000**	**-0.005**	**0.000**	**-0.008**	**0.000**	**-0.011**	**0.000**	**-0.018**	**0.000**	**-0.027**
18	**30**	**0.000**	**-0.006**	**0.000**	**-0.009**	**0.000**	**-0.013**	**0.000**	**-0.021**	**0.000**	**-0.033**
30	**50**	**0.000**	**-0.007**	**0.000**	**-0.011**	**0.000**	**-0.016**	**0.000**	**-0.025**	**0.000**	**-0.039**
50	**80**	**0.000**	**-0.008**	**0.000**	**-0.013**	**0.000**	**-0.019**	**0.000**	**-0.030**	**0.000**	**-0.046**
80	**120**	**0.000**	**-0.010**	**0.000**	**-0.015**	**0.000**	**-0.022**	**0.000**	**-0.035**	**0.000**	**-0.054**
120	**180**	**0.000**	**-0.012**	**0.000**	**-0.018**	**0.000**	**-0.025**	**0.000**	**-0.040**	**0.000**	**-0.063**
180	**250**	**0.000**	**-0.014**	**0.000**	**-0.020**	**0.000**	**-0.029**	**0.000**	**-0.046**	**0.000**	**-0.072**
250	**315**	**0.000**	**-0.016**	**0.000**	**-0.023**	**0.000**	**-0.032**	**0.000**	**-0.052**	**0.000**	**-0.081**
315	**400**	**0.000**	**-0.018**	**0.000**	**-0.025**	**0.000**	**-0.036**	**0.000**	**-0.057**	**0.000**	**-0.089**

Diameters **mm**		Deviations **mm**									
		h9		h10		h11		h12		h13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	**3**	**0.000**	**-0.025**	**0.000**	**-0.040**	**0.000**	**-0.060**	**0.000**	**-0.100**	**0.000**	**-0.140**
3	**6**	**0.000**	**-0.030**	**0.000**	**-0.048**	**0.000**	**-0.075**	**0.000**	**-0.120**	**0.000**	**-0.180**
6	**10**	**0.000**	**-0.036**	**0.000**	**-0.058**	**0.000**	**-0.090**	**0.000**	**-0.150**	**0.000**	**-0.220**
10	**18**	**0.000**	**-0.043**	**0.000**	**-0.070**	**0.000**	**-0.110**	**0.000**	**-0.180**	**0.000**	**-0.270**
18	**30**	**0.000**	**-0.052**	**0.000**	**-0.084**	**0.000**	**-0.130**	**0.000**	**-0.210**	**0.000**	**-0.330**
30	**50**	**0.000**	**-0.062**	**0.000**	**-0.100**	**0.000**	**-0.160**	**0.000**	**-0.250**	**0.000**	**-0.390**
50	**80**	**0.000**	**-0.074**	**0.000**	**-0.120**	**0.000**	**-0.190**	**0.000**	**-0.300**	**0.000**	**-0.460**
80	**120**	**0.000**	**-0.087**	**0.000**	**-0.140**	**0.000**	**-0.220**	**0.000**	**-0.350**	**0.000**	**-0.540**
120	**180**	**0.000**	**-0.100**	**0.000**	**-0.160**	**0.000**	**-0.250**	**0.000**	**-0.400**	**0.000**	**-0.630**
180	**250**	**0.000**	**-0.115**	**0.000**	**-0.185**	**0.000**	**-0.290**	**0.000**	**-0.460**	**0.000**	**-0.720**
250	**315**	**0.000**	**-0.130**	**0.000**	**-0.210**	**0.000**	**-0.320**	**0.000**	**-0.520**	**0.000**	**-0.810**
315	**400**	**0.000**	**-0.140**	**0.000**	**-0.230**	**0.000**	**-0.360**	**0.000**	**-0.570**	**0.000**	**-0.890**

ISO Tolerances for Shafts – Metric

Diameter **mm**		Deviations **mm**						Deviations **mm**					
		j5		j6		j7		k5		k6		k7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	0.002	-0.002	0.004	-0.002	0.006	-0.004	0.004	0.000	0.006	0.000	0.010	0.000
3	6	0.003	-0.002	0.006	-0.002	0.008	-0.004	0.006	0.001	0.009	0.001	0.013	0.001
6	10	0.004	-0.002	0.007	-0.002	0.010	-0.005	0.007	0.001	0.010	0.001	0.016	0.001
10	18	0.005	-0.003	0.008	-0.003	0.012	-0.006	0.009	0.001	0.012	0.001	0.019	0.001
18	30	0.005	-0.004	0.009	-0.004	0.013	-0.008	0.011	0.002	0.015	0.002	0.023	0.002
30	50	0.006	-0.005	0.011	-0.005	0.015	-0.010	0.013	0.002	0.018	0.002	0.027	0.002
50	80	0.006	-0.007	0.012	-0.007	0.018	-0.012	0.015	0.002	0.021	0.002	0.032	0.002
80	120	0.006	-0.009	0.013	-0.009	0.020	-0.015	0.018	0.003	0.025	0.003	0.038	0.003
120	180	0.007	-0.011	0.014	-0.011	0.022	-0.018	0.021	0.003	0.028	0.003	0.043	0.003
180	250	0.007	-0.013	0.016	-0.013	0.025	-0.021	0.024	0.004	0.033	0.004	0.050	0.004
250	315	0.007	-0.016	0.016	-0.016	0.026	-0.026	0.027	0.004	0.036	0.004	0.056	0.004
315	400	0.007	-0.018	0.018	-0.018	0.029	-0.028	0.029	0.004	0.040	0.004	0.061	0.004

Diameter **mm**		Deviations **mm**						Deviations **mm**					
		m5		m6		m7		n5		n6		n7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	0.006	0.002	0.008	0.002	0.012	0.002	0.008	0.004	0.010	0.004	0.014	0.004
3	6	0.009	0.004	0.012	0.004	0.016	0.004	0.013	0.008	0.016	0.008	0.020	0.008
6	10	0.012	0.006	0.015	0.006	0.021	0.006	0.016	0.010	0.019	0.010	0.025	0.010
10	18	0.015	0.007	0.018	0.007	0.025	0.007	0.020	0.012	0.023	0.012	0.030	0.012
18	30	0.017	0.008	0.021	0.008	0.029	0.008	0.024	0.015	0.028	0.015	0.036	0.015
30	50	0.020	0.009	0.025	0.009	0.034	0.009	0.028	0.017	0.033	0.017	0.042	0.017
50	80	0.024	0.011	0.030	0.011	0.041	0.011	0.033	0.020	0.039	0.020	0.050	0.020
80	120	0.028	0.013	0.035	0.013	0.048	0.013	0.038	0.023	0.045	0.023	0.058	0.023
120	180	0.033	0.015	0.040	0.015	0.055	0.015	0.045	0.027	0.052	0.027	0.067	0.027
180	250	0.037	0.017	0.046	0.017	0.063	0.017	0.051	0.031	0.060	0.031	0.077	0.031
250	315	0.043	0.020	0.052	0.020	0.072	0.020	0.057	0.034	0.066	0.034	0.086	0.034
315	400	0.046	0.021	0.057	0.021	0.078	0.021	0.062	0.037	0.073	0.037	0.094	0.037

Diameter **mm**		Deviations **mm**					
		p6		r6		r7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.
80	100	0.059	0.037	-	-	-	-
100	120	0.059	0.037	-	-	-	-
120	140	0.068	0.043	0.090	0.065	-	-
140	160	0.068	0.043	0.090	0.065	-	-
160	180	0.068	0.043	0.090	0.065	-	-
180	200	0.079	0.050	0.106	0.077	-	-
200	225	0.079	0.050	0.109	0.080	0.126	0.080
225	250	0.079	0.050	0.113	0.084	0.130	0.084
250	280	0.088	0.056	0.126	0.094	0.146	0.094
280	315	0.088	0.056	0.130	0.098	0.150	0.098
315	355	0.098	0.062	0.144	0.108	0.165	0.108
355	400	0.098	0.062	0.150	0.114	0.171	0.114
400	450	0.108	0.068	0.166	0.126	0.189	0.126
450	500	0.108	0.068	0.172	0.132	0.195	0.132

ISO Tolerances for Holes – inch

Diameter in		Deviations in						Deviations in					
		B10		B11		B12		C9		C10		C11	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0074	+0.0055	+0.0085	+0.0055	+0.0102	+0.0055	+0.0039	+0.0028	+0.0046	+0.0028	+0.0057	+0.0028
0.2362	0.3937	+0.0082	+0.0059	+0.0094	+0.0059	+0.0118	+0.0059	+0.0046	+0.0031	+0.0054	+0.0031	+0.0067	+0.0031
0.3937	0.7087	+0.0087	+0.0059	+0.0102	+0.0059	+0.0130	+0.0059	+0.0054	+0.0037	+0.0065	+0.0037	+0.0081	+0.0037
0.7087	1.1811	+0.0096	+0.0063	+0.0114	+0.0063	+0.0146	+0.0063	+0.0064	+0.0043	+0.0076	+0.0043	+0.0094	+0.0043
1.1811	1.5748	+0.0106	+0.0067	+0.0130	+0.0067	+0.0165	+0.0067	+0.0072	+0.0047	+0.0087	+0.0047	+0.0110	+0.0047
1.5748	1.9685	+0.0110	+0.0071	+0.0134	+0.0071	+0.0169	+0.0071	+0.0076	+0.0051	+0.0091	+0.0051	+0.0114	+0.0051
1.9685	2.5591	+0.0122	+0.0075	+0.0150	+0.0075	+0.0193	+0.0075	+0.0084	+0.0055	+0.0102	+0.0055	+0.0120	+0.0055
2.5591	3.1496	+0.0126	+0.0079	+0.0154	+0.0079	+0.0197	+0.0079	+0.0088	+0.0059	+0.0106	+0.0059	+0.0134	+0.0059
3.1496	3.9370	+0.0142	+0.0087	+0.0173	+0.0087	+0.0224	+0.0087	+0.0101	+0.0067	+0.0122	+0.0067	+0.0154	+0.0067
3.9370	4.7244	+0.0150	+0.0094	+0.0181	+0.0094	+0.0232	+0.0094	+0.0105	+0.0071	+0.0126	+0.0071	+0.0157	+0.0071
4.7244	5.5118	+0.0165	+0.0102	+0.0201	+0.0102	+0.0260	+0.0102	+0.0118	+0.0079	+0.0142	+0.0079	+0.0177	+0.0079
5.5118	6.2992	+0.0173	+0.0110	+0.0209	+0.0110	+0.0268	+0.0110	+0.0122	+0.0083	+0.0146	+0.0083	+0.0181	+0.0083
6.2992	7.0866	+0.0185	+0.0122	+0.0220	+0.0122	+0.0280	+0.0122	+0.0130	+0.0091	+0.0154	+0.0091	+0.0189	+0.0091
7.0866	7.8740	+0.0207	+0.0134	+0.0248	+0.0134	+0.0315	+0.0134	+0.0140	+0.0094	+0.0167	+0.0094	+0.0209	+0.0094
7.8740	8.8583	+0.0222	+0.0150	+0.0264	+0.0150	+0.0331	+0.0150	+0.0148	+0.0102	+0.0175	+0.0102	+0.0217	+0.0102
8.8583	9.8425	+0.0238	+0.0165	+0.0280	+0.0165	+0.0346	+0.0165	+0.0156	+0.0110	+0.0183	+0.0110	+0.0224	+0.0110
9.8425	11.0236	+0.0272	+0.0189	+0.0315	+0.0189	+0.0394	+0.0189	+0.0169	+0.0118	+0.0201	+0.0118	+0.0244	+0.0118
11.0236	12.4016	+0.0295	+0.0213	+0.0339	+0.0213	+0.0417	+0.0213	+0.0181	+0.0130	+0.0213	+0.0130	+0.0256	+0.0130
12.4016	13.9764	+0.0327	+0.0236	+0.0378	+0.0236	+0.0461	+0.0236	+0.0197	+0.0142	+0.0232	+0.0142	+0.0283	+0.0142
13.9764	15.7480	+0.0358	+0.0268	+0.0409	+0.0268	+0.0492	+0.0268	+0.0213	+0.0157	+0.0248	+0.0157	+0.0299	+0.0157
15.7480	17.7165	+0.0398	+0.0299	+0.0457	+0.0299	+0.0547	+0.0299	+0.0234	+0.0173	+0.0272	+0.0173	+0.0331	+0.0173
17.71654	19.6850	+0.0429	+0.0331	+0.0488	+0.0331	+0.0579	+0.0331	+0.0250	+0.0189	+0.0287	+0.0189	+0.0346	+0.0189

Diameter in		Deviations in									
		E9		E10		E11		E12		E13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0020	+0.0008	+0.0027	+0.0008	+0.0037	+0.0008	+0.0055	+0.0008	+0.0079	+0.0008
0.2362	0.3937	+0.0024	+0.0010	+0.0033	+0.0010	+0.0045	+0.0010	+0.0069	+0.0010	+0.0096	+0.0010
0.3937	0.7087	+0.0030	+0.0013	+0.0040	+0.0013	+0.0056	+0.0013	+0.0083	+0.0013	+0.0119	+0.0013
0.7087	1.1811	+0.0036	+0.0016	+0.0049	+0.0016	+0.0067	+0.0016	+0.0098	+0.0016	+0.0146	+0.0016
1.1811	1.9685	+0.0044	+0.0020	+0.0059	+0.0020	+0.0083	+0.0020	+0.0118	+0.0020	+0.0173	+0.0020
1.9685	3.1496	+0.0053	+0.0024	+0.0071	+0.0024	+0.0098	+0.0024	+0.0142	+0.0024	+0.0205	+0.0024
3.1496	4.7244	+0.0063	+0.0028	+0.0083	+0.0028	+0.0115	+0.0028	+0.0166	+0.0028	+0.0241	+0.0028
4.7244	7.0866	+0.0073	+0.0033	+0.0096	+0.0033	+0.0132	+0.0033	+0.0191	+0.0033	+0.0281	+0.0033
7.0866	9.8425	+0.0085	+0.0039	+0.0112	+0.0039	+0.0154	+0.0039	+0.0220	+0.0039	+0.0323	+0.0039
9.8425	12.4016	+0.0094	+0.0043	+0.0126	+0.0043	+0.0169	+0.0043	+0.0248	+0.0043	+0.0362	+0.0043
12.4016	15.7480	+0.0104	+0.0049	+0.0140	+0.0049	+0.0191	+0.0049	+0.0274	+0.0049	+0.0400	+0.0049
15.7480	19.6850	+0.0114	+0.0053	+0.0152	+0.0053	+0.0211	+0.0053	+0.0301	+0.0053	+0.0435	+0.0053

Diameter in		Deviations in							
		F5		F6		F7		F8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0006	+0.0004	+0.0007	+0.0004	+0.0009	+0.0004	+0.0011	+0.0004
0.2362	0.3937	+0.0007	+0.0005	+0.0009	+0.0005	+0.0011	+0.0005	+0.0014	+0.0005
0.3937	0.7087	+0.0009	+0.0006	+0.0011	+0.0006	+0.0013	+0.0006	+0.0017	+0.0006
0.7087	1.1811	+0.0011	+0.0008	+0.0013	+0.0008	+0.0016	+0.0008	+0.0021	+0.0008
1.1811	1.9685	+0.0014	+0.0010	+0.0016	+0.0010	+0.0020	+0.0010	+0.0025	+0.0010
1.9685	3.1496	+0.0017	+0.0012	+0.0019	+0.0012	+0.0024	+0.0012	+0.0030	+0.0012
3.1496	4.7244	+0.0020	+0.0014	+0.0023	+0.0014	+0.0028	+0.0014	+0.0035	+0.0014
4.7244	7.0866	+0.0024	+0.0017	+0.0027	+0.0017	+0.0033	+0.0017	+0.0042	+0.0017
7.0866	9.8425	+0.0028	+0.0020	+0.0031	+0.0020	+0.0038	+0.0020	+0.0048	+0.0020
9.8425	12.4016	+0.0031	+0.0022	+0.0035	+0.0022	+0.0043	+0.0022	+0.0054	+0.0022
12.4016	15.7480	+0.0034	+0.0024	+0.0039	+0.0024	+0.0047	+0.0024	+0.0059	+0.0024
15.7480	19.6850	+0.0037	+0.0027	+0.0043	+0.0027	+0.0052	+0.0027	+0.0065	+0.0027

ISO Tolerances for Holes – inch

Diameter in		Deviations in					
		G5		G6		G7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0004	+0.0002	+0.0005	+0.0002	+0.0006	+0.0002
0.2362	0.3937	+0.0004	+0.0002	+0.0006	+0.0002	+0.0008	+0.0002
0.3937	0.7087	+0.0006	+0.0002	+0.0007	+0.0002	+0.0009	+0.0002
0.7087	1.1811	+0.0006	+0.0003	+0.0008	+0.0003	+0.0011	+0.0003
1.1811	1.9685	+0.0008	+0.0004	+0.0010	+0.0004	+0.0013	+0.0004
1.9685	3.1496	+0.0009	+0.0004	+0.0011	+0.0004	+0.0016	+0.0004
3.1496	4.7244	+0.0011	+0.0005	+0.0013	+0.0005	+0.0019	+0.0005
4.7244	7.0866	+0.0013	+0.0006	+0.0015	+0.0006	+0.0021	+0.0006
7.0866	9.8425	+0.0014	+0.0006	+0.0017	+0.0006	+0.0024	+0.0006
9.8425	12.4016	+0.0016	+0.0007	+0.0019	+0.0007	+0.0027	+0.0007
12.4016	15.7480	+0.0017	+0.0007	+0.0021	+0.0007	+0.0030	+0.0007
15.7480	19.6850	+0.0019	+0.0008	+0.0024	+0.0008	+0.0033	+0.0008

Diameter in		Deviations in									
		H4		H5		H6		H7		H8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0002	0	+0.0002	0	+0.0003	0	+0.0005	0	+0.0007	0
0.2362	0.3937	+0.0002	0	+0.0002	0	+0.0004	0	+0.0006	0	+0.0009	0
0.3937	0.7087	+0.0002	0	+0.0003	0	+0.0004	0	+0.0007	0	+0.0011	0
0.7087	1.1811	+0.0002	0	+0.0004	0	+0.0005	0	+0.0008	0	+0.0013	0
1.1811	1.9685	+0.0003	0	+0.0004	0	+0.0006	0	+0.0010	0	+0.0015	0
1.9685	3.1496	+0.0003	0	+0.0005	0	+0.0007	0	+0.0012	0	+0.0018	0
3.1496	4.7244	+0.0004	0	+0.0006	0	+0.0009	0	+0.0014	0	+0.0021	0
4.7244	7.0866	+0.0005	0	+0.0007	0	+0.0010	0	+0.0016	0	+0.0025	0
7.0866	9.8425	+0.0006	0	+0.0008	0	+0.0011	0	+0.0018	0	+0.0028	0
9.8425	12.4016	+0.0006	0	+0.0009	0	+0.0013	0	+0.0020	0	+0.0032	0
12.4016	15.7480	+0.0007	0	+0.0010	0	+0.0014	0	+0.0022	0	+0.0035	0
15.7480	19.6850	+0.0008	0	+0.0011	0	+0.0016	0	+0.0025	0	+0.0038	0

Diameter in		Deviations in							
		H9		H10		H11		H12	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0012	0	+0.0019	0	+0.0030	0	+0.0047	0
0.2362	0.3937	+0.0014	0	+0.0023	0	+0.0035	0	+0.0059	0
0.3937	0.7087	+0.0017	0	+0.0028	0	+0.0043	0	+0.0071	0
0.7087	1.1811	+0.0020	0	+0.0033	0	+0.0051	0	+0.0083	0
1.1811	1.9685	+0.0024	0	+0.0039	0	+0.0063	0	+0.0098	0
1.9685	3.1496	+0.0029	0	+0.0047	0	+0.0075	0	+0.0118	0
3.1496	4.7244	+0.0034	0	+0.0055	0	+0.0087	0	+0.0138	0
4.7244	7.0866	+0.0039	0	+0.0063	0	+0.0098	0	+0.0157	0
7.0866	9.8425	+0.0045	0	+0.0073	0	+0.0114	0	+0.0181	0
9.8425	12.4016	+0.0051	0	+0.0083	0	+0.0126	0	+0.0205	0
12.4016	15.7480	+0.0055	0	+0.0091	0	+0.0142	0	+0.0224	0
15.7480	19.6850	+0.0061	0	+0.0098	0	+0.0157	0	+0.0248	0

ISO Tolerances for Holes – inch

Diameter in		Deviations in						Deviations in					
		J6		J7		J8		K6		K7		K8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.00020	-0.00012	+0.00024	-0.00024	+0.00039	-0.00031	+0.00008	-0.00024	+0.00012	-0.00035	+0.00020	-0.00051
0.2362	0.3937	+0.00020	-0.00016	+0.00031	-0.00028	+0.00047	-0.00039	+0.00008	-0.00028	+0.00020	-0.00039	+0.00024	-0.00063
0.3937	0.7087	+0.00024	-0.00020	+0.00039	-0.00031	+0.00059	-0.00047	+0.00008	-0.00035	+0.00024	-0.00047	+0.00031	-0.00075
0.7087	1.1811	+0.00031	-0.00020	+0.00047	-0.00035	+0.00079	-0.00051	+0.00008	-0.00043	+0.00024	-0.00059	+0.00039	-0.00091
1.1811	1.9685	+0.00039	-0.00024	+0.00055	-0.00043	+0.00094	-0.00059	+0.00012	-0.00051	+0.00028	-0.00071	+0.00047	-0.00106
1.9685	3.1496	+0.00051	-0.00024	+0.00071	-0.00047	+0.00110	-0.00071	+0.00016	-0.00059	+0.00035	-0.00083	+0.00055	-0.00126
3.1496	4.7244	+0.00063	-0.00024	+0.00087	-0.00051	+0.00134	-0.00079	+0.00016	-0.00071	+0.00039	-0.00098	+0.00063	-0.00150
4.7244	7.0866	+0.00071	-0.00028	+0.00102	-0.00055	+0.00161	-0.00087	+0.00016	-0.00083	+0.00047	-0.00110	+0.00079	-0.00169
7.0866	9.8425	+0.00087	-0.00028	+0.00118	-0.00063	+0.00185	-0.00098	+0.00020	-0.00094	+0.00051	-0.00130	+0.00087	-0.00197
9.8425	12.4016	+0.00098	-0.00028	+0.00142	-0.00063	+0.00217	-0.00102	+0.00020	-0.00106	+0.00063	-0.00142	+0.00098	-0.00220
12.4016	15.7480	+0.00114	-0.00028	+0.00154	-0.00071	+0.00236	-0.00114	+0.00028	-0.00114	+0.00067	-0.00157	+0.00110	-0.00240
15.7480	19.6850	+0.00130	-0.00028	+0.00169	-0.00079	+0.00259	-0.00122	+0.00031	-0.00126	+0.00071	-0.00177	+0.00114	-0.00268

Diameter in		Deviations in						Deviations in					
		M5		M6		M7		N6		N7		N8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	-0.00012	-0.00031	-0.00004	-0.00035	0	-0.00047	-0.0002	-0.0005	-0.0002	-0.0006	-0.0001	-0.0008
0.2362	0.3937	-0.00016	-0.00039	-0.00012	-0.00047	0	-0.00059	-0.0003	-0.0006	-0.0002	-0.0007	-0.0001	-0.0010
0.3937	0.7087	-0.00016	-0.00047	-0.00016	-0.00059	0	-0.00071	-0.0004	-0.0008	-0.0002	-0.0009	-0.0001	-0.0012
0.7087	1.1811	-0.00020	-0.00055	-0.00016	-0.00067	0	-0.00083	-0.0004	-0.0009	-0.0003	-0.0011	-0.0001	-0.0014
1.1811	1.9685	-0.00020	-0.00063	-0.00016	-0.00079	0	-0.00098	-0.0005	-0.0011	-0.0003	-0.0013	-0.0001	-0.0017
1.9685	3.1496	-0.00024	-0.00075	-0.00020	-0.00094	0	-0.00118	-0.0006	-0.0013	-0.0004	-0.0015	-0.0002	-0.0020
3.1496	4.7244	-0.00031	-0.00091	-0.00024	-0.00110	0	-0.00138	-0.0006	-0.0015	-0.0004	-0.0018	-0.0002	-0.0023
4.7244	7.0866	-0.00035	-0.00106	-0.00031	-0.00130	0	-0.00157	-0.0008	-0.0018	-0.0005	-0.0020	-0.0002	-0.0026
7.0866	9.8425	-0.00043	-0.00122	-0.00031	-0.00146	0	-0.00181	-0.0009	-0.0020	-0.0006	-0.0024	-0.0002	-0.0030
9.8425	12.4016	-0.00051	-0.00142	-0.00035	-0.00161	0	-0.00205	-0.0000	-0.0022	-0.0006	-0.0026	-0.0002	-0.0034
12.4016	15.7480	-0.00055	-0.00154	-0.00039	-0.00181	0	-0.00224	-0.0010	-0.0024	-0.0006	-0.0029	-0.0002	-0.0037
15.7480	19.6850	-0.00063	-0.00169	-0.00039	-0.00197	0	-0.00248	-0.0011	-0.0026	-0.0007	-0.0031	-0.0002	-0.0041

Diameter in		Deviations in				Deviations in					
		P6		P7		R6		R7		R8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	-0.0004	-0.0007	-0.0003	-0.0008	-0.0005	-0.0008	-0.0004	-0.0009	-0.0006	-0.0013
0.2362	0.3937	-0.0005	-0.0008	-0.0004	-0.0009	-0.0006	-0.0010	-0.0005	-0.0011	-0.0007	-0.0016
0.3937	0.7087	-0.0006	-0.0010	-0.0004	-0.0011	-0.0008	-0.0012	-0.0006	-0.0013	-0.0009	-0.0020
0.7087	1.1811	-0.0007	-0.0012	-0.0006	-0.0014	-0.0009	-0.0015	-0.0008	-0.0016	-0.0011	-0.0024
1.1811	1.9685	-0.0008	-0.0015	-0.0007	-0.0017	-0.0011	-0.0018	-0.0010	-0.0020	-0.0013	-0.0029
1.9685	2.5591	-0.0010	-0.0018	-0.0008	-0.0020	-0.0014	-0.0021	-0.0012	-0.0024	-0.0016	-0.0034
2.5591	3.1496	-0.0010	-0.0018	-0.0008	-0.0020	-0.0015	-0.0022	-0.0013	-0.0024	-0.0017	-0.0035
3.1496	3.9370	-0.0012	-0.0020	-0.0009	-0.0023	-0.0017	-0.0026	-0.0015	-0.0029	-0.0020	-0.0041
3.9370	4.7244	-0.0012	-0.0020	-0.0009	-0.0023	-0.0019	-0.0027	-0.0016	-0.0030	-0.0021	-0.0043
4.7244	5.5118	-0.0014	-0.0024	-0.0011	-0.0027	-0.0022	-0.0032	-0.0019	-0.0035	-0.0025	-0.0050
5.5118	6.2992	-0.0014	-0.0024	-0.0011	-0.0027	-0.0023	-0.0033	-0.0020	-0.0035	-0.0026	-0.0050
6.2992	7.0866	-0.0014	-0.0024	-0.0011	-0.0027	0.0024	-0.0034	-0.0021	-0.0037	-0.0027	-0.0052
7.0866	7.8740	-0.0016	-0.0028	-0.0013	-0.0031	-0.0027	-0.0038	-0.0024	-0.0042	-0.0030	-0.0059
7.8740	8.8583	-0.0016	-0.0028	-0.0013	-0.0031	0.0028	-0.0039	-0.0025	-0.0043	-0.0031	-0.0060
8.8583	9.8425	-0.0016	-0.0028	-0.0013	-0.0031	-0.0030	-0.0041	-0.0026	-0.0044	-0.0033	-0.0061
9.8425	11.0236	-0.0019	-0.0031	-0.0014	-0.0035	-0.0033	-0.0046	-0.0029	-0.0050	-0.0037	-0.0069
11.0236	12.4016	-0.0019	-0.0031	-0.0014	-0.0035	-0.0035	-0.0048	-0.0031	-0.0051	-0.0039	-0.0070
12.4016	13.9764	-0.0020	-0.0034	-0.0016	-0.0039	-0.0038	-0.0052	-0.0034	-0.0057	-0.0043	-0.0078
13.9764	15.7480	-0.0020	-0.0034	-0.0016	-0.0039	-0.0041	-0.0055	-0.0037	-0.0059	-0.0045	-0.0080
15.7480	17.7165	-0.0022	-0.0037	-0.0018	-0.0043	-0.0044	-0.0060	-0.0041	-0.0065	-0.0050	-0.0088
17.7165	19.6850	-0.0022	-0.0037	-0.0018	-0.0043	-0.0047	-0.0063	-0.0043	-0.0068	-0.0052	-0.0090

ISO Tolerances for Shafts – inch									
Diameter in		Deviations in							
		a10		a11		a12		a13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
–	0.1181	-0.0106	-0.0122	-0.0106	-0.0130	-0.0106	-0.0146	-0.0106	-0.0161
0.1181	0.2362	-0.0106	-0.0125	-0.0106	-0.0136	-0.0106	-0.0154	-0.0106	-0.0177
0.2362	0.3937	-0.0110	-0.0133	-0.0110	-0.0146	-0.0110	-0.0169	-0.0110	-0.0197
0.3937	0.7087	-0.0114	-0.0142	-0.0114	-0.0157	-0.0114	-0.0185	-0.0114	-0.0220
0.7087	1.1811	-0.0118	-0.0151	-0.0118	-0.0169	-0.0118	-0.0201	-0.0118	-0.0248
1.1811	1.5748	-0.0122	-0.0161	-0.0122	-0.0185	-0.0122	-0.0220	-0.0122	-0.0276
1.5748	1.9685	-0.0126	-0.0165	-0.0126	-0.0189	-0.0126	-0.0224	-0.0126	-0.0280
1.9685	2.5591	-0.0134	-0.0181	-0.0134	-0.0209	-0.0134	-0.0252	-0.0134	-0.0315
2.5591	3.1496	-0.0142	-0.0189	-0.0142	-0.0217	-0.0142	-0.0260	-0.0142	-0.0323
3.1496	3.9370	-0.0150	-0.0205	-0.0150	-0.0236	-0.0150	-0.0287	-0.0150	-0.0362
3.9370	4.7244	-0.0161	-0.0217	-0.0161	-0.0248	-0.0161	-0.0299	-0.0161	-0.0374
4.7244	5.5118	-0.0181	-0.0244	-0.0181	-0.0280	-0.0181	-0.0339	-0.0181	-0.0429
5.5118	6.2992	-0.0205	-0.0268	-0.0205	-0.0303	-0.0205	-0.0362	-0.0205	-0.0453
6.2992	7.0866	-0.0228	-0.0291	-0.0228	-0.0327	-0.0228	-0.0386	-0.0228	-0.0476
7.0866	7.8740	-0.0260	-0.0333	-0.0260	-0.0374	-0.0260	-0.0441	-0.0260	-0.0543
7.8740	8.8583	-0.0291	-0.0364	-0.0291	-0.0406	-0.0291	-0.0472	-0.0291	-0.0575
8.8583	9.8425	-0.0323	-0.0396	-0.0323	-0.0437	-0.0323	-0.0504	-0.0323	-0.0606
9.8425	11.0236	-0.0362	-0.0445	-0.0362	-0.0488	-0.0362	-0.0567	-0.0362	-0.0681
11.0236	12.4016	-0.0413	-0.0496	-0.0413	-0.0539	-0.0413	-0.0618	-0.0413	-0.0732
12.4016	13.9764	-0.0472	-0.0563	-0.0472	-0.0614	-0.0472	-0.0697	-0.0472	-0.0823
13.9764	15.7480	-0.0531	-0.0622	-0.0531	-0.0673	-0.0531	-0.0756	-0.0531	-0.0882

Diameter in		Deviations in						Deviations in					
		c11		c12		c13		e11		e12		e13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	-0.0024	-0.0047	-0.0024	-0.0063	-0.0024	-0.0079	-0.0006	-0.0029	-0.0006	-0.0045	-0.0006	-0.0061
0.1181	0.2362	-0.0028	-0.0057	-0.0028	-0.0075	-0.0028	-0.0098	-0.0008	-0.0037	-0.0008	-0.0055	-0.0008	-0.0079
0.2362	0.3937	-0.0031	-0.0067	-0.0031	-0.0091	-0.0031	-0.0118	-0.0010	-0.0045	-0.0010	-0.0069	-0.0010	-0.0096
0.3937	0.7087	-0.0037	-0.0081	-0.0037	-0.0108	-0.0037	-0.0144	-0.0013	-0.0056	-0.0013	-0.0083	-0.0013	-0.0119
0.7087	1.1811	-0.0043	-0.0094	-0.0043	-0.0126	-0.0043	-0.0173	-0.0016	-0.0067	-0.0016	-0.0098	-0.0016	-0.0146
1.1811	1.5748	-0.0047	-0.0110	-0.0047	-0.0146	-0.0047	-0.0201	-0.0020	-0.0083	-0.0020	-0.0118	-0.0020	-0.0173
1.5748	1.9685	-0.0051	-0.0114	-0.0051	-0.0150	-0.0051	-0.0205	-0.0020	-0.0083	-0.0020	-0.0118	-0.0020	-0.0173
1.9685	2.5591	-0.0055	-0.0130	-0.0055	-0.0173	-0.0055	-0.0236	-0.0024	-0.0098	-0.0024	-0.0142	-0.0024	-0.0205
2.5591	3.1496	-0.0059	-0.0134	-0.0059	-0.0177	-0.0059	-0.0240	-0.0024	-0.0098	-0.0024	-0.0142	-0.0024	-0.0205
3.1496	3.9370	-0.0067	-0.0154	-0.0067	-0.0205	-0.0067	-0.0280	-0.0028	-0.0115	-0.0028	-0.0166	-0.0028	-0.0241
3.9370	4.7244	-0.0071	-0.0157	-0.0071	-0.0209	-0.0071	-0.0283	-0.0028	-0.0115	-0.0028	-0.0166	-0.0028	-0.0241
4.7244	5.5118	-0.0079	-0.0177	-0.0079	-0.0236	-0.0079	-0.0327	-0.0033	-0.0132	-0.0033	-0.0191	-0.0033	-0.0281
5.5118	6.2992	-0.0083	-0.0181	-0.0083	-0.0240	-0.0083	-0.0331	-0.0033	-0.0132	-0.0033	-0.0191	-0.0033	-0.0281
6.2992	7.0866	-0.0091	-0.0189	-0.0091	-0.0248	-0.0091	-0.0339	-0.0033	-0.0132	-0.0033	-0.0191	-0.0033	-0.0281
7.0866	7.8740	-0.0094	-0.0209	-0.0094	-0.0276	-0.0094	-0.0378	-0.0039	-0.0154	-0.0039	-0.0220	-0.0039	-0.0323
7.8740	8.8583	-0.0102	-0.0217	-0.0102	-0.0283	-0.0102	-0.0386	-0.0039	-0.0154	-0.0039	-0.0220	-0.0039	-0.0323
8.8583	9.8425	-0.0110	-0.0224	-0.0110	-0.0291	-0.0110	-0.0394	-0.0039	-0.0154	-0.0039	-0.0220	-0.0039	-0.0323
9.8425	11.0236	-0.0118	-0.0244	-0.0118	-0.0323	-0.0118	-0.0437	-0.0043	-0.0169	-0.0043	-0.0248	-0.0043	-0.0362
11.0236	12.4016	-0.0130	-0.0256	-0.0130	-0.0335	-0.0130	-0.0449	-0.0043	-0.0169	-0.0043	-0.0248	-0.0043	-0.0362
12.4016	13.9764	-0.0142	-0.0283	-0.0142	-0.0366	-0.0142	-0.0492	-0.0049	-0.0191	-0.0049	-0.0274	-0.0049	-0.0400
13.9764	15.7480	-0.0157	-0.0299	-0.0157	-0.0382	-0.0157	-0.0508	-0.0049	-0.0191	-0.0049	-0.0274	-0.0049	-0.0400

ISO Tolerances for Shafts – inch

Diameter in		Deviations in						Deviations in					
		f5		f6		f7		g5		g6		g7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	-0.0002	-0.0004	-0.0002	-0.0005	-0.0002	-0.0006	-0.0001	-0.0002	-0.0001	-0.0003	-0.0001	-0.0005
0.1181	0.2362	-0.0004	-0.0006	-0.0004	-0.0007	-0.0004	-0.0009	-0.0002	-0.0004	-0.0002	-0.0005	-0.0002	-0.0006
0.2362	0.3937	-0.0005	-0.0007	-0.0005	-0.0009	-0.0005	-0.0011	-0.0002	-0.0004	-0.0002	-0.0006	-0.0002	-0.0008
0.3937	0.7087	-0.0006	-0.0009	-0.0006	-0.0011	-0.0006	-0.0013	-0.0002	-0.0006	-0.0002	-0.0007	-0.0002	-0.0009
0.7087	1.1811	-0.0008	-0.0011	-0.0008	-0.0013	-0.0008	-0.0016	-0.0003	-0.0006	-0.0003	-0.0008	-0.0003	-0.0011
1.1811	1.9685	-0.0010	-0.0014	-0.0010	-0.0016	-0.0010	-0.0020	-0.0004	-0.0008	-0.0004	-0.0010	-0.0004	-0.0013
1.9685	3.1496	-0.0012	-0.0017	-0.0012	-0.0019	-0.0012	-0.0024	-0.0004	-0.0009	-0.0004	-0.0011	-0.0004	-0.0016
3.1496	4.7244	-0.0014	-0.0020	-0.0014	-0.0023	-0.0014	-0.0028	-0.0005	-0.0011	-0.0005	-0.0013	-0.0005	-0.0019
4.7244	7.0866	-0.0017	-0.0024	-0.0017	-0.0027	-0.0017	-0.0033	-0.0006	-0.0013	-0.0006	-0.0015	-0.0006	-0.0021
7.0866	9.8425	-0.0020	-0.0028	-0.0020	-0.0031	-0.0020	-0.0038	-0.0006	-0.0014	-0.0006	-0.0017	-0.0006	-0.0024
9.8425	12.4016	-0.0022	-0.0031	-0.0022	-0.0035	-0.0022	-0.0043	-0.0007	-0.0016	-0.0007	-0.0019	-0.0007	-0.0027
12.4016	15.7480	-0.0024	-0.0034	-0.0024	-0.0039	-0.0024	-0.0047	-0.0007	-0.0017	-0.0007	-0.0021	-0.0007	-0.0030

Diameter in		Deviations in									
		h4		h5		h6		h7		h8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	0	-0.00012	0	-0.00016	0	-0.00024	0	-0.0004	0	-0.0006
0.1181	0.2362	0	-0.00016	0	-0.00020	0	-0.00031	0	-0.0005	0	-0.0007
0.2362	0.3937	0	-0.0002	0	-0.00024	0	-0.0004	0	-0.0006	0	-0.0009
0.3937	0.7087	0	-0.0002	0	-0.00031	0	-0.0004	0	-0.0007	0	-0.0011
0.7087	1.1811	0	-0.0002	0	-0.0004	0	-0.0005	0	-0.0008	0	-0.0013
1.1811	1.9685	0	-0.0003	0	-0.0004	0	-0.0006	0	-0.0010	0	-0.0015
1.9685	3.1496	0	-0.0003	0	-0.0005	0	-0.0007	0	-0.0012	0	-0.0018
3.1496	4.7244	0	-0.0004	0	-0.0006	0	-0.0009	0	-0.0014	0	-0.0021
4.7244	7.0866	0	-0.0005	0	-0.0007	0	-0.0010	0	-0.0016	0	-0.0025
7.0866	9.8425	0	-0.0006	0	-0.0008	0	-0.0011	0	-0.0018	0	-0.0028
9.8425	12.4016	0	-0.0006	0	-0.0009	0	-0.0013	0	-0.0020	0	-0.0032
12.4016	15.7480	0	-0.0007	0	-0.0010	0	-0.0014	0	-0.0022	0	-0.0035

Diameter in		Deviations in									
		h9		h10		h11		h12		h13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	0	-0.0010	0	-0.0016	0	-0.0024	0	-0.0039	0	-0.0055
0.1181	0.2362	0	-0.0012	0	-0.0019	0	-0.0030	0	-0.0047	0	-0.0071
0.2362	0.3937	0	-0.0014	0	-0.0023	0	-0.0035	0	-0.0059	0	-0.0087
0.3937	0.7087	0	-0.0017	0	-0.0028	0	-0.0043	0	-0.0071	0	-0.0106
0.7087	1.1811	0	-0.0020	0	-0.0033	0	-0.0051	0	-0.0083	0	-0.0130
1.1811	1.9685	0	-0.0024	0	-0.0039	0	-0.0063	0	-0.0098	0	-0.0154
1.9685	3.1496	0	-0.0029	0	-0.0047	0	-0.0075	0	-0.0118	0	-0.0181
3.1496	4.7244	0	-0.0034	0	-0.0055	0	-0.0087	0	-0.0138	0	-0.0213
4.7244	7.0866	0	-0.0039	0	-0.0063	0	-0.0098	0	-0.0157	0	-0.0248
7.0866	9.8425	0	-0.0045	0	-0.0073	0	-0.0114	0	-0.0181	0	-0.0283
9.8425	12.4016	0	-0.0051	0	-0.0083	0	-0.0126	0	-0.0205	0	-0.0319
12.4016	15.7480	0	-0.0055	0	-0.0091	0	-0.0142	0	-0.0224	0	-0.0350

ISO Tolerances for Shafts – inch													
Diameter in		Deviations in						Deviations in					
		j5		j6		j7		k5		k6		k7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	+0.00008	-0.00008	+0.00016	-0.00008	+0.00024	-0.00016	+0.00016	0	+0.00024	0	+0.00039	0
0.1181	0.2362	+0.00012	-0.00008	+0.00024	-0.00008	+0.00031	-0.00016	+0.00024	+0.00004	+0.00035	+0.00004	+0.00051	+0.00004
0.2362	0.3937	+0.00016	-0.00008	+0.00028	-0.00008	+0.00039	-0.00020	+0.00028	+0.00004	+0.00039	+0.00004	+0.00063	+0.00004
0.3937	0.7087	+0.00020	-0.00012	+0.00031	-0.00012	+0.00047	-0.00024	+0.00035	+0.00004	+0.00047	+0.00004	+0.00075	+0.00004
0.7087	1.1811	+0.00020	-0.00016	+0.00035	-0.00016	+0.00051	-0.00031	+0.00043	+0.00008	+0.00059	+0.00008	+0.00091	+0.00008
1.1811	1.9685	+0.00024	-0.00020	+0.00043	-0.00020	+0.00059	-0.00039	+0.00051	+0.00008	+0.00071	+0.00008	+0.00106	+0.00008
1.9685	3.1496	+0.00024	-0.00028	+0.00047	-0.00028	+0.00071	-0.00047	+0.00059	+0.00008	+0.00083	+0.00008	+0.00126	+0.00008
3.1496	4.7244	+0.00024	-0.00035	+0.00051	-0.00035	+0.00079	-0.00059	+0.00071	+0.00012	+0.00098	+0.00012	+0.00150	+0.00012
4.7244	7.0866	+0.00028	-0.00043	+0.00055	-0.00043	+0.00087	-0.00071	+0.00083	+0.00012	+0.00110	+0.00012	+0.00169	+0.00012
7.0866	9.8425	+0.00028	-0.00051	+0.00063	-0.00051	+0.00098	-0.00083	+0.00094	+0.00016	+0.00130	+0.00016	+0.00197	+0.00016
9.8425	12.4016	+0.00028	-0.00063	+0.00063	-0.00063	+0.00102	-0.00102	+0.00106	+0.00016	+0.00142	+0.00016	+0.00220	+0.00016
12.4016	15.7480	+0.00028	-0.00071	+0.00071	-0.00071	+0.00114	-0.00110	+0.00114	+0.00016	+0.00157	+0.00016	+0.00240	+0.00016

Diameter in		Deviations in						Deviations in					
		m5		m6		m7		n5		n6		n7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	+0.00024	+0.00008	+0.00031	+0.00008	+0.00047	+0.00008	+0.0003	+0.0002	+0.0004	+0.0002	+0.0006	+0.0002
0.1181	0.2362	+0.00035	+0.00016	+0.00047	+0.00016	+0.00063	+0.00016	+0.0005	+0.0003	+0.0006	+0.0003	+0.0008	+0.0003
0.2362	0.3937	+0.00047	+0.00024	+0.00059	+0.00024	+0.00083	+0.00024	+0.0006	+0.0004	+0.0007	+0.0004	+0.0010	+0.0004
0.3937	0.7087	+0.00059	+0.00028	+0.00071	+0.00028	+0.00098	+0.00028	+0.0008	+0.0005	+0.0009	+0.0005	+0.0012	+0.0005
0.7087	1.1811	+0.00067	+0.00031	+0.00083	+0.00031	+0.00114	+0.00031	+0.0009	+0.0006	+0.0011	+0.0006	+0.0014	+0.0006
1.1811	1.9685	+0.00079	+0.00035	+0.00098	+0.00035	+0.00134	+0.00035	+0.0011	+0.0007	+0.0013	+0.0007	+0.0017	+0.0007
1.9685	3.1496	+0.00094	+0.00043	+0.00118	+0.00043	+0.00161	+0.00043	+0.0013	+0.0008	+0.0015	+0.0008	+0.0020	+0.0008
3.1496	4.7244	+0.00110	+0.00051	+0.00138	+0.00051	+0.00189	+0.00051	+0.0015	+0.0009	+0.0018	+0.0009	+0.0023	+0.0009
4.7244	7.0866	+0.00130	+0.00059	+0.00157	+0.00059	+0.00217	+0.00059	+0.0018	+0.0011	+0.0020	+0.0011	+0.0026	+0.0011
7.0866	9.8425	+0.00146	+0.00067	+0.00181	+0.00067	+0.00248	+0.00067	+0.0020	+0.0012	+0.0024	+0.0012	+0.0030	+0.0012
9.8425	12.4016	+0.00169	+0.00079	+0.00205	+0.00079	+0.00283	+0.00079	+0.0022	+0.0013	+0.0026	+0.0013	+0.0034	+0.0013
12.4016	15.7480	+0.00181	+0.00083	+0.00224	+0.00083	+0.00307	+0.00083	+0.0024	+0.0015	+0.0029	+0.0015	+0.0037	+0.0015

Diameter in		Deviations in					
		p6		r6		r7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.
3.1496	3.9370	+0.0023	+0.0015	-	-	-	-
3.9370	4.7244	+0.0023	+0.0015	-	-	-	-
4.7244	5.5118	+0.0027	+0.0017	+0.0035	+0.0026	-	-
5.5118	6.2992	+0.0027	+0.0017	+0.0035	+0.0026	-	-
6.2992	7.0866	+0.0027	+0.0017	+0.0035	+0.0026	-	-
7.0866	7.8740	+0.0031	+0.0020	+0.0042	+0.0030	-	-
7.8740	8.8583	+0.0031	+0.0020	+0.0043	+0.0031	+0.0050	+0.0031
8.8583	9.8425	+0.0031	+0.0020	+0.0044	+0.0033	+0.0051	+0.0033
9.8425	11.0236	+0.0035	+0.0022	+0.0050	+0.0037	+0.0057	+0.0037
11.0236	12.4016	+0.0035	+0.0022	+0.0051	+0.0039	+0.0059	+0.0039
12.4016	13.9764	+0.0039	+0.0024	+0.0057	+0.0043	+0.0065	+0.0043
13.9764	15.7480	+0.0039	+0.0024	+0.0059	+0.0045	+0.0067	+0.0045
15.7480	17.7165	+0.0043	+0.0027	+0.0065	+0.0050	+0.0074	+0.0050
17.7165	19.6850	+0.0043	+0.0027	+0.0068	+0.0052	+0.0077	+0.0052

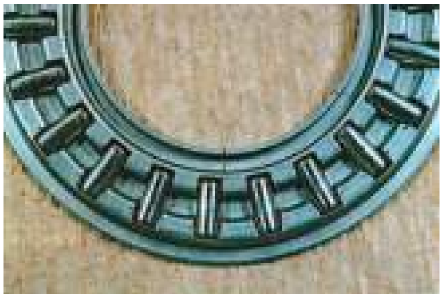
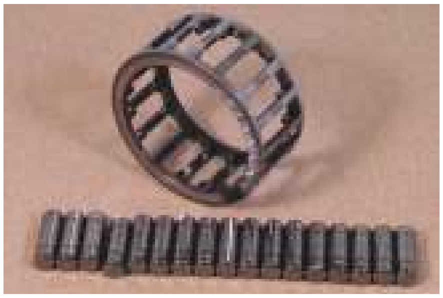
EXAMPLES OF BEARING FAILURES

Failures	Characteristics	
(1) Flaking	  	Flaking is a phenomenon that material is removed in flakes from a surface layer of the bearing raceways or rolling elements due to rolling fatigue. This phenomenon is generally attributed to the approaching end of bearing service life. However, if flaking occurs at early stages of bearing service life, it is necessary to determine causes and adopt countermeasures, since there is a possibility of abnormality in this case. Pitting Pitting is another type of failure caused by rolling fatigue, in which minute holes of approx. 0.1 mm in depth are generated on the raceway surface. Peeling (shown in middle figure) Peeling is a phenomenon in which the lubricant film separation is insufficient for complete surface separation (0.02 mm or less) of the rolling surfaces causing fatigue and peeling due to concentrated stress acting on microscopic peaks of surface roughness.
(2) Cracking Chipping	 	Cracking is mainly triggered by debris initiated defects due to wear of other system components, partial shape defects, and concentrated stress and overload caused by edge load. It may occur on bearing rings due to fatigue caused by repeated bend stress.

	Damages	Causes	Countermeasures
	Flaking occurring at an incipient stage	· Too small internal clearance · Improper or insufficient lubricant · Load too high · Rust	· Provide proper internal clearance. · Select proper lubricating method or lubricant.
	Symmetrical flaking along circumference of raceway	· Inaccurate housing roundness	· Correct processing accuracy of housing bore. Especially for split housings, care should be taken to ensure processing accuracy.
	Flaking occurring near the edge of the raceway or rolling contact surface	· Improper mounting · Shaft deflection · Inaccuracy of the shaft and housing	· Correct centering. · Correct squareness of shaft or housing shoulder.
	Flaking on the raceway surface at the same interval as rolling element spacing	· Heavy impact load during mounting · A flaw caused during mounting · Rust generated while out of operation	· Improve mounting procedure. · Provide rust prevention treatment before long cessation of operation.
	Cracking in outer ring, inner ring or race	· Excessive interference · Excessive fillet on shaft or housing · Heavy impact load · Advanced flaking or seizure · Impact on race during mounting	· Select proper fit. · Adjust fillet in the shaft or in the housing to smaller than that of the bearing chamfer dimension. · Re-examine load conditions. · Improve mounting procedures.
	Cracking on rolling elements	· Heavy impact load · Advanced flaking	· Improve mounting and handling procedures. · Re-examine load conditions.

Failures	Characteristics	
(3) Brinelling Nicks		· Brinelling is a small surface indentation generated either on the raceway through plastic deformation at the contact point between the raceway and rolling elements, or on the rolling surfaces from insertion of foreign matter, when heavy load is applied while the bearing is stationary or rotating at a low rotation speed. · Nicks are indentations produced directly by rough handling such as hammering.
(4) Wear		Normally, wear of bearing is observed on sliding contact surfaces such as roller end faces and rib faces, cage pockets, the guide surface of cages and cage riding lands. Wear is not directly related to material fatigue. Wear caused by foreign matter and corrosion can affect not only sliding surfaces but rolling surfaces.
(5) Fretting	 	Fretting occurs to bearings which are subject to vibration while in stationary condition or which are exposed to minute vibrations. It is characterized by rust-colored wear particles. Since fretting on the raceways often appears similar to brinelling, it is sometimes called "false brinelling".
(6) Creeping		Creeping is a phenomenon in which bearing rings move relative to the shaft or housing during operation.

Damages	Causes	Countermeasures
Brinelling on the raceway or rolling contact surface	· Entry of foreign matter	· Clean bearing and its peripheral parts. · Improve sealing devices.
Brinelling on the raceway surface at the same interval as the rolling element spacing	· Impact load during mounting · Excessive load applied while bearing is stationary	· Improve mounting procedure. · Improve machine handling.
Nicks on the raceway or rolling contact surface	· Careless handling	· Improve mounting and handling procedure.
Wear on the contact surfaces (cage pockets, cage riding land)	· Improper or insufficient lubricant	· Select proper lubricating method or lubricant. · Improve sealing device. · Clean the bearing and its peripheral parts.
Wear on raceways and rolling contact surfaces	· Entry of foreign matter · Improper or insufficient lubricant	
Rust-colored wear particles generated on the fitting surface (fretting corrosion)	· Insufficient interference	· Provide greater interference. · Apply lubricant to the fitting surface.
Brinelling on the raceway surface at the same interval as rolling element spacing (false brinelling)	· Vibration and oscillation when bearings are stationary.	· Improve fixing method of the shaft and housing.
Wear, discoloration, and scuffing caused by slipping on the fitting surfaces	· Insufficient interference · Insufficient tightening of sleeve	· Provide greater interference. · Proper tightening of sleeve.

Failures	Characteristics	
(7) Damage to Cages	 	Since cages are made of low hardness materials, external pressure and contact with other parts can easily produce flaws and distortion. In some cases, these are aggravated and become chips and cracks. Large chips and cracks are often accompanied by deformation, which may reduce the accuracy of the cage itself and may hinder the smooth movement of rolling elements.
(8) Seizing	 	A phenomenon caused by abnormal heating in bearings due to various reasons

	Damages	Causes	Countermeasures
	Flaws, distortion, chipping, cracking and excessive wear in cages.	· Extraordinary vibration, impact, moment · Improper or insufficient lubricant · Dents made during mounting	· Re-examine load conditions. · Select proper lubricating method or lubricant. · Re-examine cage types. · Improve mounting.
	Discoloration, distortion, and melting together due to heating in bearings	· Too small internal clearance · Improper or insufficient lubricant · Excessive load · Aggravated by other bearing flaws	· Provide proper internal clearance. · Select proper lubricating method or lubricant. · Re-examine bearing type. · Earlier discovery of bearing flaws

NOTES

NEEDLE ROLLER BEARINGS

B

B NEEDLE ROLLER BEARINGS

NEEDLE ROLLER BEARINGS

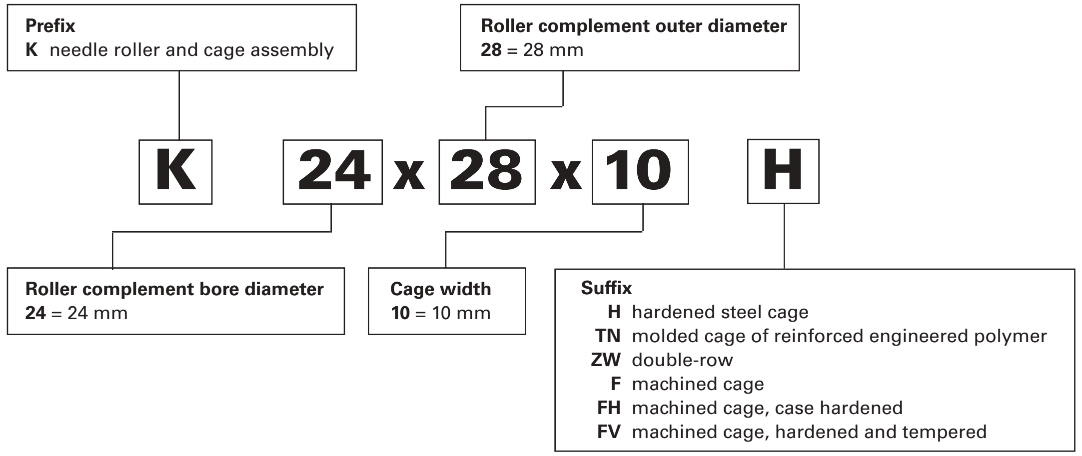
B

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

Overview: Needle roller and cage assemblies feature a complement of needles held in place by a cage with no inner or outer ring. The minimal cross section provides maximum load-carrying capability within the smallest envelope.

- **Catalogue range:** 3 mm – 127 mm (0.1181 in – 5.0000 in) bore.
- **Markets:** Automotive and truck transmissions, agricultural and construction equipment, two-cycle engines, pumps and compressors.
- **Features and Benefits:**
  - Unitized design simplifies handling and installation while allowing for increased lube flow.
  - Split and segmented designs allow mounting at difficult positions on crankshafts and gear shafts.
  - Controlled contour rollers optimize contact stress distribution.
  - Special manufacturing processes help increase roller fatigue resistance and minimize axial drift effects in critical applications.
  - Optimized cage piloting geometry minimizes pressure velocity effects.
  - Steel or polymer cages are available to suit your application requirements.
  - Coatings are available to help avoid corrosion and improve wear resistance.

Radial Needle Roller and Cage Assemblies – Metric Nominal Dimensions

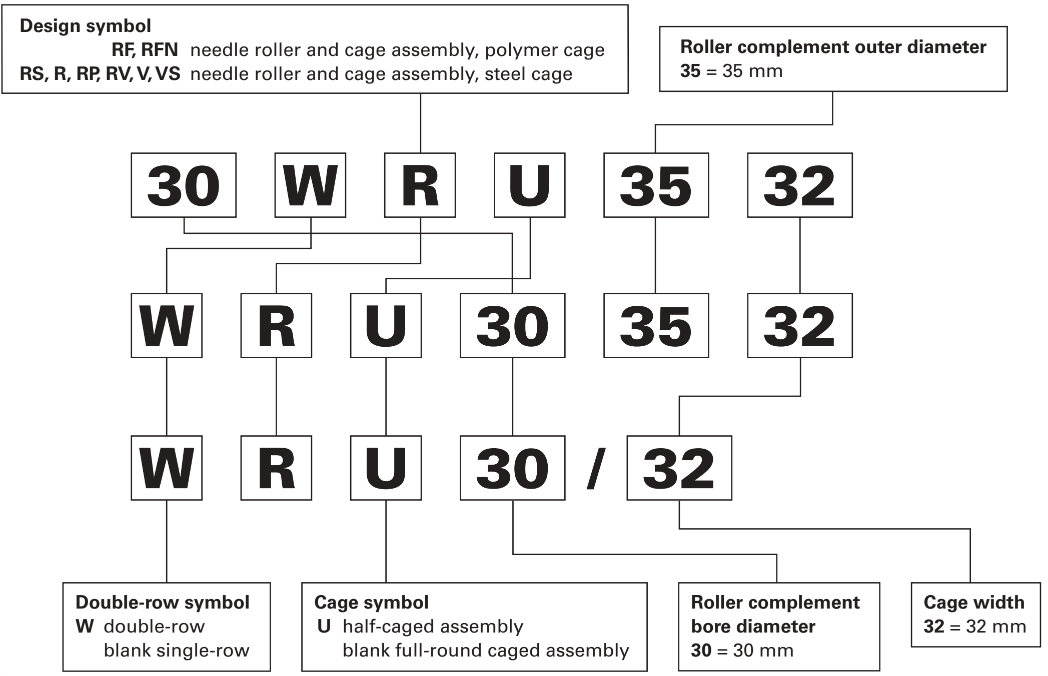

Prefix
K needle roller and cage assembly

Roller complement outer diameter
28 = 28 mm

Roller complement bore diameter
24 = 24 mm

Cage width
10 = 10 mm

Suffix
H hardened steel cage
TN molded cage of reinforced engineered polymer
ZW double-row
F machined cage
FH machined cage, case hardened
FV machined cage, hardened and tempered


Design symbol
RF, RFN needle roller and cage assembly, polymer cage
RS, R, RP, RV, V, VS needle roller and cage assembly, steel cage

Roller complement outer diameter
35 = 35 mm

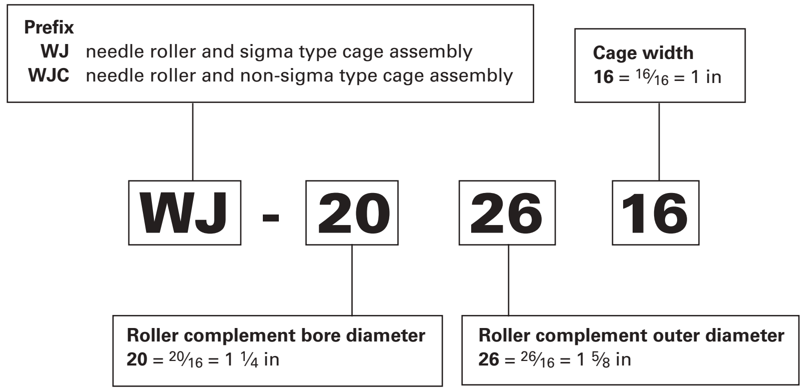
Double-row symbol
W double-row
blank single-row

Cage symbol
U half-caged assembly
blank full-round caged assembly

Roller complement bore diameter
30 = 30 mm

Cage width
32 = 32 mm

Inch Nominal Dimensions

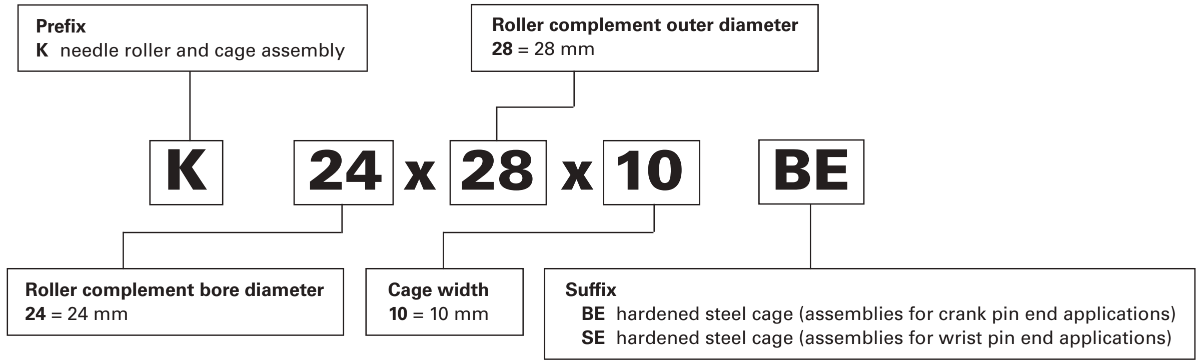

Prefix
WJ needle roller and sigma type cage assembly
WJC needle roller and non-sigma type cage assembly

Cage width
16 = 16⁄16 = 1 in

Roller complement bore diameter
20 = 20⁄16 = 1 ¼ in

Roller complement outer diameter
26 = 26⁄16 = 1 ⅝ in

Radial Needle Roller and Cage Assemblies for Connecting Rod Applications – Nominal Dimensions

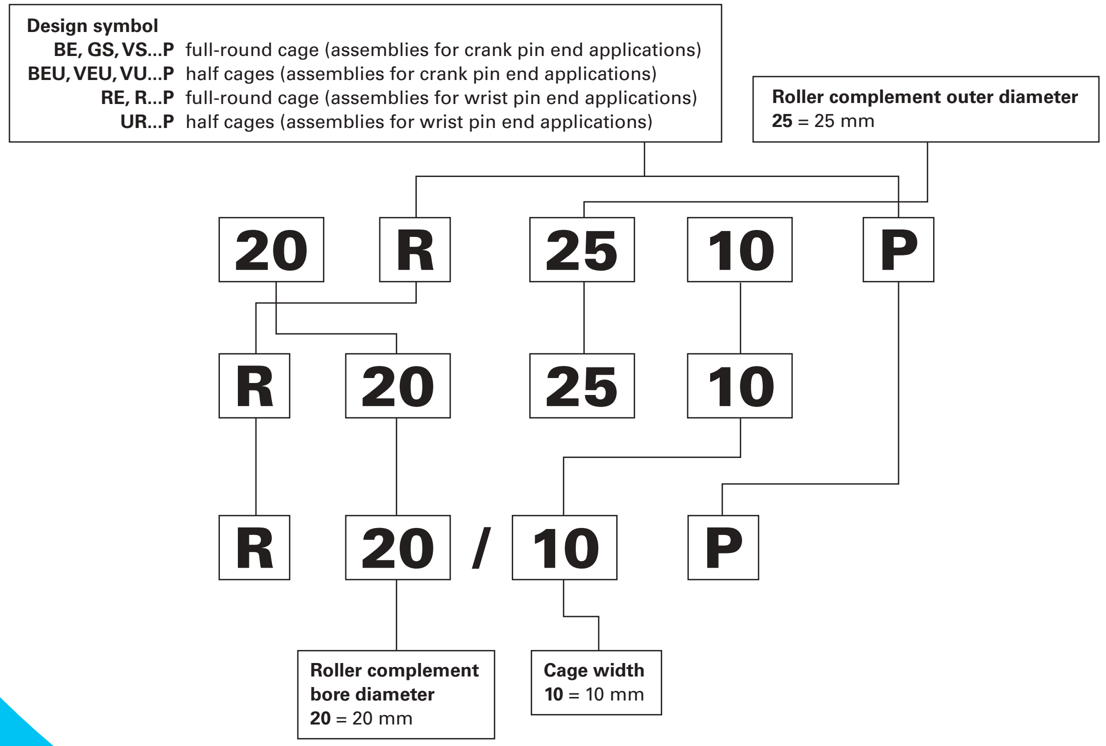

Prefix
K needle roller and cage assembly

Roller complement outer diameter
28 = 28 mm

Roller complement bore diameter
24 = 24 mm

Cage width
10 = 10 mm

Suffix
BE hardened steel cage (assemblies for crank pin end applications)
SE hardened steel cage (assemblies for wrist pin end applications)


Design symbol
BE, GS, VS...P full-round cage (assemblies for crank pin end applications)
BEU, VEU, VU...P half cages (assemblies for crank pin end applications)
RE, R...P full-round cage (assemblies for wrist pin end applications)
UR...P half cages (assemblies for wrist pin end applications)

Roller complement outer diameter
25 = 25 mm

Roller complement bore diameter
20 = 20 mm

Cage width
10 = 10 mm

Radial Needle Roller and Cage Assemblies

Single-Row, Double-Row Assemblies – Metric Series

Assemblies for Crank Pin End Applications – Metric Series

Assemblies for Wrist Pin End Applications – Metric Series

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

METRIC SERIES

Metric series radial needle roller and cage assemblies are available in a variety of sizes and designs. This catalog includes the most popular, standardized designs.

REFERENCE STANDARDS ARE:

- **ISO 3030** – needle roller bearings – radial needle roller and cage assemblies – boundary dimensions and tolerances.
- **DIN 5405 Part 1** – rolling bearings – needle roller bearings – radial needle roller and cage assemblies.
- **ANSI/ABMA 18.1** – needle roller bearings – radial, metric design.
- **JIS B 1536** – roller bearings – boundary dimensions and tolerances of needle roller bearings.

Before selecting specific metric series radial needle roller and cage assemblies, the engineering section should be reviewed.

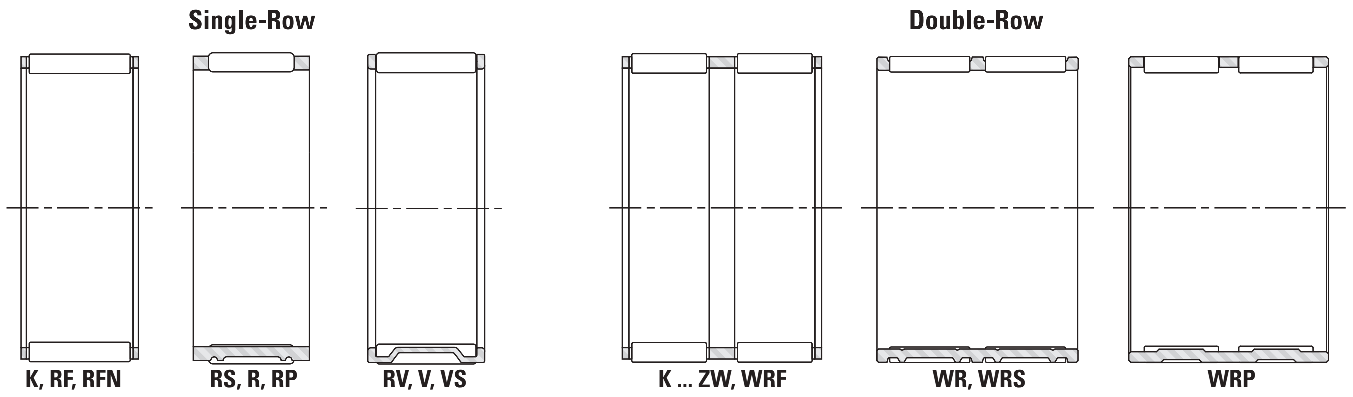


Fig. B1-1. Types of Metric Series Radial Needle Roller and Cage Assemblies

CONSTRUCTION

Radial needle roller and cage assemblies have a steel cage that provides both inward and outward retention for the needle rollers. The designs provide maximum cage strength consistent with the inherent high load-ratings of needle roller bearings. Accurate guidance of the needle rollers by the cage bars allows for operation at high speeds. Needle roller and cage assemblies have either one or two rows of needle rollers.

Also listed are metric series needle roller and cage assemblies using molded, one-piece glass-reinforced engineered polymer cages. These operate well at temperatures up to 120° C (250° F) over extended periods. However, care should be exercised when these assemblies are lubricated with oils containing additives as service life may be reduced if the operating temperature exceeds 100° C (212° F). At such high temperatures oil can deteriorate with time and it is suggested that oil change intervals are observed.

Needle rollers with relieved ends used in these assemblies are made of high-carbon chrome steel, through-hardened, ground and lapped to close tolerances for diameter and roundness. See the engineering section for further discussion of relieved end rollers.

DIMENSIONAL ACCURACY

NEEDLE ROLLER GROUPS (GAGES)

Applicable: K, K .. ZW series

Metric series radial needle roller and cage assemblies are supplied with needle roller complements subdivided into groups (gages) shown in Table B1-1. This is in accordance with Grade G2 specified in ISO 3096 standard (see needle rollers, page B8-13). The group limits of the needle rollers are indicated on the package. Labels of identifying colors show the group limits of the needle rollers. The needle roller and cage assemblies of one shipment usually contain needle rollers with group limits of between 0.000 to -0.002 mm (0.0000 to -0.00008 in) and -0.005 to -0.007 mm (-0.0002 to -0.0003 in) [colors red, blue and white]. For additional information on needle roller and cage assemblies with needle rollers of different group limits contact your representative.

Applicable: RF, RFN, RS, R, RP, RV, V, VS, WRF, WR, WRS, WRP series

The purchased group is 0.000 to -0.006 mm.

Table B1-1. Needle roller group limits (Grade G2)

Group tolerance		Marking gage
mm in	**mm** in	
0.000 0.0000	**-0.002** -0.00008	P0M2
-0.001 -0.00004	**-0.003** -0.00012	M1M3
-0.002 -0.00008	**-0.004** -0.0002	M2M4
-0.003 -0.00012	**-0.005** -0.0002	M3M5
-0.004 -0.0002	**-0.006** -0.0002	M4M6
-0.005 -0.0002	**-0.007** -0.0003	M5M7
-0.006 -0.0002	**-0.008** -0.0003	M6M8
-0.007 -0.0003	-0.009 -0.0004	M7M9
-0.008 -0.0003	**-0.010** -0.0004	M8M10
-0.009 -0.0004	**-0.011** -0.0004	M9M11

In the marking of the gages, P identifies zero (0) or plus (+), M identifies minus (-).

MOUNTING DIMENSIONS

DESIGN OF RACEWAYS

Radial needle roller and cage assemblies use the housing bore as the outer raceway and the shaft as the inner raceway. To realize full bearing load rating and life, the housing bore and the shaft raceways must have the correct geometric and metallurgical characteristics. The housing should be of sufficient cross section to maintain adequate roundness and running clearance under load. Additional design details for housings and shafts used as outer and inner raceways can be found in the engineering section. The only limit to precision of the radial clearance of a mounted assembly is the capability of the user to hold close tolerances on the inner and outer raceways. The suggested shaft tolerances listed in Table B1-2 are based on housing bore tolerance G6 and apply to metric series needle roller bearing and cage assemblies.

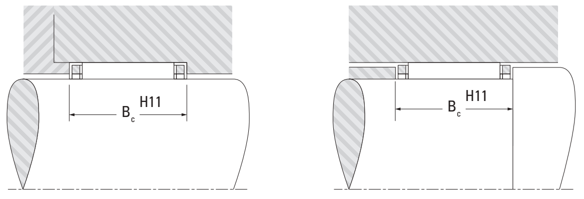
Table B1-2. Suggested shaft tolerances for housing bores machined to G6

Condition	Tolerance zone class		
	Axis		Housing hole
Radial clearance	Fw ≤ 50 mm	Fw > 50 mm	
Smaller than normal	j5	h5	G6
Normal	h5	g5	
Larger than normal	g6	f6	

AXIAL GUIDANCE REQUIREMENTS

Radial needle roller and cage assembly must be axially guided by shoulders or other suitable means. The end guiding surfaces should be hardened to minimize wear and must provide sufficient axial clearance to prevent end-locking of the assembly. Length tolerance H11 is suggested.

If end guidance is provided by a housing shoulder at one end and by a shaft shoulder at the other end, the shaft must be axially positioned to prevent end-locking of needle roller and cage assembly. The housing and shaft shoulder heights should be 70 percent to 90 percent of the needle roller diameter to provide proper axial guidance.



Guidance in the housing

Guidance in the shaft

Fig. B1-2. Axial guidance requirements

MOUNTING IN SETS

Radial needle roller and cage assemblies that are mounted side by side must have needle rollers of the same group limits to ensure uniform load distribution.

LUBRICATION

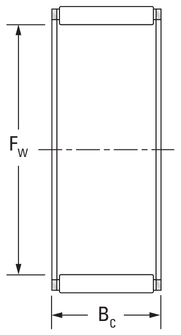
Oil is the preferred lubricant for most applications. In critical applications involving high speeds, ample oil flow must be provided. Where assemblies are subjected to high centrifugal forces – such as in epicyclic gearing, or inertia forces, as in the small end of a connecting rod – the contact pressure between the cage and the raceway guiding surface becomes critical. The allowable contact pressure depends on a combination of the induced force and the relative velocity between the cage and raceway and the rate of lubricant flow. Consult your representative when cages will be subjected to high induced forces.

SPECIAL DESIGNS

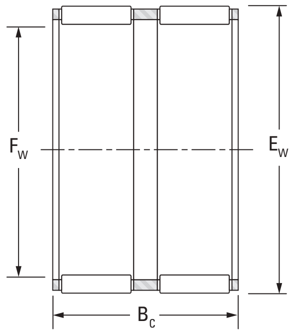
Radial needle roller and cage assemblies made to special dimensions or configurations – such as those which are split to assemble around a one-piece crankshaft – can be made available on special order. Special coated or plated cages to enhance life, under conditions of marginal lubrication and high induced forces, also can be made available.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

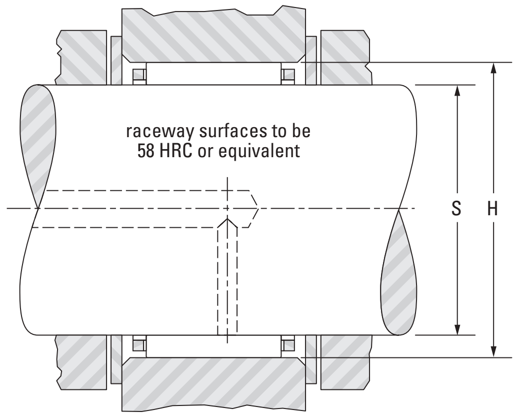
METRIC SERIES
K, K ZW SERIES



K



K ZW



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static			Grease	Oil		S		H	
					C	C_0						Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
3 0.1181	3 0.1181	5 0.1969	7 0.2756	K3X5X7TN	1.56 351	1.29 290	0.200	P	48000	74000	0.0002 0.0004	3.000 0.1181	2.996 0.1180	5.004 0.1970	5.012 0.1973
4 0.1575	4 0.1575	7 0.2756	7 0.276	K4X7X7TN	1.83 411	1.32 297	0.200	P	34000	52000	0.0005 0.001	4.000 0.1575	3.995 0.1573	7.014 0.2761	7.005 0.2758
5 0.1969	5 0.1969	8 0.315	8 0.315	K5X8X8TN	2.18 490	1.71 384	0.260	P	31000	47000	0.0007 0.002	5.000 0.1969	4.995 0.1967	8.014 0.3155	8.005 0.3152
	5 0.1969	8 0.315	10 0.394	K5X8X10TN	3.04 683	2.63 591	0.400	P	31000	47000	0.0008 0.002	5.000 0.1969	4.995 0.1967	8.014 0.3155	8.005 0.3152
	5 0.1969	9 0.3543	13 0.512	K5X9X13TN	4.29 964	3.55 798	0.540	P	26000	40000	0.002 0.004	5.000 0.1969	4.995 0.1967	9.014 0.3549	9.005 0.3545
6 0.2362	6 0.2362	9 0.3543	8 0.315	K6X9X8H	3.19 717	2.90 652	0.420	S	29000	44000	0.0008 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
	6 0.2362	9 0.3543	8 0.315	K6X9X8TN	2.47 555	2.07 465	0.310	P	29000	44000	0.001 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
	6 0.2362	9 0.3543	10 0.394	K6X9X10TN	3.07 690	2.74 616	0.420	P	29000	44000	0.001 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
7 0.2756	7 0.2756	10 0.3937	8 0.315	K7X10X8TN	2.74 616	2.44 549	0.370	P	28000	42000	0.001 0.002	7.000 0.2756	6.994 0.2754	10.014 0.3943	10.005 0.3939
	7 0.2756	10 0.3937	10 0.394	K7X10X10TN	3.40 764	3.22 724	0.490	P	28000	42000	0.001 0.002	7.000 0.2756	6.994 0.2754	10.014 0.3943	10.005 0.3939
	7 0.2756	11 0.4331	15 0.591	K7X11X15TN	6.44 1450	6.24 1400	0.940	P	23000	35000	0.003 0.007	7.000 0.2756	6.994 0.2754	11.017 0.4337	11.006 0.4333
8 0.3150	8 0.315	11 0.4331	8 0.315	K8X11X8FV	3.23 726	3.11 699	0.470	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	8 0.315	K8X11X8TN	2.34 526	2.05 461	0.300	P	26000	41000	0.001 0.002	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8X11X10H	4.57 1030	4.89 1100	0.740	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8X11X10FV	4.01 901	4.11 924	0.630	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8x11x10TN	3.84 864	3.91 880	0.600	P	26000	41000	0.001 0.002	8.000 0.3150	7.994 0.3147	11.006 0.4333	11.017 0.4337
	8 0.315	11 0.4331	13 0.512	K8x11x13TN	5.18 1170	5.75 1290	0.870	P	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.006 0.4333	11.017 0.4337
8 0.3150	8 0.315	11 0.4331	13 0.512	K8X11X13H	5.22 1170	5.78 1300	0.880	S	26000	41000	0.003 0.007	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
9 0.3543	9 0.3543	12 0.4724	10 0.394	K9X12X10FH	4.27 960	4.60 1030	0.700	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	10 0.394	K9X12X10FV	4.27 960	4.60 1030	0.700	S	26000	40000	0.002 0.004	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	13 0.512	K9X12X13FH	5.57 1250	6.47 1450	0.980	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	13 0.512	K9X12X13FV	5.57 1250	6.47 1450	0.980	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	13 0.5118	8 0.315	K9X13X8H	3.96 890	3.50 787	0.530	S	21000	32000	0.003 0.007	9.000 0.3543	8.994 0.3541	13.017 0.5125	13.006 0.5120
10 0.3937	10 0.3937	13 0.5118	10 0.394	K10X13X10H	5.40 1210	6.43 1450	0.980	S	25000	39000	0.002 0.004	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	10 0.394	K10X13X10TN	4.29 964	4.77 1070	0.730	P	25000	39000	0.002 0.004	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	13 0.512	K10X13X13	5.90 1330	7.16 1610	1.10	S	25000	39000	0.003 0.007	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	16 0.63	K10X13X16	7.43 1670	9.64 2170	1.50	S	25000	39000	0.004 0.009	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	14 0.5512	10 0.394	K10X14X10H	6.12 1380	6.29 1410	0.960	S	20000	31000	0.003 0.007	10.000 0.3937	9.994 0.3935	14.017 0.5519	14.006 0.5514
	10 0.3937	14 0.5512	13 0.512	K10X14X13H	7.88 1770	8.71 1960	1.35	S	20000	31000	0.004 0.009	10.000 0.3937	9.994 0.3935	14.017 0.5519	14.006 0.5514
	10 0.3937	16 0.6299	12 0.472	K10X16X12F	8.39 1890	7.47 1680	1.15	S	15000	24000	0.006 0.013	10.000 0.3937	9.994 0.3935	16.017 0.6306	16.006 0.6302
	10 0.3937	16 0.6299	12 0.472	K10X16X12TN	7.50 1690	6.40 1440	0.970	P	15000	24000	0.005 0.011	10.000 0.3937	9.994 0.3935	16.017 0.6306	16.006 0.6302
12 0.4724	12 0.4724	15 0.5906	10 0.394	K12X15X10H	5.85 1320	7.51 1690	1.15	S	24000	37000	0.003 0.007	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	15 0.5906	13 0.512	K12X15X13H	6.78 1520	9.03 2030	1.40	S	24000	37000	0.004 0.009	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	16 0.6299	13 0.512	K12X16X13H	7.49 1680	8.51 1910	1.60	S	19000	30000	0.006 0.013	12.000 0.4724	11.992 0.4721	16.017 0.6306	16.006 0.6302

(1) Cage material: P: polymer cage, S: steel cage

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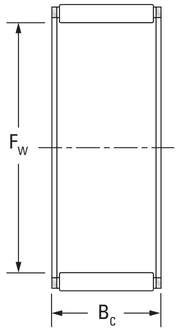
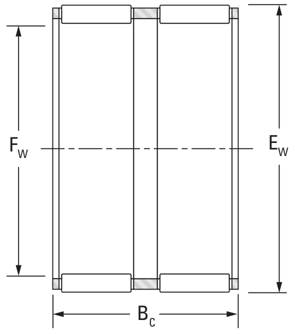
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



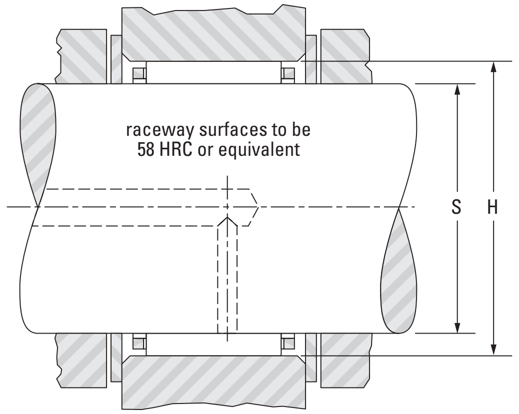
K



K ZW

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C₀			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min⁻¹		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
12 0.4724	**12** 0.4724	**17** 0.6693	**13** 0.512	K12X17X13	**8.93** 2010	**9.29** 2090	1.20	S	16000	25000	**0.008** 0.018	**12.000** 0.4724	**11.992** 0.4721	**17.017** 0.6700	**17.006** 0.6695
	12 0.4724	**18** 0.7087	**12** 0.472	K12X18X12H	**9.76** 2190	**9.40** 2110	1.40	S	14000	22000	**0.009** 0.020	**12.000** 0.4724	**11.992** 0.4721	**18.017** 0.7093	**18.006** 0.7089
13 0.5118	**13** 0.5118	**17** 0.6693	**10** 0.394	K13X17X10	**7.22** 1620	**8.33** 1870	1.25	S	19000	29000	**0.004** 0.009	**13.000** 0.5118	**12.992** 0.5115	**17.017** 0.6700	**17.006** 0.6695
	13 0.5118	**18** 0.7087	**15** 0.591	K13X18X15F	**10.8** 2430	**12.1** 2720	1.85	S	16000	25000	**0.008** 0.01	**13.000** 0.5118	**12.992** 0.5115	**18.017** 0.7093	**18.006** 0.7089
14 0.5512	**14** 0.5512	**18** 0.7087	**8** 0.315	K14X18X8	**5.39** 1210	**5.82** 1310	0.880	S	19000	29000	**0.004** 0.009	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**18** 0.7087	**10** 0.394	K14X18X10	**7.17** 1 610	**8.41** 1890	1.30	S	19000	29000	**0.005** 0.011	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**18** 0.7087	**13** 0.512	K14X18X13	**9.73** 2190	**12.5** 2810	1.90	S	19000	29000	**0.006** 0.013	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**18** 0.7087	**15** 0.591	K14X18X15	**10.5** 2360	**13.8** 3100	2.15	S	19000	29000	**0.007** 0.015	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**18** 0.7087	**17** 0.669	K14X18X17H	**12.4** 2790	**17.1** 3840	2.65	S	19000	29000	**0.008** 0.018	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**19** 0.748	**13** 0.512	K14X19X13H	**10.2** 2290	**11.4** 2560	1.75	S	16000	24000	**0.008** 0.018	**14.000** 0.5512	**13.992** 0.5509	**19.020** 0.7488	**19.007** 0.7483
	14 0.5512	**19** 0.748	**18** 0.709	K14X19X18F	**13.2** 2970	**16.0** 3600	2.50	S	16000	24000	**0.011** 0.024	**14.000** 0.5512	**13.992** 0.5509	**19.020** 0.7488	**19.007** 0.7483
	14 0.5512	**20** 0.7874	**12** 0.472	K14X20X12	**10.5** 2360	**10.6** 2380	1.60	S	14000	21000	**0.009** 0.020	**14.000** 0.5512	**13.992** 0.5509	**20.020** 0.7882	**20.007** 0.7877
15 0.5906	**15** 0.5906	**18** 0.7087	**14** 0.551	K15X18X14TN	**7.92** 1780	**11.9** 2680	1.80	P	13000	23000	**0.003** 0.007	**15.000** 0.5906	**14.992** 0.5902	**18.017** 0.7093	**18.006** 0.7089
	15 0.5906	**18** 0.7087	**16** 0.63	K15X18X16F	**8.36** 1880	**12.6** 2830	1.95	S	13000	23000	**0.005** 0.011	**15.000** 0.5906	**14.992** 0.5902	**18.017** 0.7093	**18.006** 0.7089
	15 0.5906	**18** 0.7087	**17** 0.669	K15X18X17	**8.08** 1820	**12.1** 2720	1.85	S	23000	36000	**0.005** 0.011	**15.000** 0.5906	**14.992** 0.5902	**18.017** 0.7093	**18.006** 0.7089
	15 0.5906	**19** 0.748	**10** 0.394	K15X19X10	**7.87** 1770	**9.69** 2180	1.45	S	18000	28000	**0.005** 0.011	**15.000** 0.5906	**14.992** 0.5902	**19.020** 0.7488	**19.007** 0.7483
	15 0.5906	**19** 0.748	**13** 0.512	K15X19X13	**9.66** 2170	**12.6** 2830	1.90	S	18000	28000	**0.007** 0.015	**15.000** 0.5906	**14.992** 0.5902	**19.020** 0.7488	**19.007** 0.7483

(1) Cage material: P: polymer cage, S: steel cage



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C₀			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min⁻¹		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
15 0.5906	**15** 0.5906	**19** 0.748	**17** 0.669	K15X19X17H	**12.3** 2770	**17.2** 3870	2.65	S	18000	28000	**0.009** 0.020	**15.000** 0.5906	**14.992** 0.5902	**19.020** 0.7488	**19.007** 0.7483
	15 0.5906	**19** 0.748	**22** 0.866	K15X19X22ZW	**12.2** 2740	**17.0** 3820	2.60	S	18000	28000	**0.010** 0.022	**15.000** 0.5906	**14.992** 0.5902	**19.020** 0.7488	**19.007** 0.7483
	15 0.5906	**20** 0.7874	**13** 0.512	K15X20X13H	**9.93** 2230	**11.3** 2540	1.80	S	16000	24000	**0.008** 0.018	**15.000** 0.5906	**14.992** 0.5902	**20.020** 0.7882	**20.007** 0.7877
	15 0.5906	**21** 0.8268	**15** 0.591	K15X21X15	**13.4** 3010	**14.8** 3330	2.30	S	14000	21000	**0.013** 0.029	**15.000** 0.5906	**14.992** 0.5902	**21.020** 0.8276	**21.007** 0.8270
	15 0.5906	**21** 0.8268	**21** 0.827	K15X21X21H	**18.0** 4050	**21.7** 4880	3.40	S	14000	21000	**0.018** 0.040	**15.000** 0.5906	**14.992** 0.5902	**21.020** 0.8276	**21.007** 0.8270
16 0.6299	**16** 0.6299	**20** 0.7874	**8** 0.315	K16X20X8F	**6.37** 1430	**7.51** 1690	1.15	S	18000	28000	**0.005** 0.011	**16.000** 0.6299	**15.992** 0.6296	**20.020** 0.7882	**20.007** 0.7877
	16 0.6299	**20** 0.7874	**10** 0.394	K16X20X10H	**7.82** 1760	**9.76** 2190	1.50	S	18000	28000	**0.006** 0.013	**16.000** 0.6299	**15.992** 0.6296	**20.020** 0.7882	**20.007** 0.7877
	16 0.6299	**20** 0.7874	**13** 0.512	K16X20X13	**10.1** 2270	**13.5** 3030	2.05	S	18000	28000	**0.007** 0.015	**16.000** 0.6299	**15.992** 0.6296	**20.020** 0.7882	**20.007** 0.7877
	16 0.6299	**20** 0.7874	**14** 0.551	K16X20X14	**10.8** 2430	**14.8** 3330	2.25	S	18000	28000	**0.007** 0.015	**16.000** 0.6299	**15.992** 0.6296	**20.020** 0.7882	**20.007** 0.7877
	16 0.6299	**20** 0.7874	**17** 0.669	K16X20X17H	**12.9** 2900	**18.5** 4160	2.85	S	18000	28000	**0.008** 0.018	**16.000** 0.6299	**15.992** 0.6296	**20.020** 0.7882	**20.007** 0.7877
	16 0.6299	**20** 0.7874	**20** 0.787	K16X20X20	**13.4** 3010	**19.5** 4380	3.05	S	18000	28000	**0.011** 0.024	**16.000** 0.6299	**15.992** 0.6296	**20.020** 0.7882	**20.007** 0.7877
	16 0.6299	**22** 0.8661	**12** 0.472	K16X22X12	**11.2** 2520	**11.9** 2680	1.80	S	19000	29000	**0.010** 0.022	**16.000** 0.6299	**15.992** 0.6296	**22.020** 0.8669	**22.007** 0.8664
	16 0.6299	**22** 0.8661	**16** 0.63	K16X22X16H	**14.9** 3350	**17.2** 3870	2.70	S	19000	29000	**0.014** 0.031	**16.000** 0.6299	**15.992** 0.6296	**22.020** 0.8669	**22.007** 0.8664
	16 0.6299	**22** 0.8661	**20** 0.787	K16X22X20	**18.6** 4180	**22.9** 5150	3.60	S	19000	29000	**0.017** 0.037	**16.000** 0.6299	**15.992** 0.6296	**22.020** 0.8669	**22.007** 0.8664
	16 0.6299	**24** 0.9449	**20** 0.787	K16X24X20	**20.2** 4540	**21.4** 4810	3.45	S	20000	30000	**0.025** 0.055	**16.000** 0.6299	**15.992** 0.6296	**24.020** 0.9457	**24.007** 0.9452
17 0.6693	**17** 0.6693	**20** 0.7874	**10** 0.394	K17X20X10	**5.96** 1340	**8.53** 1920	1.30	S	16000	25000	**0.004** 0.009	**17.000** 0.6693	**16.992** 0.6690	**20.020** 0.7882	**20.007** 0.7877
	17 0.6693	**21** 0.8268	**10** 0.394	K17X21X10	**8.12** 1830	**10.4** 2340	1.60	S	17000	26000	**0.006** 0.013	**17.000** 0.6693	**16.992** 0.6690	**21.020** 0.8276	**21.007** 0.8270

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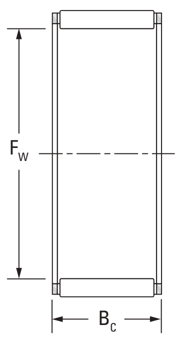
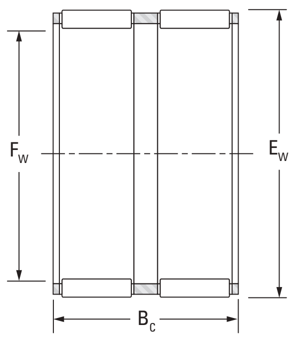
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



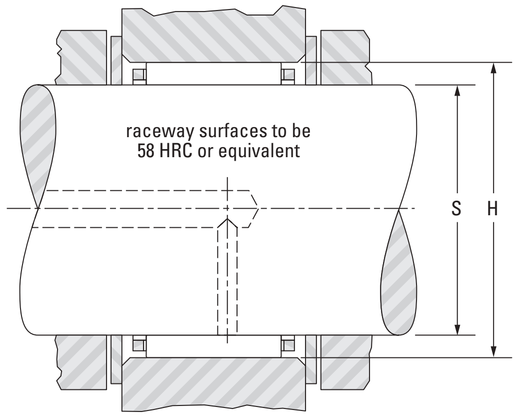
K



K ZW

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
17 0.6693	**17** 0.6693	**21** 0.8268	**12.8** 0.504	K17X21X13H	**10.5** 2360	**14.5** 3260	2.20	S	17000	26000	**0.008** 0.018	**17.000** 0.6693	**16.992** 0.6690	**21.020** 0.8276	**21.007** 0.8270
	17 0.6693	**21** 0.8268	**15** 0.591	K17X21X15	**11.4** 2560	**16.1** 3620	2.50	S	17000	26000	**0.008** 0.018	**17.000** 0.6693	**16.992** 0.6690	**21.020** 0.8276	**21.007** 0.8270
	17 0.6693	**21** 0.8268	**17** 0.669	K17X21X17H	**13.4** 3010	**19.8** 4450	3.05	S	17000	26000	**0.011** 0.024	**17.000** 0.6693	**16.992** 0.6690	**21.020** 0.8276	**21.007** 0.8270
	17 0.6693	**22** 0.8661	**20** 0.787	K17X22X20FH	**17.0** 3820	**23.3** 5240	3.65	S	17000	27000	**0.015** 0.033	**17.000** 0.6693	**16.992** 0.6690	**22.020** 0.8669	**22.007** 0.8664
	17 0.6693	**23** 0.9055	**15** 0.591	K17X23X15F	**14.1** 3170	**16.3** 3660	2.55	S	18000	27000	**0.010** 0.022	**17.000** 0.6693	**16.992** 0.6690	**23.020** 0.9063	**23.007** 0.9058
18 0.7087	**18** 0.7087	**22** 0.8661	**8** 0.315	K18X22X8F	**6.32** 1420	**7.70** 1730	1.15	S	16000	24000	**0.005** 0.011	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**10** 0.394	K18X22X10H	**8.41** 1890	**11.1** 2500	1.70	S	16000	24000	**0.006** 0.013	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**13** 0.512	K18X22X13H	**10.8** 2430	**15.4** 3460	2.35	S	16000	24000	**0.008** 0.018	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**14** 0.551	K18X22X14	**11.6** 2610	**16.8** 3780	2.55	S	16000	24000	**0.009** 0.020	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**14** 0.551	K18X22X14FV	**11.3** 2540	**16.3** 3660	2.45	S	16000	24000	**0.009** 0.020	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**17** 0.669	K18X22X17H	**13.3** 2990	**19.9** 4470	3.10	S	16000	24000	**0.009** 0.020	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**20** 0.787	K18X22X20F	**15.0** 3370	**23.4** 5260	3.65	S	16000	24000	**0.011** 0.024	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**24** 0.9449	**12** 0.472	K18X24X12	**11.8** 2650	**13.1** 2940	1.95	S	17000	25000	**0.011** 0.024	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
	18 0.7087	**24** 0.9449	**20** 0.787	K18X24X20H	**19.4** 4360	**24.9** 5600	3.90	S	16000	25000	**0.019** 0.042	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
	18 0.7087	**25** 0.9843	**22** 0.866	K18X25X22H	**23.3** 5240	**28.6** 6430	4.50	S	17000	26000	**0.025** 0.055	**18.000** 0.7087	**17.992** 0.7083	**25.020** 0.9850	**25.007** 0.9845
	18 0.7087	**26** 1.0236	**12** 0.472	K18X26X12FV	**13.8** 3100	**13.5** 3030	2.10	S	11000	17000	**0.020** 0.044	**18.000** 0.7087	**17.992** 0.7083	**26.020** 1.0244	**26.007** 1.0239
	18 0.7087	**26** 1.0236	**20** 0.787	K18X26X20F	**21.7** 4880	**24.1** 5420	3.85	S	17000	26000	**0.027** 0.060	**18.000** 0.7087	**17.992** 0.7083	**26.020** 1.0244	**26.007** 1.0239

(1) Cage material: P: polymer cage, S: steel cage



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
19 0.7480	**19** 0.748	**23** 0.9055	**13** 0.512	K19X23X13	**10.8** 2430	**15.5** 3480	2.35	S	15000	23000	**0.008** 0.018	**19.000** 0.7480	**18.991** 0.7477	**23.020** 0.9063	**23.007** 0.9058
	19 0.748	**23** 0.9055	**17** 0.669	K19X23X17	**13.4** 3010	**20.6** 4630	3.20	S	15000	23000	**0.011** 0.024	**19.000** 0.7480	**18.991** 0.7477	**23.020** 0.9063	**23.007** 0.9058
20 0.7874	**20** 0.7874	**24** 0.9449	**8** 0.315	K20X24X8F	**7.31** 1640	**9.60** 2160	1.50	S	14000	22000	**0.005** 0.011	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**10** 0.394	K20X24X10H	**8.97** 2020	**12.5** 2810	2.05	S	14000	22000	**0.006** 0.013	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**12** 0.472	K20X24X12	**10.7** 2410	**15.7** 3530	2.40	S	14000	22000	**0.008** 0.018	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**13** 0.512	K20X24X13H	**11.5** 2590	**17.3** 3890	1.30	S	14000	22000	**0.009** 0.020	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**14** 0.551	K20X24X14	**12.4** 2790	**18.9** 4250	2.85	S	14000	22000	**0.009** 0.020	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**17** 0.669	K20X24X17H	**14.8** 3330	**23.7** 5330	3.65	S	14000	22000	**0.011** 0.024	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**26** 1.0236	**12** 0.472	K20X26X12	**13.0** 2920	**15.3** 3440	2.30	S	15000	23000	**0.012** 0.026	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**26** 1.0236	**13** 0.512	K20X26X13H	**13.4** 3010	**15.9** 3570	2.35	S	15000	23000	**0.014** 0.031	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**26** 1.0236	**17** 0.669	K20X26X17H	**19.3** 4340	**25.5** 5730	4.00	S	15000	23000	**0.017** 0.037	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**26** 1.0236	**20** 0.787	K20X26X20	**20.3** 4560	**27.2** 6110	4.25	S	15000	23000	**0.020** 0.044	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**28** 1.1024	**20** 0.787	K20X28X20H	**24.6** 5530	**29.0** 6520	2.70	S	15000	23000	**0.028** 0.062	**20.000** 0.7874	**19.991** 0.7870	**28.020** 1.1031	**28.007** 1.1026
	20 0.7874	**28** 1.1024	**25** 0.984	K20X28X25H	**29.7** 6680	**37.0** 8320	5.80	S	15000	23000	**0.036** 0.079	**20.000** 0.7874	**19.991** 0.7870	**28.020** 1.1031	**28.007** 1.1026
	20 0.7874	**30** 1.1811	**30** 1.181	K20X30X30H	**38.9** 8750	**45.8** 10300	7.20	S	16000	24000	**0.055** 0.121	**20.000** 0.7874	**19.991** 0.7870	**30.020** 1.1819	**30.007** 1.1814
	20 0.7874	**32** 1.2598	**36** 1.417	K20X32X36H	**49.9** 11220	**57.0** 12810	9.15	S	16000	25000	**0.082** 0.181	**20.000** 0.7874	**19.991** 0.7870	**32.025** 1.2608	**32.009** 1.2602
21 0.8268	**21** 0.8268	**25** 0.9843	**17** 0.669	K21X25X17H	**14.3** 3210	**23.1** 5190	3.60	S	14000	21000	**0.013** 0.029	**21.000** 0.8268	**20.991** 0.8264	**25.020** 0.9850	**25.007** 0.9845

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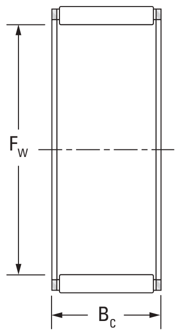
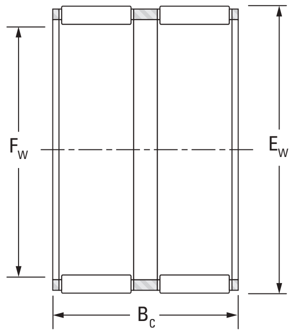
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

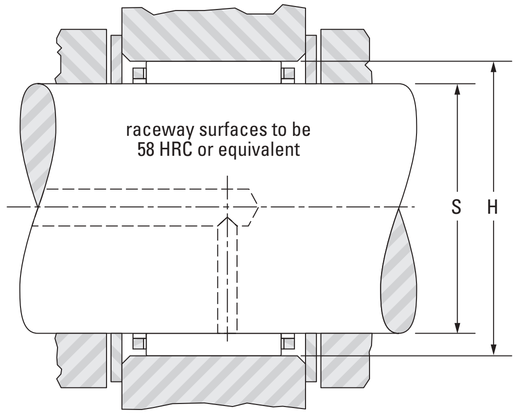
METRIC SERIES
K, K ZW SERIES



K



K ZW



raceway surfaces to be
58 HRC or equivalent

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static			Grease	Oil		S		H	
					C	C_0						Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min⁻¹		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
22 0.8661	**22** 0.8661	**26** 1.0236	**10** 0.394	K22X26X10H	**9.81** 2210	**14.5** 3 260	2.20	S	13000	20000	**0.007** 0.015	**22.000** 0.8661	**21.991** 0.8658	**26.020** 1.0244	**26.007** 1.0239
	22 0.8661	**26** 1.0236	**13** 0.512	K22X26X13H	**11.8** 2650	**18.3** 4110	2.95	S	13000	20000	**0.012** 0.026	**22.000** 0.8661	**21.991** 0.8658	**26.020** 1.0244	**26.007** 1.0239
	22 0.8661	**26** 1.0236	**17** 0.669	K22X26X17H	**15.6** 3510	**26.3** 5910	4.05	S	13000	20000	**0.012** 0.026	**22.000** 0.8661	**21.991** 0.8658	**26.020** 1.0244	**26.007** 1.0239
	22 0.8661	**26** 1.0236	**18** 0.709	K22X26X18H	**15.3** 3440	**25.5** 5730	4.00	S	13000	20000	**0.017** 0.037	**22.000** 0.8661	**21.991** 0.8658	**26.020** 1.0244	**26.007** 1.0239
	22 0.8661	**28** 1.1024	**13** 0.512	K22X28X13	**13.9** 3120	**17.1** 3840	2.60	S	13000	20000	**0.015** 0.033	**22.000** 0.8661	**21.991** 0.8658	**28.020** 1.1031	**28.007** 1.1026
	22 0.8661	**28** 1.1024	**17** 0.669	K22X28X17H	**18.2** 4090	**24.2** 5440	3.80	S	13000	20000	**0.020** 0.044	**22.000** 0.8661	**21.991** 0.8658	**28.020** 1.1031	**28.007** 1.1026
	22 0.8661	**30** 1.1811	**15** 0.591	K22X30X15H	**19.7** 4430	**22.3** 5010	3.45	S	14000	21000	**0.023** 0.051	**22.000** 0.8661	**21.991** 0.8658	**30.020** 1.1819	**30.007** 1.1814
	22 0.8661	**30** 1.1811	**20** 0.787	K22X30X20FV	**24.4** 5490	**29.4** 6610	4.70	S	14000	21000	**0.031** 0.068	**22.000** 0.8661	**21.991** 0.8658	**30.020** 1.1819	**30.007** 1.1814
	22 0.8661	**32** 1.2598	**24** 0.945	K22X32X24F	**33.1** 7440	**37.9** 8520	6.05	S	14000	22000	**0.046** 0.101	**22.000** 0.8661	**21.991** 0.8658	**32.025** 1.2608	**32.009** 1.2602
	22 0.8661	**32** 1.2598	**30** 1.181	K22X32X30H	**41.8** 9400	**51.3** 11530	8.05	S	14000	22000	**0.057** 0.126	**22.000** 0.8661	**21.991** 0.8658	**32.025** 1.2608	**32.009** 1.2602
23 0.9055	**23** 0.9055	**28** 1.1024	**24** 0.945	K23X28X24F	**22.4** 5040	**36.2** 8140	5.70	S	12000	19000	**0.023** 0.051	**23.000** 0.9055	**22.991** 0.9052	**28.020** 1.1031	**28.007** 1.1026
	23 0.9055	**35** 1.378	**16** 0.63	K23X35X16H	**25.9** 5820	**25.1** 5640	3.90	S	14000	21000	**0.040** 0.088	**23.000** 0.9055	**22.991** 0.9052	**35.025** 1.3789	**35.009** 1.3783
24 0.9449	**24** 0.9449	**28** 1.1024	**10** 0.394	K24X28X10H	**9.67** 2170	**14.6** 3280	2.20	S	12000	18000	**0.027** 0.060	**24.000** 0.9449	**23.991** 0.9445	**28.020** 1.1031	**28.007** 1.1026
	24 0.9449	**28** 1.1024	**13** 0.512	K24X28X13H	**12.5** 2810	**20.2** 4540	3.05	S	12000	18000	**0.010** 0.022	**24.000** 0.9449	**23.991** 0.9445	**28.020** 1.1031	**28.007** 1.1026
	24 0.9449	**28** 1.1024	**16** 0.63	K24X28X16F	**12.6** 2830	**20.4** 4590	3.10	S	12000	18000	**0.012** 0.026	**24.000** 0.9449	**23.991** 0.9445	**28.020** 1.1031	**28.007** 1.1026
	24 0.9449	**28** 1.1024	**17** 0.669	K24X28X17H	**15.4** 3460	**26.4** 5930	4.10	S	12000	18000	**0.013** 0.029	**24.000** 0.9449	**23.991** 0.9445	**28.020** 1.1031	**28.007** 1.1026
	24 0.9449	**30** 1.1811	**10** 0.394	K24X30X10TN	**11.3** 2540	**13.5** 3030	2.05	P	12000	19000	**0.008** 0.018	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814
24 0.9449	**24** 0.9449	**30** 1.1811	**17** 0.669	K24X30X17H	**19.8** 4450	**27.7** 6230	4.35	S	12000	19000	**0.020** 0.044	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814
	24 0.9449	**30** 1.1811	**22** 0.866	K24X30X22	**25.0** 5620	**37.3** 8390	5.80	S	12000	19000	**0.024** 0.053	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814
	24 0.9449	**36** 1.4173	**23** 0.906	K24X36X23H	**37.1** 8340	**40.1** 9010	6.40	S	13000	20000	**0.070** 0.154	**24.000** 0.9449	**23.991** 0.9445	**36.025** 1.4183	**36.009** 1.4177
25 0.9843	**25** 0.9843	**29** 1.1417	**10** 0.394	K25X29X10H	**9.61** 2160	**14.6** 3280	2.25	S	11000	17000	**0.008** 0.018	**25.000** 0.9843	**24.991** 0.9839	**29.020** 1.1425	**29.007** 1.1420
	25 0.9843	**29** 1.1417	**13** 0.512	K25X29X13H	**12.8** 2880	**21.1** 4740	3.20	S	11000	17000	**0.010** 0.022	**25.000** 0.9843	**24.991** 0.9839	**29.020** 1.1425	**29.007** 1.1420
	25 0.9843	**29** 1.1417	**17** 0.669	K25X29X17H	**15.1** 3390	**26.2** 5890	4.10	S	11000	17000	**0.016** 0.035	**25.000** 0.9843	**24.991** 0.9839	**29.020** 1.1425	**29.007** 1.1420
	25 0.9843	**30** 1.1811	**13** 0.512	K25X30X13	**14.6** 3280	**21.4** 4810	3.25	S	11000	17000	**0.012** 0.026	**25.000** 0.9843	**24.991** 0.9839	**30.020** 1.1819	**30.007** 1.1814
	25 0.9843	**30** 1.1811	**17** 0.669	K25X30X17H	**18.8** 4230	**29.8** 6700	4.60	S	11000	17000	**0.016** 0.035	**25.000** 0.9843	**24.991** 0.9839	**30.020** 1.1819	**30.007** 1.1814
	25 0.9843	**30** 1.1811	**18** 0.709	K25X30X18	**20.6** 4630	**33.4** 7510	5.30	S	11000	17000	**0.017** 0.037	**25.000** 0.9843	**24.991** 0.9839	**30.020** 1.1819	**30.007** 1.1814
	25 0.9843	**30** 1.1811	**20** 0.787	K25X30X20H	**21.9** 4920	**36.1** 8120	5.65	S	11000	17000	**0.019** 0.042	**25.000** 0.9843	**24.991** 0.9839	**30.020** 1.1819	**30.007** 1.1814
	25 0.9843	**30** 1.1811	**24** 0.945	K25X30X24H	**24.8** 5580	**42.4** 9530	6.60	S	11000	17000	**0.024** 0.053	**25.000** 0.9843	**24.991** 0.9839	**30.020** 1.1819	**30.007** 1.1814
	25 0.9843	**30** 1.1811	**26** 1.024	K25X30X26ZW	**23.0** 5170	**38.6** 8680	5.90	S	11000	17000	**0.027** 0.060	**25.000** 0.9843	**24.991** 0.9839	**30.020** 1.1819	**30.007** 1.1814
	25 0.9843	**31** 1.2205	**14** 0.551	K25X31X14H	**16.8** 3780	**22.7** 5100	3.45	S	12000	18000	**0.017** 0.037	**25.000** 0.9843	**24.991** 0.9839	**31.025** 1.2215	**31.009** 1.2208
	25 0.9843	**31** 1.2205	**17** 0.669	K25X31X17H	**19.7** 4430	**27.8** 6250	4.35	S	12000	18000	**0.020** 0.044	**25.000** 0.9843	**24.991** 0.9839	**31.025** 1.2215	**31.009** 1.2208
	25 0.9843	**31** 1.2205	**21** 0.827	K25X31X21H	**25.1** 5640	**38.0** 8540	5.95	S	12000	18000	**0.026** 0.057	**25.000** 0.9843	**24.991** 0.9839	**31.025** 1.2215	**31.009** 1.2208
	25 0.9843	**31** 1.2205	**24** 0.945	K25X31X24FH	**25.3** 5690	**38.5** 8660	6.05	S	12000	18000	**0.031** 0.068	**25.000** 0.9843	**24.991** 0.9839	**31.025** 1.2215	**31.009** 1.2208
	25 0.9843	**32** 1.2598	**16** 0.63	K25X32X16	**19.8** 4450	**25.3** 5690	4.00	S	12000	18000	**0.027** 0.060	**25.000** 0.9843	**24.991** 0.9839	**32.025** 1.2608	**32.009** 1.2602

(1) Cage material: P: polymer cage, S: steel cage

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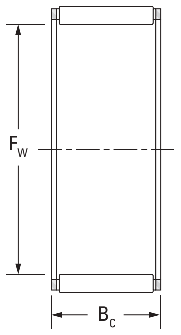
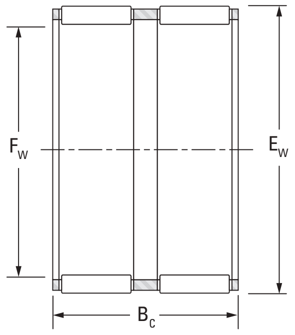
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



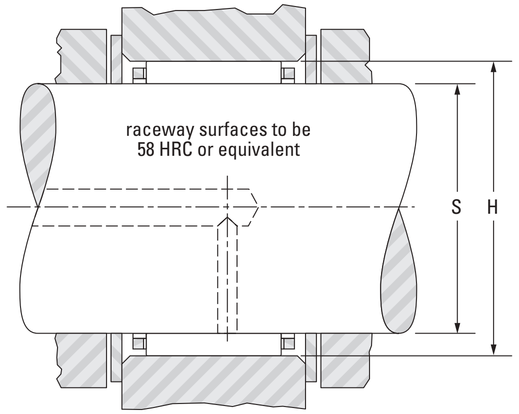
K



K ZW

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C₀			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min⁻¹		kg lbs	mm in	mm in	mm in	mm in
25 0.9843	**25** 0.9843	**33** 1.2992	**20** 0.787	K25X33X20H	**28.8** 6470	**37.6** 8450	5.95	S	12000	18000	**0.035** 0.077	**25.000** 0.9843	**24.991** 0.9839	**33.025** 1.3002	**33.009** 1.2996
	25 0.9843	**33** 1.2992	**24** 0.945	K25X33X24H	**32.3** 7260	**43.5** 9780	6.85	S	12000	18000	**0.038** 0.084	**25.000** 0.9843	**24.991** 0.9839	**33.025** 1.3002	**33.009** 1.2996
	25 0.9843	**33** 1.2992	**25** 0.984	K25X33X25H	**33.0** 7420	**44.6** 10030	7.00	S	12000	18000	**0.041** 0.090	**25.000** 0.9843	**24.991** 0.9839	**33.025** 1.3002	**33.009** 1.2996
	25 0.9843	**35** 1.378	**23.7** 0.933	K25X35X23,7H	**35.9** 8070	**42.3** 9510	6.90	S	12000	19000	**0.050** 0.110	**25.000** 0.9843	**24.991** 0.9839	**35.025** 1.3789	**35.009** 1.3783
	25 0.9843	**35** 1.378	**25** 0.984	K25X35X25H	**37.8** 8500	**46.2** 10390	7.25	S	12000	19000	**0.054** 0.119	**25.000** 0.9843	**24.991** 0.9839	**35.025** 1.3789	**35.009** 1.3783
	25 0.9843	**35** 1.378	**30** 1.181	K25X35X30H	**44.6** 10030	**57.2** 12860	9.00	S	12000	19000	**0.060** 0.132	**25.000** 0.9843	**24.991** 0.9839	**35.025** 1.3789	**35.009** 1.3783
	25 0.9843	**35** 1.378	**36** 1.417	K25X35X36H	**52.4** 11780	**70.4** 15830	11.0	S	12000	19000	**0.074** 0.163	**25.000** 0.9843	**24.991** 0.9839	**35.025** 1.3789	**35.009** 1.3783
	25 0.9843	**37** 1.4567	**20** 0.787	K25X37X20H	**32.5** 7310	**34.1** 7670	5.45	S	12000	19000	**0.055** 0.121	**25.000** 0.9843	**24.991** 0.9839	**37.025** 1.4577	**37.009** 1.4570
26 1.0236	**26** 1.0236	**30** 1.1811	**10** 0.394	K26X30X10F	**9.46** 2130	**14.5** 3260	2.20	S	11000	16000	**0.007** 0.015	**26.000** 1.0236	**25.991** 1.0233	**30.020** 1.1819	**30.007** 1.1814
	26 1.0236	**30** 1.1811	**13** 0.512	K26X30X13	**12.3** 2770	**20.4** 4590	3.10	S	10000	16000	**0.011** 0.024	**26.000** 1.0236	**25.991** 1.0233	**30.020** 1.1819	**30.007** 1.1814
	26 1.0236	**30** 1.1811	**17** 0.669	K26X30X17	**15.0** 3370	**26.3** 5910	3.10	S	10000	16000	**0.014** 0.031	**26.000** 1.0236	**25.991** 1.0233	**30.020** 1.1819	**30.007** 1.1814
	26 1.0236	**30** 1.1811	**22** 0.866	K26X30X22ZW	**16.7** 3750	**30.2** 6790	4.60	S	10000	16000	**0.018** 0.040	**26.000** 1.0236	**25.991** 1.0233	**30.020** 1.1819	**30.007** 1.1814
28 1.1024	**28** 1.1024	**32** 1.2598	**21** 0.827	K28X32X21F	**18.7** 4200	**35.7** 8030	5.55	S	9900	15000	**0.018** 0.040	**28.000** 1.1024	**27.991** 1.1020	**32.025** 1.2608	**32.009** 1.2602
	28 1.1024	**33** 1.2992	**13** 0.512	K28X33X13F	**14.1** 3170	**21.4** 4810	3.25	S	10000	15000	**0.015** 0.033	**28.000** 1.1024	**27.991** 1.1020	**33.025** 1.3002	**33.009** 1.2996
	28 1.1024	**33** 1.2992	**17** 0.669	K28X33X17H	**19.8** 4450	**33.0** 7420	5.10	S	10000	15000	**0.018** 0.040	**28.000** 1.1024	**27.991** 1.1020	**33.025** 1.3002	**33.009** 1.2996
	28 1.1024	**33** 1.2992	**27** 1.063	K28X33X27	**29.0** 6520	**53.8** 12090	8.30	S	10000	15000	**0.027** 0.060	**28.000** 1.1024	**27.991** 1.1020	**33.025** 1.3002	**33.009** 1.2996
	28 1.1024	**34** 1.3386	**17** 0.669	K28X34X17	**21.1** 4740	**31.5** 7080	6.30	S	10000	16000	**0.022** 0.049	**28.000** 1.1024	**27.991** 1.1020	**34.025** 1.3396	**34.009** 1.3389

(1) Cage material: P: polymer cage, S: steel cage



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C₀			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min⁻¹		kg lbs	mm in	mm in	mm in	mm in
28 1.1024	**28** 1.1024	**34** 1.3386	**20** 0.787	K28X34X20H	**24.4** 5490	**37.8** 8500	7.65	S	10000	16000	**0.025** 0.055	**28.000** 1.1024	**27.991** 1.1020	**34.025** 1.3396	**34.009** 1.3389
	28 1.1024	**35** 1.378	**15** 0.591	K28X35X15H	**19.5** 4380	**25.6** 5760	3.95	S	10000	16000	**0.025** 0.055	**28.000** 1.1024	**27.991** 1.1020	**35.025** 1.3789	**35.009** 1.3783
	28 1.1024	**35** 1.378	**16** 0.63	K28X35X16H	**21.5** 4830	**29.1** 6540	4.60	S	10000	16000	**0.026** 0.057	**28.000** 1.1024	**27.991** 1.1020	**35.025** 1.3789	**35.009** 1.3783
	28 1.1024	**35** 1.378	**27** 1.063	K28X35X27H	**35.2** 7910	**54.7** 12300	8.50	S	10000	16000	**0.042** 0.093	**28.000** 1.1024	**27.991** 1.1020	**35.025** 1.3789	**35.009** 1.3783
	28 1.1024	**36** 1.4173	**20** 0.787	K28X36X20FV	**27.8** 6250	**37.0** 8320	5.95	S	10000	16000	**0.039** 0.086	**28.000** 1.1024	**27.991** 1.1020	**36.025** 1.4183	**36.009** 1.4177
	28 1.1024	**38** 1.4961	**25** 1.004	K28X38X25,5	**40.9** 9190	**52.7** 11850	8.25	S	11000	16000	**0.059** 0.130	**28.000** 1.1024	**27.991** 1.1020	**38.025** 1.4970	**38.009** 1.4964
	28 1.1024	**40** 1.5748	**18** 0.709	K28X40X18H	**33.6** 7550	**36.5** 8210	5.90	S	11000	17000	**0.060** 0.132	**28.000** 1.1024	**27.991** 1.1020	**40.025** 1.5758	**40.009** 1.5752
	28 1.1024	**40** 1.5748	**25** 0.984	K28X40X25H	**45.5** 10230	**54.0** 12140	8.55	S	11000	17000	**0.072** 0.159	**28.000** 1.1024	**27.991** 1.1020	**40.025** 1.5758	**40.009** 1.5752
	28 1.1024	**40** 1.5748	**30** 1.181	K28X40X30H	**54.3** 12210	**67.8** 15240	10.7	S	11000	17000	**0.100** 0.220	**28.000** 1.1024	**27.991** 1.1020	**40.025** 1.5758	**40.009** 1.5752
	28 1.1024	**41** 1.6142	**25** 0.984	K28X41X25H	**49.2** 11060	**57.1** 12840	9.05	S	11000	17000	**0.082** 0.181	**28.000** 1.1024	**27.991** 1.1020	**41.025** 1.6152	**41.009** 1.6145
29 1.1417	**29** 1.1417	**34** 1.3386	**27** 1.063	K29X34X27F	**28.9** 6500	**54.0** 12140	8.40	S	9700	15000	**0.033** 0.073	**29.000** 1.1417	**28.991** 1.1414	**34.025** 1.3396	**34.009** 1.3389
30 1.1811	**30** 1.1811	**34** 1.3386	**13** 0.512	K30X34X13	**13.5** 3030	**24.1** 5420	3.65	S	9200	14000	**0.011** 0.024	**30.000** 1.1811	**29.991** 1.1807	**34.025** 1.3396	**34.009** 1.3389
	30 1.1811	**35** 1.378	**13** 0.512	K30X35X13H	**15.6** 3510	**24.9** 5600	3.80	S	9300	14000	**0.017** 0.037	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**35** 1.378	**17** 0.669	K30X35X17H	**20.2** 4540	**34.6** 7780	5.35	S	9300	14000	**0.022** 0.049	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**35** 1.378	**20** 0.787	K30X35X20H	**23.5** 5280	**41.9** 9420	6.55	S	9300	14000	**0.023** 0.051	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**35** 1.378	**22.8** 0.898	K30X35X23F	**25.6** 5760	**46.8** 10520	7.40	S	9300	14000	**0.028** 0.062	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**35** 1.378	**27** 1.063	K30X35X27H	**30.6** 6880	**59.0** 13260	9.10	S	9300	14000	**0.032** 0.071	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783

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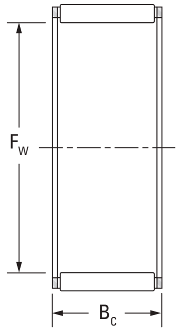
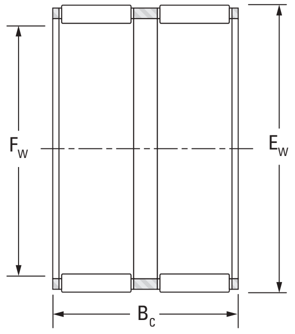
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

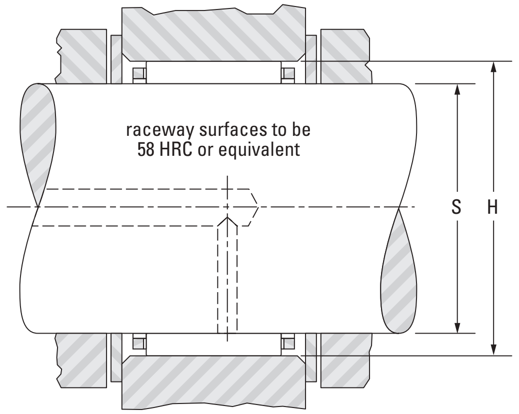
METRIC SERIES
K, K ZW SERIES



K



K ZW


raceway surfaces to be 58 HRC or equivalent

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min-1		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
30 1.1811	**30** 1.1811	**35** 1.378	**27** 1.063	K30X35X27HZW	**19.9** 4470	**33.6** 7550	5.10	S	9300	14000	**0.033** 0.073	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**36** 1.4173	**14** 0.551	K30X36X14	**18.0** 4050	**26.2** 5890	4.00	S	9500	15000	**0.020** 0.044	**30.000** 1.1811	**29.991** 1.1807	**36.025** 1.4183	**36.009** 1.4177
	30 1.1811	**37** 1.4567	**17.8** 0.701	K30X37X18	**24.3** 5460	**34.8** 7820	6.00	S	9600	15000	**0.033** 0.073	**30.000** 1.1811	**29.991** 1.1807	**37.025** 1.4577	**37.009** 1.4570
	30 1.1811	**40** 1.5748	**30** 1.181	K30X40X30H	**49.2** 11060	**67.8** 15240	10.6	S	9900	15000	**0.077** 0.170	**30.000** 1.1811	**29.991** 1.1807	**40.025** 1.5758	**40.009** 1.5752
	30 1.1811	**42** 1.6535	**30** 1.181	K30X42X30H	**54.2** 12180	**68.6** 15420	10.8	S	10000	16000	**0.096** 0.212	**30.000** 1.1811	**29.991** 1.1807	**42.025** 1.6545	**42.009** 1.6539
	30 1.1811	**44** 1.7323	**26** 1.024	K30X44X26H	**52.4** 11780	**59.9** 13470	9.55	S	10000	16000	**0.095** 0.209	**30.000** 1.1811	**29.991** 1.1807	**44.025** 1.7333	**44.009** 1.7326
32 1.2598	**32** 1.2598	**36** 1.4173	**15** 0.591	K32X36X15F	**11.6** 2610	**20.2** 4540	3.10	S	8600	13000	**0.015** 0.033	**32.000** 1.2598	**31.989** 1.2594	**36.025** 1.4183	**36.009** 1.4177
	32 1.2598	**37** 1.4567	**13** 0.512	K32X37X13	**15.2** 3420	**24.4** 5490	4.00	S	8700	13000	**0.018** 0.040	**32.000** 1.2598	**31.989** 1.2594	**37.025** 1.4577	**37.009** 1.4570
	32 1.2598	**37** 1.4567	**17** 0.669	K32X37X17H	**20.0** 4500	**34.8** 7820	5.40	S	8700	13000	**0.020** 0.044	**32.000** 1.2598	**31.989** 1.2594	**37.025** 1.4577	**37.009** 1.4570
	32 1.2598	**37** 1.4567	**27** 1.063	K32X37X27	**29.3** 6590	**56.8** 12770	8.85	S	8700	13000	**0.035** 0.077	**32.000** 1.2598	**31.989** 1.2594	**37.025** 1.4577	**37.009** 1.4570
	32 1.2598	**38** 1.4961	**20** 0.787	K32X38X20H	**27.3** 6140	**45.7** 10270	7.15	S	8800	14000	**0.030** 0.066	**32.000** 1.2598	**31.989** 1.2594	**38.025** 1.4970	**38.009** 1.4964
	32 1.2598	**38** 1.4961	**26** 1.024	K32X38X26H	**33.2** 7460	**58.8** 13220	9.15	S	8800	14000	**0.037** 0.082	**32.000** 1.2598	**31.989** 1.2594	**38.025** 1.4970	**38.009** 1.4964
	32 1.2598	**39** 1.5354	**16** 0.63	K32X39X16H	**23.0** 5170	**33.0** 7420	5.20	S	8900	14000	**0.030** 0.066	**32.000** 1.2598	**31.989** 1.2594	**39.025** 1.5364	**39.009** 1.5358
	32 1.2598	**39** 1.5354	**18** 0.709	K32X39X18H	**25.8** 5800	**38.2** 8590	6.05	S	8900	14000	**0.033** 0.073	**32.000** 1.2598	**31.989** 1.2594	**39.025** 1.5364	**39.009** 1.5358
	32 1.2598	**40** 1.5748	**25** 0.984	K32X40X25H	**37.9** 8520	**57.2** 12860	8.90	S	9000	14000	**0.052** 0.115	**32.000** 1.2598	**31.989** 1.2594	**40.025** 1.5758	**40.009** 1.5752
	32 1.2598	**40** 1.5748	**36** 1.417	K32X40X36H	**52.3** 11760	**86.4** 19420	13.6	S	9000	14000	**0.080** 0.176	**32.000** 1.2598	**31.989** 1.2594	**40.025** 1.5758	**40.009** 1.5752
	32 1.2598	**42** 1.6535	**42** 1.654	K32X42X42H	**69.2** 15560	**108** 24280	17.1	S	9200	14000	**0.110** 0.243	**32.000** 1.2598	**31.989** 1.2594	**42.025** 1.6545	**42.009** 1.6539
32 1.2598	**32** 1.2598	**46** 1.811	**18** 0.709	K32X46X18H	**39.2** 8810	**41.9** 9420	6.80	S	9600	15000	**0.075** 0.165	**32.000** 1.2598	**31.989** 1.2594	**46.025** 1.8120	**46.009** 1.8114
	32 1.2598	**46** 1.811	**32** 1.26	K32X46X32H	**67.0** 15060	**83.4** 18750	13.1	S	9600	15000	**0.140** 0.309	**32.000** 1.2598	**31.989** 1.2594	**46.025** 1.8120	**46.009** 1.8114
	32 1.2598	**46** 1.811	**40** 1.575	K32X46X40H	**81.7** 18370	**108** 24280	12.2	S	9600	15000	**0.158** 0.348	**32.000** 1.2598	**31.989** 1.2594	**46.025** 1.8120	**46.009** 1.8114
33 1.2992	**33** 1.2992	**51** 2.0079	**23** 0.906	K33X51X23H	**55.9** 12570	**57.6** 12950	9.35	S	9600	15000	**0.140** 0.309	**33.000** 1.2992	**32.989** 1.2988	**51.029** 2.0090	**51.010** 2.0083
34 1.3386	**34** 1.3386	**38** 1.4961	**11** 0.433	K34X38X11	**12.2** 2740	**21.9** 4920	3.35	S	8100	12000	**0.011** 0.024	**34.000** 1.3386	**33.989** 1.3381	**38.025** 1.4970	**38.009** 1.4964
	34 1.3386	**44** 1.7323	**26** 1.024	K34X44X26FH	**42.9** 9640	**58.9** 13240	9.40	S	8600	13000	**0.080** 0.176	**34.000** 1.3386	**33.989** 1.3381	**44.025** 1.7333	**44.009** 1.7326
35 1.3780	**35** 1.378	**40** 1.5748	**13** 0.512	K35X40X13H	**16.2** 3640	**27.2** 6110	4.15	S	7900	12000	**0.018** 0.040	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**40** 1.5748	**17** 0.669	K35X40X17H	**22.1** 4970	**40.8** 9170	6.35	S	7900	12000	**0.025** 0.055	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**40** 1.5748	**19** 0.748	K35X40X19H	**23.2** 5220	**43.2** 9710	6.80	S	7900	12000	**0.025** 0.055	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**40** 1.5748	**25** 0.984	K35X40X25H	**28.4** 6380	**56.2** 12630	8.70	S	7900	12000	**0.035** 0.077	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**40** 1.5748	**27** 1.063	K35X40X27H	**29.8** 6700	**59.6** 13400	9.20	S	7900	12000	**0.037** 0.082	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**42** 1.6535	**16** 0.63	K35X42X16AH	**24.5** 5510	**36.8** 8270	5.80	S	8100	12000	**0.031** 0.068	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539
	35 1.378	**42** 1.6535	**18** 0.709	K35X42X18	**27.5** 6180	**42.6** 9580	6.75	S	8100	12000	**0.035** 0.077	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539
	35 1.378	**42** 1.6535	**20** 0.787	K35X42X20H	**30.4** 6830	**48.5** 10900	7.65	S	8100	12000	**0.037** 0.082	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539
	35 1.378	**42** 1.6535	**30** 1.181	K35X42X30FH	**40.5** 9100	**70.0** 15740	10.9	S	8100	12000	**0.061** 0.134	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539
	35 1.378	**45** 1.7717	**20** 0.787	K35X45X20FH	**36.5** 8210	**49.9** 11220	8.00	S	8400	13000	**0.059** 0.130	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**45** 1.7717	**30** 1.181	K35X45X30F	**51.2** 11510	**74.5** 16750	11.7	S	8400	13000	**0.100** 0.220	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720

(1) Cage material: P: polymer cage, S: steel cage

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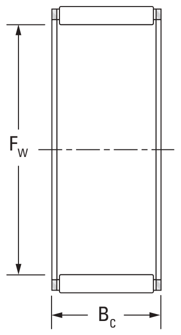
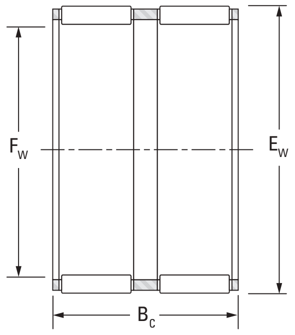
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



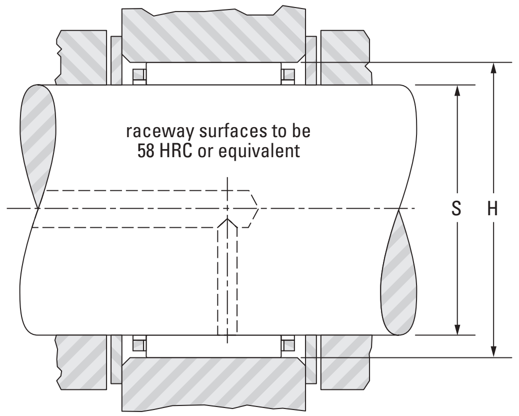
K



K ZW

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
35 1.3780	**35** 1.378	**45** 1.7717	**35** 1.378	K35X45X35H	**62.1** 13960	**95.5** 21470	15.0	S	8400	13000	**0.085** 0.187	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**45** 1.7717	**41** 1.614	K35X45X41	**70.8** 15920	**113** 25400	17.7	S	8400	13000	**0.120** 0.265	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**45** 1.7717	**49** 1.929	K35X45X49H	**82.5** 18550	**138** 31020	21.4	S	8400	13000	**0.143** 0.315	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**45** 1.7717	**49** 1.929	K35X45X49HZW	**71.8** 16140	**115** 25850	18.1	S	8400	13000	**0.143** 0.315	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**50** 1.9685	**23** 0.906	K35X50X23H	**53.0** 11910	**60.3** 13550	9.75	S	8700	13000	**0.110** 0.242	**35.000** 1.3780	**34.989** 1.3775	**50.025** 1.9695	**50.009** 1.9689
	35 1.378	**50** 1.9685	**40** 1.575	K35X50X40F	**79.7** 17920	**102** 22930	16.2	S	8700	13000	**0.200** 0.441	**35.000** 1.3780	**34.989** 1.3775	**50.025** 1.9695	**50.009** 1.9689
36 1.4173	**36** 1.4173	**40** 1.5748	**29** 1.142	K36X40X29TN	**21.2** 4770	**45.2** 10160	7.15	P	7600	12000	**0.029** 0.064	**36.000** 1.4173	**35.989** 1.4169	**40.025** 1.5758	**40.009** 1.5752
	36 1.4173	**42** 1.6535	**16** 0.63	K36X42X16	**22.8** 5130	**37.7** 8480	5.95	S	7800	12000	**0.027** 0.060	**36.000** 1.4173	**35.989** 1.4169	**42.025** 1.6545	**42.009** 1.6539
37 1.4567	**37** 1.4567	**42** 1.6535	**13** 0.512	K37X42X13H	**16.9** 3800	**29.4** 6610	4.50	S	7500	11000	**0.017** 0.037	**37.000** 1.4567	**36.989** 1.4563	**42.025** 1.6545	**42.009** 1.6539
	37 1.4567	**42** 1.6535	**17** 0.669	K37X42X17H	**21.9** 4920	**41.0** 9220	6.35	S	7500	11000	**0.025** 0.055	**37.000** 1.4567	**36.989** 1.4563	**42.025** 1.6545	**42.009** 1.6539
	37 1.4567	**42** 1.6535	**27** 1.063	K37X42X27F	**32.1** 7220	**66.9** 15040	10.4	S	7500	11000	**0.039** 0.086	**37.000** 1.4567	**36.989** 1.4563	**42.025** 1.6545	**42.009** 1.6539
	37 1.4567	**44** 1.7323	**19** 0.748	K37X44X19H	**29.7** 6680	**48.0** 10790	7.65	S	7600	12000	**0.039** 0.086	**37.000** 1.4567	**36.989** 1.4563	**44.025** 1.7333	**44.009** 1.7326
38 1.4961	**38** 1.4961	**41** 1.6142	**9** 0.354	K38X41X9TN	**5.93** 1330	**11.0** 2470	1.65	P	7100	11000	**0.004** 0.009	**38.000** 1.4961	**37.989** 1.4956	**41.025** 1.6152	**41.009** 1.6145
	38 1.4961	**43** 1.6929	**17** 0.669	K38X43X17H	**21.8** 4900	**41.0** 9220	6.35	S	7300	11000	**0.032** 0.071	**38.000** 1.4961	**37.989** 1.4956	**43.025** 1.6939	**43.009** 1.6933
	38 1.4961	**43** 1.6929	**27** 1.063	K38X43X27	**31.9** 7170	**67.0** 15060	10.4	S	7300	11000	**0.041** 0.090	**38.000** 1.4961	**37.989** 1.4956	**43.025** 1.6939	**43.009** 1.6933
	38 1.4961	**46** 1.811	**19.8** 0.78	K38X46X20H	**33.3** 7490	**51.0** 11470	8.10	S	7500	12000	**0.055** 0.121	**38.000** 1.4961	**37.989** 1.4956	**46.025** 1.8120	**46.009** 1.8114
	38 1.4961	**46** 1.811	**32** 1.26	K38X46X32H	**55.2** 12410	**98.1** 22050	15.3	S	7500	12000	**0.090** 0.198	**38.000** 1.4961	**37.989** 1.4956	**46.025** 1.8120	**46.009** 1.8114

(1) Cage material: P: polymer cage, S: steel cage



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
38 1.4961	**38** 1.4961	**50** 1.9685	**25** 0.984	K38X50X25	**53.0** 11910	**70.8** 15920	11.2	S	7800	12000	**0.100** 0.220	**38.000** 1.4961	**37.989** 1.4956	**50.025** 1.9695	**50.009** 1.9689
	38 1.4961	**50** 1.9685	**33** 1.299	K38X50X33H	**68.3** 15350	**98.2** 22080	15.4	S	7800	12000	**0.126** 0.278	**38.000** 1.4961	**37.989** 1.4956	**50.025** 1.9695	**50.009** 1.9689
	38 1.4961	**50** 1.9685	**40** 1.575	K38X50X40FH	**76.2** 17130	**113** 25400	17.8	S	7800	12000	**0.170** 0.375	**38.000** 1.4961	**37.989** 1.4956	**50.025** 1.9695	**50.009** 1.9689
40 1.5748	**40** 1.5748	**45** 1.7717	**13** 0.512	K40X45X13H	**17.6** 3960	**31.7** 7130	4.80	S	6900	11000	**0.022** 0.049	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**18** 0.709	K40X45X18H	**25.1** 5640	**50.4** 11330	8.00	S	6900	11000	**0.031** 0.068	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**21** 0.827	K40X45X21H	**23.3** 5240	**45.2** 10160	8.50	S	6900	11000	**0.033** 0.073	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**27** 1.063	K40X45X27H	**32.7** 7350	**70.2** 15780	10.8	S	6900	11000	**0.040** 0.088	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**27** 1.063	K40X45X27TN	**33.3** 7490	**72.1** 16210	11.2	P	6900	11000	**0.030** 0.066	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**29** 1.142	K40X45X29H	**34.7** 7800	**75.9** 17060	11.7	S	6900	11000	**0.050** 0.110	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**46** 1.811	**17** 0.669	K40X46X17	**25.2** 5670	**44.0** 9890	6.95	S	7000	11000	**0.033** 0.073	**40.000** 1.5748	**39.989** 1.5744	**46.025** 1.8120	**46.009** 1.8114
	40 1.5748	**47** 1.8504	**18** 0.709	K40X47X18	**28.0** 6290	**45.6** 10250	7.25	S	7000	11000	**0.041** 0.090	**40.000** 1.5748	**39.989** 1.5744	**47.025** 1.8514	**47.009** 1.8507
	40 1.5748	**47** 1.8504	**20** 0.787	K40X47X20	**31.1** 6990	**52.1** 11710	8.25	S	7000	11000	**0.042** 0.093	**40.000** 1.5748	**39.989** 1.5744	**47.025** 1.8514	**47.009** 1.8507
	40 1.5748	**48** 1.8898	**20** 0.787	K40X48X20FV1	**35.5** 7980	**56.3** 12660	8.45	S	7100	11000	**0.052** 0.115	**40.000** 1.5748	**39.989** 1.5744	**48.025** 1.8907	**48.009** 1.8901
	40 1.5748	**48** 1.8898	**20** 0.787	K40X48X20H	**35.5** 7980	**56.3** 12660	8.95	S	7100	11000	**0.050** 0.110	**40.000** 1.5748	**39.989** 1.5744	**48.025** 1.8907	**48.009** 1.8901
	40 1.5748	**48** 1.8898	**35** 1.378	K40X48X35H	**57.3** 12880	**104** 23380	16.3	S	7100	11000	**0.098** 0.216	**40.000** 1.5748	**39.989** 1.5744	**48.025** 1.8907	**48.009** 1.8901
	40 1.5748	**50** 1.9685	**27** 1.063	K40X50X27H	**53.0** 11910	**81.0** 18210	12.7	S	7200	11000	**0.084** 0.185	**40.000** 1.5748	**39.989** 1.5744	**50.025** 1.9695	**50.009** 1.9689
	40 1.5748	**55** 2.1654	**45** 1.772	K40X55X45H	**103** 23160	**146** 32820	23.0	S	7500	12000	**0.221** 0.487	**40.000** 1.5748	**39.989** 1.5744	**55.029** 2.1665	**55.010** 2.1657

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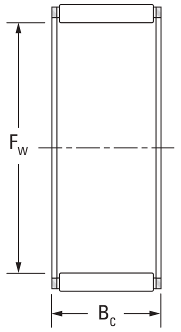
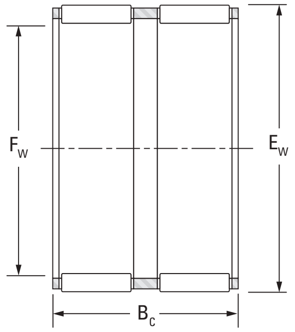
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

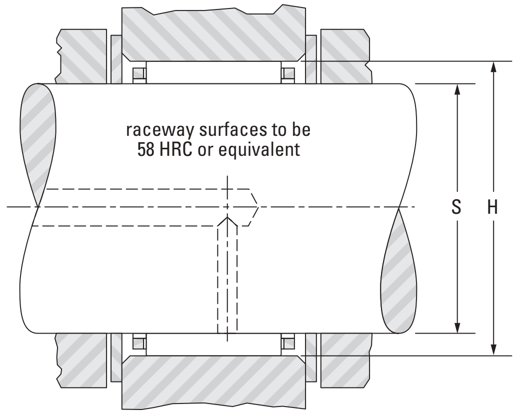
METRIC SERIES
K, K ZW SERIES



K



K ZW



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
40 1.5748	**40** 1.5748	**56** 2.2047	**26** 1.024	K40X56X26H	**63.7** 14320	**75.7** 17020	12.0	S	7600	12000	**0.138** 0.304	**40.000** 1.5748	**39.989** 1.5744	**56.029** 2.2059	**56.010** 2.2051
41 1.6142	**41** 1.6142	**48** 1.8898	**31** 1.22	K41X48X31HZW	**38.0** 8540	**68.1** 15310	10.6	S	6800	11000	**0.067** 0.148	**41.000** 1.6142	**40.989** 1.6137	**48.025** 1.8907	**48.009** 1.8901
42 1.6535	**42** 1.6535	**47** 1.8504	**13** 0.512	K42X47X13H	**18.7** 4200	**34.9** 7850	5.30	S	6500	10000	**0.027** 0.060	**42.000** 1.6535	**41.989** 1.6531	**47.025** 1.8514	**47.009** 1.8507
	42 1.6535	**47** 1.8504	**17** 0.669	K42X47X17H	**22.8** 5130	**45.2** 10160	7.30	S	6500	10000	**0.028** 0.062	**42.000** 1.6535	**41.989** 1.6531	**47.025** 1.8514	**47.009** 1.8507
	42 1.6535	**47** 1.8504	**27** 1.063	K42X47X27H	**33.8** 7600	**74.7** 16790	11.6	S	6500	10000	**0.041** 0.090	**42.000** 1.6535	**41.989** 1.6531	**47.025** 1.8514	**47.009** 1.8507
	42 1.6535	**48** 1.8898	**24** 0.945	K42X48X24F	**33.1** 7440	**63.9** 14370	10.1	S	6600	10000	**0.046** 0.101	**42.000** 1.6535	**41.989** 1.6531	**48.025** 1.8907	**48.009** 1.8901
	42 1.6535	**50** 1.9685	**13** 0.512	K42X50X13H	**20.9** 4700	**28.9** 6500	4.45	S	6700	10000	**0.035** 0.077	**42.000** 1.6535	**41.989** 1.6531	**50.025** 1.9695	**50.009** 1.9689
	42 1.6535	**50** 1.9685	**20** 0.787	K42X50X20H	**35.2** 7910	**56.6** 12720	9.00	S	6700	10000	**0.054** 0.119	**42.000** 1.6535	**41.989** 1.6531	**50.025** 1.9695	**50.009** 1.9689
	42 1.6535	**50** 1.9685	**30** 1.181	K42X50X30H	**51.3** 11530	**91.9** 20660	14.4	S	6700	10000	**0.080** 0.176	**42.000** 1.6535	**41.989** 1.6531	**50.025** 1.9695	**50.009** 1.9689
43 1.6929	**43** 1.6929	**48** 1.8898	**17** 0.669	K43X48X17FH	**23.0** 5170	**45.8** 10300	6.85	S	6400	9800	**0.036** 0.079	**43.000** 1.6929	**42.989** 1.6925	**48.025** 1.8907	**48.009** 1.8901
	43 1.6929	**48** 1.8898	**27** 1.063	K43X48X27H	**34.8** 7820	**78.0** 17540	12.1	S	6400	9800	**0.050** 0.110	**43.000** 1.6929	**42.989** 1.6925	**48.025** 1.8907	**48.009** 1.8901
44 1.7323	**44** 1.7323	**50** 1.9685	**22** 0.866	K44X50X22H	**31.6** 7100	**60.6** 13620	9.45	S	6400	9900	**0.046** 0.101	**44.000** 1.7323	**43.989** 1.7319	**50.025** 1.9695	**50.009** 1.9689
	44 1.7323	**50** 1.9685	**30** 1.201	K44X50X30,5HZW	**35.5** 7980	**70.5** 15850	10.7	S	6400	9900	**0.068** 0.150	**44.000** 1.7323	**43.989** 1.7319	**50.025** 1.9695	**50.009** 1.9689
45 1.7717	**45** 1.7717	**50** 1.9685	**13** 0.512	K45X50X13H	**18.4** 4140	**35.1** 7890	5.35	S	6100	9400	**0.022** 0.049	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**15** 0.591	K45X50X15H	**19.4** 4360	**37.3** 8390	5.75	S	6100	9400	**0.028** 0.062	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**17** 0.669	K45X50X17H	**24.9** 5600	**51.8** 11650	8.05	S	6100	9400	**0.030** 0.066	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**20** 0.787	K45X50X20F	**27.0** 6070	**57.4** 12900	9.00	S	6100	9400	**0.040** 0.088	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689

(1) Cage material: P: polymer cage, S: steel cage

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
45 1.7717	**45** 1.7717	**50** 1.9685	**21** 0.827	K45X50X21CH	**24.6** 5530	**50.4** 11330	7.85	S	6100	9400	**0.036** 0.079	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**27** 1.063	K45X50X27FH	**34.2** 7690	**77.4** 17400	12.0	S	6100	9400	**0.043** 0.095	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**27** 1.063	K45X50X27TN	**31.8** 7150	**70.7** 15890	11.0	P	6100	9400	**0.048** 0.106	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**52** 2.0472	**18** 0.709	K45X52X18H	**30.1** 6770	**52.0** 11690	8.25	S	6200	9500	**0.045** 0.099	**45.000** 1.7717	**44.989** 1.7712	**52.029** 2.0484	**52.010** 2.0476
	45 1.7717	**52** 2.0472	**21** 0.827	K45X52X21F	**35.0** 7870	**63.2** 14210	9.90	S	6200	9500	**0.055** 0.121	**45.000** 1.7717	**44.989** 1.7712	**52.029** 2.0484	**52.010** 2.0476
	45 1.7717	**53** 2.0866	**20** 0.787	K45X53X20H	**36.0** 8090	**59.5** 13380	9.45	S	6200	9600	**0.054** 0.119	**45.000** 1.7717	**44.989** 1.7712	**53.029** 2.0878	**53.010** 2.0870
	45 1.7717	**53** 2.0866	**24.8** 0.976	K45X53X25H	**45.9** 10320	**81.5** 18320	12.7	S	6200	9600	**0.072** 0.159	**45.000** 1.7717	**44.989** 1.7712	**53.029** 2.0878	**53.010** 2.0870
	45 1.7717	**53** 2.0866	**25** 0.984	K45X53X25F	**42.5** 9550	**73.7** 16570	11.7	S	6200	9600	**0.075** 0.165	**45.000** 1.7717	**44.989** 1.7712	**53.029** 2.0878	**53.010** 2.0870
	45 1.7717	**53** 2.0866	**28** 1.102	K45X53X28H	**49.3** 11080	**89.2** 20050	13.9	S	6200	9600	**0.078** 0.172	**45.000** 1.7717	**44.989** 1.7712	**53.029** 2.0878	**53.010** 2.0870
	45 1.7717	**55** 2.1654	**20** 0.787	K45X55X20H	**42.0** 9440	**62.2** 13980	10.0	S	6400	9800	**0.074** 0.163	**45.000** 1.7717	**44.989** 1.7712	**55.029** 2.1665	**55.010** 2.1657
	45 1.7717	**59** 2.3228	**18** 0.709	K45X59X18H	**47.8** 10750	**58.9** 13240	9.60	S	6600	10000	**0.107** 0.236	**45.000** 1.7717	**44.989** 1.7712	**59.029** 2.3240	**59.010** 2.3232
	45 1.7717	**59** 2.3228	**18** 0.709	K45X59X18TN	**45.7** 10270	**55.4** 12450	9.00	P	6600	10000	**0.097** 0.214	**45.000** 1.7717	**44.989** 1.7712	**59.029** 2.3240	**59.010** 2.3232
	45 1.7717	**59** 2.3228	**36** 1.417	K45X59X36H	**82.4** 18520	**118** 26530	18.6	S	6600	10000	**0.181** 0.399	**45.000** 1.7717	**44.989** 1.7712	**59.029** 2.3240	**59.010** 2.3232
	45 1.7717	**60** 2.3622	**30** 1.181	K45X60X30H	**75.5** 16970	**101** 22710	16.0	S	6600	10000	**0.171** 0.377	**45.000** 1.7717	**44.989** 1.7712	**60.029** 2.3633	**60.010** 2.3626
	45 1.7717	**60** 2.3622	**45** 1.772	K45X60X45H	**108** 24280	**160** 35970	25.2	S	6600	10000	**0.280** 0.617	**45.000** 1.7717	**44.989** 1.7712	**60.029** 2.3633	**60.010** 2.3626
46 1.8110	**46** 1.811	**53** 2.0866	**36** 1.417	K46X53X36HZW	**48.6** 10930	**96.7** 21740	15.3	S	6100	9300	**0.100** 0.220	**46.000** 1.8110	**45.989** 1.8106	**53.029** 2.0878	**53.010** 2.0870
47 1.8504	**47** 1.8504	**52** 2.0472	**15** 0.591	K47X52X15FH	**20.1** 4520	**39.8** 8950	6.15	S	5800	8900	**0.030** 0.066	**47.000** 1.8504	**46.989** 1.8500	**52.029** 2.0484	**52.010** 2.0476

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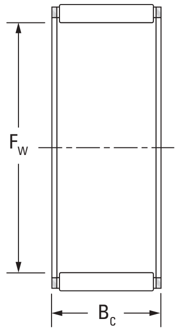
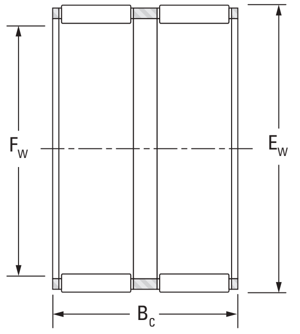
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

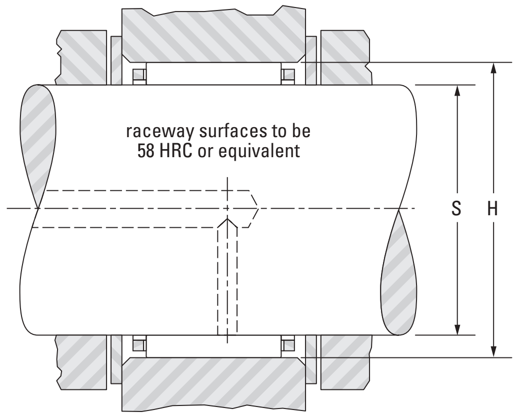
METRIC SERIES
K, K ZW SERIES



K



K ZW



raceway surfaces to be 58 HRC or equivalent

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
47 1.8504	47 1.8504	52 2.0472	17 0.669	K47X52X17H	24.2 5440	50.4 11330	7.85	S	5800	8900	0.032 0.071	47.000 1.8504	46.989 1.8500	52.029 2.0484	52.010 2.0476
	47 1.8504	52 2.0472	27 1.063	K47X52X27H	36.6 8230	85.9 19310	13.3	S	5800	8900	0.045 0.099	47.000 1.8504	46.989 1.8500	52.029 2.0484	52.010 2.0476
	47 1.8504	55 2.1654	28 1.102	K47X55X28FV1	48.9 10990	89.5 20120	14.0	S	6000	9200	0.092 0.203	47.000 1.8504	46.989 1.8500	55.029 2.1665	55.010 2.1657
48 1.8898	48 1.8898	53 2.0866	17 0.669	K48X53X17H	25.7 5780	54.9 12340	8.55	S	5700	8700	0.032 0.071	48.000 1.8898	47.989 1.8893	53.029 2.0878	53.010 2.0870
	48 1.8898	54 2.126	19 0.748	K48X54X19H	30.9 6950	61.2 13760	9.85	S	5700	8800	0.042 0.093	48.000 1.8898	47.989 1.8893	54.029 2.1271	54.010 2.1264
49 1.9291	49 1.9291	55 2.1654	32 1.26	K49X55X32HZW	40.2 9040	86.4 19420	13.4	S	5600	8600	0.080 0.176	49.000 1.9291	48.989 1.9287	55.029 2.1665	55.010 2.1657
	49 1.9291	65 2.5591	38 1.496	K49X65X38H	100 22480	142 31920	22.7	S	6100	9300	0.244 0.538	49.000 1.9291	48.989 1.9287	65.029 2.5602	65.010 2.5594
50 1.9685	50 1.9685	55 2.1654	17 0.669	K50X55X17H	25.5 5730	55.0 12360	8.55	S	5400	8400	0.032 0.071	50.000 1.9685	49.989 1.9681	55.029 2.1665	55.010 2.1657
	50 1.9685	55 2.1654	20 0.787	K50X55X20H	30.2 6790	68.5 15400	10.7	S	5400	8400	0.038 0.084	50.000 1.9685	49.989 1.9681	55.029 2.1665	55.010 2.1657
	50 1.9685	55 2.1654	30 1.181	K50X55X30	38.2 8590	92.4 20770	14.4	S	5400	8400	0.057 0.120	50.000 1.9685	49.989 1.9681	55.029 2.1665	55.010 2.1657
	50 1.9685	55 2.1654	30 1.181	K50X55X30FV1	38.2 8590	92.4 20770	14.4	S	5400	8400	0.057 0.126	50.000 1.9685	49.989 1.9681	55.029 2.1665	55.010 2.1657
	50 1.9685	56 2.2047	23 0.906	K50X56X23	35.5 7980	74.1 16660	11.7	S	5500	8500	0.051 0.112	50.000 1.9685	49.989 1.9681	56.029 2.2059	56.010 2.2051
	50 1.9685	57 2.2441	18 0.709	K50X57X18FH	31.3 7040	56.4 12680	8.95	S	5500	8500	0.050 0.110	50.000 1.9685	49.989 1.9681	57.029 2.2452	57.010 2.2445
	50 1.9685	58 2.2835	20 0.787	K50X58X20H	38.8 8720	67.8 15240	10.8	S	5600	8600	0.065 0.143	50.000 1.9685	49.989 1.9681	58.029 2.2846	58.010 2.2839
	50 1.9685	58 2.2835	25 0.984	K50X58X25H	46.5 10450	85.6 19240	13.4	S	5600	8600	0.081 0.179	50.000 1.9685	49.989 1.9681	58.029 2.2846	58.010 2.2839
	50 1.9685	58 2.2835	35 1.378	K50X58X35H	64.9 14590	131 29450	20.6	S	5600	8600	0.105 0.231	50.000 1.9685	49.989 1.9681	58.029 2.2846	58.010 2.2839
	50 1.9685	62 2.4409	30 1.181	K50X62X30H	64.6 14520	98.1 22050	15.5	S	5800	8900	0.136 0.300	50.000 1.9685	49.989 1.9681	62.029 2.4421	62.010 2.4413
50 1.9685	50 1.9685	66 2.5984	30 1.181	K50X66X30H	80.9 18190	109 24500	17.4	S	5900	9100	0.192 0.423	50.000 1.9685	49.989 1.9681	66.029 2.5996	66.010 2.5988
	50 1.9685	70 2.7559	32 1.26	K50X70X32H	103 23160	129 29000	20.6	S	6100	9300	0.224 0.494	50.000 1.9685	49.989 1.9681	70.029 2.7570	70.010 2.7563
52 2.0472	52 2.0472	57 2.2441	12 0.472	K52X57X12	18.4 4140	36.7 8250	5.60	S	5200	8000	0.022 0.049	52.000 2.0472	51.987 2.0467	57.029 2.2452	57.010 2.2445
	52 2.0472	57 2.2441	17 0.669	K52X57X17H	21.4 4810	44.3 9960	6.90	S	5200	8000	0.035 0.077	52.000 2.0472	51.987 2.0467	57.029 2.2452	57.010 2.2445
	52 2.0472	60 2.3622	24 0.945	K52X60X24	47.1 10600	88.3 19900	13.9	S	5400	8200	0.078 0.172	52.000 2.0472	51.987 2.0467	60.029 2.3633	60.010 2.3626
55 2.1654	55 2.1654	60 2.3622	17 0.669	K55X60X17	26.0 5850	58.3 13100	9.10	S	4900	7600	0.037 0.082	55.000 2.1654	54.987 2.1648	60.029 2.3633	60.010 2.3626
	55 2.1654	60 2.3622	20 0.787	K55X60X20H	30.7 6900	72.4 16300	11.3	S	4900	7600	0.042 0.093	55.000 2.1654	54.987 2.1648	60.029 2.3633	60.010 2.3626
	55 2.1654	60 2.3622	27 1.063	K55X60X27H	40.1 9010	102 22900	15.7	S	4900	7600	0.055 0.121	55.000 2.1654	54.987 2.1648	60.029 2.3633	60.010 2.3626
	55 2.1654	60 2.3622	30 1.181	K55X60X30FH	40.6 9130	103 23200	16.1	S	4900	7600	0.068 0.150	55.000 2.1654	54.987 2.1648	60.029 2.3633	60.010 2.3626
	55 2.1654	61 2.4016	26 1.024	K55X61X26H	44.3 9960	102 22900	15.9	S	5000	7600	0.063 0.139	55.000 2.1654	54.987 2.1648	61.029 2.4027	61.010 2.4020
	55 2.1654	62 2.4409	18 0.709	K55X62X18H	33.2 7460	62.8 14100	10.0	S	5000	7700	0.055 0.121	55.000 2.1654	54.987 2.1648	62.029 2.4421	62.010 2.4413
	55 2.1654	63 2.4803	15 0.591	K55X63X15F	30.5 6860	51.5 11600	8.00	S	5000	7800	0.054 0.119	55.000 2.1654	54.987 2.1648	63.029 2.4815	63.010 2.4807
	55 2.1654	63 2.4803	20 0.787	K55X63X20	40.3 9060	73.5 16500	11.7	S	5000	7800	0.072 0.159	55.000 2.1654	54.987 2.1648	63.029 2.4815	63.010 2.4807
	55 2.1654	63 2.4803	25 0.984	K55X63X25	49.8 11200	96.5 21700	15.1	S	5000	7800	0.080 0.176	55.000 2.1654	54.987 2.1648	63.029 2.4815	63.010 2.4807
	55 2.1654	63 2.4803	32 1.26	K55X63X32	62.3 14000	129 29000	20.0	S	5000	7800	0.108 0.238	55.000 2.1654	54.987 2.1648	63.029 2.4815	63.010 2.4807
58 2.2835	58 2.2835	63 2.4803	17 0.669	K58X63X17F	27.0 6070	62.6 14100	9.80	S	4700	7200	0.037 0.082	58.000 2.2835	57.987 2.2830	63.029 2.4815	63.010 2.4807
	58 2.2835	64 2.5197	19 0.748	K58X64X19H	32.9 7400	70.6 15900	11.3	S	4700	7200	0.037 0.082	58.000 2.2835	57.987 2.2830	64.029 2.5208	64.010 2.5201

(1) Cage material: P: polymer cage, S: steel cage

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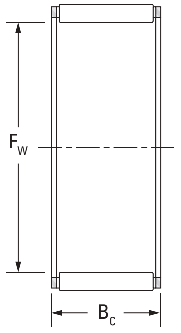
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



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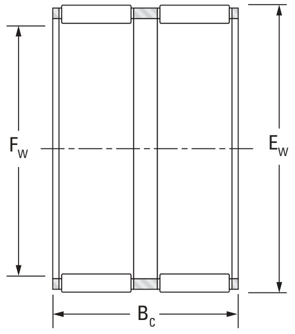
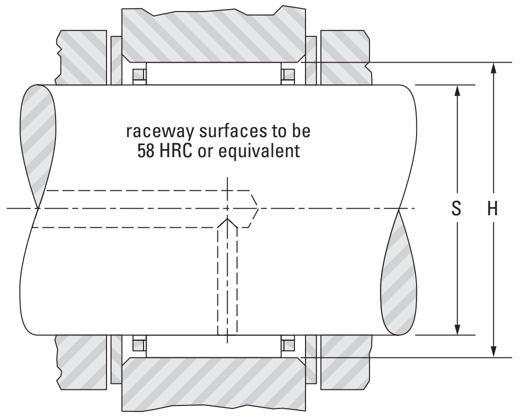


K ZW



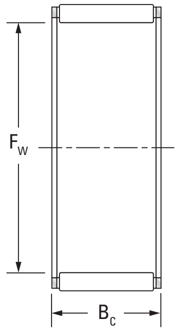
Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min⁻¹		kg lbs	mm in	mm in	mm in	mm in
58 2.2835	58 2.2835	65 2.5591	18 0.709	K58X65X18H	34.3 7710	67.1 15100	10.7	S	4700	7300	0.058 0.128	58.000 2.2835	57.987 2.2830	65.029 2.5602	65.010 2.5594
60 2.3622	60 2.3622	65 2.5591	20 0.787	K60X65X20H	31.9 7170	78.1 17600	12.2	S	4500	6900	0.046 0.101	60.000 2.3622	59.987 2.3617	65.029 2.5602	65.010 2.5594
	60 2.3622	65 2.5591	26.8 1.055	K60X65X27FH	39.5 8880	103 23200	16.0	S	4500	6900	0.059 0.130	60.000 2.3622	59.987 2.3617	65.029 2.5602	65.010 2.5594
	60 2.3622	65 2.5591	29.8 1.173	K60X65X30FH	42.9 9640	114 25600	17.8	S	4500	6900	0.085 0.187	60.000 2.3622	59.987 2.3617	65.029 2.5602	65.010 2.5594
	60 2.3622	65 2.5591	30 1.181	K60X65X30	42.9 9640	114 25600	17.8	S	4500	6900	0.070 0.154	60.000 2.3622	59.987 2.3617	65.029 2.5602	65.010 2.5594
	60 2.3622	68 2.6772	17 0.669	K60X68X17F	34.2 7690	61.4 13800	9.50	S	4600	7100	0.066 0.146	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
	60 2.3622	68 2.6772	20 0.787	K60X68X20H	41.8 9400	79.2 17800	12.6	S	4600	7100	0.066 0.146	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
	60 2.3622	68 2.6772	23 0.906	K60X68X23H	49.0 11000	97.2 21900	15.4	S	4600	7100	0.089 0.196	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
	60 2.3622	68 2.6772	25 0.984	K60X68X25	51.6 11600	104 23400	16.3	S	4600	7100	0.091 0.201	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
	60 2.3622	68 2.6772	30 1.181	K60X68X30ZW	46.4 10400	90.1 20300	13.9	S	4600	7100	0.119 0.262	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
63 2.4803	63 2.4803	71 2.7953	20 0.787	K63X71X20	41.4 9310	79.4 17800	12.7	S	4400	6700	0.070 0.154	63.000 2.4803	62.987 2.4798	71.029 2.7964	71.010 2.7957
64 2.5197	64 2.5197	70 2.7559	16 0.63	K64X70X16	26.4 5930	55.1 12400	8.55	S	4200	6500	0.049 0.108	64.000 2.5197	63.987 2.5192	70.029 2.7570	70.010 2.7563
65 2.5591	65 2.5591	70 2.7559	20 0.787	K65X70X20CH	28.6 6430	69.2 15600	10.8	S	4100	6400	0.050 0.110	65.000 2.5591	64.987 2.5585	70.029 2.7570	70.010 2.7563
	65 2.5591	70 2.7559	30 1.181	K65X70X30	44.4 9980	123 27700	19.1	S	4100	6400	0.075 0.165	65.000 2.5591	64.987 2.5585	70.029 2.7570	70.010 2.7563
	65 2.5591	73 2.874	23 0.906	K65X73X23H	48.2 10800	97.7 22000	15.5	S	4200	6500	0.091 0.201	65.000 2.5591	64.987 2.5585	73.029 2.8752	73.010 2.8744
	65 2.5591	73 2.874	30 1.181	K65X73X30H	60.1 13500	129 29100	20.3	S	4200	6500	0.116 0.256	65.000 2.5591	64.987 2.5585	73.029 2.8752	73.010 2.8744
68 2.6772	68 2.6772	74 2.9134	20 0.787	K68X74X20FH	37.5 8430	88.1 19800	13.2	S	4000	6100	0.062 0.137	68.000 2.6772	67.987 2.6767	74.029 2.9145	74.010 2.9138
68 2.6772	68 2.6772	74 2.9134	28 1.102	K68X74X28CH	44.8 10100	110 24700	17.1	S	4000	6100	0.082 0.181	68.000 2.6772	67.987 2.6767	74.029 2.9145	74.010 2.9138
	68 2.6772	74 2.9134	30 1.181	K68X74X30H	47.6 10700	119 26800	18.5	S	4000	6100	0.098 0.216	68.000 2.6772	67.987 2.6767	74.029 2.9145	74.010 2.9138
	68 2.6772	74 2.9134	35 1.378	K68X74X35HZW	45.1 10100	111 25000	17.1	S	4000	6100	0.120 0.265	68.000 2.6772	67.987 2.6767	74.029 2.9145	74.010 2.9138
	68 2.6772	76 2.9921	20 0.787	K68X76X20	43.8 9850	87.8 19700	14.0	S	4000	6200	0.086 0.190	68.000 2.6772	67.987 2.6767	76.029 2.9933	76.010 2.9925
70 2.7559	70 2.7559	76 2.9921	20 0.787	K70X76X20	36.1 8120	84.7 19000	13.5	S	3900	5900	0.065 0.143	70.000 2.7559	69.987 2.7554	76.029 2.9933	76.010 2.9925
	70 2.7559	76 2.9921	30 1.181	K70X76X30	51.6 11600	134.0 30100	20.9	S	3900	5900	0.097 0.214	70.000 2.7559	69.987 2.7554	76.029 2.9933	76.010 2.9925
	70 2.7559	78 3.0709	20 0.787	K70X78X20H	43.6 9800	87.9 19800	14.0	S	3900	6000	0.090 0.198	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	78 3.0709	23 0.906	K70X78X23F	49.8 11200	104.0 23400	16.6	S	3900	6000	0.115 0.254	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	78 3.0709	24.8 0.976	K70X78X25F	49.8 11200	104.0 23400	16.6	S	3900	6000	0.115 0.254	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	78 3.0709	30 1.181	K70X78X30H	62.2 14000	139.0 31200	21.8	S	3900	6000	0.140 0.309	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	78 3.0709	46 1.811	K70X78X46ZW	78.4 17600	187.0 42000	29.5	S	3900	6000	0.188 0.414	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	85 3.3465	40 1.575	K70X85X40F	118 26500	203 45600	32.4	S	4100	6300	0.338 0.745	70.000 2.7559	69.987 2.7554	85.034 3.3478	85.012 3.3469
	70 2.7559	88 3.4646	30 1.181	K70X88X30H	115 25900	175 39300	28.1	S	4100	6400	0.205 0.452	70.000 2.7559	69.987 2.7554	88.034 3.4659	88.012 3.4650
72 2.8346	72 2.8346	80 3.1496	20 0.787	K72X80X20	44.4 9980	90.7 20400	14.5	S	3800	5800	0.084 0.185	72.000 2.8346	71.987 2.8341	80.029 3.1507	80.010 3.1500
73 2.8740	73 2.874	79 3.1102	20 0.787	K73X79X20	37.0 8320	88.7 19900	14.1	S	3700	5700	0.068 0.150	73.000 2.8740	72.987 2.8735	79.029 3.1114	79.010 3.1106
75 2.9528	75 2.9528	81 3.189	20 0.787	K75X81X20F	37.4 8410	90.7 20400	14.5	S	3600	5500	0.075 0.165	75.000 2.9528	74.987 2.9522	81.034 3.1903	81.012 3.1894
	75 2.9528	83 3.2677	23 0.906	K75X83X23	52.5 11800	114.0 25600	18.2	S	3600	5600	0.104 0.229	75.000 2.9528	74.987 2.9522	83.034 3.2691	83.012 3.2682

(1) Cage material: P: polymer cage, S: steel cage

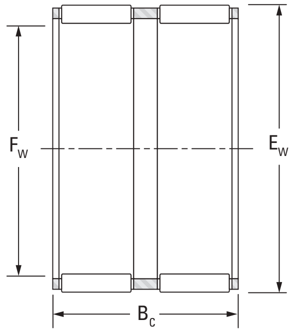
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

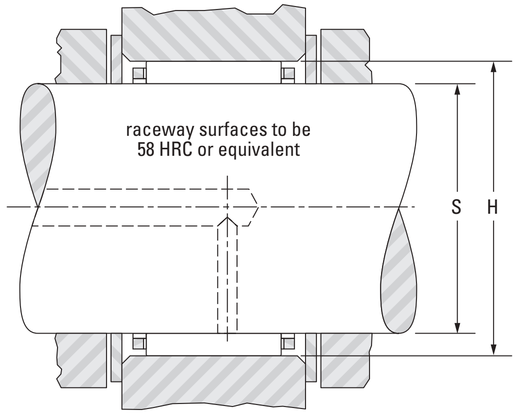
METRIC SERIES
K, K ZW SERIES



K



K ZW

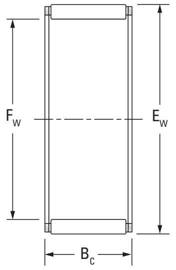


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
75 2.9528	**75** 2.9528	**83** 3.2677	**30** 1.181	K75X83X30	**60.9** 13700	**138** 31000	21.7	S	3600	5600	**0.141** 0.311	**75.000** 2.9528	**74.987** 2.9522	**83.034** 3.2691	**83.012** 3.2682
	75 2.9528	**83** 3.2677	**30** 1.181	K75X83X30FH	**60.9** 13700	**138** 31000	21.7	S	3600	5600	**0.141** 0.311	**75.000** 2.9528	**74.987** 2.9522	**83.034** 3.2691	**83.012** 3.2682
80 3.1496	**80** 3.1496	**86** 3.3858	**20** 0.787	K80X86X20H	**38.6** 8680	**96.7** 21700	15.4	S	3400	5200	**0.072** 0.159	**80.000** 3.1496	**79.987** 3.1491	**86.034** 3.3872	**86.012** 3.3863
	80 3.1496	**88** 3.4646	**25** 0.984	K80X88X25FV1	**54.0** 12100	**121** 27200	19.2	S	3400	5200	**0.134** 0.295	**80.000** 3.1496	**79.987** 3.1491	**88.034** 3.4659	**88.012** 3.4650
	80 3.1496	**88** 3.4646	**30** 1.181	K80X88X30	**67.5** 15200	**161** 36200	25.4	S	3400	5200	**0.153** 0.337	**80.000** 3.1496	**79.987** 3.1491	**88.034** 3.4659	**88.012** 3.4650
85 3.3465	**85** 3.3465	**92** 3.622	**20** 0.787	K85X92X20H	**39.9** 8970	**91.7** 20600	14.6	S	3200	4900	**0.085** 0.187	**84.988** 3.3460	**84.973** 3.3454	**92.034** 3.6234	**92.012** 3.6225
	85 3.3465	**93** 3.6614	**25** 0.984	K85X93X25F	**58.8** 13219	**138** 31024	21.7	S	3200	4900	**0.128** 0.282	**84.988** 3.3460	**84.973** 3.3454	**93.034** 3.6628	**93.012** 3.6619
	85 3.3465	**93** 3.6614	**30** 1.181	K85X93X30H	**69.4** 15600	**170.4** 38200	26.8	S	3200	4900	**0.166** 0.366	**84.988** 3.3460	**84.973** 3.3454	**93.034** 3.6628	**93.012** 3.6619
90 3.5433	**90** 3.5433	**97** 3.8189	**20** 0.787	K90X97X20	**46.3** 10400	**114** 25600	18.1	S	3000	4600	**0.095** 0.209	**89.988** 3.5428	**89.973** 3.5422	**97.034** 3.8202	**97.012** 3.8194
	90 3.5433	**98** 3.8583	**25** 0.984	K90X98X25F	**54.8** 12300	**128** 28800	20.3	S	3000	4600	**0.134** 0.295	**89.988** 3.5428	**89.973** 3.5422	**98.034** 3.8596	**98.012** 3.8587
	90 3.5433	**98** 3.8583	**30** 1.181	K90X98X30	**63.6** 14300	**155** 34800	24.3	S	3000	4600	**0.168** 0.370	**89.988** 3.5428	**89.973** 3.5422	**98.034** 3.8596	**98.012** 3.8587
95 3.7402	**95** 3.7402	**103** 4.0551	**20** 0.787	K95X103X20	**49.3** 11100	**114** 25600	18.3	S	2800	4400	**0.130** 0.287	**94.988** 3.7397	**94.973** 3.7391	**103.034** 4.0565	**103.012** 4.0556
	95 3.7402	**103** 4.0551	**30** 1.181	K95X103X30F	**71.0** 16000	**183** 41100	28.6	S	2800	4400	**0.180** 0.39	**94.988** 3.7397	**94.973** 3.7391	**103.034** 4.0565	**103.012** 4.0556
100 3.9370	**100** 3.937	**108** 4.252	**30** 1.181	K100X108X30	**72.4** 16300	**191** 42900	29.5	S	2700	4200	**0.210** 0.463	**99.988** 3.9365	**99.973** 3.9359	**108.034** 4.2533	**108.012** 4.2524
110 4.3307	**110** 4.3307	**118** 4.6457	**24** 0.945	K110X118X24	**64.0** 14400	**168** 37800	25.6	S	2400	3800	**0.165** 0.364	**109.988** 4.3302	**109.973** 4.3296	**118.034** 4.6470	**118.012** 4.6461
	110 4.3307	**118** 4.6457	**30** 1.181	K110X118X30H	**75.3** 16900	**207** 46500	31.2	S	2400	3800	**0.200** 0.441	**109.988** 4.3302	**109.973** 4.3296	**118.034** 4.6470	**118.012** 4.6461

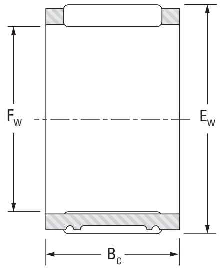
(1) Cage material: P: polymer cage, S: steel cage

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

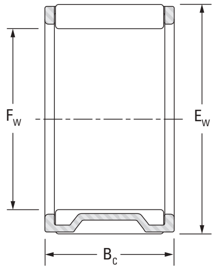
METRIC SERIES R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



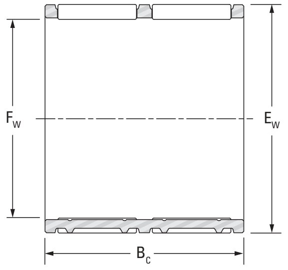
RS, R, RP



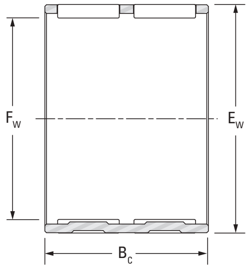
RV, V, VS

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
12 0.4724	**12**	**16**	**20**	12R1620A	**9.5**	**11.5**	1.80	S	20000	30000	**0.010**	**12.000**	**11.992**	**16.017**	**16.006**
	12	**17**	**11.5**	RV121712A-2	**8.25**	**8.4**	1.25	S	16000	25000	**0.007**	**12.000**	**11.992**	**17.017**	**17.006**
13 0.5118	**13**	**17**	**10**	RS131710-2	**5.85**	**6.35**	0.970	S	23000	29000	**0.006**	**13.000**	**12.992**	**17.017**	**17.006**
	13	**17**	**12**	RS131712	**7.25**	**8.35**	1.25	S	23000	29000	**0.007**	**13.000**	**12.992**	**17.017**	**17.006**
15 0.5906	**15**	**19**	**10**	R15/10-1	**6.3**	**7.2**	1.10	S	18000	28000	**0.006**	**15.000**	**14.992**	**19.02**	**19.007**
	15	**19**	**20**	R15/20	**12.6**	**17.7**	2.80	S	18000	28000	**0.012**	**15.000**	**14.992**	**19.02**	**19.007**
	15	**21**	**9**	RV152109-4	**7.65**	**7.15**	1.10	S	14000	21000	**0.008**	**15.000**	**14.992**	**21.02**	**21.007**
17 0.6693	**17**	**21**	**13**	R17/13	**9.4**	**12.6**	1.90	S	17000	26000	**0.009**	**17.000**	**16.992**	**21.02**	**21.007**
	17	**23**	**13**	RS17/13	**11.4**	**12.4**	1.90	S	18000	27000	**0.014**	**17.000**	**16.992**	**23.02**	**23.007**
18 0.7087	**18**	**22**	**16**	R18/16-8	**11.2**	**16**	2.45	S	16000	24000	**0.011**	**18.000**	**17.992**	**22.02**	**22.007**
	18	**22**	**17**	R18/17	**11.9**	**17.4**	2.65	S	16000	24000	**0.012**	**18.000**	**17.992**	**22.02**	**22.007**
	18	**24**	**17.2**	RS182417	**15.1**	**17.9**	2.75	S	16000	25000	**0.019**	**18.000**	**17.992**	**24.02**	**24.007**
	18	**26**	**21.9**	RF182622A-1	**19.1**	**20.3**	3.20	P	17000	26000	**0.019**	**18.000**	**17.992**	**26.02**	**26.007**
	18	**26**	**21.9**	RV182622A-2	**22.7**	**25.5**	4.00	S	17000	26000	**0.031**	**18.000**	**17.992**	**26.02**	**26.007**
	18	**27**	**11**	RF182711-1	**15.5**	**14.6**	2.25	P	18000	27000	**0.014**	**18.000**	**17.992**	**27.02**	**27.007**
20 0.7874	**20**	**24**	**10**	R20/10	**7.25**	**9.4**	1.45	S	14000	22000	**0.008**	**20.000**	**19.991**	**24.02**	**24.007**
	20	**25**	**25**	RF202525	**19.1**	**28.2**	4.45	P	14000	22000	**0.014**	**20.000**	**19.991**	**25.02**	**25.007**

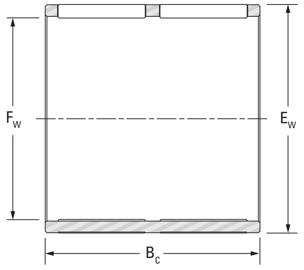
(1) Cage material: P: polymer cage, S: steel cage



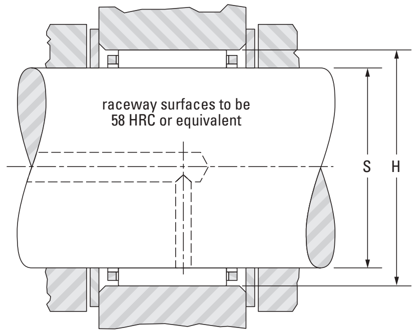
WR, WRS



WRP



WRF

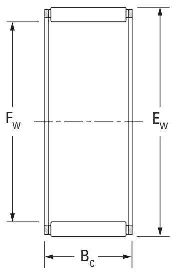


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
20 0.7874	**20**	**25**	**26**	20WR2526	**15.8**	**22**	3.30	S	14000	22000	**0.027**	**20.000**	**19.991**	**25.02**	**25.007**
	20	**26**	**11.7**	20VS2612	**10.8**	**11.9**	1.85	S	15000	23000	**0.012**	**20.000**	**19.991**	**26.02**	**26.007**
	20	**26**	**12**	RV202612-4	**13.1**	**15.4**	2.35	S	15000	23000	**0.014**	**20.000**	**19.992**	**26.02**	**26.007**
	20	**27**	**15**	20V2715	**16.2**	**18.3**	2.80	S	15000	23000	**0.019**	**20.000**	**19.991**	**27.02**	**27.007**
	20	**28**	**20**	RP202820	**24.3**	**28.5**	4.55	S	15000	23000	**0.028**	**20.000**	**19.992**	**28.02**	**28.007**
22 0.8661	**22**	**26**	**17**	R22/17	**13**	**20.7**	3.15	S	13000	20000	**0.014**	**22.000**	**21.991**	**26.02**	**26.007**
	22	**28**	**17**	RS22/17	**16.2**	**20.7**	3.15	S	13000	20000	**0.022**	**22.000**	**21.991**	**28.02**	**28.007**
	22	**28**	**23.2**	VS22/23B	**24.3**	**35.1**	5.45	S	13000	20000	**0.025**	**22.000**	**21.991**	**28.02**	**28.007**
	22	**30**	**20**	RV223020-1	**24.2**	**29**	4.60	S	14000	21000	**0.031**	**22.000**	**21.991**	**30.02**	**30.007**
	22	**32**	**11**	RF223211-1	**19.5**	**19.3**	2.95	P	14000	22000	**0.019**	**22.000**	**21.991**	**32.025**	**32.009**
	22	**32**	**15**	RV223215	**21.8**	**22.1**	3.45	S	14000	22000	**0.032**	**22.000**	**21.991**	**32.025**	**32.009**
	22	**32**	**16**	RV223216	**21.8**	**22.1**	3.45	S	14000	22000	**0.035**	**22.000**	**21.991**	**32.025**	**32.009**
23 0.9055	**23**	**33**	**20.3**	23V3320-1	**27.6**	**30.2**	4.85	S	13000	20000	**0.044**	**23.000**	**22.991**	**33.025**	**33.009**
24 0.9449	**24**	**28**	**13**	RS242813-1	**11.2**	**17.6**	2.65	S	12000	18000	**0.012**	**24.000**	**23.991**	**28.02**	**28.007**
	24	**28**	**17**	R24/17A	**13.7**	**22.8**	3.45	S	12000	18000	**0.016**	**24.000**	**23.991**	**28.02**	**28.007**
	24	**28**	**34**	WR24/34	**22**	**41.6**	6.35	S	12000	18000	**0.031**	**24.000**	**23.991**	**28.02**	**28.007**
	24	**32**	**15**	RV243215-4	**20.2**	**23.4**	3.60	S	12000	19000	**0.027**	**24.000**	**23.991**	**32.025**	**32.009**

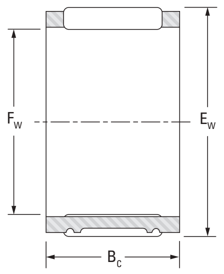
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

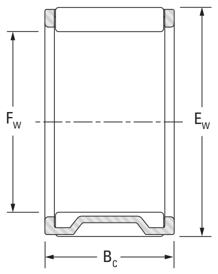
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



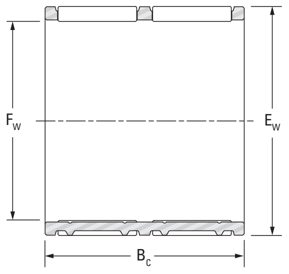
RS, R, RP



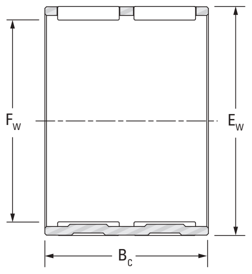
RV, V, VS

Shaft Dia.	Fw	Ew	Bc -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit Cu	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions S		Mounting Dimensions H	
					C	C0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min⁻¹		kg lbs	mm in	mm in	mm in	mm in
24.9 0.9803	24.9	29.9	26.8	RFU253027A	20.3	32.3	5.05	P	12000	18000	0.017	24.900	24.891	29.92	29.907
25 0.9843	25	29	10.1	R25/10A	7.25	10.1	1.55	S	11000	17000	0.010	25.000	24.991	29.02	29.007
	25	29	17	RF252917	14	23.7	3.70	P	11000	17000	0.009	25.000	24.991	29.02	29.007
	25	29	22	WR25/22	16	28.2	4.30	S	11000	17000	0.022	25.000	24.991	29.02	29.007
	25	30	12	25R3012	10.5	14.1	2.10	S	11000	17000	0.015	25.000	24.991	30.02	30.007
	25	30	20	RFU253020	17.7	27.4	4.35	P	11000	17000	0.014	25.000	24.991	30.02	30.007
	25	30	26	25WR3026	22.4	37.2	5.75	S	11000	17000	0.032	25.000	24.991	30.02	30.007
	25	31	24	25R3124	25.1	37.8	5.90	S	12000	18000	0.035	25.000	24.991	31.025	31.009
	25	32	16	25V3216	19.5	24.7	3.80	S	12000	18000	0.025	25.000	24.991	32.025	32.009
	25	32	32	RV253232	40	62.5	9.75	S	12000	18000	0.049	25.000	24.991	32.025	32.009
	25	33	24	25R3324B-1	30.3	40	6.35	S	12000	18000	0.048	25.000	24.991	33.025	33.009
	25	33	30	RF253330	38.7	54.8	8.50	P	12000	18000	0.041	25.000	24.991	33.025	33.009
	25	34	32	RV253432	46.1	63.9	10.0	S	12000	18000	0.066	25.000	24.991	34.025	34.009
	25	35	25	25R3525	32.5	38	6.00	S	12000	19000	0.065	25.000	24.991	35.025	35.009
	25	37	24	25V3724	34.4	36.6	5.85	S	12000	19000	0.072	25.000	24.991	37.025	37.009
	25	37	25	25V3725A	38.9	43.1	6.85	S	12000	19000	0.077	25.000	24.991	37.025	37.009
	25	37	33	RV253733	48.2	56.7	8.90	S	12000	19000	0.100	25.000	24.991	37.025	37.009

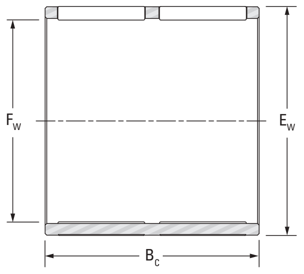
(1) Cage material: P: polymer cage, S: steel cage



WR, WRS



WRP



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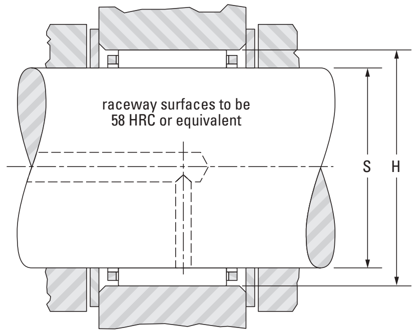
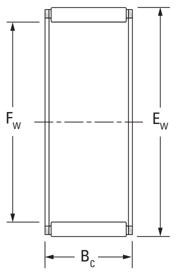


Shaft Dia.	Fw	Ew	Bc -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit Cu	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions S		Mounting Dimensions H	
					C	C0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min⁻¹		kg lbs	mm in	mm in	mm in	mm in
26 1.0236	26	30	17	RFU263017	13.9	23.7	3.70	P	10000	16000	0.009	26.000	25.991	30.02	30.007
	26	30	20	RS263020	17.1	31.1	4.90	S	10000	16000	0.020	26.000	25.991	30.02	30.007
	26	30	21.9	RS263022A	16.9	30.4	4.75	S	10000	16000	0.022	26.000	25.991	30.02	30.007
	26	31	24	26WR3124-2	20.7	33.9	5.20	S	11000	17000	0.030	26.000	25.991	31.025	31.009
	26	33	34	RPU263334F	30.7	44.3	6.90	S	11000	17000	0.043	26.000	25.991	33.025	33.009
27 1.0630	27	31	23.8	WRS273124A	19.1	36.2	5.50	S	10000	16000	0.025	27.000	26.991	31.025	31.009
28 1.1024	28	32	26	28R3226	17.1	31.5	4.95	S	10000	15000	0.027	28.000	27.991	32.025	32.009
	28	32	27	RF283227	22	43.9	6.80	P	10000	15000	0.017	28.000	27.991	32.025	32.009
	28	33	17	28R3317	18	29	4.50	S	10000	15000	0.022	28.000	27.991	33.025	33.009
	28	33	20	RF283320	19.5	32.2	5.10	P	10000	15000	0.016	28.000	27.991	33.025	33.009
	28	33	27	R28/27	25.1	44.5	6.95	S	10000	15000	0.036	28.000	27.991	33.025	33.009
	28	34	20	RFU283420	20.2	29.6	4.70	P	10000	16000	0.018	28.000	27.991	34.025	34.009
	28	35	37.5	RPU283538A	37	57.9	9.05	S	10000	16000	0.048	28.000	27.991	35.025	35.009
	28	38	20	28VU3820	21.6	22.9	3.65	S	10000	16000	0.048	28.000	27.991	38.025	38.009
	28	38	24	RS283824	31.7	37.9	6.05	S	10000	16000	0.070	28.000	27.991	38.025	38.009
	28	41	25	RV284125	40.9	44.6	7.15	S	11000	17000	0.088	28.000	27.991	41.025	41.009
	28	42	50.5	RF284251A	89.5	118	18.4	P	11000	17000	0.182	28.000	27.991	42.025	42.009

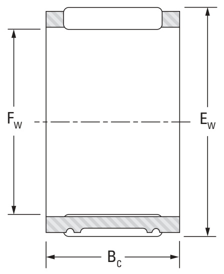
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

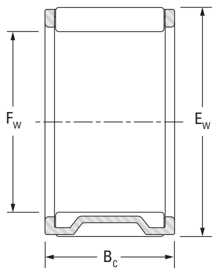
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



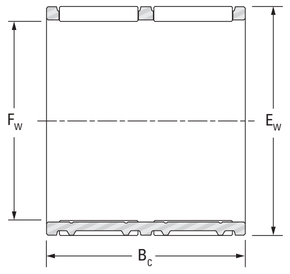
RS, R, RP



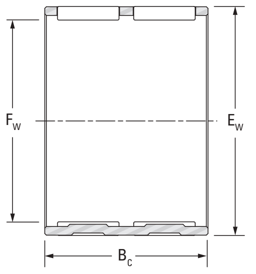
RV, V, VS

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
29 1.1417	**29**	**34**	**22**	R29/22A	**17.3**	**27.6**	4.30	S	10000	15000	**0.030**	**29.000**	**28.991**	**34.025**	**34.009**
	29	**34**	**24.4**	RFU293424A-1	**19.9**	**33.2**	5.15	P	10000	15000	**0.017**	**29.000**	**28.991**	**34.025**	**34.009**
	29	**34**	**27**	29R3427A-1	**25.8**	**46.7**	7.30	S	10000	15000	**0.037**	**29.000**	**28.991**	**34.025**	**34.009**
	29	**43**	**43**	RV294343	**74.4**	**93.3**	14.7	S	10000	16000	**0.177**	**29.000**	**28.991**	**43.025**	**43.009**
30 1.1811	**30**	**34**	**29**	30WR3429A	**14.3**	**25.2**	3.85	S	9100	14000	**0.032**	**30.000**	**29.991**	**34.025**	**34.009**
	30	**34**	**29**	RF303429	**20.6**	**41.2**	6.50	P	9100	14000	**0.016**	**30.000**	**29.991**	**34.025**	**34.009**
	30	**35**	**16**	RS303516	**18**	**29.7**	4.55	S	9100	14000	**0.023**	**30.000**	**29.991**	**35.025**	**35.009**
	30	**35**	**17**	R30/17-1	**18**	**29.7**	4.55	S	9100	14000	**0.024**	**30.000**	**29.991**	**35.025**	**35.009**
	30	**35**	**21.1**	RS303521A	**22.4**	**39.5**	6.20	S	9100	14000	**0.030**	**30.000**	**29.991**	**35.025**	**35.009**
	30	**35**	**24**	RS303524	**24.8**	**44.8**	7.05	S	9100	14000	**0.034**	**30.000**	**29.991**	**35.025**	**35.009**
	30	**37**	**16**	RV303716	**21.9**	**30.3**	4.65	S	10000	15000	**0.029**	**30.000**	**29.991**	**37.025**	**37.009**
	30	**37**	**26**	RV303726	**35.2**	**55.8**	8.75	S	10000	15000	**0.047**	**30.000**	**29.991**	**37.025**	**37.009**
	30	**37**	**32**	WRS30/32B	**32.6**	**50.4**	7.75	S	10000	15000	**0.066**	**30.000**	**29.991**	**37.025**	**37.009**
	30	**40**	**15.5**	RV304016A-4	**27.5**	**32.3**	4.90	S	10000	15000	**0.046**	**30.000**	**29.991**	**40.025**	**40.009**
	30	**42**	**32.2**	30V4232	**53.3**	**67.1**	10.6	S	10000	16000	**0.108**	**30.000**	**29.991**	**42.025**	**42.009**
	30	**45**	**30**	30V4530	**55.1**	**61.2**	9.75	S	10000	16000	**0.134**	**30.000**	**29.991**	**45.025**	**45.009**
31 1.2205	**31**	**36**	**20.3**	RFU313620A-1	**20.1**	**34.7**	5.40	P	9100	14000	**0.017**	**31.000**	**30.989**	**36.025**	**36.009**

(1) Cage material: P: polymer cage, S: steel cage



WR, WRS



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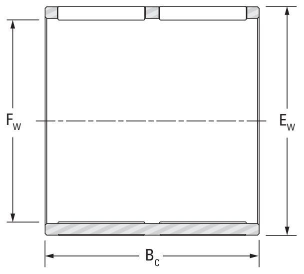

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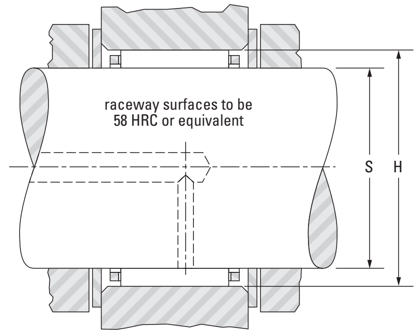
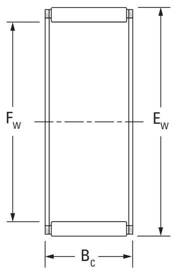


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
31 1.2205	**31**	**36**	**24.4**	RFU313624A	**21.3**	**37.1**	5.75	P	9100	14000	**0.019**	**31.000**	**30.989**	**36.025**	**36.009**
32 1.2598	**32**	**37**	**17**	R32/17-1	**18.9**	**32.4**	4.95	S	8500	13000	**0.026**	**32.000**	**31.989**	**37.025**	**37.009**
	32	**37**	**35**	WRS323735	**33.1**	**66.5**	10.3	S	8500	13000	**0.053**	**32.000**	**31.989**	**37.025**	**37.009**
	32	**38**	**25.9**	RP323826	**27.6**	**46.1**	7.20	S	9100	14000	**0.034**	**32.000**	**31.989**	**38.025**	**38.009**
	32	**39**	**16**	RS323916	**20.8**	**28.9**	4.40	S	9100	14000	**0.035**	**32.000**	**31.989**	**39.025**	**39.009**
	32	**39**	**42**	RVU323942	**41.3**	**69.3**	10.9	S	9100	14000	**0.078**	**32.000**	**31.989**	**39.025**	**39.009**
	32	**42**	**16**	RV324216	**28.4**	**34.1**	5.35	S	9100	14000	**0.049**	**32.000**	**31.989**	**42.025**	**42.009**
	32	**42**	**20.5**	RV324221-1	**34.3**	**43.4**	7.00	S	9100	14000	**0.060**	**32.000**	**31.989**	**42.025**	**42.009**
	32	**45**	**28**	32V4528	**48.7**	**57.6**	9.20	S	10000	15000	**0.112**	**32.000**	**31.989**	**45.025**	**45.009**
	32	**46**	**18**	RV324618-1	**31.1**	**30.8**	4.85	S	10000	15000	**0.075**	**32.000**	**31.989**	**46.025**	**46.009**
33 1.2992	**33**	**37**	**26**	RF333726	**23**	**49.1**	7.65	P	8500	13000	**0.018**	**33.000**	**32.989**	**37.025**	**37.009**
34 1.3386	**34**	**39**	**20.3**	RFU343920A	**19.8**	**34.9**	5.40	P	8500	13000	**0.018**	**34.000**	**33.989**	**39.025**	**39.009**
	34	**39**	**62.1**	WRFU343962A	**46.6**	**105**	16.3	P	8500	13000	**0.052**	**34.000**	**33.989**	**39.025**	**39.009**
	34	**42**	**38.2**	34R4238	**49.5**	**81.9**	12.8	S	8500	13000	**0.098**	**34.000**	**33.989**	**42.025**	**42.009**
35 1.3780	**35**	**40**	**25**	RS354025-1	**27.2**	**53.2**	8.40	S	7800	12000	**0.041**	**35.000**	**34.989**	**40.025**	**40.009**
	35	**40**	**28**	RF354028	**28.7**	**56.9**	8.90	P	7800	12000	**0.027**	**35.000**	**34.989**	**40.025**	**40.009**
	35	**40**	**28.9**	RP354029-1	**30.6**	**61.7**	9.50	S	7800	12000	**0.033**	**35.000**	**34.989**	**40.025**	**40.009**

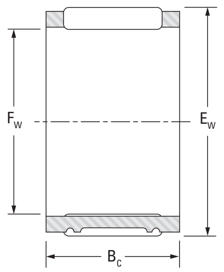
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

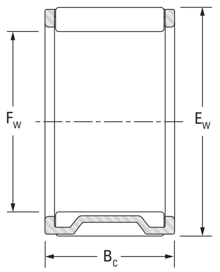
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



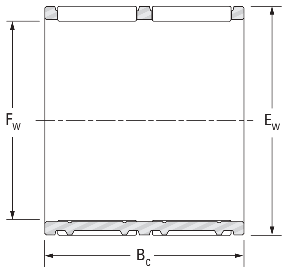
RS, R, RP



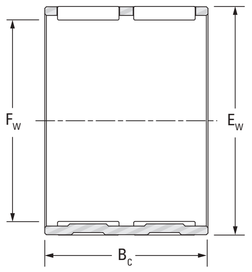
RV, V, VS

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
35 1.3780	35	40	31	RP354031	30.8	62.1	9.60	S	7800	12000	0.037	35.000	34.989	40.025	40.009
	35	40	33	RP354033-1	31.3	63.8	9.85	S	7800	12000	0.040	35.000	34.989	40.025	40.009
	35	40	35	RF354035	31.8	64.9	10.1	P	7800	12000	0.032	35.000	34.989	40.025	40.009
	35	42	20	VS35/20	27.5	42.6	6.80	S	7800	12000	0.042	35.000	34.989	42.025	42.009
	35	48	17.5	RF354818A-1	42.5	50	7.85	P	8500	13000	0.061	35.000	34.989	48.025	48.009
	35	48	17.5	RV354818A-4	38.7	44.1	6.90	S	8500	13000	0.081	35.000	34.989	48.025	48.009
36 1.4173	36	41	20	RS364120	22	40.9	6.35	S	7800	12000	0.034	36.000	35.989	41.025	41.009
	36	42	17	RS364217-K	20.5	32.8	5.05	S	7800	12000	0.035	36.000	35.989	42.025	42.009
	36	43	22.4	RFU364322A	26	39.8	6.30	P	7800	12000	0.029	36.000	35.989	43.025	43.009
37 1.4567	37	42	22	37R4222	24.1	46.3	7.25	S	7200	11000	0.038	37.000	36.989	42.025	42.009
	37	42	23	RF374223-1	24.1	46.1	7.20	P	7200	11000	0.022	37.000	36.989	42.025	42.009
38 1.4961	38.02	42.98	17	R38/17-1	18.6	33.6	5.15	S	7200	11000	0.032	38.000	37.989	43.025	43.009
	38	44	26	RF384426	28.9	51.7	8.15	P	7200	11000	0.031	38.000	37.989	44.025	44.009
	38	44	33	RP384433	38.1	74	11.5	S	7200	11000	0.055	38.000	37.989	44.025	44.009
	38	44	39.8	RP384440A	43.9	88.7	13.8	S	7200	11000	0.064	38.000	37.989	44.025	44.009
	38	44	40	WRPU384440F	44.1	89.3	14.2	S	7200	11000	0.075	38.000	37.989	44.025	44.009
	38	46	26	RS384626	36.8	57.8	9.10	S	7800	12000	0.077	38.000	37.989	46.025	46.009

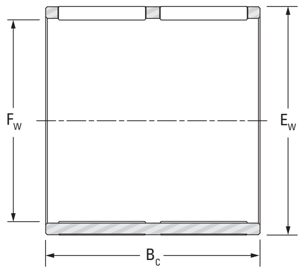
(1) Cage material: P: polymer cage, S: steel cage



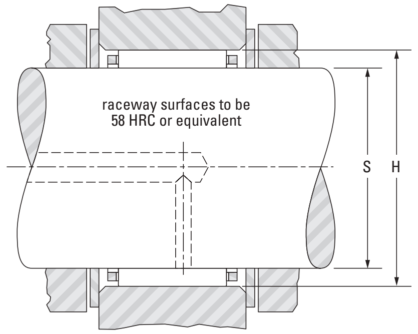
WR, WRS



WRP



WRF

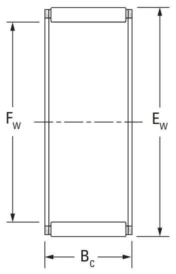


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
39 1.5354	39	44	43	WRS394443	41.3	94.3	14.9	S	7200	11000	0.075	39.000	38.989	44.025	44.009
	39	44	43.8	39WR4444	39.1	88	13.7	S	7200	11000	0.080	39.000	38.989	44.025	44.009
	39	46	32.8	39R4633	42.5	76.9	12.0	S	7200	11000	0.086	39.000	38.989	46.025	46.009
	39	46	37.8	RSU394638A	46.2	85.4	13.3	S	7200	11000	0.096	39.000	38.989	46.025	46.009
	39	46	44.3	WRP394644A	54.9	107	16.8	S	7200	11000	0.102	39.000	38.989	46.025	46.009
	39	55	20.5	RF395521A	56.1	64.2	10.5	P	7800	12000	0.098	39.000	38.989	55.029	55.01
40 1.5748	40	45	27	RS404527	30.3	63.6	9.90	S	7200	11000	0.049	40.000	39.989	45.025	45.009
	40	45	30	R40/30	30.8	64.9	10.1	S	7200	11000	0.055	40.000	39.989	45.025	45.009
	40	45	32	R40/32A	14.3	23.3	3.60	S	7200	11000	0.053	40.000	39.989	45.025	45.009
	40	47	20	RS40/20	27.7	44.8	7.00	S	7200	11000	0.054	40.000	39.989	47.025	47.009
	40	48	34	40V4834	50.5	88.3	13.7	S	7200	11000	0.087	40.000	39.989	48.025	48.009
	40	55	27.5	RF405528A-1	68.8	87.1	13.8	P	7800	12000	0.121	40.000	39.989	55.029	55.01
	40	55	30	RF405530	73.6	94.9	15.2	P	7800	12000	0.132	40.000	39.989	55.029	55.01
	40	56	20	RV405620-4	51.9	58.3	9.45	S	7800	12000	0.130	40.000	39.989	56.029	56.01
	40	60	31.5	RF406032A	95.2	112	17.8	P	7800	12000	0.214	40.000	39.989	60.029	60.01
41.3 1.6260	41.3	47.3	23.6	RFU414724A	27.9	50.8	7.95	P	6500	10000	0.030	41.300	41.289	47.325	47.309
42 1.6535	42	47	30	RSU424730F	32.3	70.4	11.0	S	6500	10000	0.058	42.000	41.989	47.025	47.009

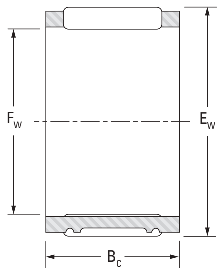
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

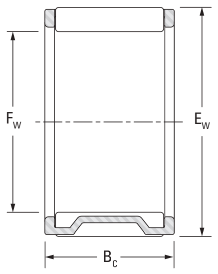
METRIC SERIES R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



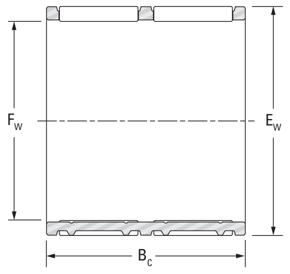
RS, R, RP



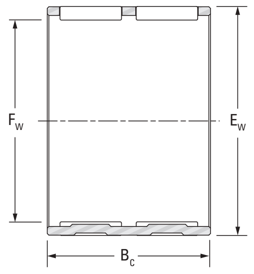
RV, V, VS

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
42 1.6535	42	49	22	RF424922	29.7	49.7	7.95	P	6500	10000	0.035	42.000	41.989	49.025	49.009
43.5 1.7126	43.5	50.5	33.8	RF445134A	46.5	89.6	13.9	P	6500	10000	0.059	43.500	43.489	50.529	50.51
44 1.7323	44	50	27.5	44RFN5028	36	72.2	11.3	P	6500	10000	0.041	44.000	43.989	50.025	50.009
	44	50	39	RP445039	46.8	101	15.6	S	6500	10000	0.070	44.000	43.989	50.025	50.009
44.5 1.7520	44.5	51.5	36	RP455236A	49.1	96.6	15.0	S	6500	10000	0.075	44.500	44.489	51.529	51.51
	44.5	51.5	41.6	RP455242A	54	109	17.1	S	6500	10000	0.086	44.500	44.489	51.529	51.51
45 1.7717	45	49	25	RFU454925	25.3	61.5	9.70	P	6000	9300	0.023	45.000	44.989	49.025	49.009
	45	50	17	RS455017	23.1	46.8	7.30	S	6100	9400	0.035	45.000	44.989	50.025	50.009
	45	50	19	R45/19	24.2	49.7	7.80	S	6100	9400	0.039	45.000	44.989	50.025	50.009
	45	50	24	RS455024	29.4	63.9	10.0	S	6100	9400	0.050	45.000	44.989	50.025	50.009
	45	50	33	R45/33	37.1	86.1	13.3	S	6100	9400	0.068	45.000	44.989	50.025	50.009
	45	52	22	RS455222	35.4	63.9	10.0	S	6200	9500	0.066	45.000	44.989	52.029	52.01
	45	64	23	RV456423-7	65.2	72.1	11.8	S	6500	10000	0.191	45.000	44.989	64.029	64.01
46 1.8110	46	53	42.6	RPU465343A	48.3	95	14.9	S	6000	9300	0.084	46.000	45.989	53.029	53.01
47 1.8504	47	52	30	R47/30H	36.5	85.4	13.2	S	5800	8900	0.062	47.000	46.989	52.029	52.01
	47	53	28.8	RP475329A	35.6	72.7	11.4	S	5900	9000	0.054	47.000	46.989	53.029	53.01
	47	53	36	RP475336	47.4	105	16.2	S	5900	9000	0.068	47.000	46.989	53.029	53.01

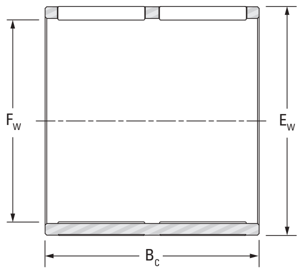
(1) Cage material: P: polymer cage, S: steel cage



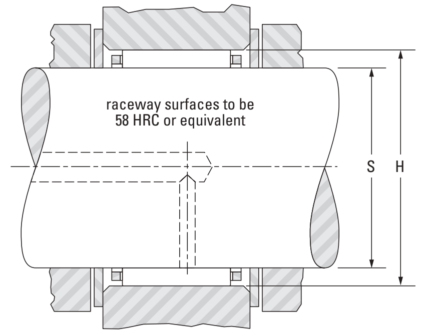
WR, WRS



WRP



WRF

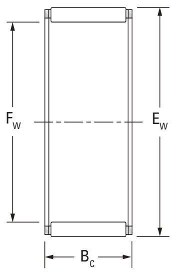


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
47 1.8504	47	54	38.6	WRP475439A	49.1	98.4	15.5	S	5900	9100	0.107	47.000	46.989	54.029	54.01
47.9 1.8858	47.9	52.9	25	RF485325A-1	31.2	70.4	10.9	P	5700	8800	0.033	47.900	47.889	52.929	52.91
	47.9	52.9	33.8	RF485334A-1	23.7	48.3	7.50	P	5700	8800	0.030	47.900	47.889	52.929	52.91
48 1.8898	48	53	28	48R5328	34.2	79.2	12.3	S	5700	8700	0.060	48.000	47.989	53.029	53.01
	48	54	20	48R5420-1	29.4	57.3	8.90	S	5700	8800	0.054	48.000	47.989	54.029	54.01
	48	54	39	48R5439	48.5	109	16.8	S	5700	8800	0.106	48.000	47.989	54.029	54.01
49 1.9291	49	56	44.6	RF495645A	61.2	133	20.7	P	5700	8700	0.087	49.000	48.989	56.029	56.01
50 1.9685	50	55	27	R50/27A	11.5	18.9	2.95	S	5500	8400	0.056	50.000	49.989	55.029	55.01
	50	56	30	RF505630	41.2	89.6	14.0	P	5500	8500	0.050	50.000	49.989	56.029	56.01
	50	56	40	50WR5640	51.2	119	18.5	S	5500	8500	0.110	50.000	49.989	56.029	56.01
	50	57	33.5	RP505734A	48.1	97.9	15.3	S	5500	8500	0.080	50.000	49.989	57.029	57.01
	50	57	38.9	RS505739A	58.4	126	19.7	S	5500	8500	0.142	50.000	49.989	57.029	57.01
	50	58	25	RF505825	38.5	66.9	10.6	P	5600	8600	0.054	50.000	49.989	58.029	58.01
	50	70	36	RF507036	115	149	23.9	P	6000	9300	0.277	50.000	49.989	70.029	70.01
50.8 2.0000	50.8	64.8	50	RF516550A	124	207	32.4	P	5700	8800	0.258	50.800	50.787	64.829	64.81
	50.8	64.8	60	RV516560	138	237	36.7	S	5700	8800	0.369	50.800	50.787	64.829	64.81
51.9 2.0433	51.9	57.9	28	RF525828A	40.9	89.9	14.0	P	5300	8100	0.050	55.500	55.487	61.529	61.51

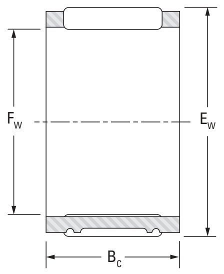
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

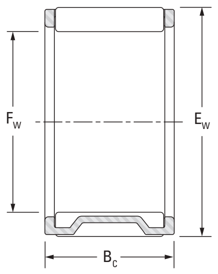
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



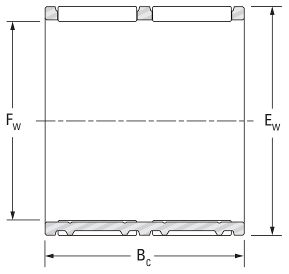
RS, R, RP



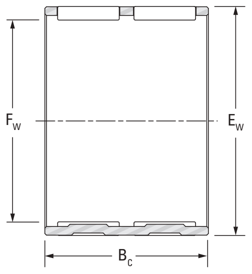
RV, V, VS

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
51.9 2.0433	51.9	57.9	35.4	RF525835A	28.2	54.3	8.45	P	5300	8100	0.041	55.500	55.487	61.529	61.51
53 2.0866	53	58	25	RF535825	32.3	76	11.9	P	5100	7900	0.035	53.000	52.987	58.029	58.01
54 2.1260	54	60	36	RP546036	46	105	16.5	S	5100	7800	0.085	54.000	53.987	60.029	60.01
	54	61	35.8	RFU546136A	53.2	114	17.8	P	5100	7900	0.075	54.000	53.987	61.029	61.01
	54	61	41.3	RF546141A	63.5	143	22.4	P	5100	7900	0.092	54.000	53.987	61.029	61.01
55 2.1654	55	59	13	55RFN5913A	10.9	21.9	3.35	P	4900	7500	0.011	55.000	54.987	59.029	59.01
56 2.2047	56	61	33.5	R56/34	42.6	111	17.2	S	4800	7400	0.084	56.000	55.987	61.029	61.01
	56	63	47	RPU566347	60	135	21.1	S	4900	7600	0.119	56.000	55.987	63.029	63.01
58 2.2835	58	65	26.2	58R6526	42.2	87.1	13.7	S	4700	7300	0.099	58.000	57.987	65.029	65.01
	58	65	36.6	58RFN6537A	55.9	125	19.5	P	4700	7300	0.081	58.000	57.987	65.029	65.01
	58	65	36.6	RS586537A-2	56.7	127	19.8	S	4700	7300	0.157	58.000	57.987	65.029	65.01
	58	65	42.6	WRP586543A	60.1	137	21.9	S	4700	7300	0.144	58.000	57.987	65.029	65.01
	58	80	72	RV588072	233	361	55.9	S	5200	8000	0.889	58.000	57.987	80.029	80.01
60 2.3622	60	65	30	R60/30	40.1	105	16.2	S	4500	6900	0.081	60.000	59.987	65.029	65.01
	60	82	30	RF608230	120	155	24.9	P	5000	7700	0.340	60.000	59.987	82.034	82.012
63 2.4803	63	68	30	R63/30	41	110	17.0	S	4300	6600	0.083	63.000	62.987	68.029	68.01
	63	75	38.15	RV637538-1	121	240	38.0	S	4500	6900	0.270	63.000	62.987	75.029	75.01

(1) Cage material: P: polymer cage, S: steel cage



WR, WRS



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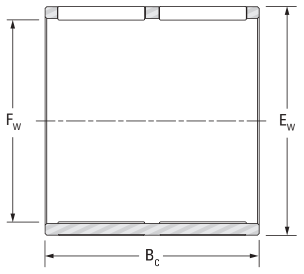
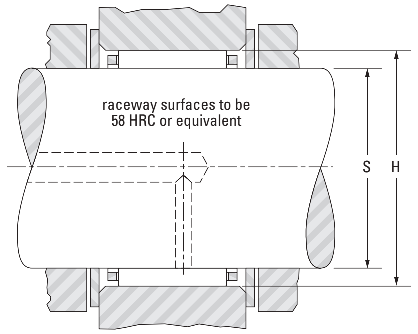


WRF



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
65 2.5591	65	70	20	R65/20A	12.2	22.3	3.50	S	4200	6400	0.057	65.000	64.987	70.029	70.01
	65	70	24	R65/24A	12.5	22.9	3.60	S	4200	6400	0.067	65.000	64.987	70.029	70.01
68 2.6772	68	73	31.6	WRS687332A	45.7	129	19.8	S	4000	6100	0.095	68.000	67.987	73.029	73.01
70 2.7559	70	76	20	70R7620	34.8	80.8	12.7	S	3800	5900	0.077	70.000	69.987	76.029	76.01
	70	80	55	70WR8055	103	225	35.5	S	4000	6100	0.351	70.000	69.987	80.029	80.01
71 2.7953	71	79	30.15	71V7930B	61.5	138	21.4	S	3800	5900	0.135	71.000	70.987	79.029	79.01
73 2.8740	73	79	20	R73/20	36.4	86.8	13.5	S	3700	5700	0.084	73.000	72.987	79.029	79.01
76.2 3.0000	76.2	85.5	31.7	76V8632A	76.3	167	26.1	S	3600	5600	0.177	76.200	76.187	85.534	85.512
	76.2	85.5	33.2	RV768633A	78.5	173	27.2	S	3600	5600	0.187	76.200	76.187	85.534	85.512
	76.2	85.5	44.2	RV768644A-2	95.6	222	34.8	S	3600	5600	0.235	76.200	76.187	85.534	85.512
	76.2	88	34	RV768834A	91.1	177	27.9	S	3600	5600	0.250	76.200	76.187	88.034	88.012

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CONNECTING ROD APPLICATIONS

METRIC SERIES

Connecting rods have two bearing positions: the crank pin or big end, and the wrist pin or small end.

In the crank pin position there may be severe operating conditions due to centrifugal forces, internal forces, accelerations and high rotational speeds, requiring the use of special radial needle roller and cage assemblies.

Similarly, in the wrist pin position the reciprocating inertia loads and high oscillating speeds dictate the use of special cage designs.

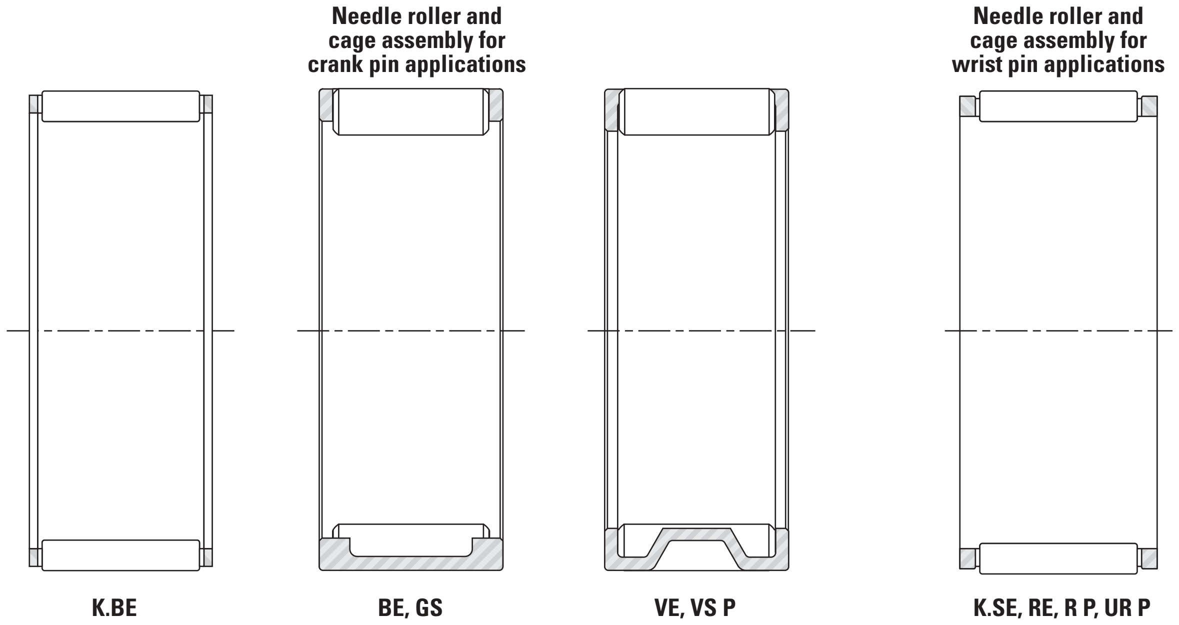


Fig. B1-3. Types of metric series radial needle roller and cage assemblies

CONSTRUCTION

METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CRANK PIN POSITIONS

Needle roller and cage assemblies for use in crank pin positions have cages with a large outside cylindrical surface to ensure optimum radial guidance in the connecting rod bore. Due to the inherent low weight and strength of the heat-treated cages, the needle roller and cage assemblies are well-suited for high-speed engine applications. When necessary, silver plating and copper plating can be applied for optimum performance during operation at high speeds.

METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR WRIST PIN POSITIONS

Reciprocating inertia loads and oscillating speeds require the cages used in the wrist pin positions to be heat-treated and to guide on the wrist pin.

These cages are available in a variety of widths to allow the selection of a needle roller and cage assembly with the length of needle rollers to match the connecting rod width.

SIZE SELECTION

In most instances, selection of a suitable size of a needle roller and cage assembly for typical connecting rod positions may be based on the cylinder displacement of the engine which in turn, dictates the crank pin and wrist pin diameters.

Suggestions, based on engine displacements, are listed in the following table.

Table B1-3. Crank pin and wrist pin diameters, determined by the cylinder displacement of the engine

		Cylinder displacement in cm^3						
Cylinder Displacement	>		40	60	100	150	200	300
	≤	40	60	100	150	200	300	
		Diameter						
		mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
Crank pin		**12/14** 0.4724/0.5512	**15/16/18** 0.5906/0.6299/0.7087	**18/20** 0.7087/0.7874	**18/20/22** 0.7087/0.7874/0.8661	**24/25/28** 0.9449/0.9843/1.1024	**28/30** 1.1024/1.1811	**35/40** 1.3780/1.5748
Wrist pin		**10/11** 0.3937/0.4331	**12/13** 0.4724/0.5118	**14/15** 0.5512/0.5906	**15/16** 0.5906/0.6299	**18** 0.7087	**20** 0.7874	**20** 0.7874

CONNECTING ROD GUIDANCE ARRANGEMENTS

End guidance of a connecting rod can be provided either at the crank pin or at the wrist pin end. Connecting-rod guidance is achieved at the crank pin end using a small clearance between the crank counterweights. Guidance at the wrist pin end is controlled by a small clearance between the piston bosses.

CRANK PIN END GUIDANCE

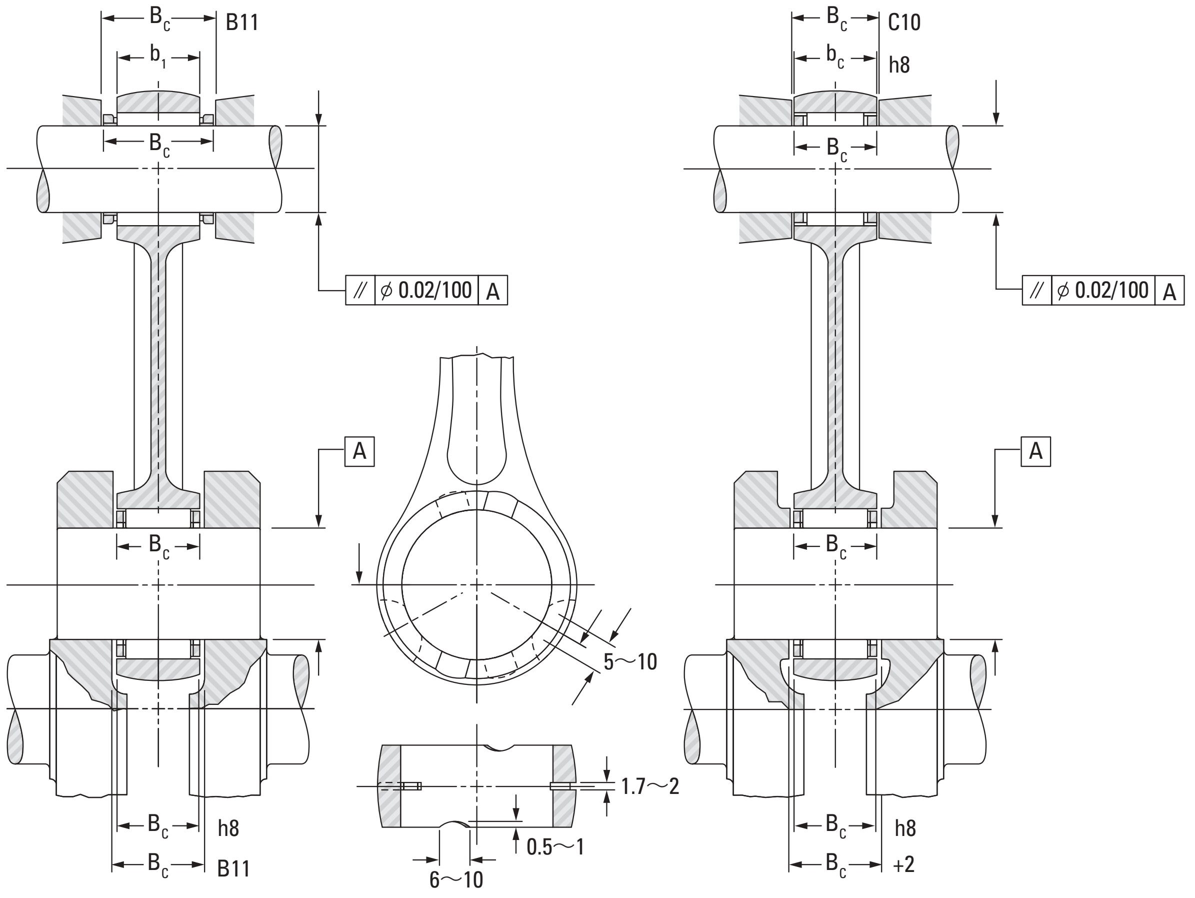
With crank pin end guidance, care must be taken that an adequate amount of lubricant is supplied to the crank pin bearing and the surfaces that guide the connecting rod. For this purpose, grooves in the connecting rod end faces, or slots in the connecting rod bore aligned with the incoming lubrication path, should be provided. Occasionally, bronze or hardened steel washers may be used for end guidance of the connecting rod.

At the wrist pin end, the needle roller and cage assembly is located axially between the piston bosses. It may be both economical and effective to machine the connecting rod at the wrist pin end and at the crank pin end to the same width. It is suggested that, at the wrist pin end, the needle roller length does not overhang the connecting rod width. Otherwise, the load rating of the needle roller and cage assembly will be reduced.

WRIST PIN END GUIDANCE

Wrist pin end will get the most effective axial guidance between the piston bosses. Grooves in the bottom of the piston bosses and a chamfer of small angle – on each side of the upper portion of the connecting rod small end – can improve the oil flow to the needle roller and cage assembly and its guiding surfaces.

The length of the needle roller and cage assembly and the connecting rod width at the crank pin end should be identical to ensure best possible radial piloting of cage in the bore of the connecting rod. The crank counterweights are recessed to allow proper axial alignment of the connecting rod. As a rule, it is not necessary to have an additional supply of lubricant. Only in engines with sparse lubrication should consideration be given to provide lubricating slots in the connecting rod bores as with crank pin end guidance.



Crank Pin End Guidance

Wrist Pin End Guidance

Fig. B1-4. Crank pin and wrist pin end guidance

SUITABLE MATERIALS AND HEAT TREATMENT

Connecting rod crank pin end and wrist pin end bores that serve as raceways:

> a case-hardening steel such as SNCM 420, 15 CrNi 6, 17 MnCr 5, or AISI 8620.

Crank pins:

> a case-hardening steel such as SCM 415, 15 Cr 3, AISI 8620, or AISI 1018; a through-hardening steel such as SUJ 2m, 100 Cr 6, or AISI 52100; or a similar substance.

Wrist pins:

> a case-hardening steel such as SCr 420, Ck 15, or 15 Cr 3; a through-hardening steel such as SUJ 2, 100 Cr 6, or AISI 52100; or a similar substance.

See Table B1-4 for the effective case depths of the raceways.

After hardening, the connecting rods must be stress-relieved.

FORM TOLERANCES

The recommended mounting specifications for crank pins, wrist pins, and connecting rods are listed in Table B1-4.

Table B1-4. Form tolerances

Classification		Connecting rod crank pin end and wrist pin end holes	Crank pin and wrist pin outer diameters
Surface roughness (Ra)		**0.16 a or less**	**0.1 a or less**
Hardness		**60 – 64 HRC**	
Hardening layer depth (mm) (depth to 550 HV)		**0.6 – 1.2 mm**	
Out-of-roundness (μm)	Greater than 9 and less than or equal to 18	**1.5**	**1**
	Greater than 18 and less than or equal to 30	**2**	**1.5**
	Greater than 30 and less than or equal to 40	**2.5**	**2**
Taper (μm)	Greater than 9 and less than or equal to 18	**2**	**1**
	Greater than 18 and less than or equal to 30	**3**	**2**
	Greater than 30 and less than or equal to 42	**4**	**3**
Parallelism		**0.02 mm or less per 100 mm**	

RADIAL CLEARANCE

METRIC SERIES CRANK PIN BEARINGS

The high speeds of modern production engines dictate the need for crank pin bearings with a relatively large radial clearance. As an approximation, the minimum clearance can be taken as the crank pin diameter/1000. The maximum radial clearance would be a result of the sorting plan shown in Table B1-6(1) on page B1-46.

As shown in the example of the matching scheme, the suggested mounting diameters for the crank pin position are G6 for the connecting rod bore diameters and h5 for the crank pin diameters. Axial location of the cage is shown on the crank pin end guidance arrangement.

Racing and sport engines operate at even higher speeds than production engines, requiring 50 percent larger radial clearances in the crank pin bearings. The larger radial clearances also should be used in bores of split connecting rods to avoid the danger of distortion – resulting from the unavoidable connecting rod deformation occurring in operation. Consult your representative for advice on such applications.

METRIC SERIES WRIST PIN BEARINGS

The radial clearance in wrist pin bearings should be held as small as possible. The minimum clearance should be aimed at 2 μm with the maximum clearance resulting from the proposed sorting plan in Table B1-6(2) on page B1-46. The maximum clearance should be held as close as possible to 12 μm for all wrist pin bearings based on sorting wrist pins made to a tolerance h5, small end bore diameter tolerance of K6 and needle roller grades as shown in Table B1-6(2) on page B1-46.

The recommended radial clearances for prefix BE, GS, VE, VSP, RE, RP, and URP bearings are shown in Table B1-5.

Table B1-5. Recommended radial clearances

Diameter classification		Crank pin end		Wrist pin end	
Over	Or less	Min.	Max.	Min.	Max.
mm		**μm**		**μm**	
—	10	9	25	3	14
10	18	9	25	3	14
18	30	10	25	5	17
30	40	18	33	—	—

METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CONNECTING ROD APPLICATIONS

MATCHING SCHEME FOR A CRANK PIN BEARING ARRANGEMENT
(three diameter ranges are specified for the connecting rod and crank pin)

Example:	Satisfy conditions of Radial clearance 20 µm – 33 µm	
	Crank pin diameter	20 mm, tolerance h5
	Connecting rod bore diameter	26 mm, tolerance G6
	Needle roller and cage assembly	K20x26x12BE

Table B1-6(1). Radial clearance

		Connecting Rod Crank Pin End Bore Diameter 26 mm Tolerance range					
		+7 – +12		+12 – +16		+16 – +20	
		Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance
Crank Pin Diameter 20 mm Tolerance range	**-3 – 0**	-9 – -7	21 – 33	-6 – -4 -7 – -5	20 – 31 22 – 33	-4 – -2 -5 – -3	20 – 31 22 – 33
	-6 – -3	-7 – -5	20 – 32	-5 – -3	21 – 32	-3 – -1	21 – 32
	-9 – -6	-6 – -4	21 – 33	-3 – -1 -4 – -2	20 – 31 22 – 33	-2 – 0	22 – 33

MATCHING SCHEME FOR A WRIST PIN BEARING ARRANGEMENT
(three diameter ranges are specified for the connecting rod and wrist pin)

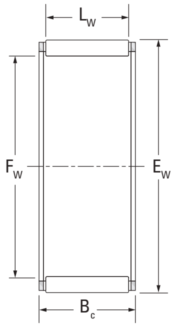
Example:	Satisfy conditions of Radial clearance 2 µm – 16 µm	
	Wrist pin diameter	16 mm, tolerance h5
	Connecting rod bore diameter	20 mm, tolerance K6
	Needle roller and cage assembly	K16x20x20SE

Table B1-6(2). Radial clearance

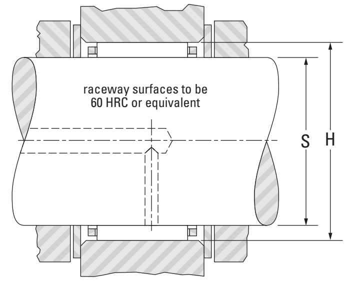
		Wrist Pin End Bore Diameter 20 mm Tolerance range					
		-11 – -6		-6 – -2		-2 – +2	
		Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance
Wrist Pin Diameter 16 mm Tolerance range	**-3 – 0**			-6 – -4 -7 – -5	2 – 13 4 – 15	-4 – -2 -5 – -3	2 – 13 4 – 15
	-6 – -3	-7 – -5	2 – 14	-5 – -3 -6 – -4	3 – 14 5 – 16	-3 – -1 -4 – -2	3 – 14 5 – 16
	-8 – -6	-6 – -4 -7 – -5	3 – 14 5 – 16	-3 – -1 -4 – -2	2 – 12 4 – 14	-2 – 0	4 – 10

ASSEMBLIES FOR CRANK PIN END APPLICATIONS

METRIC SERIES
K BE SERIES



K BE



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	kg lbs	mm in	mm in	mm in	mm in
12 0.4724	**12** 0.4724	**16** 0.6299	**10** 0.394	**7.8** 0.307	K12X16X10BE	**6.21** 1400	**6.70** 1510	1.00	**0.004** 0.009	**12.000** 0.4724	**11.992** 0.4721	**16.017** 0.6306	**16.006** 0.6302
	12 0.4724	**17** 0.6693	**10** 0.394	**7.8** 0.307	K12X17X10BE	**7.32** 1650	**7.21** 1620	1.10	**0.005** 0.011	**12.000** 0.4724	**11.992** 0.4721	**17.017** 0.6700	**17.006** 0.6695
14 0.5512	**14** 0.5512	**18** 0.7087	**10** 0.394	**7.8** 0.307	K14X18X10BE	**6.89** 1550	**7.98** 1790	1.20	**0.005** 0.011	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**20** 0.7874	**10** 0.394	**7.8** 0.307	K14X20X10BE	**8.90** 2000	**8.61** 1940	1.30	**0.007** 0.015	**14.000** 0.5512	**13.992** 0.5509	**20.020** 0.7882	**20.007** 0.7877
	14 0.5512	**20** 0.7874	**12** 0.472	**9.5** 0.374	K14X20X12BE	**10.50** 2360	**10.60** 2380	1.60	**0.009** 0.020	**14.000** 0.5512	**13.992** 0.5509	**20.020** 0.7882	**20.007** 0.7877
16 0.6299	**16** 0.6299	**21** 0.8268	**10** 0.394	**7.8** 0.307	K16X21X10BE	**8.17** 1840	**8.90** 2000	1.35	**0.007** 0.015	**16.000** 0.6299	**15.992** 0.6296	**21.020** 0.8276	**21.007** 0.8270
	16 0.6299	**22** 0.8661	**12** 0.472	**9.5** 0.374	K16X22X12BE	**11.20** 2520	**11.90** 2680	1.80	**0.011** 0.024	**16.000** 0.6299	**15.992** 0.6296	**22.020** 0.8669	**22.007** 0.8664
18 0.7087	**18** 0.7087	**24** 0.9449	**12** 0.472	**9.5** 0.374	K18X24X12BE	**11.80** 2650	**13.10** 2940	1.95	**0.011** 0.024	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
	18 0.7087	**24** 0.9449	**13** 0.512	**10.5** 0.413	WK18X24X13BE	**12.80** 2880	**14.60** 3280	2.20	**0.011** 0.024	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
	18 0.7087	**24** 0.9449	**15** 0.591	**11.8** 0.465	K18X24X15BE	**13.30** 2990	**15.20** 3420	2.35	**0.014** 0.031	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
19 0.748	**19** 0.748	**25** 0.9843	**15** 0.591	**12.5** 0.492	K19X25X15BE	**14.70** 3300	**17.60** 3960	2.70	**0.014** 0.031	**19.000** 0.7480	**18.991** 0.7477	**25.020** 0.9850	**25.007** 0.9845
20 0.7874	**20** 0.7874	**26** 1.0236	**12** 0.472	**9.8** 0.386	K20X26X12BE	**13.30** 2990	**15.80** 3550	2.40	**0.013** 0.029	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**26** 1.0236	**17** 0.669	**13.8** 0.543	K20X26X17BE	**14.90** 3350	**18.20** 4090	2.85	**0.017** 0.037	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
22 0.8661	**22** 0.8661	**28** 1.1024	**13** 0.512	**9.8** 0.386	K22X28X13BE	**13.90** 3120	**17.10** 3840	2.60	**0.015** 0.033	**22.000** 0.8661	**21.991** 0.8658	**28.020** 1.1031	**28.007** 1.1026
	22 0.8661	**29** 1.1417	**16** 0.63	**12.8** 0.504	K22X29X16BE	**18.50** 4160	**22.30** 5010	3.45	**0.021** 0.046	**22.000** 0.8661	**21.991** 0.8658	**29.020** 1.1425	**29.007** 1.1420
24 0.9449	**24** 0.9449	**30** 1.1811	**13** 0.512	**9.8** 0.386	K24X30X13BE	**14.40** 3240	**18.40** 4140	2.80	**0.016** 0.035	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814
	24 0.9449	**30** 1.1811	**15** 0.591	**11.8** 0.465	K24X30X15BE	**15.30** 3440	**19.70** 4430	3.05	**0.018** 0.040	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814

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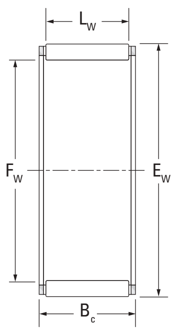
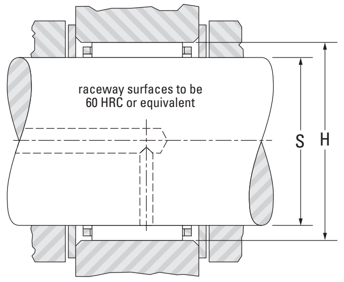
ASSEMBLIES FOR CRANK PIN END APPLICATIONS

METRIC SERIES
K BE SERIES



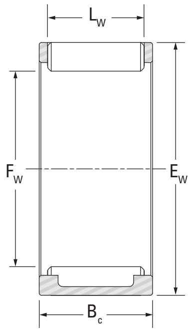
K BE



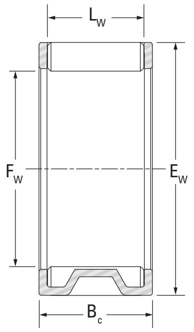
Shaft Dia.	Fw	Ew	Bc -0.20 -0.008 -0.55 -0.022	Lw	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C0	Fatigue Load Limit Cu	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	kg lbs	mm in	mm in	mm in	mm in
24 0.9449	**24** 0.9449	**30** 1.1811	**17** 0.669	**13.8** 0.543	K24X30X17BE	**19.00** 4270	**26.30** 5910	4.15	**0.021** 0.040	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814
25 0.9843	**25** 0.9843	**31** 1.2205	**19.8** 0.78	**17.8** 0.701	WK25X31X20BE	**23.30** 5240	**34.50** 7760	5.40	**0.024** 0.053	**25.000** 0.9843	**24.991** 0.9839	**31.025** 1.2215	**31.009** 1.2208
	25 0.9843	**32** 1.2598	**16** 0.63	**12.8** 0.504	K25X32X16BE	**19.20** 4320	**24.30** 5460	3.75	**0.022** 0.049	**25.000** 0.9843	**24.991** 0.9839	**32.025** 1.2608	**32.009** 1.2602
	25 0.9843	**32** 1.2598	**24** 0.945	**19.8** 0.780	K25X32X24BE	**27.50** 6180	**38.50** 8660	6.05	**0.035** 0.077	**25.000** 0.9843	**24.991** 0.9839	**32.025** 1.2608	**32.009** 1.2602
30 1.1811	**30** 1.1811	**37** 1.4567	**16** 0.63	**12.8** 0.504	K30X37X16BE	**21.60** 4860	**29.80** 6700	4.60	**0.029** 0.064	**30.000** 1.1811	**29.991** 1.1807	**37.025** 1.4577	**37.009** 1.4570
35 1.378	**35** 1.378	**42** 1.6535	**20** 0.787	**16.8** 0.661	K35X42X20BE	**29.70** 6680	**47.00** 10600	7.45	**0.039** 0.086	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539

ASSEMBLIES FOR CRANK PIN END APPLICATIONS

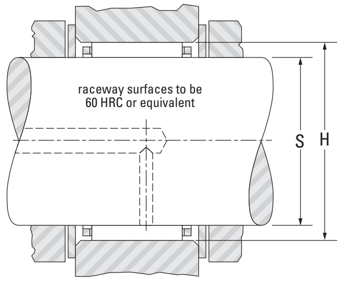
METRIC SERIES
BE, GS, VE, VS P SERIES



BE, GS



VE, VS P



Shaft Dia.	Fw	Ew	Bc -0.20 -0.008 -0.55 -0.022	Lw	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C0	Fatigue Load Limit Cu	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	kg lbs	mm in	mm in	mm in	mm in
12 0.4724	**12**	**16**	**10**	**7.4**	12VS1610P-1	**5.95**	**6.35**	0.960	**0.004**				
16 0.6299	**16**	**22**	**11.8**	**8.8**	VE162212AB1-2	**9.65**	**9.8**	1.50	**0.011**				
	16	**22**	**13.2**	**9.8**	VE162213ASB1	**10.6**	**11**	1.70	**0.012**				
17 0.6693	**17**	**23**	**14**	**10.8**	17VS2314AP	**11.2**	**12.1**	1.85	**0.013**				
20 0.7874	**20**	**26**	**13.8**	**10.8**	BE202614BSB1	**15.2**	**18.7**	2.85	**0.017**				
	20	**26**	**14**	**10.8**	20VS2614CP-2	**13.3**	**15.7**	2.40	**0.015**				
	20	**26**	**14**	**10.8**	BE202614SY1B1	**13.3**	**15.7**	2.40	**0.016**				
22 0.8661	**22**	**28**	**14**	**10.8**	22VS2814FP	**13.2**	**15.9**	2.45	**0.016**				
	22	**28**	**15.7**	**12.8**	BE222816ASB1	**17.9**	**23.7**	3.65	**0.02**				
	22	**28**	**16**	**11.8**	VS22/16KP-1	**13.8**	**16.9**	2.55	**0.018**				
	22	**29**	**16**	**11.8**	22VS2916BP	**15.7**	**18**	2.75	**0.021**				
	22	**29**	**16.8**	**12.8**	BE222917ASY1B1-2	**18.7**	**22.7**	3.45	**0.027**				
23 0.9055	**23**	**28**	**12**	**8.8**	23VS2812AP	**11.6**	**15.5**	2.30	**0.013**				
25 0.9843	**25**	**32**	**15.8**	**12.8**	BE253216ASY1B1	**20.6**	**26.6**	4.10	**0.026**				
26 1.0236	**26**	**32**	**19.8**	**15.8**	BE263220ASB1	**22.9**	**34.2**	5.45	**0.03**				
27 1.0630	**27**	**36**	**18**	**13.8**	27VS3618P	**23.4**	**27.1**	4.15	**0.042**				
	27	**36**	**20.8**	**16.8**	VE273621AB1	**29.8**	**37.1**	5.90	**0.047**				

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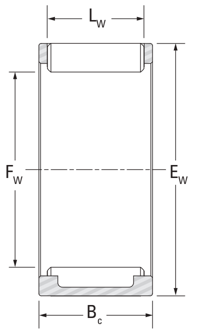
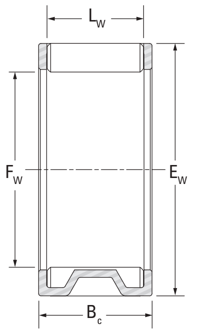
ASSEMBLIES FOR CRANK PIN END APPLICATIONS

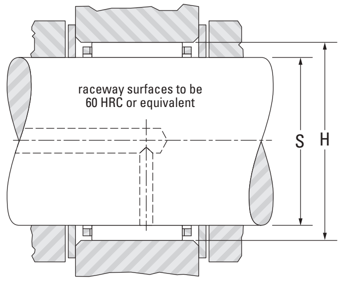
METRIC SERIES
BE, GS, VE, VS P SERIES



BE, GS



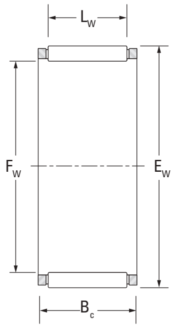
VE, VS P



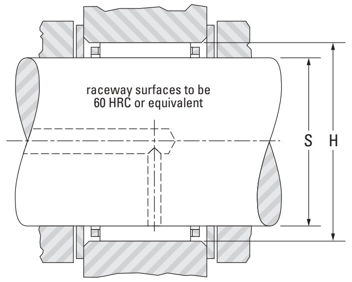
Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
30 1.1811	**30**	**37**	**16**	**12.8**	30VS3716AP-1	**20.8**	**28.3**	4.35	**0.03**				
	30	**37**	**20**	**15.8**	30VS3720P	**24.6**	**35.2**	5.50	**0.036**				
	30	**38**	**17.8**	**14.8**	VE303818AB1	**26.5**	**35.4**	5.60	**0.038**				
32 1.2598	**32**	**40**	**20**	**15.8**	VE324020SB1	**29.9**	**42.2**	6.75	**0.048**				
34 1.3386	**34**	**43**	**19.8**	**15.8**	BE344320ASB1	**34.2**	**47.2**	7.60	**0.059**				
	34	**43**	**22**	**17.8**	GS344322-1	**37.7**	**53.5**	8.45	**0.063**				
	34	**44**	**19.8**	**16.8**	BE344420ASY1B1	**38.6**	**51.5**	8.25	**0.064**				
35 1.378	**35**	**43**	**20**	**15.8**	35VS4320BP	**32**	**47.4**	7.60	**0.051**				
	35	**43**	**21.8**	**17.8**	BE354322ASB1	**36.6**	**56.4**	8.90	**0.057**				
	35	**45**	**21.8**	**17.8**	BE354522ASYB1	**43.5**	**60.7**	9.75	**0.081**				
	35	**45**	**24.8**	**20.8**	BE354525ASYB1	**48.6**	**70.0**	11.1	**0.088**				
37 1.4567	**37**	**47**	**25**	**20.8**	37VS4725P-1	**43.9**	**61.9**	9.80	**0.082**				
38 1.4961	**38**	**50**	**22.8**	**18.8**	BE385023ASY1B3-5	**51.4**	**68.2**	10.9	**0.113**				

ASSEMBLIES FOR WRIST PIN END APPLICATIONS

METRIC SERIES
K SE SERIES



K SE



Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
9 0.3543	**9** 0.3543	**12** 0.4724	**11.5** 0.453	**8.4** 0.331	K9X12X11,5SE	**4.23** 951	**4.53** 1020	0.690	**0.003** 0.007	**9.000** 0.3543	**8.994** 0.3541	**12.017** 0.4731	**12.006** 0.4727
	9 0.3543	**13** 0.5118	**12.5** 0.492	**9.8** 0.386	K9X13X12,5SE	**5.58** 1250	**5.41** 1220	0.820	**0.005** 0.011	**9.000** 0.3543	**8.994** 0.3541	**13.017** 0.5125	**13.006** 0.5120
10 0.3937	**10** 0.3937	**13** 0.5118	**14.5** 0.571	**11.8** 0.465	K10X13X14,5SE	**5.93** 1330	**7.20** 1620	1.10	**0.004** 0.009	**10.000** 0.3937	**9.994** 0.3935	**13.017** 0.5125	**13.006** 0.5120
	10 0.3937	**14** 0.5512	**10** 0.394	**7.0** 0.276	K10X14X10SE	**4.62** 1040	**4.36** 980	0.640	**0.004** 0.009	**10.000** 0.3937	**9.994** 0.3935	**14.017** 0.5519	**14.006** 0.5514
12 0.4724	**12** 0.4724	**15** 0.5906	**13** 0.512	**9.8** 0.386	K12X15X13SE	**6.00** 1350	**7.72** 1740	1.20	**0.004** 0.009	**12.000** 0.4724	**11.992** 0.4721	**15.017** 0.5912	**15.006** 0.5908
	12 0.4724	**15** 0.5906	**15** 0.591	**11.8** 0.465	K12X15X15SE	**6.97** 1570	**9.36** 2100	1.40	**0.005** 0.011	**12.000** 0.4724	**11.992** 0.4721	**15.017** 0.5912	**15.006** 0.5908
	12 0.4724	**15** 0.5906	**17.5** 0.689	**12.8** 0.504	K12X15X17,5SE	**7.45** 1670	**10.2** 2290	1.60	**0.006** 0.013	**12.000** 0.4724	**11.992** 0.4721	**15.017** 0.5912	**15.006** 0.5908
	12 0.4724	**16** 0.6299	**13** 0.512	**9.8** 0.386	K12X16X13SE	**6.03** 1360	**6.38** 1430	0.970	**0.006** 0.013	**12.000** 0.4724	**11.992** 0.4721	**16.017** 0.6306	**16.006** 0.6302
	12 0.4724	**17** 0.6693	**13** 0.512	**9.8** 0.386	K12X17X13SE	**7.61** 1710	**7.54** 1700	1.15	**0.007** 0.015	**12.000** 0.4724	**11.992** 0.4721	**17.017** 0.6700	**17.006** 0.6695
	12 0.4724	**17** 0.6693	**15** 0.591	**12.5** 0.492	K12X17X15SE	**9.30** 2090	**9.75** 2190	1.50	**0.007** 0.015	**12.000** 0.4724	**11.992** 0.4721	**17.017** 0.6700	**17.006** 0.6695
13 0.5118	**13** 0.5118	**16** 0.6299	**14** 0.551	**9.8** 0.386	K13X16X14SE	**5.62** 1260	**7.23** 1630	1.10	**0.005** 0.011	**13.000** 0.5118	**12.992** 0.5115	**16.017** 0.6306	**16.006** 0.6302
	13 0.5118	**17** 0.6693	**17.7** 0.697	**13.8** 0.543	K13X17X17,7SE	**9.80** 2200	**12.3** 2770	1.90	**0.008** 0.018	**13.000** 0.5118	**12.992** 0.5115	**17.017** 0.6700	**17.006** 0.6695
	13 0.5118	**18** 0.7087	**15** 0.591	**12.5** 0.492	K13X18X15SE	**9.28** 2090	**9.88** 2220	1.50	**0.008** 0.018	**13.000** 0.5118	**12.992** 0.5115	**18.017** 0.7093	**18.006** 0.7089
14 0.5512	**14** 0.5512	**18** 0.7087	**13** 0.512	**9.8** 0.386	K14X18X13SE	**7.39** 1660	**8.69** 1950	1.30	**0.007** 0.015	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**18** 0.7087	**17** 0.669	**11.8** 0.465	K14X18X17SE	**8.59** 1930	**10.5** 2360	1.60	**0.009** 0.020	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**18** 0.7087	**21** 0.827	**14.8** 0.583	K14X18X21SE	**10.3** 2320	**13.3** 2990	2.05	**0.011** 0.024	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
15 0.5906	**15** 0.5906	**19** 0.748	**17** 0.669	**11.8** 0.465	K15X19X17SE	**9.05** 2030	**11.5** 2590	1.75	**0.009** 0.020	**15.000** 0.5906	**14.992** 0.5902	**19.020** 0.7488	**19.007** 0.7483

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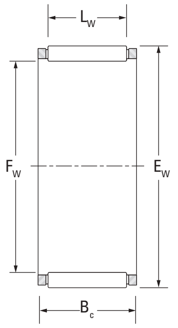
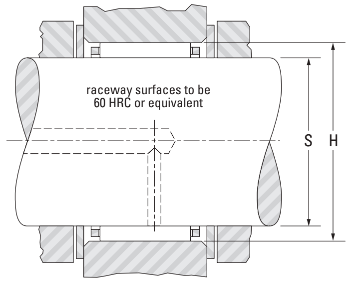
ASSEMBLIES FOR WRIST PIN END APPLICATIONS

METRIC SERIES
K SE SERIES



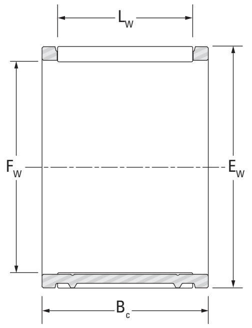
K SE



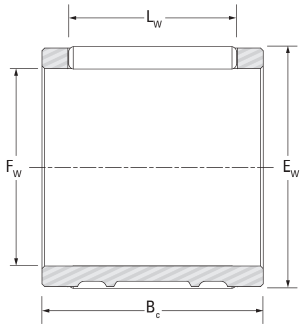
Shaft Dia.	Fw	Ew	Bc	Lw	Assembly Designation	Load Ratings		Fatigue Load Limit Cu	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
15 0.5906	**15** 0.5906	**19** 0.748	**19.5** 0.768	**15.8** 0.622	K15X19X19,5SE	**10.8** 2430	**14.3** 3210	2.25	**0.010** 0.022	**15.000** 0.5906	**14.992** 0.5902	**19.020** 0.7488	**19.007** 0.7483
	15 0.5906	**19** 0.748	**20** 0.787	**15.8** 0.622	K15X19X20SE	**10.8** 2430	**14.3** 3210	2.25	**0.010** 0.022	**15.000** 0.5906	**14.992** 0.5902	**19.020** 0.7488	**19.007** 0.7483
16 0.6299	**16** 0.6299	**20** 0.7874	**20** 0.787	**15.8** 0.622	K16X20X20SE	**12.0** 2700	**16.9** 3800	2.60	**0.011** 0.024	**16.000** 0.6299	**15.992** 0.6296	**20.020** 0.7882	**20.007** 0.7877
	16 0.6299	**20** 0.7874	**23** 0.906	**15.8** 0.622	K16X20X23SE	**10.7** 2410	**14.5** 3260	2.25	**0.013** 0.029	**16.000** 0.6299	**15.992** 0.6296	**20.020** 0.7882	**20.007** 0.7877
18 0.7087	**18** 0.7087	**22** 0.8661	**22** 0.866	**17.8** 0.701	K18X22X22SE	**14.4** 3240	**22.0** 4950	3.45	**0.016** 0.035	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**23** 0.9055	**20** 0.787	**15.8** 0.622	K18X23X20SE	**13.6** 3060	**17.6** 3960	2.80	**0.015** 0.033	**18.000** 0.7087	**17.992** 0.7083	**23.020** 0.9063	**23.007** 0.9058
	18 0.7087	**23** 0.9055	**23** 0.906	**17.8** 0.701	K18X23X23SE	**15.9** 3570	**21.6** 4860	3.35	**0.018** 0.040	**18.000** 0.7087	**17.992** 0.7083	**23.020** 0.9063	**23.007** 0.9058
20 0.7874	**20** 0.7874	**24** 0.9449	**23** 0.906	**17.8** 0.701	K20X24X23SE	**14.8** 3330	**23.7** 5330	3.70	**0.017** 0.037	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**25** 0.9843	**22** 0.866	**16.8** 0.661	K20X25X22SE	**15.9** 3570	**22.2** 4990	3.50	**0.020** 0.044	**20.000** 0.7874	**19.991** 0.7870	**25.020** 0.9850	**25.007** 0.9845
	20 0.7874	**25** 0.9843	**23** 0.906	**17.8** 0.701	K20X25X23SE	**17.5** 3930	**25.2** 5670	3.95	**0.025** 0.055	**20.000** 0.7874	**19.991** 0.7870	**25.020** 0.9850	**25.007** 0.9845

ASSEMBLIES FOR WRIST PIN END APPLICATIONS

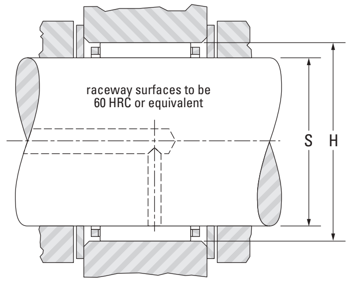
METRIC SERIES
R P, RE, UR P SERIES



R P



RE, UR P



Shaft Dia.	Fw	Ew	Bc	Lw	Assembly Designation	Load Ratings		Fatigue Load Limit Cu	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
9 0.3543	**9**	**12**	**12**	**8.8**	9R1212P	**4.95**	**5.55**	0.830	**0.004**				
12 0.4724	**12**	**16**	**14.8**	**11.8**	12R1615CP	**8.35**	**9.8**	1.50	**0.008**				
	12	**16**	**15.4**	**11.8**	RE121615AL1	**8.35**	**9.8**	1.50	**0.008**				
	12	**16**	**16**	**12.8**	12UR1616P	**7.7**	**8.75**	1.35	**0.008**				
14 0.5512	**14**	**18**	**15.8**	**11.8**	RE141816AL1	**8.9**	**11.1**	1.70	**0.01**				
	14	**18**	**16.5**	**12.8**	RE141817AL2-2	**9.45**	**11.9**	1.80	**0.01**				
	14	**18**	**17.5**	**11.8**	14R1818P	**8.3**	**10.1**	1.55	**0.011**				
	14	**18**	**20**	**13.8**	UR14/20P	**8.9**	**11**	1.70	**0.012**				
15 0.5906	**15**	**19**	**17.3**	**12.8**	RE151917BL3	**9.9**	**12.9**	1.95	**0.011**				
	15	**19**	**20**	**15.8**	15R1920BP-1	**12.1**	**16.6**	2.60	**0.013**				
	15	**20**	**17.8**	**13.8**	RE152018BL2	**12.3**	**14.7**	2.30	**0.014**				
	15	**20**	**19.8**	**15.8**	RE152020CL2	**13.1**	**16**	2.50	**0.016**				
16 0.6299	**16**	**20**	**18.8**	**14.8**	R16/18.8AP-2	**11**	**15.1**	2.35	**0.013**				
	16	**20**	**19.5**	**13.8**	R16/19.5FP	**9.95**	**13.2**	2.05	**0.014**				
	16	**20**	**19.5**	**13.8**	RE162020AL2	**9.95**	**13.2**	2.05	**0.013**				
	16	**20**	**22.5**	**14.8**	R16/22.5EP	**9.85**	**13**	2.00	**0.016**				
	16	**21**	**17.5**	**13.8**	16R2118BP-2	**12.2**	**14.8**	2.30	**0.016**				

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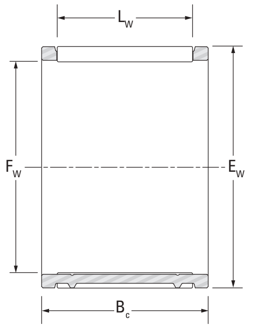
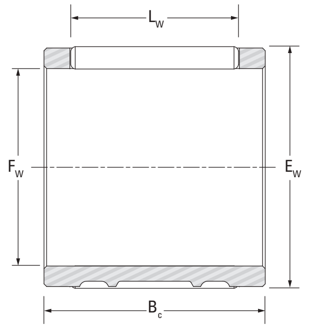
ASSEMBLIES FOR WRIST PIN END APPLICATIONS

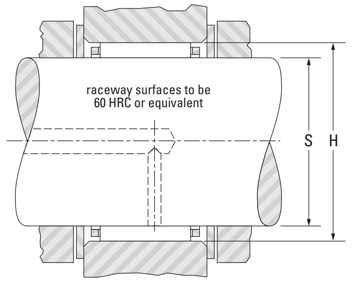
METRIC SERIES
R P, RE, UR P SERIES



R P



RE, UR P



Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
16 0.6299	**16**	**21**	**19.5**	**15.8**	16R2120EP-2	**13.5**	**16.9**	2.65	**0.017**				
	16	**21**	**22.5**	**16.8**	RE162123AL2	**15.4**	**20**	3.15	**0.02**				
18 0.7087	**18**	**22**	**19.65**	**13.8**	RE182220AL1	**10.9**	**15.4**	2.40	**0.015**				
	18	**22**	**22**	**15.8**	18R2222P	**12.1**	**17.6**	2.70	**0.017**				
	18	**22**	**23.6**	**17.8**	RE182224AL2	**13.3**	**20**	3.10	**0.017**				
	18	**23**	**22**	**15.8**	18R2322P	**14.2**	**18.6**	2.90	**0.021**				
	18	**23**	**23.8**	**17.8**	RE182324AL2	**16.5**	**22.7**	3.55	**0.024**				
19 0.7480	**19**	**24**	**24.8**	**18.8**	RE192425AL1	**18.3**	**26.2**	4.10	**0.026**				
20 0.7874	**20**	**24**	**13**	**9.8**	R20/13P	**9.85**	**14**	2.15	**0.01**				
	20	**25**	**13**	**9.8**	20R2513P	**11.2**	**14.1**	2.15	**0.013**				
	20	**25**	**21.8**	**16.8**	RE202522AL2	**17.6**	**25.3**	4.00	**0.024**				
	20	**25**	**23**	**18.8**	RE202523L1	**19.1**	**28.2**	4.40	**0.024**				
	20	**25**	**24**	**17.8**	RE202524L2-1	**16.3**	**23**	3.60	**0.026**				
	20	**25**	**27.8**	**21.8**	RE202528AL1	**21.7**	**33.2**	5.15	**0.03**				

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

INCH SERIES

Inch series radial needle roller and cage assemblies are available in a variety of sizes and designs. This catalog includes the most popular, standardized designs.

REFERENCE STANDARDS:

- **ANSI/ABMA 18.2** – needle roller bearings – radial, inch design.

Before selecting specific inch series radial needle roller and cage assemblies, the engineering section should be reviewed.

WJ WJC

Fig. B1-5 . Types of inch series radial needle roller and cage assemblies

There are two primary constructions of inch series needle roller and cage assemblies. WJ assemblies are heavy-duty compared to WJC assemblies due to the nature of the roller diameter.

CONSTRUCTION

Radial needle roller and cage assemblies have a steel cage that provides both inward and outward retention for the needle rollers. The designs provide maximum cage strength consistent with the inherent high load-ratings of needle roller bearings.

Accurate guidance of the needle rollers by the cage bars allows for operation at high speeds. Needle roller and cage assemblies have either one or two rows of needle rollers.

Also available (by request) are needle roller and cage assemblies using molded, one-piece glass-reinforced engineered polymer cages. These operate well at temperatures up to 250° F (120° C) over extended periods. However, care should be exercised when bearings are lubricated with oils containing additives, as service life may be reduced if the operating temperature exceeds 212° F (100˚ C). At such high temperatures, oil can deteriorate with time and it is suggested that oil change intervals are observed.

Needle rollers with relieved ends – used in these assemblies are made of high carbon chrome steel through-hardened, ground and lapped to close tolerances for diameter and roundness. See the engineering section for further discussion of relieved end rollers.

DIMENSIONAL ACCURACY

The nominal inch assemblies, WJ and WJC, contain needle rollers manufactured to only one diameter grade. Within any one assembly, the needle rollers have a total diameter tolerance of 0.0001 in (0.003 mm).

The limit to precision of the radial clearance of mounted needle roller and cage assemblies is the capability of the user to hold close tolerances on the inner and outer raceways.

The tolerance of the overall width of these assemblies is given in the bearing tables of this section.

MOUNTING DIMENSIONS

The needle roller and cage assembly normally uses the shaft and housing as the inner and outer raceways. To realize full bearing load rating and life, the shaft and housing must have the correct geometric and metallurgical characteristics.

The tables of dimensions for these assemblies list the suggested diameters for the shaft when used as the inner raceway. These are consistent with ISO h5 shaft raceway tolerances. Additional design details for shafts used as inner raceways can be found in the engineering section.

Since the housing normally serves as the outer raceway, it should be of sufficient cross section to maintain adequate roundness and running clearance under load. The tables of dimensions also list the suggested diameters for the housings when used as outer raceways. These are consistent with ISO G6 housing bore tolerances. Additional design details for housings used as outer raceways can be found in the engineering section.

The suggested mounting diameter tolerances for these needle roller and cage assemblies will provide correct running clearance for most applications.

The needle roller and cage assembly must be axially located by shoulders or other suitable means. End locating surfaces should be hardened to minimize wear. For satisfactory operation, minimum axial clearance should be 0.008 in (0.203 mm). When using type WJ assembly, fillets adjacent to the assembly must not exceed 0.03 in (0.762 mm) radius. When it is necessary to use fillets adjacent to WJC assembly, please consult your representative for suggestions.

LUBRICATION

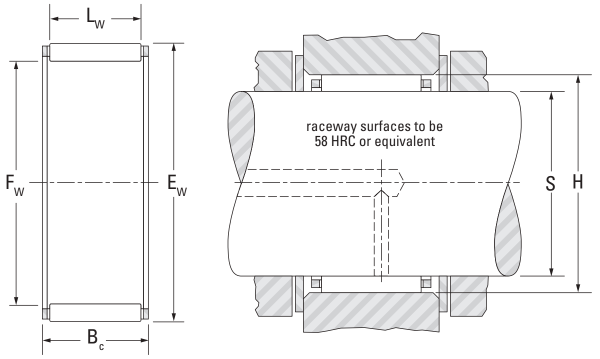
Oil is the preferred lubricant for most applications. In critical applications involving high speeds, ample oil flow must be provided. Where assemblies are subjected to high centrifugal forces, such as in epicyclic gearing, or inertia forces, as in the small end of a connecting rod, the contact pressure between the cage and the raceway guiding surface becomes critical. The allowable contact pressure depends on a combination of the induced force and the relative velocity between the cage and the raceway and the rate of lubricant flow. Consult your representative when cages will be subjected to high induced forces.

SPECIAL DESIGNS

Needle roller and cage assemblies made to special dimensions or configurations, such as those that are split to assemble around a one-piece crankshaft, can be made available on special order where quantities permit. Special plated cages to enhance life under conditions of high induced forces can also be made available.

SINGLE-ROW ASSEMBLIES

INCH SERIES



WJ, WJC

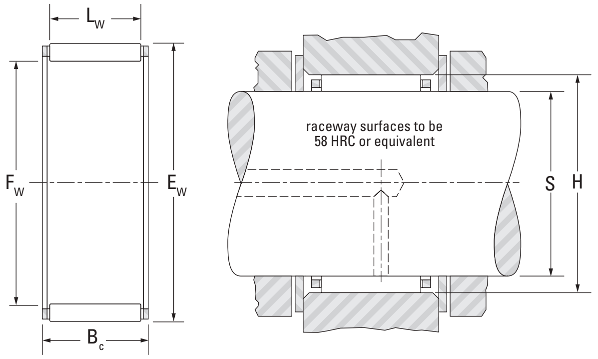
Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Mounting Dimensions				Approx. Wt.
			+0 -0.38 +0 -0.015		Dynamic	Static				S (ISO h5)		H (ISO G6)		
					C	C_0		Grease	Oil	Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min⁻¹		**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
⅜	**9.525** 0.3750	**12.700** 0.5000	**9.53** 0.375	WJC-060806	**3.87** 870	**4.00** 900	0.600	24000	37000	**9.525** 0.3750	**9.520** 0.3748	**12.715** 0.5006	**12.705** 0.5002	**0.003** 0.006
½	**12.700** 0.5000	**15.875** 0.6250	**12.70** 0.500	WJC-081008	**6.23** 1400	**8.01** 1800	1.65	23000	35000	**12.700** 0.5000	**12.692** 0.4997	**15.890** 0.6256	**15.880** 0.6252	**0.005** 0.010
9⁄16	**14.288** 0.5625	**17.463** 0.6875	**12.70** 0.500	WJC-091108	**6.81** 1530	**9.25** 2080	1.40	22000	34000	**14.288** 0.5625	**14.280** 0.5622	**17.478** 0.6881	**17.468** 0.6877	**0.006** 0.013
⅝	**15.875** 0.6250	**19.050** 0.7500	**12.70** 0.500	WJC-101208	**7.03** 1580	**9.96** 2240	1.50	18000	27000	**15.875** 0.6250	**15.867** 0.6247	**19.070** 0.7508	**19.058** 0.7503	**0.006** 0.013
	15.875 0.6250	**22.225** 0.8750	**15.88** 0.625	WJ-101410	**15.6** 3510	**17.8** 3990	2.80	19000	29000	**15.875** 0.6250	**15.867** 0.6247	**22.245** 0.8758	**22.233** 0.8753	**0.012** 0.027
	15.875 0.6250	**22.225** 0.8750	**22.23** 0.875	WJ-101414	**21.3** 4780	**26.4** 5940	4.10	19000	29000	**15.875** 0.6250	**15.867** 0.6247	**22.245** 0.8758	**22.233** 0.8753	**0.017** 0.038
¾	**19.050** 0.7500	**25.400** 1.0000	**25.40** 1.000	WJ-121616	**26.8** 6020	**37.2** 8370	5.80	16000	24000	**19.050** 0.7500	**19.040** 0.7496	**25.420** 1.0008	**25.408** 1.0003	**0.023** 0.051
13⁄16	**20.638** 0.8125	**26.988** 1.0625	**22.23** 0.875	WJ-131714	**25.1** 5650	**35.0** 7880	5.50	14000	22000	**20.638** 0.8125	**20.627** 0.8121	**27.008** 1.0633	**26.995** 1.0628	**0.021** 0.046
⅞	**22.225** 0.8750	**28.575** 1.1250	**25.40** 1.000	WJ-141816	**29.2** 6570	**43.5** 9770	6.75	13000	20000	**22.225** 0.8750	**22.215** 0.8746	**28.595** 1.1258	**28.583** 1.1253	**0.026** 0.058
1	**25.400** 1.0000	**33.338** 1.3125	**19.05** 0.750	WJ-162112	**28.1** 6320	**37.1** 8340	5.90	12000	18000	**25.400** 1.0000	**25.390** 0.9996	**33.363** 1.3135	**33.348** 1.3129	**0.029** 0.063
	25.400 1.0000	**33.338** 1.3125	**25.40** 1.000	WJ-162116	**36.8** 8270	**52.5** 11800	8.20	12000	18000	**25.400** 1.0000	**25.390** 0.9996	**33.363** 1.3135	**33.348** 1.3129	**0.038** 0.084
	25.400 1.0000	**33.338** 1.3125	**31.75** 1.250	WJ-162120	**44.5** 10000	**67.2** 15100	10.5	12000	18000	**25.400** 1.0000	**25.390** 0.9996	**33.363** 1.3135	**33.348** 1.3129	**0.048** 0.105
1⅛	**28.575** 1.1250	**38.100** 1.5000	**25.40** 1.000	WJ-182416	**42.4** 9520	**57.8** 13000	9.05	10000	16000	**28.575** 1.1250	**28.565** 1.1246	**38.125** 1.5010	**38.110** 1.5004	**0.041** 0.090
	28.575 1.1250	**38.100** 1.5000	**31.75** 1.250	WJ-182420	**52** 11700	**74.7** 16800	11.7	10000	16000	**28.575** 1.1250	**28.565** 1.1246	**38.125** 1.5010	**38.110** 1.5004	**0.065** 0.143
1¼	**31.750** 1.2500	**41.275** 1.6250	**19.05** 0.750	WJ-202612	**33.4** 7520	**43.7** 9830	7.05	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.043** 0.094
	31.750 1.2500	**41.275** 1.6250	**25.40** 1.000	WJ-202616	**44.1** 9910	**62.3** 14000	9.80	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.061** 0.134
	31.750 1.2500	**41.275** 1.6250	**31.75** 1.250	WJ-202620	**53.8** 12100	**81.0** 18200	12.6	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.071** 0.156

Continued on next page.

· Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
· Minimum axial clearance should be 0.02 mm (0.008 in).

SINGLE-ROW ASSEMBLIES

INCH SERIES



WJ, WJC

Shaft Dia.	F_w	E_w	B_c +0 -0.38 / +0 -0.015	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Mounting Dimensions S (ISO h5) Max.	Mounting Dimensions S (ISO h5) Min.	Mounting Dimensions H (ISO G6) Max.	Mounting Dimensions H (ISO G6) Min.	Approx. Wt.
in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		mm in	mm in	mm in	mm in	kg lbs
1¼	**31.750** 1.2500	**41.275** 1.6250	**38.10** 1.500	WJ-202624	**63.6** 14300	**99.6** 22400	15.6	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.085** 0.188
1⅜	**34.925** 1.3750	**44.450** 1.7500	**25.40** 1.000	WJ-222816	**45.8** 10300	**67.2** 15100	10.5	8300	13000	**34.925** 1.3750	**34.915** 1.3746	**44.475** 1.7510	**44.460** 1.7504	**0.067** 0.147
	34.925 1.3750	**44.450** 1.7500	**31.75** 1.250	WJ-222820	**56.0** 12600	**87.2** 19600	13.6	8300	13000	**34.925** 1.3750	**34.915** 1.3746	**44.475** 1.7510	**44.460** 1.7504	**0.077** 0.170
1½	**38.100** 1.5000	**47.625** 1.8750	**25.40** 1.000	WJ-243016	**47.2** 10600	**71.6** 16100	11.3	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.078** 0.172
	38.100 1.5000	**47.625** 1.8750	**31.75** 1.250	WJ-243020	**57.8** 13000	**93.0** 20900	14.5	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.083** 0.184
	38.100 1.5000	**47.625** 1.8750	**38.10** 1.500	WJ-243024	**68.1** 15300	**114.8** 25800	18.0	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.100** 0.220
	38.100 1.5000	**47.625** 1.8750	**44.45** 1.750	WJ-243028	**77.4** 17400	**135.7** 30500	21.2	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.134** 0.295
1¾	**44.450** 1.7500	**53.975** 2.1250	**19.05** 0.750	WJ-283412	**39.5** 8870	**59.6** 13400	9.60	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.058** 0.127
	44.450 1.7500	**53.975** 2.1250	**25.40** 1.000	WJ-283416	**52.0** 11700	**85.0** 19100	13.4	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.084** 0.185
	44.450 1.7500	**53.975** 2.1250	**38.10** 1.500	WJ-283424	**74.7** 16800	**136** 30600	21.3	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.115** 0.253
2	**50.800** 2.0000	**60.325** 2.3750	**19.05** 0.750	WJ-323812	**42.8** 9610	**69** 15500	11.1	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.065** 0.143
	50.800 2.0000	**60.325** 2.3750	**25.40** 1.000	WJ-323816	**56.5** 12700	**98** 22100	15.5	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.105** 0.231
	50.800 2.0000	**60.325** 2.3750	**31.75** 1.250	WJ-323820	**69.0** 15500	**127** 28700	20.0	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.108** 0.238
	50.800 2.0000	**60.325** 2.3750	**38.10** 1.500	WJ-323824	**81.0** 18200	**157** 35300	24.6	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.130** 0.286
2¹⁄₁₆	**52.388** 2.0625	**61.913** 2.4375	**25.40** 1.000	WJ-333916	**57.8** 13000	**102** 23100	16.2	5400	8300	**52.388** 2.0625	**52.375** 2.0620	**61.940** 2.4386	**61.923** 2.4379	**0.099** 0.218
2⅛	**53.975** 2.1250	**63.500** 2.5000	**25.40** 1.000	WJ-344016	**52.5** 11800	**92.08** 20700	14.6	5200	8000	**53.975** 2.1250	**53.962** 2.1245	**63.528** 2.5011	**63.510** 2.5004	**0.089** 0.196
	53.975 2.1250	**63.500** 2.5000	**38.10** 1.500	WJ-344024	**78.3** 17600	**153** 34500	24.0	5200	8000	**53.975** 2.1250	**53.962** 2.1245	**63.528** 2.5011	**63.510** 2.5004	**0.137** 0.302

· Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
· Minimum axial clearance should be 0.02 mm (0.008 in).

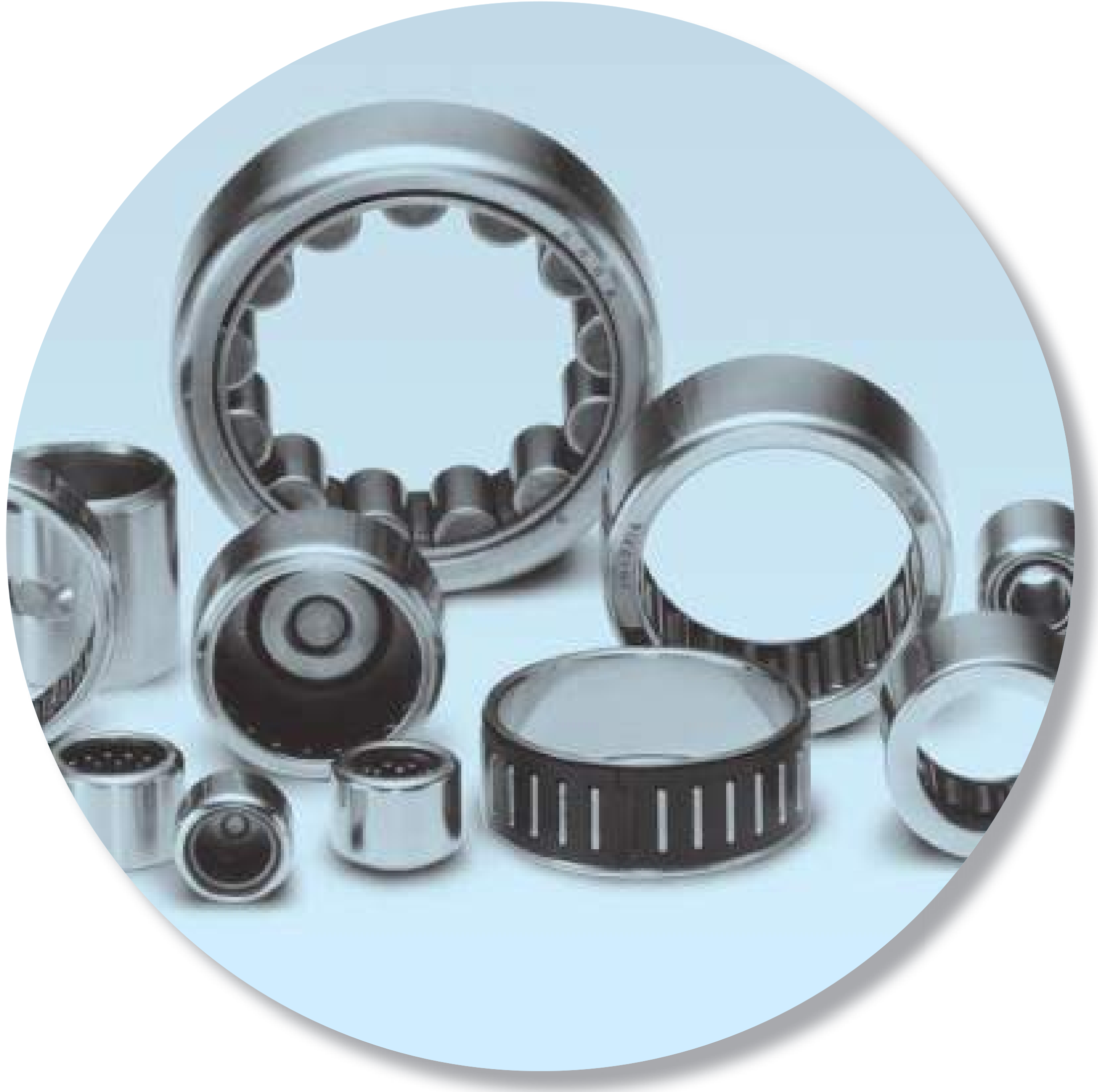
Shaft Dia.	F_w	E_w	B_c +0 -0.38 / +0 -0.015	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Mounting Dimensions S (ISO h5) Max.	Mounting Dimensions S (ISO h5) Min.	Mounting Dimensions H (ISO G6) Max.	Mounting Dimensions H (ISO G6) Min.	Approx. Wt.
in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		mm in	mm in	mm in	mm in	kg lbs
2³⁄₁₆	**55.563** 2.1875	**65.088** 2.5625	**19.05** .750	WJ-354112	**44.5** 10000	**75.17** 16900	12.2	5000	7800	**55.563** 2.1875	**55.550** 2.1870	**65.115** 2.5636	**65.098** 2.5629	**0.070** 0.155
	55.563 2.1875	**65.088** 2.5625	**25.40** 1.000	WJ-354116	**57.8** 13000	**107** 24100	16.9	5000	7800	**55.563** 2.1875	**55.550** 2.1870	**65.115** 2.5636	**65.098** 2.5629	**0.094** 0.207
2¼	**57.150** 2.2500	**66.675** 2.6250	**25.40** 1.000	WJ-364216	**53.8** 12100	**96.08** 21600	15.2	4900	7500	**57.150** 2.2500	**57.137** 2.2495	**66.703** 2.6261	**66.685** 2.6254	**0.096** 0.212
	57.150 2.2500	**66.675** 2.6250	**31.75** 1.250	WJ-364220	**67.6** 15200	**128** 28900	20.1	4900	7500	**57.150** 2.2500	**57.137** 2.2495	**66.703** 2.6261	**66.685** 2.6254	**0.120** 0.265
2⅜	**60.325** 2.3750	**69.850** 2.7500	**38.10** 1.500	WJ-384424	**81.4** 18300	**167** 37600	26.1	4600	7100	**60.325** 2.3750	**60.312** 2.3745	**69.878** 2.7511	**69.860** 2.7504	**0.151** 0.334
2½	**63.500** 2.5000	**73.025** 2.8750	**25.40** 1.000	WJ-404616	**55.6** 12500	**104** 23400	16.5	4400	6700	**63.500** 2.5000	**63.487** 2.4995	**73.053** 2.8761	**73.035** 2.8754	**0.106** 0.234
	63.500 2.5000	**73.025** 2.8750	**31.75** 1.250	WJ-404620	**69.8** 15700	**139** 31400	21.8	4400	6700	**63.500** 2.5000	**63.487** 2.4995	**73.053** 2.8761	**73.035** 2.8754	**0.132** 0.292
	63.500 2.5000	**73.025** 2.8750	**38.10** 1.500	WJ-404624	**83.2** 18700	**173** 39100	27.2	4400	6700	**63.500** 2.5000	**63.487** 2.4995	**73.053** 2.8761	**73.035** 2.8754	**0.179** 0.395
2¾	**69.850** 2.7500	**79.375** 3.1250	**25.40** 1.000	WJ-445016	**57.8** 13000	**112.54** 25300	17.8	4000	6100	**69.850** 2.7500	**69.837** 2.7495	**79.403** 3.1261	**79.385** 3.1254	**0.116** 0.256
3	**76.200** 3.0000	**85.725** 3.3750	**25.40** 1.000	WJ-485416	**59.6** 13400	**120.55** 27100	19.1	3600	5600	**76.200** 3.0000	**76.187** 2.9995	**85.761** 3.3764	**85.738** 3.3755	**0.126** 0.278
	76.200 3.0000	**85.725** 3.3750	**38.10** 1.500	WJ-485424	**85.4** 19200	**191.72** 43100	29.9	3600	5600	**76.200** 3.0000	**76.187** 2.9995	**85.761** 3.3764	**85.738** 3.3755	**0.189** 0.416
3¼	**82.550** 3.2500	**92.075** 3.6250	**25.40** 1.000	WJ-525816	**61.4** 13800	**128.55** 28900	20.4	3300	5100	**82.550** 3.2500	**82.535** 3.2494	**92.111** 3.6264	**92.088** 3.6255	**0.136** 0.299
	82.550 3.2500	**92.075** 3.6250	**38.10** 1.500	WJ-525824	**88.1** 19800	**204.62** 46000	31.9	3300	5100	**82.550** 3.2500	**82.535** 3.2494	**92.111** 3.6264	**92.088** 3.6255	**0.220** 0.486
3½	**88.900** 3.5000	**98.425** 3.8750	**25.40** 1.000	WJ-566216	**63.2** 14200	**136.56** 30700	21.7	3100	4700	**88.900** 3.5000	**88.885** 3.4994	**98.461** 3.8764	**98.438** 3.8755	**0.146** 0.321
	88.900 3.5000	**101.600** 4.0000	**25.40** 1.000	WJ-566416	**79.6** 17900	**150.35** 33800	23.9	3100	4800	**88.900** 3.5000	**88.885** 3.4994	**101.636** 4.0014	**101.613** 4.0005	**0.197** 0.435
	88.900 3.5000	**101.600** 4.0000	**38.10** 1.500	WJ-566424	**113** 25600	**237.53** 53400	37.4	3100	4800	**88.900** 3.5000	**88.885** 3.4994	**101.636** 4.0014	**101.613** 4.0005	**0.296** 0.653
4	**101.600** 4.0000	**114.300** 4.5000	**25.40** 1.000	WJ-647216	**83.6** 18800	**166.59** 37450	30.9	2700	4200	**101.600** 4.0000	**101.585** 3.9994	**114.336** 4.5014	**114.313** 4.5005	**0.224** 0.493
	101.600 4.0000	**114.300** 4.5000	**38.10** 1.500	WJ-647224	**119** 26800	**263.33** 59200	40.6	2700	4200	**101.600** 4.0000	**101.585** 3.9994	**114.336** 4.5014	**114.313** 4.5005	**0.335** 0.739
5	**127.000** 5.0000	**152.400** 6.0000	**38.10** 1.500	WJ-809624	**211** 47600	**365.20** 82100	51.9	2200	3400	**127.000** 5.0000	**126.982** 4.9993	**152.438** 6.0015	**152.415** 6.0006	**1.018** 2.244

NOTES

DRAWN CUP NEEDLE ROLLER BEARINGS

Overview: Drawn cup needle roller bearings support radial loads and reduce friction between rotating components, with a drawn outer shell serving as a raceway for the rollers. The small cross section of the drawn cup bearing provides high load-carrying capability with minimum required space. Drawn cup bearings are easily installed with a press fit in the housing.

- **Catalogue range:** 3 mm – 139.7 mm (0.1181 in – 5.5000 in) bore.
- **Markets:** Transmissions, transfer cases, engines, valve trains, steering and braking systems, axle supports, outboard engines, power tools, copiers, fax machines, paper-moving equipment and appliances.
- **Features:** Available in two basic designs: full complement and caged.
- **Benefits:** Full complement bearings handle high radial load-carrying capability. Caged bearings provide high speed and maximum lubricant-retention capability.



Drawn Cup Needle Roller Bearings – Metric Nominal Dimensions

Prefix
HK drawn cup bearing, caged, open ends
BK drawn cup bearing, caged, closed end
DL drawn cup bearing, full complement, open ends
DLF drawn cup bearing, full complement, closed end

Width
12 = 12 mm

HK 10 12 AS1

Needle roller complement bore diameter
10 = 10 mm

Suffix(1)
RS lip contact seal on one side of the bearing
.2RS lip contact seal on each side of the bearing
AS1 lubricating hole

(1) These suffixes only apply to the HK and BK Series bearings.

Prefix
BTM, BHTM, BKM, BHKM, BSM drawn cup bearing, caged, open ends
BM, BHM, YM drawn cup bearing, full complement, open ends

Width
10 = 10 mm

BTM 17 10 UU

Suffix
UU lip contact seal on each side of the bearing
J bearing designed according to ISO standards

Needle roller complement bore diameter
17 = 17 mm

Prefix
BTM, BHTM, BKM, BHKM, BSM drawn cup bearing, caged, open ends
BM, BHM, YM drawn cup bearing, full complement, open ends

Width
12 = 12 mm

17 BKM 23 12 UU

BKM 17 23 12 UU

Needle roller complement bore diameter
17 = 17 mm

Outer diameter
23 = 23 mm

Suffix
UU lip contact seal on each side of the bearing
J bearing designed according to ISO standards

Inner Rings – Metric Nominal Dimensions

Prefix
JR inner ring
JRZ inner ring without mounting chamfers
IM inner ring for full complement bearings
IMC inner ring with lubricating hole for full complement bearings

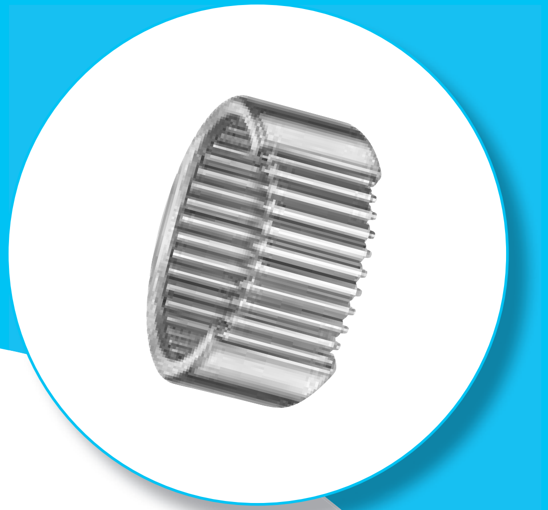
Outer diameter
14 = 14 mm

Suffix
JS1 lubricating hole
R6 crowned raceway (IM types)

JR 10 x 14 x 12 JS1

Bore diameter
10 = 10 mm

Width
12 = 12 mm



Drawn Cup Needle Roller Bearings – Inch Nominal Dimensions

Prefix
J, JH, JP, BT drawn cup bearing, caged, open ends
MJ, MJH drawn cup bearing, caged, closed end
JT drawn cup bearing, caged, one seal, open ends
JTT drawn cup bearing, caged, two seals, open ends
B, BH, Y drawn cup bearing, full complement, open ends
GB, GBH drawn cup bearing, full complement, open ends, extra precision
M, MH drawn cup bearing, full complement, closed end

Suffix
1 closed end
blank open ends

MJH - 18 16 1

Needle roller complement bore diameter
18 = $^{18}/_{16}$ = 1 $^{1}/_{8}$ in

Width
16 = $^{16}/_{16}$ = 1 in

Inner Rings (with four-digit number) Inch Nominal Dimensions

Prefix
IR regular width (for use with drawn cup bearings only)
IRA extended width (for use with drawn cup bearings only)

IR - 14 16

Bore diameter
14 = $^{14}/_{16}$ = $^{7}/_{8}$ in

Width (IR series only)
16 = $^{16}/_{16}$ = 1 in

Drawn Cup Needle Roller Bearings

Page

Caged, Open Ends, Closed One End – Metric Series

Sealed – Metric Series

Full Complement Open Ends, Closed One End – Metric Series

Full Complement Bearings Open Ends, Closed One End – Inch Series

Caged Bearings – Open Ends, Closed One End – Inch Series

DRAWN CUP NEEDLE ROLLER BEARINGS

METRIC SERIES

When a rolling bearing is needed for a compact and economic design and where it is not practical to harden and grind the housing bore, or where the housing materials are of low rigidity such as cast iron, aluminum or even plastics – drawn cup needle roller bearings should be considered.

REFERENCE STANDARDS ARE:

- **ISO 3245** – rolling bearings – needle roller bearings, drawn cup, without inner ring, boundary dimensions and tolerances.
- **ANSI/ABMA 18.1** – needle roller bearings – radial, metric design.
- **DIN 618** – needle roller bearings with cage – drawn cups with open end, drawn cup with closed end.
- **JIS B 1536** – rolling bearings – needle roller bearings – boundary dimensions and tolerances.

Before selecting specific drawn cup needle roller bearings, please review the engineering section of this catalog.

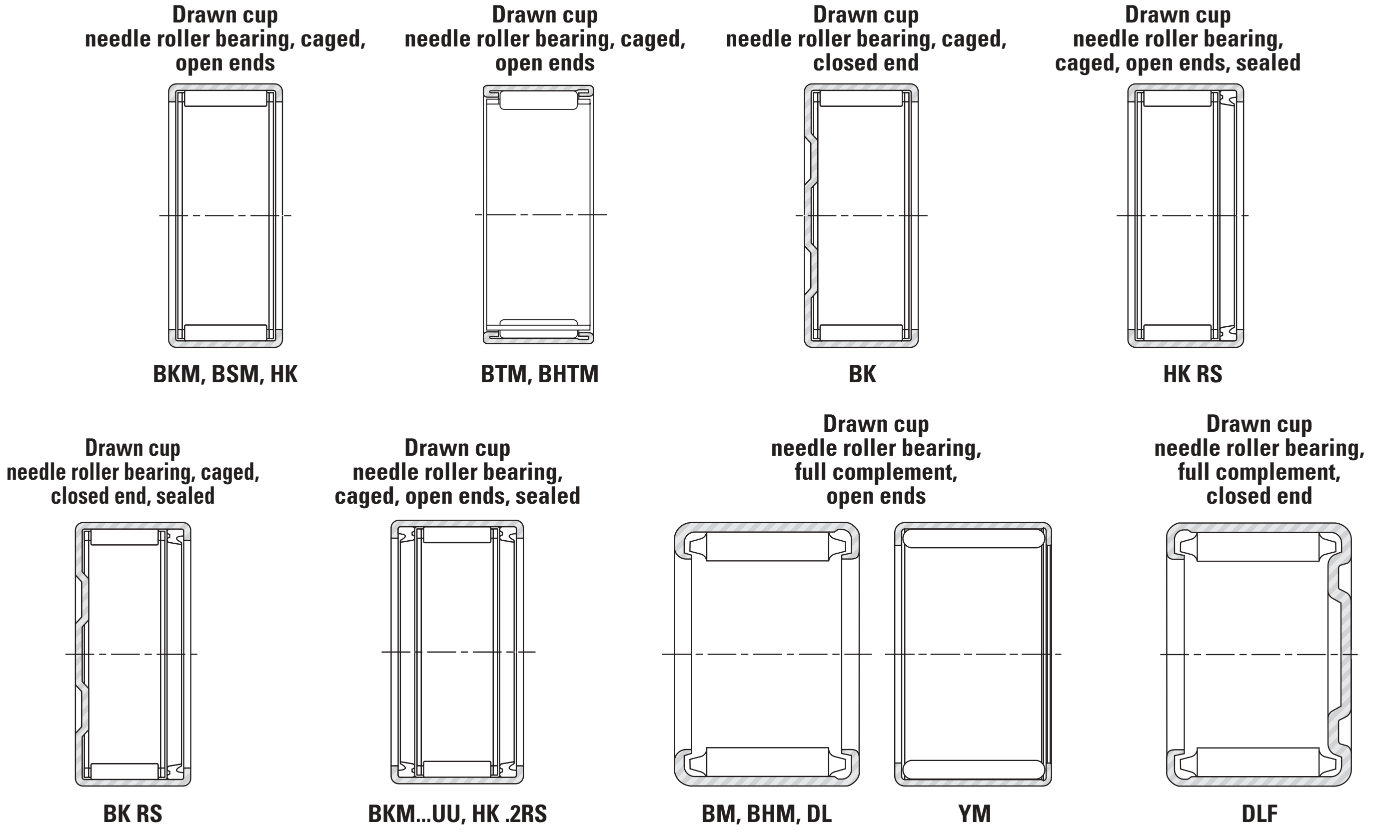


Fig. B2-1. Types of metric series drawn cup needle roller bearings

CONSTRUCTION

The prefix letters in metric series drawn cup bearing designations denote whether the bearings are made with a full complement of needle rollers or caged needle rollers. The use of a full complement of needle rollers is indicated by the prefix code letters **DL**, **BM**, **BHM**, **YM** or **DLF**, and for use of caged needle rollers by the prefix code letters **HK**, **BKM**, **BTM**, **BHTM**, **BSM** or **BK**.

The outer ring, in the form of a cup, is accurately drawn and no subsequent machining is performed. Drawn cup needle roller bearings of series **HK**, **BKM**, **BTM**, **BHTM**, **BSM**, **DL**, **BM**, **BHM** and **YM** have open ends. The **HK** and **BKM** series also are available with one seal, **HK RS**, and with two seals, **HK 2RS** and **BKM UU**. The stamped lip of a drawn cup needle roller bearing of series **HK RS** is at the seal end.

Drawn cup needle roller bearings of series **BK** and **DLF** are closed at one end. They are used for shaft-end mounting. The open end is typically not sealed.

The one-piece steel cage used in **HK**, **BKM** and **BK** series drawn cup bearings is designed to provide rigidity and minimize wear. This cage design separates the needle roller guiding and retention functions.

Drawn cup needle roller bearings also are available with two needle roller and cage assemblies. They have a lubricating hole in the outer ring. Metric series drawn cup bearings with one needle roller and cage assembly may be made available on request with a lubricating hole, indicated by suffix **AS1** and **JS1**.

SEALED BEARINGS

The HK and BKM series drawn cup bearings are offered with integral seals. The tables of dimensions on pages B-2-24 to B-2-26, indicate those sizes available with lip contact seals. The seal lip design achieves a light and constant contact with the inner raceway throughout the range of mounted bearing clearances, thereby ensuring positive sealing and low frictional drag.

Sealed drawn cup needle roller bearings are intended to retain grease or non-pressurized oil within a bearing while also preventing contaminants from entering the raceway area.

Details of shaft design for sealed bearings are given in the engineering section of this catalog.

The standard lip contact seals are compatible with common lubricating oils and petroleum based fuels; but, they are adversely affected by certain fire-resistant hydraulic fluids and most common solvents. Sealed drawn cup bearings are normally filled with a high-quality lithium soap-based general purpose grease. The seal material and grease properties limit the bearing operating temperature between -30° C and +100° C (-22° F and + 212° F).

If the operating temperature must be outside of the range for the seals mentioned here, or if the seals are exposed to unusual fluids, please consult your representative.

BEARING MOUNTING FITS AND INTERNAL CLEARANCE

Drawn cup needle roller bearings are manufactured to a degree of precision that will satisfy the radial clearance requirements of most applications. The total radial clearance for an installed drawn cup bearing results from the buildup of manufacturing tolerances of the housing bore, the inner raceway diameter and the bearing, as well as the minimum radial clearance required for the application (reference Table B2-1 on page B-2-8).

For metric series caged drawn cup needle roller bearings requiring close control of radial internal clearance, the suggested housing bore tolerance is N6 and h5 tolerance for the inner raceway diameter. When such exacting close control of radial internal clearance is not required, the user may select N7 housing bore and h6 inner raceway diameter tolerances.

For metric series full complement drawn cup bearings requiring close control of radial internal clearance, the suggested housing bore tolerance is H6 and h5 tolerance for the inner raceway diameter. When such exacting close control of radial internal clearance is not required, the user may select H7 housing bore and h6 inner raceway diameter tolerances.

TOLERANCES FOR HOUSING MATERIALS OF LOW RIGIDITY

The suggested housing bore tolerance for metric series caged drawn cup bearings used in housings made from materials of low rigidity or steel housings of small section is R6. To maintain normal radial internal clearance, the inner raceway diameter tolerance should be h5. When such exacting close control of radial internal clearance is not required, the user may select R7 housing bore and h6 inner raceway diameter tolerances.

The suggested housing bore tolerance for metric series full complement drawn cup bearings used in housings made from materials of low rigidity or steel housings of small section is M6. To maintain normal radial internal clearance, the inner raceway diameter tolerance should be h5. When such exacting close control of radial internal clearance is not required, the user may select M7 housing bore and h6 inner raceway diameter tolerances.

OUTER RING ROTATION

For metric series caged drawn cup bearing applications where the outer ring rotates with respect to the load, it is suggested that both the housing bore and the inner raceway diameter be reduced using R6 and f5 tolerance practice respectively. The user may select R7 housing bore and f6 inner raceway diameter tolerance when such exacting close control of radial internal clearance is not required.

For metric series full complement drawn cup bearings applications where the outer ring rotates with respect to the load, it is suggested that both the housing bore and the inner raceway diameter tolerance be reduced using is M6 and f5 tolerance practice respectively. The user may select M7 housing bore and f6 inner raceway diameter tolerances when such exacting close control of radial internal clearance is not required.

OSCILLATING MOTION

Metric series drawn cup needle roller bearing applications involving oscillating motion may require reduced radial internal clearances. This reduction may be accomplished by increasing the inner raceway diameter using j5 tolerance. When such exacting close control of radial clearance is not required, the user may select j6 inner raceway diameter tolerances.

Table B2-1. Metric mounting fits

Bearing type	Operating condition	Shaft fit (recommended internal radial clearances)	Housing fit (recommended internal radial clearances)
HK, BK, HKRS, HK.2RS, BTM, BHTM, BSM, BKM (caged)	One piece heavy section steel or cast iron housing	h5 (h6)	N6 (N7)
	Housing material of low rigidity	h5 (h6)	R6 (R7)
	Outer ring rotation (one piece heavy section steel or cast iron housing)	f5 (f6)	R6 (R7)
	Oscillating motion	j5 (j6)	(1)
DL, DLF, BM, BHM, YM (full complement)	One piece heavy section steel or cast iron housing	h5 (h6)	H6 (H7)
	Housing material of low rigidity	h5 (h6)	M6 (M7)
	Outer ring rotation (one piece heavy section steel or cast iron housing)	f5 (f6)	M6 (M7)
	Oscillating motion	j5 (j6)	(1)

[1] Tolerance dependent on housing design.

INNER RINGS

When it becomes impractical to meet the shaft raceway design requirements (hardness, case depth, surface finish, etc.) outlined in the engineering section of this catalog, standard inner rings may be used with metric series drawn cup bearings. It is suggested that when metric series inner rings are used with metric series drawn cup bearings, they should be mounted with a loose transition fit on the shaft using g5 shaft diameter tolerance. The inner ring should be end-clamped against a shoulder. If a tight transition fit must be used (shaft diameter tolerance h5) to keep the inner ring from rotating relative to the shaft, the inner ring outer diameter, as mounted, must not exceed the raceway diameter required by the drawn cup bearing for the particular application. In case the outer diameter of the inner ring, when mounted on the shaft, exceeds the required raceway diameter for the matching drawn cup bearing, it should be ground to proper diameter while mounted on the shaft. When such exacting close control of radial internal clearance is not required the user may select g6 or h5 shaft diameter tolerances.

LOAD RATING FACTORS

DYNAMIC LOADS

Drawn cup needle roller bearings can accommodate only radial loads.

$P = F_r$

$P =$ The maximum dynamic radial load that may be applied to a drawn cup bearing based on the dynamic load rating, C_r given in the bearing tables. This load should be $\leq C_r/3$.

STATIC LOADS

$$f_0 = \frac{C_0}{P_0}$$

f_0 = static load safety factor

C_0 = basic static load rating (kN)

P_0 = maximum applied static load (kN)

To ensure satisfactory operation of drawn cup needle roller bearings, under all types of conditions, the static load safety factor f_0 should be ≥ 3.

INSPECTION OF DRAWN CUP NEEDLE ROLLER BEARINGS

Although the bearing cup is accurately drawn from strip steel, because of its fairly thin section, it may go out-of-round during heat treatment. When the bearing is pressed into a true round housing, or ring gage of correct size and wall thickness, it becomes round and is sized properly. *For this reason, it is incorrect to inspect an unmounted drawn cup bearing by measuring the outer diameter.* The correct method for inspecting the bearing size is to:

1. Press the bearing into a ring gage of proper size.
2. Plug the bearing bore with the appropriate “go” and “no go” gages, or measure it with a tapered arbor (lathe mandrel).

- HK, BK and DL series

The "go" gage size is the minimum needle roller complement bore diameter.

The "no go" gage size is larger than the maximum needle roller complement bore diameter by 0.002 mm (0.0001 in). (Tables B2-2 and B2-3)

- BTM, BHTM, BSM, BKM, BM and YM series

The inspection gage (ring gage and plug gage) sizes are listed in Table B2-4.

NOTE

SPECIAL BEARINGS. There are bearings available with other cage designs, and materials such as reinforced engineered polymer for use where operating conditions permit.

Table B2-2. Caged bearing gage sizes

Nominal bore diameter	Ring gage[1]	Needle roller complement bore diameter	
		Max.	Min.
mm in	mm in	mm in	mm in
3.000 0.1181	**6.484** 0.2553	**3.024** 0.1191	**3.006** 0.1183
4.000 0.1575	**7.984** 0.3143	**4.028** 0.1586	**4.010** 0.1579
5.000 0.1969	**8.984** 0.3537	**5.028** 0.1980	**5.010** 0.1972
6.000 0.2362	**9.984** 0.3931	**6.028** 0.2373	**6.010** 0.2366
7.000 0.2756	**10.980** 0.4323	**7.031** 0.2768	**7.013** 0.2761
8.000 0.3150	**11.980** 0.4717	**8.031** 0.3162	**8.013** 0.3155
9.000 0.3543	**12.980** 0.5110	**9.031** 0.3555	**9.013** 0.3548
10.000 0.3937	**13.980** 0.5504	**10.031** 0.3949	**10.013** 0.3942
12.000 0.4724	**15.980** 0.6291	**12.034** 0.4738	**12.016** 0.4731
12.000 0.4724	**17.980** 0.7079	**12.034** 0.4738	**12.016** 0.4731
13.000 0.5118	**18.976** 0.7471	**13.034** 0.5131	**13.016** 0.5124
14.000 0.5512	**19.976** 0.7865	**14.034** 0.5525	**14.016** 0.5518
15.000 0.5906	**20.976** 0.8258	**15.034** 0.5919	**15.016** 0.5912
16.000 0.6299	**21.976** 0.8652	**16.034** 0.6313	**16.016** 0.6306
17.000 0.6693	**22.976** 0.9046	**17.034** 0.6706	**17.016** 0.6699
18.000 0.7087	**23.976** 0.9439	**18.034** 0.7100	**18.016** 0.7093
20.000 0.7874	**25.976** 1.0227	**20.041** 0.7890	**20.020** 0.7882
22.000 0.8661	**27.976** 1.1014	**22.041** 0.8678	**22.020** 0.8669
25.000 0.9843	**31.972** 1.2587	**25.041** 0.9859	**25.020** 0.9850
28.000 1.1024	**34.972** 1.3769	**28.041** 1.1040	**28.020** 1.1031
30.000 1.1811	**36.972** 1.4556	**30.041** 1.1827	**30.020** 1.1819
35.000 1.3780	**41.972** 1.6524	**35.050** 1.3799	**35.025** 1.3789
40.000 1.5750	**46.972** 1.8493	**40.050** 1.5768	**40.025** 1.5758
45.000 1.7717	**51.967** 2.0459	**45.050** 1.7736	**45.025** 1.7726
50.000 1.9685	**57.967** 2.2822	**50.050** 1.9705	**50.025** 1.9695
60.000 2.3622	**67.967** 2.6759	**60.060** 2.3646	**60.030** 2.3634

[1] The ring gage sizes are in accordance with ISO N6 lower limit.

Table B2-3. Full complement bearing gage sizes

Nominal bore diameter	Ring gage	Needle roller complement bore diameter	
		Max.	Min.
mm in	mm in	mm in	mm in
6.000 0.2362	**12.000** 0.4724	**6.034** 0.2376	**6.009** 0.2366
8.000 0.3150	**14.000** 0.5512	**8.034** 0.3163	**8.009** 0.3153
9.000 0.3543	**14.000** 0.5512	**9.034** 0.3557	**9.009** 0.3547
10.000 0.3937	**16.000** 0.6299	**10.034** 0.3950	**10.009** 0.3941
12.000 0.4724	**18.000** 0.7087	**10.033** 0.3950	**10.009** 0.3941
13.000 0.5118	**19.000** 0.7480	**13.033** 0.5131	**13.009** 0.5122
14.000 0.5512	**20.000** 0.7874	**14.033** 0.5525	**14.009** 0.5515
15.000 0.5906	**21.000** 0.8268	**15.033** 0.5919	**15.009** 0.5909
16.000 0.6299	**22.000** 0.8661	**16.033** 0.6312	**16.009** 0.6303
17.000 0.6693	**23.000** 0.9055	**17.033** 0.6706	**17.009** 0.6696
18.000 0.7087	**24.000** 0.9449	**18.033** 0.7100	**18.009** 0.7090
20.000 0.7874	**26.000** 1.0236	**20.033** 0.7887	**20.009** 0.7878
22.000 0.8661	**28.000** 1.1024	**22.033** 0.8674	**22.009** 0.8665
25.000 0.9843	**33.000** 1.2992	**25.039** 0.9858	**25.015** 0.9848
28.000 1.1024	**36.000** 1.4173	**28.039** 1.1039	**28.015** 1.1030
30.000 1.1811	**38.000** 1.4961	**30.039** 1.1826	**30.015** 1.1817
35.000 1.3780	**43.000** 1.6929	**35.039** 1.3795	**35.015** 1.3785
40.000 1.5748	**48.000** 1.8898	**40.039** 1.5763	**40.015** 1.5754
44.000 1.7323	**52.000** 2.0472	**44.039** 1.7338	**44.015** 1.7329
47.000 1.8504	**55.000** 2.1654	**47.039** 1.8519	**47.015** 1.8510
50.000 1.9685	**58.000** 2.2835	**50.039** 1.9700	**50.015** 1.9691
55.000 2.1654	**63.000** 2.4803	**55.039** 2.1669	**55.015** 2.1659

Table B2-4. Needle roller bearing gage sizes (metric series)

Needle roller complement bore diameter Fw nominal size	Ring gage	Plug gage	
		Go	No go
mm	mm	mm	mm
4	7.996	4.023	4.048
5	8.996	5.023	5.048
6	9.996	6.028	6.053
7	10.995	7.031	7.056
8	11.995 14.995	8.031	8.056
9	12.995 15.995	9.031	9.056
10	13.995 16.995	10.031	10.056
12	15.995 17.995 18.993	12.031	12.056
13	18.993	13.034	13.059
14	18.993 19.993 21.993	14.034	14.059
15	19.993 20.993 21.993	15.034	15.059
16	21.993 23.993	16.034	16.059
17	21.972 22.972 23.972	17.013	17.038
18	23.972 24.972	18.013	18.038
19	26.972	19.013	19.038
20	25.972 26.972	20.013	20.038
22	27.972 28.972 29.972	22.013	22.038
24	29.972 30.967 34.967	24.013	24.038
25	31.967 32.967	25.013	25.038
26	33.967	26.013	26.038
28	33.967 34.967 36.967	28.013	28.038
30	36.967 37.967 39.967	30.013	30.038
32	37.967 39.967 41.967	32.013	32.038
35	41.967 44.967	35.013	35.038
36	41.967 43.967 47.967	36.013	36.038
37	42.967 46.967	37.013	37.038
38	47.967	38.013	38.038
40	46.967 49.967	40.013	40.043
45	51.961 54.961	45.013	45.043
50	57.961 61.961	50.013	50.043
55	62.961	55.013	55.051

INSTALLATION PROCEDURES

GENERAL INSTALLATION REQUIREMENTS

- A drawn cup needle roller bearing must be pressed into its housing.
- An installation tool, similar to the ones illustrated must be used in conjunction with a standard press.
- The bearing must not be hammered into its housing, even in conjunction with the proper assembly mandrel.
- The bearing must not be pressed tightly against a shoulder in the housing.
- If it is necessary to use a shouldered housing, the depth of the housing bore must be sufficient to ensure that the housing shoulder fillet, as well as the shoulder face, clears the bearing.
- The installation tool must be coaxial with the housing bore.

INSTALLATION OF OPEN ENDS CAGED BEARINGS

It is advisable to utilize a positive stop on the press tool to locate the bearing properly in the housing. The assembly tool should have a leader or a pilot, as shown, to aid in starting the bearing true in the housing. The "O" ring shown on the drawing may be used to assist in holding the bearing on the installation tool. The bearing should be installed with the stamped end (the end with the identification markings) against the angled shoulder of the pressing tool.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)
D – pilot length should be length of bearing less 0.80 mm (0.030 in)
E – approximately $\frac{1}{2}$ D

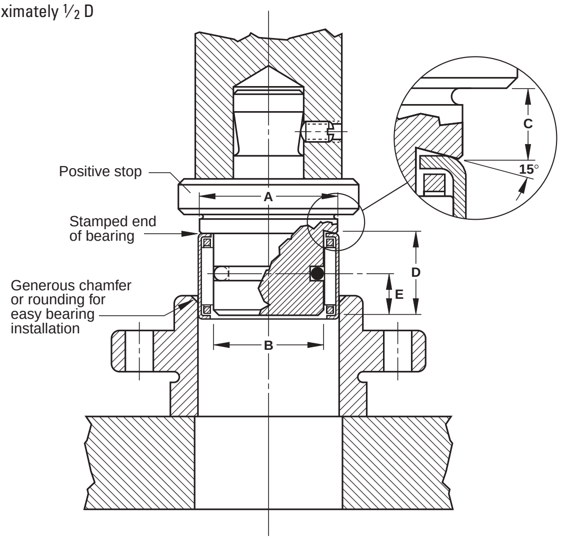


Fig. B2-2. Installation of open ends caged bearings

INSTALLATION OF CLOSED END CAGED BEARINGS

Bearing can be piloted from below for installation.

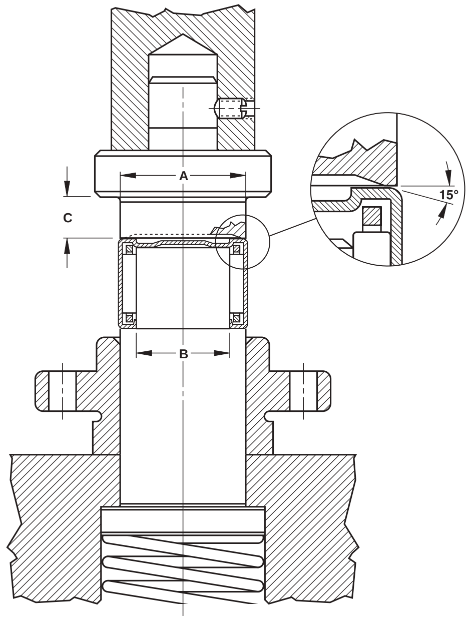


Fig. B2-3. Installation of closed end caged bearings

EXTRACTION FROM A STRAIGHT HOUSING (CAGED AND FULL COMPLEMENT BEARINGS)

Bearing can be extracted by pushing it through the housing. After extraction, the drawn cup needle roller bearing should not be reused.

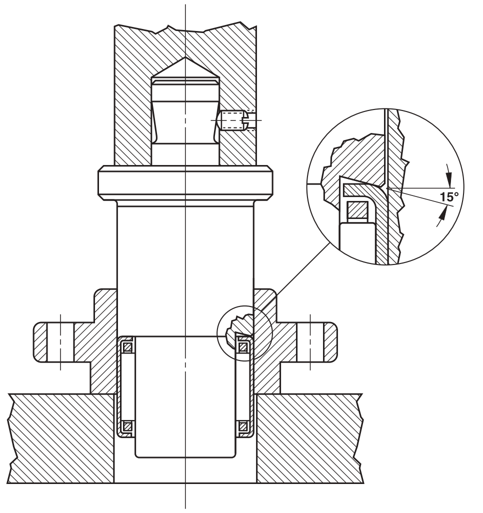


Fig. B2-4. Extraction from a straight housing

INSTALLATION OF OPEN ENDS FULL COMPLEMENT BEARINGS

It is advisable to utilize a positive stop on the press tool to locate the bearing properly in the housing. The assembly tool should have a leader or a pilot, as shown, to aid in starting the bearing true in the housing. The ball detent shown on the drawing is used to assist in aligning the rollers of a full complement bearing during installation and to hold the bearing on the installation tool. The bearing should be installed with the marked end (the end with identification markings) against the angled shoulder of the pressing tool.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)
D – pilot length should be length of bearing less 0.80 mm (0.030 in)
E – approximately 1⁄2 D

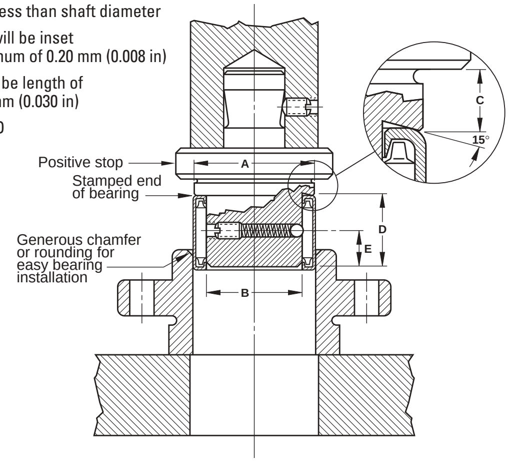


Fig. B2-5. Installation of open ends full complement bearings

INSTALLATION OF CLOSED END FULL COMPLEMENT BEARINGS

The installation tool combines all the features of the tool used to install open end bearings, but the pilot is spring loaded and is part of the press bed.

The angled shoulder of the pressing tool should bear against the closed end with the bearing held on the pilot to aid in starting the bearing true in the housing.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)

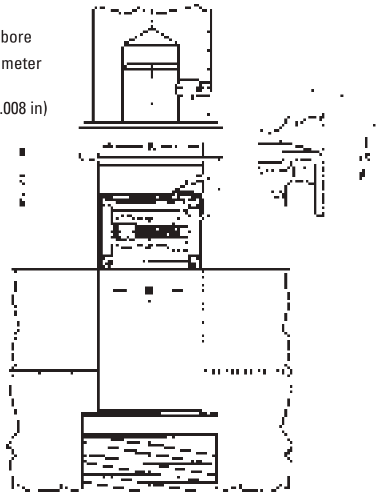


Fig. B2-6. Installation of closed end full complement bearings

EXTRACTION FROM A SHOULDERED OR DEAD END HOUSING (CAGED AND FULL COMPLEMENT BEARINGS) (with space between the bearing and the housing shoulder)

Bearings may be extracted from shouldered or dead end housings with a common bearing puller tool as shown. This type of tool is slotted in two places at right angles to form four prongs. The four puller prongs are pressed together and inserted into the space between the end of the bearing and the shoulder. The prongs are forced outward by inserting the expansion rod, and then the bearing is extracted. Do not reuse the bearing after extraction.

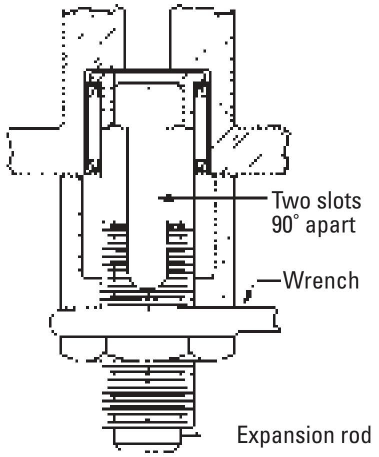


Fig. B2-7. Extraction from a shouldered or dead end housing

EXTRACTION FROM A SHOULDERED HOUSING (CAGED AND FULL COMPLEMENT BEARINGS) (with bearing pressed up close to the shoulder)

The tool to be used, as shown, is of a similar type described for a shouldered or dead end housing, but the rollers must first be removed from the bearing.

The four segment puller jaws are collapsed and slipped into the empty cup. The jaws are then forced outward into the cup bore by means of the tapered expansion rod. The jaws should bear on the lip as near as possible to the cup bore. The cup is then pressed out from the top.

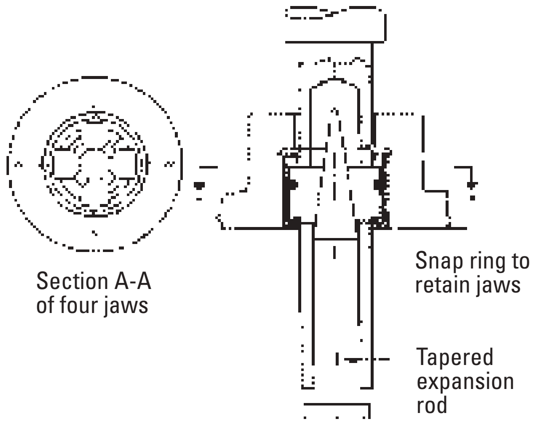
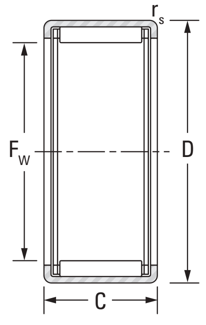


Fig. B2-8. Extraction from a shouldered housing

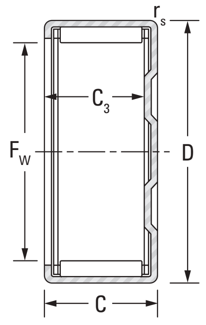
NOTES

DRAWN CUP NEEDLE ROLLER BEARINGS CAGED, OPEN ENDS, CLOSED ONE END

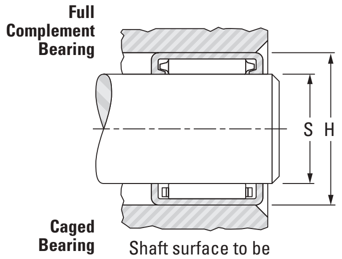
METRIC SERIES HK, BK SERIES



HK



BK



Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C	$C_{3\,min.}$	$r_{s\,min.}$	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 **-0.3** -0.012					Dynamic	Static					Shaft (h5)		Housing (N6)			
						Open Ends	Closed One End	C	C_0		Grease	Oil		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
3 0.1181	**3** 0.1181	**6.5** 0.2559	**6** 0.236	**5.20** 0.205	**0.30** 0.012	—	BK0306	**1.20** 270	**0.78** 180	0.130	30000	46000	**0.001** 0.002	**3.000** 0.1181	**2.996** 0.118	**6.493** 0.2556	**6.484** 0.2553	Table B2-2	
	3 0.1181	**6.5** 0.2559	**6** 0.236	—	**0.30** 0.012	HK0306	—	**1.20** 270	**0.78** 180	0.130	30000	46000	**0.001** 0.002	**3.000** 0.1181	**2.996** 0.118	**6.493** 0.2556	**6.484** 0.2553	Table B2-2	
4 0.1575	**4** 0.1575	**8** 0.3150	**8** 0.315	**6.40** 0.252	**0.40** 0.016	—	BK0408	**1.88** 423	**1.38** 310	0.200	25000	39000	**0.002** 0.004	**4.000** 0.1575	**3.995** 0.1573	**7.993** 0.3147	**7.984** 0.3143	Table B2-2	
	4 0.1575	**8** 0.3150	**8** 0.315	—	**0.40** 0.016	HK0408	—	**1.88** 420	**1.38** 310	0.200	25000	39000	**0.002** 0.004	**4.000** 0.1575	**3.995** 0.1573	**7.993** 0.3147	**7.984** 0.3143	Table B2-2	
5 0.1969	**5** 0.1969	**9** 0.3543	**9** 0.354	**7.40** 0.291	**0.40** 0.016	—	BK0509	**2.52** 570	**2.07** 470	0.320	23000	36000	**0.002** 0.004	**5.000** 0.1969	**4.995** 0.1967	**8.993** 0.3541	**8.984** 0.3537	Table B2-2	
	5 0.1969	**9** 0.3543	**9** 0.354	—	**0.40** 0.016	HK0509	—	**2.52** 570	**2.07** 470	0.320	23000	36000	**0.002** 0.004	**5.000** 0.1969	**4.995** 0.1967	**8.993** 0.3541	**8.984** 0.3537	Table B2-2	
6 0.2362	**6** 0.2362	**10** 0.3937	**8** 0.315	**6.40** 0.252	**0.40** 0.016	—	BK0608	**2.34** 530	**1.95** 440	0.290	22000	33000	**0.002** 0.004	**6.000** 0.2362	**5.995** 0.236	**9.993** 0.3934	**9.984** 0.3931	Table B2-2	
	6 0.2362	**10** 0.3937	**8** 0.315	—	**0.40** 0.016	HK0608	—	**2.34** 530	**1.95** 440	0.290	22000	33000	**0.002** 0.004	**6.000** 0.2362	**5.995** 0.236	**9.993** 0.3934	**9.984** 0.3931	Table B2-2	
	6 0.2362	**10** 0.3937	**9** 0.354	**7.40** 0.291	**0.40** 0.016	—	BK0609	**3.14** 710	**2.85** 640	0.290	22000	33000	**0.003** 0.007	**6.000** 0.2362	**5.995** 0.236	**9.993** 0.3934	**9.984** 0.3931	Table B2-2	
	6 0.2362	**10** 0.3937	**9** 0.354	—	**0.40** 0.016	HK0609	—	**3.14** 710	**2.85** 640	0.290	22000	33000	**0.002** 0.004	**6.000** 0.2362	**5.995** 0.236	**9.993** 0.3934	**9.984** 0.3931	Table B2-2	
7 0.2756	**7** 0.2756	**11** 0.4331	**9** 0.354	**7.40** 0.291	**0.40** 0.016	—	BK0709	**3.23** 730	**3.05** 690	0.470	21000	32000	**0.003** 0.007	**7.000** 0.2756	**6.994** 0.2754	**10.991** 0.4327	**10.980** 0.4323	Table B2-2	
	7 0.2756	**11** 0.4331	**9** 0.354	—	**0.40** 0.016	HK0709	—	**3.23** 730	**3.05** 690	0.470	21000	32000	**0.003** 0.007	**7.000** 0.2756	**6.994** 0.2754	**10.991** 0.4327	**10.980** 0.4323	Table B2-2	
8 0.3150	**8** 0.3150	**12** 0.4724	**8** 0.315	**6.40** 0.252	**0.40** 0.016	—	BK0808	**2.90** 650	**2.73** 610	0.400	20000	31000	**0.003** 0.007	**8.000** 0.315	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	Table B2-2	
	8 0.3150	**12** 0.4724	**8** 0.315	—	**0.40** 0.016	HK0808	—	**2.90** 650	**2.73** 610	0.400	20000	31000	**0.003** 0.007	**8.000** 0.315	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	Table B2-2	
	8 0.3150	**12** 0.4724	**10** 0.394	**8.40** 0.331	**0.40** 0.016	—	BK0810	**3.95** 890	**4.07** 920	0.600	20000	31000	**0.004** 0.009	**8.000** 0.315	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	Table B2-2	JR5x8x12
	8 0.3150	**12** 0.4724	**10** 0.394	—	**0.40** 0.016	HK0810	—	**3.95** 890	**4.07** 920	0.600	20000	31000	**0.004** 0.009	**8.000** 0.315	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	Table B2-2	JR5x8x12
9 0.3543	**9** 0.3543	**13** 0.5118	**10** 0.394	**8.40** 0.331	**0.40** 0.016	—	BK0910	**4.57** 1030	**5.07** 1140	0.770	19000	30000	**0.004** 0.009	**9.000** 0.3543	**8.994** 0.3541	**12.991** 0.5115	**12.980** 0.5110	Table B2-2	JR6x9x12

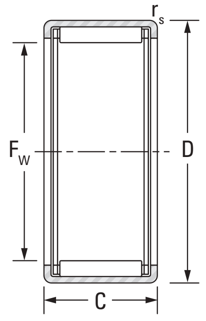
(1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.

Shaft Dia.	F_w	D	C	$C_{3\,min.}$	$r_{s\,min.}$	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 **-0.3** -0.012					Dynamic	Static					Shaft (h5)		Housing (N6)			
						Open Ends	Closed One End	C	C_0		Grease	Oil		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
9 0.3543	**9** 0.3543	**13** 0.5118	**10** 0.394	—	**0.40** 0.016	HK0910	—	**4.57** 1030	**5.07** 1140	0.770	19000	30000	**0.004** 0.009	**9.000** 0.3543	**8.994** 0.3541	**12.991** 0.5115	**12.980** 0.5110	Table B2-2	JR6x9x12
	9 0.3543	**13** 0.5118	**12** 0.472	**10.40** 0.409	**0.40** 0.016	—	BK0912	**5.65** 1270	**6.65** 1490	1.00	19000	30000	**0.005** 0.011	**9.000** 0.3543	**8.994** 0.3541	**12.991** 0.5115	**12.980** 0.5110	Table B2-2	JR6x9x12
	9 0.3543	**13** 0.5118	**12** 0.472	—	**0.40** 0.016	HK0912	—	**5.65** 1270	**6.65** 1490	1.00	19000	30000	**0.005** 0.011	**9.000** 0.3543	**8.994** 0.3541	**12.991** 0.5115	**12.980** 0.5110	Table B2-2	JR6x9x12
10 0.3937	**10** 0.3937	**14** 0.5512	**10** 0.394	**8.40** 0.331	**0.40** 0.016	—	BK1010	**4.78** 1070	**5.51** 1240	0.840	19000	29000	**0.004** 0.009	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	Table B2-2	JR7x10x10,5
	10 0.3937	**14** 0.5512	**10** 0.394	—	**0.40** 0.016	HK1010	—	**4.78** 1070	**5.51** 1240	0.840	19000	29000	**0.004** 0.009	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	Table B2-2	JR7x10x10,5
	10 0.3937	**14** 0.5512	**12** 0.472	**10.40** 0.409	**0.40** 0.016	—	BK1012	**5.90** 1330	**7.23** 1630	1.10	19000	29000	**0.006** 0.013	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	Table B2-2	JR7x10x12
	10 0.3937	**14** 0.5512	**12** 0.472	—	**0.40** 0.016	HK1012	—	**5.90** 1330	**7.23** 1630	1.10	19000	29000	**0.005** 0.011	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	Table B2-2	JR7x10x12
	10 0.3937	**14** 0.5512	**15** 0.591	**13.40** 0.528	**0.40** 0.016	—	BK1015	**7.49** 1680	**9.81** 2210	1.50	19000	29000	**0.006** 0.013	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	Table B2-2	JR7x10x16
	10 0.3937	**14** 0.5512	**15** 0.591	—	**0.40** 0.016	HK1015	—	**7.49** 1680	**9.81** 2210	1.50	19000	29000	**0.006** 0.013	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	Table B2-2	JR7x10x16
12 0.4724	**12** 0.4724	**16** 0.6299	**10** 0.394	**8.40** 0.331	**0.40** 0.016	—	BK1210	**5.24** 1180	**6.55** 1470	0.890	18000	28000	**0.006** 0.013	**12.000** 0.4724	**11.992** 0.4721	**15.991** 0.6296	**15.980** 0.6291	Table B2-2	JR8x12x10,5
	12 0.4724	**16** 0.6299	**10** 0.394	—	**0.40** 0.016	HK1210	—	**5.24** 1180	**6.55** 1470	0.890	18000	28000	**0.006** 0.013	**12.000** 0.4724	**11.992** 0.4721	**15.991** 0.6296	**15.980** 0.6291	Table B2-2	JR8x12x10,5
	12 0.4724	**18** 0.7087	**12** 0.472	**9.30** 0.366	**1** 0.039	—	BK1212	**6.61** 1490	**7.29** 1640	1.10	14000	22000	**0.012** 0.026	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	Table B2-2	JR8x12x12,5
	12 0.4724	**18** 0.7087	**12** 0.472	—	**1** 0.039	HK1212	—	**6.61** 1490	**7.29** 1640	1.10	14000	22000	**0.01** 0.022	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	Table B2-2	JR8x12x12,5
13 0.5118	**13** 0.5118	**19** 0.7480	**12** 0.472	**9.30** 0.366	**1** 0.039	—	BK1312	**6.92** 1560	**7.89** 1770	1.20	14000	22000	**0.012** 0.026	**13.000** 0.5118	**12.992** 0.5115	**18.989** 0.7476	**18.976** 0.7471	Table B2-2	JR10x13x12,5
	13 0.5118	**19** 0.7480	**12** 0.472	—	**1** 0.039	HK1312	—	**6.92** 1560	**7.89** 1770	1.20	14000	22000	**0.01** 0.022	**13.000** 0.5118	**12.992** 0.5115	**18.989** 0.7476	**18.976** 0.7471	Table B2-2	JR10x13x12,5
14 0.5512	**14** 0.5512	**20** 0.7874	**12** 0.472	**9.30** 0.366	**1** 0.039	—	BK1412	**7.21** 1620	**8.50** 1910	1.30	14000	21000	**0.014** 0.031	**14.000** 0.5512	**13.992** 0.5509	**19.989** 0.7870	**19.976** 0.7865	Table B2-2	JR10x14x12
	14 0.5512	**20** 0.7874	**12** 0.472	—	**1** 0.039	HK1412	—	**7.21** 1620	**8.50** 1910	1.30	14000	21000	**0.011** 0.024	**14.000** 0.5512	**13.992** 0.5509	**19.989** 0.7870	**19.976** 0.7865	Table B2-2	JR10x14x12
15 0.5906	**15** 0.5906	**21** 0.8268	**12** 0.472	**9.30** 0.366	**1** 0.039	—	BK1512	**7.49** 1680	**9.11** 2050	1.40	14000	21000	**0.015** 0.033	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x12,5
	15 0.5906	**21** 0.8268	**12** 0.472	—	**1** 0.039	HK1512	—	**7.49** 1680	**9.11** 2050	1.40	14000	21000	**0.012** 0.026	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x12,5
	15 0.5906	**21** 0.8268	**16** 0.630	**13.30** 0.524	**1** 0.039	—	BK1516	**10.7** 2410	**14.4** 3240	2.20	14000	21000	**0.019** 0.042	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x16,5
	15 0.5906	**21** 0.8268	**16** 0.630	—	**1** 0.039	HK1516	—	**10.7** 2410	**14.4** 3240	2.20	14000	21000	**0.018** 0.040	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x16,5
	15 0.5906	**21** 0.8268	**22** 0.866	**19.30** 0.760	**1** 0.039	—	BK1522(1)	**13.5** 3030	**19.4** 4360	2.95	14000	21000	**0.022** 0.049	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x22,5
	15 0.5906	**21** 0.8268	**22** 0.866	—	**1** 0.039	HK1522(1)	—	**13.5** 3030	**19.4** 4360	2.95	14000	21000	**0.024** 0.053	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x22,5
16 0.6299	**16** 0.6299	**22** 0.8661	**12** 0.472	**9.30** 0.366	**1** 0.039	—	BK1612	**7.76** 1740	**9.72** 2190	1.50	14000	21000	**0.016** 0.035	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	Table B2-2	JR12x16x12

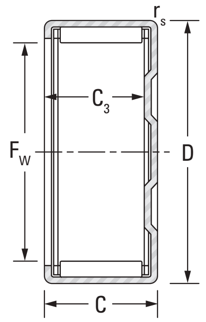
Continued on next page.

DRAWN CUP NEEDLE ROLLER BEARINGS
CAGED,
OPEN ENDS,
CLOSED ONE END

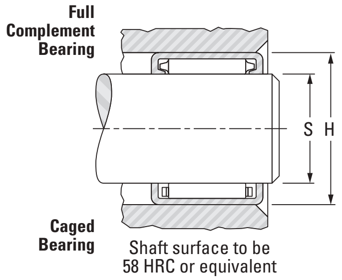
METRIC SERIES
HK, BK SERIES



HK



BK



Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C	$C_{3\,min.}$	$r_{s\,min.}$	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012			Open Ends	Closed One End	Dynamic	Static		Grease	Oil		Shaft (h5)		Housing (N6)			
								C	C_0					Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
16 0.6299	16 0.6299	22 0.8661	12 0.472	—	1 0.039	HK1612	—	7.76 1740	9.72 2190	1.50	14000	21000	0.012 0.026	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x12
	16 0.6299	22 0.8661	16 0.630	13.30 0.524	1 0.039	—	BK1616	11.1 2500	15.3 3440	2.35	14000	21000	0.02 0.044	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x16
	16 0.6299	22 0.8661	16 0.630	—	1 0.039	HK1616	—	11.1 2500	15.3 3440	2.35	14000	21000	0.016 0.035	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x16
	16 0.6299	22 0.8661	22 0.866	19.30 0.760	1 0.039	—	BK1622(1)	13.4 3010	19.5 4380	2.95	14000	21000	0.028 0.062	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x22
	16 0.6299	22 0.8661	22 0.866	—	1 0.039	HK1622(1)	—	13.4 3010	19.5 4380	2.95	14000	21000	0.022 0.049	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x22
17 0.6693	17 0.6693	23 0.9055	12 0.472	9.30 0.366	1 0.039	—	BK1712	8.12 1830	10.4 2340	1.60	13000	20000	0.018 0.040	17.000 0.6693	16.992 0.6690	22.989 0.9051	22.976 0.9046	Table B2-2	
	17 0.6693	23 0.9055	12 0.472	—	1 0.039	HK1712	—	8.12 1830	10.4 2340	1.60	13000	20000	0.013 0.029	17.000 0.6693	16.992 0.6690	22.989 0.9051	22.976 0.9046	Table B2-2	
18 0.7087	18 0.7087	24 0.9449	12 0.472	9.30 0.366	1 0.039	—	BK1812	8.41 1890	11.1 2500	1.70	12000	18000	0.017 0.037	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	
	18 0.7087	24 0.9449	12 0.472	—	1 0.039	HK1812	—	8.41 1890	11.1 2500	1.70	12000	18000	0.015 0.033	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	
	18 0.7087	24 0.9449	16 0.630	13.30 0.524	1 0.039	—	BK1816	11.6 2610	16.8 3780	2.55	12000	18000	0.022 0.049	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	JR15x18x16,5
	18 0.7087	24 0.9449	16 0.630	—	1 0.039	HK1816	—	11.6 2610	16.8 3780	2.55	12000	18000	0.018 0.040	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	JR15x18x16,5
20 0.7874	20 0.7874	26 1.0236	12 0.472	9.3 0.366	1 0.039	—	BK2012	8.97 2020	12.5 2810	1.90	11000	16000	0.017 0.037	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR15x20x12
	20 0.7874	26 1.0236	12 0.472	—	1 0.039	HK2012	—	8.97 2020	12.5 2810	1.90	11000	16000	0.015 0.033	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR15x20x12
	20 0.7874	26 1.0236	16 0.630	13.3 0.524	1 0.039	—	BK2016	12.4 2790	18.9 4250	2.85	11000	16000	0.024 0.053	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x16,5
	20 0.7874	26 1.0236	16 0.630	—	1 0.039	HK2016	—	12.4 2790	18.9 4250	2.85	11000	16000	0.022 0.049	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x16,5
	20 0.7874	26 1.0236	20 0.787	17.3 0.681	1 0.039	—	BK2020	15.5 3480	25.3 5690	3.95	11000	16000	0.027 0.060	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x20,5
	20 0.7874	26 1.0236	20 0.787	—	1 0.039	HK2020	—	15.5 3480	25.3 5690	3.95	11000	16000	0.025 0.055	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x20,5

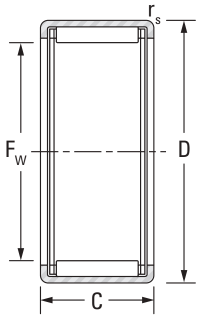
(1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.

Shaft Dia.	F_w	D	C	$C_{3\,min.}$	$r_{s\,min.}$	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012			Open Ends	Closed One End	Dynamic	Static		Grease	Oil		Shaft (h5)		Housing (N6)			
								C	C_0					Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
20 0.7874	20 0.7874	26 1.0236	30 1.181	27.3 1.075	1 0.039	—	BK2030(1)	21.2 4770	37.8 8500	5.75	11000	16000	0.043 0.095	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x30,5
	20 0.7874	26 1.0236	30 1.181	—	1 0.039	HK2030(1)	—	21.2 4770	37.8 8500	5.75	11000	16000	0.041 0.090	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x30,5
22 0.8661	22 0.8661	28 1.1024	10 0.394	—	1 0.039	HK2210	—	7.06 1590	9.49 2130	1.45	9600	15000	0.013 0.029	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	
	22 0.8661	28 1.1024	12 0.472	9.3 0.366	1 0.039	—	BK2212	9.81 2210	14.5 3260	2.20	9600	15000	0.02 0.044	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x13
	22 0.8661	28 1.1024	12 0.472	—	1 0.039	HK2212	—	9.81 2210	14.5 3260	2.20	9600	15000	0.015 0.033	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x13
	22 0.8661	28 1.1024	16 0.630	13.3 0.524	1 0.039	—	BK2216	13.1 2940	20.9 4700	3.20	9600	15000	0.027 0.060	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x16
	22 0.8661	28 1.1024	16 0.630	—	1 0.039	HK2216	—	13.1 2940	20.9 4700	3.20	9600	15000	0.022 0.049	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x16
	22 0.8661	28 1.1024	20 0.787	17.3 0.681	1 0.039	—	BK2220	15.3 3440	25.5 5730	4.00	9600	15000	0.028 0.062	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x23
	22 0.8661	28 1.1024	20 0.787	—	1 0.039	HK2220	—	15.3 3440	25.5 5730	4.00	9600	15000	0.026 0.057	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x23
25 0.9843	25 0.9843	32 1.2598	12 0.472	9.30 0.366	1 0.039	—	BK2512	10.9 2450	14.7 3300	2.25	8500	13000	0.025 0.055	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	
	25 0.9843	32 1.2598	12 0.472	—	1 0.039	HK2512	—	10.9 2450	14.7 3300	2.25	8500	13000	0.021 0.046	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	
	25 0.9843	32 1.2598	16 0.630	13.3 0.524	1 0.039	—	BK2516	15.6 3510	23.5 5280	3.55	8500	13000	0.031 0.068	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x17
	25 0.9843	32 1.2598	16 0.630	—	1 0.039	HK2516	—	15.6 3510	23.5 5280	3.55	8500	13000	0.028 0.062	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x17
	25 0.9843	32 1.2598	20 0.787	17.3 0.681	1 0.039	—	BK2520	20.6 4630	33.4 7510	5.30	8500	13000	0.043 0.095	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x20,5
	25 0.9843	32 1.2598	20 0.787	—	1 0.039	HK2520	—	20.6 4630	33.4 7510	5.30	8500	13000	0.040 0.088	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x20,5
	25 0.9843	32 1.2598	26 1.024	23.3 0.917	1 0.039	—	BK2526	25.7 5780	44.4 9980	6.95	8500	13000	0.051 0.112	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x26,5
	25 0.9843	32 1.2598	26 1.024	—	1 0.039	HK2526	—	25.7 5780	44.4 9980	6.95	8500	13000	0.046 0.101	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x26,5
	25 0.9843	32 1.2598	38 1.496	35.3 1.390	1 0.039	—	BK2538(1)	35.3 7940	66.9 15000	10.6	8500	13000	0.077 0.170	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x38,5
	25 0.9843	32 1.2598	38 1.496	—	1 0.039	HK2538(1)	—	35.3 7940	66.9 15000	10.6	8500	13000	0.068 0.150	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x38,5
28 1.1024	28 1.1024	35 1.3780	16 0.630	—	1 0.039	HK2816	—	17.4 3910	28.1 6320	3.85	7500	12000	0.032 0.071	28.000 1.1024	27.991 1.1020	34.988 1.3775	34.972 1.3769	Table B2-2	JR22x28x17
	28 1.1024	35 1.3780	20 0.787	17.3 0.681	1 0.039	—	BK2820	20.9 4700	35.3 7940	5.60	7500	12000	0.047 0.104	28.000 1.1024	27.991 1.1020	34.988 1.3775	34.972 1.3769	Table B2-2	JR22x28x20,5
	28 1.1024	35 1.3780	20 0.787	—	1 0.039	HK2820	—	20.9 4700	35.3 7940	5.60	7500	12000	0.040 0.088	28.000 1.1024	27.991 1.1020	34.988 1.3775	34.972 1.3769	Table B2-2	JR22x28x20,5
30 1.1811	30 1.1811	37 1.4567	12 0.472	9.3 0.366	1 0.039	—	BK3012	12.0 2700	17.7 3980	2.90	7000	11000	0.031 0.068	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	
	30 1.1811	37 1.4567	12 0.472	—	1 0.039	HK3012	—	12.0 2700	17.7 3980	2.70	7000	11000	0.024 0.053	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	

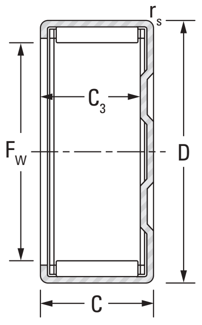
Continued on next page.

DRAWN CUP NEEDLE ROLLER BEARINGS CAGED, OPEN ENDS, CLOSED ONE END

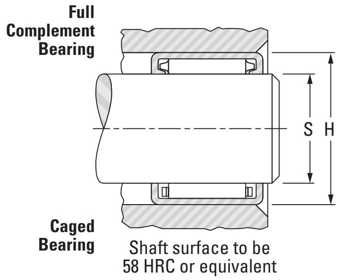
METRIC SERIES HK, BK SERIES



HK



BK



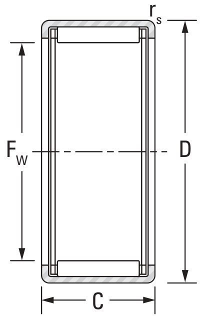
Shaft Dia.	F_w	D	C	$C_{3\,min.}$	$r_{s\,min.}$	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012			Open Ends	Closed One End	Dynamic	Static		Grease	Oil		Shaft (h5)		Housing (N6)			
								C	C_0					Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
30 1.1811	**30** 1.1811	**37** 1.4567	**16** 0.630	**13.30** 0.524	**1** 0.039	—	BK3016	**16.8** 3780	**27.3** 6140	4.20	7000	11000	**0.041** 0.090	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x17
	30 1.1811	**37** 1.4567	**16** 0.630	—	**1** 0.039	HK3016	—	**16.8** 3780	**27.3** 6140	4.20	7000	11000	**0.032** 0.071	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x17
	30 1.1811	**37** 1.4567	**20** 0.787	**17.3** 0.681	**1** 0.039	—	BK3020	**22.4** 5040	**39.6** 8900	6.25	7000	11000	**0.053** 0.117	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x20,5
	30 1.1811	**37** 1.4567	**20** 0.787	—	**1** 0.039	HK3020	—	**22.4** 5040	**39.6** 8900	6.25	7000	11000	**0.042** 0.093	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x20,5
	30 1.1811	**37** 1.4567	**26** 1.024	**23.3** 0.917	**1** 0.039	—	BK3026	**27.4** 6160	**51.2** 11500	7.95	7000	11000	**0.067** 0.148	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x26,5
	30 1.1811	**37** 1.4567	**26** 1.024	—	**1** 0.039	HK3026	—	**27.4** 6160	**51.2** 11500	7.95	7000	11000	**0.054** 0.119	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x26,5
	30 1.1811	**37** 1.4567	**38** 1.496	**35.3** 1.390	**1** 0.039	—	BK3038(1)	**38.4** 8630	**79.2** 17800	12.5	7000	11000	**0.093** 0.205	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x38,5
	30 1.1811	**37** 1.4567	**38** 1.496	—	**1** 0.039	HK3038(1)	—	**38.4** 8630	**79.2** 17800	12.5	7000	11000	**0.075** 0.165	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x38,5
35 1.3780	**35** 1.3780	**42** 1.6535	**12** 0.472	—	**1** 0.039	HK3512	—	**12.3** 2770	**19.2** 4320	2.90	5900	9100	**0.028** 0.062	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	
	35 1.3780	**42** 1.6535	**16** 0.630	—	**1** 0.039	HK3516	—	**18.7** 4200	**33.0** 7420	4.60	5900	9100	**0.037** 0.082	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x17
	35 1.3780	**42** 1.6535	**20** 0.787	**17.3** 0.681	**1** 0.039	—	BK3520	**24.5** 5510	**46.8** 10520	7.40	5900	9100	**0.065** 0.143	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x20,5
	35 1.3780	**42** 1.6535	**20** 0.787	—	**1** 0.039	HK3520	—	**24.5** 5510	**46.8** 10500	7.40	5900	9100	**0.049** 0.108	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x20,5
40 1.5748	**40** 1.5748	**47** 1.8504	**12** 0.472	—	**1** 0.039	HK4012	—	**13.4** 3010	**22.4** 5040	3.40	5200	7900	**0.033** 0.073	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	
	40 1.5748	**47** 1.8504	**16** 0.630	—	**1** 0.039	HK4016	—	**18.9** 4250	**34.8** 7820	5.35	5200	7900	**0.042** 0.093	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x17
	40 1.5748	**47** 1.8504	**20** 0.787	**17.3** 0.681	**1** 0.039	—	BK4020	**25.1** 5640	**50.4** 11330	8.00	5200	7900	**0.070** 0.154	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x20,5
	40 1.5748	**47** 1.8504	**20** 0.787	—	**1** 0.039	HK4020	—	**25.1** 5640	**50.4** 11330	8.00	5200	7900	**0.060** 0.132	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x20,5
45 1.7717	**45** 1.7717	**52** 2.0472	**12** 0.472	—	**1** 0.039	HK4512	—	**14.1** 3170	**24.8** 5580	3.75	4600	7000	**0.036** 0.079	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	

(1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.

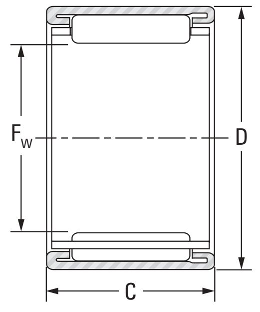
Shaft Dia.	F_w	D	C	$C_{3\,min.}$	$r_{s\,min.}$	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012			Open Ends	Closed One End	Dynamic	Static		Grease	Oil		Shaft (h5)		Housing (N6)			
								C	C_0					Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
45 1.7717	**45** 1.7717	**52** 2.0472	**16** 0.630	—	**1** 0.039	HK4516	—	**19.8** 4450	**38.5** 8660	5.95	4600	7000	**0.048** 0.106	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	JR40x45x17
	45 1.7717	**52** 2.0472	**20** 0.787	**17.3** 0.681	**1** 0.039	—	BK4520	**27.2** 6110	**58.2** 13100	8.80	4600	7000	**0.079** 0.174	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	JR40x45x20,5
	45 1.7717	**52** 2.0472	**20** 0.787	—	**1** 0.039	HK4520	—	**27.2** 6110	**58.2** 13100	8.80	4600	7000	**0.059** 0.130	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	JR40x45x20,5
50 1.9685	**50** 1.9685	**58** 2.2835	**12** 0.472	—	**1** 0.039	HK5012	—	**17.0** 3820	**28.7** 6450	4.40	4100	6300	**0.045** 0.099	**50.000** 1.9685	**49.989** 1.9681	**57.986** 2.2829	**57.967** 2.2822	Table B2-2	
	50 1.9685	**58** 2.2835	**20** 0.787	—	**1** 0.039	HK5020	—	**30.9** 6950	**62.2** 14000	8.80	4100	6300	**0.072** 0.159	**50.000** 1.9685	**49.989** 1.9681	**57.986** 2.2829	**57.967** 2.2822	Table B2-2	JR45x50x20
	50 1.9685	**58** 2.2835	**25** 0.984	—	**1** 0.039	HK5025	—	**35.5** 7980	**74.1** 16700	11.7	4100	6300	**0.092** 0.203	**50.000** 1.9685	**49.989** 1.9681	**57.986** 2.2829	**57.967** 2.2822	Table B2-2	JR45x50x25,5
55 2.1654	**55** 2.1654	**63** 2.4803	**20** 0.787	—	**1** 0.039	HK5520	—	**31.0** 6970	**64.4** 14480	10.0	3700	5700	**0.079** 0.174	**55.000** 2.1654	**54.987** 2.1648	**62.986** 2.4798	**62.967** 2.4790	Table B2-2	
60 2.3622	**60** 2.3622	**68** 2.6772	**12** 0.472	—	**1** 0.039	HK6012	—	**18.6** 6110	**34.4** 13100	5.25	3400	5200	**0.060** 0.132	**60.000** 2.3622	**59.987** 2.3617	**67.986** 2.6766	**67.967** 2.6759	Table B2-2	
	60 2.3622	**68** 2.6772	**20** 0.787	—	**1** 0.039	HK6020	—	**35.6** 8000	**79.5** 17870	10.9	3400	5200	**0.090** 0.198	**60.000** 2.3622	**59.987** 2.3617	**67.986** 2.6766	**67.967** 2.6759	Table B2-2	

DRAWN CUP NEEDLE ROLLER BEARINGS
CAGED,
OPEN ENDS

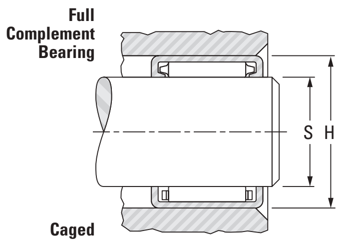
METRIC SERIES
BSM, BKM, BTM, BHTM SERIES



BSM, BKM



BTM, BHTM



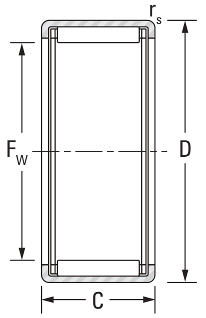
Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C	$C_{3\,min.}$	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012				Dynamic	Static					Shaft (h5)		Housing (N6)			
						Open Ends	C	C_0		Grease	Oil		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
6 0.2362	6	10	9	—	—	6BTM109	2.65 600	2.40 540	0.350	23000	36000	0.003	6.000	5.995	9.993	9.984	Table B2-4	—
8 0.3150	8	12	10	—	—	8BTM1210	3.55 800	3.85 870	0.580	21000	33000	0.004	8.000	7.994	11.991	11.98	Table B2-4	—
	8	15	15	—	—	BHTM815	7.55 1700	6.55 1470	1.00	13000	20000	0.009	8.000	7.994	14.991	14.98	Table B2-4	—
9 0.3543	9	13	10	—	—	9BTM1310A	3.80 850	4.25 960	0.630	21000	32000	0.004	9.000	8.994	12.991	12.98	Table B2-4	—
9.8 0.3858	9.8	13.8	10	—	—	BTM101410A	3.75 840	4.25 960	0.640	21000	32000	0.004	9.800	9.794	13.791	13.78	Table B2-4	—
10 0.3937	10	14	10	—	—	10BTM1410	3.95 890	4.60 1030	0.690	20000	31000	0.004	10.000	9.994	13.991	13.98	Table B2-4	—
	10	17	20	—	—	BHTM1020	11.9 2680	12.6 2830	1.95	12000	19000	0.015	10.000	9.994	16.991	16.98	Table B2-4	—
12 0.4724	12	16	10	—	—	12BTM1610	4.45 1000	5.60 1260	0.860	20000	30000	0.005	12.000	11.992	15.991	15.98	Table B2-4	—
	12	18	12	—	—	12BTM1812	6.55 1470	6.70 1510	1.00	14000	21000	0.009	12.000	11.992	17.991	17.98	Table B2-4	—
13 0.5118	13	17	15	—	—	BKM131715J	5.65 1270	7.85 1760	1.20	20000	30000	0.007	13.000	12.992	16.991	16.98	Table B2-4	—
	13	19	14	—	—	BKM131914J	8.60 1930	9.95 2240	1.50	14000	21000	0.011	13.000	12.992	18.989	18.976	Table B2-4	—
	13	20	12	—	—	13BTM2012J	8.25 1860	8.40 1890	1.30	12000	18000	0.012	13.000	12.992	19.989	19.976	Table B2-4	—
	13	21	14	—	—	BKM132114BJ	10.8 2430	10.5 2360	1.60	10000	16000	0.015	13.000	12.992	20.989	20.976	Table B2-4	—
13.5 0.5315	13.5	19	12	—	—	BTM141912A	6.70 1510	7.60 1710	1.15	14000	22000	0.010	13.500	13.492	18.989	18.976	Table B2-4	—
14 0.5512	14	19	16	—	—	14BTM1916B-1	8.80 1980	11.9 2680	1.80	16000	24000	0.011	14.000	13.992	18.989	18.976	Table B2-4	—
	14	20	12	—	—	14BTM2012	6.95 1560	7.50 1690	1.15	13000	20000	0.010	14.000	13.992	19.989	19.976	Table B2-4	—
14.5 0.5709	14.5	19.5	13.5	—	—	BTM152014A	8.35 1880	10.9 2450	1.65	15000	23000	0.009	14.500	14.492	19.489	19.476	Table B2-4	—
14.975 0.5896	14.975	21	10	—	—	BTM152110JA	5.80 1300	6.25 1410	0.950	13000	20000	0.009	14.975	14.967	20.989	20.976	Table B2-4	—
15 0.5906	15	20	16	—	—	15BTM2016C-2	9.05 2030	12.6 2830	1.90	15000	23000	0.012	15.000	14.992	19.989	19.976	Table B2-4	—
	15	21	16	—	—	15BTM2116	10.8 2430	13.6 3060	2.05	12000	19000	0.014	15.000	14.992	20.989	20.976	Table B2-4	—
	15	21	22	—	—	15BTM2122	14.3 3220	19.5 4380	3.05	12000	19000	0.020	15.000	14.992	20.989	20.976	Table B2-4	—
	15	22	15	—	—	BHTM1515-1	11.9 2680	13.3 2990	2.05	10000	16000	0.015	15.000	14.992	21.989	21.976	Table B2-4	—
17 0.6693	17	21.5	15	—	—	17BTM2215	6.80 1530	9.60 2160	1.45	12000	19000	0.010	17.000	16.992	21.489	21.476	Table B2-4	—
	17	23	12	—	—	BTM172312	8.45 1900	10.2 2290	1.55	13000	20000	0.012	17.000	16.992	22.989	22.976	Table B2-4	—
	17	24	15	—	—	BHTM1715-1	12.4 2790	14.8 3330	2.25	13000	20000	0.017	17.000	16.992	23.989	23.976	Table B2-4	—
	17	24	20	—	—	BHTM1720-1	16.8 3780	21.9 4920	3.40	13000	20000	0.023	17.000	16.992	23.989	23.976	Table B2-4	—
	17	25	15	—	—	BTM172515	13.2 2970	14.9 3350	2.25	13000	20000	0.020	17.000	16.992	24.989	24.976	Table B2-4	—
18 0.7087	18	24	11.6	—	—	18BTM2412	8.75 1970	10.9 2450	1.65	12000	18000	0.012	18.000	17.992	23.989	23.976	Table B2-4	—
	18	24	16	—	—	BTM182416	12.3 2770	16.8 3780	2.55	12000	18000	0.017	18.000	17.992	23.989	23.976	Table B2-4	—
	18	25	20	—	—	BTM1820	16.7 3750	22.0 4950	3.50	12000	19000	0.024	18.000	17.992	24.989	24.976	Table B2-4	—
	18	25	20	—	—	BTM182520	16.8 3780	22.1 4970	3.45	12000	19000	0.024	18.000	17.992	24.989	24.976	Table B2-4	—
20 0.7874	20	26	16	—	—	BTM202616	13.3 2990	19.6 4410	3.00	10000	16000	0.019	20.000	19.991	25.989	25.976	Table B2-4	—
	20	27	20	—	—	BTM202720-2	19.6 4410	27.6 6200	4.35	11000	17000	0.027	20.000	19.991	26.989	26.976	Table B2-4	—
	20	27	25	—	—	BTM2025	24.3 5460	36.4 8180	5.70	11000	17000	0.033	20.000	19.991	26.989	26.976	Table B2-4	—
	20	27	30	—	—	BTM202730	28.1 6320	43.8 9850	6.80	11000	17000	0.040	20.000	19.991	26.989	26.976	Table B2-4	—
21.6 0.8504	21.6	26.645	12.4	—	—	BTM222712A	9.15 2060	13.9 3130	2.10	9800	15000	0.012	21.600	21.591	26.634	26.621	Table B2-4	—
22 0.8661	22	28	12	—	—	22BTM2812	10.0 2250	13.5 3040	2.05	9800	15000	0.014	22.000	21.991	27.989	27.976	Table B2-4	—
24 0.9449	24	30	13	—	—	BTM243013J	10.5 2360	15.7 3530	2.35	9100	14000	0.018	24.000	23.991	29.989	29.976	Table B2-4	—
25 0.9843	25	31	19	—	—	25BTM3119A	17.9 4020	30.1 6770	4.65	8500	13000	0.026	25.000	24.991	30.988	30.972	Table B2-4	—
	25	32	12	—	—	BTM2512	10.2 2290	12.8 2880	1.95	8500	13000	0.019	25.000	24.991	31.988	31.972	Table B2-4	—
	25	33	20	—	—	BHTM2520-1	21.3 4790	29.7 6680	4.60	8500	13000	0.037	25.000	24.991	32.988	32.972	Table B2-4	—

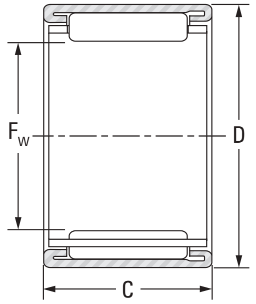
Continued on next page.

DRAWN CUP NEEDLE ROLLER BEARINGS CAGED, OPEN ENDS

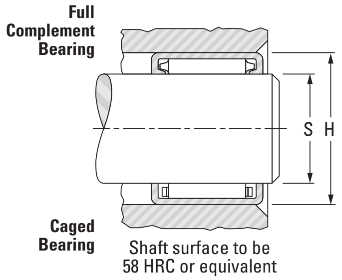
METRIC SERIES
BSM, BKM, BTM, BHTM SERIES



BSM, BKM



BTM, BHTM

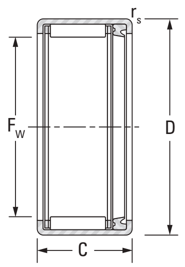


Shaft Dia.	Fw	D	C	C3 min.	rs min.	Bearing Designation	Load Ratings		Fatigue Load Limit	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012			Open Ends	Dynamic C	Static C0	Cu	Grease	Oil		Shaft (h5) Max.	Shaft (h5) Min.	Housing (N6) Max.	Housing (N6) Min.		
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min-1		kg lbs	mm in	mm in	mm in	mm in		
25 0.9843	25	33	30	—	—	BHTM2530-1	31.0 6970	48.0 10790	7.55	8500	13000	0.054	25.000	24.991	32.988	32.972	Table B2-4	—
25.8 1.0157	25.8	33	16	—	—	BTM263316A	15.7 3530	22.4 5040	3.40	8500	13000	0.028	25.800	25.791	32.988	32.972	Table B2-4	—
26 1.0236	26	31.4	12	—	—	BKM263112A	9.45 2120	14.5 3260	2.20	7800	12000	0.014	26.000	25.991	31.388	31.372	Table B2-4	—
28 1.1024	28	33	12	—	—	BTM283312J	9.50 2140	15.8 3550	2.40	7200	11000	0.015	28.000	27.991	32.988	32.972	Table B2-4	—
	28	35	20	—	—	28BTM3520	21.1 4740	33.4 7510	5.20	7800	12000	0.035	28.000	27.991	34.988	34.972	Table B2-4	—
	28	36	20.75	—	—	BTM283621JA	25.3 5690	39.3 8840	6.15	7800	12000	0.044	28.000	27.991	35.988	35.972	Table B2-4	—
	28	37	20	—	—	BTM283720	24.2 5440	33.5 7530	5.30	7800	12000	0.046	28.000	27.991	36.988	36.972	Table B2-4	—
	28	37	30	—	—	BHTM2830	36.3 8160	56.5 12700	8.75	7800	12000	0.069	28.000	27.991	36.988	36.972	Table B2-4	—
30 1.1811	30	37	12	—	—	BTM303712	13.3 2990	18.8 4230	2.90	7200	11000	0.022	30.000	29.991	36.988	36.972	Table B2-4	—
	30	37	16	—	—	30BTM3716BM	18.8 4230	29.3 6590	4.45	7200	11000	0.030	30.000	29.991	36.988	36.972	Table B2-4	—
	30	37	20	—	—	30BTM3720	22.7 5100	40.1 9010	6.35	7200	11000	0.040	30.000	29.991	36.988	36.972	Table B2-4	—
	30	40	25	—	—	BHTM3025-1	32.7 7350	46.8 10520	7.35	7200	11000	0.069	30.000	29.991	39.988	39.972	Table B2-4	—
	30	40	30	—	—	BHTM3030-1A	39.2 8810	59.0 13260	9.15	7200	11000	0.083	30.000	29.991	39.988	39.972	Table B2-4	—
31 1.2205	31	39	17.8	—	—	31BTM3918A	22.9 5150	34.8 7820	5.50	7200	11000	0.039	31.000	30.989	38.988	38.972	Table B2-4	—
32 1.2598	32	38	11	—	—	32BTM3811A	5.40 1210	6.75 1520	1.05	6500	10000	0.017	32.000	31.989	37.988	37.972	Table B2-4	—
	32	42	20	—	—	BHTM3220A	26.1 5870	35.1 7890	5.60	6500	10000	0.058	32.000	31.989	41.988	41.972	Table B2-4	—
	32	42	30	—	—	BHTM3230	40.5 9100	61.9 13920	9.65	6500	10000	0.086	32.000	31.989	41.988	41.972	Table B2-4	—

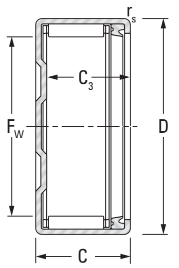
Shaft Dia.	Fw	D	C	C3 min.	rs min.	Bearing Designation	Load Ratings		Fatigue Load Limit	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012			Open Ends	Dynamic C	Static C0	Cu	Grease	Oil		Shaft (h5) Max.	Shaft (h5) Min.	Housing (N6) Max.	Housing (N6) Min.		
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min-1		kg lbs	mm in	mm in	mm in	mm in		
33.5 1.3189	33.5	40	17	—	—	BTM344017A	18.5 4160	33.5 7530	5.25	6200	9500	0.034	33.500	33.489	39.988	39.972	Table B2-4	—
35 1.3780	35	42	16	—	—	BTM3516	20.3 4560	34.7 7800	5.35	6000	9200	0.035	35.000	34.989	41.988	41.972	Table B2-4	—
	35	45	20	—	—	BHTM3520	28.8 6470	41.7 9370	6.60	6100	9400	0.065	35.000	34.989	44.988	44.972	Table B2-4	—
	35	45	30	—	—	BHTM3530	43.8 9850	71.5 16070	11.2	6100	9400	0.096	35.000	34.989	44.988	44.972	Table B2-4	—
37 1.4567	37	43	12	—	—	37BTM4312A	8.80 1980	13.6 3060	2.05	5600	8600	0.022	37.000	36.989	42.988	42.972	Table B2-4	—
38 1.4961	38	45	12	—	—	BTM384512A	14.2 3190	23.3 5240	3.55	5500	8400	0.029	38.000	37.989	44.988	44.972	Table B2-4	—
	38	48	30	—	—	BTM3830PL	45.6 10250	76.5 17200	11.9	5600	8600	0.102	38.000	37.989	47.988	47.972	Table B2-4	—
40 1.5748	40	51	30	—	—	40BTM5130J	48.6 10930	77.5 17420	12.1	5400	8300	0.112	40.000	39.989	50.986	50.967	Table B2-4	—
41.5 1.6339	41.5	46.5	8.5	—	—	BTM424709AJ	7.75 1740	13.9 3120	2.10	4900	7500	0.015	41.500	41.489	46.488	46.472	Table B2-4	—
42 1.6535	42	53	30	—	—	BTM425330J	51.0 11470	85.0 19110	13.3	5100	7800	0.121	42.000	41.989	52.986	52.967	Table B2-4	—
43.52 1.7134	43.52	48.52	14	—	—	44BTM4914A	13.3 2990	29.0 6520	4.35	4700	7200	0.027	43.520	43.509	48.508	48.492	Table B2-4	—
45 1.7717	45	52	12	—	—	45BTM5212A	15.2 3420	27.3 6140	4.15	4600	7000	0.034	45.000	44.989	51.986	51.967	Table B2-4	—
48 1.8898	48	56	30	—	—	BTM485630J	45.4 10210	100 22480	15.6	4300	6600	0.103	48.000	47.989	55.986	55.967	Table B2-4	—
50 1.9685	50	58	20	—	—	50BTM5820J	31.7 7130	61.9 13920	9.65	4200	6400	0.068	50.000	49.989	57.986	57.967	Table B2-4	—
	50	62	25	—	—	BTM5025	49.3 11080	79.5 17870	12.7	4200	6500	0.125	50.000	49.989	61.986	61.967	Table B2-4	—
55 2.1654	55	63	20	—	—	55BTM6320	32.5 7310	66.0 14840	10.3	3700	5700	0.073	55.000	54.987	62.986	62.967	Table B2-4	—
55.254 2.1754	55.254	60.3	14	—	—	BSM5514BJ-2	16.7 3750	41.0 9220	6.30	3600	5600	0.035	55.254	55.241	60.286	60.267	Table B2-4	—
64 2.5197	64	73.178	21.1	—	—	64BTM7321A	40.3 9060	84.9 19090	13.5	3200	4900	0.110	64.000	63.987	73.164	73.145	Table B2-4	—

DRAWN CUP NEEDLE ROLLER BEARINGS SEALED

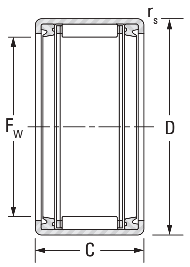
METRIC SERIES
HK RS, BK RS, HK.2RS SERIES



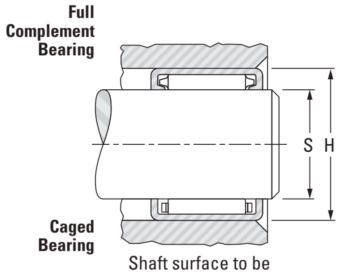
HK RS



BK RS



HK.2RS



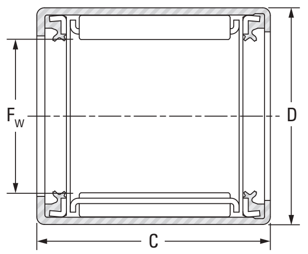
Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C	C_3 min.	r_s min.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 **-0.3** -0.012					Dynamic	Static				Shaft (h5)		Housing (N6)			
						Open Ends	Closed One End	C	C_0		Grease		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}	kg lbs	mm in	mm in	mm in	mm in		
8 0.3150	**8** 0.3150	**12** 0.4724	**10** 0.394	—	**0.4** 0.016	HK0810RS	—	**2.90** 650	**2.73** 610	0.400	20000	**0.004** 0.009	**8.000** 0.3150	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	Table B2-2	
10 0.3937	**10** 0.3937	**14** 0.5512	**12** 0.472	—	**0.4** 0.016	HK1012RS	—	**4.78** 1070	**5.51** 1240	0.840	19000	**0.006** 0.013	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	Table B2-2	
12 0.4724	**12** 0.4724	**18** 0.7087	**14** 0.551	—	**1** 0.039	HK1214RS	—	**6.61** 1490	**7.29** 1640	1.10	14000	**0.013** 0.029	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	Table B2-2	
	12 0.4724	**18** 0.7087	**16** 0.630	—	**1** 0.039	HK1216.2RS	—	**6.87** 1540	**7.65** 1720	1.15	14000	**0.016** 0.035	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	Table B2-2	
14 0.5512	**14** 0.5512	**20** 0.7874	**14** 0.551	**11.6** 0.457	**1** 0.039	—	BK1414RS	**7.17** 1610	**8.41** 1890	1.30	14000	**0.014** 0.031	**14.000** 0.5512	**13.992** 0.5509	**19.989** 0.7870	**19.976** 0.7865	Table B2-2	
	14 0.5512	**20** 0.7874	**14** 0.551	—	**1** 0.039	HK1414RS	—	**7.17** 1610	**8.41** 1890	1.30	14000	**0.015** 0.033	**14.000** 0.5512	**13.992** 0.5509	**19.989** 0.7870	**19.976** 0.7865	Table B2-2	JR10x14x16
	14 0.5512	**20** 0.7874	**16** 0.630	—	**1** 0.039	HK1416.2RS	—	**7.17** 1610	**8.41** 1890	1.30	14000	**0.014** 0.031	**14.000** 0.5512	**13.992** 0.5509	**19.989** 0.7870	**19.976** 0.7865	Table B2-2	JR10x14x20
15 0.5906	**15** 0.5906	**21** 0.8268	**14** 0.551	**11.3** 0.445	**1** 0.039	—	BK1514RS	**7.87** 1770	**9.69** 2180	1.45	13000	**0.017** 0.037	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x16,5
	15 0.5906	**21** 0.8268	**14** 0.551	—	**1** 0.039	HK1514RS	—	**7.87** 1770	**9.69** 2180	1.45	13000	**0.016** 0.035	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x16,5
	15 0.5906	**21** 0.8268	**16** 0.630	—	**1** 0.039	HK1516.2RS	—	**7.87** 1770	**9.69** 2180	1.45	13000	**0.019** 0.042	**15.000** 0.5906	**14.992** 0.5902	**20.989** 0.8263	**20.976** 0.8258	Table B2-2	JR12x15x16,5
16 0.6299	**16** 0.6299	**22** 0.8661	**14** 0.551	—	**1** 0.039	HK1614RS	—	**7.76** 1740	**9.76** 2190	1.50	12000	**0.014** 0.031	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	Table B2-2	JR12x16x16
	16 0.6299	**22** 0.8661	**16** 0.630	—	**1** 0.039	HK1616.2RS	—	**7.82** 1760	**9.76** 2190	1.50	12000	**0.015** 0.033	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	Table B2-2	JR12x16x20
18 0.7087	**18** 0.7087	**24** 0.9449	**14** 0.551	—	**1** 0.039	HK1814RS	—	**8.41** 1890	**11.10** 2500	1.70	11000	**0.018** 0.040	**18.000** 0.7087	**17.992** 0.7083	**23.989** 0.9444	**23.976** 0.9439	Table B2-2	JR15x18x16,5
	18 0.7087	**24** 0.9449	**16** 0.630	—	**1** 0.039	HK1816.2RS	—	**8.41** 1890	**11.10** 2500	1.70	11000	**0.017** 0.037	**18.000** 0.7087	**17.992** 0.7083	**23.989** 0.9444	**23.976** 0.9439	Table B2-2	JR15x18x16,5
20 0.7874	**20** 0.7874	**26** 1.0236	**16** 0.630	—	**1** 0.039	HK2016.2RS	—	**8.97** 2020	**12.50** 2810	1.90	9700	**0.023** 0.051	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	Table B2-2	JR17x20x16,5
	20 0.7874	**26** 1.0236	**18** 0.709	—	**1** 0.039	HK2018RS	—	**12.40** 2790	**18.90** 4250	2.85	9700	**0.025** 0.055	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	Table B2-2	JR17x20x20,5
	20 0.7874	**26** 1.0236	**20** 0.787	—	**1** 0.039	HK2020.2RS	—	**12.40** 2790	**18.90** 4250	2.85	9700	**0.028** 0.062	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	Table B2-2	JR17x20x20,5

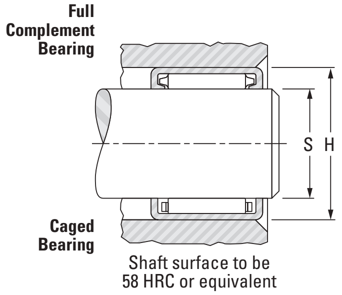
Shaft Dia.	F_w	D	C	C_3 min.	r_s min.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 **-0.3** -0.012					Dynamic	Static				Shaft (h5)		Housing (N6)			
						Open Ends	Closed One End	C	C_0		Grease		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}	kg lbs	mm in	mm in	mm in	mm in		
22 0.8661	**22** 0.8661	**28** 1.1024	**16** 0.630	—	**1** 0.039	HK2216.2RS	—	**9.81** 2210	**14.50** 3260	2.20	8800	**0.025** 0.055	**22.000** 0.8661	**21.991** 0.8658	**27.989** 1.1019	**27.976** 1.1014	Table B2-2	
	22 0.8661	**28** 1.1024	**18** 0.709	—	**1** 0.039	HK2218RS	—	**13.10** 2950	**20.90** 4700	3.20	8800	**0.027** 0.060	**22.000** 0.8661	**21.991** 0.8658	**27.989** 1.1019	**27.976** 1.1014	Table B2-2	JR17x22x23
	22 0.8661	**28** 1.1024	**20** 0.787	—	**1** 0.039	HK2220.2RS	—	**13.10** 2950	**20.90** 4700	3.20	8800	**0.026** 0.057	**22.000** 0.8661	**21.991** 0.8658	**27.989** 1.1019	**27.976** 1.1014	Table B2-2	JR17x22x23
25 0.9843	**25** 0.9843	**32** 1.2598	**16** 0.630	—	**1** 0.039	HK2516.2RS	—	**11.10** 2500	**15.10** 3390	2.30	7800	**0.030** 0.066	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	Table B2-2	JR20x25x17
	25 0.9843	**32** 1.2598	**18** 0.709	—	**1** 0.039	HK2518RS	—	**15.6** 3510	**24.60** 5530	3.80	7800	**0.034** 0.075	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	Table B2-2	JR20x25x20,5
	25 0.9843	**32** 1.2598	**20** 0.787	—	**1** 0.039	HK2520.2RS	—	**16.20** 3640	**24.60** 5530	3.80	7800	**0.033** 0.073	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	Table B2-2	JR20x25x20,5
	25 0.9843	**32** 1.2598	**22** 0.866	—	**1** 0.039	HK2522RS	—	**20.60** 4630	**33.40** 7510	5.30	7800	**0.042** 0.093	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	Table B2-2	JR20x25x26
	25 0.9843	**32** 1.2598	**24** 0.945	—	**1** 0.039	HK2524.2RS	—	**20.6** 4630	**33.4** 7510	5.30	7800	**0.047** 0.104	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	Table B2-2	JR20x25x26
28 1.1024	**28** 1.1024	**35** 1.3780	**20** 0.787	—	**1** 0.039	HK2820.2RS	—	**15.9** 3570	**24.9** 5600	3.85	6900	**0.042** 0.093	**28.000** 1.1024	**27.991** 1.1020	**34.988** 1.3775	**34.972** 1.3769	Table B2-2	JR22x28x20,5
30 1.1811	**30** 1.1811	**37** 1.4567	**16** 0.63	—	**1** 0.039	HK3016.2RS	—	**11.6** 2610	**16.8** 3780	2.55	6500	**0.030** 0.066	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x17
	30 1.1811	**37** 1.4567	**18** 0.709	—	**1** 0.039	HK3018RS	—	**16.8** 3780	**27.3** 6140	4.20	6500	**0.042** 0.093	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x20,5
	30 1.1811	**37** 1.4567	**20** 0.787	—	**1** 0.039	HK3020.2RS	—	**16.8** 3780	**27.3** 6140	4.20	6500	**0.040** 0.088	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x20,5
	30 1.1811	**37** 1.4567	**22** 0.866	—	**1** 0.039	HK3022RS	—	**22.4** 5040	**39.6** 8900	6.25	6500	**0.051** 0.112	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x26
	30 1.1811	**37** 1.4567	**24** 0.945	—	**1** 0.039	HK3024.2RS	—	**22.4** 5040	**39.6** 8900	6.25	6500	**0.057** 0.126	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x26
35 1.3780	**35** 1.3780	**42** 1.6535	**16** 0.630	—	**1** 0.039	HK3516.2RS	—	**13.4** 3010	**21.4** 4810	3.25	5500	**0.047** 0.104	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x17
	35 1.3780	**42** 1.6535	**18** 0.709	—	**1** 0.039	HK3518RS	—	**17.4** 3910	**29.9** 6720	4.60	5500	**0.054** 0.119	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x20,5
	35 1.3780	**42** 1.6535	**20** 0.787	—	**1** 0.039	HK3520.2RS	—	**17.4** 3910	**29.9** 6720	4.60	5500	**0.044** 0.097	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x20,5
40 1.5748	**40** 1.5748	**47** 1.8504	**16** 0.630	—	**1** 0.039	HK4016.2RS	—	**13.4** 3010	**22.4** 5040	3.40	4900	**0.037** 0.082	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x20
	40 1.5748	**47** 1.8504	**18** 0.709	—	**1** 0.039	HK4018RS	—	**18.9** 4250	**34.8** 7820	5.35	4900	**0.057** 0.126	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x20,5
	40 1.5748	**47** 1.8504	**20** 0.787	—	**1** 0.039	HK4020.2RS	—	**18.9** 4250	**34.8** 7820	5.35	4900	**0.053** 0.117	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x20,5
45 1.7717	**45** 1.7717	**52** 2.0472	**18** 0.709	—	**1** 0.039	HK4518RS	—	**19.8** 4450	**38.5** 8660	5.95	4300	**0.064** 0.141	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	JR40x45x20,5
	45 1.7717	**52** 2.0472	**20** 0.787	—	**1** 0.039	HK4520.2RS	—	**19.8** 4450	**38.5** 8660	5.95	4300	**0.055** 0.121	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	JR40x45x20,5
50 1.9685	**50** 1.9685	**58** 2.2835	**22** 0.866	—	**1** 0.039	HK5022RS	—	**28.8** 6470	**56.6** 12700	8.80	3900	**0.097** 0.214	**50.000** 1.9685	**49.989** 1.9681	**57.986** 2.2829	**57.967** 2.2822	Table B2-2	JR45x50x25,5
	50 1.9685	**58** 2.2835	**24** 0.945	—	**1** 0.039	HK5024.2RS	—	**28.8** 6470	**56.6** 12700	8.80	3900	**0.083** 0.183	**50.000** 1.9685	**49.989** 1.9681	**57.986** 2.2829	**57.967** 2.2822	Table B2-2	JR45x50x25,5

DRAWN CUP NEEDLE ROLLER BEARINGS SEALED

METRIC SERIES
BKM UU, BHKM UU SERIES



BKM UU, BHKM UU



Shaft Dia.	Fw	D	C	C3 min.	rs min.	Bearing Designation	Load Ratings		Fatigue Load Limit Cu	Speed Rating	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static				Shaft (h5)		Housing (N6)			
						Open Ends	C	C_0		Grease		Max.	Min.	Max.	Min.		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in		
17 0.6693	**17**	**24**	**26**	—	—	BHKM1726JUU	**17.6** 3960	**23.3** 5240	3.65	13000	**0.029**	**17.000**	**16.992**	**23.989**	**23.976**	Table B2-4	—
20 0.7874	**20**	**27**	**26**	—	—	BKM2026JUU	**20.5** 4610	**29.2** 6560	4.60	11000	**0.033**	**20.000**	**19.991**	**26.989**	**26.976**	Table B2-4	—
	20	**27**	**30**	—	—	BKM2030JUU	**24.3** 5460	**36.4** 8180	5.70	11000	**0.038**	**20.000**	**19.991**	**26.989**	**26.976**	Table B2-4	—
	20	**27**	**35**	—	—	BKM2035JUU	**28.9** 6500	**45.4** 10210	7.05	11000	**0.045**	**20.000**	**19.991**	**26.989**	**26.976**	Table B2-4	—

INNER RINGS

METRIC SERIES

When it is impractical to meet the shaft raceway design requirements (hardness, surface finish, case depth, etc.) outlined in the engineering section of this catalog, standard inner rings may be used.

Inner rings are made of rolling bearing steel and after hardening, their bores, raceways and end surfaces are ground. Metric series inner rings may be used to provide inner raceway surfaces for metric series radial needle roller and cage assemblies, metric series needle roller bearings and metric series drawn cup needle roller bearings. The extended inner rings are suitable for use with bearings containing lip contact seals and for applications in which axial movement may be present.

CONSTRUCTION

Metric series inner rings are available in four basic designs and differ only by the chamfers at the ends of the raceway surfaces, the lubricant access holes and the raceway profile. Inner rings of series JR have chamfers to assist in bearing installation but are without lubricating holes. Inner rings of series JR.JS1 and IMC have bearing installation chamfers and lubricating holes (bore diameters 5 to 180 mm [0.1969 in to 7.0866 in]). Inner rings of series JRZ.JS1 are without installation chamfers, allowing for maximum possible raceway contact.

DIMENSIONAL ACCURACY

The tolerances of size, form, and runout for metric series inner rings meet the requirements of ISO normal tolerance class for radial bearings (see the engineering section). Most metric series inner rings are produced with outside diameter raceway tolerance in accordance with h5 which, in most cases, is suitable for combining the metric series needle roller bearings to give the normal clearance class, and for use with drawn cup bearings. Other raceway tolerances may also be found on inner rings for combining with needle roller bearings to give one of the clearance requirements.

MOUNTING OF INNER RINGS

Inner rings may be mounted on the shaft with either a loose transition fit or an interference fit. These fits used in conjunction with the proper fit of the bearing outer ring, will provide the correct operating clearances for most applications.

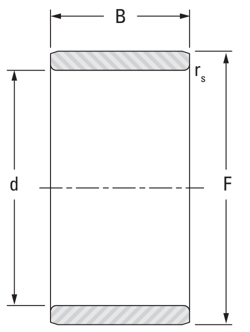
Regardless of the fit of the inner ring on the shaft, the inner ring should be axially located by shaft shoulders or other positive means. The shaft shoulder diameter adjacent to the inner ring must not exceed the inner ring outside diameter (per suggestions on pages B-4-9 and B-4-10 of the metric series needle roller bearing section).

When metric series inner rings are to be used with the metric series needle roller bearings, appropriate shaft tolerances should be selected from Table B4-4 on page B-4-9 in the metric series needle roll bearing section. When Metric series inner rings are to be used with drawn cup bearings the suggested shaft tolerances are given in the “Inner ring” discussion on page B-2-8 of the “metric series drawn cup needle roller bearings” section of this catalog.

INCH SERIES INNER RINGS

Inch series inner rings for use with inch series drawn cup bearings are tabulated on page B-2-74 of this catalog.

INNER RINGS



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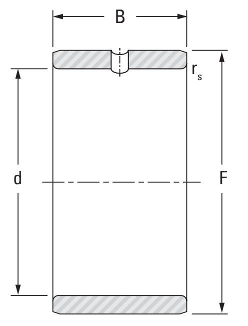
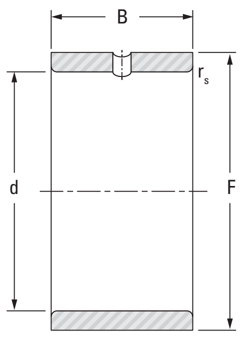


JR.JS1

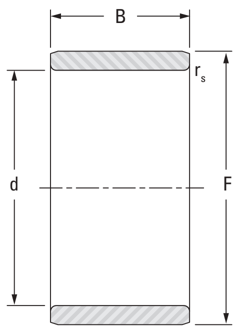


JRZ.JS1

Shaft Dia.	d	F [(1)]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
5 0.1969	**5** 0.1969	**8** 0.3150	**8** 0.3150	**0.3** 0.01	JR5x8x8JS1	**0.002** 0.004
	5 0.1969	**8** 0.3150	**12** 0.4724	**0.3** 0.01	JR5x8x12	**0.003** 0.007
	5 0.1969	**8** 0.3150	**16** 0.630	**0.3** 0.01	JR5x8x16	**0.004** 0.009
6 0.2362	**6** 0.2362	**9** 0.3543	**8** 0.315	**0.3** 0.01	JR6x9x8JS1	**0.002** 0.004
	6 0.2362	**9** 0.3543	**12** 0.4724	**0.3** 0.01	JR6x9x12	**0.003** 0.007
	6 0.2362	**9** 0.3543	**16** 0.630	**0.3** 0.01	JR6x9x16	**0.004** 0.009
	6 0.2362	**10** 0.3937	**10** 0.394	**0.3** 0.01	JR6x10x10	**0.004** 0.009
	6 0.2362	**10** 0.3937	**10** 0.394	**0.3** 0.01	JR6x10x10JS1	**0.004** 0.009
	6 0.2362	**10** 0.3937	**12** 0.4724	**0.3** 0.01	JRZ6x10x12JS1	**0.005** 0.011
7 0.2756	**7** 0.2756	**10** 0.3937	**10.5** 0.413	**0.3** 0.01	JR7x10x10,5	**0.003** 0.007
	7 0.2756	**10** 0.3937	**12** 0.4724	**0.3** 0.01	JR7x10x12	**0.004** 0.009
	7 0.2756	**10** 0.3937	**16** 0.630	**0.3** 0.01	JR7x10x16	**0.005** 0.011
8 0.3150	**8** 0.3150	**12** 0.4724	**10** 0.394	**0.3** 0.01	JR8x12x10	**0.005** 0.011
	8 0.3150	**12** 0.4724	**10** 0.394	**0.3** 0.01	JR8x12x10JS1	**0.005** 0.011
	8 0.3150	**12** 0.4724	**10.5** 0.413	**0.3** 0.01	JR8x12x10,5	**0.005** 0.011
	8 0.3150	**12** 0.4724	**12** 0.472	**0.3** 0.01	JRZ8xl2x12JS1	**0.006** 0.013
	8 0.3150	**12** 0.4724	**12.5** 0.492	**0.3** 0.01	JR8x12x12,5	**0.006** 0.013
	8 0.3150	**12** 0.4724	**16** 0.630	**0.3** 0.01	IM 8 12 16 P	**0.007** 0.016
9 0.3543	**9** 0.3543	**12** 0.4724	**12** 0.4724	**0.3** 0.01	JR9x12x12	**0.005** 0.011
	9 0.3543	**12** 0.4724	**16** 0.630	**0.3** 0.01	JR9x12x16	**0.006** 0.013
10 0.3937	**10** 0.3937	**13** 0.5118	**12.5** 0.492	**0.3** 0.01	JR10x13x12,5	**0.005** 0.011
	10 0.3937	**14** 0.5512	**11** 0.433	**0.3** 0.01	JR10x14x11JS1	**0.007** 0.015
	10 0.3937	**14** 0.5512	**12** 0.4724	**0.3** 0.01	JR10x14x12	**0.007** 0.015
	10 0.3937	**14** 0.5512	**12** 0.4724	**0.3** 0.01	JR10x14x12JS1	**0.007** 0.015

[1] Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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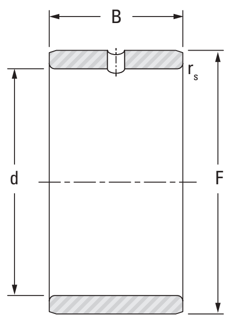
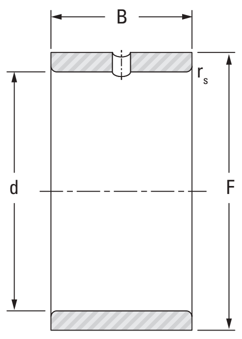


JR.JS1



JRZ.JS1

Shaft Dia.	d	F [(1)]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
10 0.3937	**10** 0.3937	**14** 0.5512	**13** 0.512	**0.3** 0.01	JR10x14x13	**0.007** 0.015
	10 0.3937	**14** 0.5512	**14** 0.551	**0.3** 0.01	JRZ10x14x14JS1	**0.008** 0.018
	10 0.3937	**14** 0.5512	**16** 0.630	**0.3** 0.01	JR10x14x16	**0.009** 0.020
	10 0.3937	**14** 0.5512	**20** 0.787	**0.3** 0.01	JR10x14x20	**0.012** 0.026
12 0.4724	**12** 0.4724	**15** 0.5906	**12.5** 0.492	**0.3** 0.01	JR12x15x12,5	**0.006** 0.013
	12 0.4724	**15** 0.5906	**16** 0.630	**0.3** 0.01	JR12x15x16	**0.008** 0.018
	12 0.4724	**15** 0.5906	**16.5** 0.650	**0.3** 0.01	JR12x15x16,5	**0.008** 0.018
	12 0.4724	**15** 0.5906	**18.5** 0.728	**0.3** 0.01	JR12x15x18,5	**0.009** 0.020
	12 0.4724	**15** 0.5906	**22.4** 0.882	**0.2** 0.01	IM 12 15 22,4 P	**0.011** 0.024
	12 0.4724	**15** 0.5906	**22.5** 0.886	**0.3** 0.01	JR12x15x22,5	**0.011** 0.024
	12 0.4724	**16** 0.6299	**12** 0.472	**0.3** 0.01	JR12x16x12	**0.008** 0.018
	12 0.4724	**16** 0.6299	**12** 0.472	**0.3** 0.01	JR12x16x12JS1	**0.008** 0.018
	12 0.4724	**16** 0.6299	**13** 0.512	**0.3** 0.01	JR12x16x13	**0.008** 0.018
	12 0.4724	**16** 0.6299	**14** 0.551	**0.3** 0.01	JRZ12x16x14JS1	**0.010** 0.022
	12 0.4724	**16** 0.6299	**16** 0.630	**0.3** 0.01	JR12x16x16	**0.011** 0.024
	12 0.4724	**16** 0.6299	**20** 0.787	**0.3** 0.01	JR12x16x20	**0.014** 0.031
	12 0.4724	**16** 0.6299	**22** 0.866	**0.3** 0.01	JR12x16x22	**0.015** 0.033
13 0.5118	**13** 0.5118	**18** 0.7087	**16** 0.630	**0.35** 0.014	IM 13 18 16 P	**0.015** 0.033
14 0.5512	**14** 0.5512	**17** 0.6693	**17** 0.669	**0.3** 0.01	JR14x17x17	**0.009** 0.020
15 0.5906	**15** 0.5906	**18** 0.7087	**16.5** 0.650	**0.3** 0.01	JR15x18x16,5	**0.010** 0.022
	15 0.5906	**19** 0.7480	**16** 0.630	**0.3** 0.01	JR15x19x16	**0.013** 0.029
	15 0.5906	**19** 0.7480	**20** 0.787	**0.3** 0.01	JR15x19x20	**0.017** 0.037
	15 0.5906	**20** 0.7874	**12** 0.472	**0.3** 0.01	JR15x20x12	**0.012** 0.026
	15 0.5906	**20** 0.7874	**12** 0.472	**0.3** 0.01	JR15x20x12JS1	**0.012** 0.026

[1] Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

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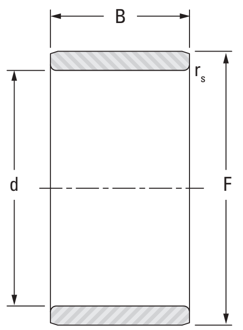
INNER RINGS



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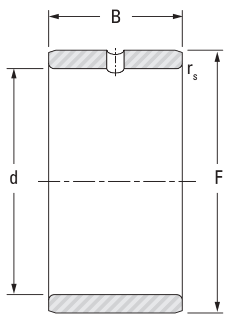
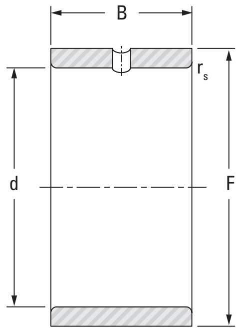


JR.JS1

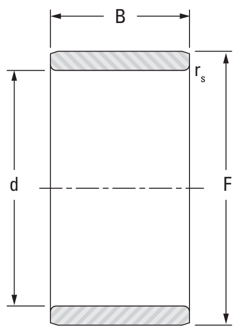


JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
15 0.5906	**15** 0.5906	**20** 0.7874	**13** 0.512	**0.3** 0.01	JR15x20x13	**0.014** 0.031
	15 0.5906	**20** 0.7874	**14** 0.551	**0.3** 0.01	JRZ15x20x14JS1	**0.015** 0.033
	15 0.5906	**20** 0.7874	**16** 0.630	**0.3** 0.01	JR15x20x16	**0.017** 0.037
	15 0.5906	**20** 0.7874	**20** 0.787	**0.35** 0.014	IM 15 20 20 P	**0.021** 0.045
	15 0.5906	**20** 0.7874	**23** 0.906	**0.3** 0.01	JR15x20x23	**0.025** 0.055
	15 0.5906	**20** 0.7874	**26** 1.024	**0.3** 0.01	JR15x20x26	**0.028** 0.062
17 0.6693	**17** 0.6693	**20** 0.7874	**16.5** 0.650	**0.3** 0.01	JR17x20x16,5	**0.011** 0.024
	17 0.6693	**20** 0.7874	**20** 0.787	**0.3** 0.01	JR17x20x20	**0.014** 0.031
	17 0.6693	**20** 0.7874	**20.5** 0.807	**0.3** 0.01	JR17x20x20,5	**0.014** 0.031
	17 0.6693	**20** 0.7874	**30.5** 1.201	**0.3** 0.01	JR17x20x30,5	**0.021** 0.046
	17 0.6693	**21** 0.8268	**16** 0.630	**0.3** 0.01	JR17x21x16	**0.015** 0.033
	17 0.6693	**21** 0.8268	**20** 0.787	**0.3** 0.01	JR17x21x20	**0.019** 0.042
	17 0.6693	**22** 0.8661	**13** 0.512	**0.3** 0.01	JR17x22x13	**0.015** 0.033
	17 0.6693	**22** 0.8661	**13** 0.512	**0.35** 0.014	IM 4903	**0.015** 0.033
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JR17x22x16	**0.019** 0.042
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JR17x22x16JS1	**0.019** 0.042
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JRZ17x22x16JS1	**0.019** 0.042
	17 0.6693	**22** 0.8661	**20** 0.787	**0.35** 0.014	IM 17 22 20 P	**0.023** 0.051
	17 0.6693	**22** 0.8661	**23** 0.906	**0.3** 0.01	JR17x22x23	**0.028** 0.062
	17 0.6693	**22** 0.8661	**26** 1.024	**0.3** 0.01	JR17x22x26	**0.031** 0.068
	17 0.6693	**22** 0.8661	**32** 1.260	**0.3** 0.01	JR17x22x32	**0.038** 0.084
20 0.7874	**20** 0.7874	**24** 0.9449	**16** 0.630	**0.3** 0.01	JR20x24x16	**0.018** 0.040
	20 0.7874	**24** 0.9449	**20** 0.787	**0.3** 0.01	JR20x24x20	**0.022** 0.049
	20 0.7874	**25** 0.9843	**16** 0.630	**0.3** 0.01	JR20x25x16	**0.022** 0.049

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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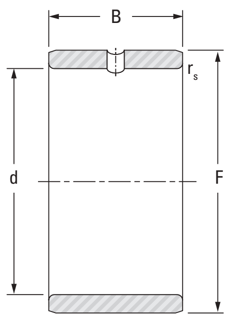
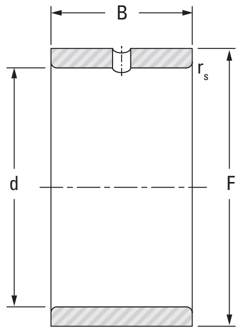


JR.JS1



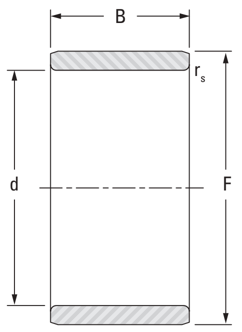
JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
20 0.7874	**20** 0.7874	**25** 0.9843	**16** 0.630	**0.3** 0.01	JR20x25x16JS1	**0.022** 0.049
	20 0.7874	**25** 0.9843	**17** 0.669	**0.3** 0.01	JR20x25x17	**0.023** 0.051
	20 0.7874	**25** 0.9843	**18** 0.709	**0.3** 0.01	JRZ20x25x18JS1	**0.025** 0.055
	20 0.7874	**25** 0.9843	**20** 0.787	**0.3** 0.01	JR20x25x20	**0.028** 0.062
	20 0.7874	**25** 0.9843	**20.5** 0.807	**0.3** 0.01	JR20x25x20,5	**0.029** 0.064
	20 0.7874	**25** 0.9843	**26** 1.024	**0.3** 0.01	JR20x25x26	**0.036** 0.079
	20 0.7874	**25** 0.9843	**26.5** 1.043	**0.3** 0.01	JR20x25x26,5	**0.037** 0.082
	20 0.7874	**25** 0.9843	**30** 1.181	**0.3** 0.01	JR20x25x30	**0.042** 0.093
	20 0.7874	**25** 0.9843	**32** 1.260	**0.3** 0.01	JR20x25x32	**0.044** 0.097
	20 0.7874	**25** 0.9843	**38.5** 1.516	**0.3** 0.01	JR20x25x38,5	**0.054** 0.119
22 0.8661	**22** 0.8661	**26** 1.0236	**16** 0.630	**0.3** 0.01	JR22x26x16	**0.019** 0.042
	22 0.8661	**26** 1.0236	**20** 0.787	**0.3** 0.01	JR22x26x20	**0.023** 0.051
	22 0.8661	**28** 1.1024	**17** 0.669	**0.3** 0.01	JR22x28x17	**0.030** 0.066
	22 0.8661	**28** 1.1024	**20.5** 0.807	**0.3** 0.01	JR22x28x20,5	**0.038** 0.084
	22 0.8661	**28** 1.1024	**30** 1.181	**0.3** 0.01	JR22x28x30	**0.056** 0.123
23 0.9055	**23** 0.9055	**28** 1.1024	**20** 0.787	**0.35** 0.014	IM 23 28 20 P	**0.030** 0.066
25 0.9843	**25** 0.9843	**29** 1.1417	**20** 0.787	**0.3** 0.01	JR25x29x20	**0.027** 0.060
	25 0.9843	**29** 1.1417	**30** 1.181	**0.3** 0.01	JR25x29x30	**0.040** 0.088
	25 0.9843	**30** 1.1811	**16** 0.630	**0.3** 0.01	JR25x30x16	**0.027** 0.060
	25 0.9843	**30** 1.1811	**16** 0.630	**0.3** 0.01	JR25x30x16JS1	**0.027** 0.060
	25 0.9843	**30** 1.1811	**17** 0.669	**0.3** 0.01	JR25x30x17	**0.028** 0.062
	25 0.9843	**30** 1.1811	**18** 0.709	**0.3** 0.01	JRZ25x30x18JS1	**0.031** 0.068
	25 0.9843	**30** 1.1811	**20** 0.787	**0.3** 0.01	JR25x30x20	**0.034** 0.075
	25 0.9843	**30** 1.1811	**20.5** 0.807	**0.3** 0.01	JR25x30x20,5	**0.035** 0.077

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

Continued on next page.

INNER RINGS



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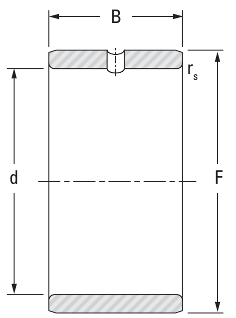
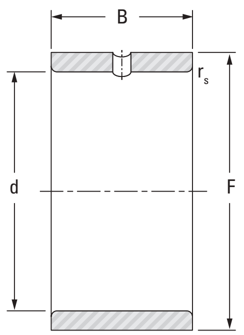


JR.JS1

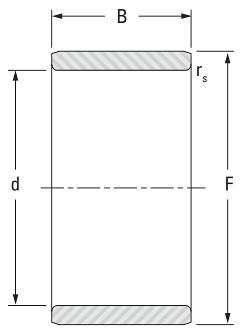


JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
25 0.9843	**25** 0.9843	**30** 1.1811	**26** 1.024	**0.3** 0.01	JR25x30x26	**0.044** 0.097
	25 0.9843	**30** 1.1811	**26.5** 1.043	**0.3** 0.01	JR25x30x26,5	**0.045** 0.099
	25 0.9843	**30** 1.1811	**30** 1.181	**0.3** 0.01	JR25x30x30	**0.051** 0.112
	25 0.9843	**30** 1.1811	**32** 1.260	**0.3** 0.01	JR25x30x32	**0.054** 0.119
	25 0.9843	**30** 1.1811	**38.5** 1.516	**0.3** 0.01	JR25x30x38,5	**0.066** 0.146
28 1.1024	**28** 1.1024	**32** 1.2598	**17** 0.669	**0.3** 0.01	JR28x32x17	**0.028** 0.062
	28 1.1024	**32** 1.2598	**20** 0.787	**0.3** 0.01	JR28x32x20	**0.030** 0.066
	28 1.1024	**32** 1.2598	**30** 1.181	**0.3** 0.01	JR28x32x30	**0.044** 0.097
30 1.1811	**30** 1.1811	**35** 1.3780	**16** 0.630	**0.3** 0.01	JR30x35x16	**0.031** 0.068
	30 1.1811	**35** 1.3780	**17** 0.669	**0.3** 0.01	JR30x35x17	**0.033** 0.073
	30 1.1811	**35** 1.3780	**17** 0.669	**0.35** 0.014	IM 4906	**0.033** 0.073
	30 1.1811	**35** 1.3780	**18** 0.709	**0.3** 0.01	JRZ30x35x18JS1	**0.036** 0.079
	30 1.1811	**35** 1.3780	**20** 0.787	**0.3** 0.01	JR30x35x20	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20** 0.787	**0.3** 0.01	JRZ30x35x20JS1	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20.5** 0.807	**0.3** 0.01	JR30x35x20,5	**0.040** 0.088
	30 1.1811	**35** 1.3780	**26** 1.024	**0.3** 0.01	JR30x35x26	**0.054** 0.119
	30 1.1811	**35** 1.3780	**30** 1.181	**0.3** 0.01	JR30x35x30	**0.057** 0.126
	30 1.1811	**35** 1.3780	**32** 1.260	**0.3** 0.01	JR30x35x32	**0.062** 0.137
	30 1.1811	**38** 1.4961	**20** 0.787	**0.6** 0.02	JR30x38x20JS1	**0.067** 0.148
32 1.2598	**32** 1.2598	**37** 1.4567	**20** 0.787	**0.3** 0.01	JR32x37x20	**0.043** 0.095
	32 1.2598	**37** 1.4567	**30** 1.181	**0.3** 0.01	JR32x37x30	**0.064** 0.141
	32 1.2598	**40** 1.5748	**20** 0.787	**0.6** 0.02	JR32x40x20	**0.069** 0.152
	32 1.2598	**40** 1.5748	**36** 1.417	**0.6** 0.02	JR32x40x36	**0.128** 0.282
35 1.3780	**35** 1.3780	**40** 1.5748	**17** 0.669	**0.3** 0.01	JR35x40x17	**0.040** 0.088

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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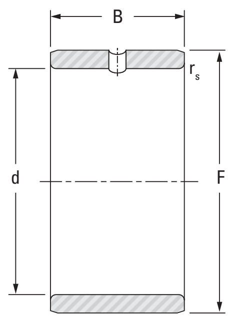
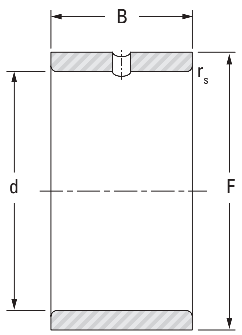


JR.JS1



JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
35 1.3780	**35** 1.3780	**40** 1.5748	**20** 0.787	**0.3** 0.01	JR35x40x20	**0.046** 0.101
	35 1.3780	**40** 1.5748	**20.5** 0.807	**0.3** 0.01	JR35x40x20,5	**0.049** 0.108
	35 1.3780	**40** 1.5748	**22** 0.866	**0.3** 0.01	JR35x40x22	**0.052** 0.115
	35 1.3780	**40** 1.5748	**30** 1.181	**0.3** 0.01	JR35x40x30	**0.071** 0.157
	35 1.3780	**40** 1.5748	**34** 1.339	**0.3** 0.01	JR35x40x34	**0.080** 0.176
	35 1.3780	**40** 1.5748	**40** 1.575	**0.3** 0.01	JR35x40x40	**0.094** 0.207
	35 1.3780	**42** 1.6535	**20** 0.787	**0.6** 0.02	JR35x42x20	**0.065** 0.143
	35 1.3780	**42** 1.6535	**20** 0.787	**0.6** 0.02	JR35x42x20JS1	**0.065** 0.143
	35 1.3780	**42** 1.6535	**23** 0.906	**0.6** 0.02	JRZ35x42x23JS1	**0.074** 0.163
	35 1.3780	**42** 1.6535	**36** 1.417	**0.6** 0.02	JR35x42x36	**0.122** 0.269
	35 1.3780	**44** 1.7323	**22** 0.866	**0.6** 0.02	JR35x44x22	**0.097** 0.214
37 1.4567	**37** 1.4567	**42** 1.6535	**20** 0.787	**0.35** 0.014	IM 37 42 20 P	**0.046** 0.101
38 1.4961	**38** 1.4961	**43** 1.6929	**20** 0.787	**0.3** 0.01	JR38x43x20	**0.050** 0.110
	38 1.4961	**43** 1.6929	**30** 1.181	**0.3** 0.01	JR38x43x30	**0.075** 0.165
40 1.5748	**40** 1.5748	**45** 1.7717	**17** 0.669	**0.3** 0.01	JR40x45x17	**0.044** 0.097
	40 1.5748	**45** 1.7717	**20** 0.787	**0.3** 0.01	JR40x45x20	**0.052** 0.115
	40 1.5748	**45** 1.7717	**20.5** 0.807	**0.3** 0.01	JR40x45x20,5	**0.054** 0.119
	40 1.5748	**45** 1.7717	**25** 0.984	**0.35** 0.014	IM 40 45 25 P	**0.062** 0.137
	40 1.5748	**45** 1.7717	**30** 1.181	**0.3** 0.01	JR40x45x30	**0.078** 0.172
	40 1.5748	**45** 1.7717	**34** 1.339	**0.3** 0.01	JR40x45x34	**0.089** 0.196
	40 1.5748	**45** 1.7717	**40** 1.575	**0.3** 0.01	JR40x45x40	**0.115** 0.254
	40 1.5748	**48** 1.8898	**22** 0.866	**0.6** 0.02	JR40x48x22	**0.094** 0.207
	40 1.5748	**48** 1.8898	**23** 0.906	**0.6** 0.02	JRZ40x48x23JS1	**0.100** 0.220
	40 1.5748	**48** 1.8898	**40** 1.575	**0.6** 0.02	JR40x48x40	**0.173** 0.381

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

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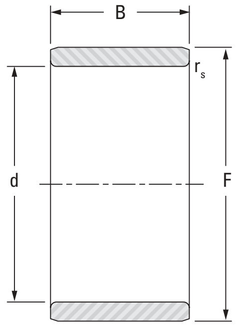
INNER RINGS



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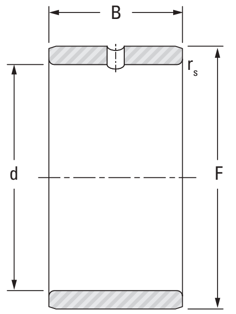
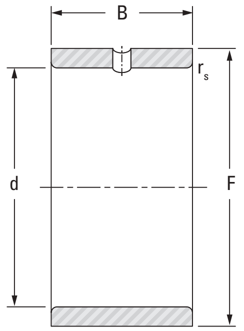


JR.JS1

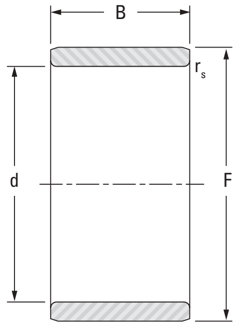


JRZ.JS1

Shaft Dia.	d	F (1)	B	r_s min.	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
40 1.5748	**40** 1.5748	**50** 1.9685	**20** 0.787	**1** 0.04	JR40x50x20	**0.110** 0.243
42 1.6535	**42** 1.6535	**47** 1.8504	**20** 0.787	**0.3** 0.01	JR42x47x20	**0.055** 0.121
	42 1.6535	**47** 1.8504	**30** 1.181	**0.3** 0.01	JR42x47x30	**0.083** 0.183
45 1.7717	**45** 1.7717	**50** 1.9685	**20** 0.787	**0.3** 0.01	JR45x50x20	**0.058** 0.128
	45 1.7717	**50** 1.9685	**25** 0.984	**0.6** 0.02	JR45x50x25	**0.073** 0.161
	45 1.7717	**50** 1.9685	**25.5** 1.004	**0.3** 0.01	JR45x50x25,5	**0.075** 0.165
	45 1.7717	**50** 1.9685	**35** 1.378	**0.6** 0.02	JR45x50x35	**0.103** 0.227
	45 1.7717	**50** 1.9685	**40** 1.575	**0.3** 0.01	JR45x50x40	**0.117** 0.258
	45 1.7717	**52** 2.0472	**22** 0.866	**0.6** 0.02	JR45x52x22	**0.090** 0.198
	45 1.7717	**52** 2.0472	**22** 0.866	**0.85** 0.033	IM 4909	**0.087** 0.192
	45 1.7717	**52** 2.0472	**23** 0.906	**0.6** 0.02	JR45x52x23	**0.096** 0.212
	45 1.7717	**52** 2.0472	**23** 0.906	**0.6** 0.02	JRZ45x52x23JS1	**0.096** 0.212
	45 1.7717	**52** 2.0472	**40** 1.575	**0.6** 0.02	JR45x52x40	**0.167** 0.368
	45 1.7717	**55** 2.1654	**20** 0.787	**1** 0.04	JR45x55x20	**0.133** 0.293
	45 1.7717	**55** 2.1654	**20** 0.787	**1** 0.04	JR45x55x20JS1	**0.133** 0.293
	45 1.7717	**55** 2.1654	**22** 0.866	**1** 0.04	JR45x55x22	**0.135** 0.298
	45 1.7717	**55** 2.1654	**40** 1.575	**1** 0.04	JR45x55x40	**0.247** 0.545
50 1.9685	**50** 1.9685	**55** 2.1654	**20** 0.787	**0.3** 0.01	JR50x55x20	**0.065** 0.143
	50 1.9685	**55** 2.1654	**25** 0.984	**0.6** 0.02	JR50x55x25	**0.081** 0.179
	50 1.9685	**55** 2.1654	**35** 1.378	**0.65** 0.026	IM 50 55 35 P	**0.107** 0.236
	50 1.9685	**55** 2.1654	**35** 1.378	**0.6** 0.02	JR50x55x35	**0.113** 0.249
	50 1.9685	**55** 2.1654	**40** 1.575	**0.3** 0.01	JR50x55x40	**0.130** 0.287
	50 1.9685	**58** 2.2835	**22** 0.866	**0.6** 0.02	JR50x58x22	**0.117** 0.258
	50 1.9685	**58** 2.2835	**23** 0.906	**0.6** 0.02	JRZ50x58x23JS1	**0.122** 0.269

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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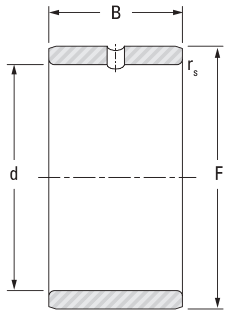
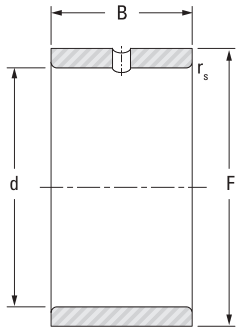


JR.JS1



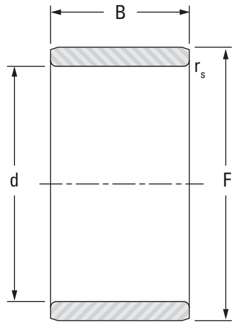
JRZ.JS1

Shaft Dia.	d	F (1)	B	r_s min.	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
50 1.9685	**50** 1.9685	**58** 2.2835	**40** 1.575	**0.6** 0.02	JR50x58x40	**0.213** 0.470
	50 1.9685	**60** 2.3622	**20** 0.787	**1** 0.04	JR50x60x20	**0.155** 0.342
	50 1.9685	**60** 2.3622	**20** 0.787	**1** 0.04	JR50x60x20JS1	**0.155** 0.342
	50 1.9685	**60** 2.3622	**25** 0.984	**1** 0.04	JR50x60x25	**0.170** 0.375
	50 1.9685	**60** 2.3622	**40** 1.575	**1** 0.04	JR50x60x40	**0.310** 0.683
55 2.1654	**55** 2.1654	**60** 2.3622	**25** 0.984	**0.6** 0.02	JR55x60x25	**0.088** 0.194
	55 2.1654	**60** 2.3622	**35** 1.378	**0.65** 0.026	IM 55 60 35 P	**0.118** 0.260
	55 2.1654	**60** 2.3622	**35** 1.378	**0.6** 0.02	JR55x60x35	**0.124** 0.273
	55 2.1654	**63** 2.4803	**25** 0.984	**1** 0.04	JR55x63x25	**0.141** 0.311
	55 2.1654	**63** 2.4803	**45** 1.772	**1** 0.04	JR55x63x45	**0.286** 0.631
	55 2.1654	**65** 2.5591	**30** 1.181	**1** 0.04	JR55x65x30	**0.222** 0.489
	55 2.1654	**65** 2.5591	**60** 2.362	**1** 0.04	JR55x65x60	**0.444** 0.979
58 2.2835	**58** 2.2835	**65** 2.5591	**25** 0.984	**0.85** 0.033	IM 58 65 25 P	**0.125** 0.276
60 2.3622	**60** 2.3622	**68** 2.6772	**25** 0.984	**0.6** 0.02	JR60x68x25	**0.153** 0.337
	60 2.3622	**68** 2.6772	**35** 1.378	**0.6** 0.02	JR60x68x35	**0.220** 0.485
	60 2.3622	**68** 2.6772	**45** 1.772	**1** 0.04	JR60x68x45	**0.284** 0.626
	60 2.3622	**70** 2.7559	**25** 0.984	**1** 0.04	JR60x70x25	**0.200** 0.441
	60 2.3622	**70** 2.7559	**30** 1.181	**1** 0.04	JR60x70x30	**0.240** 0.529
	60 2.3622	**70** 2.7559	**35** 1.378	**0.85** 0.033	IM 60 70 35 P	**0.280** 0.616
	60 2.3622	**70** 2.7559	**60** 2.362	**1** 0.04	JR60x70x60	**0.480** 1.058
65 2.5591	**65** 2.5591	**72** 2.8346	**25** 0.984	**1** 0.04	JR65x72x25	**0.143** 0.315
	65 2.5591	**72** 2.8346	**45** 1.772	**1** 0.04	JR65x72x45	**0.266** 0.586
	65 2.5591	**73** 2.8740	**25** 0.984	**0.6** 0.02	JR65x73x25	**0.170** 0.375
	65 2.5591	**73** 2.8740	**35** 1.378	**0.6** 0.02	JR65x73x35	**0.240** 0.529

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

Continued on next page.

INNER RINGS



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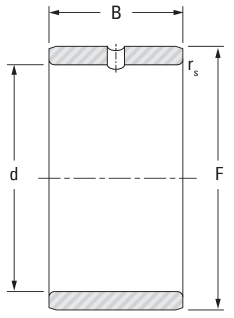
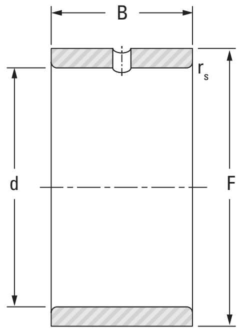


JR.JS1

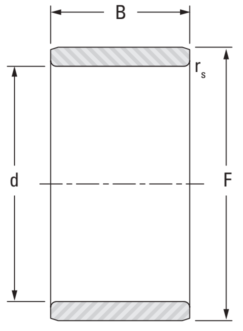


JRZ.JS1

Shaft Dia.	d	F (1)	B	rs min.	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
65 2.5591	**65** 2.5591	**75** 2.9528	**28** 1.102	**1** 0.04	JR65x75x28	**0.240** 0.529
	65 2.5591	**75** 2.9528	**30** 1.181	**1** 0.04	JR65x75x30	**0.260** 0.573
	65 2.5591	**75** 2.9528	**60** 2.362	**1** 0.04	JR65x75x60	**0.520** 1.146
70 2.7559	**70** 2.7559	**80** 3.1496	**25** 0.984	**1** 0.04	JR70x80x25	**0.230** 0.507
	70 2.7559	**80** 3.1496	**30** 1.181	**1** 0.04	JR70x80x30	**0.270** 0.595
	70 2.7559	**80** 3.1496	**35** 1.378	**1** 0.04	JR70x80x35	**0.320** 0.705
	70 2.7559	**80** 3.1496	**54** 2.126	**1** 0.04	JR70x80x54	**0.500** 1.102
	70 2.7559	**80** 3.1496	**60** 2.362	**1** 0.04	JR70x80x60	**0.556** 1.226
75 2.9528	**75** 2.9528	**85** 3.3465	**25** 0.984	**1** 0.04	JR75x85x25	**0.240** 0.529
	75 2.9528	**85** 3.3465	**30** 1.181	**1** 0.04	JR75x85x30	**0.289** 0.637
	75 2.9528	**85** 3.3465	**35** 1.378	**1** 0.04	JR75x85x35	**0.338** 0.745
	75 2.9528	**85** 3.3465	**54** 2.126	**1** 0.04	JR75x85x54	**0.530** 1.168
80 3.1496	**80** 3.1496	**90** 3.5433	**25** 0.984	**1** 0.04	JR80x90x25	**0.260** 0.573
	80 3.1496	**90** 3.5433	**30** 1.181	**1** 0.04	JR80x90x30	**0.306** 0.675
	80 3.1496	**90** 3.5433	**35** 1.378	**1** 0.04	JR80x90x35	**0.355** 0.783
	80 3.1496	**90** 3.5433	**54** 2.126	**1** 0.04	JR80x90x54	**0.565** 1.246
85 3.3465	**85** 3.3465	**95** 3.7402	**26** 1.024	**1** 0.04	JR85x95x26	**0.290** 0.639
	85 3.3465	**95** 3.7402	**30** 1.181	**1** 0.04	JR85x95x30	**0.334** 0.736
	85 3.3465	**95** 3.7402	**36** 1.417	**1** 0.04	JR85x95x36	**0.397** 0.875
	85 3.3465	**100** 3.9370	**35** 1.378	**1.1** 0.04	JR85x100x35	**0.595** 1.312
	85 3.3465	**100** 3.9370	**63** 2.480	**1.1** 0.04	JR85x100x63	**1.080** 2.381
90 3.5433	**90** 3.5433	**100** 3.9370	**26** 1.024	**1** 0.04	JR90x100x26	**0.300** 0.661
	90 3.5433	**100** 3.9370	**30** 1.181	**1** 0.04	JR90x100x30	**0.350** 0.772
	90 3.5433	**100** 3.9370	**36** 1.417	**1** 0.04	JR90x100x36	**0.422** 0.930

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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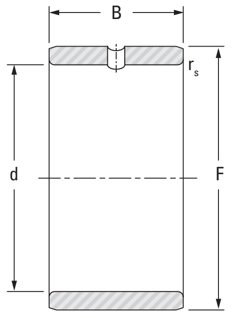
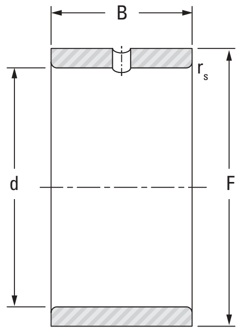


JR.JS1



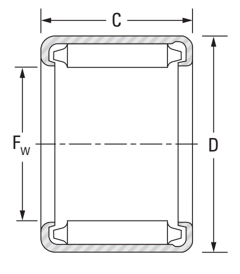
JRZ.JS1

Shaft Dia.	d	F (1)	B	rs min.	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
90 3.5433	**90** 3.5433	**105** 4.1339	**32** 1.260	**1.1** 0.04	JR90x105x32	**0.580** 1.279
	90 3.5433	**105** 4.1339	**35** 1.378	**1.1** 0.04	JR90x105x35	**0.624** 1.376
	90 3.5433	**105** 4.1339	**63** 2.480	**1.1** 0.04	JR90x105x63	**1.140** 2.513
95 3.7402	**95** 3.7402	**105** 4.1339	**26** 1.024	**1** 0.04	JR95x105x26	**0.310** 0.683
	95 3.7402	**105** 4.1339	**36** 1.417	**1** 0.04	JR95x105x36	**0.430** 0.948
	95 3.7402	**110** 4.3307	**35** 1.378	**1.1** 0.04	JR95x110x35	**0.653** 1.440
	95 3.7402	**110** 4.3307	**63** 2.480	**1.1** 0.04	JR95x110x63	**1.200** 2.646
100 3.9370	**100** 3.9370	**110** 4.3307	**30** 1.181	**1.1** 0.04	JR100x110x30	**0.384** 0.847
	100 3.9370	**110** 4.3307	**40** 1.575	**1.1** 0.04	JR100x110x40	**0.510** 1.124
	100 3.9370	**115** 4.5276	**40** 1.575	**1.1** 0.04	JR100x115x40	**0.790** 1.742
110 4.3307	**110** 4.3307	**120** 4.7244	**30** 1.181	**1** 0.04	JR110x120x30	**0.425** 0.937
	110 4.3307	**125** 4.9213	**40** 1.575	**1.1** 0.04	JR110x125x40	**0.870** 1.918
120 4.7244	**120** 4.7244	**130** 5.1181	**30** 1.181	**1** 0.04	JR120x130x30	**0.460** 1.014
	120 4.7244	**135** 5.3150	**45** 1.772	**1.1** 0.04	JR120x135x45	**1.060** 2.337
130 5.1181	**130** 5.1181	**145** 5.7087	**35** 1.378	**1.1** 0.04	JR130x145x35	**0.890** 1.962
	130 5.1181	**150** 5.9055	**50** 1.969	**1.5** 0.06	JR130x150x50	**1.730** 3.814
140 5.5118	**140** 5.5118	**155** 6.1024	**35** 1.378	**1.1** 0.04	JR140x155x35	**0.955** 2.105
	140 5.5118	**160** 6.2992	**50** 1.969	**1.5** 0.06	JR140x160x50	**1.860** 4.101
150 5.9055	**150** 5.9055	**165** 6.4961	**40** 1.575	**1.1** 0.04	JR150x165x40	**1.170** 2.579
160 6.2992	**160** 6.2992	**175** 6.8898	**40** 1.575	**1.1** 0.04	JR160x175x40	**1.240** 2.734
170 6.6929	**170** 6.6929	**185** 7.2835	**45** 1.772	**1.1** 0.04	JR170x185x45	**1.480** 3.263
180 7.0866	**180** 7.0866	**195** 7.6772	**45** 1.772	**1.1** 0.04	JR180x195x45	**1.560** 3.439

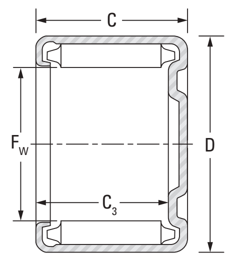
(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

DRAWN CUP NEEDLE ROLLER BEARINGS
FULL COMPLEMENT
OPEN ENDS, CLOSED ONE END

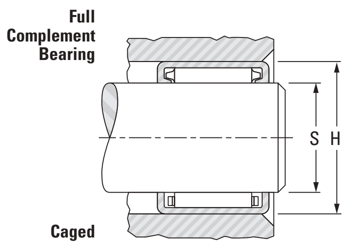
METRIC SERIES
DL, DLF SERIES



DL



DLF



Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C	C_3 min.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-43 to B-2-45)
			+0 +0.000 -0.3 -0.012		Open Ends	Closed One End	Dynamic	Static			Shaft (h5)		Housing (H6)			
							C	C_0			Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in		
6 0.2362	6 0.2362	12 0.4724	10 0.394	—	DL 6 10	—	5.10 650	4.80 850	0.720	0.004 0.009	6.000 0.2362	5.995 0.2360	12.011 0.4729	12.000 0.4724	Table B2-3	
	6 0.2362	12 0.4724	10 0.394	7.7 0.303	—	DLF 6 10	5.10 650	4.80 850	0.720	0.004 0.010	6.000 0.2362	5.995 0.2360	12.011 0.4729	12.000 0.4724	Table B2-3	
8 0.3150	8 0.3150	14 0.5512	10 0.394	—	DL 8 10	—	6.15 1010	6.45 1460	0.970	0.005 0.012	8.000 0.3150	7.994 0.3147	14.011 0.5516	14.000 0.5512	Table B2-3	
	8 0.3150	14 0.5512	10 0.394	7.7 0.303	—	DLF 8 10	6.15 1010	6.45 1460	0.970	0.006 0.013	8.000 0.3150	7.994 0.3147	14.011 0.5516	14.000 0.5512	Table B2-3	
9 0.3543	9 0.3543	14 0.5512	12 0.472	—	DL 9 14 12	—	8.95 1370	11.9 1270	1.80	0.006 0.013	9.000 0.3543	8.994 0.3541	14.011 0.5516	14.000 0.5512	Table B2-3	
	9 0.3547	14 0.5512	12 0.472	9.7 0.382	—	DLF 9 14 12	8.95 1370	11.9 1270	1.80	0.007 0.015	9.000 0.3543	8.994 0.3541	14.011 0.5516	14.000 0.5512	Table B2-3	
10 0.3937	10 0.3937	16 0.6299	12 0.472	—	DL 10 12	—	8.85 1570	10.9 2450	1.65	0.008 0.018	10.000 0.3937	9.994 0.3935	16.011 0.6304	16.000 0.6299	Table B2-3	
	10 0.3937	16 0.6299	12 0.472	9.7 0.382	—	DLF 10 12	8.85 1570	10.9 2450	1.65	0.009 0.020	10.000 0.3937	9.994 0.3935	16.011 0.6304	16.000 0.6299	Table B2-3	
12 0.4724	12 0.4724	18 0.7087	10 0.394	—	DL 12 10	—	7.85 1350	9.75 2180	1.45	0.008 0.017	12.000 0.4724	11.992 0.4721	18.011 0.7091	18.000 0.7087	Table B2-3	
	12 0.4724	18 0.7087	10 0.394	7.7 0.303	—	DLF 12 10	7.85 1350	9.75 2180	1.45	0.008 0.018	12.000 0.4724	11.992 0.4721	18.011 0.7091	18.000 0.7087	Table B2-3	
	12 0.4724	18 0.7087	12 0.472	—	DL 12 12	—	9.80 1570	13.0 2590	1.95	0.009 0.021	12.000 0.4724	11.992 0.4721	18.011 0.7091	18.000 0.7087	Table B2-3	IM 8 12 12,4
	12 0.4724	18 0.7087	12 0.472	9.7 0.382	—	DLF 12 12	9.80 1570	13.0 2590	1.95	0.010 0.022	12.000 0.4724	11.992 0.4721	18.011 0.7091	18.000 0.7087	Table B2-3	IM 8 12 12,4
13 0.5118	13 0.5118	19 0.7480	12 0.472	—	DL 13 12	—	10.4 1910	14.1 3190	2.15	0.010 0.022	13.000 0.5118	12.992 0.5115	19.013 0.7485	19.000 0.7480	Table B2-3	IM 9 13 12,4
	13 0.5118	19 0.7480	12 0.472	9.7 0.382	—	DLF 13 12	10.4 1910	14.1 3190	2.15	0.011 0.024	13.000 0.5118	12.992 0.5115	19.013 0.7485	19.000 0.7480	Table B2-3	IM 9 13 12,4
14 0.5512	14 0.5512	20 0.7874	12 0.472	—	DL 14 12	—	10.7 1780	15.2 3030	2.30	0.011 0.023	14.000 0.5512	13.992 0.5509	20.013 0.7879	20.000 0.7874	Table B2-3	IM 10 14 12,4
	14 0.5512	20 0.7874	12 0.472	9.7 0.382	—	DLF 14 12	10.7 1780	15.2 3030	2.30	0.012 0.026	14.000 0.5512	13.992 0.5509	20.013 0.7879	20.000 0.7874	Table B2-3	IM 10 14 12,4
15 0.5906	15 0.5906	21 0.8268	12 0.472	—	DL 15 12	—	11.3 2110	16.3 3690	2.50	0.011 0.024	15.000 0.5906	14.992 0.5902	21.013 0.8273	21.000 0.8268	Table B2-3	IM 12 15 12,4
	15 0.5906	21 0.8268	12 0.472	9.7 0.382	—	DLF 15 12	11.3 2110	16.3 3690	2.50	0.012 0.026	15.000 0.5906	14.992 0.5902	21.013 0.8273	21.000 0.8268	Table B2-3	IM 12 15 12,4
16 0.6299	16 0.6299	22 0.8661	12 0.472	—	DL 16 12	—	11.5 1960	17.4 3480	2.65	0.012 0.026	16.000 0.6299	15.992 0.6296	22.013 0.8667	22.000 0.8661	Table B2-3	IM 12 16 12,4

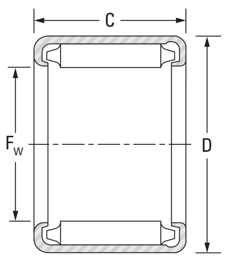
Note) · For information on the speed ratings, contact JTEKT.

Shaft Dia.	F_w	D	C	C_3 min.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-43 to B-2-45)
			+0 +0.000 -0.3 -0.012		Open Ends	Closed One End	Dynamic	Static			Shaft (h5)		Housing (H6)			
							C	C_0			Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in		
16 0.6299	16 0.6299	22 0.8661	12 0.472	9.7 0.382	—	DLF 16 12	11.5 1960	17.4 3480	2.65	0.013 0.029	16.000 0.6299	15.992 0.6296	22.013 0.8667	22.000 0.8661	Table B2-3	IM 12 16 12,4
17 0.6693	17 0.6693	23 0.9055	12 0.472	—	DL 17 12	—	12.0 2020	18.5 3640	2.80	0.013 0.029	17.000 0.6693	16.992 0.6690	23.013 0.9060	23.000 0.9055	Table B2-3	IM 13 17 12,4
	17 0.6693	23 0.9055	12 0.472	9.7 0.382	—	DLF 17 12	12.0 2020	18.5 3640	2.80	0.014 0.031	17.000 0.6693	16.992 0.6690	23.013 0.9060	23.000 0.9055	Table B2-3	IM 13 17 12,4
18 0.7087	18 0.7087	24 0.9449	12 0.472	—	DL 18 12	—	12.3 2410	19.6 4380	3.00	0.014 0.031	18.000 0.7087	17.992 0.7083	24.013 0.9454	24.000 0.9449	Table B2-3	IM 13 18 12,4
	18 0.7087	24 0.9449	12 0.472	9.7 0.382	—	DLF 18 12	12.3 2410	19.6 4380	3.00	0.016 0.035	18.000 0.7087	17.992 0.7083	24.013 0.9454	24.000 0.9449	Table B2-3	IM 13 18 12,4
	18 0.7087	24 0.9449	16 0.630	—	DL 18 16	—	16.9 3600	29.6 6630	4.50	0.019 0.042	18.000 0.7087	17.992 0.7083	24.013 0.9454	24.000 0.9449	Table B2-3	IM 13 18 16,4
	18 0.7087	24 0.9449	16 0.630	13.7 0.539	—	DLF 18 16	16.9 3600	29.6 6630	4.50	0.021 0.046	18.000 0.7087	17.992 0.7083	24.013 0.9454	24.000 0.9449	Table B2-3	IM 13 18 16,4
20 0.7874	20 0.7874	26 1.0236	12 0.472	—	DL 20 12	—	13.0 2290	21.8 4380	3.30	0.015 0.033	20.000 0.7874	19.991 0.7870	26.013 1.0241	26.000 1.0236	Table B2-3	IM 15 20 12,4
	20 0.7874	26 1.0236	12 0.472	9.7 0.382	—	DLF 20 12	13.0 2290	21.8 4380	3.30	0.017 0.037	20.000 0.7874	19.991 0.7870	26.013 1.0241	26.000 1.0236	Table B2-3	IM 15 20 12,4
	20 0.7874	26 1.0236	16 0.630	—	DL 20 16	—	17.8 3600	32.8 6860	5.00	0.020 0.044	20.000 0.7874	19.991 0.7870	26.013 1.0241	26.000 1.0236	Table B2-3	IM 15 20 16,4
	20 0.7874	26 1.0236	16 0.630	13.7 0.539	—	DLF 20 16	17.8 3600	32.8 6860	5.00	0.022 0.049	20.000 0.7874	19.991 0.7870	26.013 1.0241	26.000 1.0236	Table B2-3	IM 15 20 16,4
22 0.8661	22 0.8661	28 1.1024	16 0.630	—	DL 22 16	—	18.7 3820	36.1 7420	5.55	0.022 0.049	22.000 0.8661	21.991 0.8658	28.013 1.1029	28.000 1.1024	Table B2-3	IM 17 22 16,4
	22 0.8661	28 1.1024	16 0.630	13.7 0.539	—	DLF 22 16	18.7 3820	36.1 7420	5.55	0.025 0.055	22.000 0.8661	21.991 0.8658	28.013 1.1029	28.000 1.1024	Table B2-3	IM 17 22 16,4
25 0.9843	25 0.9843	33 1.2992	16 0.630	—	DL 25 16	—	23.5 3600	38.8 7310	6.00	0.035 0.077	25.000 0.9843	24.991 0.9839	33.016 1.2998	33.000 1.2992	Table B2-3	IM 20 25 16,4
	25 0.9843	33 1.2992	16 0.630	13.7 0.539	—	DLF 25 16	23.5 3600	38.8 7310	6.00	0.039 0.086	25.000 0.9843	24.991 0.9839	33.016 1.2998	33.000 1.2992	Table B2-3	IM 20 25 16,4
	25 0.9843	33 1.2992	20 0.787	—	DL 25 20	—	29.7 5130	52.6 10300	8.35	0.043 0.095	25.000 0.9843	24.991 0.9839	33.016 1.2998	33.000 1.2992	Table B2-3	IM 20 25 20,4
	25 0.9843	33 1.2992	20 0.787	17.7 0.697	—	DLF 25 20	29.7 5130	52.6 10300	8.35	0.047 0.104	25.000 0.9843	24.991 0.9839	33.016 1.2998	33.000 1.2992	Table B2-3	IM 20 25 20,4
28 1.1024	28 1.1024	36 1.4173	20 0.787	—	DL 28 20	—	31.6 5510	58.9 11700	9.35	0.047 0.104	28.000 1.1024	27.991 1.1020	36.016 1.4180	36.000 1.4173	Table B2-3	IM 23 28 20,4
	28 1.1024	36 1.4173	20 0.787	17.7 0.697	—	DLF 28 20	31.6 5510	58.9 11700	9.35	0.051 0.112	28.000 1.1024	27.991 1.1020	36.016 1.4180	36.000 1.4173	Table B2-3	IM 23 28 20,4
30 1.1811	30 1.1811	38 1.4961	16 0.630	—	DL 30 16	—	25.9 4880	46.6 10500	7.20	0.040 0.088	30.000 1.1811	29.991 1.1807	38.016 1.4967	38.000 1.4961	Table B2-3	IM 25 30 16,4
	30 1.1811	38 1.4961	16 0.630	13.7 0.539	—	DLF 30 16	25.9 4880	46.6 10500	7.20	0.045 0.099	30.000 1.1811	29.991 1.1807	38.016 1.4967	38.000 1.4961	Table B2-3	IM 25 30 16,4
	30 1.1811	38 1.4961	20 0.787	—	DL 30 20	—	32.8 5850	63.1 12600	10.0	0.050 0.110	30.000 1.1811	29.991 1.1807	38.016 1.4967	38.000 1.4961	Table B2-3	IM 25 30 20,4
	30 1.1811	38 1.4961	20 0.787	17.7 0.697	—	DLF 30 20	32.8 5850	63.1 12600	10.0	0.055 0.121	30.000 1.1811	29.991 1.1807	38.016 1.4967	38.000 1.4961	Table B2-3	IM 25 30 20,4
	30 1.1811	38 1.4961	25 0.984	—	DL 30 25	—	40.9 7980	83.8 17100	13.1	0.063 0.139	30.000 1.1811	29.991 1.1807	38.016 1.4967	38.000 1.4961	Table B2-3	IM 25 30 25
	30 1.1811	38 1.4961	25 0.984	22.7 0.894	—	DLF 30 25	40.9 7980	83.8 17100	13.1	0.068 0.150	30.000 1.1811	29.991 1.1807	38.016 1.4967	38.000 1.4961	Table B2-3	IM 25 30 25
35 1.3780	35 1.3780	43 1.6929	16 0.630	—	DL 35 16	—	28.1 5400	54.4 12100	8.40	0.046 0.101	35.000 1.3780	34.989 1.3775	43.016 1.6935	43.000 1.6929	Table B2-3	IM 30 35 16,4

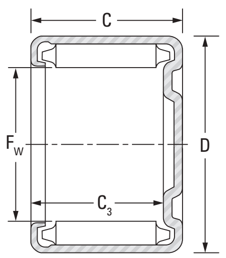
Continued on next page.

DRAWN CUP NEEDLE ROLLER BEARINGS FULL COMPLEMENT OPEN ENDS, CLOSED ONE END

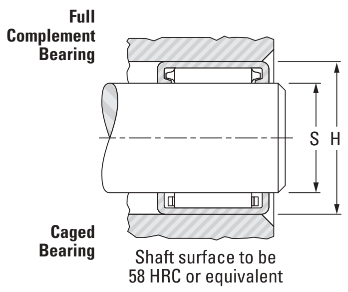
METRIC SERIES DL, DLF SERIES



DL



DLF

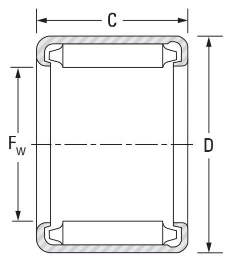


Shaft Dia.	Fw	D	C	C3 min.	Bearing Designation		Load Ratings		Fatigue Load Limit Cu	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-43 to B-2-45)
			+0 +0.000 -0.3 -0.012				Dynamic	Static			Shaft (h5)		Housing (H6)			
					Open Ends	Closed One End	C	C0			Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in		
35 1.3780	35 1.3780	43 1.6929	16 0.630	13.7 0.539	—	DLF 35 16	28.1 5400	54.4 12100	8.40	0.053 0.117	35.000 1.3780	34.989 1.3775	43.016 1.6935	43.000 1.6929	Table B2-3	IM 30 35 16,4
	35 1.3780	43 1.6929	20 0.787	—	DL 35 20	—	35.7 6520	73.7 14600	11.7	0.057 0.126	35.000 1.3780	34.989 1.3775	43.016 1.6935	43.000 1.6929	Table B2-3	IM 30 35 20,4
	35 1.3780	43 1.6929	20 0.787	17.7 0.697	—	DLF 35 20	35.7 6520	73.7 14600	11.7	0.064 0.141	35.000 1.3780	34.989 1.3775	43.016 1.6935	43.000 1.6929	Table B2-3	IM 30 35 20,4
40 1.5748	40 1.5748	48 1.8898	16 0.630	—	DL 40 16	—	30.2 5960	62.2 13900	9.60	0.051 0.112	40.000 1.5748	39.989 1.5744	48.016 1.8904	48.000 1.8898	Table B2-3	IM 35 40 16,4
	40 1.5748	48 1.8898	16 0.063	13.7 0.539	—	DLF 40 16	30.2 5960	62.2 13900	9.60	0.061 0.134	40.000 1.5748	39.989 1.5744	48.016 1.8904	48.000 1.8898	Table B2-3	IM 35 40 16,4
	40 1.5748	48 1.8898	20 0.787	—	DL 40 20	—	38.3 8090	84.3 18900	13.4	0.064 0.141	40.000 1.5748	39.989 1.5744	48.016 1.8904	48.000 1.8898	Table B2-3	IM 35 40 20,4
	40 1.5748	48 1.8898	20 0.787	17.7 0.697	—	DLF 40 20	38.3 8090	84.3 18900	13.4	0.074 0.163	40.000 1.5748	39.989 1.5744	48.016 1.8904	48.000 1.8898	Table B2-3	IM 35 40 20,4
44 1.7323	44 1.7323	52 2.0472	16 0.630	—	DL 44 16	—	31.7 5350	68.4 12800	10.6	0.056 0.123	44.000 1.7323	43.989 1.7319	52.019 2.0480	52.000 2.0472	Table B2-3	IM 40 44 16,4
	44 1.7323	52 2.0472	16 0.630	13.7 0.539	—	DLF 44 16	31.7 5350	68.4 12800	10.6	0.066 0.146	44.000 1.7323	43.989 1.7319	52.019 2.0480	52.000 2.0472	Table B2-3	IM 40 44 16,4
47 1.8504	47 1.8504	55 2.1654	16 0.630	—	DL 47 16	—	32.8 5620	73.1 13700	11.3	0.060 0.132	47.000 1.8504	46.989 1.8500	55.019 2.1661	55.000 2.1654	Table B2-3	
	47 1.8504	55 2.1654	16 0.630	13.7 0.539	—	DLF 47 16	32.8 5620	73.1 13700	11.3	0.071 0.157	47.000 1.8504	46.989 1.8500	55.019 2.1661	55.000 2.1654	Table B2-3	
50 1.9685	50 1.9685	58 2.2835	12 0.472	—	DL 50 12	—	24.1 4500	50.1 11200	7.60	0.047 0.104	50.000 1.9685	49.989 1.9681	58.019 2.2842	58.000 2.2835	Table B2-3	
	50 1.9685	58 2.2835	12 0.472	9.7 0.382	—	DLF 50 12	24.1 4500	50.1 11200	7.60	0.061 0.134	50.000 1.9685	49.989 1.9681	58.019 2.2842	58.000 2.2835	Table B2-3	
	50 1.9685	58 2.2835	18 0.709	—	DL 50 18	—	38.5 8210	91.6 20700	14.4	0.071 0.157	50.000 1.9685	49.989 1.9681	58.019 2.2842	58.000 2.2835	Table B2-3	
	50 1.9685	58 2.2835	18 0.709	15.7 0.618	—	DLF 50 18	38.5 8210	91.6 20700	14.4	0.085 0.187	50.000 1.9685	49.989 1.9681	58.019 2.2842	58.000 2.2835	Table B2-3	
	50 1.9685	58 2.2835	20 0.787	—	DL 50 20	—	43.0 8320	105 20900	16.8	0.077 0.170	50.000 1.9685	49.989 1.9681	58.019 2.2842	58.000 2.2835	Table B2-3	IM 45 50 20,4
	50 1.9685	58 2.2835	20 0.787	17.7 0.697	—	DLF 50 20	43.0 8320	105 20900	16.8	0.091 0.201	50.000 1.9685	49.989 1.9681	58.019 2.2842	58.000 2.2835	Table B2-3	IM 45 50 20,4
55 2.1654	55 2.1654	63 2.4803	20 0.787	—	DL 55 20	—	46.0 8880	115 22900	18.3	0.086 0.190	55.000 2.1654	54.987 2.1648	63.019 2.4811	63.000 2.4803	Table B2-3	IM 50 55 20,4
	55 2.1654	63 2.4803	20 0.787	17.7 0.697	—	DLF 55 20	46.0 8880	115 22900	18.3	0.102 0.225	55.000 2.1654	54.987 2.1648	63.019 2.4811	63.000 2.4803	Table B2-3	IM 50 55 20,4

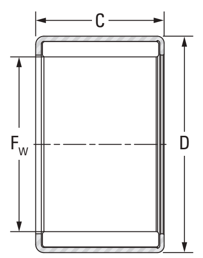
Note) · For information on the speed ratings, contact JTEKT.

DRAWN CUP NEEDLE ROLLER BEARINGS FULL COMPLEMENT OPEN ENDS

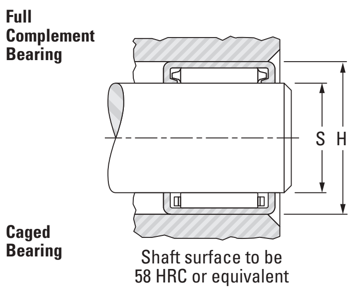
METRIC SERIES BM, BHM, YM SERIES



BM, BHM



YM



Shaft Dia.	Fw	D	C	C3 min.	Bearing Designation	Load Ratings		Fatigue Load Limit Cu	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-43 to B-2-45)
			+0 +0.000 -0.3 -0.012			Dynamic	Static			Shaft (h5)		Housing (H6)			
					Open Ends	C	C0			Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in		
3.5 0.1378	3.5	8	11	—	YM040811A	4.50 1010	4.20 940	0.62	0.003	3.500	3.495	8.009	8.000	Table B2-4	—
6.13 0.2413	6.13	11	9.7	—	6YM1110BM	5.20 1170	5.80 1300	0.88	0.004	6.130	6.124	11.011	11.000	Table B2-4	—
8 0.3150	8	12	10	—	YM081210	6.70 1510	8.80 1980	1.35	0.004	8.000	7.994	12.011	12.000	Table B2-4	—
	8	13	10	—	YM081310AM	6.20 1390	7.70 1730	1.15	0.006	8.000	7.994	13.011	13.000	Table B2-4	—
10 0.3937	10	14	10	—	10BM1410	7.20 1620	9.50 2140	1.45	0.004	10.000	9.994	14.011	14.000	Table B2-4	—
12 0.4724	12	18	12	—	12BM1812	10.7 2410	12.8 2880	1.90	0.010	12.000	11.992	18.011	18.000	Table B2-4	—
14 0.5512	14	20	12	—	14BM2012	11.6 2610	14.8 3330	2.25	0.011	14.000	13.992	20.013	20.000	Table B2-4	—
15 0.5906	15	21	10	—	15BM2110	9.75 2190	12.0 2700	1.85	0.009	15.000	14.992	21.013	21.000	Table B2-4	—
	15	21	12	—	15BM2112	12.3 2770	16.1 3620	2.45	0.012	15.000	14.992	21.013	21.000	Table B2-4	—
	15	21	16	—	15BM2116	16.9 3800	24.4 5490	3.70	0.016	15.000	14.992	21.013	21.000	Table B2-4	—
16 0.6299	16	22	12	—	16BM2212	12.9 2900	17.3 3890	2.65	0.012	16.000	15.992	22.013	22.000	Table B2-4	—
17 0.6693	17	23	12	—	17BM2312	13.0 2920	18.2 4090	2.70	0.013	17.000	16.992	23.013	23.000	Table B2-4	—
	17	24	12	—	YM172412-1	16.3 3660	21.5 4830	3.25	0.016	17.000	16.992	24.013	24.000	Table B2-4	
	17	24	17	—	BM172417-1	20.1 4520	28.2 6340	4.30	0.023	17.000	16.992	24.013	24.000	Table B2-4	—
	17	24	20	—	BHM1720A	23.9 5370	35.1 7890	5.55	0.026	17.000	16.992	24.013	24.000	Table B2-4	—
	17	24	25	—	BHM1725	29.9 6720	46.9 10540	7.30	0.034	17.000	16.992	24.013	24.000	Table B2-4	—
18 0.7087	18	24	16	—	18BM2416	18.9 4250	29.4 6610	4.45	0.018	18.000	17.992	24.013	24.000	Table B2-4	—
20 0.7874	20	26	14	—	YM202614	19.0 4270	31.4 7060	4.75	0.019	20.000	19.991	26.013	26.000	Table B2-4	—
	20	26	16	—	20BM2616	18.7 4200	31.7 7130	4.85	0.021	20.000	19.991	26.013	26.000	Table B2-4	—

Note) · For information on the speed ratings, contact JTEKT.

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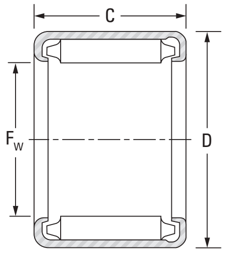
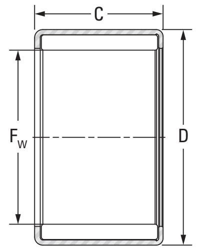
DRAWN CUP NEEDLE ROLLER BEARINGS FULL COMPLEMENT OPEN ENDS

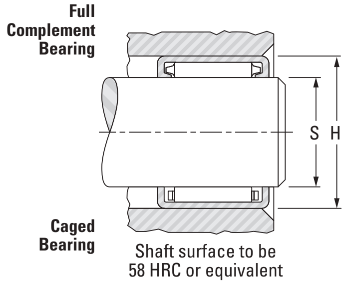
METRIC SERIES
BM, BHM, YM SERIES



BM, BHM



YM

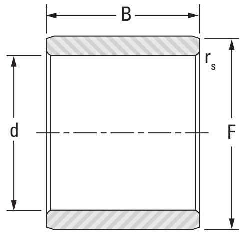


Shaft Dia.	F_W	D	C	$C_{3\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-43 to B-2-45)
			+0 / -0.3 +0.000 / -0.012		Open Ends	Dynamic C	Static C_0			Shaft (h5) Max.	Shaft (h5) Min.	Housing (H6) Max.	Housing (H6) Min.		
mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	kg lbs	mm in	mm in	mm in	mm in		
20 0.7874	20	26	20	—	20BM2620	23.6 5310	42.7 9600	6.70	0.026	20.000	19.991	26.013	26.000	Table B2-4	—
	20	27	15	—	BM2015	19.6 4410	28.0 6290	4.25	0.022	20.000	19.991	27.013	27.000	Table B2-4	—
	20	27	26	—	BM2026	34.7 7800	58.3 13110	9.10	0.040	20.000	19.991	27.013	27.000	Table B2-4	—
21 0.8268	21	27	20	—	21YM2720J	25.6 5750	47.6 10700	7.45	0.029	21.000	20.991	27.013	27.000	Table B2-4	—
22 0.8661	22	29	25	—	BM222925	33.5 7530	60.1 13510	9.40	0.043	22.000	21.991	29.013	29.000	Table B2-4	—
25 0.9843	25	32	16	—	BM2516	23.6 5310	38.3 8610	5.85	0.028	25.000	24.991	32.016	32.000	Table B2-4	—
	25	32	20	—	BM2520	30.0 6740	52.0 11690	8.15	0.036	25.000	24.991	32.016	32.000	Table B2-4	—
	25	32	26	—	BM2526	38.9 8740	72.7 16340	11.4	0.048	25.000	24.991	32.016	32.000	Table B2-4	—
	25	33	25	—	BHM2525	39.3 8830	66.6 14970	10.4	0.053	25.000	24.991	33.016	33.000	Table B2-4	—
28 1.1024	28	34	17	—	BM2817	26.0 5840	50.0 11240	7.80	0.029	28.000	27.991	34.016	34.000	Table B2-4	—
	28	34	24	—	BM2824	36.3 8160	77.1 17330	12.1	0.042	28.000	27.991	34.016	34.000	Table B2-4	
	28	37	30	—	28BHM3730	54.8 12320	95.1 21380	14.9	0.080	28.000	27.991	37.016	37.000	Table B2-4	—
	28	39	30	—	BM283930A	55.8 12540	86.3 19400	13.5	0.101	28.000	27.991	39.016	39.000	Table B2-4	—
30 1.1811	30	37	20	—	30BM3720	33.6 7550	62.9 14140	10.0	0.042	30.000	29.991	37.016	37.000	Table B2-4	—
	30	37	26	—	30BM3726	43.6 9800	87.7 19710	13.7	0.056	30.000	29.991	37.016	37.000	Table B2-4	—
34 1.3386	34	42	25	—	34YM4225L	46.3 10410	94.1 21150	14.7	0.075	34.000	33.989	42.016	42.000	Table B2-4	—
38 1.4961	38	48	20	—	YM3820PL	48.1 10810	83.3 18730	13.3	0.082	38.000	37.989	48.016	48.000	Table B2-4	—
40 1.5748	40	53	20	—	YM405320JM	59.6 13400	89.9 20210	14.4	0.116	40.000	39.989	53.019	53.000	Table B2-4	—

Note) · For information on the speed ratings, contact JTEKT.

INNER RINGS FOR FULL COMPLEMENT DRAWN CUP NEEDLE ROLLER BEARINGS

METRIC SERIES



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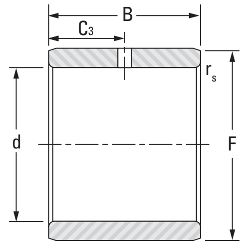

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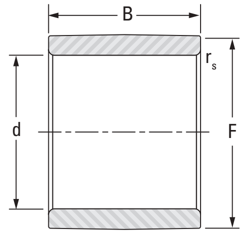


IM…R6

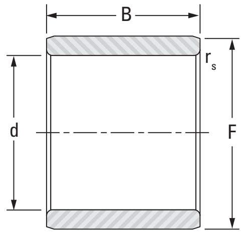
Shaft Dia.	d	F (1)	B	Hole Location C_3	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in		kg lbs
8 0.3150	8 0.3150	12 0.4724	12.4 0.488		0.3 0.01	IM 8 12 12,4	0.006 0.013
9 0.3543	9 0.3543	13 0.5118	12.4 0.488		0.3 0.01	IM 9 13 12,4	0.006 0.013
	9 0.3543	13 0.5118	12.4 0.488		0.3 0.01	IM 9 13 12,4 R6	0.006 0.013
10 0.3937	10 0.3937	14 0.5512	12.4 0.488		0.3 0.01	IM 10 14 12,4	0.007 0.015
	10 0.3937	14 0.5512	16.4 0.646		0.3 0.01	IM 10 14 16,4	0.009 0.020
11 0.4331	11 0.4331	15 0.5906	12.4 0.488		0.3 0.01	IM 11 15 12,4	0.008 0.018
12 0.4724	12 0.4724	15 0.5906	12.4 0.488		0.2 0.01	IM 12 15 12,4	0.006 0.013
	12 0.4724	16 0.6299	12.4 0.488		0.2 0.01	IM 12 16 12,4	0.008 0.018
	12 0.4724	16 0.6299	12.4 0.488		0.3 0.01	IM 12 16 12,4 R6	0.008 0.018
	12 0.4724	16 0.6299	12.4 0.488	6.2 0.24	0.3 0.01	IMC 12 16 12,4	0.008 0.018
13 0.5118	13 0.5118	17 0.6693	12.4 0.488		0.3 0.01	IM 13 17 12,4	0.009 0.020
	13 0.5118	18 0.7087	12.4 0.488		0.35 0.014	IM 13 18 12,4	0.011 0.025
	13 0.5118	18 0.7087	12.4 0.488		0.35 0.014	IM 13 18 12,4 R6	0.011 0.025
	13 0.5118	18 0.7087	16.4 0.646		0.35 0.014	IM 13 18 16,4	0.015 0.033
15 0.5906	15 0.5906	20 0.7874	12.4 0.488		0.35 0.014	IM 15 20 12,4	0.013 0.028
	15 0.5906	20 0.7874	16.4 0.646		0.35 0.014	IM 15 20 16,4	0.017 0.037
	17 0.6693	22 0.8661	16.4 0.646		0.35 0.014	IM 17 22 16,4	0.019 0.041
	17 0.6693	22 0.8661	16.4 0.646		0.35 0.014	IM 17 22 16,4 R6	0.019 0.041
17 0.6693	17 0.6693	22 0.8661	16.4 0.646	8.2 0.32	0.35 0.014	IMC 17 22 16,4	0.019 0.041
20 0.7874	20 0.7874	25 0.9843	16.4 0.646		0.35 0.014	IM 20 25 16,4	0.022 0.047
	20 0.7874	25 0.9843	16.4 0.646		0.35 0.014	IM 20 25 16,4 R6	0.022 0.047
	20 0.7874	25 0.9843	16.4 0.646	8.2 0.32	0.35 0.014	IMC 20 25 16,4	0.022 0.047
	20 0.7874	25 0.9843	20.4 0.803		0.35 0.014	IM 20 25 20,4	0.027 0.060

(1) Call for O.D. tolerance

Continued on next page.

INNER RINGS FOR FULL COMPLEMENT DRAWN CUP NEEDLE ROLLER BEARINGS

METRIC SERIES



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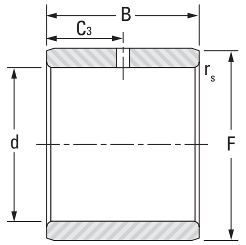

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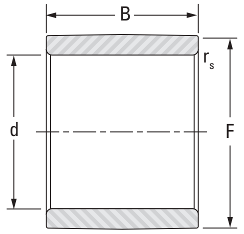


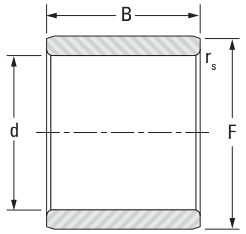
IM…R6

Shaft Dia.	d	F (1)	B	Hole Location C_3	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
20 0.7874	**20** 0.7874	**25** 0.9843	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 20 25 20,4	**0.027** 0.060
	20 0.7874	**25** 0.9843	**25.0** 0.984		**0.35** 0.014	IM 20 25 25	**0.033** 0.073
23 0.9055	**23** 0.9055	**28** 1.1024	**20.4** 0.803		**0.35** 0.014	IM 23 28 20,4	**0.031** 0.067
25 0.9843	**25** 0.9843	**30** 1.1811	**16.4** 0.646		**0.35** 0.014	IM 25 30 16,4	**0.027** 0.060
	25 0.9843	**30** 1.1811	**16.4** 0.646		**0.35** 0.014	IM 25 30 16,4 R6	**0.027** 0.060
	25 0.9843	**30** 1.1811	**16.4** 0.646	**8.2** 0.32	**0.35** 0.014	IMC 25 30 16,4	**0.027** 0.058
	25 0.9843	**30** 1.1811	**20.4** 0.803		**0.35** 0.014	IM 25 30 20,4	**0.033** 0.073
	25 0.9843	**30** 1.1811	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 25 30 20,4	**0.033** 0.073
	25 0.9843	**30** 1.1811	**25** 0.984		**0.35** 0.014	IM 25 30 25	**0.040** 0.088
30 1.1811	**30** 1.1811	**35** 1.3780	**16.4** 0.646		**0.35** 0.014	IM 30 35 16,4	**0.031** 0.068
	30 1.1811	**35** 1.3780	**16.4** 0.646		**0.35** 0.014	IM 30 35 16,4 R6	**0.031** 0.068
	30 1.1811	**35** 1.3780	**16.4** 0.646	**8.2** 0.32	**0.35** 0.014	IMC 30 35 16,4	**0.031** 0.068
	30 1.1811	**35** 1.3780	**20.4** 0.803		**0.35** 0.014	IM 30 35 20,4	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20.4** 0.803		**0.35** 0.014	IM 30 35 20,4 R6	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 30 35 20,4	**0.039** 0.086
	30 1.1811	**35** 1.3780	**25.0** 0.984		**0.35** 0.014	IM 30 35 25	**0.048** 0.106
35 1.3780	**35** 1.3780	**40** 1.5748	**16.4** 0.646		**0.35** 0.014	IM 35 40 16,4	**0.036** 0.079
	35 1.3780	**40** 1.5748	**16.4** 0.646		**0.35** 0.014	IM 35 40 16,4 R6	**0.036** 0.079
	35 1.3780	**40** 1.5748	**20.4** 0.803		**0.35** 0.014	IM 35 40 20,4	**0.045** 0.099
	35 1.3780	**40** 1.5748	**20.4** 0.803		**0.35** 0.014	IM 35 40 20,4 R6	**0.045** 0.099
	35 1.3780	**40** 1.5748	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 35 40 20,4	**0.045** 0.099
	35 1.3780	**40** 1.5748	**25** 0.984		**0.35** 0.014	IM 35 40 25	**0.055** 0.121
40 1.5748	**40** 1.5748	**44** 1.7323	**16.4** 0.646		**0.3** 0.01	IM 40 44 16,4	**0.032** 0.071

(1) Call for O.D. tolerance

INNER RINGS FOR FULL COMPLEMENT DRAWN CUP NEEDLE ROLLER BEARINGS

METRIC SERIES



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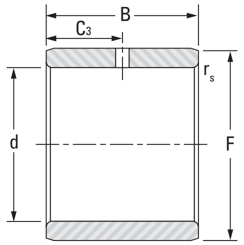

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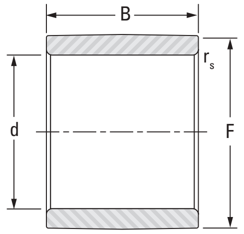


IM…R6

Shaft Dia.	d	F (1)	B	Hole Location C_3	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
40 1.5748	**40** 1.5748	**44** 1.7323	**16.4** 0.646		**0.3** 0.01	IM 40 44 16,4 R6	**0.032** 0.071
	40 1.5748	**44** 1.7323	**16.4** 0.646	**8.2** 0.32	**0.3** 0.01	IMC 40 44 16,4	**0.032** 0.071
	40 1.5748	**45** 1.7717	**20.4** 0.803		**0.35** 0.014	IM 40 45 20,4	**0.051** 0.112
	40 1.5748	**44** 1.7323	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 40 45 20,4	**0.051** 0.112
45 1.7717	**45** 1.7717	**50** 1.9685	**20.4** 0.803		**0.65** 0.026	IM 45 50 20,4	**0.056** 0.123
	45 1.7717	**50** 1.9685	**20.4** 0.803		**0.65** 0.026	IM 45 50 20,4 R6	**0.056** 0.123
	45 1.7717	**50** 1.9685	**25** 0.984		**0.65** 0.026	IM 45 50 25	**0.069** 0.152
	45 1.7717	**50** 1.9685	**25** 0.984		**0.65** 0.026	IM 45 50 25 R6	**0.069** 0.152
50 1.9685	**50** 1.9685	**55** 2.1654	**20.4** 0.803		**0.65** 0.026	IM 50 55 20,4 R6	**0.062** 0.137
	50 1.9685	**55** 2.1654	**20.4** 0.803		**0.65** 0.026	IM 50 55 20,4	**0.062** 0.137

(1) Call for O.D. tolerance

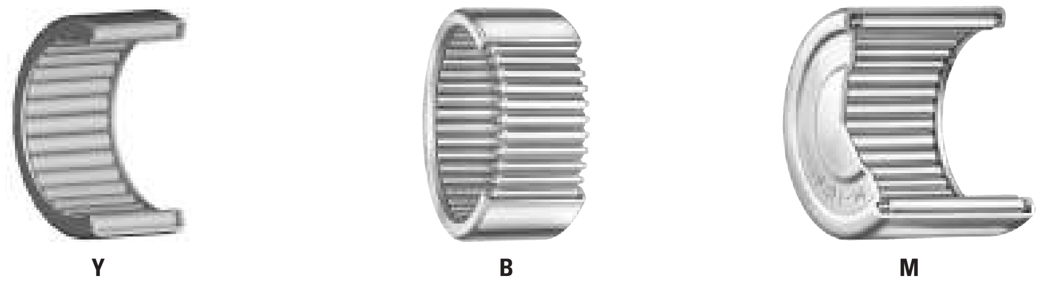
DRAWN CUP NEEDLE ROLLER BEARINGS

INCH SERIES

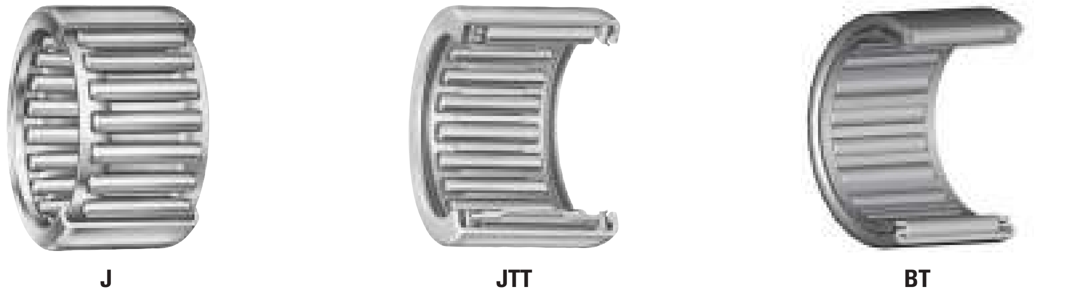
When a rolling bearing is needed for a compact and economical design, where it is not practical to harden and grind the housing bore, or where the housing materials are of low rigidity such as cast iron, aluminum or even plastics – drawn cup needle roller bearings should be considered.

REFERENCE STANDARDS

- **ANSI/ABMA 18.2** – needle roller bearings - radial, inch design.
- **JIS B 1536** – rolling bearings – needle roller bearings – boundary dimensions and tolerances.



Full complement bearings



Caged bearings

Fig. B2-9. Types of inch series drawn cup needle roller bearings

CONSTRUCTION

FULL COMPLEMENT BEARINGS

The original drawn cup needle roller bearing employs a full complement of needle rollers. The full complement drawn cup bearing combines maximum load-carrying capability with the advantages of the drawn outer ring.

The inward turned lips of the cup are used to mechanically retain the full complement of needle rollers, providing their positive radial retention – even though it may be necessary to remove the shaft repeatedly during servicing of the mechanism employing the bearing.

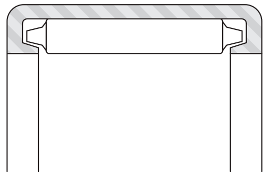


Fig. B2-10. Full complement bearing

CAGED BEARINGS

The one-piece steel cage, used in most caged drawn cup bearings, is designed to provide rigidity and minimize wear. This cage design separates the roller guiding and roller retainment functions. The portions of the cage that retain the rollers cannot contact the rollers while the bearing is operating. Thus, there is no wear which might affect roller retention.

The cage contacts the rollers only near their ends at the roller pitch line, so accurate guidance is achieved with least effort. Pitch line guidance at the ends of the rollers prevents skewing and assures roller stability, with little stress on the cage itself. The design minimizes the contact area and force required for roller guidance, and thus minimizes drag between cage and rollers.

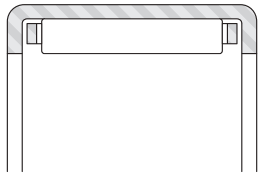


Fig. B2-11. Caged bearing

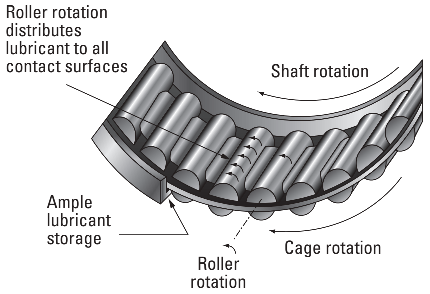


Fig. B2-12. Cage design

The same design feature that assures no contact between roller retention bars and rollers while the bearing is operating, also provides ample clearance along the length of the roller to enhance the circulation of lubricant.

There are bearings with other cage designs. Bearings with engineered polymer cages are for use where operating conditions permit. Before applying bearings with engineered polymer cages, please consult your representative.

SEALED BEARINGS

Drawn cup caged needle roller bearings are offered with integral seals. The tables of dimensions on pages B-2-72 and B-2-73 indicate those sizes available with lip contact seals. The seal lip design achieves a light and constant contact with the shaft throughout the range of mounting bearing clearances thereby ensuring positive sealing and low frictional drag.

Sealed drawn cup bearings are intended to retain grease or non-pressurized oil within a bearing while also preventing contaminants from entering the raceway area.

Details of shaft design for sealed bearings are given in the engineering section.

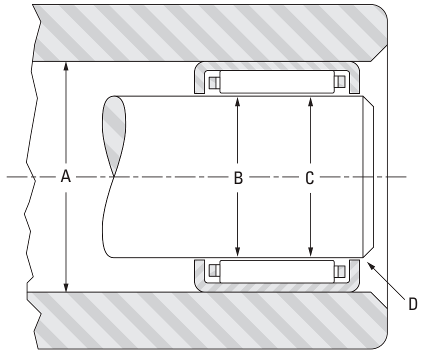
The standard lip contact seals are compatible with common lubricating oils and petroleum based fuels. But they are adversely affected by certain fire-resistant hydraulic fluids and most common solvents.

If the operating temperature must be outside of the specified range, or if the seals are exposed to unusual fluids, please consult your representative.

DIMENSIONAL ACCURACY AND MOUNTING DIMENSIONS

MANUFACTURING TOLERANCES AND RESULTING CLEARANCES

Reference: J-1616 bearing



A. Housing bore tolerance 0.025 mm (0.0010in)
B. Manufacturing tolerance for bearing 0.023 mm (0.0009 in)
C. Shaft diameter tolerance 0.013 mm (0.0005 in)
D. Min. Initial radial clearance 0.013 mm (0.0005 in)

Fig. B2-13. Manufacturing tolerances and resulting clearances

BEARING MOUNTING FITS AND RADIAL INTERNAL CLEARANCE

Drawn cup bearings are manufactured to a degree of precision that will satisfy the radial clearance requirements of most applications. The total radial clearance of an installed drawn cup bearing results from the buildup of manufacturing tolerances of the housing bore, inner raceway O.D., and the bearing – as well as the minimum radial clearance required for the application.

For bearings of nominal inch dimensions, the suggested mounting dimensions will provide correct running clearance for most applications. Closer control of radial clearance would be governed by the user's capability of holding housing and shaft raceway dimensional tolerances tighter than the limits shown in the bearing tables.

The drawing illustrates the manufacturing tolerances and resulting clearances applying to medium size drawn cup bearings, in rotating applications, when using the suggested tabulated mounting dimensions.

Radial clearance in a mounted bearing may be more closely controlled by reducing the manufacturing tolerances of the housing bore and inner raceway diameter. Where extremely close control of radial clearance is required for bearings of nominal inch dimensions, extra-precision full complement bearings are available (see page B-2-63).

TOLERANCES FOR HOUSING MATERIALS OF LOW RIGIDITY

For housing materials of low rigidity, or steel housings of small section, it is suggested that for initial trial the housing bore diameters given in the bearing tables be reduced by the amounts shown in Table B2-5. To maintain normal radial internal clearance, the inner raceway diameter tolerance given in the bearing tables should be used.

Table B2-5. Low Rigidity Housing Bore

Nom. housing bore				Subtract	
Over	Incl.	Over	Incl.		
mm		in		**mm**	in
0.0	**9.5**	0.00	0.38	**0.010**	0.0004
9.5	**25.4**	0.38	1.00	**0.015**	0.0006
25.4	**50.8**	1.00	2.00	**0.025**	0.0010
50.8	**76.2**	2.00	3.00	**0.030**	0.0012
76.2	**152.4**	3.00	6.00	**0.036**	0.0014

OUTER RING ROTATION

For applications where the outer ring rotates with respect to the load, it is suggested that both the housing bore and inner raceway diameter be reduced. Bearings of nominal inch dimensions should have the housing bore and inner raceway diameters reduced by 0.013 mm (0.0005 in)

OSCILLATING MOTION

Applications involving oscillating motion often require reduced radial clearances. This reduction is accomplished by increasing the shaft raceway diameters as shown in Table B2-6.

Table B2-6. Nominal inch bearing oscillating shaft size

Shaft size		Add	
mm	in	**mm**	in
2.38 to 4.76	0.094 to 0.188	**0.008**	0.0003
6.35 to 47.62	0.250 to 1.875	**0.013**	0.0005
50.8 to 139.70	2.000 to 5.500	**0.015**	0.0006

For information on fits to housing materials of low rigidity and on fits during outer ring rotation and during oscillation rotation, contact JTEKT.

INNER RINGS

Where it becomes impractical to meet the shaft raceway design requirements (hardness, case depth, surface finish, etc.) outlined in the engineering section, standard inner rings for drawn cup bearings are available. These are tabulated on pages B-2-74 to B-2-76 of the drawn cup section.

Inner rings for drawn cup bearings are designed to be a loose transition fit on the shaft and should be clamped against a shoulder. If a tight transition fit must be used to keep the inner ring from rotating relative to the shaft, the inner ring O.D., as mounted, must not exceed the raceway diameters required by the drawn cup bearing for the particular application.

LOAD RATING FACTORS

Dynamic Loads

Drawn cup needle roller bearings can accommodate only radial loads.

$P = F_r$

P = The maximum dynamic radial load that may be applied to a drawn cup bearing based on the dynamic load rating, C_r given in the bearing tables. This load should be $\leq C_r/3$.

Static Loads

$$f_0 = \frac{C_0}{P_0}$$

f_0 = static load safety factor

C_0 = basic static load rating

P_0 = maximum applied static load

To ensure satisfactory operation of drawn cup needle roller bearings under all types of conditions the static load safety factor f_0 should be ≥ 3.

INSPECTION PROCEDURES

Although the bearing cup (outer ring) is accurately drawn from strip steel it may go out of round during heat treatment. When the bearing is pressed into a true, round housing or ring gage of correct size and wall thickness, it becomes round and is sized properly. For this reason, it is incorrect to inspect an unmounted drawn cup bearing by measuring the O.D. The correct method for inspecting the bearing size is to:

1. Press the bearing into a ring gage of proper size.
2. Plug the bearing bore with the appropriate "go" and "no go" gages.

Tables B2-7 and B2-8 starting on page B-2-50 provide the correct ring and plug gage diameters for inspecting drawn cup needle roller bearings.

When the letter **H** appears in the columns headed "Bearing Bore Designation" and "Nominal Shaft Diameter" in Table B2-7, the gage sizes listed are for the larger cross section bearings, which include **H** in their bearing designation prefix.

Example

Find the ring gage and plug gage dimensions for a BH-68 bearing.

The nominal bore diameter (F_w) for this bearing, as shown in the table of dimensions on page B-2-55, is 9.525 mm (0.3750 in). Since the letter H appears in the bearing designation, the following information will be found opposite H6 9.525 mm (0.3750 in) in Table B2-7 on page B-2-50.

	in
ring gage	0.6255
diameter under needle rollers, min.	0.3765
diameter under needle rollers, max.	0.3774

The "go" plug gage is the same size as the minimum needle roller complement bore diameter and the "no go" plug gage size is 0.002 mm (0.0001 in) larger than the maximum bore diameter. Therefore the correct ring and plug gage dimensions are:

	in
ring gage	0.6255
plug gage, "go"	0.3765
plug gage, "no go"	0.3775

These same gage dimensions also apply to JH-68.

Table B2-7 applies to the B, M, J and JTT series. Table B2-8 applies to the BT.

Table B2-7. Ring and plug gage dimensions

Bearing bore designation	Nominal shaft diameter	Nominal. bore diameter	Ring gage	Needle roller complement bore diameter	
				Max.	Min.
	mm in	**mm** in	**mm** in	**mm** in	**mm** in
2	**3.175** 1/8	**3.175** 0.1250	**6.363** 0.2505	**3.218** 0.1267	**3.195** 0.1258
2 1/2	**3.970** 5/32	**3.967** 0.1562	**7.155** 0.2817	**4.013** 0.1580	**3.99** 0.1571
3	**4.763** 3/16	**4.763** 0.1875	**8.730** 0.3437	**4.806** 0.1892	**4.783** 0.1883
4	**6.350** 1/4	**6.350** 0.2500	**11.125** 0.4380	**6.411** 0.2524	**6.388** 0.2515
5	**7.938** 5/16	**7.938** 0.3125	**12.713** 0.5005	**7.998** 0.3149	**7.976** 0.3140
H 5	**H 7.938** H 5/16	**7.938** 0.3125	**14.300** 0.5630	**7.998** 0.3149	**7.976** 0.3140
6	**9.525** 3/8	**9.525** 0.3750	**14.300** 0.5630	**9.586** 0.3774	**9.563** 0.3765
H 6	**H 9.525** H 3/8	**9.525** 0.3750	**15.888** 0.6255	**9.586** 0.3774	**9.563** 0.3765
7	**11.113** 7/16	**11.113** 0.4375	**15.888** 0.6255	**11.174** 0.4399	**11.151** 0.4390
H 7	**H 11.113** H 7/16	**11.113** 0.4375	**17.475** 0.6880	**11.174** 0.4399	**11.151** 0.4390
8	**12.700** 1/2	**12.700** 0.5000	**17.475** 0.6880	**12.761** 0.5024	**12.738** 0.5015
H 8	**H12.700** H 1/2	**12.700** 0.5000	**19.063** 0.7505	**12.761** 0.5024	**12.738** 0.5015
9	**14.288** 9/16	**14.288** 0.5625	**19.063** 0.7505	**14.349** 0.5649	**14.326** 0.5640
H 9	**H 14.288** H 9/16	**14.288** 0.5625	**20.650** 0.8130	**14.349** 0.5649	**14.326** 0.5640
10	**15.875** 5/8	**15.875** 0.6250	**20.650** 0.8130	**14.349** 0.6274	**15.913** 0.6265
H 10	**H 15.875** H 5/8	**15.875** 0.6250	**22.238** 0.8755	**14.349** 0.6274	**15.913** 0.6265
11	**17.463** 11/16	**17.463** 0.6875	**22.238** 0.8755	**17.524** 0.6899	**17.501** 0.6890
H 11	**H 17.463** H 11/16	**17.463** 0.6875	**23.825** 0.9380	**17.524** 0.6899	**17.501** 0.6890
12	**19.050** 3/4	**19.050** 0.7500	**25.387** 0.9995	**19.086** 0.7514	**19.063** 0.7505
H 12	**H 19.050** H 3/4	**19.050** 0.7500	**26.975** 1.0620	**19.086** 0.7514	**19.063** 0.7505
13	**20.638** 13/16	**20.638** 0.8125	**26.975** 1.0620	**20.673** 0.8139	**20.650** 0.8130
H 13	**H 20.638** H 13/16	**20.638** 0.8125	**28.562** 1.1245	**20.673** 0.8139	**20.650** 0.8130
14	**22.225** 7/8	**22.225** 0.8750	**28.562** 1.1245	**22.261** 0.8764	**22.238** 0.8755
H 14	**H 22.225** H 7/8	**22.225** 0.8750	**30.150** 1.1870	**22.261** 0.8764	**22.238** 0.8755
15	**23.813** **15/16**	**23.813** 0.9375	**30.150** 1.1870	**23.848** 0.9389	**23.825** 0.9380
16	**25.400** 1	**25.400** 1.0000	**31.737** 1.2495	**25.436** 1.0014	**25.413** 1.0005
H 16	**H 25.400** H 1	**25.400** 1.0000	**33.325** 1.3120	**25.436** 1.0014	**25.413** 1.0005
17	**26.988** 1 1/16	**26.988** 1.0625	**33.325** 1.3120	**27.023** 1.0639	**27.000** 1.0630
18	**28.575** 1 1/8	**28.575** 1.1250	**34.912** 1.3745	**28.611** 1.1264	**28.588** 1.1255
H 18	**H 28.575** H 1 1/8	**28.575** 1.1250	**38.087** 1.4995	**28.611** 1.1264	**28.588** 1.1255
19	**30.163** 1 3/16	**30.163** 1.1875	**38.087** 1.4995	**30.198** 1.1889	**30.175** 1.1880
20	**31.750** 1 1/4	**31.750** 1.2500	**38.087** 1.4995	**31.786** 1.2514	**31.763** 1.2505
H 20	**H 31.750** H 1 1/4	**31.750** 1.2500	**41.262** 1.6245	**31.786** 1.2514	**31.763** 1.2505
21	**33.338** 1 5/16	**33.338** 1.3125	**41.262** 1.6245	**33.376** 1.3140	**33.350** 1.3130
22	**34.925** 1 3/8	**34.925** 1.3750	**41.262** 1.6245	**34.963** 1.3765	**34.938** 1.3755
H 22	**H 34.925** H1 3/8	**34.925** 1.3750	**44.437** 1.7495	**34.963** 1.3765	**34.938** 1.3755
24	**38.100** 1 1/2	**38.100** 1.5000	**47.612** 1.8745	**38.141** 1.5016	**38.113** 1.5005
26	**41.275** 1 5/8	**41.275** 1.6250	**50.787** 1.9995	**41.316** 1.6266	**41.288** 1.6255
28	**44.450** 1 3/4	**44.450** 1.7500	**53.962** 2.1245	**44.493** 1.7517	**44.463** 1.7505
30	**47.625** 1 7/8	**47.625** 1.8750	**57.137** 2.2495	**47.668** 1.8767	**47.638** 1.8755
32	**50.800** 2	**50.800** 2.0000	**60.312** 2.3745	**50.846** 2.0018	**50.815** 2.0006
H 33	**H 52.388** H 2 1/16	**52.388** 2.0625	**64.280** 2.5307	**52.436** 2.0644	**52.400** 2.0630
34	**53.975** 2 1/8	**53.975** 2.1250	**63.487** 2.4995	**54.026** 2.1270	**53.990** 2.1256
36	**57.150** 2 1/4	**57.150** 2.2500	**66.662** 2.6245	**57.201** 2.2520	**57.165** 2.2506
42	**66.675** 2 5/8	**66.675** 2.6250	**76.187** 2.9995	**66.736** 2.6274	**66.700** 2.6260
44	**69.850** 2 3/4	**69.850** 2.7500	**79.362** 3.1245	**69.911** 2.7524	**69.875** 2.7510
56	**88.900** 3 1/2	**88.900** 3.5000	**101.587** 3.9995	**88.961** 3.5024	**88.925** 3.5010
88	**139.700** 5 1/2	**139.700** 5.5000	**152.375** 5.9990	**139.774** 5.5029	**139.725** 5.5010

Bearing bore should be checked with "go" and "no go" plug gages. The "go" gage size is the minimum needle roller complement bore diameter. The "no go" gage size is larger than the maximum needle roller complement bore diameter by 0.0001 in

Table B2-8. Ring and plug gage dimensions[1]

Needle roller complement bore diameter F_w nominal size	Ring gage	Plug gage	
		Go	No go
mm (in)	**mm**	**mm**	**mm**
4.762(3/16)	8.730	4.783	4.808
6.350(1/4)	11.125	6.388	6.413
7.938(5/16)	12.713 14.300	7.976	8.001
9.525(3/8)	14.300 15.888	9.563	9.588
11.112(7/16)	15.888 17.475	11.151	11.176
12.700(1/2)	17.475 19.063	12.738	12.763
14.288(9/16)	19.063 20.650	14.326	14.351
15.875(5/8)	20.650 22.237	15.913	15.938
17.462(11/16)	22.237 23.825	17.501	17.526
19.050(3/4)	25.387	19.063	19.088
20.638(13/16)	26.975 28.562	20.650	20.675
22.225(7/8)	28.562 30.150	22.238	22.263
23.812(15/16)	30.150	23.825	23.850
25.400(1)	31.737 33.325	25.413	25.438
26.988(1 1/16)	33.325	27.000	27.025
28.575(1 1/8)	34.912 38.087	28.588	28.613
30.162(1 3/16)	38.087	30.175	30.200
31.750(1 1/4)	38.087 41.262	31.763	31.788
33.338(1 5/16)	41.262	33.350	33.378
34.925(1 3/8)	41.262 44.437	34.938	34.966
38.100(1 1/2)	47.612	38.113	38.143
41.275(1 5/8)	50.787	41.288	41.318
44.450(1 3/4)	53.962	44.463	44.496
47.625(1 7/8)	57.137	47.638	47.671
50.800(2)	60.312	50.815	50.848
52.388(2 1/16)	64.280	52.413	52.451
53.975(2 1/8)	63.487	53.990	54.028
57.150(2 1/4)	66.662	57.165	57.203
63.500(2 1/2)	73.139	63.515	63.553
66.675(2 5/8)	76.187	66.700	66.738
69.850(2 3/4)	79.362	69.875	69.913
88.900(3 1/2)	101.587	88.925	88.963

1) These values apply to the needle roller bearings of the BT series with inch nominal dimensions.

INSTALLATION OF DRAWN CUP NEEDLE ROLLER BEARINGS

GENERAL INSTALLATION REQUIREMENTS

- A drawn cup needle roller bearing must be pressed into its housing.
- An installation tool, similar to the ones shown, must be used in conjunction with a standard press.
- The bearing must not be hammered into its housing – even in conjunction with the proper assembly mandrel.
- The bearing must not be pressed tightly against a shoulder in the housing.
- If it is necessary to use a shouldered housing, the depth of the housing bore must be sufficient to ensure the housing shoulder fillet, and the shoulder face, clear the bearing.
- The installation tool must be coaxial with the housing bore.

INSTALLATION OF OPEN END BEARINGS

It is advisable to utilize a positive stop on the press tool to locate the bearing properly in the housing. The assembly tool should have a leader or a pilot, as shown, to aid in starting the bearing true in the housing. The ball detent shown on the drawing is used to assist in aligning the rollers of a full complement bearing during installation and to hold the bearing on the installation tool. A caged-type drawn cup bearing does not require a ball detent to align its rollers. The ball detent may still be used to hold the bearing on the installation tool or an "O" ring may be used as shown in the drawing on this page. The bearing should be installed with the marked end (the end with identification markings) against the angled shoulder of the pressing tool.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)
D – pilot length should be length of bearing less 0.80 mm (0.030 in)
E – approximately 1⁄2 D

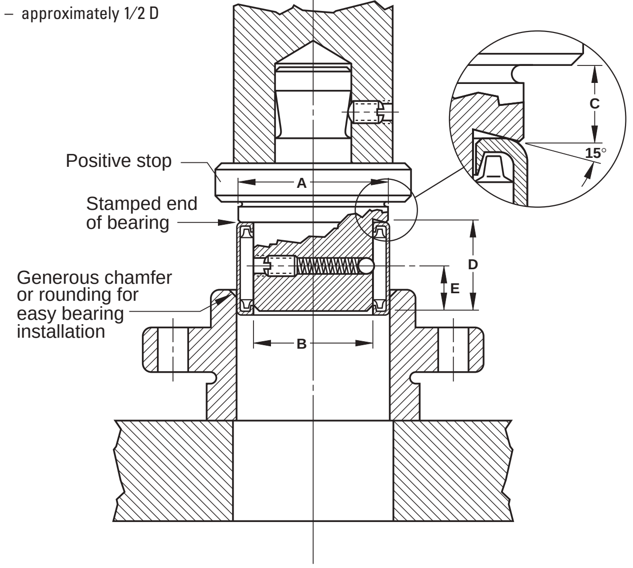


Fig. B2-14. Installation of open ends caged bearings

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)
D – pilot length should be length of bearing less 0.80 mm (0.030 in)
E – approximately 1⁄2 D

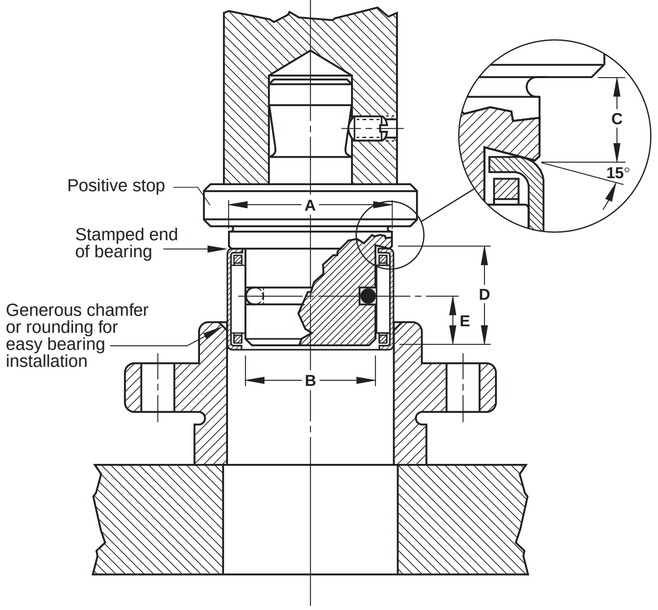


Fig. B2-15. Installation of open ends full complement bearings

INSTALLATION OF CLOSED END BEARINGS

The installation tool combines all the features of the tool used to install open end bearings. But the pilot is spring loaded and is part of the press bed.

The angled shoulder of the pressing tool should bear against the closed end, with the bearing held on the pilot, to aid in starting the bearing true in the housing.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)

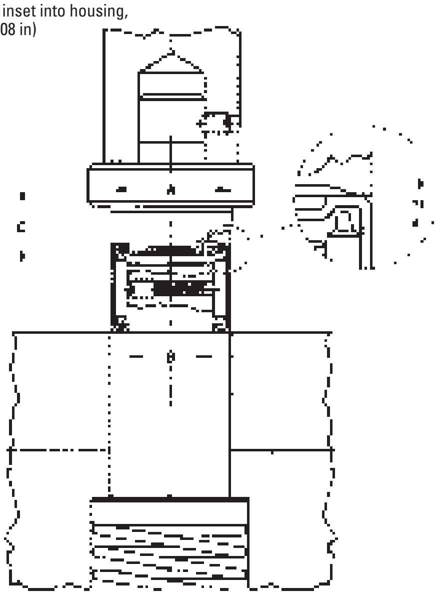


Fig. B2-16. Installation of closed end bearings

EXTRACTION OF DRAWN CUP NEEDLE ROLLER BEARINGS

The need to extract a drawn cup needle roller bearing does not arise often. Standard extractor tools may be purchased from a reputable manufacturer. Customers may produce the special extraction tools at their own facilities. After extraction, the drawn cup needle roller bearing should not be reused.

EXTRACTION FROM A STRAIGHT HOUSING

When it is necessary to extract a drawn cup needle roller bearing from a straight housing, a similar tool to the installation tool – but without the stop – may be used. To avoid damage to the bearing, pressure should be applied against the marked end of the bearing, just as it is done at installation.

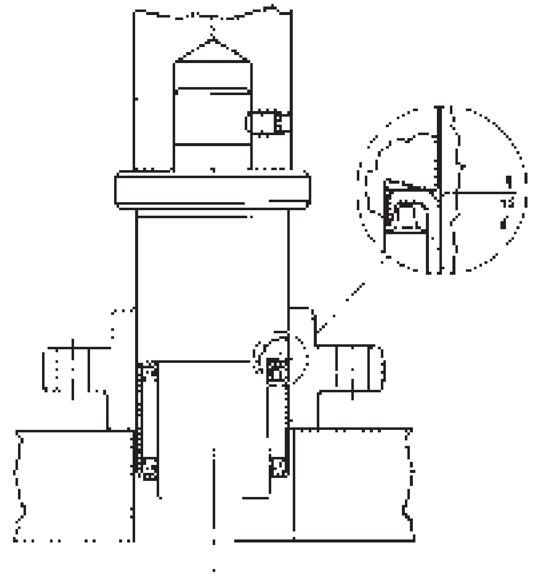


Fig. B2-17. Extraction from a straight housing

EXTRACTION FROM A SHOULDERED HOUSING

(with bearing pressed up close to the shoulder)

The tool to be used, as shown, is of a similar type described for a shouldered or dead end housing. But the rollers must first be removed from the bearing.

The four segment puller jaws are collapsed and slipped into the empty cup. The jaws are then forced outward into the cup bore, by means of the tapered expansion rod. The jaws should bear on the lip as near as possible to the cup bore. The cup is then pressed out from the top.

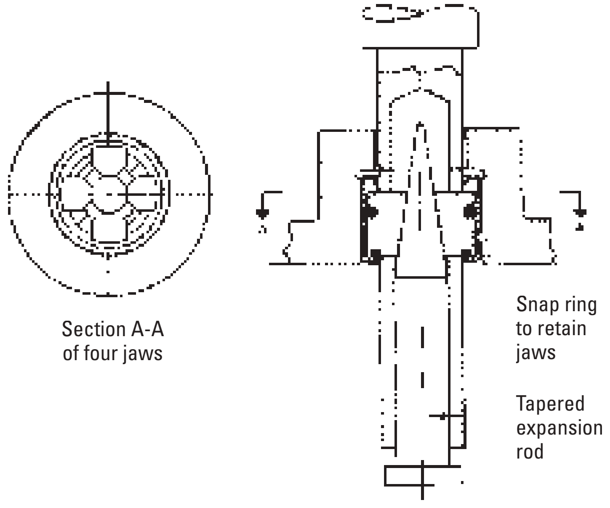


Fig. B2-18. Extraction from a shouldered housing

EXTRACTION FROM A SHOULDERED OR DEAD END HOUSING

(with space between the bearing and the housing shoulder)

Bearings may be extracted from shouldered or dead end housings with a common bearing puller tool as shown. This type of tool is slotted in two places, at right angles, to form four prongs. The four puller prongs are pressed together and inserted into the space between the end of the bearing and the shoulder. The prongs are forced outward by inserting the expansion rod, and then the bearing is extracted. Do not reuse the bearing after extraction.

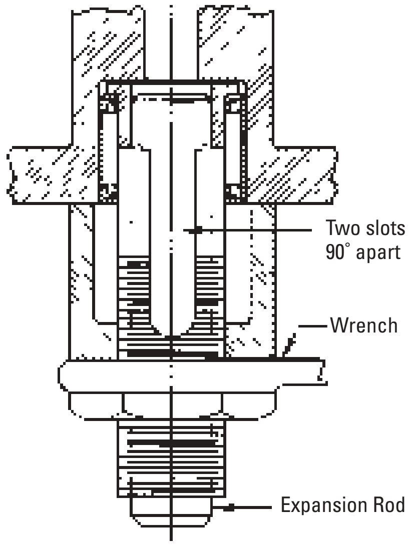
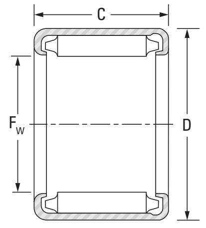


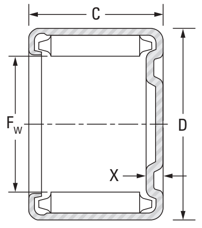
Fig. B2-19. Extraction from a shouldered or dead end housing

FULL COMPLEMENT BEARINGS
OPEN ENDS, CLOSED ONE END

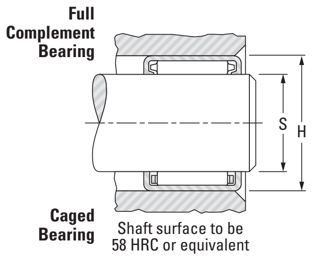
INCH SERIES
B, BH, NB, NBH, M- 1, MH- 1 SERIES



B, BH, NB, NBH



M- 1, MH- 1



Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
			+0 +0.000 -0.3 -0.012				Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
$^{1}/_{8}$	3.175 0.1250	6.350 0.2500	6.35 0.250	—	B-24	—	1.73 390	1.65 370	0.24	0.001 0.002	—	3.175 0.1250	3.167 0.1247	6.363 0.2505	6.350 0.2500	Table B2-7	
$^{5}/_{32}$	3.970 0.1563	7.142 0.2812	6.35 0.250	—	B-2 1/2 4	—	2.00 450	2.00 450	0.31	0.001 0.002	—	3.970 0.1563	3.962 0.1560	7.155 0.2817	7.142 0.2812	Table B2-7	
	3.970 0.1563	7.142 0.2812	7.92 0.312	—	B-2 1/2 5	—	2.58 580	2.80 630	0.42	0.001 0.003	—	3.970 0.1563	3.962 0.1560	7.155 0.2817	7.142 0.2812	Table B2-7	
$^{3}/_{16}$	4.763 0.1875	8.733 0.3438	6.35 0.250	1.78 0.070	B-34	M-341	2.20 490	2.12 480	0.36	0.001 0.003	0.002 0.004	4.763 0.1875	4.755 0.1872	8.730 0.3437	8.717 0.3432	Table B2-7	
	4.763 0.1875	8.733 0.3438	9.53 0.375	1.78 0.070	B-36	M-361	3.78 850	4.23 950	0.64	0.002 0.005	0.003 0.006	4.763 0.1875	4.755 0.1872	8.730 0.3437	8.717 0.3432	Table B2-7	
$^{1}/_{4}$	6.350 0.2500	11.113 0.4375	6.35 0.250	2.03 0.080	B-44	M-441	2.74 620	2.63 590	0.45	0.002 0.005	0.003 0.006	6.350 0.2500	6.337 0.2495	11.125 0.4380	11.100 0.4370	Table B2-7	
	6.350 0.2500	11.113 0.4375	7.92 0.312	2.03 0.080	B-45	M-451	3.55 800	3.68 830	0.56	0.003 0.007	0.004 0.008	6.350 0.2500	6.337 0.2495	11.125 0.4380	11.100 0.4370	Table B2-7	
	6.350 0.2500	11.113 0.4375	9.53 0.375	—	B-46	—	4.55 1020	5.06 1140	0.77	0.004 0.008	—	6.350 0.2500	6.337 0.2495	11.125 0.4380	11.100 0.4370	Table B2-7	
	6.350 0.2500	11.113 0.4375	11.13 0.438	2.03 0.080	B-47	M-471	5.51 1240	6.46 1450	0.98	0.004 0.009	0.005 0.011	6.350 0.2500	6.337 0.2495	11.125 0.4380	11.100 0.4370	Table B2-7	
$^{5}/_{16}$	7.938 0.3125	12.700 0.5000	7.92 0.312	2.03 0.080	B-55	M-551	4.08 920	4.60 1030	0.70	0.004 0.008	0.004 0.009	7.938 0.3125	7.925 0.3120	12.713 0.5005	12.687 0.4995	Table B2-7	
	7.938 0.3125	12.700 0.5000	9.53 0.375	—	B-56	—	5.23 1180	6.33 1420	0.97	0.005 0.010	—	7.938 0.3125	7.925 0.3120	12.713 0.5005	12.687 0.4995	Table B2-7	
	7.938 0.3125	12.700 0.5000	11.13 0.438	2.03 0.080	B-57	M-571	6.33 1420	8.09 1820	1.20	0.005 0.011	0.006 0.013	7.938 0.3125	7.925 0.3120	12.713 0.5005	12.687 0.4995	Table B2-7	
	7.938 0.3125	12.700 0.5000	14.27 0.562	—	B-59	—	8.37 1880	11.6 2600	1.75	0.006 0.014	—	7.938 0.3125	7.925 0.3120	12.713 0.5005	12.687 0.4995	Table B2-7	
	7.938 0.3125	14.288 0.5625	11.13 0.438	2.29 0.090	BH-57	MH-571	7.01 1580	7.33 1650	1.10	0.007 0.016	0.008 0.018	7.938 0.3125	7.925 0.3120	14.300 0.5630	14.275 0.5620	Table B2-7	
	7.938 0.3125	14.288 0.5625	14.27 0.562	—	BH-59	—	9.46 2130	10.8 2420	1.65	0.009 0.020	—	7.938 0.3125	7.925 0.3120	14.300 0.5630	14.275 0.5620	Table B2-7	
$^{21}/_{64}$	8.331 0.3280	14.288 0.5625	12.70 0.500	—	NB-3	—	8.10 1820	9.56 2150	1.45	0.008 0.018	—	8.331 0.3280	8.319 0.3275	14.300 0.5630	14.275 0.5620	Table B2-7	
$^{3}/_{8}$	9.525 0.3750	14.288 0.5625	7.92 0.312	2.03 0.080	B-65	M-651	4.55 1020	5.53 1240	0.84	0.004 0.009	0.005 0.010	9.525 0.3750	9.512 0.3745	14.300 0.5630	14.275 0.5620	Table B2-7	IRA-3
	9.525 0.3750	14.288 0.5625	9.53 0.375	2.03 0.080	B-66	M-661	5.83 1310	7.61 1710	1.15	0.005 0.011	0.005 0.012	9.525 0.3750	9.512 0.3745	14.300 0.5630	14.275 0.5620	Table B2-7	IRA-3
	9.525 0.3750	14.288 0.5625	11.13 0.438	—	B-67	—	7.06 1590	9.72 2190	1.45	0.006 0.013	—	9.525 0.3750	9.512 0.3745	14.300 0.5630	14.275 0.5620	Table B2-7	IRA-3

Note) · For information on the speed ratings, contact JTEKT.

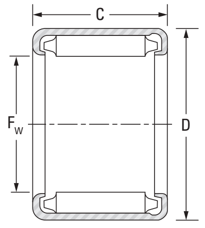
(1) IRA inner ring provides additional length if required.

Shaft Dia.	F_w	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
			+0 +0.000 -0.3 -0.012				Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
$^{3}/_{8}$	9.525 0.3750	14.288 0.5625	12.70 0.500	2.03 0.080	B-68	M-681	8.21 1850	11.8 2650	1.80	0.007 0.015	0.008 0.017	9.525 0.3750	9.512 0.3745	14.300 0.5630	14.275 0.5620	Table B2-7	IRA-3
	9.525 0.3750	14.288 0.5625	14.27 0.562	—	B-69	—	9.33 2100	13.9 3130	2.10	0.007 0.016	—	9.525 0.3750	9.512 0.3745	14.300 0.5630	14.275 0.5620	Table B2-7	
	9.525 0.3750	14.288 0.5625	15.88 0.625	2.03 0.080	B-610	M-6101	10.4 2340	16.0 3590	2.40	0.008 0.018	0.010 0.021	9.525 0.3750	9.512 0.3745	14.300 0.5630	14.275 0.5620	Table B2-7	
	9.525 0.3750	15.875 0.6250	12.70 0.500	—	BH-68	—	9.35 2100	10.9 2460	1.65	0.010 0.021	—	9.525 0.3750	9.512 0.3745	15.888 0.6255	15.862 0.6245	Table B2-7	IRA-3
$^{7}/_{16}$	11.113 0.4375	15.875 0.6250	9.53 0.375	—	B-76	—	6.37 1430	8.88 2000	1.35	0.005 0.012	—	11.113 0.4375	11.100 0.4370	15.888 0.6255	15.862 0.6245	Table B2-7	IRA-4
	11.113 0.4375	15.875 0.6250	11.13 0.438	—	B-77	—	7.71 1730	11.3 2550	1.70	0.007 0.015	—	11.113 0.4375	11.100 0.4370	15.888 0.6255	15.862 0.6245	Table B2-7	IRA-4
	11.113 0.4375	15.875 0.6250	12.70 0.500	2.03 0.080	B-78	M-781	8.97 2020	13.8 3100	2.10	0.008 0.017	0.009 0.019	11.113 0.4375	11.100 0.4370	15.888 0.6255	15.862 0.6245	Table B2-7	IRA-4
	11.113 0.4375	15.875 0.6250	15.88 0.625	—	B-710	—	11.4 2560	18.7 4200	2.80	0.010 0.021	—	11.113 0.4375	11.100 0.4370	15.888 0.6255	15.862 0.6245	Table B2-7	
	11.113 0.4375	17.463 0.6875	12.70 0.500	—	BH-78	—	10.3 2320	12.8 2870	1.95	0.010 0.023	—	11.113 0.4375	11.100 0.4370	17.475 0.6880	17.450 0.6870	Table B2-7	IRA-4
0.439	11.151 0.439	15.908 0.6263	12.70 0.500	—	NB-38		9.00 2020	13.8 3100	2.10	0.032 0.071	—	11.151 0.4390	11.143 0.4387	15.908 0.6263	15.9 0.6260	Table B2-7	
$^{1}/_{2}$	12.700 0.5000	17.463 0.6875	7.92 0.312	2.03 0.080	B-85	M-851	5.36 1200	7.38 1660	1.15	0.005 0.012	0.006 0.014	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	Table B2-7	IRA-5
	12.700 0.5000	17.463 0.6875	9.53 0.375	2.03 0.080	B-86	M-861	6.87 1540	10.2 2290	1.55	0.006 0.014	0.007 0.016	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	Table B2-7	IRA-5
	12.700 0.5000	17.463 0.6875	11.13 0.438	2.03 0.080	B-87	M-871	8.31 1870	13.0 2920	1.95	0.007 0.016	0.008 0.018	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	Table B2-7	IRA-5
	12.700 0.5000	17.463 0.6875	12.70 0.500	2.03 0.080	B-88	—	9.63 2160	15.7 3530	2.40	0.009 0.019	0.010 0.021	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	Table B2-7	IRA-5
	12.700 0.5000	17.463 0.6875	12.70 0.500	2.03 0.080	—	M-881	9.66 2170	15.8 3550	2.40	—	0.010 0.021	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	Table B2-7	
	12.700 0.5000	17.463 0.6875	15.88 0.625	2.03 0.080	B-810	M-8101	12.2 2750	21.3 4800	3.20	0.010 0.023	0.012 0.026	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	Table B2-7	
	12.700 0.5000	17.463 0.6875	19.05 0.750	2.03 0.080	B-812	M-8121	14.7 3300	26.9 6050	4.20	0.013 0.028	0.014 0.031	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	Table B2-7	
	12.700 0.5000	19.050 0.7500	11.13 0.438	—	BH-87	—	9.46 2130	11.8 2650	1.80	0.010 0.023	—	12.700 0.5000	12.687 0.4995	19.063 0.7505	19.037 0.7495	Table B2-7	IRA-5
	12.700 0.5000	19.050 0.7500	12.70 0.500	—	BH-88	—	11.2 2510	14.6 3280	2.20	0.012 0.026	—	12.700 0.5000	12.687 0.4995	19.063 0.7505	19.037 0.7495	Table B2-7	IRA-5
	12.700 0.5000	19.050 0.7500	15.88 0.625	—	BH-810	—	14.4 3230	20.2 4540	3.05	0.015 0.033	—	12.700 0.5000	12.687 0.4995	19.063 0.7505	19.037 0.7495	Table B2-7	
	12.700 0.5000	19.050 0.7500	19.05 0.750	2.29 0.090	BH-812	MH-8121	17.4 3910	25.8 5790	3.95	0.018 0.039	0.020 0.044	12.700 0.5000	12.687 0.4995	19.063 0.7505	19.037 0.7495	Table B2-7	
$^{9}/_{16}$	14.288 0.5625	19.050 0.7500	7.92 0.312	2.03 0.080	B-95	M-951	5.72 1290	8.31 1870	1.25	0.006 0.013	0.006 0.014	14.288 0.5625	14.275 0.5620	19.063 0.7505	19.037 0.7495	Table B2-7	IR-68
	14.288 0.5625	19.050 0.7500	9.53 0.375	2.03 0.080	B-96	M-961	7.33 1650	11.4 2570	1.75	0.007 0.015	0.008 0.018	14.288 0.5625	14.275 0.5620	19.063 0.7505	19.037 0.7495	Table B2-7	IR-68
	14.288 0.5625	19.050 0.7500	11.13 0.438	2.03 0.080	B-97	M-971	8.87 1990	14.6 3280	2.20	0.008 0.018	0.010 0.021	14.288 0.5625	14.275 0.5620	19.063 0.7505	19.037 0.7495	Table B2-7	IR-68
	14.288 0.5625	19.050 0.7500	12.70 0.500	2.03 0.080	B-98	M-981	10.3 2320	17.7 3990	2.70	0.009 0.020	0.010 0.023	14.288 0.5625	14.275 0.5620	19.063 0.7505	19.037 0.7495	Table B2-7	IR-68
	14.288 0.5625	19.050 0.7500	15.88 0.625	2.03 0.080	B-910	M-9101	13.1 2940	24.0 5400	3.60	0.012 0.026	0.013 0.029	14.288 0.5625	14.275 0.5620	19.063 0.7505	19.037 0.7495	Table B2-7	IR-612[(1)]

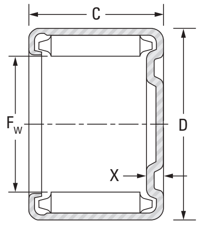
Continued on next page.

FULL COMPLEMENT BEARINGS
OPEN ENDS, CLOSED ONE END

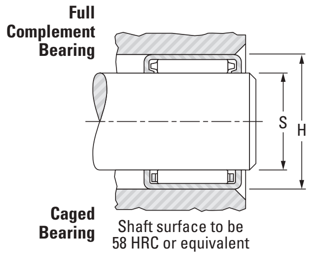
INCH SERIES
B, BH, NB, NBH, M- 1, MH- 1 SERIES



B, BH, NB, NBH



M- 1, MH- 1



Shaft Dia.	F_w	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0	C_u	Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		kN	**kg** lbs		**mm** in	**mm** in	**mm** in	**mm** in		
9/16	**14.288** 0.5625	**19.050** 0.7500	**19.05** 0.750	**2.03** 0.080	B-912	M-9121	**15.6** 3510	**30.3** 6820	4.70	**0.014** 0.031	**0.015** 0.034	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-7	IR-612(1)
	14.288 0.5625	**20.638** 0.8125	**12.70** 0.500	—	BH-98	—	**12.0** 2690	**16.4** 3690	2.50	**0.013** 0.029	—	**14.288** 0.5625	**14.275** 0.5620	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-68
	14.288 0.5625	**20.638** 0.8125	**15.88** 0.625	—	BH-910	—	**15.4** 3460	**22.7** 5110	3.45	**0.016** 0.036	—	**14.288** 0.5625	**14.275** 0.5620	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-612(1)
	14.288 0.5625	**20.638** 0.8125	**19.05** 0.750	—	BH-912	—	**18.6** 4190	**29.0** 6520	4.45	**0.020** 0.043	—	**14.288** 0.5625	**14.275** 0.5620	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-612(1)
5/8	**15.875** 0.6250	**20.638** 0.8125	**7.92** 0.312	**2.03** 0.080	B-105	M-1051	**6.05** 1360	**9.24** 2080	1.40	**0.006** 0.014	**0.007** 0.016	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-68-1
	15.875 0.6250	**20.638** 0.8125	**11.13** 0.438	**2.03** 0.080	B-107	M-1071	**9.39** 2110	**16.2** 3650	2.45	**0.009** 0.020	**0.010** 0.022	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-68-1
	15.875 0.6250	**20.638** 0.8125	**12.70** 0.500	**2.03** 0.080	B-108	M-1081	**10.9** 2450	**19.7** 4430	3.00	**0.010** 0.022	**0.012** 0.026	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-68-1
	15.875 0.6250	**20.638** 0.8125	**15.88** 0.625	**2.03** 0.080	B-1010	M-10101	**13.80** 3110	**26.7** 6000	4.00	**0.013** 0.028	**0.015** 0.032	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-612-1
	15.875 0.6250	**20.638** 0.8125	**19.05** 0.750	**2.03** 0.080	B-1012	M-10121	**16.6** 3720	**33.7** 7580	5.25	**0.015** 0.034	**0.017** 0.038	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**12.70** 0.500	**2.29** 0.090	BH-108	MH-1081	**12.7** 2860	**18.3** 4110	2.75	**0.014** 0.031	**0.016** 0.035	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	IR-68-1
	15.875 0.6250	**22.212** 0.8745	**15.88** 0.625	—	BH-1010	—	**16.4** 3680	**25.3** 5680	3.85	**0.018** 0.039	—	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**19.05** 0.750	—	BH-1012	—	**19.8** 4450	**32.3** 7250	4.95	**0.021** 0.047	—	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**25.40** 1.000	—	BH-1016	—	**26.2** 5890	**46.2** 10390	7.10	**0.028** 0.062	—	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	
11/16	**17.463** 0.6875	**22.212** 0.8745	**9.53** 0.375	**2.03** 0.080	B-116	M-1161	**8.17** 1840	**14.0** 3140	2.15	**0.008** 0.018	**0.009** 0.020	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	
	17.463 0.6875	**22.212** 0.8745	**12.70** 0.500	**2.03** 0.080	B-118	M-1181	**11.5** 2580	**21.7** 4880	3.30	**0.011** 0.024	**0.012** 0.027	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	
	17.463 0.6875	**22.212** 0.8745	**15.88** 0.625	**2.03** 0.080	B-1110	M-11101	**14.6** 3270	**29.4** 6610	4.40	**0.014** 0.030	**0.015** 0.034	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	
	17.463 0.6875	**22.212** 0.8745	**19.05** 0.750	**2.03** 0.080	B-1112	M-11121	**17.4** 3920	**37.1** 8340	5.75	**0.016** 0.036	**0.019** 0.041	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	
	17.463 0.6875	**23.813** 0.9375	**11.13** 0.438	—	BH-117	—	**11.4** 2560	**16.2** 3650	2.45	**0.014** 0.030	—	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-7	
	17.463 0.6875	**23.813** 0.9375	**15.88** 0.625	**2.29** 0.090	BH-1110	MH-11101	**17.3** 3890	**27.8** 6250	4.25	**0.019** 0.042	**0.021** 0.047	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-7	

Note) · For information on the speed ratings, contact JTEKT.

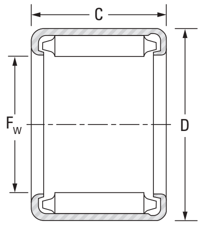
(1) IRA inner ring provides additional length if required.

Shaft Dia.	F_w	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0	C_u	Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		kN	**kg** lbs		**mm** in	**mm** in	**mm** in	**mm** in		
11/16	**17.463** 0.6875	**23.813** 0.9375	**19.05** 0.750	—	BH-1112	—	**20.9** 4700	**35.5** 7980	5.45	**0.023** 0.051	—	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-7	
3/4	**19.050** 0.7500	**25.400** 1.0000	**9.53** 0.375	**2.29** 0.090	B-126	M-1261	**9.70** 2180	**13.6** 3050	2.10	**0.012** 0.027	**0.014** 0.031	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-7	IR-88
	19.050 0.7500	**25.400** 1.0000	**12.70** 0.500	**2.29** 0.090	B-128	M-1281	**14.1** 3170	**22.0** 4940	3.30	**0.016** 0.036	**0.019** 0.041	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-7	IR-88
	19.050 0.7500	**25.400** 1.0000	**15.88** 0.625	**2.29** 0.090	B-1210	M-12101	**18.1** 4070	**30.4** 6830	4.60	**0.020** 0.045	**0.024** 0.052	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-7	IR-812(1)
	19.050 0.7500	**25.400** 1.0000	**19.05** 0.750	**2.29** 0.090	B-1212	M-12121	**21.9** 4930	**38.7** 8710	5.95	**0.024** 0.054	**0.028** 0.062	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-7	IR-812(1)
13/16	**20.638** 0.8125	**26.988** 1.0625	**9.53** 0.375	—	B-136	—	**10.1** 2280	**14.7** 3300	2.25	**0.013** 0.029	—	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-7	
	20.638 0.8125	**26.988** 1.0625	**12.70** 0.500	**2.29** 0.090	B-138	M-1381	**14.7** 3300	**23.8** 5350	3.60	**0.018** 0.039	**0.020** 0.044	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-7	
	20.638 0.8125	**26.988** 1.0625	**22.23** 0.875	**2.29** 0.090	B-1314	M-13141	**26.7** 6010	**51.1** 11490	7.90	**0.031** 0.068	**0.035** 0.077	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-7	
	20.638 0.8125	**26.988** 1.0625	**25.40** 1.000	**2.29** 0.090	B-1316	M-13161	**30.3** 6820	**60.2** 13530	9.25	**0.035** 0.078	**0.040** 0.088	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-7	
	20.638 0.8125	**26.988** 1.0625	**31.75** 1.250	—	B-1320	—	**37.3** 8380	**78.4** 17620	12.0	**0.044** 0.098	—	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-7	
	20.638 0.8125	**28.575** 1.1250	**12.70** 0.500	**2.79** 0.110	BH-138	MH-1381	**14.8** 3330	**20.8** 4680	3.10	**0.023** 0.050	**0.026** 0.057	**20.638** 0.8125	**20.625** 0.8120	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	
	20.638 0.8125	**28.575** 1.1250	**15.88** 0.625	**2.79** 0.110	BH-1310	MH-13101	**19.7** 4430	**29.9** 6720	4.50	**0.029** 0.063	**0.032** 0.071	**20.638** 0.8125	**20.625** 0.8120	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	
	20.638 0.8125	**28.575** 1.1250	**19.05** 0.750	**2.79** 0.110	BH-1312	MH-13121	**24.2** 5440	**39.0** 8760	6.10	**0.034** 0.076	**0.039** 0.086	**20.638** 0.8125	**20.625** 0.8120	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	
7/8	**22.225** 0.8750	**28.575** 1.1250	**9.53** 0.375	**2.29** 0.090	B-146	M-1461	**10.6** 2380	**15.8** 3560	2.45	**0.014** 0.031	**0.016** 0.035	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	
	22.225 0.8750	**28.575** 1.1250	**12.70** 0.500	**2.29** 0.090	B-148	M-1481	**15.4** 3450	**25.6** 5760	3.85	**0.019** 0.042	**0.022** 0.048	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	IR-1012(1)
	22.225 0.8750	**28.575** 1.1250	**19.05** 0.750	**2.29** 0.090	B-1412	M-14121	**23.9** 5370	**45.2** 10160	6.95	**0.028** 0.062	**0.032** 0.070	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	IR-1012(1)
	22.225 0.8750	**28.575** 1.1250	**25.40** 1.000	**2.29** 0.090	B-1416	M-14161	**31.6** 7100	**64.8** 14570	10.0	**0.038** 0.083	**0.043** 0.094	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	IR-1016
	22.225 0.8750	**28.575** 1.1250	**28.58** 1.125	—	B-1418	—	**35.2** 7920	**74.6** 16770	11.4	**0.043** 0.094	—	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	
	22.225 0.8750	**30.163** 1.1875	**15.88** 0.625	**2.79** 0.110	BH-1410	MH-14101	**20.3** 4570	**32.2** 7240	4.85	**0.030** 0.067	**0.035** 0.076	**22.225** 0.8750	**22.212** 0.8745	**30.175** 1.1880	**30.150** 1.1870	Table B2-7	IR-1012(1)
	22.225 0.8750	**30.163** 1.1875	**19.05** 0.750	**2.79** 0.110	BH-1412	MH-14121	**25.0** 5620	**42.0** 9440	6.55	**0.036** 0.080	**0.041** 0.091	**22.225** 0.8750	**22.212** 0.8745	**30.175** 1.1880	**30.150** 1.1870	Table B2-7	IR-1012(1)
	22.225 0.8750	**30.163** 1.1875	**25.40** 1.000	—	BH-1416	—	**33.7** 7570	**61.6** 13850	9.60	**0.049** 0.107	—	**22.225** 0.8750	**22.212** 0.8745	**30.175** 1.1880	**30.150** 1.1870	Table B2-7	IR-1016
15/16	**23.813** 0.9375	**30.163** 1.1875	**12.70** 0.500	—	B-158	—	**15.9** 3580	**27.5** 6180	4.15	**0.020** 0.044	—	**23.813** 0.9375	**23.800** 0.9370	**30.175** 1.1880	**30.150** 1.1870	Table B2-7	
	23.813 0.9375	**30.163** 1.1875	**25.40** 1.000	**2.29** 0.090	B-1516	M-15161	**32.8** 7370	**69.5** 15620	10.7	**0.040** 0.088	**0.045** 0.100	**23.813** 0.9375	**23.800** 0.9370	**30.175** 1.1880	**30.150** 1.1870	Table B2-7	
1	**25.400** 1.0000	**31.750** 1.2500	**9.53** 0.375	—	B-166	—	**11.3** 2550	**18.1** 4070	2.80	**0.016** 0.035	—	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	Table B2-7	IR-128
	25.400 1.0000	**31.750** 1.2500	**11.13** 0.438	**2.29** 0.090	B-167	M-1671	**14.0** 3140	**23.7** 5320	3.60	**0.019** 0.041	**0.021** 0.046	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	Table B2-7	IR-128
	25.400 1.0000	**31.750** 1.2500	**12.70** 0.5000	**2.29** 0.090	B-168	M-1681	**16.5** 3710	**29.3** 6590	4.45	**0.021** 0.047	**0.024** 0.053	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	Table B2-7	IR-128

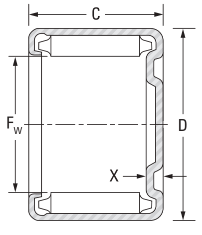
Continued on next page.

FULL COMPLEMENT BEARINGS OPEN ENDS, CLOSED ONE END

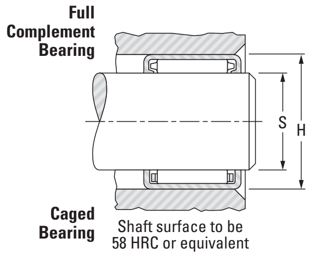
INCH SERIES
B, BH, NB, NBH, M- 1, MH- 1 SERIES



B, BH, NB, NBH



M- 1, MH- 1



Shaft Dia.	F_w	D	C +0 +0.000 -0.3 -0.012	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
							Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
1	25.400 1.0000	31.750 1.2500	15.88 0.625	2.29 0.090	B-1610	M-16101	21.2 4770	40.5 9110	6.15	0.026 0.058	0.030 0.066	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	Table B2-7	IR-1212
	25.400 1.0000	31.750 1.2500	19.05 0.750	2.29 0.090	B-1612	M-16121	25.7 5770	51.7 11620	7.95	0.032 0.070	0.036 0.080	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	Table B2-7	IR-1212
	25.400 1.0000	31.750 1.2500	25.40 1.000	2.29 0.090	B-1616	M-16161	34.0 7640	74.1 16660	11.4	0.043 0.094	0.048 0.106	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	Table B2-7	IR-1216(1)
	25.400 1.0000	33.338 1.3125	12.70 0.500	2.79 0.110	BH-168	MH-1681	16.6 3740	25.6 5760	3.80	0.027 0.060	0.031 0.068	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-7	IR-128
	25.400 1.0000	33.338 1.3125	15.88 0.625	—	BH-1610	—	22.0 4950	36.8 8280	5.50	0.034 0.075	—	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-7	IR-1212
	25.400 1.0000	33.338 1.3125	19.05 0.750	2.79 0.110	BH-1612	MH-16121	27.1 6090	48.0 10800	7.45	0.041 0.090	0.046 0.102	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-7	IR-1212
	25.400 1.0000	33.338 1.3125	22.23 0.875	—	BH-1614	—	31.9 7170	59.2 13300	9.15	0.048 0.105	—	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-7	IR-1216(1)
	25.400 1.0000	33.338 1.3125	25.40 1.000	2.79 0.110	BH-1616	MH-16161	36.5 8200	70.4 15830	10.9	0.054 0.120	0.062 0.136	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-7	IR-1216(1)
	25.400 1.0000	33.338 1.3125	31.75 1.250	—	BH-1620	—	45.2 10160	92.8 20860	14.2	0.068 0.150	—	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-7	IR-1220
	25.400 1.0000	33.338 1.3125	38.10 1.500	2.79 0.110	BH-1624	MH-16241	53.5 12030	115 25900	17.7	0.082 0.180	0.093 0.204	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-7	IR-1224
1 1/16	26.988 1.0625	33.338 1.3125	15.88 0.625	2.29 0.090	B-1710	M-17101	21.9 4930	43.1 9680	6.55	0.028 0.062	0.032 0.070	26.988 1.0625	26.975 1.0620	33.350 1.3130	33.325 1.3120	Table B2-7	
	26.988 1.0625	34.925 1.3750	19.05 0.750	—	BH-1712	—	29.5 6630	52.4 11780	8.05	0.035 0.078	—	26.988 1.0625	26.975 1.0620	34.938 1.3755	34.912 1.3745	Table B2-7	
1 1/8	28.575 1.1250	34.925 1.3750	9.53 0.375	2.29 0.090	B-186	M-1861	12.1 2720	20.4 4580	3.10	0.018 0.039	0.020 0.044	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-7	IR-1416(1)
	28.575 1.1250	34.925 1.3750	12.70 0.500	2.29 0.090	B-188	M-1881	17.6 3950	33.0 7420	4.95	0.024 0.052	0.027 0.059	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-7	IR-1416(1)
	28.575 1.1250	34.925 1.3750	15.88 0.625	—	B-1810	—	22.6 5080	45.6 10250	6.90	0.029 0.065	—	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-7	IR-1416(1)
	28.575 1.1250	34.925 1.3750	19.05 0.750	2.29 0.090	B-1812	M-18121	27.3 6140	58.2 13080	8.90	0.035 0.078	0.040 0.088	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-7	IR-1416(1)
	28.575 1.1250	34.925 1.3750	25.40 1.000	2.29 0.090	B-1816	M-18161	36.1 8120	83.4 18750	12.8	0.047 0.104	0.054 0.118	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-7	IR-1416(1)
	28.575 1.1250	38.100 1.5000	19.05 0.750	3.05 0.120	BH-1812	MH-18121	31.5 7090	52.9 11900	8.30	0.056 0.123	0.063 0.138	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-7	IR-1416(1)
	28.575 1.1250	38.100 1.5000	25.40 1.000	3.05 0.120	BH-1816	MH-18161	42.5 9560	77.8 17500	12.0	0.074 0.164	0.084 0.186	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-7	IR-1416(1)
1 1/8	28.575 1.1250	38.100 1.5000	31.75 1.250	3.05 0.120	BH-1820	MH-18201	53.0 11910	103 23200	15.8	0.093 0.205	0.105 0.232	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-7	
1 3/16	30.163 1.1875	38.100 1.5000	15.88 0.625	2.79 0.110	B-1910	M-19101	24.1 5420	43.8 9840	6.55	0.040 0.088	0.045 0.099	30.163 1.1875	30.150 1.1870	38.113 1.5005	38.087 1.4995	Table B2-7	
	30.163 1.1875	38.100 1.5000	25.40 1.000	—	B-1916	—	39.9 8970	83.7 18820	13.0	0.064 0.140	—	30.163 1.1875	30.150 1.1870	38.113 1.5005	38.087 1.4995	Table B2-7	
1 1/4	31.750 1.2500	38.100 1.5000	12.70 0.500	2.29 0.090	B-208	M-2081	18.6 4170	36.7 8250	5.50	0.026 0.057	0.029 0.065	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-7	IR-1612
	31.750 1.2500	38.100 1.5000	15.88 0.625	2.29 0.090	B-2010	M-20101	23.9 5370	50.7 11400	7.70	0.032 0.071	0.044 0.097	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-7	IR-1612
	31.750 1.2500	38.100 1.5000	19.05 0.750	2.29 0.090	B-2012	M-20121	28.9 6490	64.7 14540	9.90	0.039 0.086	0.045 0.099	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-7	IR-1612
	31.750 1.2500	38.100 1.5000	25.40 1.000	2.29 0.090	B-2016	M-20161	38.2 8590	92.7 20840	14.2	0.052 0.114	0.059 0.130	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-7	IR-1616(1)
	31.750 1.2500	38.100 1.5000	31.75 1.250	2.29 0.090	B-2020	M-20201	46.9 10540	121 27200	18.4	0.065 0.143	0.073 0.162	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-7	
	31.750 1.2500	41.275 1.6250	12.70 0.500	3.05 0.120	BH-208	MH-2081	19.7 4420	30.0 6750	4.50	0.041 0.090	0.046 0.102	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-7	IR-1612
	31.750 1.2500	41.275 1.6250	19.05 0.750	3.05 0.120	BH-2012	MH-20121	33.1 7440	58.6 13170	9.10	0.061 0.135	0.069 0.153	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-7	IR-1612
	31.750 1.2500	41.275 1.6250	25.40 1.000	3.05 0.120	BH-2016	MH-20161	44.9 10100	86.6 19470	13.4	0.081 0.179	0.092 0.203	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-7	IR-1616(1)
	31.750 1.2500	41.275 1.6250	31.75 1.250	3.05 0.120	BH-2020	MH-20201	55.9 12570	115 25800	17.6	0.102 0.224	0.115 0.254	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-7	
1 5/16	33.338 1.3125	41.275 1.6250	12.70 0.500	2.79 0.110	B-218	M-2181	19.3 4330	33.7 7570	5.00	0.034 0.076	0.039 0.086	33.338 1.3125	33.325 1.3120	41.288 1.6255	41.262 1.6245	Table B2-7	
	33.338 1.3125	41.275 1.6250	15.88 0.625	2.79 0.110	B-2110	M-21101	25.5 5740	48.4 10880	7.25	0.043 0.095	0.049 0.108	33.338 1.3125	33.325 1.3120	41.288 1.6255	41.262 1.6245	Table B2-7	
	33.338 1.3125	41.275 1.6250	31.75 1.250	—	B-2120	—	52.6 11820	123 27650	18.8	0.087 0.191	—	33.338 1.3125	33.325 1.3120	41.288 1.6255	41.262 1.6245	Table B2-7	
1 3/8	34.925 1.3750	41.275 1.6250	12.70 0.500	2.29 0.090	B-228	M-2281	19.5 4390	40.3 9060	6.05	0.028 0.062	0.032 0.070	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-7	IR-1812
	34.925 1.3750	41.275 1.6250	19.05 0.750	2.29 0.090	B-2212	M-22121	30.4 6830	71.2 16000	10.9	0.043 0.094	0.049 0.107	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-7	IR-1812
	34.925 1.3750	41.275 1.6250	25.40 1.000	2.29 0.090	B-2216	M-22161	40.2 9030	102 22900	15.7	0.057 0.125	0.064 0.142	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-7	IR-1816
	34.925 1.3750	41.275 1.6250	31.75 1.250	2.29 0.090	B-2220	M-22201	49.3 11080	133 29900	20.3	0.071 0.156	0.080 0.177	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-7	IR-1820
	34.925 1.3750	44.450 1.7500	12.70 0.500	—	BH-228	—	21.2 4770	33.5 7540	5.15	0.044 0.098	—	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-7	IR-1812
	34.925 1.3750	44.450 1.7500	15.88 0.625	—	BH-2210	—	28.5 6410	48.9 11000	7.45	0.055 0.122	—	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-7	IR-1812
	34.925 1.3750	44.450 1.7500	19.05 0.750	3.05 0.120	BH-2212	MH-22121	35.3 7930	64.3 14450	10.0	0.066 0.146	0.075 0.165	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-7	IR-1812
	34.925 1.3750	44.450 1.7500	25.40 1.000	3.05 0.120	BH-2216	MH-22161	47.6 10700	94.8 21300	14.7	0.088 0.195	0.100 0.221	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-7	IR-1816
	34.925 1.3750	44.450 1.7500	31.75 1.250	—	BH-2220	—	59.4 13350	126 28300	19.4	0.111 0.244	0.125 0.276	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-7	IR-1820
1 1/2	38.100 1.5000	47.625 1.8750	12.70 0.500	3.05 0.120	B-248	M-2481	22.3 5020	37.1 8340	5.60	0.048 0.105	0.054 0.119	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-7	IR-1916
	38.100 1.5000	47.625 1.8750	15.88 0.625	3.05 0.120	B-2410	M-24101	29.9 6720	53.9 12120	8.10	0.060 0.132	0.068 0.150	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-7	IR-1916

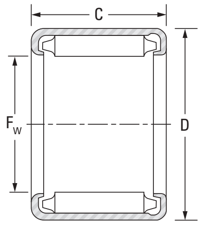
Note) · For information on the speed ratings, contact JTEKT.

(1) IRA inner ring provides additional length if required.

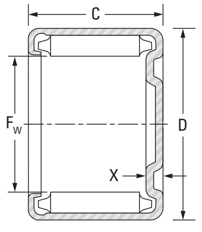
Continued on next page.

FULL COMPLEMENT BEARINGS
OPEN ENDS, CLOSED ONE END

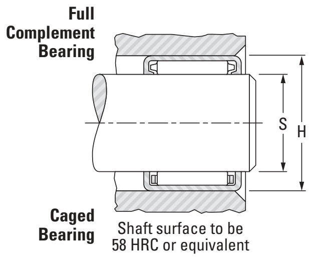
INCH SERIES
B, BH, NB, NBH, M- 1, MH- 1 SERIES



B, BH, NB, NBH



M- 1, MH- 1



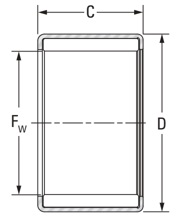
Shaft Dia.	F_w	D	C +0 +0.000 -0.3 -0.012	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
					Open Ends	Closed One End	Dynamic C	Static C_0		Open Ends	Closed One End	Shaft Max.	Shaft Min.	Housing Max.	Housing Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
1 1/2	38.100 1.5000	47.625 1.8750	19.05 0.750	3.05 0.120	B-2412	M-24121	36.9 8290	70.7 15900	11.1	0.072 0.158	0.081 0.179	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-7	IR-1916
	38.100 1.5000	47.625 1.8750	22.23 0.875	3.05 0.120	B-2414	M-24141	43.5 9780	87.5 19670	13.6	0.083 0.184	0.095 0.209	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-7	IR-1916
	38.100 1.5000	47.625 1.8750	25.40 1.000	3.05 0.120	B-2416	M-24161	49.7 11170	104 23380	16.1	0.096 0.211	0.108 0.239	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-7	IR-1916
	38.100 1.5000	47.625 1.8750	31.75 1.250	3.05 0.120	B-2420	M-24201	62.0 13940	138 31000	21.2	0.119 0.263	0.135 0.298	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-7	IR-1920
1 5/8	41.275 1.6250	50.800 2.0000	12.70 0.500	—	B-268	—	22.7 5100	39.2 8820	5.85	0.051 0.113	—	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-7	IR-2020(1)
	41.275 1.6250	50.800 2.0000	15.88 0.625	3.05 0.120	B-2610	M-26101	30.6 6890	57.4 12900	8.60	0.064 0.141	0.073 0.160	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-7	IR-2020(1)
	41.275 1.6250	50.800 2.0000	25.40 1.000	—	B-2616	—	51.4 11550	112 25200	17.4	0.103 0.226	—	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-7	IR-2020(1)
	41.275 1.6250	50.800 2.0000	31.75 1.250	3.05 0.120	B-2620	M-26201	64.0 14400	148 33270	22.9	0.128 0.282	0.145 0.320	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-7	IR-2220(1)
1 3/4	44.450 1.7500	53.975 2.1250	19.05 0.750	3.05 0.120	B-2812	M-28121	39.3 8830	81.5 18320	12.8	0.082 0.181	0.093 0.205	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-7	IR-2316
	44.450 1.7500	53.975 2.1250	25.40 1.000	3.05 0.120	B-2816	M-28161	53.3 11980	121 27100	18.8	0.110 0.242	0.124 0.274	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-7	IR-2316
	44.450 1.7500	53.975 2.1250	31.75 1.250	—	B-2820	—	66.4 14930	160 36000	24.7	0.137 0.302	—	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-7	IR-2324
	44.450 1.7500	53.975 2.1250	38.10 1.500	3.05 0.120	B-2824	M-26241	78.7 17700	199 44800	30.5	0.165 0.363	0.186 0.411	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-7	IR-2324
1 7/8	47.625 1.8750	57.150 2.2500	12.70 0.500	3.05 0.120	B-308	M-3081	25.1 5650	46.4 10430	7.00	0.059 0.129	0.066 0.146	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-7	
	47.625 1.8750	57.150 2.2500	15.888 0.625	—	B-3010	—	33.6 7550	67.4 15150	10.2	0.073 0.161	—	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-7	
	47.625 1.8750	57.150 2.2500	19.05 0.750	—	B-3012	—	41.5 9330	88.4 19870	13.9	0.088 0.193	—	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-7	
	47.625 1.8750	57.150 2.2500	25.40 1.000	3.05 0.120	B-3016	M-30161	56.0 12600	130 29200	20.1	0.117 0.258	0.132 0.292	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-7	
2	50.800 2.0000	60.325 2.3750	12.70 0.500	3.05 0.120	B-328	M-3281	25.4 5710	48.2 10840	7.20	0.062 0.136	0.070 0.154	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-7	
	50.800 2.0000	60.325 2.3750	15.88 0.625	—	B-3210	—	34.2 7680	70.7 15900	10.6	0.078 0.171	—	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-7	
	50.800 2.0000	60.325 2.3750	22.23 0.875	—	B-3214	—	50.1 11260	116 26080	18.0	0.108 0.239	—	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-7	
2	50.800 2.0000	60.325 2.3750	25.40 1.000	3.05 0.120	B-3216	M-32161	57.5 12930	138 31000	21.5	0.124 0.273	0.140 0.309	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-7	
	50.800 2.0000	60.325 2.3750	31.75 1.250	3.05 0.120	B-3220	M-32201	71.5 16070	183 41100	28.3	0.155 0.341	0.175 0.386	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-7	
	50.800 2.0000	60.325 2.3750	38.10 1.500	3.05 0.120	B-3224	M-32241	84.8 19060	228 51200	34.9	0.186 0.410	0.211 0.465	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-7	
	50.800 2.0000	60.325 2.3750	44.45 1.750	3.05 0.120	B-3228	M-32281	97.6 21940	272 61150	41.9	0.217 0.478	0.245 0.541	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-7	
2 1/16	52.388 2.0625	64.292 2.5312	19.05 0.750	—	BH-3312	—	46.1 10360	86.9 19540	13.4	0.122 0.269	—	52.388 2.0625	52.372 2.0619	64.305 2.5317	64.280 2.5307	Table B2-7	IR-2916
	52.388 2.0625	64.292 2.5312	25.40 1.000	3.56 0.140	BH-3316	MH-33161	64.2 14430	133 29900	20.7	0.162 0.358	0.184 0.406	52.388 2.0625	52.372 2.0619	64.305 2.5317	64.280 2.5307	Table B2-7	IR-2916
	52.388 2.0625	64.292 2.5312	38.10 1.500	3.56 0.140	BH-3324	MH-33241	96.8 21760	226 50700	34.8	0.244 0.537	0.276 0.609	52.388 2.0625	52.372 2.0619	64.305 2.5317	64.280 2.5307	Table B2-7	IR-2924
2 1/8	53.975 2.1250	63.500 2.5000	12.70 0.500	—	B-348	—	26.1 5870	51.3 11530	7.65	0.065 0.144	—	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-7	IR-3024
	53.975 2.1250	63.500 2.5000	19.05 0.750	—	B-3412	—	43.6 9790	99.0 22260	15.5	0.098 0.216	—	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-7	IR-3024
	53.975 2.1250	63.500 2.5000	25.40 1.000	3.05 0.120	B-3416	M-34161	59.1 13290	147 33000	22.8	0.131 0.289	0.148 0.327	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-7	IR-3024
	53.975 2.1250	63.500 2.5000	31.75 1.250	—	B-3420	—	73.6 16550	194 43700	30.1	0.164 0.361	—	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-7	IR-3024
	53.975 2.1250	63.500 2.5000	38.10 1.500	3.05 0.120	B-3424	M-34241	87.3 19630	242 54400	37.1	0.196 0.433	0.223 0.491	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-7	IR-3024
2 1/4	57.150 2.2500	66.675 2.6250	19.05 0.750	3.30 0.130	B-3612	M-36121	46 10340	105 23700	16.5	0.103 0.228	0.117 0.258	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-7	
	57.150 2.2500	66.675 2.6250	25.40 1.000	—	B-3616	—	62.3 14010	155.6 35000	24.2	0.138 0.304	—	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-7	
	57.150 2.2500	66.675 2.6250	31.75 1.250	—	B-3620	—	77.5 17420	206 46400	31.8	0.172 0.380	—	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-7	
	57.150 2.2500	66.675 2.6250	38.10 1.500	3.30 0.130	B-3624	M-36241	91.9 20660	257 57700	39.6	0.207 0.456	0.235 0.517	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-7	
2 1/2	63.500 2.5000	73.020 2.8750	19.05 0.750	—	NB-4012	—	48.1 10800	117 26300	18.4	0.116 0.255	—	63.500 2.5000	63.485 2.4994	73.165 2.8805	73.139 2.8795	Table B2-7	
	63.500 2.5000	73.020 2.8750	28.58 1.125	—	NB-4018	—	73.3 16500	201 45200	31.2	0.174 0.383	—	63.500 2.5000	63.485 2.4994	73.165 2.8805	73.139 2.8795	Table B2-7	
	63.500 2.5000	73.020 2.8750	38.10 1.500	—	NB-4024	—	96.2 21600	285 64100	44.5	0.231 0.508	—	63.500 2.5000	63.485 2.4994	73.165 2.8805	73.139 2.8795	Table B2-7	
2 5/8	66.675 2.6250	76.200 3.0000	25.40 1.000	3.30 0.130	B-4216	M-42161	66.7 15000	182 40900	23.9	0.159 0.351	0.181 0.398	66.675 2.6250	66.660 2.6244	76.213 3.0005	76.187 2.9995	Table B2-7	
2 3/4	69.850 2.7500	79.375 3.1250	15.88 0.625	—	B-4410	—	41.0 9210	98.0 22000	14.9	0.104 0.229	—	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-7	IR-4016
	69.850 2.7500	79.375 3.1250	19.050 0.7500	—	B-4412	—	50.7 11400	129 29000	20.1	0.124 0.274	—	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-7	IR-4016
	69.850 2.7500	79.375 3.1250	25.40 1.000	—	B-4416	—	68.8 15470	191 42940	29.5	0.166 0.366	—	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-7	IR-4016
	69.850 2.7500	79.375 3.1250	31.75 1.250	3.30 0.130	B-4420	M-44201	85.5 19220	252 56700	38.9	0.208 0.458	0.235 0.519	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-7	
3	76.200 3.0000	88.900 3.5000	19.05 0.750	—	NBH-4812	—	59.3 13300	127 28600	19.7	0.186 0.409	—	76.200 3.0000	76.185 2.9994	89.040 3.5055	89.014 3.5045	Table B2-7	
	76.200 3.0000	88.900 3.5000	38.10 1.500	—	NBH-4824	—	124 27900	329 74000	51.4	0.372 0.818	—	76.200 3.0000	76.185 2.9994	89.040 3.5055	89.014 3.5045	Table B2-7	
3 1/2	88.900 3.5000	101.600 4.0000	19.05 0.750	—	B-5612	—	65.1 14630	150 33700	22.9	0.212 0.468	—	88.900 3.5000	88.885 3.4994	101.613 4.0005	101.587 3.9995	Table B2-7	
5 1/2	139.700 5.5000	152.400 6.0000	19.05 0.750	—	B-8812	—	76.8 17260	231 52000	31.6	0.325 0.717	—	139.700 5.5000	139.682 5.4993	152.425 6.0010	152.375 5.9990	Table B2-7	

Note) · For information on the speed ratings, contact JTEKT.

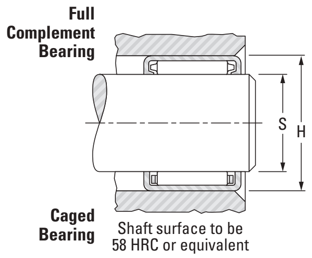
(1) IRA inner ring provides additional length if required.

FULL COMPLEMENT BEARINGS OPEN ENDS

INCH SERIES
Y SERIES



Y



Shaft Dia.	F_w	D	C	X max.	Bearing Designation	Load Ratings		Fatigue Load Limit	Approx. Wt.	Mounting Dimensions				Inspection gage
			+0 +0.000 **-0.3** -0.012			Dynamic	Static			Shaft		Housing		
					Open Ends	C	C_0	C_u	Open Ends	Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in	
5/32	**3.970** 0.1563	**7.142** 0.2812	**3.96** 0.156	—	Y-2 1/2 2 1/2	**1.29** 290	**1.14** 260	—	**0.001** 0.002	**3.970** 0.1563	**3.962** 0.1560	**7.155** 0.2817	**7.142** 0.2812	Table B2-7
3/8	**9.525** 0.3750	**14.288** 0.5625	**9.53** 0.375	—	Y-66	**6.67** 1500	**9.04** 2030	1.45	**0.005** 0.011	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-7
	9.525 0.3750	**14.288** 0.5625	**19.05** 0.750	—	Y-612	**13.2** 2970	**21.6** 4860	3.5	**0.010** 0.022	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-7
7/16	**11.113** 0.4375	**15.875** 0.625	**9.53** 0.375	—	Y-76	**7.29** 1640	**10.6** 2380	1.7	**0.005** 0.012	**11.113** 0.4375	**11.100** 0.4370	**15.888** 0.6255	**15.862** 0.6245	Table B2-7
9/16	**14.288** 0.5625	**19.050** 0.7500	**9.53** 0.375	—	Y-96	**8.38** 1880	**13.6** 3060	2.2	**0.007** 0.015	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-7
	14.288 0.5625	**19.050** 0.7500	**12.70** 0.500	—	Y-98	**11.3** 2540	**19.9** 4470	3.2	**0.009** 0.020	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-7
	14.288 0.5625	**19.050** 0.7500	**15.88** 0.625	—	Y-910	**14.0** 3150	**26.2** 5890	4.2	**0.012** 0.026	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-7
	14.288 0.5625	**19.050** 0.7500	**19.05** 0.750	—	Y-912	**16.5** 3710	**32.5** 7310	5.25	**0.014** 0.031	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-7
5/8	**15.875** 0.6250	**20.638** 0.8125	**15.88** 0.625	—	Y-1010	**14.8** 3330	**29.2** 6560	4.7	**0.013** 0.029	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7
11/16	**17.463** 0.6875	**22.212** 0.8745	**6.35** 0.250	—	Y-114	**5.76** 1290	**8.92** 2010	1.55	**0.005** 0.012	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-7

Note) · For information on the speed ratings, contact JTEKT.

EXTRA-PRECISION BEARINGS

INCH SERIES

Open-end full-complement mechanically retained drawn cup needle roller bearings, manufactured to inch standards, are offered with extra-precision specifications. The manufacturing tolerance of these bearings is one-third that of the standard precision bearings. In production operations, using closer tolerances on shaft and housing, they will assemble with consistently lower radial internal clearances than can be expected with the standard precision series bearings.

Extra-precision bearings are suitable for those applications requiring close control of radial play and eccentricity. They are also preferred when two bearings are mounted adjacent to each other because greater accuracy in manufacture will provide better load distribution between the bearings.

Nominal dimensions, load ratings, speed ratings and other general specifications for extra-precision bearings are the same as for the corresponding "B" or "BH" sizes of drawn cup needle roller bearings. Consequently, the data on pages B-2-54 to B-2-61 can be used in bearing size selection.

When ordering an extra-precision bearing, add the prefix letter "G" to the bearing designation. For example, after following the size selection procedure outlined in the engineering section, bearing B-1212 is selected – but extra-precision tolerances are required. These are designated by ordering a GB-1212 bearing.

To realize the advantages of the expected closer radial internal clearance of the extra-precision bearing, the user must have the capability of producing housing bore and shaft raceway diameters to the close tolerances indicated by the bearing tables on page B-2-65.

The resulting total radial internal clearance, within the installed GB-1212 extra-precision drawn cup needle roller bearing, will lie in the range from 0.005 mm to 0.030 mm (0.0002 in to 0.0012 in)

Inspection dimensions for the extra-precision bearings are given in table on page B-2-64. Note that these bearings must be inspected while mounted in the specified ring gage. Bearing bores are checked with "go" and "no go" plug gages. The "go" gage size is the minimum diameter inside the needle rollers. The "no go" gage size is 0.002 mm (0.0001 in) larger than the maximum diameter inside the needle rollers.

Procedures for selecting ring and plug gage dimensions are the same as for those involving standard precision needle roller bearings – except that the ring gage diameters and diameters inside the needle rollers must be drawn from the table on page B-2-64.

Table B2-9. Inspection for extra-precision drawn cup needle roller bearings – inch series

Nominal shaft diameter	Gaging		
	Ring gage	Diameter inside needle rollers	
		Max.	Min.
mm in	mm in	mm in	mm in
3.175 1/8	**6.281** 0.2473	**3.200** 0.1260	**3.190** 0.1256
3.970 5/32	**7.074** 0.2785	**3.995** 0.1573	**3.985** 0.1569
4.763 3/16	**8.611** 0.3390	**4.788** 0.1885	**4.777** 0.1881
6.350 1/4	**10.993** 0.4328	**6.375** 0.2510	**6.365** 0.2506
7.938 5/16	**12.581** 0.4953	**7.963** 0.3135	**7.953** 0.3131
H 7.938 H 5/16	**14.168** 0.5578	**7.963** 0.3135	**7.953** 0.3131
9.525 3/8	**14.168** 0.5578	**9.550** 0.3760	**9.540** 0.3756
H 9.525 H 3/8	**15.756** 0.6203	**9.550** 0.3760	**9.540** 0.3756
11.113 7/16	**15.756** 0.6203	**11.138** 0.4385	**11.127** 0.4381
H 11.113 H 7/16	**17.343** 0.6828	**11.138** 0.4385	**11.127** 0.4381
12.700 1/2	**17.343** 0.6828	**12.725** 0.5010	**12.715** 0.5006
H 12.700 H 1/2	**18.931** 0.7453	**12.725** 0.5010	**12.715** 0.5006
14.288 9/16	**18.931** 0.7453	**14.313** 0.5635	**14.303** 0.5631
H 14.288 H 9/16	**20.518** 0.8078	**14.313** 0.5635	**14.303** 0.5631
15.875 5/8	**20.518** 0.8078	**15.900** 0.6260	**15.890** 0.6256
H 15.875 H 5/8	**22.106** 0.8703	**15.900** 0.6260	**15.890** 0.6256
17.463 11/16	**22.106** 0.8703	**17.488** 0.6885	**17.478** 0.6881
H 17.463 H 11/16	**23.693** 0.9328	**17.488** 0.6885	**17.478** 0.6881
19.050 3/4	**25.273** 0.9950	**19.068** 0.7507	**19.058** 0.7503
H 19.050 H 3/4	**26.861** 1.0575	**19.068** 0.7507	**19.058** 0.7503
20.638 13/16	**26.861** 1.0575	**20.655** 0.8132	**20.645** 0.8128
H 20.638 H 13/16	**28.448** 1.1200	**20.655** 0.8132	**20.645** 0.8128
22.225 7/8	**28.448** 1.1200	**22.243** 0.8757	**22.233** 0.8753
H 22.225 H 7/8	**30.036** 1.1825	**22.243** 0.8757	**22.233** 0.8753
23.813 15/16	**30.036** 1.1825	**23.830** 0.9382	**23.820** 0.9378
25.400 1	**31.623** 1.2450	**25.418** 1.0007	**25.408** 1.0003
H 25.400 H 1	**33.211** 1.3075	**25.418** 1.0007	**25.408** 1.0003
26.988 1 1/16	**33.211** 1.3075	**27.005** 1.0632	**26.995** 1.0628
28.575 1 1/8	**34.798** 1.3700	**28.593** 1.1257	**28.583** 1.1253
H 28.575 H 1 1/8	**37.973** 1.4950	**28.593** 1.1257	**28.583** 1.1253
30.163 1 3/16	**37.973** 1.4950	**30.180** 1.1882	**30.170** 1.1878
31.750 1 1/4	**37.973** 1.4950	**31.768** 1.2507	**31.758** 1.2503
H 31.750 H 1 1/4	**41.148** 1.6200	**31.768** 1.2507	**31.758** 1.2503
33.338 1 5/16	**41.148** 1.6200	**33.355** 1.3132	**33.345** 1.3128
34.925 1 3/8	**41.148** 1.6200	**34.943** 1.3757	**34.933** 1.3753
H 34.925 H 1 3/8	**44.323** 1.7450	**34.943** 1.3757	**34.933** 1.3753
38.100 1 1/2	**47.498** 1.8700	**38.120** 1.5008	**38.108** 1.5003
41.275 1 5/8	**50.673** 1.9950	**41.295** 1.6258	**41.283** 1.6253
44.450 1 3/4	**53.848** 2.1200	**44.470** 1.7508	**44.458** 1.7503
47.625 1 7/8	**57.023** 2.2450	**47.645** 1.8758	**47.633** 1.8753
50.800 2	**60.198** 2.3700	**50.820** 2.0008	**50.808** 2.0003
H 52.388 H 2 1/16	**64.166** 2.5262	**52.408** 2.0633	**52.395** 2.0628
53.975 2 1/8	**63.373** 2.4950	**53.995** 2.1258	**53.983** 2.1253
57.150 2 1/4	**66.548** 2.6200	**57.170** 2.2508	**57.158** 2.2503
66.675 2 5/8	**76.073** 2.9950	**66.700** 2.6260	**66.685** 2.6254
69.850 2 3/4	**79.248** 3.1200	**69.875** 2.7510	**69.860** 2.7504
88.900 3 1/2	**101.473** 3.9950	**88.925** 3.5010	**88.710** 3.5004

Table B2-10. Mounting dimensions for extra-precision drawn cup needle roller bearings – inch series

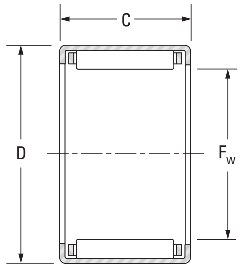
Bearing bore designation	Mounting					
	Nominal bore	Nominal O.D.	Shaft raceway diameter		Housing bore	
			Max.	Min.	Max.	Min.
	mm in	mm in	mm in	mm in	mm in	mm in
GB-2	**3.175** 0.1250	**6.350** 0.2500	**3.178** 0.1251	**3.170** 0.1248	**6.281** 0.2473	**6.274** 0.2470
GB-2 1/2	**3.967** 0.1562	**7.142** 0.2812	**3.973** 0.1564	**3.965** 0.1561	**7.074** 0.2785	**7.066** 0.2782
GB-3	**4.763** 0.1875	**8.733** 0.3438	**4.765** 0.1876	**4.757** 0.1873	**8.611** 0.3390	**8.603** 0.3387
GB-4	**6.350** 0.2500	**11.113** 0.4375	**6.353** 0.2501	**6.345** 0.2498	**10.993** 0.4328	**10.986** 0.4325
GB-5	**7.938** 0.3125	**12.700** 0.5000	**7.940** 0.3126	**7.932** 0.3123	**12.581** 0.4953	**12.573** 0.4950
GBH-5	**7.938** 0.3125	**14.288** 0.5625	**7.940** 0.3126	**7.932** 0.3123	**14.168** 0.5578	**14.161** 0.5575
GB-6	**9.525** 0.3750	**14.288** 0.5625	**9.528** 0.3751	**9.520** 0.3748	**14.168** 0.5578	**14.161** 0.5575
GBH-6	**9.525** 0.3750	**15.875** 0.6250	**9.528** 0.3751	**9.520** 0.3748	**15.756** 0.6203	**15.748** 0.6200
GB-7	**11.113** 0.4375	**15.875** 0.6250	**11.115** 0.4376	**11.107** 0.4373	**15.756** 0.6203	**15.748** 0.6200
GBH-7	**11.113** 0.4375	**17.463** 0.6875	**11.115** 0.4376	**11.107** 0.4373	**17.343** 0.6828	**17.336** 0.6825
GB-8	**12.700** 0.5000	**17.463** 0.6875	**12.703** 0.5001	**12.695** 0.4998	**17.343** 0.6828	**17.336** 0.6825
GBH-8	**12.700** 0.5000	**19.050** 0.7500	**12.703** 0.5001	**12.695** 0.4998	**18.931** 0.7453	**18.923** 0.7450
GB-9	**14.288** 0.5625	**19.050** 0.7500	**14.290** 0.5626	**14.282** 0.5623	**18.931** 0.7453	**18.923** 0.7450
GBH-9	**14.288** 0.5625	**20.638** 0.8125	**14.290** 0.5626	**14.282** 0.5623	**20.518** 0.8078	**20.511** 0.8075
GB-10	**15.875** 0.6250	**20.638** 0.8125	**14.878** 0.6251	**15.870** 0.6248	**20.518** 0.8078	**20.511** 0.8075
GBH-10	**15.875** 0.6250	**22.225** 0.8750	**14.878** 0.6251	**15.870** 0.6248	**22.106** 0.8703	**22.098** 0.8700
GB-11	**17.463** 0.6875	**22.225** 0.8750	**17.465** 0.6876	**17.457** 0.6873	**22.106** 0.8703	**22.098** 0.8700
GBH-11	**17.463** 0.6875	**23.813** 0.9375	**17.465** 0.6876	**17.457** 0.6873	**23.693** 0.9328	**23.686** 0.9325
GB-12	**19.050** 0.7500	**25.400** 1.0000	**19.053** 0.7501	**19.045** 0.7498	**25.281** 0.9953	**25.273** 0.9950
GBH-12	**19.050** 0.7500	**26.988** 1.0625	**19.053** 0.7501	**19.045** 0.7498	**26.868** 1.0578	**26.861** 1.0575
GB-13	**20.638** 0.8125	**26.988** 1.0625	**20.640** 0.8126	**20.632** 0.8123	**26.868** 1.0578	**26.861** 1.0575
GBH-13	**20.638** 0.8125	**28.575** 1.1250	**20.640** 0.8126	**20.632** 0.8123	**28.456** 1.1203	**28.448** 1.1200
GB-14	**22.225** 0.8750	**28.575** 1.1250	**22.228** 0.8751	**22.220** 0.8748	**28.456** 1.1203	**28.448** 1.1200
GBH-14	**22.225** 0.8750	**30.163** 1.1875	**22.228** 0.8751	**22.220** 0.8748	**30.046** 1.1829	**30.036** 1.1825
GB-15	**23.813** 0.9375	**30.163** 1.1875	**23.815** 0.9376	**23.807** 0.9373	**30.046** 1.1829	**30.036** 1.1825
GB-16	**25.400** 1.0000	**31.750** 1.2500	**25.403** 1.0001	**25.395** 0.9998	**31.633** 1.2454	**31.623** 1.2450
GBH-16	**25.400** 1.0000	**33.338** 1.3125	**25.403** 1.0001	**25.395** 0.9998	**33.221** 1.3079	**33.211** 1.3075
GB-17	**26.988** 1.0625	**33.338** 1.3125	**26.990** 1.0626	**26.982** 1.0623	**33.221** 1.3079	**33.211** 1.3075
GB-18	**28.575** 1.1250	**34.925** 1.3750	**28.578** 1.1251	**28.570** 1.1248	**34.808** 1.3704	**34.798** 1.3700
GBH-18	**28.575** 1.1250	**38.100** 1.5000	**28.578** 1.1251	**28.570** 1.1248	**37.986** 1.4955	**37.973** 1.4950
GB-19	**30.163** 1.1875	**38.100** 1.5000	**30.165** 1.1876	**30.157** 1.1873	**37.986** 1.4955	**37.973** 1.4950
GB-20	**31.750** 1.2500	**38.100** 1.5000	**31.753** 1.2501	**31.745** 1.2498	**37.986** 1.4955	**37.973** 1.4950
GBH-20	**31.750** 1.2500	**41.275** 1.6250	**31.753** 1.2501	**31.745** 1.2498	**41.161** 1.6205	**41.148** 1.6200
GB-21	**33.338** 1.3125	**41.275** 1.6250	**33.340** 1.3126	**33.332** 1.3123	**41.161** 1.6205	**41.148** 1.6200
GB-22	**34.925** 1.3750	**41.275** 1.6250	**34.925** 1.3750	**34.917** 1.3747	**41.161** 1.6205	**41.148** 1.6200
GBH-22	**34.925** 1.3750	**44.450** 1.7500	**34.925** 1.3750	**34.917** 1.3747	**44.336** 1.7455	**44.323** 1.7450
GB-24	**38.100** 1.5000	**47.625** 1.8750	**38.100** 1.5000	**38.092** 1.4997	**47.511** 1.8705	**47.498** 1.8700
GB-26	**41.275** 1.6250	**50.800** 2.0000	**41.275** 1.6250	**41.267** 1.6247	**50.686** 1.9955	**50.673** 1.9950
GB-28	**44.450** 1.7500	**53.975** 2.1250	**44.450** 1.7500	**44.442** 1.7497	**53.861** 2.1205	**53.848** 2.1200
GB-30	**47.625** 1.8750	**57.150** 2.2500	**47.625** 1.8750	**47.617** 1.8747	**57.036** 2.2455	**57.023** 2.2450
GB-32	**50.800** 2.0000	**60.325** 2.3750	**50.800** 2.0000	**50.792** 1.9997	**60.211** 2.3705	**60.198** 2.3700
GBH-33	**52.388** 2.0625	**64.293** 2.5312	**52.385** 2.0624	**52.377** 2.0621	**64.178** 2.5267	**64.166** 2.5262
GB-34	**53.975** 2.1250	**63.500** 2.5000	**53.973** 2.1249	**53.965** 2.1246	**63.386** 2.4955	**63.373** 2.4950
GB-36	**57.150** 2.2500	**66.675** 2.6250	**57.148** 2.2499	**57.140** 2.2496	**66.561** 2.6205	**66.548** 2.6200
GB-42	**66.675** 2.6250	**76.200** 3.0000	**66.670** 2.6248	**66.662** 2.6245	**76.088** 2.9956	**76.073** 2.9950
GB-44	**69.850** 2.7500	**79.375** 3.1250	**69.845** 2.7498	**69.837** 2.7495	**79.263** 3.1206	**79.248** 3.1200
GB-56	**88.900** 3.5000	**101.600** 4.0000	**88.895** 3.4998	**88.887** 3.4995	**101.488** 3.9956	**101.473** 3.9950

NOTE

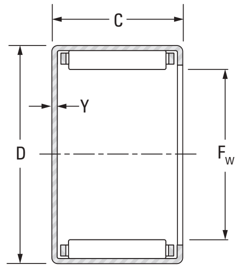
Check for availability as not every size may be in production.

CAGED BEARINGS – OPEN ENDS, CLOSED ONE END

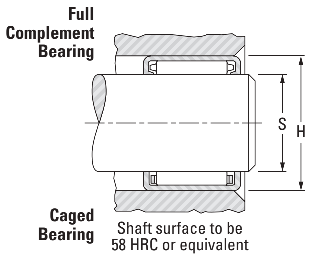
INCH SERIES
J, JH, MJ- 1, MJH- 1 SERIES



J, JH



MJ- 1, MJH- 1



Shaft Dia.	F_w	D	C	Y max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static						Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Grease	Oil	Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		kN	min^{-1}		**kg** lbs		**mm** in	**mm** in	**mm** in	**mm** in		
1/8	**3.175** 0.1250	**6.350** 0.2500	**4.78** 0.188	—	JP-23-F	—	**0.90** 200	**0.61** 140	0.100	33000	51000	**0.001** 0.001	—	**3.175** 0.1250	**3.167** 0.1247	**6.363** 0.2505	**6.350** 0.2500	Table B2-7	
	3.175 0.1250	**6.350** 0.2500	**6.35** 0.250	—	JP-24-F	—	**1.33** 300	**1.01** 230	0.150	33000	51000	**0.001** 0.001	—	**3.175** 0.1250	**3.167** 0.1247	**6.363** 0.2505	**6.350** 0.2500	Table B2-7	
5/32	**3.970** 0.1563	**7.142** 0.2812	**4.78** 0.188	—	JP-2 1/2 3F	—	**0.91** 200	**0.62** 140	0.110	31000	47000	**0.001** 0.001	—	**3.970** 0.1563	**3.962** 0.1560	**7.155** 0.2817	**7.142** 0.2812	Table B2-7	
3/16	**4.763** 0.1875	**8.733** 0.3438	**4.77** 0.188	—	JP-33-F	—	**1.07** 240	**0.73** 160	0.120	25000	38000	**0.001** 0.002	—	**4.763** 0.1875	**4.755** 0.1872	**8.730** 0.3437	**8.717** 0.3432	Table B2-7	
	4.763 0.1875	**8.733** 0.3438	**6.35** 0.250	—	JP-34-F	—	**1.72** 390	**1.34** 300	0.200	25000	38000	**0.001** 0.002	—	**4.763** 0.1875	**4.755** 0.1872	**8.730** 0.3437	**8.717** 0.3432	Table B2-7	
	4.763 0.1875	**8.733** 0.3438	**9.53** 0.375	**1.02** 0.040	J-36	MJ-361	**2.28** 510	**1.92** 430	0.290	25000	38000	**0.002** 0.004	**0.002** 0.005	**4.763** 0.1875	**4.755** 0.1872	**8.730** 0.3437	**8.717** 0.3432	Table B2-7	
1/4	**6.350** 0.2500	**11.113** 0.4375	**7.92** 0.312	**1.02** 0.040	J-45	MJ-451	**2.21** 500	**1.74** 390	0.300	20000	30000	**0.003** 0.006	**0.003** 0.007	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	Table B2-7	
	6.350 0.2500	**11.113** 0.4375	**11.13** 0.438	**1.02** 0.040	J-47	MJ-471	**3.40** 760	**3.01** 680	0.450	20000	30000	**0.004** 0.008	**0.004** 0.009	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	Table B2-7	
5/16	**7.938** 0.3125	**12.700** 0.5000	**7.92** 0.312	—	J-55	—	**2.40** 540	**2.01** 450	0.340	18000	28000	**0.003** 0.007	—	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	Table B2-7	
	7.938 0.3125	**12.700** 0.5000	**11.13** 0.438	**1.02** 0.040	J-57	MJ-571	**4.03** 910	**3.92** 880	0.590	18000	28000	**0.004** 0.009	**0.005** 0.011	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	Table B2-7	
	7.938 0.3125	**14.288** 0.5625	**11.13** 0.438	**1.02** 0.040	JH-57	MJH-571	**4.65** 1050	**3.76** 850	0.570	14000	22000	**0.006** 0.013	**0.007** 0.016	**7.938** 0.3125	**7.925** 0.3120	**14.300** 0.5630	**14.275** 0.5620	Table B2-7	
3/8	**9.525** 0.3750	**14.288** 0.5625	**7.92** 0.312	**1.02** 0.040	J-65	MJ-651	**2.73** 610	**2.49** 560	0.430	18000	27000	**0.004** 0.008	**0.004** 0.009	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-7	IRA-3
	9.525 0.3750	**14.288** 0.5625	**9.53** 0.375	**1.02** 0.040	J-66	MJ-661	**3.53** 790	**3.46** 780	0.530	18000	27000	**0.004** 0.009	**0.005** 0.010	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-7	IRA-3
	9.525 0.3750	**14.288** 0.5625	**12.70** 0.500	**1.02** 0.040	J-68	MJ-681	**5.22** 1170	**5.72** 1290	0.860	18000	27000	**0.005** 0.012	**0.006** 0.013	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-7	IRA-3
	9.525 0.3750	**15.875** 0.6250	**12.70** 0.500	—	JH-68	—	**6.59** 1480	**6.08** 1370	0.920	13000	20000	**0.008** 0.017	—	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	Table B2-7	IRA-3
7/16	**11.113** 0.4375	**15.875** 0.6250	**12.70** 0.500	**1.02** 0.040	J-78	MJ-781	**6.34** 1430	**7.67** 1720	1.15	17000	26000	**0.006** 0.014	**0.007** 0.016	**11.113** 0.4375	**11.100** 0.4370	**15.888** 0.6255	**15.862** 0.6245	Table B2-7	
	11.113 0.4375	**17.463** 0.6875	**12.70** 0.500	—	JH-78	—	**7.10** 1600	**6.89** 1550	1.05	13000	19000	**0.009** 0.019	—	**11.113** 0.4375	**11.100** 0.4370	**17.475** 0.6880	**17.450** 0.6870	Table B2-7	

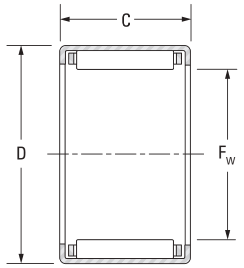
(1) IRA inner ring provides additional length if required.

Shaft Dia.	F_w	D	C	Y max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static						Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Grease	Oil	Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		kN	min^{-1}		**kg** lbs		**mm** in	**mm** in	**mm** in	**mm** in		
1/2	**12.700** 0.5000	**17.463** 0.6875	**7.92** 0.312	**1.02** 0.040	J-85	MJ-851	**3.46** 780	**3.66** 820	0.630	16000	25000	**0.005** 0.010	**0.005** 0.012	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-7	IRA-5
	12.700 0.5000	**17.463** 0.6875	**9.53** 0.375	**1.02** 0.040	J-86	MJ-861	**4.67** 1050	**5.39** 1210	0.830	16000	25000	**0.005** 0.011	**0.006** 0.013	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-7	IRA-5
	12.700 0.5000	**17.463** 0.6875	**12.70** 0.500	**1.02** 0.040	J-88	MJ-881	**6.32** 1420	**7.92** 1780	1.20	16000	25000	**0.007** 0.015	**0.008** 0.018	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-7	IRA-5
	12.700 0.5000	**17.463** 0.6875	**19.05** 0.750	—	J-812	—	**10.2** 2290	**14.7** 3300	2.25	16000	25000	**0.010** 0.023	—	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-7	
	12.700 0.5000	**19.050** 0.7500	**11.13** 0.438	**1.02** 0.040	JH-87	MJH-871	**6.39** 1440	**6.20** 1390	0.950	12000	19000	**0.009** 0.019	**0.010** 0.023	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-7	IRA-5
	12.700 0.5000	**19.050** 0.7500	**12.70** 0.500	**1.02** 0.040	JH-88	MJH-881	**7.56** 1700	**7.69** 1730	1.15	12000	19000	**0.010** 0.022	**0.012** 0.026	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-7	IRA-5
	12.700 0.5000	**19.050** 0.7500	**19.05** 0.750	—	JH-812	—	**12.3** 2770	**14.4** 3240	2.25	12000	19000	**0.015** 0.032	—	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-7	
9/16	**14.288** 0.5625	**19.050** 0.750	**11.13** 0.438	**1.02** 0.040	J-97	MJ-971	**5.47** 1230	**6.80** 1530	1.05	16000	25000	**0.007** 0.016	**0.009** 0.019	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-7	IR-68
	14.288 0.5625	**19.050** 0.7500	**12.70** 0.500	**1.02** 0.040	J-98	MJ-981	**6.23** 1400	**8.03** 1810	1.20	16000	25000	**0.008** 0.017	**0.009** 0.020	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-7	IR-68
	14.288 0.5625	**19.050** 0.7500	**15.88** 0.625	—	J-910	—	**8.27** 1860	**11.6** 2610	1.75	16000	25000	**0.010** 0.021	—	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-7	IR-612(1)
	14.288 0.5625	**20.638** 0.8125	**12.70** 0.500	**1.02** 0.040	JH-98	MJH-981	**7.98** 1790	**8.49** 1910	1.30	12000	18000	**0.011** 0.025	**0.014** 0.030	**14.288** 0.5625	**14.275** 0.5620	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-68
5/8	**15.875** 0.6250	**20.638** 0.8125	**12.70** 0.500	**1.02** 0.040	J-108	MJ-1081	**6.71** 1510	**9.13** 2050	1.40	13000	21000	**0.009** 0.019	**0.010** 0.023	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-68-1
	15.875 0.6250	**20.638** 0.8125	**15.88** 0.625	**1.02** 0.040	J-1010	MJ-10101	**8.80** 1980	**12.9** 2900	1.95	13000	21000	**0.010** 0.023	**0.013** 0.028	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-612-1
	15.875 0.6250	**20.638** 0.8125	**19.05** 0.750	**1.02** 0.040	J-1012	MJ-10121	**11.8** 2650	**18.9** 4250	2.90	13000	21000	**0.013** 0.028	**0.015** 0.033	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-7	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**15.88** 0.625	**1.02** 0.040	JH-1010	MJH-10101	**11.6** 2610	**14.1** 3170	2.15	14000	21000	**0.015** 0.032	**0.017** 0.037	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**25.40** 1.000	**1.02** 0.040	JH-1016	MJH-10161	**19.8** 4450	**28.1** 6320	4.35	14000	21000	**0.024** 0.052	**0.028** 0.062	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	
11/16	**17.463** 0.6875	**22.212** 0.8745	**19.05** 0.750	**1.02** 0.040	J-1112	MJ-11121	**12.5** 2800	**20.9** 4700	3.20	12000	19000	**0.014** 0.030	**0.016** 0.036	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-7	
	17.463 0.6875	**23.813** 0.9375	**15.88** 0.625	**1.02** 0.040	JH-1110	MJH-11101	**12.1** 2710	**15.2** 3420	2.30	13000	19000	**0.016** 0.035	**0.019** 0.042	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-7	
	17.463 0.6875	**23.813** 0.9375	**19.05** 0.750	—	JH-1112	—	**16.1** 3620	**22.2** 4990	3.10	13000	19000	**0.019** 0.042	—	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-7	
3/4	**19.050** 0.7500	**25.400** 1.0000	**9.53** 0.375	—	J-126	—	**6.49** 1460	**7.05** 1580	1.10	11000	18000	**0.010** 0.022	—	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-7	IR-88
	19.050 0.7500	**25.400** 1.0000	**12.70** 0.500	—	J-128	—	**9.94** 2230	**12.2** 2740	1.85	11000	18000	**0.014** 0.030	—	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-7	IR-88
	19.050 0.7500	**25.400** 1.0000	**15.88** 0.625	**1.02** 0.040	J-1210	MJ-12101	**12.5** 2810	**16.3** 3670	2.50	11000	18000	**0.017** 0.038	**0.020** 0.045	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-7	IR-812(1)
	19.050 0.7500	**25.400** 1.0000	**19.05** 0.750	**1.02** 0.040	J-1212	MJ-12121	**15.5** 3490	**21.6** 4860	3.35	11000	18000	**0.020** 0.045	**0.025** 0.054	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-7	IR-812(1)
	19.050 0.7500	**26.988** 1.0625	**19.05** 0.750	**1.02** 0.040	JH-1212	MJH-12121	**19.1** 4290	**23.6** 5300	3.70	12000	18000	**0.026** 0.058	**0.031** 0.069	**19.050** 0.7500	**19.037** 0.7495	**27.000** 1.0630	**26.975** 1.0620	Table B2-7	IR-812(1)

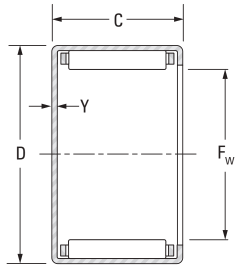
Continued on next page.

CAGED BEARINGS – OPEN ENDS, CLOSED ONE END

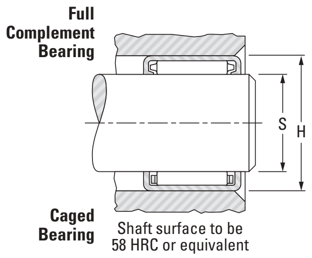
INCH SERIES
J, JH, MJ- 1, MJH- 1 SERIES



J, JH



MJ- 1, MJH- 1

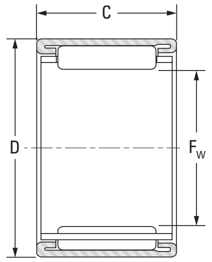


Shaft Dia.	F_w	D	C	Y max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static						Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Grease	Oil	Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		kN	min^{-1}		**kg** lbs		**mm** in	**mm** in	**mm** in	**mm** in		
$^{13}/_{16}$	**20.638** 0.8125	**26.988** 1.0625	**22.23** 0.875	—	J-1314	—	**19.3** 4340	**29.31** 6590	4.55	10000	16000	**0.025** 0.056	—	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-7	
	20.638 0.8125	**28.575** 1.1250	**19.05** 0.750	**1.27** 0.050	JH-1312	MJH-13121	**18.8** 4220	**24.5** 5510	3.85	11000	16000	**0.028** 0.062	**0.034** 0.074	**20.638** 0.8125	**20.625** 0.8120	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	
$^{7}/_{8}$	**22.225** 0.8750	**28.575** 1.1250	**9.53** 0.375	—	J-146	—	**7.20** 1620	**8.43** 1900	1.30	9700	15000	**0.012** 0.026	—	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	IR-1012(1)
	22.225 0.8750	**28.575** 1.1250	**12.70** 0.500	—	J-148	—	**10.9** 2460	**14.5** 3260	2.20	9700	15000	**0.015** 0.034	—	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	IR-1012(1)
	22.225 0.8750	**28.575** 1.1250	**19.05** 0.750	**1.02** 0.040	J-1412	MJ-14121	**17.9** 4020	**24.5** 5510	4.20	9700	15000	**0.024** 0.052	**0.028** 0.062	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	IR-1012(1)
	22.225 0.8750	**28.575** 1.1250	**25.40** 1.000	**1.02** 0.040	J-1416	MJ-14161	**23.7** 5320	**39.0** 8760	6.05	9700	15000	**0.031** 0.069	**0.059** 0.129	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-7	IR-1016
	22.225 0.8750	**30.163** 1.1875	**19.05** 0.750	**1.27** 0.050	JH-1412	MJH-14121	**18.3** 4120	**24.5** 5510	3.75	9800	15000	**0.030** 0.066	**0.036** 0.079	**22.225** 0.8750	**22.212** 0.8745	**30.175** 1.1880	**30.150** 1.1870	Table B2-7	IR-1012(1)
	22.225 0.8750	**30.163** 1.1875	**25.40** 1.000	**1.27** 0.050	JH-1416	MJH-14161	**25.4** 5710	**37.4** 8400	5.80	9800	15000	**0.040** 0.089	**0.048** 0.106	**22.225** 0.8750	**22.212** 0.8745	**30.175** 1.1880	**30.150** 1.1870	Table B2-7	IR-1016
1	**25.400** 1.0000	**31.750** 1.2500	**19.05** 0.750	—	J-1612	—	**18.1** 4070	**28.8** 6480	4.45	8400	13000	**0.026** 0.058	—	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	Table B2-7	IR-1212
	25.400 1.0000	**31.750** 1.2500	**25.40** 1.000	**1.02** 0.040	J-1616	MJ-16161	**25.0** 5610	**43.4** 9760	6.75	8400	13000	**0.035** 0.077	**0.042** 0.092	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	Table B2-7	IR-1216(1)
	25.400 1.0000	**33.338** 1.3125	**19.05** 0.750	**1.27** 0.050	JH-1612	MJH-16121	**20.7** 4650	**29.6** 6650	4.60	8500	13000	**0.034** 0.074	**0.040** 0.088	**25.400** 1.0000	**25.387** 0.9995	**33.350** 1.3130	**33.325** 1.3120	Table B2-7	IR-1212
	25.400 1.0000	**33.338** 1.3125	**25.40** 1.000	**1.27** 0.050	JH-1616	MJH-16161	**27.6** 6200	**42.9** 9640	6.65	8500	13000	**0.045** 0.099	**0.054** 0.119	**25.400** 1.0000	**25.387** 0.9995	**33.350** 1.3130	**33.325** 1.3120	Table B2-7	IR-1216(1)
$1\,^{1}/_{8}$	**28.575** 1.1250	**34.925** 1.3750	**12.70** 0.500	**1.02** 0.040	J-188	MJ-1881	**11.7** 2620	**16.9** 3800	2.55	7400	11000	**0.020** 0.043	**0.023** 0.050	**28.575** 1.1250	**28.562** 1.1245	**34.938** 1.3755	**34.912** 1.3745	Table B2-7	IR-1416(1)
	28.575 1.1250	**34.925** 1.3750	**19.05** 0.750	**1.02** 0.040	J-1812	MJ-18121	**19.0** 4280	**31.8** 7140	4.90	7400	11000	**0.029** 0.064	**0.035** 0.076	**28.575** 1.1250	**28.562** 1.1245	**34.938** 1.3755	**34.912** 1.3745	Table B2-7	IR-1416(1)
	28.575 1.1250	**34.925** 1.3750	**25.40** 1.000	**1.02** 0.040	J-1816	MJ-18161	**26.2** 5880	**47.8** 10750	7.40	7400	11000	**0.039** 0.086	**0.047** 0.103	**28.575** 1.1250	**28.562** 1.1245	**34.938** 1.3755	**34.912** 1.3745	Table B2-7	IR-1416(1)
	28.575 1.1250	**38.100** 1.5000	**19.05** 0.750	**1.27** 0.050	JH-1812	MJH-18121	**23.3** 5240	**31.3** 7040	4.75	7600	12000	**0.046** 0.101	**0.055** 0.121	**28.575** 1.1250	**28.562** 1.1245	**38.113** 1.5005	**38.087** 1.4995	Table B2-7	IR-1416(1)
	28.575 1.1250	**38.100** 1.5000	**25.40** 1.000	**1.27** 0.050	JH-1816	MJH-18161	**33.1** 7450	**49.2** 11060	7.70	7600	12000	**0.061** 0.135	**0.074** 0.162	**28.575** 1.1250	**28.562** 1.1245	**38.113** 1.5005	**38.087** 1.4995	Table B2-7	IR-1416(1)
$1\,^{1}/_{8}$	**28.575** 1.1250	**38.100** 1.5000	**28.58** 1.125	**1.27** 0.050	JH-1818	MJH-18181	**36.3** 8160	**55.3** 12430	8.60	7600	12000	**0.069** 0.152	**0.082** 0.181	**28.575** 1.1250	**28.562** 1.1245	**38.113** 1.5005	**38.087** 1.4995	Table B2-7	
$1\,^{1}/_{4}$	**31.750** 1.2500	**38.100** 1.5000	**19.05** 0.750	**1.02** 0.040	J-2012	MJ-20121	**19.8** 4460	**34.7** 7800	5.35	6600	10000	**0.036** 0.080	**0.043** 0.095	**31.750** 1.2500	**31.737** 1.2495	**38.113** 1.5005	**38.087** 1.4995	Table B2-7	IR-1612
	31.750 1.2500	**38.100** 1.5000	**25.40** 1.000	**1.02** 0.040	J-2016	MJ-20161	**28.8** 6480	**56.3** 12660	8.70	6600	10000	**0.043** 0.094	**0.051** 0.113	**31.750** 1.2500	**31.737** 1.2495	**38.113** 1.5005	**38.087** 1.4995	Table B2-7	IR-1616(1)
	31.750 1.2500	**41.275** 1.6250	**19.05** 0.750	—	JH-2012	—	**24.1** 5420	**34.0** 7640	5.80	6800	10000	**0.050** 0.111	—	**31.750** 1.2500	**31.737** 1.2495	**41.288** 1.6255	**41.262** 1.6245	Table B2-7	IR-1612
	31.750 1.2500	**41.275** 1.6250	**25.40** 1.000	—	JH-2016	—	**34.0** 7640	**52.8** 11870	8.20	6800	10000	**0.067** 0.148	—	**31.750** 1.2500	**31.737** 1.2495	**41.288** 1.6255	**41.262** 1.6245	Table B2-7	IR-1616(1)
	31.750 1.2500	**41.275** 1.6250	**31.75** 1.250	—	JH-2020	—	**43.4** 9750	**72.3** 16250	10.8	6800	10000	**0.084** 0.185	—	**31.750** 1.2500	**31.737** 1.2495	**41.288** 1.6255	**41.262** 1.6245	Table B2-7	
$1\,^{3}/_{8}$	**34.925** 1.3750	**41.275** 1.6250	**12.70** 0.500	**1.02** 0.040	J-228	MJ-2281	**14.0** 3140	**22.9** 5150	3.50	6000	9200	**0.024** 0.052	**0.028** 0.062	**34.925** 1.3750	**34.912** 1.3745	**41.288** 1.6255	**41.262** 1.6245	Table B2-7	IR-1812
	34.925 1.3750	**41.275** 1.6250	**19.05** 0.750	—	J-2212	—	**22.8** 5130	**43.0** 9660	6.65	6000	9200	**0.035** 0.077	—	**34.925** 1.3750	**34.912** 1.3745	**41.288** 1.6255	**41.262** 1.6245	Table B2-7	IR-1812
	34.925 1.3750	**44.450** 1.7500	**19.05** 0.750	**1.27** 0.050	JH-2212	MJH-22121	**26.2** 5900	**38.4** 8640	5.90	6100	9400	**0.055** 0.121	**0.065** 0.144	**34.925** 1.3750	**34.912** 1.3745	**44.463** 1.7505	**44.437** 1.7495	Table B2-7	IR-1812
	34.925 1.3750	**44.450** 1.7500	**25.40** 1.000	**1.27** 0.050	JH-2216	MJH-22161	**36.5** 8210	**58.8** 13220	9.20	6100	9400	**0.073** 0.161	**0.087** 0.192	**34.925** 1.3750	**34.912** 1.3745	**44.463** 1.7505	**44.437** 1.7495	Table B2-7	IR-1816
$1\,^{1}/_{2}$	**38.100** 1.5000	**47.625** 1.8750	**19.05** 0.750	**1.27** 0.050	J-2412	MJ-24121	**29.9** 6720	**47.1** 10590	7.40	5600	8600	**0.059** 0.131	**0.094** 0.208	**38.100** 1.5000	**38.087** 1.4995	**47.638** 1.8755	**47.612** 1.8745	Table B2-7	IR-1916
	38.100 1.5000	**47.625** 1.8750	**25.40** 1.000	**1.27** 0.050	J-2416	MJ-24161	**39.3** 8840	**66.9** 15040	10.4	5600	8600	**0.079** 0.174	**0.094** 0.208	**38.100** 1.5000	**38.087** 1.4995	**47.638** 1.8755	**47.612** 1.8745	Table B2-7	IR-1916
	38.100 1.5000	**47.625** 1.8750	**31.75** 1.250	—	J-2420	—	**49.5** 11130	**90.0** 20230	14.0	5600	8600	**0.099** 0.218	—	**38.100** 1.5000	**38.087** 1.4995	**47.638** 1.8755	**47.612** 1.8745	Table B2-7	IR-1920
$1\,^{5}/_{8}$	**41.275** 1.6250	**50.800** 2.0000	**15.88** 0.625	—	J-2610	—	**26.1** 5870	**41.0** 9210	6.25	5100	7900	**0.053** 0.117	—	**41.275** 1.6250	**41.262** 1.6245	**50.813** 2.0005	**50.787** 1.9995	Table B2-7	IR-2020(1)
	41.275 1.6250	**50.800** 2.0000	**25.40** 1.000	**1.27** 0.050	J-2616	M-26161	**39.3** 8830	**69.0** 15500	10.8	5100	7900	**0.085** 0.187	**0.101** 0.223	**41.275** 1.6250	**41.262** 1.6245	**50.813** 2.0005	**50.787** 1.9995	Table B2-7	IR-2020(1)
$1\,^{3}/_{4}$	**44.450** 1.7500	**53.975** 2.1250	**19.05** 0.750	**1.27** 0.050	J-2812	MJ-28121	**29.6** 6650	**49.3** 11080	7.45	4700	7300	**0.068** 0.150	**0.081** 0.179	**44.450** 1.7500	**44.437** 1.7495	**53.988** 2.1255	**53.962** 2.1245	Table B2-7	IR-2316
	44.450 1.7500	**53.975** 2.1250	**25.40** 1.000	**1.27** 0.050	J-2816	MJ-28161	**40.1** 9010	**72.9** 16390	11.4	4700	7300	**0.091** 0.200	**0.108** 0.239	**44.450** 1.7500	**44.437** 1.7495	**53.988** 2.1255	**53.962** 2.1245	Table B2-7	IR-2316
	44.450 1.7500	**53.975** 2.1250	**38.10** 1.500	**1.27** 0.050	J-2824	MJ-28241	**59.8** 13440	**122** 27400	18.9	4700	7300	**0.136** 0.300	**0.162** 0.358	**44.450** 1.7500	**44.437** 1.7495	**53.988** 2.1255	**53.962** 2.1245	Table B2-7	IR-2324
$1\,^{7}/_{8}$	**47.625** 1.8750	**57.150** 2.2500	**25.40** 1.000	**1.27** 0.050	J-3016	MJ-30161	**41.1** 9240	**76.0** 17080	11.9	4400	6800	**0.097** 0.213	**0.115** 0.254	**47.625** 1.8750	**47.612** 1.8745	**57.163** 2.2505	**57.137** 2.2495	Table B2-7	
2	**50.800** 2.0000	**60.325** 2.3750	**25.40** 1.000	**1.27** 0.050	J-3216	MJ-32161	**42.4** 9530	**81.2** 18250	12.7	4100	6300	**0.103** 0.226	**0.137** 0.301	**50.800** 2.0000	**50.785** 1.9994	**60.338** 2.3755	**60.312** 2.3745	Table B2-7	
$2\,^{1}/_{4}$	**57.150** 2.2500	**66.675** 2.6250	**19.05** 0.750	—	J-3612	—	**35.4** 7960	**65.9** 14810	10.0	3600	5600	**0.086** 0.189	—	**57.150** 2.2500	**57.135** 2.2494	**66.688** 2.6255	**66.662** 2.6245	Table B2-7	
	57.150 2.2500	**66.675** 2.6250	**25.40** 1.000	—	J-3616	—	**46.1** 10360	**92.3** 20750	14.4	3600	5600	**0.114** 0.252	—	**57.150** 2.2500	**57.135** 2.2494	**66.688** 2.6255	**66.662** 2.6245	Table B2-7	
$2\,^{3}/_{4}$	**69.850** 2.7500	**79.375** 3.1250	**19.05** 0.750	—	J-4412	—	**36.2** 8140	**72.9** 16390	11.3	2900	4500	**0.103** 0.227	—	**69.850** 2.7500	**69.835** 2.7494	**79.388** 3.1255	**79.362** 3.1245	Table B2-7	IR-4016

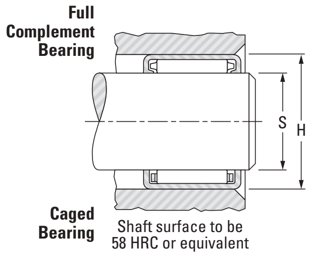
(1) IRA inner ring provides additional length if required.

CAGED BEARINGS – OPEN ENDS

INCH SERIES
BT SERIES



BT



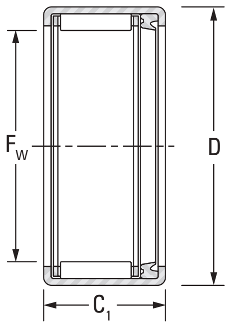
Shaft Dia.	F$_w$	D	C	Y max.	Bearing Designation	Load Ratings		Fatigue Load Limit C$_u$	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-74 to B-2-76)
						Dynamic	Static					Shaft		Housing			
			+0 +0.000 **-0.3** -0.012		Open Ends	C	C$_0$		Grease	Oil	Open Ends	Max.	Min.	Max.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in		
$^{11}/_{16}$	**17.462** 0.6870	**22.225** 0.875	**19.05** 0.750	—	BT1112-1	**12.7** 2850	**21.2** 4770	3.30	12000	19000	**0.015** 0.033	**17.462** 0.6875	**17.451** 0.6870	**22.237** 0.8755	**22.216** 0.8746	Table B2-8	—
$^{7}/_{8}$	**22.225** 0.875	**28.575** 1.125	**9.525** 0.375	—	BT146P	**7.05** 1580	**8.55** 1920	1.35	9800	15000	**0.012** 0.027	**22.225** 0.8750	**22.212** 0.8745	**28.587** 1.1255	**28.566** 1.1246	Table B2-8	—
1	**25.400** 1.0000	**31.750** 1.250	**9.525** 0.375	—	BT166	**7.45** 1670	**9.50** 2140	1.50	8500	13000	**0.014** 0.031	**25.400** 1.0000	**25.387** 0.9995	**31.764** 1.2506	**31.739** 1.2496	Table B2-8	—
1 $^{1}/_{8}$	**28.575** 1.125	**34.925** 1.375	**12.70** 0.500	—	BT188	**13.1** 2940	**20.3** 4560	3.10	7200	11000	**0.021** 0.047	**28.575** 1.1250	**28.562** 1.1245	**34.939** 1.3756	**34.914** 1.3746	Table B2-8	—
1 $^{3}/_{16}$	**30.162** 1.187	**38.100** 1.500	**25.40** 1.000	—	BT1916M	**31.5** 7080	**51.9** 11670	8.15	7200	11000	**0.054** 0.119	**30.162** 1.1875	**30.146** 1.1869	**38.114** 1.5006	**38.089** 1.4996	Table B2-8	—
1 $^{1}/_{4}$	**31.750** 1.250	**38.100** 1.500	**19.05** 0.750	—	BT2012	**21.2** 4770	**38.7** 8700	6.00	6500	10000	**0.035** 0.077	**31.750** 1.2500	**31.734** 1.2494	**38.114** 1.5006	**38.089** 1.4996	Table B2-8	—
1 $^{5}/_{8}$	**41.275** 1.625	**50.800** 2.000	**22.225** 0.875	—	BT2614	**34.1** 7670	**56.9** 12790	9.00	5100	7900	**0.082** 0.180	**41.275** 1.6250	**41.259** 1.6244	**50.818** 2.0007	**50.788** 1.9995	Table B2-8	—
1 $^{7}/_{8}$	**47.625** 1.875	**57.150** 2.250	**15.875** 0.625	—	BT3010-1	**25.2** 5660	**40.1** 9010	6.20	4400	6800	**0.064** 0.140	**47.625** 1.8750	**47.609** 1.8744	**57.168** 2.2507	**57.138** 2.2495	Table B2-8	—

NOTES

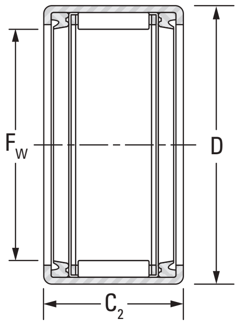
SEALED DRAWN CUP BEARINGS

INCH SERIES

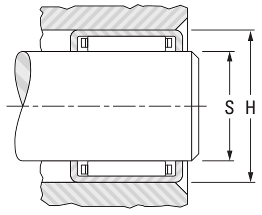
- Check for availability. Not all bearings are in production.
- Pre-packed with general purpose ball and roller bearing grease unless otherwise specified.
- Bearing operating temperature limited between -30° C and +110° C (-25° F and +225° F).
- Consult your representative for operating temperatures outside the above range or if seals have been exposed to unusual fluids.
- Speed rating based on shaft contact speed of 610 m/min. (2000 fpm).
- Reduce the listed speed rating by one-half for outer ring rotation.



JT – One Seal



JTT – Two Seals



Shaft surface to be 58 HRC or equivalent

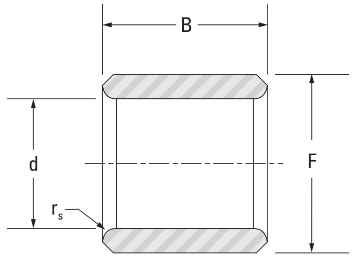
Drawn cup bearings of nominal inch dimensions, with one closed end, that are not tabulated, may be made available upon request.

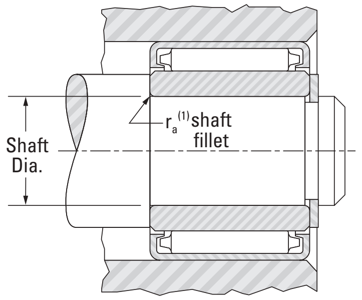
Mounting dimensions are based on the inner ring rotating and the outer ring being stationary, relative to the load. The housing should be of high strength material.

Shaft Dia.	F_w	D	Bearings With One Seal			Bearings With Two Seals			Load Ratings		Fatigue Load Limit C_u	Approx. Speed Rating (Grease)	Mounting Dimensions				Inspection			Shaft Dia.
			C_1 **+0** +0.000 **-0.3** -0.010	Bearing Designation	Approx. Wt.	C_2 **+0** +0.000 **-0.3** -0.010	Bearing Designation	Approx. Wt.	Dynamic	Static			S		H		Ring Gage	Plug Gage		
									C	C_0			Max.	Min.	Max.	Min.		go	no go	
in	**mm** in	**mm** in	**mm** in		**kg** lbs			**kg** lbs	**kN** lbf		kN	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in				in
$^5/_{16}$	**7.938** 0.3125	**12.700** 0.5000	**9.53** 0.375	JT-56	**0.004** 0.008	**11.13** 0.438	JTT-57	**0.004** 0.009	**2.40** 540	**2.00** 450	0.340	18000	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	**12.713** 0.5005	**7.976** 0.3140	**8.001** 0.3150	$^5/_{16}$
	7.938 0.3125	**12.700** 0.5000	—	—	—	**14.27** 0.562	JTT-59	**0.005** 0.012	**4.05** 910	**3.91** 880	0.590	18000	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	**12.713** 0.5005	**7.976** 0.3140	**8.001** 0.3150	
$^3/_8$	**9.525** 0.3750	**14.288** 0.5625	**9.53** 0.375	JT-66	**0.004** 0.009	**11.13** 0.438	JTT-67	**0.005** 0.011	**2.74** 615	**2.49** 560	0.430	18000	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	**14.300** 0.5630	**9.563** 0.3765	**9.589** 0.3775	$^3/_8$
	9.525 0.3750	**14.288** 0.5625	**14.27** 0.562	JT-69	**0.006** 0.014	—	—	—	**5.20** 1 170	**5.74** 1 290	0.860	18000	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	**14.300** 0.5630	**9.563** 0.3765	**9.589** 0.3775	
$^1/_2$	**12.700** 0.5000	**17.463** 0.6875	**9.53** 0.375	JT-86	**0.005** 0.012	**11.13** 0.438	JTT-87	**0.006** 0.013	**3.47** 780	**3.65** 820	0.630	15000	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	**17.475** 0.6880	**12.738** 0.5015	**12.764** 0.5025	$^1/_2$
	12.700 0.5000	**17.463** 0.6875	**14.27** 0.562	JT-89	**0.008** 0.017	**15.88** 0.625	JTT-810	**0.009** 0.019	**6.32** 1 420	**7.92** 1 780	1.20	15000	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	**17.475** 0.6880	**12.738** 0.5015	**12.764** 0.5025	
	12.700 0.5000	**17.463** 0.6875	—	—	—	**22.23** 0.875	JTT-814	**0.012** 0.027	**10.2** 2 300	**14.7** 3 310	2.25	15000	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	**17.475** 0.6880	**12.738** 0.5015	**12.764** 0.5025	
$^9/_{16}$	**14.288** 0.5625	**19.050** 0.7500	**14.27** 0.562	JT-99	**0.009** 0.019	**15.88** 0.625	JTT-910	**0.010** 0.021	**6.23** 1 400	**8.01** 1 800	1.20	14000	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	**19.063** 0.7505	**14.326** 0.5640	**14.351** 0.5650	$^9/_{16}$
	14.288 0.5625	**19.050** 0.7500	—	—	—	**19.05** 0.750	JTT-912	**0.011** 0.025	**8.18** 1 840	**11.4** 2 560	1.70	14000	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	**19.063** 0.7505	**14.326** 0.5640	**14.351** 0.5650	
$^5/_8$	**15.875** 0.6250	**20.638** 0.8125	**14.27** 0.562	JT-109	**0.010** 0.021	**15.88** 0.625	JTT-1010	**0.010** 0.023	**6.72** 1 510	**9.12** 2 050	1.40	12000	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	**20.650** 0.8130	**15.913** 0.6265	**15.939** 0.6275	$^5/_8$
	15.875 0.6250	**20.638** 0.8125	—	—	—	**19.05** 0.750	JTT-1012	**0.013** 0.028	**8.81** 1 980	**12.9** 2 910	1.95	12000	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	**20.650** 0.8130	**15.913** 0.6265	**15.939** 0.6275	
	15.875 0.6250	**20.638** 0.8125	—	—	—	**22.23** 0.875	JTT-1014	**0.015** 0.032	**11.7** 2 640	**18.9** 4 240	2.90	12000	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	**20.650** 0.8130	**15.913** 0.6265	**15.939** 0.6275	
$^{11}/_{16}$	**17.463** 0.6875	**22.225** 0.8750	—	—	—	**22.23** 0.875	JTT-1114	**0.016** 0.035	**12.5** 2 800	**20.9** 4 700	3.20	11000	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	**22.238** 0.8755	**17.501** 0.6890	**17.526** 0.6900	$^{11}/_{16}$
$^3/_4$	**19.050** 0.7500	**25.400** 1.0000	**14.27** 0.562	JT-129	**0.015** 0.034	**15.88** 0.625	JTT-1210	**0.017** 0.038	**9.92** 2 230	**12.2** 2 740	1.85	10000	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**25.387** 0.9995	**19.063** 0.7505	**19.088** 0.7515	$^3/_4$
	19.050 0.7500	**25.400** 1.0000	**17.48** 0.688	JT-1211	**0.019** 0.041	—	—	—	**12.5** 2 810	**16.3** 3 670	2.50	10000	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**25.387** 0.9995	**19.063** 0.7505	**19.088** 0.7515	
	19.050 0.7500	**25.400** 1.0000	**20.62** 0.812	JT-1213	**0.022** 0.049	**22.23** 0.875	JTT-1214	**0.024** 0.053	**15.5** 3 490	**21.6** 4 860	3.35	10000	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**25.387** 0.9995	**19.063** 0.7505	**19.088** 0.7515	
$^7/_8$	**22.225** 0.8750	**28.575** 1.1250	**14.27** 0.562	JT-149	**0.018** 0.039	**15.88** 0.625	JTT-1410	**0.020** 0.043	**10.9** 2 460	**14.5** 3 260	2.20	8700	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	**28.562** 1.1245	**22.238** 0.8755	**22.263** 0.8765	$^7/_8$
	22.225 0.8750	**28.575** 1.1250	**26.97** 1.062	JT-1417	**0.033** 0.073	—	—	—	**23.7** 5 320	**39.0** 8 760	6.05	8700	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	**28.562** 1.1245	**22.238** 0.8755	**22.263** 0.8765	
1	**25.400** 1.0000	**31.750** 1.2500	**20.62** 0.812	JT-1613	**0.029** 0.063	**22.23** 0.875	JTT-1614	**0.031** 0.068	**18.1** 4 080	**28.8** 6 480	4.45	7600	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	**31.737** 1.2495	**25.413** 1.0005	**25.438** 1.0015	1
1 $^1/_8$	**28.575** 1.1250	**34.925** 1.3750	**20.62** 0.812	JT-1813	**0.032** 0.070	**22.23** 0.875	JTT-1814	**0.034** 0.075	**19.0** 4 280	**31.8** 7 140	4.90	6800	**28.575** 1.1250	**28.562** 1.1245	**34.938** 1.3755	**34.912** 1.3745	**34.912** 1.3745	**28.588** 1.1255	**28.613** 1.1265	1 $^1/_8$
1 $^1/_4$	**31.750** 1.2500	**38.100** 1.5000	**20.62** 0.812	JT-2013	**0.035** 0.077	—	—	—	**19.8** 4 460	**34.7** 7 800	5.35	6100	**31.750** 1.2500	**31.737** 1.2495	**38.113** 1.5005	**38.087** 1.4995	**38.087** 1.4995	**31.763** 1.2505	**31.788** 1.2515	1 $^1/_4$
	31.750 1.2500	**38.100** 1.5000	—	—	—	**28.58** 1.125	JTT-2018	**0.048** 0.106	**28.8** 6 480	**56.5** 12 700	8.70	6100	**31.750** 1.2500	**31.737** 1.2495	**38.113** 1.5005	**38.087** 1.4995	**38.087** 1.4995	**31.763** 1.2505	**31.788** 1.2515	
1 $^1/_2$	**38.100** 1.5000	**47.625** 1.8750	**33.32** 1.312	JT-2421	**0.104** 0.229	—	—	—	**49.4** 11 100	**89.9** 20 200	14.0	5100	**38.100** 1.5000	**38.087** 1.4995	**47.638** 1.8755	**47.612** 1.8745	**47.612** 1.8745	**38.113** 1.5005	**38.143** 1.5017	1 $^1/_2$

INNER RINGS FOR INCH SERIES DRAWN CUP BEARINGS

- Check for availability.
- Ideal choice when shaft is not practical to use as inner raceway.
- Provided in inch (IR, IRA) nominal dimensions for use with inch series drawn cup bearings.
- Designed to meet established inch tolerances.
- Designed to be wider than matching drawn cup bearing.
- Maximum shaft fillet radius ($r_{a\,max.}$) cannot exceed inner ring bore chamfer ($r_{s\,min.}$) as shown.
- Optional centralized lubrication groove (bore) and thru-hole available – specify when ordering.
- Designed to provide a loose transition fit on the shaft and should be axially clamped against a shoulder.
- If a tight transition fit must be used to keep the inner ring from rotating relative to the shaft, the inner ring O.D. must not exceed the raceway diameter for the matching drawn cup bearing after being mounted on the shaft.
- See tables for bearing raceway diameter dimensions.
- After mounting, if O.D. of inner ring exceeds required raceway diameter for matching bearing, ring should be ground to proper diameter while mounted on shaft.





Shaft Dia.	d		F		B		$r_{s\,min.}$	Inner Ring Designation	Mounting Dimensions Transition Fit				Approx. Wt.
									Loose		Tight		
	Max.	Min.	Max.	Min.	Max.	Min.	Min.		Max.	Min.	Max.	Min.	
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	kg lbs
3/16	**4.826** 0.1900	**4.813** 0.1895	**9.525** 0.3750	**9.512** 0.3745	**13.61** 0.536	**13.36** 0.526	**0.64** 0.025	IRA-3	**4.818** 0.1897	**4.806** 0.1892	**4.829** 0.1901	**4.816** 0.1896	**0.005** 0.012
1/4	**6.350** 0.2500	**6.337** 0.2495	**11.113** 0.4375	**11.100** 0.4370	**13.61** 0.536	**13.36** 0.526	**0.64** 0.025	IRA-4	**6.342** 0.2497	**6.330** 0.2492	**6.353** 0.2501	**6.340** 0.2496	**0.006** 0.014
5/16	**7.938** 0.3125	**7.925** 0.3120	**12.700** 0.5000	**12.687** 0.4995	**13.61** 0.536	**13.36** 0.526	**0.64** 0.025	IRA-5	**7.930** 0.3122	**7.917** 0.3117	**7.940** 0.3126	**7.927** 0.3121	**0.008** 0.017
3/8	**9.525** 0.3750	**9.512** 0.3745	**14.288** 0.5625	**14.275** 0.5620	**13.08** 0.515	**12.83** 0.505	**0.64** 0.025	IR-68	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.009** 0.019
	9.525 0.3750	**9.512** 0.3745	**14.288** 0.5625	**14.275** 0.5620	**19.43** 0.765	**19.18** 0.755	**0.64** 0.025	IR-612	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.013** 0.028
	9.525 0.3750	**9.512** 0.3745	**14.288** 0.5625	**14.275** 0.5620	**19.96** 0.786	**19.71** 0.776	**0.64** 0.025	IRA-6	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.013** 0.029
	9.525 0.3750	**9.512** 0.3745	**15.875** 0.6250	**15.862** 0.6245	**13.08** 0.515	**12.83** 0.505	**0.64** 0.025	IR-68-1	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.012** 0.027
	9.525 0.3750	**9.512** 0.3745	**15.875** 0.6250	**15.862** 0.6245	**19.43** 0.765	**19.18** 0.755	**0.64** 0.025	IR-612-1	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.018** 0.040
7/16	**11.113** 0.4375	**11.100** 0.4370	**15.875** 0.6250	**15.862** 0.6245	**19.96** 0.786	**19.71** 0.776	**0.64** 0.025	IRA-7	**11.105** 0.4372	**11.092** 0.4367	**11.115** 0.4376	**11.102** 0.4371	**0.015** 0.033
1/2	**12.700** 0.5000	**12.687** 0.4995	**19.050** 0.7500	**19.037** 0.7495	**13.08** 0.515	**12.83** 0.505	**1.02** 0.040	IR-88	**12.692** 0.4997	**12.680** 0.4992	**12.703** 0.5001	**12.690** 0.4996	**0.015** 0.033
	12.700 0.5000	**12.687** 0.4995	**19.050** 0.7500	**19.037** 0.7495	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-812	**12.692** 0.4997	**12.680** 0.4992	**12.703** 0.5001	**12.690** 0.4996	**0.023** 0.050

Bore and O.D. tolerance limits correspond to the single mean diameter (the arithmetical mean of the largest and smallest diameters in a single radial plane).

(1) $r_{a\,max.}$ is equal to minimum inner ring bore chamfer ($r_{s\,min.}$).

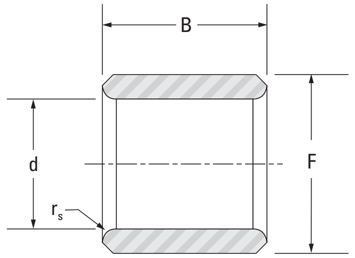
Shaft Dia.	d		F		B		$r_{s\,min.}$	Inner Ring Designation	Mounting Dimensions Transition Fit				Approx. Wt.
									Loose		Tight		
	Max.	Min.	Max.	Min.	Max.	Min.	Min.		Max.	Min.	Max.	Min.	
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	kg lbs
1/2	**12.700** 0.5000	**12.687** 0.4995	**19.050** 0.7500	**19.037** 0.7495	**19.96** 0.786	**19.71** 0.776	**1.02** 0.040	IRA-8	**12.692** 0.4997	**12.680** 0.4992	**12.703** 0.5001	**12.690** 0.4996	**0.023** 0.051
5/8	**15.875** 0.6250	**15.862** 0.6245	**22.225** 0.8750	**22.212** 0.8745	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1012	**15.867** 0.6247	**15.855** 0.6242	**15.878** 0.6251	**15.865** 0.6246	**0.027** 0.060
	15.875 0.6250	**15.862** 0.6245	**22.225** 0.8750	**22.212** 0.8745	**19.96** 0.786	**19.71** 0.776	**1.02** 0.040	IRA-10	**15.867** 0.6247	**15.855** 0.6242	**15.878** 0.6251	**15.865** 0.6246	**0.028** 0.062
	15.875 0.6250	**15.862** 0.6245	**22.225** 0.8750	**22.212** 0.8745	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1016	**15.867** 0.6247	**15.855** 0.6242	**15.878** 0.6251	**15.865** 0.6246	**0.036** 0.080
3/4	**19.050** 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**13.08** 0.515	**12.83** 0.505	**1.02** 0.040	IR-128	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.021** 0.047
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1212	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.032** 0.070
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1216	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.042** 0.093
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**26.31** 1.036	**26.06** 1.026	**1.02** 0.040	IRA-12	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.043** 0.095
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**32.13** 1.265	**31.88** 1.255	**1.02** 0.040	IR-1220	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.053** 0.116
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**38.48** 1.515	**38.23** 1.505	**1.02** 0.040	IR-1224	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.063** 0.139
13/16	**20.638** 0.8125	**20.625** 0.8120	**25.400** 1.0000	**25.387** 0.9995	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1312	**20.630** 0.8122	**20.617** 0.8117	**20.640** 0.8126	**20.627** 0.8121	**0.024** 0.054
	20.638 0.8125	**20.625** 0.8120	**25.400** 1.0000	**25.387** 0.9995	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1316	**20.630** 0.8122	**20.617** 0.8117	**20.640** 0.8126	**20.627** 0.8121	**0.033** 0.072
7/8	**22.225** 0.8750	**22.212** 0.8745	**28.575** 1.1250	**28.562** 1.1245	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1416	**22.217** 0.8747	**22.205** 0.8742	**22.228** 0.8751	**22.215** 0.8746	**0.050** 0.111
	22.225 0.8750	**22.212** 0.8745	**28.575** 1.1250	**28.562** 1.1245	**26.31** 1.036	**26.06** 1.026	**1.02** 0.040	IRA-14	**22.217** 0.8747	**22.205** 0.8742	**22.228** 0.8751	**22.215** 0.8746	**0.050** 0.111
15/16	**23.813** 0.9375	**23.800** 0.9370	**28.575** 1.1250	**28.562** 1.1245	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1516	**23.805** 0.9372	**23.792** 0.9367	**23.815** 0.9376	**23.802** 0.9371	**0.037** 0.082
1	**25.400** 1.0000	**25.387** 0.9995	**31.750** 1.2500	**31.737** 1.2495	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1612	**25.392** 0.9997	**25.380** 0.9992	**25.403** 1.0001	**25.390** 0.9996	**0.041** 0.090
	25.400 1.0000	**25.387** 0.9995	**31.750** 1.2500	**31.737** 1.2495	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1616	**25.392** 0.9997	**25.380** 0.9992	**25.403** 1.0001	**25.390** 0.9996	**0.057** 0.125
	25.400 1.0000	**25.387** 0.9995	**31.750** 1.2500	**31.737** 1.2495	**26.31** 1.036	**26.06** 1.026	**1.02** 0.040	IRA-16	**25.392** 0.9997	**25.380** 0.9992	**25.403** 1.0001	**25.390** 0.9996	**0.056** 0.124
1 1/8	**28.575** 1.1250	**28.562** 1.1245	**34.925** 1.3750	**34.912** 1.3745	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1812	**28.567** 1.1247	**28.555** 1.1242	**28.578** 1.1251	**28.565** 1.1246	**0.045** 0.100
	28.575 1.1250	**28.562** 1.1245	**34.925** 1.3750	**34.912** 1.3745	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1816	**28.567** 1.1247	**28.555** 1.1242	**28.578** 1.1251	**28.565** 1.1246	**0.060** 0.133
	28.575 1.1250	**28.562** 1.1245	**34.925** 1.3750	**34.912** 1.3745	**32.13** 1.265	**31.88** 1.255	**1.02** 0.040	IR-1820	**28.567** 1.1247	**28.555** 1.1242	**28.578** 1.1251	**28.565** 1.1246	**0.075** 0.166
1 3/16	**30.163** 1.1875	**30.150** 1.1870	**38.100** 1.5000	**38.087** 1.4995	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1916	**30.155** 1.1872	**30.142** 1.1867	**30.165** 1.1876	**30.152** 1.1871	**0.084** 0.186
	30.163 1.1875	**30.150** 1.1870	**38.100** 1.5000	**38.087** 1.4995	**32.13** 1.265	**31.88** 1.255	**1.02** 0.040	IR-1920	**30.155** 1.1872	**30.142** 1.1867	**30.165** 1.1876	**30.152** 1.1871	**0.101** 0.223
1 1/4	**31.750** 1.2500	**31.737** 1.2495	**38.100** 1.5000	**38.087** 1.4995	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-2016	**31.742** 1.2497	**31.730** 1.2492	**31.753** 1.2501	**31.740** 1.2496	**0.069** 0.152
	31.750 1.2500	**31.737** 1.2495	**38.100** 1.5000	**38.087** 1.4995	**32.13** 1.265	**31.88** 1.255	**1.52** 0.060	IR-2020	**31.742** 1.2497	**31.730** 1.2492	**31.753** 1.2501	**31.740** 1.2496	**0.086** 0.190

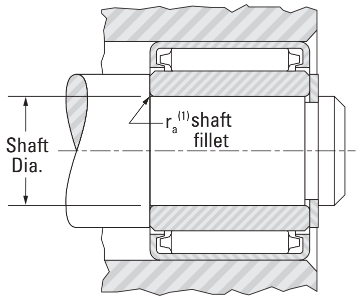
Bore and O.D. tolerance limits correspond to the single mean diameter (the arithmetical mean of the largest and smallest diameters in a single radial plane).

Continued on next page.

INNER RINGS FOR INCH SERIES DRAWN CUP BEARINGS

- Check for availability.
- Ideal choice when shaft is not practical to use as inner raceway.
- Provided in inch (IR, IRA) nominal dimensions for use with inch series drawn cup bearings.
- Designed to meet established inch tolerances.
- Designed to be wider than matching drawn cup bearing.
- Maximum shaft fillet radius ($r_{a\,max.}$) cannot exceed inner ring bore chamfer ($r_{s\,min.}$) as shown.
- Optional centralized lubrication groove (bore) and thru-hole available – specify when ordering.
- Designed to provide a loose transition fit on the shaft and should be axially clamped against a shoulder.
- If a tight transition fit must be used to keep the inner ring from rotating relative to the shaft, the innr ring O.D. must not exceed the raceway diameter for the matching drawn cup bearing after being mounted on the shaft.
- See tables for bearing raceway diameter dimensions.
- After mounting, if O.D. of inner ring exceeds required raceway diameter for matching bearing, ring should be ground to proper diameter while mounted on shaft.





Shaft Dia.	d		F		B		$r_{s\,min.}$	Inner Ring Designation	Mounting Dimensions Transition Fit				Approx. Wt.
									Loose		Tight		
	Max.	Min.	Max.	Min.	Max.	Min.	Min.		Max.	Min.	Max.	Min.	
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	kg lbs
1 1/4	**31.750** 1.2500	**31.737** 1.2495	**38.100** 1.5000	**38.087** 1.4995	**32.66** 1.286	**32.41** 1.276	**1.52** 0.060	IRA-20	**31.742** 1.2497	**31.730** 1.2492	**31.753** 1.2501	**31.740** 1.2496	**0.086** 0.190
1 3/8	**34.925** 1.3750	**34.912** 1.3745	**41.275** 1.6250	**41.262** 1.6245	**32.13** 1.265	**31.88** 1.255	**1.52** 0.060	IR-2220	**34.917** 1.3747	**34.905** 1.3742	**34.928** 1.3751	**34.915** 1.3746	**0.094** 0.208
1 7/16	**36.513** 1.4375	**36.500** 1.4370	**44.450** 1.7500	**44.437** 1.7495	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-2316	**36.505** 1.4372	**36.492** 1.4367	**36.515** 1.4376	**36.502** 1.4371	**0.100** 0.220
	36.513 1.4375	**36.500** 1.4370	**44.450** 1.7500	**44.437** 1.7495	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2324	**36.505** 1.4372	**36.492** 1.4367	**36.515** 1.4376	**36.502** 1.4371	**0.150** 0.331
1 1/2	**38.100** 1.5000	**38.087** 1.4995	**44.450** 1.7500	**44.437** 1.7495	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-2416	**38.092** 1.4997	**38.080** 1.4992	**38.103** 1.5001	**38.090** 1.4996	**0.078** 0.173
	38.100 1.5000	**38.087** 1.4995	**44.450** 1.7500	**44.437** 1.7495	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2424	**38.092** 1.4997	**38.080** 1.4992	**38.103** 1.5001	**38.090** 1.4996	**0.122** 0.270
1 11/16	**42.863** 1.6875	**42.850** 1.6870	**52.388** 2.0625	**52.375** 2.0620	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2724	**42.855** 1.6872	**42.842** 1.6867	**42.865** 1.6876	**42.852** 1.6871	**0.212** 0.468
1 3/4	**44.450** 1.7500	**44.437** 1.7495	**52.388** 2.0625	**52.375** 2.0620	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2824	**44.442** 1.7497	**44.430** 1.7492	**44.453** 1.7501	**44.440** 1.7496	**0.180** 0.396
1 13/16	**46.038** 1.8125	**46.025** 1.8120	**52.388** 2.0625	**52.375** 2.0620	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-2916	**46.030** 1.8122	**46.017** 1.8117	**46.040** 1.8126	**46.027** 1.8121	**0.097** 0.214
	46.038 1.8125	**46.025** 1.8120	**52.388** 2.0625	**52.375** 2.0620	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2924	**46.030** 1.8122	**46.017** 1.8117	**46.040** 1.8126	**46.027** 1.8121	**0.146** 0.322
1 7/8	**47.625** 1.8750	**47.612** 1.8745	**53.975** 2.1250	**53.962** 2.1245	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-3024	**47.617** 1.8747	**47.605** 1.8742	**47.628** 1.8751	**47.615** 1.8746	**0.145** 0.319
2 1/2	**63.500** 2.5000	**63.487** 2.4995	**69.850** 2.7500	**69.837** 2.7495	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-4016	**63.495** 2.4998	**63.477** 2.4991	**63.505** 2.5002	**63.487** 2.4995	**0.132** 0.290

Bore and O.D. tolerance limits correspond to the single mean diameter (the arithmetical mean of the largest and smallest diameters in a single radial plane).

[1] $r_{a\,max.}$ is equal to minimum inner ring bore chamfer ($r_{s\,min.}$).

DRAWN CUP ROLLER CLUTCHES

Overview: Drawn cup needle roller clutches are similar to drawn cup needle roller bearings in design; however, they allow free rotation in only one direction while transmitting torque in the opposite direction. These designs use the same small radial section as drawn cup needle roller bearings and are offered as clutch-only units or as clutch and bearing assemblies.

- **Catalogue range:** 3.2 mm – 35 mm (0.1250 in – 1.3780 in) bore.
- **Markets:** Office equipment, paper-towel dispensers, exercise equipment, appliances and two-speed gearboxes.
- **Features:** Compact, lightweight and operate directly on a hardened shaft.
- **Benefits:** Installation is easily accomplished with a simple press fit.

Drawn Cup Roller Clutches Metric Series

FCS, FC-K	regular clutch, single roller per stainless steel spring
FC	regular clutch, multi-roller per stainless steel spring
FCL-K	light series clutch, single roller per stainless steel spring
FCB	regular clutch and bearing assembly, multi-roller per stainless steel spring
FCBL-K, FCBN-K	light series clutch and bearing assembly, single roller per stainless steel spring

FCL - 10 - K

Bore, in millimeters

Inch Series

RC	regular clutch, single roller per integral spring
RC-FS	regular clutch, single roller per stainless steel spring
RCB	regular clutch and bearing assembly, single roller per integral spring
RCB-FS	regular clutch and bearing assembly, single roller per stainless steel spring

Outer Diameter
14 = $^{14}/_{16}$ = $^{7}/_{8}$ in

RC - 10 14 10 - FS

Bore
10 = $^{10}/_{16}$ = $^{5}/_{8}$ in

Width
10 = $^{10}/_{16}$ = $^{5}/_{8}$ in

Drawn Cup Roller Clutches

Page

DRAWN CUP ROLLER CLUTCHES

METRIC AND INCH SERIES

Drawn cup roller clutch transmits torque between shaft and housing in one direction and allows free overrun in the opposite direction. When transmitting torque, either the shaft or the housing can be the input member. Applications are generally described as indexing, backstopping or overrunning.

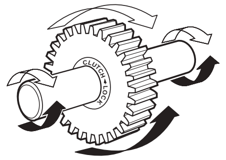


Fig. B3-1.
Lock function: shaft drives gear clockwise (white arrows) or gear can drive shaft counterclockwise (black arrows)

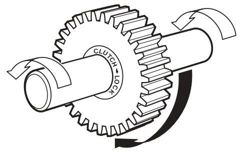


Fig. B3-2.
Overrun function: shaft overruns in gear counter-clockwise (white arrows) or gear overruns on shaft clockwise (black arrow)

IDENTIFICATION

The prefix letters in the designation of the drawn cup roller clutches and drawn cup roller clutch and bearing assemblies denote whether these are manufactured to metric or inch nominal dimensions. Designation codes for clutches and clutch and bearing assemblies with metric nominal dimensions begin with the letter "F." Designation codes for clutches and clutch and bearing assemblies with inch nominal dimensions begin with the letter "R."

The basic types of clutches and clutch and bearing assemblies are listed below:

METRIC SERIES TYPES

FCS, FC-K	Regular clutch, single roller per stainless steel spring.
FC	Regular clutch, multi-roller per stainless steel spring.
FCB	Regular clutch and bearing assembly, multi-roller per stainless steel spring.
FCL-K	Light series clutch, single roller per stainless steel spring.
FCBL-K, FCBN-K	Light series clutch and bearing assembly. Single roller per stainless steel spring.

INCH SERIES TYPES

RC	Regular clutch, single roller per integral spring.
RC-FS	Regular clutch, single roller per stainless steel spring.
RCB	Regular clutch and bearing assembly, single roller per integral spring.
RCB-FS	Regular clutch and bearing assembly, single roller per stainless steel spring.

Drawn cup roller clutch type FC with stainless steel springs

Drawn cup clutch and bearing assembly type FCB with stainless steel springs

Drawn cup roller clutch, types FCS, FC-K, FCL-K, and RC-FS with stainless steel springs

Drawn cup clutch and bearing assembly types FCBL-K, FCBN-K and RCB-FS with stainless steel springs

Drawn cup roller clutch, type RC with integral springs

Drawn cup clutch and bearing assembly type RCB with integral springs

Fig. B3-3. Types of clutches and clutch and bearing assemblies

CONSTRUCTION

In many respects, construction is similar to that of drawn cup bearings. Design and manufacture of drawn cup clutches – just as with drawn cup bearings – was pioneered and developed by JTEKT. The well-established design utilizes the same low-profile radial section as drawn cup bearings. The precisely formed interior ramps provide surfaces against which the needle rollers wedge. These positively lock the clutch with the shaft when rotated in the proper direction. These ramps, formed during the operation of drawing the cup, are case hardened for wear resistance. The incorporation of ramp forming into the cup drawing operation is a manufacturing innovation that contributes to the low cost of the unit.

Two designs of precision molded clutch cages are employed. Clutch and clutch and bearing assembly types – FC, FC-K, FCS, FCL-K, RC-FS, FCB, FCBN-K, FCBL-K and RCB-FS – use a glass fiber, reinforced nylon cage, equipped with inserted stainless steel leaf springs. The stainless steel springs permit higher rates of clutch engagement and achieve greater spring life. The nylon cage permits operation at higher temperatures. Clutch types RC and RCB utilize a one-piece cage of acetyl resin polymer with integral leaf style springs. They are used for lower temperatures than permitted for the units with nylon cages.

Types FCB, FCBL-K, FCBN-K, RCB and RCB-FS clutch and bearing assemblies have cages, for retention and guidance of the needle rollers in the bearings, located on both sides of the clutch unit.

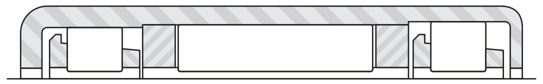


Fig. B3-4. Clutch and bearing assembly

Types FC, FC-K, FCS, FCL-K, RC and RC-FS are of clutch-only configurations for use with external radial support (usually two drawn cup needle roller bearings). Separate bearings position the shaft and housing concentrically and carry the radial load during overrun.

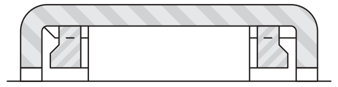


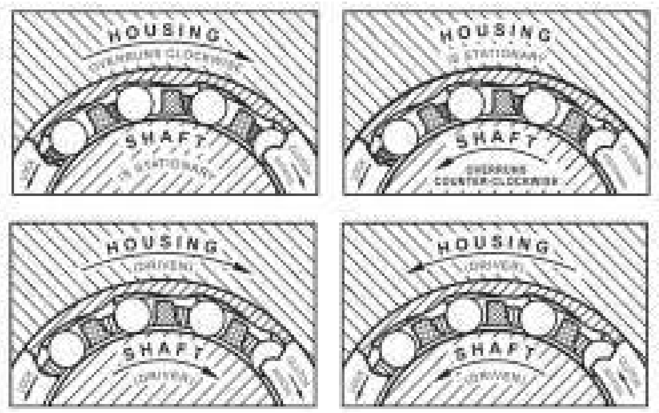
Fig. B3-5. Clutch only

OPERATION

Operation is in two modes: the overrun mode and the lock mode. Operational mode is controlled by the direction of the clutch or shaft rotation with respect to the locking ramps.

In the overrun mode, shown in the drawings below, the relative rotation between the housed clutch and the shaft causes the rollers to move away from their locking position against the locking ramps in the drawn cup. The housing and the clutch are then free to overrun in one direction, or the shaft is free to overrun in the other direction.

In the lock mode, shown in the drawings below, the relative rotation between the housed clutch and the shaft is opposite to that in the overrun mode. The rollers, assisted by the leaf-type springs, become wedged between the locking ramps and the shaft to transmit torque between the two members. Either the member housing the clutch drives the shaft in one direction, or the shaft can drive the clutch and its housing member in the other direction.



Clearance between the rollers and cup ramps is exaggerated in these drawings.

Fig. B3-6. Overrun mode and lock mode

APPLICATION

Clutches and clutch and bearing assemblies are successfully applied in a wide range of commercial products where indexing, backstopping and overrunning operations must be performed reliably. The sketches on these pages illustrate some of the many possible uses.

When applying the clutch-only unit, separate bearings on each side of the clutch are required to position the shaft concentrically with the housing, and to carry the radial loads during overrun. Drawn cup needle roller bearings, with the same radial section as the clutch, should be used in the through-bored housings for simplicity and economy. Two clutches can be used side by side for greater torque capacity.

Where the radial loads are light, the clutch and bearing assembly can be used without additional support bearings. This reduces the overall assembly width, the number of stocked and ordered parts and assembly costs, as well.

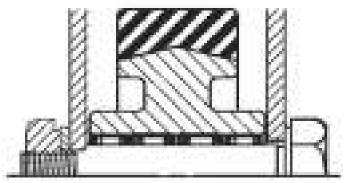


Fig. B3-7. Clutch and bearing arrangement for heavy loads

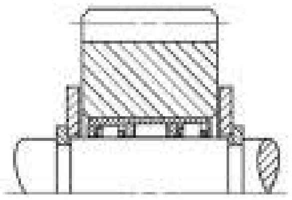


Fig. B3-8. Clutch and bearing assembly for light loads

Drawn cup roller clutches are manufactured to commercial hardware standards and are used extensively in appliances, business machines, industrial and recreation equipment and a wide range of other applications.

In any application where our clutch may be considered, it will be part of a system in which the operating conditions and the clutch mounting will affect its function. Before any clutch selection is made, it is important that the following catalog section be carefully studied to understand the effects of these factors. Consideration should be given to operating conditions such as:

- Magnitude of externally applied torque, as well as inertial torque.
- Magnitude of applied radial loads during overrunning.
- Potential for vibration or axial shaft movement within the clutch during engagement.
- Engagement rate, as it pertains to the selection of stainless steel or plastic leaf springs.
- Oil lubricant supply during high overrunning speeds.
- External and internal environmental temperatures that can affect clutch performance.
- Lubricant selection effect on clutch engagement.
- Indexing inaccuracies resulting from backlash (lost motion).

Consideration should be given to the shaft and housing design requirements such as:

- Shaft hardness and strength particularly when approaching torque rating limits.
- Shaft roundness, taper and surface finish necessary to ensure sufficient fatigue life and torque-carrying ability.
- Housing strength (hardness and cross section) to support the applied torque loads.
- Housing roundness, taper and surface finish necessary to ensure uniform torque and load distribution.

A test program under all expected operating conditions should be carried out before putting a new application into production. Customer engineers are constantly working with and testing new applications, and their experience can be of great help to the designer considering the use of a drawn cup roller clutch.

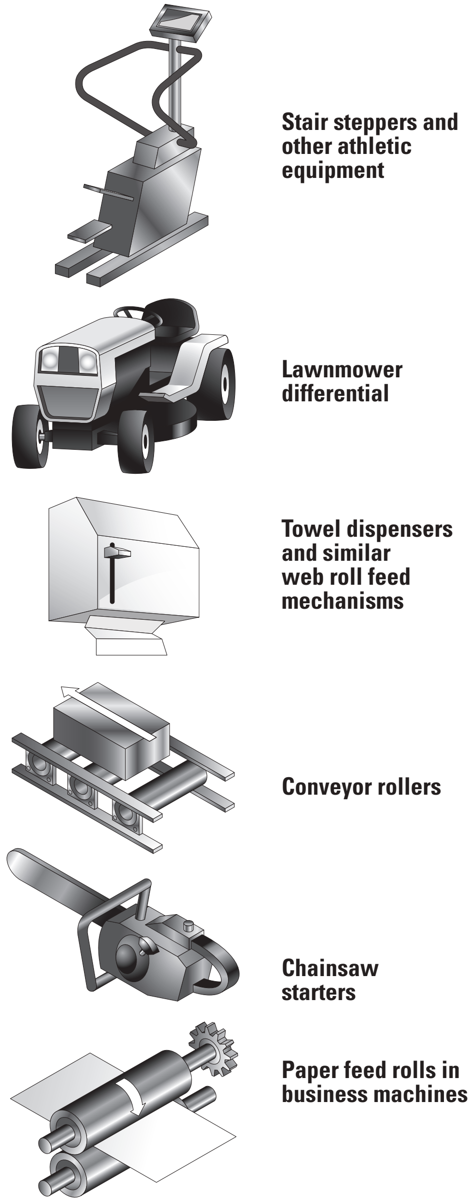


Fig. B3-9(1). Drawn cup clutches and clutch and bearing assembly applications

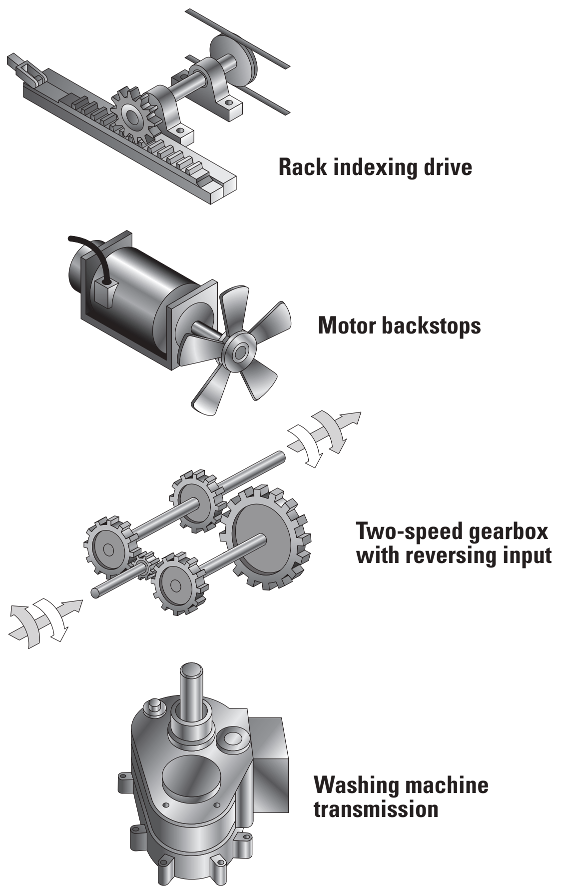


Fig. B3-9(2). Drawn cup clutches and clutch and bearing assembly applications

HOUSING DESIGN

Drawn cup clutches and clutch and bearing assemblies are mounted with a simple press fit in their housings. Through-bored and chamfered housings are preferred. A 30 degree angle is suggested and care should be taken to round the edge where the chamfer meets the housing bore. A sharp edge at this location can greatly increase installation forces. Provisions for axial location, such as shoulders or snap rings, are not required. The case hardened cups must be properly supported. Steel housings are preferred and must be used for applications involving high-torque loads to prevent radial expansion of the clutch cups. The suggested minimum housing outer diameters in the tables of dimensions are for steel.

The housing bore should be round within one-half of the diameter tolerance.

The taper within the length of the outer ring should not exceed 0.013 mm (0.0005 in).

The surface finish of the housing bore should not exceed 1.6 µm R_a (63 µin R_a).

The torque ratings, given in the clutch tables, are based on a steel housing of a large section. When other housing material must be used (such as aluminum, powdered metal and plastics), the torque rating of the clutch will be reduced. Such housings may be satisfactory for lightly torqued applications. But, your representative should be consulted for appropriate housing and shaft suggestions. Otherwise, an insufficient press fit and use of a lower strength housing material can result in more internal clearance and reduced performance of the clutch.

When using non-steel housings, thorough testing of the design is suggested.

Adhesive compounds can be used to prevent creeping rotation of the clutch in plastic housings with low friction properties. Adhesives will not provide proper support in oversized metal housings. When using adhesives, care must be taken to keep the adhesive out of the clutches and bearings.

SHAFT DESIGN

The clutch or clutch and bearing assembly operates directly on the shaft whose specifications of dimension, hardness and surface finish are well within standard manufacturing limits.

Either case-hardening or through-hardening grades of good bearing-quality steel are satisfactory for raceways. Steels modified for free machining, such as those high in sulfur content and particularly those containing lead, are seldom satisfactory for raceways.

For long fatigue life, the shaft raceway must have a hardness equivalent to 58 HRC minimum and must be ground to the suggested diameter shown in the tables of dimensions. It may be through-hardened, or it may be case hardened with an effective case depth of 0.40 mm (0.015 in). Effective case depth is defined as the distance from the surface inward to the equivalent of 50 HRC hardness level after grinding.

Taper within the length of the raceway should not exceed 0.008 mm (0.0003 in), or one-half the diameter tolerance – whichever is smaller. The radial deviation from true circular form of the raceway should not exceed 0.0025 mm (0.0001 in) for diameters up to and including 25 mm (1.0 in). For raceways greater than 25 mm (1.0 in), the allowable radial deviation should not exceed 0.0025 mm (0.0001 in) multiplied by a factor of the raceway diameter divided by 25 mm (1.0 in). Surface finish on the raceway should not exceed 0.4 µm (16 µin) R_a. Deviations will reduce the load capacity and fatigue life of the shaft.

INSTALLATION

Simplicity of installation promotes additional cost savings. The drawn cup roller clutch or the clutch and bearing assembly must be pressed into its housing. Procedures are virtually identical with those for installing drawn cup bearings, as detailed on pages B-2-11and B-2-52. The unit is pressed into the bore of a gear or pulley hub or housing of the proper size. No shoulders, splines, keys, screws or snap rings are required.

Installation procedures are summarized in the following sketches:

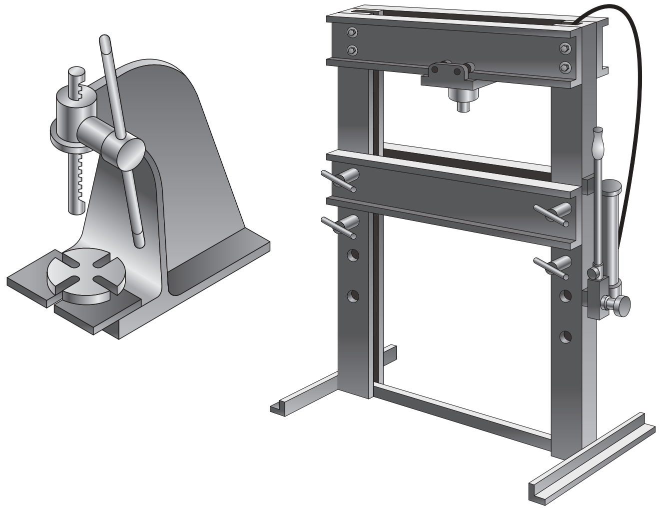


Fig. B3-10. Arbor press and hydraulic ram press

Use an arbor press or hydraulic ram press to exert steady pressure. Never use a hammer, or other tool requiring pounding to drive the clutch into its housing.

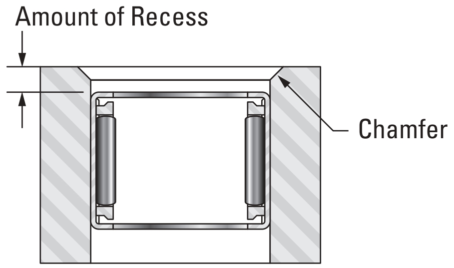


Fig. B3-11. Chamfered housing bore

Make sure that the housing bore is chamfered to permit easy introduction of the clutch and bearing or the clutch unit. Press unit slightly beyond the chamfer in the housing bore to assure full seating. Through-bored housings are always preferred. If the housing has a shoulder, never seat the clutch against the shoulder. For further details, see pages B-2-11 and B-2-52.

Fig. B3-12. Lock marking

IMPORTANT: The mounted clutch or clutch and bearing assembly engages when the housing is rotated relative to the shaft in the direction of the arrow and lock marking (◄ LOCK) stamped on the cup. Make sure that the unit is oriented properly before pressing it into its housing.

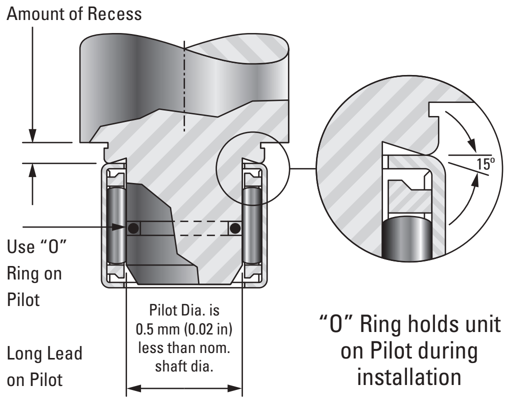


Fig. B3-13. Installation tool

Use an installation tool as shown in Fig. B3-13. If the clutch is straddled by needle roller bearings, press units into position – in proper sequence – and preferably leave a small clearance between units.

When assembling the shaft, it should be rotated in the overrun direction during insertion. The end of the shaft should have a large chamfer or rounding.

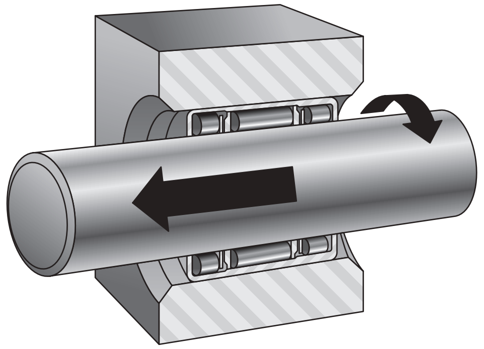


Fig. B3-14. Rotate shaft in the overrun direction during insertion

APPLIED LOADS

The clutch-only unit is designed to transmit purely torque loads. Applied torque should not exceed the catalog ratings, which are based on the compressive strength of well-aligned clutch components. Bearings on either side of the clutch are to assure concentricity between the shaft and the housing to support radial loads during clutch overrun. Integral clutch and bearing assemblies are available for this purpose, especially where the radial loads are light. The total maximum dynamic radial load that may be shared by the two needle roller and cage radial bearing assemblies should not be greater than Cr/3.

In determining the total torque load on a clutch, it is essential to consider the torque, due to inertial forces developed in the mechanism, in addition to the externally applied torque. The larger the clutch, and the greater the mass of the mechanism controlled by it, the more important this consideration becomes.

Clutch lockup depends on friction. For this reason, applications involving severe vibrations or axial motion of the shaft within the clutch are to be avoided. Applications where overhanging or overturning loads occur should incorporate bearings that will maintain alignment between the shaft and the clutch housing. Consult your representative for suggestions.

LUBRICATION

Oil is the preferred lubricant; it minimizes wear and heat generation. For those applications where oil is not practical, clutches are packed with a soft grease containing mineral oil. Thick grease will retard roller engagement and can cause individual rollers to slip, possibly overloading any engaged rollers.

TEMPERATURE

Temperature extremes can cause clutch malfunctions and failure. The molded plastic cage with integral springs holds its necessary resiliency and strength when the operating temperature within the clutch is kept below 90° C (200° F). The clutch with reinforced nylon cage and separate steel springs operates well at temperatures up to 120° C (250° F) continuously and to 150° C (300° F) intermittently. Excessive thickening of the lubricant at low temperatures may prevent some, or all, of the rollers from engaging. New applications should be tested under expected operating conditions to determine whether or not temperature problems exist.

BACKLASH

Backlash, or lost motion, prior to engagement is minimal. The variation in backlash from one cycle to another is extremely low. Grease lubrication, or improper fit (housing bore and shaft diameter), may increase backlash. Angular displacement between the shaft and housing increases as an applied torque load is increased.

RATE OF ENGAGEMENT

Clutch lockup depends upon static friction. Axial motion between shaft and clutch rollers prevents lockup.

Clutches with integral springs engage satisfactorily at cyclic rates up to 200 engagements per minute. Intermittent operation at higher rates has been successful. The steel spring type clutches have proven dependability at rates up to 6000 or 7000 engagements per minute. Even higher cyclic rates may be practical. Because grease may impair engagement at high cyclic rates, a light oil should be used.

OVERRUN LIMIT SPEED RATING

Exact limiting speed ratings are not easily predictable. The value for each clutch given in the bearing tables is not absolute but serves as a guide for the designer. Oil lubrication is absolutely necessary for high speed operations. Consult your representative when overrunning speeds are high.

INSPECTION

Although the outer cup of the clutch is accurately drawn from strip steel, it can go slightly out of round during heat treat. When the assembly is pressed into a ring gage, or properly prepared housing of correct size and wall thickness, it becomes round and properly sized. Direct measurement of the outer diameter of a drawn cup assembly is an incorrect procedure. The proper inspection procedure is as follows:

1. Press the assembly into a ring gage of the proper size, as given in the tables.
2. Gage the bore with the specified plug gages of the proper size, as given in the tables of dimensions.
    a. The locking plug is rotated to ensure lockup when the clutch is operated on a low-limit shaft and is mounted in a high-limit housing, strong enough to properly size the clutch.
    b. The overrun plug is rotated to ensure free overrunning when the clutch is operated on a high-limit shaft and is mounted in a low-limit housing.
    c. The "go" plug and "no go" plug ensure proper size of the bearings in the clutch and bearing assemblies.

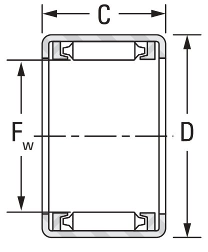
Gage sizes are listed in the tables of dimensions. Plug gage sizes reflect adjustment for the loose and tight conditions resulting from high or low housings or shafts.

DRAWN CUP ROLLER CLUTCHES

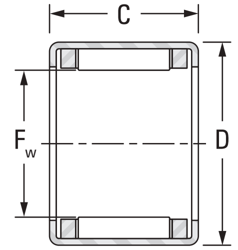
METRIC SERIES

- For proper application, separate bearings are suggested (adjacent to clutch) to carry radial loads and assure concentricity between shaft and housing.
- The clutch engages when housing is rotated relative to the shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-3-9.
- Full details on installation are given on page B-3-8.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Types FC, FCS, FC-K and FCL-K clutches have stainless steel springs inserted in molded cage to position rollers for lockup.

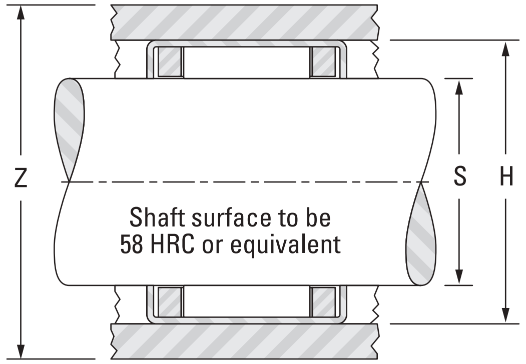
The mounted clutch engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.



FC



FCS, FCL-K and FC-K



Shaft Diameter	F_w	D	C	Clutch Designation	Torque Rating	Minimum O.D. of Steel Housing for Rated Torque	Overrun Limiting Speed Rating for Rotating Shaft[1]	Suitable Drawn Cup Bearing[2]	Gaging			Mounting				Approx. Wt.
												Shaft Raceway Diameter		Housing Bore		
			-0.30 mm -0.012 in			Z			Ring Gage	Clutch Locking Plug	Clutch Overrun Plug	S		H		
												Max.	Min.	Max.	Min.	
mm in	**mm** in	**mm** in	**mm** in		**N-m** lbf-in	**mm** in	min⁻¹		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
4 0.1575	**4** 0.1575	**8** 0.3150	**6** 0.236	FC-4-K	**0.349** 3.09	**11** 0.433	26000	HK0408	**7.984** 0.3143	**3.980** 0.1567	**4.004** 0.1576	**4.000** 0.1575	**3.995** 0.1573	**7.993** 0.3147	**7.984** 0.3143	**0.001** 0.002
6 0.2362	**6** 0.2362	**10** 0.3937	**12** 0.472	FCS-6	**2.15** 19.0	**14** 0.551	22000	HK0608	**9.984** 0.3931	**5.980** 0.2354	**6.004** 0.2364	**6.000** 0.2362	**5.995** 0.2360	**9.993** 0.3934	**9.984** 0.3931	**0.003** 0.007
	6 0.2362	**10** 0.3937	**12** 0.472	FC-6	**2.63** 23.3	**14** 0.551	22000	HK0608	**9.984** 0.3931	**5.980** 0.2354	**6.004** 0.2364	**6.000** 0.2362	**5.995** 0.2360	**9.993** 0.3934	**9.984** 0.3931	**0.004** 0.009
8 0.3150	**8** 0.3150	**12** 0.4724	**12** 0.472	FCL-8-K	**3.39** 30.0	**17** 0.669	21000	HK0808	**11.980** 0.4717	**7.976** 0.3140	**8.005** 0.3152	**8.000** 0.3150	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	**0.003** 0.007
	8 0.3150	**14** 0.5512	**12** 0.472	FC-8	**4.42** 39.1	**20** 0.787	21000	—	**13.980** 0.5504	**7.976** 0.3140	**8.005** 0.3152	**8.000** 0.3150	**7.994** 0.3147	**13.991** 0.5508	**13.980** 0.5504	**0.007** 0.015
10 0.3937	**10** 0.3937	**14** 0.5512	**12** 0.472	FCL-10-K	**4.60** 40.7	**20** 0.787	19000	HK1010	**13.980** 0.5504	**9.976** 0.3928	**10.005** 0.3939	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	**0.004** 0.009
	10 0.3937	**16** 0.6299	**12** 0.472	FC-10	**5.82** 51.5	**25** 0.984	19000	—	**15.980** 0.6291	**9.976** 0.3928	**10.005** 0.3939	**10.000** 0.3937	**9.994** 0.3935	**15.991** 0.6296	**15.980** 0.6291	**0.009** 0.020
12 0.4724	**12** 0.4724	**18** 0.7087	**16** 0.630	FC-12	**14.0** 124	**27** 1.063	19000	HK1212	**17.980** 0.7079	**11.974** 0.4714	**12.006** 0.4727	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	**0.012** 0.026
16 0.6299	**16** 0.6299	**22** 0.8661	**16** 0.630	FC-16	**21.7** 192	**31** 1.22	14000	HK1612	**21.976** 0.8652	**15.972** 0.6288	**16.006** 0.6302	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	**0.018** 0.040
20 0.7874	**20** 0.7874	**26** 1.0236	**16** 0.630	FC-20	**32.6** 289	**38** 1.496	11000	HK2012	**25.976** 1.0227	**19.970** 0.7862	**20.007** 0.7877	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	**0.021** 0.046
25 0.9843	**25** 0.9843	**32** 1.2598	**20** 0.787	FC-25	**71.0** 628	**46** 1.811	8700	HK2512	**31.972** 1.2587	**24.967** 0.9830	**25.007** 0.9845	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	**0.034** 0.075
30 1.1811	**30** 1.1811	**37** 1.4567	**20** 0.787	FC-30	**99.1** 877	**51** 2.008	7300	HK3012	**36.972** 1.4556	**29.967** 1.1798	**30.007** 1.1814	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	**0.042** 0.093
35 1.3780	**35** 1.3780	**42** 1.6535	**20** 0.787	FCS-35	**107.0** 947	**56** 2.205	6100	HK3512	**41.972** 1.6524	**34.964** 1.3765	**35.009** 1.3783	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	**0.048** 0.106

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[1] Indicates the number of relative rotations allowed when the shaft idles.
[2] See pages B-2-14 to B-2-25 for suitable bearing types and sizes.

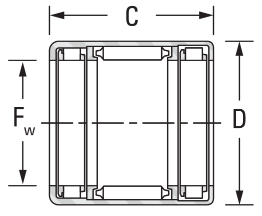
DRAWN CUP ROLLER CLUTCHES AND BEARING ASSEMBLIES

METRIC SERIES

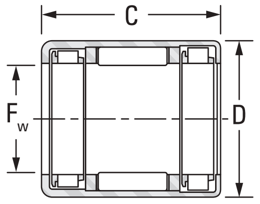
- The clutch and bearing assembly engages when the housing is rotated relative to shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-3-9.
- Full details on installation are given on page B-3-8.
- Types FCB, FCBL-K and FCBN-K clutch and bearing assemblies have stainless steel springs inserted in molded cage to position rollers for lockup.

The mounted clutch and bearing assembly engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.

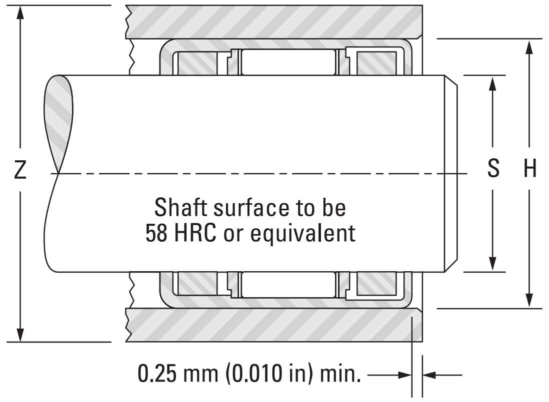
Clutch and bearing assemblies



FCB



FCBL-K and FCBN-K



Shaft Diameter	F_w	D	C	Clutch and Bearing Assembly Designation	Torque Rating	Minimum O.D. of Steel Housing for Rated Torque	Load Ratings[1]		Fatigue Load Limit C_u
			-0.30 mm -0.012 in				Dynamic	Static	
						Z	C	C_0	
mm in	**mm** in	**mm** in	**mm** in		**N-m** lbf-in		**kN** lbf	**kN** lbf	kN
4 0.1575	**4** 0.1575	**10** 0.3937	**9** 0.354	FCBN-4-K	**0.19** 1.68	**16** 0.630	**1.86** 418	**0.99** 223	0.160
6 0.2362	**6** 0.2362	**12** 0.4724	**10** 0.394	FCBN-6-K	**0.56** 4.96	**18** 0.709	**2.48** 558	**1.48** 333	0.240
8 0.3150	**8** 0.3150	**12** 0.4724	**22** 0.866	FCBL-8-K	**3.39** 30.0	**17** 0.669	**3.62** 814	**3.28** 737	0.520
	8 0.3150	**14** 0.5512	**20** 0.787	FCB-8	**4.42** 39.1	**20** 0.787	**4.22** 949	**3.04** 683	0.500
10 0.3937	**10** 0.3937	**16** 0.6299	**20** 0.787	FCB-10	**5.82** 51.5	**25** 0.984	**4.84** 1090	**3.80** 854	0.630
12 0.4724	**12** 0.4724	**18** 0.7087	**26** 1.024	FCB-12	**14.0** 124	**27** 1.063	**6.30** 1420	**5.84** 1310	0.970
16 0.6299	**16** 0.6299	**22** 0.8661	**26** 1.024	FCB-16	**21.7** 192	**31** 1.220	**6.64** 1490	**7.12** 1600	1.20
20 0.7874	**20** 0.7874	**26** 1.0236	**26** 1.024	FCB-20	**32.6** 289	**38** 1.496	**8.16** 1830	**9.46** 2130	1.55
25 0.9843	**25** 0.9843	**32** 1.2598	**30** 1.181	FCB-25	**71.0** 628	**46** 1.811	**11.3** 2540	**13.1** 2940	2.20
30 1.1811	**30** 1.1811	**37** 1.4567	**30** 1.181	FCB-30	**99.1** 877	**51** 2.008	**11.5** 2590	**14.9** 3350	2.50

Clutch and Bearing Assembly Designation	Overrun Limiting Speed Rating for Rotating Shaft[2]	Gaging				Mounting				Approx. Wt.
		Ring Gage	Clutch Locking Plug	Clutch Overrun and Bearing Go Plug	Bearing No Go Plug	S		H		
						Max.	Min.	Max.	Min.	
	min-1	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
FCBN-4-K	26000	**9.984** 0.3931	**3.980** 0.1567	**4.004** 0.1576	**4.030** 0.1587	**4.000** 0.1575	**3.995** 0.1573	**9.993** 0.3934	**9.984** 0.3931	**0.003** 0.007
FCBN-6-K	22000	**11.980** 0.4717	**5.980** 0.2354	**6.004** 0.2364	**6.030** 0.2374	**6.000** 0.2362	**5.995** 0.2360	**11.991** 0.4721	**11.980** 0.4717	**0.004** 0.009
FCBL-8-K	21000	**11.980** 0.4717	**7.976** 0.3140	**8.005** 0.3152	**8.033** 0.3163	**8.000** 0.3150	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	**0.005** 0.011
FCB-8	21000	**13.980** 0.5504	**7.976** 0.3140	**8.005** 0.3152	**8.033** 0.3163	**8.000** 0.3150	**7.994** 0.3147	**13.991** 0.5508	**13.980** 0.5504	**0.011** 0.024
FCB-10	19000	**15.980** 0.6291	**9.976** 0.3928	**10.005** 0.3939	**10.033** 0.3950	**10.000** 0.3937	**9.994** 0.3935	**15.991** 0.6296	**15.980** 0.6291	**0.013** 0.029
FCB-12	19000	**17.980** 0.7079	**11.974** 0.4714	**12.006** 0.4727	**12.036** 0.4739	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	**0.018** 0.040
FCB-16	14000	**21.976** 0.8652	**15.972** 0.6288	**16.006** 0.6302	**16.036** 0.6313	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	**0.024** 0.053
FCB-20	11000	**25.976** 1.0227	**19.970** 0.7862	**20.007** 0.7877	**20.043** 0.7891	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	**0.028** 0.062
FCB-25	8700	**31.972** 1.2587	**24.967** 0.9830	**25.007** 0.9845	**25.043** 0.9859	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	**0.048** 0.106
FCB-30	7300	**36.972** 1.4556	**29.967** 1.1798	**30.007** 1.1814	**30.043** 1.1828	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	**0.054** 0.119

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[1] Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
[2] Indicates the number of relative rotations allowed when the shaft idles.

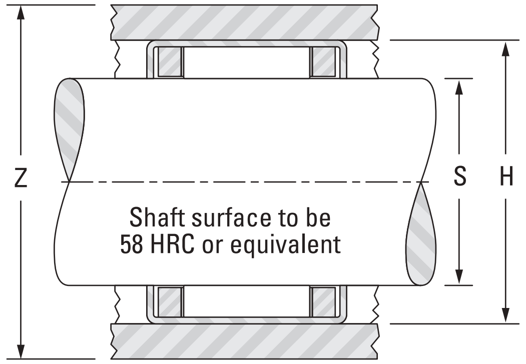
DRAWN CUP ROLLER CLUTCHES

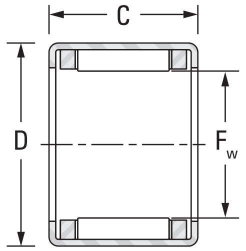
INCH SERIES

- For proper application, separate bearings are suggested (adjacent to clutch) to carry radial loads and assure concentricity between shaft and housing.
- The clutch engages when housing is rotated relative to the shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-3-9.
- Full details on installation are given on page B-3-8.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Type RC clutches have springs integrally molded with the cage to position the rollers for lockup.

  Type RC-FS clutches have stainless steel springs inserted into the molded cage to position the rollers for lockup.

The mounted clutch engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.





RC and RC-FS

Shaft Diameter	F_w	D	C **-0.25 mm** -0.010 in	Clutch Designations With Stainless Steel Springs	Clutch Designations With Integral Springs	Torque Rating	Minimum O.D. of Steel Housing for Rated Torque Z	Overrun Limiting Speed Rating for Rotating Shaft[1]
mm in	**mm** in	**mm** in	**mm** in			**N-m** lbs-in		min^{-1}
3.175 0.1250	**3.18** 0.125	**7.14** 0.281	**6.35** 0.250	—	RC-02	**0.323** 2.86	**11.2** 0.44	34000
6.350 0.2500	**6.35** 0.250	**11.13** 0.438	**12.70** 0.500	RC-040708-FS[2]	RC-040708	**1.94** 17.2	**15.7** 0.62	20000
9.525 0.3750	**9.53** 0.375	**15.88** 0.625	**12.70** 0.500	RC-061008-FS[2]	RC-061008	**5.45** 48.2	**22.4** 0.88	18000
12.700 0.5000	**12.70** 0.500	**19.05** 0.750	**12.70** 0.500	RC-081208-FS[2]	RC-081208	**8.85** 78.3	**27.9** 1.10	17000
15.875 0.6250	**15.88** 0.625	**22.23** 0.875	**15.88** 0.625	RC-101410-FS[2]	RC-101410	**16.8** 149	**30.5** 1.20	14000
19.050 0.7500	**19.05** 0.750	**25.40** 1.000	**15.88** 0.625	RC-121610-FS[2]	RC-121610	**23.3** 206	**35.6** 1.40	12000
25.400 1.0000	**25.40** 1.000	**33.35** 1.313	**15.88** 0.625	RC-162110-FS[2]	RC-162110	**49.6** 439	**48.3** 1.90	8700

Suitable Drawn Cup Bearing[3]	Gaging Ring Gage	Gaging Clutch Locking Plug	Gaging Clutch Overrun Plug	Mounting Shaft Raceway Diameter S Max.	Mounting Shaft Raceway Diameter S Min.	Mounting Housing Bore H Max.	Mounting Housing Bore H Min.	Approx. Wt.
	mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
—	**7.155** 0.2817	**3.160** 0.1244	**3.195** 0.1258	**3.175** 0.1250	**3.167** 0.1247	**7.155** 0.2817	**7.142** 0.2812	**0.001** 0.002
J-45	**11.125** 0.4380	**6.337** 0.2495	**6.383** 0.2513	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	**0.004** 0.008
JH-68	**15.888** 0.6255	**9.512** 0.3745	**9.558** 0.3763	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	**0.008** 0.017
JH-87	**19.063** 0.7505	**12.687** 0.4995	**12.733** 0.5013	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	**0.009** 0.020
JH-1010	**22.238** 0.8755	**15.862** 0.6245	**15.908** 0.6263	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	**0.014** 0.030
J-126	**25.387** 0.9995	**19.012** 0.7485	**19.058** 0.7503	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**0.015** 0.034
JH-1612	**33.325** 1.3120	**25.362** 0.9985	**25.408** 1.0003	**25.400** 1.0000	**25.387** 0.9995	**33.350** 1.3130	**33.325** 1.3120	**0.026** 0.058

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[1] Indicates the number of relative rotations allowed when the shaft idles.

[2] Suffix "-FS" is not always stamped on the clutch cup. Type RC-FS with stainless steel springs are always readily identified by RED clutch cage.

[3] See pages B-2-66 to B-2-69 for other suitable bearing types and sizes.

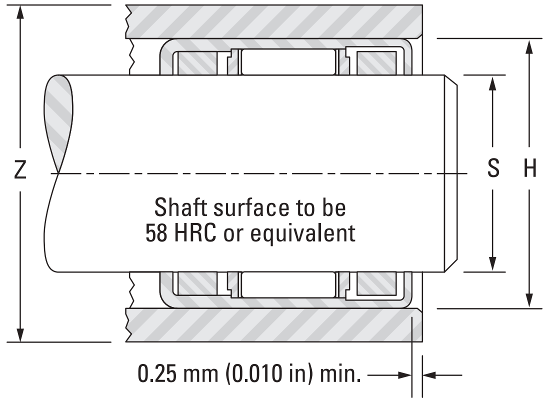
DRAWN CUP ROLLER CLUTCH AND BEARING ASSEMBLIES

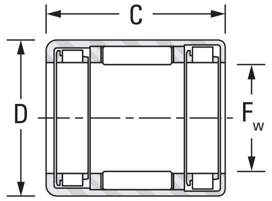
INCH SERIES

- Clutch and bearing assembly engages when the housing is rotated relative to shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-3-9.
- Full details on installation are given on page B-3-8.
- Type RCB clutch and bearing assemblies have springs integrally molded with the cage to position the rollers for lockup.

  Type RCB-FS clutch and bearing assemblies have stainless steel springs inserted into the molded cage to position the rollers for lockup.

The mounted clutch and bearing assembly engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.





RCB and RCB-FS

Shaft Diameter	F_w	D	C	Clutch and Bearing Designations		Torque Rating	Minimum O.D. of Steel Housing for Rated Torque	Load Ratings(2)		Fatigue Load Limit C_u	Overrun Limiting Speed Rating for Rotating Shaft(3)	Gaging				Mounting				Approx. Wt.
			-0.25 mm -0.010 in	With Stainless Steel Springs	With Integral Springs			Dynamic	Static			Ring Gage	Clutch Locking Plug	Clutch Overrun and Bearing Go Plug	Bearing No Go Plug	Shaft Raceway Diameter		Housing Bore		
							Z	C	C_0							S		H		
																Max.	Min.	Max.	Min.	
mm in	**mm** in	**mm** in	**mm** in			**N-m** lbf-in		**kN** lbf	**kN** lbf	kN	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
9.525 0.3750	**9.53** 0.375	**15.88** 0.625	**22.23** 0.875	RCB-061014-FS(1)	RCB-061014	**5.45** 48.2	**22.4** 0.88	**6.01** 1350	**4.89** 1100	0.800	18000	**15.888** 0.6255	**9.512** 0.3745	**9.553** 0.3761	**9.589** 0.3775	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	**0.014** 0.030
12.700 0.5000	**12.70** 0.500	**19.05** 0.750	**22.23** 0.875	RCB-081214-FS(1)	RCB-081214	**8.85** 78.3	**27.9** 1.1	**7.12** 1600	**6.49** 1460	1.05	17000	**19.063** 0.7505	**12.687** 0.4995	**12.728** 0.5011	**12.764** 0.5025	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	**0.016** 0.036
15.875 0.6250	**15.88** 0.625	**22.23** 0.875	**25.40** 1.000	RCB-101416-FS(1)	RCB-101416	**16.8** 149	**30.5** 1.2	**8.05** 1810	**8.14** 1830	1.35	14000	**22.238** 0.8755	**15.862** 0.6245	**15.903** 0.6261	**15.939** 0.6275	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	**0.023** 0.050
19.050 0.7500	**19.05** 0.750	**25.40** 1.000	**25.40** 1.000	RCB-121616-FS(1)	RCB-121616	**23.3** 206	**35.6** 1.4	**8.90** 2000	**9.79** 2200	1.60	12000	**25.387** 0.9995	**19.012** 0.7485	**19.053** 0.7501	**19.088** 0.7515	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**0.026** 0.057
25.400 1.0000	**25.40** 1.000	**33.35** 1.313	**27.00** 1.063	RCB-162117-FS(1)	RCB-162117	**49.6** 439	**48.3** 1.9	**15.4** 3460	**17.6** 3960	2.85	8700	**33.325** 1.3120	**25.362** 0.9985	**25.403** 1.0001	**25.438** 1.0015	**25.400** 1.0000	**25.387** 0.9995	**33.350** 1.3130	**33.325** 1.3120	**0.045** 0.100

(1) Suffix "-FS" is not always stamped on the clutch cup. Type RC-FS with stainless steel springs are always readily identified by RED clutch cage.
(2) Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
(3) Indicates the number of relative rotations allowed when the shaft idles.

INTRODUCTION

OTHER AVAILABLE CLUTCHES

In addition to the metric and inch sizes of drawn cup clutches and clutch and bearing assemblies already discussed, JTEKT offers other types of drawn cup clutches to address special customer needs:

CHARACTERISTICS

- Locking protrusions are provided around the drawn cup, so that creeping can be prevented without having to hold the surface dimensional accuracy precisely.
- Pre-lubricated with optimum grease, so that no lubrication is necessary under normal operating conditions.
- Unit products with a synthetic resin housing are also available.
  They are compatible with components of various types, such as gears, timing pulleys, cams and rubber rollers. Consult with JTEKT for further information.

Fig. B3-15. 1WC series

Fig. B3-16. EWC series

Fig. B3-17. Various housings and unit products

STRUCTURE AND PRINCIPLES

WHEN THE CLUTCH SYSTEM WORKS

When the shaft rotates clockwise as in cross section A-A', rollers are locked while engaged with the drawn cup cam surfaces by the effect of springs (wedging of the shaft by the cam surfaces). The drawn cup is driven as a consequence.

CLUTCH IDLE RUNNING

When the shaft rotates counter-clockwise as in cross section A-A', rollers move away from the drawn cup cam surfaces and rotate freely.

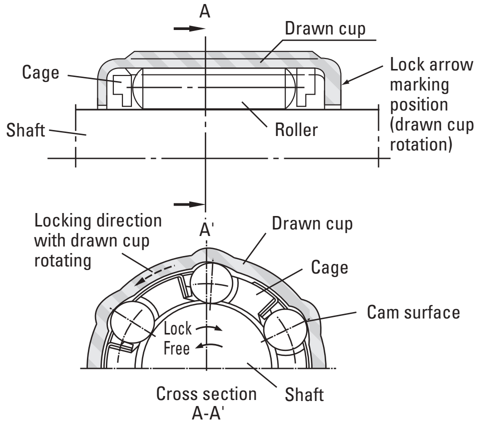


Fig. B3-18.

Table B3-1. Miniature one-way clutch types and characteristics

	1WC series (with metal springs)	EWC series (with synthetic resin springs)	
	Heavy load type	Heavy load type	Light load type
	1WC...	EWC...C	EWC...A
Torque capacity	Heavy load	Heavy load	Light load
Operating temperature range	– 10 to + 90°C	– 10 to + 70°C	
Locking life	Locking system can function more than one million. (Note : this estimation is valid as long as torque magnitude does not exceed the torque capacity shown in the specification table.)		
Insert molding	Possible	Impossible	
Delivery of clutch only	Possible		
Unit delivery	Possible		

Table B3-2. Shaft tolerance

	Heavy load type (1WC... , EWC...C)	Light load type (EWC...A)
Shaft tolerance class	h 8	
Surface hardness	50 HRC or harder	30 HRC or harder
Roughness (Ra)	0.3 a or less	0.8 a or less
Roundness and cylindricity	0.005 mm or less	

[Remarks] In some operating conditions, shafts need not be as accurate as shown here.
For example :

1. When clutch engaging accuracy is considered unimportant, or when a radial load or moment is not generated, the shaft diameter tolerance can be :
   - **shaft diameter 6 mm or less, and EWC0809 (C, A)** ······ 0 to – 0.040 mm
   - **shaft diameter 8 mm or more** ································· h 10
2. When the loaded torque is smaller than the torque capacity, shaft surface hardness can be determined as follows :
   - The diagram on the right shows approximate shaft surface hardness relative to torque ratio A.

$$\textbf{Torque ratio (A)} = \frac{\textbf{Loaded torque}}{\textbf{Heavy load type torque capacity}}$$

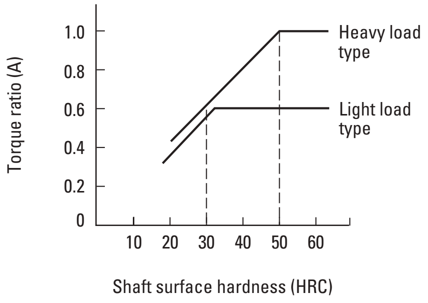
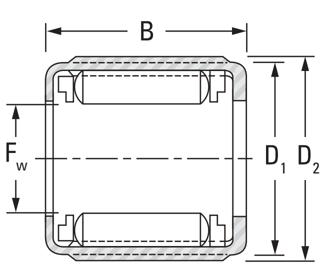
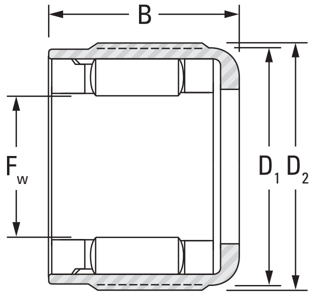


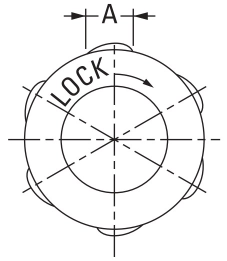
Fig. B3-19.

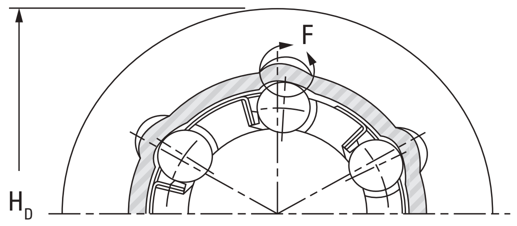


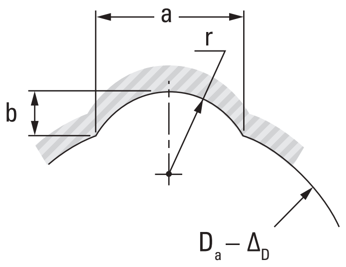
1WC Series



EWC Series







Details of Section F

Shaft Diameter	F_w	D_1	D_2	B	A	Torque Capacity	Designations		No. of [1] Outer Ring Protrusion	Recommended Housing Dimensions						Approx. Wt.	
							1WC Series (With Metal Springs)	EWC Series (With Resin Springs)		H_D	a	b	r	D_a	Δ_D[2]	1WC	EWC
mm in	mm in	mm in	mm in	mm in	mm in	N-m				mm in	mm in	mm in	mm in	mm in	mm in	g	
4	4	8	8.4	6	2.6	0.08	—	EWC0406A	4	12	2.65	0.50	2	8	0.06	—	1.0
	4	8	8.4	6	2.6	0.15	—	EWC0406C	4	12	2.65	0.50	2	8	0.06	—	1.0
6	6	10	10.4	8	2.8	0.25	—	EWC0608A	6	14	2.8	0.57	2	10	0.08	—	1.7
	6	10	10.4	8	2.8	0.44	—	EWC0608C	6	14	2.8	0.57	2	10	0.08	—	1.7
	6	10	10.4	8	2.8	0.44	1WC0608	—	6	14	2.8	0.57	2	10	0.08	2.0	—
	6	10	10.4	12	2.8	0.88	1WC0612	—	6	14	2.8	0.57	2	10	0.08	3.0	—
8	8	12	12.4	9	2.6	0.49	—	EWC0809A	6	16	2.6	0.48	2	12	0.10	—	2.4
	8	12	12.4	9	2.6	0.88	—	EWC0809C	6	16	2.6	0.48	2	12	0.10	—	2.4
	8	14.2	15	12	3.6	1.18	—	EWC0812A	6	18.5	3.6	0.87	2.3	14.2	0.11	—	5.8
	8	14.2	15	12	3.6	1.96	—	EWC0812C	6	18.5	3.6	0.87	2.3	14.2	0.11	—	5.8
	8	14.2	15	12	3.6	1.96	1WC0812	—	6	18.5	3.6	0.87	2.3	14.2	0.11	7.0	—
	8	14.2	15	14.5	3.6	2.65	1WC0815	—	6	18.5	3.6	0.87	2.3	14.2	0.11	8.0	—
10	10	16	17	10	5	1.18	—	EWC1010A	6	21	5.0	1.20	3.2	16	0.13	—	6.0
	10	16	17	10	5	1.96	—	EWC1010C	6	21	5.0	1.20	3.2	16	0.13	—	6.0
	10	16	17	12	5	1.37	—	EWC1012A	6	21	5.0	1.20	3.2	16	0.13	—	6.8
	10	16	17	12	5	2.35	—	EWC1012C	6	21	5.0	1.20	3.2	16	0.13	—	6.8
	10	16	17	12	5	2.35	1WC1012	—	6	21	5.0	1.20	3.2	16	0.13	8.0	—
12	12	18	19	16	5.1	6.28	1WC1216	—	8	23	5.1	1.20	3.3	18	0.14	12	—

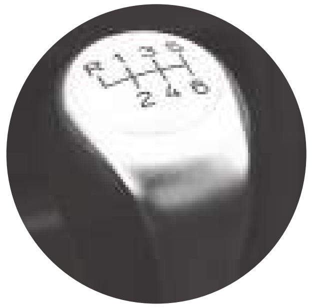
(1) Provided at equal intervals.
(2) Recommended interference when polyacetal resin housing is used.

NOTES

HEAVY-DUTY NEEDLE ROLLER BEARINGS

Overview: Heavy-duty needle roller bearings consist of a machined and ground channel-shaped outer ring with a complement of needle rollers, and a cage. The high-strength cage retains and guides the rollers. An optional lubrication groove and hole in the outer ring facilitates re-lubrication. These bearings can be used with or without a machined and ground inner ring, depending on the suitability of the shaft as a raceway surface.

- **Catalogue range:** 5 mm – 335 mm (0.1969 in – 13.1890 in) bore.
- **Markets:** Gear pumps, sheaves, automotive transmissions and two-cycle engines.
- **Features:** Thick outer ring provides maximum load capacity and shock resistance with a relatively small radial cross section.
- **Benefits:** Optimum speed and lubrication-retention capability.



Needle Roller Bearings with Inner Rings – Metric Nominal Dimensions

Series
48 = dimension series 48
49 = dimension series 49
69 = dimension series 69
10 = Series 1000
20 = Series 2000
220 = Series 22000
30 = Series 3000

Inner Ring Bore Diameter
(for NA49, NA69: < 17 mm bore)
00 = 10 mm
01 = 12 mm
02 = 15 mm
03 = 17 mm

(for NA48, NA49, NA69: ≥ 20 mm bore)
bore code x 5 = bore diameter

NA 49 04 .2RS

NA 69 / 22

Suffix
RS lip contact seal on one side
.2RS lip contact seal on both sides
TN molded cage of reinforced polymer
A modified internal design

Prefix
NA needle roller bearing with inner ring, lube hole in outer ring
NKJ needle roller bearing with inner ring
NKJS needle roller bearing with inner ring, lube hole in outer ring
NAO needle roller bearing with inner ring, without flanges

NKJ 7 / 16 TN

Inner Ring Bore Diameter
(for NA49, NA69, NKJ, NKJS, NAO)
7 = 7 mm
22 = 22 mm
30 = 3 mm

Bearing Width
(for NKJ, NAO)
16 = 16 mm
17 = 17 mm

NAO 30 x 45 x 17

Outer Ring Diameter
45 = 45 mm

Prefix
NQI with inner ring

Width
16 = 16 mm

NQI 15 / 16

Inner ring bore diameter
15 = 15 mm

Needle Roller Bearings without Inner Rings – Metric Nominal Dimensions

Series
48 = dimension series 48
49 = dimension series 49
69 = dimension series 69
10 = Series 1000
20 = Series 2000
220 = Series 22000
30 = Series 3000

Needle Roller Complement Bore Code
See tables for dimensions

RNA 49 04 .2RS

Suffix
RS lip contact seal on one side
.2RS lip contact seal on both sides
TN molded cage of reinforced polymer
A modified internal design

Prefix
RNA needle roller bearing without inner ring, lube hole in outer ring
NK needle roller bearing without inner ring
NKS needle roller bearing without inner ring, lube hole in outer ring
RNAO needle roller bearing without inner ring, without flanges

RNA 69 / 22

NK 10 / 16 TN

Needle Roller Complement Bore Diameter
(NK, NKS, RNAO):
10 = 10 mm
35 = 35 mm
(for RNA49, RNA69):
22 = 28 mm
28 = 32 mm
32 = 40 mm

Outer Ring Width
(for NK, RNAO)
16 = 16 mm
17 = 17 mm

RNAO 35 x 45 x 17

Outer Ring Diameter
45 = 45 mm

Prefix
NQ without inner ring

Width
10 = 10 mm

15 NQ 24 10 D

Needle roller complement bore diameter
15 = 15 mm

Outer diameter
24 = 24 mm

Suffix
D Case hardened steel used for outer rings
N With snap ring groove (outer ring)

Inner Rings for Needle Roller Bearings – Metric Nominal Dimensions

Prefix
JR inner ring for use with metric needle roller bearing
JRZ inner ring for use with metric needle roller bearing, without mounting chamfers

Bore Diameter
25 = 25 mm

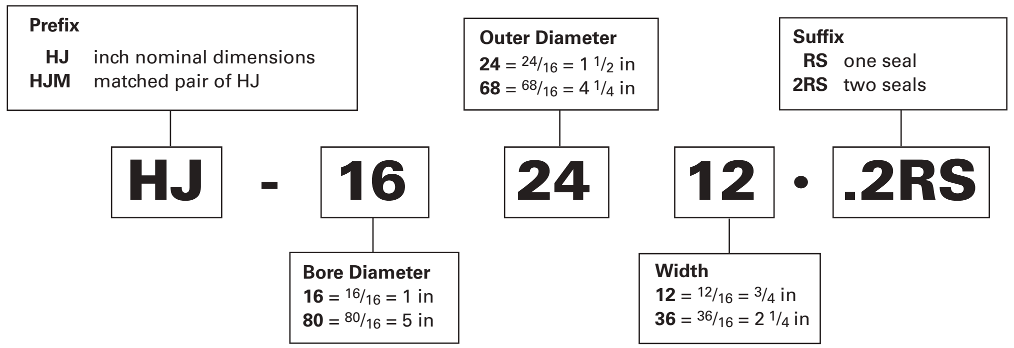
Width
18 = 18 mm

JRZ 25 x 30 x 18 JS1

Outer Diameter
30 = 30 mm

Suffix
JS1 lubrication hole

Needle Roller Bearings – Inch Nominal Dimensions



Prefix
HJ inch nominal dimensions
HJM matched pair of HJ

Outer Diameter
24 = 24/16 = 1 1/2 in
68 = 68/16 = 4 1/4 in

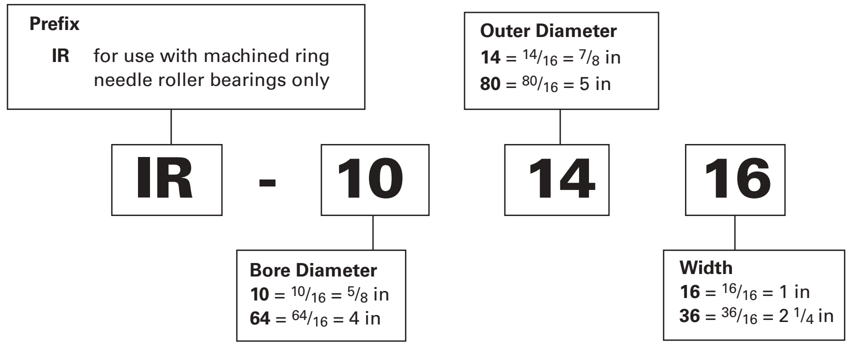
Suffix
RS one seal
2RS two seals

HJ - 16 24 12 • .2RS

Bore Diameter
16 = 16/16 = 1 in
80 = 80/16 = 5 in

Width
12 = 12/16 = 3/4 in
36 = 36/16 = 2 1/4 in

Inner Rings (six-digit number) – Inch Nominal Dimensions



Prefix
IR for use with machined ring needle roller bearings only

Outer Diameter
14 = 14/16 = 7/8 in
80 = 80/16 = 5 in

IR - 10 14 16

Bore Diameter
10 = 10/16 = 5/8 in
64 = 64/16 = 4 in

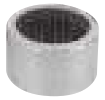
Width
16 = 16/16 = 1 in
36 = 36/16 = 2 1/4 in

Heavy-Duty Needle Roller Bearings

Page

NEEDLE ROLLER BEARINGS – METRIC SERIES

NEEDLE ROLLER BEARINGS – INCH SERIES



NEEDLE ROLLER BEARINGS

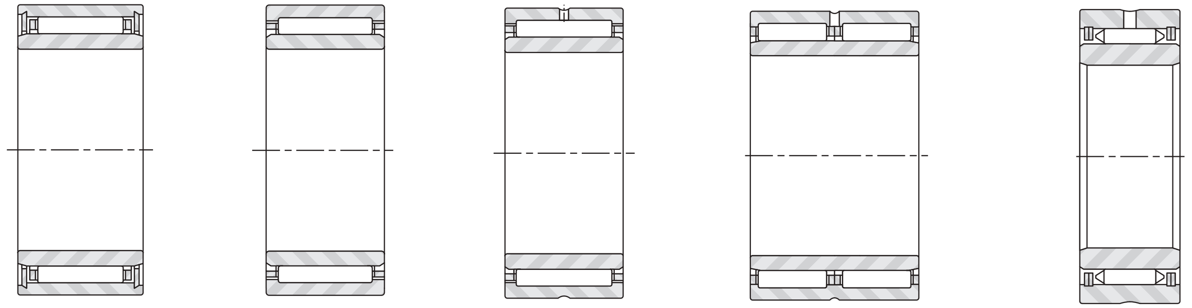
METRIC SERIES

When applications involve very heavy dynamic, static or even shock load conditions, the needle roller bearing may be found to give best results.

REFERENCE STANDARDS ARE:

- **ISO 1206** – needle roller bearings – light and medium series – dimensions and tolerances.
- **DIN 617** – rolling bearings – needle roller bearings with cage – dimension Series 48 and 49.
- **JIS B 1536** – rolling bearings – needle roller bearings – boundary dimensions and precision.

TYPES OF METRIC SERIES NEEDLE ROLLER BEARINGS



NKJ (d ≤ 7 mm [0.2756 in])

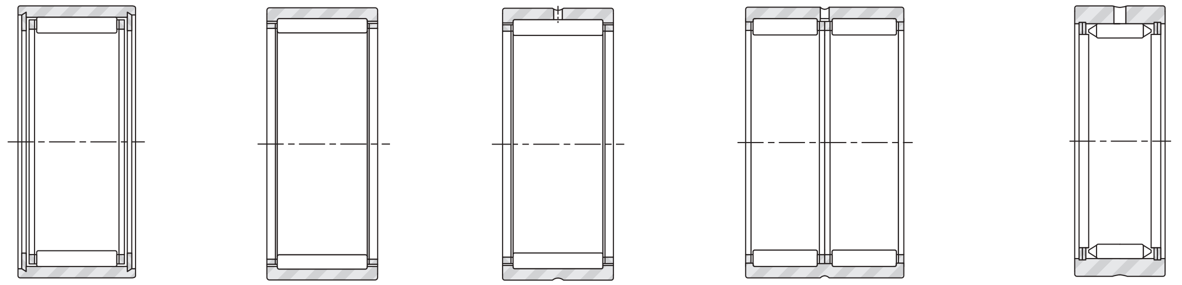
NQI

NKJ, NKJS (d ≥ 9 mm [0.3543 in]) NA48, NA49 NA69 (d ≤ 30 mm [1.1811 in])

NA69 (d ≥ 32 mm [1.2598 in])

NA Series 1000, 2000, 22000, 3000

Fig. B4-1. Needle roller bearings with inner rings



NK (F_w ≤ 10 mm [0.03937 in])

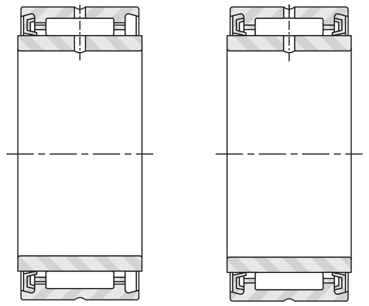
NQ

NK (F_w ≥ 12 mm [0.4724 in]) NKS, RNA48, RNA49 RNA69 (F_w ≤ 35 mm [1.3780 in])

RNA69 (F_w ≥ 40 mm [1.5748 in])

RNA Series 1000, 2000, 22000, 3000

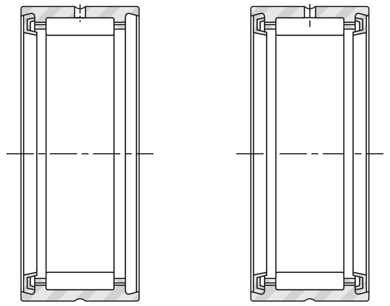
Fig. B4-2. Needle roller bearings without inner rings



NA49RS

NA49.2RS

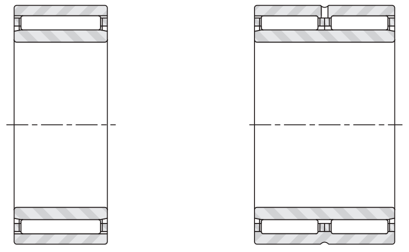
Fig. B4-3. Sealed needle roller bearings with inner rings



RNA49RS

RNA49.2RS

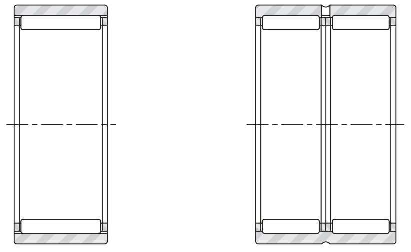
Fig. B4-4. Sealed needle roller bearings without inner rings



NAO

NAO

Fig. B4-5. Needle roller bearings without flanges, with inner rings



RNAO

RNAO

Fig. B4-6. Needle roller bearings without flanges, without inner rings

CONSTRUCTION

The basic constructions of metric series needle roller bearings are:

- With integral end flanges on the one-piece, channel-shaped outer rings (F_w ≥ 12.000 mm[0.4724 in]).
- With inserted-end washers to provide axial retention of the needle roller and cage assemblies (F_w ≤ 10.000 mm 0.3937 in).
- Without flanges where separate end washers or housing shoulders are required to provide axial retention of the needle roller and cage assemblies.
- Full, outer ring piloted complement of needle rollers (with or without inner ring).

METRIC SERIES NEEDLE ROLLER BEARINGS WITH INNER RINGS

This applies to the NKJ, NA, and NAO series.

When it is impractical to finish the shaft to meet the desired raceway design requirements, an inner ring may be used. Standard needle roller bearings are available with inner rings (such as the NA Series) to form complete bearings. Bearings furnished with inner rings meet the quality requirements in accordance with ISO standards.

- For inner- and outer-ring tolerances, the metric series bearings follow the normal tolerance class in ISO Standard 492 covering radial bearings. Bearings to more precise tolerance classes, P6 and P5, may be obtained upon request.
- The metric series bearings may be obtained with radial internal clearance in accordance with ISO Standard 5753, also specified for cylindrical roller bearings. Mostly, they follow the normal (C0) radial clearance group, although bearings to clearance groups C2, C3 and C4 may be made available on request.
- Inner ring and outer ring chamfer dimensions meet the requirements of ISO Standard 582.

METRIC SERIES NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

Whenever the shaft can be used as the inner raceway, needle roller bearings without inner rings provide advantages of economy and close control of radial internal clearance in operation. Tolerance class F6 is the normal specification for the metric series needle roller complement bore diameter of an unmounted bearing, as shown in Table B4-1 on page B-4-7 and Table B4-2 on page B-4-8. In the case of needle roller bearings of series RNAO, without flanges and without inner rings, the outer rings and needle roller and cage assemblies are not interchangeable.

Table B4-1. Metric series caged needle roller complement bore diameter for bearings without inner rings

F_w		ΔF_w min.	
>	≤	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in
3.000 0.1181	**6.000** 0.2362	**+0.018** +0.0007	**+0.010** +0.0004
6.000 0.2362	**10.000** 0.3937	**+0.022** +0.0009	**+0.013** +0.0005
10.000 0.3937	**18.000** 0.7087	**+0.027** +0.0011	**+0.016** +0.0006
18.000 0.7087	**30.000** 1.1811	**+0.033** +0.0013	**+0.020** +0.0008
30.000 1.1811	**50.000** 1.9685	**+0.041** +0.0016	**+0.025** +0.0010
50.000 1.9685	**80.000** 3.1496	**+0.049** +0.0019	**+0.030** +0.0012
80.000 3.1496	**120.000** 4.7244	**+0.058** +0.0023	**+0.036** +0.0014
120.000 4.7244	**180.000** 7.0866	**+0.068** +0.0027	**+0.043** +0.0017
180.000 7.0866	**250.000** 9.8425	**+0.079** +0.0031	**+0.050** +0.0020
250.000 9.8425	**315.000** 12.4016	**+0.088** +0.0035	**+0.056** +0.0022
315.000 12.4016	**400.000** 15.7480	**+0.098** +0.0039	**+0.062** +0.0024

Table B4-2. Full complement metric needle roller complement bore diameter for bearings without inner rings

F_w		ΔF_w min.	
>	≤	Max.	Min.
mm in	mm in	mm in	mm in
5.000 0.1969	**15.000** 0.5906	**+0.040** +0.0016	**+0.020** +0.0008
15.000 0.5906	**25.000** 0.9843	**+0.043** +0.0017	**+0.020** +0.0008
25.000 0.9843	**30.000** 1.1811	**+0.048** +0.0019	**+0.025** +0.0010
30.000 1.1811	**35.000** 1.3780	**+0.053** +0.0021	**+0.030** +0.0012
35.000 1.3780	**60.000** 2.3622	**+0.058** +0.0023	**+0.035** +0.0014
60.000 2.3622	**80.000** 3.1496	**+0.073** +0.0029	**+0.045** +0.0018
80.000 3.1496	**115.000** 4.5276	**+0.078** +0.0031	**+0.050** +0.0020
115.000 4.5276	**180.000** 7.0866	**+0.088** +0.0035	**+0.060** +0.0024
180.000 7.0866	**220.000** 8.6614	**+0.103** +0.0041	**+0.070** +0.0028
220.000 8.6614	**270.000** 10.6299	**+0.113** +0.0044	**+0.080** +0.0031
270.000 10.6299	**350.000** 13.7795	**+0.128** +0.0050	**+0.090** +0.0035

METRIC SERIES NEEDLE ROLLER BEARINGS WITH INTEGRAL FLANGES

The needle roller bearing has a one-piece, channel-shaped outer ring of bearing-quality steel heat treated to yield maximum load rating. The integral end flanges provide axial location for the needle rollers. The bores of the end flanges serve as piloting surfaces for the cage.

A steel cage provides inward retention for the needle rollers, and the design assures roller stability and minimizes friction between the cage and the needle rollers. The cage has maximum strength consistent with the inherent high-load ratings of needle roller bearings.

Needle roller bearings of series NKJ, NQI, NKJS, NA48 and NA49 contain one needle roller and cage assembly. Bearings of series NA69, with bearing bores of 32.000 mm (1.2598 in) and above, have two needle roller and cage assemblies.

The outer ring has a lubricating groove and a lubricating hole for more convenient lubrication of the bearing. However, the smaller bearings of series **NKJ** and **NK** (Fw < 12 mm [0.4724 in]) do not have a lubricating groove or a lubricating hole.

METRIC SERIES NEEDLE ROLLER BEARINGS WITH INSERTED END WASHERS

Some metric series needle roller bearings have inserted end washers to provide axial retention of the needle roller and cage assembly. The radial needle roller and cage assemblies, consistent with other designs, provide inward and outward retention for the needle rollers.

METRIC SERIES NEEDLE ROLLER BEARINGS WITHOUT FLANGES

The radial needle roller and cage assembly, used in the metric series needle roller bearings without flanges, is slightly narrower than the inner and outer rings to ensure unobstructed operation. Separate end washers are required to provide axial retention of the radial needle roller and cage assembly. Wide needle roller bearings, using two needle roller and cage assemblies, have a lubricating groove and one lubricating hole in the outer ring to facilitate re-lubrication of the bearing. Narrow needle roller bearings do not have a lubricating groove or a lubricating hole in the outer ring.

SEALED METRIC SERIES NEEDLE ROLLER BEARINGS OF DIMENSION SERIES 49

Needle roller bearings of Series 49 are available with one or two integral lip-contact seals, as listed on page B-4-30. One seal is designated by suffix letters RS. Two seals are designated by .2RS. When combining sealed metric series needle roller bearings with inner rings, it is suggested to use inner rings, shown on pages B-2-28 and B-8-22, with designation JRZ because they are wider than the outer rings to ensure positive seal contact.

Sealed bearings are normally packed with a high quality lithium soap-based grease suitable up to 120° C (248° F) for short periods of operation.

The speed rating specified for sealed bearings listed in the bearing tables is based on operating conditions determined by testing. Optimum performance may be expected providing the bearing is properly installed with appropriate internal clearances and subjected to a load of low magnitude. Care should be taken that overheating will not occur, thus preventing breakdown of the grease and eventual bearing failure.

METRIC SERIES FULL COMPLEMENT NEEDLE ROLLER BEARINGS

Series NA and RNA 1000, 2000, 22000 and 3000 are available with possible options of extra wide and/or crowned inner ring raceways. Consult your representative for application details.

BEARING MOUNTING

MOUNTING DIMENSIONS

It is suggested that needle roller bearings are mounted in their housings with a clearance fit, if the load is stationary relative to the housing, or with a tight transition fit, if the load rotates relative to the housing. Table B4-3 lists the suggested tolerances for the housing bore and the shaft raceway for metric series bearings without inner rings. Table B4-4 lists the suggested shaft tolerances for the above two mounting conditions when the metric series bearings are used with inner rings. The suggested housing bore tolerances for metric series bearings with inner rings is the same as the housing bore tolerance listed in Table B4-3 for metric series bearings without inner rings. Other quality requirements for shafts and housings are given in the engineering section.

Other mounting dimensions may be required for special operating conditions such as:

1. Extremely heavy radial loads.
2. Shock loads.
3. Temperature gradient across bearing.
4. Housing material with heat expansion coefficient different than that of the bearing.
5. Oscillating motion applications.

Table B4-3. Mounting tolerances for metric series bearings without inner ring

Rotation conditions	Nominal housing bore diameter D	ISO tolerance zone for housing		Nominal shaft diameter F shaft	ISO tolerance zone for shaft	
	mm	caged	full	mm	caged	full
Load stationary relative to housing	all diameters	H7 (J7)	J6	all diameters	**h6 (h5)**	**h5**
General work with larger clearance		K7	—		**g6**	—
Load rotates relative to housing		N7	M6		**f6**	**g5**

Care should be taken that the selected bearing internal clearance is appropriate for the operating conditions.

Table B4-4. Shaft tolerances for metric series bearings with inner rings (use housing tolerance shown in Table B4-3)

Rotation conditions	Nominal shaft diameter, d		ISO tolerance zone for shaft	
	mm in	mm in	caged	full
Load rotates relative to housing	all diameters		g6	h5 (h6)
Load stationary relative to housing	>	≤		
		40.000 1.5748	k6	k5
	40.000 1.5748	**100.000** 3.9370	m6	m5
	100.000 3.9370	**140.000** 5.5118	m6	m5
	140.000 5.5118		n6	n6

Care should be taken that the selected bearing internal clearance is appropriate for the operating conditions.

Regardless of the fit of the bearing outer ring in the housing, the outer ring should be axially located by housing shoulders or other positive means. The bearing rings should closely fit against the shaft and housing shoulders and must not contact the fillet radius. The maximum shaft or housing fillet $r_{a\ max}$ should be no greater than the minimum bearing chamfer $r_{s\ min}$, as shown in Table B4-5 on page B-4-10.

In order to permit mounting and dismounting of the shaft, the maximum diameter D_1 in Table B4-6 on page B-4-10 must not be exceeded. F_W is shown in the bearing tables.

Needle roller bearings without flanges of series RNAO and NAO must have the radial needle roller and cage assembly properly end-guided by shoulders, as shown in Table B4-7(1) on page B-4-11 and Table B4-7(2) on page B-4-12, or other suitable means, such as spring steel washers (SNSH) shown on page B-8-39. These end-guiding surfaces should be hardened and precision turned, or ground to minimize wear, and should properly fit against the outer rings and the inner rings to provide the desired end clearance for the needle roller and cage assembly.

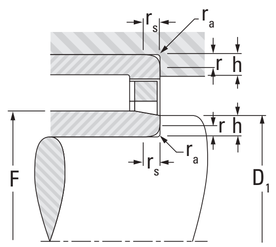


Fig. B4-7. Fillet

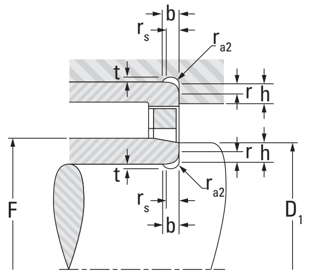


Fig. B4-8. Undercut

Table B4-5. Fillets, undercuts, and shoulder heights for metric series bearings

r_s[1]	r_a	t	r_{a2}	b	h
Min.	Max.		Min.		Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
0.15 0.0059	**0.15** 0.0059				**0.6** 0.0236
0.3 0.0118	**0.3** 0.0118				**1** 0.0394
0.6 0.0236	**0.6** 0.0236				**2** 0.0787
1 0.0394	**1** 0.0394	**0.2** 0.0079	**1.3** 0.0512	**2** 0.0787	**2.5** 0.0984
1.1 0.0433	**1** 0.0394	**0.3** 0.0118	**2** 0.0787	**3** 0.1181	**3.25** 0.1280
1.5 0.0591	**1.5** 0.0591	**0.4** 0.0158	**2** 0.0787	**3.2** 0.1260	**4** 0.1575
2 0.0787	**2** 0.0787	**0.5** 0.0197	**2.5** 0.0984	**4** 0.1575	**5** 0.1969
2.1 0.0827	**2.1** 0.0827	**0.5** 0.0197	**3** 0.1181	**4.7** 0.1850	**5.5** 0.2165
3 0.1181	**2.5** 0.0984	**0.5** 0.0197	**3.5** 0.1378	**5.3** 0.2087	**6** 0.2362

[1] r_s : Bearing component corner rounding.

Table B4-6. Shoulder diameter $D_{1\ max.}$ for metric series bearings

		mm in	**mm** in	**mm** in	**mm** in	**mm** in
Needle roller complement bore diameter F_w	>		**20.000** 0.7874	**55.000** 2.1653	**100.000** 3.9370	**250.000** 9.8425
	≤	**20.000** 0.7874	**55.000** 2.1653	**100.000** 3.9370	**250.000** 9.8425	
Diameter	D_{1max}	F_w -0.3	F_w -0.5	F_w -0.7	F_w -1.0	F_w -1.5

LOAD RATING FACTORS

DYNAMIC LOADS

Needle roller bearings can accommodate only radial loads.

$$P = F_r \qquad (kN)$$

P = The maximum dynamic radial load that may be applied to a needle roller bearing based on the dynamic load rating, C_r, given in the bearing tables. This load should be $\leq C_r/3$.

STATIC LOADS

Needle roller bearings can accommodate only radial loads.

$$P_0 = F_r \qquad (kN)$$

MOUNTING IN SETS

Radial needle roller and cage assemblies that are mounted side by side must have needle rollers of the same group limits to ensure uniform load distribution.

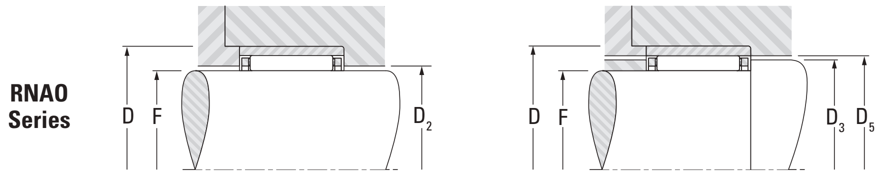


Fig. B4-9. Guidance in the housing (left) and on the shaft (right)

Table B4-7(1). Mounting dimensions for metric series needle roller bearings without flanges

Dimensions	Bearing series RNAO		
	D_3	D_2	D_5
FxD	Max.	Min.	Min.
mm in	**mm** in	**mm** in	**mm** in
10x17 0.3937x0.6693	**12.7** 0.5000	**10.3** 0.4055	**13.3** 0.5236
12x19 0.4724x0.7480	**14.7** 0.5787	**12.3** 0.4843	**15.3** 0.6024
14x22 0.5512x0.8661	**17.6** 0.6929	**14.4** 0.5669	**18.3** 0.7205
15x23 0.5906x0.9055	**18.6** 0.7323	**15.4** 0.6063	**19.3** 0.7598
16x24 0.6299x0.9499	**19.6** 0.7717	**16.4** 0.6457	**20.3** 0.7992
17x25 0.6693x0.9843	**20.6** 0.8110	**17.4** 0.6850	**21.3** 0.8386
18x26 0.7087x1.0236	**21.6** 0.8504	**18.4** 0.7244	**22.3** 0.8780
18x30 0.7087x1.1811	**23.6** 0.9291	**18.6** 0.7323	**24.5** 0.9646
20x28 0.7874x1.1024	**23.6** 0.9291	**20.4** 0.8032	**24.3** 0.9567
20x32 0.7874x1.2598	**25.6** 1.0079	**20.6** 0.8110	**26.5** 1.0433
22x30 0.8661x1.1811	**25.6** 1.0079	**22.4** 0.8819	**26.3** 0.9291
22x35 0.8661x1.3780	**28.4** 1.1181	**22.8** 0.8976	**29.5** 1.1614
25x35 0.9843x1.3780	**29.4** 1.1575	**25.6** 1.0079	**30.5** 1.2008
25x37 0.9843x1.4567	**31.4** 1.2362	**25.8** 1.0158	**32.5** 1.2795
28x40 1.1024x1.5748	**34.4** 1.3543	**28.8** 1.1339	**35.5** 1.3976
30x40 1.1811x1.5748	**34.4** 1.3543	**30.6** 1.2047	**35.5** 1.3976
30x42 1.1811x1.6535	**36.4** 1.4331	**30.8** 1.2126	**37.5** 1.4764
35x45 1.3780x1.7717	**39.4** 1.5512	**35.6** 1.4016	**40.5** 1.5945
35x47 1.3780x1.8504	**41.4** 1.6299	**35.8** 1.4096	**42.5** 1.6732
40x50 1.5748x1.9685	**44.4** 1.7480	**40.6** 1.5984	**45.5** 1.7913
40x55 1.5748x2.1654	**47.2** 1.8582	**41** 1.6142	**48.5** 1.9095
45x55 1.7717x2.1654	**49.4** 1.9449	**45.6** 1.7953	**50.5** 1.9882
45x62 1.7717x2.4409	**52.2** 2.0551	**46** 1.8110	**53.5** 2.1063
50x62 1.9685x2.4409	**54.4** 2.1417	**50.6** 1.9921	**55.8** 2.1969
50x65 1.9685x2.5591	**57.2** 2.2520	**51** 2.0079	**58.8** 2.3032
55x68 2.1654x2.6772	**59.4** 2.3386	**55.6** 2.1890	**60.8** 2.3937
55x72 2.1654x2.8347	**62.2** 2.4488	**56** 2.2047	**63.8** 2.5118
60x78 2.3622x3.0709	**67.2** 2.6457	**61** 2.4016	**68.8** 2.7087
65x85 2.5591x3.3465	**72.2** 2.8425	**66** 2.5984	**73.8** 2.9055
70x90 2.7559x3.5433	**77.2** 3.0394	**71** 2.7953	**78.8** 3.1024
75x95 2.9528x3.7402	**82.2** 3.2362	**76** 2.9921	**84** 3.3071
80x100 3.1496x3.9370	**87.2** 3.4331	**81** 3.1890	**89** 3.5039
85x105 3.3465x4.1339	**92.2** 3.6299	**86** 3.3858	**94** 3.7008
90x110 3.5433x4.3307	**97.2** 3.8268	**91** 3.5827	**99** 3.8976
95x115 3.7402x4.5276	**102.2** 4.0236	**96** 3.7795	**104** 4.0945
100x120 3.9370x4.7244	**107.2** 4.2205	**101** 3.9764	**109** 4.2913

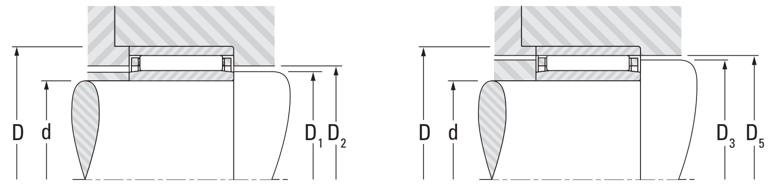


Fig. B4-10. Guidance in the housing (left) and on the shaft (right)

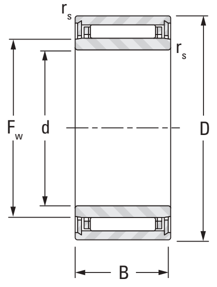
Table B4-7(2). Mounting dimensions for metric series needle roller bearings without flanges

Dimensions	Bearing series NAO			
	D1	D2	D3	D5
dxD	Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in
6x17 0.2362x'0.6693	**9.7** 0.3819	**10.3** 0.4055	**12.7** 0.5000	**13.3** 0.5236
8x19 0.3150x'0.7480	**11.7** 0.4606	**12.3** 0.4843	**14.7** 0.5787	**15.3** 0.6024
10x22 0.3937x'0.8661	**13.7** 0.5394	**14.4** 0.5669	**17.6** 0.6929	**18.3** 0.7205
10x26 0.3937x1.0236	**13.7** 0.5394	**14.6** 0.5748	**19.6** 0.7717	**20.3** 0.7992
12x24 0.4724x'0.9449	**15.7** 0.6181	**16.4** 0.6457	**19.6** 0.7717	**20.3** 0.7992
12x28 0.4724x1.1024	**15.7** 0.6181	**16.6** 0.6535	**21.6** 0.8504	**22.3** 0.878
15x28 0.5906x1.1024	**19.5** 0.7677	**20.4** 0.8032	**23.6** 0.9291	**24.3** 0.9567
15x32 0.5906x1.2598	**19.5** 0.7677	**20.6** 0.811	**25.6** 1.0079	**26.5** 1.0433
17x30 0.6693x1.1811	**21.5** 0.8465	**22.4** 0.8819	**25.6** 1.0079	**26.3** 1.0354
17x35 0.6693x1.3780	**21.5** 0.8465	**22.8** 0.8976	**28.4** 1.1181	**29.5** 1.1614
20x35 0.7874x1.3780	**24.5** 0.9646	**25.6** 1.0079	**29.4** 1.1575	**30.5** 1.2008
20x37 0.7874x1.4567	**24.5** 0.9646	**25.8** 1.0158	**31.4** 1.2362	**32.5** 1.2795
25x40 0.9843x1.5748	**29.5** 1.1614	**30.6** 1.2047	**34.4** 1.3543	**35.5** 1.3976
25x42 0.9843x1.6535	**29.5** 1.1614	**30.8** 1.2126	**36.4** 1.4331	**37.5** 1.4764
30x45 1.1811x1.7717	**34.5** 1.3583	**35.6** 1.4016	**39.4** 1.5512	**40.5** 1.5945
30x47 1.1811x1.8504	**34.5** 1.3583	**35.8** 1.4095	**41.4** 1.6299	**42.5** 1.6732

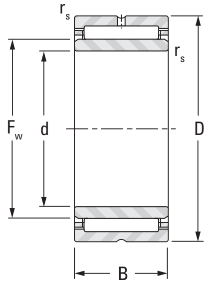
Dimensions	Bearing series NAO			
	D1	D2	D3	D5
dxD	Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in
35x50 1.3780x1.9685	**39.5** 1.5551	**40.6** 1.5984	**44.4** 1.748	**45.5** 1.7913
35x55 1.3780x2.1654	**39.5** 1.5551	**41** 1.6142	**47.2** 1.8583	**48.5** 1.9095
40x55 1.5748x2.1654	**44.5** 1.7520	**45.6** 1.7952	**49.4** 1.9449	**50.5** 1.9882
40x62 1.5748x2.4409	**44.5** 1.7520	**46** 1.8110	**52.2** 2.0551	**53.5** 2.1063
45x62 1.7717x2.4409	**49.5** 1.9488	**50.6** 1.9921	**54.4** 2.1417	**55.8** 2.1969
45x72 1.7717x2.8347	**54.5** 2.1457	**56** 2.2047	**62.2** 2.4488	**63.8** 2.5118
50x68 1.9685x2.6772	**54.5** 2.1457	**55.6** 2.1890	**59.4** 2.3386	**60.8** 2.3937
50x78 1.9685x3.0709	**59.3** 2.3347	**61** 2.4016	**67.2** 2.6457	**68.8** 2.7087
55x85 2.1654x3.3465	**64.3** 2.5315	**66** 2.5984	**72.2** 2.8425	**73.8** 2.9055
60x90 2.3622x3.5433	**69.3** 2.7284	**71** 2.7953	**77.2** 3.0394	**78.8** 3.1024
65x95 2.5591x3.7402	**74.3** 2.9252	**76** 2.9921	**82.2** 3.2362	**84** 3.3071
70x100 2.7559x3.9370	**79.3** 3.1221	**81** 3.1890	**87.2** 3.4331	**89** 3.5039
75x105 2.9528x4.1339	**84.3** 3.3189	**86** 3.3858	**92.2** 3.6299	**94** 3.7008
80x110 3.1496x4.3307	**89.3** 3.5158	**91** 3.5827	**97.2** 3.8268	**99** 3.8976
85x115 3.3465x4.5276	**94.3** 3.7126	**96** 3.7795	**102.2** 4.0236	**104** 4.0945
90x120 3.5433x4.7244	**99.3** 3.9095	**101** 3.9764	**107.2** 4.2205	**109** 4.2913

NEEDLE ROLLER BEARINGS WITH INNER RINGS

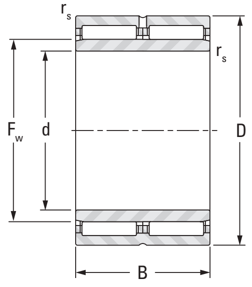
METRIC SERIES
NKJ, NKJS, NA48
NA49, NA69 SERIES



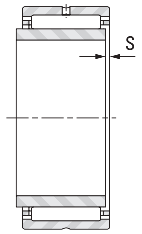
NKJ (d ≤ 7)



NKJ (d ≥ 9),
NKJS, NA48, NA49,
NA69 (d ≤ 30)



NA69
(d ≥ 32)



Shaft Dia.	d	D	B	Fw	rs min.	s(1)	Bearing Designation	Load Ratings		Fatigue Load Limit Cu	Speed Ratings		Approx. Wt.
								Dynamic	Static		Grease	Oil	
								C	C0				
mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min-1		kg lbs
5 0.1969	**5** 0.1969	**15** 0.5906	**12** 0.472	**8** 0.315	**0.3** 0.012	**1.5** 0.059	NKJ5/12	**4.57** 1030	**4.89** 1100	0.740	26000	41000	**0.014** 0.031
	5 0.1969	**15** 0.5906	**16** 0.63	**8** 0.315	**0.3** 0.012	**1.5** 0.059	NKJ5/16	**5.22** 1170	**5.78** 1300	0.880	26000	41000	**0.017** 0.037
6 0.2362	**6** 0.2362	**16** 0.6299	**12** 0.472	**9** 0.3543	**0.3** 0.012	**1.5** 0.059	NKJ6/12	**4.27** 960	**4.6** 1030	0.700	26000	40000	**0.015** 0.033
	6 0.2362	**16** 0.6299	**16** 0.63	**9** 0.3543	**0.3** 0.012	**1.5** 0.059	NKJ6/16	**5.57** 1250	**6.47** 1450	0.980	26000	40000	**0.019** 0.042
7 0.2756	**7** 0.2756	**17** 0.6693	**12** 0.472	**10** 0.3937	**0.3** 0.012	**1.5** 0.059	NKJ7/12	**5.4** 1210	**6.43** 1450	0.980	25000	39000	**0.017** 0.037
	7 0.2756	**17** 0.6693	**16** 0.63	**10** 0.3937	**0.3** 0.012	**1.5** 0.059	NKJ7/16TN	**5.3** 1190	**6.27** 1410	0.940	25000	39000	**0.021** 0.046
9 0.3543	**9** 0.3543	**19** 0.748	**12** 0.472	**12** 0.4724	**0.3** 0.012	**1.5** 0.059	NKJ9/12A	**6.86** 1540	**7.6** 1710	1.15	19000	30000	**0.018** 0.04
	9 0.3543	**19** 0.748	**16** 0.63	**12** 0.4724	**0.3** 0.012	**1.5** 0.059	NKJ9/16	**6.78** 1520	**9.03** 2030	1.40	19000	30000	**0.024** 0.053
10 0.3937	**10** 0.3937	**22** 0.8661	**13** 0.512	**14** 0.5512	**0.3** 0.012	**1** 0.039	NA4900	**9.39** 2110	**10.3** 2320	1.55	16000	24000	**0.025** 0.055
	10 0.3937	**22** 0.8661	**16** 0.63	**14** 0.5512	**0.6** 0.024	**1.5** 0.059	NKJ10/16A	**12.4** 2790	**14.8** 3330	2.10	16000	24000	**0.032** 0.071
	10 0.3937	**22** 0.8661	**20** 0.787	**14** 0.5512	**0.3** 0.012	**1.5** 0.059	NKJ10/20A	**14.7** 3300	**18.4** 4140	2.75	16000	24000	**0.04** 0.088
12 0.4724	**12** 0.4724	**24** 0.9449	**13** 0.512	**16** 0.6299	**0.3** 0.012	**1** 0.039	NA4901	**10.5** 2360	**12** 2700	1.85	18000	28000	**0.028** 0.062
	12 0.4724	**24** 0.9449	**16** 0.63	**16** 0.6299	**0.3** 0.012	**1.5** 0.059	NKJ12/16A	**13** 2920	**16.2** 3640	2.50	18000	28000	**0.036** 0.079
	12 0.4724	**24** 0.9449	**20** 0.787	**16** 0.6299	**0.3** 0.012	**1.5** 0.059	NKJ12/20A	**15.4** 3460	**20.2** 4540	3.20	18000	28000	**0.046** 0.101
	12 0.4724	**24** 0.9449	**22** 0.866	**16** 0.6299	**0.3** 0.012	**1** 0.039	NA6901A	**16.1** 3620	**21.3** 4790	3.55	18000	28000	**0.051** 0.11
15 0.5906	**15** 0.5906	**27** 1.063	**16** 0.63	**19** 0.748	**0.3** 0.012	**1.5** 0.059	NKJ15/16A	**14.1** 3170	**19** 4270	2.90	15000	24000	**0.042** 0.093
	15 0.5906	**27** 1.063	**20** 0.787	**19** 0.748	**0.3** 0.012	**1.5** 0.059	NKJ15/20A	**16.8** 3780	**23.6** 5310	3.75	15000	24000	**0.054** 0.119
	15 0.5906	**28** 1.1024	**13** 0.512	**20** 0.7874	**0.3** 0.012	**1** 0.039	NA4902	**11.8** 2650	**15.3** 3440	2.35	14000	22000	**0.037** 0.082
	15 0.5906	**28** 1.1024	**23** 0.906	**20** 0.7874	**0.3** 0.012	**1.5** 0.059	NA6902A	**18.4** 4140	**26.9** 6050	4.20	14000	22000	**0.067** 0.148
17 0.6693	**17** 0.6693	**29** 1.1417	**16** 0.63	**21** 0.8268	**0.3** 0.012	**2** 0.079	NKJ17/16A	**15.3** 3440	**21.6** 4860	3.30	14000	21000	**0.047** 0.104

[1] Max. axial displacement

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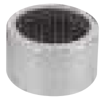
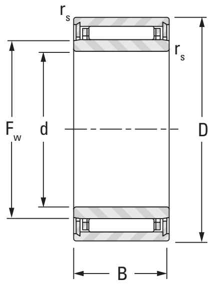
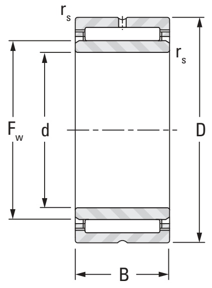


NEEDLE ROLLER BEARINGS WITH INNER RINGS

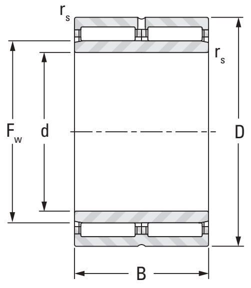
METRIC SERIES
NKJ, NKJS, NA48
NA49, NA69 SERIES



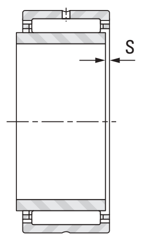
NKJ (d ≤ 7)



NKJ (d ≥ 9),
NKJS, NA48, NA49,
NA69 (d ≤ 30)



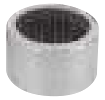
NA69
(d ≥ 32)



Shaft Dia.	d	D	B	F_w	$r_{s\,min.}$	s(1)	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								Dynamic	Static		Grease	Oil	
								C	C_0				
mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
17 0.6693	17 0.6693	29 1.1417	20 0.787	21 0.8268	0.3 0.012	1.5 0.059	NKJ17/20A	18.1 4070	23.9 5370	4.25	14000	21000	0.059 0.13
	17 0.6693	30 1.1811	13 0.512	22 0.8661	0.3 0.012	1 0.039	NA4903	12.2 2740	16.4 3690	2.50	13000	20000	0.04 0.088
	17 0.6693	30 1.1811	23 0.906	22 0.8661	0.6 0.024	1 0.039	NA6903A	19.8 4450	30.6 6880	4.75	13000	20000	0.084 0.185
	17 0.6693	37 1.4567	20 0.787	24 0.9449	0.6 0.024	1 0.039	NKJS17A	29.1 6540	32.8 7370	5.30	13000	20000	0.108 0.238
20 0.7874	20 0.7874	32 1.2598	16 0.63	24 0.9449	0.3 0.012	1.5 0.059	NKJ20/16A	16.2 3640	24.3 5460	3.70	12000	18000	0.053 0.117
	20 0.7874	32 1.2598	20 0.787	24 0.9449	0.3 0.012	1.5 0.059	NKJ20/20A	19.3 4340	30.3 6810	4.80	12000	18000	0.067 0.148
	20 0.7874	37 1.4567	17 0.669	25 0.9843	0.3 0.012	1.5 0.059	NA4904	21.3 4790	25.5 5730	6.75	12000	18000	0.084 0.185
	20 0.7874	37 1.4567	30 1.181	25 0.9843	0.3 0.012	1.5 0.059	NA6904A	36.6 8230	51 11500	7.95	12000	18000	0.133 0.293
	20 0.7874	42 1.6535	20 0.787	28 1.1024	0.6 0.024	1 0.039	NKJS20A	30.3 6810	38.4 8630	6.15	11000	16000	0.13 0.287
22 0.8661	22 0.8661	34 1.3386	16 0.63	26 1.0236	0.3 0.012	1.5 0.059	NKJ22/16A	16.6 3730	25.7 5780	3.95	11000	17000	0.058 0.128
	22 0.8661	34 1.3386	20 0.787	26 1.0236	0.3 0.012	2 0.079	NKJ22/20A	19.7 4430	32 7190	5.05	11000	17000	0.071 0.157
	22 0.8661	39 1.5354	17 0.669	28 1.1024	0.3 0.012	1.5 0.059	NA49/22A	23.3 5240	29.6 6650	4.55	10000	16000	0.089 0.196
	22 0.8661	39 1.5354	30 1.181	28 1.1024	0.3 0.012	1 0.039	NA69/22A	30.6 6880	50.7 11400	7.85	10000	16000	0.163 0.359
25 0.9843	25 0.9843	38 1.4961	20 0.787	29 1.1417	0.3 0.012	2 0.079	NKJ25/20A	23.4 5260	36.4 8180	5.80	9800	15000	0.086 0.19
	25 0.9843	38 1.4961	30 1.181	29 1.1417	0.3 0.012	2 0.079	NKJ25/30A	29.8 6700	56.4 12700	8.70	9800	15000	0.13 0.287
	25 0.9843	42 1.6535	17 0.669	30 1.1811	0.3 0.012	1.5 0.059	NA4905	24.3 5460	31.7 7130	4.90	9700	15000	0.099 0.218
	25 0.9843	42 1.6535	30 1.181	30 1.1811	0.3 0.012	1.5 0.059	NA6905A	39.7 8920	59.6 13400	9.30	9700	15000	0.178 0.392
	25 0.9843	47 1.8504	22 0.866	32 1.2598	0.6 0.024	1.5 0.059	NKJS25A	36 8090	36.2 8140	7.40	9200	14000	0.174 0.384
28 1.1024	28 1.1024	42 1.6535	20 0.787	32 1.2598	0.3 0.012	2 0.079	NKJ28/20A	24.8 5580	40.4 9080	6.45	8800	14000	0.104 0.229
	28 1.1024	42 1.6535	30 1.181	32 1.2598	0.3 0.012	2 0.079	NKJ28/30A	35.6 8000	64.3 14500	9.95	8800	14000	0.156 0.344
28 1.1024	28 1.1024	45 1.7717	17 0.669	32 1.2598	0.3 0.012	1.5 0.059	NA49/28	25.1 5640	33.8 7600	5.20	9000	14000	0.108 0.238
	28 1.1024	45 1.7717	30 1.181	32 1.2598	0.3 0.012	1.5 0.059	NA69/28A	37.1 8340	55.4 12500	9.75	9000	14000	0.19 0.419
30 1.1811	30 1.1811	45 1.7717	20 0.787	35 1.378	0.3 0.012	1.5 0.059	NKJ30/20A	26.1 5870	44.4 9980	7.05	8000	12000	0.12 0.265
	30 1.1811	45 1.7717	30 1.181	35 1.378	0.3 0.012	1.5 0.059	NKJ30/30A	37.4 8410	70.6 15900	11.0	8000	12000	0.179 0.395
	30 1.1811	47 1.8504	17 0.669	35 1.378	0.3 0.012	1.5 0.059	NA4906	25.9 5820	36 8090	5.55	8200	13000	0.114 0.251
	30 1.1811	47 1.8504	30 1.181	35 1.378	0.3 0.012	1 0.039	NA6906A	42.6 9580	68.2 15300	10.6	8200	13000	0.205 0.452
	30 1.1811	52 2.0472	22 0.866	37 1.4567	0.6 0.024	1.5 0.059	NKJS30A	39 8770	53.4 12000	8.55	7900	12000	0.198 0.437
32 1.2598	32 1.2598	47 1.8504	20 0.787	37 1.4567	0.3 0.012	2 0.079	NKJ32/20	26.1 5870	45.2 10200	7.05	7600	12000	0.127 0.28
	32 1.2598	47 1.8504	30 1.181	37 1.4567	0.3 0.012	1.5 0.059	NKJ32/30A	38.2 8590	73.9 16600	11.5	7600	12000	0.192 0.423
	32 1.2598	52 2.0472	20 0.787	40 1.5748	0.6 0.024	1.5 0.059	NA49/32	32 7190	49.3 11100	7.85	7100	11000	0.169 0.373
	32 1.2598	52 2.0472	36 1.417	40 1.5748	0.6 0.024	1 0.039	NA69/32A	48.6 10900	84.5 19000	13.1	7100	11000	0.313 0.69
35 1.378	35 1.378	50 1.9685	20 0.787	40 1.5748	0.3 0.012	2 0.079	NKJ35/20A	27.8 6250	50.4 11300	8.05	7000	11000	0.135 0.298
	35 1.378	50 1.9685	30 1.181	40 1.5748	0.3 0.012	1.5 0.059	NKJ35/30A	40 8990	80.2 18000	12.4	7000	11000	0.208 0.459
	35 1.378	55 2.1654	20 0.787	42 1.6535	0.6 0.024	1.5 0.059	NA4907	32.8 7370	51.7 11600	8.25	6700	10000	0.179 0.395
	35 1.378	55 2.1654	36 1.417	42 1.6535	0.6 0.024	1 0.039	NA6907A	49.9 11200	88.7 19900	13.7	6700	10000	0.34 0.75
	35 1.378	58 2.2835	22 0.866	43 1.6929	0.6 0.024	1 0.039	NKJS35A	41.6 9350	60.7 13600	9.75	6700	10000	0.235 0.518
38 1.4961	38 1.4961	53 2.0866	20 0.787	43 1.6929	0.3 0.012	2 0.079	NKJ38/20A	29 6520	54.4 12200	8.65	6400	9900	0.146 0.322
	38 1.4961	53 2.0866	30 1.181	43 1.6929	0.3 0.012	1.5 0.059	NKJ38/30A	41.6 9350	86.6 19500	13.4	6400	9900	0.196 0.432
40 1.5748	40 1.5748	55 2.1654	20 0.787	45 1.7717	0.3 0.012	2 0.079	NKJ40/20A	29.5 6630	56.4 12700	9.00	6100	9400	0.152 0.335
	40 1.5748	55 2.1654	30 1.181	45 1.7717	0.3 0.012	1.5 0.059	NKJ40/30A	42.3 9510	89.8 20200	13.9	6100	9400	0.229 0.505
	40 1.5748	62 2.4409	22 0.866	48 1.8898	0.6 0.024	1.5 0.059	NA4908	44.2 9940	67.8 15200	10.9	5900	9100	0.248 0.547
	40 1.5748	62 2.4409	40 1.575	48 1.8898	0.6 0.024	1.5 0.059	NA6908A	70.8 15900	124 27900	19.8	5900	9100	0.473 1.043
	40 1.5748	65 2.5591	22 0.866	50 1.9685	1 0.039	1 0.039	NKJS40A	45.5 10200	71.3 16000	11.4	5700	8700	0.292 0.644
42 1.6535	42 1.6535	57 2.2441	20 0.787	47 1.8504	0.3 0.012	2 0.079	NKJ42/20A	30 6740	58.5 13200	9.30	5900	9000	0.159 0.351
	42 1.6535	57 2.2441	30 1.181	47 1.8504	0.3 0.012	1.5 0.059	NKJ42/30A	39.9 8970	84.1 18900	13.0	5900	9000	0.241 0.531
45 1.7717	45 1.7717	62 2.4409	25 0.984	50 1.9685	0.6 0.024	3 0.118	NKJ45/25A	40.7 9150	79.3 17800	12.5	5500	8500	0.223 0.492

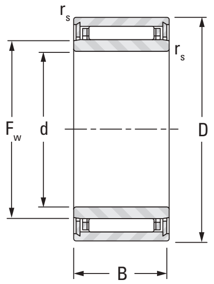
(1) Max. axial displacement

Continued on next page.

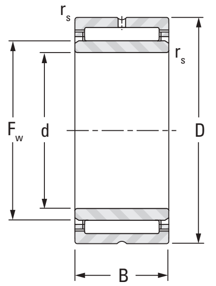


NEEDLE ROLLER BEARINGS WITH INNER RINGS

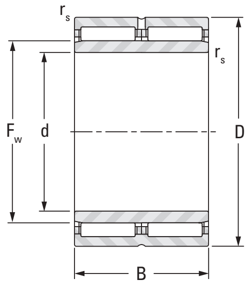
METRIC SERIES
NKJ, NKJS, NA48
NA49, NA69 SERIES



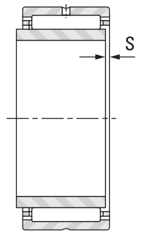
NKJ (d ≤ 7)



NKJ (d ≥ 9),
NKJS, NA48, NA49,
NA69 (d ≤ 30)



NA69
(d ≥ 32)



Shaft Dia.	d	D	B	F_w	$r_{s\ min.}$	s(1)	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								Dynamic	Static				
								C	C_0		Grease	Oil	
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
45 1.7717	**45** 1.7717	**62** 2.4409	**35** 1.378	**50** 1.9685	**0.6** 0.024	**3** 0.118	NKJ45/35A	**55** 12400	**117** 26300	18.2	5500	8500	**0.345** 0.761
	45 1.7717	**68** 2.6772	**22** 0.866	**52** 2.0472	**0.6** 0.024	**2** 0.079	NA4909	**46.8** 10500	**74.8** 16800	12.0	5400	8400	**0.291** 0.642
	45 1.7717	**68** 2.6772	**40** 1.575	**52** 2.0472	**0.6** 0.024	**1.5** 0.059	NA6909A	**74.7** 16800	**137** 30800	21.7	5400	8400	**0.55** 1.232
	45 1.7717	**72** 2.8346	**22** 0.866	**55** 2.1654	**1** 0.039	**1** 0.039	NKJS45A	**47.9** 10800	**78.4** 17600	12.6	5100	7900	**0.36** 0.794
50 1.9685	**50** 1.9685	**68** 2.6772	**25** 0.984	**55** 2.1654	**0.6** 0.024	**3** 0.118	NKJ50/25A	**46.1** 10400	**87.3** 19600	13.9	5000	7800	**0.288** 0.635
	50 1.9685	**68** 2.6772	**35** 1.378	**55** 2.1654	**0.6** 0.024	**3** 0.118	NKJ50/35A	**62.3** 14000	**129** 29000	20.0	5000	7800	**0.406** 0.895
	50 1.9685	**72** 2.8346	**22** 0.866	**58** 2.2835	**0.6** 0.024	**2** 0.079	NA4910	**48.9** 11000	**82** 18400	13.2	4800	7400	**0.296** 0.653
	50 1.9685	**72** 2.8346	**40** 1.575	**58** 2.2835	**0.6** 0.024	**1.5** 0.059	NA6910A	**75.7** 17000	**144** 32400	22.8	4800	7400	**0.577** 1.272
	50 1.9685	**80** 3.1496	**28** 1.102	**60** 2.3622	**1.1** 0.043	**1.5** 0.059	NKJS50A	**66.9** 15000	**103** 23200	16.5	4800	7300	**0.523** 1.153
55 2.1654	**55** 2.1654	**72** 2.8346	**25** 0.984	**60** 2.3622	**0.6** 0.024	**3** 0.118	NKJ55/25A	**44.3** 9960	**94** 21100	14.9	4600	7000	**0.29** 0.639
	55 2.1654	**72** 2.8346	**35** 1.378	**60** 2.3622	**0.6** 0.024	**3** 0.118	NKJ55/35A	**59.9** 13500	**139** 31200	21.5	4600	7000	**0.41** 0.904
	55 2.1654	**80** 3.1496	**25** 0.984	**63** 2.4803	**1** 0.039	**2.5** 0.098	NA4911	**62** 13900	**107** 24100	17.1	4500	6900	**0.426** 0.939
	55 2.1654	**80** 3.1496	**45** 1.772	**63** 2.4803	**1** 0.039	**2.5** 0.098	NA6911A	**94.2** 21200	**172** 38700	27.8	4500	6900	**0.8** 1.764
	55 2.1654	**85** 3.3465	**28** 1.102	**65** 2.5591	**1.1** 0.043	**1.5** 0.059	NKJS55A	**71** 16000	**114** 25600	18.3	4400	6700	**0.569** 1.254
60 2.3622	**60** 2.3622	**82** 3.2283	**25** 0.984	**68** 2.6772	**0.6** 0.024	**2** 0.079	NKJ60/25A	**49** 11000	**101** 22700	16.1	4000	6200	**0.44** 0.97
	60 2.3622	**82** 3.2283	**35** 1.378	**68** 2.6772	**0.6** 0.024	**2.5** 0.098	NKJ60/35A	**66.2** 14900	**149** 33500	23.2	4000	6200	**0.52** 1.146
	60 2.3622	**85** 3.3465	**25** 0.984	**68** 2.6772	**1** 0.039	**1.5** 0.059	NA4912	**64.8** 14600	**116** 26100	18.6	4100	6300	**0.457** 1.008
	60 2.3622	**85** 3.3465	**45** 1.772	**68** 2.6772	**1** 0.039	**2** 0.079	NA6912A	**99.3** 22300	**189** 42500	30.5	4100	6400	**0.829** 1.828
	60 2.3622	**90** 3.5433	**28** 1.102	**70** 2.7559	**1.1** 0.043	**1.5** 0.059	NKJS60A	**72.6** 16300	**120** 27000	19.3	4000	6200	**0.607** 1.338
65 2.5591	**65** 2.5591	**90** 3.5433	**25** 0.984	**72** 2.8346	**1** 0.039	**1.5** 0.059	NA4913	**66** 14800	**121** 27200	19.4	3900	5900	**0.489** 1.078

(1) Max. axial displacement

Shaft Dia.	d	D	B	F_w	$r_{s\ min.}$	s(1)	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								Dynamic	Static				
								C	C_0		Grease	Oil	
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
65 2.5591	**65** 2.5591	**90** 3.5433	**25** 0.984	**73** 2.874	**0.6** 0.024	**2** 0.079	NKJ65/25A	**61.5** 13800	**119** 26800	19.0	3800	5800	**0.5** 1.102
	65 2.5591	**90** 3.5433	**35** 1.378	**73** 2.874	**0.6** 0.024	**2** 0.079	NKJ65/35A	**82.5** 18500	**173** 38900	27.1	3800	5800	**0.69** 1.521
	65 2.5591	**90** 3.5433	**45** 1.772	**72** 2.8346	**1** 0.039	**2** 0.079	NA6913A	**107** 24100	**213** 47900	34.5	3900	6000	**0.945** 2.083
	65 2.5591	**95** 3.7402	**28** 1.102	**75** 2.9528	**1.1** 0.043	**1.5** 0.059	NKJS65A	**76.5** 17200	**132** 29700	21.1	3700	5800	**0.655** 1.444
70 2.7559	**70** 2.7559	**95** 3.7402	**25** 0.984	**80** 3.1496	**1** 0.039	**2** 0.079	NKJ70/25A	**65** 14600	**131** 29400	21.0	3400	5300	**0.561** 1.237
	70 2.7559	**95** 3.7402	**35** 1.378	**80** 3.1496	**1** 0.039	**3.5** 0.138	NKJ70/35A	**79.7** 17900	**184** 41400	28.7	3400	5300	**0.779** 1.717
	70 2.7559	**100** 3.937	**28** 1.102	**80** 3.1496	**1.1** 0.043	**1.5** 0.059	NKJS70A	**80.1** 18000	**143** 32100	22.9	3500	5400	**0.772** 1.702
	70 2.7559	**100** 3.937	**30** 1.181	**80** 3.1496	**1** 0.039	**2.5** 0.098	NA4914	**86.3** 19400	**157** 35300	25.1	3500	5400	**0.772** 1.702
	70 2.7559	**100** 3.937	**54** 2.126	**80** 3.1496	**1** 0.039	**2** 0.079	NA6914A	**137** 30800	**286** 64300	45.7	3500	5400	**1.45** 3.197
75 2.9528	**75** 2.9528	**105** 4.1339	**25** 0.984	**85** 3.3465	**1** 0.039	**2** 0.079	NKJ75/25A	**76.4** 17200	**137** 30800	22.2	3300	5000	**0.64** 1.411
	75 2.9528	**105** 4.1339	**30** 1.181	**85** 3.3465	**1** 0.039	**2.5** 0.098	NA4915	**92.4** 20800	**175** 39300	28.0	3300	5000	**0.817** 1.801
	75 2.9528	**105** 4.1339	**32** 1.26	**90** 3.5433	**1.1** 0.043	**1.5** 0.059	NKJS75A	**91.5** 20600	**176** 39600	28.1	3100	4700	**1.06** 2.337
	75 2.9528	**105** 4.1339	**35** 1.378	**85** 3.3465	**1** 0.039	**2** 0.079	NKJ75/35A	**108** 24300	**214** 48100	33.6	3300	5000	**1.05** 2.315
	75 2.9528	**105** 4.1339	**54** 2.126	**85** 3.3465	**1** 0.039	**2** 0.079	NA6915A	**143** 32100	**308** 69200	49.3	3300	5000	**1.554** 3.426
80 3.1496	**80** 3.1496	**110** 4.3307	**25** 0.984	**90** 3.5433	**1** 0.039	**2** 0.079	NKJ80/25A	**79.5** 17900	**147** 33000	23.8	3100	4700	**0.79** 1.742
	80 3.1496	**110** 4.3307	**30** 1.181	**90** 3.5433	**1** 0.039	**2.5** 0.098	NA4916	**91.5** 20600	**176** 39600	28.1	3100	4700	**0.862** 1.9
	80 3.1496	**110** 4.3307	**32** 1.26	**95** 3.7402	**1.1** 0.043	**2** 0.079	NKJS80A	**95.1** 21400	**188** 42300	30.0	2900	4500	**1.14** 2.513
	80 3.1496	**110** 4.3307	**35** 1.378	**90** 3.5433	**1** 0.039	**2** 0.079	NKJ80/35A	**113** 25400	**230** 51700	36.1	3100	4700	**0.98** 2.161
	80 3.1496	**110** 4.3307	**54** 2.126	**90** 3.5433	**1** 0.039	**2** 0.079	NA6916A	**126** 28300	**320** 71900	50.8	3000	4700	**1.615** 3.56
85 3.3465	**85** 3.3465	**115** 4.5276	**26** 1.024	**95** 3.7402	**1** 0.039	**3** 0.118	NKJ85/26A	**49.3** 11100	**114** 25600	24.6	2800	4400	**0.862** 1.9
	85 3.3465	**115** 4.5276	**36** 1.417	**95** 3.7402	**1** 0.039	**2** 0.079	NKJ85/36A	**114** 25600	**238** 53500	37.3	2800	4400	**1.04** 2.293
	85 3.3465	**120** 4.7244	**35** 1.378	**100** 3.937	**1.1** 0.043	**2.5** 0.098	NA4917	**110** 24700	**230** 51700	36.0	2800	4200	**1.31** 2.888
	85 3.3465	**120** 4.7244	**63** 2.48	**100** 3.937	**1.1** 0.043	**2** 0.079	NA6917A	**150** 33700	**416** 93500	64.2	2700	4200	**2.427** 5.351
90 3.5433	**90** 3.5433	**120** 4.7244	**26** 1.024	**100** 3.937	**1** 0.039	**3** 0.118	NKJ90/26A	**83.6** 18800	**163** 36600	25.8	2800	4200	**0.78** 1.72
	90 3.5433	**120** 4.7244	**36** 1.417	**100** 3.937	**1** 0.039	**2.5** 0.098	NKJ90/36A	**118** 26500	**254** 57100	39.1	2800	4200	**1.08** 2.381
	90 3.5433	**125** 4.9213	**35** 1.378	**105** 4.1339	**1.1** 0.043	**2.5** 0.098	NA4918	**114** 25600	**245** 55100	37.8	2600	4000	**1.37** 3.02

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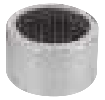
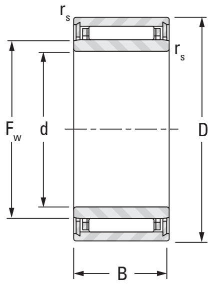
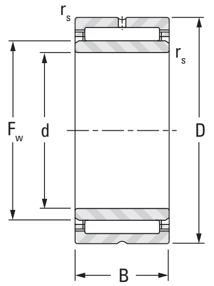


NEEDLE ROLLER BEARINGS WITH INNER RINGS

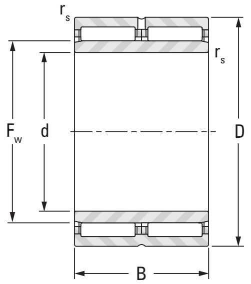
METRIC SERIES
NKJ, NKJS, NA48
NA49, NA69 SERIES



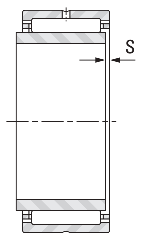
NKJ (d ≤ 7)



NKJ (d ≥ 9),
NKJS, NA48, NA49,
NA69 (d ≤ 30)



NA69
(d ≥ 32)



Shaft Dia.	d	D	B	Fw	$r_{s\,min.}$	s(1)	Bearing Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								C	C_0		Grease	Oil	
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min-1		**kg** lbs
90 3.5433	**90** 3.5433	**125** 4.9213	**63** 2.48	**105** 4.1339	**1.1** 0.043	**2** 0.079	NA6918A	**175** 39300	**427** 96000	66.0	2600	4000	**2.64** 5.82
95 3.7402	**95** 3.7402	**125** 4.9213	**26** 1.024	**105** 4.1339	**1** 0.039	**2.5** 0.098	NKJ95/26A	**52.2** 11700	**127** 28600	19.9	2600	3900	**0.935** 2.061
	95 3.7402	**130** 5.1181	**35** 1.378	**110** 4.3307	**1.1** 0.043	**2.5** 0.098	NA4919	**115** 25900	**253** 56900	38.4	2500	3800	**1.43** 3.153
	95 3.7402	**130** 5.1181	**63** 2.48	**110** 4.3307	**1.1** 0.043	**2** 0.079	NA6919A	**158** 35500	**458** 103000	68.8	2500	3800	**2.67** 5.88
100 3.937	**100** 3.937	**130** 5.1181	**30** 1.181	**110** 4.3307	**1.1** 0.043	**2** 0.079	NKJ100/30A	**103** 23200	**220** 49500	33.6	2500	3800	**0.984** 2.169
	100 3.937	**130** 5.1181	**40** 1.575	**110** 4.3307	**1.1** 0.043	**2** 0.079	NKJ100/40	**130** 29200	**296** 66500	44.8	2500	3800	**1.41** 3.109
	100 3.937	**135** 5.315	**32** 1.26	**115** 4.5276	**1.1** 0.043	**2** 0.079	NKJS100A	**104** 23400	**226** 50800	34.1	2400	3700	**2.01** 4.431
	100 3.937	**140** 5.5118	**40** 1.575	**115** 4.5276	**1.1** 0.043	**3.5** 0.138	NA4920	**139** 31200	**296** 66500	43.9	2400	3700	**2.01** 4.431
110 4.3307	**110** 4.3307	**140** 5.5118	**30** 1.181	**120** 4.7244	**1** 0.039	**0.5** 0.02	NA4822	**90.3** 20300	**230** 51700	33.7	2300	3500	**1.21** 2.668
	110 4.3307	**150** 5.9055	**40** 1.575	**125** 4.9213	**1.1** 0.043	**3.5** 0.138	NA4922	**147** 33000	**325** 73100	47.0	2200	3400	**2.19** 4.828
120 4.7244	**120** 4.7244	**150** 5.9055	**30** 1.181	**130** 5.1181	**1** 0.039	**0.5** 0.02	NA4824	**94.2** 21200	**249** 56000	35.7	2100	3200	**1.31** 2.888
	120 4.7244	**165** 6.4961	**45** 1.772	**135** 5.315	**1.1** 0.043	**3.5** 0.138	NA4924	**177** 39800	**407** 91500	58.5	2000	3100	**3.04** 6.702
130 5.1181	**130** 5.1181	**165** 6.4961	**35** 1.378	**145** 5.7087	**1.1** 0.043	**1** 0.039	NA4826	**112** 25200	**323** 72600	44.8	1900	2900	**1.99** 4.387
	130 5.1181	**180** 7.0866	**50** 1.969	**150** 5.9055	**1.5** 0.059	**3** 0.118	NA4926	**201** 45200	**495** 111000	68.7	1800	2800	**4.14** 9.127
140 5.5118	**140** 5.5118	**175** 6.8898	**35** 1.378	**155** 6.1024	**1.1** 0.043	**1** 0.039	NA4828	**116** 26100	**346** 77800	47.1	1700	2700	**2.12** 4.674
	140 5.5118	**190** 7.4803	**50** 1.969	**160** 6.2992	**1.5** 0.059	**3** 0.118	NA4928	**214** 48100	**549** 123000	74.8	1700	2600	**4.41** 9.72
150 5.9055	**150** 5.9055	**190** 7.4803	**40** 1.575	**165** 6.4961	**1.1** 0.043	**2** 0.079	NA4830A	**142** 31900	**402** 90400	53.5	1600	2500	**2.7** 5.952
160 6.2992	**160** 6.2992	**200** 7.874	**40** 1.575	**175** 6.8898	**1.1** 0.043	**2** 0.079	NA4832A	**146** 32800	**425** 95500	46.6	1500	2400	**3.15** 6.944

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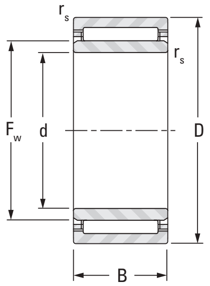
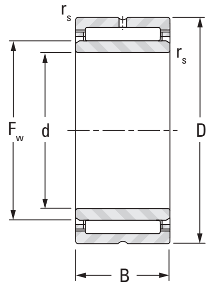
[1] Max. axial displacement

NEEDLE ROLLER BEARINGS WITH INNER RINGS

METRIC SERIES
NQI, NA49 SERIES



NQI



NA49

Shaft Dia.	d	D	B	Fw	$r_{s\,min.}$	s(1)	Bearing Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								C	C_0		Grease	Oil	
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min-1		**kg** lbs
12 0.4724	**12**	**24**	**13**	**16**	**0.3**	—	NA4901C3	**8.65**	**11.1**	1.70	—	28000	**0.027**
20 0.7874	**20**	**32**	**20**	**24**	**0.3**	—	NQI203220AD	**17.4**	**26.5**	4.15	—	18000	**0.062**
	20	**37**	**17**	**25**	**0.3**	—	NA4904NA	**16.2**	**21.5**	3.25	—	18000	**0.083**
25 0.9843	**25**	**44**	**25**	**30**	**0.3**	—	25NQI4425A(2)	**36.6**	**49.6**	7.90	—	15000	**0.161**
30 1.1811	**30**	**47**	**17**	**35**	**0.3**	—	NA4906D	**20.2**	**31.9**	4.85	—	12000	**0.114**
38 1.4961	**38**	**53**	**30**	**43**	**0.6**	—	NQI38/30	**41.3**	**85.9**	13.4	—	9900	**0.205**

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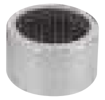
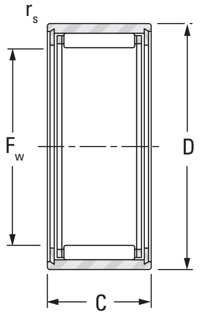
[1] Max. axial displacement
[2] Inner ring width 25.5mm

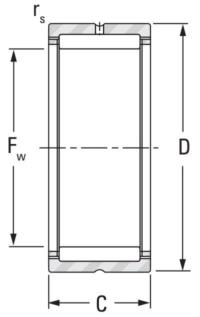


NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

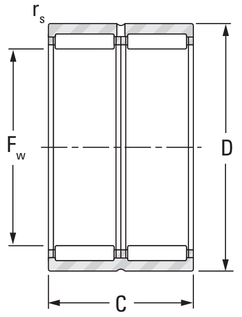
METRIC SERIES
NK, NKS, RNA48, RNA49 RNA69, NKTN SERIES



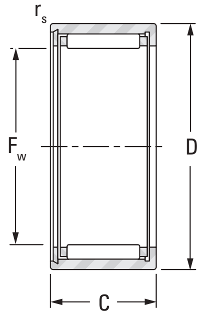
NK (Fw ≤ 10)



NK (Fw ≥ 12),
NKS, RNA48, RNA49,
RNA69 (Fw ≤ 35)



RNA69
(Fw ≥ 40)



NKTN

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static		Grease	Oil	
						C	C_0				
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
5 0.1969	**5** 0.1969	**10** 0.3937	**10** 0.394	**0.2** 0.006	NK5/10TN	**2.18** 490	**1.71** 384	0.260	31000	47000	**0.004** 0.009
	5 0.1969	**10** 0.3937	**12** 0.472	**0.2** 0.006	NK5/12TN	**3.04** 683	**2.63** 591	0.400	31000	47000	**0.004** 0.009
6 0.2362	**6** 0.2362	**12** 0.4724	**10** 0.394	**0.2** 0.006	NK6/10	**3.19** 717	**2.9** 652	0.420	29000	44000	**0.005** 0.011
	6 0.2362	**12** 0.4724	**12** 0.472	**0.2** 0.006	NK6/12TN	**3.07** 690	**2.74** 616	0.420	29000	44000	**0.006** 0.013
7 0.2756	**7** 0.2756	**14** 0.5512	**10** 0.394	**0.3** 0.012	NK7/10TN	**2.74** 616	**2.44** 549	0.370	28000	42000	**0.007** 0.015
	7 0.2756	**14** 0.5512	**12** 0.472	**0.3** 0.012	NK7/12TN	**3.4** 764	**3.22** 724	0.490	28000	42000	**0.009** 0.020
8 0.315	**8** 0.315	**15** 0.5906	**12** 0.472	**0.3** 0.012	NK8/12	**4.57** 1030	**4.89** 1 100	0.740	26000	41000	**0.011** 0.024
	8 0.315	**15** 0.5906	**12** 0.472	**0.3** 0.012	NK8/12ASR1	**4.57** 1030	**4.89** 1100	0.740	26000	41000	**0.011** 0.024
	8 0.315	**15** 0.5906	**16** 0.63	**0.3** 0.012	NK8/16	**5.22** 1170	**5.78** 1300	0.880	26000	41000	**0.013** 0.029
9 0.3543	**9** 0.3543	**16** 0.6299	**12** 0.472	**0.3** 0.012	NK9/12	**4.27** 960	**4.6** 1030	0.700	26000	40000	**0.012** 0.026
	9 0.3543	**16** 0.6299	**16** 0.63	**0.3** 0.012	NK9/16	**5.57** 1250	**6.47** 1450	0.980	26000	40000	**0.015** 0.033
10 0.3937	**10** 0.3937	**17** 0.6693	**12** 0.472	**0.3** 0.012	NK10/12	**5.4** 1210	**6.43** 1450	0.980	25000	39000	**0.013** 0.029
	10 0.3937	**17** 0.6693	**16** 0.63	**0.3** 0.012	NK10/16TN	**5.3** 1190	**6.27** 1410	0.940	25000	39000	**0.015** 0.033
12 0.4724	**12** 0.4724	**19** 0.748	**12** 0.472	**0.3** 0.012	NK12/12A	**6.86** 1540	**7.6** 1710	1.15	19000	30000	**0.013** 0.029
	12 0.4724	**19** 0.748	**16** 0.63	**0.3** 0.012	NK12/16	**6.78** 1520	**9.03** 2030	1.40	24000	37000	**0.018** 0.040
14 0.5512	**14** 0.5512	**22** 0.8661	**13** 0.512	**0.3** 0.012	RNA4900	**9.39** 2110	**10.3** 2320	1.55	16000	24000	**0.018** 0.040
	14 0.5512	**22** 0.8661	**16** 0.63	**0.3** 0.012	NK14/16A	**12.4** 2790	**14.8** 3330	2.25	16000	24000	**0.023** 0.051
	14 0.5512	**22** 0.8661	**20** 0.787	**0.3** 0.012	NK14/20A	**14.7** 3300	**18.4** 4140	2.90	16000	24000	**0.028** 0.060
15 0.5906	**15** 0.5906	**23** 0.9055	**16** 0.63	**0.3** 0.012	NK15/16A	**12.4** 2790	**15** 3370	2.30	15000	24000	**0.024** 0.053
	15 0.5906	**23** 0.9055	**20** 0.787	**0.3** 0.012	NK15/20A	**14.7** 3300	**18.6** 4180	2.95	15000	24000	**0.031** 0.068
16 0.6299	**16** 0.6299	**24** 0.9449	**13** 0.512	**0.3** 0.012	RNA4901	**10.5** 2360	**12.3** 2770	1.85	18000	28000	**0.020** 0.044
	16 0.6299	**24** 0.9449	**16** 0.63	**0.3** 0.012	NK16/16A	**13** 2920	**16.2** 3640	2.50	18000	28000	**0.025** 0.055
16 0.6299	**16** 0.6299	**24** 0.9449	**20** 0.787	**0.3** 0.012	NK16/20A	**15.4** 3460	**20.2** 4540	3.20	18000	28000	**0.036** 0.079
	16 0.6299	**24** 0.9449	**22** 0.866	**0.3** 0.012	RNA6901	**16.1** 3620	**21.3** 4790	3.30	18000	28000	**0.036** 0.079
17 0.6693	**17** 0.6693	**25** 0.9843	**16** 0.63	**0.3** 0.012	NK17/16A	**13.6** 3060	**17.5** 3930	2.70	17000	27000	**0.027** 0.060
	17 0.6693	**25** 0.9843	**20** 0.787	**0.3** 0.012	NK17/20A	**15.4** 3460	**20.4** 4590	3.25	17000	27000	**0.034** 0.075
18 0.7087	**18** 0.7087	**26** 1.0236	**16** 0.63	**0.3** 0.012	NK18/16A	**13.6** 3060	**17.7** 3980	2.70	16000	25000	**0.028** 0.062
	18 0.7087	**26** 1.0236	**20** 0.787	**0.3** 0.012	NK18/20A	**16.1** 3620	**22.0** 4950	3.50	16000	25000	**0.035** 0.077
	18 0.7087	**30** 1.1811	**16** 0.63	**0.3** 0.012	NKS18A	**15.9** 3570	**16.2** 3640	2.45	17000	26000	**0.045** 0.099
19 0.748	**19** 0.748	**27** 1.063	**16** 0.63	**0.3** 0.012	NK19/16A	**14.1** 3170	**19.0** 4270	2.90	15000	24000	**0.029** 0.064
	19 0.748	**27** 1.063	**20** 0.787	**0.3** 0.012	NK19/20A	**18.8** 4230	**23.6** 5310	3.75	15000	24000	**0.037** 0.082
20 0.7874	**20** 0.7874	**28** 1.1024	**13** 0.512	**0.3** 0.012	RNA4902	**11.8** 2650	**15.3** 3440	2.35	14000	22000	**0.023** 0.051
	20 0.7874	**28** 1.1024	**16** 0.63	**0.3** 0.012	NK20/16A	**14.1** 3170	**19.1** 4290	2.90	14000	22000	**0.030** 0.066
	20 0.7874	**28** 1.1024	**20** 0.787	**0.3** 0.012	NK20/20A	**17.5** 3930	**25.3** 5690	4.00	14000	22000	**0.038** 0.084
	20 0.7874	**28** 1.1024	**23** 0.906	**0.3** 0.012	RNA6902A	**18.4** 4140	**26.9** 6050	4.20	14000	22000	**0.042** 0.093
	20 0.7874	**32** 1.2598	**20** 0.787	**0.6** 0.024	NKS20A	**24.4** 5490	**26.7** 6000	4.30	15000	24000	**0.058** 0.128
21 0.8268	**21** 0.8268	**29** 1.1417	**16** 0.63	**0.3** 0.012	NK21/16A	**15.3** 3440	**21.6** 4860	3.30	14000	21000	**0.032** 0.071
	21 0.8268	**29** 1.1417	**20** 0.787	**0.3** 0.012	NK21/20A	**18.1** 4070	**26.9** 6050	4.25	14000	21000	**0.040** 0.088
22 0.8661	**22** 0.8661	**30** 1.1811	**13** 0.512	**0.3** 0.012	RNA4903	**12.2** 2740	**16.4** 3690	2.50	13000	20000	**0.025** 0.055
	22 0.8661	**30** 1.1811	**16** 0.63	**0.3** 0.012	NK22/16A	**15.2** 3420	**21.7** 4880	3.30	13000	20000	**0.033** 0.073
	22 0.8661	**30** 1.1811	**20** 0.787	**0.3** 0.012	NK22/20A	**18** 4050	**27** 6070	4.30	13000	20000	**0.041** 0.090
	22 0.8661	**30** 1.1811	**23** 0.906	**0.3** 0.012	RNA6903A	**19.8** 4450	**30.6** 6880	4.75	13000	20000	**0.056** 0.123
	22 0.8661	**35** 1.378	**20** 0.787	**0.6** 0.024	NKS22A	**22.9** 5150	**27.1** 6090	4.30	14000	21000	**0.069** 0.152
24 0.9449	**24** 0.9449	**32** 1.2598	**16** 0.63	**0.3** 0.012	NK24/16A	**16.2** 3640	**24.3** 5460	3.70	12000	18000	**0.035** 0.077
	24 0.9449	**32** 1.2598	**20** 0.787	**0.3** 0.012	NK24/20A	**19.3** 4340	**30.3** 6810	4.80	12000	18000	**0.045** 0.099
	24 0.9449	**37** 1.4567	**20** 0.787	**0.6** 0.024	NKS24A	**29.1** 6540	**32.8** 7370	5.30	13000	20000	**0.073** 0.161
25 0.9843	**25** 0.9843	**33** 1.2992	**16** 0.63	**0.3** 0.012	NK25/16A	**16.1** 3620	**24.4** 5490	3.75	11000	17000	**0.037** 0.082
	25 0.9843	**33** 1.2992	**20** 0.787	**0.3** 0.012	NK25/20A	**19.1** 4290	**30.4** 6830	4.80	11000	17000	**0.047** 0.104
	25 0.9843	**37** 1.4567	**17** 0.669	**0.3** 0.012	RNA4904	**21.3** 4790	**25.5** 5730	3.95	12000	18000	**0.061** 0.134
	25 0.9843	**37** 1.4567	**30** 1.181	**0.3** 0.012	RNA6904A	**36.6** 8230	**51.0** 11500	7.95	12000	18000	**0.091** 0.201

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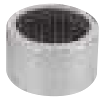
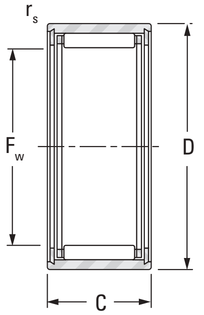
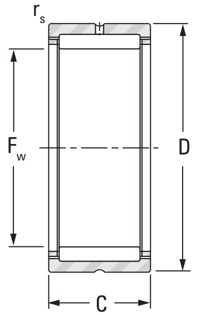


NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

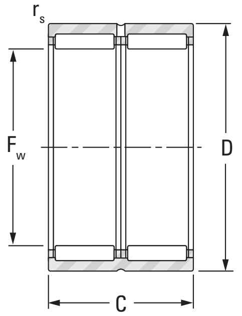
METRIC SERIES
NK, NKS, RNA48, RNA49
RNA69, NKTN SERIES



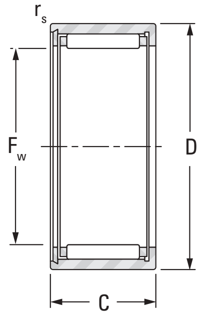
NK (Fw ≤ 10)



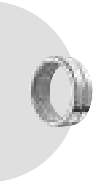
NK (Fw ≥ 12),
NKS, RNA48, RNA49,
RNA69 (Fw ≤ 35)



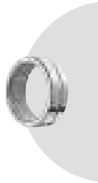
RNA69
(Fw ≥ 40)



NKTN



Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static				
						C	C_0		Grease	Oil	
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
25 0.9843	**25** 0.9843	**38** 1.4961	**20** 0.787	**0.6** 0.024	NKS25A	**29.1** 6540	**33** 7420	5.30	12000	19000	**0.076** 0.168
26 1.0236	**26** 1.0236	**34** 1.3386	**16** 0.63	**0.3** 0.012	NK26/16A	**16.6** 3730	**25.7** 5780	3.95	11000	17000	**0.039** 0.086
	26 1.0236	**34** 1.3386	**20** 0.787	**0.3** 0.012	NK26/20A	**19.7** 4430	**32** 7190	5.05	11000	17000	**0.048** 0.106
28 1.1024	**28** 1.1024	**37** 1.4567	**20** 0.787	**0.3** 0.012	NK28/20A	**22.6** 5080	**34.4** 7730	5.50	10000	16000	**0.057** 0.126
	28 1.1024	**37** 1.4567	**30** 1.181	**0.3** 0.012	NK28/30A	**29** 6520	**53.8** 12100	8.30	10000	16000	**0.088** 0.194
	28 1.1024	**39** 1.5354	**17** 0.669	**0.3** 0.012	RNA49/22	**23.3** 5240	**29.6** 6650	4.55	10000	16000	**0.059** 0.130
	28 1.1024	**39** 1.5354	**30** 1.181	**0.3** 0.012	RNA69/22A	**30.6** 6880	**50.7** 11400	3.95	10000	16000	**0.107** 0.236
	28 1.1024	**42** 1.6535	**20** 0.787	**0.6** 0.024	NKS28A	**30.3** 6810	**38.4** 8630	6.15	11000	16000	**0.094** 0.207
29 1.1417	**29** 1.1417	**38** 1.4961	**20** 0.787	**0.3** 0.012	NK29/20A	**23.4** 5260	**36.4** 8180	5.80	9800	15000	**0.059** 0.130
	29 1.1417	**38** 1.4961	**30** 1.181	**0.3** 0.012	NK29/30A	**29.8** 6700	**56.4** 12700	8.70	9700	15000	**0.090** 0.198
30 1.1811	**30** 1.1811	**40** 1.5748	**20** 0.787	**0.3** 0.012	NK30/20A	**24.2** 5440	**38.3** 8610	6.10	9500	15000	**0.071** 0.157
	30 1.1811	**40** 1.5748	**30** 1.181	**0.3** 0.012	NK30/30A	**34.7** 7800	**61** 13700	9.45	9500	15000	**0.107** 0.236
	30 1.1811	**42** 1.6535	**17** 0.669	**0.3** 0.012	RNA4905	**24.3** 5460	**31.7** 7130	4.90	9700	15000	**0.071** 0.157
	30 1.1811	**42** 1.6535	**30** 1.181	**0.3** 0.012	RNA6905A	**39.7** 8920	**59.6** 13400	9.30	9700	15000	**0.127** 0.280
	30 1.1811	**45** 1.7717	**20** 0.787	**0.6** 0.024	NKS30A	**34.3** 7710	**42.8** 9620	6.85	9900	15000	**0.114** 0.251
32 1.2598	**32** 1.2598	**42** 1.6535	**20** 0.787	**0.3** 0.012	NK32/20A	**24.8** 5580	**40.4** 9080	6.45	8800	14000	**0.074** 0.163
	32 1.2598	**42** 1.6535	**30** 1.181	**0.3** 0.012	NK32/30A	**35.6** 8000	**64.3** 14500	9.95	8800	14000	**0.112** 0.247
	32 1.2598	**45** 1.7717	**17** 0.669	**0.3** 0.012	RNA49/28	**25.1** 5640	**33.8** 7600	5.20	9000	14000	**0.080** 0.176
	32 1.2598	**45** 1.7717	**30** 1.181	**0.3** 0.012	RNA69/28A	**43.2** 9710	**62.5** 14100	9.75	9100	14000	**0.140** 0.309
	32 1.2598	**47** 1.8504	**22** 0.866	**0.6** 0.024	NKS32A	**36** 8090	**46.2** 10400	7.40	9200	14000	**0.120** 0.265
35 1.378	**35** 1.378	**45** 1.7717	**20** 0.787	**0.3** 0.012	NK35/20A	**26.1** 5870	**44.4** 9980	7.05	8000	12000	**0.081** 0.179
	35 1.378	**45** 1.7717	**30** 1.181	**0.3** 0.012	NK35/30A	**37.4** 8410	**70.6** 15900	11.0	8000	12000	**0.122** 0.269



Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static				
						C	C_0		Grease	Oil	
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
35 1.378	**35** 1.378	**47** 1.8504	**18** 0.709	**0.3** 0.012	RNA4906	**25.9** 5820	**36** 8090	5.55	8200	13000	**0.081** 0.179
	35 1.378	**47** 1.8504	**30** 1.181	**0.3** 0.012	RNA6906A	**42.6** 9580	**68.2** 15300	10.6	8200	13000	**0.148** 0.326
	35 1.378	**50** 1.9685	**22** 0.866	**0.6** 0.024	NKS35A	**37.5** 8430	**49.9** 11200	8.00	8400	13000	**0.130** 0.287
37 1.4567	**37** 1.4567	**47** 1.8504	**20** 0.787	**0.3** 0.012	NK37/20A	**26.6** 5980	**46.4** 10400	7.40	7600	12000	**0.084** 0.185
	37 1.4567	**47** 1.8504	**30** 1.181	**0.3** 0.012	NK37/30A	**38.2** 8590	**73.9** 16600	11.5	7600	12000	**0.128** 0.282
	37 1.4567	**52** 2.0472	**22** 0.866	**0.6** 0.024	NKS37A	**39** 8770	**53.4** 12000	8.55	7900	12000	**0.134** 0.295
38 1.4961	**38** 1.4961	**48** 1.8898	**20** 0.787	**0.3** 0.012	NK38/20A	**21.7** 4880	**40.9** 9190	6.40	7300	11000	**0.087** 0.192
	38 1.4961	**48** 1.8898	**30** 1.181	**0.3** 0.012	NK38/30A	**31.9** 7170	**67** 15100	10.4	7300	11000	**0.131** 0.289
40 1.5748	**40** 1.5748	**50** 1.9685	**20** 0.787	**0.3** 0.012	NK40/20A	**27.8** 6250	**50.4** 11300	8.05	7000	11000	**0.089** 0.196
	40 1.5748	**50** 1.9685	**30** 1.181	**0.3** 0.012	NK40/30A	**40** 8990	**80.2** 18000	12.4	7000	11000	**0.137** 0.302
	40 1.5748	**52** 2.0472	**20** 0.787	**0.6** 0.024	RNA49/32	**32** 7190	**49.3** 11100	7.85	7100	11000	**0.100** 0.220
	40 1.5748	**52** 2.0472	**36** 1.417	**0.6** 0.024	RNA69/32A	**48.6** 10900	**84.5** 19000	26.1	7100	11000	**0.185** 0.408
	40 1.5748	**55** 2.1654	**22** 0.866	**0.6** 0.024	NKS40A	**40.3** 9060	**57** 12800	9.15	7200	11000	**0.140** 0.309
42 1.6535	**42** 1.6535	**52** 2.0472	**20** 0.787	**0.3** 0.012	NK42/20A	**28.3** 6360	**52.4** 11800	8.35	6600	10000	**0.085** 0.187
	42 1.6535	**52** 2.0472	**30** 1.181	**0.3** 0.012	NK42/30A	**40.7** 9150	**83.5** 18800	13.0	6600	10000	**0.141** 0.311
	42 1.6535	**55** 2.1654	**20** 0.787	**0.6** 0.024	RNA4907	**32.8** 7370	**51.7** 11600	8.25	6700	10000	**0.114** 0.251
	42 1.6535	**55** 2.1654	**36** 1.417	**0.6** 0.024	RNA6907A	**49.9** 11200	**88.7** 19900	13.7	6700	10000	**0.218** 0.481
43 1.6929	**43** 1.6929	**53** 2.0866	**20** 0.787	**0.3** 0.012	NK43/20A	**29** 6520	**54.4** 12200	8.65	6400	9900	**0.096** 0.212
	43 1.6929	**53** 2.0866	**30** 1.181	**0.3** 0.012	NK43/30A	**41.6** 9350	**86.6** 19500	13.4	6400	9900	**0.134** 0.295
	43 1.6929	**58** 2.2835	**22** 0.866	**0.6** 0.024	NKS43A	**41.6** 9350	**60.7** 13600	9.75	6700	10000	**0.150** 0.331
45 1.7717	**45** 1.7717	**55** 2.1654	**20** 0.787	**0.3** 0.012	NK45/20A	**29.5** 6630	**56.4** 12700	9.00	6100	9400	**0.100** 0.220
	45 1.7717	**55** 2.1654	**30** 1.181	**0.3** 0.012	NK45/30A	**42.3** 9510	**89.8** 20200	13.9	6100	9400	**0.151** 0.333
	45 1.7717	**60** 2.3622	**22** 0.866	**0.6** 0.024	NKS45A	**43** 9670	**64.2** 14400	10.3	6400	9800	**0.156** 0.344
47 1.8504	**47** 1.8504	**57** 2.2441	**20** 0.787	**0.3** 0.012	NK47/20A	**30** 6740	**58.5** 13200	9.30	5900	9000	**0.104** 0.229
	47 1.8504	**57** 2.2441	**30** 1.181	**0.3** 0.012	NK47/30A	**43** 9670	**93.1** 20900	14.4	5900	9000	**0.158** 0.348
48 1.8898	**48** 1.8898	**62** 2.4409	**22** 0.866	**0.6** 0.024	RNA4908	**44.2** 9940	**67.8** 15200	10.9	5900	9100	**0.154** 0.340
	48 1.8898	**62** 2.4409	**40** 1.575	**0.6** 0.024	RNA6908A	**70.8** 15900	**124** 27900	19.8	5900	9100	**0.300** 0.661
50 1.9685	**50** 1.9685	**62** 2.4409	**25** 0.984	**0.3** 0.012	NK50/25A	**40.7** 9150	**79.3** 17800	12.5	5500	8500	**0.171** 0.377

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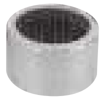
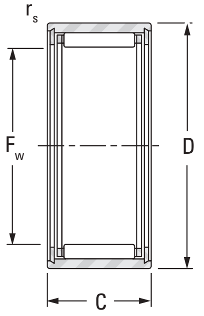
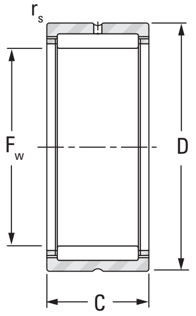


NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

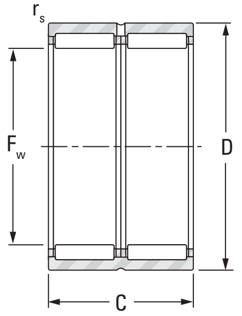
METRIC SERIES
NK, NKS, RNA48, RNA49
RNA69, NKTN SERIES



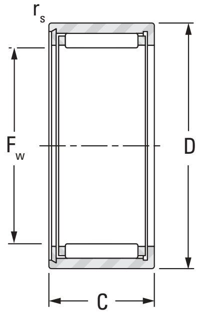
NK (Fw ≤ 10)



NK (Fw ≥ 12),
NKS, RNA48, RNA49,
RNA69 (Fw ≤ 35)



RNA69
(Fw ≥ 40)



NKTN

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static		Grease	Oil	
						C	C_0				
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
50 1.9685	**50** 1.9685	**62** 2.4409	**35** 1.378	**0.6** 0.024	NK50/35A	**55** 12400	**117** 26300	18.2	5500	8500	**0.242** 0.534
	50 1.9685	**65** 2.5591	**22** 0.866	**1** 0.039	NKS50A	**45.5** 10200	**71.3** 16000	11.4	5700	8700	**0.170** 0.375
52 2.0472	**52** 2.0472	**68** 2.6772	**22** 0.866	**0.6** 0.024	RNA4909	**46.8** 10500	**74.8** 16800	12.0	5400	8400	**0.201** 0.443
	52 2.0472	**68** 2.6772	**40** 1.575	**0.6** 0.024	RNA6909A	**74.7** 16800	**137** 30800	21.7	5400	8400	**0.392** 0.864
55 2.1654	**55** 2.1654	**68** 2.6772	**25** 0.984	**0.6** 0.024	NK55/25A	**46.1** 10400	**87.3** 19600	13.9	5000	7800	**0.207** 0.456
	55 2.1654	**68** 2.6772	**35** 1.378	**0.6** 0.024	NK55/35A	**62.3** 14000	**129** 29000	20.0	5000	7800	**0.293** 0.646
	55 2.1654	**72** 2.8346	**22** 0.866	**1** 0.039	NKS55A	**47.9** 10800	**78.4** 17600	12.6	5100	7900	**0.225** 0.496
58 2.2835	**58** 2.2835	**72** 2.8346	**22** 0.866	**0.6** 0.024	RNA4910	**48.9** 11000	**82** 18400	13.2	4800	7400	**0.179** 0.395
	58 2.2835	**72** 2.8346	**40** 1.575	**0.6** 0.024	RNA6910A	**75.7** 17000	**144** 32400	22.8	4800	7400	**0.364** 0.802
60 2.3622	**60** 2.3622	**72** 2.8346	**25** 0.984	**0.6** 0.024	NK60/25A	**44.3** 9960	**94** 21100	14.9	4400	7000	**0.202** 0.445
	60 2.3622	**72** 2.8346	**35** 1.378	**0.6** 0.024	NK60/35A	**59.9** 13500	**139** 31200	21.5	4400	7000	**0.286** 0.631
	60 2.3622	**80** 3.1496	**28** 1.102	**1.1** 0.043	NKS60A	**66.9** 15000	**103** 23200	16.5	4800	7300	**0.337** 0.743
63 2.4803	**63** 2.4803	**80** 3.1496	**25** 0.984	**1** 0.039	RNA4911	**62** 13900	**107** 24100	17.1	4500	6900	**0.285** 0.628
	63 2.4803	**80** 3.1496	**45** 1.772	**1** 0.039	RNA6911A	**94.2** 21200	**172** 38700	27.8	4500	6900	**0.540** 1.190
65 2.5591	**65** 2.5591	**78** 3.0709	**25** 0.984	**0.6** 0.024	NK65/25A	**48.2** 10800	**97.7** 22000	15.5	4200	6500	**0.257** 0.567
	65 2.5591	**78** 3.0709	**35** 1.378	**0.6** 0.024	NK65/35A	**65.2** 14700	**144** 32400	22.4	4200	6500	**0.298** 0.657
	65 2.5591	**85** 3.3465	**28** 1.102	**1.1** 0.043	NKS65A	**71** 16000	**114** 25600	18.3	4200	6700	**0.362** 0.798
68 2.6772	**68** 2.6772	**82** 3.2283	**25** 0.984	**0.6** 0.024	NK68/25A	**49** 11000	**101** 22700	16.1	4000	6200	**0.287** 0.633
	68 2.6772	**82** 3.2283	**35** 1.378	**0.6** 0.024	NK68/35A	**66.2** 14900	**149** 33500	23.2	4000	6200	**0.350** 0.772
	68 2.6772	**85** 3.3465	**25** 0.984	**1** 0.039	RNA4912	**64.8** 14600	**116** 26100	18.6	4100	6300	**0.304** 0.670
	68 2.6772	**85** 3.3465	**45** 1.772	**1** 0.039	RNA6912A	**99.3** 22300	**189** 42500	30.5	4100	6300	**0.546** 1.204
70 2.7559	**70** 2.7559	**85** 3.3465	**25** 0.984	**0.6** 0.024	NK70/25A	**43.6** 9800	**87.9** 19800	16.6	3900	6000	**0.298** 0.657
70 2.7559	**70** 2.7559	**85** 3.3465	**35** 1.378	**0.6** 0.024	NK70/35A	**62.2** 14000	**139** 31200	24.0	3900	6000	**0.411** 0.906
	70 2.7559	**90** 3.5433	**28** 1.102	**1.1** 0.043	NKS70A	**72.6** 16300	**120** 27000	19.3	4000	6200	**0.383** 0.844
72 2.8346	**72** 2.8346	**90** 3.5433	**25** 0.984	**1** 0.039	RNA4913	**66** 14800	**121** 27200	19.4	3900	5900	**0.346** 0.763
	72 2.8346	**90** 3.5433	**45** 1.772	**1** 0.039	RNA6913A	**107** 24100	**213** 47900	34.5	3900	5900	**0.679** 1.497
73 2.874	**73** 2.874	**90** 3.5433	**25** 0.984	**0.6** 0.024	NK73/25A	**61.5** 13800	**119** 26800	19.0	3800	5800	**0.320** 0.705
	73 2.874	**90** 3.5433	**35** 1.378	**0.6** 0.024	NK73/35A	**82.5** 18500	**173** 38900	27.1	3800	5800	**0.450** 0.992
75 2.9528	**75** 2.9528	**92** 3.622	**25** 0.984	**0.6** 0.024	NK75/25A	**43.7** 9820	**90.2** 20300	19.0	3600	5600	**0.364** 0.802
	75 2.9528	**92** 3.622	**35** 1.378	**0.6** 0.024	NK75/35A	**60.9** 13700	**138** 31000	27.1	3600	5600	**0.518** 1.142
	75 2.9528	**95** 3.7402	**28** 1.102	**1.1** 0.043	NKS75A	**76.5** 17200	**132** 29700	21.1	3700	5800	**0.413** 0.911
80 3.1496	**80** 3.1496	**95** 3.7402	**25** 0.984	**1** 0.039	NK80/25A	**65** 14600	**131** 29400	21.0	3400	5300	**0.331** 0.730
	80 3.1496	**95** 3.7402	**35** 1.378	**1** 0.039	NK80/35A	**79.7** 17900	**184** 41400	28.7	3400	5300	**0.380** 0.838
	80 3.1496	**100** 3.937	**30** 1.181	**1** 0.039	RNA4914	**86.3** 19400	**157** 35300	25.1	3500	5400	**0.502** 1.107
	80 3.1496	**100** 3.937	**54** 2.126	**1** 0.039	RNA6914A	**137** 30800	**286** 64300	45.7	3500	5400	**0.946** 2.086
85 3.3465	**85** 3.3465	**105** 4.1339	**25** 0.984	**1** 0.039	NK85/25A	**76.4** 17200	**137** 30800	22.2	3300	5000	**0.506** 1.116
	85 3.3465	**105** 4.1339	**30** 1.181	**1** 0.039	RNA4915	**92.4** 20800	**175** 39300	28.0	3300	5000	**0.528** 1.164
	85 3.3465	**105** 4.1339	**35** 1.378	**1** 0.039	NK85/35A	**108** 24300	**214** 48100	34.7	3300	5000	**0.610** 1.345
	85 3.3465	**105** 4.1339	**54** 2.126	**1** 0.039	RNA6915A	**143** 32100	**308** 69200	49.3	3300	5000	**1.020** 2.249
90 3.5433	**90** 3.5433	**110** 4.3307	**25** 0.984	**1** 0.039	NK90/25A	**79.5** 17900	**147** 33000	23.8	3100	4700	**0.450** 0.992
	90 3.5433	**110** 4.3307	**30** 1.181	**1** 0.039	RNA4916	**91.5** 20600	**176** 39600	28.1	3100	4700	**0.556** 1.226
	90 3.5433	**110** 4.3307	**35** 1.378	**1** 0.039	NK90/35A	**113** 25400	**230** 51700	36.1	3100	4700	**0.745** 1.642
	90 3.5433	**110** 4.3307	**54** 2.126	**1** 0.039	RNA6916A	**126** 28300	**320** 71900	50.8	3100	4700	**1.050** 2.315
95 3.7402	**95** 3.7402	**115** 4.5276	**26** 1.024	**1** 0.039	NK95/26A	**49.3** 11100	**114** 25600	24.6	2800	4400	**0.572** 1.261
	95 3.7402	**115** 4.5276	**36** 1.417	**1** 0.039	NK95/36A	**114** 25600	**238** 53500	37.3	2900	4500	**0.803** 1.770
100 3.937	**100** 3.937	**120** 4.7244	**26** 1.024	**1** 0.039	NK100/26A	**83.6** 18800	**163** 36600	25.8	2800	4200	**0.530** 1.168
	100 3.937	**120** 4.7244	**35** 1.378	**1.1** 0.043	RNA4917	**110** 24700	**230** 51700	36.0	2800	4200	**0.715** 1.576
	100 3.937	**120** 4.7244	**36** 1.417	**1** 0.039	NK100/36A	**118** 26500	**254** 57100	39.1	2800	4200	**0.658** 1.451
	100 3.937	**120** 4.7244	**63** 2.48	**1.1** 0.043	RNA6917A	**150** 33700	**416** 93500	63.0	2800	4200	**1.350** 2.976
105 4.1339	**105** 4.1339	**125** 4.9213	**26** 1.024	**1** 0.039	NK105/26A	**52.2** 11700	**127** 28600	19.9	2600	3900	**0.595** 1.312

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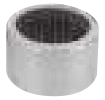
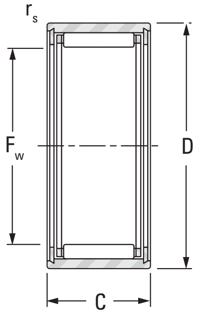
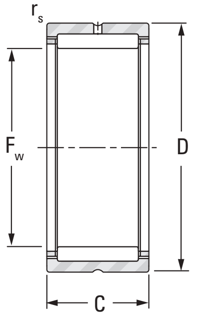


NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

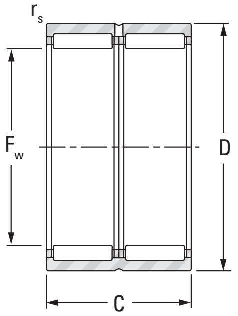
METRIC SERIES
NK, NKS, RNA48, RNA49
RNA69, NKTN SERIES



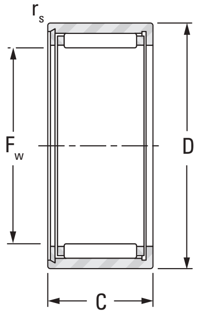
NK (Fw ≤ 10)



NK (Fw ≥ 12),
NKS, RNA48, RNA49,
RNA69 (Fw ≤ 35)



RNA69
(Fw ≥ 40)

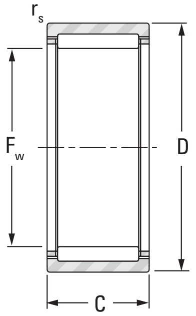


NKTN

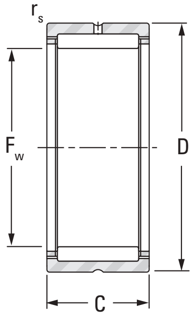
Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
105 4.1339	**105** 4.1339	**125** 4.9213	**35** 1.378	**1.1** 0.043	RNA4918	**114** 25600	**245** 55100	37.8	2600	4000	**0.746** 1.645
	105 4.1339	**125** 4.9213	**63** 2.48	**1.1** 0.043	RNA6918A	**154** 34600	**437** 98200	66.0	2600	4000	**1.500** 3.300
110 4.3307	**110** 4.3307	**130** 5.1181	**30** 1.181	**1.1** 0.043	NK110/30A	**103** 23200	**220** 49500	33.6	2500	3800	**0.660** 1.455
	110 4.3307	**130** 5.1181	**35** 1.378	**1.1** 0.043	RNA4919	**115** 25900	**253** 56900	38.4	2500	3800	**0.777** 1.713
	110 4.3307	**130** 5.1181	**40** 1.575	**1.1** 0.043	NK110/40A	**132** 29700	**301** 67700	45.7	2500	3800	**0.900** 1.984
	110 4.3307	**130** 5.1181	**63** 2.48	**1.1** 0.043	RNA6919A	**158** 35500	**458** 103000	68.8	2500	3800	**1.470** 3.241
115 4.5276	**115** 4.5276	**140** 5.5118	**40** 1.575	**1.1** 0.043	RNA4920	**139** 31200	**296** 66500	43.9	2400	3700	**1.220** 2.690
120 4.7244	**120** 4.7244	**140** 5.5118	**30** 1.181	**1** 0.039	RNA4822	**90.3** 20300	**230** 51700	33.7	2300	3500	**0.785** 1.731
125 4.9213	**125** 4.9213	**150** 5.9055	**40** 1.575	**1.1** 0.043	RNA4922	**147** 33000	**325** 73100	47.0	2200	3400	**1.320** 2.910
130 5.1181	**130** 5.1181	**150** 5.9055	**30** 1.181	**1** 0.039	RNA4824	**94.1** 21200	**249** 56000	35.7	2100	3200	**0.850** 1.874
135 5.315	**135** 5.315	**165** 6.4961	**45** 1.772	**1.1** 0.043	RNA4924	**177** 39800	**407** 91500	58.5	2000	3100	**1.980** 4.365
145 5.7087	**145** 5.7087	**165** 6.4961	**35** 1.378	**1** 0.039	RNA4826	**112** 25200	**323** 72600	44.8	1900	2900	**1.100** 2.425
150 5.9055	**150** 5.9055	**180** 7.0866	**50** 1.969	**1.5** 0.059	RNA4926	**201** 45200	**495** 111000	68.7	1800	2800	**2.420** 5.335
155 6.1024	**155** 6.1024	**175** 6.8898	**35** 1.378	**1.1** 0.043	RNA4828	**116** 26100	**346** 77800	47.1	1700	2700	**1.170** 2.579
160 6.2992	**160** 6.2992	**190** 7.4803	**50** 1.969	**1.5** 0.059	RNA4928	**214** 48100	**549** 123000	74.8	1700	2600	**2.560** 5.644
165 6.4961	**165** 6.4961	**190** 7.4803	**40** 1.575	**1.1** 0.043	RNA4830A	**142** 31900	**402** 90400	53.5	1600	2500	**1.540** 3.395
175 6.8898	**175** 6.8898	**200** 7.874	**40** 1.575	**1.1** 0.043	RNA4832A	**146** 32800	**425** 95500	55.6	1500	2400	**1.910** 4.211

NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

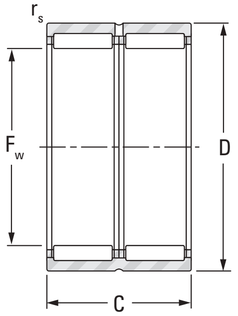
METRIC SERIES
NQ, RNA49, RNA69 SERIES



NQ



RNA49



RNA69

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
12 0.4724	**12**	**19**	**12**	**0.3**	NQ12/12AD	**5.3**	**5.45**	0.820	—	30000	**0.012**
	12	**24**	**9.8**	**0.3**	12NQ2410A	**5.9**	**6.3**	0.960	—	30000	**0.023**
13 0.5118	**13**	**21**	**12**	**0.3**	NQ132112	**8.25**	**8.4**	1.30	—	24000	**0.015**
14 0.5512	**14**	**22**	**16**	**0.5**	NQ14/16D	**11.8**	**13.8**	2.10	—	24000	**0.021**
15 0.5906	**15**	**23**	**16**	**0.5**	NQ15/16B	**15.2**	**17.4**	2.65	—	21000	**0.021**
	15	**24**	**10**	**0.3**	15NQ2410D	**8.65**	**8.45**	1.30	—	21000	**0.016**
	15	**24**	**12**	**0.3**	15NQ2412A	**9.7**	**9.75**	1.50	—	21000	**0.019**
	15	**25**	**12**	**0.6**	NQ152512	**10.7**	**11.1**	1.70	—	21000	**0.022**
	15	**25**	**16**	**0.5**	NQ152516[1]	**11.8**	**14**	2.10	—	24000	**0.032**
	15	**28**	**12**	**0.6**	15NQ2812	**10.7**	**11.1**	1.70	—	21000	**0.034**
	15	**28**	**12**	**0.6**	NQ152812-1	**10.7**	**11.1**	1.70	—	21000	**0.034**
	15	**28**	**15**	**1.0**	15NQ2815	**12.7**	**13.7**	2.10	—	21000	**0.042**
16 0.6299	**16**	**23**	**16**	**0.5**	16NQ2316	**13**	**16.2**	2.50	—	23000	**0.019**
	16	**23**	**22**	**0.5**	16NQ2322A	**17**	**22.9**	3.55	—	23000	**0.026**
17 0.6693	**17**	**25**	**16**	**0.5**	NQ17/16D	**11.4**	**16.2**	2.45	—	26000	**0.026**
	17	**30**	**13**	**0.3**	17NQ3013D	**10.2**	**10.8**	1.65	—	27000	**0.041**
	17	**32**	**16**	**0.6**	17NQ3216D	**18.5**	**17.1**	2.65	—	29000	**0.053**
18 0.7087	**18**	**29**	**25**	**0.3**	NQ182925-1	**24.2**	**27.5**	4.30	—	26000	**0.056**
	18	**34**	**20**	**0.3**	18NQ3420AD	**17.1**	**21.2**	3.35	—	25000	**0.090**
20 0.7874	**20**	**28**	**16**	**0.3**	NQ20/16D	**12.1**	**18.2**	2.75	—	22000	**0.030**
	20	**28**	**23**	**0.3**	NQ202823	**18.5**	**27.1**	4.25	—	22000	**0.040**
	20	**30**	**15**	**0.6**	20NQ3015ED	**11.4**	**15.4**	2.35	—	22000	**0.037**

[1] With outer ring groove

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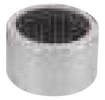
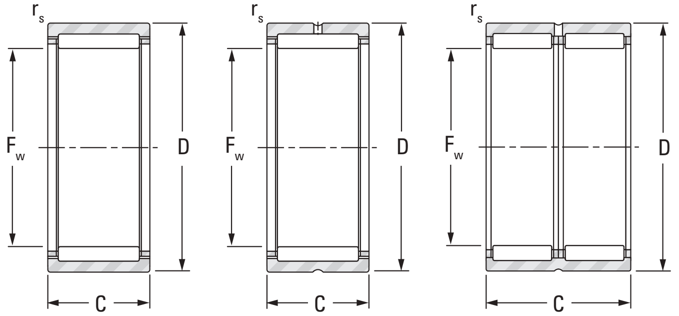


NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

METRIC SERIES
NQ, RNA49, RNA69 SERIES

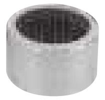


NQ RNA49 RNA69

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static		Grease	Oil	
						C	C_0				
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
20 0.7874	20	30	20	0.3	20NQ3020	19.9	26.4	4.10	—	23000	0.048
	20	32	12	0.3	20NQ3212	11.9	11.3	1.70	—	23000	0.033
	20	32	18	0.3	NQ203218	21.2	26.1	4.05	—	23000	0.053
	20	32	20	0.3	NQ203220	23	26.6	4.20	—	23000	0.057
	20	33	15	0.3	20NQ3315NE(1)	13.8	16.5	2.50	—	23000	0.053
	20	34	18	0.6	20NQ3418D	21.6	21.5	3.35	—	24000	0.060
22 0.8661	22	30	20	0.3	NQ22/20	15.3	25.6	3.95	—	20000	0.041
	22	35	20	0.3	NQS22/20D	21.8	25.4	4.05	—	21000	0.071
24 0.9449	24	32	20	0.3	NQ24/20AD	17.4	26.5	4.15	—	18000	0.041
25 0.9843	25	37	17	1.0	25NQ3717AD-1	19.4	22.5	3.45	—	18000	0.056
	25	37	17	0.9	RNA4904ARD	21.5	25.7	3.95	—	18000	0.057
28 1.1024	28	37	20	0.3	NQ283720D	20.7	34.9	5.40	—	15000	0.056
	28	39	17	0.3	RNA49/22R	22.2	30.3	4.80	—	16000	0.055
30 1.1811	30	42	30	0.6	NQ304230	40.6	61.2	9.60	—	15000	0.118
35 1.378	35	45	14	0.6	NQ354514	16.9	29	4.40	—	12000	0.055
	35	47	17	0.3	RNA4906D	20.2	31.9	4.85	—	12000	0.081
	35	47	30	0.3	RNA6906	43.1	69.3	10.8	—	13000	0.131
37 1.4567	37	47	20	0.3	NQ37/20D	26.3	45.7	7.10	—	12000	0.079
40 1.5748	40	48	20	0.3	NQ404820	21.2	40.4	6.20	—	11000	0.064
	40	50	15	0.3	NQ40/15AD	21.3	35.8	5.45	—	11000	0.063
	40	52	20	0.6	RNA49/32R-1(2)	32.4	50	7.85	—	11000	0.100
	40	60	25	1.0	NQ406025	54.2	66.8	10.7	—	11000	0.213

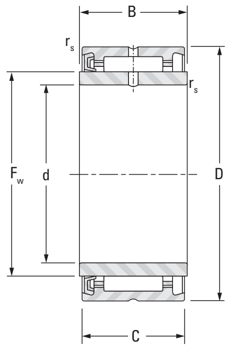
(1) With outer ring groove
(2) Without outer ring lubrication holes

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static		Grease	Oil	
						C	C_0				
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
45 1.7717	45	58	20	0.6	RNA49/38R-1(2)	36.7	56.2	8.90	—	9700	0.116
48 1.8898	48	62	22	0.6	RNA4908R-2(2)	44.3	67.8	10.9	—	9100	0.142

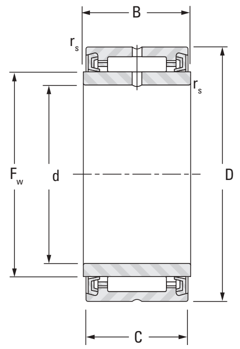


SEALED NEEDLE ROLLER BEARINGS WITH INNER RINGS

METRIC SERIES



NA49RS

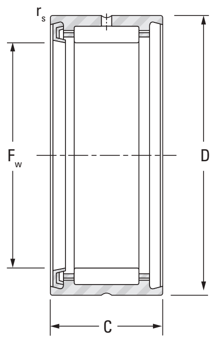


NA49.2RS

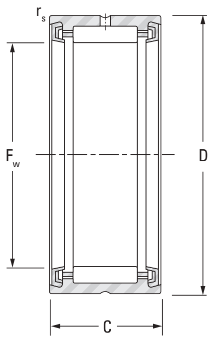
Shaft Dia.	d	D	B	C	Fw	rs min.	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C0	Fatigue Load Limit Cu	Speed Rating Grease	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min-1	kg lbs
10 0.3937	10 0.3937	22 0.8661	14 0.551	13 0.512	14 0.5512	0.3 0.012	NA4900ARS	7.76 1740	8.06 1810	1.20	14000	0.027 0.060
	10 0.3937	22 0.8661	14 0.551	13 0.512	14 0.5512	0.3 0.012	NA4900A.2RS	7.76 1740	8.06 1810	1.20	14000	0.027 0.060
12 0.4724	12 0.4724	24 0.9449	14 0.551	13 0.512	16 0.6299	0.3 0.012	NA4901ARS	8.64 1940	9.59 2160	1.45	12000	0.031 0.068
	12 0.4724	24 0.9449	14 0.551	13 0.512	16 0.6299	0.3 0.012	NA4901A.2RS	8.64 1940	9.59 2160	1.45	12000	0.031 0.068
15 0.5906	15 0.5906	28 1.1024	14 0.551	13 0.512	20 0.7874	0.3 0.012	NA4902ARS	9.77 2200	12.0 2700	1.80	9700	0.041 0.090
	15 0.5906	28 1.1024	14 0.551	13 0.512	20 0.7874	0.3 0.012	NA4902A.2RS	9.77 2200	12.0 2700	1.80	9700	0.041 0.090
17 0.6693	17 0.6693	30 1.1811	14 0.551	13 0.512	22 0.8661	0.3 0.012	NA4903ARS	10.1 2270	12.8 2880	1.95	8800	0.044 0.097
	17 0.6693	30 1.1811	14 0.551	13 0.512	22 0.8661	0.3 0.012	NA4903A.2RS	10.1 2270	12.8 2880	1.95	8800	0.044 0.097
20 0.7874	20 0.7874	37 1.4567	18 0.709	17 0.669	25 0.9843	0.3 0.012	NA4904ARS	18.5 4160	21.2 4770	3.30	7800	0.087 0.192
	20 0.7874	37 1.4567	18 0.709	17 0.669	25 0.9843	0.3 0.012	NA4904A.2RS	18.5 4160	21.2 4770	3.30	7800	0.087 0.192
25 0.9843	25 0.9843	42 1.6535	18 0.709	17 0.669	30 1.1811	0.3 0.012	NA4905ARS	21.0 4720	26.4 5930	4.10	6500	0.106 0.234
	25 0.9843	42 1.6535	18 0.709	17 0.669	30 1.1811	0.3 0.012	NA4905A.2RS	21.0 4720	26.4 5930	4.10	6500	0.106 0.234
30 1.1811	30 1.1811	47 1.8504	18 0.709	17 0.669	35 1.3780	0.3 0.012	NA4906ARS	22.5 5060	30.0 6740	4.65	5500	0.119 0.262
	30 1.1811	47 1.8504	18 0.709	17 0.669	35 1.3780	0.3 0.012	NA4906A.2RS	22.5 5060	30.0 6740	4.65	5500	0.119 0.262
35 1.3780	35 1.3780	55 2.1654	21 0.827	20 0.787	42 1.6535	0.6 0.024	NA4907ARS	29.1 6540	44.4 9980	6.85	4600	0.198 0.437
	35 1.3780	55 2.1654	21 0.827	20 0.787	42 1.6535	0.6 0.024	NA4907A.2RS	29.1 6540	44.4 9980	6.85	4600	0.198 0.437
40 1.5748	40 1.5748	62 2.4409	23 0.906	22 0.866	48 1.8898	0.6 0.024	NA4908ARS	38.6 8680	57.0 12800	9.10	4000	0.263 0.580
	40 1.5748	62 2.4409	23 0.906	22 0.866	48 1.8898	0.6 0.024	NA4908A.2RS	38.6 8680	57.0 12800	9.10	4000	0.263 0.580
45 1.7717	45 1.7717	68 2.6772	23 0.906	22 0.866	52 2.0472	0.6 0.024	NA4909ARS	39.4 8860	60.0 13500	9.60	3700	0.303 0.668
	45 1.7717	68 2.6772	23 0.906	22 0.866	52 2.0472	0.6 0.024	NA4909A.2RS	39.4 8860	60.0 13500	9.60	3700	0.303 0.668
50 1.9685	50 1.9685	72 2.8346	23 0.906	22 0.866	58 2.2835	0.6 0.024	NA4910ARS	41.2 9260	65.8 14800	10.5	3300	0.309 0.681
	50 1.9685	72 2.8346	23 0.906	22 0.866	58 2.2835	0.6 0.024	NA4910A.2RS	41.2 9260	65.8 14800	10.5	3300	0.309 0.681

SEALED NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

METRIC SERIES



RNA49RS

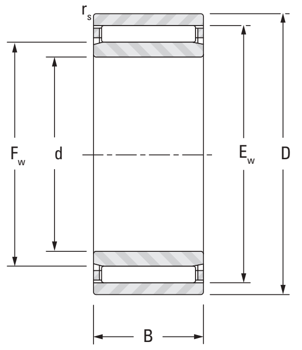


RNA49.2RS

Shaft Dia.	Fw	D	C	rs min.	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C0	Fatigue Load Limit Cu	Speed Rating Grease	Approx. Wt.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min-1	kg lbs
14 0.5512	14 0.5512	22 0.8661	13 0.512	0.3 0.012	RNA4900ARS	7.76 1740	8.06 1810	1.20	14000	0.019 0.042
	14 0.5512	22 0.8661	13 0.512	0.3 0.012	RNA4900A.2RS	7.76 1740	8.06 1810	1.20	14000	0.019 0.042
16 0.6299	16 0.6299	24 0.9449	13 0.512	0.3 0.012	RNA4901ARS	8.64 1940	9.59 2160	1.45	12000	0.021 0.046
	16 0.6299	24 0.0449	13 0.512	0.3 0.012	RNA4901A.2RS	8.64 1940	9.59 2160	1.45	12000	0.021 0.046
20 0.7874	20 0.7874	28 1.1024	13 0.512	0.3 0.012	RNA4902ARS	9.70 2180	12.0 2700	1.80	9700	0.026 0.057
	20 0.7874	28 1.1024	13 0.512	0.3 0.012	RNA4902A.2RS	9.70 2180	12.0 2700	1.80	9700	0.026 0.057
22 0.8661	22 0.8661	30 1.1811	13 0.512	0.3 0.012	RNA4903ARS	10.1 2270	12.8 2880	1.95	8800	0.027 0.060
	22 0.8661	30 1.1811	13 0.512	0.3 0.012	RNA4903A.2RS	10.1 2270	12.8 2880	1.95	8800	0.027 0.060
25 0.9843	25 0.9843	37 1.4567	17 0.669	0.3 0.012	RNA4904ARS	18.5 4160	21.2 4770	3.30	7800	0.062 0.137
	25 0.9843	37 1.4567	17 0.669	0.3 0.012	RNA4904A.2RS	18.5 4160	21.2 4770	3.30	7800	0.062 0.137
30 1.1811	30 1.1811	42 1.6535	17 0.669	0.3 0.012	RNA4905ARS	21.0 4720	26.4 5930	4.10	6500	0.075 0.165
	30 1.1811	42 1.6535	17 0.669	0.3 0.012	RNA4905A.2RS	21.0 4720	26.4 5930	4.10	6500	0.075 0.165
35 1.3780	35 1.3780	47 1.864	17 0.669	0.3 0.012	RNA4906ARS	22.5 5060	30.0 6740	4.65	5500	0.083 0.183
	35 1.3780	47 1.8504	17 0.669	0.3 0.012	RNA4906A.2RS	22.5 5060	30.0 6740	4.65	5500	0.083 0.183
42 1.6535	42 1.6535	55 2.1654	20 0.787	0.6 0.024	RNA4907ARS	29.1 6540	44.4 9980	6.85	4600	0.130 0.287
	42 1.6535	55 2.1654	20 0.787	0.6 0.024	RNA4907A.2RS	29.1 6540	44.4 9980	6.85	4600	0.130 0.287
48 1.8898	48 1.8898	62 2.4409	22 0.866	0.6 0.024	RNA4908ARS	38.6 8680	57.0 12800	9.10	4000	0.163 0.359
	48 1.8898	62 2.4409	22 0.866	0.6 0.024	RNA4908A.2RS	38.6 8680	57.0 12800	9.10	4000	0.163 0.359
52 2.0472	52 2.0472	68 2.6772	22 0.866	0.6 0.024	RNA4909ARS	39.4 8860	60.0 13500	9.60	3700	0.207 0.456
	52 2.0472	68 2.6772	22 0.866	0.6 0.024	RNA4909A.2RS	39.4 8860	60.0 13500	9.60	3700	0.207 0.456
58 2.2835	58 2.2835	72 2.8346	22 0.866	0.6 0.024	RNA4910ARS	41.2 9260	65.8 14800	10.5	3300	0.187 0.412
	58 2.2835	72 2.8346	22 0.866	0.6 0.024	RNA4910A.2RS	41.2 9260	65.8 14800	10.5	3300	0.187 0.412

NEEDLE ROLLER BEARINGS WITHOUT FLANGES WITH INNER RINGS

METRIC SERIES



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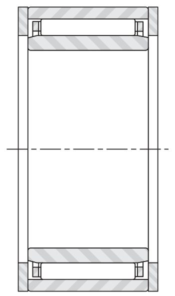

SNSH

Shaft Dia.	d	D	B	F_w	E_w	$r_{s\ min.}$	$s^{(1)}$	Bearing Designation	End Washer Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs
6 0.2362	**6** 0.2362	**17** 0.6693	**10** 0.394	**10** 0.3937	**13** 0.5118	**0.3** 0.012	**0.5** 0.020	NAO6X17X10	SNSH10,5X17X0,5	**5.40** 1210	**6.43** 1450	0.980	25000	39000	**0.014** 0.031
	8 0.3150	**19** 0.7480	**10** 0.394	**12** 0.4724	**15** 0.5906	**0.3** 0.012	**0.5** 0.020	NAO8X19X10	SNSH12,5X19X0,5	**5.85** 1320	**7.51** 1690	1.15	24000	37000	**0.017** 0.037
10 0.3937	**10** 0.3937	**22** 0.8661	**13** 0.512	**14** 0.5512	**18** 0.7087	**0.3** 0.012	**1.0** 0.039	NAO10X22X13	SNSH14,5X22X0,5	**9.73** 2190	**12.5** 2810	1.90	19000	29000	**0.026** 0.057
	10 0.3937	**22** 0.8661	**20** 0.787	**14** 0.5512	**18** 0.7087	**0.3** 0.012	**0.5** 0.020	NAO10X22X20	SNSH14,5X22X0,5	**12.3** 2770	**16.8** 3780	1.30	19000	29000	**0.041** 0.090
	10 0.3937	**26** 1.0236	**12** 0.472	**14** 0.5512	**20** 0.7874	**0.3** 0.012	**0.7** 0.028	NAO10X26X12	SNSH14,5X26X0,5	**10.5** 2360	**10.6** 2380	1.60	14000	21000	**0.036** 0.079
12 0.4724	**12** 0.4724	**24** 0.9449	**13** 0.512	**16** 0.6299	**20** 0.7874	**0.3** 0.012	**1.0** 0.039	NAO12X24X13	SNSH16,5X24X0,5	**10.1** 2270	**13.5** 3030	2.05	18000	28000	**0.030** 0.066
	12 0.4724	**24** 0.9449	**20** 0.787	**16** 0.6299	**20** 0.7874	**0.3** 0.012	**0.5** 0.020	NAO12X24X20	SNSH16,5X24X0,5	**13.4** 3010	**19.5** 4380	2.95	18000	28000	**0.046** 0.101
	12 0.4724	**28** 1.1024	**12** 0.472	**16** 0.6299	**22** 0.8661	**0.3** 0.012	**0.7** 0.028	NAO12X28X12	SNSH16,5X28X0,5	**11.2** 2520	**11.9** 2680	1.80	19000	29000	**0.041** 0.090
15 0.5906	**15** 0.5906	**28** 1.1024	**13** 0.512	**20** 0.7874	**24** 0.9449	**0.3** 0.012	**1.0** 0.039	NAO15X28X13	SNSH20,5X28X0,5	**11.5** 2590	**17.3** 3890	2.65	14000	22000	**0.039** 0.086
	15 0.5906	**28** 1.1024	**26** 1.024	**20** 0.7874	**24** 0.9449	**0.3** 0.012	**1.0** 0.039	NAO15X28X26	SNSH20,5X28X0,5	**19.8** 4450	**34.6** 7780	5.25	14000	22000	**0.078** 0.172
	15 0.5906	**32** 1.2598	**12** 0.472	**20** 0.7874	**26** 1.0236	**0.3** 0.012	**0.7** 0.028	NAO15X32X12	SNSH20,5X32X0,5	**13.0** 2920	**15.0** 3370	2.30	15000	23000	**0.050** 0.110
17 0.6693	**17** 0.6693	**30** 1.1811	**13** 0.512	**22** 0.8661	**26** 1.0236	**0.3** 0.012	**1.0** 0.039	NAO17X30X13	SNSH22,5X30X0,5	**11.8** 2650	**18.3** 4110	2.80	13000	20000	**0.043** 0.095
	17 0.6693	**30** 1.1811	**26** 1.024	**22** 0.8661	**26** 1.0236	**0.3** 0.012	**1.0** 0.039	NAO17X30X26	SNSH22,5X30X0,5	**20.2** 4540	**36.6** 8230	5.55	13000	20000	**0.084** 0.185
	17 0.6693	**35** 1.3780	**16** 0.630	**22** 0.8661	**29** 1.1417	**0.3** 0.012	**1.5** 0.059	NAO17X35X16	SNSH22,5X35X0,5	**19.0** 4270	**23.3** 5240	3.70	13000	20000	**0.078** 0.172
	17 0.6693	**35** 1.3780	**32** 1.260	**22** 0.8661	**29** 1.1417	**0.3** 0.012	**1.5** 0.059	NAO17X35X32	SNSH22,5X35X0,5	**32.7** 7350	**46.5** 10500	7.35	13000	20000	**0.154** 0.340
20 0.7874	**20** 0.7874	**35** 1.3780	**17** 0.669	**25** 0.9843	**30** 1.1811	**0.3** 0.012	**1.2** 0.047	NAO20X35X17	SNSH25,5X35X0,5	**18.8** 4230	**29.8** 6700	4.60	11000	17000	**0.073** 0.161
	20 0.7874	**35** 1.3780	**26** 1.024	**25** 0.9843	**30** 1.1811	**0.3** 0.012	**1.2** 0.047	NAO20X35X26	SNSH25,5X35X0,5	**25.0** 5620	**42.8** 9620	6.50	11000	17000	**0.112** 0.247
	20 0.7874	**37** 1.4567	**16** 0.630	**25** 0.9843	**32** 1.2598	**0.3** 0.012	**1.5** 0.059	NAO20X37X16	SNSH25,5X37X0,5	**19.8** 4450	**25.3** 5690	4.10	11000	17000	**0.080** 0.176
20 0.7874	**20** 0.7874	**37** 1.4567	**32** 1.260	**25** 0.9843	**32** 1.2598	**0.3** 0.012	**1.5** 0.059	NAO20X37X32	SNSH25,5X37X0,5	**34.0** 7640	**50.7** 11400	8.00	11000	17000	**0.162** 0.357
25 0.9843	**25** 0.9843	**40** 1.5748	**17** 0.669	**30** 1.1811	**35** 1.3780	**0.3** 0.012	**1.2** 0.047	NAO25X40X17	SNSH30,5X40X0,5	**20.2** 4540	**34.9** 7850	5.35	9300	14000	**0.088** 0.194
	25 0.9843	**40** 1.5748	**26** 1.024	**30** 1.1811	**35** 1.3780	**0.3** 0.012	**1.2** 0.047	NAO25X40X26	SNSH30,5X40X0,5	**26.8** 6020	**49.7** 11200	7.55	9300	14000	**0.132** 0.291
	25 0.9843	**42** 1.6535	**16** 0.630	**30** 1.1811	**37** 1.4567	**0.3** 0.012	**1.5** 0.059	NAO25X42X16		**22.4** 5040	**31.0** 6970	4.90	9600	15000	**0.096** 0.212
	25 0.9843	**42** 1.6535	**32** 1.260	**30** 1.1811	**37** 1.4567	**0.3** 0.012	**1.5** 0.059	NAO25X42X32		**38.2** 8590	**62.1** 14000	9.85	9600	15000	**0.185** 0.408
30 1.1811	**30** 1.1811	**45** 1.7717	**17** 0.669	**35** 1.3780	**40** 1.5748	**0.3** 0.012	**1.2** 0.047	NAO30X45X17		**22.1** 4970	**40.8** 9170	6.35	7900	12000	**0.102** 0.225
	30 1.1811	**45** 1.7717	**26** 1.024	**35** 1.3780	**40** 1.5748	**0.3** 0.012	**1.2** 0.047	NAO30X45X26		**27.7** 6230	**54.5** 12300	8.95	7900	12000	**0.155** 0.342
	30 1.1811	**47** 1.8504	**16** 0.630	**35** 1.3780	**42** 1.6535	**0.3** 0.012	**1.5** 0.059	NAO30X47X16	SNSH35,5X47X0,5	**24.5** 5510	**36.8** 8270	5.80	8100	12000	**0.106** 0.234
	30 1.1811	**47** 1.8504	**32** 1.260	**35** 1.3780	**42** 1.6535	**0.3** 0.012	**1.5** 0.059	NAO30X47X32	SNSH35,5X47X0,5	**42.0** 9440	**73.5** 16500	11.6	8100	12000	**0.218** 0.481
35 1.3780	**35** 1.3780	**50** 1.9685	**17** 0.669	**40** 1.5748	**45** 1.7717	**0.3** 0.012	**1.2** 0.047	NAO35X50X17		**23.8** 5350	**47.0** 10600	7.30	6900	11000	**0.126** 0.278
	35 1.3780	**50** 1.9685	**34** 1.339	**40** 1.5748	**45** 1.7717	**0.3** 0.012	**0.7** 0.028	NAO35X50X34	SNSH40,5X50X0,5	**40.9** 9190	**94.1** 21200	14.6	6900	11000	**0.232** 0.511
	35 1.3780	**55** 2.1654	**20** 0.787	**40** 1.5748	**48** 1.8898	**0.3** 0.012	**1.5** 0.059	NAO35X55X20	SNSH41X55X1	**35.5** 7980	**56.3** 12700	8.95	7100	11000	**0.185** 0.408
	35 1.3780	**55** 2.1654	**40** 1.575	**40** 1.5748	**48** 1.8898	**0.3** 0.012	**1.7** 0.067	NAO35X55X40		**60.8** 13700	**113** 25400	17.9	7100	11000	**0.370** 0.816
40 1.5748	**40** 1.5748	**55** 2.1654	**17** 0.669	**45** 1.7717	**50** 1.9685	**0.3** 0.012	**0.7** 0.028	NAO40X55X17	SNSH45,5X55X0,5	**24.9** 5600	**51.8** 11600	8.05	6100	9400	**0.133** 0.293
	40 1.5748	**55** 2.1654	**34** 1.339	**45** 1.7717	**50** 1.9685	**0.3** 0.012	**0.7** 0.028	NAO40X55X34	SNSH45,5X55X0,5	**42.7** 9600	**104** 23400	16.1	6100	9400	**0.257** 0.567
	40 1.5748	**62** 2.4409	**20** 0.787	**45** 1.7717	**53** 2.0866	**0.3** 0.012	**1.5** 0.059	NAO40X62X20	SNSH46X62X1	**36.0** 8090	**59.5** 13400	9.05	6200	9600	**0.215** 0.474
	40 1.5748	**62** 2.4409	**40** 1.575	**45** 1.7717	**53** 2.0866	**0.3** 0.012	**1.7** 0.067	NAO40X62X40	SNSH46X62X1	**61.7** 13900	**119** 26800	18.1	6200	9600	**0.440** 0.970
45 1.7717	**45** 1.7717	**62** 2.4409	**20** 0.787	**50** 1.9685	**55** 2.1654	**0.3** 0.012	**0.7** 0.028	NAO45X62X20		**30.2** 6790	**68.5** 15400	10.7	5400	8400	**0.200** 0.441
	45 1.7717	**62** 2.4409	**40** 1.575	**50** 1.9685	**55** 2.1654	**0.3** 0.012	**0.5** 0.020	NAO45X62X40		**50.7** 11400	**137** 30800	21.4	5400	8400	**0.386** 0.851
	45 1.7717	**72** 2.8346	**20** 0.787	**55** 2.1654	**63** 2.4803	**1.0** 0.039	**1.5** 0.059	NAO45X72X20	SNSH56X72X1	**40.3** 9060	**73.5** 16500	11.7	5000	7800	**0.345** 0.761
	45 1.7717	**72** 2.8346	**40** 1.575	**55** 2.1654	**63** 2.4803	**1.0** 0.039	**1.7** 0.067	NAO45X72X40	SNSH56X72X1	**69.1** 15500	**147** 33000	23.4	5000	7800	**0.680** 1.499
50 1.9685	**50** 1.9685	**68** 2.6772	**20** 0.787	**55** 2.1654	**60** 2.3622	**0.3** 0.012	**0.7** 0.028	NAO50X68X20		**30.7** 6900	**72.4** 16300	11.3	4900	7600	**0.230** 0.507
	50 1.9685	**68** 2.6772	**40** 1.575	**55** 2.1654	**60** 2.3622	**0.3** 0.012	**0.5** 0.020	NAO50X68X40		**52.7** 11800	**145** 32600	22.6	4900	7600	**0.450** 0.992
	50 1.9685	**78** 3.0709	**20** 0.787	**60** 2.3622	**68** 2.6772	**1.0** 0.039	**1.5** 0.059	NAO50X78X20	SNSH61X78X1	**41.8** 9400	**79.2** 17800	12.6	4600	7100	**0.385** 0.849

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[1] Max. axial displacement.

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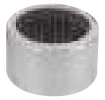
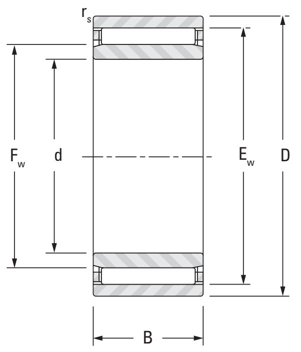
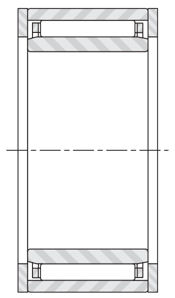


NEEDLE ROLLER BEARINGS WITHOUT FLANGES WITH INNER RINGS

METRIC SERIES



NAO



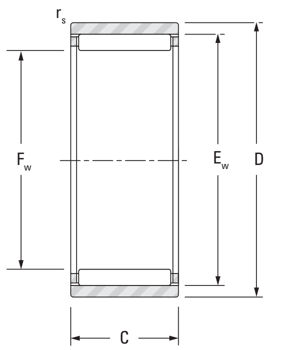
SNSH

Shaft Dia.	d	D	B	F$_w$	E$_w$	r$_{s\ min.}$	s[1]	Bearing Designation	End Washer Designation	Load Ratings		Fatigue Load Limit C$_u$	Speed Ratings		Approx. Wt.
										Dynamic	Static		Grease	Oil	
										C	C$_0$				
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs
50 1.9685	**50** 1.9685	**78** 3.0709	**40** 1.575	**60** 2.3622	**68** 2.6772	**1.0** 0.039	**1.7** 0.067	NAO50X78X40	SNSH61X78X1	**71.7** 16100	**158** 35500	25.2	4600	7100	**0.746** 1.645
55 2.1654	**55** 2.1654	**85** 3.3465	**30** 1.181	**65** 2.5591	**73** 2.8740	**1.0** 0.039	**2.0** 0.079	NAO55X85X30	SNSH66X85X1	**60.1** 13500	**129** 29000	20.3	4200	6500	**0.690** 1.521
	55 2.1654	**85** 3.3465	**60** 2.362	**65** 2.5591	**73** 2.8740	**1.0** 0.039	**1.5** 0.059	NAO55X85X60	SNSH66X85X1	**103** 23200	**259** 58200	40.7	4200	6500	**1.320** 2.910
60 2.3622	**60** 2.3622	**90** 3.5433	**30** 1.181	**70** 2.7559	**78** 3.0709	**1.0** 0.039	**2.0** 0.079	NAO60X90X30		**62.2** 14000	**139** 31200	21.8	3900	6000	**0.745** 1.642
	60 2.3622	**90** 3.5433	**60** 2.362	**70** 2.7559	**78** 3.0709	**1.0** 0.039	**1.7** 0.067	NAO60X90X60		**107** 24100	**277** 62300	43.6	3900	6000	**1.405** 3.097
65 2.5591	**65** 2.5591	**95** 3.7402	**30** 1.181	**75** 2.9528	**83** 3.2677	**1.0** 0.039	**2.0** 0.079	NAO65X95X30		**60.9** 13700	**138** 31000	21.7	3600	5600	**0.770** 1.698
	65 2.5591	**95** 3.7402	**60** 2.362	**75** 2.9528	**83** 3.2677	**1.0** 0.039	**1.7** 0.067	NAO65X95X60		**116** 26100	**277** 62300	43.3	3600	5600	**1.500** 3.307
70 2.7559	**70** 2.7559	**100** 3.9370	**30** 1.181	**80** 3.1496	**88** 3.4646	**1.0** 0.039	**2.0** 0.079	NAO70X100X30		**67.5** 15200	**161** 36200	25.4	3400	5200	**0.850** 1.874
	70 2.7559	**100** 3.9370	**60** 2.362	**80** 3.1496	**88** 3.4646	**1.0** 0.039	**1.7** 0.067	NAO70X100X60		**116** 26100	**322** 72400	50.7	3400	5200	**1.600** 3.527
80 3.1496	**80** 3.1496	**110** 4.3307	**30** 1.181	**90** 3.5433	**98** 3.8583	**1.0** 0.039	**2.0** 0.079	NAO80X110X30		**63.6** 14300	**155** 34800	24.3	3000	4600	**0.920** 2.028
85 3.3465	**85** 3.3465	**115** 4.5276	**30** 1.181	**95** 3.7402	**103** 4.0551	**1.0** 0.039	**2.0** 0.079	NAO85X115X30		**71.0** 16000	**183** 41100	28.6	2800	4400	**0.985** 2.172
90 3.5433	**90** 3.5433	**120** 4.7244	**30** 1.181	**100** 3.9370	**108** 4.2520	**1.0** 0.039	**2.0** 0.079	NAO90X120X30		**72.4** 16300	**191** 42900	29.5	2700	4200	**1.010** 2.22

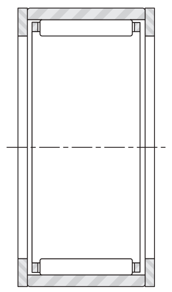
[1] Max. axial displacement.

NEEDLE ROLLER BEARINGS WITHOUT FLANGES WITHOUT INNER RINGS

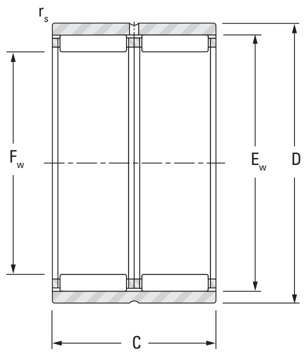
METRIC SERIES



RNAO



SNSH



RNAO

Shaft Dia.	F$_w$	D	C	E$_w$	r$_{s\ min.}$	Bearing Designation	End Washer Designation	Load Ratings		Fatigue Load Limit C$_u$	Speed Ratings		Approx. Wt.
								Dynamic	Static		Grease	Oil	
								C	C$_0$				
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs
6 0.2362	**6** 0.2362	**13** 0.5118	**8** 0.315	**9** 0.3543	**0.3** 0.012	RNAO6X13X8TN		**2.47** 560	**2.07** 470	0.310	29000	44000	**0.005** 0.011
7 0.2756	**7** 0.2756	**14** 0.5512	**8** 0.315	**10** 0.3937	**0.3** 0.012	RNAO7X14X8TN		**2.74** 620	**2.44** 550	0.370	28000	42000	**0.007** 0.015
8 0.3150	**8** 0.3150	**15** 0.5906	**10** 0.394	**11** 0.4331	**0.3** 0.012	RNAO8X15X10	SNSH8,5X15X0,5	**4.57** 1030	**4.89** 1100	0.740	26000	41000	**0.008** 0.018
9 0.3543	**9** 0.3543	**16** 0.6299	**10** 0.394	**12** 0.4724	**0.3** 0.012	RNAO9X16X10		**4.27** 960	**4.60** 1030	0.700	26000	40000	**0.009** 0.020
10 0.3937	**10** 0.3937	**17** 0.6693	**10** 0.394	**13** 0.5118	**0.3** 0.012	RNAO10X17X10	SNSH10,5X17X0,5	**5.40** 1210	**6.43** 1450	0.980	25000	39000	**0.010** 0.022
	10 0.3937	**17** 0.6693	**20** 0.787	**13** 0.5118	**0.3** 0.012	RNAO10X17X20	SNSH10,5X17X0,5	**9.25** 2080	**12.9** 2900	0.980	25000	39000	**0.019** 0.042
12 0.4724	**12** 0.4724	**19** 0.7480	**10** 0.394	**15** 0.5906	**0.3** 0.012	RNAO12X19X10	SNSH12,5X19X0,5	**5.85** 1320	**7.51** 1690	1.15	24000	37000	**0.012** 0.026
14 0.5512	**14** 0.5512	**22** 0.8661	**13** 0.512	**18** 0.7087	**0.3** 0.012	RNAO14X22X13	SNSH14,5X22X0,5	**9.73** 2190	**12.5** 2810	1.90	19000	29000	**0.018** 0.040
	14 0.5512	**22** 0.8661	**20** 0.787	**18** 0.7087	**0.3** 0.012	RNAO14X22X20	SNSH14,5X22X0,5	**12.3** 2770	**16.8** 3780	1.30	19000	29000	**0.029** 0.064
	14 0.5512	**26** 1.0236	**12** 0.472	**20** 0.7874	**0.3** 0.012	RNAO14X26X12	SNSH14,5X26X0,5	**10.5** 2360	**10.6** 2380	1.60	14000	21000	**0.029** 0.064
15 0.5906	**15** 0.5906	**23** 0.9055	**13** 0.512	**19** 0.7480	**0.3** 0.012	RNAO15X23X13	SNSH15,5X23X0,5	**9.66** 2170	**12.6** 2830	1.90	18000	28000	**0.019** 0.042
	15 0.5906	**23** 0.9055	**20** 0.787	**19** 0.7480	**0.3** 0.012	RNAO15X23X20	SNSH15,5X23X0,5	**13.5** 3030	**19.4** 4360	1.45	18000	28000	**0.029** 0.064
16 0.6299	**16** 0.6299	**24** 0.9449	**13** 0.512	**20** 0.7874	**0.3** 0.012	RNAO16X24X13	SNSH16,5X24X0,5	**10.1** 2270	**13.5** 3030	2.10	18000	28000	**0.022** 0.049
	16 0.6299	**24** 0.9449	**20** 0.787	**20** 0.7874	**0.3** 0.012	RNAO16X24X20	SNSH16,5X24X0,5	**13.4** 3010	**19.5** 4380	2.95	18000	28000	**0.032** 0.071
	16 0.6299	**28** 1.1024	**12** 0.472	**22** 0.8661	**0.3** 0.012	RNAO16X28X12	SNSH16,5X28X0,5	**11.2** 2520	**11.9** 2680	1.80	19000	29000	**0.033** 0.073
17 0.6693	**17** 0.6693	**25** 0.9843	**13** 0.512	**21** 0.8268	**0.3** 0.012	RNAO17X25X13	SNSH17,5X25X0,5	**10.5** 2360	**14.5** 3260	2.20	17000	26000	**0.022** 0.049
	17 0.6693	**25** 0.9843	**20** 0.787	**21** 0.8268	**0.3** 0.012	RNAO17X25X20	SNSH17,5X25X0,5	**14.7** 3300	**22.5** 5060	3.20	17000	26000	**0.032** 0.071
18 0.7087	**18** 0.7087	**26** 1.0236	**13** 0.512	**22** 0.8661	**0.3** 0.012	RNAO18X26X13	SNSH18,5X26X0,5	**10.8** 2430	**15.4** 3460	2.35	16000	24000	**0.024** 0.053
	18 0.7087	**26** 1.0236	**13** 0.512	**22** 0.8661	**0.3** 0.012	RNAO18X26X13ASR1	SNSH18,5X26X0,5	**10.8** 2430	**15.4** 3460	2.35	16000	24000	**0.024** 0.053
	18 0.7087	**26** 1.0236	**20** 0.787	**22** 0.8661	**0.3** 0.012	RNAO18X26X20	SNSH18,5X26X0,5	**14.4** 3240	**22.2** 4990	3.40	16000	24000	**0.034** 0.075
	18 0.7087	**30** 1.1811	**24** 0.945	**24** 0.9449	**0.3** 0.012	RNAO18X30X24		**20.2** 4540	**26.2** 5890	3.95	17000	25000	**0.070** 0.154
20 0.7874	**20** 0.7874	**28** 1.1024	**13** 0.512	**24** 0.9449	**0.3** 0.012	RNAO20X28X13	SNSH20,5X28X0,5	**11.5** 2590	**17.3** 3890	1.45	14000	22000	**0.025** 0.055

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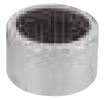

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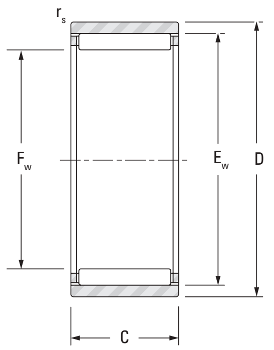
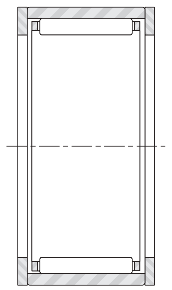
METRIC SERIES



RNAO



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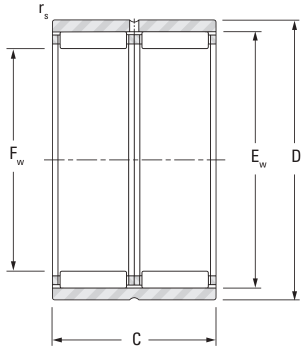
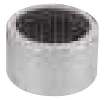


RNAO

Shaft Dia.	F_w	D	C	E_w	$r_{s\,min.}$	Bearing Designation	End Washer Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								Dynamic	Static		Grease	Oil	
								C	C_0				
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min-1		kg lbs
20 0.7874	**20** 0.7874	**28** 1.1024	**26** 1.024	**24** 0.9449	**0.3** 0.012	RNAO20X28X26	SNSH20,5X28X0,5	**19.8** 4450	**34.6** 7780	2.90	14000	22000	**0.050** 0.110
	20 0.7874	**32** 1.2598	**12** 0.472	**26** 1.0236	**0.3** 0.012	RNAO20X32X12	SNSH20,5X32X0,5	**13.0** 2920	**15.3** 3440	2.30	15000	23000	**0.038** 0.084
	20 0.7874	**32** 1.2598	**24** 0.945	**26** 1.0236	**0.3** 0.012	RNAO20X32X24	SNSH20,5X32X0,5	**22.3** 5010	**30.6** 6880	4.60	15000	23000	**0.080** 0.176
22 0.8661	**22** 0.8661	**30** 1.1811	**13** 0.512	**26** 1.0236	**0.3** 0.012	RNAO22X30X13	SNSH22,5X30X0,5	**11.8** 2650	**18.3** 4110	2.80	13000	20000	**0.028** 0.062
	22 0.8661	**30** 1.1811	**26** 1.024	**26** 1.0236	**0.3** 0.012	RNAO22X30X26	SNSH22,5X30X0,5	**20.2** 4540	**36.6** 8230	5.55	13000	20000	**0.053** 0.117
	22 0.8661	**35** 1.3780	**16** 0.630	**29** 1.1417	**0.3** 0.012	RNAO22X35X16	SNSH22,5X35X0,5	**19.1** 4290	**23.3** 5240	3.70	13000	21000	**0.059** 0.130
	22 0.8661	**35** 1.3780	**32** 1.260	**29** 1.1417	**0.3** 0.012	RNAO22X35X32	SNSH22,5X35X0,5	**32.7** 7350	**46.5** 10500	7.35	13000	21000	**0.116** 0.256
25 0.9843	**25** 0.9843	**35** 1.3780	**17** 0.669	**30** 1.1811	**0.3** 0.012	RNAO25X35X17	SNSH25,5X35X0,5	**18.8** 4230	**29.8** 6700	4.60	11000	17000	**0.050** 0.110
	25 0.9843	**35** 1.3780	**26** 1.024	**30** 1.1811	**0.3** 0.012	RNAO25X35X26	SNSH25,5X35X0,5	**25.0** 5620	**42.8** 9620	6.50	11000	17000	**0.076** 0.168
	25 0.9843	**37** 1.4567	**16** 0.630	**32** 1.2598	**0.3** 0.012	RNAO25X37X16	SNSH25,5X37X0,5	**19.8** 4450	**25.3** 5690	4.00	12000	18000	**0.058** 0.128
	25 0.9843	**37** 1.4567	**32** 1.260	**32** 1.2598	**0.3** 0.012	RNAO25X37X32	SNSH25,5X37X0,5	**19.2** 4320	**23.6** 5310	8.00	12000	18000	**0.118** 0.260
28 1.1024	**28** 1.1024	**40** 1.5748	**16** 0.630	**35** 1.3780	**0.3** 0.012	RNAO28X40X16	SNSH28,5X40X0,5	**20.9** 4700	**27.9** 6270	4.30	10000	16000	**0.063** 0.139
	28 1.1024	**40** 1.5748	**32** 1.260	**35** 1.3780	**0.3** 0.012	RNAO28X40X32	SNSH28,5X40X0,5	**35.8** 8050	**55.9** 12600	8.60	10000	16000	**0.128** 0.282
30 1.1811	**30** 1.1811	**40** 1.5748	**17** 0.669	**35** 1.3780	**0.3** 0.012	RNAO30X40X17	SNSH30,5X40X0,5	**20.2** 4540	**34.6** 7780	5.35	9300	14000	**0.060** 0.132
	30 1.1811	**40** 1.5748	**26** 1.024	**35** 1.3780	**0.3** 0.012	RNAO30X40X26	SNSH30,5X40X0,5	**26.8** 6020	**49.7** 11200	7.55	9300	14000	**0.088** 0.194
	30 1.1811	**42** 1.6535	**16** 0.630	**37** 1.4567	**0.3** 0.012	RNAO30X42X16		**22.3** 5010	**31.0** 6970	4.90	9600	15000	**0.069** 0.152
	30 1.1811	**42** 1.6535	**32** 1.260	**37** 1.4567	**0.3** 0.012	RNAO30X42X32		**38.2** 8590	**62.1** 14000	9.85	9600	15000	**0.131** 0.289
35 1.3780	**35** 1.3780	**45** 1.7717	**17** 0.669	**40** 1.5748	**0.3** 0.012	RNAO35X45X17		**22.1** 4970	**40.8** 9170	6.35	7900	12000	**0.069** 0.152
	35 1.3780	**45** 1.7717	**26** 1.024	**40** 1.5748	**0.3** 0.012	RNAO35X45X26		**27.7** 6230	**54.5** 12300	8.30	7900	12000	**0.091** 0.201
	35 1.3780	**47** 1.8504	**16** 0.630	**41** 1.6142	**0.3** 0.012	RNAO35X47X16	SNSH35,5X47X0,5	**24.5** 5510	**36.8** 8270	5.80	8100	12000	**0.075** 0.165
	35 1.3780	**47** 1.8504	**32** 1.260	**42** 1.6535	**0.3** 0.012	RNAO35X47X32	SNSH35,5X47X0,5	**42.0** 9440	**73.5** 16500	11.6	8100	12000	**0.156** 0.344
40 1.5748	**40** 1.5748	**50** 1.9685	**17** 0.669	**45** 1.7717	**0.3** 0.012	RNAO40X50X17	SNSH40,5X50X0,5	**23.8** 5350	**47.0** 10600	7.30	6900	11000	**0.086** 0.190
40 1.5748	**40** 1.5748	**50** 1.9685	**34** 1.339	**45** 1.7717	**0.3** 0.012	RNAO40X50X34	SNSH40,5X50X0,5	**40.9** 9190	**94.1** 21200	14.6	6900	11000	**0.152** 0.335
	40 1.5748	**55** 2.1654	**20** 0.787	**48** 1.8898	**0.3** 0.012	RNAO40X55X20	SNSH41X55X1	**35.5** 7980	**56.3** 12700	8.95	7100	11000	**0.139** 0.306
	40 1.5748	**55** 2.1654	**40** 1.575	**48** 1.8898	**0.3** 0.012	RNAO40X55X40	SNSH41X55X1	**60.8** 13700	**113** 25400	17.9	7100	11000	**0.276** 0.608
45 1.7717	**45** 1.7717	**55** 2.1654	**17** 0.669	**50** 1.9685	**0.3** 0.012	RNAO45X55X17	SNSH45,5X55X0,5	**24.9** 5600	**51.8** 11600	8.05	6100	9400	**0.089** 0.196
	45 1.7717	**55** 2.1654	**34** 1.339	**50** 1.9685	**0.3** 0.012	RNAO45X55X34	SNSH45,5X55X0,5	**42.7** 9600	**104** 23400	16.1	6100	9400	**0.168** 0.370
	45 1.7717	**62** 2.4409	**20** 0.787	**53** 2.0866	**0.3** 0.012	RNAO45X62X20	SNSH46X62X1	**30.8** 6920	**68.1** 15300	9.05	6100	9400	**0.163** 0.359
	45 1.7717	**62** 2.4409	**40** 1.575	**53** 2.0866	**0.3** 0.012	RNAO45X62X40	SNSH46X62X1	**61.7** 13900	**119** 26800	18.1	6200	9600	**0.325** 0.717
50 1.9685	**50** 1.9685	**62** 2.4409	**20** 0.787	**55** 2.1654	**0.3** 0.012	RNAO50X62X20		**30.2** 6790	**68.5** 15400	10.7	5400	8400	**0.142** 0.313
	50 1.9685	**62** 2.4409	**40** 1.575	**55** 2.1654	**0.3** 0.012	RNAO50X62X40		**51.7** 11600	**137** 30800	21.4	5400	8400	**0.269** 0.593
	50 1.9685	**65** 2.5591	**20** 0.787	**58** 2.2835	**0.3** 0.012	RNAO50X65X20	SNSH51X65X1	**38.8** 8720	**67.8** 15200	10.8	5600	8600	**0.167** 0.368
	50 1.9685	**65** 2.5591	**40** 1.575	**58** 2.2835	**0.3** 0.012	RNAO50X65X40		**66.5** 14900	**136** 30600	21.6	5600	8600	**0.342** 0.754
55 2.1654	**55** 2.1654	**68** 2.6772	**20** 0.787	**60** 2.3622	**0.3** 0.012	RNAO55X68X20		**30.7** 6900	**72.4** 16300	11.3	4900	7600	**0.165** 0.364
	55 2.1654	**68** 2.6772	**40** 1.575	**60** 2.3622	**0.3** 0.012	RNAO55X68X40		**52.7** 11800	**145** 32600	22.6	4900	7600	**0.320** 0.705
	55 2.1654	**72** 2.8346	**20** 0.787	**63** 2.4803	**1.0** 0.039	RNAO55X72X20	SNSH56X72X1	**40.3** 9060	**73.5** 16500	11.7	5000	7800	**0.212** 0.467
	55 2.1654	**72** 2.8346	**40** 1.575	**63** 2.4803	**1.0** 0.039	RNAO55X72X40	SNSH56X72X1	**69.1** 15500	**127** 28600	23.4	5000	7800	**0.433** 0.955
60 2.3622	**60** 2.3622	**78** 3.0709	**20** 0.787	**68** 2.6772	**1.0** 0.039	RNAO60X78X20	SNSH61X78X1	**41.8** 9400	**79.2** 17800	12.6	4600	7100	**0.230** 0.507
	60 2.3622	**78** 3.0709	**40** 1.575	**68** 2.6772	**1.0** 0.039	RNAO60X78X40	SNSH61X78X1	**71.7** 16100	**158** 35500	25.2	4600	7100	**0.436** 0.961
65 2.5591	**65** 2.5591	**85** 3.3465	**30** 1.181	**73** 2.8740	**1.0** 0.039	RNAO65X85X30	SNSH66X85X1	**60.1** 13500	**129** 29000	20.3	4200	6500	**0.468** 1.032
	65 2.5591	**85** 3.3465	**60** 2.362	**73** 2.8740	**1.0** 0.039	RNAO65X85X60	SNSH66X85X1	**103** 23200	**259** 58200	40.7	4200	6500	**0.876** 1.931
70 2.7559	**70** 2.7559	**90** 3.5433	**30** 1.181	**78** 3.0709	**1.0** 0.039	RNAO70X90X30		**62.2** 14000	**139** 31200	21.8	3900	6000	**0.505** 1.113
	70 2.7559	**90** 3.5433	**60** 2.362	**78** 3.0709	**1.0** 0.039	RNAO70X90X60		**107** 24100	**277** 62300	43.6	3900	6000	**0.925** 2.039
75 2.9528	**75** 2.9528	**95** 3.7402	**30** 1.181	**83** 3.2677	**1.0** 0.039	RNAO75X95X30		**60.9** 13700	**138** 31000	21.7	3600	5600	**0.510** 1.124
	75 2.9528	**95** 3.7402	**60** 2.362	**83** 3.2677	**1.0** 0.039	RNAO75X95X60		**104** 23400	**277** 62300	43.3	3600	5600	**0.980** 2.161
80 3.1496	**80** 3.1496	**100** 3.9370	**30** 1.181	**88** 3.4646	**1.0** 0.039	RNAO80X100X30		**67.5** 15200	**161** 36200	25.4	3400	5200	**0.580** 1.279
	80 3.1496	**100** 3.9370	**60** 2.362	**88** 3.4646	**1.0** 0.039	RNAO80X100X60		**116** 26100	**322** 72400	50.7	3400	5200	**1.044** 2.30
85 3.3465	**85** 3.3465	**105** 4.1339	**30** 1.181	**93** 3.6614	**1.0** 0.039	RNAO85X105X30		**69.4** 15600	**170** 38200	26.8	3000	4600	**0.586** 1.292
100 3.9370	**100** 3.9370	**120** 4.7244	**30** 1.181	**108** 4.2520	**1.0** 0.039	RNAO100X120X30		**72.4** 16300	**191** 42900	29.5	2700	4200	**0.660** 1.455



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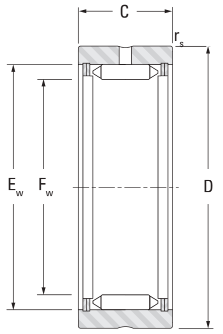
METRIC SERIES

- Check for availability.



RNA

Shaft Dia.	F_w	D	C	E_w	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
							Dynamic	Static		Grease	Oil	
							C	C_0				
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
7.3 0.2874	**7.3** 0.2874	**16** 0.6299	**12** 0.472	**12.3** 0.4843	**0.35** 0.014	RNA1005(1)	**3.95** 888	**4.45** 1000	0.880	34000	52000	**0.010** 0.022
9.7 0.3819	**9.7** 0.3819	**19** 0.7480	**12** 0.472	**14.7** 0.5787	**0.35** 0.014	RNA1007(1)	**4.80** 1080	**5.90** 1330	1.15	25000	39000	**0.013** 0.029
12.1 0.4764	**12.1** 0.4764	**22** 0.8661	**12** 0.472	**17.1** 0.6732	**0.35** 0.014	RNA1009(1)	**5.60** 1260	**7.40** 1660	1.45	20000	31000	**0.018** 0.040
14.4 0.5669	**14.4** 0.5669	**24** 0.9449	**12** 0.472	**19.4** 0.7638	**0.35** 0.014	RNA1010(1)	**6.35** 1430	**8.90** 2000	1.75	17000	26000	**0.020** 0.044
17.6 0.6929	**17.6** 0.6929	**28** 1.1024	**15** 0.591	**22.6** 0.8898	**0.35** 0.014	RNA1012(1)	**11.0** 2470	**16.5** 3710	2.95	14000	22000	**0.034** 0.075
20.8 0.8189	**20.8** 0.8189	**32** 1.2598	**15** 0.591	**25.8** 1.0157	**0.65** 0.026	RNA1015(1)	**12.4** 2790	**19.5** 4380	3.05	12000	18000	**0.044** 0.097
22.1 0.8701	**22.1** 0.8701	**35** 1.3780	**22** 0.866	**28.1** 1.1063	**0.65** 0.026	RNA2015	**23.5** 5280	**37.5** 8430	7.20	11000	17000	**0.082** 0.181
23.9 0.9409	**23.9** 0.9409	**35** 1.3780	**15** 0.591	**28.9** 1.1378	**0.65** 0.026	RNA1017(1)	**13.7** 3080	**22.5** 5060	4.05	10000	16000	**0.047** 0.104
28.7 1.1299	**28.7** 1.1299	**42** 1.6535	**18** 0.709	**34.7** 1.3661	**0.65** 0.026	RNA1020	**19.3** 4340	**33.5** 7530	5.55	8600	13000	**0.084** 0.185
	28.7 1.1299	**42** 1.6535	**22** 0.866	**34.7** 1.3661	**0.65** 0.026	RNA2020	**28.5** 6410	**49.0** 11000	8.15	8600	13000	**0.104** 0.229
33.5 1.3189	**33.5** 1.3189	**47** 1.8504	**18** 0.709	**39.5** 1.5551	**0.65** 0.026	RNA1025	**21.5** 4830	**39.0** 8770	6.50	7200	11000	**0.097** 0.214
	33.5 1.3189	**47** 1.8504	**22** 0.866	**39.5** 1.5551	**0.65** 0.026	RNA2025	**33.0** 7420	**60.0** 13500	9.55	7200	11000	**0.122** 0.269
	33.5 1.3189	**47** 1.8504	**30** 1.181	**39.5** 1.5551	**0.65** 0.026	RNA22025	**52.0** 11700	**94.0** 21100	15.2	7200	11000	**0.170** 0.375
38.2 1.5039	**38.2** 1.5039	**52** 2.0472	**18** 0.709	**44.2** 1.7402	**0.65** 0.026	RNA1030	**23.5** 5280	**44.5** 10000	7.40	6500	10000	**0.107** 0.236
	38.2 1.5039	**52** 2.0472	**22** 0.866	**44.2** 1.7402	**0.65** 0.026	RNA2030	**34.5** 7760	**66.0** 14800	10.9	6500	10000	**0.139** 0.306
	38.2 1.5039	**52** 2.0472	**30** 1.181	**44.2** 1.7402	**0.65** 0.026	RNA22030	**57.0** 12800	**108** 24300	17.4	6500	10000	**0.193** 0.425
44 1.7323	**44** 1.7323	**58** 2.2835	**18** 0.709	**50.0** 1.9685	**0.65** 0.026	RNA1035	**26.0** 5850	**51.0** 11500	8.55	5600	8600	**0.127** 0.280
	44 1.7323	**58** 2.2835	**22** 0.866	**50.0** 1.9685	**0.65** 0.026	RNA2035	**38.0** 8540	**75.0** 16900	12.6	5600	8600	**0.160** 0.353
	44 1.7323	**58** 2.2835	**30** 1.181	**50.0** 1.9685	**0.65** 0.026	RNA22035	**63.0** 14200	**124** 27900	20.0	5600	8600	**0.225** 0.496

(1) No lubrication holes.

Shaft Dia.	F_w	D	C	E_w	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
							Dynamic	Static		Grease	Oil	
							C	C_0				
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
44 1.7323	**44** 1.7323	**62** 2.4409	**30** 1.181	**51.0** 2.0094	**0.65** 0.026	RNA3030	**64.0** 14400	**125** 28100	19.5	5600	8600	**0.309** 0.681
49.7 1.9567	**49.7** 1.9567	**65** 2.5591	**18** 0.709	**55.7** 2.1929	**0.85** 0.033	RNA1040	**28.5** 6410	**58.0** 13000	9.65	4900	7600	**0.160** 0.353
	49.7 1.9567	**65** 2.5591	**22** 0.866	**55.7** 2.1929	**0.65** 0.026	RNA2040	**41.5** 9330	**85.0** 19100	14.2	4900	7600	**0.200** 0.441
	49.7 1.9567	**65** 2.5591	**30** 1.181	**55.7** 2.1929	**0.65** 0.026	RNA22040	**68.0** 15300	**140** 31500	22.4	4900	7600	**0.278** 0.613
	49.7 1.9567	**72** 2.8346	**36** 1.417	**56.8** 2.2346	**0.65** 0.026	RNA3035	**90.0** 20200	**183** 41100	28.3	4900	7600	**0.545** 1.202
55.4 2.1811	**55.4** 2.1811	**72** 2.8346	**18** 0.709	**61.4** 2.4173	**0.85** 0.033	RNA1045	**30.5** 6860	**65.0** 14600	10.8	4500	6900	**0.193** 0.425
	55.4 2.1811	**72** 2.8346	**22** 0.866	**61.4** 2.4173	**0.85** 0.033	RNA2045	**45.0** 10100	**95.0** 21400	15.9	4500	6900	**0.242** 0.534
	55.4 2.1811	**80** 3.1496	**36** 1.417	**62.5** 2.4591	**0.85** 0.033	RNA3040	**97.0** 21800	**204** 45900	31.5	4500	6900	**0.672** 1.482
62.1 2.4449	**62.1** 2.4449	**80** 3.1496	**20** 0.787	**68.1** 2.6811	**0.85** 0.033	RNA1050	**33.0** 7420	**73.0** 16400	12.1	4000	6100	**0.255** 0.562
	62.1 2.4449	**80** 3.1496	**28** 1.102	**68.1** 2.6811	**0.85** 0.033	RNA2050	**64.0** 14400	**142** 31900	23.1	4000	6100	**0.375** 0.827
	62.1 2.4449	**85** 3.3465	**38** 1.496	**69.2** 2.7228	**0.85** 0.033	RNA3045	**105** 23600	**230** 51700	35.4	4000	6100	**0.710** 1.565
68.8 2.7087	**68.8** 2.7087	**85** 3.3465	**20** 0.787	**74.8** 2.9449	**0.85** 0.033	RNA1055	**35.5** 7980	**80.0** 18000	13.4	3600	5500	**0.258** 0.569
	68.8 2.7087	**85** 3.3465	**28** 1.102	**74.8** 2.9449	**0.85** 0.033	RNA2055	**69.0** 15500	**157** 35300	25.6	3600	5500	**0.361** 0.796
	68.8 2.7087	**90** 3.5433	**38** 1.496	**75.9** 2.9866	**0.85** 0.033	RNA3050	**113** 25400	**255** 57300	39.2	3600	5500	**0.705** 1.55
72.6 2.8583	**72.6** 2.8583	**90** 3.5433	**20** 0.787	**78.6** 3.0945	**0.85** 0.033	RNA1060	**37.0** 8320	**85.0** 19100	14.1	3400	5200	**0.283** 0.624
	72.6 2.8583	**90** 3.5433	**28** 1.102	**78.6** 3.0945	**0.85** 0.033	RNA2060	**72.0** 16200	**165** 37100	26.6	3400	5200	**0.413** 0.911
	72.6 2.8583	**95** 3.7402	**38** 1.496	**79.6** 3.1339	**0.85** 0.033	RNA3055	**117** 26300	**268** 60200	41.8	3400	5200	**0.782** 1.724
78.3 3.0827	**78.3** 3.0827	**95** 3.7402	**20** 0.787	**84.3** 3.3189	**0.85** 0.033	RNA1065	**41.5** 9330	**97.0** 21800	14.9	3200	4900	**0.306** 0.675
	78.3 3.0827	**95** 3.7402	**28** 1.102	**84.3** 3.3189	**0.85** 0.033	RNA2065	**78.0** 17500	**184** 41400	28.7	3200	4900	**0.433** 0.955
	78.3 3.0827	**100** 3.9370	**38** 1.496	**85.3** 3.3583	**0.85** 0.033	RNA3060	**123.0** 27700	**290** 65200	45.0	3200	4900	**0.810** 1.786
83.1 3.2717	**83.1** 3.2717	**100** 3.9370	**20** 0.787	**89.1** 3.5079	**0.85** 0.033	RNA1070	**43.0** 9670	**103** 23200	15.8	2900	4500	**0.322** 0.710
	83.1 3.2717	**100** 3.9370	**28** 1.102	**89.1** 3.5079	**0.85** 0.033	RNA2070	**81.0** 18200	**195** 43800	30.5	2900	4500	**0.470** 1.036
	83.1 3.2717	**105** 4.1339	**38** 1.496	**90.2** 3.5496	**0.85** 0.033	RNA3065	**129** 29000	**308** 69200	41.3	2900	4500	**0.865** 1.907
88 3.4646	**88** 3.4646	**110** 4.3307	**24** 0.945	**95.0** 3.7402	**0.85** 0.033	RNA1075	**64.0** 14400	**155** 34800	26.6	2800	4300	**0.577** 1.272

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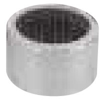
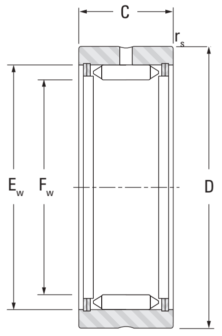


NEEDLE ROLLER BEARINGS FULL COMPLEMENT WITHOUT INNER RINGS

METRIC SERIES

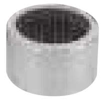
- Check for availability.



RNA

Shaft Dia.	F_w	D	C	E_w	$r_{s\,min.}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
88 3.4646	**88** 3.4646	**110** 4.3307	**32** 1.260	**95.0** 3.7402	**0.85** 0.033	RNA2075	**104** 23400	**253** 56900	39.5	2800	4300	**0.767** 1.691
	88 3.4646	**110** 4.3307	**38** 1.496	**95.0** 3.7402	**0.85** 0.033	RNA3070	**134** 30100	**325** 73100	50.8	2800	4300	**0.906** 1.997
96 3.7795	**96** 3.7795	**115** 4.5276	**24** 0.945	**103.0** 4.0551	**0.85** 0.033	RNA1080	**68.0** 15300	**170** 38200	26.7	2600	4000	**0.510** 1.124
	96 3.7795	**115** 4.5276	**32** 1.254	**103.0** 4.0551	**0.85** 0.033	RNA2080	**110** 24700	**275** 61800	43.0	2600	4000	**0.694** 1.530
	96 3.7795	**120** 4.7244	**38** 1.496	**103.0** 4.0551	**0.85** 0.033	RNA3075	**142** 31900	**355** 79800	55.3	2600	4000	**1.098** 2.421
99.5 3.9173	**99.5** 3.9173	**120** 4.7244	**32** 1.260	**106.5** 4.1929	**1.35** 0.053	RNA2085	**113** 25400	**285** 64100	44.1	2500	3800	**0.787** 1.735
	99.5 3.9173	**125** 4.9213	**38** 1.496	**106.5** 4.1929	**0.85** 0.033	RNA3080	**145** 32600	**365** 82100	56.8	2500	3800	**1.220** 2.690
104.7 4.1220	**104.7** 4.1220	**125** 4.9213	**32** 1.260	**111.7** 4.3976	**1.35** 0.053	RNA2090	**117** 26300	**300** 67400	45.9	2300	3600	**0.837** 1.845
	104.7 4.1220	**130** 5.1181	**38** 1.496	**111.7** 4.3976	**1.35** 0.053	RNA3085	**150** 33700	**390** 87700	59.1	2300	3600	**1.252** 2.760
109.1 4.2953	**109.1** 4.2953	**130** 5.1181	**32** 1.260	**116.1** 4.5709	**1.35** 0.053	RNA2095	**120** 27000	**315** 70800	47.2	2300	3500	**0.882** 1.944
	109.1 4.2953	**135** 5.3150	**43** 1.693	**116.1** 4.5709	**1.35** 0.053	RNA3090	**185** 41600	**480** 108000	72.1	2300	3500	**1.522** 3.355
114.7 4.5157	**114.7** 4.5157	**135** 5.3150	**32** 1.260	**121.7** 4.7913	**1.35** 0.053	RNA2100	**125** 28100	**330** 74200	48.9	2100	3300	**0.677** 1.493
	114.7 4.5157	**140** 5.5118	**43** 1.693	**121.7** 4.7913	**1.35** 0.053	RNA3095	**190** 42700	**505** 114000	74.7	2100	3300	**1.551** 3.419
119.2 4.6929	**119.2** 4.6929	**140** 5.5118	**32** 1.260	**126.2** 4.9685	**1.35** 0.053	RNA2105	**129** 29000	**340** 76400	50.3	2100	3200	**0.941** 2.075
	119.2 4.6929	**145** 5.7087	**43** 1.693	**126.2** 4.9685	**1.35** 0.053	RNA3100	**195** 43800	**520** 117000	76.8	2100	3200	**1.645** 3.627
124.5 4.9016	**124.5** 4.9016	**145** 5.7087	**34** 1.339	**131.5** 5.1772	**1.35** 0.053	RNA2110	**133** 29900	**360** 80900	51.9	2000	3000	**1.015** 2.238
	124.5 4.9016	**150** 5.9055	**45** 1.772	**131.5** 5.1772	**1.35** 0.053	RNA3105	**203** 45600	**550** 124000	79.3	2000	3000	**1.762** 3.885
132.5 5.2165	**132.5** 5.2165	**155** 6.1024	**34** 1.339	**139.5** 5.4921	**1.35** 0.053	RNA2115	**139** 31200	**380** 85400	54.2	1900	2900	**1.205** 2.657
	132.5 5.2165	**160** 6.2992	**45** 1.772	**139.5** 5.4921	**1.35** 0.053	RNA3110	**210** 47200	**580** 130000	85.5	1900	2900	**2.037** 4.49

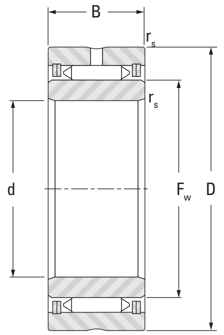
Shaft Dia.	F_w	D	C	E_w	$r_{s\,min.}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
137 5.3937	**137** 5.3937	**160** 6.2992	**34** 1.339	**144.0** 5.6693	**1.35** 0.053	RNA2120	**142** 31900	**395** 88800	84.8	1800	2800	**1.265** 2.789
	137 5.3937	**165** 6.4961	**45** 1.772	**144.0** 5.6693	**1.35** 0.053	RNA3115	**215** 48300	**600** 135000	84.8	1800	2800	**2.140** 4.718
143.5 5.6496	**143.5** 5.6496	**165** 6.4961	**34** 1.339	**150.5** 5.9268	**1.35** 0.053	RNA2125	**145** 32600	**410** 92200	57.0	1800	2700	**1.218** 2.685
	143.5 5.6496	**170** 6.6929	**45** 1.772	**150.5** 5.9268	**1.35** 0.053	RNA3120	**224** 50400	**630** 142000	87.0	1800	2700	**2.107** 4.645
148 5.8268	**148** 5.8268	**170** 6.6929	**34** 1.339	**155.0** 6.1039	**1.35** 0.053	RNA2130	**150** 33700	**425** 95500	88.9	1700	2600	**1.292** 2.848
158 6.2205	**158** 6.2205	**180** 7.0866	**36** 1.417	**165.0** 6.4976	**1.35** 0.053	RNA2140	**157** 35300	**455** 102000	61.0	1600	2400	**1.478** 3.258
	158 6.2205	**190** 7.4803	**52** 2.047	**166.0** 6.5354	**1.35** 0.053	RNA3130	**275** 61800	**790** 178000	108	1600	2400	**3.285** 7.242
170.5 6.7126	**170.5** 6.7126	**195** 7.6772	**36** 1.417	**177.5** 6.9882	**1.35** 0.053	RNA2150	**165** 37100	**490** 110000	64.8	1400	2200	**1.790** 3.946
	170.5 6.7126	**205** 8.0709	**52** 2.047	**178.5** 7.0276	**1.35** 0.053	RNA3140	**290** 65200	**860** 193000	114	1400	2200	**3.840** 8.466
179.3 7.0591	**179.3** 7.0591	**205** 8.0709	**36** 1.417	**186.3** 7.3346	**1.35** 0.053	RNA2160	**170** 38200	**515** 116000	67.2	1400	2100	**1.970** 4.343
	179.3 7.0591	**215** 8.4646	**52** 2.047	**187.3** 7.3756	**1.35** 0.053	RNA3150	**300** 67400	**900** 202000	117	1400	2100	**4.185** 9.226
193.8 7.6299	**193.8** 7.6299	**220** 8.6614	**42** 1.654	**200.8** 7.9055	**1.85** 0.073	RNA2170	**233** 52400	**720** 162000	91.4	1300	2000	**2.570** 5.666
	193.8 7.6299	**230** 9.0551	**57** 2.244	**201.9** 7.9496	**1.35** 0.053	RNA3160	**360** 80900	**1110** 250000	139	1300	2000	**4.955** 10.924
202.6 7.9764	**202.6** 7.9764	**230** 9.0551	**42** 1.654	**209.6** 8.2520	**1.85** 0.073	RNA2180	**240** 54000	**750** 169000	94.4	1200	1900	**2.835** 6.250
216 8.5039	**216** 8.5039	**245** 9.6457	**42** 1.654	**223.0** 8.7795	**1.85** 0.073	RNA2190	**250** 56200	**800** 180000	98.7	1200	1800	**3.210** 7.077
	216 8.5039	**255** 10.0394	**57** 2.244	**224.1** 8.8236	**1.85** 0.073	RNA3180	**385** 86600	**1240** 279000	150	1200	1800	**6.040** 13.316
224.1 8.8228	**224.1** 8.8228	**255** 10.0394	**42** 1.654	**231.1** 9.0984	**1.85** 0.073	RNA2200	**257** 57800	**830** 187000	101	1100	1700	**3.560** 7.848
236 9.2913	**236** 9.2913	**265** 10.4331	**42** 1.654	**243.1** 9.5693	**1.85** 0.073	RNA2210	**279** 62700	**910** 205000	104	1000	1600	**3.470** 7.650
258.4 10.1732	**258.4** 10.1732	**300** 11.8110	**64** 2.520	**268.4** 10.5677	**1.85** 0.073	RNA3220	**490** 110000	**1650** 371000	192	980	1500	**8.570** 18.894
269.6 10.6142	**269.6** 10.6142	**300** 11.8110	**49** 1.929	**276.6** 10.8898	**1.85** 0.073	RNA2240	**345** 77600	**1190** 268000	137	910	1400	**4.985** 10.990
281.9 11.0984	**281.9** 11.0984	**325** 12.7953	**64** 2.520	**291.9** 11.4921	**1.85** 0.073	RNA3240	**520** 117000	**1800** 405000	204	850	1300	**9.480** 20.900
335 13.1890	**335** 13.1890	**375** 14.7638	**54** 2.126	**343.0** 13.5039	**1.85** 0.073	RNA2300	**460** 103000	**1690** 380000	183	720	1100	**8.600** 18.960



NEEDLE ROLLER BEARINGS
FULL COMPLEMENT
WITH INNER RINGS

METRIC SERIES

- Check for availability.



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Shaft Dia.	d	D	B	F_w	$r_{s\ min.}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min-1		kg lbs
12 0.4724	**12** 0.4724	**28** 1.1024	**15** 0.591	**17.6** 0.6929	**0.35** 0.014	NA1012(1)	**11.0** 2470	**16.5** 3710	2.95	14000	22000	**0.050** 0.110
15 0.5906	**15** 0.5906	**32** 1.2598	**15** 0.591	**20.8** 0.8189	**0.65** 0.026	NA1015(1)	**12.4** 2790	**19.5** 4380	3.05	12000	18000	**0.062** 0.137
	15 0.5906	**35** 1.3780	**22** 0.866	**22.1** 0.8701	**0.65** 0.026	NA2015	**23.5** 5280	**37.5** 8430	7.20	11000	17000	**0.117** 0.258
17 0.6693	**17** 0.6693	**35** 1.3780	**15** 0.591	**23.9** 0.9409	**0.65** 0.026	NA1017(1)	**13.7** 3080	**22.5** 5060	4.05	10000	16000	**0.073** 0.161
20 0.7874	**20** 0.7874	**42** 1.6535	**18** 0.709	**28.7** 1.1299	**0.65** 0.026	NA1020	**19.3** 4340	**33.5** 7530	5.55	8600	13000	**0.130** 0.287
	20 0.7874	**42** 1.6535	**22** 0.866	**28.7** 1.1299	**0.65** 0.026	NA2020	**28.5** 6410	**49.0** 11000	8.15	8600	13000	**0.160** 0.353
25 0.9843	**25** 0.9843	**47** 1.8504	**18** 0.709	**33.5** 1.3189	**0.65** 0.026	NA1025	**21.5** 4830	**39.0** 8770	6.50	7200	11000	**0.151** 0.333
	25 0.9843	**47** 1.8504	**22** 0.866	**33.5** 1.3189	**0.65** 0.026	NA2025	**33.0** 7420	**60.0** 13500	9.55	7200	11000	**0.187** 0.412
	25 0.9843	**47** 1.8504	**30** 1.181	**33.5** 1.3189	**0.65** 0.026	NA22025	**52.0** 11700	**94.0** 21100	15.2	7200	11000	**0.259** 0.571
30 1.1811	**30** 1.1811	**52** 2.0472	**18** 0.709	**38.2** 1.5039	**0.65** 0.026	NA1030	**23.5** 5280	**44.5** 10000	7.40	6500	10000	**0.167** 0.368
	30 1.1811	**52** 2.0472	**22** 0.866	**38.2** 1.5039	**0.65** 0.026	NA2030	**34.5** 7760	**66.0** 14800	10.9	6500	10000	**0.213** 0.470
	30 1.1811	**52** 2.0472	**30** 1.181	**38.2** 1.5039	**0.65** 0.026	NA22030	**57.0** 12800	**108** 24300	17.4	6500	10000	**0.293** 0.646
	30 1.1811	**62** 2.4409	**30** 1.181	**44.0** 1.7323	**0.65** 0.026	NA3030	**64.0** 14400	**125** 28100	19.5	5600	8600	**0.497** 1.10
35 1.3780	**35** 1.3780	**58** 2.2835	**18** 0.709	**44.0** 1.7323	**0.65** 0.026	NA1035	**26.0** 5850	**51.0** 11500	8.55	5600	8600	**0.204** 0.450
	35 1.3780	**58** 2.2835	**22** 0.866	**44.0** 1.7323	**0.65** 0.026	NA2035	**38.0** 8540	**75.0** 16900	12.6	5600	8600	**0.253** 0.558
	35 1.3780	**58** 2.2835	**30** 1.181	**44.0** 1.7323	**0.65** 0.026	NA22035	**63.0** 14200	**124** 27900	20.0	5600	8600	**0.352** 0.776
	35 1.3780	**72** 2.8346	**36** 1.417	**49.7** 1.9567	**0.65** 0.026	NA3035	**90.0** 20200	**183** 41100	28.3	4900	7600	**0.815** 1.80
40 1.5748	**40** 1.5748	**65** 2.5591	**18** 0.709	**49.7** 1.9567	**0.85** 0.033	NA1040	**28.5** 6410	**58.0** 13000	9.65	4900	7600	**0.254** 0.560
	40 1.5748	**65** 2.5591	**22** 0.866	**49.7** 1.9567	**0.85** 0.033	NA2040	**41.5** 9330	**85.0** 19100	14.2	4900	7600	**0.315** 0.694
	40 1.5748	**65** 2.5591	**30** 1.181	**49.7** 1.9567	**0.85** 0.033	NA22040	**68.0** 15300	**140** 31500	22.4	4900	7600	**0.434** 0.957
	40 1.5748	**80** 3.1496	**36** 1.417	**55.4** 2.1811	**0.85** 0.033	NA3040	**97.0** 21800	**204** 45900	31.5	4500	6900	**0.993** 2.19
45 1.7717	**45** 1.7717	**72** 2.8346	**18** 0.709	**55.4** 2.1811	**0.85** 0.033	NA1045	**30.5** 6860	**65.0** 14600	10.8	4500	6900	**0.306** 0.675

(1) No lubrication holes.

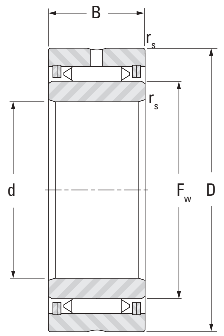
Shaft Dia.	d	D	B	F_w	$r_{s\ min.}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min-1		kg lbs
45 1.7717	**45** 1.7717	**72** 2.8346	**22** 0.866	**55.4** 2.1811	**0.85** 0.033	NA2045	**45.0** 10100	**95.0** 21400	15.9	4500	6900	**0.381** 0.840
	45 1.7717	**85** 3.3465	**38** 1.496	**62.1** 2.4449	**0.85** 0.033	NA3045	**105.0** 23600	**230** 51700	35.4	4000	6100	**1.13** 2.50
50 1.9685	**50** 1.9685	**80** 3.1496	**20** 0.787	**62.1** 2.4449	**0.85** 0.033	NA1050	**33.0** 7420	**73.0** 16400	12.1	4000	6100	**0.418** 0.922
	50 1.9685	**80** 3.1496	**28** 1.102	**62.1** 2.4449	**0.85** 0.033	NA2050	**64.0** 14400	**142** 31900	23.1	4000	6100	**0.603** 1.33
	50 1.9685	**90** 3.5433	**38** 1.496	**68.8** 2.7087	**0.85** 0.033	NA3050	**113.0** 25400	**255** 57300	39.2	3600	5500	**1.22** 2.69
55 2.1654	**55** 2.1654	**85** 3.3465	**20** 0.787	**68.8** 2.7087	**0.85** 0.033	NA1055	**35.5** 7980	**80.0** 18000	13.4	3600	5500	**0.453** 0.999
	55 2.1654	**85** 3.3465	**28** 1.102	**68.8** 2.7087	**0.85** 0.033	NA2055	**69.0** 15500	**157** 35300	25.6	3600	5500	**0.649** 1.43
	55 2.1654	**95** 3.7402	**38** 1.496	**72.6** 2.8583	**0.85** 0.033	NA3055	**117.0** 26300	**268** 60200	41.8	3400	5200	**1.31** 2.88
60 2.3622	**60** 2.3622	**90** 3.5433	**20** 0.787	**72.6** 2.8583	**0.85** 0.033	NA1060	**37.0** 8320	**85.0** 19100	14.1	3400	5200	**0.485** 1.07
	60 2.3622	**90** 3.5433	**28** 1.102	**72.6** 2.8583	**0.85** 0.033	NA2060	**72.0** 16200	**165** 37100	26.6	3400	5200	**0.695** 1.53
	60 2.3622	**100** 3.9370	**38** 1.496	**78.3** 3.0827	**0.85** 0.033	NA3060	**123.0** 27700	**290** 65200	45.0	3200	4900	**1.39** 3.07
65 2.5591	**65** 2.5591	**95** 3.7402	**20** 0.787	**78.3** 3.0827	**0.85** 0.033	NA1065	**41.5** 9330	**97.0** 21800	14.9	3200	4900	**0.536** 1.18
	65 2.5591	**95** 3.7402	**28** 1.102	**78.3** 3.0827	**0.85** 0.033	NA2065	**78.0** 17500	**184** 41400	28.7	3200	4900	**0.757** 1.67
	65 2.5591	**105** 4.1339	**38** 1.496	**83.1** 3.2717	**0.85** 0.033	NA3065	**129.0** 29000	**308** 69200	41.3	2900	4500	**1.49** 3.28
70 2.7559	**70** 2.7559	**100** 3.9370	**20** 0.787	**83.1** 3.2717	**0.85** 0.033	NA1070	**43.0** 9670	**103** 23200	15.8	2900	4500	**0.567** 1.25
	70 2.7559	**100** 3.9370	**28** 1.102	**83.1** 3.2717	**0.85** 0.033	NA2070	**81.0** 18200	**195** 43800	30.5	2900	4500	**0.805** 1.77
	70 2.7559	**110** 4.3307	**38** 1.496	**88.0** 3.4646	**0.85** 0.033	NA3070	**134.0** 30100	**325** 73100	50.8	2800	4300	**1.57** 3.46
75 2.9528	**75** 2.9528	**110** 4.3307	**32** 1.260	**88.0** 3.4646	**0.85** 0.033	NA2075	**104.0** 23400	**253** 56900	39.5	2800	4300	**1.18** 2.59
	75 2.9528	**120** 4.7244	**38** 1.496	**96.0** 3.7795	**0.85** 0.033	NA3075	**142.0** 31900	**355** 79800	55.3	2600	4000	**1.92** 4.24
80 3.1496	**80** 3.1496	**115** 4.5276	**24** 0.945	**96.0** 3.7795	**0.85** 0.033	NA1080	**68.0** 15300	**170** 38200	26.7	2600	4000	**0.920** 2.03
	80 3.1496	**115** 4.5276	**32** 1.254	**96.0** 3.7795	**0.85** 0.033	NA2080	**110.0** 24700	**275** 61800	43.0	2600	4000	**1.24** 2.73
	80 3.1496	**125** 4.9213	**38** 1.496	**99.5** 3.9173	**0.85** 0.033	NA3080	**145.0** 32600	**365** 82100	56.8	2500	3800	**2.03** 4.46
85 3.3465	**85** 3.3465	**120** 4.7244	**32** 1.260	**99.5** 3.9173	**1.35** 0.053	NA2085	**113.0** 25400	**285** 64100	44.1	2500	3800	**1.30** 2.87
	85 3.3465	**130** 5.1181	**38** 1.496	**104.7** 4.1220	**1.35** 0.053	NA3085	**150.0** 33700	**390** 87700	59.1	2300	3600	**2.12** 4.67
90 3.5433	**90** 3.5433	**125** 4.9213	**32** 1.260	**104.7** 4.1220	**1.35** 0.053	NA2090	**117.0** 26300	**300** 67400	45.9	2300	3600	**1.37** 3.02
	90 3.5433	**135** 5.3150	**43** 1.693	**109.7** 4.3189	**1.35** 0.053	NA3090	**185.0** 41600	**480** 108000	72.1	2300	3500	**2.51** 5.54
95 3.7402	**95** 3.7402	**130** 5.1181	**32** 1.260	**109.1** 4.2953	**1.35** 0.053	NA2095	**120.0** 27000	**315** 70800	47.2	2300	3500	**1.43** 3.15
	95 3.7402	**140** 5.5118	**43** 1.693	**114.7** 4.5157	**1.35** 0.053	NA3095	**190.0** 42700	**505** 114000	74.7	2100	3300	**2.63** 5.79

Continued on next page.

NEEDLE ROLLER BEARINGS FULL COMPLEMENT WITH INNER RINGS

METRIC SERIES

- Check for availability.



NA

Shaft Dia.	d	D	B	F_w	$r_{s\ min.}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	min^{-1}	min^{-1}	kg lbs
100 3.9370	**100** 3.9370	**135** 5.3150	**32** 1.260	**114.7** 4.5157	**1.35** 0.053	NA2100	**125.0** 28100	**330** 74200	48.9	2100	3300	**1.50** 3.30
	100 3.9370	**145** 5.7087	**43** 1.693	**119.2** 4.6929	**1.35** 0.053	NA3100	**195.0** 43800	**520** 117000	76.8	2100	3200	**2.74** 6.03
105 4.1339	**105** 4.1339	**140** 5.5118	**32** 1.260	**119.2** 4.6929	**1.35** 0.053	NA2105	**129.0** 29000	**340** 76400	50.3	2100	3200	**1.56** 3.43
	105 4.1339	**150** 5.9055	**45** 1.772	**124.7** 4.9094	**1.35** 0.053	NA3105	**203.0** 45600	**550** 124000	79.3	2000	3000	**2.99** 6.59
110 4.3307	**110** 4.3307	**145** 5.7087	**34** 1.339	**124.7** 4.9094	**1.35** 0.053	NA2110	**133.0** 29900	**360** 80900	51.9	2000	3000	**1.72** 3.79
	110 4.3307	**160** 6.2992	**45** 1.772	**132.5** 5.2165	**1.35** 0.053	NA3110	**210.0** 47200	**580** 130000	85.5	1900	2900	**3.53** 7.79
115 4.5276	**115** 4.5276	**155** 6.1024	**34** 1.339	**132.5** 5.2165	**1.35** 0.053	NA2115	**139.0** 31200	**380** 85400	54.2	1900	2900	**2.10** 4.63
	115 4.5276	**165** 6.4961	**45** 1.772	**137.0** 5.3937	**1.35** 0.053	NA3115	**215.0** 48300	**600** 135000	84.8	1800	2800	**3.66** 8.07
120 4.7244	**120** 4.7244	**160** 6.2992	**34** 1.339	**137.0** 5.3937	**1.35** 0.053	NA2120	**142.0** 31900	**395** 88800	84.8	1800	2800	**2.17** 4.78
	120 4.7244	**170** 6.6929	**45** 1.772	**143.5** 5.6496	**1.35** 0.053	NA3120	**224.0** 50400	**630** 142000	87.0	1800	2700	**3.79** 8.36
125 4.9213	**125** 4.9213	**165** 6.4961	**34** 1.339	**143.5** 5.6496	**1.35** 0.053	NA2125	**145.0** 32600	**410** 92200	57.0	1800	2700	**2.24** 4.94
130 5.1181	**130** 5.1181	**170** 6.6929	**34** 1.339	**148.0** 5.8268	**1.35** 0.053	NA2130	**150.0** 33700	**425** 95500	88.9	1700	2600	**2.33** 5.13
140 5.5118	**140** 5.5118	**180** 7.0866	**36** 1.417	**158.0** 6.2205	**1.35** 0.053	NA2140	**157.0** 35300	**455** 102000	61.0	1600	2400	**2.64** 5.83
	140 5.5118	**205** 8.0709	**52** 2.047	**170.5** 6.7126	**1.35** 0.053	NA3140	**290.0** 65200	**860** 193000	114	1400	2200	**6.84** 15.1
150 5.9055	**150** 5.9055	**195** 7.6772	**36** 1.417	**170.5** 6.7126	**1.35** 0.053	NA2150	**165.0** 37100	**490** 110000	64.8	1400	2200	**3.23** 7.12
160 6.2992	**160** 6.2992	**205** 8.0709	**36** 1.417	**179.3** 7.0591	**1.35** 0.053	NA2160	**170.0** 38200	**515** 116000	67.2	1400	2100	**3.40** 7.50
170 6.6929	**170** 6.6929	**220** 8.6614	**42** 1.654	**193.8** 7.6299	**1.35** 0.053	NA2170	**233.0** 52400	**720** 162000	91.4	1300	2000	**4.77** 10.5
180 7.0866	**180** 7.0866	**230** 9.0551	**42** 1.654	**202.6** 7.9764	**1.35** 0.053	NA2180	**240.0** 54000	**750** 169000	94.4	1200	1900	**5.01** 11.0
190 7.4803	**190** 7.4803	**245** 9.6457	**42** 1.654	**216.0** 8.5039	**1.35** 0.053	NA2190	**250.0** 56200	**800** 180000	98.7	1200	1800	**5.89** 13.0
200 7.8740	**200** 7.8740	**255** 10.0394	**42** 1.654	**224.1** 8.8228	**1.35** 0.053	NA2200	**257.0** 57800	**830** 187000	101	1100	1700	**6.15** 13.6

NEEDLE ROLLER BEARINGS

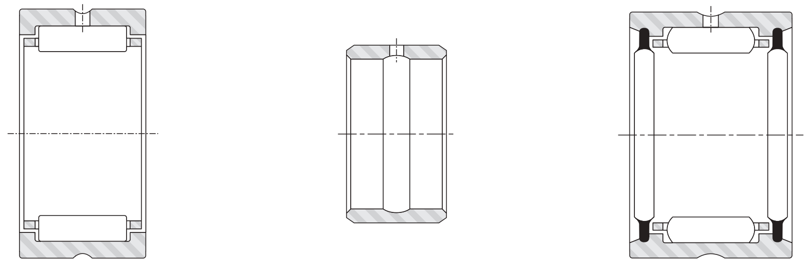
INCH SERIES

When there is a requirement for a rolling bearing to support very high dynamic, static or even shock loads with a restricted mounting space – the needle roller bearing may give best results.

REFERENCE STANDARDS ARE:

- **ANSI/ABMA Standard 18.2** – needle roller bearings – radial, inch design.
- **ASTM Standard F 2246** – standard specification for bearing, roller, needle: thick outer ring with rollers and cage.
- **Military Standard MS 51961** – bearing, roller, needle: thick outer ring with rollers and cage.
- **ASTM Standard F2431** – standard specification for ring, bearing, inner: needle roller bearing with thick outer ring.

IDENTIFICATION



HJ IR HJ – .2RS

Fig. B4-11. Construction of inch series heavy-duty needle roller bearings

The prefix letters HJ in the needle roller bearing designation denote that the bearing is manufactured to inch nominal dimensions.

Bearings are available with one or two lip-contact seals, as listed on pages B-4-52 and B-4-53. One seal is designated by suffix letters RS. Two seals are designated by .2RS.

Inner rings can be used with HJ Series needle roller bearings for applications where it is impractical to use the shaft as the inner raceway. These inch series inner rings are identified by the prefix letters IR.

Because the entire identification code may not appear on the bearing itself, the manufacturer's parts list or another reliable source should always be consulted when ordering bearings for service or field replacement to make certain that the correct bearing with the correct lubricant is used.

CONSTRUCTION

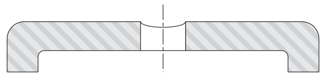


Fig. B4-12. One-piece, channel-shaped outer ring

Fig. B4-13. Steel cage

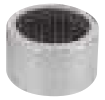
The HJ Series needle roller bearing has a one-piece channel-shaped outer ring of bearing-quality steel heat treated to provide maximum load rating. The integral end flanges provide axial location for the needle rollers. The bores of the end flanges serve as piloting surfaces for the cage, locating it to prevent removal of the lubricant film on the raceway.

These bearings have a steel cage, which provides inward retention for the needle rollers. The design assures roller stability and minimizes friction between the cage and the needle rollers. The cage has a maximum strength consistent with the inherent high load ratings of needle roller bearings.

The needle rollers are made from high-carbon chrome steel, through-hardened, ground and lapped to close tolerance with controlled contour for optimum load distribution.

SEALS

Shaft contact seals, which fit into the same housing bore as the heavy-duty needle roller bearings, may be obtained from recognized seal manufacturers. Bearings can also be made available with one or two integral seals. For information and listing of sealed bearings, see pages B-4-52 and B-4-53.



LUBRICATION

The outer rings of the HJ bearings are supplied with a lubrication groove on the O.D. and a lubrication hole in this groove to facilitate re-lubrication through the outer ring. The IR inner rings have lubrication grooves in the bore and a re-lubrication hole to facilitate re-lubrication through the inner ring.

HJ Series bearings (with or without seals) are typically shipped protected with a corrosion-preventive compound that is not a lubricant. When specified by the customer, HJ Series bearings may be ordered prelubricated with suitable greases and oils.

MOUNTING DIMENSIONS

HJ needle roller bearings are normally mounted in their housings with a clearance fit if the load is stationary relative to the housing, and with a tight transition fit if the load rotates relative to the housing. Because the tight transition fit of the bearing in its housing may result in a reduction of the needle roller complement bore diameter, the shaft raceway diameter should be reduced to a like amount.

The mounting dimensions in the bearing tables (pages B-4-48 to B-4-53) list the suggested ISO H7 tolerances for the housing bore and the suggested ISO h6 tolerances for the shaft raceway when the outer ring is to be mounted with a clearance fit. The tables also list the suggested ISO N7 tolerances for the housing bore and the suggested ISO f6 tolerances for the shaft raceway when the outer ring is to be mounted with a tight transition fit.

Other mounting dimensions may be required for special conditions such as:

1. Extremely heavy radial loads.
2. Shock loads.
3. Load rotating relative to both inner and outer rings.
4. Temperature gradient across bearing.
5. Housing with heat expansion coefficient differing from that of the bearing.

If these conditions are expected, please consult your representative.

DIMENSIONAL ACCURACY, BEARINGS

HJ SERIES

Tolerances for the HJ bearings are given in Tables B4-8 and B4-9. Pages B-4-48 to B-4-53 list the nominal outer diameter, width and needle roller complement bore diameter for the HJ bearings.

Table B4-8. Outer diameter and width tolerances, HJ bearings

D				Deviaiton from nominal							
Nominal outer diameter				of single mean outer diameter, D_{mp}[1]				of width, C			
>	≤	>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
mm	**mm**	in	in	**mm**	**mm**	in	in	**mm**	**mm**	in	in
19.050	**50.800**	0.7500	2.0000	**+0**	**-0.013**	+0	-0.0005	**+0**	**-0.013**	+0	-0.005
50.800	**82.550**	2.0000	3.2500	**+0**	**-0.015**	+0	-0.0006	**+0**	**-0.013**	+0	-0.005
82.550	**120.650**	3.2500	4.7500	**+0**	**-0.020**	+0	-0.0008	**+0**	**-0.013**	+0	-0.005

[1] "Single mean diameter" is defined as the mean diameter in a single radial plane.

Table B4-9. Roller complement bore tolerance, HJ bearings

F_w				Deviaiton from nominal of the smallest single diameter of the roller complement bore, F_m[1]			
Nominal roller complement bore diameter							
>	≤	>	≤	Max.	Min.	Max.	Min.
mm	**mm**	in	in	**mm**	**mm**	in	in
12.700	**15.875**	0.5000	0.6250	**+0.043**	**+0.020**	+0.0017	+0.0008
15.875	**28.575**	0.6250	1.1250	**+0.046**	**+0.023**	+0.0018	+0.0009
28.575	**41.275**	1.1250	1.6250	**+0.048**	**+0.025**	+0.0019	+0.0010
41.275	**47.625**	1.6250	1.8750	**+0.050**	**+0.025**	+0.0020	+0.0010
47.625	**69.850**	1.8750	2.7500	**+0.053**	**+0.028**	+0.0021	+0.0011
69.850	**76.200**	2.7500	3.0000	**+0.058**	**+0.028**	+0.0023	+0.0011
76.200	**101.600**	3.0000	4.0000	**+0.060**	**+0.030**	+0.0024	+0.0012

[1] "The smallest single diameter of the roller complement bore" is defined as the diameter of the cylinder which, when used as a bearing inner ring, results in zero radial internal clearance in the bearing on at least one diameter.

DIMENSIONAL ACCURACY, INNER RINGS

IR SERIES

Tolerances for the IR inner rings are given in Tables B4-10 and B4-11. Pages B-4-54 to B-4-57 list the nominal outer diameter, width and bore diameter for the IR series inner rings.

Table B4-10. Bore and width tolerances, IR inner rings

d				Deviaiton from nominal							
Nominal bore diameter				of single mean bore diameter, d_{mp}[1]				of width, B			
>	≤	>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
mm	**mm**	in	in	**mm**	**mm**	in	in	**mm**	**mm**	in	in
7.938	**19.050**	0.3125	0.7500	**+0**	**-0.010**	+0	-0.0004	**+0.25**	**+0.12**	+0.010	+0.005
19.050	**50.800**	0.7500	2.0000	**+0**	**-0.013**	+0	-0.0005	**+0.25**	**+0.12**	+0.010	+0.005
50.800	**82.550**	2.0000	3.2500	**+0**	**-0.015**	+0	-0.0006	**+0.25**	**+0.12**	+0.010	+0.005

[1] "Single mean diameter" is defined as the mean diameter in a single radial plane.

Table B4-11. Outer diameter tolerance, IR inner rings

F				Deviaiton from nominal of single mean outer diameter, F_{mp}[1]			
Nominal outer diameter							
>	≤	>	≤	Max.	Min.	Max.	Min.
mm	**mm**	in	in	**mm**	**mm**	in	in
12.700	**15.875**	0.5000	0.6250	**-0.013**	**-0.023**	-0.0005	-0.0009
15.875	**25.400**	0.6250	1.0000	**-0.018**	**-0.031**	-0.0007	-0.0012
25.400	**28.575**	1.0000	1.1250	**-0.023**	**-0.036**	-0.0009	-0.0014
28.575	**34.925**	1.1250	1.3750	**-0.023**	**-0.036**	-0.0009	-0.0015
34.925	**47.625**	1.3750	1.8750	**-0.025**	**-0.038**	-0.0010	-0.0016
47.625	**76.200**	1.8750	3.0000	**-0.028**	**-0.040**	-0.0011	-0.0018
76.200	**95.250**	3.0000	3.7500	**-0.033**	**-0.046**	-0.0013	-0.0022

[1] "Single mean diameter" is defined as the mean diameter in a single radial plane.

LOAD RATING FACTORS

DYNAMIC LOADS

Needle roller bearings can accommodate only radial loads.

$$P = F_r$$

P = The maximum dynamic radial load that may be applied to a needle roller bearing based on the dynamic load rating, C_r, given in the bearing tables. This load should be $\leq C_r/3$.

STATIC LOADS

Needle roller bearings can accommodate only radial loads.

$$P_0 = F_r$$

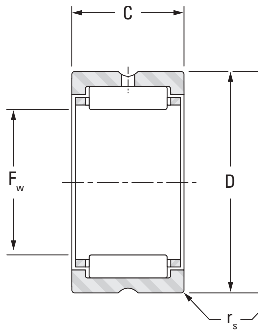
SPECIAL BEARINGS

For needle roller bearings with special dimensions or special features, such as split outer ring, consult your representative.

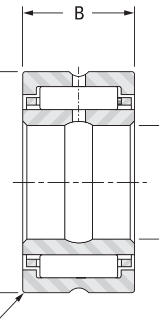
HJ TYPE

INCH SERIES

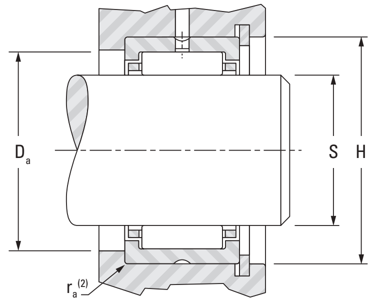
- Check for availability.
- Nominal bearing diameters and widths shown.
- Tolerance tables found on page B-4-46.
- Clearance fit suggested for outer ring when housing is stationary relative to load.
- Tight transition fit suggested if housing rotates relative to load.
- Consult your representative for oscillating applications (e.g., low radial clearance concerns).
- Unmarked end of outer ring should be assembled against housing shoulder to clear maximum allowed housing fillet.
- Meets Military Standard MS 51961 and ASTM F2246.



HJ



HJ with IR



Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C (B)	$r_{s\ min.}$	Bearing Designation	Used With Inner Ring Designation(1)	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil
in	mm in	mm in	mm in	mm in			kN lbf	kN lbf	kN	min⁻¹	min⁻¹
5/8	**15.875** 0.6250	**28.575** 1.1250	**19.050** 0.750	**0.64** 0.025	HJ-101812	IR-061012	**19.3** 4350	**20.7** 4650	3.25	20000	30000
3/4	**19.050** 0.7500	**31.750** 1.2500	**19.050** 0.750	**1.02** 0.04	HJ-122012	IR-081212	**20.7** 4650	**23.3** 5240	3.65	16000	25000
	19.050 0.7500	**31.750** 1.2500	**25.400** 1.000	**1.02** 0.04	HJ-122016	IR-081216	**27.8** 6250	**33.8** 7600	5.30	16000	25000
7/8	**22.225** 0.8750	**34.925** 1.3750	**19.050** 0.750	**1.02** 0.04	HJ-142212	IR-101412	**23.1** 5180	**27.9** 6270	4.35	13000	21000
	22.225 0.8750	**34.925** 1.3750	**25.400** 1.000	**1.02** 0.04	HJ-142216	IR-101416	**31.0** 6970	**40.5** 9100	6.35	13000	21000
1	**25.400** 1.0000	**38.100** 1.5000	**19.050** 0.750	**1.02** 0.04	HJ-162412	IR-121612	**25.2** 5680	**32.5** 7300	5.10	12000	18000
	25.400 1.0000	**38.100** 1.5000	**25.400** 1.000	**1.02** 0.04	HJ-162416	IR-121616 IR-131616	**34.0** 7640	**47.2** 10600	7.40	12000	18000
1 1/8	**28.575** 1.1250	**41.275** 1.6250	**25.400** 1.000	**1.02** 0.04	HJ-182616	IR-141816 IR-151816	**36.3** 8170	**53.8** 12100	8.45	10000	16000
	28.575 1.1250	**41.275** 1.6250	**31.750** 1.250	**1.02** 0.04	HJ-182620	IR-141820 IR-151820	**44.9** 10100	**70.3** 15800	10.9	10000	16000
1 1/4	**31.750** 1.2500	**44.450** 1.7500	**25.400** 1.000	**1.02** 0.04	HJ-202816	IR-162016	**37.4** 8410	**57.4** 12900	9.00	9100	14000
	31.750 1.2500	**44.450** 1.7500	**31.750** 1.250	**1.02** 0.04	HJ-202820	IR-162020	**46.3** 10400	**75.2** 16900	11.7	9100	14000
1 3/8	**34.925** 1.3750	**47.625** 1.8750	**25.400** 1.000	**1.02** 0.04	HJ-223016	IR-182216	**39.8** 8950	**64.1** 14400	10.1	8200	13000
	34.925 1.3750	**47.625** 1.8750	**31.750** 1.250	**1.02** 0.04	HJ-223020	IR-182220	**49.4** 11100	**84.1** 18900	13.0	8200	13000
1 1/2	**38.100** 1.5000	**52.388** 2.0625	**25.400** 1.000	**1.52** 0.06	HJ-243316	IR-202416	**47.6** 10700	**72.5** 16300	11.4	7600	12000
	38.100 1.5000	**52.388** 2.0625	**31.750** 1.250	**1.52** 0.06	HJ-243320	IR-192420 IR-202420	**58.7** 13200	**95.2** 21400	14.9	7600	12000
1 5/8	**41.275** 1.6250	**55.563** 2.1875	**25.400** 1.000	**1.52** 0.06	HJ-263516	IR-212616	**48.5** 10900	**76.5** 17200	12.1	7000	11000
	41.275 1.6250	**55.563** 2.1875	**31.750** 1.250	**1.52** 0.06	HJ-263520	IR-212620 IR-222620	**60.1** 13500	**100.5** 22600	15.7	7000	11000
1 3/4	**44.450** 1.7500	**58.738** 2.3125	**25.400** 1.000	**1.52** 0.06	HJ-283716	IR-232816 IR-242816	**49.8** 11200	**81.0** 18200	12.8	6400	9900

Approx. Wt.	Mounting Dimensions Clearance Fit S (ISO h6) Max.	Mounting Dimensions Clearance Fit S (ISO h6) Min.	Mounting Dimensions Clearance Fit H (ISO H7) Max.	Mounting Dimensions Clearance Fit H (ISO H7) Min.	Bearing Designation	Mounting Dimensions Tight Transition Fit S (ISO f6) Max.	Mounting Dimensions Tight Transition Fit S (ISO f6) Min.	Mounting Dimensions Tight Transition Fit H (ISO N7) Max.	Mounting Dimensions Tight Transition Fit H (ISO N7) Min.	Shoulder Dia. D_a **±0.38** ±0.015	Shaft Dia.
kg lbs	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	mm in	in
0.050 0.11	**15.875** 0.6250	**15.865** 0.6246	**28.595** 1.1258	**28.575** 1.1250	HJ-101812	**15.860** 0.6244	**15.850** 0.6240	**28.567** 1.1247	**28.547** 1.1239	**23.83** 0.938	5/8
0.059 0.13	**19.050** 0.7500	**19.037** 0.7495	**31.775** 1.2510	**31.750** 1.2500	HJ-122012	**19.030** 0.7492	**19.017** 0.7487	**31.742** 1.2497	**31.717** 1.2487	**26.97** 1.062	3/4
0.077 0.17	**19.050** 0.7500	**19.037** 0.7495	**31.775** 1.2510	**31.750** 1.2500	HJ-122016	**19.030** 0.7492	**19.017** 0.7487	**31.742** 1.2497	**31.717** 1.2487	**26.97** 1.062	
0.064 0.14	**22.225** 0.8750	**22.212** 0.8745	**34.950** 1.3760	**34.925** 1.3750	HJ-142212	**22.205** 0.8742	**22.192** 0.8737	**34.917** 1.3747	**34.892** 1.3737	**30.18** 1.188	7/8
0.086 0.19	**22.225** 0.8750	**22.212** 0.8745	**34.950** 1.3760	**34.925** 1.3750	HJ-142216	**22.205** 0.8742	**22.192** 0.8737	**34.917** 1.3747	**34.892** 1.3737	**30.18** 1.188	
0.073 0.16	**25.400** 1.0000	**25.387** 0.9995	**38.125** 1.5010	**38.100** 1.5000	HJ-162412	**25.380** 0.9992	**25.367** 0.9987	**38.092** 1.4997	**38.067** 1.4987	**33.32** 1.312	1
0.095 0.21	**25.400** 1.0000	**25.387** 0.9995	**38.125** 1.5010	**38.100** 1.5000	HJ-162416	**25.380** 0.9992	**25.367** 0.9987	**38.092** 1.4997	**38.067** 1.4987	**33.32** 1.312	
0.104 0.23	**28.575** 1.1250	**28.562** 1.1245	**41.300** 1.6260	**41.275** 1.6250	HJ-182616	**28.555** 1.1242	**28.542** 1.1237	**41.267** 1.6247	**41.242** 1.6237	**36.53** 1.438	1 1/8
0.132 0.29	**28.575** 1.1250	**28.562** 1.1245	**41.300** 1.6260	**41.275** 1.6250	HJ-182620	**28.555** 1.1242	**28.542** 1.1237	**41.267** 1.6247	**41.242** 1.6237	**36.53** 1.438	
0.113 0.25	**31.750** 1.2500	**31.735** 1.2494	**44.475** 1.7510	**44.450** 1.7500	HJ-202816	**31.725** 1.2490	**31.709** 1.2484	**44.442** 1.7497	**44.417** 1.7487	**39.67** 1.562	1 1/4
0.145 0.32	**31.750** 1.2500	**31.735** 1.2494	**44.475** 1.7510	**44.450** 1.7500	HJ-202820	**31.725** 1.2490	**31.709** 1.2484	**44.442** 1.7497	**44.417** 1.7487	**39.67** 1.562	
0.127 0.28	**34.925** 1.3750	**34.910** 1.3744	**47.650** 1.8760	**47.625** 1.8750	HJ-223016	**34.900** 1.374	**34.884** 1.3734	**47.617** 1.8747	**47.592** 1.8737	**42.88** 1.688	1 3/8
0.159 0.35	**34.925** 1.3750	**34.910** 1.3744	**47.650** 1.8760	**47.625** 1.8750	HJ-223020	**34.900** 1.3740	**34.884** 1.3734	**47.617** 1.8747	**47.592** 1.8737	**42.88** 1.688	
0.154 0.34	**38.100** 1.5000	**38.085** 1.4994	**52.418** 2.0637	**52.388** 2.0625	HJ-243316	**38.075** 1.4990	**38.059** 1.4984	**52.380** 2.0622	**52.349** 2.0610	**47.63** 1.875	1 1/2
0.195 0.43	**38.100** 1.5000	**38.085** 1.4994	**52.418** 2.0637	**52.388** 2.0625	HJ-243320	**38.075** 1.4990	**38.059** 1.4984	**52.380** 2.0622	**52.349** 2.0610	**47.63** 1.875	
0.163 0.36	**41.275** 1.6250	**41.260** 1.6244	**55.593** 2.1887	**55.563** 2.1875	HJ-263516	**41.250** 1.6240	**41.234** 1.6234	**55.555** 2.1872	**55.524** 2.1860	**50.80** 2.000	1 5/8
0.209 0.46	**41.275** 1.6250	**41.260** 1.6244	**55.593** 2.1887	**55.563** 2.1875	HJ-263520	**41.250** 1.6240	**41.234** 1.6234	**55.555** 2.1872	**55.524** 2.1860	**50.80** 2.000	
0.177 0.39	**44.450** 1.7500	**44.435** 1.7494	**58.768** 2.3137	**58.738** 2.3125	HJ-283716	**44.425** 1.7490	**44.409** 1.7484	**58.730** 2.3122	**58.699** 2.3110	**53.98** 2.125	1 3/4

Continued on next page.

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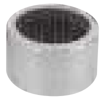
(1) See pages B-4-54 to B-4-57 for inch series inner rings. Order inner rings separately.

(2) $r_{a\ max.}$ is equal to the minimum bearing chamfer ($r_{s\ min.}$) at unmarked end.



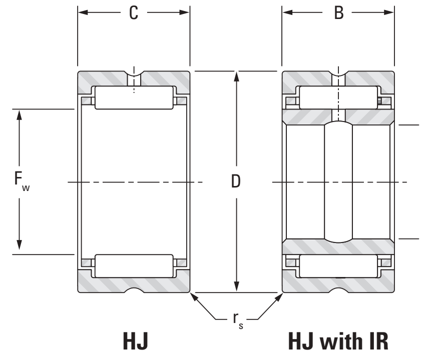
HJ TYPE

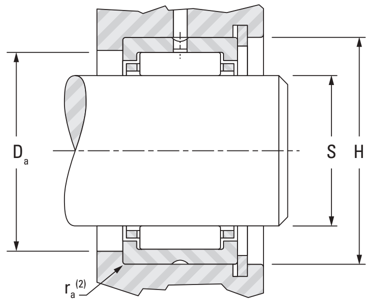
INCH SERIES

- Check for availability.
- Nominal bearing diameters and widths shown.
- Tolerance tables found on page B-4-46.
- Clearance fit suggested for outer ring when housing is stationary relative to load.
- Tight transition fit suggested if housing rotates relative to load.
- Consult your representative for oscillating applications (e.g., low radial clearance concerns).
- Unmarked end of outer ring should be assembled against housing shoulder to clear maximum allowed housing fillet ($r_{a\ max.}$[2]).
- Meets Military Standard MS 51961 and ASTM F2246.

Shaft Dia.	F_w	D	C (B)	$r_{s\ min.}$	Bearing Designation	Used With Inner Ring Designation[1]	Load Ratings		Fatigue Load Limit C_u	Speed Ratings	
							Dynamic	Static			
							C	C_0		Grease	Oil
in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}	
1 3/4	**44.450** 1.7500	**58.738** 2.3125	**31.750** 1.250	**1.52** 0.06	HJ-283720	IR-222820 IR-232820 IR-242820	**61.8** 13900	**106** 23900	16.6	6400	9900
1 7/8	**47.625** 1.8750	**61.913** 2.4375	**31.750** 1.250	**1.52** 0.06	HJ-303920	IR-253020	**65.4** 14700	**117** 26300	18.1	6000	9200
2	**50.800** 2.0000	**65.088** 2.5625	**25.400** 1.000	**1.52** 0.06	HJ-324116	IR-273216	**53.8** 12100	**93.0** 20900	14.7	5600	8600
	50.800 2.0000	**65.088** 2.5625	**31.750** 1.250	**1.52** 0.06	HJ-324120	IR-243220 IR-253220 IR-263220 IR-273220	**66.7** 15000	**122** 27500	19.1	5600	8600
2 1/4	**57.150** 2.2500	**76.200** 3.0000	**38.100** 1.500	**1.52** 0.06	HJ-364824	IR-283624	**89.9** 20200	**164** 36900	25.7	5000	7600
	57.150 2.2500	**76.200** 3.0000	**44.450** 1.750	**1.52** 0.06	HJ-364828	IR-283628	**104** 23400	**198** 44500	30.8	5000	7600
2 1/2	**63.500** 2.5000	**82.550** 3.2500	**38.100** 1.500	**2.03** 0.08	HJ-405224	IR-314024 IR-324024	**97.0** 21800	**187** 42100	29.4	4400	6800
	63.500 2.5000	**82.550** 3.2500	**44.450** 1.750	**2.03** 0.08	HJ-405228	IR-314028 IR-324028	**112** 25200	**226** 50800	35.2	4400	6800
2 3/4	**69.850** 2.7500	**88.900** 3.5000	**25.400** 1.000	**2.03** 0.08	HJ-445616	—	**67.2** 15100	**120** 27000	19.1	4000	6200
	69.850 2.7500	**88.900** 3.5000	**38.100** 1.500	**2.03** 0.08	HJ-445624	IR-364424	**101** 22700	**203** 45700	31.9	4000	6200
	69.850 2.7500	**88.900** 3.5000	**44.450** 1.750	**2.03** 0.08	HJ-445628	IR-354428 IR-364428	**117** 26300	**245** 55100	38.2	4000	6200
3	**76.200** 3.0000	**95.250** 3.7500	**38.100** 1.500	**2.03** 0.08	HJ-486024	IR-404824	**107** 24100	**226** 50900	35.5	3700	5600
	76.200 3.0000	**95.250** 3.7500	**44.450** 1.750	**2.03** 0.08	HJ-486028	IR-384828 IR-404828	**124** 27900	**273** 61400	42.5	3700	5600
3 1/4	**82.550** 3.2500	**107.950** 4.2500	**44.450** 1.750	**2.03** 0.08	HJ-526828	IR-445228	**163** 36600	**307** 69000	48.3	3400	5300
	82.550 3.2500	**107.950** 4.2500	**50.800** 2.000	**2.03** 0.08	HJ-526832	IR-445232	**184** 41300	**360** 80900	56.2	3400	5300
3 1/2	**88.900** 3.5000	**114.300** 4.5000	**50.800** 2.000	**2.03** 0.08	HJ-567232	IR-475632 IR-485632	**188** 42200	**377** 84700	58.9	3200	4900

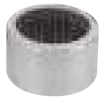
[1] See pages B-4-54 to B-4-57 for inch series inner rings. Order inner rings separately.
[2] $r_{a\ max.}$ is equal to the minimum bearing chamfer ($r_{s\ min.}$) at unmarked end.





Shaft surface to be 58 HRC or equivalent

Approx. Wt.	Mounting Dimensions Clearance Fit				Bearing Designation	Mounting Dimensions Tight Transition Fit				Shoulder Dia.	Shaft Dia.
	S (ISO h6)		H (ISO H7)			S (ISO f6)		H (ISO N7)		D_a	
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.	**±0.38** ±0.015	
kg lbs	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	mm in	in
0.222 0.49	**44.450** 1.7500	**44.435** 1.7494	**58.768** 2.3137	**58.738** 2.3125	HJ-283720	**44.425** 1.7490	**44.409** 1.7484	**58.730** 2.3122	**58.699** 2.3110	**53.98** 2.125	
0.236 0.52	**47.625** 1.8750	**47.610** 1.8744	**61.943** 2.4387	**61.913** 2.4375	HJ-303920	**47.600** 1.8740	**47.584** 1.8734	**61.905** 2.4372	**61.874** 2.4360	**57.15** 2.250	1 7/8
0.200 0.44	**50.800** 2.0000	**50.782** 1.9993	**65.118** 2.5637	**65.088** 2.5625	HJ-324116	**50.770** 1.9988	**50.752** 1.9981	**65.080** 2.5622	**65.049** 2.5610	**60.33** 2.375	
0.249 0.55	**50.800** 2.0000	**50.782** 1.9993	**65.118** 2.5637	**65.088** 2.5625	HJ-324120	**50.770** 1.9988	**50.752** 1.9981	**65.080** 2.5622	**65.049** 2.5610	**60.33** 2.375	2
0.458 1.01	**57.150** 2.2500	**57.132** 2.2493	**76.230** 3.0012	**76.200** 3.0000	HJ-364824	**57.120** 2.2488	**57.102** 2.2481	**76.192** 2.9997	**76.162** 2.9985	**68.28** 2.688	2 1/4
0.531 1.17	**57.150** 2.2500	**57.132** 2.2493	**76.230** 3.0012	**76.200** 3.0000	HJ-364828	**57.120** 2.2488	**57.102** 2.2481	**76.192** 2.9997	**76.162** 2.9985	**68.28** 2.688	
0.499 1.10	**63.500** 2.5000	**63.482** 2.4993	**82.586** 3.2514	**82.550** 3.2500	HJ-405224	**63.470** 2.4988	**63.452** 2.4981	**82.537** 3.2495	**82.502** 3.2481	**74.63** 2.938	2 1/2
0.499 1.29	**63.500** 2.5000	**63.482** 2.4993	**82.586** 3.2514	**82.550** 3.2500	HJ-405228	**63.470** 2.4988	**63.452** 2.4981	**82.537** 3.2495	**82.502** 3.2481	**74.63** 2.938	
0.363 0.80	**69.850** 2.7500	**69.832** 2.7493	**88.936** 3.5014	**88.900** 3.5000	HJ-445616	**69.820** 2.7488	**69.802** 2.7481	**88.887** 3.4995	**88.852** 3.4981	**80.98** 3.188	
0.544 1.20	**69.850** 2.7500	**69.832** 2.7493	**88.936** 3.5014	**88.900** 3.5000	HJ-445624	**69.820** 2.7488	**69.802** 2.7481	**88.887** 3.4995	**88.852** 3.4981	**80.98** 3.188	2 3/4
0.635 1.40	**69.850** 2.7500	**69.832** 2.7493	**88.936** 3.5014	**88.900** 3.5000	HJ-445628	**69.820** 2.7488	**69.802** 2.7481	**88.887** 3.4995	**88.852** 3.4981	**80.98** 3.188	
0.585 1.29	**76.200** 3.0000	**76.182** 2.9993	**95.286** 3.7514	**95.250** 3.7500	HJ-486024	**76.170** 2.9988	**76.152** 2.9981	**95.237** 3.7495	**95.202** 3.7481	**87.33** 3.438	3
0.685 1.51	**76.200** 3.0000	**76.182** 2.9993	**95.286** 3.7514	**95.250** 3.7500	HJ-486028	**76.170** 2.9988	**76.152** 2.9981	**95.237** 3.7495	**95.202** 3.7481	**87.33** 3.438	
1.016 2.24	**82.550** 3.2500	**82.527** 3.2491	**107.986** 4.2514	**107.950** 4.2500	HJ-526828	**82.514** 3.2486	**82.492** 3.2477	**107.937** 4.2495	**107.902** 4.2481	**98.43** 3.875	3 1/4
1.161 2.56	**82.550** 3.2500	**82.527** 3.2491	**107.986** 4.2514	**107.950** 4.2500	HJ-526832	**82.514** 3.2486	**82.492** 3.2477	**107.937** 4.2495	**107.902** 4.2481	**98.43** 3.875	
1.238 2.73	**88.900** 3.5000	**88.877** 3.4991	**114.336** 4.5014	**114.300** 4.5000	HJ-567232	**88.864** 3.4986	**88.842** 3.4977	**114.287** 4.4995	**114.252** 4.4981	**104.78** 4.125	3 1/2



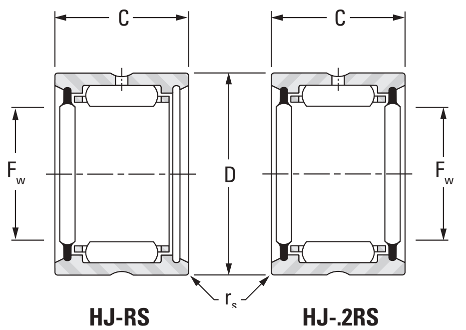
SEALED HEAVY-DUTY NEEDLE ROLLER BEARINGS

INCH SERIES

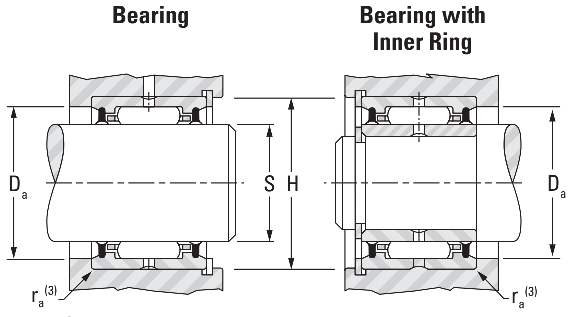
- Bearing diameters and widths listed are nominal.
- For inspection purposes, see tolerance tables on page B-4-46.
- Available with one or two lip-contact seals designed to retain lubricant and exclude foreign material.
- Single seals are normally installed in the stamped end of bearing.
- Seals limit the bearing operating temperature between -30° C and +110° C (-25° F and +225° F).
- For operating temperature outside of the above range or if seals are exposed to unusual fluids, please consult your representative.

Shaft Dia.	F_w	D	C (B)	$r_{s\,min.}$	Bearing Designation		Used With Inner Ring[1]	Load Ratings		Fatigue Load Limit C_u	Speed Rating[2]
					One Seal	Two Seals		Dynamic C	Static C_0		
in	mm in	mm in	mm in	mm in				kN lbf		kN	min^{-1}
5/8	15.875 0.6250	28.575 1.1250	25.40 1.000	0.64 0.03	HJ-101816RS	HJ-101816.2RS	—	19.3 4350	20.7 4650	3.25	12000
3/4	19.050 0.7500	31.750 1.2500	25.40 1.000	1.02 0.04	HJ-122016RS	HJ-122016.2RS	IR-081216	20.7 4650	23.3 5240	3.65	10000
7/8	22.225 0.8750	34.925 1.3750	25.40 1.000	1.02 0.04	HJ-142216RS	HJ-142216.2RS	IR-101416	23.0 5180	27.9 6270	4.35	8700
1	25.400 1.0000	38.100 1.5000	25.40 1.000	1.02 0.04	HJ-162416RS	HJ-162416.2RS	IR-121616 IR-131616	25.3 5680	32.5 7300	5.10	7600
1 1/8	28.575 1.1250	41.275 1.6250	31.75 1.250	1.02 0.04	HJ-182620RS	HJ-182620.2RS	IR-141820	36.3 8170	53.8 12100	8.45	6800
1 1/4	31.750 1.2500	44.450 1.7500	31.75 1.250	1.02 0.04	HJ-202820RS	HJ-202820.2RS	IR-162020	37.4 8410	57.4 12900	9.00	6100
1 3/8	34.925 1.3750	47.625 1.8750	31.75 1.250	1.02 0.04	HJ-223020RS	HJ-223020.2RS	IR-182220	39.8 8950	64.1 14400	10.1	5600
1 1/2	38.100 1.5000	52.388 2.0625	31.75 1.250	1.52 0.06	HJ-243320RS	HJ-243320.2RS	IR-192420	47.6 10700	72.5 16300	11.4	5100
1 5/8	41.275 1.6250	55.563 2.1875	31.75 1.250	1.52 0.06	HJ-263520RS	HJ-263520.2RS	IR-212620	48.5 10900	76.5 17200	12.1	2400
1 3/4	44.450 1.7500	58.738 2.3125	31.75 1.250	1.52 0.06	HJ-283720RS	HJ-283720.2RS	IR-222820 IR-232820 IR-242820	49.8 11200	81.0 18200	12.8	4400
2	50.800 2.0000	65.088 2.5625	31.75 1.250	1.52 0.06	HJ-324120RS	HJ-324120.2RS	IR-243220 IR-253220 IR-263220 IR-273220	53.8 12100	93.0 20900	14.7	3800
2 1/4	57.150 2.2500	76.200 3.0000	44.45 1.750	1.52 0.06	HJ-364828RS	HJ-364828.2RS	IR-283628	89.9 20200	164.1 36900	25.7	1700
2 1/2	63.500 2.5000	82.550 3.2500	44.45 1.750	2.03 0.08	HJ-405228RS	HJ-405228.2RS	IR-314028 IR-324028	97.0 21800	187.3 42100	29.4	3100
2 3/4	69.850 2.7500	88.900 3.5000	44.45 1.750	2.03 0.08	HJ-445628RS	HJ-445628.2RS	IR-354428 IR-364428	101.0 22700	203.3 45700	31.9	1400
3	76.200 3.0000	95.250 3.7500	44.45 1.750	2.03 0.08	HJ-486028RS	HJ-486028.2RS	IR-384828 IR-404828	107.2 24100	226.4 50900	35.5	2500

[1] See pages B-4-54 to B-4-57 for inch series inner rings. Order inner rings separately.
[2] Based on standard seal shaft contact speed of 5 m/sec., 1000 ft./min.
[3] $r_{a\,max.}$ is equal to the minimum bearing chamfer ($r_{s\,min.}$) at unmarked end.

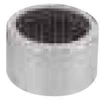


HJ-RS HJ-.2RS



Shaft surface to be 58 HRC or equivalent

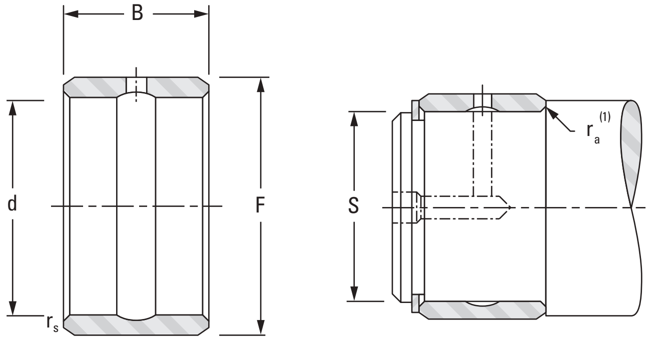
Approx. Wt.	Mounting Dimensions Clearance Fit				Bearing Designation	Mounting Dimensions Tight Transition Fit				Shoulder Dia.	Shaft Dia.
	S (ISO h6)		H (ISO H7)			S (ISO f6)		H (ISO N7)		D_a	
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.	±0.38 ±0.015	
kg lbs	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	mm in	in
0.07 0.15	15.875 0.6250	15.865 0.6246	28.595 1.1258	28.575 1.1250	HJ-101816-	15.860 0.6244	15.850 0.6240	28.567 1.1247	28.547 1.1239	23.83 0.938	5/8
0.08 0.17	19.050 0.7500	19.037 0.7495	31.775 1.2510	31.750 1.2500	HJ-122016-	19.030 0.7492	19.017 0.7487	31.742 1.2497	31.717 1.2487	26.97 1.062	3/4
0.09 0.19	22.225 0.8750	22.212 0.8745	34.950 1.3760	34.925 1.3750	HJ-142216-	22.205 0.8742	22.192 0.8737	34.917 1.3747	34.892 1.3737	30.18 1.188	7/8
0.10 0.21	25.400 1.0000	25.387 0.9995	38.125 1.5010	38.100 1.5000	HJ-162416-	25.380 0.9992	25.367 0.9987	38.092 1.4997	38.067 1.4987	33.32 1.312	1
0.13 0.29	28.575 1.1250	28.562 1.1245	41.300 1.6260	41.275 1.6250	HJ-182620-	28.555 1.1242	28.542 1.1237	41.267 1.6247	41.242 1.6237	36.53 1.438	1 1/8
0.15 0.32	31.750 1.2500	31.735 1.2494	44.475 1.7510	44.450 1.7500	HJ-202820-	31.725 1.2490	31.709 1.2484	44.442 1.7497	44.417 1.7487	39.67 1.562	1 1/4
0.16 0.35	34.925 1.3750	34.910 1.3744	47.650 1.8760	47.625 1.8750	HJ-223020-	34.900 1.3740	34.884 1.3734	47.617 1.8747	47.592 1.8737	42.88 1.688	1 3/8
0.20 0.43	38.100 1.5000	38.085 1.4994	52.418 2.0637	52.388 2.0625	HJ-243320-	38.075 1.4990	38.059 1.4984	52.380 2.0622	52.349 2.0610	47.63 1.875	1 1/2
0.21 0.46	41.275 1.6250	41.260 1.6244	55.593 2.1887	55.563 2.1875	HJ-263520-	41.250 1.6240	41.234 1.6234	55.555 2.1872	55.524 2.1860	50.80 2.000	1 5/8
0.22 0.49	44.450 1.7500	44.435 1.7494	58.768 2.3137	58.738 2.3125	HJ-283720-	44.425 1.7490	44.409 1.7484	58.730 2.3122	58.699 2.3110	53.98 2.125	1 3/4
0.25 0.55	50.800 2.0000	50.782 1.9993	65.118 2.5637	65.088 2.5625	HJ-324120-	50.770 1.9988	50.752 1.9981	65.080 2.5622	65.049 2.5610	60.33 2.375	2
0.53 1.17	57.150 2.2500	57.132 2.2493	76.230 3.0012	76.200 3.0000	HJ-364828-	57.120 2.2488	57.102 2.2481	76.192 2.9997	76.162 2.9985	68.28 2.688	2 1/4
0.59 1.29	63.500 2.5000	63.482 2.4993	82.586 3.2514	82.550 3.2500	HJ-405228-	63.470 2.4988	63.452 2.4981	82.537 3.2495	82.502 3.2481	74.63 2.938	2 1/2
0.64 1.40	69.850 2.7500	69.832 2.7493	88.936 3.5014	88.900 3.5000	HJ-445628-	69.820 2.7488	69.802 2.7481	88.887 3.4995	88.852 3.4981	80.98 3.188	2 3/4
0.68 1.51	76.200 3.0000	76.182 2.9993	95.286 3.7514	95.250 3.7500	HJ-486028-	76.170 2.9988	76.152 2.9981	95.237 3.7495	95.202 3.7481	87.33 3.438	3



INNER RINGS

INCH SERIES

- Check for availability.
- Ideal choice when shaft is not practical to use as inner raceway.
- Provided in inch nominal dimensions for use with inch series heavy-duty needle roller bearings.
- Designed to meet established inch tolerances.
- Selected size should be wider than matching needle roller bearing.
- Maximum shaft fillet radius ($r_{a\,max.}$) cannot exceed inner ring bore chamfer ($r_{s\,min.}$) as shown.
- Optional centralized lubrication groove (bore) or through-hole available. Specify when ordering.
- Designed to be axially clamped against shoulder for loose transition fit on shaft.
- After mounting, for tight transition fit (keeping inner ring from rotating relative to shaft), inner ring O.D. must not exceed raceway diameter on matching bearing. (See mounting dimensions in the bearing table for the required raceway diameter.)
- After mounting, if O.D. of inner ring exceeds the required raceway diameter for matching bearing, ring should be ground to proper diameter while mounted on shaft.
- Meets ASTMF-2431.



Shaft Dia.	d	F	B	$r_{s\,min.}$	Bearing Designation	Approx. Wt.	Loose Transition Fit		Interference Fit		Used With Bearing Designation
							S		S		
							Max.	Min.	Max.	Min.	
in	mm in	mm in	mm in	mm in		kg lbs	mm in	mm in	mm in	mm in	
3/8	9.525 0.3750	15.875 0.6250	19.05 0.750	0.64 0.025	IR-061012	0.018 0.040	9.520 0.3748	9.510 0.3744	9.538 0.3755	9.530 0.3752	HJ-101812
1/2	12.700 0.5000	19.050 0.7500	19.05 0.750	1.02 0.04	IR-081212	0.023 0.050	12.692 0.4997	12.682 0.4993	12.715 0.5006	12.708 0.5003	HJ-122012
	12.700 0.5000	19.050 0.7500	25.40 1.000	1.02 0.04	IR-081216	0.032 0.070	12.692 0.4997	12.682 0.4993	12.715 0.5006	12.708 0.5003	HJ-122016
5/8	15.875 0.6250	22.225 0.8750	19.05 0.750	1.02 0.04	IR-101412	0.027 0.060	15.867 0.6247	15.857 0.6243	15.890 0.6256	15.883 0.6253	HJ-142212
	15.875 0.6250	22.225 0.8750	25.40 1.000	1.02 0.04	IR-101416	0.036 0.080	15.867 0.6247	15.857 0.6243	15.890 0.6256	15.883 0.6253	HJ-142216
11/16	17.463 0.6875	22.225 0.8750	19.05 0.750	1.02 0.04	IR-111412	0.023 0.050	17.455 0.6872	17.445 0.6868	17.478 0.6881	17.470 0.6878	HJ-142212
3/4	19.050 0.7500	25.400 1.0000	19.05 0.750	1.02 0.04	IR-121612	0.032 0.070	19.042 0.7497	19.030 0.7492	19.068 0.7507	19.058 0.7503	HJ-162412
	19.050 0.7500	25.400 1.0000	25.40 1.000	1.02 0.04	IR-121616	0.041 0.090	19.042 0.7497	19.030 0.7492	19.068 0.7507	19.058 0.7503	HJ-162416
13/16	20.638 0.8125	25.400 1.0000	25.40 1.000	1.02 0.04	IR-131616	0.032 0.070	20.630 0.8122	20.617 0.8117	20.655 0.8132	20.645 0.8128	HJ-162416
7/8	22.225 0.8750	28.575 1.1250	25.40 1.000	1.02 0.04	IR-141816	0.050 0.110	22.217 0.8747	22.205 0.8742	22.243 0.8757	22.233 0.8753	HJ-182616
	22.225 0.8750	28.575 1.1250	31.75 1.250	1.02 0.04	IR-141820	0.059 0.130	22.217 0.8747	22.205 0.8742	22.243 0.8757	22.233 0.8753	HJ-182620
15/16	23.813 0.9375	28.575 1.1250	25.40 1.000	1.02 0.04	IR-151816	0.036 0.080	23.805 0.9372	23.792 0.9367	23.830 0.9382	23.820 0.9378	HJ-182616
	23.813 0.9375	28.575 1.1250	31.75 1.250	1.02 0.04	IR-151820	0.045 0.100	23.805 0.9372	23.792 0.9367	23.830 0.9382	23.820 0.9378	HJ-182620
1	25.400 1.0000	31.750 1.2500	25.40 1.000	1.02 0.04	IR-162016	0.054 0.120	25.392 0.9997	25.380 0.9992	25.418 1.0007	25.408 1.0003	HJ-202816
	25.400 1.0000	31.750 1.2500	31.75 1.250	1.02 0.04	IR-162020	0.068 0.150	25.392 0.9997	25.380 0.9992	25.418 1.0007	25.408 1.0003	HJ-202820
1 1/8	28.575 1.1250	34.925 1.3750	25.40 1.000	1.02 0.04	IR-182216	0.059 0.130	28.567 1.1247	28.555 1.1242	28.593 1.1257	28.583 1.1253	HJ-223016
	28.575 1.1250	34.925 1.3750	31.75 1.250	1.02 0.04	IR-182220	0.077 0.170	28.567 1.1247	28.555 1.1242	28.593 1.1257	28.583 1.1253	HJ-223020
1 3/16	30.163 1.1875	38.100 1.5000	31.75 1.250	1.52 0.06	IR-192420	0.100 0.220	30.155 1.1872	30.142 1.1867	30.180 1.1882	30.170 1.1878	HJ-243320
1 1/4	31.750 1.2500	38.100 1.5000	25.40 1.000	1.52 0.06	IR-202416	0.068 0.150	31.740 1.2496	31.725 1.2490	31.770 1.2508	31.760 1.2504	HJ-243316
1 1/4	31.750 1.2500	38.100 1.5000	31.75 1.250	1.52 0.06	IR-202420	0.082 0.180	31.740 1.2496	31.725 1.2490	31.770 1.2508	31.760 1.2504	HJ-243320
1 5/16	33.338 1.3125	41.275 1.6250	25.40 1.000	1.52 0.06	IR-212616	0.086 0.190	33.327 1.3121	33.312 1.3115	33.358 1.3133	33.348 1.3129	HJ-263516
	33.338 1.3125	41.275 1.6250	31.75 1.250	1.52 0.06	IR-212620	0.109 0.240	33.327 1.3121	33.312 1.3115	33.358 1.3133	33.348 1.3129	HJ-263520
1 3/8	34.925 1.3750	41.275 1.6250	31.75 1.250	1.52 0.06	IR-222620	0.091 0.200	34.915 1.3746	34.900 1.3740	34.945 1.3758	34.935 1.3754	HJ-263520
	34.925 1.3750	44.450 1.7500	31.75 1.250	1.52 0.06	IR-222820	0.141 0.310	34.915 1.3746	34.900 1.3740	34.945 1.3758	34.935 1.3754	HJ-283720
1 7/16	36.513 1.4375	44.450 1.7500	25.40 1.000	1.52 0.06	IR-232816	0.095 0.210	36.502 1.4371	36.487 1.4365	36.533 1.4383	36.523 1.4379	HJ-283716
	36.513 1.4375	44.450 1.7500	31.75 1.250	1.52 0.06	IR-232820	0.118 0.260	36.502 1.4371	36.487 1.4365	36.533 1.4383	36.523 1.4379	HJ-283720
1 1/2	38.100 1.5000	44.450 1.7500	25.40 1.000	1.52 0.06	IR-242816	0.077 0.170	38.090 1.4996	38.075 1.4990	38.120 1.5008	38.110 1.5004	HJ-283716
	38.100 1.5000	44.450 1.7500	31.75 1.250	1.52 0.06	IR-242820	0.095 0.210	38.090 1.4996	38.075 1.4990	38.120 1.5008	38.110 1.5004	HJ-283720
	38.100 1.5000	50.800 2.0000	31.75 1.250	1.52 0.06	IR-243220	0.209 0.460	38.090 1.4996	38.075 1.4990	38.120 1.5008	38.110 1.5004	HJ-324120
1 9/16	39.688 1.5625	47.625 1.8750	31.75 1.250	1.52 0.06	IR-253020	0.127 0.280	39.677 1.5621	39.662 1.5615	39.708 1.5633	39.698 1.5629	HJ-303920
	39.688 1.5625	50.800 2.0000	31.75 1.250	1.52 0.06	IR-253220	0.186 0.410	39.677 1.5621	39.662 1.5615	39.708 1.5633	39.698 1.5629	HJ-324120
1 5/8	41.275 1.6250	50.800 2.0000	31.75 1.250	1.52 0.06	IR-263220	0.163 0.360	41.265 1.6246	41.250 1.6240	41.295 1.6258	41.285 1.6254	HJ-324120
1 11/16	42.863 1.6875	50.800 2.0000	25.40 1.000	1.52 0.06	IR-273216	0.109 0.240	42.852 1.6871	42.837 1.6865	42.883 1.6883	42.873 1.6879	HJ-324116
	42.863 1.6875	50.800 2.0000	31.75 1.250	1.52 0.06	IR-273220	0.136 0.300	42.852 1.6871	42.837 1.6865	42.883 1.6883	42.873 1.6879	HJ-324120
1 3/4	44.450 1.7500	57.150 2.2500	38.10 1.500	1.52 0.06	IR-283624	0.286 0.630	44.440 1.7496	44.425 1.7490	44.470 1.7508	44.460 1.7504	HJ-364824
	44.450 1.7500	57.150 2.2500	44.45 1.750	1.52 0.06	IR-283628	0.336 0.740	44.440 1.7496	44.425 1.7490	44.470 1.7508	44.460 1.7504	HJ-364828
1 15/16	49.213 1.9375	63.500 2.5000	38.10 1.500	2.03 0.08	IR-314024	0.358 0.790	49.202 1.9371	49.187 1.9365	49.233 1.9383	49.223 1.9379	HJ-405224
	49.213 1.9375	63.500 2.5000	44.45 1.750	2.03 0.08	IR-314028	0.417 0.920	49.202 1.9371	49.187 1.9365	49.233 1.9383	49.223 1.9379	HJ-405228

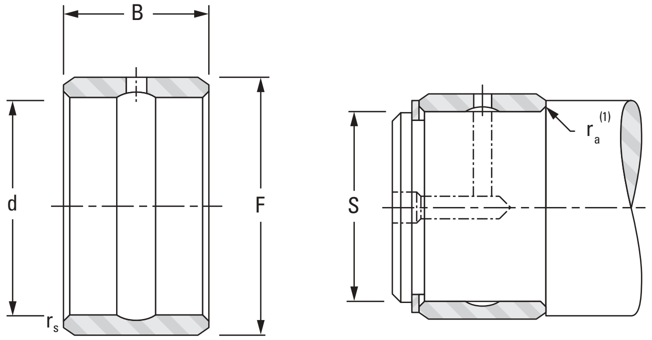
[1] $r_{a\,max.}$ is equal to the minimum bearing chamfer ($r_{s\,min.}$).

Continued on next page.

INNER RINGS

INCH SERIES

- Check for availability.
- Ideal choice when shaft is not practical to use as inner raceway.
- Provided in inch nominal dimensions for use with inch series heavy-duty needle roller bearings.
- Designed to meet established inch tolerances.
- Selected size should be wider than matching needle roller bearing.
- Maximum shaft fillet radius ($r_{a\,max.}$) cannot exceed inner ring bore chamfer ($r_{s\,min.}$) as shown.
- Optional centralized lubrication groove (bore) or through-hole available. Specify when ordering.
- Designed to be axially clamped against shoulder for loose transition fit on shaft.
- After mounting, for tight transition fit (keeping inner ring from rotating relative to shaft), inner ring O.D. must not exceed raceway diameter on matching bearing. (See mounting dimensions in the bearing table for the required raceway diameter).
- After mounting, if O.D. of inner ring exceeds the required raceway diameter for matching bearing, ring should be ground to proper diameter while mounted on shaft.
- Meets ASTMF-2431.



Shaft Dia.	d	F	B	$r_{s\,min.}$	Bearing Designation	Approx. Wt.	Loose Transition Fit		Interference Fit		Used With Bearing Designation
							S		S		
							Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in	
2	**50.800** 2.0000	**63.500** 2.5000	**38.10** 1.500	**2.03** 0.08	IR-324024	**0.322** 0.710	**50.790** 1.9996	**50.772** 1.9989	**50.823** 2.0009	**50.810** 2.0004	HJ-405224
	50.800 2.0000	**63.500** 2.5000	**44.45** 1.750	**2.03** 0.08	IR-324028	**0.376** 0.830	**50.790** 1.9996	**50.772** 1.9989	**50.823** 2.0009	**50.810** 2.0004	HJ-405228
2 3/16	**55.563** 2.1875	**69.850** 2.7500	**44.45** 1.750	**2.03** 0.08	IR-354428	**0.467** 1.030	**55.552** 2.1871	**55.535** 2.1864	**55.585** 2.1884	**55.573** 2.1879	HJ-445628
2 1/4	**57.150** 2.2500	**69.850** 2.7500	**38.10** 1.500	**2.03** 0.08	IR-364424	**0.358** 0.790	**57.140** 2.2496	**57.122** 2.2489	**57.173** 2.2509	**57.160** 2.2504	HJ-445624
	57.150 2.2500	**69.850** 2.7500	**44.45** 1.750	**2.03** 0.08	IR-364428	**0.417** 0.920	**57.140** 2.2496	**57.122** 2.2489	**57.173** 2.2509	**57.160** 2.2504	HJ-445628
2 3/8	**60.325** 2.3750	**76.200** 3.0000	**44.45** 1.750	**2.03** 0.08	IR-384828	**0.562** 1.240	**60.315** 2.3746	**60.297** 2.3739	**60.348** 2.3759	**60.335** 2.3754	HJ-486028
2 1/2	**63.500** 2.5000	**76.200** 3.0000	**38.10** 1.500	**2.03** 0.08	IR-404824	**0.395** 0.870	**63.490** 2.4996	**63.472** 2.4989	**63.523** 2.5009	**63.510** 2.5004	HJ-486024
	63.500 2.5000	**76.200** 3.0000	**44.45** 1.750	**2.03** 0.08	IR-404828	**0.463** 1.020	**63.490** 2.4996	**63.472** 2.4989	**63.523** 2.5009	**63.510** 2.5004	HJ-486028
2 3/4	**69.850** 2.7500	**82.550** 3.2500	**44.45** 1.750	**2.03** 0.08	IR-445228	**0.503** 1.110	**69.840** 2.7496	**69.822** 2.7489	**69.873** 2.7509	**69.860** 2.7504	HJ-526828
	69.850 2.7500	**82.550** 3.2500	**50.80** 2.000	**2.03** 0.08	IR-445232	**0.576** 1.270	**69.840** 2.7496	**69.822** 2.7489	**69.873** 2.7509	**69.860** 2.7504	HJ-526832
2 15/16	**74.613** 2.9375	**88.900** 3.5000	**50.80** 2.000	**2.03** 0.08	IR-475632	**0.694** 1.530	**74.602** 2.9371	**74.585** 2.9364	**74.635** 2.9384	**74.623** 2.9379	HJ-567232
3	**76.200** 3.0000	**88.900** 3.5000	**50.80** 2.000	**2.03** 0.08	IR-485632	**0.621** 1.370	**76.190** 2.9996	**76.172** 2.9989	**76.223** 3.0009	**76.210** 3.0004	HJ-567232

[1] $r_{a\,max.}$ is equal to the minimum bearing chamfer ($r_{s\,min.}$).

NOTES

TRACK ROLLERS

Overview: Track rollers (also known as cam followers) are characterized by their thick-walled outer rings that run directly on a track. The thick outer rings permit high load-carrying capability while minimizing both distortion and bending stresses. Sealed designs with internal thrust washers help extend service life under conditions of infrequent lubrication.

- **Catalogue range:** Stud-Type: 10 mm – 130 mm (0.3937 in – 5.1180 in) O.D.
  Yoke-Type: 10 mm – 300 mm (0.3937 in – 11.816 in) O.D.
- **Markets:** Ram support rollers, material handling and indexing equipment.
- **Features:** Available in two basic designs: with an inner ring for straddle mounting in a yoke or with an integral stud for cantilever mounting.
- **Benefits:** High load-carrying capability with minimized distortion and bending stresses.
  Extended service life under conditions of infrequent re-lubrication.

Caged Yoke-Type Track Rollers – Metric Nominal Dimensions

Bore diameter from 10 mm to 17 mm (for NA22)
00 = 10 mm
01 = 12 mm
02 = 15 mm
03 = 17 mm

Bore diameter > 17 mm (for NA22)
05 = 25 mm

NA22 **05** **2RS**

Prefix

NA22	track roller, yoke-type, profiled outer diameter, with inner ring, sealed
RNA22	track roller, yoke-type, profiled outer diameter, without inner ring, sealed
RSTO	track roller, yoke-type, profiled outer diameter, without inner ring, without washers
STO	track roller, yoke-type, profiled outer diameter, with inner ring, without washers
NATR	track roller, yoke-type, profiled outer diameter, with inner ring, with washers

Suffix

TN	molded cage of reinforced, engineered polymer
DZ	cylindrical outer diameter
ZZ	two washers for track rollers used for axial location
.2RS	lip contact seal on each side of the bearing
ZZ.DZ	two washers for track rollers used for axial location; cylindrical outer diameter
DZ.TN	cylindrical outer diameter; molded cage of reinforced, engineered polymer
.2RS.DZ	lip contact seal on each side of bearing; cylindrical outer diameter

STO **25** **DZ**

Bore diameter for STO, NATR
25 = 25 mm
45 = 45 mm

Caged Stud-Type Track Rollers – Metric Nominal Dimensions

Prefix Modification
E eccentric stud

Suffix

SK	hexagonal wrench socket in stud head
DZ.2RS	cylindrical outer diameter: lip contact seals on each end of bearing
.2RS	lip contact seal on each side of the bearing
DZ	cylindrical outer diameter

KR **E** **22** **.2RS**

Prefix

KR	track roller, stud-type with cage, profiled outer diameter

Outer Diameter
22 = 22 mm

Full Complement Yoke-Type Track Rollers – Metric Nominal Dimensions

Prefix

NUTR	track roller, yoke-type, crowned outer diameter with inner ring and washers (two paths of cylindrical rollers)
FG	track roller, yoke-type, crowned outer diameter standard series
FGU	track roller, yoke-type, crowned outer diameter light series
FGU	track roller, yoke-type, crowned outer diameter heavy series (larger O.D. than light series of same bore size)
FP	track roller, yoke-type, crowned outer diameter small series
RNA	track roller, yoke-type, crowned outer diameter 11000 Series (without seals)

B	convex outer ring to maximum slope of 1.5%. Tolerance h9 on dim.D
L	cylindrical outer ring. Tolerance h7 on dim. D

(see tables for dimensions on page B-5-44)

RNA **L** **110** **12** **B6**

B6 convex outer ring to maximum slope of 0.15%. Tolerance h9 on dim. D

NUTR **45** **100** **.DZ**

Suffix

.DZ	cylindrical outer diameter (NUTR styles only)
EE	two polymer shields (FG styles only)
EEM	two metal shields (FG styles only)
MM	two metal shields (FGU styles only)

Bore Diameter
6 = 6 mm
45 = 45 mm

Outer Diameter
19 = 19 mm
100 = 100 mm

FG **L** **6** **19** **EEM**

Prefix Modification
L cylindrical outer diameter

Full Complement Stud-Type Track Rollers – Metric Nominal Dimensions

Prefix

NUKR	track roller, stud-type, crowned outer diameter (two paths of cylindrical rollers)
KRV	track roller, stud-type, crowned outer diameter with full complement of needle rollers
GC	track roller, stud-type, crowned outer diameter small series (up to 15 mm O.D.), standard series
GCU	track roller, stud-type, crowned outer diameter light series

Outer Diameter
16 = 16 mm
19 = 19 mm
62 = 62 mm

KRV **16** **.DZ**

NUKR **62** **.2SK**

GC **L** **19** **EEM**

Prefix Modification

L	cylindrical outer diameter
R	eccentric collar (GC, GCU styles only)
E	eccentric stud (NUKR style only)

Suffix

.DZ	cylindrical outer diameter (KRV styles only)
.2SK	hexagonal socket in stud head (NUKR styles only)
EE	two polymer shields (GC, GCR styles only)
EEM	two metal shields (GC, GCR styles only)
MM	two metal shields (GCU, GCUR styles only)

Track Rollers

STUD-TYPE AND YOKE-TYPE TRACK ROLLERS

METRIC SERIES

STUD-TYPE METRIC SERIES

YOKE-TYPE METRIC SERIES

STUD-TYPE AND YOKE-TYPE TRACK ROLLERS

METRIC SERIES

JTEKT track rollers listed in this catalog have been designed with outer rings of a large radial cross section to withstand heavy rolling and shock loads on track-type or cam-controlled equipment. The outer diameters of the outer rings are either crowned or cylindrical. Crowned track rollers are designed to alleviate uneven bearing loading resulting from deflection, bending or misalignment in mounting.

Stud-type track rollers are available in various open designs, as well as with lip contact seals or metal shields.

Yoke-type track rollers are designed for straddle mounting. The various metric series designs are grouped and organized on page B-5-7 and page B-5-8.

REFERENCE STANDARDS ARE:

- **ISO 6278** – needle roller bearings – track rollers – boundary dimensions.
- **ISO 492** – radial bearings – tolerances.
- **DIN 620** – tolerances of ball and roller bearings.
- **ISO 281** – rolling bearings – dynamic load ratings and rating life.

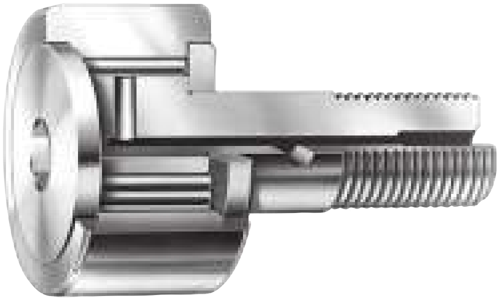


Fig. B5-1. Stud-type track rollers


Fig. B5-2. Yoke-type track rollers

Suffixes – Stud-Type, Metric Series (except GC types)

.2RS	two seals
DZ	cylindrical outer diameter
DZ.2RS	cylindrical outer diameter • two seals
SK	hexagonal socket in flange end
2SK	hexagonal socket in both flange and stud ends

Suffixes – Yoke-Type, Metric Series (except FP or FG types)

DZ.TN	cylindrical outer diameter • molded cage of reinforced engineered polymer
TN	molded cage of reinforced engineered polymer
DZ	cylindrical outer diameter
ZZ	two end washers for the outer ring
ZZ.DZ	two end washers for the outer ring • cylindrical outer diameter
.2RS	two seals
.2RS.DZ	two seals • cylindrical outer diameter

Suffixes – Yoke-Type (FP, FG) and Stud-Type (GC)

EE	polymer shields
EEM	metal shields
MM	metal shields

STUD-TYPE METRIC SERIES TRACK ROLLER TYPES

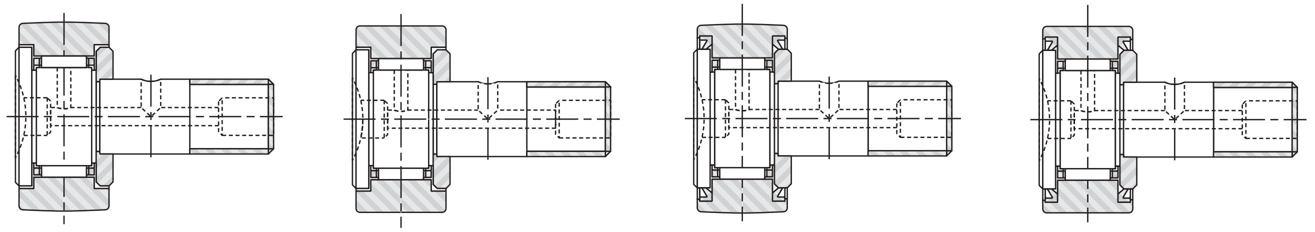

KR
KR.DZ
KR.2RS
KR.DZ.2RS

Fig. B5-3. Stud-type track rollers, caged needle rollers

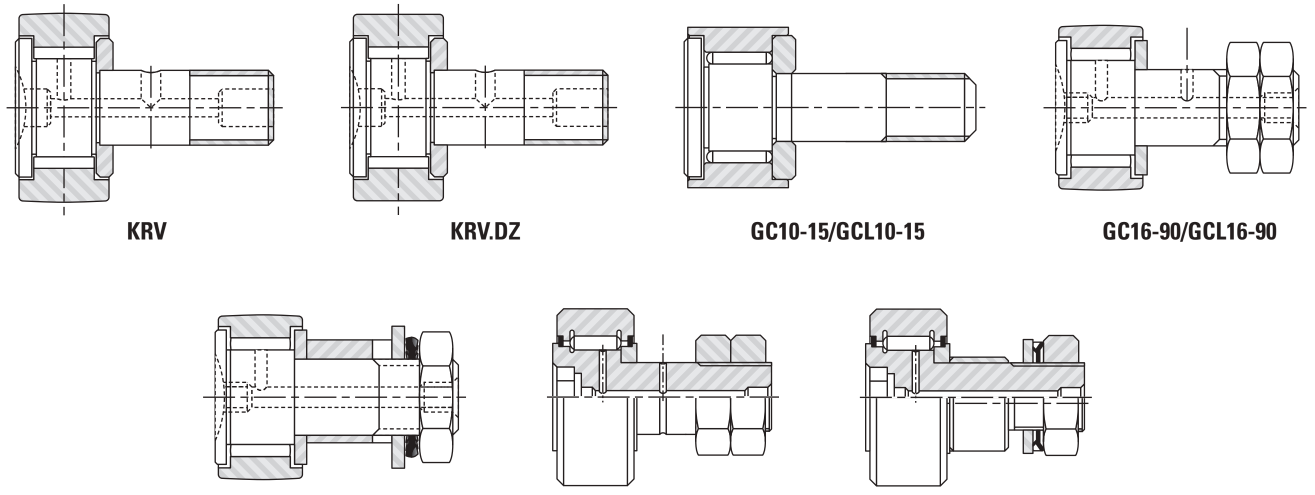

KRV
KRV.DZ
GC10-15/GCL10-15
GC16-90/GCL16-90
GCR/GCRL
GCU/GCUL
GCUR/GCURL

Fig. B5-4. Stud-type track rollers, full complement needle rollers

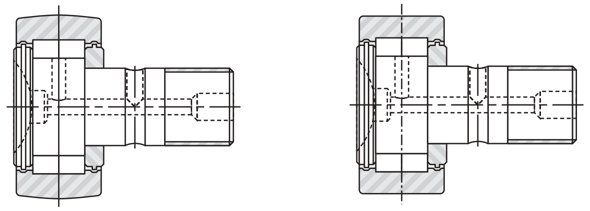

NUKR
NUKR.DZ

Fig. B5-5. Stud-type track rollers, full complement cylindrical rollers

TYPES OF METRIC SERIES YOKE-TYPE TRACK ROLLERS

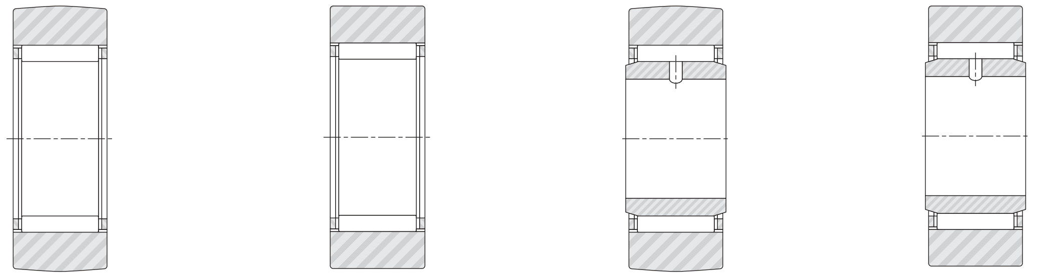

RSTO RSTO.DZ STO STO.DZ

Fig. B5-6. Yoke-type track rollers without end washers

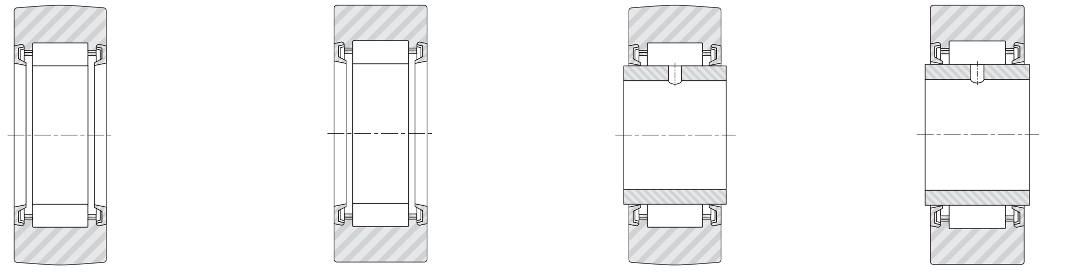

RNA22.2RS RNA22.2RS.DZ NA22.2RS NA22.2RS.DZ

Fig. B5-7. Sealed yoke-type track rollers without end washers

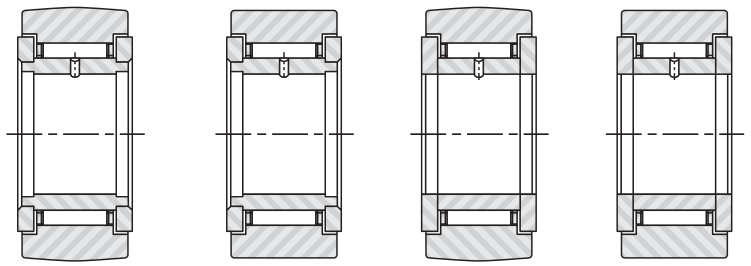

NATR NATR.DZ STO.ZZ STO.ZZ.DZ

Fig. B5-8. Yoke-type track rollers with end washers

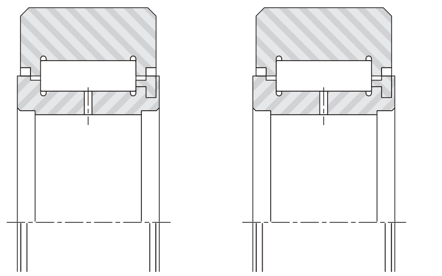

FGU/FGUL Light FGU/FGUL Heavy

Fig. B5-9. Yoke-type track rollers with metal seals, full complement of cylindrical rollers

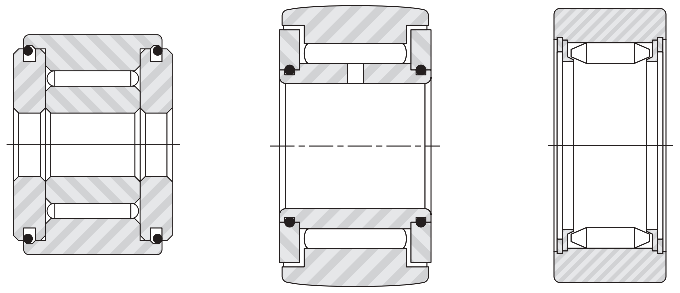

FP/FPL FG/FGL RNA1100

Fig. B5-10. Yoke-type track rollers with end washers, full complement of needle rollers

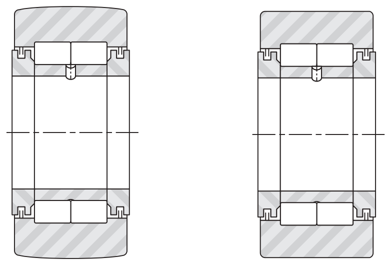

NUTR NUTR.DZ

Fig. B5-11. Yoke-type track rollers with end washers, full complement of cylindrical rollers

CONSTRUCTION

STUD-TYPE TRACK ROLLERS

The metric series stud-type track roller is a non-separable unit – consisting of a large radial cross section outer ring, radial needle roller and cage assembly, or a full complement of needle or cylindrical rollers, a stud and a retaining washer securely fastened to the stud.

The seals on the sealed stud-type track rollers are located in the counterbores of the outer ring and seal against the stud flange and the retaining washer, providing good retention of lubricant and exclusion of foreign material. The seals are thermally stable in a temperature range between -30° C and 110° C (-25° F and 225° F).

A screwdriver slot (standard) or a hexagonal wrench socket (customer requested) in the head of the stud facilitates mounting. Wrench sizes are listed on the dimensional tables where found among certain GC Series sizes, beginning on page B-5-24. Other metric series hexagonal socket sizes are listed in Table B5-1.

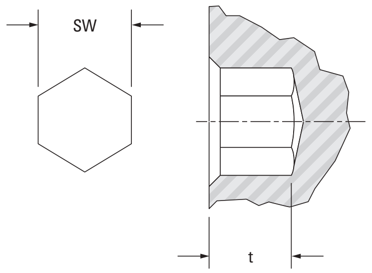


Fig. B5-12. Hexagonal socket – metric series.

Table B5-1. Hexagonal socket wrench sizes

Stud-type track roller O.D.			
>	≤	SW	t
mm in	**mm** in	**mm** in	**mm** in
- -	**16.000** 0.6299	**3.000** 0.1181	**2.500** 0.0984
19.000 0.7480	**26.000** 1.0236	**4.000** 0.1575	**2.500** 0.0984
30.000 1.1811	**35.000** 1.3779	**6.000** 0.2362	**4.000** 0.1575
40.000 1.5748	**52.000** 2.0472	**8.000** 0.3150	**5.000** 0.1968
62.000 2.4409	**72.000** 2.8346	**12.000** 0.4724	**7.000** 0.2756
80.000 3.1496	**90.000** 3.5433	**17.000** 0.6693	**10.000** 0.3937

ECCENTRIC STUDS FOR STUD-TYPE TRACK ROLLERS

To provide radial adjustment of the outer ring toward the track or cam surface at the time of installation, some metric series stud-type track rollers are available with eccentric studs – specified by adding the letter "E" to the designation letters: KRE and NUKRE. The GCR and GCUR Series include an eccentric bushing added to the track roller stud. Appropriate dimensions of the eccentric stud bushing are listed in Table B5-2 on page B-5-9 and Table B5-3 on page B-5-10.

Since a track roller with an eccentric stud is usually adjusted upon installation by turning the stud in the mounting hole, a close clearance fit between the outer diameter of the bushing and the mounting hole is necessary. For turning the stud, a hexagonal wrench is generally more convenient than a screwdriver. Thus, the option of a hexagonal wrench socket in the head of the stud should be exercised.

Some applications may require more secure positioning than provided by the tightened stud nut. If so, it is recommended that the mounting hole and the eccentric bushing be drilled at the time of installation to accept a locating dowel pin.

Fig. B5-13. Eccentric bushing dimensions – metric series (except GCR, GCUR series)

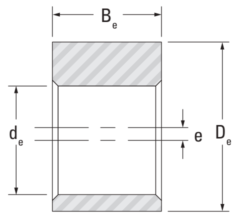


Table B5-2. Eccentric bushing dimensions – metric series (except GCR, GCUR series)

Stud-type track roller O.D.		d_e	D_e	B_e	e
>	≤	Eccentric bushing dimensions			
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
19.000 07480	**19.000** 0.7480	**8.000** 0.3150	**11.000** 0.4331	**9.000** 0.3543	**0.500** 0.0197
22.000 0.8661	**26.000** 1.10236	**10.000** 0.3937	**13.000** 0.5118	**10.000** 0.3937	**0.500** 0.0197
30.000 1.1811	**32.000** 1.2598	**12.000** 0.4724	**15.000** 0.5905	**11.000** 0.4331	**0.500** 0.0197
35.000 1.3779	**35.000** 1.3779	**16.000** 0.6299	**20.000** 0.7874	**14.000** 0.5512	**1.000** 0.0394
40.000 1.5748	**40.000** 1.5748	**18.000** 0.7087	**22.000** 0.8661	**16.000** 0.6299	**1.000** 0.0394
47.000 1.8504	**52.000** 2.0472	**20.000** 0.7874	**24.000** 0.9449	**18.000** 0.7087	**1.000** 0.0394
62.000 2.4409	**72.000** 2.8346	**24.000** 0.9449	**28.000** 1.1024	**22.000** 0.8661	**1.000** 0.0394
80.000 3.1496	**90.000** 3.5433	**30.000** 1.1811	**35.000** 1.3779	**29.000** 1.1417	**1.500** 0.0591

Table B5-3. Eccentric bushing dimensions metric series GCR and GCUR

Stud-type track roller O.D.		d_e	D_e	B_e	e
Over	Incl.	Eccentric bushing dimensions			
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
16.000 0.6299	**16.000** 0.6299	**6.000** 0.2362	**9.000** 0.3543	**7.500** 0.2953	**0.500** 0.0197
16.000 0.6299	**19.000** 0.7480	**8.000** 0.3149	**11.000** 0.4330	**7.500** 0.2953	**0.500** 0.0197
19.000 07480	**28.000** 1.1024	**10.000** 0.3937	**14.000** 0.5512	**10.500** 0.4134	**1.000** 0.0394
28.000 1.1024	**32.000** 1.2598	**12.000** 0.4724	**16.000** 0.6299	**11.500** 0.4528	**1.000** 0.0394
32.000 1.2598	**35.000** 1.3779	**16.000** 0.6299	**21.000** 0.8268	**15.100** 0.5945	**1.500** 0.0591
35.000 1.3779	**40.000** 1.5748	**18.000** 0.7087	**24.000** 0.9449	**17.100** 0.6732	**1.500** 0.0591
40.000 1.5748	**52.000** 2.0472	**20.000** 0.7874	**27.000** 1.0630	**19.100** 0.7520	**2.000** 0.0787
52.000 2.0472	**72.000** 2.8346	**24.000** 0.9449	**36.000** 1.4173	**24.100** 0.9488	**3.000** 0.1181
72.000 2.8346	**90.000** 3.5433	**30.000** 1.1811	**42.000** 1.6535	**30.700** 1.2087	**3.000** 0.1181
90.000 3.5433	**110.000** 4.3307	**36.000** 1.4173	**48.000** 1.8898	**36.500** 1.4370	**3.000** 0.1181
110.000 4.3307	- -	**42.000** 1.6535	**54.000** 2.1260	**43.500** 1.7126	**3.000** 0.1181

METRIC SERIES YOKE-TYPE TRACK ROLLERS WITHOUT END WASHERS

These yoke-type track rollers are available with a profiled or a cylindrical outer diameter of the outer ring, and with or without a separable inner ring. Since they are supplied without end washers, their outer rings must be guided by the adjacent end locating surfaces. Tolerance class F6 is the normal specification for the bore of the metric series radial needle roller and cage assemblies used with these yoke-type track rollers.

YOKE-TYPE TRACK ROLLERS – SERIES RSTO AND STO

Series STO have a separable inner ring and when the inner ring is removed they become series RSTO. They run directly on a hardened and ground inner raceway. Quality requirements for inner raceways are given in the engineering section of this catalog.

SEALED YOKE-TYPE TRACK ROLLERS WITHOUT END WASHERS – SERIES RNA 22.2RS AND NA22.2RS

These yoke-type track rollers have the same bore diameter and outer diameter as most of the other metric series yoke-type track rollers listed in this catalog. The thick section outer ring is made of one-piece channel-shaped bearing-quality steel – heat-treated to yield maximum load-carrying capability. The integral end flanges provide axial guidance for the large diameter needle rollers, and a cage supplies their inward retention. These track rollers have two integral lip contact seals designated by .2RS. The seals are thermally stable in a temperature range between -30° C and 110° C (-25° F and 225° F). Care should be exercised when mounting track rollers without inner rings onto inner raceways, to avoid damage to the seals.

METRIC SERIES YOKE-TYPE TRACK ROLLERS WITH END WASHERS

These yoke-type track rollers are available with a crowned or a cylindrical outer diameter to the outer ring. Metric series yoke-type track rollers with end washers – depending on the internal construction – may be end guided, either through the end washers or between the end faces of the rollers and the inside faces of the outer ring flanges.

YOKE-TYPE TRACK ROLLERS – SERIES NATR AND STO.ZZ

The series NATR yoke-type track rollers are of non-separable design, consisting of a crowned or a cylindrical outer ring, caged needle rollers, an inner ring and two retaining end washers securely fastened to the inner ring. The series STO.ZZ yoke-type track rollers are of separable design with two loose end washers. These end washers, placed in the counter bores of the outer ring, form very effective labyrinth-type shields, providing good retention of lubricant and exclusion of foreign material. A lubrication hole in the inner ring enables re-lubrication when a cross-drilled bolt or shaft – which can be serviced from the end – is used.

YOKE-TYPE TRACK ROLLERS – SERIES NUTR

The series NUTR yoke-type track rollers are of non-separable design consisting of a crowned or cylindrical outer ring, two rows of full complements of cylindrical rollers, an inner ring, two retaining end washers and two shields. The outer ring is located axially through the cylindrical rollers.

A lubricating hole in the inner ring enables re-lubrication when a cross-drilled bolt or shaft, which can be serviced from the end, is used.

The smallest track roller of this series has an outer diameter of 35.000 mm (1.3780 in). NUTR yoke-type track rollers are well-suited to carry high loads and designs with a thicker outer ring and particularly suitable for high shock loads. Designs with thicker outer rings have a larger outer diameter which can be identified by the bearing designation (e.g., NUTR 1542).

YOKE-TYPE TRACK ROLLERS – SERIES FP AND FG

The FP and FG non-separable inner ring designs are available in crowned or cylindrical outer rings. Both employ a full complement of needle rollers and require re-lubrication via a pathway through the shaft. The FP Series is the smallest series available and is not offered with seals.

YOKE-TYPE TRACK ROLLERS – SERIES FGU (LIGHT AND HEAVY TYPES)

The FGU non-separable inner ring designs are available in crowned or cylindrical outer rings. All FGU series use a full complement of cylindrical rollers between the inner and outer rings and require re-lubrication via a pathway through the shaft. The FGU heavy series uses a thicker outer ring section and is capable of higher loads.

Both FGU series are only available with a metal shield for a roller sealing option.

YOKE-TYPE TRACK ROLLERS – SERIES RNA, RNAB, RNAL

The RNA and RNAB Series design uses a full complement of needle rollers retained with a pair of end washers. A separate, matching inner ring is listed in the tables of part numbers. The RNAL Series uses a cylindrical outer ring and is only offered in limited sizes.

DIMENSIONAL ACCURACY

The tolerances of the basic metric series caged roller and NUKR stud-type and yoke-type track rollers, whose outer rings have a cylindrical outer diameter, correspond to tolerances specified in ISO 492 Radial bearings tolerances. The outer ring tolerances given in Table B5-4 apply to the outer rings used in the caged roller and NUKR stud-type and caged roller and NUTR yoke-type, metric series, track rollers. Metric series track rollers with a crowned outer diameter are the exception – their outer diameter tolerance is 0-0.05 for all caged roller sizes and NUTR, NUKR types. The remaining types have h9 tolerance on profiled outer diameters and h7 for straight diameters. Stud diameter and stud length tolerances are given in Table B5-5. The inner ring tolerances, given in Table B5-6 on page B-5-12, apply to inner rings used in metric series caged roller, NUKR Series yoke-type track rollers.

MOUNTING

STUD-TYPE TRACK ROLLERS

When the stud shank of a metric series stud-type track roller is mounted in a hole of tolerance H7, the installation force should be applied only to the center portion of the flanged end of the stud – preferably with an arbor press. The surface of the hole in the machine element which supports the stud must not deform under the expected load. And the support should be sufficiently rigid to resist bending loads. Deformation and bending will cause uneven loading of the outer ring.

Table B5-5. Tolerances for stud diameter and stud length – metric series

d_1		Δd_{1S}		B_2	ΔB_2	
Stud diameters				Stud lengths		
>	≤	Max.	Min.		Max.	Min.
mm		**µm**		**mm**		
3	**6**	**0**	**-12**	all lengths	**0**	**-1**
6	**10**	**0**	**-15**			
10	**18**	**0**	**-18**			
18	**30**	**0**	**-21**			
30	**50**	**0**	**-25**			
50	**80**	**0**	**-30**			
80	**100**	**0**	**-35**			

Table B5-4. Outer ring – metric series (caged roller and NUKR, NUTR types)

D		Δ_{Dmp}				Δ_{Cs}		K_{ea}
		Cylindrical		Crowned				
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
10.000 0.3937	**18.000** 0.7087	**0.000** 0.0000	**-0.008** -0.0003	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.015** 0.0006
18.000 0.7087	**30.000** 1.1811	**0.000** 0.0000	**-0.009** -0.00035	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.015** 0.0006
30.000 1.1811	**50.000** 1.9685	**0.000** 0.0000	**-0.011** -0.0004	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.020** 0.0008
50.000 1.9685	**80.000** 3.1496	**0.000** 0.0000	**-0.013** -0.0005	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.025** 0.0010
80.000 3.1496	**120.000** 4.7244	**0.000** 0.0000	**-0.015** -0.0006	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.035** 0.0014
120.000 4.7244	**150.000** 5.9055	**0.000** 0.0000	**-0.018** -0.0007	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.040** 0.0016
150.000 5.9055	**180.000** 7.0866	**0.000** 0.0000	**-0.025** -0.0010	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.150** -0.0059	**0.045** 0.0018
180.000 7.0866	**240.000** 9.4488	**0.000** 0.0000	**-0.030** -0.0012	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.200** -0.0079	**0.050** 0.0020

Table B5-6. Inner ring – metric series (caged roller types)

d		Δ_{dmp}		Δ_{Bs}	
>	≤	Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in
2.500 0.0984	**18.000** 0.7087	**0.000** 0.0000	**-0.008** -0.0003	**0.000** 0.0000	**-0.180** -0.0071
18.000 0.7087	**30.000** 1.1811	**0.000** 0.0000	**0.010** -0.0004	**0.000** 0.0000	**-0.210** -0.0083
30.000 1.1811	**50.000** 1.9685	**0.000** 0.0000	**-0.012** -0.0005	**0.000** 0.0000	**-0.250** -0.0098
50.000 1.9685	**80.000** 3.1496	**0.000** 0.0000	**-0.015** '-0.0006	**0.000** 0.0000	**-0.300** -0.0118
80.000 3.1496	**120.000** 4.7244	**0.000** 0.0000	**-0.020** -0.0008	**0.000** 0.0000	**-0.350** -0.0138

In mounting the stud-type track roller, the retaining washer must be firmly backed up by a flat shoulder which is square with the stud center line. The shoulder diameter must be no smaller than the minimum clamping diameter, d_a listed in the bearing tables.

The maximum inherent strength of the stud is obtained when the track roller is supported, as close as possible, to the retaining washer – which minimizes the bending moment. For this reason the edge of the housing – which supports the stud shank – should be kept as sharp as practical but free from burrs.

The clamping nut should not be tightened with a torque value higher than the maximum listed. A screwdriver slot, or hexagonal wrench socket in the flanged end of the stud, is provided for a tool to prevent the stud from turning when the nut is being tightened. Since the bottom of the screwdriver slot is not flat, it is helpful to put a radius on the tip of the screwdriver being used to hold the stud more securely. Hexagonal nuts are supplied with all metric series stud-type track rollers.

YOKE-TYPE TRACK ROLLERS

The machine element with the holes in which the mounting bolt or shaft is supported must be sufficiently rigid to resist local crushing under the applied load and to resist bending which can cause uneven loading of the needle rollers.

When applied loads are high, the h6 or j6 tolerance should be used in conjunction with a high strength shaft or bolt for mounting metric series yoke-type track rollers. When loads are moderate, a g6 tolerance may be used with a high strength shaft or bolt. For light loads, the loose transition fit with the f6 tolerance may be used with an unhardened shaft or bolt.

The yoke-type track rollers with inner rings – including those with end washers as well as inner rings – should be clamped endwise between parallel faces, perpendicular to the axis to prevent the retaining washers from coming off under load. The dimensions of machine parts, adjoining the metric series yoke-type track rollers, should be based on the minimum clamping diameter d_a to ensure that the washers are adequately supported. If the track roller cannot be end clamped, a close axial fit in the yoke is required. Care should be taken to assure that the lubricating hole is located in the unloaded zone of the raceway.

The metric series yoke-type track rollers without inner rings require a hardened and ground shaft, or bolt with a k5 tolerance. Inner raceway quality requirements are given in the engineering section.

LOAD RATINGS

DYNAMIC LOADING AS A TRACK ROLLER

When the outer ring of a stud-type or yoke-type track roller runs on a track, the contact – under a radial load – causes elastic (oval) deformation of the outer ring. As a result, a smaller zone of the raceway is loaded and the load is distributed on fewer needle rollers. This, in turn, affects the dynamic and static load ratings of the track rollers. Also, this deformation generates bending stress in the outer ring which must not exceed the maximum permitted for the material of the outer ring. The maximum permissible dynamic ($F_{r\,perm}$) radial load condition is determined by this requirement.

The rating life of stud-type or yoke-type track rollers should be calculated using the dynamic load ratings, C_w, shown in the following tables. The tables also show the maximum permissible radial load, $F_{r\,perm}$, that can be dynamically applied on stud-type or yoke-type track rollers. However, to calculate the L_{10} life of a track roller, the applied radial load must not be greater than $C_w/2$ based on ideal operating conditions of alignment, lubrication, temperature, speed and accelerations.

Example:

Given: A track roller application for a linear slide in which each roller supports a 4.45 kN (1000 lbf.) load and travels at 609.600 mm (24.0000 in) per second.

Select a track roller and calculate the L_{10} life in hours assuming continuous operation at the given speed. Assume conditions of alignment, lubrication and temperature are ideal.

Solution: Calculate the minimum C_w required.

The applied radial load must not be greater than $C_w/2$ based on ideal operating conditions.

Therefore, $Fr < C_w/2$ or $C_w > 8.9$ kN (2000 lbf.)

For a KRV30, $C_w = 9.85$ kN (2210 lbf.)

To calculate the speed in min^{-1}, $V = Pi \cdot D \cdot n$

Where:

V = linear velocity
Pi = 3.14
D = outside diameter of the track roller assembly

Therefore, 609.600 mm (24.000 in)/sec. = $3.14 \cdot 30.000$ mm $\cdot\ n$

Making appropriate substitutions and solving for n yields a value of approximately 388 min^{-1}.

The standard catalog life equation of a roller bearing is:

$$L_{10} = (C/P)10/3 \cdot (16667/n)$$

Where:

L_{10} = calculated fatigue life in hours
C = the dynamic radial load ratings based on 1000000 revolutions
P = the dynamic equivalent radial load
n = speed in min^{-1}

Substituting C_w for C and solving:

$$L_{10} = (9.85/4.45)\ 10/3 \cdot (16667/388) = 604 \text{ hours}$$

STATIC RATING AS A TRACK ROLLER

In addition to the basic static load rating, C_0, the tables also list the maximum permissible static radial load, $F_{0r\,perm}$, that may be applied to a stud-type or yoke-type metric series track roller. The values of $F_{0r\,perm}$ result in a calculated minimum static factor f_s of 0.7 for the worst condition of internal load distribution in metric series track roller operation. The $F_{0r\,perm}$ values must not be exceeded. Exceeding $F_{0r\,perm}$ may cause permanent damage to the track roller. A damaged track roller could cause the equipment in which the track roller is installed to malfunction. The static factor f_s can be calculated using the following formula:

$$f_s \geq 0.7 \left(\frac{F_{0r\,perm}}{P_{0r}}\right)$$

Where:

$F_{0r\,perm}$ = Maximum permissible static radial load
P_{0r} = Equivalent static load (F_{0r} for yoke-type track rollers)
F_{0r} = Static radial load
f_s = Static factor whose values should not be smaller than those suggested in Table B5-7.

Table B5-7. Suggested values for static factors f_s for metric series track rollers

Requirements for yoke – type track rollers and stud – type track rollers	Suggested f_s values	
	Max.	Min.
High shock-type loads Quiet running	2.5	1.5
Normal loading Normal quietness of running	1.5	1
Minor impact loads and rotary motion particularly quiet running not required	1	0.7

LUBRICATION OF STUD-TYPE TRACK ROLLERS

JTEKT metric series stud-type track rollers are supplied with a lithium soap-based, general-purpose grease. When the caged KR Series track rollers are operated at low speeds, with light loads and in clean environments, there is often no need to re-lubricate the track roller. In other applications, periodic re-lubrication may be necessary to obtain optimum performance. The full complement series of track rollers have less internal volume available for grease storage. Therefore, they may require more frequent lubrication than caged-type track rollers. Stud-type track rollers – with a screwdriver slot in the flanged end of the stud – have provisions for re-lubrication through the flanged end of the stud. Metric series stud-type track rollers, with hexagonal sockets, can not be re-lubricated from the flanged end of the stud. Both types of metric series stud-type track rollers – with outer diameters larger than 22.000 mm (0.8661 in) (28.000 mm [1.1024 in] for all GC variations) – allow for re-lubrication through the threaded end of the stud. In addition, caged roller and NUKR Series stud-type track rollers – with 30.000 mm (1.8110 in) and larger outer diameters – allow for re-lubrication through a cross-drilled hole in the stud shank. The ends of the axial holes are counterbored to accept press-fit grease fittings of series VENN. The grease fittings are supplied with metric series stud-type track rollers. Hole diameters (d_4) for these grease fittings are listed in the tables of dimensions on pages later in this chapter as it applies. Note that the GC small series has no axial hole.

One or more plugs are supplied with every metric series stud-type track roller, to close off unused holes. At the flanged end, the plug must not be pushed in too deeply, as it may cover the cross-drilled lubricating hole. The plug should be pressed in using an installation tool whose dimensions are given in Table B5-9. If the cross-drilled hole in the stud shank is not used, it will be covered when the track roller is properly installed.

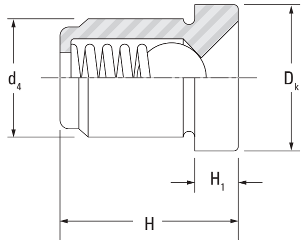


Fig. B5-14. Metric series grease fittings

Table B5-8. Metric series grease fittings, series VENN

Designation	d_4	D_k	H	H_1	Approx. wt.
	mm in	**mm** in	**mm** in	**mm** in	**g** lbs
VENN 4	**4.000** 0.1575	**6.000** 0.2362	**6.000** 0.2362	**1.500** 0.0591	**0.4** 0.0009
VENN 6	**6.000** 0.2362	**8.000** 0.3147	**7.000** 0.2756	**2.000** 0.0787	**1.6** 0.0035
VENN 8	**8.000** 0.3150	**10.000** 0.3937	**12.000** 0.4724	**3.000** 0.1181	**4.7** 0.0104

During installation of the track roller it is desirable to ensure that the cross-drilled hole is positioned in the unloaded zone of the track roller raceway. The location of the cross-drilled hole can be best recognized by its alignment with the manufacturer's stamp, parallel to the screwdriver slot (when applicable).

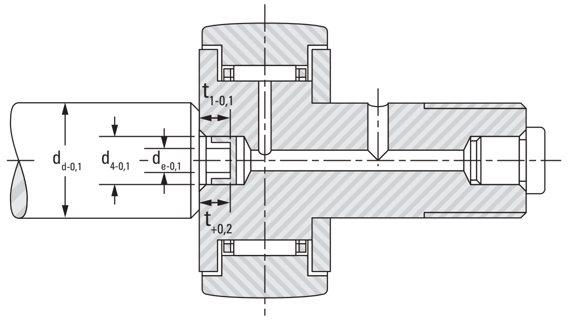


Fig. B5-15. Installation tool for metric series plug

Table B5-9. Installation tool for metric series plug

Stud-type track rollers O.D.		d_4	d_d	d_e	t	t_1
>	≤					
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
16.000 0.6299	**26.000** 1.0236	**3.900** 0.1535	**10.000** 0.3937	**2.700** 0.1063	**3.700** 0.1457	**4.500** 0.1772
30.000 1.1811	**40.000** 1.5748	**5.900** 0.2323	**12.000** 0.4724	**4.700** 0.1850	**4.700** 0.1850	**7.000** 0.2756
47.000 1.8504	**90.000** 3.5433	**7.900** 0.3110	**15.000** 0.5905	**6.700** 0.2638	**6.700** 0.2638	**10.000** 0.3937

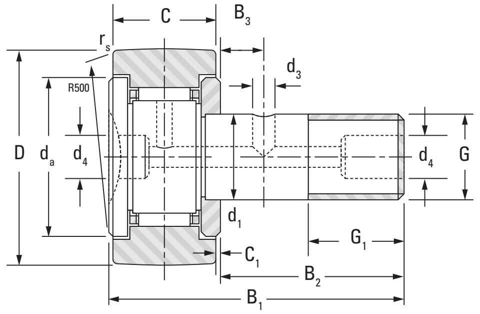
LUBRICATION OF YOKE-TYPE TRACK ROLLERS

Yoke-type track rollers are produced with a lubricating hole in the inner ring so they can be re-lubricated through a cross-drilled hole in the supporting shaft or bolt. When mounting yoke-type track rollers, care should be taken that the lubrication hole is located in the unloaded raceway zone.

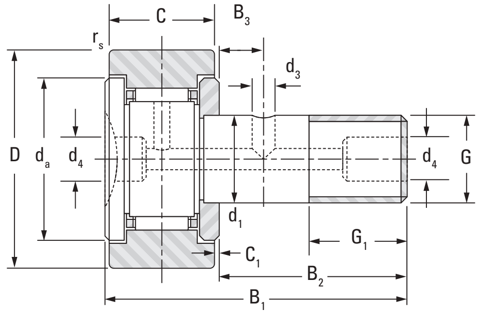
Oil is the preferred lubricant for yoke-type track rollers. Continuous oil lubrication, or frequent grease lubrication should be used for steady rotating conditions. Applications involving slow, intermittent oscillations are not as critical, and longer intervals between re-lubrication are permitted. Sealed yoke-type track rollers are normally supplied with an initial charge of a medium-temperature grease. Caged yoke-type track rollers have maximum grease storage capacity and, consequently, longer pregreased life than full complement types.

NEEDLE ROLLER AND CAGE ASSEMBLIES, STUD-TYPE (KR SERIES)

METRIC SERIES



KR



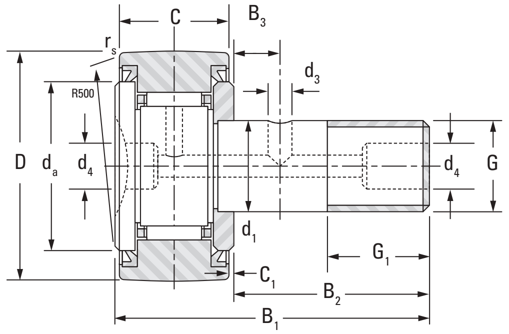
KR.DZ

Outer Dia.	d_1 h7	D	C	$r_{s\ min.}$	B_1	B_2	B_3	G_1	d_4	d_3	Thread G	C_1	d_a
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		mm in	mm in
16 0.6299	**6** 0.2362	**16** 0.6299	**11** 0.433	**0.3** 0.012	**28.2** 1.110	**16** 0.630		**8** 0.315	**4** 0.157		M6x1	**0.6** 0.024	**11** 0.433
19 0.7480	**8** 0.3150	**19** 0.7480	**11** 0.433	**0.3** 0.012	**32.2** 1.268	**20** 0.787		**10** 0.394	**4** 0.157		M8x1.25	**0.6** 0.024	**13** 0.512
22 0.8661	**10** 0.3937	**22** 0.8661	**12** 0.472	**0.3** 0.012	**36.0** 1.417	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
26 1.0236	**10** 0.3937	**26** 1.0236	**12** 0.472	**0.3** 0.012	**36.0** 1.417	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
30 0.551	**12** 0.4724	**30** 1.1811	**14** 0.551	**0.6** 0.024	**40.0** 1.575	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827
32 0.551	**12** 0.4724	**32** 1.2598	**14** 0.551	**0.6** 0.024	**40.0** 1.575	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827

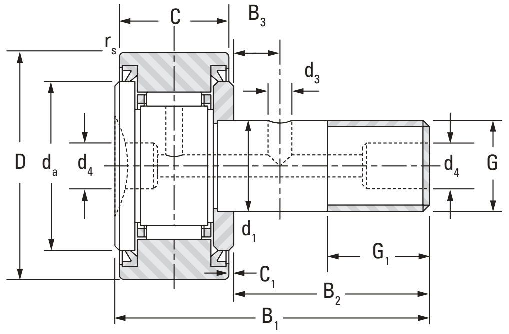
Crowned Designation	Cylindrical Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Approx. Wt.
		As a Bearing		As a Track Roller					
		Dynamic	Static	Dynamic		Static			
		C	C_o	C_w	$F_{r\ perm}$	$F_{0r\ perm}$			
		kN lbf		**kN** lbf			**N-m** lb-in	min^{-1}	**kg** lbs
KR16	KR16.DZ	**3.60** 810	**3.58** 800	**2.97** 670	**2.85** 640	**3.58** 800	**7** 62.0	17000	**0.019** 0.042
KR19	KR19.DZ	**4.18** 940	**4.65** 1050	**3.28** 740	**3.29** 740	**4.22** 950	**16** 142	13000	**0.031** 0.068
KR22	KR22.DZ	**5.35** 1200	**6.79** 1530	**3.94** 890	**4.04** 910	**5.45** 1230	**28** 248	10000	**0.046** 0.101
KR26	KR26.DZ	**5.35** 1200	**6.79** 1530	**4.55** 1020	**6.78** 1520	**7.24** 1630	**28** 248	10000	**0.059** 0.130
KR30	KR30.DZ	**7.89** 1770	**9.79** 2200	**6.32** 1420	**7.74** 1740	**9.31** 2090	**45** 398	8200	**0.087** 0.192
KR32	KR32.DZ	**7.89** 1770	**9.79** 2200	**6.65** 1490	**9.62** 2160	**10.3** 2320	**45** 398	8200	**0.095** 0.209

NEEDLE ROLLER AND CAGE ASSEMBLIES, SEALED, STUD-TYPE (KR...2S SERIES)

METRIC SERIES



KR.2RS



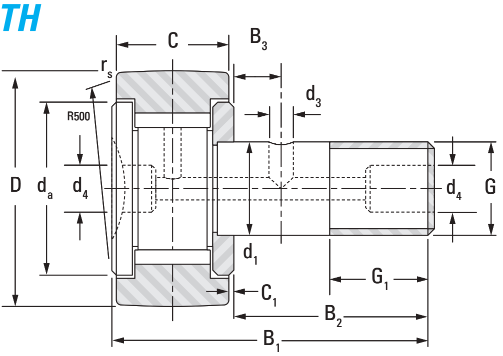
KR.DZ.2RS

Outer Dia.	d_1 h7	D	C	$r_{s\,min.}$	B_1	B_2	B_3	G_1	d_4	d_3	Thread G	C_1	d_a
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		mm in	mm in
16 0.6299	**6** 0.2362	**16** 0.6299	**11** 0.433	**0.3** 0.012	**28.2** 1.110	**16** 0.630		**8** 0.315	**4** 0.157		M6x1	**0.6** 0.024	**11** 0.433
19 0.7480	**8** 0.3150	**19** 0.7480	**11** 0.433	**0.3** 0.012	**32.2** 1.268	**20** 0.787		**10** 0.394	**4** 0.157		M8x1.25	**0.6** 0.024	**13** 0.512
22 0.8661	**10** 0.3937	**22** 0.8661	**12** 0.472	**0.3** 0.012	**36.2** 1.425	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
26 1.0236	**10** 0.3937	**26** 1.0236	**12** 0.472	**0.3** 0.012	**36.2** 1.425	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
30 1.1811	**12** 0.4724	**30** 1.1811	**14** 0.551	**0.6** 0.024	**40.2** 1.583	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827
32 1.2598	**12** 0.4724	**32** 1.2598	**14** 0.551	**0.6** 0.024	**40.2** 1.583	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827

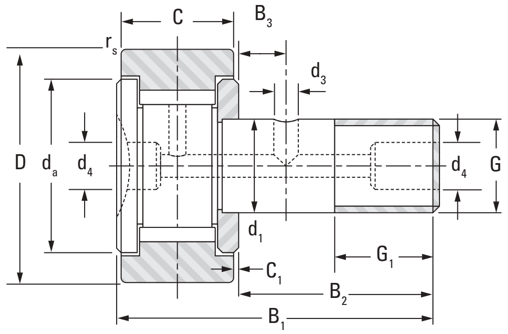
Crowned Designation	Cylindrical Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Approx. Wt.
		As a Bearing		As a Track Roller					
		Dynamic	Static	Dynamic		Static			
		C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$			
		kN lbf		**kN** lbf			**N-m** lb-in	min^{-1}	**kg** lbs
KR16.2RS	KR16.DZ.2RS	**3.60** 810	**3.58** 800	**2.97** 670	**2.85** 640	**3.58** 800	**7.0** 61.96	17000	**0.019** 0.042
KR19.2RS	KR19.DZ.2RS	**4.18** 940	**4.65** 1050	**3.28** 740	**3.29** 740	**4.22** 950	**16** 141.61	13000	**0.031** 0.068
KR22.2RS	KR22.DZ.2RS	**5.35** 1200	**6.79** 1530	**3.94** 890	**4.04** 910	**5.45** 1230	**28** 247.82	10000	**0.046** 0.101
KR26.2RS	KR26.DZ.2RS	**5.35** 1200	**6.79** 1530	**4.55** 1020	**6.78** 1520	**7.24** 1630	**28** 247.82	10000	**0.059** 0.130
KR30.2RS	KR30.DZ.2RS	**7.89** 1770	**9.79** 2200	**6.32** 1420	**7.74** 1740	**9.31** 2090	**45** 398.28	8200	**0.087** 0.192
KR32.2RS	KR32.DZ.2RS	**7.89** 1770	**9.79** 2200	**6.65** 1490	**9.62** 2160	**10.3** 2320	**45** 398.28	8200	**0.098** 0.216

FULL COMPLEMENT WITH NEEDLE ROLLERS (KRV SERIES) OR CYLINDRICAL ROLLERS, STUD-TYPE (NUKR SERIES)

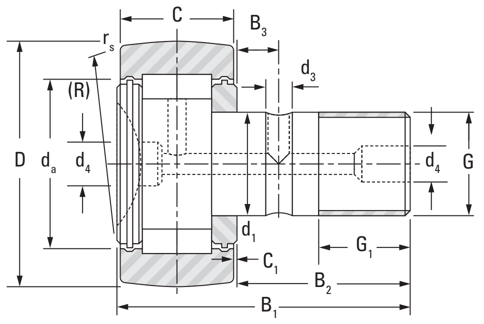
METRIC SERIES



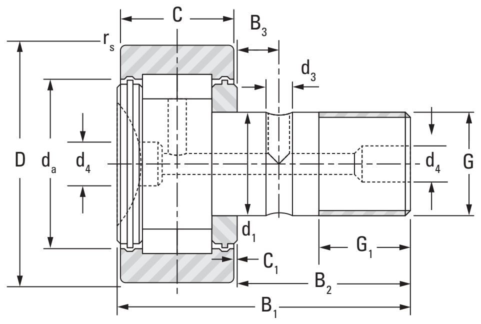
KRV



KRV.DZ



NUKR



NUKR.DZ

Outer Dia.	d_1 h7	D	C	$r_{s\ min.}$	B_1	B_2	B_3	G_1	d_4	d_3	Thread	C_1	d_a
											G		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**mm** in	**mm** in
16 0.6299	**6** 0.2362	**16** 0.6299	**11** 0.433	**0.3** 0.012	**28.2** 1.110	**16** 0.630		**8** 0.315	**4** 0.157		M6x1	**0.6** 0.024	**11** 0.433
19 0.7480	**8** 0.3150	**19** 0.7480	**11** 0.433	**0.3** 0.012	**32.2** 1.268	**20** 0.787		**10** 0.394	**4** 0.157		M8x1.25	**0.6** 0.024	**13** 0.512
22 0.8661	**10** 0.3937	**22** 0.8661	**12** 0.472	**0.3** 0.012	**36.2** 1.425	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
26 1.0236	**10** 0.3937	**26** 1.0236	**12** 0.472	**0.3** 0.012	**36.2** 1.425	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
30 1.1811	**12** 0.4724	**30** 1.1811	**14** 0.551	**0.6** 0.024	**40.2** 1.583	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827
32 1.2598	**12** 0.4724	**32** 1.2598	**14** 0.551	**0.6** 0.024	**40.2** 1.583	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827
35 1.3780	**16** 0.6299	**35** 1.3780	**18** 0.709	**0.6** 0.024	**52** 2.047	**32.5** 1.280	**8** 0.315	**17** 0.669	**6** 0.236	**3** 0.118	M16x1.5	**0.8** 0.031	**25** 0.984
40 1.5748	**18** 0.7087	**40** 1.5748	**20** 0.787	**1** 0.039	**58** 2.283	**36.5** 1.437	**8** 0.315	**19** 0.748	**6** 0.236	**3** 0.118	M18x1.5	**0.8** 0.031	**27** 1.063
47 1.8504	**20** 0.7874	**47** 1.8504	**24** 0.945	**1** 0.039	**66** 2.598	**40.5** 1.594	**9** 0.354	**21** 0.827	**6** 0.236	**4** 0.157	M20x1.5	**0.8** 0.031	**33** 1.299
52 2.0472	**20** 0.7874	**52** 2.0472	**24** 0.945	**1** 0.039	**66** 2.598	**40.5** 1.594	**9** 0.354	**21** 0.827	**6** 0.236	**4** 0.157	M20x1.5	**0.8** 0.031	**37** 1.457
62 2.4409	**24** 0.9449	**62** 2.4409	**29** 1.142	**1** 0.039	**80** 3.150	**49.5** 1.949	**11** 0.433	**25** 0.984	**8** 0.315	**4** 0.157	M24x1.5	**0.8** 0.031	**45** 1.772
72 2.8346	**24** 0.9449	**72** 2.8346	**29** 1.142	**1.1** 0.043	**80** 3.150	**49.5** 1.949	**11** 0.433	**25** 0.984	**8** 0.315	**4** 0.157	M24x1.5	**0.8** 0.031	**51** 2.008
80 3.1496	**30** 1.1811	**80** 3.1496	**35** 1.378	**1.1** 0.043	**100** 3.937	**63** 2.480	**15** 0.591	**32** 1.260	**8** 0.315	**4** 0.157	M30x1.5	**1.0** 0.039	**52** 2.047
90 3.5433	**30** 1.1811	**90** 3.5433	**35** 1.378	**1.1** 0.043	**100** 3.937	**63** 2.480	**15** 0.591	**32** 1.260	**8** 0.315	**4** 0.157	M30x1.5	**1.0** 0.039	**52** 2.047

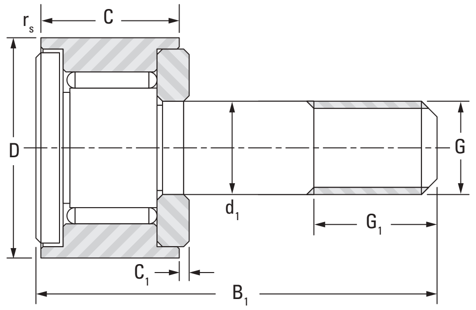
Crowned Designation	Cylindrical Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Approx. Wt.
		As a Bearing		As a Track Roller					
		Dynamic	Static	Dynamic		Static			
		C	C_o	C_w	$F_{r\ perm}$	$F_{0r\ perm}$			
		kN lbf		**kN** lbf			**N-m** lb-in	min^{-1}	**kg** lbs
KRV16	KRV16.DZ	**6.90** 1550	**8.40** 1890	**5.11** 1150	**3.49** 780	**6.28** 1410	**7** 62.0	5700	**0.019** 0.042
KRV19	KRV19.DZ	**8.08** 1820	**11.0** 2470	**5.66** 1270	**4.13** 930	**7.43** 1670	**16** 142	4300	**0.031** 0.068
KRV22	KRV22.DZ	**9.45** 2120	**14.3** 3210	**6.32** 1420	**5.04** 1130	**9.07** 2040	**28** 248	3400	**0.046** 0.101
KRV26	KRV26.DZ	**9.45** 2120	**14.3** 3210	**7.30** 1640	**8.60** 1930	**12.7** 2860	**28** 248	3400	**0.059** 0.130
KRV30	KRV30.DZ	**13.4** 3010	**19.8** 4450	**9.85** 2210	**9.20** 2070	**15.7** 3530	**45** 398	2800	**0.087** 0.192
KRV32	KRV32.DZ	**13.4** 3010	**19.8** 4450	**10.4** 2340	**11.3** 2540	**17.4** 3910	**45** 398	2800	**0.098** 0.216
NUKR35.2SK		**24.7** 5550	**29.4** 6610	**16.2** 3640	**10.1** 2270	**16.1** 3620	**53.2** 471	6100	**0.170** 0.375
NUKR40.2SK		**26.6** 5980	**33.3** 7490	**18.7** 4200	**15.0** 3370	**23.9** 5370	**77.5** 686	5300	**0.250** 0.551
NUKR47.2SK		**41.4** 9310	**53.2** 12000	**28.1** 6320	**20.5** 4610	**32.7** 7350	**109** 965	4500	**0.380** 0.838
NUKR52.2SK		**45.8** 10300	**63.1** 14200	**29.6** 6650	**22.2** 4990	**35.4** 7960	**109** 965	3700	**0.461** 1.016
NUKR62.2SK		**62.7** 14100	**83.1** 18700	**40.9** 9190	**29.6** 6650	**47.2** 10600	**193** 1708	3200	**0.790** 1.742
NUKR72.2SK		**68.9** 15500	**97.8** 22000	**46.1** 10400	**39.6** 8900	**63.1** 14200	**193** 1708	2600	**1.040** 2.293
NUKR80.2SK		**95.4** 21400	**130** 29200	**69.7** 15700	**63.2** 14200	**101** 22700	**390** 3452	2900	**1.550** 3.417
NUKR90.2SK		**95.4** 21400	**130** 29200	**77.8** 17500	**97.8** 22000	**128** 28800	**390** 3452	2900	**2.020** 4.453

FULL COMPLEMENT, SMALL SERIES, UNSEALED, STUD-TYPE (GC SERIES)

METRIC SERIES

GC: crowned outer ring

GCL: cylindrical outer ring



GC10-15/GCL10-15 Series

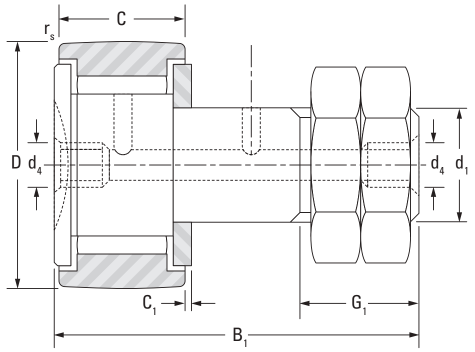
Outer Dia.	D	d_1	Thread	C	C_1	$r_{s\,min.}$	B_1	G_1	Crowned Designation	Cylindrical Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Approx. Wt.
			G								As a Bearing		As a Track Roller					
											Dynamic	Static	Dynamic		Static			
											C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$			
mm in	**mm** in	**mm** in		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			**N-m** lb-in	min^{-1}	**kg** lbs
10 0.3937	**10** 0.3937	**4** 0.1575	M4 x 0.7	**8** 0.315	**0.25** 0.010	**0.2** 0.008	**19.5** 0.768	**6** 0.236	GC 10	GCL 10	**2.80** 629	**3.09** 695	**1.92** 432	**1.01** 227	**1.82** 409	**0.9** 7.97	8500	**0.006** 0.014
11 0.4331	**11** 0.4331	**4** 0.1575	M4 x 0.7	**8** 0.315	**0.25** 0.010	**0.2** 0.008	**19.5** 0.768	**6** 0.236	GC 11	GCL 11	**2.8** 629	**3.09** 695	**2.12** 477	**1.43** 321	**2.58** 580	**0.9** 7.97	8500	**0.007** 0.016
12 0.4724	**12** 0.4724	**5** 0.1969	M5 x 0.8	**9** 0.354	**0.25** 0.010	**0.2** 0.008	**22.5** 0.886	**7** 0.276	GC 12	GCL 12	**3.74** 841	**4.74** 1070	**2.54** 571	**1.63** 366	**2.94** 661	**1.8** 15.93	6600	**0.011** 0.024
13 0.5118	**13** 0.5118	**5** 0.1969	M5 x 0.8	**9** 0.354	**0.25** 0.010	**0.2** 0.008	**22.5** 0.886	**7** 0.276	GC 13	GCL 13	**3.74** 841	**4.74** 1070	**2.16** 486	**2.75** 618	**3.89** 874	**1.8** 15.93	6600	**0.011** 0.024
14 0.5512	**14** 0.5512	**6** 0.2362	M6 x 1	**9.5** 0.374	**0.25** 0.010	**0.3** 0.012	**26** 1.024	**8** 0.315	GC 14	GCL 14	**4.05** 910	**5.44** 1220	**2.86** 643	**2.26** 508	**4.07** 915	**3.0** 26.55	5700	**0.016** 0.035
15 0.5906	**15** 0.5906	**6** 0.2362	M6 x 1	**9.5** 0.374	**0.25** 0.010	**0.3** 0.012	**26** 1.024	**8** 0.315	GC 15	GCL 15	**4.05** 910	**5.44** 1220	**3.04** 683	**2.83** 636	**4.65** 1050	**3.0** 26.55	5700	**0.018** 0.039

FULL COMPLEMENT, STANDARD SERIES, WITH OR WITHOUT SEALS, STUD-TYPE (GC SERIES)

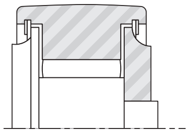
METRIC SERIES

GC: crowned outer ring
GCL: cylindrical outer ring

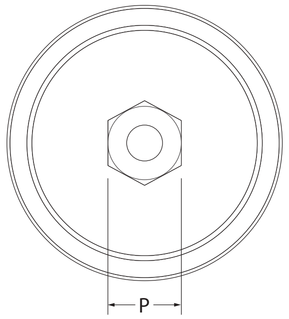
EE: with plastic seals
EEM: with metal seals



GC16-90/GCL16-90 Series



GC...EE, GC...EEM
GCL...EE, GCL...EEM



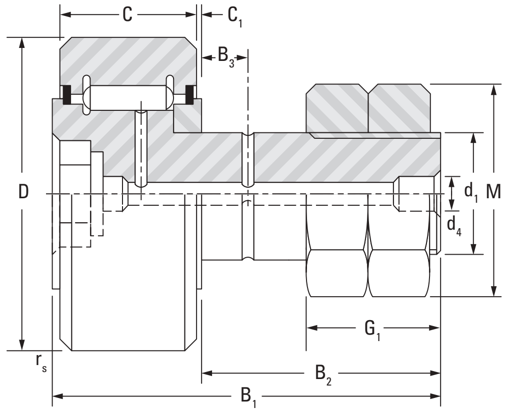
Hex Socket Roller End

Outer Dia.	D	d_1	Pitch	C	C_1	$r_{s\ min.}$	B_1	G_1	Crowned Designation	Cylindrical Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Wrench	d_4	Approx. Wt.
											As a Bearing		As a Track Roller							
											Dynamic	Static	Dynamic		Static					
											C	C_o	C_w	$F_{r\ perm}$	$F_{0r\ perm}$			P		
mm in	**mm** in	**mm** in	**mm**	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			**N-m** lb-in	min^{-1}	**mm**	**mm** in	**kg** lbs
16 0.6299	**16** 0.6299	**6** 0.2362	**1.0**	**11** 0.433	**0.60** 0.024	**0.3** 0.012	**28.3** 1.114	**8** 0.315	GC 16	GCL 16	**5.66** 1270	**6.51** 1460	**4.19** 942	**2.79** 627	**5.02** 1130	**3** 26.6	5700	—	**4** 0.157	**0.021** 0.046
19 0.748	**19** 0.748	**8** 0.315	**1.25**	**11** 0.433	**0.60** 0.024	**0.3** 0.012	**32.3** 1.272	**10** 0.394	GC 19	GCL 19	**6.44** 1450	**8.15** 1830	**4.65** 1050	**3** 785	**6.28** 1410	**8** 70.8	4400	—	**4** 0.157	**0.034** 0.075
22 0.8661	**22** 0.8661	**10** 0.3937	**1.25**	**12** 0.472	**0.60** 0.024	**0.3** 0.012	**36.3** 1.429	**12** 0.472	GC 22	GCL 22	**7.3** 1640	**10.2** 2290	**5.05** 1140	**4.07** 915	**7.33** 1650	**20** 177	3500	—	**4** 0.157	**0.058** 0.128
24 0.9449	**24** 0.9449	**10** 0.3937	**1.25**	**12** 0.472	**0.60** 0.024	**0.3** 0.012	**36.3** 1.429	**12** 0.472	GC 24	GCL 24	**7.3** 1640	**10.2** 2290	**5.45** 1230	**5.42** 1220	**8.63** 1940	**20** 177	3500	—	**4** 0.157	**0.067** 0.148
26 1.0236	**26** 1.0236	**10** 0.3937	**1.25**	**12** 0.472	**0.60** 0.024	**0.3** 0.012	**36.3** 1.429	**12** 0.472	GC 26	GCL 26	**9.92** 2230	**12.9** 2900	**7.09** 1590	**5.43** 1220	**9.77** 2200	**20** 177	3200	—	**4** 0.157	**0.072** 0.159
28 1.1024	**28** 1.1024	**10** 0.3937	**1.25**	**12** 0.472	**0.60** 0.024	**0.3** 0.012	**36.3** 1.429	**12** 0.472	GC 28	GCL 28	**9.92** 2230	**12.9** 2900	**7.57** 1700	**6.95** 1560	**11.4** 2560	**20** 177	3200	—	**4** 0.157	**0.08** 0.176
30 1.1811	**30** 1.1811	**12** 0.4724	**1.5**	**14** 0.51	**0.60** 0.024	**0.6** 0.024	**40.3** 1.587	**13** 0.512	GC 30	GCL 30	**15.5** 3480	**20.4** 4590	**11.2** 2520	**8.48** 1910	**15.3** 3440	**26** 230	2900	**8**	**4** 0.157	**0.115** 0.254
32 1.2598	**32** 1.2598	**12** 0.4724	**1.5**	**14** 0.51	**0.60** 0.024	**0.6** 0.024	**40.3** 1.587	**13** 0.512	GC 32	GCL 32	**15.5** 3480	**20.4** 4590	**11.8** 2650	**10.6** 2380	**18.1** 4070	**26** 230	2900	**8**	**4** 0.157	**0.12** 0.265
35 1.378	**35** 1.378	**16** 0.6299	**1.5**	**18** 0.709	**0.80** 0.031	**0.6** 0.024	**52.3** 2.059	**17** 0.669	GC 35	GCL 35	**23.6** 5310	**33.1** 7440	**15.7** 3530	**10.8** 2430	**19.4** 4360	**64** 566	2200	**10**	**6** 0.236	**0.208** 0.459
47 1.8504	**47** 1.8504	**20** 0.7874	**1.5**	**24** 0.45	**0.80** 0.031	**1** 0.039	**66.3** 2.61	**21** 0.827	GC 47	GCL 47	**36.5** 8210	**65.5** 14700	**22.5** 5060	**20.2** 4540	**36.4** 8180	**120** 1060	1400	**14**	**6** 0.236	**0.477** 1.052
52 2.0472	**52** 2.0472	**20** 0.7874	**1.5**	**24** 0.45	**0.80** 0.031	**1** 0.039	**66.3** 2.61	**21** 0.827	GC 52	GCL 52	**36.5** 8210	**65.5** 14700	**25.2** 5670	**28** 6290	**47.5** 10700	**120** 1060	1400	**14**	**6** 0.236	**0.542** 1.195
62 2.4409	**62** 2.4409	**24** 0.9449	**1.5**	**29** 1.142	**0.80** 0.031	**1** 0.039	**80.3** 3.161	**25** 0.984	GC 62	GCL 62	**43.3** 9730	**85.6** 19200	**30.5** 6860	**42.9** 9640	**64.7** 14500	**220** 1950	1200	**12**	**6** 0.236	**0.944** 2.081
72 2.8346	**72** 2.8346	**24** 0.9449	**1.5**	**29** 1.142	**0.80** 0.031	**1** 0.039	**80.3** 3.161	**25** 0.984	GC 72	GCL 72	**43.3** 9730	**85.6** 19200	**33.9** 7620	**65.8** 14800	**79.5** 17900	**220** 1950	1200	**12**	**6** 0.236	**1.165** 2.568
80 3.1496	**80** 3.1496	**30** 1.1811	**1.5**	**35** 1.378	**1.00** 0.039	**1** 0.039	**100.3** 3.949	**32** 1.26	GC 80	GCL 80	**65.1** 14600	**144** 32400	**42.7** 9600	**62.9** 14100	**95.3** 21400	**450** 3980	870	**14**	**8** 0.315	**1.915** 4.222
85 3.3465	**85** 3.3465	**30** 1.1811	**1.5**	**35** 1.378	**1.00** 0.039	**1** 0.039	**100.3** 3.949	**32** 1.26	GC 85	GCL 85	**65.1** 14600	**144** 32400	**45.1** 10100	**75.3** 16900	**106** 23800	**450** 3980	870	**14**	**8** 0.315	**2.096** 4.621
90 3.5433	**90** 3.5433	**30** 1.1811	**1.5**	**35** 1.378	**1.00** 0.039	**1** 0.039	**100.3** 3.949	**32** 1.26	GC 90	GCL 90	**65.1** 14600	**144** 32400	**47.1** 10600	**88.8** 20000	**115** 25900	**450** 3980	870	**14**	**8** 0.315	**2.287** 5.042

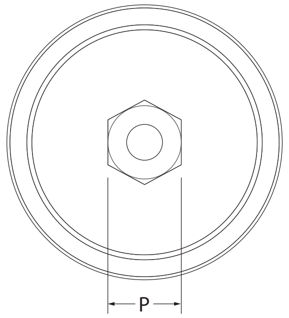
FULL COMPLEMENT, WITH METAL SEALS, STUD-TYPE (GCU...MM SERIES)

METRIC SERIES

GCU: crowned outer ring
GCUL: cylindrical outer ring



GCU, GCUL



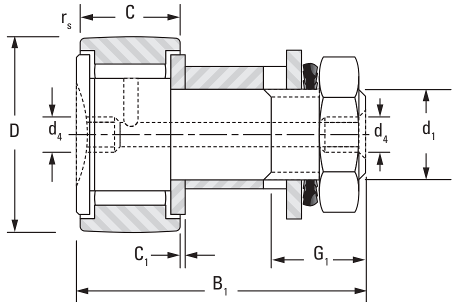
Hex Socket Roller End

Outer Dia.	D	d_1	C	C_1	B_1	G_1	$r_{s\,min.}$	Crowned Designation	Cylindrical Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Wrench	B_2	B_3	d_4	M	Approx. Wt.
										As a Bearing		As a Track Roller										
										Dynamic	Static	Dynamic		Static								
										C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$			P					
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN lbf			N-m lb-in	min^{-1}	mm	mm in	mm in	mm in	mm in	kg lbs
35 1.3780	**35** 1.3780	**16** 0.6299	**18** 0.709	**0.85** 0.033	**52.3** 2.059	**17** 0.669	**0.6** 0.024	GCU 35 MM	GCUL 35 MM	**26.4** 5930	**32.4** 7280	**15.4** 3460	**7.25** 1630	**13.1** 2940	**64** 566	2200	**10**	**32.8** 1.291	**8** 0.315	**6** 0.236	**26.0** 1.024	**0.200** 0.441
40 1.5748	**40** 1.5748	**18** 0.7087	**20** 0.787	**0.85** 0.033	**58.3** 2.295	**19** 0.748	**1.0** 0.039	GCU 40 MM	GCUL 40 MM	**26.4** 5930	**32.4** 7280	**18.7** 4200	**12.1** 2720	**21.8** 4900	**90** 797	2200	**12**	**36.8** 1.449	**8** 0.315	**6** 0.236	**28.6** 1.126	**0.289** 0.637
47 1.8504	**47** 1.8504	**20** 0.7874	**24** 0.945	**0.85** 0.033	**66.3** 2.610	**21** 0.827	**1.0** 0.039	GCU 47 MM	GCUL 47 MM	**43.8** 9850	**57.9** 13000	**26.7** 6000	**14.3** 3210	**25.8** 5800	**120** 1060	1600	**14**	**40.8** 1.606	**9** 0.354	**6** 0.236	**33.6** 1.323	**0.450** 0.992
52 2.0472	**52** 2.0472	**20** 0.7874	**24** 0.945	**0.85** 0.033	**66.3** 2.610	**21** 0.827	**1.0** 0.039	GCU 52 MM	GCUL 52 MM	**43.8** 9850	**57.9** 13000	**30.6** 6880	**21.2** 4770	**38.2** 8590	**120** 1060	1600	**14**	**40.8** 1.606	**9** 0.354	**6** 0.236	**33.6** 1.323	**0.520** 1.146
62 2.4409	**62** 2.4409	**24** 0.9449	**29** 1.142	**0.85** 0.033	**80.3** 3.161	**25** 0.984	**1.0** 0.039	GCU 62 MM	GCUL 62 MM	**63.7** 14300	**87.4** 19600	**44.1** 9910	**30.9** 6950	**55.6** 12500	**220** 1950	1400	**12**	**49.8** 1.961	**11** 0.433	**6** 0.236	**38.9** 1.531	**0.910** 2.006
72 2.8346	**72** 2.8346	**24** 0.9449	**29** 1.142	**0.85** 0.033	**80.3** 3.161	**25** 0.984	**1.1** 0.043	GCU 72 MM	GCUL 72 MM	**63.7** 14300	**87.4** 19600	**50.8** 11400	**52.7** 11800	**84.1** 18900	**220** 1950	1400	**12**	**49.8** 1.961	**11** 0.433	**6** 0.236	**38.9** 1.531	**1.140** 2.513
80 3.1496	**80** 3.1496	**30** 1.1811	**35** 1.378	**1.10** 0.043	**100.3** 3.949	**32** 1.260	**1.1** 0.043	GCU 80 MM	GCUL 80 MM	**100** 22500	**140** 31500	**66.8** 15000	**43.8** 9850	**78.8** 17700	**450** 3980	1000	**14**	**63.3** 2.492	**15** 0.591	**8** 0.315	**51.8** 2.039	**1.870** 4.123
90 3.5433	**90** 3.5433	**30** 1.1811	**35** 1.378	**1.10** 0.043	**100.3** 3.949	**32** 1.260	**1.1** 0.043	GCU 90 MM	GCUL 90 MM	**100** 22500	**140** 31500	**75.8** 17000	**68.1** 15300	**122** 27400	**450** 3980	1000	**14**	**63.3** 2.492	**15** 0.591	**8** 0.315	**51.8** 2.039	**2.230** 4.914
100 3.9370	**100** 3.9370	**36** 1.4173	**40** 1.575	**1.10** 0.043	**117.3** 4.618	**38** 1.496	**2.0** 0.079	GCU 100 MM	GCUL 100 MM	**115** 25900	**175** 39300	**82.1** 18500	**76.6** 17200	**135** 30300	**740** 6550	840	**17**	**75.3** 2.965	**20** 0.787	**8** 0.315	**61.0** 2.402	**3.290** 7.253
110 4.3307	**110** 4.3307	**36** 1.4173	**40** 1.575	**1.10** 0.043	**117.3** 4.618	**38** 1.496	**2.0** 0.079	GCU 110 MM	GCUL 110 MM	**115** 25900	**175** 39300	**89.7** 20200	**107** 24100	**161** 36200	**740** 6550	840	**17**	**75.3** 2.965	**20** 0.787	**8** 0.315	**61.0** 2.402	**3.800** 8.378
120 4.7244	**120** 4.7244	**42** 1.6535	**46** 1.811	**1.10** 0.043	**136.3** 5.366	**44** 1.732	**2.0** 0.079	GCU 120 MM	GCUL 120 MM	**167** 37500	**240** 54000	**124** 27900	**107** 24100	**193** 43400	**1 200** 10620	740	**19**	**88.3** 3.476	**24** 0.945	**8** 0.315	**71.0** 2.795	**5.422** 11.953
130 5.1181	**130** 5.1181	**42** 1.6535	**46** 1.811	**1.10** 0.043	**136.3** 5.366	**44** 1.732	**2.0** 0.079	GCU 130 MM	GCUL 130 MM	**167** 37500	**240** 54000	**133** 30000	**142** 31900	**228** 51300	**1 200** 10620	740	**19**	**88.3** 3.476	**24** 0.945	**8** 0.315	**71.0** 2.795	**5.780** 12.743

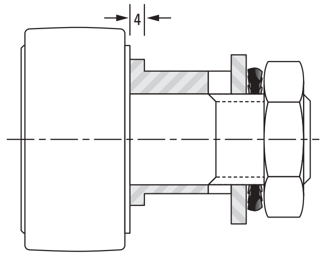
FULL COMPLEMENT, ECCENTRIC, STUD-TYPE (GCR SERIES)

METRIC SERIES

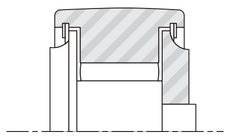
GCR: crowned outer ring
GCRL: cylindrical outer ring
EE: polymer shields
EEM: metal shields



GCR 16-52



GCR 62-90



GCR..EE, GCR..EEM
GCRL..EE, GCRL..EEM

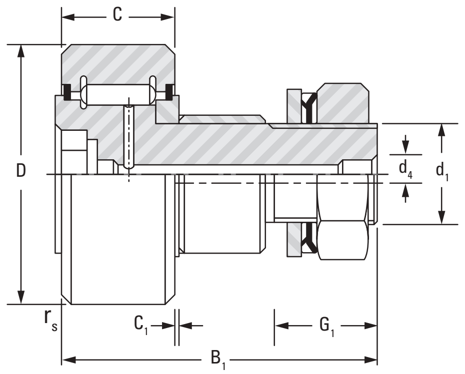
Outer Dia.	D	d_1	C	C_1	B_1	G_1	$r_{s\,min.}$	Crowned Designation	Cylindrical Designation
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		
16 0.6299	**16** 0.6299	**6** 0.2362	**11** 0.433	**0.60** 0.024	**28.3** 1.114	**8** 0.315	**0.3** 0.012	GCR 16	
19 0.748	**19** 0.748	**8** 0.315	**11** 0.433	**0.60** 0.024	**32.3** 1.272	**10** 0.394	**0.3** 0.012	GCR 19	
22 0.8661	**22** 0.8661	**10** 0.3937	**12** 0.472	**0.60** 0.024	**36.3** 1.429	**12** 0.472	**0.3** 0.012	GCR 22	GCRL 22
24 0.9449	**24** 0.9449	**10** 0.3937	**12** 0.472	**0.60** 0.024	**36.3** 1.429	**12** 0.472	**0.3** 0.012	GCR 24	
26 1.0236	**26** 1.0236	**10** 0.3937	**12** 0.472	**0.60** 0.024	**36.3** 1.429	**12** 0.472	**0.3** 0.012	GCR 26	GCRL 26
28 1.1024	**28** 1.1024	**10** 0.3937	**12** 0.472	**0.60** 0.024	**36.3** 1.429	**12** 0.472	**0.3** 0.012	GCR 28	GCRL 28
30 1.1811	**30** 1.1811	**12** 0.4724	**14** 0.551	**0.60** 0.024	**40.3** 1.587	**13** 0.512	**0.6** 0.024	GCR 30	GCRL 30
32 1.2598	**32** 1.2598	**12** 0.4724	**14** 0.551	**0.60** 0.024	**40.3** 1.587	**13** 0.512	**0.6** 0.024	GCR 32	GCRL 32
35 1.378	**35** 1.378	**16** 0.6299	**18** 0.709	**0.80** 0.031	**52.3** 2.059	**17** 0.669	**0.6** 0.024	GCR 35	GCRL 35
40 1.5748	**40** 1.5748	**18** 0.7087	**20** 0.787	**0.80** 0.709	**58.3** 2.295	**19** 0.748	**1** 0.039	GCR 40	GCRL 40
47 1.8504	**47** 1.8504	**20** 0.7874	**24** 0.945	**0.80** 0.709	**66.3** 2.61	**21** 0.827	**1** 0.039	GCR 47 EE	GCRL 47
52 2.0472	**52** 2.0472	**20** 0.7874	**24** 0.945	**0.80** 0.709	**66.3** 2.61	**21** 0.827	**1** 0.039	GCR 52	GCRL 52
62 2.4409	**62** 2.4409	**24** 0.9449	**29** 1.142	**0.80** 0.709	**80.3** 3.161	**25** 0.984	**1** 0.039	GCR 62	GCRL 62
72 2.8346	**72** 2.8346	**24** 0.9449	**29** 1.142	**0.80** 0.709	**80.3** 3.161	**25** 0.984	**1** 0.039	GCR 72	GCRL 72
80 3.1496	**80** 3.1496	**30** 1.1811	**35** 1.378	**1.00** 0.039	**100.3** 3.949	**32** 1.26	**1** 0.039	GCR 80	
90 3.5433	**90** 3.5433	**30** 1.1811	**35** 1.378	**1.00** 0.039	**100.3** 3.949	**32** 1.26	**1** 0.039	GCR 90	GCRL 90

Crowned Designation	Load Ratings					Tightening Torque	Speed Rating Grease	d_4	Approx. Wt.
	As a Bearing		As a Track Roller						
	Dynamic	Static	Dynamic		Static				
	C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$				
	kN lbf		kN lbf			N-m lb-in	min^{-1}	mm in	kg lbs
GCR 16	**5.66** 1270	**6.51** 1460	**4.19** 942	**2.79** 627	**5.02** 1130	**2** 17.7	5700	**4** 0.157	**0.024** 0.053
GCR 19	**6.44** 1450	**8.15** 1830	**4.65** 1050	**3** 785	**6.28** 1410	**5** 44.3	4400	**4** 0.157	**0.039** 0.086
GCR 22	**7.3** 1640	**10.2** 2290	**5.05** 1140	**4.07** 915	**7.33** 1650	**16** 142	3500	**4** 0.157	**0.057** 0.126
GCR 24	**7.3** 1640	**10.2** 2290	**5.45** 1230	**5.42** 1220	**8.63** 1940	**16** 142	3500	**4** 0.157	**0.072** 0.159
GCR 26	**9.92** 2230	**12.9** 2900	**7.09** 1590	**5.43** 1220	**9.77** 2200	**16** 142	3200	**4** 0.157	**0.080** 0.176
GCR 28	**9.92** 2230	**12.9** 2900	**7.57** 1700	**6.95** 1560	**11.4** 2560	**16** 142	3200	**4** 0.157	**0.088** 0.194
GCR 30	**15.5** 3480	**20.4** 4590	**11.2** 2520	**8.48** 1910	**15.3** 3440	**22** 195	2900	**4** 0.157	**0.118** 0.260
GCR 32	**15.5** 3480	**20.4** 4590	**11.8** 2650	**10.6** 2380	**18.1** 4070	**22** 195	2900	**4** 0.157	**0.126** 0.278
GCR 35	**23.6** 5310	**33.1** 7440	**15.7** 3530	**10.8** 2430	**19.4** 4360	**55** 487	2200	**6** 0.236	**0.220** 0.485
GCR 40	**29.9** 6720	**48** 10800	**18.5** 4160	**13.8** 3100	**24.8** 5580	**75** 664	1800	**6** 0.236	**0.321** 0.708
GCR 47 EE	**36.5** 8210	**65.5** 14700	**22.5** 5060	**20.2** 4540	**36.4** 8180	**100** 885	1400	**6** 0.236	**0.500** 1.102
GCR 52	**36.5** 8210	**65.5** 14700	**25.2** 5670	**28** 6290	**47.5** 10700	**100** 885	1400	**6** 0.236	**0.568** 1.252
GCR 62	**43.3** 9730	**85.6** 19200	**30.5** 6860	**42.9** 9640	**64.7** 14500	**180** 1590	1200	**8** 0.315	**1.035** 2.282
GCR 72	**43.3** 9730	**85.6** 19200	**33.9** 7620	**65.8** 14800	**79.5** 17900	**180** 1590	1200	**8** 0.315	**1.278** 2.818
GCR 80	**65.1** 14600	**144** 32400	**42.7** 9600	**62.9** 14100	**95.3** 21400	**370** 3270	870	**8** 0.315	**2.074** 4.572
GCR 90	**65.1** 14600	**144** 32400	**47.1** 10600	**88.8** 20000	**115** 25900	**370** 3270	870	**8** 0.315	**2.435** 5.368

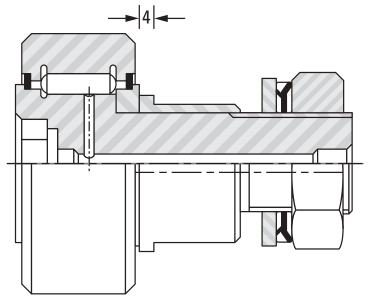
FULL COMPLEMENT, ECCENTRIC, WITH METAL SEALS, STUD-TYPE (GCUR...MM SERIES)

METRIC SERIES

GCUR: crowned outer ring
GCURL: cylindrical outer ring



GCUR 35-52



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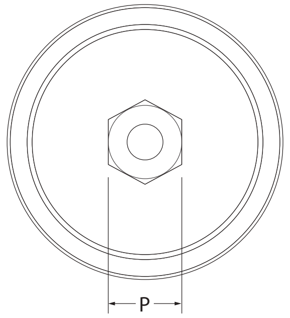
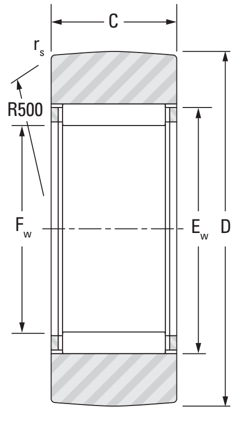


Hex Socket Roller End

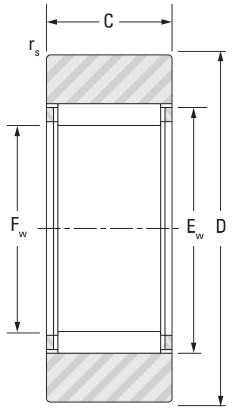
Outer Dia.	D	d_1	C	C_1	B_1	G_1	$r_{s\,min.}$	Crowned Designation	Cylindrical Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Wrench	d_4	Approx. Wt.
										As a Bearing		As a Track Roller							
										Dynamic	Static	Dynamic		Static					
										C	C_o	C_w	$F_{r\ perm}$	$F_{0r\ perm}$			P		
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN lbf			N-m lb-in	min^{-1}	mm	mm in	kg lbs
35 1.3780	35 1.3780	16 0.6299	18 0.709	0.85 0.033	52.3 2.059	17 0.669	0.6 0.024	GCUR 35 MM		26.4 5930	32.4 7280	15.4 3460	7.25 1630	13.1 2940	55 487	2200	10	6 0.236	0.215 0.474
40 1.5748	40 1.5748	18 0.7087	20 0.787	0.85 0.033	58.3 2.295	19 0.748	1.0 0.039		GCURL 40 MM	26.4 5930	32.4 7280	18.7 4200	12.1 2720	21.8 4900	75 664	2200	12	6 0.236	0.313 0.690
52 2.0472	52 2.0472	20 0.7874	24 0.945	0.85 0.033	66.3 2.610	21 0.827	1.0 0.039	GCUR 52 MM		43.8 9850	57.9 13000	30.6 6880	21.2 4770	38.2 8590	100 885	1600	14	6 0.236	0.555 1.224
62 2.4409	62 2.4409	24 0.9449	29 1.142	0.85 0.033	80.3 3.161	25 0.984	1.0 0.039	GCUR 62 MM		63.7 14300	87.4 19600	44.1 9910	30.9 6950	55.6 12500	180 1593	1400	12	6 0.236	1.022 2.253
72 2.8346	72 2.8346	24 0.9449	29 1.142	0.85 0.033	80.3 3.161	25 0.984	1.1 0.043	GCUR 72 MM		63.7 14300	87.4 19600	50.8 11400	52.7 11800	84.1 18900	180 1593	1400	12	6 0.236	0.113 0.249
80 3.1496	80 3.1496	30 1.1811	35 1.378	1.10 0.043	100.3 3.949	32 1.260	1.1 0.043	GCUR 80 MM		100 22500	140 31500	66.8 15000	43.8 9850	78.8 17700	370 3275	1000	14	8 0.315	0.182 0.401
90 3.5433	90 3.5433	30 1.1811	35 1.378	1.10 0.043	100.3 3.949	32 1.260	1.1 0.043	GCUR 90 MM		100 22500	140 31500	75.8 17000	68.1 15300	122 27400	370 3275	1000	14	8 0.315	0.182 0.401
100 3.9370	100 3.9370	36 1.4173	40 1.575	1.10 0.043	117.3 4.618	38 1.496	2.0 0.079	GCUR 100 MM		115 25900	175 39300	82.1 18500	76.6 17200	135 30300	610 5399	840	17	8 0.315	0.244 0.539
110 4.3307	110 4.3307	36 1.4173	40 1.575	1.10 0.043	117.3 4.618	38 1.496	2.0 0.079	GCUR 110 MM		115 25900	175 39300	89.7 20200	107 24100	161 36200	610 5399	840	17	8 0.315	0.245 0.540
120 4.7244	120 4.7244	42 1.6535	46 1.811	1.10 0.043	136.3 5.366	44 1.732	2.0 0.079	GCUR 120 MM		167 37500	240 54000	124 27900	107 24100	193 43400	1000 8851	740	19	8 0.315	0.328 0.724
130 5.1181	130 5.1181	42 1.6535	46 1.811	1.10 0.043	136.3 5.366	44 1.732	2.0 0.079	GCUR 130 MM		167 37500	240 54000	133 30000	142 31900	228 51300	1000 8851	740	19	8 0.315	0.329 0.725

CAGED, WITHOUT INNER RING, NO END WASHERS, YOKE-TYPE (RSTO SERIES)

METRIC SERIES



RSTO

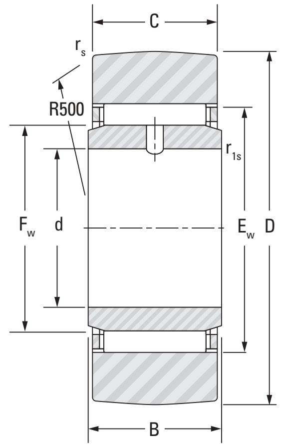


RSTO.DZ

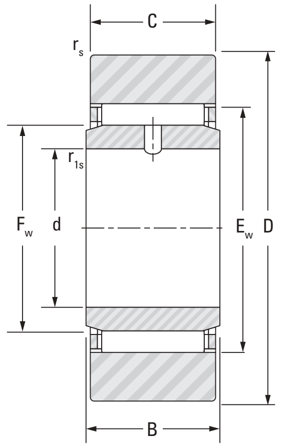
Outer Dia.	D	C	F_w	E_w	$r_{s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
						Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
								Dynamic	Static	Dynamic		Static		
								C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
16 0.6299	**16** 0.6299	**7.8** 0.307	**7** 0.2756	**10** 0.394	**0.3** 0.012	RSTO5A.TN	RSTO5ADZ.TN	**2.74** 616	**2.44** 549	**2.49** 560	**2.97** 668	**2.44** 549	19000	**0.009** 0.020
19 0.7480	**19** 0.7480	**9.8** 0.386	**10** 0.3937	**13** 0.512	**0.3** 0.012	RSTO6	RSTO6DZ	**5.40** 1210	**6.43** 1450	**4.15** 933	**4.04** 908	**5.63** 1270	13000	**0.014** 0.031
24 0.9449	**24** 0.9449	**9.8** 0.386	**12** 0.4724	**15** 0.591	**0.3** 0.012	RSTO8	RSTO8DZ	**5.85** 1320	**7.51** 1690	**4.79** 1080	**6.67** 1500	**7.44** 1670	10000	**0.023** 0.051
30 1.1811	**30** 1.1811	**11.8** 0.465	**14** 0.5512	**20** 0.787	**0.3** 0.012	RSTO10	RSTO10DZ	**10.40** 2340	**10.6** 2380	**8.62** 1940	**7.69** 1730	**10.6** 2380	9400	**0.044** 0.097
32 1.2598	**32** 1.2598	**11.8** 0.465	**16** 0.6299	**22** 0.866	**0.3** 0.012	RSTO12	RSTO12DZ	**11.20** 2520	**11.9** 2680	**8.80** 1980	**7.65** 1720	**10.9** 2450	8100	**0.049** 0.108
35 1.3780	**35** 1.3780	**11.8** 0.465	**20** 0.7874	**26** 1.024	**0.3** 0.012	RSTO15	RSTO15DZ	**12.90** 2900	**15.3** 3440	**9.13** 2050	**6.95** 1560	**11.2** 2520	6300	**0.052** 0.115
40 1.5748	**40** 1.5748	**15.8** 0.622	**22** 0.8661	**29** 1.142	**0.3** 0.012	RSTO17	RSTO17DZ	**19.00** 4270	**23.3** 5240	**13.8** 3100	**11.4** 2560	**18.2** 4090	5800	**0.095** 0.209
47 1.8504	**47** 1.8504	**15.8** 0.622	**25** 0.9843	**32** 1.260	**0.3** 0.012	RSTO20	RSTO20DZ	**20.00** 4500	**25.3** 5690	**15.3** 3440	**16.5** 3710	**22.2** 4990	5000	**0.134** 0.295
52 2.0472	**52** 2.0472	**15.8** 0.622	**30** 1.1811	**37** 1.457	**0.3** 0.012	RSTO25	RSTO25DZ	**22.40** 5040	**31.0** 6970	**16.0** 3600	**16.9** 3800	**23.7** 5330	4100	**0.155** 0.342
62 2.4409	**62** 2.4409	**19.8** 0.780	**38** 1.4961	**46** 1.811	**0.6** 0.024	RSTO30	RSTO30DZ	**33.30** 7490	**51.0** 11470	**22.3** 5010	**23.2** 5220	**34.2** 7690	3200	**0.258** 0.569
72 2.8346	**72** 2.8346	**19.8** 0.780	**42** 1.6535	**50** 1.969	**0.6** 0.024	RSTO35	RSTO35DZ	**35.20** 7910	**56.6** 12720	**25.2** 5670	**33.3** 7490	**43.0** 9670	2900	**0.37** 0.816
80 3.1496	**80** 3.1496	**19.8** 0.780	**50** 1.9685	**58** 2.283	**0.6** 0.024	RSTO40	RSTO40DZ	**38.80** 8720	**67.8** 15240	**25.9** 5820	**34.7** 7800	**45.0** 10120	2400	**0.430** 0.948
85 3.3465	**85** 3.3465	**19.8** 0.780	**55** 2.1654	**63** 2.480	**0.6** 0.024	RSTO45		**40.30** 9060	**73.5** 16520	**26.0** 5850	**35.8** 8050	**45.5** 10230	2200	**0.447** 0.985
90 3.5433	**90** 3.5433	**19.8** 0.780	**60** 2.3622	**68** 2.677	**0.6** 0.024	RSTO50		**41.80** 9400	**79.2** 17800	**26.0** 5850	**37.1** 8340	**45.8** 10300	2000	**0.495** 1.091

CAGED, WITH INNER RING, NO END WASHERS YOKE-TYPE (STO SERIES)

METRIC SERIES



STO

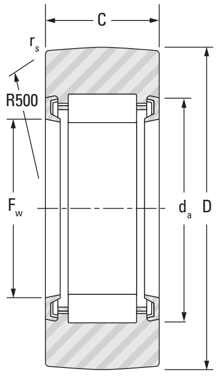


STO.DZ

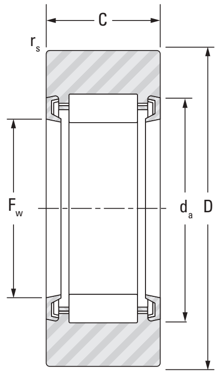
Outer Dia.	D	d	B	C	F_w	E_w	r_s	$r_{1s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
									Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
											Dynamic	Static	Dynamic		Static		
											C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
19 0.7480	**19** 0.7480	**6** 0.2362	**10** 0.394	**9.8** 0.386	**10** 0.3937	**13** 0.5118	**0.3** 0.012	**0.3** 0.012	STO6	STO6DZ	**5.40** 1210	**6.43** 1450	**4.15** 933	**4.04** 908	**5.63** 1270	9400	**0.018** 0.040
24 0.9449	**24** 0.9449	**8** 0.3150	**10** 0.394	**9.8** 0.386	**12** 0.4724	**15** 0.5906	**0.3** 0.012	**0.3** 0.012	STO8	STO8DZ	**5.85** 1320	**7.51** 1690	**4.79** 1080	**6.67** 1500	**7.44** 1670	8100	**0.028** 0.062
30 1.1811	**30** 1.1811	**10** 0.3937	**12** 0.472	**11.8** 0.465	**14** 0.5512	**20** 0.7874	**0.3** 0.012	**0.3** 0.012	STO10	STO10DZ	**10.4** 2340	**10.6** 2380	**8.62** 1940	**7.69** 1730	**10.6** 2380	6300	**0.065** 0.143
32 1.2598	**32** 1.2598	**12** 0.4724	**12** 0.472	**11.8** 0.465	**16** 0.6299	**22** 0.8661	**0.3** 0.012	**0.3** 0.012	STO12	STO12DZ	**11.2** 2520	**11.9** 2680	**8.80** 1980	**7.65** 1720	**10.9** 2450	5800	**0.114** 0.251
35 1.3780	**35** 1.3780	**15** 0.5906	**12** 0.472	**11.8** 0.465	**20** 0.7874	**26** 1.0236	**0.3** 0.012	**0.3** 0.012	STO15	STO15DZ	**12.9** 2900	**15.3** 3440	**9.13** 2050	**6.95** 1560	**11.2** 2520	5000	**0.065** 0.143
40 1.5748	**40** 1.5748	**17** 0.6693	**16** 0.630	**15.8** 0.622	**22** 0.8661	**29** 1.1417	**0.3** 0.012	**0.3** 0.012	STO17	STO17DZ	**19.1** 4290	**23.3** 5240	**13.8** 3100	**11.4** 2560	**18.2** 4090	4100	**0.114** 0.251
47 1.8504	**47** 1.8504	**20** 0.7874	**16** 0.630	**15.8** 0.622	**25** 0.9843	**32** 1.2598	**0.3** 0.012	**0.3** 0.012	STO20	STO20DZ	**19.8** 4450	**25.3** 5690	**15.3** 3440	**16.5** 3710	**22.2** 4990	3200	**0.160** 0.353
52 2.0472	**52** 2.0472	**25** 0.9843	**16** 0.630	**15.8** 0.622	**30** 1.1811	**37** 1.4567	**0.3** 0.012	**0.3** 0.012	STO25	STO25DZ	**22.4** 5040	**31.0** 6970	**16.0** 3600	**16.9** 3800	**23.7** 5330	2900	**0.435** 0.959
62 2.4409	**62** 2.4409	**30** 1.1811	**20** 0.787	**19.8** 0.780	**38** 1.4961	**46** 1.8110	**0.6** 0.024	**0.6** 0.024	STO30	STO30DZ	**33.3** 7490	**51.0** 11470	**22.3** 5010	**23.2** 5220	**34.2** 7690	2400	**0.325** 0.717
72 2.8346	**72** 2.8346	**35** 1.3780	**20** 0.787	**19.8** 0.780	**42** 1.6535	**50** 1.9685	**0.6** 0.024	**0.6** 0.024	STO35	STO35DZ	**35.2** 7910	**56.6** 12720	**25.2** 5670	**33.3** 7490	**43.0** 9670	2200	**0.435** 0.959
80 3.1496	**80** 3.1496	**40** 1.5748	**20** 0.787	**19.8** 0.780	**50** 1.9685	**58** 2.2835	**0.6** 0.024	**1.0** 0.039	STO40	STO40DZ	**38.8** 8720	**67.8** 15240	**25.9** 5820	**34.7** 7800	**45.0** 10120	2400	**0.540** 1.190
85 3.3465	**85** 3.3465	**45** 1.7717	**20** 0.787	**19.8** 0.780	**55** 2.1654	**63** 2.4803	**0.6** 0.024	**1.0** 0.039	STO45	STO45DZ	**40.3** 9060	**73.5** 16520	**26.0** 5850	**35.8** 8050	**45.5** 10230	2200	**0.580** 1.279
90 3.5433	**90** 3.5433	**50** 1.9685	**20** 0.787	**19.8** 0.780	**60** 2.3622	**68** 2.6772	**0.6** 0.024	**1.0** 0.039	STO50	STO50DZ	**41.8** 9400	**79.2** 17800	**26.0** 5850	**37.1** 8340	**45.8** 10300	2000	**0.650** 1.433

CAGED, WITHOUT INNER RING, NO END WASHERS, SEALED, YOKE-TYPE (RNA22 SERIES)

METRIC SERIES



RNA22.2RS

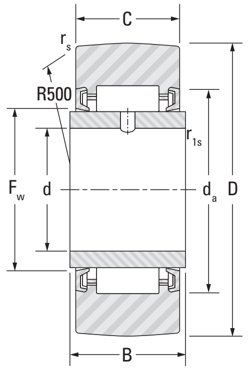


RNA22.2RS.DZ

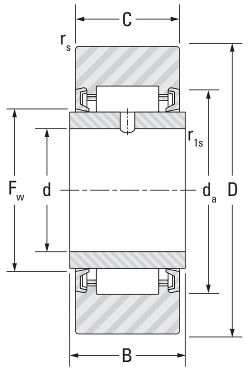
Outer Dia.	D	C	F_w	d_a	$r_{s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
						Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
								Dynamic	Static	Dynamic		Static		
								C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN lbf			min^{-1}	kg lbs
19 0.7480	19 0.7480	11.8 0.465	10 0.3937	14 0.551	0.3 0.012	RNA22/6.2RS	RNA22/6.2RS.DZ	4.70 1060	5.43 1220	4.13 928	3.06 688	4.59 1030	13000	0.014 0.031
24 0.9449	24 0.9449	11.8 0.465	12 0.4724	18 0.709	0.3 0.012	RNA22/8.2RS	RNA22/8.2RS.DZ	6.70 1510	6.08 1370	5.31 1190	3.37 758	5.22 1170	11000	0.025 0.055
30 1.1811	30 1.1811	13.8 0.543	14 0.5512	20 0.787	0.6 0.024	RNA2200.2RS	RNA2200.2RS.DZ	8.50 1910	9.45 2120	8.03 1810	7.85 1760	9.45 2120	9400	0.049 0.108
32 1.2598	32 1.2598	13.8 0.543	16 0.6299	22 0.866	0.6 0.024	RNA2201.2RS	RNA2201.2RS.DZ	9.00 2020	10.5 2360	8.2 1840	7.78 1750	10.1 2270	8100	0.053 0.117
35 1.3780	35 1.3780	13.8 0.543	20 0.7874	27 1.063	0.6 0.024	RNA2202.2RS	RNA2202.2RS.DZ	12.2 2740	14.5 3260	9.24 2080	6.00 1350	10.2 2290	6300	0.055 0.121
40 1.5748	40 1.5748	15.8 0.622	22 0.8661	30 1.181	1.0 0.039	RNA2203.2RS	RNA2203.2RS.DZ	16.3 3660	17.8 4000	11.9 2680	8.50 1910	13.7 3080	5900	0.090 0.198
47 1.8504	47 1.8504	17.8 0.701	25 0.9843	35 1.378	1.0 0.039	RNA2204.2RS	RNA2204.2RS.DZ	19.6 4410	20.2 4540	14.8 3330	11.0 2470	16.7 3750	5200	0.150 0.331
52 2.0472	52 2.0472	17.8 0.701	30 1.1811	40 1.575	1.0 0.039	RNA2205.2RS	RNA2205.2RS.DZ	21.6 4860	24.3 5460	15.5 3480	11.3 2540	17.7 3980	4300	0.171 0.377
62 2.4409	62 2.4409	19.8 0.780	35 1.3780	47 1.850	1.0 0.039	RNA2206.2RS	RNA2206.2RS.DZ	29.0 6520	32.8 7370	21.2 4770	15.8 3550	24.8 5580	3700	0.285 0.628
72 2.8346	72 2.8346	22.8 0.898	42 1.6535	54 2.126	1.1 0.043	RNA2207.2RS	RNA2207.2RS.DZ	40.5 9100	52.5 11800	28.6 6430	24.2 5440	37.9 8520	3000	0.490 1.080
80 3.1496	80 3.1496	22.8 0.898	48 1.8898	60 2.362	1.1 0.043	RNA2208.2RS	RNA2208.2RS.DZ	44.0 9890	60.0 13490	30.4 6830	27.8 6250	42.0 9440	2600	0.515 1.135
85 3.3465	85 3.3465	22.8 0.898	52 2.0472	64 2.520	1.1 0.043	RNA2209.2RS	RNA2209.2RS.DZ	45.6 10250	63.9 14370	30.9 6950	29.7 6680	43.7 9820	2400	0.565 1.246
90 3.5433	90 3.5433	22.8 0.898	58 2.2835	70 2.756	1.1 0.043	RNA2210.2RS	RNA2210.2RS.DZ	48.5 10900	71.3 16030	31.0 6970	29.4 6610	43.4 9760	2100	0.590 1.301

CAGED, WITH INNER RING, NO END WASHERS, SEALED, YOKE-TYPE (NA22 SERIES)

METRIC SERIES



NA22.2RS

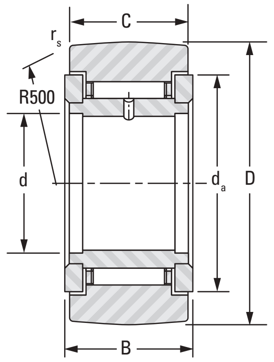


NA22.2RS.DZ

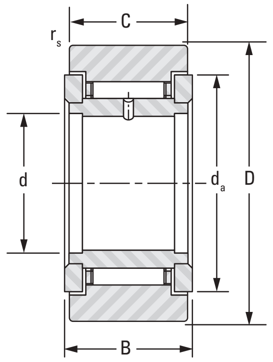
Outer Dia.	D	d	B	C	F_w	d_a	r_s	$r_{1s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
									Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
											Dynamic	Static	Dynamic		Static		
											C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN lbf			min^{-1}	kg lbs
19 0.7480	19 0.7480	6 0.2362	12 0.472	11.8 0.465	10 0.3937	14 0.5512	0.3 0.012	0.3 0.012	NA22/6.2RS	NA22/6.2RS.DZ	4.70 1060	5.43 1220	4.13 928	3.06 688	4.59 1030	13000	0.018 0.040
24 0.9449	24 0.9449	8 0.3150	12 0.472	11.8 0.465	12 0.4724	18 0.7087	0.3 0.012	0.3 0.012	NA22/8.2RS	NA22/8.2RS.DZ	6.70 1510	6.08 1370	5.31 1190	3.37 758	5.22 1170	11000	0.031 0.068
30 1.1811	30 1.1811	10 0.3937	14 0.551	13.8 0.543	14 0.5512	20 0.7874	0.6 0.024	0.3 0.012	NA2200.2RS	NA2200.2RS.DZ	8.50 1910	9.45 2120	8.03 1810	7.85 1760	9.45 2120	9400	0.057 0.126
32 1.2598	32 1.2598	12 0.4724	14 0.551	13.8 0.543	16 0.6299	22 0.8661	0.6 0.024	0.3 0.012	NA2201.2RS	NA2201.2RS.DZ	9.00 2020	10.5 2360	8.20 1840	7.78 1750	10.1 2270	8100	0.063 0.139
35 1.3780	35 1.3780	15 0.5906	14 0.551	13.8 0.543	20 0.7874	27 1.0630	0.6 0.024	0.3 0.012	NA2202.2RS	NA2202.2RS.DZ	12.2 2740	14.5 3260	9.24 2080	6.00 1350	10.2 2290	6300	0.070 0.154
40 1.5748	40 1.5748	17 0.6693	16 0.630	15.8 0.622	22 0.8661	30 1.1811	1.0 0.039	0.3 0.012	NA2203.2RS	NA2203.2RS.DZ	16.3 3660	17.8 4000	11.9 2680	8.50 1910	13.7 3080	5900	0.107 0.236
47 1.8504	47 1.8504	20 0.7874	18 0.709	17.8 0.701	25 0.9843	35 1.3780	1.0 0.039	0.3 0.012	NA2204.2RS	NA2204.2RS.DZ	19.6 4410	20.2 4540	14.8 3330	11.0 2470	16.7 3750	5200	0.175 0.386
52 2.0472	52 2.0472	25 0.9843	18 0.709	17.8 0.701	30 1.1811	40 1.5748	1.0 0.039	0.3 0.012	NA2205.2RS	NA2205.2RS.DZ	21.6 4860	24.3 5460	15.5 3480	11.3 2540	17.7 3980	4300	0.202 0.445
62 2.4409	62 2.4409	30 1.1811	20 0.787	19.8 0.780	35 1.3780	47 1.8504	1.0 0.039	0.3 0.012	NA2206.2RS	NA2206.2RS.DZ	29.0 6520	32.8 7370	21.2 4770	15.8 3550	24.8 5580	3700	0.324 0.714
72 2.8346	72 2.8346	35 1.3780	23 0.906	22.8 0.898	42 1.6535	54 2.1260	1.1 0.043	0.6 0.024	NA2207.2RS	NA2207.2RS.DZ	40.5 9100	52.5 11800	28.6 6430	24.2 5440	37.9 8520	3000	0.490 1.080
80 3.1496	80 3.1496	40 1.5748	23 0.906	22.8 0.898	48 1.8898	60 2.3622	1.1 0.043	0.6 0.024	NA2208.2RS	NA2208.2RS.DZ	44.0 9890	60.0 13500	30.4 6830	27.8 6250	42.0 9440	2600	0.615 1.356
85 3.3465	85 3.3465	45 1.7717	23 0.906	22.8 0.898	52 2.0472	64 2.5197	1.1 0.043	0.6 0.024	NA2209.2RS	NA2209.2RS.DZ	45.0 10100	63.9 14400	30.9 6950	29.7 6680	43.7 9820	2400	0.661 1.457
90 3.5433	90 3.5433	50 1.9685	23 0.906	22.8 0.898	58 2.2835	70 2.7559	1.1 0.043	0.6 0.024	NA2210.2RS	NA2210.2RS.DZ	48.0 10800	71.3 16000	31.0 6970	29.4 6610	43.4 9760	2100	0.712 1.570

CAGED, WITH INNER RING, WITH END WASHERS, YOKE-TYPE (NATR, STO...ZZ SERIES)

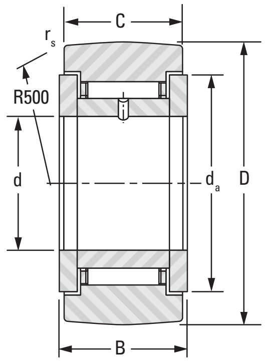
METRIC SERIES



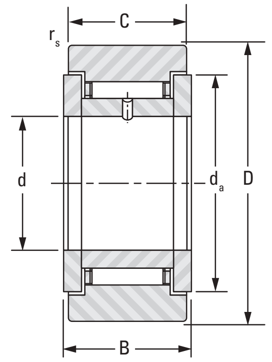
NATR



NATR.DZ



STO.ZZ

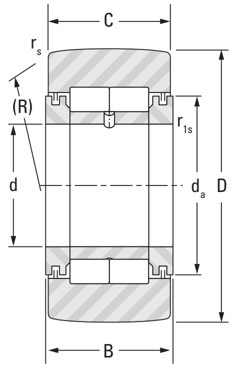


STO.ZZ.DZ

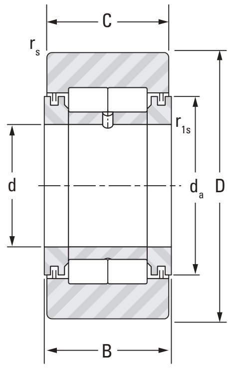
Outer Dia.	D	d	B	C	d_a	$r_{s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
									As a Bearing		As a Track Roller				
							Crowned Track Roller	Cylindrical Track Roller	Dynamic	Static	Dynamic		Static		
									C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN lbf			min^{-1}	kg lbs
16 0.6299	16 0.6299	5 0.1969	12 0.472	11.0 0.433	13 0.512	0.3 0.012	NATR5	NATR5DZ	4.62 1040	5.19 1170	3.34 751	2.62 589	4.01 901	13000	0.017 0.037
19 0.7480	19 0.7480	6 0.2362	12 0.472	11.0 0.433	16 0.630	0.3 0.012	NATR6	NATR6DZ	4.84 1090	5.66 1270	3.84 863	4.28 962	5.28 1190	12000	0.022 0.049
	19 0.7480	6 0.2362	14 0.551	13.8 0.543	15 0.591	0.3 0.012	STO6ZZ	STO6ZZ.DZ	5.37 1210	6.47 1450	4.31 969	5.23 1180	6.17 1390	12000	0.024 0.053
24 0.9449	24 0.9449	8 0.3150	14 0.551	13.8 0.543	18 0.709	0.3 0.012	STO8ZZ	STO8ZZ.DZ	5.82 1310	7.54 1700	4.97 1120	7.54 1700	8.14 1830	9900	0.040 0.088
	24 0.9449	8 0.3150	15 0.591	14.0 0.551	20 0.787	0.3 0.012	NATR8	NATR8DZ	8.39 1890	8.67 1950	6.66 1500	5.79 1300	8.08 1820	10000	0.043 0.095
30 1.1811	30 1.1811	10 0.3937	15 0.591	14.0 0.551	24 0.945	0.6 0.024	NATR10	NATR10DZ	9.57 2150	9.45 2120	8.15 1830	8.58 1930	10.1 2270	9400	0.068 0.150
	30 1.1811	10 0.3937	16 0.630	15.8 0.622	23 0.906	0.3 0.012	STO10ZZ	STO10ZZ.DZ	10.4 2340	10.6 2380	8.94 2010	9.64 2170	11.4 2560	9400	0.071 0.157
32 1.2598	32 1.2598	12 0.4724	15 0.591	14.0 0.551	26 1.024	0.6 0.024	NATR12	NATR12DZ	10.2 2290	10.5 2360	8.32 1870	8.50 1910	10.4 2340	8100	0.075 0.165
	32 1.2598	12 0.4724	16 0.630	15.8 0.622	25 0.984	0.3 0.012	STO12ZZ	STO12ZZ.DZ	11.2 2520	11.9 2680	9.13 2050	9.54 2140	11.7 2630	8100	0.078 0.172
35 1.3780	35 1.3780	15 0.5906	16 0.630	15.8 0.622	30 1.181	0.3 0.012	STO15ZZ	STO15ZZ.DZ	12.9 2900	15.3 3440	9.47 2130	8.52 1920	12.1 2720	6300	0.089 0.196
40 1.5748	40 1.5748	17 0.6693	20 0.787	19.8 0.780	33 1.299	0.3 0.012	STO17ZZ	STO17ZZ.DZ	19.0 4270	23.3 5240	14.2 3190	13.4 3010	19.3 4340	5600	0.145 0.320
47 1.8504	47 1.8504	20 0.7874	20 0.787	19.8 0.780	37 1.457	0.3 0.012	STO20ZZ	STO20ZZ.DZ	20.0 4500	25.4 5710	15.7 3530	19.5 4380	23.5 5280	4900	0.200 0.441
52 2.0472	52 2.0472	25 0.9843	20 0.787	19.8 0.780	42 1.654	0.3 0.012	STO25ZZ	STO25ZZ.DZ	22.4 5040	31.1 6990	16.4 3690	19.8 4450	25.1 5640	4100	0.240 0.529
62 2.4409	62 2.4409	30 1.1811	25 0.984	24.8 0.976	52 2.047	0.6 0.024	STO30ZZ	STO30ZZ.DZ	33.3 7490	51.0 11500	23.0 5170	26.9 6050	36.2 8140	3200	0.412 0.908
72 2.8346	72 2.8346	35 1.3780	25 0.984	24.8 0.976	56 2.205	0.6 0.024	STO35ZZ	STO35ZZ.DZ	35.2 7910	56.6 12700	25.9 5820	39.2 8810	45.5 10200	2900	0.555 1.224
80 3.1496	80 3.1496	40 1.5748	26 1.024	25.8 1.016	64 2.520	0.6 0.024	STO40ZZ	STO40ZZ.DZ	38.8 8720	67.8 15200	26.8 6020	41.5 9330	48.1 10800	2400	0.700 1.543
85 3.3465	85 3.3465	45 1.7717	26 1.024	25.8 1.016	69 2.717	0.6 0.024	STO45ZZ	STO45ZZ.DZ	40.3 9060	73.5 16500	26.9 6050	42.4 9530	48.6 10900	2200	0.770 1.698

FULL COMPLEMENT, WITH INNER RING, WITH END WASHERS, CYLINDRICAL ROLLERS, YOKE-TYPE (NUTR SERIES)

METRIC SERIES



NUTR



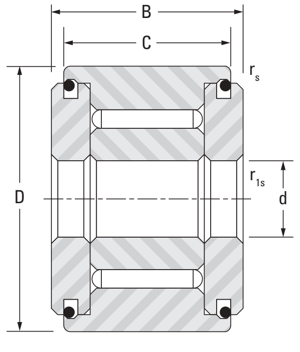
NUTR.DZ

Outer Dia.	D	d	B	C	d_a	r_s	$r_{1s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
										As a Bearing		As a Track Roller				
								Crowned Track Roller	Cylindrical Track Roller	Dynamic	Static	Dynamic		Static		
										C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN lbf			min^{-1}	kg lbs
35 1.3780	35 1.3780	15 0.5906	19 0.748	18 0.709	24 0.945	0.6 0.024	0.3 0.012	NUTR15	NUTR15DZ	24.7 5550	29.3 6590	16.2 3640	10.1 2270	16.1 3620	6100	0.105 0.231
40 1.5748	40 1.5748	17 0.6693	21 0.827	20 0.787	27 1.063	1.0 0.039	0.3 0.012	NUTR17	NUTR17DZ	26.6 5980	33.4 7510	18.7 4200	15.0 3370	23.9 5370	5300	0.154 0.340
42 1.6535	42 1.6535	15 0.5906	19 0.748	18 0.709	24 0.945	0.6 0.024	0.3 0.012	NUTR1542	NUTR1542DZ	22.8 5130	29.4 6610	20.0 4500	21.2 4770	28.4 6380	6100	0.166 0.366
47 1.8504	47 1.8504	17 0.6693	21 0.827	20 0.787	27 1.063	1.0 0.039	0.3 0.012	NUTR1747	NUTR1747DZ	24.5 5510	33.3 7490	22.0 4950	28.1 6320	33.6 7550	5300	0.230 0.507
	47 1.8504	20 0.7874	25 0.984	24 0.945	32 1.260	1.0 0.039	0.3 0.012	NUTR20	NUTR20DZ	39.0 8770	53.2 12000	28.1 6320	20.5 4610	32.7 7350	4500	0.254 0.560
52 2.0472	52 2.0472	20 0.7874	25 0.984	24 0.945	32 1.260	1.0 0.039	0.3 0.012	NUTR2052	NUTR2052DZ	39.0 8770	53.2 12000	31.6 7100	31.0 6970	45.9 10300	4500	0.326 0.719
	52 2.0472	25 0.9843	25 0.984	24 0.945	37 1.457	1.0 0.039	0.3 0.012	NUTR25	NUTR25DZ	43.0 9670	63.1 14200	29.6 6650	22.2 4990	35.4 7960	3700	0.291 0.642
62 2.4409	62 2.4409	25 0.9843	25 0.984	24 0.945	37 1.457	1.0 0.039	0.3 0.012	NUTR2562	NUTR2562DZ	43.0 9670	63.1 14200	36.0 8090	43.9 9870	57.8 13000	3700	0.460 1.014
	62 2.4409	30 1.1811	29 1.142	28 1.102	44 1.732	1.0 0.039	0.3 0.012	NUTR30	NUTR30DZ	60.0 13500	83.1 18700	40.8 9170	29.0 6520	46.2 10400	3200	0.480 1.058
72 2.8346	72 2.8346	30 1.1811	29 1.142	28 1.102	44 1.732	1.0 0.039	0.3 0.012	NUTR3072	NUTR3072DZ	60.0 13500	83.1 18700	48.6 10900	53.2 12000	74.2 16700	3200	0.711 1.567
	72 2.8346	35 1.3780	29 1.142	28 1.102	50 1.969	1.1 0.043	0.6 0.024	NUTR35	NUTR35DZ	65.5 14700	97.8 22000	45.9 10300	38.7 8700	61.7 13900	2600	0.655 1.444
80 3.1496	80 3.1496	35 1.3780	29 1.142	28 1.102	50 1.969	1.1 0.043	0.6 0.024	NUTR3580	NUTR3580DZ	65.5 14700	97.8 22000	51.7 11600	58.7 13200	81.9 18400	2600	0.865 1.907
	80 3.1496	40 1.5748	32 1.260	30 1.181	55 2.165	1.1 0.043	0.6 0.024	NUTR40	NUTR40DZ	88.0 19800	132 29700	60.6 13600	48.0 10800	76.5 17200	2500	0.848 1.870
85 3.3465	85 3.3465	45 1.7717	32 1.260	30 1.181	60 2.362	1.1 0.043	0.6 0.024	NUTR45	NUTR45DZ	93.0 20900	146 32800	62.0 13900	50.2 11300	80.0 18000	2200	0.917 2.022
90 3.5433	90 3.5433	40 1.5748	32 1.260	30 1.181	55 2.165	1.1 0.043	0.6 0.024	NUTR4090	NUTR4090DZ	88.0 19800	132 29700	69.1 15500	75.4 17000	111 25000	2500	1.162 2.562
	90 3.5433	50 1.9685	32 1.260	30 1.181	65 2.559	1.1 0.043	0.6 0.024	NUTR50	NUTR50DZ	98.0 22000	160 36000	63.3 14200	52.9 11900	84.3 19000	2000	0.988 2.178
100 3.9370	100 3.9370	45 1.7717	32 1.260	30 1.181	60 2.362	1.1 0.043	0.6 0.024	NUTR45100	NUTR45100DZ	93.0 20900	146 32800	74.3 16700	92.2 20700	127 28600	2200	1.412 3.113
110 4.3307	110 4.3307	50 1.9685	32 1.260	30 1.181	65 2.559	1.1 0.043	0.6 0.024	NUTR50110	NUTR50110DZ	98.0 22000	160 36000	79.0 17800	110 24700	141 31700	2000	1.727 3.807

FULL COMPLEMENT, NON-SEPARABLE, SMALL SERIES, UNSEALED, YOKE-TYPE (FP SERIES)

METRIC SERIES

FP: crowned outer ring
FPL: cylindrical outer ring



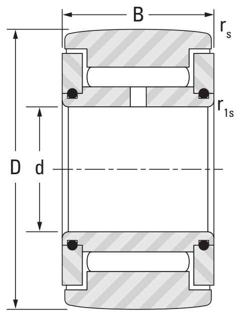
FP, FPL

Outer Dia.	D	d	C	B	$r_{s\,min.}$	$r_{1s\,min.}$	Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
							Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
									Dynamic	Static	Dynamic		Static		
									C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN lbf			min^{-1}	kg lbs
10 0.3937	10 0.3937	3 0.1181	8 0.315	8.7 0.343	0.2 0.008	0.15 0.006	FP 3 10	FPL 3 10	2.8 629	3.09 695	2.12 432	1.43 227	2.58 409	8500	0.004 0.009
11 0.4331	11 0.4331	3 0.1181	8 0.315	8.7 0.343	0.2 0.008	0.15 0.006	FP 3 11	FPL 3 11	2.8 629	3.09 695	2.12 477	1.43 321	2.58 580	8500	0.005 0.011
12 0.4724	12 0.4724	4 0.1575	9 0.354	9.7 0.382	0.2 0.008	0.15 0.006	FP 4 12	FPL 4 12	3.74 841	4.74 1070	2.54 571	1.63 366	2.94 661	6600	0.006 0.013
13 0.5118	13 0.5118	4 0.1575	9 0.354	9.7 0.382	0.2 0.008	0.15 0.006	FP 4 13	FPL 4 13	3.74 841	4.74 1070	2.16 486	2.75 618	3.89 874	6600	0.008 0.018
14 0.5512	14 0.5512	4 0.1575	9 0.354	10.2 0.402	0.3 0.012	0.15 0.006	FP 4 14	FLP 4 14	4.05 910	5.44 1220	2.86 643	2.26 508	4.07 915	5700	0.010 0.022
15 0.5906	15 0.5906	4 0.1575	9 0.354	10.2 0.402	0.3 0.012	0.15 0.006	FP 4 15	FLP 4 15	4.05 910	5.44 1220	3.04 683	2.83 636	4.65 1040	5700	0.011 0.024

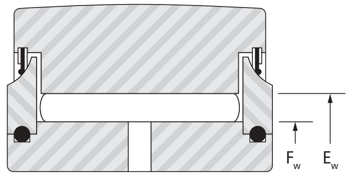
FULL COMPLEMENT, NON-SEPARABLE, SEALED OR UNSEALED, YOKE-TYPE (FG SERIES)

METRIC SERIES

FG: crowned outer ring
FGL: cylindrical outer ring
EE: polymer shields
EEM: metal shields



FG, FGL



FG..EE, FG..EEM
FGL..EE, FGL..EEM

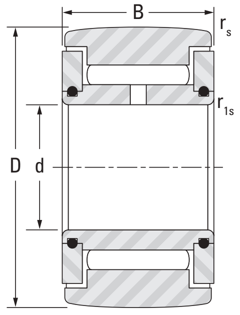
Outer Dia.	D	d	B	F_w	E_w	$r_{s\,min.}$	$r_{1s\,min.}$	Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
								Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
										Dynamic	Static	Dynamic		Static		
										C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN lbf			min^{-1}	kg lbs
16 0.6299	16 0.6299	5 0.1969	12 0.472	7.7 0.3031	10.7 0.4213	0.3 0.012	0.3 0.012	FG 5 16	FGL 5 16	5.66 1270	6.51 1460	4.19 942	2.79 627	5.02 1130	5700	0.016 0.035
19 0.7480	19 0.7480	6 0.2362	12 0.472	9.7 0.3819	12.7 0.5000	0.3 0.012	0.3 0.012	FG 6 19	FGL 6 19	6.44 1450	8.15 1830	4.65 1050	3.49 785	6.28 1410	4400	0.019 0.042
24 0.9449	24 0.9449	8 0.3150	13 0.512	12.0 0.4724	15.0 0.5906	0.3 0.012	0.3 0.012	FG 8 24	FGL 8 24	7.3 1640	10.2 2290	5.45 1230	5.42 1220	8.63 1940	3500	0.037 0.082
	24 0.9449	8 0.3150	15 0.591	12.0 0.4724	15.0 0.5906	0.3 0.012	0.3 0.012	FG 8 24 15	FGL 8 24 15	9.08 2040	13.5 3030	6.76 1520	7.05 1580	11.4 2560	3500	0.044 0.097
30 1.1811	30 1.1811	10 0.3937	15 0.591	15.2 0.5984	20.2 0.7953	0.6 0.024	0.3 0.012	FG 10 30	FGL 10 30	14.2 3190	18.3 4110	10.3 2320	7.67 1720	13.8 3100	2900	0.066 0.146
32 1.2598	32 1.2598	12 0.4724	15 0.591	17.6 0.6929	22.6 0.8898	0.6 0.024	0.3 0.012	FG 12 32	FGL 12 32	15.5 3480	21.2 4770	10.5 2360	7.52 1690	13.5 3030	2400	0.077 0.170
35 1.3780	35 1.3780	15 0.5906	19 0.748	20.1 0.7929	25.2 0.9921	0.6 0.024	0.3 0.012	FG 15 35	FGL 15 35	22.5 5060	35.4 7960	14.6 3280	11.6 2610	20.9 4700	2100	0.103 0.227
40 1.5748	40 1.5748	17 0.6693	21 0.827	24.0 0.9449	30.0 1.1811	0.6 0.024	0.3 0.012	FG 17 40	FGL 17 40	29.9 6720	48.0 10800	18.5 4160	13.8 3100	24.8 5580	1800	0.155 0.342
47 1.8504	47 1.8504	20 0.7874	25 0.984	28.7 1.1299	34.7 1.3661	1.0 0.039	0.3 0.012	FG 20 47	FGL 20 47	36.5 8210	65.5 14700	22.5 5060	20.2 4540	36.4 8180	1400	0.295 0.650
52 2.0472	52 2.0472	25 0.9843	25 0.984	33.5 1.3189	39.5 1.5551	1.0 0.039	0.3 0.012	FG 25 52	FGL 25 52	39.7 8920	76.4 17200	23.1 5190	22.6 5080	40.3 9060	1200	0.310 0.683
62 2.4409	62 2.4409	30 1.1811	29 1.142	38.2 1.5039	44.2 1.7402	1.0 0.039	0.3 0.012	FG 30 62	FGL 30 62	46.5 10500	97.9 22000	28.9 6500	35.5 7980	58.2 13100	1100	0.490 1.080
72 2.8346	72 2.8346	35 1.3780	29 1.142	44.0 1.7323	50.0 1.9685	1.0 0.039	0.6 0.024	FG 35 72	FGL 35 72	50.0 11200	113 25400	31.4 7060	45.6 10300	68.4 15400	920	0.670 1.477
80 3.1496	80 3.1496	40 1.5748	32 1.260	49.7 1.9567	55.7 2.1929	1.0 0.039	0.6 0.024	FG 40 80	FGL 40 80	62.1 14000	155 38400	38.3 8610	63.7 14300	90.6 20400	810	0.890 1.962
85 3.3465	85 3.3465	45 1.7717	32 1.260	55.4 2.1811	61.4 2.4173	1.0 0.039	0.6 0.024	FG 45 85 EE	FGL 45 85	65.7 14800	173 38900	38.4 8630	67.2 15100	91.1 20500	720	0.970 2.138
90 3.5433	90 3.5433	50 1.9685	32 1.260	62.1 2.4449	68.1 2.6811	1.0 0.039	0.6 0.024	FG 50 90	FGL 50 90	69.7 15700	194 43600	37.8 8500	74.3 16700	88.7 19900	640	1.04 2.293
100 3.9370	100 3.9370	55 2.1654	36 1.417	70.0 2.7559	77.0 3.0315	1.5 0.059	0.6 0.024	FG 55 100	FGL 55 100	85.0 19100	233 52400	45.2 10200	87.9 19800	103 23200	570	1.35 2.976
110 4.3307	110 4.3307	60 2.3622	36 1.417	75.0 2.9528	82.0 3.2283	1.5 0.059	0.6 0.024	FG 60 110		88.6 19900	251 56400	48.9 11000	99.6 22400	119 26800	530	1.65 3.638
120 4.7244	120 4.7244	65 2.5591	42 1.654	80.0 3.1496	87.0 3.4252	1.5 0.059	0.6 0.024	FG 65 120	FGL 65 120	103 23200	310 69700	58.1 13100	131 29400	154 34600	490	2.35 5.181
125 4.9213	125 4.9213	70 2.7559	42 1.654	85.0 3.3465	92.0 3.6220	1.5 0.059	0.6 0.024	FG 70 125	FGL 70 125	106 23800	332 74600	58.7 13200	142 31900	157 35300	460	2.50 5.512

Continued on next page.

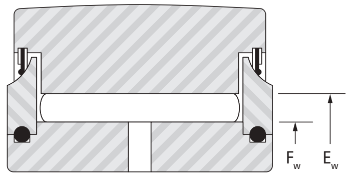
FULL COMPLEMENT, NON-SEPARABLE, SEALED OR UNSEALED, YOKE-TYPE (FG SERIES)

METRIC SERIES

FG: crowned outer ring
FGL: cylindrical outer ring
EE: polymer shields
EEM: metal shields



FG, FGL



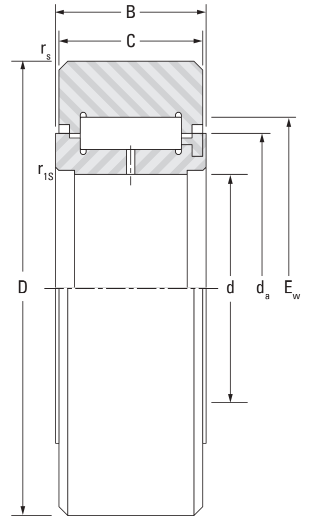
FG..EE, FG..EEM
FGL..EE, FGL..EEM

Outer Dia.	D	d	B	F_w	E_w	$r_{s\,min.}$	$r_{1s\,min.}$	Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
								Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
										Dynamic	Static	Dynamic		Static		
										C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
130 5.1181	**130** 5.1181	**75** 2.9528	**42** 1.654	**90.0** 3.5433	**97.0** 3.8189	**1.5** 0.059	**0.6** 0.024	FG 75 130		**110** 24700	**354** 79600	**59.2** 13300	**155** 34800	**159** 35700	440	**2.65** 5.842
140 5.5118	**140** 5.5118	**80** 3.1496	**48** 1.890	**100.0** 3.9370	**108.0** 4.2520	**2.0** 0.079	**1.0** 0.039	FG 80 140	FGL 80 140	**140** 31500	**455** 102000	**72.4** 13600	**202** 45400	**189** 42500	390	**3.40** 7.496
150 5.9055	**150** 5.9055	**85** 3.3465	**48** 1.890	**107.0** 4.2126	**115.0** 4.5276	**2.0** 0.079	**1.0** 0.039	FG 85 150		**146** 32800	**490** 110000	**75.3** 16900	**227** 51000	**203** 45600	370	**4.00** 8.818
160 6.2992	**160** 6.2992	**90** 3.5433	**54** 2.126	**115.0** 4.5276	**123.0** 4.8425	**2.0** 0.079	**1.0** 0.039	FG 90 160		**168** 37800	**603** 136000	**85.7** 19300	**299** 67200	**244** 54900	340	**5.30** 11.7
170 6.6929	**170** 6.6929	**95** 3.7402	**54** 2.126	**120.0** 4.7244	**128.0** 5.0394	**2.0** 0.079	**1.0** 0.039	FG 95 170		**172** 38700	**629** 141000	**89.8** 20200	**308** 69200	**267** 60000	330	**6.00** 13.2
180 7.0866	**180** 7.0866	**100** 3.9370	**65** 2.559	**126.0** 4.9606	**136.0** 5.3543	**2.0** 0.079	**1.5** 0.059	FG 100 180		**238** 53500	**828** 186000	**126** 28300	**358** 80500	**363** 81600	310	**8.05** 17.8
200 7.8740	**200** 7.8740	**110** 4.3307	**65** 2.559	**140.0** 5.5118	**150.0** 5.9055	**2.0** 0.079	**1.5** 0.059	FG 110 200		**252** 56700	**922** 207000	**133** 29900	**427** 96000	**401** 90100	280	**10.00** 22.0
215 8.4646	**215** 8.4646	**120** 4.7244	**65** 2.559	**150.0** 5.9055	**160.0** 6.2992	**2.0** 0.079	**1.5** 0.059	FG 120 215		**261** 58700	**985** 221000	**138** 31000	**476** 107000	**430** 96700	260	**11.50** 25.3
270 10.6299	**270** 10.6299	**150** 5.9055	**78** 3.071	**186.0** 7.3228	**198.0** 7.7953	**3.0** 0.118	**1.5** 0.059	FG 150 270		**372** 83600	**1470** 330000	**200** 456000	**721** 162000	**658** 148000	210	**22.00** 48.5

FULL COMPLEMENT, NON-SEPARABLE, LIGHT SERIES, WITH METAL SEALS YOKE-TYPE (FGU...MM SERIES)

METRIC SERIES

FGU: crowned outer ring
FGUL: cylindrical outer ring



FGU, FGUL

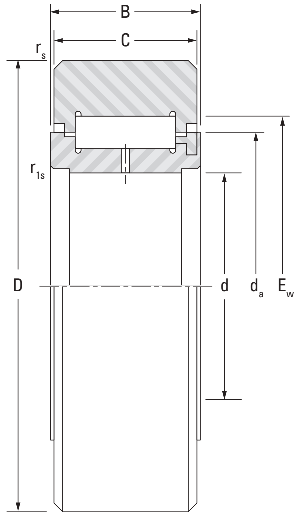
Outer Dia.	D	d	C	B	d_a	E_w	$r_{s\,min.}$	$r_{1s\,min.}$	Designation		Load Ratings			Speed Rating Grease	Approx. Wt.
									Crowned Track Roller	Cylindrical Track Roller	Dynamic		Static		
											C	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf			min^{-1}	**kg** lbs
35 1.3780	**35** 1.3780	**15** 0.5906	**18** 0.709	**19** 0.748	**20.4** 0.8031	**28.4** 1.1181	**0.6** 0.024	**0.3** 0.012	FGU 15 35		**7.80** 1750	**17.0** 3820	**17.0** 3820	5700	**0.096** 0.212
35 1.3780	**35** 1.3780	**15** 0.5906	**18** 0.709	**19** 0.748	**20.4** 0.8031	**28.4** 1.1181	**0.6** 0.024	**0.3** 0.012	FGU 15 35 MM	FGUL 15 35 MM	**7.80** 1750	**17.0** 3820	**17.0** 3820	5700	**0.096** 0.212
40 1.5748	**40** 1.5748	**17** 0.6693	**20** 0.787	**21** 0.827	**23.0** 0.9055	**31.0** 1.2205	**0.6** 0.024	**0.3** 0.012	FGU 17 40 MM		**11.5** 2590	**20.0** 4500	**21.5** 4830	5200	**0.142** 0.313
47 1.8504	**47** 1.8504	**20** 0.7874	**24** 0.945	**25** 0.984	**27.1** 1.0669	**37.1** 1.4606	**1.0** 0.039	**0.3** 0.012	FGU 20 47 MM	FGUL 20 47 MM	**15.5** 3480	**29.5** 6630	**32.3** 7260	4400	**0.235** 0.518
52 2.0472	**52** 2.0472	**25** 0.9843	**24** 0.945	**25** 0.984	**31.8** 1.2520	**41.8** 1.6457	**1.0** 0.039	**0.3** 0.012	FGU 25 52		**17.3** 3890	**31.5** 7080	**36.0** 8090	3800	**0.268** 0.591
	52 2.0472	**25** 0.9843	**24** 0.945	**25** 0.984	**31.8** 1.2520	**41.8** 1.6457	**1.0** 0.039	**0.3** 0.012	FGU 25 52 MM	FGUL 25 52 MM	**17.3** 3890	**31.5** 7080	**36.0** 8090	3800	**0.268** 0.591
62 2.4409	**62** 2.4409	**30** 1.1811	**28** 1.102	**29** 1.142	**38.2** 1.5039	**50.2** 1.9764	**1.0** 0.039	**0.3** 0.012	FGU 30 62 MM		**24.5** 5510	**44.5** 10000	**54.00** 12100	3200	**0.454** 1.001
72 2.8346	**72** 2.8346	**35** 1.3780	**28** 1.102	**29** 1.142	**45.9** 1.8071	**57.9** 2.2795	**1.0** 0.039	**0.6** 0.024	FGU 35 72 MM	FGUL 35 72 MM	**31.3** 7040	**50.0** 11200	**66.0** 14800	2700	**0.611** 1.347
80 3.1496	**80** 3.1496	**40** 1.5748	**30** 1.181	**32** 1.260	**51.6** 2.0315	**63.6** 2.5039	**1.0** 0.039	**0.6** 0.024	FGU 40 80		**40.6** 9130	**59.0** 13300	**84.0** 18900	2400	**0.822** 1.812
	80 3.1496	**40** 1.5748	**30** 1.181	**32** 1.260	**51.6** 2.0315	**63.6** 2.5039	**1.0** 0.039	**0.6** 0.024	FGU 40 80 MM	FGUL 40 80 MM	**40.6** 9130	**59.0** 13300	**84.0** 18900	2400	**0.822** 1.812
110 4.3307	**110** 4.3307	**60** 2.3622	**34** 1.339	**36** 1.417	**71.2** 2.8031	**87.2** 3.4331	**1.5** 0.059	**0.6** 0.024	FGU 60 110 MM		**64.0** 14400	**88.0** 19800	**129** 29000	1800	**1.625** 3.583
120 4.7244	**120** 4.7244	**65** 2.5591	**40** 1.575	**42** 1.654	**76.4** 3.0079	**92.4** 3.6378	**1.5** 0.059	**0.6** 0.024	FGU 65 120		**89.0** 20000	**110** 24700	**174** 39100	1700	**2.300** 5.071
	120 4.7244	**65** 2.5591	**40** 1.575	**42** 1.654	**76.4** 3.0079	**92.4** 3.6378	**1.5** 0.059	**0.6** 0.024	FGU 65 120 MM		**89.0** 20000	**110** 24700	**174** 39100	1700	**2.300** 5.071
125 4.9213	**125** 4.9213	**70** 2.7559	**40** 1.575	**42** 1.654	**81.5** 3.2087	**97.5** 3.8386	**1.5** 0.059	**0.6** 0.024	FGU 70 125 MM		**93.0** 20900	**110** 24700	**180** 40500	1600	**2.070** 4.564
140 5.5118	**140** 5.5118	**80** 3.1496	**46** 1.811	**48** 1.890	**91.7** 3.6102	**107.7** 4.2402	**2.0** 0.079	**1.0** 0.039	FGU 80 140 MM		**130** 29200	**138** 31000	**250** 56200	1400	**3.450** 7.606
160 6.2992	**160** 6.2992	**90** 3.5433	**52** 2.047	**54** 2.126	**101.8** 4.0079	**121.8** 4.7953	**2.0** 0.079	**1.0** 0.039	FGU 90 160 MM		**166** 37300	**188** 42300	**327** 73500	1300	**5.185** 11.431
170 6.6929	**170** 6.6929	**95** 3.7402	**52** 2.047	**54** 2.126	**108.2** 4.2598	**128.2** 5.0472	**2.0** 0.079	**1.0** 0.039	FGU 95 170 MM		**184** 41400	**198** 44500	**356** 80000	1200	**5.925** 13.062
200 7.8740	**200** 7.8740	**110** 4.3307	**63** 2.480	**65** 2.559	**124.1** 4.8858	**144.1** 5.6732	**2.0** 0.079	**1.5** 0.059	FGU 110 200 MM		**310** 69700	**280** 62900	**590** 132600	1100	**10.200** 22.487
215 8.4646	**215** 8.4646	**120** 4.7244	**63** 2.480	**65** 2.559	**133.6** 5.2598	**157.6** 6.2047	**2.0** 0.079	**1.5** 0.059	FGU 120 215		**310** 69700	**310** 69700	**600** 134900	960	**11.560** 25.485

FULL COMPLEMENT, NON-SEPARABLE, HEAVY SERIES, WITH METAL SEALS YOKE-TYPE (FGU...MM SERIES)

METRIC SERIES

FGU: crowned outer ring
FGUL: cylindrical outer ring

FGU, FGUL



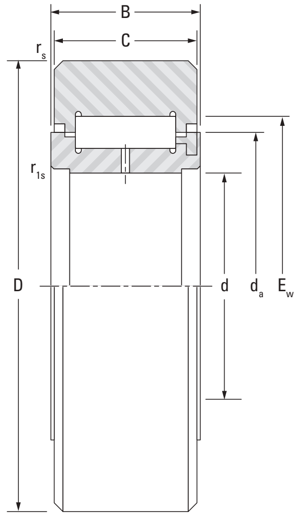
Outer Dia.	D	d	C	B	d_a	E_w	$r_{s\,min.}$	$r_{1s\,min.}$	Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
									Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
											Dynamic	Static	Dynamic		Static		
											C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
42 1.6535	**42** 1.6535	**15** 0.5906	**18** 0.709	**19** 0.748	**20.4** 0.8031	**28.4** 1.1181	**1.0** 0.039	**0.3** 0.012	FGU 15 42	FGUL 15 42 MM	**26.4** 5930	**32.4** 7280	**19.7** 4430	**14.7** 3300	**26.4** 5930	2200	**0.153** 0.337
47 1.8504	**47** 1.8504	**17** 0.6693	**20** 0.787	**21** 0.827	**20.0** 0.7874	**28.0** 1.1024	**1.0** 0.039	**0.3** 0.012	FGU 17 47 MM	FGUL 17 47 MM	**28.3** 6360	**36.5** 8210	**21.5** 4830	**18.8** 4230	**31.9** 7170	1900	**0.214** 0.472
52 2.0472	**52** 2.0472	**20** 0.7874	**24** 0.945	**25** 0.984	**27.1** 1.0669	**37.1** 1.4606	**1.0** 0.039	**0.3** 0.012	FGU 20 52 MM	FGUL 20 52 MM	**43.8** 9850	**57.9** 13000	**30.7** 6900	**21.3** 4790	**38.3** 8610	1600	**0.268** 0.591
62 2.4409	**62** 2.4409	**25** 0.9843	**24** 0.945	**25** 0.984	**31.8** 1.2520	**41.8** 1.6457	**1.0** 0.039	**0.3** 0.012	FGU 25 62		**48.2** 10800	**68.2** 15300	**35.1** 7890	**30.7** 6900	**55.1** 12400	1400	**0.435** 0.959
72 2.8346	**72** 2.8346	**30** 1.1811	**28** 1.102	**29** 1.142	**38.2** 1.5039	**50.2** 1.9764	**1.0** 0.039	**0.3** 0.012	FGU 30 72 MM	FGUL 30 72 MM	**70** 15700	**103** 23200	**49** 11000	**40** 8990	**72** 16200	1100	**0.681** 1.501
80 3.1496	**80** 3.1496	**35** 1.3780	**28** 1.102	**29** 1.142	**45.9** 1.8071	**57.9** 2.2795	**1.0** 0.039	**0.6** 0.024	FGU 35 80	FGUL 35 80	**77.5** 17400	**124** 27900	**51** 11500	**42.4** 9530	**76.3** 17200	920	**0.82** 1.808
	80 3.1496	**35** 1.3780	**28** 1.102	**29** 1.142	**45.9** 1.8071	**57.9** 2.2795	**1.0** 0.039	**0.6** 0.024	FGU 35 80 MM		**77.5** 17400	**124** 27900	**51** 11500	**42.4** 9530	**76.3** 17200	920	**0.82** 1.808
90 3.5433	**90** 3.5433	**40** 1.5748	**30** 1.181	**32** 1.260	**51.6** 2.0315	**63.6** 2.5039	**1.0** 0.039	**0.6** 0.024	FGU 40 90 MM		**89.2** 20100	**153** 34400	**60.2** 13500	**59.3** 13300	**107** 24100	810	**1.125** 2.480
100 3.9370	**100** 3.9370	**45** 1.7717	**30** 1.181	**32** 1.260	**55.4** 2.1811	**67.4** 2.6535	**1.5** 0.059	**0.6** 0.024	FGU 45 100 MM		**92.7** 20800	**165** 37100	**64.5** 14500	**73.6** 16500	**122** 27400	750	**1.395** 3.075
110 4.3307	**110** 4.3307	**50** 1.9685	**30** 1.181	**32** 1.260	**61.1** 2.4055	**73.1** 2.8780	**1.5** 0.059	**0.6** 0.024	FGU 50 110		**97.8** 22000	**182** 40900	**68.1** 15300	**85.9** 19300	**135** 30300	680	**1.683** 3.710
	110 4.3307	**50** 1.9685	**30** 1.181	**32** 1.260	**61.1** 2.4055	**73.1** 2.8780	**1.5** 0.059	**0.6** 0.024	FGU 50 110 MM		**97.8** 22000	**182** 40900	**68.1** 15300	**85.9** 19300	**135** 30300	680	**1.683** 3.710
120 4.7244	**120** 4.7244	**55** 2.1654	**34** 1.339	**36** 1.417	**66.1** 2.6024	**82.1** 3.2323	**1.5** 0.059	**0.6** 0.024	FGU 55 120		**128** 28800	**215** 48300	**88.7** 19900	**91.8** 20600	**159** 35700	640	**2.235** 4.927
	120 4.7244	**55** 2.1654	**34** 1.339	**36** 1.417	**66.1** 2.6024	**82.1** 3.2323	**1.5** 0.059	**0.6** 0.024	FGU 55 120 MM	FGUL 55 120 MM	**128** 28800	**215** 48300	**88.7** 19900	**91.8** 20600	**159** 35700	640	**2.235** 4.927
130 5.1181	**130** 5.1181	**60** 2.3622	**34** 1.339	**36** 1.417	**71.2** 2.8031	**87.2** 3.4331	**1.5** 0.059	**0.6** 0.024	FGU 60 130 MM		**133** 29900	**232** 52200	**93.4** 21000	**106** 23800	**175** 39300	590	**2.62** 5.776
140 5.5118	**140** 5.5118	**65** 2.5591	**40** 1.575	**42** 1.654	**76.4** 3.0079	**92.4** 3.6378	**2.0** 0.079	**0.6** 0.024	FGU 65 140 MM		**156** 35100	**290** 65200	**110** 24700	**142** 31900	**222** 49900	540	**3.56** 7.848

FULL COMPLEMENT, NON-SEPARABLE, HEAVY SERIES, WITH METAL SEALS YOKE-TYPE (FGU...MM SERIES)

METRIC SERIES

FGU: crowned outer ring
FGUL: cylindrical outer ring

FGU, FGUL

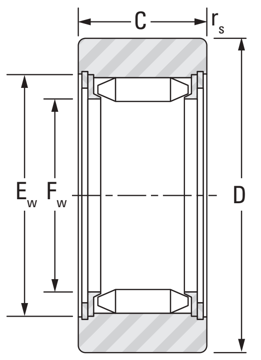


Outer Dia.	D	d	C	B	d_a	E_w	$r_{s\,min.}$	$r_{1s\,min.}$	Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
									Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
											Dynamic	Static	Dynamic		Static		
											C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
150 5.9055	**150** 5.9055	**70** 2.7559	**40** 1.575	**42** 1.654	**81.5** 3.2087	**97.5** 3.8386	**2.0** 0.079	**0.6** 0.024	FGU 70 150 MM		**161** 36200	**310** 69700	**115** 25900	**160** 36000	**240** 54000	510	**4.09** 9.017
160 6.2992	**160** 6.2992	**75** 2.9528	**40** 1.575	**42** 1.654	**86.6** 3.4094	**102.6** 4.0394	**2.0** 0.079	**0.6** 0.024	FGU 75 160		**166** 37300	**329** 74000	**119** 26800	**178** 40000	**257** 57800	480	**4.65** 10.3
	160 6.2992	**75** 2.9528	**40** 1.575	**42** 1.654	**86.6** 3.4094	**102.6** 4.0394	**2.0** 0.079	**0.6** 0.024	FGU 75 160 MM		**166** 37300	**329** 74000	**119** 26800	**178** 40000	**257** 57800	480	**4.65** 10.3
170 6.6929	**170** 6.6929	**80** 3.1496	**46** 1.811	**48** 1.890	**91.7** 3.6102	**107.7** 4.2402	**2.0** 0.079	**1.0** 0.039	FGU 80 170		**195** 43800	**412** 92600	**140** 31500	**229** 51500	**322** 72400	450	**6.07** 13.4
	170 6.6929	**80** 3.1496	**46** 1.811	**48** 1.890	**91.7** 3.6102	**107.7** 4.2402	**2.0** 0.079	**1.0** 0.039	FGU 80 170 MM		**195** 43800	**412** 92600	**140** 31500	**229** 51500	**322** 72400	450	**6.07** 13.4
180 7.0866	**180** 7.0866	**85** 3.3465	**46** 1.811	**48** 1.890	**95.5** 3.7598	**115.5** 4.5472	**2.0** 0.079	**1.0** 0.039	FGU 85 180		**224** 50400	**426** 95800	**162** 36400	**225** 50600	**340** 76400	440	**6.724** 14.8
	180 7.0866	**85** 3.3465	**46** 1.811	**48** 1.890	**95.5** 3.7598	**115.5** 4.5472	**2.0** 0.079	**1.0** 0.039	FGU 85 180 MM	FGUL 85 180 MM	**224** 50400	**426** 95800	**162** 36400	**225** 50600	**340** 76400	440	**6.724** 14.8
190 7.4803	**190** 7.4803	**90** 3.5433	**52** 2.047	**54** 2.126	**101.8** 4.0079	**121.8** 4.7953	**2.0** 0.079	**1.0** 0.039	FGU 90 190 MM		**259** 58200	**524** 118000	**186** 41800	**277** 62300	**412** 92600	410	**8.515** 18.8
260 10.2362	**260** 10.2362	**120** 4.7244	**63** 2.480	**65** 2.559	**133.6** 5.2598	**157.6** 6.2047	**3.0** 0.118	**1.5** 0.059	FGU 120 260 MM		**396** 89000	**875** 197000	**293** 65900	**540** 121000	**730** 164000	300	**19.750** 43.6
300 11.8110	**300** 11.8110	**140** 5.5118	**75** 2.953	**78** 3.071	**152.6** 6.0079	**176.6** 6.9528	**3.0** 0.118	**1.5** 0.059	FGU 140 300 MM		**493** 111000	**1210** 272000	**367** 82500	**818** 184000	**1020** 229000	260	**31.265** 68.9

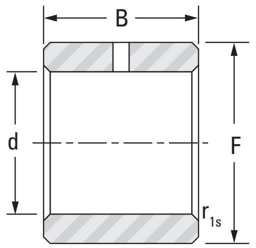
FULL COMPLEMENT, WITHOUT INNER RING, UNSEALED, YOKE-TYPE (RNA...B6, RNAB, RNAL SERIES)

SEPARATE INNER RINGS (BIC SERIES)

METRIC SERIES



RNA...B6



BIC

RNA...B6: Crowned outer ring to maximum slope of 0.15%. Tolerance h9 on dimension D.
RNAB: Crowned outer ring to maximum slope of 1.5%. Tolerance h9 on dimension D.
RNAL: Cylindrical outer ring. Tolerance h7 on dimension D.

Outer Dia.	D	C	F_w	E_w	$r_{s\,min.}$	Track Roller Designations			Load Ratings					Speed Rating Grease	Approx. Wt.	Inner Ring Designation	F	B	d	$r_{1s\,min.}$	Shaft Dia.
						RNA...B6	RNAB	RNAL	As a Bearing		As a Track Roller										
									Dynamic	Static	Dynamic		Static								
									C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$								
mm in	mm in	mm in	mm in	mm in	mm in				kN lbf		kN lbf			min^{-1}	kg lbs		mm in	mm in	mm in	mm in	mm in
19 0.7480	**19** 0.7480	**12** 0.472	**7.3** 0.287	**12.3** 0.484	**0.35** 0.014	RNA 11005 B6	RNAB 11005		**5.31** 1190	**4.44** 998	**4.82** 1080	**4.44** 998	**4.82** 1080	6500	**0.019** 0.042						
22 0.8661	**22** 0.8661	**12** 0.472	**9.7** 0.382	**14.7** 0.579	**0.35** 0.014	RNA 11007 B6	RNAB 11007	RNAL 11007	**6.42** 1440	**5.93** 1330	**5.5** 1240	**5.26** 1180	**6.55** 1470	4700	**0.022** 0.049						
28 1.1024	**28** 1.1024	**12** 0.472	**12.1** 0.476	**17.1** 0.673	**0.35** 0.014	RNA 11009 B6	RNAB 11009	RNAL 11009	**7.37** 1660	**7.42** 1670	**6.66** 1500	**7.42** 1670	**9.06** 2040	3700	**0.028** 0.062						
32 1.2598	**32** 1.2598	**15** 0.591	**17.6** 0.693	**22.6** 0.890	**0.35** 0.014	RNA 11012 B6	RNAB 11012	RNAL 11012	**12.7** 2850	**16.4** 3690	**9.38** 2110	**9.48** 2130	**13.7** 3080	2400	**0.032** 0.071	BIC 1012	**17.6** 0.693	**15** 0.591	**12** 0.472	**0.35** 0.014	**12** 0.472
35 1.3780	**35** 1.3780	**15** 0.591	**20.8** 0.819	**25.8** 1.016	**0.65** 0.026	RNA 11015 B6	RNAB 11015		**13.9** 3120	**19.4** 4360	**9.60** 2160	**9.47** 2130	**14.1** 3170	2000	**0.035** 0.077	BIC 1015	**20.8** 0.819	**15** 0.591	**15** 0.591	**0.65** 0.026	**15** 0.591
42 1.6535	**42** 1.6535	**15** 0.591	**23.9** 0.941	**28.9** 1.138	**0.65** 0.026	RNA 11017 B6	RNAB 11017	RNAL 11017	**15.0** 3370	**22.4** 5040	**11.0** 2470	**14.4** 3240	**18.4** 4140	1700	**0.042** 0.093	BIC 1017	**23.9** 0.941	**15** 0.591	**17** 0.669	**0.65** 0.026	**17** 0.669
47 1.8504	**47** 1.8504	**18** 0.709	**28.7** 1.130	**34.7** 1.366	**0.65** 0.026	RNA 11020 B6	RNAB 11020	RNAL 11020	**21.7** 4880	**33.5** 7530	**14.6** 3280	**16.0** 3600	**23.3** 5240	1400	**0.047** 0.104	BIC 2020	**28.7** 1.130	**18** 0.709	**20** 0.787	**0.65** 0.026	**20** 0.787
52 2.0472	**52** 2.0472	**18** 0.709	**33.5** 1.319	**39.5** 1.555	**0.65** 0.026	RNA 11025 B6	RNAB 11025		**23.6** 5310	**39.1** 8790	**15.0** 3370	**17.1** 3840	**24.4** 5490	1200	**0.052** 0.115	BIC 1025	**33.5** 1.319	**18** 0.709	**25** 0.984	**0.65** 0.026	**25** 0.984
62 2.4409	**62** 2.4409	**22** 0.866	**38.2** 1.504	**44.2** 1.740	**0.65** 0.026	RNA 11030 B6	RNAB 11030		**34.2** 7690	**65.8** 14800	**22.6** 5080	**32.8** 7370	**44.3** 9960	1100	**0.062** 0.137	BIC 2030	**38.2** 1.504	**22** 0.866	**30** 1.181	**0.65** 0.026	**30** 1.181
72 2.8346	**72** 2.8346	**22** 0.866	**44.0** 1.732	**50.0** 1.969	**0.65** 0.026	RNA 11035 B6			**36.7** 8250	**75.7** 17000	**24.6** 5530	**42.4** 9530	**52.2** 11700	920	**0.072** 0.159	BIC 2035	**44** 1.732	**22** 0.866	**35** 1.378	**0.65** 0.026	**35** 1.378
80 3.1496	**80** 3.1496	**22** 0.866	**49.7** 1.957	**55.7** 2.193	**0.85** 0.033		RNAB 11040		**39.2** 8810	**85.6** 19200	**25.8** 5800	**48.7** 10900	**57.0** 12800	810	**0.080** 0.176	BIC 2040	**49.7** 1.957	**22** 0.866	**40** 1.575	**0.85** 0.033	**40** 1.575
90 3.5433	**90** 3.5433	**24** 0.945	**62.1** 2.445	**68.1** 2.681	**0.85** 0.033	RNA 11050 B6			**44.0** 9890	**107** 24100	**25.8** 5800	**53.1** 11900	**57.0** 12800	640	**0.090** 0.198	BIC 11050	**62.1** 2.445	**24** 0.945	**50** 1.969	**.085** 0.033	**50** 1.969

THRUST BEARINGS, ASSEMBLIES, WASHERS

Overview: Thrust needle roller and cage assemblies are complements of small diameter needle rollers, arranged in a spoke-like configuration. Needle rollers are equally spaced by means of a cage, its web section separates the rollers and provides guidance to keep them tracking in an orbital path. The purpose of these assemblies is to transmit a thrust load between two relatively rotating objects while greatly reducing friction.

Thrust needle roller and cage assemblies also can be unitized with lipped washers to serve as raceway surfaces for the needle rollers. Washers can be supplied separately or can be mechanically unitized to the thrust needle roller and cage assemblies for ease of handling.

- **Catalogue range:** 5 mm – 240 mm (0.1969 in – 9.4488 in).
- **Markets:** Automotive automatic and manual transmissions, automotive accessories (compressors, steering gears, etc.) agricultural and construction equipment.
- **Features:** One-way fool-proof assembly features, anti-rotation locking features and lubrication flow enhancements.
- **Benefits:** High-speed performance and application flexibility.

Needle Roller Thrust Bearings – Metric Nominal Dimensions

AXZ 3.5 60 85

Prefix

AXK, FNT	thrust needle roller and cage assembly
AX	thrust needle roller and cage assembly with one unitized thin or thick washer
AR	thrust cylindrical roller and cage assembly with one unitized light and heavy series washers
AXZ	thrust needle roller and cage assembly with two washers retained with a ring
ARZ	thrust cylindrical roller and cage assembly with two washers retained with a steel ring

Width (for AX or AR bearings) over 3 mm
3.5 = 3.5 mm

Bore
60 = 60 mm
(1)thick AX series and heavy AR(Z) series have same bore but larger O.D. dimension

Outer Diameter
85 = 85 mm

K.811 04 TVP

Prefix

K.811	cylindrical roller thrust bearing
K.812	cylindrical roller thrust bearing

Bore Diameter
02 = 15 mm
03 = 17 mm
(for bore ≥ 20 mm): bore code x 5 = bore diameter
04 = 4 x 5 = 20 mm

Suffix

TVP	molded, reinforced polymer window-type cage
LPB	machined, light metal window-type cage

TVK 17 33 JL

Bearing design symbol

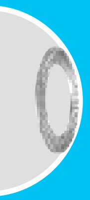
TP	thrust needle roller and cage assembly
TPK, TVK	unitized thrust bearing assembly

Bore diameter
17 = 17 mm

Outer diameter
33 = 33 mm

Thrust washer shape symbol (only for unitized bearing assemblies)

JL	with outer-diameter flange thrust washers and bore-diameter flange thrust washers
J	with outer-diameter flange thrust washers
L	with bore-diameter flange thrust washers



Thrust Washers – Metric Nominal Dimensions

LS 8 40 60

Prefix

AS	thin thrust washer
LS	heavy thrust washer
CP	thin and thick series thrust washer for AX and AR series
CPR	heavy series thrust washer for AR series
CPN	precision series thrust washer for AX series

Width (for CP and CPR washers over 1 mm thick)
8 = 8 mm

Bore
40 = 40 mm

Outer Diameter
60 = 60 mm

GS.811 04

Prefix

GS.811, GS.812	housing washer
WS.812, WS.812	shaft washer

Bore Diameter

for WS.811, WS.812:
02 = 15 mm
03 = 17 mm
(for bore ≥ 20 mm):
bore code x 5 = bore diameter
04 = 4 x 5 = 20 mm

for GS.811:
02 = 16 mm
03 = 18 mm
04 = 21 mm
05 = 26 mm
(for bore ≥ 30 mm):
[bore code x 5]+2 = bore diameter
06 = [6 x 5] +2 = 32 mm

for GS.812:
02 = 16 mm
03 = 17mm
04 = 21 mm
05 = 26 mm
(for bore ≥ 30 mm):
[bore code x 5]+2 = bore diameter
06 = [6 x 5] +2 = 32 mm
(for bore > 85 mm):
[bore code x 5]+3 = bore diameter
17 = [17 x 5] +3 = 88 mm

W 08 16 F

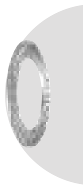
Prefix

W	thin thrust washer
WS	thick (heavy) thrust washer

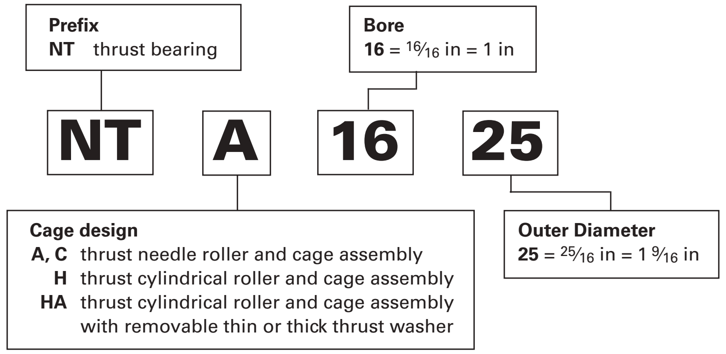
Bore diameter
08 = 8 mm

Outer diameter
16 = 16 mm

Thrust washer shape symbol
F flat thrust washer



Thrust Bearings – Inch Nominal Dimensions



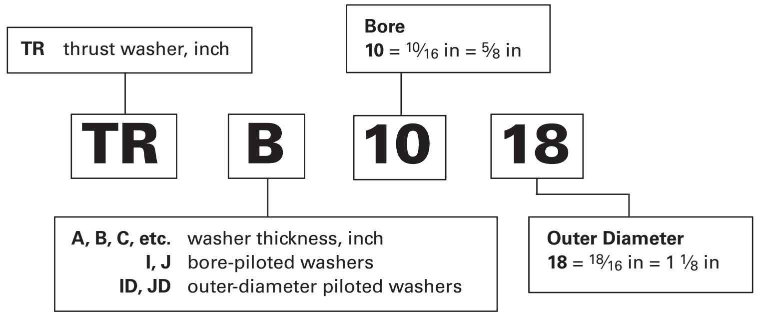
Prefix
NT thrust bearing

Bore
16 = $\frac{16}{16}$ in = 1 in

Cage design
A, C thrust needle roller and cage assembly
H thrust cylindrical roller and cage assembly
HA thrust cylindrical roller and cage assembly with removable thin or thick thrust washer

Outer Diameter
25 = $\frac{25}{16}$ in = 1 $\frac{9}{16}$ in

Thrust Washers – Inch Nominal Dimensions



TR thrust washer, inch

Bore
10 = $\frac{10}{16}$ in = $\frac{5}{8}$ in

A, B, C, etc. washer thickness, inch
I, J bore-piloted washers
ID, JD outer-diameter piloted washers

Outer Diameter
18 = $\frac{18}{16}$ in = 1 $\frac{1}{8}$ in

Thrust Bearings, Assemblies, Washers

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES AND THRUST WASHERS – METRIC SERIES *Page*

CYLINDRICAL ROLLER THRUST BEARINGS AND THEIR COMPONENTS – METRIC SERIES

THRUST ASSEMBLIES AND THRUST BEARINGS – INCH SERIES

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES AND THRUST WASHERS

METRIC SERIES

Thrust needle roller and cage assemblies are available in a variety of sizes. They all have very small cross sections. This catalog includes the most popular, standardized designs.

REFERENCE STANDARDS ARE:

- **ISO 3031** – rolling bearings – thrust needle roller and cage assemblies, thrust washers – dimensions and tolerances.
- **DIN 5405 Part 2** – rolling bearings – needle roller bearings – thrust needle roller and cage assemblies.
- **DIN 5405 Part 3** – rolling bearings – needle roller bearings – thrust washers.
- **ANSI/ABMA Std. 21.1-1988** – thrust needle roller and cage assemblies and thrust washers – metric design.
- **JIS B 1536** – roller bearings – boundary dimensions and tolerances of needle roller bearings.

FNT, AXK, TP
Thrust needle roller and cage assembly

LS, WS
Heavy thrust washer

AS, W
Thin thrust washer

FNTKF, TPK JL **TVK JL**
Unitized thrust bearing assembly

WS.811
Shaft-piloted washer

GS.811
Housing-piloted washer

AX
Unitized thrust bearing assembly

Fig. B6-1. Types of metric series thrust needle roller and cage assemblies and thrust washers

CONSTRUCTION

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

The thrust needle roller and cage assembly (FNT and TP series) has a two-piece steel cage and through-hardened needle rollers that are precision finished to close tolerances for optimum load distribution. The cage is comprised of two mating pieces that are securely fastened together.

AXK series thrust needle roller and cage assembly, which can be used interchangeably with the FNT assembly, has a one-piece cage. The cage is similar in design to the successful profiled radial steel cages.

These cage assemblies have a very thin section and when they must run directly against the backup surface raceways, their section may be 2.000 to 5.000 mm (0.0787 to 0.1969 in) – equivalent to the diameter of the needle rollers used.

When the backup surfaces cannot be hardened and ground, hardened washers of different thicknesses are available.

UNITIZED THRUST BEARING ASSEMBLIES

Thrust bearing assemblies of the FNTK, FNTF, FNTKF, TPK and TVK series have been specially designed for use in applications where a unitized assembly allows for easy installation and eliminates the need for heat treatment and precision finishing of one or both thrust bearing backup surfaces.

Each FNTK, FNTF, FNTKF, TPK and TVK assembly consists of a FNT, TP or TV thrust needle roller and cage assembly – with one or two special-lipped washers that snap over the cage to produce a unitized thrust bearing assembly. The FNTK, FNTF, TPK J, TPK L, TVK J and TVK L assembly has one such washer. The FNTKF, TPK JL and TVK JL assembly has a washer on each side of the bearing.

The backup surfaces for these unitized thrust bearing assemblies should meet the limits of permissible out-of-squareness and coning or dishing, as shown in Fig. B6-2 on page B-6-10. Oil is the preferred lubricant for these assemblies. However they also are available pre-greased for applications that do not allow for oil lubrication.

The rolling elements of the AX series thrust bearings are retained and guided in radial pockets within the cage. The cage is retained in relation to the thrust washer by means of a retaining cap. The design of a one-piece steel cage employs a special curvature that guides the rolling elements, by their ends, along their centerlines.

In addition, this special curvature gives the steel cage great rigidity, while providing maximum lubricant space. This unitized assembly of components facilitates installation and provides a high-axial-load capacity, while occupying only minimal space. Note that the AX series is not interchangeable with the AXK series or FNT, and TP series thrust needle roller and cage assemblies.

THRUST WASHERS

Ideally, a thrust washer should be stationary with respect to, and piloted by, its supporting or backing member – whether or not this is an integral part of the shaft or housing. There should be no rubbing action between the thrust washer and any other machine member. Some thrust washers are designed for bore piloting and others may be piloted by their outer diameter.

THIN THRUST WASHERS (AS, W)

The metric series thin thrust washers are made of hardened spring steel. Thin washers are used when the supporting or backing members cannot be adequately prepared as raceways for the needle rollers. These washers are only 1.000 mm (0.0394 in) thick, and provide a very compact and cost-effective bearing arrangement. Although they are usually guided on the shaft, they may be housing-guided, when required by the application.

HEAVY THRUST WASHERS (LS, WS)

These metric series thrust washers are made of bearing quality steel, hardened and precision-ground on the flat raceway surfaces. Their bores and outer diameters are not ground, but provide satisfactory surfaces for shaft-piloting or housing-piloting arrangements.

SHAFT-PILOTED WASHERS (WS.811) AND HOUSING-PILOTED WASHERS (GS.811)

These shaft-piloted and housing-piloted metric series thrust washers are primarily for use with metric series cylindrical roller thrust bearings of series 811. They are made of bearing-quality steel with hardened and precision-ground, lapped-flat raceway surfaces. The tolerances of the thrust bearing bore and outer diameter shown, in the engineering section of this catalog, apply to shaft-and housing-piloted washers.

THIN/THICK (CP) AND HEAVY (CPR) THRUST WASHERS

The washer incorporated in the AX series thrust bearing is made from hardened bearing steel. It forms one of the raceways for the rolling elements. The opposing raceway is generally provided by a separate thrust washer of similar design supplied by JTEKT. When the AX series thrust bearing is piloted by the revolving part, the thrust washer must be piloted by the stationary part and vice versa. If the revolving part and the stationary part are noticeably eccentric to each other, the thrust bearing with integral washer must, without exception, be piloted by the revolving part.

The second raceway for the rolling elements also may be formed by the face of a shoulder or an inserted washer, provided these have the correct hardness and geometric dimensions.

DIMENSIONAL ACCURACY

TOLERANCES FOR THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

Pages B-6-12 to B-6-19 list the nominal outer diameter, bore diameter and needle roller diameter for the FNT, AXK and TP series of thrust needle roller and cage assemblies and also the nominal outer diameter and bore diameter of the series AS, LS, WS.811, GS.811, W and WS thrust washers. Thickness tolerances for the AS and LS thrust washers also are included.

Tolerances for the outer and bore diameters of series FNT, AXK and TP thrust needle roller and cage assemblies are given in Table B6-1 on page B-6-7, Table B6-2 on page B-6-8 and Table B6-7 on page B-6-9.

Table B6-1. Tolerances for outer diameter (D_c) and bore diameter (D_{c1}) of series FNT and TP thrust needle roller and cage assemblies

D_c		Deviations of max. outside diameter (c12)		D_{c1}		Deviations of min. bore diameter (E11)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
18.000 0.7087	**30.000** 1.1811	**-0.110** -0.0043	**-0.320** -0.0126	**3.000** 0.1181	**6.000** 0.2362	**+0.095** +0.0037	**+0.020** +0.0008
30.000 1.1811	**40.000** 1.5748	**-0.120** -0.0047	**-0.370** -0.0146	**6.000** 0.2362	**10.000** 0.3937	**+0.115** +0.0045	**+0.025** +0.0010
40.000 1.5748	**50.000** 1.9685	**-0.130** -0.0051	**-0.380** -0.0150	**10.000** 0.3937	**18.000** 0.7087	**+0.142** +0.0056	**+0.032** +0.0013
50.000 1.9685	**65.000** 2.5591	**-0.140** -0.0055	**-0.440** -0.0173	**18.000** 0.7087	**30.000** 1.1811	**+0.170** +0.0067	**+0.040** +0.0016
65.000 2.5591	**80.000** 3.1496	**-0.150** -0.0059	**-0.450** -0.0177	**30.000** 1.1811	**50.000** 1.9685	**+0.210** +0.0083	**+0.050** +0.0020
80.000 3.1496	**100.000** 3.9370	**-0.170** -0.0067	**-0.520** -0.0205	**50.000** 1.9685	**80.000** 3.1496	**+0.250** +0.0098	**+0.060** +0.0024
100.000 3.9370	**120.000** 4.7244	**-0.180** -0.0071	**-0.530** -0.0209	**80.000** 3.1496	**120.000** 4.7244	**+0.292** +0.0115	**+0.072** +0.0028
120.000 4.7244	**140.000** 5.5118	**-0.200** -0.0079	**-0.600** -0.0236	**120.000** 4.7244	**180.000** 7.0866	**+0.335** +0.0132	**+0.085** +0.0033
140.000 5.5118	**160.000** 6.2992	**-0.210** -0.0083	**-0.610** -0.0240				
160.000 6.2992	**180.000** 7.0866	**-0.230** -0.0091	**-0.630** -0.0248				
180.000 7.0866	**200.000** 7.8740	**-0.240** -0.0094	**-0.700** -0.0276				

Table B6-2. Tolerances for outer diameter (D_c) and bore diameter (D_{c1}) of series AXK thrust needle roller and cage assemblies

D_c		Deviations of max. outside diameter (c13)		D_{c1}		Deviations of min. bore diameter (E12)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
18.000 0.7087	**30.000** 1.1811	**-0.110** -0.0043	**-0.440** -0.0173	**3.000** 0.1181	**6.000** 0.2362	**+0.140** +0.0055	**+0.020** +0.0008
30.000 1.1811	**40.000** 1.5748	**-0.120** -0.0047	**-0.510** -0.0201	**6.000** 0.2362	**10.000** 0.3937	**+0.175** +0.0069	**+0.025** +0.0010
40.000 1.5748	**50.000** 1.9685	**-0.130** -0.0051	**-0.520** -0.0205	**10.000** 0.3937	**18.000** 0.7087	**+0.212** +0.0083	**+0.032** +0.0013
50.000 1.9685	**65.000** 2.5591	**-0.140** -0.0055	**-0.600** -0.0236	**18.000** 0.7087	**30.000** 1.1811	**+0.250** +0.0098	**+0.040** +0.0016
65.000 2.5591	**80.000** 3.1496	**-0.150** -0.0059	**-0.610** -0.0240	**30.000** 1.1811	**50.000** 1.9685	**+0.300** +0.0118	**+0.050** +0.0020
80.000 3.1496	**100.000** 3.9370	**-0.170** -0.0067	**-0.710** -0.0280	**50.000** 1.9685	**80.000** 3.1496	**+0.360** +0.4220	**+0.060** +0.0024
100.000 3.9370	**120.000** 4.7244	**-0.180** -0.0071	**-0.720** -0.0283	**80.000** 3.1496	**120.000** 4.7244	**+0.422** +0.0166	**+0.072** +0.0028
120.000 4.7244	**140.000** 5.5118	**-0.200** -0.0079	**-0.830** -0.0327	**120.000** 4.7244	**180.000** 7.0866	**+0.485** +0.0191	**+0.085** +0.0033
140.000 5.5118	**160.000** 6.2992	**-0.210** -0.0083	**-0.840** -0.0331				
160.000 6.2992	**180.000** 7.0866	**-0.230** -0.0091	**-0.860** -0.0339				
180.000 7.0866	**200.000** 7.8740	**-0.240** -0.0094	**-0.960** -0.0378				

Standard AX series needle thrust bearings, combined with a thick washer, provide rotational accuracy and axial run-out to Class 6 levels – according to ISO Standard 199 for ball thrust bearings. They can be supplied in High Precision "HP" quality – providing a precision grade above Class 5. AX series needle thrust bearings with a thin washer are of minimal thickness and provide excellent economy. They should be considered whenever the degree of support and rotational accuracy requirement allow.

Table B6-3. AX Series thickness and axial run-out tolerances

	Bore Dc1		Thickness Tolerance		Axial run-out		
	>	≤	Max.	Min.	Max.		
	mm		µm		µm		
Needle thrust bearings (thin)		60	+30	-40[1]	20[1]		
	60	90	+50	-60[2]	25[2]		
	90	120	+50	-60[2]	30[2]		
Needle thrust bearings (thick)		60	+30	-30[1]	20[1]		
	60	90	+50	-50[2]	25[2]	Quality	
	90	120	+50	-50[2]	30[2]	HP	HSP
Thrust washers (thin) [thick]		120	+50	-60[-50]	5*	2	1
	120	180	+50	-110[-100]	7*	3	1.5
	180	250	+50	-160[-150]	10*	4	2

* High precision quality.

[1] Under min. load of 150 N.

[2] Under min. load of 250 N.

BORE INSPECTION PROCEDURE FOR ASSEMBLY

If an inspection of the bore diameter is desired, the bore diameter (D_{c1}) of the assembly should be checked with "go" and "no go" plug gages. The "go" plug gage size is the minimum bore diameter of the assembly. The "no go" plug gage size is the maximum bore diameter of the assembly.

The assembly, under its own weight, must fall freely from the "go" plug gage. The "no go" plug gage must not enter the bore. Where the "no go" plug gage can be forced through the bore, the assembly must not fall from the gage under its own weight.

TOLERANCES FOR THRUST WASHERS

Tolerances for the outer and bore diameters of series AS thrust washers are given in Table B6-4 on page B-6-9. Thickness tolerance for series AS thrust washers is ±0.050 mm (±0.0020 in).

Tolerances for the outer and bore diameters of series LS heavy thrust washers are given in Table B6-5 on page B-6-9.

Thickness tolerance for series LS heavy thrust washers is given in Table B6-6 on page B-6-9.

BORE INSPECTION PROCEDURE FOR SERIES AS AND LS THRUST WASHERS

If an inspection of the thrust washer bore diameter (d) is desired, it should be checked with "go" and "no go" plug gages. The "go" plug gage size is the minimum bore diameter of the thrust washer. The "no go" plug gage size is the maximum bore diameter of the thrust washer.

The thrust washer, under its own weight, must fall freely from the "go" plug gage. The "no go" plug gage must not enter the bore. Where the "no go" plug gage can be forced through the bore, the thrust washer must not fall from the gage under its own weight.

Table B6-4. Tolerances for outer diameter (d_1) and bore diameter (d) of series AS thrust washers

d_1		Deviations of max. outside diameter (e13)		d		Deviations of min. bore diameter (E13)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
18.000 0.7087	**30.000** 1.1811	**-0.040** -0.0016	**-0.370** -0.0146	**3.000** 0.1181	**6.000** 0.2362	**+0.200** +0.0079	**+0.020** +0.0008
30.000 1.1811	**50.000** 1.9685	**-0.050** -0.0020	**-0.440** -0.0173	**6.000** 0.2362	**10.000** 0.3937	**+0.245** +0.0096	**+0.025** +0.0010
50.000 1.9685	**80.000** 3.1496	**-0.060** -0.0024	**-0.520** -0.0205	**10.000** 0.3937	**18.000** 0.7087	**+0.302** +0.0119	**+0.032** +0.0013
80.000 3.1496	**120.000** 4.7244	**-0.072** -0.0028	**-0.612** -0.0241	**18.000** 0.7087	**30.000** 1.1811	**+0.370** +0.0146	**+0.040** +0.0016
120.000 4.7244	**180.000** 7.0866	**-0.085** -0.0034	**-0.715** -0.0282	**30.000** 1.1811	**50.000** 1.9685	**+0.440** +0.0173	**+0.050** +0.0020
180.000 7.0866	**250.000** 9.8425	**-0.100** -0.0039	**-0.820** -0.0323	**50.000** 1.9685	**80.000** 3.1496	**+0.520** +0.0205	**+0.060** +0.0024
				80.000 3.1496	**120.000** 4.7244	**+0.612** +0.0241	**+0.072** +0.0028
				120.000 4.7244	**180.000** 7.0866	**+0.715** +0.0281	**+0.085** +0.0034

Table B6-5. Tolerances for outer diameter (d_1) and bore diameter (d) of series LS heavy thrust washers

d_1		Deviations of max. outside diameter (a12)		d		Deviations of min. bore diameter (E12)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
18.000 0.7087	**30.000** 1.1811	**-0.300** -0.0118	**-0.510** -0.0201	**3.000** 0.1181	**6.000** 0.2362	**+0.140** +0.0055	**+0.020** +0.0008
30.000 1.1811	**40.000** 1.5748	**-0.310** -0.0122	**-0.560** -0.0221	**6.000** 0.2362	**10.000** 0.3937	**+0.175** +0.0069	**+0.025** +0.0010
40.000 1.5748	**50.000** 1.9685	**-0.320** -0.0126	**-0.570** -0.0224	**10.000** 0.3937	**18.000** 0.7087	**+0.212** +0.0084	**+0.032** +0.0013
50.000 1.9685	**65.000** 2.5591	**-0.340** -0.0134	**-0.640** -0.0252	**18.000** 0.7087	**30.000** 1.1811	**+0.250** +0.0098	**+0.040** +0.0016
65.000 2.5591	**80.000** 3.1496	**-0.360** -0.0142	**-0.660** -0.0260	**30.000** 1.1811	**50.000** 1.9685	**+0.300** +0.0118	**+0.050** +0.0020
80.000 3.1496	**100.000** 3.9370	**-0.380** -0.0150	**-0.730** -0.0290	**50.000** 1.9685	**80.000** 3.1496	**+0.360** +0.0142	**+0.060** +0.0024
100.000 3.9370	**120.000** 4.7244	**-0.410** -0.0161	**-0.760** -0.0299	**80.000** 3.1496	**120.000** 4.7244	**+0.422** +0.0166	**+0.072** +0.0028
120.000 4.7244	**140.000** 5.5118	**-0.460** -0.0181	**-0.860** -0.0339	**120.000** 4.7244	**180.000** 7.0866	**+0.485** +0.0191	**+0.085** +0.0034
140.000 5.5118	**160.000** 6.2992	**-0.520** -0.0205	**-0.920** -0.0362				
160.000 6.2992	**180.000** 7.0866	**-0.580** -0.0228	**-0.980** -0.0386				
180.000 7.0866	**200.000** 7.8740	**-0.660** -0.0260	**-1.120** -0.0441				

Table B6-6. Thickness tolerance for series LS heavy thrust washers

h		Tolerance	
>	≤	Max.	Min.
mm in		**µm** in	
0 0	**3** 0.1181	**0** 0	**-0.060** -0.0024
3 0.118	**6** 0.2362	**0** 0	**-0.075** -0.0030
6 0.236	**10** 0.3937	**0** 0	**-0.090** -0.0035

Table B6-7. W/WS series thrust washer tolerances and unitized thrust bearing assembly (TPK/TVK series) tolerances =JIS B 0401=

(1) Outer diameter

Nominal outer diameter d_1		Maximum actually measured outer diameter tolerance (e12)	
>	≤	Max.	Min.
mm		µm	
18	30	-40	-250
30	50	-50	-300
50	80	-60	-360
80	120	-72	-422
120	180	-85	-485

· These values correspond to the W and WS series thickness (h, h1) tolerances and to JIS B 0401-2 tolerance zone class js12.

(2) Bore diameter

Nominal bore diameter d		Minimum actually measured bore diameter tolerance (E12)	
>	≤	Max.	Min.
mm		µm	
6	10	+175	+25
10	18	+212	+32
18	30	+250	+40
30	50	+300	+50
50	80	+360	+60
80	120	+422	+72

· These values correspond to the W and WS series thickness (h, h1) tolerances and to JIS B 0401-2 tolerance zone class js12.

Table B6-8. Mounting tolerances for shafts and housings for metric series components

Bearing components	Shaft tolerance (shaft piloting)	Housing tolerance (housing piloting)
Needle roller and cage assembly. Types: AXK, FNT and TP	h8	H8
Needle roller and cage assembly. Type: AX	h10	H10
Thin thrust washer. Types: AS and W	h8	H8
Heavy thrust washer. Types: LS and WS	h8	H8
Shaft-piloted thrust washer. Type: WS.811	h6 (j6)	Clearance
Housing-piloted thrust washer. Type: GS.811	Clearance	H7 (K7)
Thick, thin and heavy series thrust washers. Types: CP and CPR	h10	H10 required
Unitized thrust bearing assembly. Types: FNTKF (FNTK, FNTF) and TPK/TVK series	h8	H8

MOUNTING TOLERANCES

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES – METRIC SERIES

On FNT and AXK series thrust needle roller and cage assemblies, the cage bore has a closer tolerance than the outer diameter. Therefore bore piloting is preferred for these assemblies. To reduce wear, it is suggested that the piloting surface for the cage be hardened to an equivalent of at least 55 HRC. Where design requirements prevent bore piloting, the FNT or AXK series thrust needle roller and cage assemblies may be piloted on the outer diameters. For such cases, suitable O.D. piloting dimensions should be determined. Mounting tolerances are given in Table B6-8 on page B-6-10.

THRUST WASHERS

The mounting tolerances for series AS, W, LS, WS, WS.811 and GS.811 thrust washers for use with thrust needle roller and cage assemblies are given in Table B6-8 on page B-6-10.

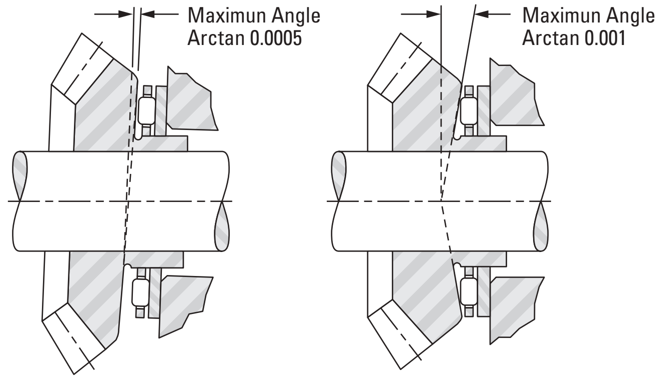
To reduce the wear in the FNT and AXK series thrust assemblies, the piloting surface for the thrust washers should also be hardened to an equivalent of at least 55 HRC.

BACKUP SURFACES

In some applications, it is desirable to use the backup surfaces as raceways for the needle rollers of the thrust needle roller and cage assemblies. In such designs, these surfaces should be parallel and must be hardened to at least 58 HRC. If this hardness cannot be achieved and thrust washers cannot be used, the load ratings must be reduced as explained in the engineering section of this catalog.

Thrust raceway surfaces must be ground to a surface finish of 0.2 µm Ra (8 µin Ra). When this requirement cannot be met, thrust washers must be used.

The raceways against which the needle rollers operate, or the surface against which the thrust washers bear, must be square with the axis of the shaft. Equally important, the raceway or surface backing of the thrust washer must not be dished or coned. The permissible limits of out-of-squareness and dishing or coning are shown in the figures below.



Out of square surface **Dished or coned surface**

Fig. B6-2. Permissible limits

For the thin series washers AS thrust washers, full backup should be provided across the whole area of circulation of the rolling elements.

Thick series needle thrust bearings and thick thrust washers can be supported on a more restricted or discontinuous shoulder – provided that the deflection of the washer under load does not impede the smooth operation of the thrust bearing or the required axial run-out.

When an application does not involve the use of a thrust washer, the surface forming the second raceway must:

- Posess a suitable surface finish 0.2 µm Ra (8 µin Ra) and sufficient hardness in relation to the load to be supported. A minimum hardness of 58 HRC, enables thrust bearings to carry their full load capacity. Lower hardness values reduce the capacities shown in the tables of dimensions (see tabulated sizes).

TOLERANCES FOR PILOTING SURFACES (AX SERIES)

- Piloting on the shaft: h10 on dimensions D_{c1} for thrust bearings or dimension d for thrust washers.
- Piloting in the housing: H10 on dimensions D for thrust bearings or dimension d_1 for thrust washers.

LOAD RATINGS

MINIMUM AXIAL LOAD

Slippage can occur if the applied axial load is too light and the operating speed of the thrust needle roller and cage assembly is high – particularly if accompanied by inadequate lubrication. For satisfactory operation, a certain minimum load must be applied to a thrust needle roller and cage assembly which can be calculated from:

$$F_{a\,min} = C_{0a}/2200 \text{ [kN]}$$

Where:

C_{0a} = static load rating [kN]
$F_{a\,min}$ = minimum axial load [kN]

LUBRICATION

Oil is the preferred lubricant for thrust needle roller and cage assemblies and an ample oil flow is absolutely necessary for high speeds or for moderate speeds when the load is relatively high.

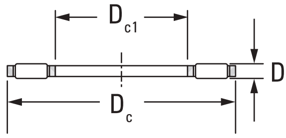
SPECIAL DESIGNS

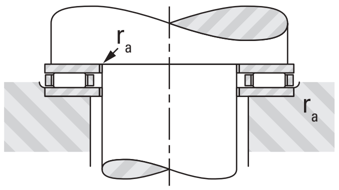
Thrust needle roller and cage assemblies and thrust washers are made to special dimensions and configurations, as well as from special materials – when quantities permit economical manufacture.

Thrust needle roller and cage assemblies are particularly adaptable to low-cost integral combination with special thrust washers. When the use of such special designs is considered, the following pages should be reviewed for evaluation of proposed arrangements.

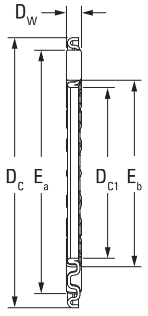
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

METRIC SERIES
AXK, FNT SERIES

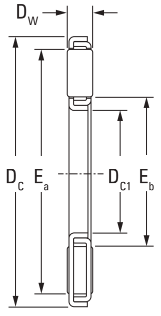




CAGE DESIGN

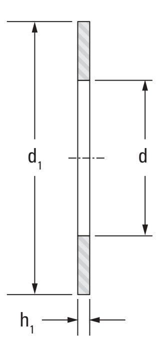


AXK

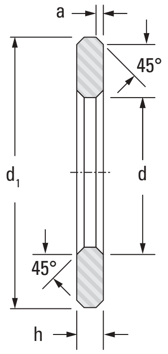


FNT

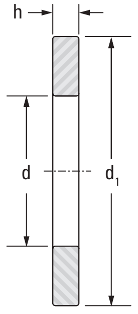
Shaft Dia.	D_{c1}	D_c	D_w	E_a	E_b	$r_{a\,max.}$	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.
								Dynamic	Static		Oil	
								C	C_o			
mm	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}	kg lbs
6	**6** 0.2362	**19** 0.7480	**2** 0.0787	**16.9** 0.665	**7.8** 0.307	**0.3** 0.012	AXK0619TN	**6.37** 1432	**14.3** 3215	1.40	23000	**0.001** 0.002
				18.0 0.709	**8.0** 0.315	**0.3** 0.012	FNT-619	**6.82** 1530	**15.6** 3510	1.50	21000	**0.002** 0.004
8	**8** 0.3150	**21** 0.8268	**2** 0.0787	**18.6** 0.732	**9.6** 0.378	**0.3** 0.012	AXK0821TN	**8.34** 1870	**21.1** 4740	2.00	20000	**0.001** 0.002
				20.0 0.787	**10.0** 0.394	**0.3** 0.012	FNT-821	**7.67** 1720	**19.1** 4290	1.85	20000	**0.002** 0.004
10	**10** 0.3937	**24** 0.9449	**2** 0.0787	**22.5** 0.886	**11.0** 0.433	**0.3** 0.012	AXK1024	**9.32** 2100	**25.9** 5820	2.90	17000	**0.003** 0.007
				23.0 0.906	**12.0** 0.472	**0.3** 0.012	FNT-1024	**9.14** 2060	**25.2** 5670	2.40	17000	**0.002** 0.004
12	**12** 0.4724	**26** 1.0236	**2** 0.0787	**24.5** 0.965	**13.0** 0.512	**0.3** 0.012	AXK1226	**10.8** 2430	**32.3** 7260	3.40	15000	**0.004** 0.009
				25.0 0.984	**14.0** 0.551	**0.3** 0.012	FNT-1226	**9.92** 2230	**29.0** 6520	2.75	15000	**0.004** 0.009
15	**15** 0.5906	**28** 1.1024	**2** 0.0787	**27.0** 1.063	**17.0** 0.669	**0.3** 0.012	AXK1528	**11.1** 2500	**35.2** 7910	3.35	15000	**0.004** 0.009
				27.0 1.063	**17.0** 0.669	**0.3** 0.012	FNT-1528	**10.2** 2290	**31.3** 7040	3.00	15000	**0.004** 0.009
17	**17** 0.6693	**30** 1.1811	**2** 0.0787	**28.7** 1.130	**18.3** 0.721	**0.3** 0.012	AXK1730TN	**11.7** 2630	**38.7** 8700	3.70	14000	**0.004** 0.009
				29.0 1.142	**19.0** 0.748	**0.3** 0.012	FNT-1730	**10.8** 2430	**34.8** 7820	3.35	14000	**0.004** 0.009
20	**20** 0.7874	**35** 1.3780	**2** 0.0787	**34.0** 1.339	**22.0** 0.866	**0.3** 0.012	AXK2035	**12.8** 2880	**45.4** 10200	4.40	12000	**0.006** 0.013
				34.0 1.339	**22.0** 0.866	**0.3** 0.012	FNTA-2035	**13.8** 3100	**50.7** 11400	4.80	12000	**0.005** 0.011
25	**25** 0.9843	**42** 1.6535	**2** 0.0787	**41.0** 1.614	**29.0** 1.142	**0.6** 0.024	AXK2542	**14.3** 3210	**56.8** 12800	5.50	10000	**0.007** 0.015
				41.0 1.614	**27.0** 1.063	**0.6** 0.024	FNT-2542	**18.0** 4050	**75.3** 16900	8.05	9700	**0.008** 0.018
30	**30** 1.1811	**47** 1.8504	**2** 0.0787	**46.0** 1.811	**35.0** 1.378	**0.6** 0.024	AXK3047	**16.0** 3600	**68.1** 15300	6.60	9000	**0.009** 0.020
				46.0 1.811	**32.0** 1.260	**0.6** 0.024	FNTA-3047	**18.6** 4180	**82.4** 18500	8.65	8900	**0.009** 0.020
35	**35** 1.3780	**52** 2.0472	**2** 0.0787	**51.0** 2.008	**40.0** 1.575	**0.6** 0.024	AXK3552	**17.4** 3910	**79.5** 17900	7.70	8100	**0.010** 0.022
				51.0 2.008	**37.0** 1.457	**0.6** 0.024	FNT-3552	**21.7** 4880	**104.0** 23400	11.1	7900	**0.010** 0.022



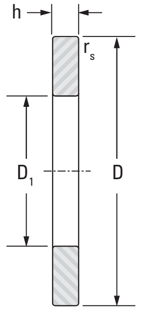
AS
($h_1 = 1.0$)



LS



WS.811



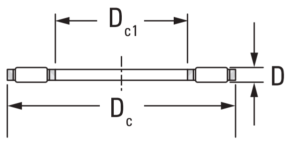
GS.811

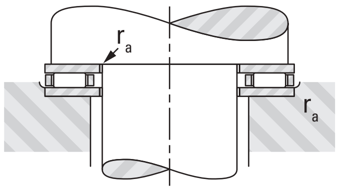
Washer Dimensions			Thin			Heavy (LS)				Heavy				
d	D, d_1	D_1	h_1	Washer Designation	Approx. Wt.	h	a	Washer Designation	Approx. Wt.	h	$r_{s\,min.}$	Washer Designation		Approx. Wt.
												Shaft Piloted	Housing Piloted	
mm in	mm in	mm in	mm in		kg lbs	mm in	mm in		kg lbs	mm in	mm in			kg lbs
6 0.2362	**19** 0.7480		**1.00** 0.0394	AS0619	**0.001** 0.002									
8 0.3150	**21** 0.8268		**1.00** 0.0394	AS0821	**0.002** 0.004	**2.75** 0.108	**0.30** 0.012	LS0821	**0.004** 0.009					
10 0.3937	**24** 0.9449		**1.00** 0.0394	AS1024	**0.003** 0.007	**2.75** 0.108	**0.50** 0.020	LS1024	**0.008** 0.018					
12 0.4724	**26** 1.0236		**1.00** 0.0394	AS1226	**0.003** 0.007	**2.75** 0.108	**0.50** 0.020	LS1226	**0.009** 0.020					
15 0.5906	**28** 1.1024	**16** 0.6299	**1.00** 0.0394	AS1528	**0.003** 0.007	**2.75** 0.108	**0.50** 0.020	LS1528	**0.010** 0.022	**2.75** 0.108	**0.30** 0.012	WS.81102	GS.81102	**0.0100** 0.0220
17 0.6693	**30** 1.1811	**18** 0.7087	**1.00** 0.0394	AS1730	**0.003** 0.007	**2.75** 0.108	**0.50** 0.020	LS1730	**0.011** 0.024	**2.75** 0.108	**0.30** 0.012	WS.81103	GS.81103	**0.011** 0.024
20 0.7874	**35** 1.3780	**21** 0.8268	**1.00** 0.0394	AS2035	**0.005** 0.011	**2.75** 0.108	**0.50** 0.020	LS2035	**0.014** 0.031	**2.75** 0.108	**0.30** 0.012	WS.81104	GS.81104	**0.014** 0.031
25 0.9843	**42** 1.6535	**26** 1.0236	**1.00** 0.0394	AS2542	**0.007** 0.015	**3.00** 0.118	**1.00** 0.039	LS2542	**0.021** 0.046	**3.00** 0.118	**0.60** 0.024	WS.81105	GS.81105	**0.021** 0.046
30 1.1811	**47** 1.8504	**32** 1.2598	**1.00** 0.0394	AS3047	**0.008** 0.018	**3.00** 0.118	**1.00** 0.039	LS3047	**0.023** 0.051	**3.00** 0.118	**0.60** 0.024	WS.81106	GS.81106	**0.023** 0.051
35 1.3780	**52** 2.0472	**37** 1.4567	**1.00** 0.0394	AS3552	**0.009** 0.020	**3.50** 0.138	**1.00** 0.039	LS3552	**0.030** 0.066	**3.50** 0.138	**0.60** 0.024	WS.81107	GS.81107	**0.032** 0.071

Continued on next page.

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

METRIC SERIES
AXK, FNT SERIES





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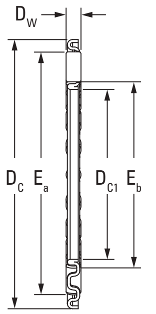
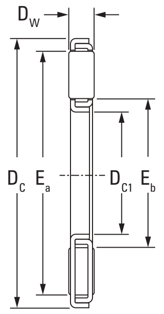
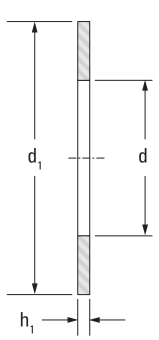


AXK



FNT

Shaft Dia.	D_{c1}	D_c	D_w	E_a	E_b	$r_{a\,max.}$	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.
								Dynamic C	Static C_o		Oil	
mm	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}	kg lbs
40	**40** 1.5748	**60** 2.3622	**3** 0.1181	**58.0** 2.283	**45.0** 1.772	**0.6** 0.024	AXK4060	**27.1** 6090	**110.0** 24700	11.9	7000	**0.016** 0.035
				57.0 2.244	**43.0** 1.693	**0.6** 0.024	FNT-4060	**31.5** 7080	**132.0** 29700	14.6	7100	**0.020** 0.044
45	**45** 1.7717	**65** 2.5591	**3** 0.1181	**63.0** 2.480	**50.0** 1.969	**0.6** 0.024	AXK4565	**29.0** 6520	**124.0** 27900	13.4	6500	**0.020** 0.044
				63.0 2.480	**47.0** 1.850	**0.6** 0.024	FNT-4565	**37.6** 8450	**172.0** 38700	18.5	6400	**0.024** 0.053
50	**50** 1.9685	**70** 2.7559	**3** 0.1181	**68.0** 2.677	**55.0** 2.165	**0.6** 0.024	AXK5070	**30.8** 6920	**137.0** 30800	14.9	6000	**0.020** 0.044
				68.0 2.677	**52.0** 2.047	**0.6** 0.024	FNT-5070	**37.9** 8520	**179.0** 40200	19.1	5900	**0.026** 0.057
55	**55** 2.1654	**78** 3.0709	**3** 0.1181	**76.0** 2.992	**60.0** 2.362	**0.6** 0.024	AXK5578	**39.4** 8860	**195.0** 43800	20.5	5300	**0.026** 0.057
				76.0 2.992	**57.0** 2.244	**0.6** 0.024	FNT-5578	**48.5** 10900	**254.0** 57100	26.3	5300	**0.033** 0.073
60	**60** 2.3622	**85** 3.3465	**3** 0.1181	**83.0** 3.268	**65.0** 2.559	**0.6** 0.024	AXK6085	**44.5** 10000	**234.0** 52600	24.7	4900	**0.035** 0.077
65	**65** 2.5591	**90** 3.5433	**3** 0.1181	**88.0** 3.465	**70.0** 2.756	**0.6** 0.024	AXK6590	**46.7** 10500	**254** 57100	26.8	4600	**0.036** 0.079
70	**70** 2.7559	**95** 3.7402	**4** 0.1575	**93.0** 3.661	**74.0** 2.913	**0.6** 0.024	AXK7095	**53.8** 12100	**253** 56900	28.0	4400	**0.055** 0.121
				93.0 3.661	**73.0** 2.874	**0.6** 0.024	FNTA-7095	**66.6** 15000	**333** 74900	35.3	4400	**0.057** 0.126
75	**75** 2.9528	**100** 3.9370	**4** 0.1575	**98.0** 3.858	**79.0** 3.110	**0.6** 0.024	AXK75100	**55.1** 12400	**266** 59800	29.4	4200	**0.058** 0.128
				98.0 3.858	**78.0** 3.071	**0.6** 0.024	FNT-75100	**71.6** 16100	**374** 84100	39.7	4100	**0.064** 0.141
80	**80** 3.1496	**105** 4.1339	**4** 0.1575	**103.0** 4.055	**84.0** 3.307	**0.6** 0.024	AXK80105	**56.4** 12700	**279** 62700	30.8	4000	**0.092** 0.203
				103.0 4.055	**83.0** 3.268	**0.6** 0.024	FNTA-80105	**71.3** 16100	**379** 85200	40.1	3900	**0.062** 0.137
85	**85** 3.3465	**110** 4.3307	**4** 0.1575	**108.0** 4.252	**89.0** 3.504	**0.6** 0.024	AXK85110	**57.6** 12900	**291** 65400	32.2	3800	**0.063** 0.139
90	**90** 3.5433	**120** 4.7244	**4** 0.1575	**118.0** 4.646	**94.0** 3.701	**0.6** 0.024	AXK90120	**72.9** 16400	**405** 91000	43.0	3500	**0.081** 0.179
100	**100** 3.9370	**135** 5.3150	**4** 0.1575	**133.0** 5.236	**105.0** 4.134	**0.6** 0.024	AXK100135	**90.2** 20300	**552** 124000	56.4	3100	**0.106** 0.234
110	**110** 4.3307	**145** 5.7087	**4** 0.1575	**143.0** 5.630	**115.0** 4.528	**0.6** 0.024	AXK110145	**93.2** 21000	**591** 133000	59.0	2800	**0.117** 0.258



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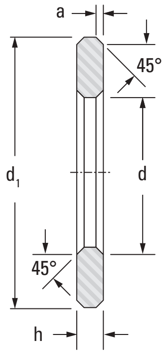
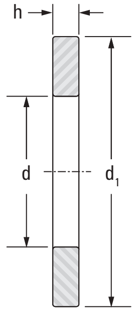
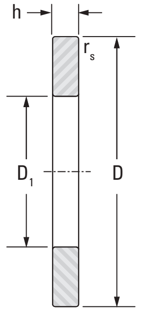


LS



WS.811



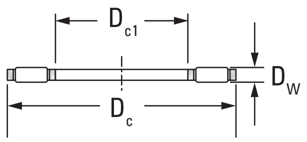
GS.811

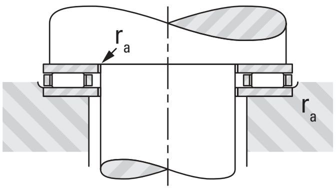
Washer Dimensions			Thin			Heavy (LS)				Heavy				
d	D, d_1	D_1	h_1	Washer Designation	Approx. Wt.	h	a	Washer Designation	Approx. Wt.	h	$r_{s\,min.}$	Washer Designation		Approx. Wt.
												Shaft Piloted	Housing Piloted	
mm in	mm in	mm in	mm in		kg lbs	mm in	mm in		kg lbs	mm in	mm in			kg lbs
40 1.5748	**60** 2.3622	**42** 1.6535	**1.00** 0.0394	AS4060	**0.012** 0.026	**3.50** 0.138	**1.00** 0.039	LS4060	**0.041** 0.090	**3.50** 0.138	**0.60** 0.024	WS.81108	GS.81108	**0.043** 0.095
45 1.7717	**65** 2.5591	**47** 1.8504	**1.00** 0.0394	AS4565	**0.013** 0.029	**4.00** 0.157	**1.00** 0.039	LS4565	**0.052** 0.115	**4.00** 0.157	**0.60** 0.024	WS.81109	GS.81109	**0.054** 0.119
50 1.9685	**70** 2.7559	**52** 2.0472	**1.00** 0.0394	AS5070	**0.014** 0.031	**4.00** 0.157	**1.00** 0.039	LS5070	**0.0560** 0.1230	**4.00** 0.157	**0.60** 0.024	WS.81110	GS.81110	**0.059** 0.130
55 2.1654	**78** 3.0709	**57** 2.2441	**1.00** 0.0394	AS5578	**0.018** 0.040	**5.00** 0.197	**1.00** 0.039	LS5578	**0.0910** 0.2010	**5.00** 0.197	**0.60** 0.024	WS.81111	GS.81111	**0.094** 0.207
60 2.3622	**85** 3.3465	**62** 2.4409	**1.00** 0.0394	AS6085	**0.022** 0.049	**4.75** 0.187	**1.50** 0.059	LS6085	**0.102** 0.225	**4.75** 0.187	**1.00** 0.039	WS.81112	GS.81112	**0.106** 0.234
65 2.5591	**90** 3.5433	**67** 2.6378	**1.00** 0.0394	AS6590	**0.023** 0.051	**5.25** 0.207	**1.50** 0.059	LS6590	**0.121** 0.267	**5.25** 0.207	**1.00** 0.039	WS.81113	GS.81113	**0.125** 0.276
70 2.7559	**95** 3.7402	**72** 2.8346	**1.00** 0.0394	AS7095	**0.025** 0.055	**5.25** 0.207	**1.50** 0.059	LS7095	**0.1280** 0.2820	**5.25** 0.207	**1.00** 0.039	WS.81114	GS.81114	**0.133** 0.293
75 2.9528	**100** 3.9370	**77** 3.0315	**1.00** 0.0394	AS75100	**0.027** 0.060	**5.75** 0.226	**1.50** 0.059	LS75100	**0.1500** 0.3310	**5.75** 0.226	**1.00** 0.039	WS.81115	GS.81115	**0.155** 0.342
80 3.1496	**105** 4.1339	**82** 3.2283	**1.00** 0.0394	AS80105	**0.028** 0.062	**5.75** 0.226	**1.50** 0.059	LS80105	**0.1580** 0.3480	**5.75** 0.226	**1.00** 0.039	WS.81116	GS.81116	**0.165** 0.364
85 3.3465	**110** 4.3307	**87** 3.4252	**1.00** 0.0394	AS85110	**0.028** 0.062	**5.75** 0.226	**1.50** 0.059	LS85110	**0.166** 0.366	**5.75** 0.226	**1.00** 0.039	WS.81117	GS.81117	**0.173** 0.381
90 3.5433	**120** 4.7244	**92** 3.6220	**1.00** 0.0394	AS90120	**0.038** 0.084	**6.50** 0.256	**1.50** 0.059	LS90120	**0.245** 0.540	**6.50** 0.256	**1.00** 0.039	WS.81118	GS.81118	**0.253** 0.558
100 3.9370	**135** 5.3150		**1.00** 0.0394	AS100135	**0.050** 0.110									
110 4.3307	**145** 5.7087		**1.00** 0.0394	AS110145	**0.055** 0.121	**7.00** 0.276	**1.50** 0.059	LS110145	**0.373** 0.822	**7.00** 0.276				

Continued on next page.

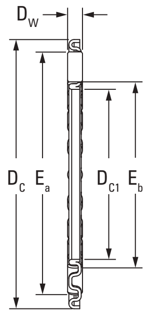
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

METRIC SERIES
AXK, FNT SERIES

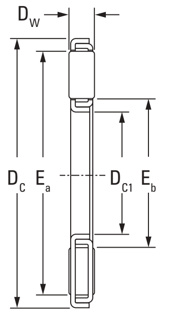




CAGE DESIGN

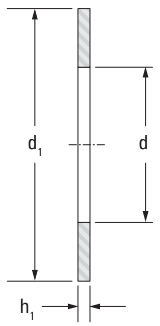


AXK



FNT

Shaft Dia.	D_{c1}	D_c	D_w	E_a	E_b	$r_{a\,max.}$	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.
								Dynamic	Static		Oil	
								C	C_o			
mm	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}	kg lbs
120	120 4.7244	155 6.1024	4 0.1575	153.0 6.024	125.0 4.921	0.6 0.024	AXK120155	98.5 22100	650 146000	63.5	2700	0.126 0.278
130	130 5.1181	170 6.6929	5 0.1969	167.0 6.575	136.0 5.354	0.6 0.024	AXK130170	132 29700	829 186000	78.7	2400	0.198 0.437
140	140 5.5118	180 7.0866	5 0.1969	177.0 6.969	146.0 5.748	0.6 0.024	AXK140180	136 30600	887 199000	82.5	2300	0.221 0.487
150	150 5.9055	190 7.4803	5 0.1969	187.0 7.362	156.0 6.142	0.6 0.024	AXK150190	141 31700	944 212000	86.2	2200	0.225 0.496
160	160 6.2992	200 7.8740	5 0.1969	197.0 7.756	166.0 6.535	0.6 0.024	AXK160200	146 32800	1000 225000	89.9	2100	0.249 0.549



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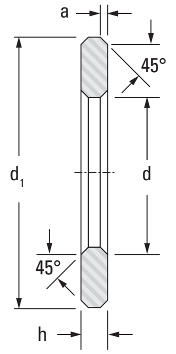
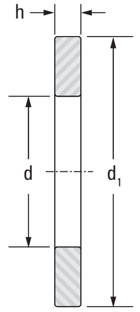
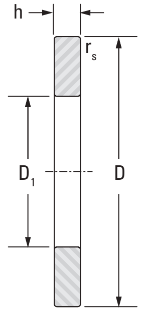


LS



WS.811

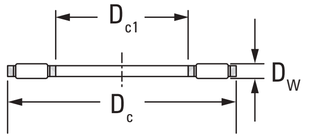


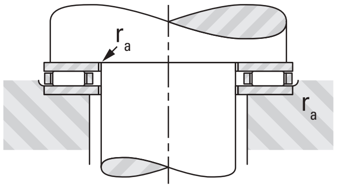
GS.811

Washer Dimensions			Thin			Heavy (LS)				Heavy				
d	D, d_1	D_1	h_1	Washer Designation	Approx. Wt.	h	a	Washer Designation	Approx. Wt.	h	$r_{s\,min.}$	Washer Designation		Approx. Wt.
												Shaft Piloted	Housing Piloted	
mm in	mm in	mm in	mm in		kg lbs	mm in	mm in		kg lbs	mm in	mm in			kg lbs
120 4.7244	155 6.1024		1.00 0.0394	AS120155	0.059 0.130									
130 5.1181	170 6.6929		1.00 0.0394	AS130170	0.074 0.163	9.00 0.354	1.50 0.059	LS130170	0.065 0.143					
140 5.5118	180 7.0866		1.00 0.0394	AS140180	0.078 0.172									
150 5.9055	190 7.4803		1.00 0.0394	AS150190	0.083 0.183									
160 6.2992	200 7.8740		1.00 0.0394	AS160200	0.089 0.196									

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

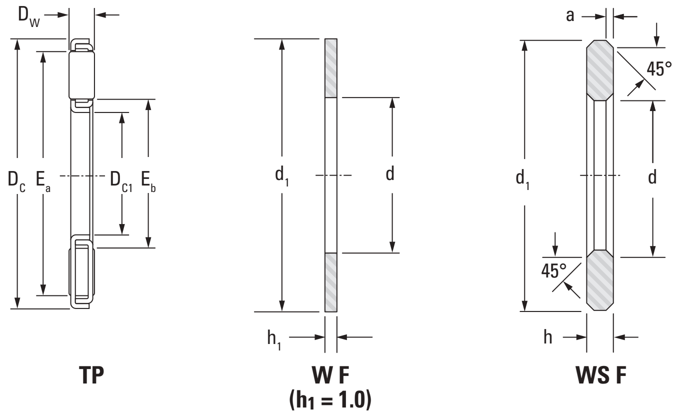
METRIC SERIES
TP SERIES





Shaft Dia.	D_{c1}	D_c	D_w	E_a	E_b	$r_{a\,max.}$	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.
								Dynamic	Static		Oil	
								C	C_o			
mm	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}	kg lbs
15	15	32.3	2	31	22		TP1532-1	12.7	44.7	4.50	13000	0.006
18	18	31	2	29	20		TP1831	10.6	34.4	3.30	14000	0.005
20	20	34.72	2	32	22		TP2035	15.3	57.4	5.70	12000	0.006
20.9	20.9	32	2	30	23		TP2132D	9.20	29.7	2.85	13000	0.005
21.9	21.9	34	2	32	25		TP2234	8.85	28.6	2.75	13000	0.005
25	25	42	2	40	28		TP2542	16.2	66.2	6.90	10000	0.009
30	30	47	2	45	34		TP3047-1	17.9	78.6	8.20	9000	0.010
33.49	33.49	45.13	2	43	37		TP3445A	9.35	34.3	4.85	9000	0.007
39.6	39.6	58.24	3	56	43		TP4058-1	29.2	120	12.9	7000	0.022
41	41	68.05	9	64	45		TP4168	86.6	233	26.5	6000	0.104
42	42	62	3	57	47		TP4262	19.3	71.4	7.00	7000	0.023
45	45	56	2	54	47		TP4556	9.90	39.6	3.80	7000	0.008
46.4	46.4	68	3.5	65	49		TP4668-2	42.2	182	19.3	6000	0.035
50	50	70	3	66	54		TP5070	29.4	129	14.2	6000	0.028
70	70	95	4	91	74		TP7095	57.3	275	29.2	4000	0.070

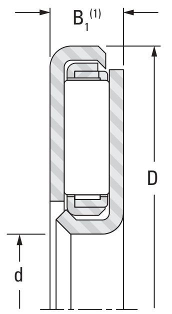
CAGE DESIGN

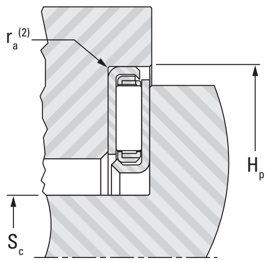


Washer Dimensions			Thin			Heavy (WS)				Heavy				
d	D, d_1	D_1	h_1	Washer Designation	Approx. Wt.	h	a	Washer Designation	Approx. Wt.	h	$r_{s\,min.}$	Washer Designation		Approx. Wt.
												Shaft Piloted	Housing Piloted	
mm in	mm in	mm in	mm in		kg lbs	mm in	mm in		kg lbs	mm in	mm in			kg lbs
15	32		1.00	W1532F	0.005									
18	31		1.00	W1831F	0.004									
25	42		1.00	W2542F	0.007	3.00		WS2542KF	0.021					
70	95					3.00		WS7095F	0.075					

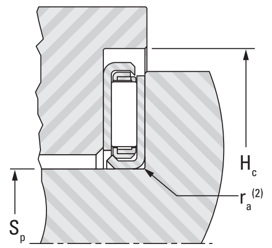
UNITIZED THRUST BEARING

METRIC SERIES
FNTKF SERIES



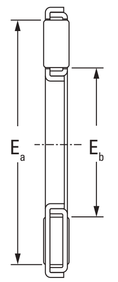


Housing Piloting



Shaft Piloting

CAGE DESIGN



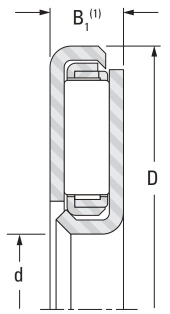
FNT

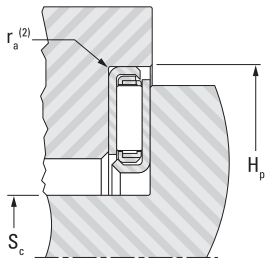
Shaft Dia.	d	D	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt
					Dynamic	Static		Oil	Housing Piloting		Shaft Piloting		E_a	E_b	
	(E13)	(e13)	(-0.2)		C	C_o			H_p	S_c(3)	S_p	H_c(3)			
									—	Max.	—	Min.			
mm	mm in	mm in	mm in		kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
10	10 0.3937	28 1.1024	3.7(1) 0.146	FNTKF-1028	9.88 2220	29.0 6520	2.75	16000	28 1.102	8 0.31496	10 0.394	30 1.181	25 0.984	14 0.551	0.010
13	13 0.5118	30 1.1811	3.7(1) 0.146	FNTKF-1330	10.1 2270	31.3 7040	3.00	15000	30 1.181	11 0.433	13 0.512	32 1.260	27 1.063	17 0.669	0.011
15	15 0.5906	32 1.2598	3.7(1) 0.146	FNTKF-1532	10.8 2430	34.8 7820	3.35	14000	32 1.260	13 0.512	15 0.591	34 1.339	29 1.142	19 0.748	0.012
18	18 0.7087	37 1.4567	3.7(1) 0.146	FNTKF-1837	13.8 3100	50.3 11300	4.80	12000	37 1.457	16 0.630	18 0.709	39 1.535	34 1.339	22 0.866	0.017
23	23 0.9055	44 1.7323	3.7(1) 0.146	FNTKF-2344	18.0 4050	75.3 16900	8.05	9700	44 1.732	21 0.827	23 0.906	46 1.811	41 1.614	27 1.063	0.021
28	28 1.1024	49 1.9291	3.7(1) 0.146	FNTKF-2849	18.6 4180	82.4 18500	8.65	8900	49 1.929	26 1.024	28 1.102	51 2.008	46 1.811	32 1.260	0.024
33	33 1.2992	54 2.126	3.7(1) 0.146	FNTKF-3354	21.6 4860	104 23400	11.1	7900	54 2.126	31 1.220	33 1.299	56 2.205	51 2.008	37 1.457	0.029
38	38 1.4961	62 2.4409	4.7(1) 0.185	FNTKF-3862	31.4 7060	132 29700	14.6	7100	62 2.441	36 1.417	38 1.496	64 2.520	57 2.244	43 1.693	0.047
43	43 1.6929	67 2.6378	4.7(1) 0.185	FNTKF-4367	37.8 8500	173 38900	18.5	6400	67 2.638	41 1.614	43 1.693	69 2.717	63 2.480	47 1.850	0.051
48	48 1.890	72 2.8346	4.7(1) 0.185	FNTKF-4872	37.9 8520	179 40200	19.1	5900	72 2.835	46 1.811	48 1.890	74 2.913	68 2.677	52 2.047	0.056
53	53 2.0866	80 3.150	4.7(1) 0.185	FNTKF-5380	48.5 10900	254 57100	26.3	5300	80 3.150	51 2.008	53 2.087	82 3.228	76 2.992	57 2.244	0.070

(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=d-2mm, H_c=D+2mm

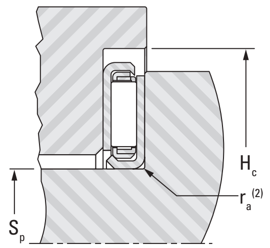
UNITIZED THRUST BEARING

METRIC SERIES
TPK JL,
TVK JL SERIES



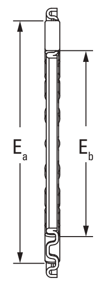


Housing Piloting

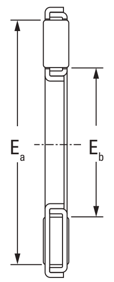


Shaft Piloting

CAGE DESIGN



TVK



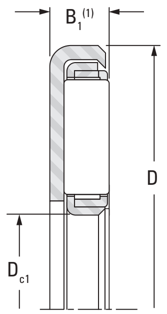
TPK

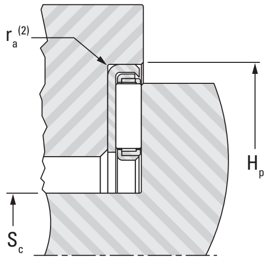
Shaft Dia.	d	D	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static		Oil	Housing Piloting		Shaft Piloting		E_a	E_b	
					C	C_o			H_p	S_c(3)	S_p	H_c(3)			
									—	Max.	—	Min.			
mm	mm in	mm in	mm in		kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
16.987	16.987	33	3.4	TVK1733JL	8.95	27.7	2.80	14000	33	15	17	35	30	21	0.011
22.6	22.6	40	3.6	TVK2340JL-3	11.8	43.1	4.35	11000	40	20.6	22.6	42	36	28	0.016
30.7	30.7	47.15	4.184	TPK3147JL-2	14.4	59.6	6.00	9000	47.1	28.7	30.7	49.1	43	34	0.024
34	34	51.4	3.6	TPK3451JL	14.5	61.6	6.20	9000	51.4	32	34	53.4	47	38	0.023
38	38	53	3.6	TPK3853JL	13.5	57.9	5.55	8000	53	36	38	55	49	42	0.022
	38	58	4.8	TPK3858JL	24.7	95.8	9.35	8000	58	36	38	60	54	43	0.041
54	54	77	6	TVK5477JL	31.4	144	15.7	6000	77	52	54	79	72	60	0.076
55.9	55.9	76	3.584	TVK5676JL	18.5	96.6	9.00	6000	76	53.9	55.9	78	70	60	0.040
60.4	60.4	77.9	3.8	TVK6078JL	15.8	80.1	8.05	5000	78	58.4	60.4	80	74	65	0.037
	60.4	78.0	3.6	TPK6078JL	20.6	114	11.5	5000	77.9	58.4	60.4	79.9	74	65	0.038
63.8	63.8	83.6	4.6	TPK6484JL	29.9	141	13.3	5000	83.6	61.8	63.8	85.6	79	69	0.054
67.6	67.6	92	5.4	TVK6892JL-1	34.7	175	19.0	5000	92	65.6	67.6	94	86	74	0.086
73.6	73.6	89.6	3.6	TPK7490JL	11.7	56.7	5.45	5000	89.6	71.6	73.6	91.6	85	78	0.041
110	110	132.2	4.3	TPK110132JL-1	22.9	131	11.6	3000	132.2	108	110	134.2	126	116	0.091

(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=d-2mm, H_c=D+2mm

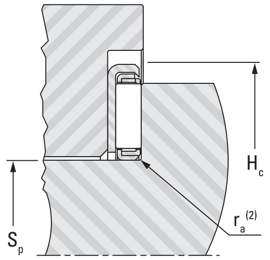
UNITIZED THRUST BEARING

METRIC SERIES
FNTK SERIES



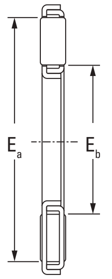


Housing Piloting



Shaft Piloting

CAGE DESIGN



FNT

Shaft Dia.	D_{c1}	D	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static		Oil	Housing Piloting		Shaft Piloting				
									H_p	S_c(3)	S_p	H_c(3)			
	(E11)	(e13)	(-0.1)		C	C_o			—	Max.	—	Min.	E_a	E_b	
mm	mm in	mm in	mm in		kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
12	**12** 0.4724	**28** 1.1024	**2.85**(1) 0.1122	FNTK-1228	**9.88** 2220	**29.0** 6520	2.75	16000	**28** 1.102	**10.5** 0.413	**12** 0.4724	**29.5** 1.161	**25** 0.9843	**14** 0.5512	**0.007**
15	**15** 0.5906	**30** 1.1811	**2.85**(1) 0.1122	FNTK-1530	**10.1** 2270	**31.3** 7040	3.00	15000	**30** 1.181	**13.5** 0.531	**15** 0.5906	**31.5** 1.240	**27** 1.063	**17** 0.6693	**0.008**
17	**17** 0.6693	**32** 1.260	**2.85**(1) 0.1122	FNTK-1732	**10.8** 2430	**34.8** 7820	3.35	14000	**32** 1.260	**15.5** 0.610	**17** 0.6693	**33.5** 1.319	**29** 1.1417	**19** 0.748	**0.008**
20	**20** 0.7874	**37** 1.4567	**2.85**(1) 0.1122	FNTK-2037	**13.8** 3100	**50.3** 11300	4.80	12000	**37** 1.457	**18.5** 0.728	**20** 0.7874	**38.5** 1.516	**34** 1.3386	**22** 0.8661	**0.012**
25	**25** 0.9843	**44** 1.7323	**2.85**(1) 0.1122	FNTK-2544	**18.0** 4050	**75.3** 16900	8.05	9700	**44** 1.732	**23.5** 0.925	**25** 0.9843	**45.5** 1.791	**41** 1.6142	**27** 1.063	**0.015**
30	**30** 1.1811	**49** 1.9291	**2.85**(1) 0.1122	FNTK-3049	**18.6** 4180	**82.4** 18500	8.65	8900	**49** 1.929	**28.5** 1.122	**30** 1.1811	**50.5** 1.988	**46** 1.811	**32** 1.260	**0.018**
35	**35** 1.378	**54** 2.126	**2.85**(1) 0.1122	FNTK-3554	**21.6** 4860	**104** 23400	11.1	7900	**54** 2.126	**33.5** 1.319	**35** 1.378	**55.5** 2.185	**51** 2.0079	**37** 1.4567	**0.021**
40	**40** 1.5748	**62** 2.4409	**3.85**(1) 0.1516	FNTK-4062	**31.4** 7060	**132** 29700	14.6	7100	**62** 2.441	**38.5** 1.516	**40** 1.5748	**63.5** 2.500	**57** 2.2441	**43** 1.6929	**0.035**
45	**45** 1.7717	**67** 2.6378	**3.85**(1) 0.1516	FNTK-4567	**37.8** 8500	**173** 38900	18.5	6400	**67** 2.638	**43.5** 1.713	**45** 1.7717	**68.5** 2.697	**63** 2.480	**47** 1.850	**0.039**
50	**50** 1.9685	**72** 2.8346	**3.85**(1) 0.1516	FNTK-5072	**37.9** 8520	**179** 40200	19.1	5900	**72** 2.835	**48.5** 1.909	**50** 1.9685	**73.5** 2.894	**68** 2.6772	**52** 2.0472	**0.042**
55	**55** 2.1654	**80** 3.150	**3.85**(1) 0.1516	FNTK-5580	**48.5** 10900	**254** 57100	26.3	5300	**80** 3.150	**53.5** 2.106	**55** 2.1654	**81.5** 3.209	**76** 2.9921	**57** 2.2441	**0.053**

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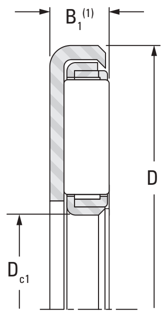
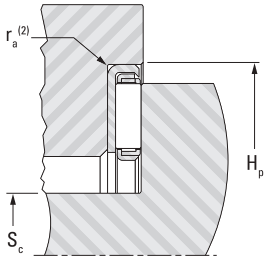
(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=D_{c1}-1.5mm, H_c=D+1.5mm

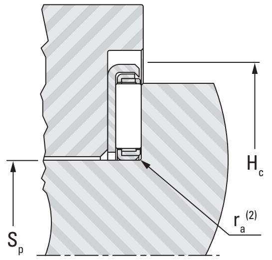
UNITIZED THRUST BEARING

METRIC SERIES
TPK J,
TVK J SERIES



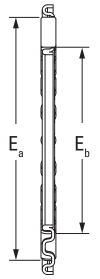


Housing Piloting

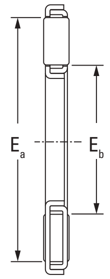


Shaft Piloting

CAGE DESIGN



TVK



TPK

Shaft Dia.	D_{c1}	D	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static		Oil	Housing Piloting		Shaft Piloting				
									H_p	S_c(3)	S_p	H_c(3)			
					C	C_o			—	Max.	—	Min.	E_a	E_b	
mm	mm in	mm in	mm in		kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
25	**25**	**39.5**	**3.3**	TVK2540J	**16**	**54.1**	5.10	11000	**39.5**	**23.5**			**36**	**26**	**0.012**
25.8	**25.8**	**42**	**2.784**	TVK2642J	**14.6**	**57**	5.65	11000	**42**	**24.3**			**37**	**27**	**0.013**
33.7	**33.7**	**48.2**	**2.784**	TVK3448J-1	**15.6**	**66.2**	6.15	9000	**48.2**	**32.2**			**45**	**35**	**0.014**
35	**35**	**53**	**2.8**	TVK3553J-1	**13.8**	**57.2**	5.95	5000	**53**	**33.5**			**49**	**37**	**0.017**
38	**38**	**52**	**2.8**	TVK3852J-1	**13.9**	**58.5**	5.90	8000	**52**	**36.5**			**48**	**39**	**0.015**

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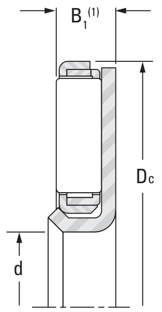
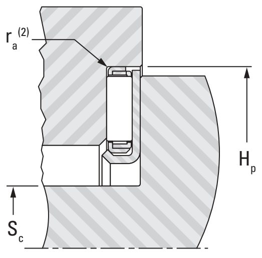
(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=D_{c1}-1.5mm, H_c=D+1.5mm

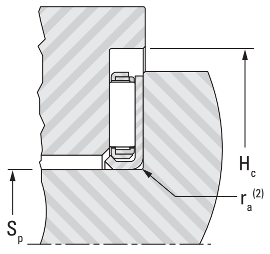
UNITIZED THRUST BEARING

METRIC SERIES
FNTF SERIES



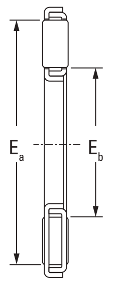


Housing Piloting



Shaft Piloting

CAGE DESIGN



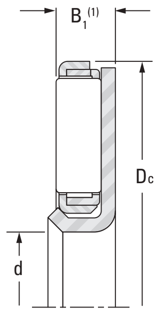
FNT

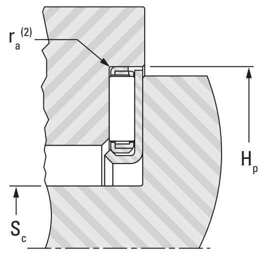
Shaft Dia.	d	D_c	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static		Oil	Housing Piloting		Shaft Piloting		E_a	E_b	
									H_p	S_c(3)	S_p	H_c(3)			
	(E13)	(c12)	(-0.1)		C	C_o			—	Max.	—	Min.			
mm	mm in	mm in	mm in		kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
10	10 0.394	26 1.024	2.85(1) 0.112	FNTF-1026	9.88 2220	29.0 6520	2.75	16000	26 1.024	8.5 0.335	10 0.394	27.5 1.083	25 0.984	14 0.551	0.006
13	13 0.512	28 1.102	2.85(1) 0.112	FNTF-1328	10.1 2270	31.3 7040	3.00	15000	28 1.102	11.5 0.453	13 0.512	29.5 1.161	27 1.063	17 0.669	0.007
15	15 0.591	30 1.181	2.85(1) 0.112	FNTF-1530	10.8 2430	34.8 7820	3.35	14000	30 1.181	13.5 0.531	15 0.591	31.5 1.240	29 1.142	19 0.748	0.008
18	18 0.709	35 1.378	2.85(1) 0.112	FNTF-1835	13.8 3100	50.3 11300	4.80	12000	35 1.378	16.5 0.650	18 0.709	36.5 1.437	34 1.339	22 0.866	0.011
23	23 0.906	42 1.654	2.85(1) 0.112	FNTF-2342	18.0 4050	75.3 16900	8.05	9700	42 1.654	21.5 0.846	23 0.906	43.5 1.713	41 1.614	27 1.063	0.014
28	28 1.102	47 1.850	2.85(1) 0.112	FNTF-2847	18.6 4180	82.4 18500	8.65	8900	47 1.850	26.5 1.043	28 1.102	48.5 1.909	46 1.811	32 1.260	0.017
33	33 1.299	52 2.047	2.85(1) 0.112	FNTF-3352	21.6 4860	104 23400	11.1	7900	52 2.047	31.5 1.240	33 1.299	53.5 2.106	51 2.008	37 1.457	0.019
38	38 1.496	60 2.362	3.85(1) 0.152	FNTF-3860	31.4 7060	132 29700	14.6	7100	60 2.362	36.5 1.437	38 1.496	61.5 2.421	57 2.244	43 1.693	0.033
43	43 1.693	65 2.559	3.85(1) 0.152	FNTF-4365	37.8 8500	173 38900	18.5	6400	65 2.559	41.5 1.634	43 1.693	66.5 2.618	63 2.480	47 1.850	0.038
48	48 1.890	70 2.756	3.85(1) 0.152	FNTF-4870	37.9 8520	179 40200	19.1	5900	70 2.756	46.5 1.831	48 1.890	71.5 2.815	68 2.677	52 2.047	0.041
53	53 2.087	78 3.071	3.85(1) 0.152	FNTF-5378	48.5 10900	254 57100	26.3	5300	78 3.071	51.5 2.028	53 2.087	79.5 3.130	76 2.992	57 2.244	0.053

(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=d-1.5mm, H_c=D_c+1.5mm

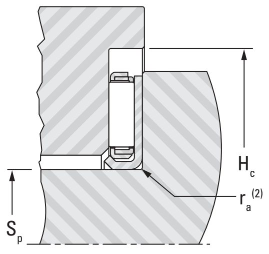
UNITIZED THRUST BEARING

METRIC SERIES
TPK L,
TVK L SERIES



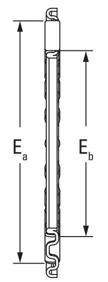


Housing Piloting

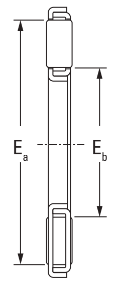


Shaft Piloting

CAGE DESIGN



TVK



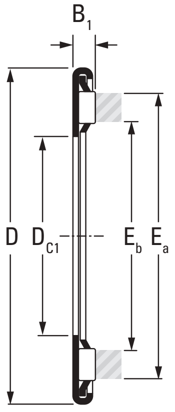
TPK

Shaft Dia.	d	D_c	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static		Oil	Housing Piloting		Shaft Piloting		E_a	E_b	
									H_p	S_c(3)	S_p	H_c(3)			
					C	C_o			—	Max.	—	Min.			
mm	mm in	mm in	mm in		kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
18.1	18.1	31.6	2.8	TPK1832L	8.70	27.1	2.60	14000			18.1	33.1	30	22	0.008
22	22	41	2.8	TPK2241L	15.0	59.4	5.90	10000			22	42.5	38	28	0.015
29	29	49	3.8	TVK2949L	24.7	90.8	9.80	8000			29	50.5	47	35	0.022
30.1	30.1	45.5	2.784	TPK3046L-3	13.7	55.9	5.20	9000			30.1	47	43	35	0.014
30.5	30.5	55.68	5.3	TPK3156L	40.7	135	15.4	8000			30.5	57.18	53	38	0.050
32.9	32.9	53.1	2.784	TVK3353L	20.8	101	10.5	8000			32.9	54.6	52	39	0.020
37.4	37.4	57.3	2.784	TVK3757L	21.9	110	11.5	7000			37.4	58.8	56	44	0.023
57	57	71	2.784	TVK5771L	16.8	85.6	8.60	6000			57	72.5	70	61	0.020
63	63	78	2.8	TVK6378L	15.7	80.1	8.05	5000			63	79.5	76	68	0.023

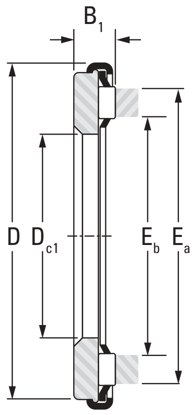
(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=d-1.5mm, H_c=D_c+1.5mm

UNITIZED THRUST BEARING TYPE AX

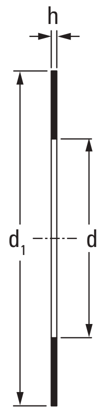
METRIC SERIES



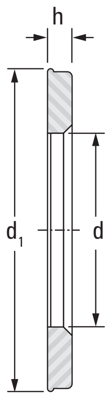
AX Thin series



AX Thick series



CP Thin series



CP Thick series

Shaft Dia.	Bearing Dimensions					Bearing Designation		Approx. Wt.	Load Ratings		Fatigue Load Limit C_u
									Dynamic	Static	
	D_{c1}	D	E_a	E_b	B_1	Thin	Thick		C	C_o	
mm	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kg** lbs	**kN** lbf		kN
5	**5** 0.197	**13** 0.512	**10.9** 0.43	**6.3** 0.25	**2.3** 0.091	AX 5 13		**0.001** 0.002	**3.00** 670	**5.70** 1280	0.790
	5 0.197	**13** 0.512	**10.9** 0.43	**6.3** 0.25	**3.5** 0.138		AX 3,5 5 13	**0.002** 0.004	**3.00** 670	**5.70** 1280	0.790
6	**6** 0.236	**14** 0.551	**11.9** 0.47	**7.3** 0.29	**2.3** 0.091	AX 6 14		**0.001** 0.002	**3.15** 710	**6.35** 1430	0.880
	6 0.236	**14** 0.551	**11.9** 0.47	**7.3** 0.29	**3.5** 0.138		AX 3,5 6 14	**0.002** 0.004	**3.15** 710	**6.35** 1430	0.880
7	**7** 0.276	**15** 0.591	**12.9** 0.51	**8.3** 0.33	**2.3** 0.091	AX 7 15		**0.002** 0.004	**3.55** 800	**7.60** 1710	1.05
	7 0.276	**15** 0.591	**12.9** 0.51	**8.3** 0.33	**3.5** 0.138		AX 3,5 7 15	**0.003** 0.007	**3.55** 800	**7.60** 1710	1.05
8	**8** 0.315	**16** 0.630	**13.9** 0.55	**9.3** 0.37	**2.3** 0.091	AX 8 16		**0.002** 0.004	**3.70** 830	**8.30** 1870	1.15
	8 0.315	**16** 0.630	**13.9** 0.55	**9.3** 0.37	**3.5** 0.138		AX 3,5 8 16	**0.003** 0.007	**3.70** 830	**8.30** 1870	1.15
9	**9** 0.354	**17** 0.669	**14.9** 0.59	**10.3** 0.41	**2.3** 0.091	AX 9 17		**0.002** 0.004	**4.05** 910	**9.50** 2140	1.30
	9 0.354	**17** 0.669	**14.9** 0.59	**10.3** 0.41	**3.5** 0.138		AX 3,5 9 17	**0.004** 0.009	**4.05** 910	**9.50** 2140	1.30
10	**10** 0.394	**22** 0.866	**18.6** 0.73	**12.0** 0.47	**4.0** 0.158		AX 4 10 22	**0.007** 0.015	**5.00** 1120	**10.90** 2450	1.40
12	**12** 0.472	**26** 1.024	**22.6** 0.89	**15.0** 0.59	**2.8** 0.110	AX 12 26		**0.006** 0.013	**6.90** 1550	**17.70** 3980	2.30
	12 0.472	**26** 1.024	**22.6** 0.89	**15.0** 0.59	**4.0** 0.158		AX 4 12 26	**0.010** 0.022	**6.90** 1550	**17.70** 3980	2.30
13	**13** 0.512	**26** 1.024	**22.6** 0.89	**15.0** 0.59	**2.8** 0.110	AX 13 26		**0.006** 0.013	**6.90** 1550	**17.70** 3980	2.30
	13 0.512	**26** 1.024	**22.6** 0.89	**15.0** 0.59	**4.0** 0.158		AX 4 13 26	**0.010** 0.022	**6.90** 1550	**17.70** 3980	2.30
15	**15** 0.591	**28** 1.102	**24.6** 0.97	**17.0** 0.67	**2.8** 0.110	AX 15 28		**0.007** 0.015	**7.40** 1660	**20.00** 4500	2.55

Speed Rating Oil	Washer Dimensions			Approx. Wt.	Washer Designation		Washer Designation Precision	h	Precision Wt.	Shaft Dia.
	d	d_1	h		Thin	Thick				
min^{-1}	**mm** in	**mm** in	**mm** in	**kg** lbs				**mm** in	**kg** lbs	**mm**
25000	**5** 0.197	**12.4** 0.488	**0.8** 0.032	**0.001** 0.002	CP 5 13					**5**
25000	**5** 0.197	**12.4** 0.488	**2.0** 0.079	**0.002** 0.004		CP 2 5 13				
22000	**6** 0.236	**13.4** 0.528	**0.8** 0.032	**0.001** 0.002	CP 6 14					**6**
22000	**6** 0.236	**13.4** 0.528	**2.0** 0.079	**0.002** 0.004		CP 2 6 14				
22000	**7** 0.276	**14.4** 0.567	**0.8** 0.032	**0.001** 0.002	CP 7 15					**7**
22000	**7** 0.276	**14.4** 0.567	**2.0** 0.079	**0.002** 0.004		CP 2 7 15				
22000	**8** 0.315	**15.4** 0.606	**0.8** 0.032	**0.001** 0.002	CP 8 16					**8**
22000	**8** 0.315	**15.4** 0.606	**2.0** 0.079	**0.002** 0.004		CP 2 8 16				
19000	**9** 0.354	**16.4** 0.646	**0.8** 0.032	**0.001** 0.002	CP 9 17					**9**
19000	**9** 0.354	**16.4** 0.646	**2.0** 0.079	**0.002** 0.004		CP 2 9 17				
15500	**10** 0.394	**21.5** 0.847	**2.0** 0.079	**0.002** 0.004		CP 2 10 22				**10**
13000	**12** 0.472	**25.5** 1.004	**0.8** 0.032	**0.003** 0.007	CP 12 26		CPN 2 12 26	**2.0** 0.079	**0.006** 0.013	**12**
13000	**12** 0.472	**25.5** 1.004	**2.0** 0.079	**0.006** 0.013		CP 2 12 26				
13000	**13** 0.512	**25.5** 1.004	**0.8** 0.032	**0.002** 0.004	CP 13 26					**13**
13000	**13** 0.512	**25.5** 1.004	**2.0** 0.079	**0.006** 0.013		CP 2 13 26				
11500	**15** 0.591	**27.5** 1.083	**0.8** 0.032	**0.003** 0.007	CP 15 28		CPN 2 15 28	**2.0** 0.079	**0.006** 0.013	**15**

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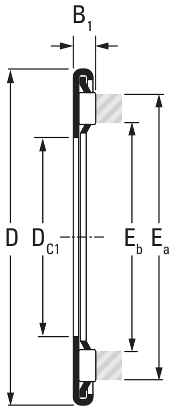
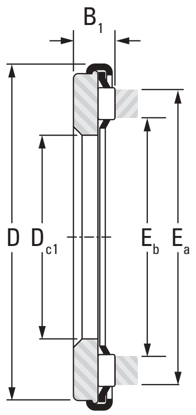
UNITIZED THRUST BEARING TYPE AX

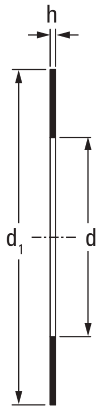
METRIC SERIES



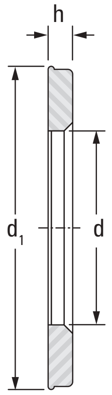
AX Thin series



AX Thick series



CP Thin series



CP Thick series

Shaft Dia.	Bearing Dimensions					Bearing Designation		Approx. Wt.	Load Ratings		Fatigue Load Limit C_u
									Dynamic	Static	
	D_{c1}	D	E_a	E_b	B_1	Thin	Thick		C	C_o	
mm	mm in	mm in	mm in	mm in	mm in			kg lbs	kN lbf		kN
15	**15** 0.591	**28** 1.102	**24.6** 0.97	**17.0** 0.67	**4.0** 0.158		AX 4 15 28	**0.009** 0.020	**7.40** 1660	**20.00** 4500	2.55
17	**17** 0.669	**30** 1.181	**26.6** 1.05	**19.0** 0.75	**2.8** 0.110	AX 17 30		**0.008** 0.018	**7.80** 1750	**22.00** 4950	2.60
	17 0.669	**30** 1.181	**26.6** 1.05	**19.0** 0.75	**4.0** 0.158		AX 4 17 30	**0.010** 0.022	**7.80** 1750	**22.00** 4950	2.60
19	**19** 0.748	**32** 1.260	**28.6** 1.13	**21.0** 0.83	**2.8** 0.110	AX 19 32		**0.009** 0.020	**8.00** 1800	**23.30** 5240	3.00
	19 0.748	**32** 1.260	**28.6** 1.13	**21.0** 0.83	**4.0** 0.158		AX 4 19 32	**0.013** 0.029	**8.00** 1800	**23.30** 5240	3.00
20	**20** 0.787	**35** 1.378	**31.6** 1.24	**22.0** 0.87	**5.0** 0.197		AX 5 20 35	**0.018** 0.040	**11.80** 2650	**39.00** 8770	4.40
25	**25** 0.984	**42** 1.654	**37.4** 1.47	**27.7** 1.09	**2.8** 0.110	AX 25 42		**0.012** 0.026	**13.30** 2990	**49.00** 11000	5.50
	25 0.984	**42** 1.654	**37.4** 1.47	**27.7** 1.09	**5.0** 0.197		AX 5 25 42	**0.025** 0.055	**13.30** 2990	**49.00** 11000	5.50
27	**27** 1.063	**44** 1.732	**39.6** 1.56	**30.0** 1.18	**2.8** 0.110	AX 27 44		**0.012** 0.026	**13.70** 3080	**52.00** 11700	5.90
30	**30** 1.181	**47** 1.850	**42.4** 1.67	**32.7** 1.29	**2.8** 0.110	AX 30 47		**0.014** 0.031	**14.50** 3260	**57.00** 12800	6.45
	30 1.181	**47** 1.850	**42.4** 1.67	**32.7** 1.29	**5.0** 0.197		AX 5 30 47	**0.029** 0.064	**14.50** 3260	**57.00** 12800	6.45
35	**35** 1.337	**52** 2.047	**49.0** 1.93	**37.2** 1.47	**2.8** 0.110	AX 35 52		**0.019** 0.042	**18.90** 4250	**84.00** 18900	9.65
	35 1.337	**52** 2.047	**49.0** 1.93	**37.2** 1.47	**5.0** 0.197		AX 5 35 52	**0.035** 0.077	**18.90** 4250	**84.00** 18900	9.65
	35 1.337	**53** 2.087	**49.0** 1.93	**37.2** 1.47	**2.8** 0.110	AX 35 53		**0.019** 0.042	**18.90** 4250	**84.00** 18900	9.65
	35 1.337	**53** 2.087	**49.0** 1.93	**37.2** 1.47	**5.0** 0.197		AX 5 35 53	**0.036** 0.079	**18.90** 4250	**84.00** 18900	9.65

Speed Rating Oil	Washer Dimensions			Approx. Wt.	Washer Designation		Washer Designation Precision	h	Precision Wt.	Shaft Dia.
	d	d_1	h		Thin	Thick				
min^{-1}	mm in	mm in	mm in	kg lbs				mm in	kg lbs	mm
11500	**15** 0.591	**27.5** 1.083	**2.0** 0.079	**0.006** 0.013		CP 2 15 28				
10500	**17** 0.669	**29.5** 1.161	**0.8** 0.032	**0.003** 0.007	CP 17 30		CPN 7 17 30	**7.0** 0.276	**0.025** 0.055	**17**
10500	**17** 0.669	**29.5** 1.161	**2.0** 0.079	**0.007** 0.015		CP 2 17 30				
10000	**19** 0.748	**31.5** 1.240	**0.8** 0.032	**0.004** 0.009	CP 19 32					**19**
10000	**19** 0.748	**31.5** 1.240	**2.0** 0.079	**0.009** 0.020		CP 2 19 32				
9000	**20** 0.787	**34.5** 1.358	**3.0** 0.118	**0.013** 0.029		CP 3 20 35	CPN 3 20 35	**3.0** 0.118	**0.013** 0.029	**20**
7500	**25** 0.984	**41.5** 1.634	**0.8** 0.032	**0.005** 0.011	CP 25 42		CPN 3 25 42	**3.0** 0.118	**0.019** 0.042	**25**
7500	**25** 0.984	**41.5** 1.634	**3.0** 0.118	**0.019** 0.042		CP 3 25 42				
7200	**27** 1.063	**43.7** 1.721	**0.8** 0.032	**0.006** 0.013	CP 27 44					**27**
6500	**30** 1.181	**46.5** 1.831	**0.8** 0.032	**0.006** 0.013	CP 30 47		CPN 5 30 47	**5.0** 0.197	**0.037** 0.082	**30**
6500	**30** 1.181	**46.5** 1.831	**3.0** 0.118	**0.022** 0.049		CP 3 30 47				
5500	**35** 1.378	**51.5** 2.028	**0.8** 0.032	**0.007** 0.015	CP 35 52		CPN 3 35 52	**3.0** 0.118	**0.027** 0.060	**31**
5500	**35** 1.378	**51.5** 2.028	**3.0** 0.118	**0.026** 0.057		CP 3 35 52				**35**
5500	**35** 1.378	**52.5** 2.067	**0.8** 0.032	**0.007** 0.015	CP 35 53					
5500	**35** 1.378	**52.5** 2.067	**3.0** 0.118	**0.027** 0.060		CP 3 35 53				

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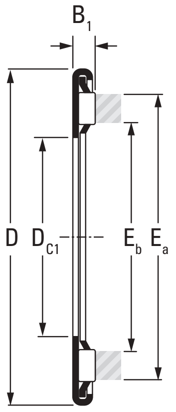
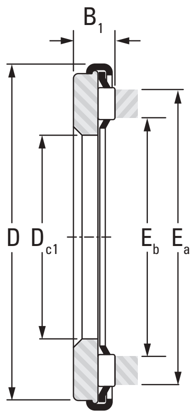
UNITIZED THRUST BEARING TYPE AX

METRIC SERIES

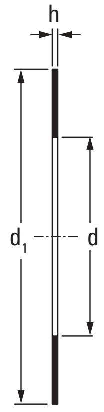


AX Thin series

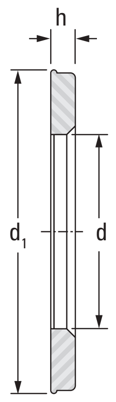


AX Thick series

Shaft Dia.	Bearing Dimensions					Bearing Designation		Approx. Wt.	Load Ratings		Fatigue Load Limit C_u
	D_{c1}	D	E_a	E_b	B_1	Thin	Thick		Dynamic C	Static C_o	
mm	mm in	mm in	mm in	mm in	mm in			kg lbs	kN lbf		kN
40	40 1.557	60 2.362	54.9 2.16	43.0 1.69	2.8 0.110	AX 40 60		0.024 0.053	20.40 4590	96.00 21600	11.1
	40 1.557	60 2.362	54.9 2.16	43.0 1.69	5.0 0.197		AX 5 40 60	0.046 0.101	20.40 4590	96.00 21600	11.1
45	45 1.772	65 2.559	59.9 2.36	48.0 1.89	2.8 0.110	AX 45 65		0.025 0.055	21.80 4900	109 24500	12.5
	45 1.772	65 2.559	59.9 2.36	48.0 1.89	5.0 0.197		AX 5 45 65	0.050 0.110	21.80 4900	109 24500	12.5
50	50 1.969	70 2.756	65.7 2.59	53.3 2.10	2.8 0.110	AX 50 70		0.026 0.057	22.50 5060	118 26500	13.5
	50 1.969	70 2.756	65.7 2.59	53.3 2.10	5.0 0.197		AX 5 50 70	0.055 0.121	22.50 5060	118 26500	13.5
55	55 2.165	78 3.071	72.5 2.85	58.4 2.30	2.8 0.110	AX 55 78		0.034 0.075	28.50 6410	164 36900	18.8
	55 2.165	78 3.071	72.5 2.85	58.4 2.30	6.0 0.236		AX 6 55 78	0.089 0.196	28.50 6410	164 36900	18.8
60	60 2.362	85 3.347	79.2 3.12	63.5 2.50	6.0 0.236		AX 6 60 85	0.106 0.234	31.50 7080	193 43400	21.6
65	65 2.559	90 3.543	84.2 3.32	68.5 2.70	3.5 0.138	AX 3,5 65 90		0.059 0.130	33.50 7530	210 47200	23.7
	65 2.559	90 3.543	84.2 3.32	68.5 2.70	6.0 0.236		AX 6 65 90	0.114 0.251	33.50 7530	210 47200	23.7
70	70 2.759	95 3.740	89.2 3.51	73.5 2.89	3.5 0.138	AX 3,5 70 95		0.061 0.135	34.50 7760	223 50100	25.0
	70 2.759	95 3.740	89.2 3.51	73.5 2.89	6.0 0.236		AX 6 70 95	0.120 0.265	34.50 7760	223 50100	25.0
75	75 2.953	100 3.937	94.2 3.71	78.5 3.09	3.5 0.138	AX 3,5 75 100		0.065 0.143	36.00 8090	240 54000	27.0
	75 2.953	100 3.937	94.2 3.71	78.5 3.09	6.0 0.236		AX 6 75 100	0.127 0.280	36.00 8090	240 54000	27.0
80	80 3.150	105 4.134	99.2 3.91	83.5 3.29	3.5 0.138	AX 3,5 80 105		0.069 0.152	36.50 8210	253 56900	28.4
	80 3.150	105 4.134	99.2 3.91	83.5 3.29	6.0 0.236		AX 6 80 105	0.134 0.295	36.50 8210	253 56900	28.4
85	85 3.347	110 4.331	104.2 4.10	88.5 3.48	3.5 0.138	AX 3,5 85 110		0.078 0.172	38.00 8540	270 60700	30.4



CP Thin series



CP Thick series

Speed Rating Oil	Washer Dimensions			Approx. Wt.	Washer Designation		Washer Designation Precision	h	Precision Wt.	Shaft Dia.
	d	d_1	h		Thin	Thick				
min^{-1}	mm in	mm in	mm in	kg lbs				mm in	kg lbs	mm
5000	40 1.575	59.5 2.343	0.8 0.032	0.009 0.020	CP 40 60		CPN 3 40 60	3.0 0.118	0.034 0.075	40
5000	40 1.575	59.5 2.343	3.0 0.118	0.034 0.075		CP 3 40 60				
4500	45 1.772	64.4 2.535	0.8 0.032	0.010 0.022	CP 45 65		CPN 3 45 65	3.0 0.118	0.037 0.082	45
4500	45 1.772	64.4 2.535	3.0 0.118	0.037 0.082		CP 3 45 65				
4000	50 1.969	69.4 2.732	0.8 0.032	0.011 0.024	CP 50 70					50
4000	50 1.969	69.4 2.732	3.0 0.118	0.040 0.088		CP 3 50 70				
3800	55 2.165	77.4 3.047	0.8 0.032	0.014 0.031	CP 55 78					55
3800	55 2.165	77.4 3.047	4.0 0.158	0.069 0.152		CP 4 55 78				
3500	60 2.362	84.3 3.319	4.0 0.158	0.083 0.183		CP 4 60 85				60
3200	65 2.559	89.3 3.516	1.5 0.059	0.033 0.073	CP 1,5 65 90					65
3200	65 2.559	89.3 3.516	4.0 0.158	0.088 0.194		CP 4 65 90				
3000	70 2.756	94.3 3.713	1.5 0.059	0.034 0.075	CP 1,5 70 95		CPN 4 70 95	4.0 0.158	0.093 0.205	70
3000	70 2.756	94.3 3.713	4.0 0.158	0.093 0.205		CP 4 70 95				
2900	75 2.953	99.3 3.909	1.5 0.059	0.037 0.082	CP 1,5 75 100					75
2900	75 2.953	99.3 3.909	4.0 0.158	0.099 0.218		CP 4 75 100				
2700	80 3.150	104.3 4.106	1.5 0.059	0.039 0.086	CP 1,5 80 105					80
2700	80 3.150	104.3 4.106	4.0 0.158	0.104 0.229		CP 4 80 105				
2600	85 3.347	109.3 4.303	1.5 0.059	0.047 0.104	CP 1,5 85 110					85

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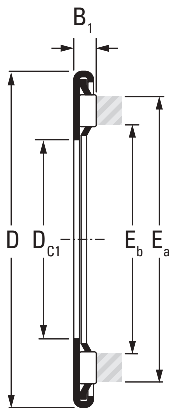
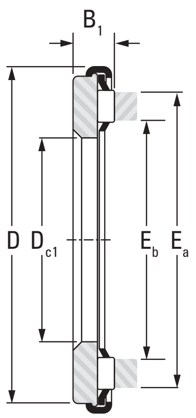
UNITIZED THRUST BEARING TYPE AX

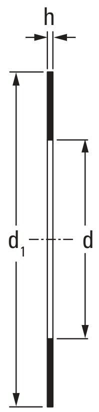
METRIC SERIES



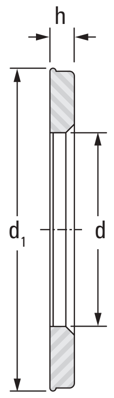
AX Thin series



AX Thick series



CP Thin series



CP Thick series

Shaft Dia.	Bearing Dimensions					Bearing Designation		Approx. Wt.	Load Ratings		Fatigue Load Limit C_u
	D_{c1}	D	E_a	E_b	B_1	Thin	Thick		Dynamic C	Static C_0	
mm	mm in	mm in	mm in	mm in	mm in			kg lbs	kN lbf		kN
85	**85** 3.347	**110** 4.331	**104.2** 4.10	**88.5** 3.48	**6.0** 0.236		AX 6 85 110	**0.142** 0.313	**38.00** 8540	**270** 60700	30.4
90	**90** 3.543	**120** 4.724	**112.9** 4.45	**94.2** 3.71	**4.5** 0.177	AX 4,5 90 120		**0.117** 0.258	**59.00** 13300	**360** 80900	41.0
	90 3.543	**120** 4.724	**112.9** 4.45	**94.2** 3.71	**8.0** 0.315		AX 8 90 120	**0.238** 0.525	**59.00** 13300	**360** 80900	41.0
100	**100** 3.937	**135** 5.315	**127.3** 5.01	**104.2** 4.10	**9.0** 0.354		AX 9 100 135	**0.364** 0.803	**73.00** 16400	**490** 110000	52.6
110	**110** 4.331	**145** 5.709	**137.3** 5.41	**114.2** 4.50	**4.5** 0.177	AX 4,5 110 145		**0.168** 0.370	**77.00** 17300	**550** 124000	57.2
	110 4.331	**145** 5.709	**137.3** 5.41	**114.2** 4.50	**9.0** 0.354		AX 9 110 145	**0.393** 0.867	**77.00** 17300	**550** 124000	57.2
120	**120** 4.724	**155** 6.102	**147.3** 5.80	**124.2** 4.89	**4.5** 0.177	AX 4,5 120 155		**0.182** 0.401	**80.00** 18000	**590** 133000	60.2
	120 4.724	**155** 6.102	**147.3** 5.80	**124.2** 4.89	**9.0** 0.354		AX 9 120 155	**0.424** 0.935	**80.00** 18000	**590** 133000	60.2
130	**130** 5.118	**170** 6.693	**161.0** 6.34	**135.0** 5.32	**11.0** 0.433		AX 11 130 170	**0.660** 1.455	**106** 23800	**710** 160000	71.3
140	**140** 5.512	**180** 7.087	**171.0** 6.73	**145.0** 5.71	**9.0** 0.354		AX 11 140 180	**0.670** 1.477	**111** 25000	**770** 173000	75.7
150	**150** 5.906	**190** 7.480	**181.0** 7.13	**155.0** 6.10	**9.0** 0.354		AX 11 150 190	**0.710** 1.566	**115** 25900	**830** 187000	78.2
160	**160** 6.299	**200** 7.874	**191.0** 7.52	**165.0** 6.50	**9.0** 0.354		AX 11 160 200	**0.760** 1.676	**118** 26500	**870** 196000	82.4
170	**170** 6.693	**215** 8.465	**207.0** 8.15	**175.0** 6.89	**12.0** 0.472		AX 12 170 215	**1.000** 2.205	**165** 37100	**1160** 261000	113
180	**180** 7.087	**225** 8.858	**217.0** 8.54	**185.0** 7.28	**12.0** 0.472		AX 12 180 225	**1.050** 2.315	**173** 38900	**1250** 281000	120
190	**190** 7.480	**240** 9.449	**232.0** 9.13	**196.0** 7.72	**13.9** 0.547		AX 14 190 240	**1.400** 3.087	**230** 51700	**1650** 371000	141
200	**200** 7.874	**250** 9.843	**242.0** 9.53	**206.0** 8.11	**13.9** 0.547		AX 14 200 250	**1.500** 3.308	**239** 53700	**1730** 389000	146
220	**220** 8.661	**270** 10.630	**262.0** 10.32	**226.0** 8.90	**13.9** 0.547		AX 14 220 270	**1.600** 3.528	**248** 55800	**1850** 416000	154
240	**240** 9.449	**300** 11.811	**286.0** 11.26	**246.0** 9.69	**14.9** 0.587		AX 15 240 300	**2.300** 5.072	**280** 62900	**2240** 504000	175

Speed Rating Oil	Washer Dimensions			Approx. Wt.	Washer Designation		Washer Designation Precision	h	Precision Wt.	Shaft Dia.
	d	d_1	h		Thin	Thick				
min^{-1}	mm in	mm in	mm in	kg lbs				mm in	kg lbs	mm
2600	**85** 3.347	**109.3** 4.303	**4.0** 0.158	**0.111** 0.245		CP 4 85 110				
2400	**90** 3.543	**118.8** 4.677	**1.5** 0.059	**0.052** 0.115	CP 1,5 90 120					**90**
2400	**90** 3.543	**118.8** 4.677	**5.0** 0.197	**0.173** 0.381		CP 5 90 120				
2100	**100** 3.937	**133.8** 5.268	**6.0** 0.236	**0.277** 0.611		CP 6 100 135				**100**
2000	**110** 4.331	**143.8** 5.661	**1.5** 0.059	**0.075** 0.165	CP 1,5 110 145					**110**
2000	**110** 4.331	**143.8** 5.661	**6.0** 0.236	**0.300** 0.662		CP 6 110 145				
1800	**120** 4.724	**153.8** 6.055	**1.5** 0.059	**0.081** 0.179	CP 1,5 120 155					**120**
1800	**120** 4.724	**153.8** 6.055	**6.0** 0.236	**0.323** 0.712		CP 6 120 155				
1700	**130** 5.118	**168.7** 6.642	**7.0** 0.276	**0.480** 1.058		CP 7 130 170				**130**
1600	**140** 5.512	**178.7** 7.035	**7.0** 0.276	**0.500** 1.103		CP 7 140 180				**140**
1500	**150** 5.906	**188.7** 7.429	**7.0** 0.276	**0.530** 1.169		CP 7 150 190				**150**
1400	**160** 6.299	**198.7** 7.823	**7.0** 0.276	**0.560** 1.235		CP 7 160 200				**160**
1300	**170** 6.693	**213.5** 8.406	**7.0** 0.276	**0.700** 1.544		CP 7 170 215				**170**
1200	**180** 7.087	**223.5** 8.799	**7.0** 0.276	**0.735** 1.621		CP 7 180 225				**180**
1200	**190** 7.480	**238.3** 9.382	**8.0** 0.315	**0.950** 2.095		CP 8 190 240				**190**
1100	**200** 7.874	**248.3** 9.776	**8.0** 0.315	**1.000** 2.205		CP 8 200 250				**200**
1000	**220** 8.661	**268.3** 10.563	**8.0** 0.315	**1.100** 2.426		CP 8 220 270				**220**
900	**240** 9.449	**298.5** 11.752	**9.0** 0.354	**1.600** 3.528		CP 9 240 300				**240**

CYLINDRICAL ROLLER THRUST BEARINGS AND THEIR COMPONENTS

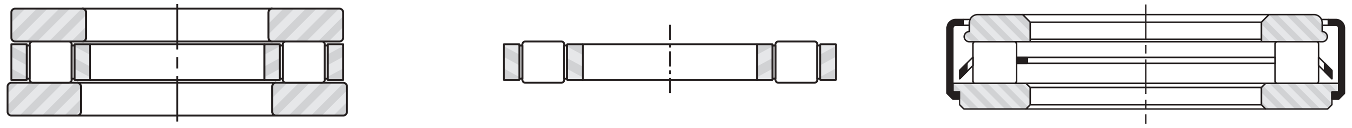
METRIC SERIES

Cylindrical roller thrust bearings provide rolling bearing arrangements that accommodate high-dynamic axial loads. The simple geometry of the bearing components allows the use of many design arrangements. As an example, for less demanding applications, it is possible to combine metric series, thrust cylindrical roller and cage assemblies, including the metric series heavy thrust washers (LS, CPR) and even the metric series thin thrust washers (AS, CP). These two thrust washer types are more commonly used with thrust needle roller and cage assemblies. Thrust cylindrical roller and cage assemblies also can be used without bearing thrust washers if the adjacent machine components can be prepared to serve as suitable raceways.

Cylindrical roller thrust bearings may be used where the load carrying capability of thrust needle roller and cage assemblies is insufficient. Also, the bearings can accommodate high-dynamic and static axial loads in one direction, but they are not suitable to transmit radial loads.

REFERENCE STANDARDS ARE:

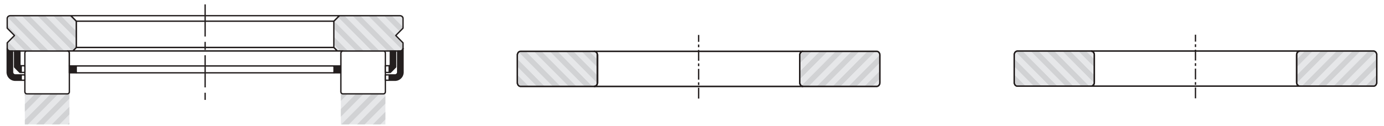
- **ISO 104** – rolling bearings – thrust bearings – boundary dimensions, general plan.
- **ISO 199** – rolling bearings – thrust bearings – tolerances.
- **DIN 616** – rolling bearings – general plan for boundary dimensions.
- **DIN 722** – rolling bearing – thrust cylindrical roller bearings – single direction.



811, 812 Series
Cylindrical roller thrust bearings

K.811, K.812
Thrust cylindrical roller and cage assemblies

AXZ, ARZ
Unitized cylindrical roller thrust bearing



AR
Unitized thrust bearing assemblies

WS.811, WS.812
Shaft washers

GS.811, GS.812
Housing washers

Fig. B6-3. Types of metric series cylindrical roller thrust bearings and their components

Suffixes	
LPB	Machined light metal window-type cage.
TVP	Molded window-type cage of glass reinforced nylon.

CONSTRUCTION

BASIC DESIGNS

Cylindrical roller thrust bearings of dimension series 811 and 812 comprise a thrust cylindrical roller and cage assembly (K), a shaft washer (WS) and a housing washer (GS). Providing the backup surfaces can be hardened and ground, they can be used as raceways for the cylindrical rollers of the thrust cylindrical roller and cage assembly resulting in a compact bearing arrangement.

Series AR is available with thin or thick CP washers or heavy CPR thrust washers.

Thrust bearing types AXZ and ARZ each have two thrust washers retained by an integral cap – giving protection against the entry of dirt and metal particles, while helping to retain the lubricant.

CAGE DESIGNS

Metric series 811 and 812 cylindrical roller thrust bearings use molded cages of glass-fiber reinforced-nylon 6/6 (suffix TVP) or machined cages of light metal (suffix LPB). The cages are designed to be piloted on the shaft. The reinforced nylon cages can be used at temperatures up to 120° C (250° F) continuously for extended periods. When lubricating these bearings with oil, it should be ensured that the oil does not contain additives detrimental to the cage over extended life at operating temperatures higher than 100° C (212° F). Also, care should be exercised that oil change intervals are observed as old oil may reduce cage life at such temperatures.

The rolling elements of the AR series thrust bearings are retained and guided in radial pockets within the cage. The cage is retained in relation to the thrust washer by means of a retaining cap. The design of a one-piece steel cage employs a special curvature that guides the rolling elements, by their ends, along their centerlines.

In addition, this special curvature gives the steel cage great rigidity, while providing maximum lubricant space. This unitized assembly of components facilitates installation and provides a high-axial load capacity while occupying only minimal space.

AR series cylindrical roller thrust bearings with a thin washer are of minimal thickness and provide excellent economy. They should be considered whenever the degree of support and rotational accuracy requirement allow.

BEARING THRUST WASHERS

SHAFT WASHERS AND HOUSING WASHERS

Shaft washers of types WS.811 and WS.812, as well as housing washers of types GS.811 and GS.812, are components of the metric series cylindrical roller thrust bearings of series 811 and 812. They are made of bearing-quality steel – with hardened, precision- ground and lapped-flat raceway surfaces. The tolerances of the thrust bearing bore and outer diameter shown in Table B6-9 and Table B6-10 (see next page) apply to shaft-piloted and housing-piloted metric series washers.

HEAVY THRUST WASHERS (LS), THIN THRUST WASHERS (AS)

These thrust washers are more frequently used with thrust needle roller and cage assemblies of metric series FNT or AXK. They also are suitable for use with the thrust cylindrical roller and cage assemblies K.811. The heavy thrust washer of series LS are made of bearing-quality steel – hardened and precision-ground on the flat raceway surfaces. The bore and outer diameters of the heavy thrust washers are not ground. Therefore, when used with K.811 type assemblies, they are only suggested where accurate centering is not required. The thin thrust washers of series AS may be used in applications where the loads are light. Both types of these washers are listed in the tabular part of the metric series thrust needle roller and cage assemblies section.

THIN/THICK (CP) AND HEAVY (CPR) THRUST WASHERS

The washer incorporated in the AR series thrust bearing is made from hardened bearing steel and forms one of the raceways for the rolling elements. The opposing raceway is generally provided by a separate thrust washer of similar design supplied by JTEKT. When the AR series thrust bearing is piloted by the revolving part, the thrust washer must be piloted by the stationary part and vice versa. If the revolving part and the stationary part are noticeably eccentric to each other, the thrust bearing with integral washer must – without exception – be piloted by the revolving part.

The second raceway for the rolling elements may also be formed by the face of a shoulder or an inserted washer – provided these have the correct hardness and geometrical dimensions.

DIMENSIONAL ACCURACY

The tolerances for the metric series cylindrical roller thrust bearing bore and outer diameter shown in Table B6-9 and B6-10 apply to shaft-piloted washers of series WS.811 and WS.812, as well as housing-piloted washers of series GS.811 and GS.812. Tolerances for the bore diameter of series K.811 and K.812 thrust assemblies are given on page B-6-38.

The tolerances for the bore and outer diameter of series AS thrust washers are shown in Table B6-11 below. The tolerances for the bore and outer diameter of series LS thrust washers are given in Table B6-13 on page B-6-37. Bore inspection procedures for thin thrust washers (AS) and heavy thrust washers (LS) are given on page B-6-8.

Table B6-9. Tolerances of cylindrical roller thrust bearings - shaft piloted washer - metric series

Nominal bore diameter d		Tolerance class P0 (normal tolerance)				Tolerance class P6				Tolerance class P5			
		Deviations		Variation	Wall thickness variation	Deviations		Variation	Wall thickness variation	Deviations		Variation	Wall thickness variation
		Δ_{dmp}		V_{dsp}	S_i(1)	Δ_{dmp}		V_{dsp}	S_i(1)	Δ_{dmp}		V_{dsp}	S_i(1)
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
	18.000 0.7087	0.000 0.0000	-0.008 -0.0003	0.006 0.0002	0.010 0.0004	0.000 0.0000	-0.008 -0.0003	0.006 0.0002	0.005 0.0002	0.000 0.0000	-0.008 -0.0003	0.006 0.0002	0.003 0.0001
18.000 0.7087	30.000 1.1811	0.000 0.0000	-0.010 -0.0004	0.008 0.0003	0.010 0.0004	0.000 0.0000	-0.010 -0.0004	0.008 0.0003	0.005 0.0002	0.000 0.0000	-0.010 -0.0004	0.008 0.0003	0.003 0.0001
30.000 1.1811	50.000 1.9685	0.000 0.0000	-0.012 -0.0005	0.009 0.00035	0.010 0.0004	0.000 0.0000	-0.012 -0.0005	0.009 0.00035	0.006 0.0002	0.000 0.0000	-0.012 -0.0005	0.009 0.00035	0.003 0.0001
50.000 1.9685	80.000 3.1496	0.000 0.0000	-0.015 -0.0006	0.011 0.0004	0.010 0.0004	0.000 0.0000	-0.015 -0.0006	0.011 0.0004	0.007 0.0003	0.000 0.0000	-0.015 -0.0006	0.011 0.0004	0.004 0.0002
80.000 3.1496	120.000 4.7244	0.000 0.0000	-0.020 -0.0008	0.015 0.0006	0.015 0.0006	0.000 0.0000	-0.020 -0.0008	0.015 0.0006	0.008 0.0003	0.000 0.0000	-0.020 -0.0008	0.015 0.0006	0.004 0.0002
120.000 4.7244	180.000 7.0866	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.015 0.0006	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.009 0.00035	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.005 0.0002
180.000 7.0866	250.000 9.8425	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.020 0.0008	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.010 0.0004	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.005 0.0002
250.000 9.8425	315.000 12.4016	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.025 0.0010	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.013 0.0005	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.007 0.0003
315.000 12.4016	400.000 15.7480	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.030 0.0012	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.015 0.0006	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.007 0.0003
400.000 15.7480	500.000 19.6850	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.030 0.0012	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.018 0.0007	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.009 0.00035

*The values of the wall thickness variation Se, for the housing piloted washer are identical to Si for the shaft - piloted washers.

Table B6-10. Tolerances of cylindrical roller thrust bearings - housing piloted washer - metric series

Nominal outside diameter D		Tolerance class P0 (normal tolerance)			Tolerance class P6			Tolerance class P5		
		Deviations		Variation	Deviations		Variation	Deviations		Variation
		Δ_{Dmp}		V_{Dsp}	Δ_{Dmp}		V_{Dsp}	Δ_{Dmp}		V_{Dsp}
>	≤	Max.	Min.	Max.	Max.	Min.	Max.	Max.	Min.	Max.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
	30.000 1.1811	0.000 0.0000	-0.013 -0.0005	0.010 0.0004	0.000 0.0000	-0.013 -0.0005	0.010 0.0004	0.000 0.0000	-0.013 -0.0005	0.010 0.0004
30.000 1.1811	50.000 1.9685	0.000 0.0000	-0.016 -0.0006	0.012 0.0005	0.000 0.0000	-0.016 -0.0006	0.012 0.0005	0.000 0.0000	-0.016 -0.0006	0.012 0.0005
50.000 1.9685	80.000 3.1496	0.000 0.0000	-0.019 -0.00075	0.014 0.00055	0.000 0.0000	-0.019 -0.00075	0.014 0.00055	0.000 0.0000	-0.019 -0.00075	0.014 0.00055
80.000 3.1496	120.000 4.7244	0.000 0.0000	-0.022 -0.0009	0.017 0.0007	0.000 0.0000	-0.022 -0.0009	0.017 0.0007	0.000 0.0000	-0.022 -0.0009	0.017 0.0007
120.000 4.7244	180.000 7.0866	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.000 0.0000	-0.025 -0.0010	0.019 0.00075
180.000 7.0866	250.000 9.8425	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.000 0.0000	-0.030 -0.0012	0.023 0.0009
250.000 9.8425	315.000 12.4016	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.000 0.0000	-0.035 -0.0014	0.026 0.0010
315.000 12.4016	400.000 15.7480	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.000 0.0000	-0.040 -0.0016	0.030 0.0012
400.000 15.7480	500.000 19.6850	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.000 0.0000	-0.045 -0.0018	0.034 0.0013

Table B6-11. Tolerances for outer diameter (d_1) and bore diameter (d) of series AS thrust washers

d_1		Deviations of max. O.D. (e13)		d		Deviations of min. bore diameter (E13)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
18.000 0.7087	30.000 1.1811	-0.040 -0.0016	-0.370 -0.0146	3.000 0.1181	6.000 0.2362	+0.200 +0.0079	+0.020 +0.0008
30.000 1.1811	50.000 1.9685	-0.050 -0.0020	-0.440 -0.0173	6.000 0.2362	10.000 0.3937	+0.245 +0.0096	+0.025 +0.0010
50.000 1.9685	80.000 3.1496	-0.060 -0.0024	-0.520 -0.0205	10.000 0.3937	18.000 0.7087	+0.302 +0.0119	+0.032 +0.0013
80.000 3.1496	120.000 4.7244	-0.072 -0.0028	-0.612 -0.0241	18.000 0.7087	30.000 1.1811	+0.370 +0.0146	+0.040 +0.0016
120.000 4.7244	180.000 7.0866	-0.085 -0.0034	-0.715 -0.0282	30.000 1.1811	50.000 1.9685	+0.440 +0.0173	+0.050 +0.0020
180.000 7.0866	250.000 9.8425	-0.100 -0.0039	-0.820 -0.0323	50.000 1.9685	80.000 3.1496	+0.520 +0.0205	+0.060 +0.0024
				80.000 3.1496	120.000 4.7244	+0.612 +0.0241	+0.072 +0.0028
				120.000 4.7244	180.000 7.0866	+0.715 +0.0281	+0.085 +0.0034

Table B6-12. AR Series thickness and axial run-out tolerances

	Bore Dc1		Thickness Tolerance		Axial run-out		
	>	≤	Max.	Min.	Max.		
	mm		µm		µm		
Needle thrust bearings (thin)		60	+30	-40 [1]	20 [1]		
	60	90	+50	-60 [2]	25 [2]		
	90	120	+50	-60 [2]	30 [2]		
Needle thrust bearings (thick)		60	+30	-30 [1]	20 [1]		
	60	90	+50	-50 [2]	25 [2]	Quality	
	90	120	+50	-50 [2]	30 [2]	HP	HSP
Thrust washers (thin) [thick]		120	+50	-60[-50]	5*	2	1
	120	180	+50	-110[-100]	7*	3	1.5
	180	250	+50	-160[-150]	10*	4	2

*High precision quality. [1] Under min. load of 150 N. [2] Under min. load of 250 N.

Table B6-13. Tolerances for outer diameter (d_1) and bore diameter (d) of series LS heavy thrust washers

d1		Deviations of max. O.D. (a12)		d		Deviations of min. bore diameter (E12)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
18.000 0.7087	30.000 1.1811	-0.300 -0.0118	-0.510 -0.0201	3.000 0.1181	6.000 0.2362	+0.140 +0.0055	+0.020 +0.0008
30.000 1.1811	40.000 1.5748	-0.310 -0.0122	-0.560 -0.0221	6.000 0.2362	10.000 0.3937	+0.175 +0.0069	+0.025 +0.0010
40.000 1.5748	50.000 1.9685	-0.320 -0.0126	-0.570 -0.0224	10.000 0.3937	18.000 0.7087	+0.212 +0.0084	+0.032 +0.0013
50.000 1.9685	65.000 2.5591	-0.340 -0.0134	-0.640 -0.0252	18.000 0.7087	30.000 1.1811	+0.250 +0.0098	+0.040 +0.0016
65.000 2.5591	80.000 3.1496	-0.360 -0.0142	-0.660 -0.0260	30.000 1.1811	50.000 1.9685	+0.300 +0.0118	+0.050 +0.0020
80.000 3.1496	100.000 3.9370	-0.380 -0.0150	-0.730 -0.0290	50.000 1.9685	80.000 3.1496	+0.360 +0.0142	+0.060 +0.0024
100.000 3.9370	120.000 4.7244	-0.410 -0.0161	-0.760 -0.0299	80.000 3.1496	120.000 4.7244	+0.422 +0.0166	+0.072 +0.0028
120.000 4.7244	140.000 5.5118	-0.460 -0.0181	-0.860 -0.0339	120.000 4.7244	180.000 7.0866	+0.485 +0.0191	+0.085 +0.0034
140.000 5.5118	160.000 6.2992	-0.520 -0.0205	-0.920 -0.0362				
160.000 6.2992	180.000 7.0866	-0.580 -0.0228	-0.980 -0.0386				
180.000 7.0866	200.000 7.8740	-0.660 -0.0260	-1.120 -0.0441				

Thickness tolerances for series LS heavy thrust washers are given in bearing tables.

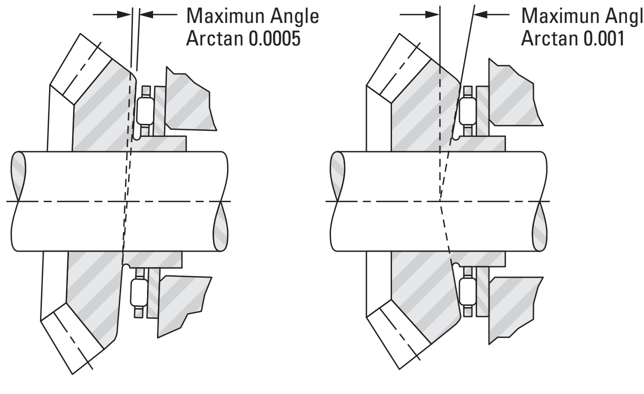
MOUNTING TOLERANCES

Shaft and housing tolerances for mounting metric series thrust cylindrical roller and cage assemblies are given in Table B6-14, shown below. If the cylindrical rollers of the thrust cylindrical roller and cage assemblies are to run directly on the adjacent support surfaces, they must be hardened to at least 58 HRC.

Table B6-14. Mounting tolerances for shafts and housings for metric series components

Bearing components	Shaft tolerance (shaft piloting)	Housing tolerance (housing piloting)	Piloting member
Thrust cylindrical roller and cage assembly. Types: K.811 and K.812	h8	H10	Shaft
Thrust cylindrical roller and cage assembly. Types: AR, AXZ, and ARZ	h10	H10	Shaft
Thin thrust washer. Type: AS	h10	H11	Shaft
Heavy thrust washer. Type: LS	h10	H11	Shaft
Shaft-piloted thrust washer. Type: WS.811, WS.812	h6 (j6)	Clearance	Shaft
Housing-piloted thrust washer. Type: GS.811, GS.812	Clearance	H7 (K7)	Housing
Thick, thin and heavy series thrust washers. Types: CP and CPR	h10	H10 required	As

The backup surfaces for the shaft washers WS.811 and WS.812 as well as the housing washers GS.811 and GS.812 of cylindrical roller thrust bearings must be square with the axis of the shaft. Equally important, the raceway or the surface backing the thrust washer must not be dished or coned. The permissible limits of the squareness and dishing or coning are shown in figures below. When using the thin (AS) thrust washers the cylindrical rollers of the thrust cage assembly must be supported over their entire length.



Out-of-square surface

Dished or coned surface

Fig. B6-4. Permissible limits

Bearing thrust washers should make close contact with the shaft or housing shoulder and must not touch the fillet radius. Therefore, the maximum fillet radius $r_{a\,max.}$ must be no greater than the minimum chamfer $r_{s\,min.}$ of the shaft washer (WS) and the housing washer (GS). See tabular pages B-6-39 and B-6-41.

Since roller thrust bearings generally run under considerable loads their incorporated washer (and thrust washer) should be supported on a shoulder covering the whole area of circulation of the rollers.

LOAD RATINGS

MINIMUM AXIAL LOAD

To prevent slippage, a cylindrical roller thrust bearing must always be axially loaded. For satisfactory operation, a certain minimum load must be applied between the cylindrical rollers and their raceways. This can be calculated from:

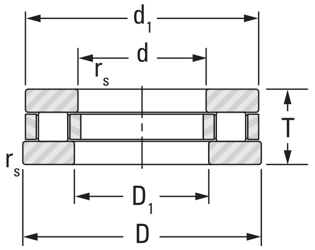
$$F_{a\,min.} = C_{0a}/2200 \text{ [kN]}$$

Where:

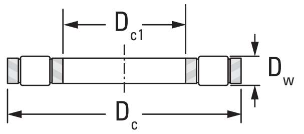
C_{0a} = static load rating [kN]
$F_{a\,min.}$ = minimum axial load [kN]

THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

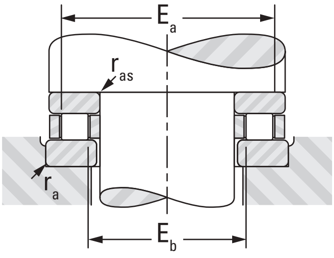
METRIC SERIES

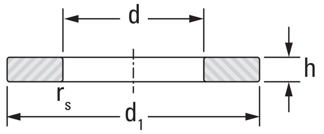


811, 812

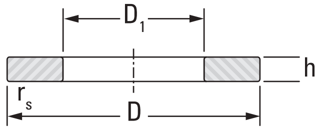


K.811, K.812





WS.811, WS.812



GS.811, GS.812

Shaft Dia.	Assembly Dimensions							Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil
	D_{c1}	D_c	D_w	T	$E_{b\,max.}$	$E_{a\,min.}$	$r_{as\,max.}$ $r_{a\,max.}$		Dynamic	Static		
	(E11)	(a13)							C	C_o		
mm	mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}
15	**15** 0.5906	**28** 1.1024	**3.5** 0.1378	**9** 0.354	**18** 0.709	**25** 0.984	**0.3** 0.012	K.81102LPB	**12.1** 2720	**26.3** 5910	3.70	12000
	15 0.5906	**28** 1.1024	**3.5** 0.1378	**9** 0.354	**18** 0.709	**25** 0.984	**0.3** 0.012	K.81102TVP	**12.8** 2880	**28.6** 6430	4.05	12000
17	**17** 0.6693	**30** 1.1811	**3.5** 0.1378	**–** –	**20** 0.787	**27** 1.063	**0.3** 0.012	K.81103LPB	**12.6** 2830	**28.6** 6430	4.05	11000
	17 0.6693	**30** 1.1811	**3.5** 0.1378	**9** 0.354	**20** 0.787	**27** 1.063	**0.3** 0.012	K.81103TVP	**14.2** 3190	**33.4** 7510	4.70	11000
20	**20** 0.7874	**35** 1.3780	**4.5** 0.1772	**10** 0.394	**23** 0.906	**32** 1.260	**0.3** 0.012	K.81104TVP	**23.6** 5310	**56.8** 12800	6.85	9500
25	**25** 0.9843	**42** 1.6535	**5.0** 0.1969	**11** 0.433	**28** 1.102	**39** 1.535	**0.6** 0.024	K.81105TVP	**31.2** 7010	**81.0** 18200	11.4	8000
30	**30** 1.1811	**47** 1.8504	**5.0** 0.1969	**–** –	**33** 1.299	**44** 1.732	**0.6** 0.024	K.81106LPB	**28.5** 6410	**69.5** 15600	10.7	6700
	30 1.1811	**47** 1.8504	**5.0** 0.1969	**11** 0.433	**33** 1.299	**44** 1.732	**0.6** 0.024	K.81106TVP	**33.0** 7420	**91.1** 20500	12.8	6700
	30 1.1811	**52** 2.0472	**7.5** 0.2953	**–** –	**33** 1.299	**49** 1.929	**0.6** 0.024	K.81206LPB	**53.4** 12000	**129** 29000	13.9	6300
	30 1.1811	**52** 2.0472	**7.5** 0.2953	**16** 0.630	**33** 1.299	**49** 1.929	**0.6** 0.024	K.81206TVP	**56.9** 12800	**141** 31700	15.2	6300
35	**35** 1.3780	**52** 2.0472	**5.0** 0.1969	**–** –	**38** 1.496	**49** 1.929	**0.6** 0.024	K.81107LPB	**30.8** 6920	**86.0** 19300	12.1	6000
	35 1.3780	**52** 2.0472	**5.0** 0.1969	**12** 0.472	**38** 1.496	**49** 1.929	**0.6** 0.024	K.81107TVP	**34.8** 7820	**101** 22700	14.2	6000
	35 1.3780	**62** 2.4409	**7.5** 0.2953	**–** –	**41** 1.614	**56** 2.205	**1.0** 0.039	K.81207LPB	**58.3** 13100	**152** 34200	16.5	5300
	35 1.3780	**62** 2.4409	**7.5** 0.2953	**18** 0.709	**41** 1.614	**56** 2.205	**1.0** 0.039	K.81207TVP	**61.6** 13800	**164** 36900	17.7	5300
40	**40** 1.5748	**60** 2.3622	**6.0** 0.2362	**–** –	**44** 1.732	**56** 2.205	**0.6** 0.024	K.81108LPB	**44.2** 9940	**126** 28300	12.0	5300
	40 1.5748	**60** 2.3622	**6.0** 0.2362	**13** 0.512	**44** 1.732	**56** 2.205	**0.6** 0.024	K.81108TVP	**49.8** 11200	**148** 33300	14.1	5300
	40 1.5748	**68** 2.6772	**9.0** 0.3543	**19** 0.748	**45** 1.772	**63** 2.480	**1.0** 0.039	K.81208TVP	**86.8** 19500	**233** 52400	26.9	4800
45	**45** 1.7717	**65** 2.5591	**6.0** 0.2362	**–** –	**49** 1.929	**61** 2.402	**0.6** 0.024	K.81109LPB	**47.0** 10600	**140** 31500	13.4	4800
	45 1.7717	**65** 2.5591	**6.0** 0.2362	**14** 0.551	**49** 1.929	**61** 2.402	**0.6** 0.024	K.81109TVP	**52.3** 11800	**163** 36600	15.5	4800
	45 1.7717	**73** 2.8740	**9.0** 0.3543	**–** –	**50** 1.969	**68** 2.677	**1.0** 0.039	K.81209TVP	**94.2** 21200	**266** 59800	30.8	4500

Approx. Wt.	Washer Dimensions			h		$r_{s\,min.}$	Washer Designation		Approx. Wt.	Shaft Dia.
	d	D_1	D, d_1	Max.	Min.					
kg lbs	mm in	mm in	mm in	mm in	mm in	mm in	Shaft Piloted	Housing Piloted	kg lbs	mm
0.006 0.013	**15** 0.591	**16** 0.630	**28** 1.102	**2.75** 0.108	**2.64** 0.104	**0.3** 0.012	WS.81102	GS.81102	**0.010** 0.022	**15**
0.006 0.013	**15** 0.591	**16** 0.630	**28** 1.102	**2.75** 0.108	**2.64** 0.104	**0.3** 0.012	WS.81102	GS.81102	**0.010** 0.022	
0.008 0.018	**17** 0.669	**18** 0.709	**30** 1.181	**2.75** 0.108	**2.64** 0.104	**0.3** 0.012	WS.81103	GS.81103	**0.011** 0.024	**17**
0.008 0.018	**17** 0.669	**18** 0.709	**30** 1.181	**2.75** 0.108	**2.64** 0.104	**0.3** 0.012	WS.81103	GS.81103	**0.011** 0.024	
0.009 0.020	**20** 0.787	**21** 0.827	**35** 1.378	**2.75** 0.108	**2.62** 0.103	**0.3** 0.012	WS.81104	GS.81104	**0.014** 0.031	**20**
0.014 0.031	**25** 0.984	**26** 1.024	**42** 1.654	**3.00** 0.118	**2.87** 0.113	**0.6** 0.024	WS.81105	GS.81105	**0.021** 0.046	**25**
0.026 0.057	**30** 1.181	**32** 1.260	**47** 1.850	**3.00** 0.118	**2.87** 0.113	**0.6** 0.024	WS.81106	GS.81106	**0.023** 0.051	**30**
0.016 0.035	**30** 1.181	**32** 1.260	**47** 1.850	**3.00** 0.118	**2.87** 0.113	**0.6** 0.024	WS.81106	GS.81106	**0.023** 0.051	
0.052 0.115	**30** 1.181	**32** 1.260	**52** 2.047	**4.25** 0.167	**4.12** 0.162	**0.6** 0.024	WS.81206	GS.81206	**0.047** 0.104	
0.034 0.075	**30** 1.181	**32** 1.260	**52** 2.047	**4.25** 0.167	**4.12** 0.162	**0.6** 0.024	WS.81206	GS.81206	**0.047** 0.104	
0.025 0.055	**35** 1.378	**37** 1.457	**52** 2.047	**3.50** 0.138	**3.34** 0.131	**0.6** 0.024	WS.81107	GS.81107	**0.032** 0.071	**35**
0.020 0.044	**35** 1.378	**37** 1.457	**52** 2.047	**3.50** 0.138	**3.34** 0.131	**0.6** 0.024	WS.81107	GS.81107	**0.032** 0.071	
0.073 0.161	**35** 1.378	**37** 1.457	**62** 2.441	**5.25** 0.207	**5.09** 0.200	**1.0** 0.039	WS.81207	GS.81207	**0.085** 0.187	
0.055 0.121	**35** 1.378	**37** 1.457	**62** 2.441	**5.25** 0.207	**5.09** 0.200	**1.0** 0.039	WS.81207	GS.81207	**0.085** 0.187	
0.044 0.097	**40** 1.575	**42** 1.654	**60** 2.362	**3.50** 0.138	**3.34** 0.131	**0.6** 0.024	WS.81108	GS.81108	**0.043** 0.095	**40**
0.031 0.068	**40** 1.575	**42** 1.654	**60** 2.362	**3.50** 0.138	**3.34** 0.131	**0.6** 0.024	WS.81108	GS.81108	**0.043** 0.095	
0.076 0.168	**40** 1.575	**42** 1.654	**68** 2.677	**5.00** 0.197	**4.84** 0.191	**1.0** 0.039	WS.81208	GS.81208	**0.093** 0.205	
0.035 0.077	**45** 1.772	**47** 1.850	**65** 2.559	**4.00** 0.157	**3.84** 0.151	**0.6** 0.024	WS.81109	GS.81109	**0.054** 0.119	**45**
0.035 0.077	**45** 1.772	**47** 1.850	**65** 2.559	**4.00** 0.157	**3.84** 0.151	**0.6** 0.024	WS.81109	GS.81109	**0.054** 0.119	
0.083 0.183	**45** 1.772	**47** 1.850	**73** 2.874	**5.50** 0.217	**5.34** 0.210	**1.0** 0.039	WS.81209	GS.81209	**0.112** 0.247	

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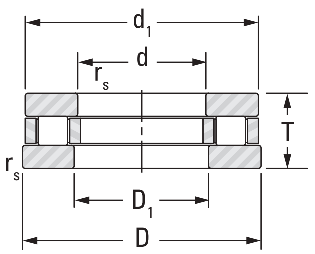
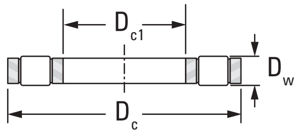
THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

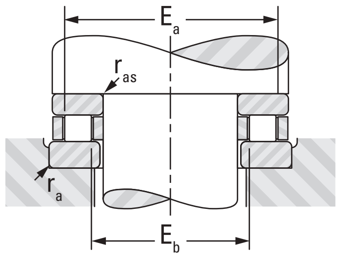
METRIC SERIES



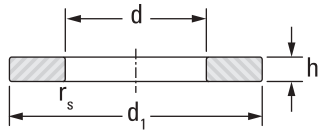
811, 812



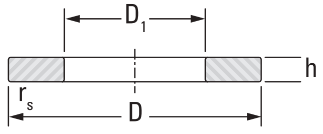
K.811, K.812



Shaft Dia.	Assembly Dimensions							Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil
	D_{c1}	D_c	D_w	T	$E_{b\,max.}$	$E_{a\,min.}$	$r_{as\,max.}$ $r_{a\,max.}$		Dynamic	Static		
	(E11)	(a13)							C	C_o		
mm	mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}
50	**50** 1.9685	**70** 2.7559	**6.0** 0.2362	**14** 0.551	**54** 2.126	**66** 2.598	**0.6** 0.024	K.81110LPB	**49.7** 11200	**155** 34800	14.8	4300
	50 1.9685	**70** 2.7559	**6.0** 0.2362	**14** 0.551	**54** 2.126	**66** 2.598	**0.6** 0.024	K.81110TVP	**54.8** 12300	**177** 39800	17.0	4300
	50 1.9685	**78** 3.0709	**9.0** 0.3543	**22** 0.866	**55** 2.165	**73** 2.874	**1.0** 0.039	K.81210TVP	**101** 22700	**299** 67200	34.6	4000
55	**55** 2.1654	**78** 3.0709	**6.0** 0.2362	**16** 0.630	**60** 2.362	**73** 2.874	**0.6** 0.024	K.81111TVP	**60.3** 13600	**207** 46500	19.8	4000
	55 2.1654	**90** 3.5433	**11.0** 0.4331	**–** –	**61** 2.402	**84** 3.307	**1.0** 0.039	K.81211LPB	**127** 28600	**359** 80700	39.6	3600
	55 2.1654	**90** 3.5433	**11.0** 0.4331	**25** 0.984	**61** 2.402	**84** 3.307	**1.0** 0.039	K.81211TVP	**138** 31000	**403** 90600	45.2	3600
60	**60** 2.3622	**85** 3.3465	**7.5** 0.2953	**17** 0.669	**65** 2.559	**80** 3.150	**1.0** 0.039	K.81112TVP	**84.4** 19000	**281** 63200	30.4	3600
	60 2.3622	**95** 3.7402	**11.0** 0.4331	**26** 1.024	**66** 2.598	**89** 3.504	**1.0** 0.039	K.81212LPB	**129** 29000	**378** 85000	42.4	3400
65	**65** 2.5591	**90** 3.5433	**7.5** 0.2953	**18** 0.709	**70** 2.756	**85** 3.346	**1.0** 0.039	K.81113TVP	**88.3** 19900	**305** 68600	33.0	3400
	65 2.5591	**100** 3.9370	**11.0** 0.4331	**27** 1.063	**71** 2.795	**94** 3.701	**1.0** 0.039	K.81213LPB	**134** 30100	**403** 90600	45.2	3200
70	**70** 2.7559	**95** 3.7402	**7.5** 0.2953	**18** 0.709	**75** 2.953	**90** 3.543	**1.0** 0.039	K.81114TVP	**92.1** 20700	**328** 73700	35.5	3200
	70 2.7559	**105** 4.1339	**11.0** 0.4331	**27** 1.063	**76** 2.992	**99** 3.898	**1.0** 0.039	K.81214LPB	**138** 31000	**428** 96200	48.0	3000
75	**75** 2.9528	**100** 3.9370	**7.5** 0.2953	**19** 0.748	**80** 3.150	**95** 3.740	**1.0** 0.039	K.81115LPB	**86.1** 19400	**305** 68600	33.0	3000
	75 2.9528	**110** 4.3307	**11.0** 0.4331	**27** 1.063	**81** 3.189	**104** 4.094	**1.0** 0.039	K.81215LPB	**143** 32100	**453** 101800	50.9	2800
80	**80** 3.1496	**105** 4.1339	**7.5** 0.2953	**19** 0.748	**85** 3.346	**100** 3.937	**1.0** 0.039	K.81116LPB	**87.5** 19700	**316** 71000	34.2	2800
	80 3.1496	**115** 4.5276	**11.0** 0.4331	**28** 1.102	**86** 3.386	**109** 4.291	**1.0** 0.039	K.81216LPB	**147** 33000	**478** 107500	53.7	2600
85	**85** 3.3465	**110** 4.3307	**7.5** 0.2953	**19** 0.748	**90** 3.543	**105** 4.134	**1.0** 0.039	K.81117LPB	**88.9** 20000	**328** 73700	35.5	2600
	85 3.3465	**125** 4.9213	**12.0** 0.4724	**31** 1.220	**93** 3.661	**117** 4.606	**1.0** 0.039	K.81217LPB	**174** 39100	**572** 128600	65.5	2400
90	**90** 3.5433	**120** 4.7244	**9.0** 0.3543	**22** 0.866	**96** 3.780	**114** 4.488	**1.0** 0.039	K.81118LPB	**119** 26800	**432** 97100	49.3	2400
	90 3.5433	**135** 5.3150	**14.0** 0.5512	**35** 1.378	**98** 3.858	**127** 5.000	**1.0** 0.039	K.81218LPB	**215** 48300	**691** 155300	81.5	2400



WS.811, WS.812

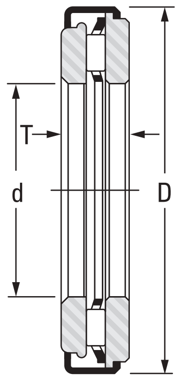


GS.811, GS.812

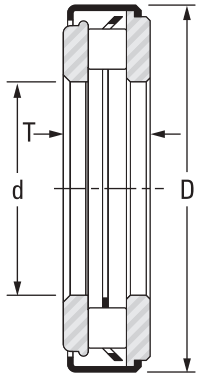
Approx. Wt.	Washer Dimensions			h		$r_{s\,min.}$	Washer Designation		Approx. Wt.	Shaft Dia.
	d	D_1	D, d_1	Max.	Min.					
kg lbs	mm in	mm in	mm in	mm in	mm in	mm in	Shaft Piloted	Housing Piloted	kg lbs	mm
0.052 0.115	**50** 1.969	**52** 2.047	**70** 2.756	**4.00** 0.157	**3.84** 0.151	**0.6** 0.024	WS.81110	GS.81110	**0.059** 0.130	**50**
0.042 0.093	**50** 1.969	**52** 2.047	**70** 2.756	**4.00** 0.157	**3.84** 0.151	**0.6** 0.024	WS.81110	GS.81110	**0.059** 0.130	
0.089 0.196	**50** 1.969	**52** 2.047	**78** 3.071	**6.5** 0.256	**6.34** 0.250	**1.0** 0.039	WS.81210	GS.81210	**0.144** 0.317	**55**
0.066 0.146	**55** 2.165	**57** 2.244	**78** 3.071	**5.00** 0.197	**4.81** 0.189	**0.6** 0.024	WS.81111	GS.81111	**0.094** 0.207	
0.156 0.344	**55** 2.165	**57** 2.244	**90** 3.543	**7.00** 0.276	**6.81** 0.268	**1.0** 0.039	WS.81211	GS.81211	**0.219** 0.483	
0.140 0.309	**55** 2.165	**57** 2.244	**90** 3.543	**7.00** 0.276	**6.81** 0.268	**1.0** 0.039	WS.81211	GS.81211	**0.219** 0.483	
0.103 0.227	**60** 2.362	**62** 2.441	**85** 3.346	**4.75** 0.187	**4.56** 0.180	**1.0** 0.039	WS.81112	GS.81112	**0.106** 0.234	**60**
0.166 0.366	**60** 2.362	**62** 2.441	**95** 3.740	**7.50** 0.295	**7.31** 0.288	**1.0** 0.039	WS.81212	GS.81212	**0.251** 0.553	
0.109 0.240	**65** 2.559	**67** 2.638	**90** 3.543	**5.25** 0.207	**5.06** 0.199	**1.0** 0.039	WS.81113	GS.81113	**0.125** 0.276	**65**
0.176 0.388	**65** 2.559	**67** 2.638	**100** 3.937	**8.00** 0.315	**7.81** 0.307	**1.0** 0.039	WS.81213	GS.81213	**0.285** 0.628	
0.056 0.123	**70** 2.756	**72** 2.835	**95** 3.740	**5.25** 0.207	**5.06** 0.199	**1.0** 0.039	WS.81114	GS.81114	**0.133** 0.293	**70**
0.186 0.410	**70** 2.756	**72** 2.835	**105** 4.134	**8.00** 0.315	**7.81** 0.307	**1.0** 0.039	WS.81214	GS.81214	**0.302** 0.666	
0.091 0.201	**75** 2.953	**77** 3.031	**100** 3.937	**5.75** 0.226	**5.56** 0.219	**1.0** 0.039	WS.81115	GS.81115	**0.155** 0.342	**75**
0.197 0.434	**75** 2.953	**77** 3.031	**110** 4.331	**8.00** 0.315	**7.81** 0.307	**1.0** 0.039	WS.81215	GS.81215	**0.319** 0.703	
0.103 0.227	**80** 3.150	**82** 3.228	**105** 4.134	**5.75** 0.226	**5.56** 0.219	**1.0** 0.039	WS.81116	GS.81116	**0.165** 0.364	**80**
0.208 0.459	**80** 3.150	**82** 3.228	**115** 4.528	**8.50** 0.335	**8.31** 0.327	**1.0** 0.039	WS.81216	GS.81216	**0.357** 0.787	
0.108 0.238	**85** 3.346	**87** 3.425	**110** 4.331	**5.75** 0.226	**5.53** 0.218	**1.0** 0.039	WS.81117	GS.81117	**0.173** 0.381	**85**
0.376 0.829	**85** 3.346	**88** 3.465	**125** 4.921	**9.50** 0.374	**9.28** 0.365	**1.0** 0.039	WS.81217	GS.81217	**0.492** 1.085	
0.156 0.344	**90** 3.543	**92** 3.622	**120** 4.724	**6.50** 0.256	**6.28** 0.247	**1.0** 0.039	WS.81118	GS.81118	**0.253** 0.558	**90**
0.540 1.190	**90** 3.543	**93** 3.661	**135** 5.315	**10.50** 0.413	**10.28** 0.405	**1.1** 0.043	WS.81218	GS.81218	**0.655** 1.444	

NEEDLE OR ROLLER THRUST BEARINGS

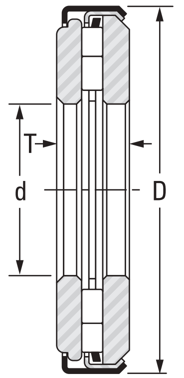
METRIC SERIES



AXZ



ARZ Light



ARZ Heavy

Shaft Dia.	d	D	T	Bearing Designations			Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil	Approx. Wt.
				AXZ	ARZ Light	ARZ Heavy	C	C_0			
mm	mm in	mm in	mm in				kN lbf		kN	min^{-1}	kg lbs
5	**5** 0.197	**13** 0.512	**5.5** 0.217	AXZ 5,5 5 13			**3.00** 670	**5.70** 1300	0.790	25000	**0.004** 0.008
6	**6** 0.236	**14** 0.551	**5.5** 0.217	AXZ 5,5 6 14			**3.15** 710	**6.35** 1400	0.880	22000	**0.004** 0.009
7	**7** 0.276	**15** 0.591	**5.5** 0.217	AXZ 5,5 7 15			**3.55** 800	**7.60** 1700	1.05	22000	**0.005** 0.010
8	**8** 0.315	**16** 0.630	**5.5** 0.217	AXZ 5,5 8 16			**3.70** 830	**8.30** 1900	1.15	22000	**0.005** 0.011
9	**9** 0.354	**17** 0.669	**5.5** 0.217	AXZ 5,5 9 17			**4.05** 910	**9.50** 2100	1.30	19000	**0.005** 0.012
10	**10** 0.394	**22.4** 0.882	**6** 0.236	AXZ 6 10 22,4			**5.00** 1120	**10.9** 2500	2.15	15500	**0.011** 0.025
	10 0.394	**22.4** 0.882	**6.5** 0.256		ARZ 6,5 10 22,4		**8.20** 1840	**17.9** 4000	2.45	15500	**0.012** 0.026
12	**12** 0.472	**26.4** 1.039	**6** 0.236	AXZ 6 12 26,4			**6.90** 1550	**17.7** 4000	3.25	13000	**0.017** 0.037
	12 0.472	**26.4** 1.039	**7** 0.275		ARZ 7 12 26,4		**12.7** 2860	**29.5** 6600	4.10	13000	**0.017** 0.037
15	**15** 0.591	**28.4** 1.118	**6** 0.236	AXZ 6 15 28,4			**7.40** 1660	**20.0** 4500	3.80	11500	**0.016** 0.034
	15 0.591	**28.4** 1.118	**7** 0.275		ARZ 7 15 28,4		**14.0** 3150	**34.0** 7600	4.80	11500	**0.019** 0.042
17	**17** 0.669	**30.4** 1.197	**6** 0.236	AXZ 6 17 30,4			**7.80** 1750	**22.0** 4900	4.10	10500	**0.018** 0.039
	17 0.669	**30.4** 1.197	**7** 0.275		ARZ 7 17 30,4		**15.0** 3370	**39.0** 8800	5.50	10500	**0.022** 0.049
20	**20** 0.787	**35.4** 1.394	**8** 0.315	AXZ 8 20 35,4			**11.80** 2650	**39.0** 8800	6.55	9000	**0.033** 0.072
	20 0.787	**35.4** 1.394	**10** 0.394		ARZ 10 20 35,4		**22.0** 4950	**54.0** 12100	7.80	9000	**0.038** 0.084
25	**25** 0.984	**43** 1.693	**8** 0.315	AXZ 8 25 43			**13.30** 2990	**49.0** 11000	8.15	7500	**0.047** 0.104
	25 0.984	**43** 1.693	**10** 0.394		ARZ 10 25 43		**25.5** 5730	**70.0** 15700	9.80	7500	**0.057** 0.126
	25 0.984	**53** 2.087	**11** 0.433			ARZ 11 25 53	**32.5** 7310	**122** 27400	34.3	6500	**0.122** 0.269
30	**30** 1.181	**48** 1.890	**8** 0.315	AXZ 8 30 48			**14.50** 3260	**57.0** 12800	9.55	6500	**0.054** 0.119
	30 1.181	**48** 1.890	**10** 0.394		ARZ 10 30 48		**26.5** 5960	**77.0** 17300	10.9	6500	**0.065** 0.143
	30 1.181	**61** 2.402	**14** 0.551			ARZ 14 30 61	**46.0** 10340	**162** 36400	45.5	5600	**0.196** 0.432

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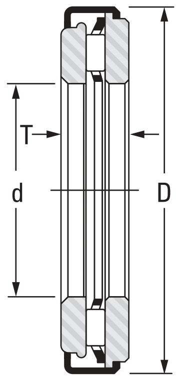
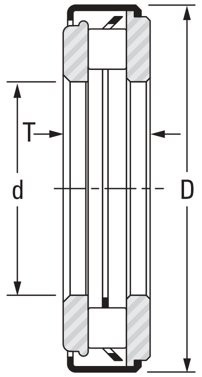
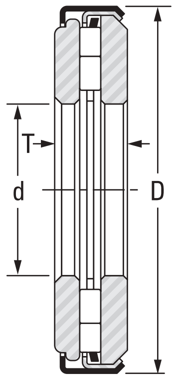


AXZ



ARZ Light

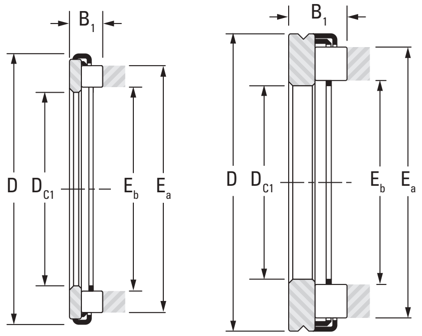


ARZ Heavy

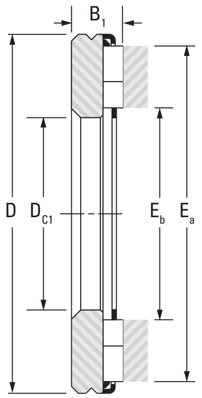
Shaft Dia.	d	D	T	Bearing Designations			Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil	Approx. Wt.
				AXZ	ARZ Light	ARZ Heavy	C	C_0			
mm	mm in	mm in	mm in				kN lbf		kN	min^{-1}	kg lbs
35	**35** 1.378	**54** 2.126	**8** 0.315	AXZ 8 35 54			**18.90** 4250	**84.0** 18900	13.4	5500	**0.066** 0.146
	35 1.378	**54** 2.126	**11** 0.433		ARZ 11 35 54		**33.8** 7600	**94.0** 21100	13.5	5500	**0.087** 0.192
	35 1.378	**69** 2.717	**14** 0.551			ARZ 14 35 69	**51.0** 11470	**194.0** 43600	54.5	4900	**0.246** 0.542
40	**40** 1.575	**61** 2.402	**8** 0.315	AXZ 8 40 61			**20.40** 4590	**96.0** 21600	15.4	5000	**0.084** 0.185
	40 1.575	**61** 2.402	**12** 0.472		ARZ 12 40 61		**46.0** 10340	**129** 29000	18.7	5000	**0.114** 0.251
	40 1.575	**79** 3.110	**17** 0.669			ARZ 17 40 79	**71.0** 15960	**265** 59600	74.3	4200	**0.387** 0.853
45	**45** 1.772	**66** 2.598	**8** 0.315	AXZ 8 45 66			**21.80** 4900	**109** 24500	17.4	4500	**0.092** 0.203
	45 1.772	**66** 2.598	**12** 0.472		ARZ 12 45 66		**49.0** 11000	**143** 32100	14.5	4500	**0.126** 0.278
	45 1.772	**86** 3.386	**22** 0.866			ARZ 22 45 86	**92.0** 20700	**340** 76400	68.6	3800	**0.595** 1.312
50	**50** 1.969	**71** 2.795	**8** 0.315	AXZ 8 50 71			**22.50** 5100	**118** 26500	18.7	4000	**0.100** 0.220
	50 1.969	**71** 2.795	**12** 0.472		ARZ 12 50 71		**51.0** 11500	**157** 35300	15.9	4000	**0.137** 0.302
	50 1.969	**96** 3.780	**22** 0.866			ARZ 22 50 96	**108.0** 24300	**430** 96700	91.9	3400	**0.756** 1.66
55	**55** 2.165	**106** 4.173	**22** 0.866			ARZ 22 55 106	**125.0** 28100	**530** 119100	118	3100	**0.917** 2.022
60	**60** 2.362	**86** 3.386	**10** 0.394	AXZ 10 60 86			**31.50** 7100	**193** 43400	21.6	3500	**0.194** 0.428
	60 2.362	**86** 3.386	**14** 0.551		ARZ 14 60 86		**71.0** 16000	**255** 57300	28.6	3500	**0.246** 0.542
	60 2.362	**111** 4.370	**22** 0.866			ARZ 22 60 111	**130.0** 29200	**580** 130400	128	2900	**0.977** 2.15
65	**65** 2.559	**116** 4.567	**22** 0.866			ARZ 22 65 116	**135.0** 30300	**620** 139400	138	2800	**1.040** 2.29
70	**70** 2.756	**96** 3.780	**10** 0.394	AXZ 10 70 96			**34.50** 7800	**223** 50100	25.0	3000	**0.220** 0.485
	70 2.756	**96** 3.780	**14** 0.551		ARZ 14 70 96		**77.0** 17300	**295** 66300	32.4	3000	**0.279** 0.615
80	**80** 3.150	**106** 4.173	**10** 0.394	AXZ 10 80 106			**36.50** 8200	**253** 56900	28.4	2700	**0.256** 0.564
	80 3.150	**106** 4.173	**14** 0.551		ARZ 14 80 106		**82.0** 18400	**330** 74200	36.7	2700	**0.312** 0.688

UNITIZED ROLLER THRUST BEARING ASSEMBLIES

METRIC SERIES

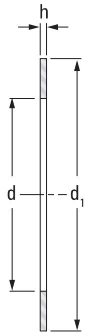


AR Light

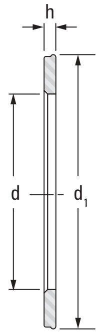


AR Heavy

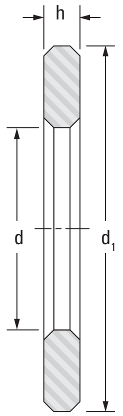
Shaft Dia.	Assembly Dimensions					Assembly Designation		Approx. Wt.	Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil
						Light Series	Heavy Series		Dynamic	Static		
	D_{c1}	D	B_1	E_a	E_b	AR	AR		C	C_0		
mm	mm in	mm in	mm in	mm in	mm in			kg lbs	kN lbf		kN	min^{-1}
10	10 0.394	22 0.866	4.5 0.177	18.5 0.73	12.2 0.48	AR 4,5 10 22		0.007 0.016	8.2 1840	17.9 4020	2.30	15500
12	12 0.472	26 1.024	5 0.197	22.9 0.90	14.8 0.58	AR 5 12 26		0.011 0.024	12.7 2860	29.5 6630	3.90	13000
15	15 0.591	28 1.103	5 0.197	24.9 0.98	16.8 0.66	AR 5 15 28		0.011 0.024	14.0 3150	34.0 7640	4.55	11500
17	17 0.669	30 1.181	5 0.197	26.9 1.06	18.8 0.74	AR 5 17 30		0.013 0.028	15.0 3370	39.0 8770	5.20	10500
20	20 0.787	35 1.378	7 0.276	31.6 1.24	22.0 0.87	AR 7 20 35		0.022 0.049	22.0 4950	54.0 12100	7.10	9000
25	25 0.984	42 1.654	7 0.276	37.3 1.47	27.7 1.09	AR 7 25 42		0.031 0.068	25.5 5730	70.0 15700	8.90	7500
	25 0.984	52 2.047	7 0.276	47.0 1.85	29.0 1.14		AR 7 25 52	0.070 0.154	32.5 7310	122.0 27400	16.0	6500
30	30 1.181	47 1.851	7 0.276	42.3 1.67	32.7 1.29	AR 7 30 47		0.036 0.079	26.5 5960	77.0 17300	9.90	6500
	30 1.181	60 2.362	9 0.354	53.5 2.11	33.5 1.32		AR 9 30 60	0.113 0.249	46.0 10340	162.0 36400	20.8	5600
35	35 1.378	53.4 2.103	8 0.315	47.8 1.88	37.8 1.49	AR 8 35 53,4		0.052 0.115	33.8 7600	94.0 21100	12.3	5500
	35 1.378	68 2.677	9 0.354	60.6 2.39	39.0 1.54		AR 9 35 68	0.144 0.317	51.0 11500	194.0 43600	25.1	4900
40	40 1.575	60.4 2.378	9 0.354	54.8 2.16	42.8 1.69	AR 9 40 60,4		0.070 0.154	46.0 10300	129.0 29000	11.4	5000
	40 1.575	78 3.071	11 0.433	70.0 2.76	44.0 1.73		AR 11 40 78	0.225 0.496	71.0 16000	265.0 59600	35.3	4200
45	45 1.772	65.4 2.575	9 0.354	59.8 2.35	47.8 1.88	AR 9 45 65,4		0.077 0.170	49.0 11000	143.0 32100	12.2	4500
	45 1.772	85 3.347	14 0.551	77.0 3.03	49.0 1.93		AR 14 45 85	0.350 0.772	92.0 20700	340.0 76400	32.8	3800
50	50 1.968	70.4 2.772	9 0.354	64.8 2.55	52.8 2.08	AR 9 50 70,4		0.082 0.181	51.0 11500	157.0 35300	13.4	4000
	50 1.968	95 3.740	14 0.551	86.0 3.39	54.0 2.13		AR 14 50 95	0.448 0.988	108.0 24300	430.0 96700	44.4	3400
55	55 2.165	78.4 3.087	10 0.394	72.5 2.85	58.5 2.30	AR 10 55 78,4		0.125 0.276	61.0 13700	203.0 45600	19.2	3800
	55 2.165	105 4.134	14 0.551	96.2 3.79	60.2 2.37		AR 14 55 105	0.537 1.184	125.0 28100	530.0 119100	57.4	3100



CP Thin



CP Thick



CPR Heavy

Washer Dimensions		Thin Series	h	Approx. Wt.	Thick Series	h	Approx. Wt.	Heavy Series	h	Approx. Wt.	Shaft Dia.
d	d_1										
mm in	mm in		mm in	kg lbs		mm in	kg lbs		mm in	kg lbs	mm
10 0.394	22 0.866	CP 10 22	0.8 0.031	0.002 0.004	CP 2 10 22	2 0.079	0.004 0.009				10
12 0.472	25 0.984	CP 12 26	0.8 0.031	0.003 0.006	CP 2 12 26	2 0.079	0.006 0.014				12
15 0.591	27 1.063	CP 15 28	0.8 0.031	0.003 0.006	CP 2 15 28	2 0.079	0.006 0.013				15
17 0.669	29 1.142	CP 17 30	0.8 0.031	0.003 0.006	CP 2 17 30	2 0.079	0.007 0.015				17
20 0.787	34 1.339	CP 20 35	0.8 0.031	0.004 0.008	CP 3 20 35	3 0.118	0.013 0.029				20
25 0.984	42 1.654	CP 25 42	0.8 0.031	0.005 0.012	CP 3 25 42	3 0.118	0.019 0.042				25
25 0.984	52 2.047							CPR 4 25 52	4 0.157	0.052 0.115	25
30 1.181	46 1.811	CP 30 47	0.8 0.031	0.006 0.013	CP 3 30 47	3 0.118	0.022 0.049				30
30 1.181	60 2.362							CPR 5 30 60	5 0.197	0.083 0.183	
35 1.378	51 2.008	CP 35 52	0.8 0.031	0.007 0.015	CP 3 35 52	3 0.118	0.026 0.057				35
35 1.378	68 2.677							CPR 5 35 68	5 0.197	0.102 0.225	
40 1.575	59 2.323	CP 40 60	0.8 0.031	0.009 0.021	CP 3 40 60	3 0.118	0.034 0.075				40
40 1.575	78 3.071							CPR 6 40 78	6 0.236	0.162 0.357	
45 1.772	64 2.520	CP 45 65	0.8 0.031	0.010 0.022	CP 3 45 65	3 0.118	0.037 0.082				45
45 1.772	85 3.347							CPR 8 45 85	8 0.315	0.245 0.540	
50 1.968	69 2.717	CP 50 70	0.8 0.031	0.011 0.024	CP 3 50 70	3 0.118	0.040 0.088				50
50 1.968	95 3.740							CPR 8 50 95	8 0.315	0.308 0.679	
55 2.165	77 3.031	CP 55 78	0.8 0.031	0.014 0.031	CP 4 55 78	4 0.157	0.069 0.152				55
55 2.165	105 4.134							CPR 8 55 105	8 0.315	0.380 0.838	

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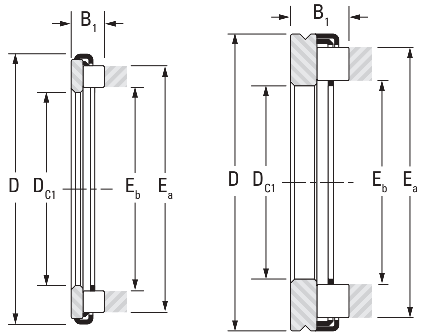
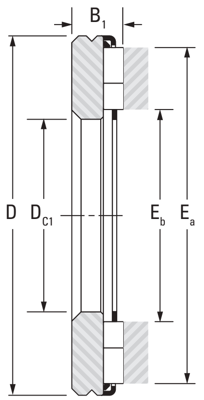
UNITIZED ROLLER THRUST BEARING ASSEMBLIES

METRIC SERIES

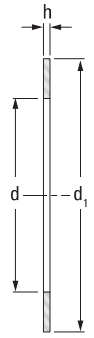


AR Light

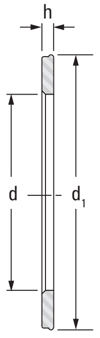


AR Heavy

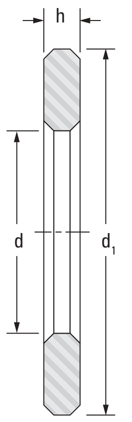
Shaft Dia.	Assembly Dimensions					Assembly Designation		Approx. Wt.	Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil
	D_{c1}	D	B_1	E_a	E_b	Light Series	Heavy Series		Dynamic	Static		
						AR	AR		C	C_0		
mm	mm in	mm in	mm in	mm in	mm in			kg lbs	kN lbf		kN	min^{-1}
60	**60** 2.362	**85.4** 3.362	**10** 0.394	**79.5** 3.13	**63.5** 2.50	AR 10 60 85,4		**0.150** 0.331	**71.0** 16000	**255.0** 57300	25.7	3500
	60 2.362	**110** 4.331	**14** 0.551	**101.2** 3.98	**65.2** 2.57		AR 14 60 110	**0.572** 1.261	**130.0** 29200	**580.0** 130400	62.2	2900
65	**65** 2.559	**90.4** 3.559	**10** 0.394	**84.5** 3.33	**68.5** 2.70	AR 10 65 90,4		**0.160** 0.353	**74.0** 16600	**275.0** 61800	27.7	3200
	65 2.559	**115** 4.528	**14** 0.551	**106.2** 4.18	**70.2** 2.76		AR 14 65 115	**0.610** 1.345	**135.0** 30300	**620.0** 139400	66.9	2800
70	**70** 2.756	**95.4** 3.756	**10** 0.394	**89.5** 3.52	**73.5** 2.89	AR 10 70 95,4		**0.170** 0.375	**77.0** 17300	**295.0** 66300	30.2	3000
	70 2.756	**125** 4.921	**16** 0.630	**116.0** 4.57	**76.0** 2.99		AR 16 70 125	**0.775** 1.709	**174.0** 39100	**710.0** 159600	75.6	2600
75	**75** 2.953	**100** 3.938	**10** 0.394	**94.5** 3.72	**78.5** 3.09	AR 10 75 100,4(1)		**0.180** 0.397	**80.0** 18000	**313.0** 70400	31.6	2800
	75 2.953	**135** 5.315	**16** 0.630	**126.0** 4.96	**82.0** 3.23		AR 16 75 135	**0.893** 1.969	**198.0** 44500	**860.0** 193300	93.1	2400
80	**80** 3.150	**105.4** 4.150	**10** 0.394	**99.5** 3.92	**83.5** 3.29	AR 10 80 105,4		**0.190** 0.419	**82.0** 18400	**330.0** 74200	34.3	2700
	80 3.150	**140** 5.512	**16** 0.630	**131.0** 5.16	**87.0** 3.43		AR 16 80 140	**0.960** 2.116	**208.0** 46800	**940.0** 211300	100	2300
85	**85** 3.346	**150** 5.906	**18** 0.709	**138.0** 5.43	**92.0** 3.62		AR 18 85 150	**1.256** 2.769	**230.0** 51700	**1010.0** 227100	105	2100
90	**90** 3.550	**155** 6.103	**18** 0.709	**143.0** 5.63	**97.0** 3.82	AR 18 90 155		**1.330** 2.932	**245.0** 55100	**1090.0** 245000		2000
100	**100** 3.937	**170** 6.693	**20** 0.787	**157.0** 6.18	**109.0** 4.29		AR 20 100 170	**1.740** 3.836	**280.0** 62900	**1250.0** 281000	130	1800
110	**110** 4.331	**190** 7.481	**24** 0.945	**178.0** 7.01	**118.0** 4.65		AR 24 110 190	**2.500** 5.512	**365.0** 82100	**1600.0** 359700	161	1700
120	**120** 4.724	**210** 8.268	**24** 0.945	**199.0** 7.83	**127.0** 5.00		AR 24 120 210	**3.200** 7.055	**470.0** 105700	**2300.0** 517100	222	1500
130	**130** 5.118	**225** 8.858	**24** 0.945	**214.0** 8.43	**138.0** 5.43		AR 24 130 225	**3.600** 7.937	**510.0** 114700	**2640.0** 593500	251	1400
140	**140** 5.511	**240** 9.449	**28** 1.102	**229.0** 9.02	**149.0** 5.87		AR 28 140 240	**4.800** 10.582	**600.0** 134900	**2980.0** 669900	290	1300



CP Thin



CP Thick



CPR Heavy

Washer Dimensions		Thin Series	h	Approx. Wt.	Thick Series	h	Approx. Wt.	Heavy Series	h	Approx. Wt.	Shaft Dia.
d	d_1										
mm in	mm in		mm in	kg lbs		mm in	kg lbs		mm in	kg lbs	mm
60 2.362	**84** 3.307	CP 60 85	**0.8** 0.031	**0.017** 0.037	CP 4 60 85	**4** 0.157	**0.083** 0.183				**60**
60 2.362	**110** 4.331							CPR 8 60 110	**8** 0.315	**0.405** 0.893	
65 2.559	**89** 3.504	CP 1,5 65 90	**1.5** 0.059	**0.033** 0.073	CP 4 65 90	**4** 0.157	**0.088** 0.194				**65**
65 2.559	**115** 4.528							CPR 8 65 115	**8** 0.315	**0.430** 0.948	
70 2.756	**94** 3.701	CP 1,5 70 95	**1.5** 0.059	**0.034** 0.076	CP 4 70 95	**4** 0.157	**0.093** 0.205				**70**
70 2.756	**125** 4.921							CPR 8 70 125	**8** 0.315	**0.510** 1.12	
75 2.953	**99** 3.898	CP 1,5 75 100	**1.5** 0.059	**0.037** 0.082	CP 4 75 100	**4** 0.157	**0.099** 0.218				**75**
75 2.953	**135** 5.315							CPR 8 75 135	**8** 0.315	**0.595** 1.31	
80 3.150	**104** 4.094	CP 1,5 80 105	**1.5** 0.059	**0.039** 0.086	CP 4 80 105	**4** 0.157	**0.104** 0.229				**80**
80 3.150	**140** 5.512							CPR 8 80 140	**8** 0.315	**0.630** 1.39	
85 3.346	**150** 5.906							CPR 9 85 150	**9** 0.354	**0.815** 1.80	**85**
90 3.550	**155** 6.103							CPR 9 90 155	**9** 0.354	**0.840** 1.85	**90**
100 3.937	**170** 6.693							CPR 10 100 170	**10** 0.394	**1.13** 2.49	**100**
110 4.331	**190** 7.481							CPR 12 110 190	**12** 0.472	**1.70** 3.75	**110**
120 4.724	**210** 8.268							CPR 12 120 210	**12** 0.472	**2.10** 4.63	**120**
130 5.118	**225** 8.858							CPR 12 130 225	**12** 0.472	**2.40** 5.29	**130**
140 5.511	**240** 9.449							CPR 14 140 240	**14** 0.550	**3.20** 7.05	**140**

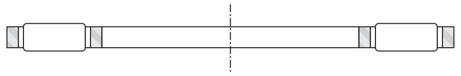
(1) Assembly designation shows 100,4 as D, but D dimension is 100.

THRUST ASSEMBLIES AND THRUST BEARINGS – INCH SERIES

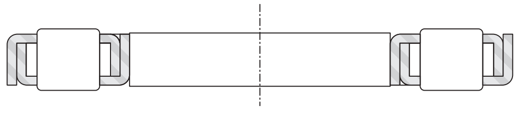
Thrust assemblies and thrust bearings of inch series are available in a variety of sizes. This catalog includes the most popular, standardized designs. If the backup surfaces cannot be used as raceways, hardened thrust washers are available.

REFERENCE STANDARDS ARE:

- **ANSI/ABMA Std. 21.2** – thrust needle roller and case assemblies and thrust washers – inch design.
- **ANSI/ABMA Std. 24.2** – thrust bearings of ball and cylindrical roller types – inch design.



NTA
Thrust needle roller and cage assembly



NTH
Thrust cylindrical roller and cage assembly

NTHA
Cylindrical roller thrust bearing

TRA…TRD
Thrust washers

Fig. B6-5. Types of inch series thrust assemblies, thrust bearings and thrust washers

IDENTIFICATION

NTA is the complete prefix code for a thrust needle roller and cage assembly with inch nominal dimensions using needle rollers of the smallest practical diameter.

Thrust cylindrical roller and cage assemblies with inch nominal dimensions are identified by the prefix letters NTH. They use large diameter cylindrical rollers, providing higher load ratings.

Thrust washers of inch nominal dimensions are identified by the prefix letters TR followed by another letter such as A, B or C etc. – indicating washer thickness. TRA is the complete prefix code for the thinnest thrust washer made to inch nominal dimensions.

Most thrust washers are intended to be piloted on their bores. Some washers, however, are designed to be piloted on their outer diameters. Such washers are identified by the letter D, following the thickness code letter. Thus TRJD is the complete prefix code for a thrust washer with inch nominal dimensions of J thickness and designed to be piloted by its outer diameter.

Cylindrical roller thrust bearings, with prefix code NTHA, are made up of one NTH assembly – one TRI or TRJ bore-piloted washer and one TRID or TRJD outer-diameter piloted washer.

Because the bearing designation for thrust assemblies does not appear on the bearing itself, the manufacturer's parts list or another reliable source should always be consulted when ordering bearings for service or field replacement – to make certain that the correct bearing with the correct lubricant is used.

CONSTRUCTION

Thrust needle roller and cage assemblies (NTA) and thrust cylindrical roller and cage assemblies (NTH) have hardened cages and through-hardened, precision-ground rollers. The cages are securely fastened assemblies of two mating pieces. This construction minimizes cage stress and assures that the roller retaining function of the cage is unaffected by normal wear. The needle rollers and the cylindrical rollers are precision ground and lapped to close tolerance for optimum load distribution.

Thrust washers for the thrust needle roller and cage assemblies are designed for bore piloting. The thinner thrust washers are tumble burnished and may be out-of-flat due to heat treatment – but will flatten under load. The raceway surfaces of thick thrust washers are ground and lapped.

Thrust washers for the thrust cylindrical roller and cage assemblies are available in both bore-piloted and outer-diameter piloted types. Their piloting surfaces are ground and raceway surfaces are ground and lapped.

DIMENSIONAL ACCURACY

TOLERANCES FOR THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

Pages B-6-52 to B-6-61, list the nominal outer diameter, bore diameter and the needle roller diameter for the inch thrust needle roller and cage assemblies and their corresponding thrust washers appear in the bearing tables.

Tolerances for the bore diameters and outer diameters of inch thrust assemblies are given in Table B6-15.

Table B6-15. Tolerances for bore (D_{c1}) and outer (D_c) diameters of nominal inch thrust needle (NTA) and cylindrical (NTH) roller and cage assemblies

NTA thrust needle roller and cage assemblies				
Needle roller diameter (nominal)	Deviations			
	Bore diameter		Outer diameter	
	D_{c1}		D_c	
D_w	Max.	Min.	Max.	Min.
mm **in**	mm **in**	mm **in**	mm **in**	mm **in**
1.981 **0.078**	+0.178 **+0.007**	+0.051 **+0.002**	-0.254 **-0.010**	-0.508 **-0.020**
3.175 **0.125**	+0.254 **+0.010**	+0.051 **+0.002**	-0.254 **-0.010**	-0.635 **-0.025**
NTH thrust cylindrical roller and cage assemblies				
All diameters	+0.381 **+0.015**	0.000 **0.000**	-0.127 **-0.005**	-0.508 **-0.020**

BORE INSPECTION PROCEDURE FOR ASSEMBLY

The bore diameter (D_{c1}) of the assembly should be checked with "go" and "no go" plug gages. The "go" plug gage size is the minimum bore diameter of the assembly. The "no go" plug gage size is the maximum bore diameter of the assembly.

The assembly must fall freely from the "go" plug gage under its own free weight. The "no go" plug gage must not enter the bore. Where the "no go" plug gage can be forced through the bore, the assembly must not fall from the gage under its own weight.

TOLERANCES FOR THRUST WASHERS

Tolerances for the outer diameters and bore diameters of nominal inch thrust washers are given in Tables B6-16 and B6-17.

Table B6-16. Tolerances for outer diameter (d_1) of nominal inch (TRA, TRB, etc.) thrust washers

d_1:Nominal outer diameter				Deviations			
>		≤		Max.		Min.	
mm	**in**	mm	**in**	mm	**in**	mm	**in**
6.000	**0.24**	133.400	**5.25**	-0.254	**-0.010**	-0.762	**-0.030**

Table B6-17. Tolerances for bore diameter (d) of nominal inch (TRA, TRB, etc.) thrust washers

d:Nominal bore diameter				Deviations			
>		≤		Max.		Min.	
mm	**in**	mm	**in**	mm	**in**	mm	**in**
6.000	**0.24**	57.200	**2.25**	+0.300	**+0.012**	+0.050	**+0.002**
57.200	**2.25**	133.400	**5.25**	+0.430	**+0.017**	+0.050	**+0.002**

BORE INSPECTION PROCEDURE FOR THRUST WASHER

The bore diameter (d) of the thrust washer should be checked with “go” and “no go” plug gages. The “go” plug gage size is the minimum bore diameter of the thrust washer. The “no go” plug gage size is the maximum bore diameter of the thrust washer.

The thrust washer, under its own weight, must fall freely from the “go” plug gage. The “no go” plug gage must not enter the bore. Where the “no go” plug gage can be forced through the bore, the thrust washer must not fall from the gage under its own weight.

TOLERANCES FOR CYLINDRICAL ROLLER THRUST BEARINGS

The tolerances for inch series cylindrical roller thrust bearings, cylindrical roller cage and thrust assemblies and their corresponding component thrust washers appear in the bearing tables.

MOUNTING TOLERANCES

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

On NTA inch type thrust needle roller and cage assemblies, the cage bore has a larger contact area and a closer tolerance than the outer diameter. Therefore, bore piloting is preferred for these assemblies. To reduce wear, it is suggested that the piloting surface for the cage be hardened to an equivalent of at least 55 HRC.

Where design requirements prevent bore piloting, the NTA thrust needle roller and cage assemblies may be piloted on the outer diameters. It should be noted that the “diameter to clear washer O.D.” given in the bearing tables is not suitable for outer diameter piloting. For such cases, suitable O.D. piloting dimensions should be determined in consultation with your representative.

THRUST WASHERS FOR USE WITH NTA THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

Ideally, a thrust washer should be stationary with respect to and piloted by its supporting or backing member – whether or not this is an integral part of the shaft or housing. There should be no rubbing action between the thrust washer and any other machine member. The economics of design, however, often preclude these ideal conditions and thrust washers must be employed in another manner. In such cases, design details should be determined in consultation with your representative.

THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES

Type NTH assembly cage has a relatively large contact area on both the bore and the outer diameter. Thus, these assemblies can be piloted by either the shaft or the housing. In order to reduce wear, it is suggested that the piloting surface for the cage be hardened to an equivalent of at least 55 HRC.

When the shaft is used as the piloting surface the outer diameter of the cage must clear the housing under all conditions. Conversely, when the housing is the piloting surface, the shaft must clear the cage bore under all conditions. The mounting dimensions are given in the bearing tables for both shaft and housing piloting. Bore inspection procedure for the assembly given on page B-6-49 should be used for checking the bore of NTH assemblies.

THRUST WASHERS FOR USE WITH THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES

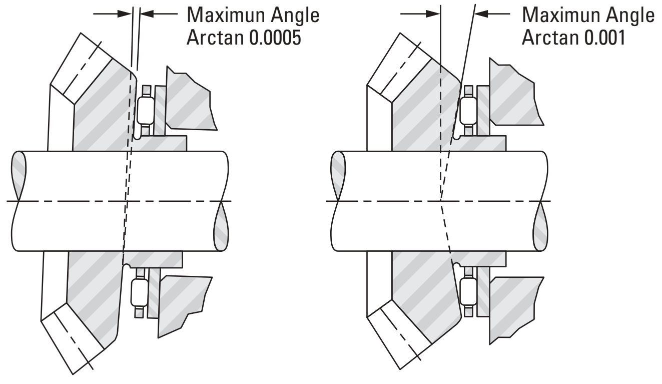
Types TRID and TRJD thrust washers for use with thrust cylindrical roller and cage assemblies are designed to pilot from the housing and to clear the shaft. Types TRI and TRJ thrust washers are designed to pilot from the shaft and clear the housing. The thrust washers should be stationary with respect to their piloting (or locating) machine members. There should be no rubbing action between the washer and any other machine member.

BACKUP SURFACES

In some applications, it is desirable to use the backup surfaces as raceways for the rollers of the thrust assemblies. When this is done, these surfaces must be hardened to an equivalent of at least 58 HRC. If this hardness cannot be achieved and thrust washers cannot be used, the load ratings must be reduced as explained in the engineering section of this catalog.

Thrust raceway surfaces must be ground to a surface of 8 µin Ra (0.20 µm Ra). When this requirement cannot be met, thrust washers must be used.

The raceways against which the rollers operate or the surfaces against which the thrust washers bear must be square with the axis of the shaft. Equally important, the raceway or surface backing the thrust washer must not be dished or coned. The permissible limits of out-of-squareness and dishing or coning are shown in the figures below.



Out-of-square surface

Dished or coned surface

Fig. B6-6. Permissible limits

TYPE NTHA CYLINDRICAL ROLLER THRUST BEARING

The NTHA cylindrical roller thrust bearing consists of the NTH thrust cylindrical roller and cage assembly and two thrust washers. This bearing is sold as a unit.

A typical mounting of the thrust bearing on a rotating shaft is shown in Fig. B6-7. The bore of the rotating shaft supported thrust washer is ground for an accurate fit on the shaft. The outer diameter of the stationary housing supported thrust washer is ground for a proper fit in the housing.

The NTHA cylindrical roller thrust bearing cage is normally shaft piloted. In the event it is necessary to pilot the cage by the housing – Fig. B6-8 illustrates a possible mounting arrangement. When other mounting arrangements are dictated by the application, they should be determined in consultation with your representative.

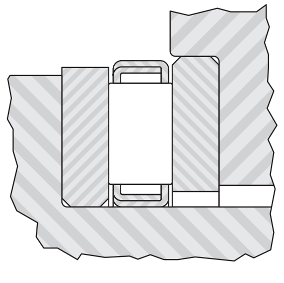


**Fig. B6-7.
Typical mounting of a thrust bearing when the shaft rotates**

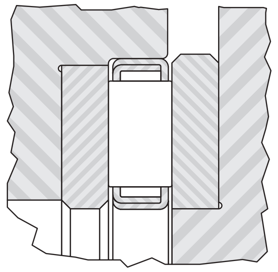


**Fig. B6-8.
NTHA possible mounting arrangement**

LOAD RATINGS

MINIMUM AXIAL LOAD

Slippage can occur if the applied axial load is too light and the operating speed of the thrust needle roller and cage assembly is high – particularly if accompanied by inadequate lubrication. For satisfactory operation, a certain minimum load must be applied to a thrust needle roller and cage assembly which can be calculated from:

$$F_{a\ min.} = C_{0a}/2200\ [kN]$$

Where:

C_{0a} = static load rating [kN]
$F_{a\ min.}$ = minimum axial load [kN]

LUBRICATION

Oil is the preferred lubricant for thrust needle or cylindrical roller and cage assemblies. An ample oil flow is absolutely necessary for high speeds or for moderate speeds when the load is relatively high.

SPECIAL DESIGNS

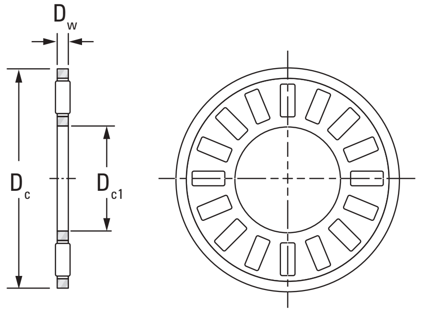
Thrust needle roller and cage assemblies and thrust washers are also made to special dimensions and configurations, as well as from special materials – when quantities permit economical manufacture.

Thrust needle roller and cage assemblies are particularly adaptable to low-cost integral combinations, with special thrust washers. When the use of such special designs are considered, the following pages should be reviewed for evaluation of proposed arrangements.

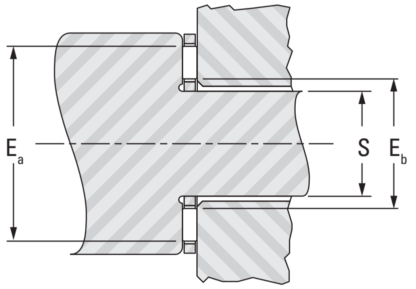
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-50 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.

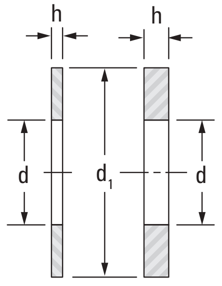


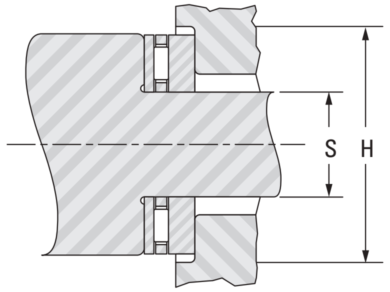
NTA



Raceway hardness to be 58 HRC or equivalent

Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating[1]
							Dynamic	Static		
	D_{c1}	D_c	D_w	E_b	E_a		C	C_o		
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min⁻¹
1/4	**6.35** 0.250	**17.45** 0.687	**1.984** 0.0781	**8.636** 0.340	**14.732** 0.580	NTA-411	**5.12** 1150	**10.76** 2420	1.05	26000
5/16	**7.92** 0.312	**19.05** 0.75	**1.984** 0.0781	**10.16** 0.400	**16.256** 0.640	NTA-512	**5.83** 1310	**13.17** 2 960	1.30	24000
3/8	**9.53** 0.375	**20.625** 0.812	**1.984** 0.0781	**11.68** 0.460	**18.034** 0.710	NTA-613	**6.05** 1360	**14.32** 3220	1.40	22000
1/2	**12.70** 0.500	**23.80** 0.937	**1.984** 0.0781	**14.99** 0.590	**21.08** 0.830	NTA-815	**7.16** 1610	**19.13** 4300	1.85	19000
9/16	**14.275** 0.562	**25.40** 1.000	**1.9837** 0.0781	**16.51** 0.650	**22.606** 0.890	NTA-916	**7.70** 1730	**21.53** 4840	2.10	18000
5/8	**15.88** 0.625	**28.575** 1.125	**1.9837** 0.0781	**18.03** 0.710	**25.908** 1.020	NTA-1018	**9.79** 2200	**30.38** 6830	2.85	15000





Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H [2]		
kg lbs		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs	in
0.001 0.003	TRA-411	**6.35** 0.250	**17.45** 0.687	**0.81** 0.032	**0.76** 0.030	**6.35** 0.250	**6.27** 0.247	**18.26** 0.719	**0.001** 0.003	1/4
	TRB-411	**6.35** 0.250	**17.45** 0.687	**1.60** 0.063	**1.52** 0.060	**6.35** 0.250	**6.27** 0.247	**18.26** 0.719	**0.002** 0.005	
	TRC-411	**6.35** 0.250	**17.45** 0.687	**2.41** 0.095	**2.34** 0.092	**6.35** 0.250	**6.27** 0.247	**18.26** 0.719	**0.004** 0.008	
0.002 0.004	TRA-512	**7.92** 0.312	**19.05** 0.750	**0.81** 0.032	**0.76** 0.030	**7.92** 0.312	**7.85** 0.309	**19.84** 0.781	**0.001** 0.003	5/16
	TRB-512	**7.92** 0.312	**19.05** 0.750	**1.60** 0.063	**1.52** 0.060	**7.92** 0.312	**7.85** 0.309	**19.84** 0.781	**0.003** 0.006	
0.002 0.004	TRA-613	**9.53** 0.375	**20.62** 0.812	**0.81** 0.032	**0.76** 0.030	**9.53** 0.375	**9.45** 0.372	**21.44** 0.844	**0.001** 0.003	3/8
	TRB-613	**9.53** 0.375	**20.62** 0.812	**1.60** 0.063	**1.52** 0.060	**9.53** 0.375	**9.45** 0.372	**21.44** 0.844	**0.003** 0.006	
	TRC-613	**9.53** 0.375	**20.62** 0.812	**2.41** 0.095	**2.34** 0.092	**9.53** 0.375	**9.45** 0.372	**21.44** 0.844	**0.004** 0.009	
0.002 0.005	TRA-815	**12.70** 0.500	**23.80** 0.937	**0.81** 0.032	**0.76** 0.030	**12.70** 0.500	**12.62** 0.497	**24.61** 0.969	**0.002** 0.004	1/2
	TRB-815	**12.70** 0.500	**23.80** 0.937	**1.60** 0.063	**1.52** 0.060	**12.70** 0.500	**12.62** 0.497	**24.61** 0.969	**0.004** 0.008	
	TRC-815	**12.70** 0.500	**23.80** 0.937	**2.41** 0.095	**2.34** 0.092	**12.70** 0.500	**12.62** 0.497	**24.61** 0.969	**0.005** 0.012	
0.003 0.006	TRA-916	**14.27** 0.562	**25.40** 1.000	**0.81** 0.032	**0.76** 0.030	**14.27** 0.562	**14.20** 0.559	**26.19** 1.031	**0.002** 0.005	9/16
	TRB-916	**14.27** 0.562	**25.40** 1.000	**1.60** 0.063	**1.52** 0.060	**14.27** 0.562	**14.20** 0.559	**26.19** 1.031	**0.004** 0.008	
	TRC-916	**14.27** 0.562	**25.40** 1.000	**2.41** 0.095	**2.34** 0.092	**14.27** 0.562	**14.20** 0.559	**26.19** 1.031	**0.006** 0.013	
0.003 0.007	TRA-1018	**15.88** 0.625	**28.58** 1.125	**0.81** 0.032	**0.76** 0.030	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.003** 0.006	5/8
	TRB-1018	**15.88** 0.625	**28.58** 1.125	**1.60** 0.063	**1.52** 0.060	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.005** 0.012	
	TRC-1018	**15.88** 0.625	**28.58** 1.125	**2.41** 0.095	**2.34** 0.092	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.008** 0.018	
	TRD-1018	**15.88** 0.625	**28.58** 1.125	**3.20** 0.126	**3.12** 0.123	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.011** 0.024	
	TRE-1018	**15.88** 0.625	**28.58** 1.125	**3.99** 0.157	**3.91** 0.154	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.013** 0.029	

Continued on next page.

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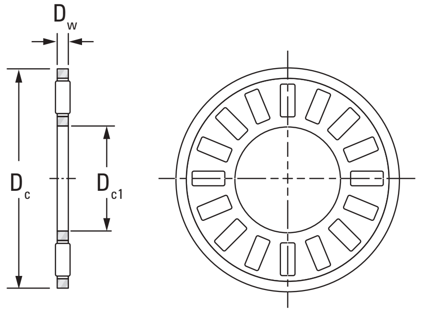
[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-51 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.

[2] If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-50 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.



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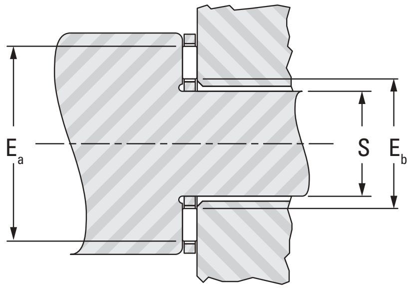

Raceway hardness to be 58 HRC or equivalent

Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating[1]
							Dynamic	Static		
	D_{c1}	D_c	D_w	E_b	E_a		C	C_o		
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}
3/4	**19.05** 0.750	**31.75** 1.250	**1.9837** 0.0781	**21.34** 0.840	**28.956** 1.140	NTA-1220	**10.90** 2450	**36.48** 8200	3.40	14000
7/8	**22.23** 0.875	**36.50** 1.437	**1.984** 0.0781	**24.38** 0.960	**33.782** 1.330	NTA-1423	**13.43** 3020	**49.82** 11200	4.65	12000
7/8	**22.23** 0.875	**42.85** 1.687	**1.984** 0.0781	**25.91** 1.020	**39.878** 1.570	NTC-1427	**18.46** 4150	**78.29** 17600	8.05	9800
1	**25.40** 1.000	**39.675** 1.562	**1.984** 0.0781	**27.69** 1.090	**36.83** 1.450	NTA-1625	**13.83** 3110	**53.82** 12100	5.00	11000
1 1/8	**28.58** 1.125	**44.45** 1.75	**1.9837** 0.0781	**30.73** 1.210	**41.656** 1.640	NTA-1828	**16.68** 3750	**71.17** 16000	7.30	9600

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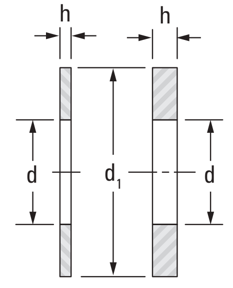
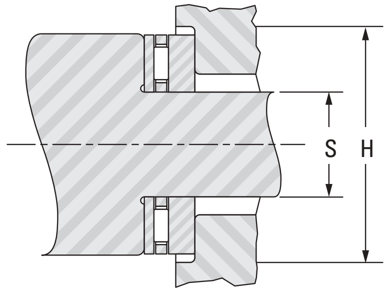
[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-51 for lubrication information.

Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.





Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H [2]		
kg lbs		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs	in
0.004 0.009	TRA-1220	**19.05** 0.750	**31.75** 1.250	**0.81** 0.032	**0.76** 0.030	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.003** 0.007	3/4
	TRB-1220	**19.05** 0.750	**31.75** 1.250	**1.60** 0.063	**1.52** 0.060	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.006** 0.013	
	TRC-1220	**19.05** 0.750	**31.75** 1.250	**2.41** 0.095	**2.34** 0.092	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.010** 0.021	
	TRD-1220	**19.05** 0.750	**31.75** 1.250	**3.20** 0.126	**3.12** 0.123	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.012** 0.026	
	TRE-1220	**19.05** 0.750	**31.75** 1.250	**3.99** 0.157	**3.91** 0.154	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.015** 0.033	
0.005 0.011	TRA-1423	**22.23** 0.875	**36.50** 1.437	**0.81** 0.032	**0.76** 0.030	**22.23** 0.875	**22.15** 0.872	**37.31** 1.469	**0.004** 0.009	7/8
	TRB-1423	**22.23** 0.875	**36.50** 1.437	**1.60** 0.063	**1.52** 0.060	**22.23** 0.875	**22.15** 0.872	**37.31** 1.469	**0.008** 0.017	
	TRC-1423	**22.23** 0.875	**36.50** 1.437	**2.41** 0.095	**2.34** 0.092	**22.23** 0.875	**22.15** 0.872	**37.31** 1.469	**0.012** 0.026	
	TRD-1423	**22.23** 0.875	**36.50** 1.437	**3.20** 0.126	**3.12** 0.123	**22.23** 0.875	**22.15** 0.872	**37.31** 1.469	**0.015** 0.034	
0.008 0.017	TRB-1427	**22.23** 0.875	**42.86** 1.688	**1.60** 0.063	**1.52** 0.060	**22.23** 0.875	**22.15** 0.872	**43.66** 1.719	**0.013** 0.029	
	TRC-1427	**22.23** 0.875	**42.86** 1.688	**2.41** 0.095	**2.34** 0.092	**22.23** 0.875	**22.15** 0.872	**43.66** 1.719	**0.020** 0.044	
	TRD-1427	**22.23** 0.875	**42.86** 1.688	**3.20** 0.126	**3.12** 0.123	**22.23** 0.875	**22.15** 0.872	**43.66** 1.719	**0.026** 0.057	
0.006 0.013	TRA-1625	**25.40** 1.000	**39.67** 1.562	**0.81** 0.032	**0.76** 0.030	**25.40** 1.000	**25.32** 0.997	**40.49** 1.594	**0.005** 0.010	1
	TRB-1625	**25.40** 1.000	**39.67** 1.562	**1.60** 0.063	**1.52** 0.060	**25.40** 1.000	**25.32** 0.997	**40.49** 1.594	**0.009** 0.019	
	TRD-1625	**25.40** 1.000	**39.67** 1.562	**3.20** 0.126	**3.12** 0.123	**25.40** 1.000	**25.32** 0.997	**40.49** 1.594	**0.017** 0.038	
	TRE-1625	**25.40** 1.000	**39.67** 1.562	**3.99** 0.157	**3.91** 0.154	**25.40** 1.000	**25.32** 0.997	**40.49** 1.594	**0.021** 0.047	
0.009 0.019	TRA-1828	**28.58** 1.125	**44.45** 1.750	**0.81** 0.032	**0.76** 0.030	**28.58** 1.125	**28.50** 1.122	**45.24** 1.781	**0.006** 0.013	1 1/8
	TRB-1828	**28.58** 1.125	**44.45** 1.750	**1.60** 0.063	**1.52** 0.060	**28.58** 1.125	**28.50** 1.122	**45.24** 1.781	**0.011** 0.024	
	TRC-1828	**28.58** 1.125	**44.45** 1.750	**2.41** 0.095	**2.34** 0.092	**28.58** 1.125	**28.50** 1.122	**45.24** 1.781	**0.017** 0.037	

Continued on next page.

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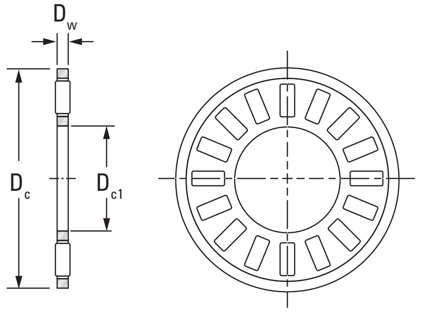
[2] If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-50 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.



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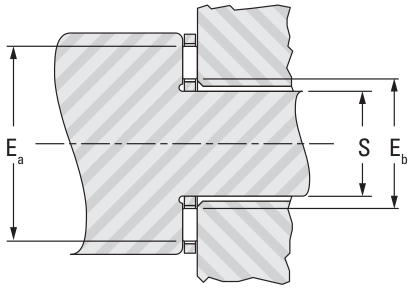

Raceway hardness to be 58 HRC or equivalent

Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating(1)
	D_{c1}	D_c	D_w	E_b	E_a		Dynamic C	Static C_o		
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}
1 1/4	**31.75** 1.250	**49.20** 1.937	**1.9837** 0.0781	**34.04** 1.340	**46.228** 1.820	NTA-2031	**20.15** 4530	**93.41** 21000	9.55	8600
1 3/8	**34.93** 1.375	**52.375** 2.062	**1.9837** 0.0781	**37.08** 1.460	**49.53** 1.950	NTA-2233	**21.35** 4800	**103.20** 23200	10.5	8000
1 1/2	**38.10** 1.500	**55.55** 2.187	**1.9837** 0.0781	**40.39** 1.590	**52.578** 2.070	NTA-2435	**23.22** 5220	**117.88** 26500	12.0	7600
1 3/4	**44.45** 1.750	**63.50** 2.500	**1.984** 0.0781	**46.74** 1.840	**58.928** 2.320	NTA-2840	**25.31** 5690	**137.45** 30900	14.0	6800

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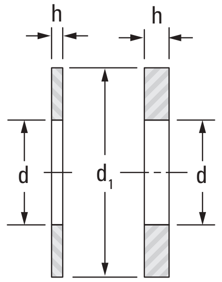
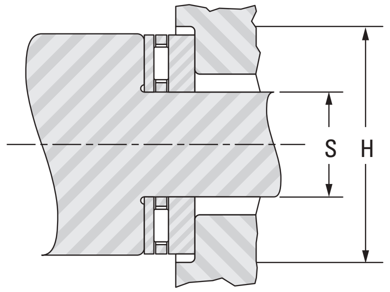
[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-51 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.





Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H (2)		
kg lbs		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs	in
	TRD-1828	**28.58** 1.125	**44.45** 1.750	**3.20** 0.126	**3.12** 0.123	**28.58** 1.125	**28.50** 1.122	**45.24** 1.781	**0.022** 0.048	
0.010 0.021	TRA-2031	**31.75** 1.250	**49.20** 1.937	**0.81** 0.032	**0.76** 0.030	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.007** 0.015	1 1/4
	TRB-2031	**31.75** 1.250	**49.20** 1.937	**1.60** 0.063	**1.52** 0.060	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.014** 0.030	
	TRC-2031	**31.75** 1.250	**49.20** 1.937	**2.41** 0.095	**2.34** 0.092	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.020** 0.044	
	TRD-2031	**31.75** 1.250	**49.20** 1.937	**3.20** 0.126	**3.12** 0.123	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.026** 0.058	
	TRF-2031	**31.75** 1.250	**49.20** 1.937	**4.78** 0.188	**4.70** 0.185	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.041** 0.090	
0.010 0.023	TRA-2233	**34.93** 1.375	**52.37** 2.062	**0.81** 0.032	**0.76** 0.030	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.007** 0.016	1 3/8
	TRB-2233	**34.93** 1.375	**52.37** 2.062	**1.60** 0.063	**1.52** 0.060	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.015** 0.033	
	TRC-2233	**34.93** 1.375	**52.37** 2.062	**2.41** 0.095	**2.34** 0.092	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.018** 0.040	
	TRD-2233	**34.93** 1.375	**52.37** 2.062	**3.20** 0.126	**3.12** 0.123	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.029** 0.065	
	TRE-2233	**34.93** 1.375	**52.37** 2.062	**3.99** 0.157	**3.91** 0.154	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.037** 0.081	
	TRF-2233	**34.93** 1.375	**52.37** 2.062	**4.78** 0.188	**4.70** 0.185	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.044** 0.097	
0.011 0.025	TRA-2435	**38.10** 1.500	**55.55** 2.187	**0.81** 0.032	**0.76** 0.030	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.008** 0.017	1 1/2
	TRB-2435	**38.10** 1.500	**55.55** 2.187	**1.60** 0.063	**1.52** 0.060	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.015** 0.034	
	TRC-2435	**38.10** 1.500	**55.55** 2.187	**2.41** 0.095	**2.34** 0.092	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.023** 0.050	
	TRD-2435	**38.10** 1.500	**55.55** 2.187	**3.20** 0.126	**3.12** 0.123	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.030** 0.067	
	TRF-2435	**38.10** 1.500	**55.55** 2.187	**4.78** 0.188	**4.70** 0.185	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.045** 0.100	
0.014 0.031	TRA-2840	**44.45** 1.750	**63.50** 2.500	**0.81** 0.032	**0.76** 0.030	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.010** 0.021	1 3/4
	TRB-2840	**44.45** 1.750	**63.50** 2.500	**1.60** 0.063	**1.52** 0.060	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.020** 0.044	

Continued on next page.

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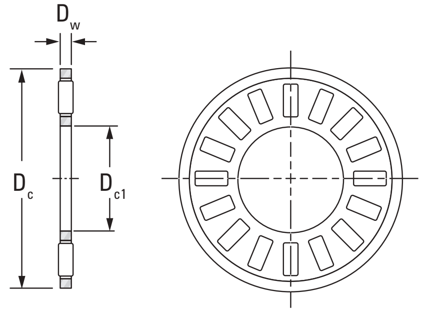
[2] If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-50 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.



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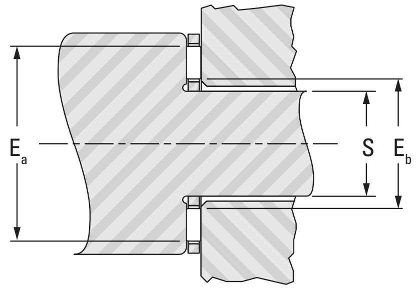

Raceway hardness to be 58 HRC or equivalent

Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating[1]
							Dynamic	Static		
	D_{c1}	D_c	D_w	E_b	E_a		C	C_0		
in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}
2	**50.80** 2.000	**69.85** 2.750	**1.9837** 0.0781	**53.09** 2.090	**65.278** 2.570	NTA-3244	**24.02** 5400	**132.56** 29800	13.5	6100
2 1/8	**53.98** 2.125	**73.025** 2.875	**1.984** 0.0781	**56.39** 2.220	**68.58** 2.700	NTA-3446	**24.42** 5490	**137.45** 30900	14.0	5800
2 1/4	**57.15** 2.250	**76.20** 3.000	**1.984** 0.0781	**59.44** 2.340	**71.628** 2.820	NTA-3648	**24.78** 5570	**142.34** 32000	14.6	5600
2 1/4	**57.15** 2.250	**79.375** 3.125	**3.175** 0.1250	**59.94** 2.360	**75.184** 2.960	NTA-3650	**37.68** 8470	**177.04** 39800	18.6	5300
2 1/2	**63.50** 2.500	**82.55** 3.250	**1.9837** 0.0781	**65.79** 2.590	**77.978** 3.070	NTA-4052	**25.53** 5740	**152.13** 34200	15.6	5100

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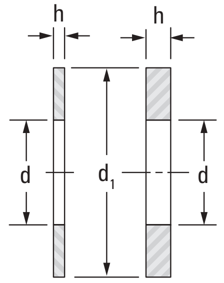
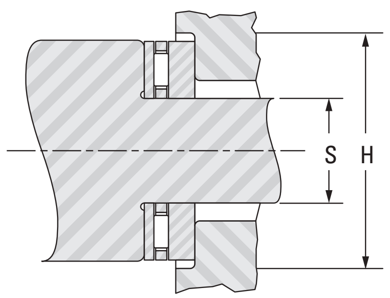
[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-51 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.





Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H [2]		
kg lbs		mm in	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs	in
	TRC-2840	**44.45** 1.750	**63.50** 2.500	**2.41** 0.095	**2.34** 0.092	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.029** 0.063	
	TRD-2840	**44.45** 1.750	**63.50** 2.500	**3.20** 0.126	**3.12** 0.123	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.038** 0.084	
	TRF-2840	**44.45** 1.750	**63.50** 2.500	**4.78** 0.188	**4.70** 0.185	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.057** 0.126	
0.015 0.033	TRA-3244	**50.80** 2.000	**69.85** 2.750	**0.81** 0.032	**0.76** 0.030	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.011** 0.024	2
	TRB-3244	**50.80** 2.000	**69.85** 2.750	**1.60** 0.063	**1.52** 0.060	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.022** 0.048	
	TRC-3244	**50.80** 2.000	**69.85** 2.750	**2.41** 0.095	**2.34** 0.092	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.033** 0.072	
	TRD-3244	**50.80** 2.000	**69.85** 2.750	**3.20** 0.126	**3.12** 0.123	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.044** 0.096	
	TRF-3244	**50.80** 2.000	**69.85** 2.750	**4.78** 0.188	**4.70** 0.185	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.066** 0.145	
0.016 0.036	TRA-3446	**53.98** 2.125	**73.03** 2.875	**0.81** 0.032	**0.76** 0.030	**53.98** 2.125	**53.90** 2.122	**73.81** 2.906	**0.012** 0.026	2 1/8
	TRB-3446	**53.98** 2.125	**73.03** 2.875	**1.60** 0.063	**1.52** 0.060	**53.98** 2.125	**53.90** 2.122	**73.81** 2.906	**0.024** 0.052	
	TRC-3446	**53.98** 2.125	**73.03** 2.875	**2.41** 0.095	**2.34** 0.092	**53.98** 2.125	**53.90** 2.122	**73.81** 2.906	**0.035** 0.078	
	TRD-3446	**53.98** 2.125	**73.03** 2.875	**3.20** 0.126	**3.12** 0.123	**53.98** 2.125	**53.90** 2.122	**73.81** 2.906	**0.047** 0.103	
0.017 0.038	TRA-3648	**57.15** 2.250	**76.20** 3.000	**0.81** 0.032	**0.76** 0.030	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.012** 0.026	2 1/4
	TRB-3648	**57.15** 2.250	**76.20** 3.000	**1.60** 0.063	**1.52** 0.060	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.022** 0.048	
	TRC-3648	**57.15** 2.250	**76.20** 3.000	**2.41** 0.095	**2.34** 0.092	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.037** 0.081	
	TRD-3648	**57.15** 2.250	**76.20** 3.000	**3.20** 0.126	**3.12** 0.123	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.048** 0.105	
	TRF-3648	**57.15** 2.250	**76.20** 3.000	**4.78** 0.188	**4.70** 0.185	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.071** 0.157	
0.029 0.064	TRC-3650	**57.15** 2.250	**79.38** 3.125	**2.41** 0.095	**2.34** 0.092	**57.15** 2.250	**57.07** 2.247	**80.16** 3.156	**0.043** 0.095	2 1/4
0.019 0.041	TRA-4052	**63.50** 2.500	**82.55** 3.250	**0.81** 0.032	**0.76** 0.030	**63.50** 2.500	**63.42** 2.497	**83.34** 3.281	**0.013** 0.029	2 1/2
	TRB-4052	**63.50** 2.500	**82.55** 3.250	**1.60** 0.063	**1.52** 0.060	**63.50** 2.500	**63.42** 2.497	**83.34** 3.281	**0.027** 0.059	

Continued on next page.

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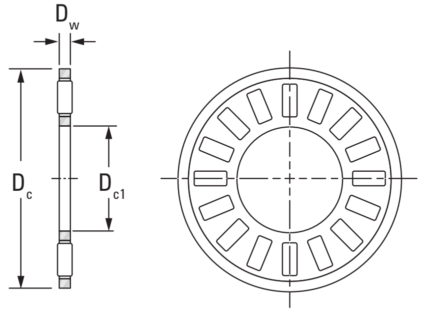
[2] If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

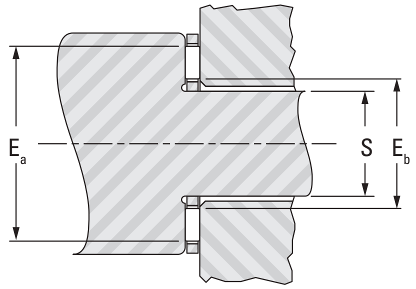
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-50 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.



NTA



Raceway hardness to be 58 HRC or equivalent

Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating[1]
	D_{c1}	D_c	D_w	E_b	E_a		Dynamic C	Static C_o		
in	mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	min^{-1}
2 $^{3}/_{4}$	**69.85** 2.750	**92.075** 3.625	**3.175** 0.1250	**72.64** 2.860	**87.884** 3.460	NTA-4458	**47.60** 10700	**255.8** 57500	26.8	4600
3	**76.20** 3.000	**95.25** 3.750	**1.9837** 0.0781	**78.49** 3.090	**90.678** 3.570	NTA-4860	**26.96** 6060	**172.1** 38700	17.6	4400
3 $^{1}/_{4}$	**82.55** 3.250	**104.78** 4.125	**3.175** 0.1250	**85.34** 3.360	**100.58** 3.960	NTA-5266	**51.60** 11600	**294.9** 66300	30.9	4000
3 $^{3}/_{4}$	**95.25** 3.750	**117.48** 4.625	**3.175** 0.1250	**98.04** 3.860	**113.28** 4.460	NTA-6074	**56.05** 12600	**344.3** 77400	35.5	3500
4 $^{1}/_{8}$	**104.78** 4.125	**128.57** 5.062	**3.175** 0.125	**107.44** 4.230	**124.46** 4.900	NTA-6681	**63.61** 14300	**414.6** 93200	41.3	3200

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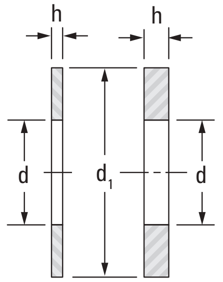
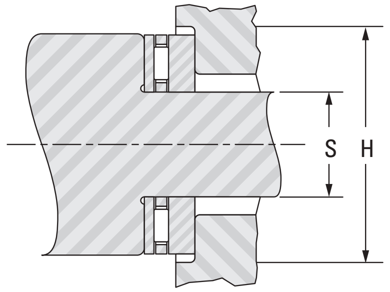
[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-51 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.





Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H[2]		
kg lbs		mm in	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs	in
	TRC-4052	**63.50** 2.500	**82.55** 3.250	**2.41** 0.095	**2.34** 0.092	**63.50** 2.500	**63.42** 2.497	**83.34** 3.281	**0.041** 0.09	
	TRD-4052	**63.50** 2.500	**82.55** 3.250	**3.20** 0.126	**3.12** 0.123	**63.50** 2.500	**63.42** 2.497	**83.34** 3.281	**0.054** 0.119	
0.037 0.082	TRA-4458	**69.85** 2.750	**92.08** 3.625	**0.81** 0.032	**0.76** 0.030	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.018** 0.039	2 $^{3}/_{4}$
	TRB-4458	**69.85** 2.750	**92.08** 3.625	**1.60** 0.063	**1.52** 0.060	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.035** 0.077	
	TRC-4458	**69.85** 2.750	**92.08** 3.625	**2.41** 0.095	**2.34** 0.092	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.051** 0.113	
	TRD-4458	**69.85** 2.750	**92.08** 3.625	**3.20** 0.126	**3.12** 0.123	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.069** 0.152	
	TRF-4458	**69.85** 2.750	**92.08** 3.625	**4.78** 0.188	**4.70** 0.185	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.104** 0.229	
0.022 0.048	TRA-4860	**76.20** 3.000	**95.25** 3.750	**0.81** 0.032	**0.76** 0.030	**76.20** 3.000	**76.12** 2.997	**96.04** 3.781	**0.015** 0.034	3
	TRB-4860	**76.20** 3.000	**95.25** 3.750	**1.60** 0.063	**1.52** 0.060	**76.20** 3.000	**76.12** 2.997	**96.04** 3.781	**0.032** 0.07	
	TRD-4860	**76.20** 3.000	**95.25** 3.750	**3.20** 0.126	**3.12** 0.123	**76.20** 3.000	**76.12** 2.997	**96.04** 3.781	**0.061** 0.135	
0.042 0.092	TRA-5266	**82.55** 3.250	**104.78** 4.125	**0.81** 0.032	**0.76** 0.030	**82.55** 3.250	**82.47** 3.247	**105.56** 4.156	**0.020** 0.044	3 $^{1}/_{4}$
	TRD-5266	**82.55** 3.250	**104.78** 4.125	**3.20** 0.126	**3.12** 0.123	**82.55** 3.250	**82.47** 3.247	**105.56** 4.156	**0.080** 0.176	
0.050 0.11	TRA-6074	**95.25** 3.750	**117.48** 4.625	**0.81** 0.032	**0.76** 0.030	**95.25** 3.750	**95.17** 3.747	**118.26** 4.656	**0.023** 0.05	3 $^{3}/_{4}$
	TRB-6074	**95.25** 3.750	**117.48** 4.625	**1.60** 0.063	**1.52** 0.060	**95.25** 3.750	**95.17** 3.747	**118.26** 4.656	**0.046** 0.101	
	TRC-6074	**95.25** 3.750	**117.48** 4.625	**2.41** 0.095	**2.34** 0.092	**95.25** 3.750	**95.17** 3.747	**118.26** 4.656	**0.069** 0.152	
	TRD-6074	**95.25** 3.750	**117.48** 4.625	**3.20** 0.126	**3.12** 0.123	**95.25** 3.750	**95.17** 3.747	**118.26** 4.656	**0.092** 0.202	
0.062 0.136	TRA-6681	**104.78** 4.125	**128.57** 5.062	**0.81** 0.032	**0.76** 0.030	**104.78** 4.125	**104.70** 4.122	**129.39** 5.094	**0.027** 0.059	4 $^{1}/_{8}$
	TRC-6681	**104.78** 4.125	**128.57** 5.062	**2.41** 0.095	**2.34** 0.092	**104.78** 4.125	**104.70** 4.122	**129.39** 5.094	**0.081** 0.178	
	TRD-6681	**104.78** 4.125	**128.57** 5.062	**3.20** 0.126	**3.12** 0.123	**104.78** 4.125	**104.70** 4.122	**129.39** 5.094	**0.109** 0.24	
	TRF-6681	**104.78** 4.125	**128.57** 5.062	**4.78** 0.188	**4.70** 0.185	**104.78** 4.125	**104.70** 4.122	**129.39** 5.094	**0.161** 0.354	

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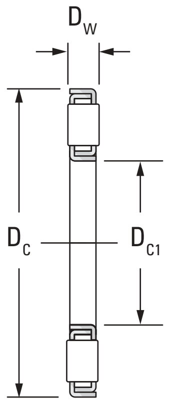
[2] If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

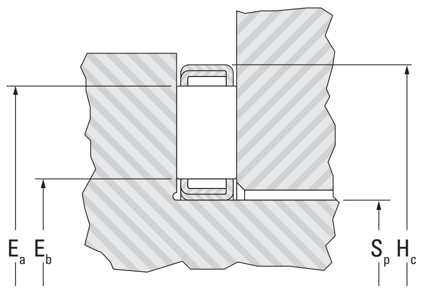
THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES

INCH SERIES

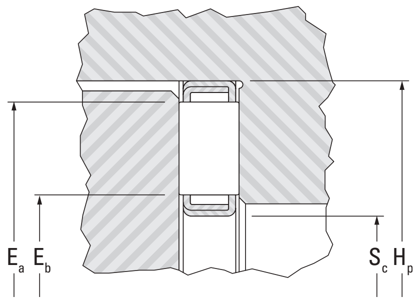
- Backup surfaces should be flat and square with the centerline of the shaft.
- See pages B-6-50 for details on piloting and backup surfaces.



NTH



Shaft Piloted



Housing Piloted

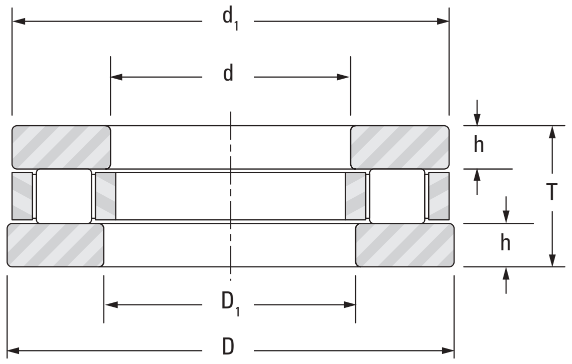
Shaft Dia.	D_{c1}	D_c	D_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating[1]
					Dynamic	Static		
					C	C_o		
in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}
1 1/2	**38.15** 1.502	**75.44** 2.970	**6.35** 0.250	NTH-2448	**81.8** 18400	**280** 62900	29.5	5700
2	**50.85** 2.002	**91.31** 3.595	**9.53** 0.375	NTH-3258	**129** 29000	**407** 91600	45.7	4700
2 1/8	**54.03** 2.127	**94.49** 3.720	**9.53** 0.375	NTH-3460	**133** 30000	**433** 97400	48.6	4500
2 1/4	**57.20** 2.252	**97.66** 3.845	**9.53** 0.375	NTH-3662	**138** 31100	**458** 103000	51.4	4400
2 3/8	**60.38** 2.377	**100.84** 3.970	**9.53** 0.375	NTH-3864	**143** 32100	**484.9** 109000	54.3	4200
2 1/2	**63.55** 2.502	**104.01** 4.095	**9.53** 0.375	NTH-4066	**147** 33000	**511** 115000	57.1	4100
2 5/8	**66.73** 2.627	**109.60** 4.315	**9.53** 0.375	NTH-4270	**156** 35100	**556** 125000	63.1	3900
2 3/4	**69.98** 2.755	**112.78** 4.440	**9.53** 0.375	NTH-4472	**161** 36100	**587** 132000	66.3	3800
3	**76.33** 3.005	**119.13** 4.690	**9.53** 0.375	NTH-4876	**169** 38000	**641** 144000	72.6	3600
3 1/4	**82.68** 3.255	**125.48** 4.940	**9.53** 0.375	NTH-5280	**178** 39900	**698** 157000	78.0	3400
3 1/2	**89.03** 3.505	**132.26** 5.207	**9.53** 0.375	NTH-5684	**180** 40500	**725** 163000	81.1	3200

Assembly Wt.	Piloting Dimensions						Shaft Dia.
	Shaft Piloting		Housing Piloting		Raceway Contact		
	S_p	H_c	S_c	H_p	E_b	E_a	
	+0, +0.000			**+0.13,** +0.005			
	-0.13, -0.005	Min.	Max.	**-0,** -0.000			
kg lbs	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in
0.10 0.23	**38.10** 1.500	**76.96** 3.030	**36.63** 1.442	**75.57** 2.975	**44.70** 1.760	**68.83** 2.710	1 1/2
0.21 0.47	**50.80** 2.000	**92.84** 3.655	**49.33** 1.942	**91.44** 3.600	**57.40** 2.260	**84.33** 3.320	2
0.22 0.49	**53.98** 2.125	**96.01** 3.780	**52.5** 2.067	**94.62** 3.725	**60.71** 2.390	**87.38** 3.440	2 1/8
0.24 0.52	**57.15** 2.250	**99.19** 3.905	**55.68** 2.192	**97.79** 3.850	**63.75** 2.510	**90.68** 3.570	2 1/4
0.24 0.54	**60.33** 2.375	**102.36** 4.030	**58.85** 2.317	**100.97** 3.975	**67.06** 2.640	**93.73** 3.690	2 3/8
0.26 0.57	**63.50** 2.500	**105.54** 4.155	**62.03** 2.442	**104.14** 4.100	**70.10** 2.760	**97.03** 3.820	2 1/2
0.28 0.62	**66.68** 2.625	**111.13** 4.375	**65.2** 2.567	**109.73** 4.320	**73.41** 2.890	**102.36** 4.030	2 5/8
0.29 0.64	**69.85** 2.750	**114.30** 4.500	**68.45** 2.695	**112.90** 4.445	**76.45** 3.010	**105.66** 4.160	2 3/4
0.31 0.69	**76.20** 3.000	**120.65** 4.750	**74.8** 2.945	**119.25** 4.695	**82.80** 3.260	**112.01** 4.410	3
0.34 0.75	**82.55** 3.250	**127.00** 5.000	**81.15** 3.195	**125.60** 4.945	**89.15** 3.510	**118.36** 4.660	3 1/4
0.37 0.81	**88.90** 3.500	**133.78** 5.267	**87.5** 3.445	**132.38** 5.212	**95.76** 3.770	**125.73** 4.950	3 1/2

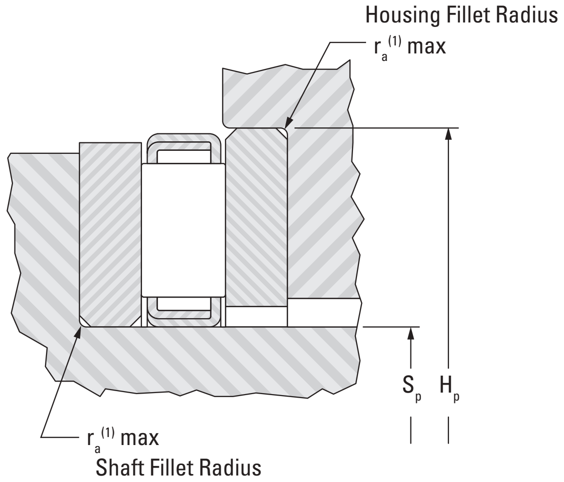
[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-51 for lubrication information.

CYLINDRICAL ROLLER THRUST BEARINGS

- The NTHA thrust cylindrical roller bearing consists of an NTH roller and cage assembly, one bore piloted washer and one O.D. piloted washer. The NTHA bearing is identified and sold as a unit and is manufactured to inch-nominal dimensions only.
- Load ratings given are identical to the corresponding NTH thrust cylindrical roller and cage assembly.
- It is suggested that the roller and cage assembly be bore piloted when applying NTHA bearings. When different arrangements of piloting are required, please contact your representative.
- Backup surfaces should be flat and square with the center line of the shaft.
- To order individual thrust washers, see washer designation below.



NTHA



Shaft Dia.	Shaft-Piloted Washer			Housing-Piloted Washer			T +0.000 −0.006	Bearing Designation	Bearing Wt.
	d		d_1	D		D_1			
	Max.	Min.	Nom.	Max.	Min.	Nom.			
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		kg lbs
1 1/2	**38.100** 1.5000	**38.082** 1.4993	**74.613** 2 15/16	**76.218** 3.0007	**76.200** 3.0000	**39.688** 1 9/16	**20.62** 0.812	NTHA-2448	**0.47** 1.03
2	**50.800** 2.0000	**50.775** 1.9990	**90.488** 3 9/16	**92.098** 3.6259	**92.075** 3.6250	**52.388** 2 1/16	**25.40** 1.000	NTHA-3258	**0.76** 1.68
2 1/8	**53.975** 2.1250	**53.950** 2.1240	**93.663** 3 11/16	**95.278** 3.7511	**95.250** 3.7500	**55.563** 2 3/16	**25.40** 1.000	NTHA-3460	**0.80** 1.76
2 1/4	**57.150** 2.2500	**57.122** 2.2489	**96.838** 3 13/16	**98.453** 3.8761	**98.425** 3.8750	**58.738** 2 5/16	**25.40** 1.000	NTHA-3662	**0.83** 1.84
2 3/8	**60.325** 2.3750	**60.297** 2.3739	**100.013** 3 15/16	**101.628** 4.0011	**101.600** 4.0000	**61.913** 2 7/16	**25.40** 1.000	NTHA-3864	**0.87** 1.91
2 1/2	**63.500** 2.5000	**63.472** 2.4989	**103.188** 4 1/16	**104.808** 4.1263	**104.775** 4.1250	**65.088** 2 9/16	**25.40** 1.000	NTHA-4066	**0.90** 1.99
2 5/8	**66.675** 2.6250	**66.645** 2.6238	**108.744** 4 9/32	**110.345** 4.3443	**110.312** 4.3430	**68.263** 2 11/16	**25.40** 1.000	NTHA-4270	**1.01** 2.22
2 3/4	**69.850** 2.7500	**69.820** 2.7488	**111.919** 4 13/32	**113.520** 4.4693	**113.487** 4.4680	**71.438** 2 13/16	**25.40** 1.000	NTHA-4472	**1.04** 2.29
3	**76.200** 3.0000	**76.170** 2.9988	**118.269** 4 21/32	**119.875** 4.7195	**119.837** 4.7180	**77.788** 3 1/16	**25.40** 1.000	NTHA-4876	**1.12** 2.46
3 1/4	**82.550** 3.2500	**82.517** 3.2487	**124.619** 4 29/32	**126.225** 4.9695	**126.187** 4.9680	**84.138** 3 5/16	**25.40** 1.000	NTHA-5280	**1.19** 2.62
3 1/2	**88.900** 3.5000	**88.867** 3.4987	**130.969** 5 5/32	**132.575** 5.2195	**132.537** 5.2180	**90.488** 3 9/16	**25.40** 1.000	NTHA-5684	**1.27** 2.80

Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil	Piloting Dimensions				Bore Piloted Washer	Washer Wt.	O.D. Piloted Washer	Washer Wt.	Shaft Dia.
Dynamic	Static			S_p	H_p	$r_{s\,min.}$	h					
C	C_o			**+0,** +0.000 **-0.13,** -0.005	**+0.13,** +0.005 **-0,** -0.000		**+0,** +0.000 **-0.076,** -0.0030					
kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in		kg lbs		kg lbs	in
81.8 18400	**280** 62900	29.5	5700	**38.082** 1.4993	**76.218** 3.0007	**0.81** 0.032	**7.137** 0.2810	TRI-2448	**0.18** 0.39	TRID-2448	**0.18** 0.39	1 1/2
129 29000	**408** 91600	45.7	4700	**50.775** 1.9990	**92.098** 3.6259	**1.57** 0.062	**7.938** 0.3125	TRJ-3258	**0.26** 0.57	TRJD-3258	**0.27** 0.59	2
133 30000	**433** 97400	48.6	4500	**53.950** 2.1240	**95.278** 3.7511	**1.57** 0.062	**7.938** 0.3125	TRJ-3460	**0.27** 0.60	TRJD-3460	**0.28** 0.61	2 1/8
138 31100	**458** 103000	51.4	4400	**57.122** 2.2489	**98.453** 3.8761	**1.57** 0.062	**7.938** 0.3125	TRJ-3662	**0.28** 0.62	TRJD-3662	**0.29** 0.64	2 1/4
143 32100	**485** 109000	54.3	4200	**60.297** 2.3739	**101.628** 4.0011	**1.57** 0.062	**7.938** 0.3125	TRJ-3864	**0.29** 0.65	TRJD-3864	**0.30** 0.66	2 3/8
147 33000	**512** 115000	57.1	4100	**63.472** 2.4989	**104.808** 4.1263	**1.57** 0.062	**7.938** 0.3125	TRJ-4066	**0.30** 0.67	TRJD-4066	**0.31** 0.69	2 1/2
156 35100	**556** 125000	63.1	3900	**66.645** 2.6238	**110.345** 4.3443	**1.57** 0.062	**7.938** 0.3125	TRJ-4270	**0.34** 0.75	TRJD-4270	**0.35** 0.77	2 5/8
161 36100	**587** 132000	66.3	3800	**69.820** 2.7488	**113.520** 4.4693	**1.57** 0.062	**7.938** 0.3125	TRJ-4472	**0.35** 0.78	TRJD-4472	**0.36** 0.80	2 3/4
169 38000	**641** 144000	72.6	3600	**76.170** 2.9988	**119.875** 4.7195	**1.57** 0.062	**7.938** 0.3125	TRJ-4876	**0.38** 0.83	TRJD-4876	**0.39** 0.85	3
177 39900	**698** 157000	78.0	3400	**82.517** 3.2487	**126.225** 4.9695	**1.57** 0.062	**7.938** 0.3125	TRJ-5280	**0.40** 0.89	TRJD-5280	**0.41** 0.91	3 1/4
180 40500	**725** 163000	81.1	3200	**88.867** 3.4987	**132.575** 5.2195	**1.57** 0.062	**7.938** 0.3125	TRJ-5684	**0.43** 0.94	TRJD-5284	**0.43** 0.96	3 1/2

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(1) $r_{a\,max}$ is equal to minimum washer chamfer $r_{s\,min}$.

NOTES

COMBINED NEEDLE ROLLER BEARINGS

Overview: Combined bearings incorporate a radial needle roller bearing and a thrust ball or roller bearing into a convenient unitized package.

- **Catalogue range:** 5.000 mm – 70.000 mm (0.1966 in – 2.7559 in) bore.
- **Markets:** Industrial applications, machine tools, and automotive transmissions.
- **Features:** Available with ball, needle roller or cylindrical roller thrust component, machined and drawn outer rings are available, some sizes available with integral dust caps.
- **Benefits:** An effective alternative to separate radial and thrust bearings.

Combined Needle Roller Bearings – Metric Nominal Dimensions

Prefix

RAX	radial needle roller and thrust needle (or cylindrical) roller bearing without inner ring or thrust washer
RAXF	closed-end drawn cup design radial needle roller and needle thrust roller bearing without inner ring or thrust washer
RAXZ	unitized machined outer ring thrust cylindrical roller and radial needle roller bearing
NAXR	machined outer ring thrust cylindrical roller and radial needle roller bearing without inner ring
NAXK	machined outer ring thrust ball and radial needle roller bearing without inner ring

RAXF 7 15 TC

NAXR 20 Z.TN

Suffix

TN	molded polymer retainer
Z	thrust washer retaining dust cap
TB	radial play under rollers set to lower half of F6 tolerance
TC	radial play under rollers set to upper half of F6 tolerance

Bore Diameter
20 = 20 mm

Series (RAX)

700	drawn cup design radial needle roller and needle thrust roller bearing without inner ring or thrust washer
400	machined ring radial needle roller and thrust needle roller bearing without inner ring or thrust washer
500	machined ring radial needle roller and thrust cylindrical roller bearing

Inner Rings for Combined Needle Roller Bearings – Metric Nominal Dimensions

Prefix

JR	inner ring for use with NAXR series bearings
IM	inner ring for use RAX series bearings

JR 25 x 30 x 18

IM 10 14 16 P

Bore Diameter
25 = 25 mm

Width
18 = 18 mm

Outer Diameter
14 = 14 mm

Suffix (IM Series)
P ISO 492 toleranced inner ring

Thrust Washers for Combined Needle Roller Bearings - Metric Nominal Dimensions

Prefix

CP	thrust washer for metric needle roller bearings

CP 15 28 – thin washer designation

CP 2 15 28 – thick washer designation

Thickness
2 = 2 mm

Outer Diameter
28 = 28 mm

Bore Diameter
15 = 15 mm

Combined Needle Roller Bearings

COMBINED BEARINGS

METRIC SERIES

Combined bearings consist of a radial bearing (needle roller bearing) and a thrust bearing (ball, roller or needle bearing). The thrust roller bearing is usually a cylindrical roller thrust bearing.

Combined bearings make an effective alternative in place of two separate bearings – in terms of cost, handling and packaging. Combined bearings can be used with or without matching inner rings and thrust washers – though these are listed opposite the bearing part numbers, where possible, on the following pages of tables for convenience.

REFERENCE STANDARDS ARE:

- **DIN 5429, Part 1** – needle roller – thrust cylindrical roller bearings, series NAXR, NAXR.Z.
- **DIN 5429, Part 1** – needle roller – thrust ball bearings, series NAXK, NAXK.Z.
- **ISO 1206** – needle roller bearings – light and medium series – dimensions and tolerances.

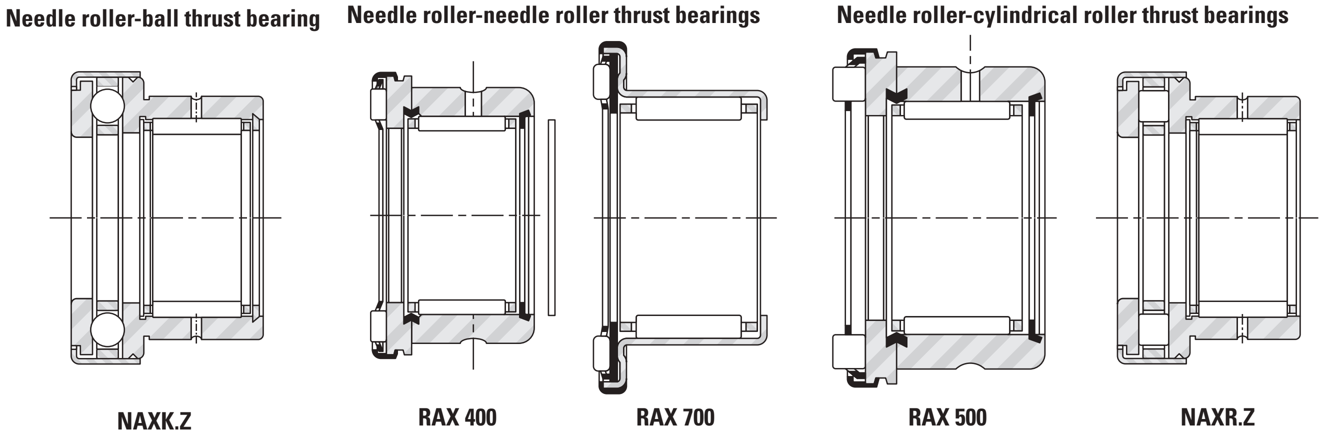


Fig. B7-1. Types of metric series combined bearings

Suffixes

TN	molded cage of reinforced engineered polymer
Z	retained with a dust cap
Z.TN	retained with a dust cap, molded cage of reinforced engineered polymer
TB	radial play under rollers set to lower half of F6 tolerance limits
TC	radial play under rollers set to upper half of F6 tolerance limits

CONSTRUCTION

Needle roller-cylindrical roller thrust bearings of series NAXR and RAXZ 500 are available with dust caps. They have the highest axial load-carrying capability of all combined bearings. The NAXR and NAXR.Z Series have the same dimensions as needle roller-ball thrust bearings (series NAXK and NAXK.Z).

Combined bearings of series RAX 700 use a thin, one-piece outer ring design, similar in construction to metric drawn cups. The RAX 700 Series is available with an open or closed (RAXF) design, as are standard drawn cups. These bearings use needle rollers for both their radial and thrust complements.

The RAX 400 Series uses needle rollers for both their radial and thrust complements, as with the RAX 700 Series, but are constructed from two separate machined rings, joined with a strong metal insert. The RAX 500 Series, fabricated like the 400 Series, uses heavier cylindrical rollers for their thrust complement.

Both series are available with matching thrust washers and inner rings. These series should be considered for applications requiring higher load capacity and running accuracy.

Each of the previous two bearing types may be best used without inner rings because the radial internal clearances are smaller if the needle roller and cage assemblies operate directly on a hardened and ground shaft. Tolerance class F6 is the normal specification for the needle roller complement bore diameters of the unmounted bearings.

RAX 400 and 500 Series (without inner rings) can be supplied with a smaller radial clearance, if desired. Refer to the suffix options TB and TC, as listed in the chart above.

Quality requirements for shafts, when used as a bearing raceway, are given in the engineering section of this catalog. When it becomes impractical to meet the shaft raceway design requirements, standard inner rings may be used with these bearings.

DIMENSIONAL ACCURACY

TOLERANCES

Metric series combined bearings (except Series RAX 700) are manufactured to the normal tolerances which apply to the metric series radial bearings and standard thrust bearings, as shown in the engineering section. The only exceptions are the diameter tolerances of the shaft-piloted washer and the bearing width tolerances. The shaft-piloted washer bore tolerance is E7 for the NAXK, NAXR, NAXK.Z and NAXR.Z Series bearings. The thickness tolerance of the combined bearings thrust component (C_1) can be found in Table B7-2 The matching thrust washer thickness tolerance may be found in the metric unitized thrust bearing section of this catalog.

Because of the nature of the RAX 700 Series design, these bearings must be inspected with suitable plug ("go" and "no go") and ring gage. The plug and ring gage sizes are listed in the inspection columns of the RAX700 Series product table.

BEARING MOUNTING

MOUNTING DIMENSIONS

Simple, through-bored housings are adequate for combined bearings. The mounting tolerances for the mechanical-ring combined bearings are provided in Table B7-1.

The shaft-piloted washers of combined bearings must be supported, at least over half of their width. Other quality requirements for shafts and housings are given in the engineering section. Requirements for fillets, recesses and shoulder heights are the same as for needle roller bearings, as shown in the Mounting Dimensions paragraph on pages B-4-9 and B-4-10.

When mounting these bearings in their housings with a tight fit, relatively high press-in forces will be required which may brinell the raceways of the thrust bearing arrangements. Particular care should be exercised when installing needle roller-cylindrical roller thrust bearings with dust caps – and where the roller assembly of the thrust bearings cannot be removed. In order to avoid brinelling of the thrust bearing raceways, the bearings should be installed with uniform, continuous pressure against the installation tool, avoiding sudden impact forces. At times it may even be desirable to heat the housing before bearing mounting.

Table B7-1. Mounting tolerances

Rotation conditions	ISO tolerance zone for housing	Nominal shaft diameters d		With inner ring	Without inner ring
		>	≤	ISO tolerances zone for shaft	
		mm in	**mm** in		
Load stationary relative to housing	K6 (M6)(1)	**10.000** 0.3937	**40.000** 1.5748	k6	h6
		40.000 1.5748	**70.000** 2.7559	m6	h6
Load rotates relative to housing	M6 (N6)(1)	All diameters		g6	f6
RAX 700 RAXF 700	H6 (H7)	All diameters		k5	h5 (h6)

(1) Tighter fit for more secure arrangement.

Table B7-2. Thrust component thickness (C_1) tolerances

Bearing series	Tolerances	
	Max.	Min.
	mm in	**mm** in
NAXK, NAXK.Z NAXR, NAXR.Z	**+0.000** +0.000	**-0.200** -0.0078
RAX 400, RAX 500	**+0.050** +0.0020	**-0.060** -0.0024
RAX 700, RAXF 700	**+0.100** +0.0039	**-0.100** -0.0039
RAXZ	**+0.100** +0.0039	**-0.110** -0.0043

LUBRICATION

When the applied axial loads are relatively high and the application allows the use of oil as the desired method of lubrication, bearing types NAXR and NAXK should be given consideration. Combined bearings with a dust cap may use oil lubrication, although their design makes them better suited for use with grease lubrication.

Combined bearings are typically shipped protected with a corrosion-preventive compound that is not a lubricant. The bearings may be used in oil- or grease-lubricated applications, without removal of the corrosion-preventive compound. However, it may be advisable to remove the corrosion-preventive compound before packing the bearings (with a suitable grease) to obtain optimum grease performance and to minimize the possibility of confusing grease bearings with bearings containing corrosion preventive.

LOAD RATINGS

Minimum axial load for combined bearings excluding RAX700:

The minimum axial load $F_{a\ min.} = C_{0a}/2200$ (kN)

Where:

C_{0a} = static load rating (kN)

DYNAMIC EQUIVALENT LOAD

Combined bearings can accommodate radial and axial loads.

Radial needle roller complement

$P = F_r$ (kN)

Cylindrical or needle roller thrust complement

$P_a = F_a$ (kN)

STATIC EQUIVALENT LOAD

For all combined bearings series:

Radial needle roller complement

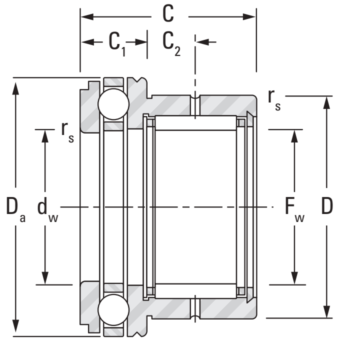
$P_0 = F_r$ (kN)

Cylindrical or needle roller thrust complement

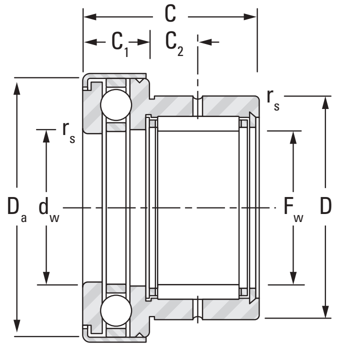
$P_{0a} = F_a$ (kN)

BALL THRUST SERIES

METRIC SERIES



NAXK



NAXK.Z

Shaft Diameter	F_w	D	C	d_w	D_a	C_1	C_2	$r_{s\ min.}$
				E7				
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
10 0.394	**10** 0.394	**19** 0.748	**23** 0.906	**10** 0.394	**24** 0.945	**9** 0.354	**6.5** 0.256	**0.3** 0.012
	10 0.394	**19** 0.748	**23** 0.906	**10** 0.394	**25** 0.984	**9** 0.354	**6.5** 0.256	**0.3** 0.012
12 0.472	**12** 0.472	**21** 0.827	**23** 0.906	**12** 0.472	**26** 1.024	**9** 0.354	**6.5** 0.256	**0.3** 0.012
	12 0.472	**21** 0.827	**23** 0.906	**12** 0.472	**27** 1.063	**9** 0.354	**6.5** 0.256	**0.3** 0.012
15 0.591	**15** 0.591	**24** 0.945	**23** 0.906	**15** 0.591	**28** 1.102	**9** 0.354	**6.5** 0.256	**0.3** 0.012
	15 0.591	**24** 0.945	**23** 0.906	**15** 0.591	**29** 1.142	**9** 0.354	**6.5** 0.256	**0.3** 0.012
17 0.669	**17** 0.669	**26** 1.024	**25** 0.984	**17** 0.669	**30** 1.181	**9** 0.354	**8** 0.315	**0.3** 0.012
	17 0.669	**26** 1.024	**25** 0.984	**17** 0.669	**31** 1.220	**9** 0.354	**8** 0.315	**0.3** 0.012
20 0.787	**20** 0.787	**30** 1.181	**30** 1.181	**20** 0.787	**35** 1.378	**10** 0.394	**10.5** 0.413	**0.3** 0.012
	20 0.787	**30** 1.181	**30** 1.181	**20** 0.787	**36** 1.417	**10** 0.394	**10.5** 0.413	**0.3** 0.012
25 0.984	**25** 0.984	**37** 1.457	**30** 1.181	**25** 0.984	**42** 1.654	**11** 0.433	**9.5** 0.374	**0.6** 0.024
	25 0.984	**37** 1.457	**30** 1.181	**25** 0.984	**43** 1.693	**11** 0.433	**9.5** 0.374	**0.6** 0.024
30 1.181	**30** 1.181	**42** 1.654	**30** 1.181	**30** 1.181	**47** 1.850	**11** 0.433	**9.5** 0.374	**0.6** 0.024
	30 1.181	**42** 1.654	**30** 1.181	**30** 1.181	**48** 1.890	**11** 0.433	**9.5** 0.374	**0.6** 0.024
35 1.378	**35** 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**52** 2.047	**12** 0.472	**9** 0.354	**0.6** 0.024
	35 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**53** 2.087	**12** 0.472	**9** 0.354	**0.6** 0.024
40 1.575	**40** 1.575	**52** 2.047	**32** 1.260	**40** 1.575	**60** 2.362	**13** 0.512	**10** 0.394	**0.6** 0.024
	40 1.575	**52** 2.047	**32** 1.260	**40** 1.575	**61** 2.402	**13** 0.512	**10** 0.394	**0.6** 0.024
45 1.772	**45** 1.772	**58** 2.283	**32** 1.260	**45** 1.772	**65** 2.559	**14** 0.551	**9** 0.354	**0.6** 0.024
	45 1.772	**58** 2.283	**32** 1.260	**45** 1.772	**66.5** 2.618	**14** 0.551	**9** 0.354	**0.6** 0.024

Bearing Designation	Speed Rating Oil	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner ring Designation	Shaft Diameter
		Radial		Thrust						
		Dynamic	Static	Dynamic	Static					
		C	C_0	C_a	C_{0a}	Radial	Thrust			
	min^{-1}	**kN** lbf		**kN** lbf		kN		kg		**mm** in
NAXK10	9500	**7.9** 1780	**8.7** 1960	**10.0** 2250	**13.9** 3120	1.35	0.630	0.04	JR7x10x16	**10** 0.394
NAXK10Z	9500	**7.9** 1780	**8.7** 1960	**10.0** 2250	**13.9** 3120	1.35	0.630	0.04	JR7x10x16	
NAXK12	9000	**7.5** 1690	**8.5** 1910	**10.3** 2320	**15.3** 3440	1.30	0.690	0.046	JR9x12x16	**12** 0.472
NAXK12Z	9000	**7.5** 1690	**8.5** 1910	**10.3** 2320	**15.3** 3440	1.30	0.690	0.047	JR9x12x16	
NAXK15	8500	**9.7** 2180	**12.6** 2830	**10.5** 2360	**16.7** 3750	1.90	0.760	0.047	JR12x15x16	**15** 0.591
NAXK15Z	8500	**9.7** 2180	**12.6** 2830	**10.5** 2360	**16.7** 3750	1.90	0.760	0.05	JR12x15x16	
NAXK17	8500	**11.4** 2560	**16.1** 3620	**11.3** 2540	**19.5** 4380	2.50	0.880	0.06	JR14x17x17	**17** 0.669
NAXK17Z	8500	**11.4** 2560	**16.1** 3620	**11.3** 2540	**19.5** 4380	2.50	0.880	0.064	JR14x17x17	
NAXK20	7000	**14.8** 3330	**23.7** 5330	**14.9** 3350	**26.5** 5960	3.65	1.20	0.089	JR17x20x20	**20** 0.787
NAXK20Z	7000	**14.8** 3330	**23.7** 5330	**14.9** 3350	**26.5** 5960	3.65	1.20	0.094	JR17x20x20	
NAXK25	6300	**18.9** 4250	**29.8** 6700	**18.1** 4070	**35.5** 7980	4.60	1.60	0.134	JR20x25x20	**25** 0.984
NAXK25Z	6300	**18.9** 4250	**29.8** 6700	**18.1** 4070	**35.5** 7980	4.60	1.60	0.141	JR20x25x20	
NAXK30	5600	**20.3** 4560	**34.6** 7780	**18.8** 4230	**39.9** 8970	5.35	2.15	0.146	JR25x30x20	**30** 1.181
NAXK30Z	5600	**20.3** 4560	**34.6** 7780	**18.8** 4230	**39.9** 8970	5.35	2.15	0.154	JR25x30x20	
NAXK35	5300	**22.1** 4970	**40.8** 9170	**20.0** 4500	**46.5** 10500	6.35	2.10	0.176	JR30x35x20	**35** 1.378
NAXK35Z	5300	**22.1** 4970	**40.8** 9170	**20.0** 4500	**46.5** 10500	6.35	2.10	0.184	JR30x35x20	
NAXK40	4500	**23.9** 5370	**47** 10600	**26.9** 6050	**62.8** 14100	7.30	2.85	0.224	JR35x40x20	**40** 1.575
NAXK40Z	4500	**23.9** 5370	**47** 10600	**26.9** 6050	**62.8** 14100	7.30	2.85	0.233	JR35x40x20	
NAXK45	4500	**25.0** 5620	**51.8** 11600	**27.8** 6250	**69.1** 15500	8.05	3.10	0.262	JR40x45x20	**45** 1.772
NAXK45Z	4500	**25.0** 5620	**51.8** 11600	**27.8** 6250	**69.1** 15500	8.05	3.10	0.275	JR40x45x20	

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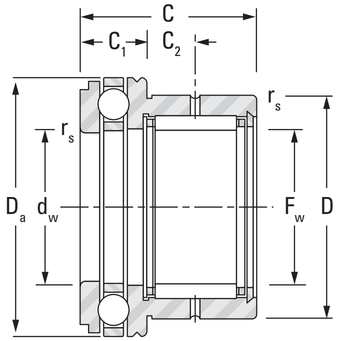
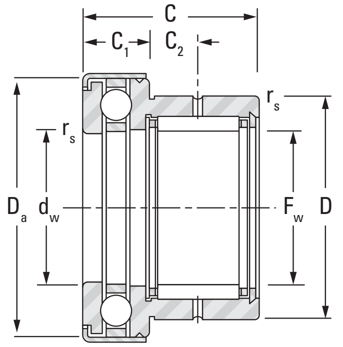
BALL THRUST SERIES

METRIC SERIES



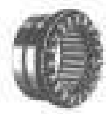
NAXK



NAXK.Z

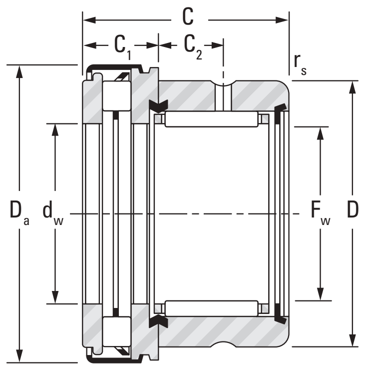
Shaft Diameter	F_w	D	C	d_w	D_a	C_1	C_2	$r_{s\,min.}$
				E7				
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
50 1.969	**50** 1.969	**62** 2.441	**35** 1.378	**50** 1.969	**70** 2.756	**14** 0.551	**10** 0.394	**0.6** 0.024
	50 1.969	**62** 2.441	**35** 1.378	**50** 1.969	**71.5** 2.815	**14** 0.551	**10** 0.394	**0.6** 0.024
60 2.362	**60** 2.362	**72** 2.835	**40** 1.575	**60** 2.362	**85** 3.346	**17** 0.669	**12** 0.472	**1** 0.039
70 2.756	**70** 2.756	**85** 3.346	**40** 1.575	**70** 2.756	**95** 3.740	**18** 0.709	**11** 0.433	**1** 0.039

Bearing Designation	Speed Rating Oil	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner ring Designation	Shaft Diameter
		Radial		Thrust						
		Dynamic	Static	Dynamic	Static					
		C	C_0	C_a	C_{0a}	Radial	Thrust			
	min^{-1}	kN lbf		kN lbf		kN		kg		mm in
NAXK50	4300	**30.2** 6790	**68.5** 15400	**28.8** 6470	**75.4** 17000	10.7	3.40	0.316	JR45x50x25	**50** 1.969
NAXK50Z	4300	**30.2** 6790	**68.5** 15400	**28.8** 6470	**75.4** 17000	10.7	3.40	0.332	JR45x50x25	
NAXK60	3600	**31.9** 7170	**78.1** 17600	**41.4** 9310	**113** 25400	12.2	5.10	0.48	JR50x60x25	**60** 2.362
NAXK70	3400	**44.9** 10100	**87.1** 19600	**40.0** 8990	**110** 24700	13.9	4.95	0.659	JR60x70x25	**70** 2.756

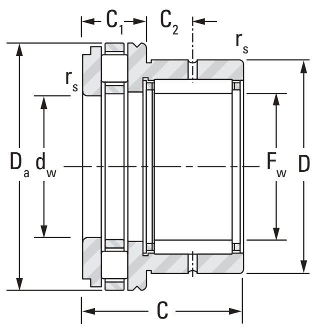


CYLINDRICAL ROLLER THRUST SERIES

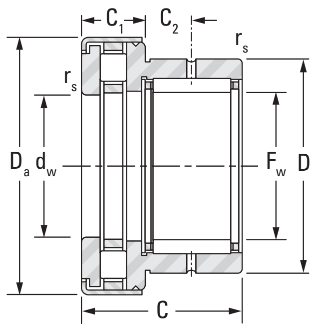
METRIC SERIES



RAXZ 500



NAXR



NAXR.Z

Shaft Diameter	F_w	D	C	d_w E7	D_a	C_1	C_2	$r_{s\ min.}$
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
10 0.394	**10** 0.394	**19** 0.748	**21.5** 0.846	**10** 0.394	**22.4** 0.882	**7.5** 0.295	**6** 0.236	**0.35** 0.014
12 0.472	**12** 0.472	**21** 0.827	**22** 0.866	**12** 0.472	**26.4** 1.039	**8** 0.315	**6** 0.236	**0.35** 0.014
15 0.591	**15** 0.591	**24** 0.945	**23** 0.906	**15** 0.591	**28** 1.102	**9** 0.354	**6.5** 0.256	**0.3** 0.012
	15 0.591	**24** 0.945	**23** 0.906	**15** 0.591	**29** 1.142	**9** 0.354	**6.5** 0.256	**0.3** 0.012
	15 0.591	**24** 0.945	**22** 0.866	**15** 0.591	**28.4** 1.118	**8** 0.315	**6** 0.236	**0.35** 0.014
17 0.669	**17** 0.669	**26** 1.024	**25** 0.984	**17** 0.669	**30** 1.181	**9** 0.354	**8.0** 0.315	**0.3** 0.012
	17 0.669	**26** 1.024	**25** 0.984	**17** 0.669	**31** 1.220	**9** 0.354	**8.0** 0.315	**0.3** 0.012
	17 0.669	**26** 1.024	**24** 0.945	**17** 0.669	**30.4** 1.197	**8** 0.315	**8** 0.315	**0.65** 0.026
20 0.787	**20** 0.787	**30** 1.181	**30** 1.181	**20** 0.787	**35** 1.378	**10** 0.394	**10.5** 0.413	**0.3** 0.012
	20 0.787	**30** 1.181	**30** 1.181	**20** 0.787	**36** 1.417	**10** 0.394	**10.5** 0.413	**0.3** 0.012
	20 0.787	**30** 1.181	**29** 1.142	**20** 0.787	**35.4** 1.394	**11** 0.433	**9** 0.354	**0.85** 0.033
25 0.984	**25** 0.984	**37** 1.457	**30** 1.181	**25** 0.984	**42** 1.654	**11** 0.433	**9.5** 0.374	**0.6** 0.024
	25 0.984	**37** 1.457	**30** 1.181	**25** 0.984	**43** 1.693	**11** 0.433	**9.5** 0.374	**0.6** 0.024
	25 0.984	**37** 1.457	**29** 1.142	**25** 0.984	**43** 1.693	**11** 0.433	**9** 0.354	**0.85** 0.033
30 1.181	**30** 1.181	**42** 1.654	**30** 1.181	**30** 1.181	**47** 1.850	**11** 0.433	**9.5** 0.374	**0.6** 0.024
	30 1.181	**42** 1.654	**30** 1.181	**30** 1.181	**48** 1.890	**11** 0.433	**9.5** 0.374	**0.6** 0.024
	30 1.181	**42** 1.654	**29** 1.142	**30** 0.181	**48** 1.890	**11** 0.433	**9** 0.354	**0.85** 0.033
35 1.378	**35** 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**52** 2.047	**12** 0.472	**9.0** 0.354	**0.6** 0.024
	35 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**53** 2.087	**12** 0.472	**9.0** 0.354	**0.6** 0.024
	35 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**54** 2.126	**12** 0.472	**9** 0.354	**0.85** 0.033

Bearing Designation			Speed Rating	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner Ring Designation	Shaft Diameter
				Radial		Thrust						
				Dynamic	Static	Dynamic	Static					
RAXZ	NAXR	NAXR.Z		C	C_0	C_a	C_{0a}	Radial	Thrust			
			min^{-1}	**kN** lbf		**kN** lbf		kN		**kg** lbs		**mm** in
RAXZ 510			15500	**6.00** 1350	**7.40** 1660	**6.40** 1440	**13.3** 2990	1.15	1.85	**0.026** 0.057	IM 7 10 16 P	**10** 0.394
RAXZ 512			13000	**6.55** 1470	**8.65** 1940	**10.0** 2250	**22.2** 4990	1.30	3.10	**0.033** 0.073	IM 9 12 16 P	**12** 0.472
	NAXR15		12000	**12.4** 2790	**15.0** 3370	**12.0** 2700	**26.3** 5910	2.30	3.70	**0.032** 0.071	JR12x15x16	**15** 0.591
		NAXR15.Z	12000	**12.4** 2790	**15.0** 3370	**12.0** 2700	**26.3** 5910	2.30	3.70	**0.035** 0.077	JR12x15x16	
RAXZ 515			11500	**9.25** 2080	**11.9** 2680	**11.0** 2470	**25.9** 5820	1.80	3.65	**0.036** 0.079	IM 12 15 16 P	
	NAXR17		11000	**13.7** 3080	**17.5** 3930	**12.6** 2830	**28.6** 6430	2.70	4.05	**0.050** 0.110	JR14x17x17	**17** 0.669
		NAXR17.Z	11000	**13.7** 3080	**17.5** 3930	**12.6** 2830	**28.6** 6430	2.70	4.05	**0.053** 0.117	JR14x17x17	
RAXZ 517			10500	**11.5** 2590	**16.5** 3710	**11.9** 2680	**29.6** 6650	2.50	4.15	**0.044** 0.097	IM 14 17 17 P	
	NAXR20TN		9500	**17.5** 3930	**25.3** 5690	**23.5** 5280	**56.8** 12800	4.00	8.00	**0.090** 0.198	JR17x20x20	**20** 0.787
		NAXR20Z.TN	9500	**17.5** 3930	**25.3** 5690	**23.5** 5280	**56.8** 12800	4.00	8.00	**0.095** 0.209	JR17x20x20	
RAXZ 520			9000	**14.5** 3260	**23.0** 5170	**16.7** 3750	**39.4** 8860	3.55	5.55	**0.070** 0.154	IM 15 20 20 P	
	NAXR25TN		8000	**19.2** 4320	**30.4** 6830	**31.2** 7010	**81.0** 18200	4.80	11.4	**0.146** 0.322	JR20x25x20	**25** 0.984
		NAXR25Z.TN	8000	**19.2** 4320	**30.4** 6830	**31.2** 7010	**81.0** 18200	4.80	11.4	**0.152** 0.335	JR20x25x20	
RAXZ 525			7500	**15.7** 3530	**27.5** 6180	**19.4** 4360	**50.7** 11400	4.25	7.15	**0.105** 0.231	IM 20 25 20 P	
	NAXR30TN		6700	**24.2** 5440	**38.3** 8610	**33.0** 7420	**91.1** 20500	6.10	12.8	**0.162** 0.357	JR25x30x20	**30** 1.181
		NAXR30Z.TN	6700	**24.2** 5440	**38.3** 8610	**33.0** 7420	**91.1** 20500	6.10	12.8	**0.169** 0.373	JR25x30x20	
RAXZ 530			6500	**19.8** 4450	**33.8** 7600	**20.3** 4560	**56.3** 12700	5.25	7.90	**0.118** 0.260	IM 25 30 20 P	
	NAXR35		6000	**26.1** 5870	**44.4** 9980	**30.8** 6920	**86.0** 19300	7.05	12.1	**0.186** 0.410	JR30x35x20	**35** 1.378
		NAXR35.Z	6000	**26.1** 5870	**44.4** 9980	**30.8** 6920	**86.0** 19300	7.05	12.1	**0.195** 0.430	JR30x35x20	
RAXZ 535			5500	**21.5** 4830	**39.4** 8860	**24.1** 5420	**62.7** 14100	6.15	8.80	**0.146** 0.322	IM 30 35 20 P	

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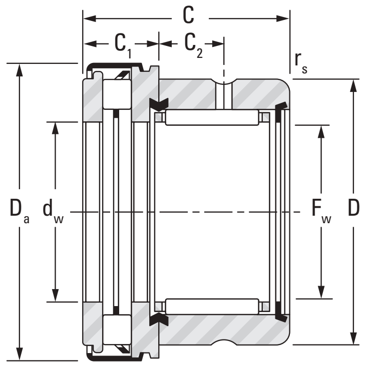
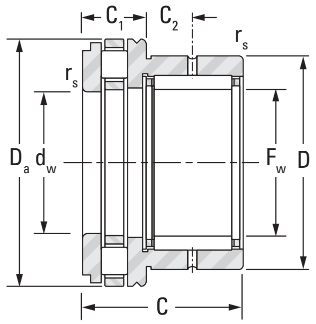
CYLINDRICAL ROLLER THRUST SERIES

METRIC SERIES



RAXZ 500



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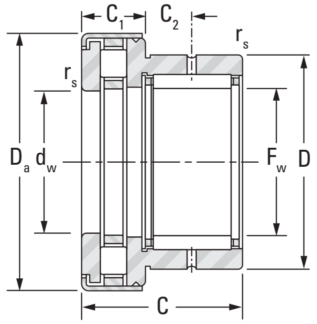


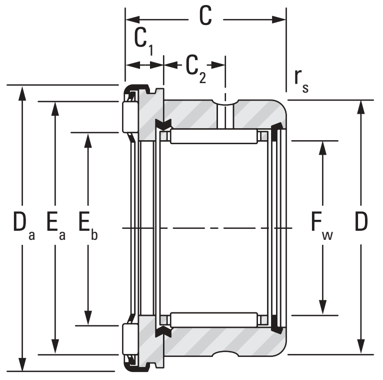
NAXR.Z

Shaft Diameter	F_w	D	C	d_w	D_a	C_1	C_2	$r_{s\ min.}$
				E7				
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
40 1.575	**40** 1.575	**52** 2.047	**32** 1.260	**40** 1.575	**60** 2.362	**13** 0.512	**10.0** 0.394	**0.6** 0.024
	40 1.575	**52** 2.047	**32** 1.260	**40** 1.575	**61** 2.402	**13** 0.512	**10.0** 0.394	**0.6** 0.024
	40 1.575	**52** 2.047	**31** 1.220	**40** 1.575	**61** 2.402	**13** 0.512	**9** 0.354	**0.85** 0.033
45 1.772	**45** 1.772	**58** 2.283	**32** 1.260	**45** 1.772	**65** 2.559	**14** 0.551	**9.0** 0.354	**0.6** 0.024
	45 1.772	**58** 2.283	**32** 1.260	**45** 1.772	**66** 2.598	**14** 0.551	**9.0** 0.354	**0.6** 0.024
	45 1.772	**58** 2.283	**31** 1.220	**45** 1.772	**66** 2.598	**13** 0.512	**9** 0.354	**0.85** 0.033
50 1.969	**50** 1.969	**62** 2.441	**35** 1.378	**50** 1.969	**70** 2.756	**14** 0.551	**10.0** 0.394	**0.6** 0.024
	50 1.969	**62** 2.441	**35** 1.378	**50** 1.969	**71** 2.795	**14** 0.551	**10.0** 0.394	**0.6** 0.024
	50 1.969	**62** 2.441	**34** 1.339	**50** 1.969	**71** 2.795	**13** 0.512	**11** 0.433	**1.3** 0.051
60 2.362	**60** 2.362	**72** 2.835	**36** 1.417	**60** 2.362	**86** 3.386	**15** 0.591	**11** 0.433	**1.3** 0.051
70 2.756	**70** 2.756	**85** 3.346	**36** 1.417	**70** 2.756	**96** 3.780	**15** 0.591	**11** 0.433	**1.3** 0.051

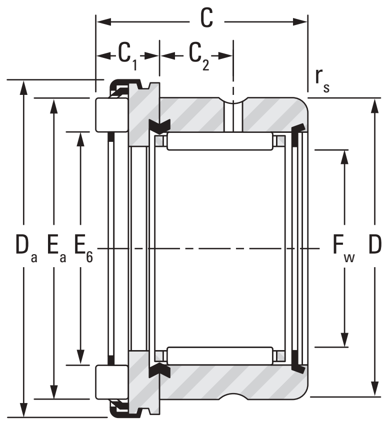
Bearing Designation			Speed Rating	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner Ring Designation	Shaft Diameter
				Radial		Thrust						
				Dynamic	Static	Dynamic	Static					
RAXZ	NAXR	NAXR.Z		C	C_0	C_a	C_{0a}	Radial	Thrust			
			min^{-1}	**kN** lbf		**kN** lbf		kN		**kg** lbs		**mm** in
	NAXR40		5300	**27.9** 6270	**50.4** 11300	**44.1** 9910	**126.0** 28300	8.05	12.0	**0.288** 0.635	JR35x40x20	**40** 1.575
		NAXR40.Z	5300	**27.9** 6270	**50.4** 11300	**44.1** 9910	**126.0** 28300	8.05	12.0	**0.299** 0.659	JR35x40x20	
RAXZ 540			5000	**23.0** 5170	**45.1** 10100	**32.8** 7370	**85.5** 19200	7.00	5.95	**0.174** 0.384	IM 35 40 20 P	
	NAXR45TN		4800	**29.5** 6630	**56.4** 12700	**52.3** 11800	**163.0** 36600	9.00	15.5	**0.360** 0.794	JR40x45x20	**45** 1.772
		NAXR45Z.TN	4800	**29.5** 6630	**56.4** 12700	**52.3** 11800	**163.0** 36600	9.00	15.5	**0.370** 0.816	JR40x45x20	
RAXZ 545			4500	**24.5** 5510	**50.7** 11400	**34.7** 7800	**95.0** 21400	7.90	6.60	**0.206** 0.454	IM 40 45 20 P	
	NAXR50		4300	**40.8** 9170	**79.3** 17800	**49.6** 11200	**155.0** 34800	12.5	14.8	**0.432** 0.952	JR45x50x25	**50** 1.969
		NAXR50.Z	4300	**40.8** 9170	**79.3** 17800	**49.6** 11200	**155.0** 34800	12.5	14.8	**0.452** 0.996	JR45x50x25	
RAXZ 550			4000	**27.4** 6160	**60.5** 13600	**36.6** 8230	**105** 23600	9.60	7.25	**0.232** 0.511	IM 45 50 25 P	
RAXZ 560			3500	**30.0** 6740	**72.2** 16200	**56.0** 12600	**192** 43200	11.5	18.4	**0.327** 0.721	IM 55 60 25 P	**60** 2.362
RAXZ 570			3000	**36.2** 8140	**85.0** 19100	**60.6** 13600	**222** 49900	13.3	21.2	**0.435** 0.959	IM 60 70 25 P	**70** 2.756

NEEDLE ROLLER AND CYLINDRICAL ROLLER THRUST SERIES

METRIC SERIES



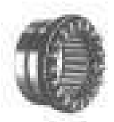
RAX 400



RAX 500

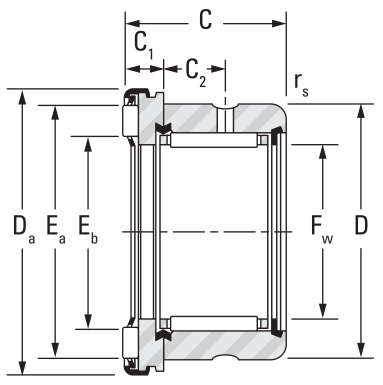
Shaft Diameter	F_w	C	D	D_a	E_b	E_a	C_1	C_2	$r_{s\,min.}$	Bearing Designation		Speed Rating	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner Ring	Thin Plate	Thick Plate	Shaft Diameter
													Radial		Thrust								
													Dynamic	Static	Dynamic	Static							
										400 Series	500 Series		C	C_0	C_a	C_{0a}	Radial	Thrust					
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			min^{-1}	**kN** lbf		**kN** lbf		kN		**kg** lbs				**mm** in
10 0.3937	**10** 0.3937	**19** 0.748	**19** 0.7480	**22** 0.8661	**12** 0.47	**18.6** 0.73	**5** 0.197	**6** 0.236	**0.35** 0.014	RAX 410		15500	**6.00** 1350	**7.40** 1660	**5.70** 1280	**13.2** 2970	1.15	1.25	**0.025** 0.055		CP 10 22	CP 2 10 22	**10** 0.3937
	10 0.3937	**19.5** 0.768	**19** 0.7480	**22** 0.8661	**12.2** 0.48	**18.5** 0.73	**5.5** 0.217	**6** 0.236	**0.35** 0.014		RAX 510	15500	**6.00** 1350	**7.40** 1660	**6.40** 1440	**13.3** 2990	1.15	1.85	**0.026** 0.057		CP 10 22	CP 2 10 22	
12 0.4724	**12** 0.4724	**19** 0.748	**21** 0.8268	**26** 1.0236	**15** 0.59	**22.6** 0.89	**5** 0.197	**6** 0.236	**0.35** 0.014	RAX 412		13000	**6.55** 1470	**8.65** 1940	**7.75** 1740	**21.1** 4740	1.30	2.10	**0.032** 0.071	IM 9 12 16 P	CP 12 26	CP 2 12 26	**12** 0.4724
15 0.5906	**15** 0.5906	**19** 0.748	**24** 0.9449	**28** 1.1024	**17** 0.67	**24.6** 0.97	**5** 0.197	**6** 0.236	**0.35** 0.014	RAX 415		11500	**9.25** 2080	**11.9** 2680	**8.30** 1870	**23.8** 5350	1.80	2.35	**0.034** 0.075	IM 12 15 16 P	CP 15 28	CP 2 15 28	**15** 0.5906
	15 0.5906	**20** 0.787	**24** 0.9449	**28** 1.1024	**16.8** 0.66	**24.9** 0.98	**6** 0.236	**6** 0.236	**0.35** 0.014		RAX 515	11500	**9.25** 2080	**11.9** 2680	**11.0** 2470	**25.9** 5820	1.80	3.65	**0.036** 0.079	IM 12 15 16 P	CP 15 28	CP 2 15 28	
17 0.6693	**17** 0.6693	**21** 0.827	**26** 1.0236	**30** 1.1811	**19** 0.75	**26.6** 1.05	**5** 0.197	**8** 0.315	**0.65** 0.026	RAX 417		10500	**11.5** 2590	**16.5** 3710	**8.80** 1980	**26.4** 5930	2.50	2.60	**0.041** 0.090	IM 14 17 17 P	CP 17 30	CP 2 17 30	**17** 0.6693
	17 0.6693	**22** 0.866	**26** 1.0236	**30** 1.1811	**18.8** 0.74	**26.9** 1.06	**6** 0.236	**8** 0.315	**0.65** 0.026		RAX 517	10500	**11.5** 2590	**16.5** 3710	**11.9** 2680	**29.6** 6650	2.50	4.15	**0.044** 0.097	IM 14 17 17 P	CP 17 30	CP 2 17 30	
20 0.7874	**20** 0.7874	**24** 0.945	**30** 1.1811	**35** 1.3780	**22** 0.87	**31.6** 1.24	**6** 0.236	**9** 0.354	**0.85** 0.033	RAX 420		9000	**14.4** 3240	**22.9** 5150	**8.95** 2010	**28.2** 6340	3.55	2.70	**0.066** 0.146	IM 15 20 20 P	CP 20 35	CP 3 20 35	**20** 0.7874
	20 0.7874	**26** 1.024	**30** 1.1811	**35** 1.3780	**22** 0.87	**31.6** 1.24	**8** 0.315	**9** 0.354	**0.85** 0.033		RAX 520	9000	**14.4** 3240	**22.9** 5150	**8.95** 2010	**28.2** 6340	3.55	3.95	**0.070** 0.154	IM 15 20 20 P	CP 20 35	CP 3 20 35	
25 0.9843	**25** 0.9843	**24** 0.945	**37** 1.4567	**42** 1.6535	**27.7** 1.09	**37.4** 1.47	**6** 0.236	**9** 0.354	**0.85** 0.033	RAX 425		7500	**14.8** 3330	**25.4** 5710	**13.8** 3100	**52.8** 11900	3.95	5.00	**0.099** 0.218	IM 20 25 20 P	CP 25 42	CP 3 25 42	**25** 0.9843
	25 0.9843	**26** 1.024	**37** 1.4567	**42** 1.6535	**27.7** 1.09	**37.4** 1.47	**8** 0.315	**9** 0.354	**0.85** 0.033		RAX 525	7500	**15.7** 3530	**27.5** 6180	**19.4** 4360	**50.7** 11400	4.25	7.15	**0.105** 0.231	IM 20 25 20 P	CP 25 42	CP 3 25 42	
30 1.1811	**30** 1.1811	**24** 0.945	**42** 1.6535	**47** 1.8504	**32.7** 1.29	**42.4** 1.67	**6** 0.236	**9** 0.354	**0.85** 0.033	RAX 430		6500	**19.8** 4450	**33.8** 7600	**15.0** 3370	**61.6** 13800	5.25	5.85	**0.111** 0.245	IM 25 30 20 P	CP 30 47	CP 3 30 47	**30** 1.1811
	30 1.1811	**26** 1.024	**42** 1.6535	**47** 1.8504	**32.7** 1.29	**42.3** 1.67	**8** 0.315	**9** 0.354	**0.85** 0.033		RAX 530	6500	**19.8** 4450	**33.8** 7600	**20.3** 4560	**56.3** 12700	5.25	7.90	**0.118** 0.260	IM 25 30 20 P	CP 30 47	CP 3 30 47	
35 1.3780	**35** 1.3780	**24** 0.945	**47** 1.8504	**53** 2.0866	**37.2** 1.46	**49** 1.93	**6** 0.236	**9** 0.354	**0.85** 0.033	RAX 435		5500	**21.5** 4830	**39.4** 8860	**19.1** 4290	**88.0** 19800	6.15	9.15	**0.130** 0.287	IM 30 35 20 P	CP 35 52	CP 3 35 52	**35** 1.3780
	35 1.3780	**27** 1.063	**47** 1.8504	**53.4** 2.1024	**37.8** 1.49	**47.8** 1.88	**9** 0.354	**9** 0.354	**0.85** 0.033		RAX 535	5500	**21.5** 4830	**39.4** 8860	**24.1** 5420	**62.7** 14100	6.15	8.80	**0.146** 0.322	IM 30 35 20 P	CP 35 52	CP 3 35 52	
40 1.5748	**40** 1.5748	**24** 0.945	**52** 2.0472	**60** 2.3622	**43** 1.69	**54.9** 2.16	**6** 0.236	**9** 0.354	**0.85** 0.033	RAX 440		5000	**23.3** 5240	**45.7** 10300	**20.6** 4630	**101** 22700	7.15	10.5	**0.150** 0.331	IM 35 40 20 P	CP 40 60	CP 3 40 60	**40** 1.5748
45 1.7717	**45** 1.7717	**24** 0.945	**58** 2.2835	**65** 2.5591	**48** 1.89	**59.9** 2.36	**6** 0.236	**9** 0.354	**0.85** 0.033	RAX 445		4500	**24.4** 5490	**50.3** 11300	**22.1** 4970	**114** 25600	7.90	11.9	**0.179** 0.395	IM 40 45 20 P	CP 45 65	CP 3 45 65	**45** 1.7717
	45 1.7717	**28** 1.102	**58** 2.2835	**65.4** 2.5748	**47.8** 1.88	**59.8** 2.35	**10** 0.394	**9** 0.354	**0.85** 0.033		RAX 545	4500	**24.4** 5490	**50.3** 11300	**34.7** 7800	**95.0** 21400	7.90	13.4	**0.206** 0.454	IM 40 45 20 P	CP 45 65	CP 3 45 65	

Continued on next page.

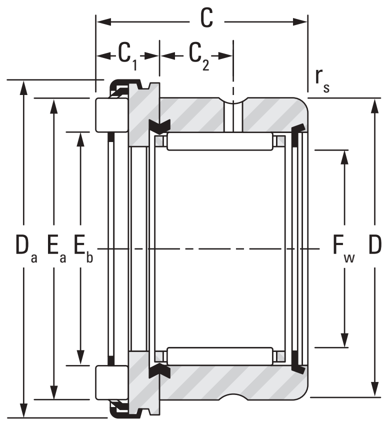


NEEDLE ROLLER AND CYLINDRICAL ROLLER THRUST SERIES

METRIC SERIES



RAX 400

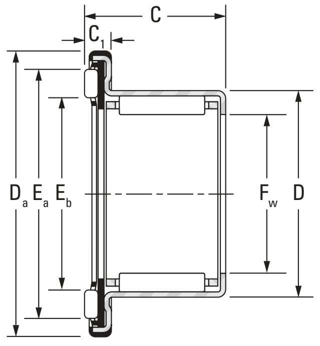


RAX 500

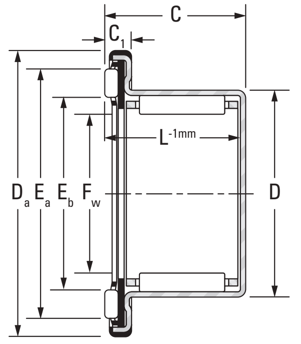
Shaft Diameter	F_w	C	D	D_a	E_b	E_a	C_1	C_2	$r_{s\ min.}$	Bearing Designation		Speed Rating	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner Ring	Thin Plate	Thick Plate	Shaft Diameter
													Radial		Thrust								
													Dynamic	Static	Dynamic	Static							
										400 Series	500 Series		C	C_0	C_a	C_{0a}	Radial	Thrust					
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			min^{-1}	kN lbf		kN lbf		kN		kg lbs				mm in
50 1.9685	**50** 1.9685	**27** 1.063	**62** 2.4409	**70** 2.7559	**53.3** 2.10	**65.7** 2.59	**6** 0.236	**11** 0.433	**1.3** 0.051	RAX 450		4000	**27.4** 6160	**60.5** 13600	**22.8** 5130	**123** 27700	9.60	12.8	**0.205** 0.452	IM 45 50 25 P	CP 50 70	CP 3 50 70	**50** 1.9685
	50 1.9685	**31** 1.220	**62** 2.4409	**70.4** 2.7717	**52.8** 2.08	**64.8** 2.55	**10** 0.394	**11** 0.433	**1.3** 0.051		RAX 550	4000	**27.4** 6160	**60.5** 13600	**36.6** 8230	**105** 23600	9.60	14.7	**0.232** 0.511	IM 45 50 25 P	CP 50 70	CP 3 50 70	
60 2.3622	**60** 2.3622	**28** 1.102	**72** 2.8346	**85** 3.3465	**63.5** 2.50	**79.2** 3.12	**7** 0.276	**11** 0.433	**1.3** 0.051	RAX 460		3500	**30.0** 6470	**72.2** 16200	**31.5** 7080	**197** 44300	11.5	20.2	**0.282** 0.622	IM 55 60 25 P	CP 60 85	CP 4 60 85	**60** 2.3622
	60 2.3622	**32** 1.260	**72** 2.8346	**85.4** 3.3622	**63.5** 2.50	**79.5** 3.13	**11** 0.433	**11** 0.433	**1.3** 0.051		RAX 560	3500	**30.0** 6740	**72.2** 16200	**56.0** 12600	**192** 43200	11.5	18.4	**0.327** 0.721	IM 55 60 25 P	CP 60 85	CP 4 60 85	
70 2.7559	**70** 2.7559	**28** 1.102	**85** 3.3465	**95** 3.7402	**73.5** 2.89	**89.2** 3.51	**7** 0.276	**11** 0.433	**1.3** 0.051	RAX 470		3000	**36.2** 8140	**85.0** 19100	**34.0** 7640	**228** 51300	13.3	23.3	**0.386** 0.851	IM 60 70 25 P	CP 1,5 70 95	CP 4 70 95	**70** 2.7559
	70 2.7559	**32** 1.260	**85** 3.3465	**95.4** 3.7559	**73.5** 2.89	**89.5** 3.52	**11** 0.433	**11** 0.433	**1.3** 0.051		RAX 570	3000	**36.2** 8140	**85.0** 19100	**60.6** 13600	**222** 49900	13.3	21.2	**0.435** 0.959	IM 60 70 25 P	CP 1,5 70 95	CP 4 70 95	

DRAWN CUP, NEEDLE ROLLER THRUST SERIES OPEN AND CLOSED BEARINGS

METRIC SERIES



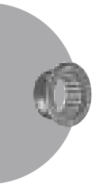
RAX 700

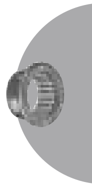


RAXF 700

Shaft Diameter	F_w	D	C	D_a	E_b	E_a	C_1	Bearing Designation	
								Open-Ends	Closed-End
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		
5 0.1969	**5** 0.1969	**9** 0.3543	**11** 0.433	**15.5** 0.6102	**7.2** 0.28	**11.2** 0.44	**3.3** 0.130	RAX 705	
12 0.4724	**12** 0.4724	**18** 0.7087	**14.2** 0.559	**27.5** 1.0827	**15** 0.59	**22.6** 0.89	**4.2** 0.165	RAX 712	RAXF 712
14 0.5512	**14** 0.5512	**20** 0.7874	**14.2** 0.559	**29.5** 1.1614	**17** 0.67	**24.6** 0.97	**4.2** 0.165	RAX 714	RAXF 714
15 0.5906	**15** 0.5906	**21** 0.8268	**14.2** 0.559	**31.5** 1.2402	**19** 0.75	**26.6** 1.05	**4.2** 0.165	RAX 715	RAXF 715
18 0.7087	**18** 0.7087	**24** 0.9449	**18.2** 0.717	**33.5** 1.3189	**21** 0.83	**28.6** 1.13	**4.2** 0.165	RAX 718	RAXF 718
20 0.7874	**20** 0.7874	**26** 1.0236	**18.2** 0.717	**36.5** 1.4370	**22** 0.87	**31.6** 1.24	**4.2** 0.165	RAX 720	RAXF 720
25 0.9843	**25** 0.9843	**33** 1.2992	**22.2** 0.874	**45.5** 1.7913	**30** 1.18	**39.6** 1.56	**4.2** 0.165	RAX 725	RAXF 725
30 1.1811	**30** 1.1811	**38** 1.4961	**22.2** 0.874	**50.5** 1.9882	**35** 1.38	**44.7** 1.76	**4.2** 0.165	RAX 730	RAXF 730
35 1.3780	**35** 1.3780	**43** 1.6929	**22.2** 0.874	**56.5** 2.2244	**39** 1.54	**50.9** 2.00	**4.2** 0.165	RAX 735	
40 1.5748	**40** 1.5748	**48** 1.8898	**22.2** 0.874	**61.5** 2.4213	**43** 1.69	**54.9** 2.16	**4.2** 0.165	RAX 7309	RAXF 7309
45 1.7717	**45** 1.7717	**52** 2.0472	**22.2** 0.874	**66.5** 2.6181	**48** 1.89	**59.9** 2.36	**4.2** 0.165	RAX 745	

L^{-1}	Speed Rating	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Inspection			Matching Inner Ring	Thin Plate	Thick Plate	Shaft Diameter
		Radial		Thrust					Ring Gage	Go Plug	No Go Plug				
		Dynamic	Static	Dynamic	Static										
		C	C_0	C_a	C_{0a}	Radial	Thrust								
mm in	min^{-1}	kN lbf		kN lbf		kN		kg lbs	mm in	mm in	mm in				mm in
–	25000	**2.55** 570	**2.10** 470	**2.85** 640	**5.60** 1260	0.320	0.060	**0.005** 0.010	**9.000** 0.3543	**5.009** 0.1972	**5.036** 0.1983				
13.2 0.520	13000	**7.05** 1580	**7.40** 1660	**7.75** 1740	**21.1** 4740	1.15	2.10	**0.017** 0.036	**18.000** 0.7087	**12.009** 0.4728	**12.035** 0.4738	IM 8 12 12,4	CP 12 26	CP 2 12 26	**12** 0.4724
13.2 0.520	11500	**7.70** 1730	**8.70** 1960	**8.30** 1870	**23.8** 5350	1.30	2.35	**0.018** 0.040	**20.000** 0.7874	**14.009** 0.5515	**14.035** 0.5526	IM 10 14 12,4	CP 14 26	CP 2 14 26	**14** 0.5512
13.2 0.520	10500	**8.20** 1840	**9.50** 2140	**8.8** 1980	**26.4** 5930	1.45	2.60	**0.020** 0.044	**21.000** 0.8268	**15.009** 0.5909	**15.035** 0.5919	IM 12 15 12,4	CP 15 28	CP 2 15 28	**15** 0.5906
17.2 0.677	10000	**12.6** 2830	**17.7** 3980	**8.95** 2010	**27.7** 6230	2.70	2.75	**0.027** 0.060	**24.000** 0.9449	**18.009** 0.7090	**18.035** 0.7100	IM 13 18 16,4	CP 18 30	CP 2 18 30	**18** 0.7087
17.2 0.677	9000	**13.4** 3010	**19.8** 4450	**12.2** 2740	**42.2** 9490	3.00	4.00	**0.031** 0.068	**26.000** 1.0236	**20.009** 0.7878	**20.035** 0.7888	IM 15 20 16,4	CP 20 35	CP 3 20 35	**20** 0.7874
21.2 0.835	7200	**22.3** 5010	**31.7** 7130	**14.2** 3190	**56.3** 12700	5.00	5.35	**0.055** 0.121	**33.000** 1.2992	**20.015** 0.7880	**25.041** 0.9859	IM 20 25 20,4	CP 25 42	CP 3 25 42	**25** 0.9843
21.2 0.835	6300	**24.3** 5460	**37.3** 8390	**15.4** 3460	**65.1** 14600	5.90	6.20	**0.063** 0.139	**38.000** 1.4961	**30.015** 1.1817	**30.041** 1.1827	IM 25 30 20,4	CP 30 47	CP 3 30 47	**30** 1.1811
21.2 0.835	5500	**26.9** 6050	**44.7** 10000	**19.6** 4410	**92.4** 20800	7.10	9.60	**0.075** 0.165	**43.000** 1.6929	**35.015** 1.3785	**35.041** 1.3796	IM 30 35 20,4	CP 35 52	CP 3 35 52	**35** 1.3780
21.2 0.835	5000	**28.5** 6410	**50.4** 11300	**20.6** 4630	**101** 22700	8.00	10.5	**0.086** 0.190	**48.000** 1.8898	**40.015** 1.5754	**40.041** 1.5764	IM 35 40 20,4	CP 40 60	CP 3 40 60	**40** 1.5748
21.2 0.835	4500	**27.0** 6070	**54.9** 12300	**22.1** 4970	**114** 25600	8.55	11.9	**0.088** 0.194	**52.000** 2.0472	**45.015** 1.7722	**45.041** 1.7733	IM 40 45 20,4	CP 45 65	CP 3 45 65	**45** 1.7717





NOTES

NEEDLE ROLLERS, ACCESSORIES

NEEDLE/CYLINDRICAL ROLLERS

Overview: Loose needle and cylindrical rollers are mainly used as bearing rolling elements to reduce friction and torque in rotating and pivoting applications. However, these precision rollers have many other uses, such as shafts or locating pins.

- **Catalogue range:** Diameters from 1 mm (0.0394 in) to 15 mm (0.5906 in).
  Lengths from 2.5 mm (0.0984 in) to 69 mm (2.7165 in).
- **Markets:** Vehicle and industrial transmissions, universal joints, and two-cycle engines.
- **Features:** Cylindrical and needle sizes are available. Needle rollers are available with flat and rounded-ends; metric series needle rollers available in Grade 2, 3 or 5.
- **Benefits:** Provide the maximum load-carrying capacity, within the smallest envelope, at a low cost.

METRIC INNER RINGS

Overview: Inner rings are made from bearing-quality steel, and their O.D. and bore are precision-ground. They function as the inner raceway for a needle roller bearing by providing a surface that meets all shaft raceway design requirements (hardness, surface finish, roundness, etc.).

- **Catalogue range:** 5 mm (0.1969 in) bore to 180 mm (7.0866 in) outer diameter.
- **Markets:** Automotive, truck, power transmissions, and industrial applications.
- **Features:** Available with and without chamfers, some are available with a profiled outer diameter.
- **Benefits:** When it is not practical to manufacture the shaft to raceway quality, an inner ring allows a customer to obtain acceptable bearing performance.

Standard Inner Rings for Needle Roller Bearings – Metric Nominal Dimensions

Prefix
JR inner ring for use with caged metric needle roller bearing
JRZ inner ring without mounting chamfers
IM inner ring for use with metric needle roller bearings

JRZ 25 x 30 x 18 JS1

IM 10 14 16 P

Bore Diameter
25 = 25 mm

Outer Diameter
14 = 14 mm

Width
18 = 18 mm

Suffix
JS1 lubrication hole
P ISO 492 toleranced inner ring

Extra Wide Inner Rings for Needle Roller Bearings – Metric Nominal Dimensions

Series
10 10 series
20 20 series
220 220 series
30 30 series
31 31 series

Width
25 = 25 mm

BIC 20 25

Prefix
BIC inner ring with oil hole for use with metric needle roller bearings
BIG, BIP, BIK extra wide inner ring for use with metric needle roller bearings
BICG extra wide inner ring with oil hole for use with metric needle roller bearings

Inner Rings for Full Complement Needle Roller Bearings – Metric Nominal Dimensions

Prefix
IM inner ring for use with metric needle roller bearings
IMC inner ring with oil hole for use with metric needle roller bearings

Series
190 190 series
206 206 series
49 49 series

Width (190, 206 Series)
25 = 25 mm

IM 190 25

Bore Size (49 Series)
00 = 10 mm
01 = 12 mm
02 = 15 mm
03 = 17 mm
bore code x 5 = bore size (mm)

IM 49 03

IM 10 14 16 R6

Bore Diameter
10 = 10 mm

Width
16 = 16 mm

Outer Diameter
14 = 14 mm

Suffix
R6 crowned raceway

Loose Rollers – Metric Nominal Dimensions

Prefix
NRO metric needle roller
.A rounded-end design
.B flat-end design
ZRO metric cylindrical roller

Suffix
G2 needle roller grade

NRO .B 1,5 x 11,8 G2

Nominal Diameter
1,5 = 1.5 mm

Nominal Length
11,8 = 11.8 mm

Needle Rollers, Accessories

NEEDLE ROLLERS – METRIC SERIES

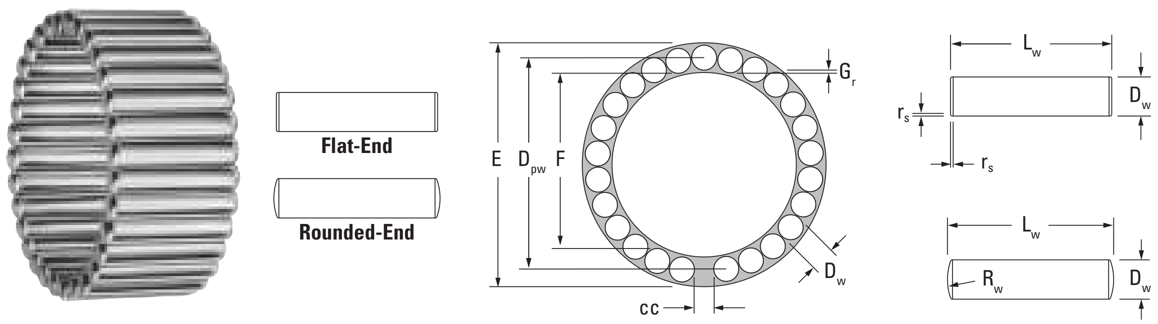


Fig. B8-1. Metric Series needle rollers

Needle rollers are made from rolling bearing-quality steel, hardened to 60-64 HRC or equivalent. Nominal metric needle rollers in various grades are standardized at national and international levels. The grades determine the dimensional and form tolerances of the needle rollers. Metric series needle rollers may differ by their end form: type A has rounded-end and type B has flat-ends. JTEKT prefers to supply needle roller in the most economical flat-end, or type B design, in G2 grade. Metric series needle rollers of type A also may be made available on request and in other G3 or G5 grades.

METRIC SERIES NEEDLE ROLLER DIMENSIONS

Nominally metric needle rollers, conforming to the International Standard ISO 3096, are shown in Table B8-2 on page B-8-8. The symbols used in Table B8-2 on page B-8-8, as well as in subsequent tables and figures, are summarized in Table B8-5 on page B-8-10. Needle rollers with flat-ends, which are the preferred design, are shown in Table B8-2 on page B-8-8. Chamfer dimension limits are also shown, the use of which results in the maximum possible effective contact length between roller and raceway. Yet, the relief at the needle roller ends help to reduce stress concentration – resulting in more uniform stress distribution, optimum load ratings, and longer life.

Every needle roller gage is separately packed, and packages are marked accordingly.

REFERENCE STANDARDS ARE:

- **ISO 3096** – rolling bearings – needle rollers – dimensions and tolerances.
- **DIN 5402** – rolling bearing components – needle rollers.

EXAMPLE OF METRIC SERIES NEEDLE ROLLER DESIGNATION AND PACKAGE MARKING:

NRO.B1,5x13,8G2
M2M4

NRO –	Needle roller
.B –	Flat-end needle rollers
1,5 –	Nominal diameter D_W = 1.500 mm
13,8 –	Nominal length L_W = 13.800 mm
G2 –	Needle roller grade
M2M4 –	Deviation of needle roller gage -2.000/-4.000 µm

The actual finished diameter is between 1.496 and 1.498 mm.

In the marking of the needle roller gage, P identifies zero (0) or plus (+), and M identifies minus (-). If a shipment of needle rollers of the same size comprises several boxes, each box contains needle rollers of the same grade. The gage may vary from box to box. Each individual box, however, contains needle rollers of the particular gage identified on the box.

METRIC SERIES NEEDLE ROLLER TOLERANCES

Table B8-1. Variation of Gage Lot Diameter, Preferred Gages and Circularity Deviation (values in µm)

<table>
<tr><th>Grade</th><th>Variation of Gage Lot Diameter V_{DwL} Max.</th><th colspan="19">Gages
High/Low Deviation of Mean Diameters
D_{wmp}</th><th>Circularity Deviation Max.</th></tr>
<tr><td>2</td><td>2</td><td>Max.
Min.</td><td colspan="2">0
-2</td><td colspan="2">-1
-3</td><td colspan="2">-2
-4</td><td colspan="2">-3
-5</td><td colspan="2">-4
-6</td><td colspan="2">-5
-7</td><td colspan="2">-6
-8</td><td colspan="2">-7
-9</td><td colspan="2">-8
-10</td><td>1</td></tr>
<tr><td>3</td><td>3</td><td>Max.
Min.</td><td colspan="3">0
-3</td><td colspan="3">-1.5
-4.5</td><td colspan="3">-3
-6</td><td colspan="3">-4.5
-7.5</td><td colspan="3">-6
-9</td><td colspan="3">-7
-10</td><td>1.5</td></tr>
<tr><td>5</td><td>5</td><td>Max.
Min.</td><td colspan="6">0
-5</td><td colspan="6">-3
-8</td><td colspan="6">-5
-10</td><td>2.5</td></tr>
</table>

Note 1 - Tolerance values apply only at the middle of the needle roller length.
Note 2 - Needle rollers of any nominal dimensions and any of the quoted grades will be supplied sub-divided into the gages listed in Table B8-1 at our option, if nothing to the contrary is agreed upon at the time of ordering.

Table B8-2. Dimensions of metric series needle rollers

D_w Dia.	L_w Length	Needle Roller Designation	Wt. 1000 pcs Approx.	$r_{s\ min.}$ Chamfer Dimension Limits	Chamfer Dimension Limits Rad.	Chamfer Dimension Limits Axial
mm in	mm in		kg lbs	mm in	mm in	mm in
1.5 0.0591	5.8 0.228	NRO.B1,5x5,8G2	0.080 0.176	0.1 0.004	0.6 0.024	0.8 0.031
1.5 0.0591	6.8 0.268	NRO.B1.5x6,8G2	0.094 0.207	0.1 0.004	0.6 0.024	0.8 0.031
1.5 0.0591	7.8 0.307	NRO.B1.5x7,8G2	0.108 0.238	0.1 0.004	0.6 0.024	0.8 0.031
1.5 0.0591	9.8 0.386	NRO.B1,5x9,8G2	0.136 0.300	0.1 0.004	0.6 0.024	0.8 0.031
1.5 0.0591	11.8 0.465	NRO.B1,5x11,8G2	0.164 0.362	0.1 0.004	0.6 0.024	0.8 0.031
1.5 0.0591	13.8 0.543	NRO.B1,5x13,8G2	0.191 0.421	0.1 0.004	0.6 0.024	0.8 0.031
2 0.0787	7.8 0.307	NRO.B2x7,8G2	0.190 0.419	0.2 0.008	0.6 0.024	0.8 0.031
2 0.0787	9.8 0.386	NRO.B2x9,8G2	0.240 0.529	0.2 0.008	0.6 0.024	0.8 0.031
2 0.0787	11.8 0.465	NRO.B2x11,8G2	0.290 0.639	0.2 0.008	0.6 0.024	0.8 0.031
2 0.0787	13.8 0.543	NRO.B2x13,8G2	0.340 0.750	0.2 0.008	0.6 0.024	0.8 0.031
2 0.0787	15.8 0.622	NRO.B2x15,8G2	0.390 0.860	0.2 0.008	0.6 0.024	0.8 0.031
2 0.0787	17.8 0.701	NRO.B2x17,8G2	0.440 0.970	0.2 0.008	0.6 0.024	0.8 0.031
2 0.0787	19.8 0.780	NRO.B2x19,8G2	0.490 1.080	0.2 0.008	0.6 0.024	0.8 0.031
2 0.0787	21.8 0.858	NRO.B2x21,8G2	0.540 1.190	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	7.8 0.307	NRO.B2,5x7,8G2	0.300 0.661	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	9.8 0.386	NRO.B2,5x9,8G2	0.380 0.838	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	11.8 0.465	NRO.B2,5x11,8G2	0.450 0.992	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	13.8 0.543	NRO.B2,5x13,8G2	0.530 1.168	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	15.8 0.622	NRO.B2,5x15,8G2	0.610 1.345	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	17.8 0.701	NRO.B2,5x17,8G2	0.690 1.521	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	19.8 0.780	NRO.B2,5x19,8G2	0.760 1.676	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	21.8 0.858	NRO.B2,5x21,8G2	0.840 1.852	0.2 0.008	0.6 0.024	0.8 0.031
2.5 0.0984	23.8 0.937	NRO.B2,5x23,8G2	0.920 2.028	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	9.8 0.386	NRO.B3x9,8G2	0.540 1.190	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	11.8 0.465	NRO.B3x11,8G2	0.650 1.433	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	13.8 0.543	NRO.B3x13,8G2	0.760 1.676	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	15.8 0.622	NRO.B3x15,8G2	0.870 1.918	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	17.8 0.701	NRO.B3x17,8G2	0.990 2.183	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	19.8 0.780	NRO.B3x19,8G2	1.100 2.425	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	21.8 0.858	NRO.B3x21,8G2	1.210 2.668	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	23.8 0.937	NRO.B3x23,8G2	1.320 2.910	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	25.8 1.016	NRO.B3x25,8G2	1.430 3.153	0.2 0.008	0.6 0.024	0.8 0.031
3 0.1181	27.8 1.094	NRO.B3x27,8G2	1.540 3.395	0.2 0.008	0.6 0.024	0.8 0.031
3.5 0.1378	11.8 0.465	NRO.B3,5x11,8G2	0.910 2.006	0.3 0.012	0.8 0.031	1.0 0.039
3.5 0.1378	13.8 0.543	NRO.B3,5x13,8G2	1.040 2.293	0.3 0.012	0.8 0.031	1.0 0.039
3.5 0.1378	15.8 0.622	NRO.B3,5x15,8G2	1.190 2.624	0.3 0.012	0.8 0.031	1.0 0.039
3.5 0.1378	17.8 0.701	NRO.B3,5x17,8G2	1.340 2.954	0.3 0.012	0.8 0.031	1.0 0.039
3.5 0.1378	21.8 0.858	NRO.B3,5x21,8G2	1.640 3.616	0.3 0.012	0.8 0.031	1.0 0.039
3.5 0.1378	23.8 0.937	NRO.B3,5x23,8G2	1.850 4.079	0.3 0.012	0.8 0.031	1.0 0.039
3.5 0.1378	25.8 1.016	NRO.B3,5x25,8G2	1.950 4.299	0.3 0.012	0.8 0.031	1.0 0.039
3.5 0.1378	29.8 1.173	NRO.B3,5x29,8G2	2.250 4.960	0.3 0.012	0.8 0.031	1.0 0.039
3.5 0.1378	34.8 1.370	NRO.B3,5x34,8G2	2.650 5.842	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	11.8 0.465	NRO.B4x11,8G2	1.600 3.527	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	13.8 0.543	NRO.B4x13,8G2	1.360 2.998	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	15.8 0.622	NRO.B4x15,8G2	1.550 3.417	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	17.8 0.701	NRO.B4x17,8G2	1.750 3.858	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	19.8 0.780	NRO.B4x19,8G2	1.950 4.299	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	21.8 0.858	NRO.B4x21,8G2	2.150 4.740	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	23.8 0.937	NRO.B4x23,8G2	2.350 5.181	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	25.8 1.016	NRO.B4x25,8G2	2.550 5.622	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	27.8 1.094	NRO.B4x27,8G2	2.740 6.041	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	29.8 1.173	NRO.B4x29,8G2	2.950 6.504	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	34.8 1.370	NRO.B4x34,8G2	3.400 7.496	0.3 0.012	0.8 0.031	1.0 0.039
4 0.1575	39.8 1.567	NRO.B4x39,8G2	3.900 8.598	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	15.8 0.622	NRO.B5x15,8G2	2.430 5.357	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	19.8 0.780	NRO.B5x19,8G2	3.050 6.724	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	21.8 0.858	NRO.B5x21,8G2	3.360 7.408	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	23.8 0.937	NRO.B5x23,8G2	3.670 8.091	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	25.8 1.016	NRO.B5x25,8G2	3.980 8.774	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	27.8 1.094	NRO.B5x27,8G2	4.290 9.458	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	29.8 1.173	NRO.B5x29,8G2	4.600 10.141	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	34.8 1.370	NRO.B5x34,8G2	5.400 11.905	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	39.8 1.567	NRO.B5x39,8G2	6.150 13.558	0.3 0.012	0.8 0.031	1.0 0.039
5 0.1969	49.8 1.961	NRO.B5x49,8G2	7.500 16.535	0.3 0.012	0.8 0.031	1.0 0.039
6 0.2362	17.8 0.701	NRO.B6x17,8G2	3.950 8.708	0.3 0.012	0.8 0.031	1.0 0.039

END FORM TOLERANCES

Table B8-3 specifies the applicable end configuration for rounded end and flat end needle rollers of all grades.

Table B8-3. End configuration limits for metric needle rollers

Rounded End Needle Rollers End Radius R_w[1] Min.	Rounded End Needle Rollers End Radius R_w[1] Max.	Nominal Diameters of Needle Roller D_w >	Nominal Diameters of Needle Roller D_w ≤	Flat End Needle Rollers Chamfer Dimension Limits (Dimensions in millimeters) $r_{s\ min.}$[1]	$r_{s\ max.}$ Radial	$r_{s\ max.}$ Axial
$\frac{D_w}{2}$	$\frac{L_w}{2}$	—	1	0.1	0.6	0.8
		1	1.5	0.1	0.6	0.8
		1.5	3	0.2	0.6	0.8
		3	6	0.3	0.8	1

[1] The chamfer of a needle roller shall clear a fillet radius equal to $r_{s\ min.}$, which should also be considered for designs using rounded end needle rollers.

NEEDLE ROLLER LENGTH TOLERANCE

Tolerances on the length L_w for needle rollers of all grades: h13, see Table B8-4.

Table B8-4. Tolerances for needle roller length, nominal metric needle rollers

Nominal Length, L_w mm >	Nominal Length, L_w mm ≤	Tolerance Limits mm (ISO h13) Max.	Tolerance Limits mm (ISO h13) Min.
3	6	0	-0.18
6	10	0	-0.22
10	18	0	-0.27
18	30	0	-0.33
30	50	0	-0.39

DESIGN CALCULATIONS FOR NEEDLE ROLLER BEARING COMPLEMENTS

In the majority of full complement needle roller applications, needle roller complements of less than 35 needle rollers per row and a ratio of length to diameter between 4:1 and 8:1, is advantageous. Other combinations of quantity and length-to-diameter ratios of needle rollers have been used successfully. Specific design requirements usually dictate the appropriate selection.

In general, needle roller complements for rotating motion should employ a smaller number of large diameter needle rollers, while needle roller complements subjected to oscillating motion (especially under high loads) should employ a large number of smaller diameter needle rollers.

Oscillating applications with small angular travel encourage the development of fretting corrosion. The best performance under these conditions has been achieved by using the largest practical number of small diameter needle rollers.

CALCULATION OF RACEWAY DIAMETERS

The calculation of inner and outer raceway diameters may be carried out using either the formula given in Table B8-5 on page B-8-10 or the raceway calculation form in Table B8-6 on page B-8-10. To assist the designer in making these calculations, the values of K, required for calculation of needle roller complements of six through 60 needle rollers, are listed in Table B8-7 on page B-8-10. Values of K, for other numbers of needle rollers, can be calculated using the formulas given in Table B8-5 on page B-8-10.

Table B8-8 on page B-8-11 lists the suggested values for minimum radial internal clearance ($G_{r\ min.}$) and the minimum circumferential clearance divided by π ($cc_{min.}/\pi$), to be used for calculating needle roller complements for normal rotating applications – where the speeds, loads and shaft deflections are moderate.

Applications with poor lubrication, unusual motion, large misalignment, raceway distortions, load reversals, high speeds, etc., cannot be characterized as normal rotating applications. These miscellaneous applications require adjustment of the minimum clearances, listed in Table B8-8 on page B-8-11. The factors in Table B8-9 on page B-8-11 may be used for general guidance in the adjustment of minimal clearances. For any of the listed miscellaneous applications or any application where abnormal factors such as those listed above exist, and particularly when the inner raceway diameter will exceed 50.000 mm (1.9685 in), consult your representative for design assistance.

Table B8-5. Design factors for needle rollers

Z	Number of needle rollers per bearing path
K	Chordal factor, K = 1/sin (180°/Z)
cc	Total circumferential clearance. See Tables B8-8 and B8-9 on page B-8-11 for cc_{min}/π values.
G_r	Radial internal clearance. See Tables B8-8 and B8-9 on page B-8-11 for $G_{r\,min}$ values
D_{pw}	Pitch diameter: $D_{pw} = KD_{w\,max.} + (cc_{min.}/\pi) = E_{min.} - D_{w\,max.}$ $= F_{max.} + G_{r\,min.} + D_{w\,max.}$
E	Outer raceway bore diameter: $E_{min.} = D_{pw} + D_{w\,max.} = (K + 1)D_{w\,max.} + (cc_{min.}/\pi)$ $= F_{max.} + G_{r\,min.} + 2D_{w\,max.}$
F	Inner raceway diameter: $F_{max.} = D_{pw} - D_{w\,max.} - G_{r\,min.}$ $= (K-1)D_{w\,max.} + (cc_{min.}/\pi) - G_{r\,min.}$ $= E_{min.} - 2D_{w\,max.} - G_{r\,min.}$
D_w	Nominal needle roller diameter
D_{we}	Needle roller diameter applicable in the calculation of load ratings: $D_{we} = D_{pw} - F_{max.} - G_{r\,min.} = \frac{D_{pw} - cc_{min.}/\pi}{K}$ $= \frac{F_{max.} + G_{r\,min.} - (cc_{min.}/\pi)}{(K-1)}$ $= E_{min.} - D_{pw} = \frac{E_{min.} - cc_{min.}/\pi}{(K+1)}$
L_w	Overall needle roller length
R_w	End radius, rounded-end needle roller
r_s	Corner rounding, flat-end needle roller
L_{we}	Needle roller length applicable in the calculation of load ratings, for rounded-end needle rollers: $L_{we} = L_{w\,max.} - (L_{w\,max.} - \sqrt{L_{w\,max.}^2 - D_{we}^2})$ For flat-end needle rollers: $L_{we} = L_{w\,max.} - (2r_{s\,min.})$

Note: If length of contact of the needle roller with the raceway is reduced because of undercuts, chamfers, etc. — L_{we} must be reduced correspondingly

RACEWAY DIAMETER TOLERANCES

Tables B8-10 and B8-11 on page B-8-11 lists the recommended tolerances that should be applied to the dimensions for the maximum inner raceway and minimum outer raceway diameter after they have been calculated using the information given in Table B8-5 or Table B8-6.

Table B8-6. Raceway calculation form

Step	Source	Design factor	**mm** (in)
1	Given	Dw, needle roller diameter	**3.000** max. (0.1181 max.)
2	Table B8-7	K, for 30 needle rollers	**9.56677**
3	(1)×(2)	KD_w	**28.700** (1.1299)
4	Table B8-8 on page B-8-11	cc_{min}/π = 0.127 mm (0.005 in)	**0.127** min. (0.005 min.)
5	(3) + (4)	Dpw pitch diameter	**28.827** (1.1349)
6	Given	Dw, needle roller diameter	**3.000** max. (0.1181 max.)
7	(5) - (6)		**25.827** (1.0168)
8	Table B8-8 on page B-8-11	Gr, radial clearance	**0.013** min. (0.0005 min.)
9	(7) - (8)	F, inner raceway diameter	**25.814** max. (1.0163 max.) **25.805** min.[1] (1.0159 min.)
10	(5) + (6)	E, outer raceway diameter	**31.827** min. (1.2530 min.) **31.843** max.[1] (1.2536 max.)

[1] Tolerance from Tables B8-10 and B8-11 on page B-8-11.

Table B8-7. K values

K values		K values		K values		K values		K values		K values	
Z	K	Z	K	Z	K	Z	K	Z	K	Z	K
6	2.00000	16	5.12583	26	8.29623	36	11.47371	46	14.65364	56	17.86471
7	2.30476	17	5.44219	27	8.61379	37	11.79163	47	14.97171	57	18.15285
8	2.61313	18	5.75877	28	8.93140	38	12.10957	48	15.28979	58	18.47100
9	2.92380	19	6.07553	29	9.24907	39	12.42752	49	15.60788	59	18.78916
10	3.23607	20	6.39245	30	9.56677	40	12.74549	50	15.92597	60	19.10732
11	3.54947	21	6.70951	31	9.88452	41	13.06348	51	16.24408		
12	3.86370	22	7.02667	32	10.20230	42	13.38149	52	16.56219		
13	4.17858	23	7.34394	33	10.52011	43	13.69951	53	16.88031		
14	4.49396	24	7.66130	34	10.83795	44	14.01754	54	17.19843		
15	4.80973	25	7.97873	35	11.15582	45	14.33559	55	17.51657		

CLEARANCES IN NEEDLE ROLLER COMPLEMENTS

Needle rollers, supplied in bulk, are generally used for full complement assemblies. Successful operation of a full complement of needle rollers not only requires careful selection of radial internal clearance, but more importantly, depends on proper circumferential clearance – or the total clearance between needle rollers.

Needle roller guidance, in a full complement assembly, depends largely on contact between needle rollers. Too little circumferential clearance causes overheating. Too much circumferential clearance in a heavily loaded full complement of needle rollers causes loss of needle roller guidance and results in needle roller skew and resultant end thrusting.

Control of radial clearance and circumferential clearance is influenced by the needle roller diameter tolerance, as well as the tolerances of the inner and outer raceway diameters.

Table B8-8. Minimum clearances, normal rotating applications

F Nominal Inner Raceway Diameter **mm** in		$CC_{min.}/\pi$	$G_{r\,min.}$
>	≤	**mm** in	**mm** in
- -	**3** 0.1181	**0.025** 0.0010	**0.006** 0.0002
3 0.1181	**6** 0.2362	**0.102** 0.0040	**0.008** 0.0003
6 0.2362	**10** 0.3937	**0.127** 0.0050	**0.009** 0.0004
10 0.3937	**18** 0.7087	**0.127** 0.0050	**0.011** 0.0004
18 0.7087	**30** 1.1811	**0.127** 0.0050	**0.013** 0.0005
30 1.1811	**50** 1.9685	**0.127** 0.0050	**0.016** 0.0006
50 1.9685	**80** 3.1496	**0.127** 0.0050	**0.019** 0.0007
80 3.1496	**120** 4.7244	**0.127** 0.0050	**0.022** 0.0009

Table B8-9. Minimum clearances, miscellaneous applications

Application	$cc_{min.}/\pi$	$G_{r\,min.}$
universal joint	$^1/_3$ • normal	$^1/_2$ • normal
transmission pilot	normal	3 • normal
constant mesh gear	0.2 • roller dia.	normal
transmission planet	normal	normal
crank pin for two cycle engine	5 • normal	7 • normal

END CLEARANCE

The total needle roller end clearance, or endplay, normally should be 0.20 mm (0.008 in) minimum per path of needle rollers.

Table B8-10. Recommended inner raceway diameter tolerances

F Nominal Inner Raceway Diameter **mm** in		Tolerance Limits (ISO h5) **mm** in	
>	≤	Max.	Min.
3 0.1181	**6** 0.2362	**0** 0	**-0.005** -0.0002
6 0.2362	**10** 0.3937	**0** 0	**-0.006** -0.0002
10 0.3937	**18** 0.7087	**0** 0	**-0.008** -0.0003
18 0.7087	**30** 1.1811	**0** 0	**-0.009** -0.0004
30 1.1811	**50** 1.9685	**0** 0	**-0.011** -0.0004
50 1.9685	**80** 3.1496	**0** 0	**-0.013** -0.0005
80 3.1496	**120** 4.7244	**0** 0	**-0.015** -0.0006

Table B8-11. Recommended outer raceway bore diameter tolerances

E Nominal Outer Raceway Bore Diameter **mm** in		Tolerance Limits (ISO H6) **mm** in	
>	≤	Max.	Min.
3 0.1181	**6** 0.2362	**0.008** 0.0003	**0** 0
6 0.2362	**10** 0.3937	**0.009** 0.0004	**0** 0
10 0.3937	**18** 0.7087	**0.011** 0.0004	**0** 0
18 0.7087	**30** 1.1811	**0.013** 0.0005	**0** 0
30 1.1811	**50** 1.9685	**0.016** 0.0006	**0** 0
50 1.9685	**80** 3.1496	**0.019** 0.0007	**0** 0
80 3.1496	**120** 4.7244	**0.022** 0.0009	**0** 0

LOAD RATING AND LIFE CALCULATIONS FOR FULL COMPLEMENTS OF NEEDLE ROLLERS

Before selecting the quantity and size of needle rollers to be used in a needle roller complement, it is usually necessary to calculate the load rating required using the applied load, speed and desired life. For a review of bearing size selection, see the engineering section of the this catalog.

Because it is not practical to tabulate the dynamic and static load ratings for the great number of needle roller complements that can be assembled by using different quantities, diameters and lengths of rollers, formulae are provided for the necessary calculations. See Tables B8-3 and B8-4 on page B-8-9 and Table B8-5 on page B-8-10 for calculation of Lwe.

For convenience, values of f_c and values of $Z^{3/4}$ have been combined into single factors ($f_c Z^{3/4}$). These factors, for a wide range of roller complements, are tabulated in Table B8-12.

Table B8-12. Values of fc $Z^{3/4}$ for metric units

Z	$f_c Z^{3/4}$ kN - units	Z	$f_c Z^{3/4}$ kN - units
	mm in		**mm** in
6	**0.267** 0.0105	34	**1.288** 0.0507
7	**0.336** 0.0132	35	**1.310** 0.0516
8	**0.400** 0.0158	36	**1.331** 0.0524
9	**0.459** 0.0181	37	**1.353** 0.0533
10	**0.514** 0.0202	38	**1.374** 0.0541
11	**0.565** 0.0222	39	**1.394** 0.0549
12	**0.613** 0.0241	40	**1.415** 0.0557
13	**0.658** 0.0259	41	**1.435** 0.0565
14	**0.701** 0.0276	42	**1.454** 0.0572
15	**0.742** 0.0292	43	**1.474** 0.0580
16	**0.781** 0.0308	44	**1.493** 0.0588
17	**0.818** 0.0322	45	**1.512** 0.0595
18	**0.853** 0.0336	46	**1.531** 0.0603
19	**0.887** 0.0349	47	**1.549** 0.0610
20	**0.919** 0.0362	48	**1.568** 0.0617
21	**0.951** 0.0374	49	**1.586** 0.0624
22	**0.981** 0.0386	50	**1.604** 0.0632
23	**1.011** 0.0398	51	**1.621** 0.0638
24	**1.039** 0.0409	52	**1.639** 0.0645
25	**1.067** 0.0420	53	**1.656** 0.0652
26	**1.094** 0.0430	54	**1.673** 0.0659
27	**1.120** 0.0441	55	**1.690** 0.0665
28	**1.145** 0.0451	56	**1.707** 0.0672
29	**1.170** 0.0461	57	**1.724** 0.0679
30	**1.195** 0.0471	58	**1.740** 0.0685
31	**1.219** 0.0480	59	**1.757** 0.0692
32	**1.242** 0.0489	60	**1.773** 0.0698
33	**1.265** 0.0498		

BASIC DYNAMIC LOAD RATINGS

The basic dynamic load rating C, for any roller bearing, can be calculated from the formula:

$$C = f_c(iL_{we}\cos\alpha)^{7/9} Z^{3/4} D_{we}^{29/27}$$

Where:

f_c = a factor which depends on the geometry of the bearing components, the accuracy to which the various components are made, and the material. Maximum values are listed in such standards as ISO 281 and USA ANSI-ABMA Standard 11.

i = number of rows of rollers in any one bearing.

α = nominal angle of contact. Since $\alpha = 0$ for a radial roller bearing, $\cos\alpha = 1$.

Other symbols are explained in Table B8-5 on page B-8-10.

For single-path radial roller bearings, where $i = 1$ and $\cos\alpha = 1$, the basic dynamic load rating formula can be written as:

$$C = f_c Z^{3/4} L_{we}^{7/9} D_{we}^{29/27}$$

Example:

Calculate the basic dynamic load rating for a full complement of 28 flat-end rollers, 3.000 mm (0.1181 in) diameter and 17.800 mm (0.7008 in) length.

$C = f_c Z^{3/4} L_{we}^{7/9} D_{we}^{29/27}$

$f_c Z^{3/4}$ from Table B8-12 on page B-8-12 = 1.145

$D_{we}^{29/27} = 3^{29/27} = 3.254$

L_{we} = 17.8- 0.4 = 17.4 mm (see Table B8-5 on page B-8-10)

$L_{we}^{7/9} = 17.4^{7/9} = 9.223$

$C = 1.145 \times 9.223 \times 3.254 = 34.4$ kN

When a couple load (overturning moment) is imposed on a single row of needle rollers, the resulting uneven distribution of load can seriously affect bearing life. In such cases, two rows of needle rollers are generally suggested.

Your representative should be consulted before a final selection of a needle roller complement is made.

BASIC STATIC LOAD RATING

The basic static load rating (C_0) for any roller bearing, including needle roller bearings, can be calculated from the following formula included in ISO 76, USA ANSI-ABMA Standard 11, and other Standards:

$$C_o = f_0\left(1 - \frac{D_{we}\cos\alpha}{D_{pw}}\right) i Z L_{we} D_{we} \cos\alpha$$

Where:

f_0 = 0.044 when kilo-newton and millimeter units are used.

D_{pw} = pitch diameter of the needle roller complement (mm).

i = number of rows of rollers in any one bearing.

α = nominal angle of contact. Since $\alpha = 0$ for radial roller bearing, $\cos\alpha = 1$.

The other symbols are described in Table B8-5 on page B-8-10.

NEEDLE ROLLERS – INCH SERIES

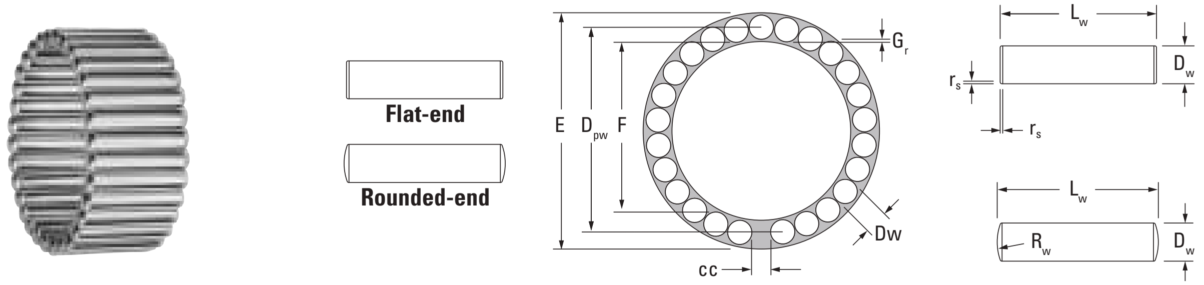


Fig. B8-2. Inch series needle rollers

INTRODUCTION

Before selecting a specific needle roller complement, the engineering section should be reviewed for detailed information concerning:

- Bearing type selection.
- Bearing life and reliability.
- Definition of load ratings.
- Life and load relationships.
- Effect of raceway hardness.
- Example of life calculation.
- Lubrication.
- Shaft design.
- Housing design.

In addition to these general considerations, material which follows should also be reviewed when selecting a needle roller complement.

Standard inch series needle rollers are furnished in two styles – rounded-end or the most economical design: flat-end. Materials, dimensions and tolerances for standard needle rollers are specified in this section.

When required, needle rollers having spherical ends, conical ends, trunnion ends or crank pin ends, as well as other end designs, can be furnished. Your representative should be consulted before final needle roller selection is made.

INCH SERIES – NEEDLE ROLLER DIMENSIONS

Needle rollers are made from rolling-bearing-quality steel hardened to 60-64 HRC or equivalent. Nominally inch needle rollers are given in Table B8-13. Your representative should be consulted for availability. The symbols used in Tables B8-13, as well as in subsequent tables and figures, are summarized in Table B8-14 on page B-8-16.

Needle rollers with rounded-ends permit the use of a more generous fillet between the raceway and the locating shoulder than is possible with flat-end rollers. Also, due to the length of the rounded-end, the possibility of the roller's cylindrical surface operating over the edge of the raceway is less – reducing the chance of occurrence of harmful stress concentrations. On the other hand, where design considerations permit their use, flat-end rollers achieve the maximum possible effective contact length between roller and raceway along with maximum load ratings and longer life.

Table B8-13. Preferred needle roller sizes

D_w	L_w																						
Nominal dia.	Nominal length																						
mm	**3.048**	**4.064**	**4.826**	**5.588**	**6.350**	**7.112**	**7.874**	**9.652**	**11.176**	**12.700**	**14.224**	**15.748**	**19.050**	**22.352**	**25.400**	**28.448**	**31.750**	**35.052**	**38.100**	**44.450**	**50.800**	**57.150**	**63.500**
in	0.12	0.16	0.19	0.22	0.25	0.28	0.31	0.38	0.44	0.5	0.56	0.62	0.75	0.88	1	1.12	1.25	1.38	1.5	1.75	2	2.25	2.5
1.588 0.0625					•	•	•	•	•	•	•	•	•										
1.984 0.0781							•	•	•	•	•	•	•	•									
2.383 0.0938								•	•	•	•	•	•	•	•								
3.175 0.1250										•	•	•	•	•	•	•	•	•					
3.967 0.1562												•	•	•	•	•	•	•	•				
4.763 0.1875													•	•	•	•	•	•	•	•			
5.558 0.2188														•	•	•	•	•	•	•	•		
6.350 0.2500															•	•	•	•	•	•	•	•	•

• Indicates preferred needle roller sizes. Consult with your representative.

CLEARANCES IN NEEDLE ROLLER COMPLEMENTS

Needle rollers, supplied in bulk, are generally used to assemble full complement bearings. Successful operation of a full complement of rollers not only requires careful selection of radial clearance, but more importantly, depends on proper circumferential clearance – or the total clearance between rollers.

Circumferential guidance in a full complement of needle rollers depends largely on roller-to-roller contact. Too little circumferential clearance causes overheating. Too much circumferential clearance, in a heavily loaded full complement of needle rollers, causes loss of roller guidance and results in roller skew and heavy end thrust.

Control of radial clearance and circumferential clearance is influenced by the roller diameter tolerance, as well as the tolerances of the inner and outer raceway diameters.

END CLEARANCE

The total needle roller end clearance, or endplay, normally should be 0.20 mm (0.008 in) minimum per path of needle rollers.

NOMINAL-INCH NEEDLE ROLLER TOLERANCES

Unless otherwise specified, inch needle rollers are normally manufactured with a tolerance of +0.000 mm -0.005 mm (+0.0000 in -0.0002 in). This tolerance has proven acceptable and ensures satisfactory control of circumferential clearance. The needle roller length tolerance may vary with the end configuration. The normal roller length tolerance for rounded-end rollers is +0.000 mm -0.508 mm (+0.0000 in -0.0200 in) .

JTEKT also manufactures needle rollers with 0.0025 mm (0.0001 in) diameter tolerance. These offer enhanced load-carrying capability and improved control of circumferential clearance. For needle rollers of greater precision, please consult with your representative.

Nominal dimensions for typical inch series needle rollers are shown in Table B8-13 on page B-8-14. JTEKT can supply rollers with smaller and larger length-to-diameter ratios for special applications. Rollers with dimensions other than those shown in Table B8-13 on page B-8-14 can be obtained, provided the quantities permit economical production. For example, although the largest needle rollers shown in Table B8-13 on page B-8-14 are 6.35 mm (0.2500 in) [the usual limits for needle rollers], JTEKT can produce quantities of rollers as large as 15.900 mm (0.6250 in) diameter.

Your representative should be contacted with the following information about the required needle rollers:

- Nominal metric or inch.
- Diameter and tolerance (e.g., 3.175 mm, + 0.000 mm, -0.005 mm [0.1250 in, + 0.0000 in, -0.0002 in]).
- Length and tolerance (e.g., 14.224 mm, + 0.000 mm, -0.508 mm [0.5600 in, + 0.0000 in, -0.0200 in]).
- End form (e.g., rounded-end or flat-end).
- Material (e.g., high-carbon chrome steel).
- Special features required (e.g., controlled stress).
- Quantity required.

DESIGN CALCULATIONS FOR NEEDLE ROLLER BEARING COMPLEMENTS

In the majority of full complement needle roller applications, roller complements of less than 35 needle rollers per row and a ratio of roller length to roller diameter between 8:1 and 4:1 is advantageous. Other combinations of quantity and length-to-diameter ratios of needle rollers have been used successfully. Specific design requirements usually dictate the appropriate selection.

In general, roller complements for rotating motion should employ a smaller number of larger-diameter needle rollers, while roller complements subjected to oscillating motion (especially under high loads) should employ a larger number of smaller-diameter needle rollers.

Oscillating applications with small angular travel encourage the development of fretting corrosion. The best performance under these conditions has been achieved by using the largest practical number of small-diameter needle rollers.

CALCULATION OF RACEWAY DIAMETERS

It may be convenient to use the Bearing Calculation Form in Table B8-15 on page B-8-16 to calculate the maximum inner raceway and the minimum outer raceway diameters of a bearing. The formula given in Table B8-14 on page B-8-16 can also be used. To assist the designer in making these calculations, the values of K, required for calculation of needle roller complements of 6 through 60 needle rollers, are listed in Table B8-18 on page B-8-17. Values of K for other numbers of needle rollers will be furnished on request or can be calculated from the formula given in Table B8-14 on page B-8-16.

Table B8-16 on page B-8-16 lists the suggested values for minimum radial clearance and ($G_{r\ min.}$) minimum circumferential clearance divided by π ($cc_{min./\pi}$), to be used for calculating needle roller complements for normal rotating applications where the speeds, loads and shaft deflections are moderate.

Applications with poor lubrication, unusual motion, large misalignment, raceway distortions, load reversals, high speeds, etc., can not be characterized as normal rotating applications. These miscellaneous applications require adjustment of the minimum clearances listed in Table B8-16 on page B-8-16. The factors in Tables B8-17 on page B-8-16 may be used for general guidance in the adjustment of the minimal clearances. For any of the listed miscellaneous applications or any application where abnormal factors such as those listed above exist – and particularly when the inner raceway diameter will exceed 50.800 mm (2.0000 in) – your representative should be consulted for design assistance.

Table B8-14. Design factors for needle rollers

Z	Number of needle rollers per bearing path
K	Chordal factor, $K = 1/\sin(180°/Z)$
cc	Total circumferential clearance. See Tables B8-16 and B8-17 for $cc_{min.}/\pi$ values.
G_r	Radial internal clearance. See Tables B8-16 and B8-17 for $G_{r\,min.}$ values
D_{pw}	Pitch diameter: $D_{pw} = KD_{w\,max.} + (cc_{min.}/\pi) = E_{min.} - D_{w\,max.}$ $= F_{max.} + G_{r\,min.} + D_{w\,max.}$
E	Outer raceway bore diameter: $E_{min.} = D_{pw} + D_{w\,max.} = (K+1)D_{w\,max.} + (cc_{min.}/\pi)$ $= F_{max.} + G_{r\,min.} + 2D_{w\,max.}$
F	Inner raceway diameter: $F_{max.} = D_{pw} - D_{w\,max.} - G_{r\,min.}$ $= (K-1)\,D_{w\,max.} + (cc_{min.}/\pi) - G_{r\,min.}$ $= E_{min.} - 2D_{w\,max.} - G_{r\,min.}$
D_w	Nominal needle roller diameter
D_{we}	Needle roller diameter applicable in the calculation of load ratings: $D_{we} = D_{pw} - F_{max.} - G_{r\,min.} = \dfrac{D_{pw} - cc_{min.}/\pi}{K}$ $= \dfrac{F_{max.} + G_{r\,min.} - (cc_{min.}/\pi)}{(K-1)}$ $= E_{min.} - D_{pw} = \dfrac{E_{min.} - cc_{min.}/\pi}{(K+1)}$
L_w	Overall needle roller length
R_w	End radius, rounded-end needle roller
r_s	Corner rounding, flat-end needle roller
L_{we}	Needle roller length applicable in the calculation of load ratings, for rounded-end needle rollers: $L_{we} = L_{w\,max.} - (0.4D_{we})$ For flat-end needle rollers: $L_{we} = L_{w\,max.} - (2r_{s\,min.})$

Note: If length of contact of the needle roller with the raceway is reduced because of undercuts, chamfers, etc. – L_{we} must be reduced correspondingly.

RACEWAY DIAMETER TOLERANCE LIMITS

Tables B8-19 and B8-20 on page B-8-17 lists the recommended tolerances that should be applied to the dimensions for the maximum inner raceway and the minimum outer raceway diameter after they have been calculated using the Bearing Calculation Form, Table B8-15.

Table B8-15. Bearing calculation form

Step	Source	Design factor	mm (in)	
1	Given	D_w, roller diameter	**3.175** (0.1250) max.	Min.
2	Table B8-18	K, for 30 rollers	**9.56677**	
3	(1)×(2)	KD_w	**30.374** (1.1958)	
4	Table B8-16	$cc_{min}/\pi = 0.127$ mm (0.005 in)	**0.127** (0.005) min.	Max.
5	(3) + (4)	D_{pw}, pitch diameter	**30.501** (1.2008)	
6	Given	D_w, roller diameter	**3.175** (0.1250) max.	Min.
7	(5) - (6)		**27.326** (1.0758)	
8	Table B8-16	G_r, radial clearance	**0.013** (0.0005) min.	Max.
9	(7) - (8)	F, inner raceway diameter	**27.349** (1.0753) max.	**27.340** (1.0749) min.(1)
10	(5) + (6)	E, outer raceway diameter	**33.676** (1.3258) min.	**33.692** (1.3264) max.(1)

(1) From Tables B8-19 and B8-20 on page B-8-17.

Table B8-16. Minimum clearances, normal rotating applications

F Nominal Inner Raceway Diameter mm **in**		$CC_{min.}/\pi$	$G_{r\,min.}$
>	≤	mm **in**	mm **in**
- **-**	3 **0.1181**	0.025 **0.0010**	0.006 **0.0002**
3 **0.1181**	6 **0.2362**	0.102 **0.0040**	0.008 **0.0003**
6 **0.2362**	10 **0.3937**	0.127 **0.0050**	0.009 **0.0004**
10 **0.3937**	18 **0.7087**	0.127 **0.0050**	0.011 **0.0004**
18 **0.7087**	30 **1.1811**	0.127 **0.0050**	0.013 **0.0005**
30 **1.1811**	50 **1.9685**	0.127 **0.0050**	0.016 **0.0006**
50 **1.9685**	80 **3.1496**	0.127 **0.0050**	0.019 **0.0007**
80 **3.1496**	120 **4.7244**	0.127 **0.0050**	0.022 **0.0009**

Table B8-17. Minimum clearances, miscellaneous applications

Application	$cc_{min.}/\pi$	$G_{r\,min.}$
universal joint	1/3 • normal	1/2 • normal
transmission pilot	normal	3 • normal
constant mesh gear	0.2 • roller dia.	normal
transmission planet	normal	normal
crank pin for two cycle engine	5 • normal	7 • normal

Table B8-18. K values

Z	K	Z	K	Z	K	Z	K
6	2.00000	21	6.70951	36	11.47371	51	16.24408
7	2.30476	22	7.02667	37	11.79163	52	16.56219
8	2.61313	23	7.34394	38	12.10957	53	16.88031
9	2.92380	24	7.66130	39	12.42752	54	17.19843
10	3.23607	25	7.97873	40	12.74549	55	17.51657
11	3.54947	26	8.29623	41	13.06348	56	17.83471
12	3.86370	27	8.61379	42	13.38149	57	18.15285
13	4.17858	28	8.93140	43	13.69951	58	18.47100
14	4.49396	29	9.24907	44	14.01754	59	18.78916
15	4.80973	30	9.56677	45	14.33559	60	19.10732
16	5.12583	31	9.88452	46	14.65364		
17	5.44219	32	10.20230	47	14.97171		
18	5.75877	33	10.52011	48	15.28979		
19	6.07553	34	10.83795	49	15.60788		
20	6.39245	35	11.15582	50	15.92597		

Table B8-19. Recommended inner raceway diameter tolerances

F Nominal Inner Raceway Diameter mm **in**		Tolerance Limits (ISO h5) mm **in**	
>	≤	Max.	Min.
3 **0.1181**	6 **0.2362**	0 **0**	-0.005 **-0.0002**
6 **0.2362**	10 **0.3937**	0 **0**	-0.006 **-0.0002**
10 **0.3937**	18 **0.7087**	0 **0**	-0.008 **-0.0003**
18 **0.7087**	30 **1.1811**	0 **0**	-0.009 **-0.0004**
30 **1.1811**	50 **1.9685**	0 **0**	-0.011 **-0.0004**
50 **1.9685**	80 **3.1496**	0 **0**	-0.013 **-0.0005**
80 **3.1496**	120 **4.7244**	0 **0**	-0.015 **-0.0006**

Table B8-20. Recommended outer raceway bore diameter tolerances

E Nominal Outer Raceway Bore Diameter mm **in**		Tolerance Limits (ISO H6) mm **in**	
>	≤	Max.	Min.
3 **0.1181**	6 **0.2362**	0.008 **0.0003**	0 **0**
6 **0.2362**	10 **0.3937**	0.009 **0.0004**	0 **0**
10 **0.3937**	18 **0.7087**	0.011 **0.0004**	0 **0**
18 **0.7087**	30 **1.1811**	0.013 **0.0005**	0 **0**
30 **1.1811**	50 **1.9685**	0.016 **0.0006**	0 **0**
50 **1.9685**	80 **3.1496**	0.019 **0.0007**	0 **0**
80 **3.1496**	120 **4.7244**	0.022 **0.0009**	0 **0**

KEYSTONED ROLLER ASSEMBLIES

Retention of the rollers in the outer raceway by keystoning can be helpful in assembly operations. The following formula may be used to check the bearing design to be sure that a given number of rollers, Z, will keystone.

$$YD_{w\,min.} > E_{max.} = \text{keystone condition}$$

That is, the product of the keystone constant Y, given below, and the minimum roller diameter $D_{w\,min.}$, must be greater than the maximum outer race bore, $E_{max.}$.

Roller complements with 14 or more rollers usually will not keystone unless steps are taken to reduce the circumferential clearance. It is suggested that your representative be consulted when designing a keystoned roller complement with 14 or more rollers.

Table B8-21. Keystone constant

Z	Y	Z	Y
8	3.67633	14	5.51128
9	3.97094	15	5.82467
10	4.27277	16	6.13885
11	4.57895	17	6.45365
12	4.88797	18	6.76893
13	5.19892	19	7.08461

LOAD RATING AND LIFE CALCULATIONS FOR FULL COMPLEMENTS OF NEEDLE ROLLERS

Before selecting the quantity and size of needle rollers to be used in a needle roller complement, it is usually necessary to calculate the load rating required using the applied load, speed and desired life.

Since it is not practical to tabulate the dynamic and static load ratings for the great number of needle roller complements that can be assembled by using different quantities, diameters and lengths of rollers, formulae are provided for the necessary calculations.

For convenience, values of f_c and values of $Z^{3/4}$ have been combined into single factors ($f_c Z^{3/4}$). These factors for a wide range of needle roller complements are contained in Table B8-22.

Table B8-22. Values of $f_c Z^{3/4}$ for inch units

Z	$f_c Z^{3/4}$ lbf - units
	in
6	24000
7	30200
8	35900
9	41200
10	46100
11	50700
12	55100
13	59100
14	63000
15	66600
16	70100
17	73400
18	76600
19	79700
20	82600
21	85400
22	88100
23	90800
24	93300
25	95800
26	98200
27	100600
28	102900
29	105100
30	107300
31	109500
32	111600
33	113600
34	115600
35	117600
36	119600
37	121500
38	123400
39	125200
40	127100
41	128900
42	130600
43	132400
44	134100
45	135800
46	137500
47	139200
48	140800
49	142400
50	144000
51	145600
52	147200
53	148800
54	150300
55	151800
56	153300
57	154800
58	156300
59	157800
60	159200

BASIC DYNAMIC LOAD RATINGS

The basic dynamic load rating, C, for any roller bearing can be calculated from the formula:

$$C = f_c (i\ L_w \cos\alpha)^{7/9} Z^{3/4} D_w^{29/27}$$

Where:

f_c = a factor which depends on the geometry of the bearing components, the accuracy to which the various components are made, and the material. Maximum values are listed in such standards as ISO 281 and USA ANSI-ABMA Standard 11.

i = number of rows of needle rollers in any one bearing.

α = nominal angle of contact. Since $\alpha = 0$ for a radial needle roller bearing, $\cos\alpha = 1$.

Other symbols are explained in Table B8-14 on page B-8-16.

For single-path radial needle roller bearings, where $i = 1$ and $\cos\alpha = 1$, the basic dynamic load rating formula can be written as:

$$C_r = f_c Z^{3/4} L_{we}^{7/9} D_w^{29/27}$$

Example:

Calculate the basic dynamic load rating in lbf for a full complement of 28 rounded-end rollers, 0.1250 inch diameter and 0.750 inch length.

$$C = f_c Z^{3/4} L_{we}^{7/9} D_{we}^{29/27}$$

$f_c Z^{3/4}$ from Table B8-22 = 102900

Where:

$D_{we}^{29/27} = 0.1250^{29/27} = 0.1072$

$L_{we} = 0.750 - (0.4)\ 0.1250 = 0.700$ (see Table B8-14 on page B-8-16)

$L_{we}^{7/9} = 0.700^{7/9} = 0.758$

$C = 102900 \times 0.1072 \times 0.758 = 8360$ lbf

When a couple load (overturning moment) is imposed on a single row of needle rollers, the resulting uneven distribution of load can seriously affect bearing life. In such cases, two rows of needle rollers are generally suggested.

Your representative should be consulted before a final selection of a needle roller complement is made.

BASIC STATIC LOAD RATING

The basic static load rating (C_0) for any roller bearing, including needle roller bearings, can be calculated from the following formula included in ISO 76, USA ANSI-ABMA Standard 11 and other Standards:

$$C_o = f_0 \left(1 - \frac{D_{we} \cos\alpha}{D_{pw}}\right) i Z L_{we} D_{we} \cos\alpha$$

Where:

f_0 = 6430 when pound-force and inch units are used

D_{pw} = pitch diameter of the needle roller complement (inch).

i = number of rows of rollers in any one bearing.

α = nominal angle of contact. Since $\alpha = 0$ for radial roller bearing, $\cos\alpha = 1$.

The other symbols are described in Table B8-14 on page B-8-16.

CYLINDRICAL ROLLERS – METRIC SERIES

JTEKT cylindrical rollers are made from bearing-quality steel and hardened to 58-65 HRC or equivalent. Nominal metric cylindrical rollers are sorted into gages based on the mean deviation from nominal diameter and nominal length. The relieved ends of the cylindrical rollers, when used in bearing complements, help to reduce stress concentration at the ends of rollers, both under misalignment or ideal alignment. This results in a more uniform stress distribution along the roller-raceway contact length and optimum bearing performance.

METRIC SERIES CYLINDRICAL ROLLER DIMENSIONS

Nominally metric cylindrical rollers conforming to DIN 5402 sheet 1 are shown in Table B8-23. Chamfer dimension limits of these cylindrical rollers with flat-ends are also shown in Table B8-23. The use of these chamfer limits results in the maximum possible effective contact length between roller and raceway, along with the already mentioned relieved ends, producing the maximum possible load ratings and longer life.

Each cylindrical roller gage is packed separately, and the mean deviations of diameter and length gages are shown on the package (below the roller designation).

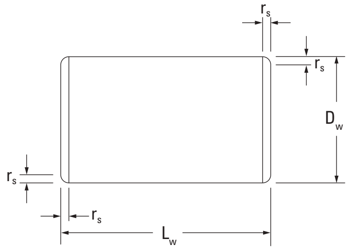


Fig. B8-3. Metric series cylindrical rollers

Table B8-23. Dimensions of metric series cylindrical rollers

D_w Nominal diameter	L_w Nominal length	$r_{s\ min.}$	$r_{s\ max.}$	Cylindrical roller designation	Wt. 100 pieces approx.
mm in	**mm** in	**mm** in	**mm** in		**kg** lbs
3 0.1181	**5** 0.1969	**0.2** 0.0079	**0.4** 0.0158	ZRO.3x5	**0.027** 0.060
3.5 0.1378	**5** 0.1969	**0.2** 0.0079	**0.4** 0.0158	ZRO.3,5x5	**0.037** 0.082
4 0.1575	**4** 0.1575	**0.2** 0.0079	**0.4** 0.0158	ZRO.4x4	**0.039** 0.086
4 0.1575	**6** 0.2362	**0.2** 0.0079	**0.4** 0.0158	ZRO.4x6	**0.058** 0.128
4 0.1575	**8** 0.3150	**0.2** 0.0079	**0.4** 0.0158	ZRO.4x8	**0.078** 0.172
5 0.1969	**5** 0.1969	**0.2** 0.0079	**0.6** 0.236	ZRO.5x5	**0.075** 0.165
5 0.1969	**8** 0.3150	**0.2** 0.0079	**0.6** 0.0236	ZRO.5x8	**0.121** 0.267
5.5 0.2165	**8** 0.3150	**0.2** 0.0079	**0.6** 0.0236	ZRO.5,5x8	**0.146** 0.322
6 0.2362	**6** 0.2362	**0.2** 0.0079	**0.6** 0.0236	ZRO.6x6	**0.13** 0.287
6 0.2362	**12** 0.4724	**0.2** 0.0079	**0.6** 0.0236	ZRO.6x12	**0.261** 0.575
6.5 0.2559	**9** 0.3543	**0.2** 0.0079	**0.6** 0.0236	ZRO.6,5x9	**0.23** 0.507
7 0.2756	**7** 0.2756	**0.2** 0.0079	**0.6** 0.0236	ZRO.7x7	**0.206** 0.454
7 0.2756	**10** 0.3937	**0.2** 0.0079	**0.6** 0.0236	ZRO.7x10	**0.296** 0.653
7 0.2756	**14** 0.5512	**0.2** 0.0079	**0.6** 0.0236	ZRO.7x14	**0.417** 0.919
7.5 0.2953	**7.5** 0.2953	**0.2** 0.0079	**0.6** 0.0236	ZRO.7,5x7.5	**0.254** 0.560
7.5 0.2953	**9** 0.3543	**0.2** 0.0079	**0.6** 0.0236	ZRO.7,5x9	**0.312** 0.688
7.5 0.2953	**11** 0.4331	**0.2** 0.0079	**0.6** 0.0236	ZRO.7,5x11	**0.374** 0.825
8 0.3150	**8** 0.3150	**0.2** 0.0079	**0.6** 0.0236	ZRO.8x8	**0.308** 0.679
8 0.3150	**12** 0.4724	**0.2** 0.0079	**0.6** 0.0236	ZRO.8x12	**0.465** 1.025
9 0.3543	**10** 0.3937	**0.3** 0.0118	**0.7** 0.0276	ZRO.9x10	**0.5** 1.102
9 0.3543	**14** 0.5512	**0.3** 0.0118	**0.7** 0.0276	ZRO.9x14	**0.68** 1.499
10 0.3937	**10** 0.3937	**0.3** 0.0118	**0.7** 0.0276	ZRO.10x10	**0.6** 1.323
10 0.3937	**11** 0.4331	**0.3** 0.0118	**0.7** 0.0276	ZRO.10x11	**0.68** 1.499
10 0.3937	**14** 0.5512	**0.3** 0.0118	**0.7** 0.0276	ZRO.10x14	**0.85** 1.874
11 0.4331	**15** 0.5906	**0.3** 0.0118	**0.7** 0.0276	ZRO.11x15	**1.1** 2.425
12 0.4724	**14** 0.5512	**0.3** 0.0118	**0.7** 00276	ZRO.12x14	**1.23** 2.712
13 0.5118	**20** 0.7874	**0.4** 0.0158	**0.8** 0.0315	ZRO.13x20	**2.04** 4.497
14 0.5512	**14** 0.5512	**0.4** 0.0158	**0.8** 0.0315	ZRO.14x14	**1.66** 3.660
14 0.5512	**20** 0.7874	**0.4** 0.0158	**0.8** 0.0315	ZRO.14x20	**2.38** 5.247

Note: Mass in accordance with DIN 5402.

EXAMPLE OF METRIC SERIES CYLINDRICAL ROLLER DESIGNATION AND PACKAGE MARKING:

ZRO.6 x 8
P0/M6
Nominal diameter: D_W = 6.000 mm
Nominal length: L_W = 8.000 mm
Mean deviation of the diameter +0.000 mm (see Table B8-24)
Mean deviation of the length -0.006 mm (see Table B8-25)
The actual finished diameter is between 5.999 and 6.001 mm
The actual finished length is between 7.991 and 7.997 mm

In the marking of the cylindrical roller gage, P identifies zero (0) or plus (+), M identifies minus (-). If a shipment of cylindrical rollers of the same size comprises several boxes, each box contains cylindrical rollers of the identical gage, although the gage may vary from box to box.

Table B8-24. Diameter and form accuracy of metric series cylindrical rollers

Nominal Diameter D_W		Total Diameter Deviation		Variation of Gage	Mean Deviation of Gage DIN/ISO 1101	Circularity Deviation
>	≤	Max.	Min.			Max.
mm	mm	µm	µm	µm	µm	µm
—	20	+7	-9	2	+6 +5 +4 +3 +2 +1 0 -1 -2 -3 -4 -5 -6 -7 -8	0.8

Table B8-25. Length gages of metric series cylindrical rollers

Nominal Diameter L_W		Total Length Deviation		Variation of Gage	ean Deviation of Gage	Axial Runout DIN/ISO 1101
>	≤	Max.	Min.			
mm	mm	µm	µm	µm	µm	µm
—	48	+9	-15	6	+6 0 -6 -12	6

INNER RINGS – METRIC SERIES

When it is impractical to meet the shaft raceway design requirements (hardness, surface finish, case depth, etc.) outlined in the engineering section of this catalog, standard inner rings may be used.

Inner rings are made of rolling bearing steel and after hardening, their bores, raceways and end surfaces are ground. Metric series inner rings may be used to provide inner raceway surfaces for metric series radial needle roller and cage assemblies, metric series needle roller bearings and metric series drawn cup needle roller bearings. The extended inner rings are suitable for use with bearings containing lip contact seals and for applications in which axial movement may be present.

CONSTRUCTION

Metric series inner rings are available with combinations of three primary design features. The inner rings may be purchased: without chamfers at the end of the raceway surface to allow for maximum possible raceway contact area, with lubrication holes to allow for increased lubrication to the bearing area, or with a profiled outer diameter for use in applications having a greater degree of misalignment. Table B8-26 outlines the features offered in the different series.

Table B8-26. Outline of features

Series	Lube Hole	Chamfers	Raceway Profile
JR		X	
JR.JS1	X	X	
JRZ.JS1	X		
IM		X	
IM...P		X	
IMC	X	X	
IM...R6		X	X

The lubrication holes are located nominally at the center of the inner ring width. The nominal diameters for the lubrication holes for inner rings listed in this section are shown in Table B8-27.

Table B8-27. Nominal diameters for the lubrication holes for inner ring

Series Designation	Inner Ring Bore Diameter		Nominal Lubrication Hole Diameter
	mm		mm
	>	≤	
JR.JS1 JRZ.JS1		20	2.0
	20	40	2.5
	40	80	3.0
	80		3.5
IMC	All catalogue parts		2.2

The BIC and BICG Series inner rings have chamfers and oil holes and are designed to be used with the full complement, metric, needle roller bearings of Series RNA1000, RNA2000 and RNA3000. These inner rings are intended for RNA bearings of the same number; for example a BIC2020 would be used with a RNA2020.

DIMENSIONAL ACCURACY

The tolerances of size, form, and runout for metric series inner rings meet the requirements of ISO normal tolerance class for radial bearings (see the engineering section of this catalog). Most metric series inner rings are produced with outer diameter raceway tolerance in accordance with h5 which, in most cases, is suitable for combining the metric series needle roller bearings to give the normal clearance class and for use with metric caged drawn cup bearings. An exception is the inner rings for metric, full complement drawn cup needle roller bearings; these inner rings are produced with outside diameter raceway tolerance in accordance with g5. Other raceway tolerances may also be found on inner rings for combining with needle roller bearings to give one of the clearance classes, or other specially requested radial internal clearance requirement.

Table B8-28 lists the dimensional accuracy of inner rings.

Table B8-28. Dimensional accuracy of inner ring

Part Designation	OD Tolerance	Other Feature Tolerances
JR & JRZ IM & IMC with P suffix	h5	ISO 492 Normal Tolerance Class
IM & IMC without P suffix	g5	Consult engineering
Series 49 (e.g. IM4901, IM4902)	Consult engineering	ISO 492 Normal Tolerance Class
Series IM 19000 & IM 20600	+0.000 / -0.005 mm	Consult engineering

MOUNTING OF INNER RINGS

Inner rings may be mounted on the shaft with either a loose transition fit or an interference fit. These fits, used in conjunction with the proper fit of the bearing outer ring, will provide the correct operating clearances for most applications.

Regardless of the fit of the inner ring on the shaft, the inner ring should be axially located by shaft shoulders or other positive means. The shaft shoulder diameter adjacent to the inner ring must not exceed the inner ring outer diameter (per suggestions on page B-4-9 of the metric series needle roller bearing section).

When metric series inner rings are to be used with the metric series needle roller bearings, appropriate shaft tolerances should be selected from Table B4-4 on page B-4-9 in the heavy-duty needle roller bearing section. When metric series inner rings are to be used with drawn- cup bearings, the suggested shaft tolerances are given in the "inner rings" discussion on page B-2-8 of the metric series drawn cup needle roller bearings section of this catalog.

INCH SERIES INNER RINGS

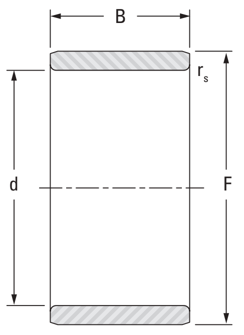
Inch series inner rings for use with inch series drawn cup bearings are tabulated on page B-2-74 of this catalog. See page B-4-54 for inch series inner rings for use with inch series heavy-duty needle roller bearings.

END WASHERS – METRIC SERIES

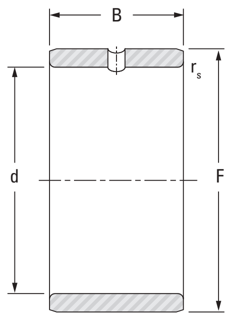
When the metric series radial needle roller and cage assembly used in series NAO and RNAO needle roller bearings without flanges cannot be axially located by suitable shoulders or side faces, end washers of series SNSH may be used. These end washers, which are made of spring steel, are designed to be guided in the housing bore. They are tabulated on page B-8-39.

INNER RINGS

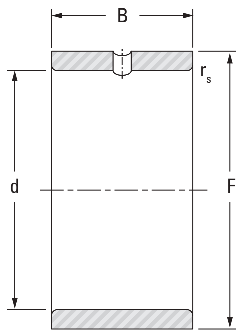
METRIC SERIES



JR, IM..P



JR.JS1



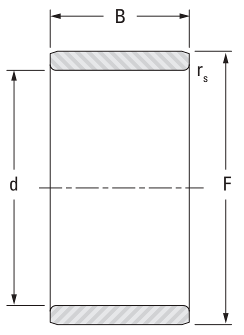
JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
5 0.1969	**5** 0.1969	**8** 0.3150	**8** 0.3150	**0.3** 0.01	JR5x8x8JS1	**0.002** 0.004
	5 0.1969	**8** 0.3150	**12** 0.4724	**0.3** 0.01	JR5x8x12	**0.003** 0.007
	5 0.1969	**8** 0.3150	**16** 0.630	**0.3** 0.01	JR5x8x16	**0.004** 0.009
6 0.2362	**6** 0.2362	**9** 0.3543	**8** 0.315	**0.3** 0.01	JR6x9x8JS1	**0.002** 0.004
	6 0.2362	**9** 0.3543	**12** 0.4724	**0.3** 0.01	JR6x9x12	**0.003** 0.007
	6 0.2362	**9** 0.3543	**16** 0.630	**0.3** 0.01	JR6x9x16	**0.004** 0.009
	6 0.2362	**10** 0.3937	**10** 0.394	**0.3** 0.01	JR6x10x10	**0.004** 0.009
	6 0.2362	**10** 0.3937	**10** 0.394	**0.3** 0.01	JR6x10x10JS1	**0.004** 0.009
	6 0.2362	**10** 0.3937	**12** 0.4724	**0.3** 0.01	JRZ6x10x12JS1	**0.005** 0.011
7 0.2756	**7** 0.2756	**10** 0.3937	**10.5** 0.413	**0.3** 0.01	JR7x10x10,5	**0.003** 0.007
	7 0.2756	**10** 0.3937	**12** 0.4724	**0.3** 0.01	JR7x10x12	**0.004** 0.009
	7 0.2756	**10** 0.3937	**16** 0.630	**0.3** 0.01	JR7x10x16	**0.005** 0.011
8 0.3150	**8** 0.3150	**12** 0.4724	**10** 0.394	**0.3** 0.01	JR8x12x10	**0.005** 0.011
	8 0.3150	**12** 0.4724	**10** 0.394	**0.3** 0.01	JR8x12x10JS1	**0.005** 0.011
	8 0.3150	**12** 0.4724	**10.5** 0.413	**0.3** 0.01	JR8x12x10,5	**0.005** 0.011
	8 0.3150	**12** 0.4724	**12** 0.472	**0.3** 0.01	JRZ8xl2x12JS1	**0.006** 0.013
	8 0.3150	**12** 0.4724	**12.5** 0.492	**0.3** 0.01	JR8x12x12,5	**0.006** 0.013
	8 0.3150	**12** 0.4724	**16** 0.630	**0.3** 0.01	IM 8 12 16 P	**0.007** 0.016
9 0.3543	**9** 0.3543	**12** 0.4724	**12** 0.4724	**0.3** 0.01	JR9x12x12	**0.005** 0.011
	9 0.3543	**12** 0.4724	**16** 0.630	**0.3** 0.01	JR9x12x16	**0.006** 0.013
10 0.3937	**10** 0.3937	**13** 0.5118	**12.5** 0.492	**0.3** 0.01	JR10x13x12,5	**0.005** 0.011
	10 0.3937	**14** 0.5512	**11** 0.433	**0.3** 0.01	JR10x14x11JS1	**0.007** 0.015
	10 0.3937	**14** 0.5512	**12** 0.4724	**0.3** 0.01	JR10x14x12	**0.007** 0.015
	10 0.3937	**14** 0.5512	**12** 0.4724	**0.3** 0.01	JR10x14x12JS1	**0.007** 0.015

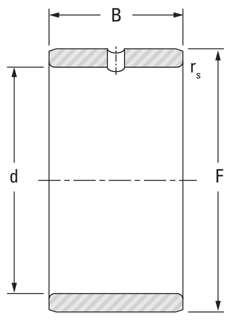
(1) See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS

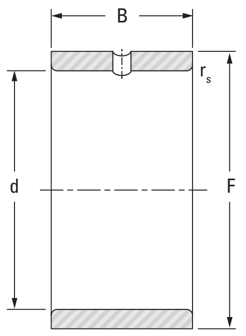
METRIC SERIES



JR, IM..P



JR.JS1



JRZ.JS1

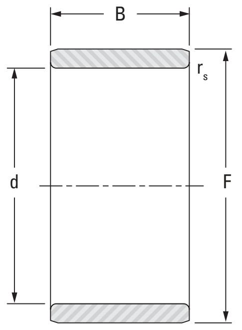
Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
10 0.3937	**10** 0.3937	**14** 0.5512	**13** 0.512	**0.3** 0.01	JR10x14x13	**0.007** 0.015
	10 0.3937	**14** 0.5512	**14** 0.551	**0.3** 0.01	JRZ10x14x14JS1	**0.008** 0.018
	10 0.3937	**14** 0.5512	**16** 0.630	**0.3** 0.01	JR10x14x16	**0.009** 0.020
	10 0.3937	**14** 0.5512	**20** 0.787	**0.3** 0.01	JR10x14x20	**0.012** 0.026
12 0.4724	**12** 0.4724	**15** 0.5906	**12.5** 0.492	**0.3** 0.01	JR12x15x12,5	**0.006** 0.013
	12 0.4724	**15** 0.5906	**16** 0.630	**0.3** 0.01	JR12x15x16	**0.008** 0.018
	12 0.4724	**15** 0.5906	**16.5** 0.650	**0.3** 0.01	JR12x15x16,5	**0.008** 0.018
	12 0.4724	**15** 0.5906	**18.5** 0.728	**0.3** 0.01	JR12x15x18,5	**0.009** 0.020
	12 0.4724	**15** 0.5906	**22.4** 0.882	**0.2** 0.01	IM 12 15 22,4 P	**0.011** 0.024
	12 0.4724	**15** 0.5906	**22.5** 0.886	**0.3** 0.01	JR12x15x22,5	**0.011** 0.024
	12 0.4724	**16** 0.6299	**12** 0.472	**0.3** 0.01	JR12x16x12	**0.008** 0.018
	12 0.4724	**16** 0.6299	**12** 0.472	**0.3** 0.01	JR12x16x12JS1	**0.008** 0.018
	12 0.4724	**16** 0.6299	**13** 0.512	**0.3** 0.01	JR12x16x13	**0.008** 0.018
	12 0.4724	**16** 0.6299	**14** 0.551	**0.3** 0.01	JRZ12x16x14JS1	**0.010** 0.022
	12 0.4724	**16** 0.6299	**16** 0.630	**0.3** 0.01	JR12x16x16	**0.011** 0.024
	12 0.4724	**16** 0.6299	**20** 0.787	**0.3** 0.01	JR12x16x20	**0.014** 0.031
	12 0.4724	**16** 0.6299	**22** 0.866	**0.3** 0.01	JR12x16x22	**0.015** 0.033
13 0.5118	**13** 0.5118	**18** 0.7087	**16** 0.630	**0.35** 0.014	IM 13 18 16 P	**0.015** 0.033
14 0.5512	**14** 0.5512	**17** 0.6693	**17** 0.669	**0.3** 0.01	JR14x17x17	**0.009** 0.020
15 0.5906	**15** 0.5906	**18** 0.7087	**16.5** 0.650	**0.3** 0.01	JR15x18x16,5	**0.010** 0.022
	15 0.5906	**19** 0.7480	**16** 0.630	**0.3** 0.01	JR15x19x16	**0.013** 0.029
	15 0.5906	**19** 0.7480	**20** 0.787	**0.3** 0.01	JR15x19x20	**0.017** 0.037
	15 0.5906	**20** 0.7874	**12** 0.472	**0.3** 0.01	JR15x20x12	**0.012** 0.026
	15 0.5906	**20** 0.7874	**12** 0.472	**0.3** 0.01	JR15x20x12JS1	**0.012** 0.026

(1) See Table B8-28 on page B-8-21 for outside diameter tolerance.

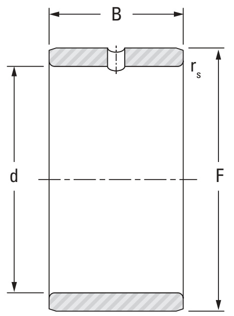
Continued on next page.

INNER RINGS

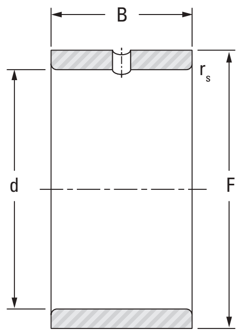
METRIC SERIES



JR, IM..P



JR.JS1



JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
15 0.5906	**15** 0.5906	**20** 0.7874	**13** 0.512	**0.3** 0.01	JR15x20x13	**0.014** 0.031
	15 0.5906	**20** 0.7874	**14** 0.551	**0.3** 0.01	JRZ15x20x14JS1	**0.015** 0.033
	15 0.5906	**20** 0.7874	**16** 0.630	**0.3** 0.01	JR15x20x16	**0.017** 0.037
	15 0.5906	**20** 0.7874	**20** 0.787	**0.35** 0.014	IM 15 20 20 P	**0.021** 0.045
	15 0.5906	**20** 0.7874	**23** 0.906	**0.3** 0.01	JR15x20x23	**0.025** 0.055
	15 0.5906	**20** 0.7874	**26** 1.024	**0.3** 0.01	JR15x20x26	**0.028** 0.062
17 0.6693	**17** 0.6693	**20** 0.7874	**16.5** 0.650	**0.3** 0.01	JR17x20x16,5	**0.011** 0.024
	17 0.6693	**20** 0.7874	**20** 0.787	**0.3** 0.01	JR17x20x20	**0.014** 0.031
	17 0.6693	**20** 0.7874	**20.5** 0.807	**0.3** 0.01	JR17x20x20,5	**0.014** 0.031
	17 0.6693	**20** 0.7874	**30.5** 1.201	**0.3** 0.01	JR17x20x30,5	**0.021** 0.046
	17 0.6693	**21** 0.8268	**16** 0.630	**0.3** 0.01	JR17x21x16	**0.015** 0.033
	17 0.6693	**21** 0.8268	**20** 0.787	**0.3** 0.01	JR17x21x20	**0.019** 0.042
	17 0.6693	**22** 0.8661	**13** 0.512	**0.3** 0.01	JR17x22x13	**0.015** 0.033
	17 0.6693	**22** 0.8661	**13** 0.512	**0.35** 0.014	IM 4903	**0.015** 0.033
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JR17x22x16	**0.019** 0.042
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JR17x22x16JS1	**0.019** 0.042
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JRZ17x22x16JS1	**0.019** 0.042
	17 0.6693	**22** 0.8661	**20** 0.787	**0.35** 0.014	IM 17 22 20 P	**0.023** 0.051
	17 0.6693	**22** 0.8661	**23** 0.906	**0.3** 0.01	JR17x22x23	**0.028** 0.062
	17 0.6693	**22** 0.8661	**26** 1.024	**0.3** 0.01	JR17x22x26	**0.031** 0.068
	17 0.6693	**22** 0.8661	**32** 1.260	**0.3** 0.01	JR17x22x32	**0.038** 0.084
20 0.7874	**20** 0.7874	**24** 0.9449	**16** 0.630	**0.3** 0.01	JR20x24x16	**0.018** 0.040
	20 0.7874	**24** 0.9449	**20** 0.787	**0.3** 0.01	JR20x24x20	**0.022** 0.049
	20 0.7874	**25** 0.9843	**16** 0.630	**0.3** 0.01	JR20x25x16	**0.022** 0.049

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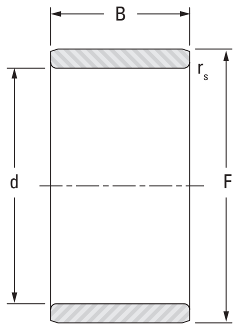
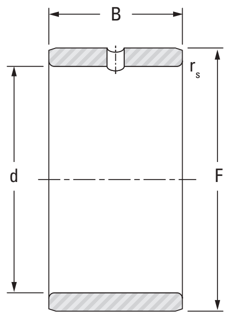
[1] See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS

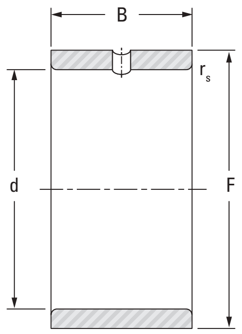
METRIC SERIES



JR, IM..P



JR.JS1



JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
20 0.7874	**20** 0.7874	**25** 0.9843	**16** 0.630	**0.3** 0.01	JR20x25x16JS1	**0.022** 0.049
	20 0.7874	**25** 0.9843	**17** 0.669	**0.3** 0.01	JR20x25x17	**0.023** 0.051
	20 0.7874	**25** 0.9843	**18** 0.709	**0.3** 0.01	JRZ20x25x18JS1	**0.025** 0.055
	20 0.7874	**25** 0.9843	**20** 0.787	**0.3** 0.01	JR20x25x20	**0.028** 0.062
	20 0.7874	**25** 0.9843	**20.5** 0.807	**0.3** 0.01	JR20x25x20,5	**0.029** 0.064
	20 0.7874	**25** 0.9843	**26** 1.024	**0.3** 0.01	JR20x25x26	**0.036** 0.079
	20 0.7874	**25** 0.9843	**26.5** 1.043	**0.3** 0.01	JR20x25x26,5	**0.037** 0.082
	20 0.7874	**25** 0.9843	**30** 1.181	**0.3** 0.01	JR20x25x30	**0.042** 0.093
	20 0.7874	**25** 0.9843	**32** 1.260	**0.3** 0.01	JR20x25x32	**0.044** 0.097
	20 0.7874	**25** 0.9843	**38.5** 1.516	**0.3** 0.01	JR20x25x38,5	**0.054** 0.119
22 0.8661	**22** 0.8661	**26** 1.0236	**16** 0.630	**0.3** 0.01	JR22x26x16	**0.019** 0.042
	22 0.8661	**26** 1.0236	**20** 0.787	**0.3** 0.01	JR22x26x20	**0.023** 0.051
	22 0.8661	**28** 1.1024	**17** 0.669	**0.3** 0.01	JR22x28x17	**0.030** 0.066
	22 0.8661	**28** 1.1024	**20.5** 0.807	**0.3** 0.01	JR22x28x20,5	**0.038** 0.084
	22 0.8661	**28** 1.1024	**30** 1.181	**0.3** 0.01	JR22x28x30	**0.056** 0.123
23 0.9055	**23** 0.9055	**28** 1.1024	**20** 0.787	**0.35** 0.014	IM 23 28 20 P	**0.030** 0.066
25 0.9843	**25** 0.9843	**29** 1.1417	**20** 0.787	**0.3** 0.01	JR25x29x20	**0.027** 0.060
	25 0.9843	**29** 1.1417	**30** 1.181	**0.3** 0.01	JR25x29x30	**0.040** 0.088
	25 0.9843	**30** 1.1811	**16** 0.630	**0.3** 0.01	JR25x30x16	**0.027** 0.060
	25 0.9843	**30** 1.1811	**16** 0.630	**0.3** 0.01	JR25x30x16JS1	**0.027** 0.060
	25 0.9843	**30** 1.1811	**17** 0.669	**0.3** 0.01	JR25x30x17	**0.028** 0.062
	25 0.9843	**30** 1.1811	**18** 0.709	**0.3** 0.01	JRZ25x30x18JS1	**0.031** 0.068
	25 0.9843	**30** 1.1811	**20** 0.787	**0.3** 0.01	JR25x30x20	**0.034** 0.075
	25 0.9843	**30** 1.1811	**20.5** 0.807	**0.3** 0.01	JR25x30x20,5	**0.035** 0.077

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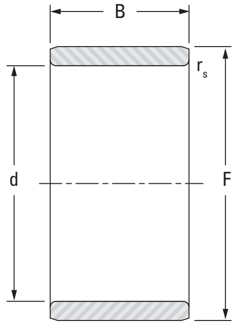
[1] See Table B8-28 on page B-8-21 for outside diameter tolerance.

Continued on next page.

INNER RINGS

METRIC SERIES



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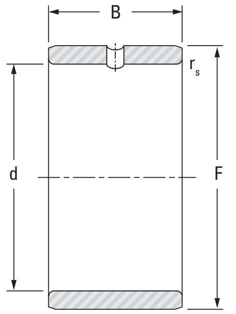
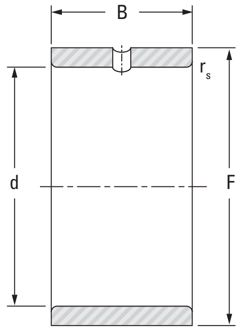


JR.JS1



JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
25 0.9843	**25** 0.9843	**30** 1.1811	**26** 1.024	**0.3** 0.01	JR25x30x26	**0.044** 0.097
	25 0.9843	**30** 1.1811	**26.5** 1.043	**0.3** 0.01	JR25x30x26,5	**0.045** 0.099
	25 0.9843	**30** 1.1811	**30** 1.181	**0.3** 0.01	JR25x30x30	**0.051** 0.112
	25 0.9843	**30** 1.1811	**32** 1.260	**0.3** 0.01	JR25x30x32	**0.054** 0.119
	25 0.9843	**30** 1.1811	**38.5** 1.516	**0.3** 0.01	JR25x30x38,5	**0.066** 0.146
28 1.1024	**28** 1.1024	**32** 1.2598	**17** 0.669	**0.3** 0.01	JR28x32x17	**0.028** 0.062
	28 1.1024	**32** 1.2598	**20** 0.787	**0.3** 0.01	JR28x32x20	**0.030** 0.066
	28 1.1024	**32** 1.2598	**30** 1.181	**0.3** 0.01	JR28x32x30	**0.044** 0.097
30 1.1811	**30** 1.1811	**35** 1.3780	**16** 0.630	**0.3** 0.01	JR30x35x16	**0.031** 0.068
	30 1.1811	**35** 1.3780	**17** 0.669	**0.3** 0.01	JR30x35x17	**0.033** 0.073
	30 1.1811	**35** 1.3780	**17** 0.669	**0.35** 0.014	IM 4906	**0.033** 0.073
	30 1.1811	**35** 1.3780	**18** 0.709	**0.3** 0.01	JRZ30x35x18JS1	**0.036** 0.079
	30 1.1811	**35** 1.3780	**20** 0.787	**0.3** 0.01	JR30x35x20	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20** 0.787	**0.3** 0.01	JRZ30x35x20JS1	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20.5** 0.807	**0.3** 0.01	JR30x35x20,5	**0.040** 0.088
	30 1.1811	**35** 1.3780	**26** 1.024	**0.3** 0.01	JR30x35x26	**0.054** 0.119
	30 1.1811	**35** 1.3780	**30** 1.181	**0.3** 0.01	JR30x35x30	**0.057** 0.126
	30 1.1811	**35** 1.3780	**32** 1.260	**0.3** 0.01	JR30x35x32	**0.062** 0.137
	30 1.1811	**38** 1.4961	**20** 0.787	**0.6** 0.02	JR30x38x20JS1	**0.067** 0.148
32 1.2598	**32** 1.2598	**37** 1.4567	**20** 0.787	**0.3** 0.01	JR32x37x20	**0.043** 0.095
	32 1.2598	**37** 1.4567	**30** 1.181	**0.3** 0.01	JR32x37x30	**0.064** 0.141
	32 1.2598	**40** 1.5748	**20** 0.787	**0.6** 0.02	JR32x40x20	**0.069** 0.152
	32 1.2598	**40** 1.5748	**36** 1.417	**0.6** 0.02	JR32x40x36	**0.128** 0.282
35 1.3780	**35** 1.3780	**40** 1.5748	**17** 0.669	**0.3** 0.01	JR35x40x17	**0.040** 0.088

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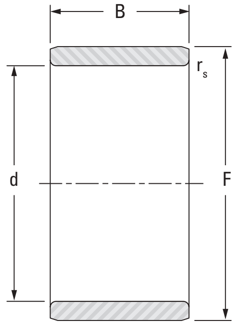
[1] See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS

METRIC SERIES



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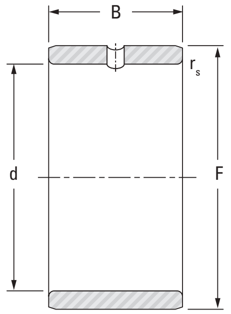
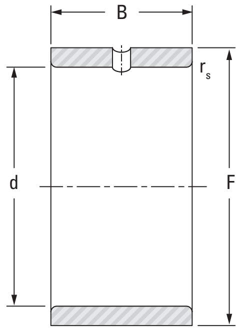


JR.JS1



JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
35 1.3780	**35** 1.3780	**40** 1.5748	**20** 0.787	**0.3** 0.01	JR35x40x20	**0.046** 0.101
	35 1.3780	**40** 1.5748	**20.5** 0.807	**0.3** 0.01	JR35x40x20,5	**0.049** 0.108
	35 1.3780	**40** 1.5748	**22** 0.866	**0.3** 0.01	JR35x40x22	**0.052** 0.115
	35 1.3780	**40** 1.5748	**30** 1.181	**0.3** 0.01	JR35x40x30	**0.071** 0.157
	35 1.3780	**40** 1.5748	**34** 1.339	**0.3** 0.01	JR35x40x34	**0.080** 0.176
	35 1.3780	**40** 1.5748	**40** 1.575	**0.3** 0.01	JR35x40x40	**0.094** 0.207
	35 1.3780	**42** 1.6535	**20** 0.787	**0.6** 0.02	JR35x42x20	**0.065** 0.143
	35 1.3780	**42** 1.6535	**20** 0.787	**0.6** 0.02	JR35x42x20JS1	**0.065** 0.143
	35 1.3780	**42** 1.6535	**23** 0.906	**0.6** 0.02	JRZ35x42x23JS1	**0.074** 0.163
	35 1.3780	**42** 1.6535	**36** 1.417	**0.6** 0.02	JR35x42x36	**0.122** 0.269
	35 1.3780	**44** 1.7323	**22** 0.866	**0.6** 0.02	JR35x44x22	**0.097** 0.214
37 1.4567	**37** 1.4567	**42** 1.6535	**20** 0.787	**0.35** 0.014	IM 37 42 20 P	**0.046** 0.101
38 1.4961	**38** 1.4961	**43** 1.6929	**20** 0.787	**0.3** 0.01	JR38x43x20	**0.050** 0.110
	38 1.4961	**43** 1.6929	**30** 1.181	**0.3** 0.01	JR38x43x30	**0.075** 0.165
40 1.5748	**40** 1.5748	**45** 1.7717	**17** 0.669	**0.3** 0.01	JR40x45x17	**0.044** 0.097
	40 1.5748	**45** 1.7717	**20** 0.787	**0.3** 0.01	JR40x45x20	**0.052** 0.115
	40 1.5748	**45** 1.7717	**20.5** 0.807	**0.3** 0.01	JR40x45x20,5	**0.054** 0.119
	40 1.5748	**45** 1.7717	**25** 0.984	**0.35** 0.014	IM 40 45 25 P	**0.062** 0.137
	40 1.5748	**45** 1.7717	**30** 1.181	**0.3** 0.01	JR40x45x30	**0.078** 0.172
	40 1.5748	**45** 1.7717	**34** 1.339	**0.3** 0.01	JR40x45x34	**0.089** 0.196
	40 1.5748	**45** 1.7717	**40** 1.575	**0.3** 0.01	JR40x45x40	**0.115** 0.254
	40 1.5748	**48** 1.8898	**22** 0.866	**0.6** 0.02	JR40x48x22	**0.094** 0.207
	40 1.5748	**48** 1.8898	**23** 0.906	**0.6** 0.02	JRZ40x48x23JS1	**0.100** 0.220
	40 1.5748	**48** 1.8898	**40** 1.575	**0.6** 0.02	JR40x48x40	**0.173** 0.381

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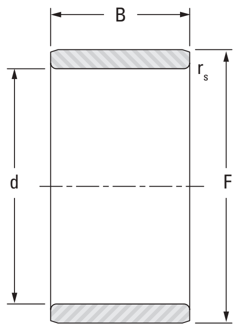
[1] See Table B8-28 on page B-8-21 for outside diameter tolerance.

Continued on next page.

INNER RINGS

METRIC SERIES



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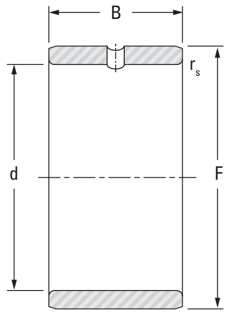
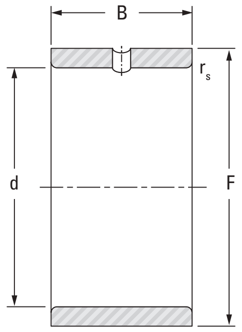


JR.JS1



JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
40 1.5748	**40** 1.5748	**50** 1.9685	**20** 0.787	**1** 0.04	JR40x50x20	**0.110** 0.243
42 1.6535	**42** 1.6535	**47** 1.8504	**20** 0.787	**0.3** 0.01	JR42x47x20	**0.055** 0.121
	42 1.6535	**47** 1.8504	**30** 1.181	**0.3** 0.01	JR42x47x30	**0.083** 0.183
45 1.7717	**45** 1.7717	**50** 1.9685	**20** 0.787	**0.3** 0.01	JR45x50x20	**0.058** 0.128
	45 1.7717	**50** 1.9685	**25** 0.984	**0.6** 0.02	JR45x50x25	**0.073** 0.161
	45 1.7717	**50** 1.9685	**25.5** 1.004	**0.3** 0.01	JR45x50x25,5	**0.075** 0.165
	45 1.7717	**50** 1.9685	**35** 1.378	**0.6** 0.02	JR45x50x35	**0.103** 0.227
	45 1.7717	**50** 1.9685	**40** 1.575	**0.3** 0.01	JR45x50x40	**0.117** 0.258
	45 1.7717	**52** 2.0472	**22** 0.866	**0.6** 0.02	JR45x52x22	**0.090** 0.198
	45 1.7717	**52** 2.0472	**22** 0.866	**0.85** 0.033	IM 4909	**0.087** 0.192
	45 1.7717	**52** 2.0472	**23** 0.906	**0.6** 0.02	JR45x52x23	**0.096** 0.212
	45 1.7717	**52** 2.0472	**23** 0.906	**0.6** 0.02	JRZ45x52x23JS1	**0.096** 0.212
	45 1.7717	**52** 2.0472	**40** 1.575	**0.6** 0.02	JR45x52x40	**0.167** 0.368
	45 1.7717	**55** 2.1654	**20** 0.787	**1** 0.04	JR45x55x20	**0.133** 0.293
	45 1.7717	**55** 2.1654	**20** 0.787	**1** 0.04	JR45x55x20JS1	**0.133** 0.293
	45 1.7717	**55** 2.1654	**22** 0.866	**1** 0.04	JR45x55x22	**0.135** 0.298
	45 1.7717	**55** 2.1654	**40** 1.575	**1** 0.04	JR45x55x40	**0.247** 0.545
50 1.9685	**50** 1.9685	**55** 2.1654	**20** 0.787	**0.3** 0.01	JR50x55x20	**0.065** 0.143
	50 1.9685	**55** 2.1654	**25** 0.984	**0.6** 0.02	JR50x55x25	**0.081** 0.179
	50 1.9685	**55** 2.1654	**35** 1.378	**0.65** 0.026	IM 50 55 35 P	**0.107** 0.236
	50 1.9685	**55** 2.1654	**35** 1.378	**0.6** 0.02	JR50x55x35	**0.113** 0.249
	50 1.9685	**55** 2.1654	**40** 1.575	**0.3** 0.01	JR50x55x40	**0.130** 0.287
	50 1.9685	**58** 2.2835	**22** 0.866	**0.6** 0.02	JR50x58x22	**0.117** 0.258
	50 1.9685	**58** 2.2835	**23** 0.906	**0.6** 0.02	JRZ50x58x23JS1	**0.122** 0.269

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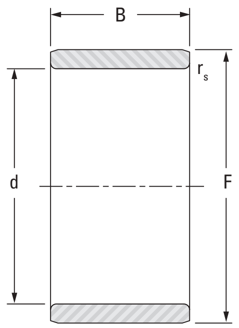
(1) See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS

METRIC SERIES



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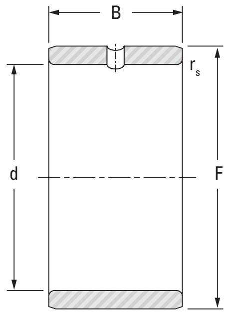
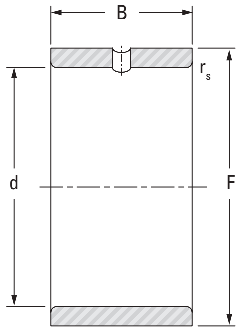


JR.JS1



JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
50 1.9685	**50** 1.9685	**58** 2.2835	**40** 1.575	**0.6** 0.02	JR50x58x40	**0.213** 0.470
	50 1.9685	**60** 2.3622	**20** 0.787	**1** 0.04	JR50x60x20	**0.155** 0.342
	50 1.9685	**60** 2.3622	**20** 0.787	**1** 0.04	JR50x60x20JS1	**0.155** 0.342
	50 1.9685	**60** 2.3622	**25** 0.984	**1** 0.04	JR50x60x25	**0.170** 0.375
	50 1.9685	**60** 2.3622	**40** 1.575	**1** 0.04	JR50x60x40	**0.310** 0.683
55 2.1654	**55** 2.1654	**60** 2.3622	**25** 0.984	**0.6** 0.02	JR55x60x25	**0.088** 0.194
	55 2.1654	**60** 2.3622	**35** 1.378	**0.65** 0.026	IM 55 60 35 P	**0.118** 0.260
	55 2.1654	**60** 2.3622	**35** 1.378	**0.6** 0.02	JR55x60x35	**0.124** 0.273
	55 2.1654	**63** 2.4803	**25** 0.984	**1** 0.04	JR55x63x25	**0.141** 0.311
	55 2.1654	**63** 2.4803	**45** 1.772	**1** 0.04	JR55x63x45	**0.286** 0.631
	55 2.1654	**65** 2.5591	**30** 1.181	**1** 0.04	JR55x65x30	**0.222** 0.489
	55 2.1654	**65** 2.5591	**60** 2.362	**1** 0.04	JR55x65x60	**0.444** 0.979
58 2.2835	**58** 2.2835	**65** 2.5591	**25** 0.984	**0.85** 0.033	IM 58 65 25 P	**0.125** 0.276
60 2.3622	**60** 2.3622	**68** 2.6772	**25** 0.984	**0.6** 0.02	JR60x68x25	**0.153** 0.337
	60 2.3622	**68** 2.6772	**35** 1.378	**0.6** 0.02	JR60x68x35	**0.220** 0.485
	60 2.3622	**68** 2.6772	**45** 1.772	**1** 0.04	JR60x68x45	**0.284** 0.626
	60 2.3622	**70** 2.7559	**25** 0.984	**1** 0.04	JR60x70x25	**0.200** 0.441
	60 2.3622	**70** 2.7559	**30** 1.181	**1** 0.04	JR60x70x30	**0.240** 0.529
	60 2.3622	**70** 2.7559	**35** 1.378	**0.85** 0.033	IM 60 70 35 P	**0.280** 0.616
	60 2.3622	**70** 2.7559	**60** 2.362	**1** 0.04	JR60x70x60	**0.480** 1.058
65 2.5591	**65** 2.5591	**72** 2.8346	**25** 0.984	**1** 0.04	JR65x72x25	**0.143** 0.315
	65 2.5591	**72** 2.8346	**45** 1.772	**1** 0.04	JR65x72x45	**0.266** 0.586
65 2.5591	**65** 2.5591	**73** 2.8740	**25** 0.984	**0.6** 0.02	JR65x73x25	**0.170** 0.375
	65 2.5591	**73** 2.8740	**35** 1.378	**0.6** 0.02	JR65x73x35	**0.240** 0.529

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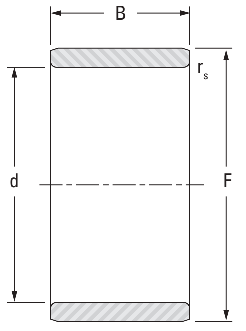
(1) See Table B8-28 on page B-8-21 for outside diameter tolerance.

Continued on next page.

INNER RINGS

METRIC SERIES



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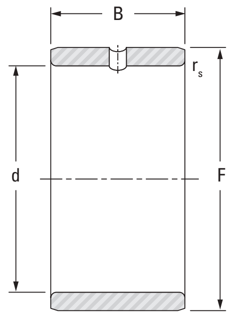
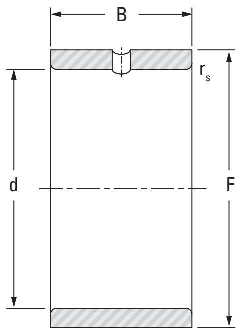


JR.JS1



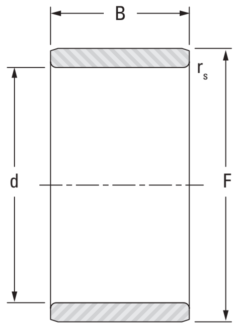
JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
65 2.5591	**65** 2.5591	**75** 2.9528	**28** 1.102	**1** 0.04	JR65x75x28	**0.240** 0.529
	65 2.5591	**75** 2.9528	**30** 1.181	**1** 0.04	JR65x75x30	**0.260** 0.573
	65 2.5591	**75** 2.9528	**60** 2.362	**1** 0.04	JR65x75x60	**0.520** 1.146
70 2.7559	**70** 2.7559	**80** 3.1496	**25** 0.984	**1** 0.04	JR70x80x25	**0.230** 0.507
	70 2.7559	**80** 3.1496	**30** 1.181	**1** 0.04	JR70x80x30	**0.270** 0.595
	70 2.7559	**80** 3.1496	**35** 1.378	**1** 0.04	JR70x80x35	**0.320** 0.705
	70 2.7559	**80** 3.1496	**54** 2.126	**1** 0.04	JR70x80x54	**0.500** 1.102
	70 2.7559	**80** 3.1496	**60** 2.362	**1** 0.04	JR70x80x60	**0.556** 1.226
75 2.9528	**75** 2.9528	**85** 3.3465	**25** 0.984	**1** 0.04	JR75x85x25	**0.240** 0.529
	75 2.9528	**85** 3.3465	**30** 1.181	**1** 0.04	JR75x85x30	**0.289** 0.637
	75 2.9528	**85** 3.3465	**35** 1.378	**1** 0.04	JR75x85x35	**0.338** 0.745
	75 2.9528	**85** 3.3465	**54** 2.126	**1** 0.04	JR75x85x54	**0.530** 1.168
80 3.1496	**80** 3.1496	**90** 3.5433	**25** 0.984	**1** 0.04	JR80x90x25	**0.260** 0.573
	80 3.1496	**90** 3.5433	**30** 1.181	**1** 0.04	JR80x90x30	**0.306** 0.675
	80 3.1496	**90** 3.5433	**35** 1.378	**1** 0.04	JR80x90x35	**0.355** 0.783
	80 3.1496	**90** 3.5433	**54** 2.126	**1** 0.04	JR80x90x54	**0.565** 1.246
85 3.3465	**85** 3.3465	**95** 3.7402	**26** 1.024	**1** 0.04	JR85x95x26	**0.290** 0.639
	85 3.3465	**95** 3.7402	**30** 1.181	**1** 0.04	JR85x95x30	**0.334** 0.736
	85 3.3465	**95** 3.7402	**36** 1.417	**1** 0.04	JR85x95x36	**0.397** 0.875
	85 3.3465	**100** 3.9370	**35** 1.378	**1.1** 0.04	JR85x100x35	**0.595** 1.312
	85 3.3465	**100** 3.9370	**63** 2.480	**1.1** 0.04	JR85x100x63	**1.080** 2.381
90 3.5433	**90** 3.5433	**100** 3.9370	**26** 1.024	**1** 0.04	JR90x100x26	**0.300** 0.661
	90 3.5433	**100** 3.9370	**30** 1.181	**1** 0.04	JR90x100x30	**0.350** 0.772
	90 3.5433	**100** 3.9370	**36** 1.417	**1** 0.04	JR90x100x36	**0.422** 0.930

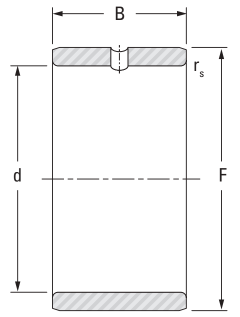
(1) See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS

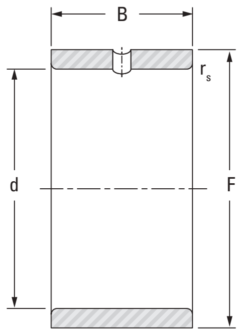
METRIC SERIES



JR, IM..P



JR.JS1



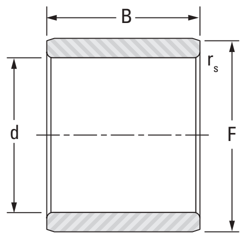
JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
90 3.5433	**90** 3.5433	**105** 4.1339	**32** 1.260	**1.1** 0.04	JR90x105x32	**0.580** 1.279
	90 3.5433	**105** 4.1339	**35** 1.378	**1.1** 0.04	JR90x105x35	**0.624** 1.376
	90 3.5433	**105** 4.1339	**63** 2.480	**1.1** 0.04	JR90x105x63	**1.140** 2.513
95 3.7402	**95** 3.7402	**105** 4.1339	**26** 1.024	**1** 0.04	JR95x105x26	**0.310** 0.683
	95 3.7402	**105** 4.1339	**36** 1.417	**1** 0.04	JR95x105x36	**0.430** 0.948
	95 3.7402	**110** 4.3307	**35** 1.378	**1.1** 0.04	JR95x110x35	**0.653** 1.440
	95 3.7402	**110** 4.3307	**63** 2.480	**1.1** 0.04	JR95x110x63	**1.200** 2.646
100 3.9370	**100** 3.9370	**110** 4.3307	**30** 1.181	**1.1** 0.04	JR100x110x30	**0.384** 0.847
	100 3.9370	**110** 4.3307	**40** 1.575	**1.1** 0.04	JR100x110x40	**0.510** 1.124
	100 3.9370	**115** 4.5276	**40** 1.575	**1.1** 0.04	JR100x115x40	**0.790** 1.742
110 4.3307	**110** 4.3307	**120** 4.7244	**30** 1.181	**1** 0.04	JR110x120x30	**0.425** 0.937
	110 4.3307	**125** 4.9213	**40** 1.575	**1.1** 0.04	JR110x125x40	**0.870** 1.918
120 4.7244	**120** 4.7244	**130** 5.1181	**30** 1.181	**1** 0.04	JR120x130x30	**0.460** 1.014
	120 4.7244	**135** 5.3150	**45** 1.772	**1.1** 0.04	JR120x135x45	**1.060** 2.337
130 5.1181	**130** 5.1181	**145** 5.7087	**35** 1.378	**1.1** 0.04	JR130x145x35	**0.890** 1.962
	130 5.1181	**150** 5.9055	**50** 1.969	**1.5** 0.06	JR130x150x50	**1.730** 3.814
140 5.5118	**140** 5.5118	**155** 6.1024	**35** 1.378	**1.1** 0.04	JR140x155x35	**0.955** 2.105
	140 5.5118	**160** 6.2992	**50** 1.969	**1.5** 0.06	JR140x160x50	**1.860** 4.101
150 5.9055	**150** 5.9055	**165** 6.4961	**40** 1.575	**1.1** 0.04	JR150x165x40	**1.170** 2.579
160 6.2992	**160** 6.2992	**175** 6.8898	**40** 1.575	**1.1** 0.04	JR160x175x40	**1.240** 2.734
170 6.6929	**170** 6.6929	**185** 7.2835	**45** 1.772	**1.1** 0.04	JR170x185x45	**1.480** 3.263
180 7.0866	**180** 7.0866	**195** 7.6772	**45** 1.772	**1.1** 0.04	JR180x195x45	**1.560** 3.439

(1) See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS FOR FULL COMPLEMENT DRAWN CUP NEEDLE ROLLER BEARINGS

METRIC SERIES



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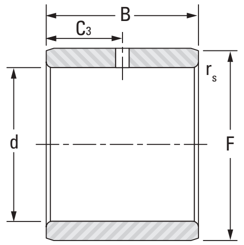

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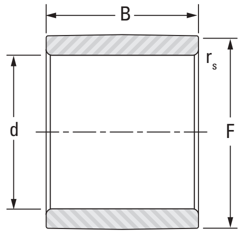


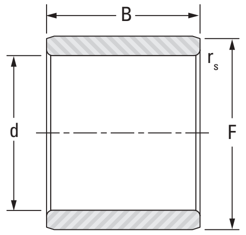
IM...R6

Shaft Dia.	d	F [1]	B	Hole Location C_3	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
8 0.3150	**8** 0.3150	**12** 0.4724	**12.4** 0.488		**0.3** 0.01	IM 8 12 12,4	**0.006** 0.013
9 0.3543	**9** 0.3543	**13** 0.5118	**12.4** 0.488		**0.3** 0.01	IM 9 13 12,4	**0.006** 0.013
	9 0.3543	**13** 0.5118	**12.4** 0.488		**0.3** 0.01	IM 9 13 12,4 R6	**0.006** 0.013
10 0.3937	**10** 0.3937	**14** 0.5512	**12.4** 0.488		**0.3** 0.01	IM 10 14 12,4	**0.007** 0.015
	10 0.3937	**14** 0.5512	**16.4** 0.646		**0.3** 0.01	IM 10 14 16,4	**0.009** 0.020
11 0.4331	**11** 0.4331	**15** 0.5906	**12.4** 0.488		**0.3** 0.01	IM 11 15 12,4	**0.008** 0.018
12 0.4724	**12** 0.4724	**15** 0.5906	**12.4** 0.488		**0.2** 0.01	IM 12 15 12,4	**0.006** 0.013
	12 0.4724	**16** 0.6299	**12.4** 0.488		**0.2** 0.01	IM 12 16 12,4	**0.008** 0.018
	12 0.4724	**16** 0.6299	**12.4** 0.488		**0.3** 0.01	IM 12 16 12,4 R6	**0.008** 0.018
	12 0.4724	**16** 0.6299	**12.4** 0.488	**6.2** 0.24	**0.3** 0.01	IMC 12 16 12,4	**0.008** 0.018
13 0.5118	**13** 0.5118	**17** 0.6693	**12.4** 0.488		**0.3** 0.01	IM 13 17 12,4	**0.009** 0.020
	13 0.5118	**18** 0.7087	**12.4** 0.488		**0.35** 0.014	IM 13 18 12,4	**0.011** 0.025
	13 0.5118	**18** 0.7087	**12.4** 0.488		**0.35** 0.014	IM 13 18 12,4 R6	**0.011** 0.025
	13 0.5118	**18** 0.7087	**16.4** 0.646		**0.35** 0.014	IM 13 18 16,4	**0.015** 0.033
15 0.5906	**15** 0.5906	**20** 0.7874	**12.4** 0.488		**0.35** 0.014	IM 15 20 12,4	**0.013** 0.028
	15 0.5906	**20** 0.7874	**16.4** 0.646		**0.35** 0.014	IM 15 20 16,4	**0.017** 0.037
	17 0.6693	**22** 0.8661	**16.4** 0.646		**0.35** 0.014	IM 17 22 16,4	**0.019** 0.041
	17 0.6693	**22** 0.8661	**16.4** 0.646		**0.35** 0.014	IM 17 22 16,4 R6	**0.019** 0.041
17 0.6693	**17** 0.6693	**22** 0.8661	**16.4** 0.646	**8.2** 0.32	**0.35** 0.014	IMC 17 22 16,4	**0.019** 0.041
20 0.7874	**20** 0.7874	**25** 0.9843	**16.4** 0.646		**0.35** 0.014	IM 20 25 16,4	**0.022** 0.047
	20 0.7874	**25** 0.9843	**16.4** 0.646		**0.35** 0.014	IM 20 25 16,4 R6	**0.022** 0.047
	20 0.7874	**25** 0.9843	**16.4** 0.646	**8.2** 0.32	**0.35** 0.014	IMC 20 25 16,4	**0.022** 0.047
	20 0.7874	**25** 0.9843	**20.4** 0.803		**0.35** 0.014	IM 20 25 20,4	**0.027** 0.060

[1] See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS FOR FULL COMPLEMENT DRAWN CUP NEEDLE ROLLER BEARINGS

METRIC SERIES



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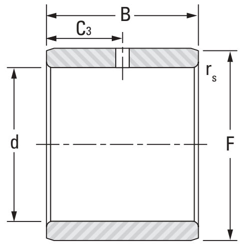

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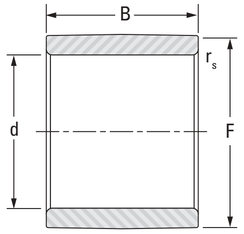


IM...R6

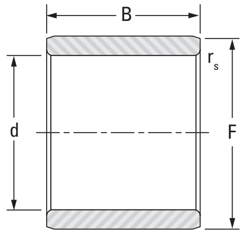
Shaft Dia.	d	F [1]	B	Hole Location C_3	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
20 0.7874	**20** 0.7874	**25** 0.9843	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 20 25 20,4	**0.027** 0.060
	20 0.7874	**25** 0.9843	**25.0** 0.984		**0.35** 0.014	IM 20 25 25	**0.033** 0.073
23 0.9055	**23** 0.9055	**28** 1.1024	**20.4** 0.803		**0.35** 0.014	IM 23 28 20,4	**0.031** 0.067
25 0.9843	**25** 0.9843	**30** 1.1811	**16.4** 0.646		**0.35** 0.014	IM 25 30 16,4	**0.027** 0.060
	25 0.9843	**30** 1.1811	**16.4** 0.646		**0.35** 0.014	IM 25 30 16,4 R6	**0.027** 0.060
	25 0.9843	**30** 1.1811	**16.4** 0.646	**8.2** 0.32	**0.35** 0.014	IMC 25 30 16,4	**0.027** 0.058
	25 0.9843	**30** 1.1811	**20.4** 0.803		**0.35** 0.014	IM 25 30 20,4	**0.033** 0.073
	25 0.9843	**30** 1.1811	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 25 30 20,4	**0.033** 0.073
	25 0.9843	**30** 1.1811	**25** 0.984		**0.35** 0.014	IM 25 30 25	**0.040** 0.088
30 1.1811	**30** 1.1811	**35** 1.3780	**16.4** 0.646		**0.35** 0.014	IM 30 35 16,4	**0.031** 0.068
	30 1.1811	**35** 1.3780	**16.4** 0.646		**0.35** 0.014	IM 30 35 16,4 R6	**0.031** 0.068
	30 1.1811	**35** 1.3780	**16.4** 0.646	**8.2** 0.32	**0.35** 0.014	IMC 30 35 16,4	**0.031** 0.068
	30 1.1811	**35** 1.3780	**20.4** 0.803		**0.35** 0.014	IM 30 35 20,4	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20.4** 0.803		**0.35** 0.014	IM 30 35 20,4 R6	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 30 35 20,4	**0.039** 0.086
	30 1.1811	**35** 1.3780	**25.0** 0.984		**0.35** 0.014	IM 30 35 25	**0.048** 0.106
35 1.3780	**35** 1.3780	**40** 1.5748	**16.4** 0.646		**0.35** 0.014	IM 35 40 16,4	**0.036** 0.079
	35 1.3780	**40** 1.5748	**16.4** 0.646		**0.35** 0.014	IM 35 40 16,4 R6	**0.036** 0.079
	35 1.3780	**40** 1.5748	**20.4** 0.803		**0.35** 0.014	IM 35 40 20,4	**0.045** 0.099
	35 1.3780	**40** 1.5748	**20.4** 0.803		**0.35** 0.014	IM 35 40 20,4 R6	**0.045** 0.099
	35 1.3780	**40** 1.5748	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 35 40 20,4	**0.045** 0.099
	35 1.3780	**40** 1.5748	**25** 0.984		**0.35** 0.014	IM 35 40 25	**0.055** 0.121
40 1.5748	**40** 1.5748	**44** 1.7323	**16.4** 0.646		**0.3** 0.01	IM 40 44 16,4	**0.032** 0.071

[1] See Table B8-28 on page B-8-21 for outside diameter tolerance.

Continued on next page.

INNER RINGS FOR FULL COMPLEMENT DRAWN CUP NEEDLE ROLLER BEARINGS

METRIC SERIES



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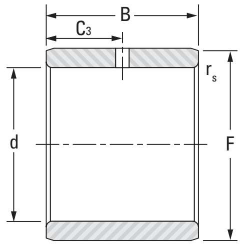

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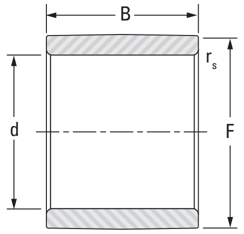


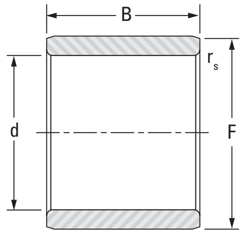
IM…R6

Shaft Dia.	d	F [1]	B	Hole Location C3	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
40 1.5748	**40** 1.5748	**44** 1.7323	**16.4** 0.646		**0.3** 0.01	IM 40 44 16,4 R6	**0.032** 0.071
	40 1.5748	**44** 1.7323	**16.4** 0.646	**8.2** 0.32	**0.3** 0.01	IMC 40 44 16,4	**0.032** 0.071
	40 1.5748	**45** 1.7717	**20.4** 0.803		**0.35** 0.014	IM 40 45 20,4	**0.051** 0.112
	40 1.5748	**44** 1.7323	**20.4** 0.803	**10.2** 0.40	**0.35** 0.014	IMC 40 45 20,4	**0.051** 0.112
45 1.7717	**45** 1.7717	**50** 1.9685	**20.4** 0.803		**0.65** 0.026	IM 45 50 20,4	**0.056** 0.123
	45 1.7717	**50** 1.9685	**20.4** 0.803		**0.65** 0.026	IM 45 50 20,4 R6	**0.056** 0.123
	45 1.7717	**50** 1.9685	**25** 0.984		**0.65** 0.026	IM 45 50 25	**0.069** 0.152
	45 1.7717	**60** 2.3622	**25** 0.984		**0.65** 0.026	IM 45 50 25 R6	**0.069** 0.152
50 1.9685	**50** 1.9685	**55** 2.1654	**20.4** 0.803		**0.65** 0.026	IM 50 55 20,4 R6	**0.062** 0.137
	50 1.9685	**55** 2.1654	**20.4** 0.803		**0.65** 0.026	IM 50 55 20,4	**0.062** 0.137

[1] See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS FOR MACHINE-TOOL QUALITY PRECISION-COMBINED BEARINGS

METRIC SERIES



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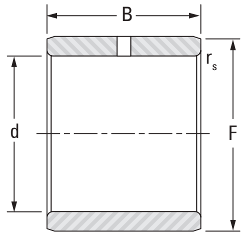

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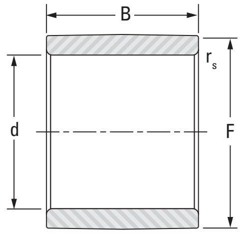


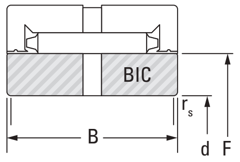
IM…R6

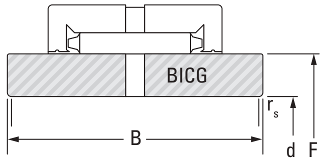
Shaft Dia.	d	F [1]	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
17 0.6693	**17** 0.6693	**20** 0.7874	**27.5** 1.083	**0.2** 0.01	IM 19017	**0.019** 0.042
	17 0.6693	**20** 0.7874	**32** 1.240	**0.2** 0.01	IM 20617	**0.021** 0.046
20 0.7874	**20** 0.7874	**25** 0.9843	**27.5** 1.083	**0.35** 0.014	IM 19020	**0.038** 0.084
	20 0.7874	**25** 0.9843	**32** 1.240	**0.35** 0.014	IM 20620	**0.044** 0.097
25 0.9843	**25** 0.9843	**30** 1.1811	**27.5** 1.083	**0.35** 0.014	IM 19025	**0.042** 0.093
	25 0.9843	**30** 1.1811	**32** 1.240	**0.35** 0.014	IM 20625	**0.052** 0.115
30 1.1811	**30** 1.1811	**35** 1.3780	**27.5** 1.083	**0.35** 0.014	IM 19030	**0.053** 0.117
	30 1.1811	**35** 1.3780	**32** 1.240	**0.35** 0.014	IM 20630	**0.061** 0.134
35 1.3780	**35** 1.3780	**40** 1.5748	**27.5** 1.083	**0.35** 0.014	IM 19035	**0.063** 0.139
	35 1.3780	**40** 1.5748	**32** 1.240	**0.35** 0.014	IM 20635	**0.072** 0.159
40 1.5748	**40** 1.5748	**45** 1.7717	**27.5** 1.083	**0.35** 0.014	IM 19040	**0.069** 0.152
	40 1.5748	**45** 1.7717	**32** 1.240	**0.35** 0.014	IM 20640	**0.080** 0.176
45 1.7717	**45** 1.7717	**50** 1.9685	**30.5** 1.201	**0.65** 0.026	IM 19045	**0.085** 0.187
	45 1.7717	**50** 1.9685	**35** 1.358	**0.65** 0.026	IM 20645	**0.096** 0.212

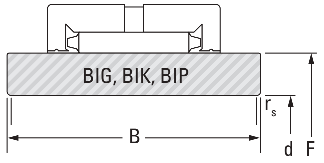
[1] See Table B8-28 on page B-8-21 for outside diameter tolerance.

INNER RINGS WITH OIL HOLES/EXTRA WIDE, RNA BEARINGS

METRIC SERIES





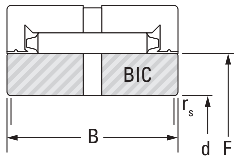


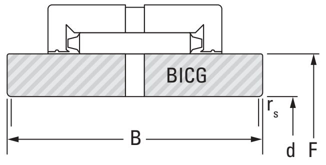
Shaft Dia.	d	F [1]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	mm in	mm in	mm in	mm in		kg lbs
12 0.4724	12 0.4724	17.6 0.6929	15 0.591	0.35 0.014	BIC 1012	0.016 0.035
	12 0.4724	17.6 0.6929	20 0.787	0.35 0.014	BIP 1012	0.020 0.044
15 0.5906	15 0.5906	20.8 0.8189	15 0.591	0.65 0.026	BIC 1015	0.018 0.040
	15 0.5906	22.1 0.8701	22 0.866	0.65 0.026	BIC 2015	0.035 0.077
17 0.6693	17 0.6693	23.9 0.9409	15 0.591	0.65 0.026	BIC 1017	0.026 0.057
20 0.7874	20 0.7874	28.7 1.1299	18 0.709	0.65 0.026	BIC 1020	0.046 0.101
	20 0.7874	28.7 1.1299	22 0.866	0.65 0.026	BIC 2020	0.056 0.123
	20 0.7874	28.7 1.1299	22 0.866	0.65 0.026	BIP 1020	0.056 0.123
25 0.9843	25 0.9843	33.5 1.3189	18 0.709	0.65 0.026	BIC 1025	0.054 0.119
	25 0.9843	33.5 1.3189	22 0.866	0.65 0.026	BIC 2025	0.065 0.143
	25 0.9843	33.5 1.3189	30 1.181	0.65 0.026	BIC 22025	0.500 1.102
	25 0.9843	33.5 1.3189	32 1.260	0.65 0.026	BIG 2025	0.095 0.209
	25 0.9843	33.5 1.3189	42 1.654	0.65 0.026	BIK 2025	0.125 0.276
30 1.1811	30 1.1811	38.2 1.5039	18 0.709	0.65 0.026	BIC 1030	0.060 0.132
	30 1.1811	38.2 1.5039	22 0.866	0.65 0.026	BIC 2030	0.074 0.163
	30 1.1811	44.0 1.7323	30 1.181	0.65 0.026	BIC 3030	0.188 0.414
	30 1.1811	38.2 1.5039	32 1.260	0.65 0.026	BIG 2030	0.108 0.238
	30 1.1811	44.0 1.7323	40 1.575	0.65 0.026	BIG 3030	0.247 0.545
35 1.3780	35 1.3780	44.0 1.7323	18 0.709	0.65 0.026	BIC 1035	0.077 0.170
	35 1.3780	44.0 1.7323	22 0.866	0.65 0.026	BIC 2035	0.093 0.205
	35 1.3780	44.0 1.7323	32 1.260	0.65 0.026	BIG 2035	0.135 0.298
40 1.5748	40 1.5748	49.7 1.9567	18 0.709	0.85 0.033	BIC 1040	0.094 0.207
	40 1.5748	49.7 1.9567	22 0.866	0.85 0.033	BIC 2040	0.115 0.254
	40 1.5748	55.4 2.1811	36 1.417	0.85 0.033	BIC 3040	0.321 0.708

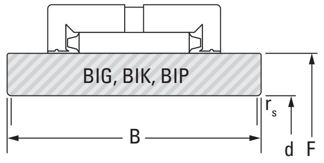
[1] Please contact JTEKT about outside diameter tolerance.

INNER RINGS WITH OIL HOLES/EXTRA WIDE, RNA BEARINGS

METRIC SERIES







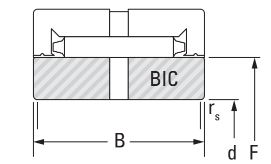
Shaft Dia.	d	F [1]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	mm in	mm in	mm in	mm in		kg lbs
	40 1.5748	49.7 1.9567	32 1.260	0.85 0.033	BIG 2040	0.170 0.375
	40 1.5748	49.7 1.9567	22 0.866	0.85 0.033	BIP 1040	0.115 0.254
45 1.7717	45 1.7717	55.4 2.1811	18 0.709	0.85 0.033	BIC 1045	0.113 0.249
	45 1.7717	55.4 2.1811	22 0.866	0.85 0.033	BIC 2045	0.139 0.306
	45 1.7717	62.1 2.4449	38 1.496	0.85 0.033	BIC 3045	0.422 0.930
	45 1.7717	55.4 2.1811	32 1.260	0.85 0.033	BIG 2045	0.210 0.463
50 1.9685	50 1.9685	62.1 2.4449	20 0.787	0.85 0.033	BIC 1050	0.163 0.359
	50 1.9685	62.1 2.4449	24 0.945	0.85 0.033	BIC 11050	0.196 0.432
	50 1.9685	62.1 2.4449	28 1.102	0.85 0.033	BIC 2050	0.228 0.503
	50 1.9685	68.8 2.7087	38 1.496	0.85 0.033	BIC 3050	0.515 1.135
	50 1.9685	62.1 2.4449	38 1.496	0.85 0.033	BIG 2050	0.312 0.688
	50 1.9685	62.1 2.4449	28 1.102	0.85 0.033	BIP 1050	0.228 0.503
55 2.1654	55 2.1654	68.8 2.7087	20 0.787	0.85 0.033	BIC 1055	0.205 0.452
	55 2.1654	72.6 2.8583	38 1.496	0.85 0.033	BIC 3055	0.525 1.157
	55 2.1654	72.6 2.8583	48 1.890	0.85 0.033	BICG 3055	0.660 1.455
	55 2.1654	68.8 2.7087	38 1.496	0.85 0.033	BIG 2055	0.390 0.860
	55 2.1654	68.8 2.7087	28 1.102	0.85 0.033	BIP 1055	0.288 0.635
60 2.3622	60 2.3622	72.6 2.8583	28 1.102	0.85 0.033	BIC 2060	0.282 0.622
	60 2.3622	78.3 3.0827	38 1.496	0.85 0.033	BIC 3060	0.583 1.285
	60 2.3622	72.6 2.8583	38 1.496	0.85 0.033	BICG 2060	0.385 0.849
	60 2.3622	72.6 2.8583	38 1.496	0.85 0.033	BIG 2060	0.385 0.849
65 2.5591	65 2.5591	83.1 3.2717	38 1.496	0.85 0.033	BIC 3065	0.623 1.373
	65 2.5591	78.3 3.0827	38 1.496	0.85 0.033	BIG 2065	0.437 0.963
70 2.7559	70 2.7559	88.0 3.4646	38 1.496	0.85 0.033	BIC 3070	0.662 1.459

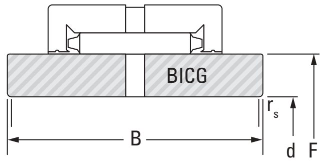
[1] Please contact JTEKT about outside diameter tolerance.

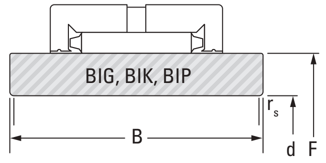
Continued on next page.

INNER RINGS WITH OIL HOLES/EXTRA WIDE, RNA BEARINGS

METRIC SERIES





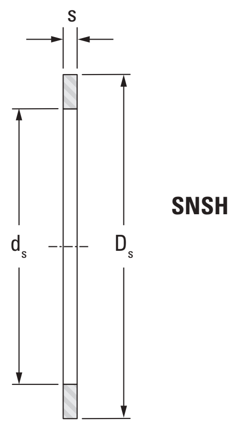


Shaft Dia.	d	F [1]	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
70 2.7559	**70** 2.7559	**88.0** 3.4646	**48** 1.890	**0.85** 0.033	BIG 3070	**0.820** 1.808
	70 2.7559	**88.0** 3.4646	**58** 2.283	**0.85** 0.033	BIK 3070	**1.010** 2.227
75 2.9528	**75** 2.9528	**88.0** 3.4646	**32** 1.260	**0.85** 0.033	BIC 2075	**0.410** 0.904
	75 2.9528	**88.0** 3.4646	**42** 1.654	**0.85** 0.033	BIG 2075	**0.538** 1.186
	75 2.9528	**96.0** 3.7795	**58** 2.283	**0.85** 0.033	BIK 3075	**1.260** 2.778
80 3.1496	**80** 3.1496	**96.0** 3.7795	**24** 0.945	**0.85** 0.033	BIC 1080	**0.410** 0.904
	80 3.1496	**96.0** 3.7795	**32** 1.260	**0.85** 0.033	BIC 2080	**0.545** 1.202
	80 3.1496	**99.5** 3.9173	**38** 1.496	**0.85** 0.033	BIC 3080	**0.805** 1.775
	80 3.1496	**96.0** 3.7795	**42** 1.654	**0.85** 0.033	BIG 2080	**0.714** 1.574
90 3.5433	**90** 3.5433	**104.7** 4.1220	**32** 1.260	**1.35** 0.053	BIC 2090	**0.531** 1.171
	90 3.5433	**109.1** 4.2953	**43** 1.693	**1.35** 0.053	BIC 3090	**0.990** 2.183
	90 3.5433	**109.1** 4.2953	**53** 2.087	**1.35** 0.053	BIG 3090	**1.220** 2.690
	90 3.5433	**109.1** 4.2953	**63** 2.480	**1.35** 0.053	BIK 3090	**1.480** 3.263
95 3.7402	**95** 3.7402	**109.1** 4.2953	**32** 1.260	**1.35** 0.053	BIC 2095	**0.548** 1.208
	95 3.7402	**114.7** 4.5157	**43** 1.693	**1.35** 0.053	BIC 3095	**1.075** 2.370
	95 3.7402	**114.7** 4.5157	**63** 2.480	**1.35** 0.053	BIK 3095	**1.585** 3.494
100 3.9370	**100** 3.9370	**119.2** 4.6929	**43** 1.693	**1.35** 0.053	BIC 3100	**1.090** 2.403
	100 3.9370	**114.7** 4.5157	**42** 1.654	**1.35** 0.053	BIG 2100	**0.800** 1.764
105 4.1339	**105** 4.1339	**119.2** 4.6929	**32** 1.260	**1.35** 0.053	BIC 2105	**0.615** 1.356
	105 4.1339	**124.7** 4.9094	**55** 2.165	**1.35** 0.053	BIG 3105	**1.505** 3.318
110 4.3307	**110** 4.3307	**124.7** 4.9094	**34** 1.339	**1.35** 0.053	BIC 2110	**0.705** 1.554
	110 4.3307	**124.7** 4.9094	**44** 1.732	**1.35** 0.053	BIG 2110	**0.920** 2.028
125 4.9213	**125** 4.9213	**142.5** 5.6102	**44** 1.732	**1.35** 0.053	BICG 2125	**1.340** 2.954
	125 4.9213	**142.5** 5.6102	**44** 1.732	**1.35** 0.053	BIG 2125	**1.325** 2.921
130 5.1181	**130** 5.1181	**158.0** 6.2205	**52** 2.047	**1.35** 0.053	BIC 3130	**2.530** 5.578

[1] Please contact JTEKT about outside diameter tolerance.

END WASHERS

METRIC SERIES



d_s	D_s	S	End Washer Designation	Approx. Wt.
mm in	**mm** in	**mm** in		**kg** lbs
8.0 0.315	**18** 0.709	**2.0** 0.079	SNSH8X18X2	**0.003** 0.007
8.5 0.335	**15** 0.591	**0.5** 0.020	SNSH8,5X15X0,5	**0.0005** 0.001
10.5 0.413	**17** 0.669	**0.5** 0.020	SNSH10,5X17X0,5	**0.0006** 0.001
10.5 0.413	**20** 0.787	**0.5** 0.020	SNSH10,5X20X0,5	**0.0009** 0.002
12.5 0.492	**19** 0.748	**0.5** 0.020	SNSH12,5X19X0,5	**0.0006** 0.001
12.5 0.492	**22** 0.866	**0.5** 0.020	SNSH12,5X22X0,5	**0.0010** 0.002
14.5 0.571	**22** 0.866	**0.5** 0.020	SNSH14,5X22X0,5	**0.0008** 0.002
14.5 0.571	**26** 1.024	**0.5** 0.020	SNSH14,5X26X0,5	**0.0014** 0.003
15.5 0.610	**23** 0.906	**0.5** 0.020	SNSH15,5X23X0,5	**0.0009** 0.002
16.5 0.650	**24** 0.945	**0.5** 0.020	SNSH16,5X24X0,5	**0.0009** 0.002
16.5 0.650	**28** 1.102	**0.5** 0.020	SNSH16,5X28X0,5	**0.0016** 0.004
17.5 0.689	**25** 0.984	**0.5** 0.020	SNSH17,5X25X0,5	**0.001** 0.002
18.5 0.728	**26** 1.024	**0.5** 0.020	SNSH18,5X26X0,5	**0.001** 0.002
18.5 0.728	**30** 1.181	**0.5** 0.020	SNSH18,5X30X0,5	**0.002** 0.004
20.5 0.807	**28** 1.102	**0.5** 0.020	SNSH20,5X28X0,5	**0.001** 0.002
20.5 0.807	**32** 1.260	**0.5** 0.020	SNSH20,5X32X0,5	**0.002** 0.004

d_s	D_s	S	End Washer Designation	Approx. Wt.
mm in	**mm** in	**mm** in		**kg** lbs
22.5 0.886	**30** 1.181	**0.5** 0.020	SNSH22,5X30X0,5	**0.001** 0.003
22.5 0.886	**35** 1.378	**0.5** 0.020	SNSH22,5X35X0,5	**0.002** 0.005
25.5 1.004	**35** 1.378	**0.5** 0.020	SNSH25,5X35X0,5	**0.002** 0.004
25.5 1.004	**37** 1.457	**0.5** 0.020	SNSH25,5X37X0,5	**0.002** 0.005
28.5 1.122	**40** 1.575	**0.5** 0.020	SNSH28,5X40X0,5	**0.002** 0.005
30.5 1.201	**40** 1.575	**0.5** 0.020	SNSH30,5X40X0,5	**0.002** 0.005
35.5 1.398	**47** 1.850	**0.5** 0.020	SNSH35,5X47X0,5	**0.003** 0.006
40.5 1.594	**50** 1.969	**0.5** 0.020	SNSH40,5X50X0,5	**0.003** 0.006
41.0 1.614	**55** 2.165	**1.0** 0.039	SNSH41X55X1	**0.008** 0.018
45.5 1.791	**55** 2.165	**0.5** 0.020	SNSH45,5X55X0,5	**0.003** 0.007
46.0 1.811	**62** 2.441	**1.0** 0.039	SNSH46X62X1	**0.011** 0.024
51.0 2.008	**65** 2.559	**1.0** 0.039	SNSH51X65X1	**0.010** 0.022
56.0 2.205	**72** 2.835	**1.0** 0.039	SNSH56X72X1	**0.013** 0.029
61.0 2.402	**78** 3.071	**1.0** 0.039	SNSH61X78X1	**0.015** 0.033
66.0 2.598	**85** 3.346	**1.0** 0.039	SNSH66X85X1	**0.018** 0.040

NOTES

SUPPLEMENTARY TABLES

C SUPPLEMENTARY TABLES, INDEX

Supplementary table 1 (1) SI units and conversion factors

Mass	SI units	Other Units[1]	Conversion into SI units	Conversion from SI units
Angle	rad	° [degree(s)] *	1° = π / 180 rad	1 rad = 57.295 78°
	[radian(s)]	′ [minute(s)] *	1′ = π / 10 800 rad	
		″ [second(s)] *	1″ = π / 648 000 rad	
Length	m	Å [Angstrom unit]	1 Å = 10^{-10} m = 0.1 nm = 100 pm	1 m = 10^{10} Å
	[meter(s)]	µ [micron(s)]	1 µ = 1 µm	
		in [inch(es)]	1 in = 25.4 mm	1 m = 39.37 in
		ft [foot(feet)]	1 ft = 12 in = 0.304 8 m	1 m = 3.280 8 ft
		yd [yard(s)]	1 yd = 3 ft = 0.914 4 m	1 m = 1.093 6 yd
		mile [mile(s)]	1 mile = 5 280 ft = 1 609.344 m	1 km = 0.621 4 mile
Area	m^2	a [are(s)]	1 a = 100 m^2	
		ha [hectare(s)]	1 ha = 10^4 m^2	
		acre [acre(s)]	1 acre = 4 840 yd^2 = 4 046.86 m^2	1 km^2 = 247.1 acre
Volume	m^3	ℓ, L [liter(s)] *	1ℓ = 1 dm^3 = 10^{-3} m^3	1 m^3 = 10^3ℓ
		cc [cubic centimeters]	1 cc = 1 cm^3 = 10^{-6} m^3	1 m^3 = 10^6 cc
		gal (US) [gallon(s)]	1 gal (US) = 231 in^3 = 3.785 41 dm^3	1 m^3 = 264.17 gal
		fl oz (US) [fluid ounce(s)]	1 fl oz (US) = 29.573 5 cm^3	1 m^3 = 33 814 fl oz
		barrel (US) [barrels (US)]	1 barrel (US) = 158.987 dm^3	1 m^3 = 6.289 8 barrel
Time	s	min [minute(s)] *		
	[second(s)]	h [hour(s)] *		
		d [day(s)] *		
Angular velocity	rad / s			
Velocity	m / s	kn [knot(s)]	1 kn = 1 852 m / h	1 km / h = 0.539 96 kn
		m / h *		
Acceleration	m / s^2	G	1 G = 9.806 65 m / s^2	1 m / s^2 = 0.101 97 G
Frequency	Hz	c / s [cycle(s) / second]	1 c / s = 1 s^{-1} = 1 Hz	
	[hertz]			
Rotational frequency	s^{-1}	rpm [revolutions per minute]	1 rpm = 1 / 60 s^{-1}	1 s^{-1} = 60 rpm
		min^{-1} *		
		r / min		
Mass	kg	t [ton(s)] *	1 t = 10^3 kg	
	[kilogram(s)]	lb [pound(s)]	1 lb = 0.453 592 37 kg	1 kg = 2.204 6 lb
		gr [grain(s)]	1 gr = 64.798 91 mg	1 g = 15.432 4 gr
		oz [ounce(s)]	1 oz = 1 / 16 lb = 28.349 5 g	1 kg = 35.274 0 oz
		ton (UK) [ton(s) (UK)]	1 ton (UK) = 1 016.05 kg	1 t = 0.984 2 ton (UK)
		ton (US) [ton(s) (US)]	1 ton (US) = 907.185 kg	1 t = 1.102 3 ton (US)
		car [carat(s)]	1 car = 200 mg	1 g = 5 car

[Note] 1) * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 1 (2) SI units and conversion factors

Mass	SI units	Other Units1)	Conversion into SI units	Conversion from SI units
Density	kg / m^3			
Linear density	kg / m			
Momentum	kg·m / s			
Moment of momentum, Angular momentum	kg·m^2 / s			
Moment of inertia	kg·m^2			
Force	N [newton(s)]	dyn [dyne(s)]	1 dyn = 10^{-5} N	1 N = 10^5 dyn
		kgf [kilogram-force]	1 kgf = 9.806 65 N	1 N = 0.101 97 kgf
		gf [gram-force]	1 gf = 9.806 65 × 10^{-3} N	
		tf [ton-force]	1 tf = 9.806 65 × 10^3 N	
		lbf [pound-force]	1 lbf = 4.448 22 N	1 N = 0.224 809 lbf
Moment of force	N·m [newton meter(s)]	gf·cm	1 gf·cm = 9.806 65 × 10^{-5} N·m	
		kgf·cm	1 kgf·cm = 9.806 65 × 10^{-2} N·m	
		kgf·m	1 kgf·m = 9.806 65 N·m	1 N·m = 0.101 97 kgf·m
		tf·m	1 tf·m = 9.806 65 × 10^3 N·m	
		lbf·ft	1 lbf·ft = 1.355 82 N·m	1 N·m = 0.737 56 lbf·ft
Pressure, Normal stress	Pa [pascal(s)] or N / m^2 {1 Pa = 1 N / m^2}	gf / cm^2	1 gf / cm^2 = 9.806 65 × 10 Pa	
		kgf / mm^2	1 kgf / mm^2 = 9.806 65 × 10^6 Pa	1 MPa = 0.101 97 kgf / mm^2
		kgf / m^2	1 kgf / m^2 = 9.806 65 Pa	1 Pa = 0.101 97 kgf / m^2
		lbf / in^2	1 lbf / in^2 = 6 894.76 Pa	1 Pa = 0.145 × 10^{-3} lbf / in^2
		bar [bar(s)]	1 bar = 10^5 Pa	1 Pa = 10^{-2} mbar
		at [engineering air pressure]	1 at = 1 kgf / cm^2 = 9.806 65 × 10^4 Pa	
		mH_2O, mAq [meter water column]	1 mH_2O = 9.806 65 × 10^3 Pa	
		atm [atmosphere]	1 atm = 101 325 Pa	
		mHg [meter mercury column]	1 mHg = $\frac{101\,325}{0.76}$ Pa	
		Torr [torr]	1 Torr = 1 mmHg = 133.322 Pa	1 Pa = 7.500 6 × 10^{-3} Torr
Viscosity	Pa·s [pascal second]	P [poise]	10^{-2} P = 1 cP = 1 mPa·s	
		kgf·s / m^2	1 kgf·s / m^2 = 9.806 65 Pa·s	1 Pa·s = 0.101 97 kgf·s / m^2
Kinematic viscosity	m^2 / s	St [stokes]	10^{-2} St = 1 cSt = 1 mm^2 / s	
Surface tension	N / m			

Supplementary table 1 (3) SI units and conversion factors

Mass	SI units	Other Units1)	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J = 1 N·m}	eV [electron volt(s)] * erg [erg(s)] kgf·m lbf·ft	1 eV = (1.602 189 2 ± 0.000 004 6) × 10^{-19} J 1 erg = 10^{-7} J 1 kgf·m = 9.806 65 J 1 lbf·ft = 1.355 82 J	1 J = 10^{7} erg 1 J = 0.101 97 kgf·m 1 J = 0.737 56 lbf·ft
Power	W [watt(s)]	erg / s [ergs per second] kgf·m / s PS [French horse-power] HP [horse-power (British)] lbf·ft / s	1 erg / s = 10^{-7} W 1 kgf·m / s = 9.806 65 W 1 PS = 75 kgf·m / s = 735.5 W 1 HP = 550 lbf·ft / s = 745.7 W 1 lbf·ft / s = 1.355 82 W	1 W = 0.101 97 kgf·m / s 1 W = 0.001 36 PS 1 W = 0.001 34 HP
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	°C [celsius(s)] {t °C = (t + 273.15) K}	°F [degree(s) Fahrenheit]	t °F = $\frac{5}{9}$(t − 32) °C	t °C = ($\frac{9}{5}$t + 32) °F
Linear expansion coefficient	K^{-1}	$°C^{-1}$ [per degree]		
Heat	J [joule(s)] {1 J = 1 N·m}	erg [erg(s)] kgf·m cal_{IT} [I. T. calories]	1 erg = 10^{-7} J 1 cal_{IT} = 4.186 8 J 1 $Mcal_{IT}$ = 1.163 kW·h	1 J = 10^{7} erg 1 J = 0.238 85 cal_{IT} 1 kW·h = 0.86 × 10^{6} cal_{IT}
Thermal conductivity	W / (m·K)	W / (m·°C) cal / (s·m·°C)	1 W / (m·°C) = 1 W / (m·K) 1 cal / (s·m·°C) = 4.186 05 W / (m·K)	
Coefficient of heat transfer	W / (m^2·K)	W / (m^2·°C) cal / (s·m^2·°C)	1 W / (m^2·°C) = 1 W / (m^2·K) 1 cal / (s·m^2·°C) = 4.186 05 W / (m^2·K)	
Heat capacity	J / K	J / °C	1 J / °C = 1 J / K	
Massic heat capacity	J / (kg·K)	J / (kg·°C)		

[Note] 1) * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 1 (4) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge, quantity of electricity	C [coulomb(s)] {1 C = 1 A·s}	A·h *	1 A·h = 3.6 kC	
Tension, electric potential	V [volt(s)] {1 V = 1 W / A}			
Capacitance	F [farad(s)] {1 F = 1 C / V}			
Magnetic field strength	A / m	Oe [oersted(s)]	1 Oe = $\frac{10^3}{4\pi}$ A / m	1 A / m = $4\pi \times 10^{-3}$ Oe
Magnetic flux density	T [tesla(s)] {1 T = 1 N / (A·m) = 1 Wb / m^2 = 1 V·s / m^2}	Gs [gauss(es)] γ [gamma(s)]	1 Gs = 10^{-4} T 1 γ = 10^{-9} T	1 T = 10^4 Gs 1 T = 10^9 γ
Magnetic flux	Wb [weber(s)] {1 Wb = 1 V·s}	Mx [maxwell(s)]	1 Mx = 10^{-8} Wb	1 Wb = 10^8 Mx
Self inductance	H [henry(-ries)] {1 H = 1 Wb / A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω = 1 V / A}			
Conductance (to direct current)	S [siemens] {1 S = 1 A / V}			
Active power	{W 1 W = 1 J / s = 1 A·V}			

Supplementary table 2 Steel hardness numbers (1)

Rockwell C-Scale Hardness Number	Diamond Pyramid Hardness Number Vickers	Brinell Hardness Number 10 mm Ball 3000 kg Load			Rockwell Hardness Number			Rockwell Superficial Hardness Number Superficial Brale Penetrator			Shore Scleroscope Hardness Number	Tensil Strength (approx.) MPa	Tensil Strength (approx.) 1000 psi	Rockwell C-Scale Hardness Number
		Standard Ball	Hultgren Ball	Tungsten Carbide Ball	A-Scale 60 kg Load Brale Penetrator	B-Scale 15 kg Load 1/16 in (1.59 mm) Dia.	D-Scale 100 kg Brale Penetrator	15-N Scale 15 kg Load	30-N Scale 30 kg Load	45-N Scale 45 kg Load				
68	940	—	—	—	85.6	—	76.9	93.2	84.4	75.4	97	—	—	68
67	900	—	—	—	85	—	76.1	92.9	83.6	74.2	95	—	—	67
66	865	—	—	—	84.5	—	75.4	92.5	82.8	73.3	92	—	—	66
65	832	—	—	739	83.9	—	74.5	92.2	81.9	72	91	—	—	65
64	800	—	—	722	83.4	—	73.8	91.8	81.1	71	88	—	—	64
63	772	—	—	705	82.8	—	73	91.4	80.1	69.9	87	—	—	63
62	746	—	—	688	82.3	—	72.2	91.1	79.3	68.8	85	—	—	62
61	720	—	—	670	81.8	—	71.5	90.7	78.4	67.7	83	—	—	61
60	697	—	613	654	81.2	—	70.7	90.2	77.5	66.6	81	—	—	60
59	674	—	599	634	80.7	—	69.9	89.8	76.6	65.5	80	2250	326	59
58	653	—	587	615	80.1	—	69.2	89.3	75.7	64.3	78	2170	315	58
57	633	—	575	595	79.6	—	68.5	88.9	74.8	63.2	76	2100	305	57
56	613	—	561	577	79	—	67.7	88.3	73.9	62	75	2030	295	56
55	595	—	546	560	78.5	—	66.9	87.9	73	60.9	74	1980	287	55
54	577	—	534	543	78	—	66.1	87.4	72	59.8	72	1920	278	54
53	560	—	519	525	77.4	—	65.4	86.9	71.2	58.6	71	1850	269	53
52	544	500	508	512	76.8	—	64.6	86.4	70.2	57.4	69	1810	262	52
51	528	487	494	496	76.3	—	63.8	85.9	69.4	56.1	68	1740	253	51
50	513	475	481	481	75.9	—	63.1	85.5	68.5	55	67	1690	245	50
49	498	464	469	469	75.2	—	62.1	85	67.6	53.8	66	1650	239	49
48	484	451	455	455	74.7	—	61.4	84.5	66.7	52.5	64	1600	232	48
47	471	442	443	443	74.1	—	60.8	83.9	65.8	51.4	63	1550	225	47
45	446	421	421	421	73.1	—	59.2	83	64	49	60	1460	212	45
44	434	409	409	409	72.5	—	58.5	82.5	63.1	47.8	58	1420	206	44
43	423	400	400	400	72	—	57.7	82	62.2	46.7	57	1390	201	43
42	412	390	390	390	71.5	—	56.9	81.5	61.3	45.5	56	1350	196	42
41	402	381	381	381	70.9	—	56.2	80.9	60.4	44.3	55	1320	191	41
40	392	371	371	371	70.4	—	55.4	80.4	59.5	43.1	54	1280	186	40
39	382	362	362	362	69.9	—	54.6	79.9	58.6	41.9	52	1250	181	39
38	372	353	353	353	69.4	—	53.8	79.4	57.7	40.8	51	1210	176	38
37	363	344	344	344	68.9	—	53.1	78.8	56.8	39.6	50	1190	172	37
36	354	336	336	336	68.4	(109)	52.3	78.3	55.9	38.4	49	1160	168	36
35	345	327	327	327	67.9	(108.5)	51.5	77.7	55	37.2	48	1120	163	35
34	336	319	319	319	67.4	(108)	50.8	77.2	54.2	36.1	47	1100	159	34
33	327	311	311	311	66.8	(107.5)	50	76.6	53.3	34.9	46	1060	154	33
32	318	301	301	301	66.3	(107)	49.2	76.1	52.1	33.7	44	1030	150	32
31	310	294	294	294	65.8	(106)	48.4	75.6	51.3	32.5	43	1010	146	31
30	302	286	286	286	65.3	(105.5)	47.7	75	50.4	31.3	42	980	142	30
29	294	279	279	279	64.7	(104.5)	47	74.5	49.5	30.1	41	950	138	29
28	286	271	271	271	64.3	(104)	46.1	73.9	48.6	28.9	41	920	134	28
27	279	264	264	264	63.8	(103)	45.2	73.3	47.7	27.8	40	900	131	27
26	272	258	258	258	63.3	(102.5)	44.6	72.8	46.8	26.7	38	880	127	26
25	266	253	253	253	62.8	(101.5)	43.8	72.2	45.9	25.5	38	850	124	25
24	260	247	247	247	62.4	(101)	43.1	71.6	45	24.3	37	830	121	24
23	254	243	243	243	62	100	42.1	71	44	23.1	36	810	118	23
22	248	237	237	237	61.5	99	41.6	70.5	43.2	22	35	790	115	22
21	243	231	231	231	61	98.5	40.9	69.9	42.3	20.7	35	780	113	21
20	238	226	226	226	60.5	97.8	40.1	69.4	41.5	19.6	34	760	110	20

(1) Source ASTM

Supplementary table 3 Inch/millimeter conversion

Inch		Inches										
		0	1	2	3	4	5	6	7	8	9	10
		mm										
0	0	**0**	**25.4000**	**50.8000**	**76.2000**	**101.6000**	**127.0000**	**152.4000**	**177.8000**	**203.2000**	**228.6000**	**254.0000**
1/64	0.015625	0.3969	25.7969	51.1969	76.5969	101.9969	127.3969	152.7969	178.1969	203.5969	228.9969	254.3969
1/32	0.03125	0.7938	26.1938	51.5938	76.9938	102.3938	127.7938	153.1938	178.5938	203.9938	229.3938	254.7938
3/64	0.046875	1.1906	26.5906	51.9906	77.3906	102.7906	128.1906	153.5906	178.9906	204.3906	229.7906	255.1906
1/16	0.0625	1.5875	26.9875	52.3875	77.7875	103.1875	128.5875	153.9875	179.3875	204.7875	230.1875	255.5875
5/64	0.078125	1.9844	27.3844	52.7844	78.1844	103.5844	128.9844	154.3844	179.7844	205.1844	230.5844	255.9844
3/32	0.09375	2.3812	27.7812	53.1812	78.5812	103.9812	129.3812	154.7812	180.1812	205.5812	230.9812	256.3812
7/64	0.109375	2.7781	28.1781	53.5781	78.9781	104.3781	129.7781	155.1781	180.5781	205.9781	231.3781	256.7781
1/8	0.125	**3.1750**	**28.5750**	**53.9750**	**79.3750**	**104.7750**	**130.1750**	**155.5750**	**180.9750**	**206.3750**	**231.7750**	**257.1750**
9/64	0.140625	3.5719	28.9719	54.3719	79.7719	105.1719	130.5719	155.9719	181.3719	206.7719	232.1719	257.5719
5/32	0.15625	3.9688	29.3688	54.7688	80.1688	105.5688	130.9688	156.3688	181.7688	207.1688	232.5688	257.9688
11/64	0.171875	4.3656	29.7656	55.1656	80.5656	105.9656	131.3656	156.7656	182.1656	207.5656	232.9656	258.3656
3/16	0.1875	4.7625	30.1625	55.5625	80.9625	106.3625	131.7625	157.1625	182.5625	207.9625	233.3625	258.7625
13/64	0.203125	5.1594	30.5594	55.9594	81.3594	106.7594	132.1594	157.5594	182.9594	208.3594	233.7594	259.1594
7/32	0.21875	5.5562	30.9562	56.3562	81.7562	107.1562	132.5562	157.9562	183.3562	208.7562	234.1562	259.5562
15/64	0.234375	5.9531	31.3531	56.7531	82.1531	107.5531	132.9531	158.3531	183.7531	209.1531	234.5531	259.9531
1/4	0.25	**6.3500**	**31.7500**	**57.1500**	**82.5500**	**107.9500**	**133.3500**	**158.7500**	**184.1500**	**209.5500**	**234.9500**	**260.3500**
17/64	0.265625	6.7469	32.1469	57.5469	82.9469	108.3469	133.7469	159.1469	184.5469	209.9469	235.3469	260.7469
9/32	0.28125	7.1438	32.5438	57.9438	83.3438	108.7438	134.1438	159.5438	184.9438	210.3438	235.7438	261.1438
19/64	0.296875	7.5406	32.9406	58.3406	83.7406	109.1406	134.5406	159.9406	185.3406	210.7406	236.1406	261.5406
5/16	0.3125	7.9375	33.3375	58.7375	84.1375	109.5375	134.9375	160.3375	185.7375	211.1375	236.5375	261.9375
21/64	0.328125	8.3344	33.7344	59.1344	84.5344	109.9344	135.3344	160.7344	186.1344	211.5344	236.9344	262.3344
11/32	0.34375	8.7312	34.1312	59.5312	84.9312	110.3312	135.7312	161.1312	186.5312	211.9312	237.3312	262.7312
23/64	0.359375	9.1281	34.5281	59.9281	85.3281	110.7281	136.1281	161.5281	186.9281	212.3281	237.7281	263.1281
3/8	0.375	**9.5250**	**34.9250**	**60.3250**	**85.7250**	**111.1250**	**136.5250**	**161.9250**	**187.3250**	**212.7250**	**238.1250**	**263.5250**
25/64	0.390625	9.9219	35.3219	60.7219	86.1219	111.5219	136.9219	162.3219	187.7219	213.1219	238.5219	263.9219
13/32	0.40625	10.3188	35.7188	61.1188	86.5188	111.9188	137.3188	162.7188	188.1188	213.5188	238.9188	264.3188
27/64	0.421875	10.7156	36.1156	61.5156	86.9156	112.3156	137.7156	163.1156	188.5156	213.9156	239.3156	264.7156
7/16	0.4375	11.1125	36.5125	61.9125	87.3125	112.7125	138.1125	163.5125	188.9125	214.3125	239.7125	265.1125
29/64	0.453125	11.5094	36.9094	62.3094	87.7094	113.1094	138.5094	163.9094	189.3094	214.7094	240.1094	265.5094
15/32	0.46875	11.9062	37.3062	62.7062	88.1062	113.5062	138.9062	164.3062	189.7062	215.1062	240.5062	265.9062
31/64	0.484375	12.3031	37.7031	63.1031	88.5031	113.9031	139.3031	164.7031	190.1031	215.5031	240.9031	266.3031
1/2	0.5	**12.7000**	**38.1000**	**63.5000**	**88.9000**	**114.3000**	**139.7000**	**165.1000**	**190.5000**	**215.9000**	**241.3000**	**266.7000**
33/64	0.515625	13.0969	38.4969	63.8969	89.2969	114.6969	140.0969	165.4969	190.8969	216.2969	241.6969	267.0969
17/32	0.53125	13.4938	38.8938	64.2938	89.6938	115.0938	140.4938	165.8938	191.2938	216.6938	242.0938	267.4938
35/64	0.546875	13.8906	39.2906	64.6906	90.0906	115.4906	140.8906	166.2906	191.6906	217.0906	242.4906	267.8906
9/16	0.5625	14.2875	39.6875	65.0875	90.4875	115.8875	141.2875	166.6875	192.0875	217.4875	242.8875	268.2875
37/64	0.578125	14.6844	40.0844	65.4844	90.8844	116.2844	141.6844	167.0844	192.4844	217.8844	243.2844	268.6844
19/32	0.59375	15.0812	40.4812	65.8812	91.2812	116.6812	142.0812	167.4812	192.8812	218.2812	243.6812	269.0812
39/64	0.609375	15.4781	40.8781	66.2781	91.6781	117.0781	142.4781	167.8781	193.2781	218.6781	244.0781	269.4781
5/8	0.625	**15.8750**	**41.2750**	**66.6750**	**92.0750**	**117.4750**	**142.8750**	**168.2750**	**193.6750**	**219.0750**	**244.4750**	**269.8750**
41/64	0.640625	16.2719	41.6719	67.0719	92.4719	117.8719	143.2719	168.6719	194.0719	219.4719	244.8719	270.2719
21/32	0.65625	16.6688	42.0688	67.4688	92.8688	118.2688	143.6688	169.0688	194.4688	219.8688	245.2688	270.6688
43/64	0.671875	17.0656	42.4656	67.8656	93.2656	118.6656	144.0656	169.4656	194.8656	220.2656	245.6656	271.0656
11/16	0.6875	17.4625	42.8625	68.2625	93.6625	119.0625	144.4625	169.8625	195.2625	220.6625	246.0625	271.4625
45/64	0.703125	17.8594	43.2594	68.6594	94.0594	119.4594	144.8594	170.2594	195.6594	221.0594	246.4594	271.8594
23/32	0.71875	18.2562	43.6562	69.0562	94.4562	119.8562	145.2562	170.6562	196.0562	221.4562	246.8562	272.2562
47/64	0.734375	18.6531	44.0531	69.4531	94.8531	120.2531	145.6531	171.0531	196.4531	221.8531	247.2531	272.6531
3/4	0.75	**19.0500**	**44.4500**	**69.8500**	**95.2500**	**120.6500**	**146.0500**	**171.4500**	**196.8500**	**222.2500**	**247.6500**	**273.0500**
49/64	0.765625	19.4469	44.8469	70.2469	95.6469	121.0469	146.4469	171.8469	197.2469	222.6469	248.0469	273.4469
25/32	0.78125	19.8438	45.2438	70.6438	96.0438	121.4438	146.8438	172.2438	197.6438	223.0438	248.4438	273.8438
51/64	0.796875	20.2406	45.6406	71.0406	96.4406	121.8406	147.2406	172.6406	198.0406	223.4406	248.8406	274.2406
13/16	0.8125	20.6375	46.0375	71.4375	96.8375	122.2375	147.6375	173.0375	198.4375	223.8375	249.2375	274.6375
53/64	0.828125	21.0344	46.4344	71.8344	97.2344	122.6344	148.0344	173.4344	198.8344	224.2344	249.6344	275.0344
27/32	0.84375	21.4312	46.8312	72.2312	97.6312	123.0312	148.4312	173.8312	199.2312	224.6312	250.0312	275.4312
55/64	0.859375	21.8281	47.2281	72.6281	98.0281	123.4281	148.8281	174.2281	199.6281	225.0281	250.4281	275.8281
7/8	0.875	**22.2250**	**47.6250**	**73.0250**	**98.4250**	**123.8250**	**149.2250**	**174.6250**	**200.0250**	**225.4250**	**250.8250**	**276.2250**
57/64	0.890625	22.6219	48.0219	73.4219	98.8219	124.2219	149.6219	175.0219	200.4219	225.8219	251.2219	276.6219
29/32	0.90625	23.0188	48.4188	73.8188	99.2188	124.6188	150.0188	175.4188	200.8188	226.2188	251.6188	277.0188
59/64	0.921875	23.4156	48.8156	74.2156	99.6156	125.0156	150.4156	175.8156	201.2156	226.6156	252.0156	277.4156
15/16	0.9375	23.8125	49.2125	74.6125	100.0125	125.4125	150.8125	176.2125	201.6125	227.0125	252.4125	277.8125
61/64	0.953125	24.2094	49.6094	75.0094	100.4094	125.8094	151.2094	176.6094	202.0094	227.4094	252.8094	278.2094
31/32	0.96875	24.6062	50.0062	75.4062	100.8062	126.2062	151.6062	177.0062	202.4062	227.8062	253.2062	278.6062
63/64	0.984375	25.0031	50.4031	75.8031	101.2031	126.6031	152.0031	177.4031	202.8031	228.2031	253.6031	279.0031

Supplementary table 4 °C / °F conversion

°C		°F	°C		°F	°C		°F	°C		°F
−73	**−100**	−148	− 1.6	**29**	84.2	17.7	**64**	147.2	37.1	**99**	210.2
−62	**− 80**	−112	− 1.1	**30**	86.0	18.2	**65**	149.0	37.7	**100**	212
−51	**− 60**	− 76	− 0.6	**31**	87.8	18.8	**66**	150.8	40.6	**105**	221
−40	**− 40**	− 40	0	**32**	89.6	19.3	**67**	152.6	43	**110**	230
−29	**− 20**	− 4	0.5	**33**	91.4	19.9	**68**	154.4	49	**120**	248
−23.3	**− 10**	14	1.1	**34**	93.2	20.4	**69**	156.2	54	**130**	266
−17.7	**0**	32	1.6	**35**	95.0	21.0	**70**	158.0	60	**140**	284
−17.2	**1**	33.8	2.2	**36**	96.8	21.5	**71**	159.8	65	**150**	302
−16.6	**2**	35.6	2.7	**37**	98.6	22.2	**72**	161.6	71	**160**	320
−16.1	**3**	37.4	3.3	**38**	100.4	22.7	**73**	163.4	76	**170**	338
−15.5	**4**	39.2	3.8	**39**	102.2	23.3	**74**	165.2	83	**180**	356
−15.0	**5**	41.0	4.4	**40**	104.0	23.8	**75**	167.0	88	**190**	374
−14.4	**6**	42.8	4.9	**41**	105.8	24.4	**76**	168.8	93	**200**	392
−13.9	**7**	44.6	5.4	**42**	107.6	25.0	**77**	170.6	121	**250**	482
−13.3	**8**	46.4	6.0	**43**	109.4	25.5	**78**	172.4	149	**300**	572
−12.7	**9**	48.2	6.6	**44**	111.2	26.2	**79**	174.2	177	**350**	662
−12.2	**10**	50.0	7.1	**45**	113.0	26.8	**80**	176.0	204	**400**	752
−11.6	**11**	51.8	7.7	**46**	114.8	27.3	**81**	177.8	232	**450**	842
−11.1	**12**	53.6	8.2	**47**	116.6	27.7	**82**	179.6	260	**500**	932
−10.5	**13**	55.4	8.8	**48**	118.4	28.2	**83**	181.4	288	**550**	1 022
−10.0	**14**	57.2	9.3	**49**	120.2	28.8	**84**	183.2	315	**600**	1 112
− 9.4	**15**	59.0	9.9	**50**	122.0	29.3	**85**	185.0	343	**650**	1 202
− 8.8	**16**	61.8	10.4	**51**	123.8	29.9	**86**	186.8	371	**700**	1 292
− 8.3	**17**	63.6	11.1	**52**	125.6	30.4	**87**	188.6	399	**750**	1 382
− 7.7	**18**	65.4	11.5	**53**	127.4	31.0	**88**	190.4	426	**800**	1 472
− 7.2	**19**	67.2	12.1	**54**	129.2	31.5	**89**	192.2	454	**850**	1 562
− 6.6	**20**	68.0	12.6	**55**	131.0	32.1	**90**	194.0	482	**900**	1 652
− 6.1	**21**	69.8	13.2	**56**	132.8	32.6	**91**	195.8	510	**950**	1 742
− 5.5	**22**	71.6	13.7	**57**	134.6	33.3	**92**	197.6	538	**1 000**	1 832
− 5.0	**23**	73.4	14.3	**58**	136.4	33.8	**93**	199.4	593	**1 100**	2 012
− 4.4	**24**	75.2	14.8	**59**	138.2	34.4	**94**	201.2	648	**1 200**	2 192
− 3.9	**25**	77.0	15.6	**60**	140.0	34.9	**95**	203.0	704	**1 300**	2 372
− 3.3	**26**	78.8	16.1	**61**	141.8	35.5	**96**	204.8	760	**1 400**	2 552
− 2.8	**27**	80.6	16.6	**62**	143.6	36.1	**97**	206.6	815	**1 500**	2 732
− 2.2	**28**	82.4	17.1	**63**	145.4	36.6	**98**	208.4	871	**1 600**	2 937

[Example] The center columns of numbers is the temperature in either degrees Centigrade (°C) or Fahrenheit (°F) whichever is desired to convert into the other. If degrees Fahrenheit is given, read degrees Centigrade to the left. If degrees Centigrade is given, read degrees Fahrenheit to the right.

$$^\circ\mathrm{C} = \frac{5}{9}(^\circ\mathrm{F} - 32)$$

$$^\circ\mathrm{F} = \frac{9}{5}\,^\circ\mathrm{C} + 32$$

Supplementary table 5 Viscosity conversion

Kinematic viscosity mm^2/s	Saybolt SUS (second)		Redwood R (second)		Engler E (degree)
	100 °F	210 °F	50 °C	100 °C	
2	32.6	32.8	30.8	31.2	1.14
3	36.0	36.3	33.3	33.7	1.22
4	39.1	39.4	35.9	36.5	1.31
5	42.3	42.6	38.5	39.1	1.40
6	45.5	45.8	41.1	41.7	1.48
7	48.7	49.0	43.7	44.3	1.56
8	52.0	52.4	46.3	47.0	1.65
9	55.4	55.8	49.1	50.0	1.75
10	58.8	59.2	52.1	52.9	1.84
11	62.3	62.7	55.1	56.0	1.93
12	65.9	66.4	58.2	59.1	2.02
13	69.6	70.1	61.4	62.3	2.12
14	73.4	73.9	64.7	65.6	2.22
15	77.2	77.7	68.0	69.1	2.32
16	81.1	81.7	71.5	72.6	2.43
17	85.1	85.7	75.0	76.1	2.54
18	89.2	89.8	78.6	79.7	2.64
19	93.3	94.0	82.1	83.6	2.76
20	97.5	98.2	85.8	87.4	2.87
21	102	102	89.5	91.3	2.98
22	106	107	93.3	95.1	3.10
23	110	111	97.1	98.9	3.22
24	115	115	101	103	3.34
25	119	120	105	107	3.46
26	123	124	109	111	3.58
27	128	129	112	115	3.70
28	132	133	116	119	3.82
29	137	138	120	123	3.95
30	141	142	124	127	4.07
31	145	146	128	131	4.20
32	150	150	132	135	4.32
33	154	155	136	139	4.45
34	159	160	140	143	4.57
35	163	164	144	147	4.70
36	168	170	148	151	4.83
37	172	173	153	155	4.96
38	177	178	156	159	5.08
39	181	183	160	164	5.21
40	186	187	164	168	5.34
41	190	192	168	172	5.47
42	195	196	172	176	5.59
43	199	201	176	180	5.72
44	204	205	180	185	5.85
45	208	210	184	189	5.98
46	213	215	188	193	6.11
47	218	219	193	197	6.24
48	222	224	197	202	6.37
49	227	228	201	206	6.50
50	231	233	205	210	6.63
55	254	256	225	231	7.24
60	277	279	245	252	7.90
65	300	302	266	273	8.55
70	323	326	286	294	9.21
75	346	349	306	315	9.89
80	371	373	326	336	10.5
85	394	397	347	357	11.2
90	417	420	367	378	11.8
95	440	443	387	399	12.5
100	464	467	408	420	13.2
120	556	560	490	504	15.8
140	649	653	571	588	18.4
160	742	747	653	672	21.1
180	834	840	734	757	23.7
200	927	933	816	841	26.3
250	1 159	1 167	1 020	1 051	32.9
300	1 391	1 400	1 224	1 241	39.5

[Remark] 1 mm^2 / s = 1 cSt (centi stokes)

INDEX

CODE	DESCRIPTION	PAGE
FCS	Drawn cup roller clutch, regular series, single roller per stainless steel spring, metric series	B-3-10~B-3-11
FG	Needle roller bearing, track roller, yoke type, full complement, non-separable, unsealed, crowned outer ring outside diameter, with inner ring, metric series	B-5-39~B-5-40
FG..EE	Needle roller bearing, track roller, yoke type, full complement, non-separable, polymer-sealed, crowned outer ring outside diameter, with inner ring, metric series	B-5-39
FGL	Needle roller bearing, track roller, yoke type, full complement, non-separable, unsealed, cylindrical outer ring outside diameter, with inner ring, metric series	B-5-39~B-5-40
FGU (MM)	Cylindrical roller bearing, track roller, yoke type, full complement, light series, metal-sealed, crowned outer ring outside diameter, with inner ring, metric series	B-5-41
FGU (MM)	Cylindrical roller bearing, track roller, yoke type, full complement, heavy series, metal-sealed, crowned outer ring outside diameter, with inner ring, metric series	B-5-42~B-5-43
FGUL (MM)	Cylindrical roller bearing, track roller, yoke type, full complement, light series, metal-sealed, cylindrical outer ring outside diameter, with inner ring, metric series	B-5-41
FGUL (MM)	Cylindrical roller bearing, track roller, yoke type, full complement, heavy series, metal-sealed, cylindrical outer ring outside diameter, with inner ring, metric series	B-5-42~B-5-43
FNT, FNTA	Thrust needle roller and cage assembly (without washers), two-piece cage, metric series	B-6-12~B-6-17
FNTF	Unitized needle roller thrust bearing, non-separable design, with one I.D. lipped thrust washer, metric series	B-6-24
FNTK	Unitized needle roller thrust bearing, non-separable design, with one O.D. lipped thrust washer, metric series	B-6-22
FNTKF	Unitized needle roller thrust bearing, with non-separable washers, one I.D. lipped washer and one O.D. lipped washer, metric series	B-6-20
FP	Needle roller bearing, track roller, yoke type, full complement, non-separable, small series, crowned outer ring outside diameter, with inner ring, metric series	B-5-38

CODE	DESCRIPTION	PAGE
FPL	Needle roller bearing, track roller, yoke type, full complement, non-separable, small series, cylindrical outer ring outside diameter, inner ring, metric series	B-5-38
GB	Extra-precision drawn cup needle roller bearing, full complement, inch series	B-2-65
GBH	Extra-precision drawn cup needle roller bearing, full complement, heavy series, inch series	B-2-65
GC 10-15	Needle roller bearing, track roller, stud type, full complement, small series, unsealed, crowned outer ring outside diameter, metric series	B-5-22~B-5-23
GC 16-90	Needle roller bearing, track roller, stud type, full complement, standard series, unsealed, crowned outer ring outside diameter, metric series	B-5-24~B-5-25
GCL 10-15	Needle roller bearing, track roller, stud type, full complement, small series, unsealed, cylindrical outer ring outside diameter, metric series	B-5-22~B-5-23
GCL 16-90	Needle roller bearing, track roller, stud type, full complement, standard series, unsealed, cylindrical outer ring outside diameter, metric series	B-5-24~B-5-25
GCR	Needle roller bearing, track roller, stud type, full complement, crowned outer ring outside diameter, eccentric collar, metric series	B-5-28~B-5-29
GCRL	Needle roller bearing, track roller, stud type, full complement, cylindrical outer ring outside diameter, eccentric collar, metric series	B-5-28~B-5-29
GCU MM	Cylindrical roller bearing, track roller, stud type, full complement, crowned outer ring outside diameter, metal-sealed, metric series	B-5-26~B-5-27
GCUL MM	Cylindrical roller bearing, track roller, stud type, full complement, cylindrical outer ring outside diameter, metal-sealed, metric series	B-5-26~B-5-27
GCUR MM	Cylindrical roller bearing, track roller, stud type, full complement, crowned outer ring outside diameter, eccentric collar, metal-sealed, metric series	B-5-30~B-5-31
GCURL MM	Cylindrical roller bearing, track roller, stud type, full complement, cylindrical outer ring outside diameter, eccentric collar, metal-sealed, metric series	B-5-30~B-5-31

CODE	DESCRIPTION	PAGE
KR .DZ	Needle roller bearing, track roller, stud type, caged, cylindrical outer ring outer diameter, metric series	B-5-16~B-5-17
KR .DZ.2RS	Needle roller bearing, track roller, stud type, caged, sealed, cylindrical outer ring outer diameter, metric series	B-5-18~B-5-19
KRV	Needle roller bearing, track roller, stud type, full complement, crowned outer ring outer diameter metric series	B-5-20~B-5-21
KRV .DZ	Needle roller bearing, track roller, stud type, full complement, cylindrical outer ring outer diameter, metric series	B-5-20~B-5-21
LS	Thrust washer for AXK series, heavy, metric series	B-6-13~B-6-17
M- 1	Drawn cup needle roller bearing, full complement, closed end, inch series	B-2-54~B-2-61
MH- 1	Drawn cup needle roller bearing, full complement, heavy series, closed end, inch series	B-2-54~B-2-61
MJ- 1	Drawn cup needle roller bearing, caged, closed end, inch series	B-2-66~B-2-69
MJH- 1	Drawn cup needle roller bearing, caged, heavy series, closed end, inch series	B-2-66~B-2-69
NA1000	Heavy-duty needle roller bearing, full complement, with inner ring, metric series	B-4-42~B-4-43
NA2000	Heavy-duty needle roller bearing, full complement, with inner ring, metric series	B-4-42~B-4-44
NA22000	Heavy-duty needle roller bearing, full complement, with inner ring, metric series	B-4-42
NA22 .2RS	Needle roller bearing, track roller, yoke type, caged, sealed, with integral flanges, crowned outer ring outer diameter, with inner ring, metric series	B-5-35
NA22.2RS.DZ	Needle roller bearing, track roller, yoke type, caged, sealed, with integral flanges, cylindrical outer ring outer diameter, with inner ring, metric series	B-5-35
NA3000	Heavy-duty needle roller bearing, full complement, with inner ring, metric series	B-4-42~B-4-44
NA48	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubrication hole in the outer ring, with inner ring, metric series	B-4-18
NA49	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubrication hole in the outer ring, with inner ring, metric series	B-4-13~B-4-18, B-4-19
NA49 RS	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, with inner ring, with one seal, metric series	B-4-30
NA49 .2RS	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, with inner ring, with two seals, metric series	B-4-30
NA69	Heavy-duty needle roller bearing, caged, with flanges (inserted or integral), lubricating groove and one Lubricating hole in the outer ring, with inner ring (sizes with 32 mm and larger bores have two needle roller and cage assemblies), metric series	B-4-13~B-4-18
NAO	Heavy-duty needle roller bearing, caged, without flanges, with inner ring, metric series	B-4-32~B-4-34
NATR	Needle roller bearing, track roller, yoke type, caged, crowned outer ring outer diameter, with end washers, non-separable design, with inner ring, metric serie	B-5-36
NATR .DZ	Needle roller bearing, track roller, yoke type, caged, cylindrical outer ring outer diameter, with end washers, non-separable design, with inner ring, metric series	B-5-36
NAXK	Combined needle roller bearings, combination machined race needle roller and thrust ball bearing, caged, single directional axial load capability, without inner ring, metric series	B-7-6~B-7-9
NAXK .Z	Combined needle roller bearings, combination machined race needle roller and thrust ball bearing, caged, single directional axial load capability, with dust cap, without inner ring, metric series	B-7-6~B-7-9
NAXR	Combined needle roller bearings, combination machined race needle roller and thrust cylindrical roller bearing, caged, single directional axial load capability, without inner ring, metric serie	B-7-10~B-7-13
NAXR .Z	Combined needle roller bearings, combination machined race needle roller and thrust cylindrical roller bearing, caged, single directional axial load capability, with dust cap, without inner ring, metric series	B-7-10~B-7-13

CODE	DESCRIPTION	PAGE
NK	Heavy-duty needle roller bearing, caged, with flanges (inserted or integral), without inner ring, metric series	B-4-20~B-4-26
NKJ	Heavy-duty needle roller bearing, caged, with flanges (inserted or integral), with inner ring, metric series	B-4-13~B-4-18
NKJS	Heavy-duty needle roller bearing, with integral flanges, lubricating groove and one lubricating hole in the outer ring, with inner ring, metric series	B-4-14~B-4-18
NKS	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, metric series	B-4-21~B-4-25
NKTN	Heavy-duty needle roller bearing, molded cage of reinforced engineered polymer, with flanges (inserted or integral), without inner ring, metric series	B-4-20
NQ	Heavy-duty needle roller bearing, caged, with integral flanges, without inner ring, metric series	B-4-27~B-4-29
NQI	Heavy-duty needle roller bearing, caged, with integral flanges, with inner ring, metric series	B-4-19
NRO.B	Needle roller, flat end, metric series	B-8-8
NTA	Thrust needle roller and cage assembly (without washers), two-piece cage, inch series	B-6-52~B-6-61
NTH	Thrust cylindrical roller and cage assembly (without washers), inch series	B-6-62~B-6-63
NTHA	Cylindrical roller thrust bearing, with separable washers, one shaft-piloted washer and one housing-piloted washer, inch series	B-6-64~B-6-65
NUKR	Cylindrical roller bearing, track roller, stud-type, full complement, with shields, crowned outer ring outer diameter, metric series	B-5-20~B-5-21
NUTR	Cylindrical roller bearing, track roller, yoke-type, full complement, crowned outer ring outer diameter, with end washers, non-separable design, with inner ring, metric series	B-5-37
NUTR.DZ	Cylindrical roller bearing, track roller, yoke-type, full complement, cylindrical outer ring outer diameter, with end washers, non-separable design, with inner ring, metric series	B-5-37
R	Radial needle roller and cage assembly, steel cage, metric series	B-1-30~B-1-41
R P	Radial needle roller and cage assembly for wrist pin applications, metric series	B-1-53~B-1-54
RAX 400	Combined needle roller bearings, combination machined race needle roller and needle roller thrust bearing, with cage, single directional axial load capability, without inner ring, metric series	B-7-14~B-7-17
RAX 500	Combined needle roller bearings, combination machined race needle roller and cylindrical roller thrust bearing, with cage, single directional axial load capability, without inner ring, metric series	B-7-14~B-7-17
RAX 700	Combined needle roller bearings, combination drawn cup needle roller (with open ends) and needle roller thrust bearing, caged, single directional axial load capability, without inner ring, metric series	B-7-18~B-7-19
RAXF 700	Combined needle roller bearings, combination drawn cup needle roller (with closed end) and needle roller thrust bearing, caged, single directional axial load capability, without inner ring, metric series	B-7-18~B-7-19
RAXZ 500	Combined needle roller bearings, combination machined race needle roller and cylindlical roller thrust bearing, caged, single directional axial load capability, without inner ring, with unitized thrust washer, metric series	B-7-10~B-7-13
RC	Drawn cup roller clutch, single roller per integral spring, inch series	B-3-14~B-3-15
RC -FS	Drawn cup roller clutch, single roller per stainless steel spring, inch series	B-3-14~B-3-15
RCB	Drawn cup roller clutch and bearing assembly, single roller per integral spring, inch series	B-3-16~B-3-17
RCB -FS	Drawn cup roller clutch and bearing assembly, single roller per stainless steel spring, inch series	B-3-16~B-3-17
RE	Radial needle roller and cage assembly for wrist pin applications, metric series	B-1-53~B-1-54
RF	Radial needle roller and cage assembly, molded polymer cage, metric series	B-1-30~B-1-40
RFN	Radial needle roller and cage assembly, molded polymer cage, metric series	B-1-40
RFU	Radial needle roller and cage assembly, half-caged, molded polymer cage, metric series	B-1-32~B-1-40

CODE	DESCRIPTION	PAGE
RNA1000	Heavy-duty needle roller bearing, full complement, without inner ring, metric series	B-4-38~B-4-40
RNA11000B6, RNAB11000	Needle roller bearing, track roller, yoke type, full complement, crowned outer ring outside diameter, without inner ring, metric series	B-5-44
RNA2000	Heavy-duty needle roller bearing, full complement, without inner ring, metric series	B-4-38~B-4-41
RNA22 .2RS	Needle roller bearing, track roller, yoke type, caged, sealed, with integral flanges, crowned outer ring outer diameter, without inner ring, metric series	B-5-34
RNA22 .2RS.DZ	Needle roller bearing, track roller, yoke type, caged, sealed, with integral flanges, cylindrical outer ring outer diameter, without inner ring, metric series	B-5-34
RNA22000	Heavy-duty needle roller bearing, full complement, without inner ring, metric series	B-4-38~B-4-39
RNA3000	Heavy-duty needle roller bearing, full complement, without inner ring, metric series	B-4-39~B-4-41
RNA48	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, metric series	B-4-26
RNA49	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, metric series	B-4-20~B-4-26, B-4-28~B-4-29
RNA49 RS	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, with one seal, metric series	B-4-31
RNA49 .2RS	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, with two seals, metric series	B-4-31
RNA69	Heavy-duty needle roller bearing, caged, with flanges (inserted or integral), lubricating groove and one lubricating hole in the outer ring, without inner ring (sizes with 40 mm and larger bores have two needle roller and cage assemblies), metric series	B-4-21~B-4-26, B-4-28
RNAL11000	Needle roller bearing, track roller, yoke type, full complement, crowned outer ring outside diameter, without inner ring, metric series	B-5-44
RNAO	Heavy-duty needle roller bearing without flanges, without inner ring, metric series	B-4-35~B-4-37
RP	Radial needle roller and cage assembly, steel cage, metric series	B-1-31~B-1-40

CODE	DESCRIPTION	PAGE
RPU	Radial needle roller and cage assembly, half-caged, steel cage, metric series	B-1-33~B-1-40
RS	Radial needle roller and cage assembly, steel cage, metric series	B-1-30~B-1-40
RSTO	Needle roller bearing, track roller, yoke type, caged, crowned outer ring outer diameter, separable design, without inner ring, without end washers, metric series	B-5-32
RSTO. DZ	Needle roller bearing, track roller, yoke type, caged, cylindrical outer ring outer diameter, separable design, without inner ring, without end washers, metric series	B-5-32
RSU	Radial needle roller and cage assembly, half-caged, steel cage, metric series	B-1-37
RV	Radial needle roller and cage assembly, steel cage, metric series	B-1-30~B-1-41
RVU	Radial needle roller and cage assembly, half-caged, steel cage, metric series	B-1-35
SNSH	End washers, for use with NAO and RNAO needle roller bearings, metric series	B-4-32~B-4-37 & B-8-39
STO	Needle roller bearing, track roller, yoke type, caged, crowned outer ring outer diameter, separable design, with inner ring, metric series	B-5-33
STO. DZ	Needle roller bearing, track roller, yoke type, caged, cylindrical outer ring outer diameter, separable design, with inner ring, metric series	B-5-33
STO. ZZ	Needle roller bearing, track roller, yoke type, caged, crowned outer ring outer diameter, with end washers, separable design, with inner ring, metric series	B-5-36
STO. ZZ.DZ	Needle roller bearing, track roller, yoke type, caged, cylindrical outer ring outer diameter, with end washers, separable design, with inner ring, metric series	B-5-36
TP	Thrust needle roller and cage assembly (without washers), two-piece cage, metric series	B-6-18
TPK J	Unitized needle roller thrust bearing, non-separable design, with one O.D. lipped thrust washer, metric series	B-6-23
TPK JL	Unitized needle roller thrust bearing, with non-separable washers, one I.D. lipped washer and one O.D. lipped washer, metric series	B-6-21
TPK L	Unitized needle roller thrust bearing, non-separable design, with one I.D. lipped thrust washer, metric series	B-6-25

NOTES

NOTES

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Kutanegara, Ciampel, Karawang Jawa Barat, 41363 INDONESIA
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FAX : 62-267-8610-271

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-Benelux Branch Office-
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2017.8

Koyo® Needle Roller Bearings

VEGETABLE OIL INK

JTEKT

JTEKT CORPORATION

CAT. NO. B2020E-1
Printed in Japan '17.9-2CDS ('13.3)

JTEKT CORPORATION

List of products that are listed in CAT.NO.B2020E-1 but not in CAT.NO.BS007EN-0DS

- Metric series drawn cup needle roller bearing (full complement type) : DL, DLF
- Metric series inner ring : IM...P, IM, IM...P6, IMC, BICG, BIG, BIK, BIP
- Metric series heavy-duty needle roller bearing (full complement type) : NA, RNA
- Metric series stud-type track rollers (full complement type) : GC16-90/GCL16-90, GCR, GCRL, GC10-15/GCL10-15, GCU, GCUL, GCUR, GCURL
- Metric series yoke-type track rollers (full complement type, sealed) : FP, FPL, FG, FGL, RNA...B6, RNAB, RNAL
- Metric series yoke-type track rollers (full complement type, with metal seals) : FGU, FGUL
- Metris series unitized thrust bearings : AX, CP, AXZ, ARZ, AR
- Metric series combined needle roller bearings : RAXZ500, RAX500, RAX400, RAX700, RAXF700

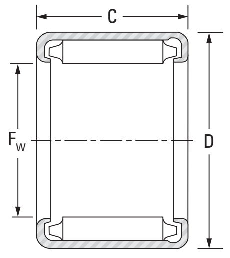
CAT.NO.B2020E-1　(B-2-41,42) 7

’NEEDLE ROLLER BEARINGS ”

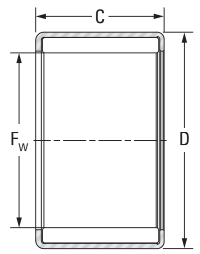
The basic dynamic load rating *C* on these two pages will be corrected as shown in the red frame.

DRAWN CUP NEEDLE ROLLER BEARINGS
FULL COMPLEMENT
OPEN ENDS

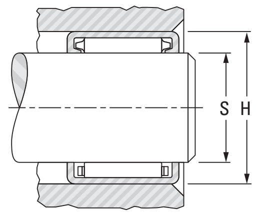
METRIC SERIES
BM, BHM, YM SERIES



BM, BHM



YM



Shaft surface to be 58 HRC or equivalent

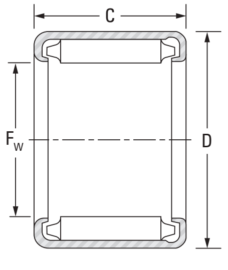
Shaft Dia.	F_w	D	C	$C_{3\,min.}$	Bearing Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit	Approx. Wt.	Mounting Dimensions Shaft (h5)		Mounting Dimensions Housing (H6)		Inspection gage	Mounting inner ring (pages B-2-43 to B-2-45)
			+0 -0.3 +0.000 -0.012		Open Ends	C	C_0	C_u		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	kg lbs	mm in	mm in	mm in	mm in		
3.5 0.1378	**3.5**	**8**	**11**	—	YM040811A	**4.10** 920	**4.20** 940	0.62	**0.003**	**3.500**	**3.495**	**8.009**	**8.000**	Table B2-4	—
6.13 0.2413	**6.13**	**11**	**9.7**	—	6YM1110BM	**4.70** 1060	**5.80** 1300	0.88	**0.004**	**6.130**	**6.124**	**11.011**	**11.000**	Table B2-4	—
8 0.3150	**8**	**12**	**10**	—	YM081210	**6.10** 1370	**8.80** 1980	1.35	**0.004**	**8.000**	**7.994**	**12.011**	**12.000**	Table B2-4	—
	8	**13**	**10**	—	YM081310AM	**5.65** 1270	**7.70** 1730	1.15	**0.006**	**8.000**	**7.994**	**13.011**	**13.000**	Table B2-4	—
10 0.3937	**10**	**14**	**10**	—	10BM1410	**6.55** 1470	**9.50** 2140	1.45	**0.004**	**10.000**	**9.994**	**14.011**	**14.000**	Table B2-4	—
12 0.4724	**12**	**18**	**12**	—	12BM1812	**9.70** 2180	**12.8** 2880	1.90	**0.010**	**12.000**	**11.992**	**18.011**	**18.000**	Table B2-4	—
14 0.5512	**14**	**20**	**12**	—	14BM2012	**10.5** 2360	**14.8** 3330	2.25	**0.011**	**14.000**	**13.992**	**20.013**	**20.000**	Table B2-4	—
15 0.5906	**15**	**21**	**10**	—	15BM2110	**8.85** 1990	**12.0** 2700	1.85	**0.009**	**15.000**	**14.992**	**21.013**	**21.000**	Table B2-4	—
	15	**21**	**12**	—	15BM2112	**11.2** 2520	**16.1** 3620	2.45	**0.012**	**15.000**	**14.992**	**21.013**	**21.000**	Table B2-4	—
	15	**21**	**16**	—	15BM2116	**15.4** 3460	**24.4** 5490	3.70	**0.016**	**15.000**	**14.992**	**21.013**	**21.000**	Table B2-4	—
16 0.6299	**16**	**22**	**12**	—	16BM2212	**11.7** 2630	**17.3** 3890	2.65	**0.012**	**16.000**	**15.992**	**22.013**	**22.000**	Table B2-4	—
17 0.6693	**17**	**23**	**12**	—	17BM2312	**11.9** 2680	**18.2** 4090	2.70	**0.013**	**17.000**	**16.992**	**23.013**	**23.000**	Table B2-4	—
	17	**24**	**12**	—	YM172412-1	**14.9** 3350	**21.5** 4830	3.25	**0.016**	**17.000**	**16.992**	**24.013**	**24.000**	Table B2-4	
	17	**24**	**17**	—	BM172417-1	**18.3** 4110	**28.2** 6340	4.30	**0.023**	**17.000**	**16.992**	**24.013**	**24.000**	Table B2-4	—
	17	**24**	**20**	—	BHM1720A	**21.7** 4880	**35.1** 7890	5.55	**0.026**	**17.000**	**16.992**	**24.013**	**24.000**	Table B2-4	—
	17	**24**	**25**	—	BHM1725	**27.2** 6110	**46.9** 10540	7.30	**0.034**	**17.000**	**16.992**	**24.013**	**24.000**	Table B2-4	—
18 0.7087	**18**	**24**	**16**	—	18BM2416	**17.2** 3870	**29.4** 6610	4.45	**0.018**	**18.000**	**17.992**	**24.013**	**24.000**	Table B2-4	—
20 0.7874	**20**	**26**	**14**	—	YM202614	**17.2** 3870	**31.4** 7060	4.75	**0.019**	**20.000**	**19.991**	**26.013**	**26.000**	Table B2-4	—
	20	**26**	**16**	—	20BM2616	**17.0** 3820	**31.7** 7130	4.85	**0.021**	**20.000**	**19.991**	**26.013**	**26.000**	Table B2-4	—

Note) · For information on the speed ratings, contact JTEKT.

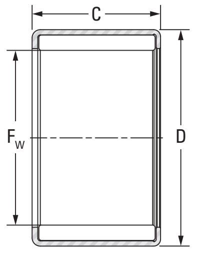
Continued on next page.

DRAWN CUP NEEDLE ROLLER BEARINGS
FULL COMPLEMENT
OPEN ENDS

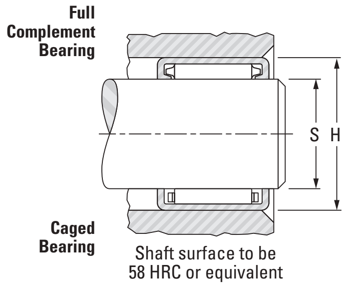
METRIC SERIES
BM, BHM, YM SERIES



BM, BHM



YM

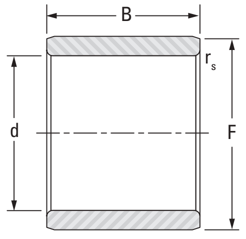


Shaft Dia.	Fw	D	C	C3 min.	Bearing Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit	Approx. Wt.	Mounting Dimensions Shaft (h5)		Mounting Dimensions Housing (H6)		Inspection gage	Mounting inner ring (pages B-2-43 to B-2-45)
			+0 +0.000 -0.3 -0.012		Open Ends	C	C0	Cu		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	kg lbs	mm in	mm in	mm in	mm in		
20 0.7874	20	26	20	—	20BM2620	21.5 4830	42.7 9600	6.70	0.026	20.000	19.991	26.013	26.000	Table B2-4	—
	20	27	15	—	BM2015	17.8 4000	28.0 6290	4.25	0.022	20.000	19.991	27.013	27.000	Table B2-4	—
	20	27	26	—	BM2026	31.5 7080	58.3 13110	9.10	0.040	20.000	19.991	27.013	27.000	Table B2-4	—
21 0.8268	21	27	20	—	21YM2720J	23.3 5240	47.6 10700	7.45	0.029	21.000	20.991	27.013	27.000	Table B2-4	—
22 0.8661	22	29	25	—	BM222925	30.5 6860	60.1 13510	9.40	0.043	22.000	21.991	29.013	29.000	Table B2-4	—
25 0.9843	25	32	16	—	BM2516	21.5 4830	38.3 8610	5.85	0.028	25.000	24.991	32.016	32.000	Table B2-4	—
	25	32	20	—	BM2520	27.3 6140	52.0 11690	8.15	0.036	25.000	24.991	32.016	32.000	Table B2-4	—
	25	32	26	—	BM2526	35.4 7960	72.7 16340	11.4	0.048	25.000	24.991	32.016	32.000	Table B2-4	—
	25	33	25	—	BHM2525	35.8 8050	66.6 14970	10.4	0.053	25.000	24.991	33.016	33.000	Table B2-4	—
28 1.1024	28	34	17	—	BM2817	23.6 5310	50.0 11240	7.80	0.029	28.000	27.991	34.016	34.000	Table B2-4	—
	28	34	24	—	BM2824	33.0 7420	77.1 17330	12.1	0.042	28.000	27.991	34.016	34.000	Table B2-4	
	28	37	30	—	28BHM3730	49.8 11200	95.1 21380	14.9	0.080	28.000	27.991	37.016	37.000	Table B2-4	—
	28	39	30	—	BM283930A	50.7 11400	86.3 19400	13.5	0.101	28.000	27.991	39.016	39.000	Table B2-4	—
30 1.1811	30	37	20	—	30BM3720	30.6 6880	62.9 14140	10.0	0.042	30.000	29.991	37.016	37.000	Table B2-4	—
	30	37	26	—	30BM3726	39.6 8900	87.7 19710	13.7	0.056	30.000	29.991	37.016	37.000	Table B2-4	—
34 1.3386	34	42	25	—	34YM4225L	42.1 9460	94.1 21150	14.7	0.075	34.000	33.989	42.016	42.000	Table B2-4	—
38 1.4961	38	48	20	—	YM3820PL	43.7 9820	83.3 18730	13.3	0.082	38.000	37.989	48.016	48.000	Table B2-4	—
40 1.5748	40	53	20	—	YM405320JM	54.2 12180	89.9 20210	14.4	0.116	40.000	39.989	53.019	53.000	Table B2-4	—

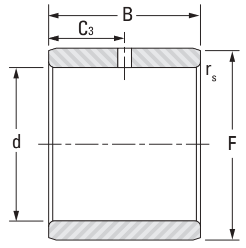
Note) · For information on the speed ratings, contact JTEKT.

INNER RINGS FOR FULL COMPLEMENT DRAWN CUP NEEDLE ROLLER BEARINGS

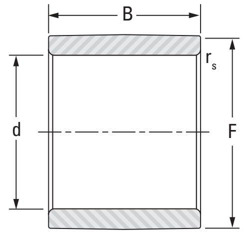
METRIC SERIES



IM



IMC



IM…R6

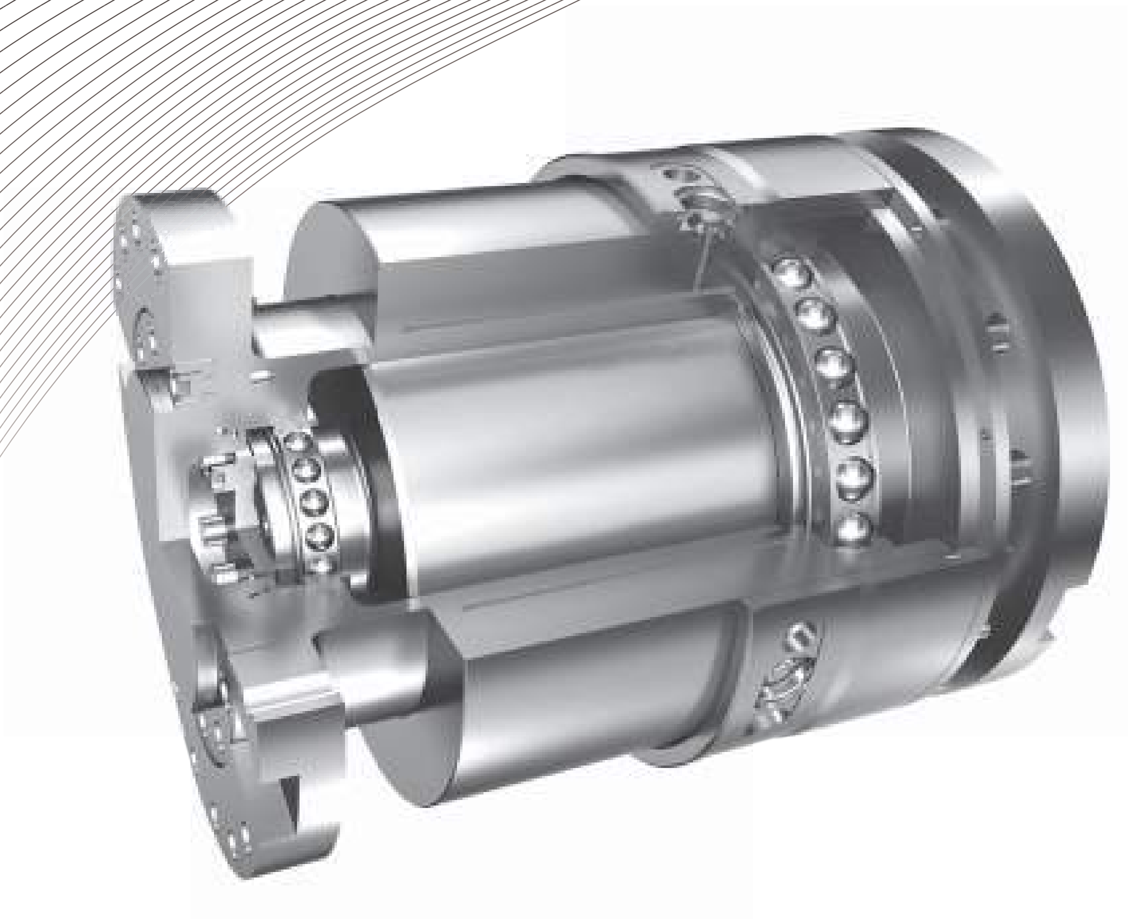
Shaft Dia.	d	F (1)	B	Hole Location C3	rs min.	Inner Ring Designation	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in		kg lbs
8 0.3150	8 0.3150	12 0.4724	12.4 0.488		0.3 0.01	IM 8 12 12,4	0.006 0.013
9 0.3543	9 0.3543	13 0.5118	12.4 0.488		0.3 0.01	IM 9 13 12,4	0.006 0.013
	9 0.3543	13 0.5118	12.4 0.488		0.3 0.01	IM 9 13 12,4 R6	0.006 0.013
10 0.3937	10 0.3937	14 0.5512	12.4 0.488		0.3 0.01	IM 10 14 12,4	0.007 0.015
	10 0.3937	14 0.5512	16.4 0.646		0.3 0.01	IM 10 14 16,4	0.009 0.020
11 0.4331	11 0.4331	15 0.5906	12.4 0.488		0.3 0.01	IM 11 15 12,4	0.008 0.018
12 0.4724	12 0.4724	15 0.5906	12.4 0.488		0.2 0.01	IM 12 15 12,4	0.006 0.013
	12 0.4724	16 0.6299	12.4 0.488		0.2 0.01	IM 12 16 12,4	0.008 0.018
	12 0.4724	16 0.6299	12.4 0.488		0.3 0.01	IM 12 16 12,4 R6	0.008 0.018
	12 0.4724	16 0.6299	12.4 0.488	6.2 0.24	0.3 0.01	IMC 12 16 12,4	0.008 0.018
13 0.5118	13 0.5118	17 0.6693	12.4 0.488		0.3 0.01	IM 13 17 12,4	0.009 0.020
	13 0.5118	18 0.7087	12.4 0.488		0.35 0.014	IM 13 18 12,4	0.011 0.025
	13 0.5118	18 0.7087	12.4 0.488		0.35 0.014	IM 13 18 12,4 R6	0.011 0.025
	13 0.5118	18 0.7087	16.4 0.646		0.35 0.014	IM 13 18 16,4	0.015 0.033
15 0.5906	15 0.5906	20 0.7874	12.4 0.488		0.35 0.014	IM 15 20 12,4	0.013 0.028
	15 0.5906	20 0.7874	16.4 0.646		0.35 0.014	IM 15 20 16,4	0.017 0.037
	17 0.6693	22 0.8661	16.4 0.646		0.35 0.014	IM 17 22 16,4	0.019 0.041
	17 0.6693	22 0.8661	16.4 0.646		0.35 0.014	IM 17 22 16,4 R6	0.019 0.041
17 0.6693	17 0.6693	22 0.8661	16.4 0.646	8.2 0.32	0.35 0.014	IMC 17 22 16,4	0.019 0.041
20 0.7874	20 0.7874	25 0.9843	16.4 0.646		0.35 0.014	IM 20 25 16,4	0.022 0.047
	20 0.7874	25 0.9843	16.4 0.646		0.35 0.014	IM 20 25 16,4 R6	0.022 0.047
	20 0.7874	25 0.9843	16.4 0.646	8.2 0.32	0.35 0.014	IMC 20 25 16,4	0.022 0.047
	20 0.7874	25 0.9843	20.4 0.803		0.35 0.014	IM 20 25 20,4	0.027 0.060

(1) Call for O.D. tolerance

Continued on next page.

Koyo

JHS Series
Hyper Coupling



JTEKT

JTEKT CORPORATION

JTEKT

Koyo TOYODA

CAT.NO.B1010E

No.1 & Only One Technological Capacity

A drive shaft that transmits power to a machine is installed between the machine and the motor. Therefore, if the machine stops suddenly and an overload is generated, the drive shaft or the motor may break down.

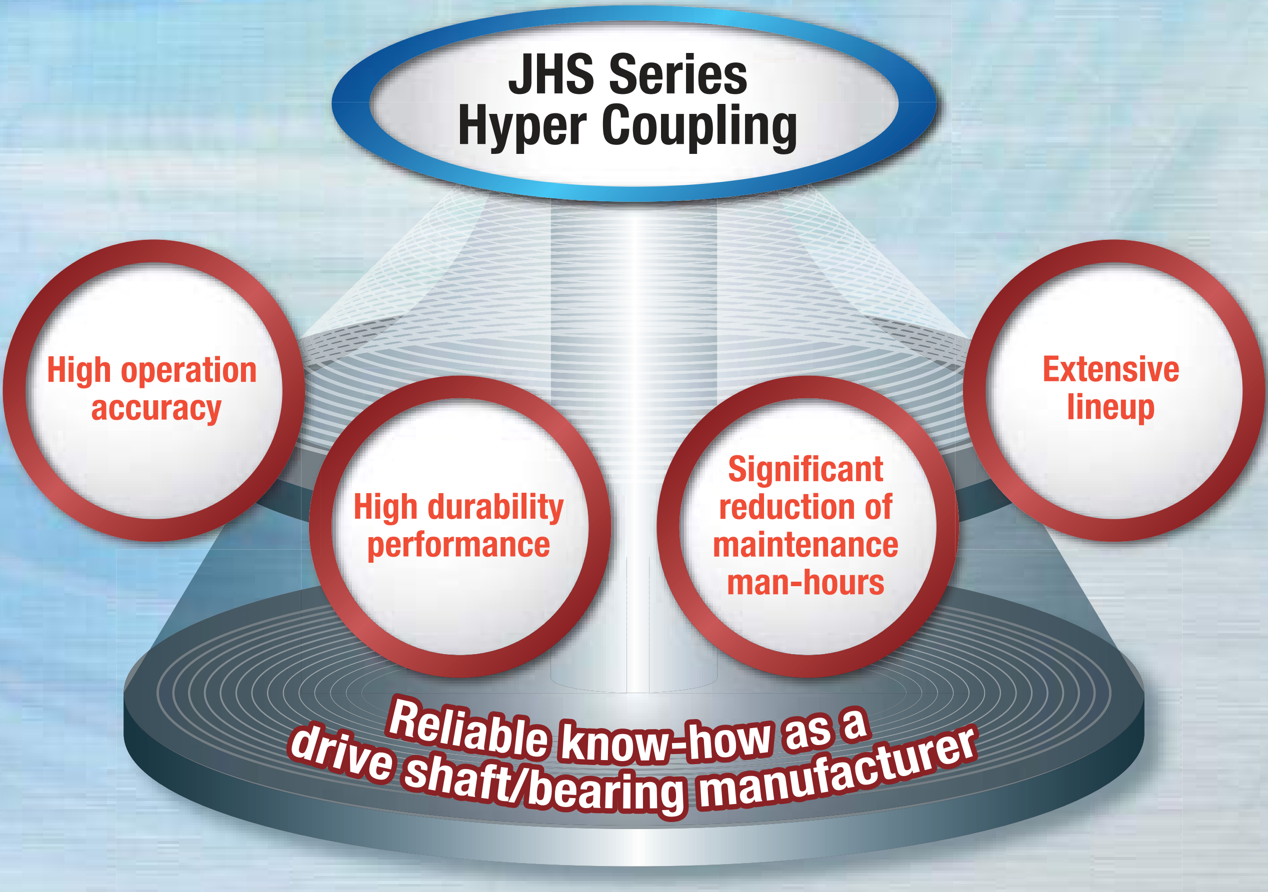
The hyper coupling developed by JTEKT is an interrupting device which prevents overloads from being transmitted to the motor or the drive shaft if an overload is generated.

JHS
JTEKT HYPER STRONG

High-level design/processing technology is added to a newly-developed material aiming at ultimate performance.
New-generation products with improved rolling fatigue life, superior toughness and corrosion resistance, as well as unparalleled load capacity, abrasion resistance, and high-speed performance – This is what the JHS (JTEKT Hyper Strong) Series is about.
JHS accelerates innovation, improvement, and rationalization at all manufacturing sites.

※JHS is a registered trademark of JTEKT Corporation

The hyper coupling is a torque limiter that protects drive systems for heavy loads



JHS Series Hyper Coupling

High operation accuracy

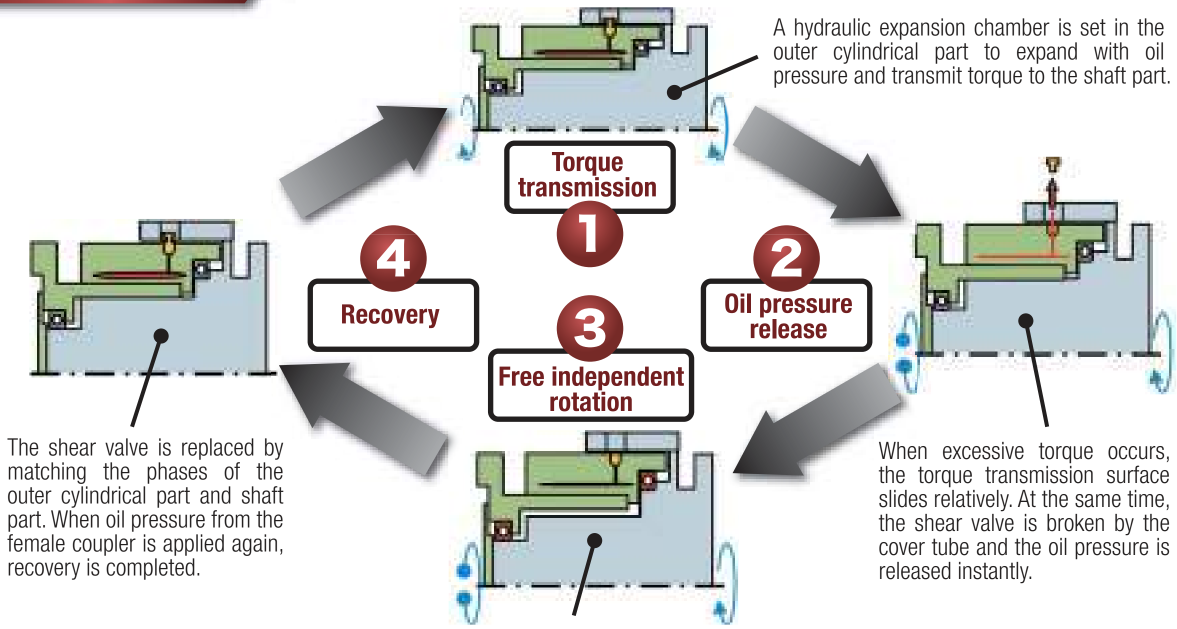
High durability performance

Significant reduction of maintenance man-hours

Extensive lineup

Reliable know-how as a drive shaft/bearing manufacturer

Operating principle



A hydraulic expansion chamber is set in the outer cylindrical part to expand with oil pressure and transmit torque to the shaft part.

1 Torque transmission

2 Oil pressure release

When excessive torque occurs, the torque transmission surface slides relatively. At the same time, the shear valve is broken by the cover tube and the oil pressure is released instantly.

3 Free independent rotation

The outer cylindrical part and the shaft part are free to rotate independently and smoothly on the bearings that support both ends of the torque transmission surface.

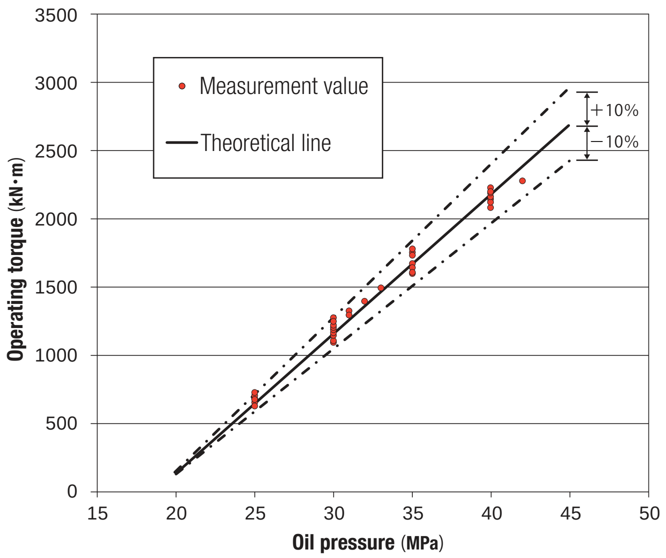
4 Recovery

The shear valve is replaced by matching the phases of the outer cylindrical part and shaft part. When oil pressure from the female coupler is applied again, recovery is completed.

High operation accuracy

Operating torque accuracy within ±10% is realized

The relationship between the operating torque and oil pressure value was obtained with analysis and verified with a large static torsion testing machine to improve reliability.



Relationship between oil pressure and operating torque

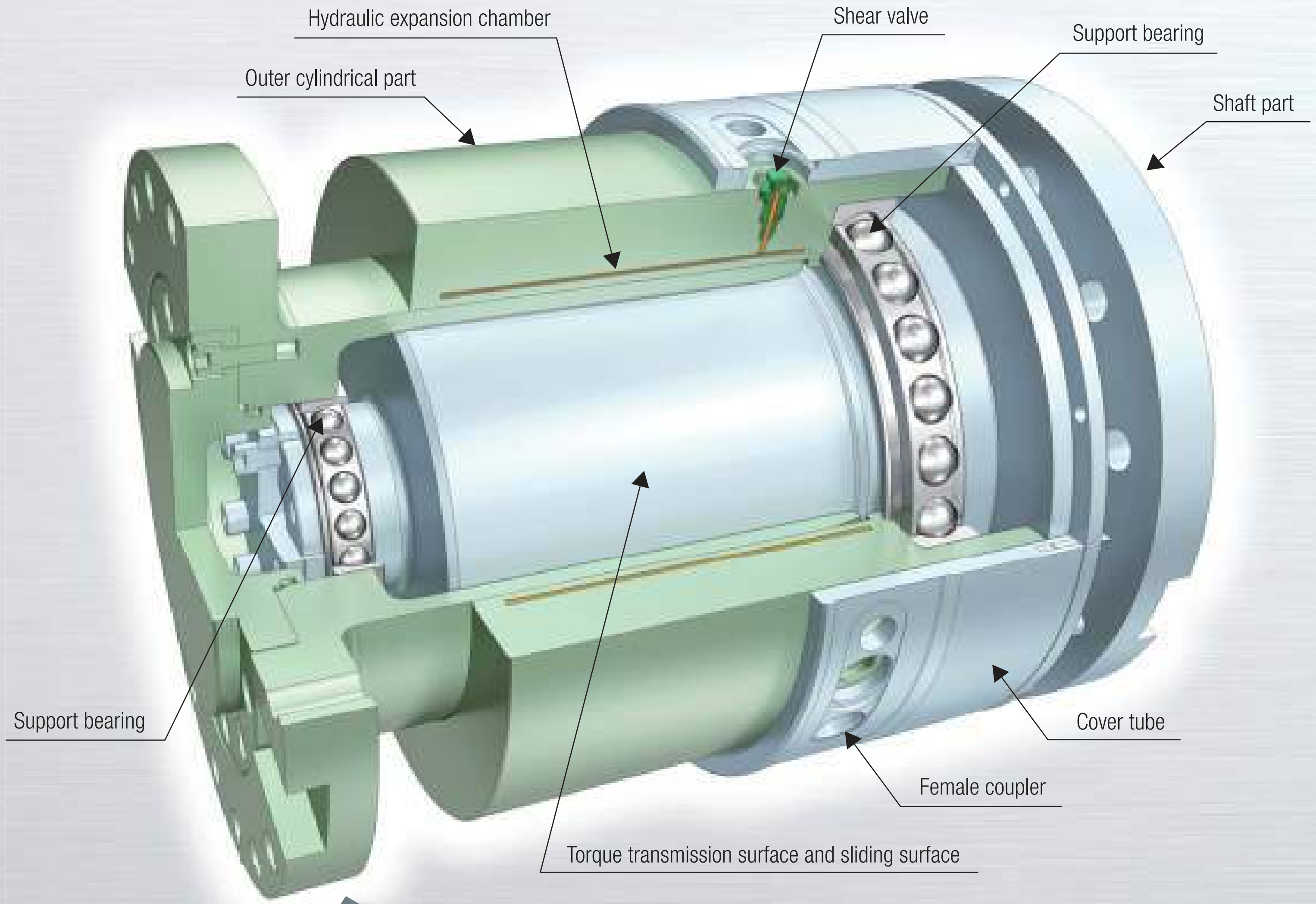
High durability performance

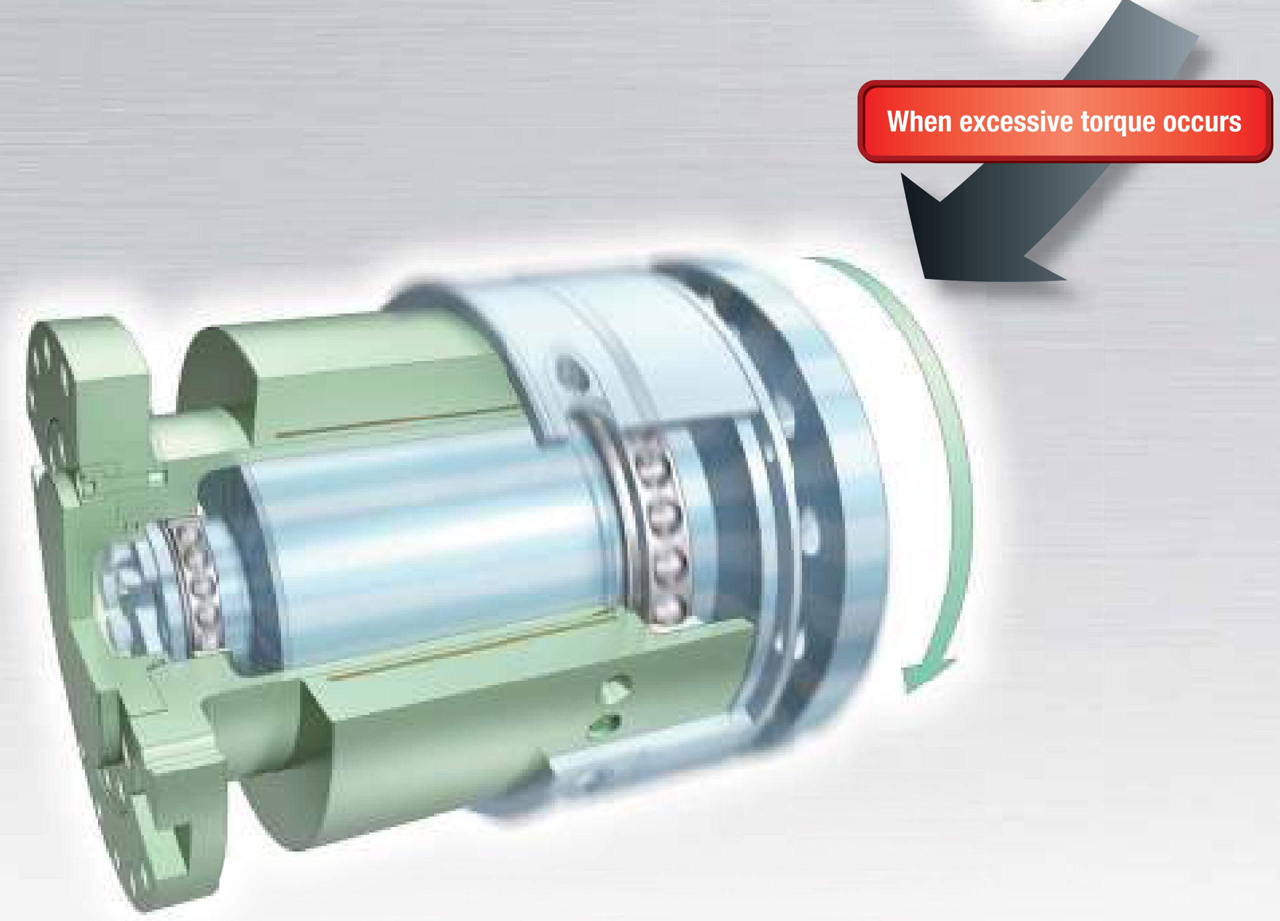
Operating durability of 150 times or more is realized

- Special surface treatment is applied to the operating surface to improve durability.
- The oil pressure release performance is improved by establishing an analysis method of the oil pressure release time.
- A high degree of free independent rotation performance after the release of the oil pressure is secured by utilizing our know-how as a bearing manufacturer.

Excellent operating surface state after evaluation

Support bearings





Reduction of maintenance man-hours

Recovery operation man-hours reduced to 1/4 (compared with the shear pin type)

Only the shear valve is required to be replaced during operation, thus improving maintenance man-hours and the cost of replacement parts.

Unlike the current shear pin type, this product does not require regular part replacement unless it is used.

The maintenance man-hours are greatly reduced, contributing to improvement of availability.

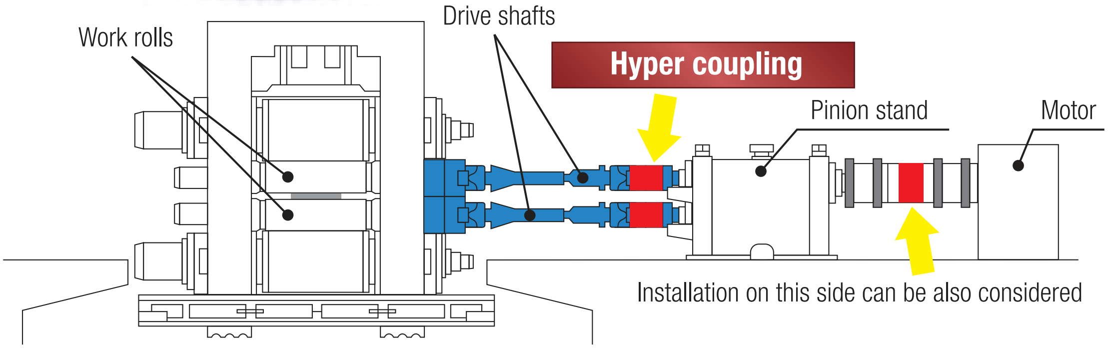
		Shear pin type	Hyper coupling
At the time of recovery	Replacement part	◆Shear pin: 4 pieces ◆Nut: 4 pieces ◆Bush: 8 pieces	◆Shear valve: 4 pieces
	Ratio of required man-hours for part replacement	1	1/4
At the regular inspection time		Regular inspection/replacement of the shear pins is required	Regular inspection/replacement of the shear valves is not required

Example of use of hyper coupling (rolling mill)

Occurrence of multiple in-take of rolled material

The rolls stop suddenly

Hyper coupling **not installed**	Hyper coupling **installed**
Excessive torque acts on the motor, pinion stand, and drive shaft	Excessive torque transmission is intercepted
Equipment is damaged	Equipment is protected
Significant downtime needed for equipment repair/replacement	**Recovery within a short time**



Examples of other applications

- Crusher
- Sizing press mill
- Plastic molding machine
- Electric resistance welded tube mill

Extensive lineup

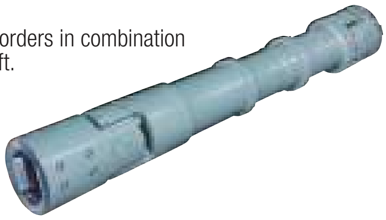
(1) Supported torque : 80 to 4200kN·m

(2) Supported size : Outside diameter ϕ 280 to 1090 mm
Full length 350 to 1500 mm

※We propose installation in your current facility by providing individual design.

Drive shaft rotation diameter of supported size : ϕ 160 to 840 mm

We also accept orders in combination with a drive shaft.



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FAX : 1-905-681-1392

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Guardia y Calle 52, Panama, REPUBLICA DE PANAMA
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FAX : 61-2-8719-5333

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Value & Technology

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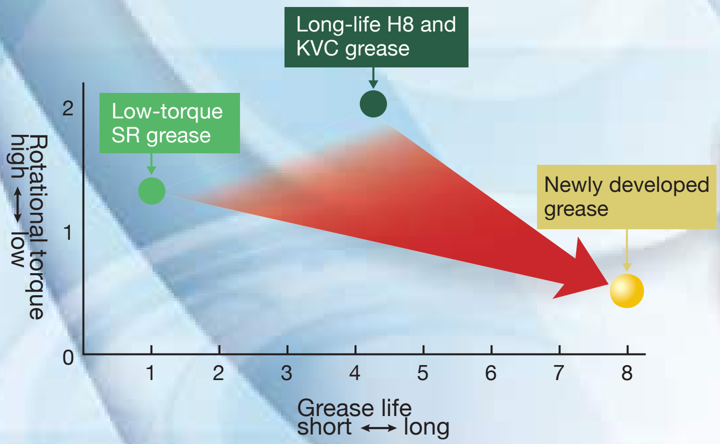
VEGETABLE OIL INK

CAT.NO.B1010E
Printed in Japan '15.05-1CM

New Development / New Product

Low-torque Long-life Deep Groove Ball Bearings for Electric Motors

Optimized grease composition substantially reduces rotational torque & extends service life!!



- Combining low viscous base oil and optimized thickener substantially reduces stir resistance.

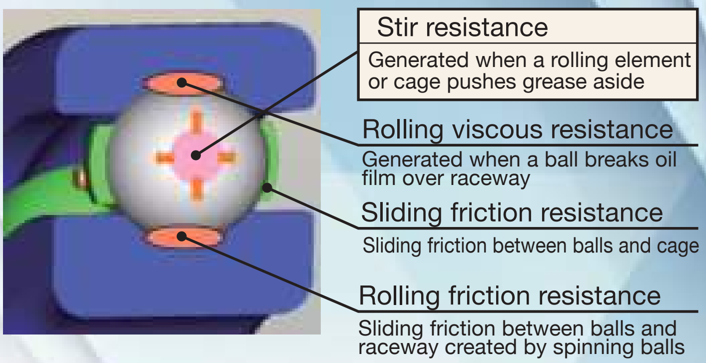
50% reduction of rotational torque from conventional products saves energy.

- Combining improved heat resistance and base oil retention capacity of the thickener with improved heat resistance of the base oil substantially extends bearing service life.

2 times longer service life compared to conventional bearings provides maintenance-free operation.

■ Grease compositions

	Newly developed grease	SR	KVC	H8
Thickener	Diurea	Lithium soap	Diurea	Diurea
Base oil	Synthetic oil	Ester oil	Synthetic oil	Synthetic oil
Base oil kinetic viscosity (40°C)	25 mm^2/s	24 mm^2/s	47 mm^2/s	47 mm^2/s
Additives	Oxidation inhibitors	Oxidation inhibitors	Oxidation inhibitors	Oxidation inhibitors



Stir resistance
Generated when a rolling element or cage pushes grease aside

Rolling viscous resistance
Generated when a ball breaks oil film over raceway

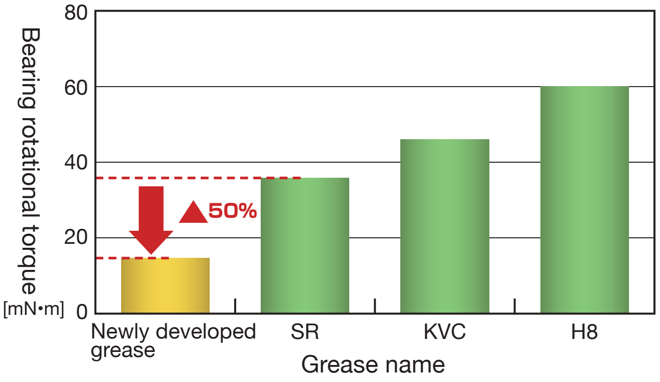
Sliding friction resistance
Sliding friction between balls and cage

Rolling friction resistance
Sliding friction between balls and raceway created by spinning balls

JTEKT CORPORATION

Rotational torque measurement results

50% reduction of rotational torque

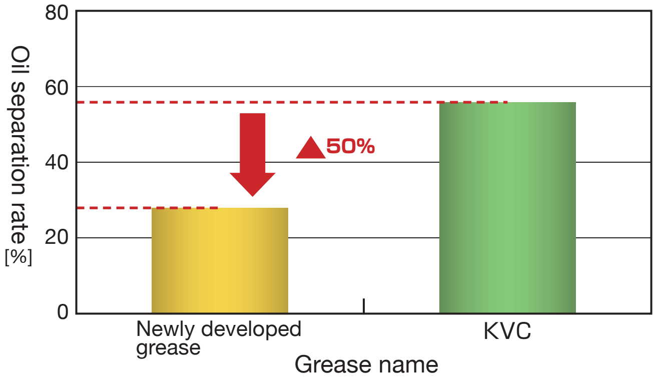


Test conditions

Bearing	6302 (Non-contact seal)
Load	Fr=0 kN　Fa=0.077 kN
Rotational speed	1,800 min^{-1}
Ambient temperature	25°C (Room temperature)
Test duration	30 min

Endurance test results

2 times the volume of remaining oil after test

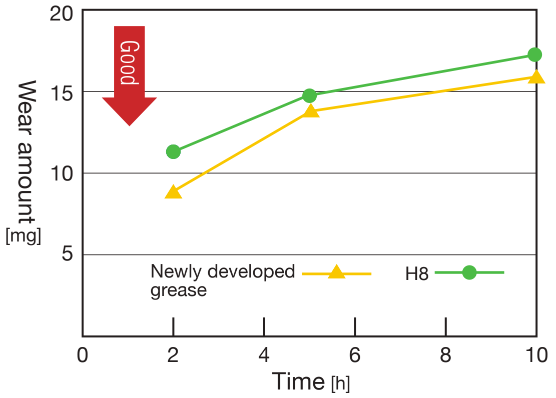


Test conditions

Bearing	6306 (Non-contact seal)
Load	Fr=0.1 kN　Fa=0.17 kN
Rotational speed	1,800 min^{-1}
Ambient temperature	140°C
Test duration	1,000 h (Suspension)

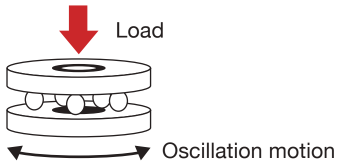
Fretting resistance

Our newly developed grease has equivalent fretting resistance to that of H8 grease.



Test conditions

Standard	ASTM D4170 compliant
Load	2.45kN
Oscillation cycle	3.4 Hz(approx. 200 cycles per minute)
Time	2 h、5 h、10 h
Oscillation angle	12°
Temperature	Room temperature



Fafnir test equipment

Applications

Household appliances/ Industrial motors

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·Information in this catalog is subject to change without notice due to continual improvements.

CAT.NO.B1018E
Printed in Japan '16.11-1CM

Needle Roller Bearings

CAT.NO.BS007EN-0DS

Bearing Size Chart

Radial Needle Roller and Cage Assemblies

Metric Series

Single-Row, Double-Row···B-1-8

Inch Series

Single-Row···B-1-57

Assemblies for Crank Pin End Applications···B-1-47

Assemblies for Wrist Pin End Applications···B-1-51

Drawn Cup Needle Roller Bearings

Metric Series (Caged)

Open Ends, Closed One End···B-2-14

Sealed···B-2-24

(Full Complement)

Open Ends···B-2-38

Inch Series (Caged)

Open Ends, Closed One End···B-2-60

Sealed···B-2-66

(Full Complement)

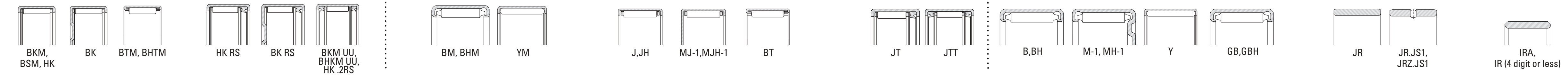
Open Ends, Closed One End···B-2-48

Extra-Precision ···B-2-59

Inner Rings

Metric Series···B-2-28

Inch Series···B-2-68



Drawn Cup Roller Clutches

Metric Series

Clutches···B-3-10

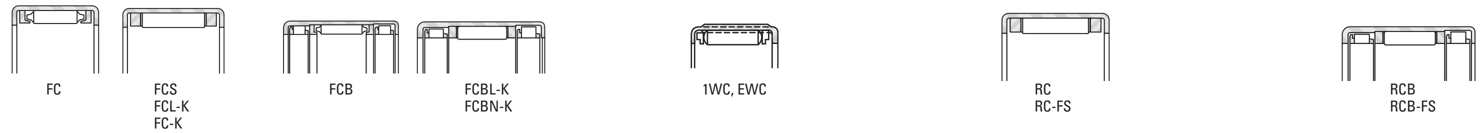
Clutch and Bearing Assemblies···B-3-12

Miniature one-way clutches...B-3-20

Inch Series

Clutches···B-3-14

Clutch and Bearing Assemblies···B-3-16



Heavy-Duty Needle Roller Bearings

Metric Series (Caged, With Inner Ring)

Unsealed···B-4-13

Sealed···B-4-30

Without Flanges ···B-4-32

(Without Inner Ring)

Unsealed···B-4-20

Sealed···B-4-31

Without Flanges···B-4-35

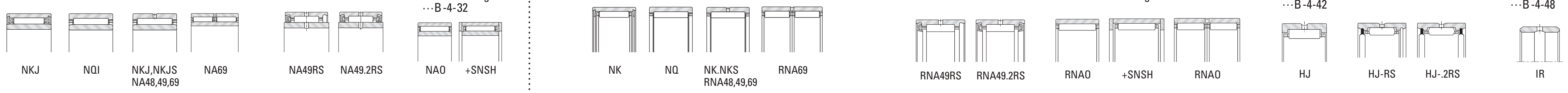
Inch Series (Without Inner Ring)

Unsealed ···B-4-42

Sealed···B-4-46

Inner Rings

Inch Series ···B-4-48



Track Rollers

Stud-Type

Metric Series (Caged)

Unsealed···B-5-16

Sealed···B-5-18

(Full Complement)

Unsealed···B-5-20

Cylindrical Rollers···B-5-20

Inch Series (Full Complement)

Standard···B-5-34

hex socket···B-5-38

Crowned outer ring···B-5-42

Hex socket, Crowned outer ring···B-5-46

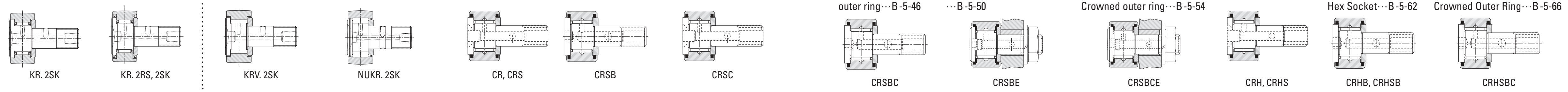
Hex socket, Eccentric stud, ···B-5-50

Hex socket, Eccentric stud, Crowned outer ring···B-5-54

Heavy Stud···B-5-58

Heavy Stud, Hex Socket···B-5-62

Heavy Stud, Hex Socket Crowned Outer Ring···B-5-66



Yoke-Type

Metric Series (Caged, Without End Washers)

Unsealed, Without Inner Ring···B-5-22

Unsealed, With Inner Ring···B-5-23

Sealed, Without Inner Ring···B-5-24

Sealed, With Inner Ring···B-5-25

(Caged, With End Washers)

With Inner Ring···B-5-26

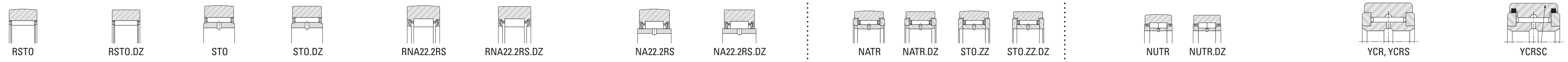
(Full Complement, With End Washers)

With Inner Ring, Cylindrical Rollers···B-5-27

Inch Series (Full Complement, With End Washers)

Non-separable, With Inner Ring···B-5-70

Non-separable, With Inner Ring, Crowned Outer Ring···B-5-74



Thrust Bearings, Assemblies, Washers

Metric Series

Thrust Needle Roller and Cage Assemblies and Thrust Washers···B-6-12

Unitized Thrust Bearing Assemblies (Double-Washer) ···B-6-20

Unitized Thrust Bearing Assemblies (Single-Washer) ···B-6-22

Unitized Thrust Bearing Assemblies (Single-Washer) ···B-6-24

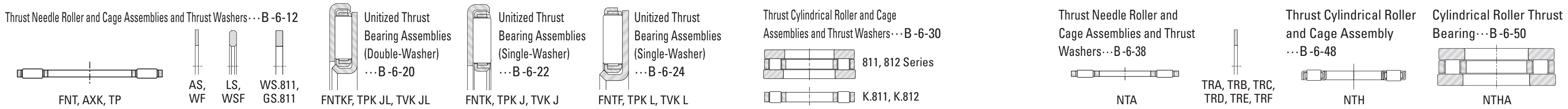
Thrust Cylindrical Roller and Cage Assemblies and Thrust Washers···B-6-30

Inch Series

Thrust Needle Roller and Cage Assemblies and Thrust Washers···B-6-38

Thrust Cylindrical Roller and Cage Assembly ···B-6-48

Cylindrical Roller Thrust Bearing···B-6-50

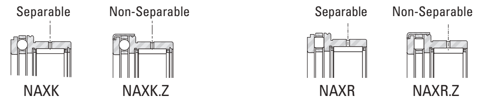


Combined Needle Roller Bearings

Metric Series (Heavy-Duty, Without Inner Ring)

Ball Thrust Series···B-7-6

Cylindrical Roller Thrust Series···B-7-10

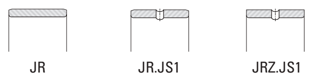


Needle Rollers, Accessories

Inner Rings (Caged)

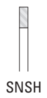
<Metric Series>

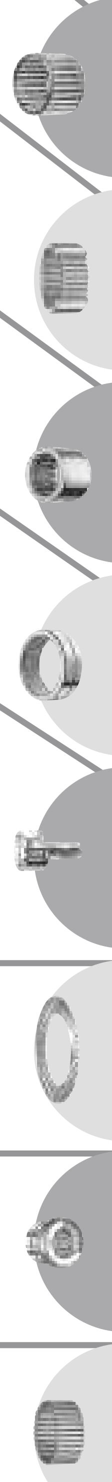
For Drawn Cup Needle Roller Bearings, Heavy-Duty···B-8-20



End Washer

For Metric Series NAO and RNAO Bearings···B-8-30





Koyo®

Needle Roller Bearings

1866 1900 1930 1960 1990 2010 **2013**

Corporate History

- 1866 Torrington is founded
- 1867 Dürkopp-Werke Bielefeld is founded
- 1921 Koyo Seiko Co., Ltd. is founded
- 1930 Nadella is founded
- 1962 FAG purchases Dürkopp-Werke AG
- 1963 New needle bearing plant is built in Tokyo
- 1962 Utsunomiya Kiki Co., Ltd. joins the group
- 1984 SNR (Nadella business partner) and Torrington commence joint venture
- 1993 Torrington purchases needle bearing business from FAG
- 2001 Torrington purchases Nadella business from SNR
- 2003 The Timken Company purchases Torrington
- 2006 JTEKT Corporation is born
- 2010 JTEKT purchases needle bearing business from The Timken Company
- 2013 JTEKT is integrated into **Koyo** brand

Bearing Trends and Market Needs

Smaller → Improvement in seizure resistance → Longer life → Reduced torque and noise, compact and lightweight, usability with less diluted lubricant

Transition of Products

1866
Foundation of Torrington

Founded as manufacturer of sewing machine needles and machinery to produce same

Early model swaging machine for uniform needle blanks

invention
No. U.S.43,772
(1864)
Hopson & Brooks
IMPROVEMENT IN POINTING WIRE FOR PINS

This invention is the origin of the extra-precision rollers now produced by JTEKT.

1920
80% market share of automobile wire wheel parts

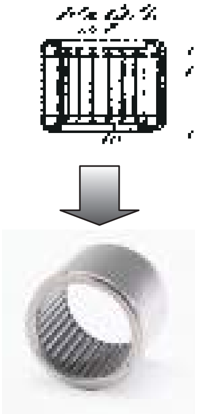
More than 60% of automobiles, including those made by Cadillac, adopt wire wheels. Torrington acquires 80% market share of wire wheel spokes and nipples.

As a result, one in every two U.S.-manufactured automobiles use Torrington spokes and nipples.

Radial Needle Bearings

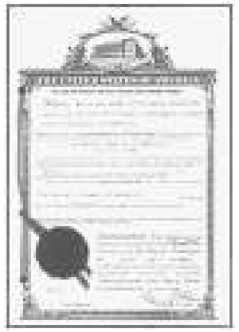
1932
Development of the world's first drawn cup needle bearing

< Space-saving and lightweight >



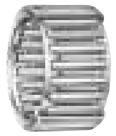
World's First

invention
No. U.S.2,038,474
(1932)
E. K. Brown
ANTIFRICTION BEARING AND METHOD OF MAKING THE SAME



1957
Development of caged drawn cup needle bearing

< Improved lubrication and support for higher speeds >



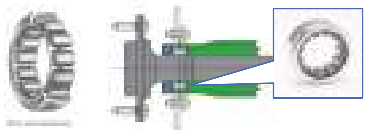
Increased lubricant retention capability

Separated rollers using cages

1968
Development of thick-wall drawn cup bearing

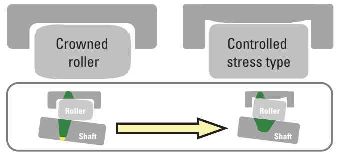
< High capacity >

Applications in axles, transmissions, pumps and motors



1996
Development of controlled stress thick-wall drawn cup needle bearing

< Longer life > Cup bore is profiled.



Reduced contact pressure on cup and shaft

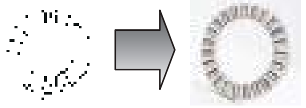
Thrust Needle Bearings

1955
Development of the world's first thrust needle bearing: contribution to the progress of AT development

< Lower torque and improved durability >

World's First

invention
No. U.S. 2,724,625
(1955)
R. H. White
NEEDLE ROLLER THRUST BEARING

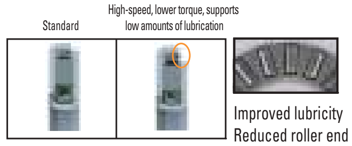


Development of the thrust needle bearing solved problems in early automatic transmissions.

< Higher speed, lower torque, and supports thin film lubricant >

Optimization of washer and cage shapes

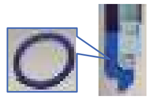
2008
Development of thrust needle bearing for high-speed applications



Improved lubricity
Reduced roller end wear

2011
Development of noise-reduced thrust needle bearing

< Noise reduction >



Vibration-resistant

Custom-shaped resin is installed on the back side of the thrust washer.

Planetary Gear Shafts

1971
Development of induction-hardened planetary gear shaft

2001
Cold forging hole processing of planetary gear shaft

< Improved installation capability >

< Weight savings, material waste reduction, and cost effective >

Regarding the Publishing of this Needle Roller Bearing Catalog

Thank you very much for your patronage of Koyo brand products.

In terms of environmental friendliness, there has been a rapidly increasing demand for smaller, lighter products, as well as lower friction, higher reliability, and higher functionality in many different industrial fields.

Our needle roller bearings are the optimal solution to all such requirements.

In 2010, as part of JTEKT's continual process for improvement in the needle roller bearing business, we integrated the technology of Torrington, a company with a long history in the United States and Europe, into the Koyo brand of traditional needle roller bearings.
In 2013, the Koyo brand will take the next step in this line of business to pursue stronger distribution and production structures and further technological development with the aim to accommodate our customers' needs on a global scale.

On this occasion, JTEKT has fully renewed its needle roller bearing catalog, which we present here.

We believe that this new catalog will prove useful in your selection and use of our needle roller bearings.

We look forward to your continued patronage.

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NEEDLE ROLLER BEARING APPLICATIONS

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SUPPLEMENTARY TABLES, INDEX

PRODUCT BREADTH

DRAWN CUP NEEDLE ROLLER BEARINGS, available in 3 mm to 139.7 mm bore (1/8 to 5 1/2 in), are designed to support radial loads and reduce friction between rotating components. The low cross section of the drawn cup bearing provides maximum load-carrying capability with minimum space required.

DRAWN CUP ROLLER CLUTCHES AND BEARING ASSEMBLIES, available in 3.175 to 35 mm bore (1/8 to 13/8 in), are designed to transmit torque between the shaft and housing in one direction and allow free overrun in the opposite direction. When transmitting torque, either the shaft or the housing can be the input member.

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES, available in 3 mm to 127 mm bore (1/8 to 5 in), consist of a complement of needle rollers held in place by a cage. With no inner or outer ring, the low cross section provides maximum load-carrying capability within the smallest envelope. The mating shaft and housing are normally used as inner and outer raceways.

NEEDLE ROLLER THRUST BEALINGS, available in 6 mm to 160 mm (15/64 to 6 19/64 in) bore, consist of a complement of needle rollers held in place by a cage.

Needle roller thrust bealings are complements of small diameter needle rollers arranged in a spoke-like configuration. Needle rollers are equally spaced by means of a cage whose web section separates the rollers and provides guidance to keep them tracking in an orbital path. The purpose of these assemblies is to transmit a thrust load between two relatively rotating objects while greatly reducing friction.

Needle roller thrust bealings also can be unitized with lipped washers which service as raceway surfaces for the needle rollers. Washers can be supplied separately or can be mechanically unitized to the needle roller thrust assemblies for ease of handling.

HEAVY-DUTY NEEDLE ROLLER BEARINGS, available in 5 mm to 175 mm bore (3/16 to 6 57/64 in), consist of a machined and ground channel-shaped outer ring with a complement of needle rollers retained and guided by a cage. The thick outer ring provides maximum load capacity and shock resistance with a relatively small radial cross section.

TRACK ROLLERS/CAM FOLLOWERS, available in 12.7 mm to 152.4 mm O.D. (1/2 to 6 in), are characterized by their thick-walled outer rings that run directly on a track. The thick outer rings permit high load-carrying capability while minimizing distortion and bending stresses.

ENGINE BEARINGS include a full line of advanced bearing assemblies for automotive engine valve trains. These assemblies help reduce friction and optimize performance in both overhead valve and overhead cam engines. They include roller rocker arms for overhead valve (pushrod) engines, roller finger followers for overhead cam engines, valve lifter rollers for overhead valve and overhead cam engines.

PRECISION NEEDLE ROLLERS have multiple uses in a variety of industries including automotive, truck, farm and construction equipment, two-cycle engines, outboard engines and consumer durables. Needle rollers are mainly used as bearing rolling elements to transmit torque and reduce friction. They also can serve as precision shafts or as precision locating pins.

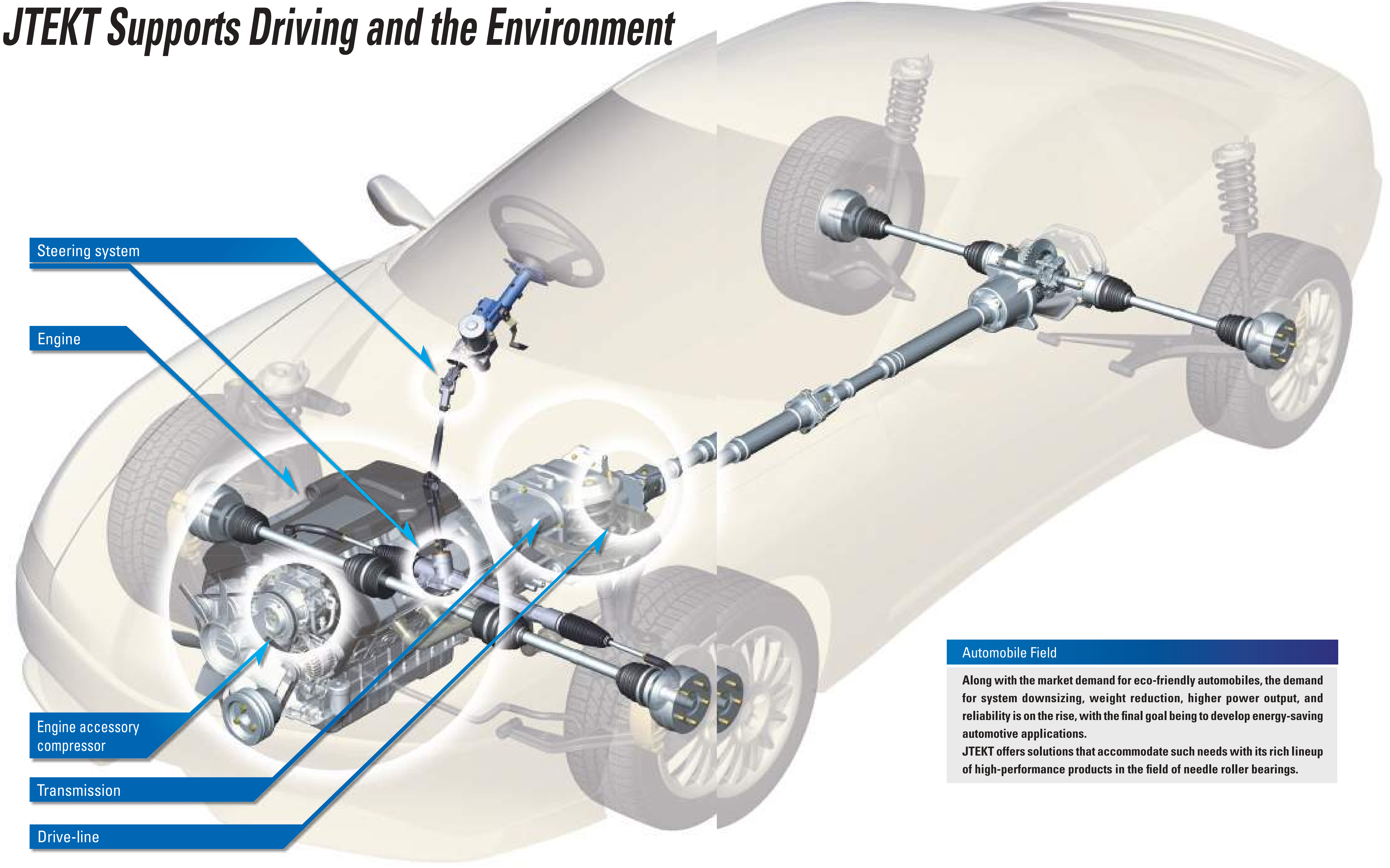
PLANETARY GEAR SHAFTS have multiple uses in a variety of industries including automotive, truck and farm and construction equipment. The shafts are used in planetary gear sets, differentials and engine valve trains.

PRECISION PINS AND SHAFTS are crafted from the highest quality steel within a TS16949/ISO9000/AS9100-certified manufacturing facility. Pins and shafts come in a larger variety of configurations and materials and flexible product volumes. These pins and shafts are found in applications such as gasoline fuel systems components, diesel systems components, aerospace rollers and precision rollers (DFAR-compliant), planet pins, racing applications, rollers for bearing assemblies, gear shafts and steering column pins.

APPLICATIONS

NEEDLE ROLLER BEARING APPLICATIONS

JTEKT Supports Driving and the Environment



Automobile Field

Along with the market demand for eco-friendly automobiles, the demand for system downsizing, weight reduction, higher power output, and reliability is on the rise, with the final goal being to develop energy-saving automotive applications.
JTEKT offers solutions that accommodate such needs with its rich lineup of high-performance products in the field of needle roller bearings.

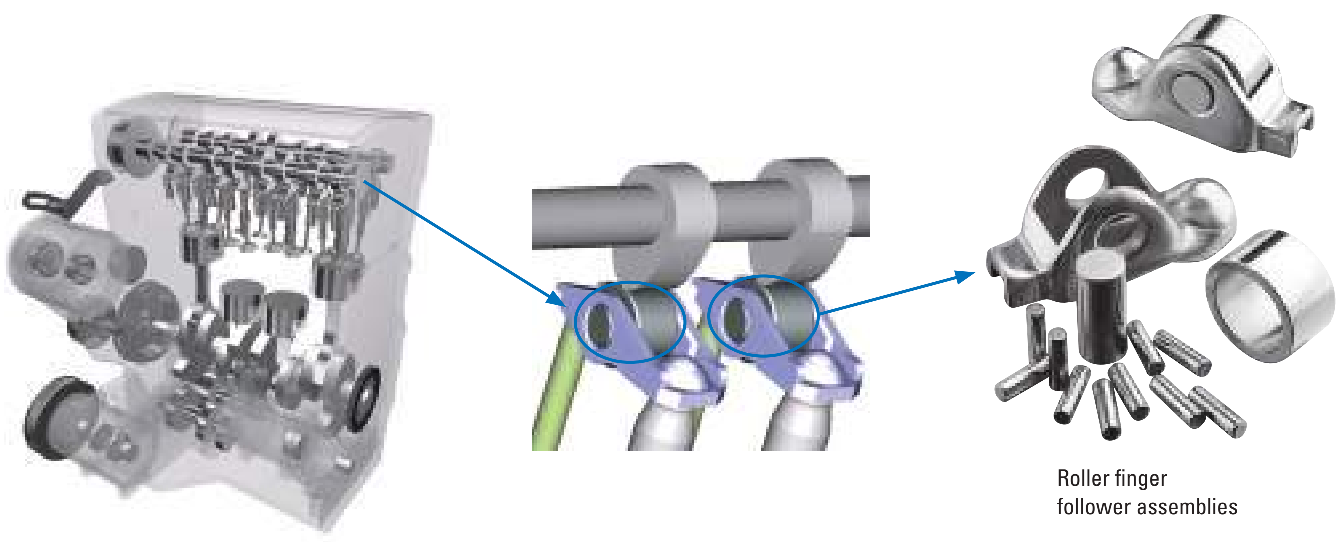
ENGINE

Valve Train Components

JTEKT's needle roller bearings for rocker arms contribute to reductions in energy used by engines and to improvements in engine reliability.

Bearing Features

- Low torque
- Wear resistance



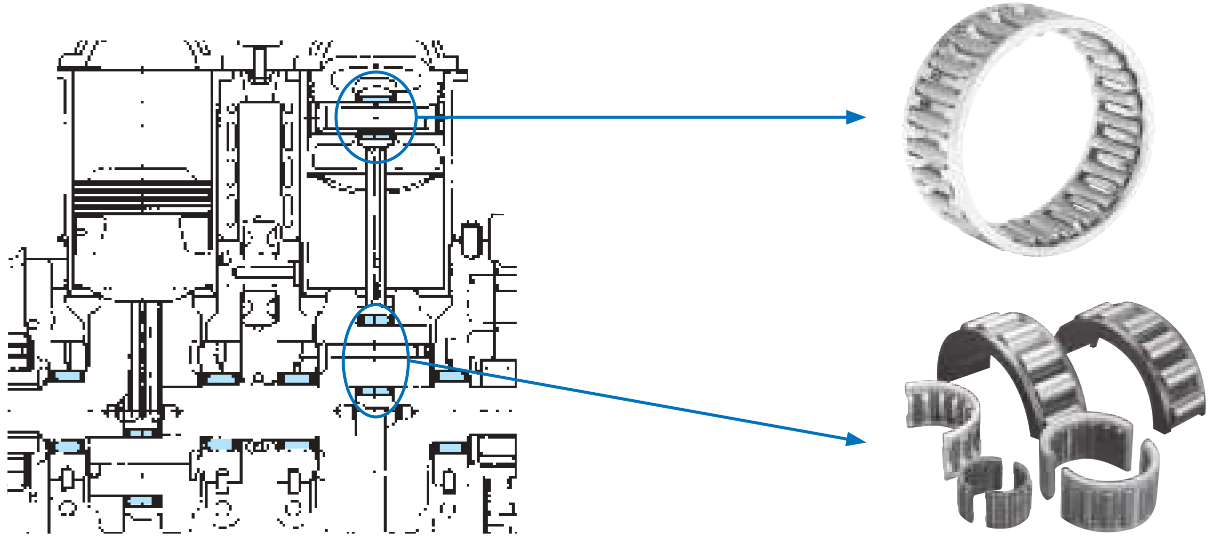
Roller finger follower assemblies

Piston and Crank Components

JTEKT's needle roller bearings for connecting rod applications respond to the need for reductions in energy used by engines and to demanding lubrication requirements, contributing to greater reliability.

Bearing Features

- Durability
- Improvement in seizure resistance
- Supports higher loads



Engines for motorcycles and boats

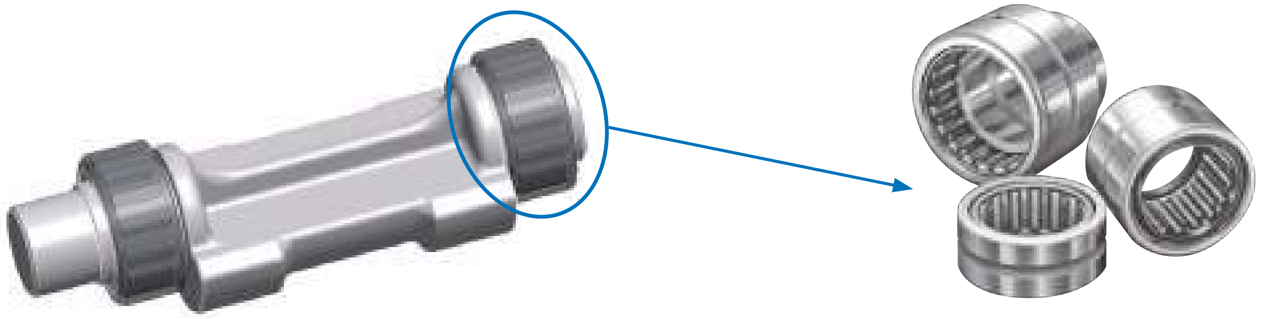
Radial needle roller and cage assemblies

Balance Shaft Components

JTEKT's needle roller bearings for balance shafts contribute to improved lubrication methods, reduced friction, and improved reliability under vibration conditions.

Bearing Features

- High reliability
- Vibration resistance



Heavy-duty needle roller bearings

ENGINE ACCESSORIES

Compressor Components

JTEKT's needle roller bearings for compressors contribute to support for thin film lubricants, improved efficiency, and improved reliability.

Bearing Features

- Wear resistance
- Low torque
- Improved lubricity

Thrust bearings

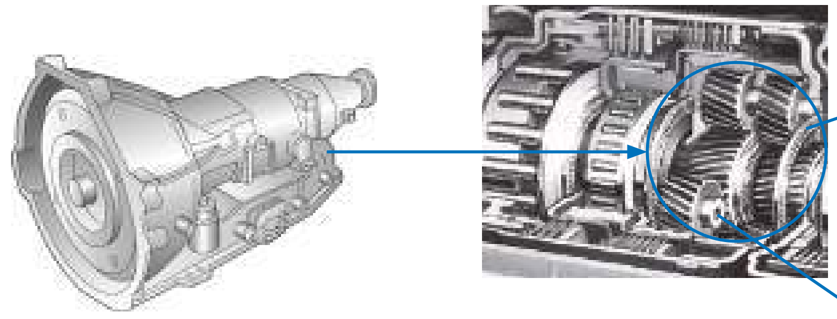
TRANSMISSION

JTEKT's needle roller bearings for transmissions contribute to reductions in the size and weight of the transmission, improved power and fuel efficiency, support for low-viscosity lubricants, and improved reliability.

Bearing Features

- Supports higher loads
- Longer life in oil with foreign material
- Low torque

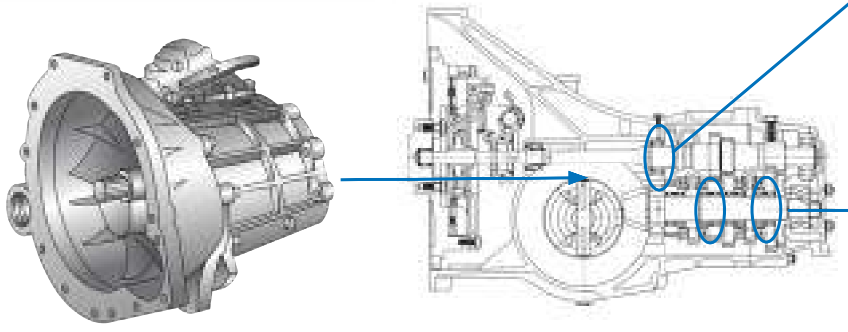
Automatic Transmissions



Thrust bearings

Radial needle roller and cage assemblies

Manual Transmissions



Split polymer caged radial assemblies

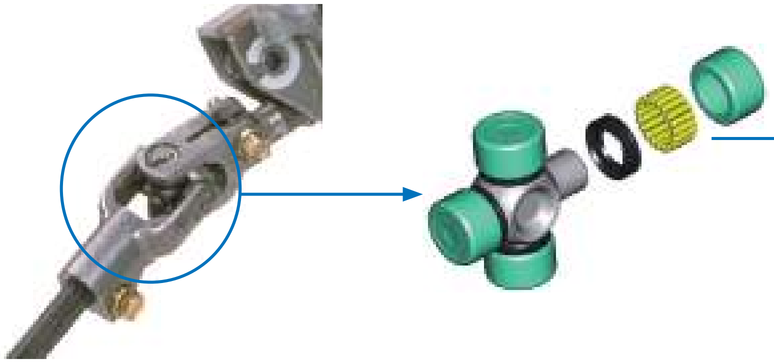
STEERING SYSTEMS

JTEKT's needle roller bearings for steering systems realize smooth steering capability with high reliability and quiet running by drawing on our experience in producing safe steering system components.

Bearing Features

- High reliability
- Reduced noise
- High rigidity

Intermediate Steering Shafts



Drawn cup needle roller bearings

Pinion Shafts

Bearing Features

- High reliability
- Reduced noise

Drawn cup needle roller bearings

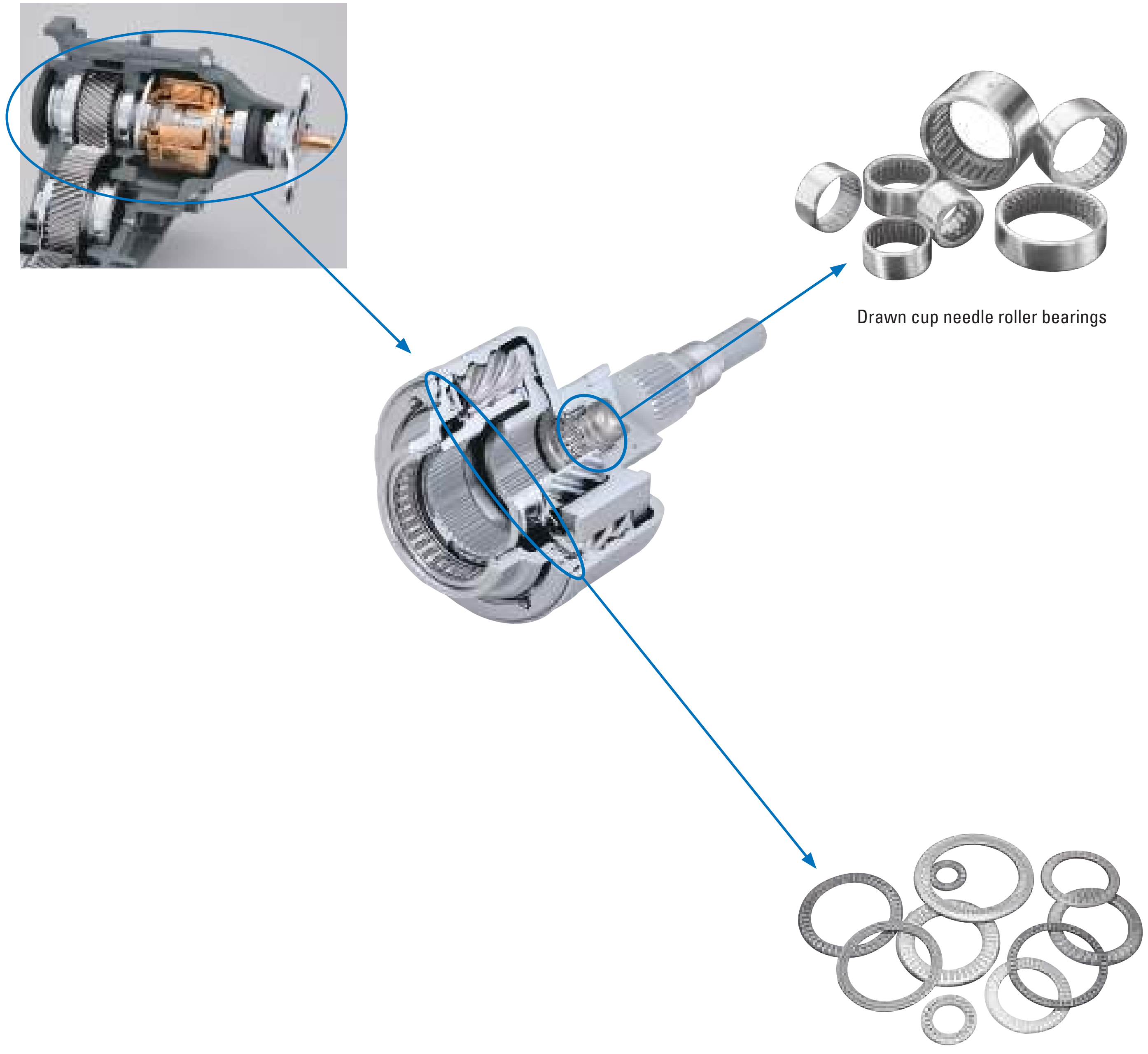
DRIVE-LINES

Torque Sensing LSD

JTEKT's needle roller bearings for torque sensing LSDs contribute to downsizing and weight reduction, higher efficiency, and improved reliability.

Bearing Features

- ●Alleviates misalignment
- ●Supports higher loads



Drawn cup needle roller bearings

Thrust bearings

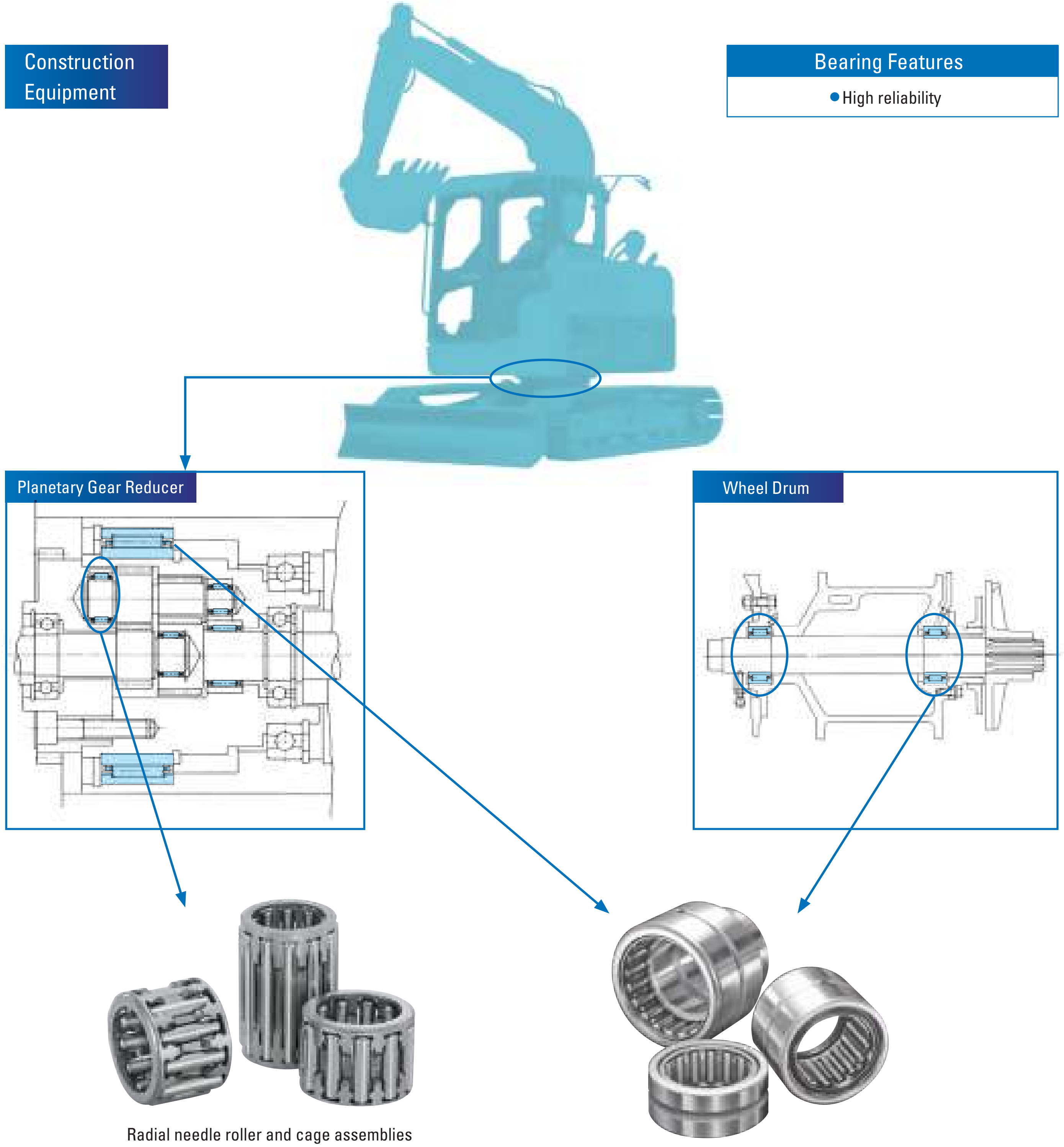
INDUSTRIAL MACHINERY FIELD

Construction equipment and agricultural machinery are used in dimanding environments and therefore require high durability. JTEKT offers high-performance needle roller bearings that respond to energy-saving requirements and high reliability needs.

Construction Equipment

Bearing Features

- ●High reliability



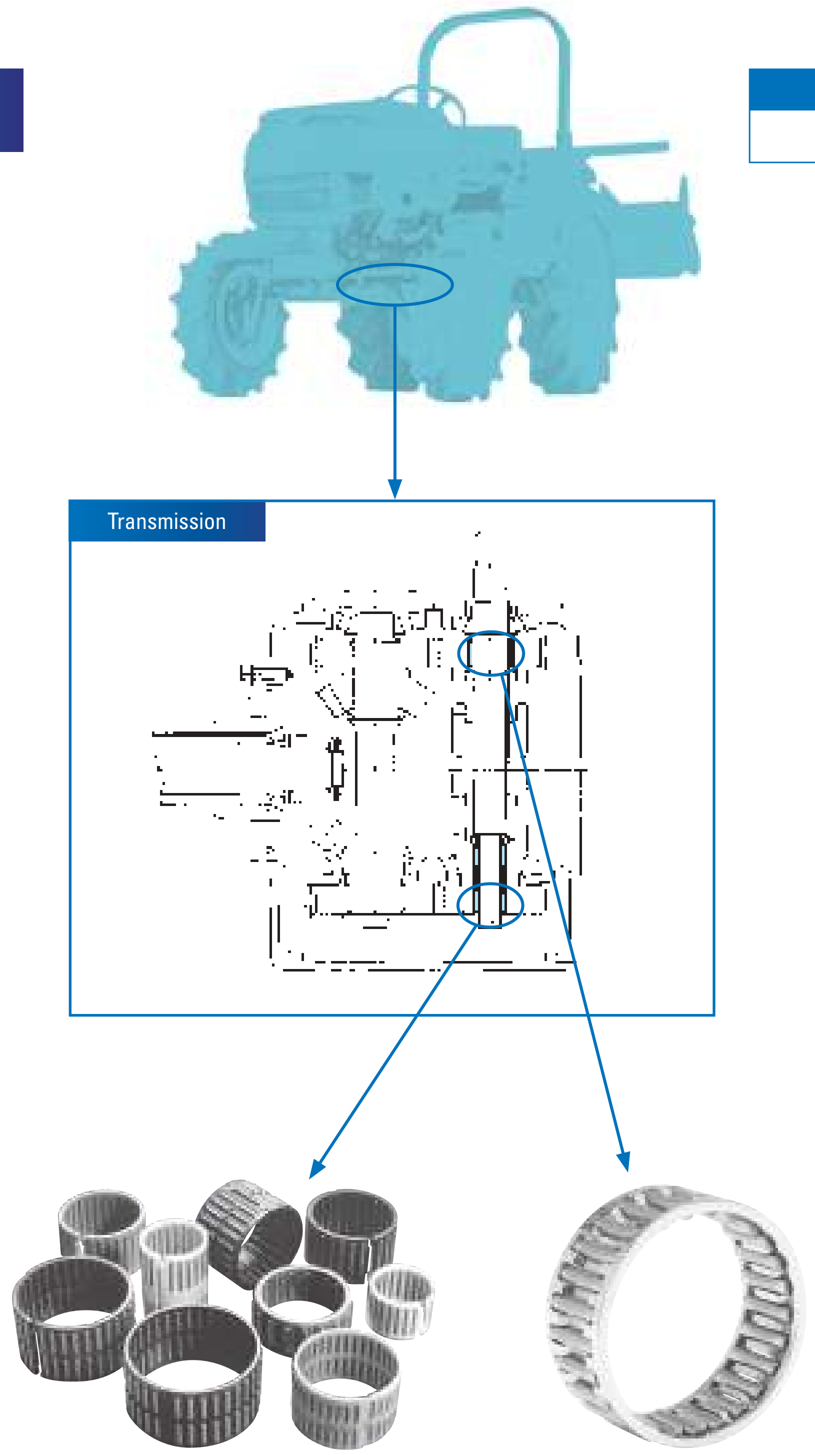
Radial needle roller and cage assemblies

Heavy-duty needle roller bearings

Agricultural Machinery

Bearing Features

- High reliability



Radial needle roller and cage assemblies

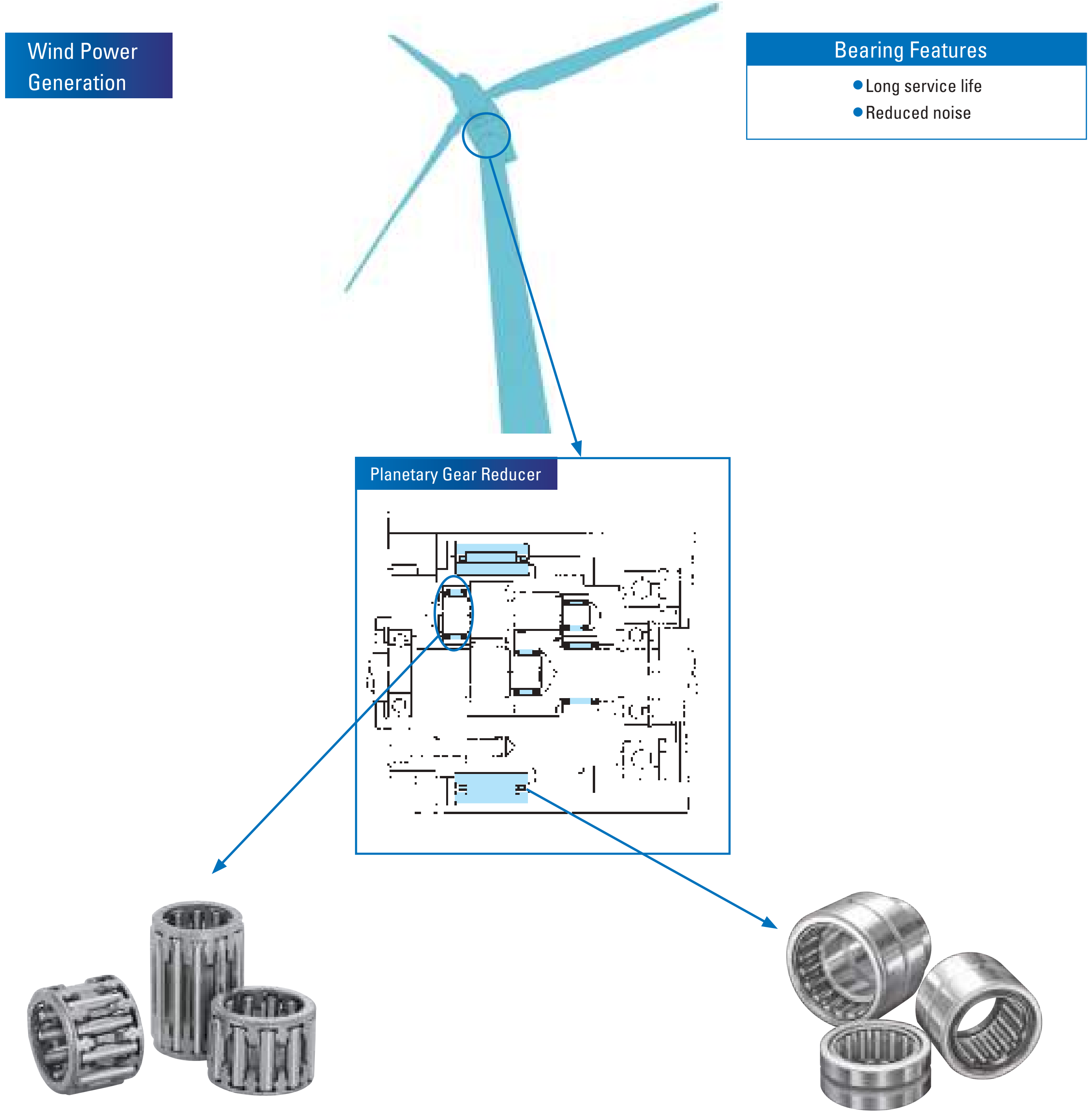
WIND POWER GENERATION

Bearings used in wind power generators require long service lives.
JTEKT offers high-performance needle roller bearings that support high reliability and demanding environmental conditions.

Wind Power Generation

Bearing Features

- Long service life
- Reduced noise



Radial needle roller and cage assemblies

Heavy-duty needle roller bearings

NOTES

ENGINEERING

A ENGINEERING

ENGINEERING

A

BEARING TYPES

NEEDLE ROLLER BEARINGS

Needle roller bearings are an economical alternative for applications requiring minimal space to carry a given load at a desired speed. Needle roller bearings can be an ideal choice because of their ability to handle a given level of speed and load capacity, yet have the smallest cross section of all roller bearing types.

We offer both metric and inch nominal bearings in popular designs such as: radial caged needle rollers, drawn cup needle roller bearings, machined ring, track rollers, thrust bearings, combined bearings, and drawn cup roller clutches.
Most of these bearing types can be operated directly on a machined shaft of suitable quality, or with a matching inner ring where this requirement cannot be conventionally satisfied.

Radial Needle Roller and Cage Assemblies

Radial needle roller and cage assemblies have a steel cage that provides both inward and outward retention for the needle rollers. The designs provide maximum cage strength consistent with the inherently high load ratings of needle roller bearings. Accurate guidance of the needle rollers by the cage bars allows for operation at high speeds. Also available are needle roller and cage assemblies using molded, one-piece glass-reinforced engineered polymer cages. Needle roller and cage assemblies are manufactured with either one or two rows of needle rollers.

Drawn Cup Bearings

The outer ring in the form of a cup is accurately drawn and no subsequent machining is performed to build the outer raceway. Drawn cup needle roller bearings are available in open ends or single, closed-end designs. They also are available with one or two integral seals. Other options include a single lubricating hole and matching inner ring.

Heavy-Duty Needle Roller Bearings

These bearings are available in a wide range of inch and metric sizes plus an array of design features including: integral seals, side flanges (or separate end washers), inner rings, oil holes and single or double caged sets (or full complement) of rollers.

Track Rollers

Track rollers listed in this catalog are designed with outer rings of large radial cross section to withstand heavy rolling and shock loads on track-type or cam-controlled equipment. The outside diameters of the outer rings are either profiled or cylindrical. Profiled track rollers are designed to alleviate uneven bearing loading resulting from deflection, bending or misalignment in mounting. Stud-type track rollers are available with or without lip contact seals, or with shields. Yoke-type track rollers are designed for straddle mounting. Each yoke-type is available with either radial needle roller and cage assemblies, or with a single (or double) full complement row of cylindrical or needle rollers.

Thrust Bearing Assemblies And Washers

Thrust needle roller and cage assemblies are available in a variety of inch or metric sizes. All types have very small cross sections. If the back up surfaces cannot be used as raceways, hardened washers are available. Thrust bearings are available with needle rollers or heavier cylindrical rollers for high load-carrying capacity.

Combined (Radial and Thrust) Bearings

Combined bearings consist of a radial bearing (needle roller bearing) and a thrust bearing (ball or roller bearing). Like other needle roller bearings, these combined bearings can be matched with an optional inner ring or thrust washer as the opposing raceway.

NEEDLE ROLLER BEARING SELECTION

Because of the possible combinations of roller complement orientation, bearing cross section thickness and raceway construction needle roller bearings should be given extra consideration for roller bearing applications selection. The table below should be used as a general guideline for the application of needle roller bearings.

Table A-1. Needle roller bearing capability comparison based on suitable oil lubrication

Bearing type/ design capability	Radial needle roller and cage assembly	Drawn cup needle roller bearing caged	Drawn cup roller bearing full complement	Needle roller bearing and inner ring	Track roller	Thrust needle roller and cage assembly	Needle rollers	Combination bearing radial/thrust
Radial load	High	Moderate	High	High	Moderate	None	Very high	High
Axial load	None	None	None	None	Low	Very high	None	High
Limiting speed	Very high	High	Moderate	Very high	Moderate	High	Moderate	Moderate
Slope tolerance	Moderate	Moderate	Very low	Moderate	Moderate[1]	Low	Very low	Low
Grease life	High	High	Low	High	Moderate	Low	Low	Low
Friction	Very low	Very low	Moderate	Very low	Low[2]	Low	Moderate	Moderate
Precision	Very high	Moderate	Moderate	High	High	High	Very high	High
Cross section	Very low	Low	Low	Moderate	High	Very low	Very low	High
Cost	Low	Low	Low	High	High	Moderate	Very low	Very high

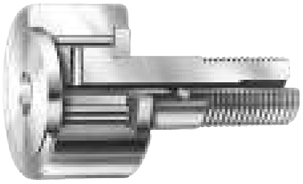
[1] "Moderate" for full complement track rollers

[2] "Low" for full complement track rollers

Radial needle roller and cage assembly

Drawn cup needle roller

Heavy-duty needle roller



Track roller

Thrust needle roller and cage assembly

Combined radial/thrust

Drawn cup roller clutch

BEARING REACTIONS, EQUIVALENT LOADS AND BEARING LIFE

DEFINITION OF LOAD RATINGS

Basic Dynamic Load Rating

The "basic dynamic load rating" (Cr) for a radial roller bearing is that calculated, constant, radial load, which a group of apparently identical bearings with stationary outer ring can theoretically endure for a rating life of one million revolutions of the inner ring. For a thrust roller bearing (Ca) is that calculated, constant, centric thrust load, which a group of apparently identical bearings can theoretically endure for a rating life of one million revolutions of one of the bearing washers. The basic dynamic load rating is a reference value only, the base value of one million revolutions has been chosen for ease of calculation. Since applied loading as great as the basic dynamic load tends to cause local plastic deformation of the rolling surfaces, it is not anticipated that such heavy loading would normally be applied.

Basic Static Load Rating

Basic static load rating for a radial roller bearing suitably manufactured from a good quality hardened alloy steel, the static radial load rating (C_{or}) is that uniformly distributed static radial bearing load, which produces a maximum contact stress of 4000 megapascals (580,000 psi) acting at the center of contact of the most heavily loaded rolling element. The static axial load rating (C_{oa}) is that uniformly distributed static centric axial load, which produces a maximum contact stress of 4000 megapascals (580,000 psi) acting at the center of contact of each rolling element.

Note: For a contact stress of 4000 megapascals (580,000 psi) a total permanent deformation of roller and raceway occurs, which is appoximately 0.0001 of the roller diameter.

EQUIVALENT DYNAMIC RADIAL BEARING LOADS (P_R)

To calculate the L_{10} life, it is necessary to calculate a dynamic equivalent radial load, designated by P_r. The dynamic equivalent radial load is defined as a single radial load that, if applied to the bearing, will result in the same life as the combined loading under which the bearing operates.

$$P_r = XF_r + YF_a$$

Where:

L_{10} = Basic rating life
P_r = Dynamic equivalent radial load
F_r = Applied radial load
F_a = Applied axial load
X = Radial load factor
Y = Axial load factor

Radial needle roller bearings are designed to carry radial load with zero thrust load under normal conditions. With the thrust load equal to zero, equivalent radial load (P_r) is equal to the design radial load (F_r). Your representative should be consulted on any applications where thrust load is involved (as the resulting increase in internal friction may require cooling to prevent increased operating temperatures).

STATIC RADIAL AND/OR AXIAL EQUIVALENT LOADS

The static equivalent radial and/or axial loading is dependent on the bearing type selected. For bearings designed to accommodate only radial or thrust loading, the static equivalent load is equal to the applied load.

For all bearings, the maximum contact stress can be approximated using the static equivalent load and the static rating.

For roller bearings:

$$\sigma_0 = 4000 \text{ x } \left(\frac{P_0}{C_0}\right)^{1/2} \text{ MPa}$$

$$\sigma_0 = 580 \text{ x } \left(\frac{P_0}{C_0}\right)^{1/2} \text{ ksi}$$

Because radial needle roller bearings are not designed to accept thrust loading, their equation to determine static radial equivalent load is:

$$P_{0r} = F_r$$

Thrust needle roller bearings are not designed to accept radial loading, so their equation to determine static thrust equivalent load is:

$$P_{0a} = F_a$$

The determination of the static load safety factor (f_0) serves to ascertain that a bearing with adequate static load rating has been selected.

$$f_0 = \frac{C_0}{P_0}$$

Where:

f_0 = Static load safety factor
C_0 = Basic static load rating (kN or lbf)
P_0 = Maximum applied static load (kN or lbf)

f_0 is a safety factor against permanent deformation of the contact areas of the rolling elements and raceways. Higher f_0 values are required for particulary smooth operation. The following values are generally suggested.

f_0 = 1.5 ... 3.0 for smooth operation
f_0 = 1.0 ... 2.0 for less smooth operation

For drawn cup needle roller bearings, f_0 should be ≥ 3.

MINIMUM BEARING LOAD

Slippage can occur if loads are too light and, if accompanied by inadequate lubrication, can cause damage to the bearings. The minimum load for bearings with cage is $P_r/C_r = 0.02$, for full-complement bearings $P_r/C_r = 0.04$ (P_r is the dynamic load and C_r is the basic dynamic load rating).

Thrust needle roller bearings also have an added design requirement such that the minimum thrust load is satisfied to prevent the rollers from skidding on the raceway. The equation for the thrust loading force is different for needle rollers versus cylindrical rollers as noted:

(Needle rollers) $F_{a\ min.} = C_{0a}/2200$ kN
(Cylindrical rollers) $F_{a\ min.} = 0.1C_{0a}/2200$ kN

MAXIMUM BEARING LOAD

The load/life relationship is applicable to a wide range of bearing loads. However, high loading may cause stress concentrations in the roller-raceway contacts. Therefore, for most applications, the maximum applied load should not be greater than one-third of the basic dynamic load rating [$P \le C/3$] in order for the basic rating life calculation to be valid.

MEAN DYNAMIC EQUIVALENT LOAD

When load magnitude or direction varies, it is necessary to calculate the mean dynamic equivalent load, which provides the same length of bearing service life as that under the actual load fluctuation. If the load and the rotational speed change in levels, as shown in Fig. A-1, the following equation can be used to calculate the mean dynamic equivalent load.

$$P_m = \sqrt[10/3]{\frac{P_1^{10/3} n_1 t_1 + P_2^{10/3} n_2 t_2 + \cdots\cdots + P_n^{10/3} n_n t_n}{n_1 t_1 + n_2 t_2 + \cdots\cdots\cdots + n_n t_n}}$$

In this equation,

P_m : Mean dynamic equivalent load N
P_1 : The load applied at rotational speed n_1 and for t_1 hours N
⋮ ⋮ ⋮
P_n : The load applied at rotational speed n_n and for t_n hours N

What's more, the following equation can be used to calculate the mean rotational speed n_m.

$$n_m = \frac{n_1 t_1 + n_2 t_2 + \cdots\cdots + n_n t_n}{t_1 + t_2 + \cdots\cdots\cdots\cdots t_n}$$

When the load changes steadily, as shown in Fig. A-2, the following equation can be used to calculate an approximation of the mean dynamic equivalent load.

$$P_m = \frac{P_{min.} + 2\,P_{max.}}{3}$$

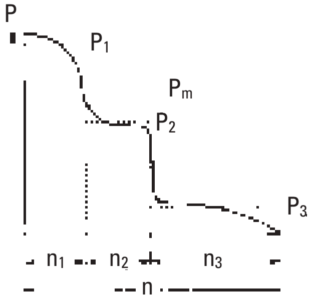


Fig. A-1

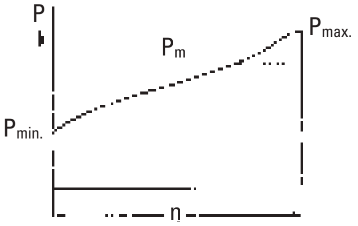


Fig. A-2

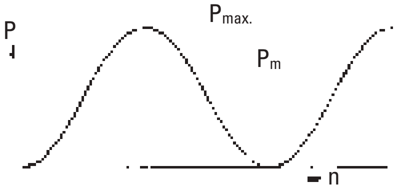


Fig. A-3

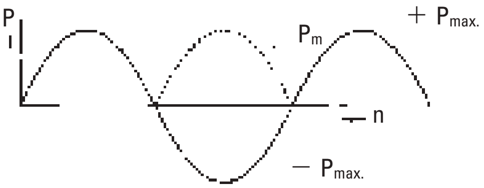


Fig. A-4

In this equation,

$P_{min.}$: The minimum dynamic equivalent load N
$P_{max.}$: The maximum dynamic equivalent load N

When the load changes like a sine wave between 0 and P_{max}, as shown in Fig. A-3, the following equation can be used to calculate an approximation of the mean dynamic equivalent load.

$$P_m \fallingdotseq 0.68\,P_{max.}$$

When the load changes between 0 and $P_{max.}$ in only the upper half of the sine wave, as shown in Fig. A-4, the following equation can be used to calculate an approximation of the mean dynamic equivalent load.

$$P_m \fallingdotseq 0.75\,P_{max.}$$

BEARING LIFE

Even if rolling bearings are rotated under ideal conditions, contact stress is continuously and repeatedly applied to the raceway surfaces of inner and outer rings or rolling contact surfaces of rolling elements, and material flakes from the raceway surfaces and rolling contact surfaces due to fatigue of material. The total number of bearing rotations (or total operating period at a constant speed) until flaking occurs is regarded as the bearing service life.

Even if bearings of the same dimensions, structure, material, and processing method are operated under the same rotating conditions, their service lives are considerably varied.

Since this phenomenon results from fatigue distribution in bearing materials themselves, differences in bearing service life should be statistically considered. When a group of identical bearings are rotated under the same conditions, the total number of revolutions until 90 % of the bearings are left without flaking (i.e. a service life of 90 % reliability) is defined as the basic rating life. Or in operating at a constant speed, it can be expressed by the total number of bearing rotations.

In practical service, however, a bearing fails not only because of fatigue, but other coefficients as well, such as wear, seizure, creep, fretting, brinelling, cracking etc. These bearing failures can be minimized by selecting the proper mounting method and lubricant, as well as the bearing most suitable for the application.

BEARING LIFE EQUATIONS

Basic Rating Life

Generally, the relationship between the basic dynamic load rating, dynamic equivalent load, and basic rating life of needle roller bearings is expressed as follows.

$$L_{10} = \left(\frac{C}{P}\right)^{10/3}$$

Where,

L_{10} : Basic rating life 10^6 rotations

C : Basic dynamic load rating N

P : Dynamic equivalent load N

It is common for the life being expressed in terms of time to be useful when the bearing is rotating at a constant speed.

In this situation, the life can be obtained with the following equation.

$$L_{10h} = \left(\frac{C}{P}\right)^{10/3} \frac{10^6}{60n}$$

Where,

L_{10h} : Basic rating life h

n : Rotational speed min^{-1}

Accordingly, where the dynamic equivalent load is P and rotational speed is n, the following equation can be used to calculate the basic dynamic load rating C, which is required to meet the design life. The bearing size most suitable for a specified purpose can then be selected by referring to the bearing specification table.

$$C = P\left(L_{10h} \times \frac{60n}{10^6}\right)^{3/10}$$

Modified Rating Life

The life of rolling bearings was standardized as a basic rating life in the 1960s, but in actual applications, sometimes the actual life and the basic rating life have been quite different due to the lubrication status and the influence of the usage environment. To make the calculated life closer to the actual life, a corrected rating life has been considered since the 1980s. In this corrected rating life, bearing characteristic factor a_2 (a correction factor for the case in which the characteristics related to the life are changed due to the bearing materials, manufacturing process, and design) and usage condition factor a_3 (a correction factor that takes into account usage conditions that have a direct influence on the bearing life, such as the lubrication) or factor a_{23} formed from the interdependence of these two factors, are considered with the basic rating life. These factors were handled differently by each bearing manufacturer, but they have been standardized as a modified rating life in **ISO 281** in 2007. In 2013, **JIS B 1518** (dynamic load ratings and rating life) was amended to conform to the **ISO**.

The basic rating life (L_{10}) shown in equation is the (fatigue) life with a dependability of 90 % under normal usage conditions for rolling bearings that have standard factors such as internal design, materials, and manufacturing quality. **JIS B 1518**:2013 specifies a calculation method based on **ISO 281**:2007. To calculate accurate bearing life under a variety of operating conditions, it is necessary to consider elements such as the effect of changes in factors that can be anticipated when using different reliabilities and system approaches, and interactions between factors. Therefore, the specified calculation method considers additional stress due to the lubrication status, lubricant contamination, and fatigue load limit C_u (refer to p. A-9) on the inside of the bearing. The life that uses this life modification factor a_{ISO}, which considers the above factors, is called modified rating life L_{nm} and is calculated with the following equation.

$$L_{nm} = a_1 \, a_{ISO} \, L_{10}$$

In this equation,

L_{nm} : Modified rating life 10^6 rotations

(This rating life has been modified for one of or a combination of the following: reliability of 90 % or higher, fatigue load limit, special bearing characteristics, lubrication contamination, and special operating conditions.)

L_{10} : Basic rating life 10^6 rotations (reliability: 90 %)

a_1 : Life modification factor for reliability ··············· Refer to section (1)

a_{ISO} : Life modification factor ··············· Refer to section (2)

[Remark]
When bearing dimensions are to be selected given L_{nm} greater than 90 % in reliability, the strength of shaft and housing must be considered.

(1) Life modification factor for reliability a_1

The term "reliability" is defined as "for a group of apparently identical rolling bearings, operating under the same conditions, the percentage of the group that is expected to attain or exceed a specified life" in **ISO 281**:2007. Values of a_1 used to calculate a modified rating life with a reliability of 90 % or higher (a failure probability of 10 % or less) are shown in Table A-2.

Table A-2. Life modification factor for reliability a_1

Reliability, %	L_{nm}	a_1
90	L_{10m}	1
95	L_{5m}	0.64
96	L_{4m}	0.55
97	L_{3m}	0.47
98	L_{2m}	0.37
99	L_{1m}	0.25
99.2	$L_{0.8m}$	0.22
99.4	$L_{0.6m}$	0.19
99.6	$L_{0.4m}$	0.16
99.8	$L_{0.2m}$	0.12
99.9	$L_{0.1m}$	0.093
99.92	$L_{0.08m}$	0.087
99.94	$L_{0.06m}$	0.080
99.95	$L_{0.05m}$	0.077

(Citation from **JIS B 1518**:2013)

(2) Life modification factor a_{ISO}

a) System approach

The various influences on bearing life are dependent on each other. The system approach of calculating the modified life has been evaluated as a practical method for determining life modification factor a_{ISO} (ref. Fig. A-5). Life modification factor a_{ISO} is calculated with the following equation. A diagram is available for each bearing type (radial ball bearings, radial roller bearings, thrust ball bearings, and thrust roller bearings). (Each diagram (Figs. A-6 to A-9) is a citation from **JIS B 1518**:2013.)

Note that in practical use, this is set so that life modification factor $a_{ISO} \leq 50$.

$$a_{ISO} = f\left(\frac{e_c C_u}{P}, \kappa\right)$$

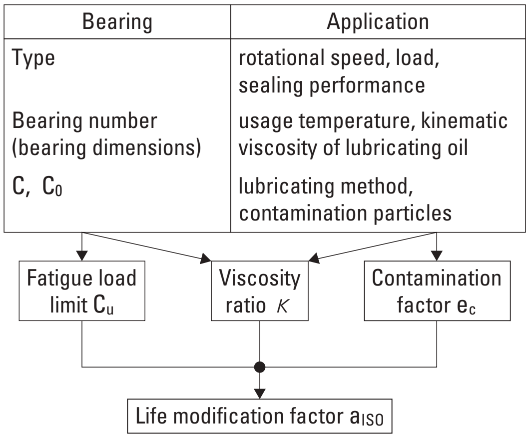


Fig. A-5. System approach

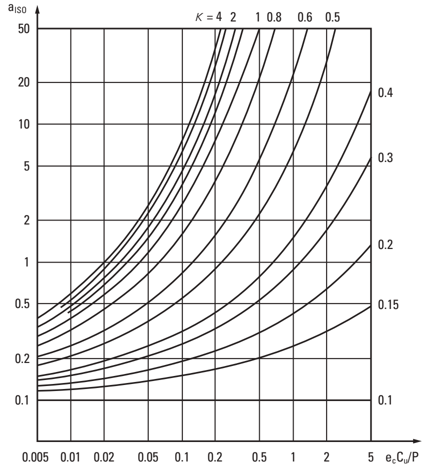


Fig. A-6. Life modification factor a_{ISO} (Radial ball bearings)

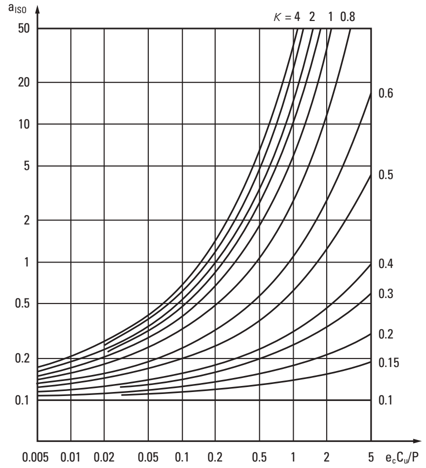


Fig. A-7. Life modification factor a_{ISO} (Radial roller bearings)

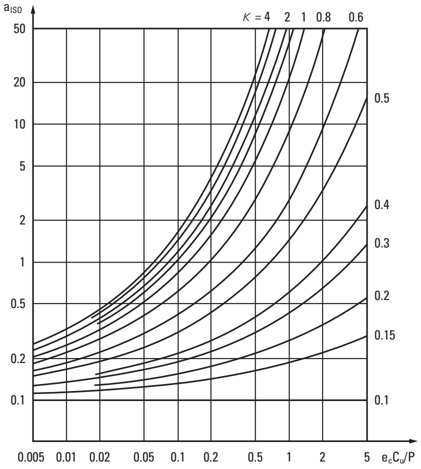


Fig. A-8. Life modification factor a_{ISO} (Thrust ball bearings)

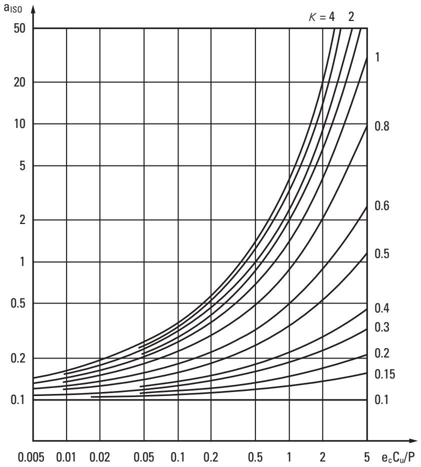


Fig. A-9. Life modification factor a_{ISO} (Thrust roller bearings)

(Figs. A-6 to A-9. Citation from **JIS B 1518**:2013)

b) Fatigue load limit C_u

For regulated steel materials or alloy steel that has equivalent quality, the fatigue life is unlimited so long as the load condition does not exceed a certain value and so long as the lubrication conditions, lubrication cleanliness class, and other operating conditions are favorable. For general high-quality materials and bearings with high manufacturing quality, the fatigue stress limit is reached at a contact stress of approximately 1.5 GPa between the raceway and rolling elements. If one or both of the material quality and manufacturing quality are low, the fatigue stress limit will also be low.

The term “fatigue load limit” C_u is defined as “bearing load under which the fatigue stress limit is just reached in the most heavily loaded raceway contact” in **ISO 281**:2007. and is affected by factors such as the bearing type, size, and material.

For details on the fatigue load limits of special bearings and other bearings not listed in this catalog, contact JTEKT.

c) Contamination factor e_C

If solid particles in the contaminated lubricant are caught between the raceway and the rolling elements, indentations may form on one or both of the raceway and the rolling elements. These indentations will lead to localized increases in stress, which will decrease the life. This decrease in life attributable to the contamination of the lubricant can be calculated from the contamination level as contamination factor e_C.

D_{pw} shown in Table A-3 is the pitch diameter of ball/roller set, which is expressed simply as $D_{pw} = (D + d)/2$. (D: Outside diameter, d: Bore diameter)

For information such as details on special lubricating conditions or detailed investigations, contact JTEKT.

Table A-3. Values of contamination factor e_C

Contamination level	e_C	
	$D_{pw} < 100$ mm	$D_{pw} \geq 100$ mm
Extremely high cleanliness: The size of the particles is approximately equal to the thickness of the lubricant oil film, this is found in laboratory-level environments.	1	1
High cleanliness: The oil has been filtered by an extremely fine filter, this is found with standard grease-packed bearings and sealed bearings.	0.8 to 0.6	0.9 to 0.8
Standard cleanliness: The oil has been filtered by a fine filter, this is found with standard grease-packed bearings and shielded bearings.	0.6 to 0.5	0.8 to 0.6
Minimal contamination: The lubricant is slightly contaminated.	0.5 to 0.3	0.6 to 0.4
Normal contamination: This is found when no seal is used and a coarse filter is used in an environment in which wear debris and particles from the surrounding area penetrate into the lubricant.	0.3 to 0.1	0.4 to 0.2
High contamination: This is found when the surrounding environment is considerably contaminated and the bearing sealing is insufficient.	0.1 to 0	0.1 to 0
Extremely high contamination	0	0

(Table A-3. Citation from **JIS B 1518**:2013)

d) Viscosity ratio κ

The lubricant forms an oil film on the roller contact surface, which separates the raceway and the rolling elements. The status of the lubricant oil film is expressed by viscosity ratio κ, the actual kinematic viscosity at the operating temperature ν divided by the reference kinematic viscosity ν_1 as shown in the following equation.

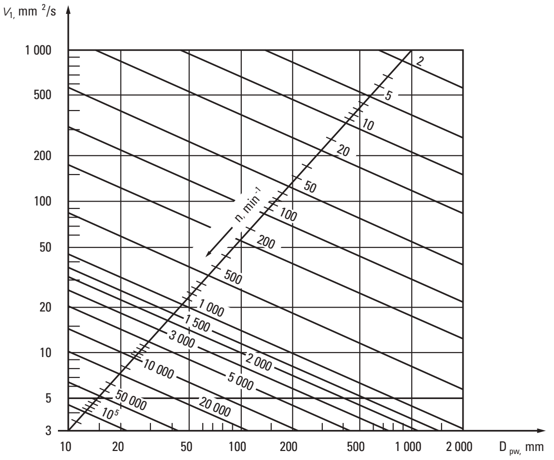
A κ greater than 4, equal to 4, or less than 0.1 is not applicable.

For details on lubricants such as grease and lubricants with extreme pressure additives, contact JTEKT.

$$\kappa = \frac{\nu}{\nu_1}$$

ν : Actual kinematic viscosity at the operating temperature; the viscosity of the lubricant at the operating temperature (refer to Fig. A-14, p. A-22)

ν_1 : Reference kinematic viscosity; determined according to the speed and pitch diameter of ball/roller set D_{pw} of the bearing (ref. Fig. A-10)



(Fig. A-10. Citation from **JIS B 1518**:2013)

Fig. A-10. Reference kinematic viscosity ν_1

Basic Dynamic Load Rating Correction Due to Temperature

During high-temperature operation, the bearing metal hardness deteriorates as the material compositions are altered. As a result, the basic dynamic load rating is diminished. Once altered, material composition does not recover, even if the operating temperature is returned to normal. Therefore, for bearings used in high temperature operations, the basic dynamic load rating must be corrected by multiplying the basic dynamic load rating values specified in the bearing specification table by the temperature coefficient values in Table A-4.

Table A-4. Temperature coefficient values

Bearing temperature, °C	125	150	175	200	250
Temperature coefficient	1	1	0.95	0.90	0.75

Hardness rating factors

Dynamic and static load ratings are based on a minimum raceway hardness equivalent to 58 HRC (HV 653). If the raceway hardness is lower, the effective load ratings will be decreased. The following factors may be used to estimate life when raceway hardness is lower than 58 HRC. Thorough validation is recommended.

Table A-5. Basic dynamic load rating coefficients

Hardness (HRC)	Coefficient
58	1
57	0.94
56	0.89
55	0.85
54	0.80
53	0.75
52	0.68
51	0.60
50	0.50
49	0.44
48	0.40
47	0.37
46	0.34
45	0.31
40	0.20

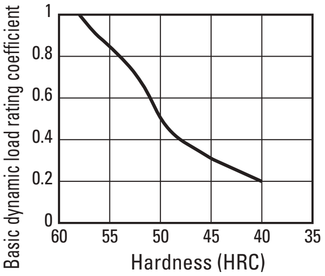


Fig. A-11. Relationship between basic dynamic load rating coefficient and hardness

Table A-6. Basic static load rating coefficients

Hardness (HRC)	Coefficient
58	1
57	0.94
56	0.88
55	0.83
54	0.78
53	0.73
52	0.68
51	0.65
50	0.61
49	0.57
48	0.53
47	0.50
46	0.47
45	0.44
40	0.32

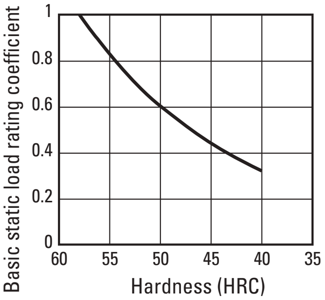


Fig. A-12. Relationship between basic static load rating coefficient and hardness

Service life of bearing system comprising two or more bearings

Even for systems which comprise two or more bearings, if one bearing is damaged, the entire system malfunctions.

Where all bearings used in an application are regarded as one system, the service life of the bearing system can be calculated using the following equation,

$$\frac{1}{L^e} = \frac{1}{L_1{}^e} + \frac{1}{L_2{}^e} + \frac{1}{L_3{}^e} + \quad \cdots\cdots\cdots$$

---

where :

L : rating life of system

L_1 , L_2 , L_3······ : rating life of each bearing

e : constant

e = 10/9······ball bearing
e = 9/8······roller bearing
The mean value is for a system
using both ball and roller bearings.

[Example]

When a shaft is supported by two roller bearings whose service lives are 50 000 hours and 30 000 hours respectively, the rating life of the bearing system supporting this shaft is calculated as follows :

$$\frac{1}{L^{9/8}} = \frac{1}{50\,000^{9/8}} + \frac{1}{30\,000^{9/8}}$$

$$L \fallingdotseq 20\,000 \text{ h}$$

This fact is very important in estimating bearing service life for applications using two or more bearings.

MOUNTING DESIGNS

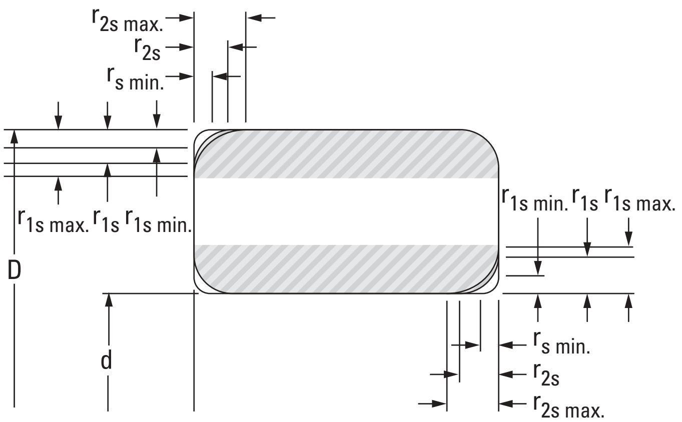
METRIC SERIES NEEDLE ROLLER BEARINGS (EXCEPT DRAWN CUP NEEDLE ROLLER BEARINGS)

Metric series needle roller bearings are available with Radial Internal Clearance (RIC) designations per either of the following table A-7: per “ISO/ABMA ‘C’ Clearance.” Non-standard values also are available by special request. Standard radial internal clearance values are listed in the following table A-7 based on bore size. The clearance required for a given application depends on the desired operating precision, rotational speed of the bearing and the fitting practice used. Most applications use a normal or C0 (Standard) clearance. Typically, larger clearance reduces the operating zone of the bearing, increases the maximum roller load and reduces the bearing’s expected life.

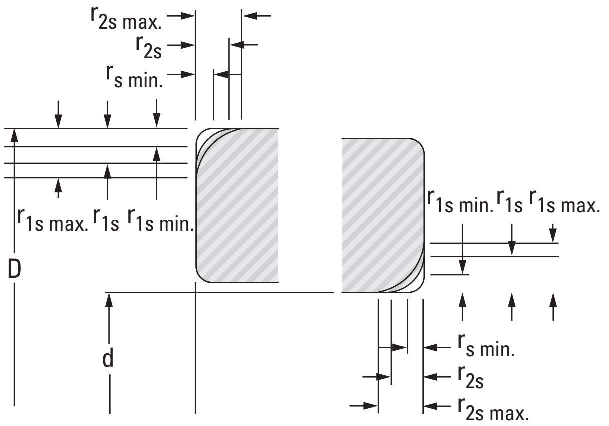
Table A-7. Metric series needle roller bearing radial internal clearance limits

Bore		RIC							
		C2		C0 (Standard)		C3		C4	
over	incl.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
-	**30.000**	**0.025**	**0.000**	**0.045**	**0.020**	**0.060**	**0.035**	**0.075**	**0.050**
-	1.1811	0.0010	0.0000	0.0018	0.0008	0.0024	0.0014	0.0030	0.0020
30.000	**40.000**	**0.030**	**0.005**	**0.050**	**0.025**	**0.070**	**0.045**	**0.085**	**0.060**
1.1811	1.5748	0.0012	0.0002	0.0020	0.0010	0.0028	0.0018	0.0033	0.0024
40.000	**50.000**	**0.035**	**0.005**	**0.060**	**0.030**	**0.080**	**0.050**	**0.100**	**0.070**
1.5748	1.9685	0.0014	0.0002	0.0024	0.0012	0.0031	0.0020	0.0039	0.0028
50.000	**65.000**	**0.040**	**0.010**	**0.070**	**0.040**	**0.090**	**0.060**	**0.110**	**0.080**
1.9685	2.5591	0.0016	0.0004	0.0028	0.0016	0.0035	0.0024	0.0043	0.0031
65.000	**80.000**	**0.045**	**0.010**	**0.075**	**0.040**	**0.100**	**0.065**	**0.125**	**0.090**
2.5591	3.1496	0.0018	0.0004	0.0030	0.0016	0.0039	0.0026	0.0049	0.0035
80.000	**100.000**	**0.050**	**0.015**	**0.085**	**0.050**	**0.110**	**0.075**	**0.140**	**0.105**
3.1496	3.9370	0.0020	0.0006	0.0033	0.0020	0.0043	0.0030	0.0055	0.0041
100.000	**120.000**	**0.055**	**0.015**	**0.090**	**0.050**	**0.125**	**0.085**	**0.165**	**0.125**
3.9370	4.7244	0.0022	0.0006	0.0035	0.0020	0.0049	0.0033	0.0065	0.0049
120.000	**140.000**	**0.060**	**0.015**	**0.105**	**0.060**	**0.145**	**0.100**	**0.190**	**0.145**
4.7244	5.5118	0.0024	0.0006	0.0041	0.0024	0.0057	0.0039	0.0075	0.0057
140.000	**160.000**	**0.070**	**0.020**	**0.120**	**0.070**	**0.165**	**0.115**	**0.215**	**0.165**
5.5118	6.2992	0.0028	0.0008	0.0047	0.0028	0.0065	0.0045	0.0085	0.0065
160.000	**180.000**	**0.075**	**0.025**	**0.125**	**0.075**	**0.170**	**0.120**	**0.220**	**0.170**
6.2992	7.0866	0.0030	0.0010	0.0049	0.0030	0.0067	0.0047	0.0087	0.0067
180.000	**200.000**	**0.090**	**0.035**	**0.145**	**0.090**	**0.195**	**0.140**	**0.250**	**0.195**
7.0866	7.8740	0.0035	0.0014	0.0057	0.0035	0.0077	0.0055	0.0098	0.0077
200.000	**225.000**	**0.105**	**0.045**	**0.165**	**0.105**	**0.220**	**0.160**	**0.280**	**0.220**
7.8740	8.8583	0.0041	0.0018	0.0065	0.0041	0.0087	0.0063	0.0110	0.0087
225.000	**250.000**	**0.110**	**0.045**	**0.175**	**0.110**	**0.235**	**0.170**	**0.300**	**0.235**
8.8583	9.8425	0.0043	0.0018	0.0069	0.0043	0.0093	0.0067	0.0118	0.0093
250.000	**280.000**	**0.125**	**0.055**	**0.195**	**0.125**	**0.260**	**0.190**	**0.330**	**0.260**
9.8425	11.0236	0.0049	0.0022	0.0077	0.0049	0.0102	0.0075	0.0130	0.0102
280.000	**315.000**	**0.130**	**0.055**	**0.205**	**0.130**	**0.275**	**0.200**	**0.350**	**0.275**
11.0236	12.4016	0.0051	0.0022	0.0081	0.0051	0.0108	0.0079	0.0138	0.0108
315.000	**355.000**	**0.145**	**0.065**	**0.225**	**0.145**	**0.305**	**0.225**	**0.385**	**0.305**
12.4016	13.9764	0.0057	0.0026	0.0089	0.0057	0.0120	0.0089	0.0152	0.0120
355.000	**400.000**	**0.190**	**0.100**	**0.280**	**0.190**	**0.370**	**0.280**	**0.460**	**0.370**
13.9764	15.7480	0.0075	0.0039	0.0110	0.0075	0.0146	0.0110	0.0181	0.0146
400.000	**450.000**	**0.210**	**0.110**	**0.310**	**0.210**	**0.410**	**0.310**	**0.510**	**0.410**
15.7480	17.7165	0.0083	0.0043	0.0122	0.0083	0.0161	0.0122	0.0201	0.0161
450.000	**500.000**	**0.220**	**0.110**	**0.330**	**0.220**	**0.440**	**0.330**	**0.550**	**0.440**
17.7165	19.6850	0.0087	0.0043	0.0130	0.0087	0.0173	0.0130	0.0217	0.0173

METRIC SERIES BEARING CHAMFER DIMENSIONS



Radial Bearings



Thrust Bearings

Table A-8. Chamfer dimensions of radial bearings metric series

$r_{s \min.}$	d Nominal bore dia.		$r_{1s \max.}$	$r_{2s \max.}$
	>	≤		
mm in	**mm** in		**mm** in	**mm** in
0.150 0.0059	**all** all		**0.300** 0.0118	**0.600** 0.0236
0.200 0.0079	**all** all		**0.500** 0.0197	**0.800** 0.0315
0.300 0.0118	–	**40.000** 1.5748	**0.600** 0.0236	**1.000** 0.0394
	40.000 1.5748	–	**0.800** 0.0315	**1.000** 0.0394
0.600 0.0236	–	**40.000** 1.5748	**1.000** 0.0394	**2.000** 0.0787
	40.000 1.5748	–	**1.300** 0.0512	**2.000** 0.0787
1.000 0.0394	–	**50.000** 1.9685	**1.500** 0.0591	**3.000** 0.1181
	50.000 1.9685	–	**1.900** 0.0748	**3.000** 0.1181
1.100 0.0433	–	**120.000** 4.7244	**2.000** 0.0787	**3.500** 0.1378
	120.000 4.7244	–	**2.500** 0.0984	**4.000** 0.1575
1.500 0.0591	–	**120.000** 4.7244	**2.300** 0.09055	**4.000** 0.1575
	120.000 4.7244	–	**3.000** 0.1181	**5.000** 0.19685
2.000 0.0787	–	**80.000** 3.1496	**3.000** 0.1181	**4.500** 0.1772
	80.000 3.1496	**220.000** 8.6614	**3.500** 0.1378	**5.000** 0.19685
	220.000 8.6614	–	**3.800** 0.1496	**6.000** 0.2362
2.100 0.0827	–	**280.000** 11.0236	**4.000** 0.1575	**6.500** 0.2559
	280.000 11.0236	–	**4.500** 0.1772	**7.000** 0.2756

Table A-9. Chamfer dimensions of thrust bearings metric series

$r_{s \min.}$	$r_{1s \max.}$	$r_{2s \max.}$
mm in	**mm** in	**mm** in
0.300 0.0118	**0.800** 0.0315	**0.800** 0.0315
0.600 0.0236	**1.500** 0.0591	**1.500** 0.0591
1.000 0.0394	**2.200** 0.0866	**2.200** 0.0866
1.100 0.0433	**2.700** 0.1063	**2.700** 0.1063
1.500 0.0591	**3.500** 0.1378	**3.500** 0.1378
2.000 0.0787	**4.000** 0.1575	**4.000** 0.1575

ABMA / ISO Symbols

d	Bearing bore diameter, nominal and shaft-piloted washer bore diameter, nominal.
D	Bearing outside diameter, nominal and housing-piloted washer outside diameter, nominal.
$r_{s \min.}$	Smallest permissible single chamfer dimension (minimum limit).
$r_{1s \max.}$	Largest permissible single chamfer dimension in a radial direction.
$r_{2s \max.}$	Largest permissible single chamfer dimension in an axial direction.

SHAFT DESIGNS

BEARINGS WITHOUT INNER RINGS

When the shaft is used as the inner raceway for needle roller bearings it must have a hardness of 58 HRC or higher and a wave-free finish in order to realize the full load-carrying capability of the bearing.

1. **Metallurgy** – either case-hardening or through-hardening grades of good bearing-quality steel are satisfactory for raceways.

   To realize full bearing capacity, the raceway area must be at least surface hard with a reasonable core strength. During the carburizing or induction-hardening of case hardened steel, not only must the surface hardness requirement of 58 HRC or higher be met, but the basic concept is that the case depth with a hardness of HV 550 (52.3 HRC) must be 0.4 mm or higher. However, if the roller diameter is smaller than 4 mm, a case depth of (0.1 × Dw) mm or higher is recommended.
   (Dw:roller diameter)
2. **Strength** – the shaft must be of sufficient strength to keep the operating deflections within the limits outlined.
3. **Tolerance** – the suggested shaft diameter tolerances for each type of needle roller bearing are indicated in the appropriate section of this catalog.
4. **Variation of mean shaft diameter (taper)** – within the range of the bearing width, 5 µm or less per 25 mm or one-half the diameter tolerance or less (whichever is smaller).
5. **Deviation from circular form** – the radial deviation from true circular form of the raceway should not exceed 2.5 µm for diameters up to and including 25 mm. For raceways greater than 25 mm, the allowable radial deviation should not exceed 2.5 µm multiplied by a factor of the raceway diameter divided by 25.
6. **High frequency lobing** – the lobing that occurs 10 or more times around the circumference of a shaft and exceeds 0.4 µm from peak to valley is called chatter. Chatter usually causes undesirable noise and reduces fatigue life.
7. **Shaft slope** – Operating conditions which cause misalignment (shaft deflection, inaccuracy of shaft and housing, mounting errors) can affect bearing performance. For needle roller bearings, Table A-10 shows misalignment limitations based on bearing width.

Table A-10. Misalignment limitations

Bearing width		Maximum slope (mm/mm)	
mm	in.	Caged	Full complement
<25.4	<1	0.0015	0.0010
25.4 – 50.8	1 – 2	0.0010	0.0005
>50.8	>2	0.0005	0.0005

8. **Surface finish** – In addition to a wave-free finish, the raceway surface roughness of $R_a \leq 0.2$ µm must be maintained for the bearing to utilize its full load rating. The raceway area also must be free of nicks, burrs, scratches and dents. Oil holes are permissible in the raceway area, but care must be taken to blend the edges gently into the raceway, and if possible, the hole should be located in the unloaded zone of the raceway.

   Care also must be taken to prevent grind reliefs, fillets, etc., from extending into the raceway area. If the rollers overhang a grind relief or step on the shaft, there will be high stress concentration with resultant early damage.
9. **End chamfer** – for the most effective assembly of the shaft into a bearing, the end of the shaft should have a large chamfer or rounding. This should help in preventing damage to the roller complement, scratching of the raceway surface, and nicking of the shaft end.
10. **Sealing surface** – in some instances, bearings have integral or immediately adjacent seals that operate on the surface ground for the bearing raceway. Here, particular attention should be paid to the pattern of the shaft finish. In no instance should there be a “lead,” or spiral effect, as often occurs with through-feed centerless grinding. Such a “lead” may pump lubricant past the seal.

BEARINGS WITH INNER RINGS

When it is undesirable or impractical to prepare the shaft to be used as a raceway, inner rings are available as listed in the tabular pages. If the shaft is not used directly as a raceway, the following design specifications must be met:

1. **Strength** – the shaft must be of sufficient strength to keep the operating deflections within the limits outlined.
2. **Tolerance** – the suggested shaft diameter tolerances for each type of needle roller bearing are indicated in the appropriate section of the catalog.
3. **Variation of mean shaft raceway diameter (taper) and deviation from circular form of the raceway** – should not exceed one-half the shaft diameter tolerance.
4. **Surface finish** – the surface finish should not exceed a roughness of Ra 0.8 µm.
5. **Locating shoulders or steps** – locating shoulders or steps in the shaft must be held to close concentricity with the bearing seat to prevent imbalance and resultant vibrations.

Table A-11. Shaft designs summary

	Shaft	
	Raceway surface	**Fitting surface**
Out-of-roundness	Shaft dia. ≤ 25 mm: 2.5 µm or less Shaft dia. > 25 mm: 2.5 µm × (shaft dia./25 mm) or less	One-half of shaft dia. tolerance or less
Variation of mean dia. (taper)	5 µm or less per 25 mm within the range of bearing width, or one-half of shaft dia. tolerance or less (whichever is smaller)	One-half of shaft dia. tolerance or less
Surface roughness	0.2a or less	0.8a or less
Hardness	58 HRC or harder1)	–

1) During the carburizing or induction-hardening of case hardened steel, not only must the surface hardness requirement of 58 HRC or higher be met, but the basic concept is that the case depth with a hardness of HV 550 (52.3 HRC) must be 0.4 mm or higher. However, if DW is smaller than 4 mm, a case depth of (0.1 × Dw) mm or higher is recommended. (Dw: roller dia.)

HOUSING DESIGNS

BEARINGS WITH OUTER RINGS

For bearings with outer rings, the function of the housing is to locate and support the outer ring. The following specifications must be met:

1. **Strength** – housings should be designed so that the radial loads placed on the bearings will cause a minimum of deflection or distortion of the housing.
2. **Variation of mean housing diameter (taper)** – within the width of the outer ring, 13 μm or one-half the diameter tolerance (whichever is smaller) or less.
3. **Deviation from circular form** – the housing bore should be round within one-half the housing bore tolerance.
4. **Parallelism** – when possible, line bore housings that are common to one shaft to obtain parallelism of the housing bores and the shaft axis.
5. **Surface finish** – The surface finish should not exceed R_a 1.6 μm.
6. **End chamfer** – to permit easy introduction of the bearing into the housing, the end of the housing should have a generous chamfer.

Only heavy-duty needle roller bearings can be installed into housings with a transition fit or a clearance fit. The outer ring should be a transition fit in the housing when it rotates relative to the load. The outer ring may be a clearance fit in the housing when it is stationary relative to the load. In either case, locate the bearings by shoulders, or other locating devices, to prevent axial movement.

Since only the heavy-duty needle roller bearing does not require an interference fit in the housing to round and size it properly, a split housing may be used if desired. Dowels should be used to maintain proper register of the housing sections.

Drawn cup needle roller bearings have a thin case-hardened outer ring that is out-of-round from the hardening operation. For proper mounting it must always be pressed into the housing. Split housings will not round and size a drawn cup bearing. When split housings must be used, the bearing should first be mounted in a cylindrical sleeve.

The housing should be of sufficient tensile strength and section to round and size the bearing. It must be designed for minimum distortion under load. Steel or cast iron housings are preferred.

Housing bores in low tensile strength materials such as aluminum, magnesium, phenolics, etc., should be reduced to provide more interference fit. Thin section cast iron and steel housings may also require reduced bores. Consult your representative for suggestions when working with these lower strength housings.

The housing should be through-bored if possible. When shouldered housing bores are unavoidable, the bearing should be located far enough from the shoulder to avoid the danger of crushing the end of the drawn cup during installation.

When the drawn cup bearing is mounted close to the housing face, care should be taken to mount the bearing at least 0.250 mm (0.0100 in) within the housing face to protect the bearing lip.

BEARINGS WITHOUT OUTER RINGS

In many cases, such as with gear bores, it is desirable to have the housing bore serve as the outer raceway for radial needle roller and cage assemblies or loose needle roller complements. In those instances, as for shafts used as raceways, the housing bore must have a hardness of 58 HRC or harder and a surface roughness $Ra \leq 0.2$ μm so that the full load-carrying capacity of the bearing is realized.

1. **Strength** – the housing must be of sufficient cross section to maintain proper roundness and running clearance under maximum load.
2. **Metallurgical** – material selection, hardness and case depth should be consistent with the requirements for inner raceways given in the shaft design.
3. **Variation of mean housing raceway diameter (taper)** – within the range of the bearing width, 5 μm or less per 25 mm or one-half the housing bore diameter tolerance or less (whichever is smaller). In addition, the bore diameter must never be smaller at both ends than in the center [sway-back].
4. **Deviation from circular form** – the raceway out-of-roundness should not exceed one-half the bore tolerance.
5. **Surface finish** – In addition to a wave-free finish, the raceway surface roughness of $Ra \leq 0.2$ μm must be maintained for the bearing to utilize its full load rating. The raceway area also must be free of nicks, burrs, scratches and dents.
6. **Grind reliefs** – care must be exercised to ensure that grind reliefs, fillets, etc., do not extend to the raceway. Oil holes in the raceway area are permissible, but the edges must be blended smoothly with the raceway and, if possible, the hole should be located in the unloaded zone of the raceway.

Table A-12. Housing designs summary

	Housing bore	
	Raceway surface	Fitting surface
Out-of-roundness	One-half of bore tolerance or less	One-half of bore tolerance or less
Variation of mean dia. (taper)	5 μm or less per 25 mm within the range of outer ring width, or one-half of bore tolerance or less (whichever is smaller)	13 μm or less within the range of outer ring width, or one-half of bore tolerance or less (whichever is smaller)
Surface roughness	0.2a or less	1.6a or less
Hardness	58 HRC or harder[1]	–

[1] During the carburizing or induction-hardening of case hardened steel, not only must the surface hardness requirement of 58 HRC or higher be met, but the basic concept is that the case depth with a hardness of HV 550 (52.3 HRC) must be 0.4 mm or higher. However, if DW is smaller than 4 mm, a case depth of (0.1 × Dw) mm or higher is recommended. (Dw: roller dia.)

FITS

The purpose of fit is to securely fix the inner or outer ring to the shaft or housing, to preclude detrimental circumferential sliding on the fitting surface.

Such detrimental sliding (referred to as "creep") will cause abnormal heat generation, wear of the fitting surface, infiltration of abrasion metal particles into the bearing, vibration, and many other harmful effects, which cause a deterioration of bearing functions.

FIT SELECTION

In selecting the proper fit, careful consideration should be given to bearing operating conditions.
Major specific considerations are :

- Direction of load
- Load characteristics and magnitude
- Temperature distribution in operating
- Bearing internal clearance
- Surface finish, material and thickness of shaft and housing
- Mounting and dismounting methods
- Necessity to compensate for shaft thermal expansion at the fitting surface
- Bearing type and size

In view of these considerations, the following paragraphs explain the details of the important factors in fit selection.

1. Direction of load

Direction of load classified into three types : rotating inner ring load; rotating outer ring load and indeterminate direction load.
Table A-13 tabulates the relationship between these characteristics and fit.

Table A-13. Direction of Load and Fits

Direction of load		Rotating Ring		Type of load	Fit	
		Inner ring	outer ring		Inner ring	outer ring
Rotating inner ring load	Inner ring : Circumferential load Outer ring : Point load	Rotating	Stationary	Rotating load	Tight	Loose
Rotating outer ring load	Inner ring : Point load Outer ring : Circumferential load	Stationary	Rotating	Rotating load	Loose	Tight
Indetermi-nate direction load	Inner ring : Circumferential load Outer ring : Oscillating load	Rotating Stationary	Stationary Rotating	Stationary load > Rotating load Stationary load < Rotating load	Tight	Slightly tight
	Inner ring : Oscillating load Outer ring : Circumferential load	Rotating Stationary	Stationary Rotating	Stationary load > Rotating load Stationary load < Rotating load	Slightly tight	Tight

2. Effect of load characteristic and magnitude

When a radial load is applied, the inner ring will expand slightly. Since this expansion enlarges the circumference of the bore minutely, the initial interference is reduced.

The reduction can be calculated by the following equations :

[in the case of $F_r \leqq 0.25\ C_0$]

$$\Delta_{dF} = 0.08\sqrt{\frac{d}{B}} \cdot F_r \times 10^{-3}$$

[in the case of $F_r > 0.25\ C_0$]

$$\Delta_{dF} = 0.02\ \frac{F_r}{B} \times 10^{-3}$$

where :

Δ_{dF} :	Reduction of inner ring interference	mm
d :	Nominal bore diameter of bearing	mm
B :	Nominal inner ring width	mm
F_r :	Radial load	N
C_0 :	Basic static load rating	N

When the radial load exceeds the C_0 value by 25%, greater interference is needed. When impact loads are expected, much greater interference is needed.

3. Effect of fitting surface roughness

The effective interference obtained after fitting differs from calculated interference due to plastic deformation of the ring fitting surface. When the inner ring is fitted, the effective interference, subject to the effect of the fitting surface finish, can be approximated by the following equations :

[In the case of a ground shaft]

$$\Delta_{deff} \fallingdotseq \frac{d}{d+2}\ \Delta_d$$

[In the case of a turned shaft]

$$\Delta_{deff} \fallingdotseq \frac{d}{d+3}\ \Delta_d$$

where :

Δ_{deff} :	Effective interference	mm
Δ_d :	Calculated interference	mm
d :	Nominal bore diameter of bearing	mm

4. Effect of temperature

A bearing generally has an operating temperature that is higher than the ambient temperature. When the inner ring operates under load, its temperature generally becomes higher than that of the shaft and the effective interference decreases due to the greater thermal expansion of the inner ring.

If the temperature difference between the bearing inside and surrounding housing is $\varDelta t$, the temperature difference between the fitting surfaces of the inner ring and shaft will be approximately (0.10 to 0.15) × $\varDelta t$. The reduction of interference ($\varDelta dt$) due to the temperature difference is then expressed as follows:

$$\begin{aligned}\varDelta_{\mathrm{dt}} &= (0.10\sim0.15)\ \varDelta_{\mathrm{t}}\cdot\alpha\cdot \mathrm{d}\\ &\doteqdot 0.001\,5\ \varDelta_{\mathrm{t}}\cdot \mathrm{d}\times10^{-3}\end{aligned}$$

In this equation,

$\varDelta_{\mathrm{dt}}$: Reduction of interference due to temperature difference mm

$\varDelta_{\mathrm{t}}$: Temperature difference between the inside of the bearing and the surrounding housing °C

α : Linear expansion coefficient of bearing steel (approximately equal to 12.5×10^{-6}) 1/°C

d : Nominal bore diameter of bearing mm

Consequently, when a bearing is higher in temperature than the shaft, greater interference is required.

However, a difference in temperature or in the coefficient of expansion may sometimes increase the interference between the outer ring and housing. Therefore, care should be taken when clearance is provided to accommodate shaft thermal expansion.

5. Maximum stress due to fit

When a bearing is fitted with interference, the bearing ring will expand or contract, generating internal stress.

Should this stress be excessive, the bearing ring may fracture.

The maximum bearing fitting-generated stress is determined by the equation in Table A-14.

In general, to avoid fracture, it is best to adjust the maximum interference to less than 1/1 000 of the shaft diameter, or the maximum stress (σ), determined by the equation in Table A-14, should be less than 120 MPa.

Table A-14 does not apply to drawn cup needle roller bearings.

Recommended Fits

Recommended fits are listed in each bearing section and within the tabular pages.

Table A-14. Maximum fitting-generated stress in bearings

Shaft & inner ring	Housing bore & outer ring
(In the case of hollow shaft) $\sigma=\dfrac{E}{2}\cdot\dfrac{\varDelta_{deff}}{d}\cdot\dfrac{\left(1-\dfrac{d_0^{\,2}}{d^2}\right)\left(1+\dfrac{d^2}{D_i^{\,2}}\right)}{\left(1-\dfrac{d_0^{\,2}}{D_i^{\,2}}\right)}$	**(In the case of $D_h\neq\infty$)** $\sigma=E\cdot\dfrac{\varDelta_{Deff}}{D}\cdot\dfrac{\left(1-\dfrac{D^2}{D_h^{\,2}}\right)}{\left(1-\dfrac{D_e^{\,2}}{D_h^{\,2}}\right)}$
(In the case of solid shaft) $\sigma=\dfrac{E}{2}\cdot\dfrac{\varDelta_{deff}}{d}\cdot\left(1+\dfrac{d^2}{D_i^{\,2}}\right)$	**(In the case of $D_h=\infty$)** $\sigma=E\cdot\dfrac{\varDelta_{Deff}}{D}$

where :

σ : Maximum stress MPa

d : Nominal bore diameter (shaft diameter) mm

D_i : Raceway contact diameter of inner ring roller bearing … $D_i \doteqdot 0.25\,(D+3d)$ mm

$\varDelta_{deff}$: Effective interference of inner ring mm

d_0 : Bore diameter of hollow shaft mm

D_e : Raceway contact diameter of outer ring roller bearing … $De \doteqdot 0.25\,(3D+d)$ mm

D : Nominal outside diameter (bore diameter of housing) mm

$\varDelta_{Deff}$: Effective interference of outer ring mm

D_h : Outside diameter of housing mm

E : Young's modulus = 2.08×10^5 MPa

[Remark] The above equations are applicable when the shaft and housing are steel.
When other materials are used, JTEKT should be consulted.

CLEARANCE

Bearing internal clearance is defined as the clearance between the bearing ring and the rolling elements. The total distance either inner or outer ring can be moved when the specified measuring load is applied to the ring in radial direction and the other ring is fixed is defined as radial internal clearance.

The term "residual clearance" is also defined as the original clearance decreased owing to expansion or contraction of a raceway due to fitting, when the bearing is mounted in the shaft and housing.

The term "effective clearance" is defined as the residual clearance decreased owing to dimensional change arising from temperature differentials within the bearing.

The term "operating clearance" is defined as the internal clearance present while a bearing mounted in a machine is rotating under a certain load, or, the effective clearance increased due to elastic deformation arising from bearing loads.

The operating clearance is closely related to bearing performance and life. It is therefore desirable to select a clearance with a lower limit value on the positive side of zero.

When selecting the clearance, fitting conditions, temperature conditions, and tolerance of mounting dimensions must all be taken into account.

The operating clearance can be obtained from the equation in Table A-15.

These calculations can be used for machined ring needle roller bearings but not for drawn cup needle roller bearings.

For the drawn cup needle roller bearings refer to page B-2-7.

Table A-15. Operating clearance

Operating clearance (S)	$S=S_o-(S_f+S_{t1}+S_{t2})+S_w$*	* [S_w (increase of clearance due to load) is generally small, and thus may be ignored, although there is a equation for determining the value.]
Decrease of clearance due to fitting (S_f)	**(In the case of hollow shaft)** $S_{fi}=\Delta_{deff}\dfrac{d}{D_i}\cdot\dfrac{\left(1-\dfrac{d_0^2}{d^2}\right)}{\left(1-\dfrac{d_0^2}{D_i^2}\right)}$ **(In the case of solid shaft)** $S_{fi}=\Delta_{deff}\dfrac{d}{D_i}$	**(In the case of $D_h\neq\infty$)** $S_{fo}=\Delta_{Deff}\dfrac{D_e}{D}\cdot\dfrac{\left(1-\dfrac{D^2}{D_h^2}\right)}{\left(1-\dfrac{D_e^2}{D_h^2}\right)}$ **(In the case of $D_h=\infty$)** $S_{fo}=\Delta_{Deff}\dfrac{D_e}{D}$
Decrease of clearance due to temperature differentials between inner and outer rings (S_{t1})	The amount of decrease varies depending on the state of housing; however, generally the amount can be approximated by the following equation on the assumption that the outer ring will not expand : $S_{t1}=\alpha(D_i\cdot t_i-D_e\cdot t_e)$	where : $D_e=D_i+2D_w$ Consequently, $S_{t1}+S_{t2}$ will be determined by the following equation : $S_{t1}+S_{t2}=\alpha\cdot D_i\cdot t_1+2\alpha\cdot D_w\cdot t_2$ [Temperature differential between the inner and outer rings, t1, can be expressed as follows : $t_1=t_i-t_e$ Temperature differential between the rolling element and outer ring, t2, can be expressed as follows : $t_2=t_w-t_e$]
Decrease of clearance due to temperature rise of rolling element (S_{t2})	$S_{t2}=2\alpha\cdot D_w\cdot t_w$	

In Table A-15,

S : Operating clearance mm
S_o : Clearance before mounting mm
S_f : Decrease of clearance due to fitting mm
S_{fi} : Expansion of inner ring raceway contact diameter mm
S_{fo} : Contraction of outer ring raceway contact diameter mm
S_{t1} : Decrease of clearance due to temperature differentials between inner and outer rings mm
S_{t2} : Decrease of clearance due to temperature rise of the rolling elements mm
S_w : Increase of clearance due to load mm
Δ_{deff} : Effective interference of inner ring mm
d : Nominal bore diameter (shaft diameter) mm
d_0 : Bore diameter of hollow shaft mm
D_i : Inner ring raceway contact diameter mm
roller bearing … $D_i\fallingdotseq 0.25(D+3d)$

Δ_{Deff} : Effective interference of outer ring mm
D_h : Outside diameter of housing mm
D_e : Outer ring raceway contact diameter mm
roller bearing … $D_e\fallingdotseq 0.25(3D+d)$
D : Nominal outside diameter mm
α : Linear expansion coefficient of bearing steel (12.5×10^{-6}) 1/°C
D_w : Average diameter of rolling elements mm
roller bearing … $D_w\fallingdotseq 0.25(D-d)$
t_i : Temperature rise of the inner ring °C
t_e : Temperature rise of the outer ring °C
t_w : Temperature rise of rolling elements °C

■ Bearings are sometimes used with a non-steel shaft or housing.
In the automotive industry, a statistical method is often incorporated for selection of clearance.
In these cases, or when other special operating conditions are involved, JTEKT should be consulted.

LUBRICATION

PURPOSE OF LUBRICATION

Lubrication is one of the most important factors determining bearing performance. Since the suitability of the lubricant and lubrication method have a dominant influence on bearing life, the most suitable lubricant should be selected according to operating conditions.

Functions of lubrication :

- To lubricate each part of the bearing, and to reduce friction and wear
- To carry away heat generated inside bearing due to friction and other causes
- To cover rolling contact surface with the proper oil film in order to prolong bearing fatigue life
- To prevent corrosion and contamination by dirt

Although the same general rules for ball bearings and roller bearings can also be applied to needle roller bearing lubrication, the following points should also be considered :

- The space in the bearing is very small; thus, only a little lubricant can be retained.
- The bearing is relatively wide, so circulating the lubricant through the bearing is difficult.
- In the case of full complement type sliding contact between rollers may arise.
- Rollers may skew during rotation.
- Often used in the application where oscillating motion is present.

Accordingly, these points must be given sufficient consideration when selecting the lubricant and method of lubrication.

LUBRICANT

Bearing lubrication is classified broadly into two categories : grease lubrication and oil lubrication. Table A-16 makes a general comparison between the two.

Table A-16. Comparison between grease and oil lubrication

Item	Grease	Oil
Sealing device	Easy	Slightly complicated and special care required for maintenance
Lubricating ability	Good	Excellent
Rotation speed	Low/medium speed	Applicable at high speed as well
Replacement of lubricant	Slightly troublesome	Easy
Life of lubricant	Relatively short	Long
Cooling effect	No cooling effect	Good (circulation is necessary)
Filtration of dirt	Difficult	Easy

GREASE LUBRICATION

Grease is made by mixing and dispersing a solid of high oil-affinity (called a thickener) with lubricant oil (as a base), and transforming it into a semi-solid state.

As well, a variety of additives can be added to improve specific performance.

Many types of grease are marketed in various combinations of thickener, base oil and additives according to the purposes. So, it is very important to select proper types of grease.

The characteristics of various greases are shown in Table A-17.

Table A-17. Characteristics of respective greases

	Lithium grease			Calcium grease (cup grease)	Sodium grease (fiber grease)	Complex base grease		Non-soap base grease		
Thickener	Lithium soap			Calcium soap	Sodium soap	Lithium complex soap	Calcium complex soap	Bentone	Urea compounds	Fluorine compounds
Base oil	Mineral oil	Synthetic oil (diester oil)	Synthetic oil (silicon oil)	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral/ synthetic oil	Synthetic oil
Dropping point (°C)	170 to 190	170 to 230	220 to 260	80 to 100	160 to 180	250 or higher	200 to 280	–	240 or higher	250 or higher
Operating temperature range (°C)	–30 to +120	–50 to +130	–50 to +180	–10 to +70	0 to +110	–30 to +150	–10 to +130	–10 to +150	–30 to +150	–40 to +250
Rotation speed range	Medium to high	High	Low to medium	Low to medium	Low to high	Low to high	Low to medium	Medium to high	Low to high	Low to medium
Mechanical stability	Excellent	Good to excellent	Good	Fair to good	Good to excellent	Good to excellent	Good	Good	Good to excellent	Good
Water resistance	Good	Good	Good	Good	Bad	Good to excellent	Good	Good	Good to excellent	Good
Pressure resistance	Good	Fair	Bad to fair	Fair	Good to excellent	Good	Good	Good to excellent	Good to excellent	Good
Remarks	Most widely usable for various rolling bearings.	Superior low temperature and friction characteristics.	Superior high and low temperature characteristics.	Suitable for applications at low rotation speed and under light load. Not applicable at high temperature.	Liable to emulsify in the presence of water. Used at relatively high temperature.	Superior mechanical stability and heat resistance. Used at relatively high temperature.	Superior pressure resistance when extreme pressure agent is added.	Suitable for applications at high temperature and under relatively heavy load.	Superior water resistance, oxidation stability, and heat stability. Suitable for applications at high temperature and high speed.	Superior chemical resistance and solvent resistance. Usable at up to 250 °C.

(1) Base oil

Mineral oil is usually used as the base oil for grease.

When low temperature fluidity, high temperature stability, or other special performance is required, diester oil, silicon oil, polyglycolic oil, fluorinated oil, or other synthetic oil is often used.

Generally, grease with a low viscosity base oil is suitable for applications at low temperature or high rotation speed; grease with high viscosity base oils are suitable for applications at high temperature or under heavy load.

(2) Thickener

Most greases use a metallic soap base such as lithium, sodium, or calcium as thickeners. For some applications, however, non-soap base thickeners (inorganic substances such as bentone, silica gel, and organic substances such as urea compounds, fluorine compounds) are also used.

In general, the mechanical stability, bearing operating temperature range, water resistance, and other characteristics of grease are determined by the thickener.

(Lithium soap base grease)
Superior in heat resistance, water resistance and mechanical stability.

(Calcium soap base grease)
Superior in water resistance; inferior in heat resistance.

(Sodium soap base grease)
Superior in heat resistance; inferior in water resistance.

(Non-soap base grease)
Superior in heat resistance.

(3) Additives

Various additives are selectively used to serve the respective purposes of grease applications.

- Extreme pressure agents
  When bearings must tolerate heavy or impact loads.
- Oxidation inhibitors
  When grease is not refilled for a long period.

Structure stabilizers, rust preventives, and corrosion inhibitors are also used.

(4) Consistency

Consistency, which indicates grease hardness, is expressed as a figure obtained, in accordance with ASTM (JIS), by multiplication by 10 the depth (in mm) to which the cone-shaped metallic plunger penetrates into the grease at 25 °C by deadweight in 5 seconds. The softer the grease, the higher the figure.

Table A-18 shows the relationships between the NLGI scales and ASTM (JIS) penetration indexes, service conditions of grease.

(NLGI : National Lubricating Grease Institute)

It is imperative that the bearing operating temperature is always within the temperature range specified for the grease used. Although softer greases provide better lubrication, they are more likely to be churned. Since grease churning tends to cause temperature rise and leakage, this characteristic should be taken into account when selecting grease consistency. For ordinary operating conditions, greases of NLGI No. 0 to 3 are commonly used. When the bearing operating speed is higher, a somewhat harder grease with high mechanical stability should be selected.

Table A-18. Grease consistency and service conditions

ASTM (JIS) penetration index (25 °C, 60 mixing operations)	NLGI scale	Service conditions/applications
355 - 385	0	For centralized lubricating
310 - 340	1	For centralized lubricating, at low temperature
265 - 295	2	For general use
220 - 250	3	For general use, at high temperature
175 - 205	4	For special applications

[Note] The larger the penetration index, the softer is the grease.

(5) Mixing of different greases

Since mixing of different greases changes their properties, greases of different brands should not be mixed.

If mixing cannot be avoided, greases containing the same thickener should be used. Even if the mixed greases contain the same thickener, however, mixing may still produce adverse effects, due to difference in additives or other factors.

Thus it is necessary to check the effects of a mixture in advance, through testing or other methods.

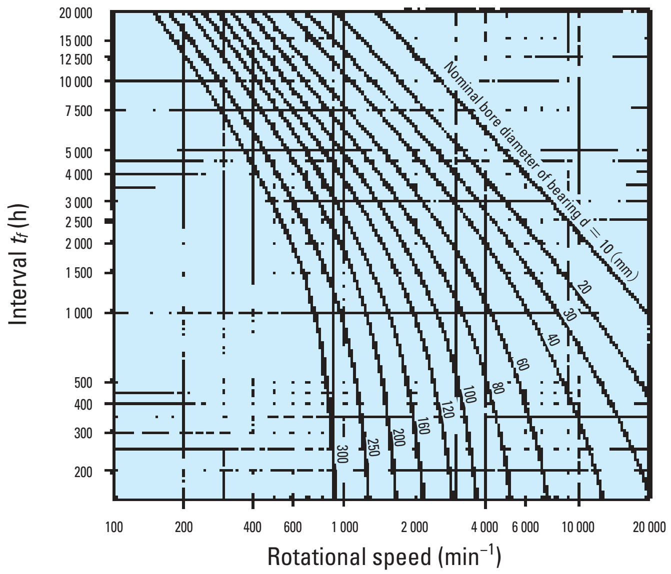
REPLENISHMENT/REPLACEMENT OF GREASE

The method of replenishing/replacing grease depends largely on the lubrication method. Whichever method may be utilized, care should be taken to use clean grease and to keep dirt or other foreign matter out of the housing.

When grease is refilled, new grease must be injected inside bearing.

In case of high speed operation or a small air space, because it is necessary to replenish grease often, a grease inlet should be provided as near the bearing as possible so that the deteriorated grease may be replaced by new grease.

Under normal operating conditions, grease life may be approximated by the graphs shown in Fig. A-13. It is recommended you use this diagram as a guide for replenishment and replacement of grease.

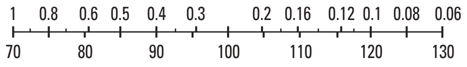


■ Temperature correction

When the bearing operating temperature exceeds 70 °C, t_f', obtained by multiplying t_f by correction coefficient a, found on the scale below, should be applied as the feeding interval.

$$t_f' = t_f \cdot a$$

Temperature correction coefficient a



Bearing operating temperature T °C

Fig. A-13 Grease feeding interval

⚠ WARNING

Mixing grease types can cause the lubricant to become ineffective, hich can result in equipment failure, creating a risk of serious bodily harm.

LUBRICATING OIL

The most commonly used bearing lubricating oil is super refined mineral oil, which has excellent oxidation stability and rust inhibition as well as high film strength. However, as bearings are being used in a variety of applications, a wide variety of synthetic oils are being used. What's more, a variety of additives (such as oxidation inhibitors, rust inhibitors, and anti-foam agents) are being used to improve the specific properties of these synthetic oils. Table A-19 shows the properties of various lubricating oils.

Table A-19. Properties of various lubricating oils

Lubricating oil type	Super refined mineral oil	Major synthetic oils				
		Diester oil	Silicon oil	Polyglycolic oil	Polyphenyl ether oil	Fluorinated oil
Bearing operating temperature range (˚C)	**–40 to +220**	**–55 to +150**	**–70 to +350**	**–30 to +150**	**0 to +330**	**–20 to +300**
Lubricating ability	Excellent	Excellent	Fair	Good	Good	Excellent
Oxidation stability	Good	Good	Fair	Fair	Excellent	Excellent
Radiation resistance	Bad	Bad	Bad to fair	Bad	Excellent	–

LUBRICATING OIL SELECTION

The most important thing to consider when selecting a lubricating oil is to select an oil that has a viscosity that is appropriate for the operating temperature of the bearing.

Use Table A-20 to select the proper kinematic viscosity for your bearing operating conditions. Use this value as a guideline.

If the viscosity of the lubricating oil is too low, an insufficient oil film will form. If the viscosity of the lubricating oil is too high, heat will be generated due to viscous resistance.

Generally, the larger the load or the higher the operating temperature, the higher the viscosity of the used lubricating oil and the higher the rotational speed, the lower the viscosity of the used lubricating oil.

The relationship between the lubricating oil viscosity and temperature is shown in Fig. A-14.

Table A-20. Proper kinematic viscosities by bearing operating conditions

Operating temperature	$d_m n$ value	Proper kinematic viscosity (expressed in the ISO viscosity grade or the SAE No.)			
		Light/normal load		Heavy/impact load	
–30 to 0°C	All rotation speeds	ISO VG 15, 22, 46	(Refrigerating Machine oil)	——	
0 to 60°C	300 000 or lower	ISO VG 46	(Bearing oil Turbine oil)	ISO VG 68 SAE 30	(Bearing oil Turbine oil)
	300 000 to 600 000	ISO VG 32	(Bearing oil Turbine oil)	ISO VG 68	(Bearing oil Turbine oil)
	600 000 or higher	ISO VG 7, 10, 22	(Bearing oil)	——	
60 to 100°C	300 000 or lower	ISO VG 68	(Bearing oil)	ISO VG 68, 100 SAE 30	(Bearing oil)
	300 000 to 600 000	ISO VG 32, 46	(Bearing oil Turbine oil)	ISO VG 68	(Bearing oil Turbine oil)
	600 000 or higher	ISO VG 22, 32, 46	(Bearing oil Turbine oil Machine oil)	——	
100 to 150°C	300 000 or lower	ISO VG 68, 100 SAE 30, 40	(Bearing oil)	ISO VG 100 to 460	(Bearing oil Gear oil)
	300 000 to 600 000	ISO VG 68 SAE 30	(Bearing oil Turbine oil)	ISO VG 68, 100 SAE 30, 40	(Bearing oil)

[Remarks] 1. $d_m n = \frac{D+d}{2} \times n$......... {$D$: nominal outside diameter (mm), d : nominal bore diameter (mm), n : rotational speed (min^{-1})}

2. Please contact with JTEKT if the bearing operating temperature is under –30 °C or over 150 °C.

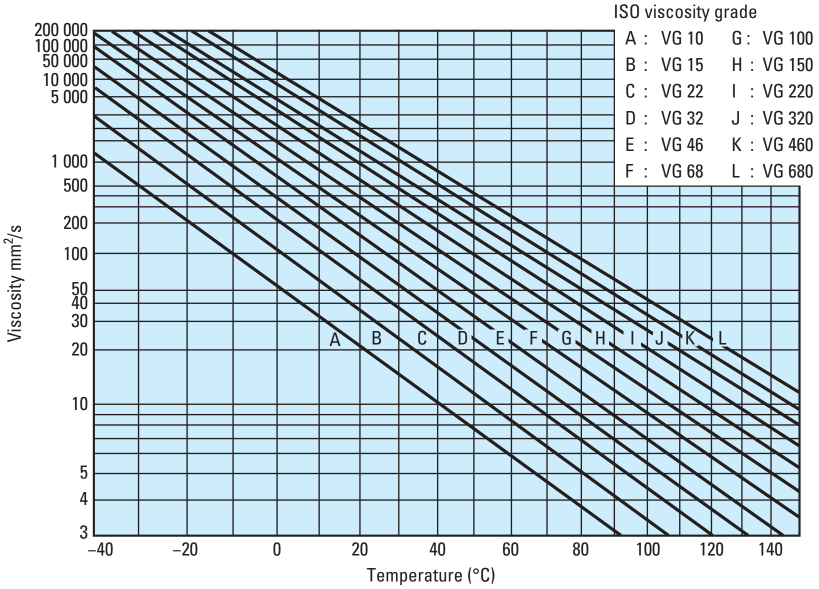


Fig. A-14. Relationship between lubricating oil viscosity and temperature (viscosity index : 100)

CLASSIFICATION

There are several classifications of oils based on viscosity grades. The most familiar are the Society of Automotive Engineers (SAE) classifications for automotive engine and gear oils. The American Society for Testing and Materials (ASTM) and the International Organization for Standardization (ISO) have adopted standard viscosity grades for industrial fluids. Fig. A-15 shows the viscosity comparisons of ISO/ASTM with SAE classification systems at 40°C (104˚F).

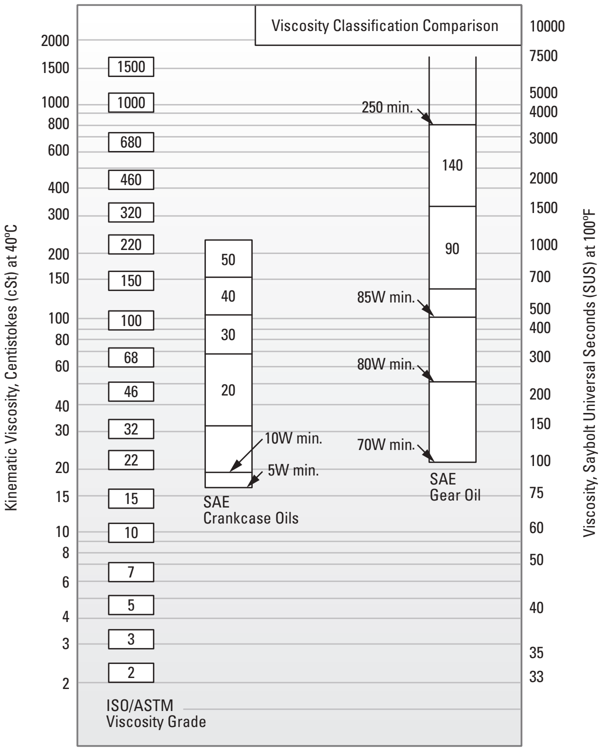


Fig. A-15. Viscosity classification comparison between ISO/ASTM grades (ISO 3448/ASTM D2442) and SAE grades (SAE J 300-80 for crankcase oils, SAE J 306-81 for axle and manual transmission oils)

OIL LUBRICATION METHOD

Oil lubrication is usable even with high speed rotation and at somewhat high temperatures and is effective in reducing bearing vibration and noise. Therefore, oil lubrication is used in many cases where grease lubrication does not work.

The main types and methods of oil lubrication are shown in Table A-21.

Table A-21. Types and methods of oil lubrication

Oil bath	• This is the simplest method. Bearings are soaked in oil before operation. • This method is applicable for low and medium rotational speeds. • Attaching an oil level gauge makes it possible to adjust the oil amount. • For horizontal shafts, approximately half of the rolling element in the lowest position is immersed. For vertical shafts, approximately 70 to 80% of the bearings are immersed. • Using magnetic lids is advantageous as it prevents iron powder generated by friction from being dispersed in the oil.
Oil drip	• An oiler is used to drip the oil, and the rotating parts are operated to fill the inside of the housing with an oil mist, which also has a cooling effect. • This method can be used with up to relatively high speeds and medium-sized loads. • The most common example of this method uses five to six drops of oil per minute. (It is difficult to adjust the amount of oil used to 1 mL/h or less.) • Ensure that oil does not accumulate in the bottom of the housing.
Oil splash	• A simple flinger or gears are attached to the shaft to supply the oil to its destination by means of flinging or splashing operations. This method can be used to supply oil even to bearings that are far away from the oil tank. • This method can be used with up to relatively high speeds. • The oil level must be maintained within a certain range. • Using magnetic lids is advantageous as it prevents iron powder generated by friction from being dispersed in the oil. What's more, to prevent the intrusion of foreign materials into the bearing, it is advisable to use a shield board or baffle.
Forced oil circulation	• This method uses an oil circulation system. After the supplied oil lubricates and cools the inside of the bearing, the oil passes through the oil return pipe to the tank. The oil is filtered and cooled and is then forcibly supplied once more by way of a pump. • This method is used a great deal under high rotational speed and high temperature conditions. • To prevent the lubricating oil from accumulating inside the housing, it is advisable to make the oil return pipe approximately twice as thick as the oil supply pipe.
Oil jet	• In this method, oil is sprayed from nozzles at a constant pressure (approximately 0.1 to 0.5 MPa). This method provides a large cooling effect. • This method is applicable for high rotational speeds and heavy loads. • Generally, the nozzle diameters are between 0.5 and 2 mm, and nozzles are installed in positions between 5 and 10 mm from the sides of the bearings. It is advisable to use between 2 and 4 nozzles for situations in which a large amount of heat is generated. • The oil jet method supplies a large quantity of oil, so it is advisable to use an oil discharge pump to forcibly discharge oil in order to prevent against the stagnation of unnecessary oil.
Oil mist lubrication (fog lubrication)	• In this method, dry mist (air that contains oil in mist form) obtained from an oil mist generator is continuously sent to the location where oil is to be applied to the bearing. The dry mist is then changed to wet mist (oil drops that can easily be affixed to a surface) by the nozzles attached to the housing or bearing, and the oil is then applied to the bearing. • This method forms and retains the minimum necessary oil film for lubrication, which provides benefits such as prevention of oil pollution, simplification of bearing maintenance, extension of bearing fatigue life, and reduction of oil consumption.
Oil and air lubrication	• In this method, a metering piston is used to eject a minuscule amount of oil, a mixing valve is used to mix the oil with compressed air, and the oil and air mixture is then applied to the bearing continuously and stably. • It's possible to perform metering management of the minuscule amount of oil, so new lubricating oil can always be supplied. Therefore, this method is applicable to usages with high rotational speeds such as machine tool main spindles. • The spindle's internal pressure rises because compressed air is supplied together with the lubricating oil. Therefore, this method is also effective at preventing the intrusion of external materials such as debris and cutting fluid. What's more, the lubricating oil flows through the oil supply pipe, so this method results in an extremely small amount of air pollution.

LIMITING SPEEDS

In addition to the bearing load ratings, the tabular pages also list the limiting speed values which are the maximum speeds at which the bearings may operate. These speeds have been calculated for unsealed and sealed bearings of conventional design, tolerances and internal clearances, properly mounted with low applied loads using normal splash, drip feed or other methods of lubrication which will provide adequate cooling of the bearings. A bearing may operate at a speed higher than the listed limiting speed with the use of a clean, good quality oil and after prior consultation with JTEKT's Engineering Department. With high speeds and high acceleration rates, the ratio of P/C should not fall below 0.02 to prevent skidding of the rolling elements.

Also the bearing should not be subjected to uneven stress distribution due to the effects of misalignment between the bearing housings, deformation of the shaft or housing.

Speeds Inadequate for Elastohydrodynamic Lubricating Film

International Standard ISO 281 which covers calculation of dynamic load ratings and rating life states that at exceptionally low rotational speeds (i.e. the product of speed and pitch diameter (D_{pw}) in mm is less than 10000) the generated lubricant film is unlikely to be adequate to separate the rolling element/raceway contacts. At such operating conditions it may be inappropriate to calculate the bearing life although practical improvement in life, may be achieved with the use of lubricants of higher kinematic viscosity or containing EP additives.

BEARING TOLERANCES, INCH AND METRIC

TOLERANCES OF NEEDLE ROLLER BEARINGS

The tolerances given in the following table apply to the rings of needle roller radial bearing types whose rings are precision finished.

TOLERANCE TERMS, SYMBOLS AND DEFINITIONS
Axes, planes etc.

Inner ring axis: Axis of the cylinder inscribed in a basically cylindrical bore. The inner ring axis is also the bearing axis.

Outer ring axis: Axis of the cylinder circumscribed around a basically cylindrical outside surface.

Radial plane: Plane perpendicular to the bearing or ring axis. It is, however, acceptable to consider radial planes referred to in the definitions as being parallel with the plane tangential to the reference face of a ring or the back face of a thrust bearing washer.

Radial direction: Direction through the bearing or ring axis in a radial plane.

Axial plane: Plane containing the bearing or ring axis.

Axial direction: Direction parallel with the bearing or ring axis. It is, however, acceptable to consider axial directions referred to in the definitions as being perpendicular to the plane tangential to the reference face of a ring or the back face of a thrust bearing washer.

Reference face: Face designated by the manufacturer of the bearings and that may be used as the reference face in measurements.

The reference face for measurement is generally taken as the unmarked face. In case of symmetrical rings, when it is not possible to identify the reference face, the tolerances are deemed to comply relative to either face, but not to both.

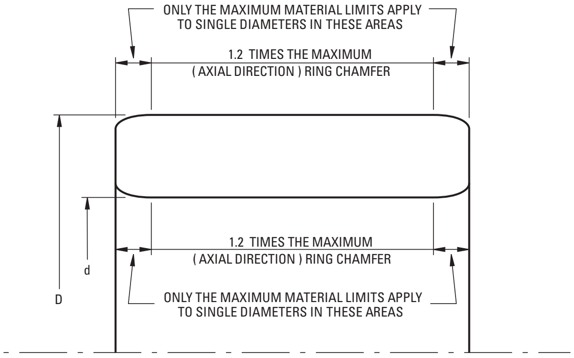
Outer ring flange back face: That side of an outer ring flange that is intended to support axial load.

Middle of raceway: Point or line on a raceway surface halfway between the two edges of the raceway.

Raceway contact diameter: Diameter of the theoretical circle through the nominal points of contact between the rolling elements and the raceway.

NOTE: For roller bearings, the nominal point of contact is generally at the middle of the roller.

Diameter deviation near ring faces: In radial planes, when nearer to the face of a ring than 1.2 times the maximum (axial direction) ring chamfer, only the maximum material limits apply.



ABMA / ISO Symbols - Inner Ring

Δd_{mp}	Single plane mean bore diameter deviation from basic bore diameter, e.g., bore tolerance for a basically tapered bore, Δd_{mp} refers only to the theoretical small bore end of the bore.
V_{dsp}	Difference between the largest and the smallest of the single bore diameters in a single radial plane.
V_{dmp}	Difference between the largest and smallest of the mean bore diameters in a single radial plane of an individual ring.

ABMA / ISO Symbols - Outer Ring

ΔD_{mp}	Single plane mean outside diameter deviation from basic outside diameter, e.g., O.D. tolerance.
V_{Dsp}	Difference between the largest and smallest of the single outside diameters in a single radial plane.

The following tables provide standard ISO tolerance information. They are provided for general use and are referenced throughout this catalog.

ISO Tolerances for Holes – Metric															
Diameters **mm**		Deviations **mm**								Deviations **mm**					
		B10		B11		B12		B13		C9		C10		C11	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.188**	**0.140**	**0.215**	**0.140**	**0.260**	**0.140**	**0.320**	**0.140**	**0.100**	**0.070**	**0.118**	**0.070**	**0.145**	**0.070**
6	**10**	**0.208**	**0.150**	**0.240**	**0.150**	**0.300**	**0.150**	**0.370**	**0.150**	**0.116**	**0.080**	**0.138**	**0.080**	**0.170**	**0.080**
10	**18**	**0.220**	**0.150**	**0.260**	**0.150**	**0.330**	**0.150**	**0.420**	**0.150**	**0.138**	**0.095**	**0.165**	**0.095**	**0.205**	**0.095**
18	**30**	**0.244**	**0.160**	**0.290**	**0.160**	**0.370**	**0.160**	**0.490**	**0.160**	**0.162**	**0.110**	**0.194**	**0.110**	**0.240**	**0.110**
30	**40**	**0.270**	**0.170**	**0.330**	**0.170**	**0.420**	**0.170**	**0.560**	**0.170**	**0.182**	**0.120**	**0.220**	**0.120**	**0.280**	**0.120**
40	**50**	**0.280**	**0.180**	**0.340**	**0.180**	**0.430**	**0.180**	**0.570**	**0.180**	**0.192**	**0.130**	**0.230**	**0.130**	**0.290**	**0.130**
50	**65**	**0.310**	**0.190**	**0.380**	**0.190**	**0.490**	**0.190**	**0.650**	**0.190**	**0.214**	**0.140**	**0.260**	**0.140**	**0.330**	**0.140**
65	**80**	**0.320**	**0.200**	**0.390**	**0.200**	**0.500**	**0.200**	**0.660**	**0.200**	**0.224**	**0.150**	**0.270**	**0.150**	**0.340**	**0.150**
80	**100**	**0.360**	**0.220**	**0.440**	**0.220**	**0.570**	**0.220**	**0.760**	**0.220**	**0.257**	**0.170**	**0.310**	**0.170**	**0.390**	**0.170**
100	**120**	**0.380**	**0.240**	**0.460**	**0.240**	**0.590**	**0.240**	**0.780**	**0.240**	**0.267**	**0.180**	**0.320**	**0.180**	**0.400**	**0.180**
120	**140**	**0.420**	**0.260**	**0.510**	**0.260**	**0.660**	**0.260**	**0.890**	**0.260**	**0.300**	**0.200**	**0.360**	**0.200**	**0.450**	**0.200**
140	**160**	**0.440**	**0.280**	**0.530**	**0.280**	**0.680**	**0.280**	**0.910**	**0.280**	**0.310**	**0.210**	**0.370**	**0.210**	**0.460**	**0.210**
160	**180**	**0.470**	**0.310**	**0.560**	**0.310**	**0.710**	**0.310**	**0.940**	**0.310**	**0.330**	**0.230**	**0.390**	**0.230**	**0.480**	**0.230**
180	**200**	**0.525**	**0.340**	**0.630**	**0.340**	**0.800**	**0.340**	**1.060**	**0.340**	**0.355**	**0.240**	**0.425**	**0.240**	**0.530**	**0.240**
200	**225**	**0.565**	**0.380**	**0.670**	**0.380**	**0.840**	**0.380**	**1.100**	**0.380**	**0.375**	**0.260**	**0.445**	**0.260**	**0.550**	**0.260**
225	**250**	**0.605**	**0.420**	**0.710**	**0.420**	**0.880**	**0.420**	**1.140**	**0.420**	**0.395**	**0.280**	**0.465**	**0.280**	**0.570**	**0.280**
250	**280**	**0.690**	**0.480**	**0.800**	**0.480**	**1.000**	**0.480**	**1.290**	**0.480**	**0.430**	**0.300**	**0.510**	**0.300**	**0.620**	**0.300**
280	**315**	**0.750**	**0.540**	**0.860**	**0.540**	**1.060**	**0.540**	**1.350**	**0.540**	**0.460**	**0.330**	**0.540**	**0.330**	**0.650**	**0.330**
315	**355**	**0.830**	**0.600**	**0.960**	**0.600**	**1.170**	**0.600**	**1.490**	**0.600**	**0.500**	**0.360**	**0.590**	**0.360**	**0.720**	**0.360**
355	**400**	**0.910**	**0.680**	**1.040**	**0.680**	**1.250**	**0.680**	**1.570**	**0.680**	**0.540**	**0.400**	**0.630**	**0.400**	**0.760**	**0.400**
400	**450**	**1.010**	**0.760**	**1.160**	**0.760**	**1.390**	**0.760**	**1.730**	**0.760**	**0.595**	**0.440**	**0.690**	**0.440**	**0.840**	**0.440**
450	**500**	**1.090**	**0.840**	**1.240**	**0.840**	**1.470**	**0.840**	**1.810**	**0.840**	**0.635**	**0.480**	**0.730**	**0.480**	**0.880**	**0.480**

Diameters **mm**		Deviations **mm**									
		E9		E10		E11		E12		E13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.050**	**0.020**	**0.068**	**0.020**	**0.095**	**0.020**	**0.140**	**0.020**	**0.200**	**0.020**
6	**10**	**0.061**	**0.025**	**0.083**	**0.025**	**0.115**	**0.025**	**0.175**	**0.025**	**0.245**	**0.025**
10	**18**	**0.075**	**0.032**	**0.102**	**0.032**	**0.142**	**0.032**	**0.212**	**0.032**	**0.302**	**0.032**
18	**30**	**0.092**	**0.040**	**0.124**	**0.040**	**0.170**	**0.040**	**0.250**	**0.040**	**0.370**	**0.040**
30	**50**	**0.112**	**0.050**	**0.150**	**0.050**	**0.210**	**0.050**	**0.300**	**0.050**	**0.440**	**0.050**
50	**80**	**0.134**	**0.060**	**0.180**	**0.060**	**0.250**	**0.060**	**0.360**	**0.060**	**0.520**	**0.060**
80	**120**	**0.159**	**0.072**	**0.212**	**0.072**	**0.292**	**0.072**	**0.422**	**0.072**	**0.612**	**0.072**
120	**180**	**0.185**	**0.085**	**0.245**	**0.085**	**0.335**	**0.085**	**0.485**	**0.085**	**0.715**	**0.085**
180	**250**	**0.215**	**0.100**	**0.285**	**0.100**	**0.390**	**0.100**	**0.560**	**0.100**	**0.820**	**0.100**
250	**315**	**0.240**	**0.110**	**0.320**	**0.110**	**0.430**	**0.110**	**0.630**	**0.110**	**0.920**	**0.110**
315	**400**	**0.265**	**0.125**	**0.355**	**0.125**	**0.485**	**0.125**	**0.695**	**0.125**	**1.015**	**0.125**
400	**500**	**0.290**	**0.135**	**0.385**	**0.135**	**0.535**	**0.135**	**0.765**	**0.135**	**1.105**	**0.135**

Diameters **mm**		Deviations **mm**							
		F5		F6		F7		F8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.015**	**0.010**	**0.018**	**0.010**	**0.022**	**0.010**	**0.028**	**0.010**
6	**10**	**0.019**	**0.013**	**0.022**	**0.013**	**0.028**	**0.013**	**0.035**	**0.013**
10	**18**	**0.024**	**0.016**	**0.027**	**0.016**	**0.034**	**0.016**	**0.043**	**0.016**
18	**30**	**0.029**	**0.020**	**0.033**	**0.020**	**0.041**	**0.020**	**0.053**	**0.020**
30	**50**	**0.036**	**0.025**	**0.041**	**0.025**	**0.050**	**0.025**	**0.064**	**0.025**
50	**80**	**0.043**	**0.030**	**0.049**	**0.030**	**0.060**	**0.030**	**0.076**	**0.030**
80	**120**	**0.051**	**0.036**	**0.058**	**0.036**	**0.071**	**0.036**	**0.090**	**0.036**
120	**180**	**0.061**	**0.043**	**0.068**	**0.043**	**0.083**	**0.043**	**0.106**	**0.043**
180	**250**	**0.070**	**0.050**	**0.079**	**0.050**	**0.096**	**0.050**	**0.122**	**0.050**
250	**315**	**0.079**	**0.056**	**0.088**	**0.056**	**0.108**	**0.056**	**0.137**	**0.056**
315	**400**	**0.087**	**0.062**	**0.098**	**0.062**	**0.119**	**0.062**	**0.151**	**0.062**
400	**500**	**0.095**	**0.068**	**0.108**	**0.068**	**0.131**	**0.068**	**0.165**	**0.068**

ISO Tolerances for Holes – Metric

Diameter **mm**		Deviations **mm**					
		G5		G6		G7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.009**	**0.004**	**0.012**	**0.004**	**0.016**	**0.004**
6	**10**	**0.011**	**0.005**	**0.014**	**0.005**	**0.020**	**0.005**
10	**18**	**0.014**	**0.006**	**0.017**	**0.006**	**0.024**	**0.006**
18	**30**	**0.016**	**0.007**	**0.020**	**0.007**	**0.028**	**0.007**
30	**50**	**0.020**	**0.009**	**0.025**	**0.009**	**0.034**	**0.009**
50	**80**	**0.023**	**0.010**	**0.029**	**0.010**	**0.040**	**0.010**
80	**120**	**0.027**	**0.012**	**0.034**	**0.012**	**0.047**	**0.012**
120	**180**	**0.032**	**0.014**	**0.039**	**0.014**	**0.054**	**0.014**
180	**250**	**0.035**	**0.015**	**0.044**	**0.015**	**0.061**	**0.015**
250	**315**	**0.040**	**0.017**	**0.049**	**0.017**	**0.069**	**0.017**
315	**400**	**0.043**	**0.018**	**0.054**	**0.018**	**0.075**	**0.018**
400	**500**	**0.047**	**0.020**	**0.060**	**0.020**	**0.083**	**0.020**

Diameters **mm**		Deviations **mm**									
		H4		H5		H6		H7		H8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.004**	**0.000**	**0.005**	**0.000**	**0.008**	**0.000**	**0.012**	**0.000**	**0.018**	**0.000**
6	**10**	**0.004**	**0.000**	**0.006**	**0.000**	**0.009**	**0.000**	**0.015**	**0.000**	**0.022**	**0.000**
10	**18**	**0.005**	**0.000**	**0.008**	**0.000**	**0.011**	**0.000**	**0.018**	**0.000**	**0.027**	**0.000**
18	**30**	**0.006**	**0.000**	**0.009**	**0.000**	**0.013**	**0.000**	**0.021**	**0.000**	**0.033**	**0.000**
30	**50**	**0.007**	**0.000**	**0.011**	**0.000**	**0.016**	**0.000**	**0.025**	**0.000**	**0.039**	**0.000**
50	**80**	**0.008**	**0.000**	**0.013**	**0.000**	**0.019**	**0.000**	**0.030**	**0.000**	**0.046**	**0.000**
80	**120**	**0.010**	**0.000**	**0.015**	**0.000**	**0.022**	**0.000**	**0.035**	**0.000**	**0.054**	**0.000**
120	**180**	**0.012**	**0.000**	**0.018**	**0.000**	**0.025**	**0.000**	**0.040**	**0.000**	**0.063**	**0.000**
180	**250**	**0.014**	**0.000**	**0.020**	**0.000**	**0.029**	**0.000**	**0.046**	**0.000**	**0.072**	**0.000**
250	**315**	**0.016**	**0.000**	**0.023**	**0.000**	**0.032**	**0.000**	**0.052**	**0.000**	**0.081**	**0.000**
315	**400**	**0.018**	**0.000**	**0.025**	**0.000**	**0.036**	**0.000**	**0.057**	**0.000**	**0.089**	**0.000**
400	**500**	**0.020**	**0.000**	**0.027**	**0.000**	**0.040**	**0.000**	**0.063**	**0.000**	**0.097**	**0.000**

Diameters **mm**		Deviations **mm**							
		H9		H10		H11		H12	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.030**	**0.000**	**0.048**	**0.000**	**0.075**	**0.000**	**0.120**	**0.000**
6	**10**	**0.036**	**0.000**	**0.058**	**0.000**	**0.090**	**0.000**	**0.150**	**0.000**
10	**18**	**0.043**	**0.000**	**0.070**	**0.000**	**0.110**	**0.000**	**0.180**	**0.000**
18	**30**	**0.052**	**0.000**	**0.084**	**0.000**	**0.130**	**0.000**	**0.210**	**0.000**
30	**50**	**0.062**	**0.000**	**0.100**	**0.000**	**0.160**	**0.000**	**0.250**	**0.000**
50	**80**	**0.074**	**0.000**	**0.120**	**0.000**	**0.190**	**0.000**	**0.300**	**0.000**
80	**120**	**0.087**	**0.000**	**0.140**	**0.000**	**0.220**	**0.000**	**0.350**	**0.000**
120	**180**	**0.100**	**0.000**	**0.160**	**0.000**	**0.250**	**0.000**	**0.400**	**0.000**
180	**250**	**0.115**	**0.000**	**0.185**	**0.000**	**0.290**	**0.000**	**0.460**	**0.000**
250	**315**	**0.130**	**0.000**	**0.210**	**0.000**	**0.320**	**0.000**	**0.520**	**0.000**
315	**400**	**0.140**	**0.000**	**0.230**	**0.000**	**0.360**	**0.000**	**0.570**	**0.000**
400	**500**	**0.155**	**0.000**	**0.250**	**0.000**	**0.400**	**0.000**	**0.630**	**0.000**

ISO Tolerances for Holes – Metric

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		J6		J7		J8		K6		K7		K8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**0.005**	**-0.003**	**0.006**	**-0.006**	**0.010**	**-0.008**	**0.002**	**-0.006**	**0.003**	**-0.009**	**0.005**	**-0.013**
6	**10**	**0.005**	**-0.004**	**0.008**	**-0.007**	**0.012**	**-0.010**	**0.002**	**-0.007**	**0.005**	**-0.010**	**0.006**	**-0.016**
10	**18**	**0.006**	**-0.005**	**0.010**	**-0.008**	**0.015**	**-0.012**	**0.002**	**-0.009**	**0.006**	**-0.012**	**0.008**	**-0.019**
18	**30**	**0.008**	**-0.005**	**0.012**	**-0.009**	**0.020**	**-0.013**	**0.002**	**-0.011**	**0.006**	**-0.015**	**0.010**	**-0.023**
30	**50**	**0.010**	**-0.006**	**0.014**	**-0.011**	**0.024**	**-0.015**	**0.003**	**-0.013**	**0.007**	**-0.018**	**0.012**	**-0.027**
50	**80**	**0.013**	**-0.006**	**0.018**	**-0.012**	**0.028**	**-0.018**	**0.004**	**-0.015**	**0.009**	**-0.021**	**0.014**	**-0.032**
80	**120**	**0.016**	**-0.006**	**0.022**	**-0.013**	**0.034**	**-0.020**	**0.004**	**-0.018**	**0.010**	**-0.025**	**0.016**	**-0.038**
120	**180**	**0.018**	**-0.007**	**0.026**	**-0.014**	**0.041**	**-0.022**	**0.004**	**-0.021**	**0.012**	**-0.028**	**0.020**	**-0.043**
180	**250**	**0.022**	**-0.007**	**0.030**	**-0.016**	**0.047**	**-0.025**	**0.005**	**-0.024**	**0.013**	**-0.033**	**0.022**	**-0.050**
250	**315**	**0.025**	**-0.007**	**0.036**	**-0.016**	**0.055**	**-0.026**	**0.005**	**-0.027**	**0.016**	**-0.036**	**0.025**	**-0.056**
315	**400**	**0.029**	**-0.007**	**0.039**	**-0.018**	**0.060**	**-0.029**	**0.007**	**-0.029**	**0.017**	**-0.040**	**0.028**	**-0.061**
400	**500**	**0.033**	**-0.007**	**0.043**	**-0.020**	**0.066**	**-0.031**	**0.008**	**-0.032**	**0.018**	**-0.045**	**0.029**	**-0.068**

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		M5		M6		M7		N6		N7		N8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**-0.003**	**-0.008**	**-0.001**	**-0.009**	**0.000**	**-0.012**	**-0.005**	**-0.013**	**-0.004**	**-0.016**	**-0.002**	**-0.020**
6	**10**	**-0.004**	**-0.010**	**-0.003**	**-0.012**	**0.000**	**-0.015**	**-0.007**	**-0.016**	**-0.004**	**-0.019**	**-0.003**	**-0.025**
10	**18**	**-0.004**	**-0.012**	**-0.004**	**-0.015**	**0.000**	**-0.018**	**-0.009**	**-0.020**	**-0.005**	**-0.023**	**-0.003**	**-0.030**
18	**30**	**-0.005**	**-0.014**	**-0.004**	**-0.017**	**0.000**	**-0.021**	**-0.011**	**-0.024**	**-0.007**	**-0.028**	**-0.003**	**-0.036**
30	**50**	**-0.005**	**-0.016**	**-0.004**	**-0.020**	**0.000**	**-0.025**	**-0.012**	**-0.028**	**-0.008**	**-0.033**	**-0.003**	**-0.042**
50	**80**	**-0.006**	**-0.019**	**-0.005**	**-0.024**	**0.000**	**-0.030**	**-0.014**	**-0.033**	**-0.009**	**-0.039**	**-0.004**	**-0.050**
80	**120**	**-0.008**	**-0.023**	**-0.006**	**-0.028**	**0.000**	**-0.035**	**-0.016**	**-0.038**	**-0.010**	**-0.045**	**-0.004**	**-0.058**
120	**180**	**-0.009**	**-0.027**	**-0.008**	**-0.033**	**0.000**	**-0.040**	**-0.020**	**-0.045**	**-0.012**	**-0.052**	**-0.004**	**-0.067**
180	**250**	**-0.011**	**-0.031**	**-0.008**	**-0.037**	**0.000**	**-0.046**	**-0.022**	**-0.051**	**-0.014**	**-0.060**	**-0.005**	**-0.077**
250	**315**	**-0.013**	**-0.036**	**-0.009**	**-0.041**	**0.000**	**-0.052**	**-0.025**	**-0.057**	**-0.014**	**-0.066**	**-0.005**	**-0.086**
315	**400**	**-0.014**	**-0.039**	**-0.010**	**-0.046**	**0.000**	**-0.057**	**-0.026**	**-0.062**	**-0.016**	**-0.073**	**-0.005**	**-0.094**
400	**500**	**-0.016**	**-0.043**	**-0.010**	**-0.050**	**0.000**	**-0.063**	**-0.027**	**-0.067**	**-0.017**	**-0.080**	**-0.006**	**-0.103**

Diameters **mm**		Deviations **mm**				Deviations **mm**					
		P6		P7		R6		R7		R8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	**6**	**-0.009**	**-0.017**	**-0.008**	**-0.020**	**-0.012**	**-0.020**	**-0.011**	**-0.023**	**-0.015**	**-0.033**
6	**10**	**-0.012**	**-0.021**	**-0.009**	**-0.024**	**-0.016**	**-0.025**	**-0.013**	**-0.028**	**-0.019**	**-0.041**
10	**18**	**-0.015**	**-0.026**	**-0.011**	**-0.029**	**-0.020**	**-0.031**	**-0.016**	**-0.034**	**-0.023**	**-0.050**
18	**30**	**-0.018**	**-0.031**	**-0.014**	**-0.035**	**-0.024**	**-0.037**	**-0.020**	**-0.041**	**-0.028**	**-0.061**
30	**50**	**-0.021**	**-0.037**	**-0.017**	**-0.042**	**-0.029**	**-0.045**	**-0.025**	**-0.050**	**-0.034**	**-0.073**
50	**65**	**-0.026**	**-0.045**	**-0.021**	**-0.051**	**-0.035**	**-0.054**	**-0.030**	**-0.060**	**-0.041**	**-0.087**
65	**80**	**-0.026**	**-0.045**	**-0.021**	**-0.051**	**-0.037**	**-0.056**	**-0.032**	**-0.062**	**-0.043**	**-0.089**
80	**100**	**-0.030**	**-0.052**	**-0.024**	**-0.059**	**-0.044**	**-0.066**	**-0.038**	**-0.073**	**-0.051**	**-0.105**
100	**120**	**-0.030**	**-0.052**	**-0.024**	**-0.059**	**-0.047**	**-0.069**	**-0.041**	**-0.076**	**-0.054**	**-0.108**
120	**140**	**-0.037**	**-0.061**	**-0.028**	**-0.068**	**-0.056**	**-0.081**	**-0.048**	**-0.088**	**-0.063**	**-0.126**
140	**160**	**-0.036**	**-0.061**	**-0.028**	**-0.068**	**-0.058**	**-0.083**	**-0.050**	**-0.090**	**-0.065**	**-0.128**
160	**180**	**-0.036**	**-0.061**	**-0.028**	**-0.068**	**-0.061**	**-0.086**	**-0.053**	**-0.093**	**-0.068**	**-0.131**
180	**200**	**-0.041**	**-0.070**	**-0.033**	**-0.079**	**-0.068**	**-0.097**	**-0.060**	**-0.106**	**-0.077**	**-0.149**
200	**225**	**-0.041**	**-0.070**	**-0.033**	**-0.079**	**-0.071**	**-0.100**	**-0.063**	**-0.109**	**-0.080**	**-0.152**
225	**250**	**-0.041**	**-0.070**	**-0.033**	**-0.079**	**-0.075**	**-0.104**	**-0.067**	**-0.113**	**-0.084**	**-0.156**
250	**280**	**-0.047**	**-0.079**	**-0.036**	**-0.088**	**-0.085**	**-0.117**	**-0.074**	**-0.126**	**-0.094**	**-0.175**
280	**315**	**-0.047**	**-0.079**	**-0.036**	**-0.088**	**-0.089**	**-0.121**	**-0.078**	**-0.130**	**-0.098**	**-0.179**
315	**355**	**-0.051**	**-0.087**	**-0.041**	**-0.098**	**-0.097**	**-0.133**	**-0.087**	**-0.144**	**-0.108**	**-0.197**
355	**400**	**-0.051**	**-0.087**	**-0.041**	**-0.098**	**-0.103**	**-0.139**	**-0.093**	**-0.150**	**-0.114**	**-0.203**
400	**450**	**-0.055**	**-0.095**	**-0.045**	**-0.108**	**-0.113**	**-0.153**	**-0.103**	**-0.166**	**-0.126**	**-0.223**
450	**500**	**-0.055**	**-0.095**	**-0.045**	**-0.108**	**-0.119**	**-0.159**	**-0.109**	**-0.172**	**-0.132**	**-0.229**

ISO Tolerances for Shafts – Metric

Diameters **mm**		Deviations **mm**							
		a10		a11		a12		a13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	-0.270	-0.310	-0.270	-0.330	-0.270	-0.370	-0.270	-0.410
3	6	-0.270	-0.318	-0.270	-0.345	-0.270	-0.390	-0.270	-0.450
6	10	-0.280	-0.338	-0.280	-0.370	-0.280	-0.430	-0.280	-0.500
10	18	-0.290	-0.360	-0.290	-0.400	-0.290	-0.470	-0.290	-0.560
18	30	-0.300	-0.384	-0.300	-0.430	-0.300	-0.510	-0.300	-0.630
30	40	-0.310	-0.410	-0.310	-0.470	-0.310	-0.560	-0.310	-0.700
40	50	-0.320	-0.420	-0.320	-0.480	-0.320	-0.570	-0.320	-0.710
50	65	-0.340	-0.460	-0.340	-0.530	-0.340	-0.640	-0.340	-0.800
65	80	-0.360	-0.480	-0.360	-0.550	-0.360	-0.660	-0.360	-0.820
80	100	-0.380	-0.520	-0.380	-0.600	-0.380	-0.730	-0.380	-0.920
100	120	-0.410	-0.550	-0.410	-0.630	-0.410	-0.760	-0.410	-0.950
120	140	-0.460	-0.620	-0.460	-0.710	-0.460	-0.860	-0.460	-1.090
140	160	-0.520	-0.680	-0.520	-0.770	-0.520	-0.920	-0.520	-1.150
160	180	-0.580	-0.740	-0.580	-0.830	-0.580	-0.980	-0.580	-1.210
180	200	-0.660	-0.845	-0.660	-0.950	-0.660	-1.120	-0.660	-1.380
200	225	-0.740	-0.925	-0.740	-1.030	-0.740	-1.200	-0.740	-1.460
225	250	-0.820	-1.005	-0.820	-1.110	-0.820	-1.280	-0.820	-1.540
250	280	-0.920	-1.130	-0.920	-1.240	-0.920	-1.440	-0.920	-1.730
280	315	-1.050	-1.260	-1.050	-1.370	-1.050	-1.570	-1.050	-1.860
315	355	-1.200	-1.430	-1.200	-1.560	-1.200	-1.770	-1.200	-2.090
355	400	-1.350	-1.580	-1.350	-1.710	-1.350	-1.920	-1.350	-2.240

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		c11		c12		c13		e11		e12		e13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	-0.060	-0.120	-0.060	-0.160	-0.060	-0.200	-0.014	-0.074	-0.014	-0.114	-0.014	-0.154
3	6	-0.070	-0.145	-0.070	-0.190	-0.070	-0.250	-0.020	-0.095	-0.020	-0.140	-0.020	-0.200
6	10	-0.080	-0.170	-0.080	-0.230	-0.080	-0.300	-0.025	-0.115	-0.025	-0.175	-0.025	-0.245
10	18	-0.095	-0.205	-0.095	-0.275	-0.095	-0.365	-0.032	-0.142	-0.032	-0.212	-0.032	-0.302
18	30	-0.110	-0.240	-0.110	-0.320	-0.110	-0.440	-0.040	-0.170	-0.040	-0.250	-0.040	-0.370
30	40	-0.120	-0.280	-0.120	-0.370	-0.120	-0.510	-0.050	-0.210	-0.050	-0.300	-0.050	-0.440
40	50	-0.130	-0.290	-0.130	-0.380	-0.130	-0.520	-0.050	-0.210	-0.050	-0.300	-0.050	-0.440
50	65	-0.140	-0.330	-0.140	-0.440	-0.140	-0.600	-0.060	-0.250	-0.060	-0.360	-0.060	-0.520
65	80	-0.150	-0.340	-0.150	-0.450	-0.150	-0.610	-0.060	-0.250	-0.060	-0.360	-0.060	-0.520
80	100	-0.170	-0.390	-0.170	-0.520	-0.170	-0.710	-0.072	-0.292	-0.072	-0.422	-0.072	-0.612
100	120	-0.180	-0.400	-0.180	-0.530	-0.180	-0.720	-0.072	-0.292	-0.072	-0.422	-0.072	-0.612
120	140	-0.200	-0.450	-0.200	-0.600	-0.200	-0.830	-0.085	-0.335	-0.085	-0.485	-0.085	-0.715
140	160	-0.210	-0.460	-0.210	-0.610	-0.210	-0.840	-0.085	-0.335	-0.085	-0.485	-0.085	-0.715
160	180	-0.230	-0.480	-0.230	-0.630	-0.230	-0.860	-0.085	-0.335	-0.085	-0.485	-0.085	-0.715
180	200	-0.240	-0.530	-0.240	-0.700	-0.240	-0.960	-0.100	-0.390	-0.100	-0.560	-0.100	-0.820
200	225	-0.260	-0.550	-0.260	-0.720	-0.260	-0.980	-0.100	-0.390	-0.100	-0.560	-0.100	-0.820
225	250	-0.280	-0.570	-0.280	-0.740	-0.280	-1.000	-0.100	-0.390	-0.100	-0.560	-0.100	-0.820
250	280	-0.300	-0.620	-0.300	-0.820	-0.300	-1.110	-0.110	-0.430	-0.110	-0.630	-0.110	-0.920
280	315	-0.330	-0.650	-0.330	-0.850	-0.330	-1.140	-0.110	-0.430	-0.110	-0.630	-0.110	-0.920
315	355	-0.360	-0.720	-0.360	-0.930	-0.360	-1.250	-0.125	-0.485	-0.125	-0.695	-0.125	-1.015
355	400	-0.400	-0.760	-0.400	-0.970	-0.400	-1.290	-0.125	-0.485	-0.125	-0.695	-0.125	-1.015

ISO Tolerances for Shafts – Metric

Diameters **mm**		Deviations **mm**						Deviations **mm**					
		f5		f6		f7		g5		g6		g7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	-0.006	-0.010	-0.006	-0.012	-0.006	-0.016	-0.002	-0.006	-0.002	-0.008	-0.002	-0.012
3	6	-0.010	-0.015	-0.010	-0.018	-0.010	-0.022	-0.004	-0.009	-0.004	-0.012	-0.004	-0.016
6	10	-0.013	-0.019	-0.013	-0.022	-0.013	-0.028	-0.005	-0.011	-0.005	-0.014	-0.005	-0.020
10	18	-0.016	-0.024	-0.016	-0.027	-0.016	-0.034	-0.006	-0.014	-0.006	-0.017	-0.006	-0.024
18	30	-0.020	-0.029	-0.020	-0.033	-0.020	-0.041	-0.007	-0.016	-0.007	-0.020	-0.007	-0.028
30	50	-0.025	-0.036	-0.025	-0.041	-0.025	-0.050	-0.009	-0.020	-0.009	-0.025	-0.009	-0.034
50	80	-0.030	-0.043	-0.030	-0.049	-0.030	-0.060	-0.010	-0.023	-0.010	-0.029	-0.010	-0.040
80	120	-0.036	-0.051	-0.036	-0.058	-0.036	-0.071	-0.012	-0.027	-0.012	-0.034	-0.012	-0.047
120	180	-0.043	-0.061	-0.043	-0.068	-0.043	-0.083	-0.014	-0.032	-0.014	-0.039	-0.014	-0.054
180	250	-0.050	-0.070	-0.050	-0.079	-0.050	-0.096	-0.015	-0.035	-0.015	-0.044	-0.015	-0.061
250	315	-0.056	-0.079	-0.056	-0.088	-0.056	-0.108	-0.017	-0.040	-0.017	-0.049	-0.017	-0.069
315	400	-0.062	-0.087	-0.062	-0.098	-0.062	-0.119	-0.018	-0.043	-0.018	-0.054	-0.018	-0.075

Diameters **mm**		Deviations **mm**									
		h4		h5		h6		h7		h8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	0.000	-0.003	0.000	-0.004	0.000	-0.006	0.000	-0.010	0.000	-0.014
3	6	0.000	-0.004	0.000	-0.005	0.000	-0.008	0.000	-0.012	0.000	-0.018
6	10	0.000	-0.004	0.000	-0.006	0.000	-0.009	0.000	-0.015	0.000	-0.022
10	18	0.000	-0.005	0.000	-0.008	0.000	-0.011	0.000	-0.018	0.000	-0.027
18	30	0.000	-0.006	0.000	-0.009	0.000	-0.013	0.000	-0.021	0.000	-0.033
30	50	0.000	-0.007	0.000	-0.011	0.000	-0.016	0.000	-0.025	0.000	-0.039
50	80	0.000	-0.008	0.000	-0.013	0.000	-0.019	0.000	-0.030	0.000	-0.046
80	120	0.000	-0.010	0.000	-0.015	0.000	-0.022	0.000	-0.035	0.000	-0.054
120	180	0.000	-0.012	0.000	-0.018	0.000	-0.025	0.000	-0.040	0.000	-0.063
180	250	0.000	-0.014	0.000	-0.020	0.000	-0.029	0.000	-0.046	0.000	-0.072
250	315	0.000	-0.016	0.000	-0.023	0.000	-0.032	0.000	-0.052	0.000	-0.081
315	400	0.000	-0.018	0.000	-0.025	0.000	-0.036	0.000	-0.057	0.000	-0.089

Diameters **mm**		Deviations **mm**									
		h9		h10		h11		h12		h13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	0.000	-0.025	0.000	-0.040	0.000	-0.060	0.000	-0.100	0.000	-0.140
3	6	0.000	-0.030	0.000	-0.048	0.000	-0.075	0.000	-0.120	0.000	-0.180
6	10	0.000	-0.036	0.000	-0.058	0.000	-0.090	0.000	-0.150	0.000	-0.220
10	18	0.000	-0.043	0.000	-0.070	0.000	-0.110	0.000	-0.180	0.000	-0.270
18	30	0.000	-0.052	0.000	-0.084	0.000	-0.130	0.000	-0.210	0.000	-0.330
30	50	0.000	-0.062	0.000	-0.100	0.000	-0.160	0.000	-0.250	0.000	-0.390
50	80	0.000	-0.074	0.000	-0.120	0.000	-0.190	0.000	-0.300	0.000	-0.460
80	120	0.000	-0.087	0.000	-0.140	0.000	-0.220	0.000	-0.350	0.000	-0.540
120	180	0.000	-0.100	0.000	-0.160	0.000	-0.250	0.000	-0.400	0.000	-0.630
180	250	0.000	-0.115	0.000	-0.185	0.000	-0.290	0.000	-0.460	0.000	-0.720
250	315	0.000	-0.130	0.000	-0.210	0.000	-0.320	0.000	-0.520	0.000	-0.810
315	400	0.000	-0.140	0.000	-0.230	0.000	-0.360	0.000	-0.570	0.000	-0.890

ISO Tolerances for Shafts – Metric

Diameter **mm**		Deviations **mm**						Deviations **mm**					
		j5		j6		j7		k5		k6		k7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	0.002	-0.002	0.004	-0.002	0.006	-0.004	0.004	0.000	0.006	0.000	0.010	0.000
3	6	0.003	-0.002	0.006	-0.002	0.008	-0.004	0.006	0.001	0.009	0.001	0.013	0.001
6	10	0.004	-0.002	0.007	-0.002	0.010	-0.005	0.007	0.001	0.010	0.001	0.016	0.001
10	18	0.005	-0.003	0.008	-0.003	0.012	-0.006	0.009	0.001	0.012	0.001	0.019	0.001
18	30	0.005	-0.004	0.009	-0.004	0.013	-0.008	0.011	0.002	0.015	0.002	0.023	0.002
30	50	0.006	-0.005	0.011	-0.005	0.015	-0.010	0.013	0.002	0.018	0.002	0.027	0.002
50	80	0.006	-0.007	0.012	-0.007	0.018	-0.012	0.015	0.002	0.021	0.002	0.032	0.002
80	120	0.006	-0.009	0.013	-0.009	0.020	-0.015	0.018	0.003	0.025	0.003	0.038	0.003
120	180	0.007	-0.011	0.014	-0.011	0.022	-0.018	0.021	0.003	0.028	0.003	0.043	0.003
180	250	0.007	-0.013	0.016	-0.013	0.025	-0.021	0.024	0.004	0.033	0.004	0.050	0.004
250	315	0.007	-0.016	0.016	-0.016	0.026	-0.026	0.027	0.004	0.036	0.004	0.056	0.004
315	400	0.007	-0.018	0.018	-0.018	0.029	-0.028	0.029	0.004	0.040	0.004	0.061	0.004

Diameter **mm**		Deviations **mm**						Deviations **mm**					
		m5		m6		m7		n5		n6		n7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	3	0.006	0.002	0.008	0.002	0.012	0.002	0.008	0.004	0.010	0.004	0.014	0.004
3	6	0.009	0.004	0.012	0.004	0.016	0.004	0.013	0.008	0.016	0.008	0.020	0.008
6	10	0.012	0.006	0.015	0.006	0.021	0.006	0.016	0.010	0.019	0.010	0.025	0.010
10	18	0.015	0.007	0.018	0.007	0.025	0.007	0.020	0.012	0.023	0.012	0.030	0.012
18	30	0.017	0.008	0.021	0.008	0.029	0.008	0.024	0.015	0.028	0.015	0.036	0.015
30	50	0.020	0.009	0.025	0.009	0.034	0.009	0.028	0.017	0.033	0.017	0.042	0.017
50	80	0.024	0.011	0.030	0.011	0.041	0.011	0.033	0.020	0.039	0.020	0.050	0.020
80	120	0.028	0.013	0.035	0.013	0.048	0.013	0.038	0.023	0.045	0.023	0.058	0.023
120	180	0.033	0.015	0.040	0.015	0.055	0.015	0.045	0.027	0.052	0.027	0.067	0.027
180	250	0.037	0.017	0.046	0.017	0.063	0.017	0.051	0.031	0.060	0.031	0.077	0.031
250	315	0.043	0.020	0.052	0.020	0.072	0.020	0.057	0.034	0.066	0.034	0.086	0.034
315	400	0.046	0.021	0.057	0.021	0.078	0.021	0.062	0.037	0.073	0.037	0.094	0.037

Diameter **mm**		Deviations **mm**					
		p6		r6		r7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.
80	100	0.059	0.037	-	-	-	-
100	120	0.059	0.037	-	-	-	-
120	140	0.068	0.043	0.090	0.065	-	-
140	160	0.068	0.043	0.090	0.065	-	-
160	180	0.068	0.043	0.090	0.065	-	-
180	200	0.079	0.050	0.106	0.077	-	-
200	225	0.079	0.050	0.109	0.080	0.126	0.080
225	250	0.079	0.050	0.113	0.084	0.130	0.084
250	280	0.088	0.056	0.126	0.094	0.146	0.094
280	315	0.088	0.056	0.130	0.098	0.150	0.098
315	355	0.098	0.062	0.144	0.108	0.165	0.108
355	400	0.098	0.062	0.150	0.114	0.171	0.114
400	450	0.108	0.068	0.166	0.126	0.189	0.126
450	500	0.108	0.068	0.172	0.132	0.195	0.132

ISO Tolerances for Holes – inch

Diameter **in**		Deviations **in**						Deviations **in**					
		B10		B11		B12		C9		C10		C11	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0074	+0.0055	+0.0085	+0.0055	+0.0102	+0.0055	+0.0039	+0.0028	+0.0046	+0.0028	+0.0057	+0.0028
0.2362	0.3937	+0.0082	+0.0059	+0.0094	+0.0059	+0.0118	+0.0059	+0.0046	+0.0031	+0.0054	+0.0031	+0.0067	+0.0031
0.3937	0.7087	+0.0087	+0.0059	+0.0102	+0.0059	+0.0130	+0.0059	+0.0054	+0.0037	+0.0065	+0.0037	+0.0081	+0.0037
0.7087	1.1811	+0.0096	+0.0063	+0.0114	+0.0063	+0.0146	+0.0063	+0.0064	+0.0043	+0.0076	+0.0043	+0.0094	+0.0043
1.1811	1.5748	+0.0106	+0.0067	+0.0130	+0.0067	+0.0165	+0.0067	+0.0072	+0.0047	+0.0087	+0.0047	+0.0110	+0.0047
1.5748	1.9685	+0.0110	+0.0071	+0.0134	+0.0071	+0.0169	+0.0071	+0.0076	+0.0051	+0.0091	+0.0051	+0.0114	+0.0051
1.9685	2.5591	+0.0122	+0.0075	+0.0150	+0.0075	+0.0193	+0.0075	+0.0084	+0.0055	+0.0102	+0.0055	+0.0120	+0.0055
2.5591	3.1496	+0.0126	+0.0079	+0.0154	+0.0079	+0.0197	+0.0079	+0.0088	+0.0059	+0.0106	+0.0059	+0.0134	+0.0059
3.1496	3.9370	+0.0142	+0.0087	+0.0173	+0.0087	+0.0224	+0.0087	+0.0101	+0.0067	+0.0122	+0.0067	+0.0154	+0.0067
3.9370	4.7244	+0.0150	+0.0094	+0.0181	+0.0094	+0.0232	+0.0094	+0.0105	+0.0071	+0.0126	+0.0071	+0.0157	+0.0071
4.7244	5.5118	+0.0165	+0.0102	+0.0201	+0.0102	+0.0260	+0.0102	+0.0118	+0.0079	+0.0142	+0.0079	+0.0177	+0.0079
5.5118	6.2992	+0.0173	+0.0110	+0.0209	+0.0110	+0.0268	+0.0110	+0.0122	+0.0083	+0.0146	+0.0083	+0.0181	+0.0083
6.2992	7.0866	+0.0185	+0.0122	+0.0220	+0.0122	+0.0280	+0.0122	+0.0130	+0.0091	+0.0154	+0.0091	+0.0189	+0.0091
7.0866	7.8740	+0.0207	+0.0134	+0.0248	+0.0134	+0.0315	+0.0134	+0.0140	+0.0094	+0.0167	+0.0094	+0.0209	+0.0094
7.8740	8.8583	+0.0222	+0.0150	+0.0264	+0.0150	+0.0331	+0.0150	+0.0148	+0.0102	+0.0175	+0.0102	+0.0217	+0.0102
8.8583	9.8425	+0.0238	+0.0165	+0.0280	+0.0165	+0.0346	+0.0165	+0.0156	+0.0110	+0.0183	+0.0110	+0.0224	+0.0110
9.8425	11.0236	+0.0272	+0.0189	+0.0315	+0.0189	+0.0394	+0.0189	+0.0169	+0.0118	+0.0201	+0.0118	+0.0244	+0.0118
11.0236	12.4016	+0.0295	+0.0213	+0.0339	+0.0213	+0.0417	+0.0213	+0.0181	+0.0130	+0.0213	+0.0130	+0.0256	+0.0130
12.4016	13.9764	+0.0327	+0.0236	+0.0378	+0.0236	+0.0461	+0.0236	+0.0197	+0.0142	+0.0232	+0.0142	+0.0283	+0.0142
13.9764	15.7480	+0.0358	+0.0268	+0.0409	+0.0268	+0.0492	+0.0268	+0.0213	+0.0157	+0.0248	+0.0157	+0.0299	+0.0157
15.7480	17.7165	+0.0398	+0.0299	+0.0457	+0.0299	+0.0547	+0.0299	+0.0234	+0.0173	+0.0272	+0.0173	+0.0331	+0.0173
17.71654	19.6850	+0.0429	+0.0331	+0.0488	+0.0331	+0.0579	+0.0331	+0.0250	+0.0189	+0.0287	+0.0189	+0.0346	+0.0189

Diameter **in**		Deviations **in**									
		E9		E10		E11		E12		E13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0020	+0.0008	+0.0027	+0.0008	+0.0037	+0.0008	+0.0055	+0.0008	+0.0079	+0.0008
0.2362	0.3937	+0.0024	+0.0010	+0.0033	+0.0010	+0.0045	+0.0010	+0.0069	+0.0010	+0.0096	+0.0010
0.3937	0.7087	+0.0030	+0.0013	+0.0040	+0.0013	+0.0056	+0.0013	+0.0083	+0.0013	+0.0119	+0.0013
0.7087	1.1811	+0.0036	+0.0016	+0.0049	+0.0016	+0.0067	+0.0016	+0.0098	+0.0016	+0.0146	+0.0016
1.1811	1.9685	+0.0044	+0.0020	+0.0059	+0.0020	+0.0083	+0.0020	+0.0118	+0.0020	+0.0173	+0.0020
1.9685	3.1496	+0.0053	+0.0024	+0.0071	+0.0024	+0.0098	+0.0024	+0.0142	+0.0024	+0.0205	+0.0024
3.1496	4.7244	+0.0063	+0.0028	+0.0083	+0.0028	+0.0115	+0.0028	+0.0166	+0.0028	+0.0241	+0.0028
4.7244	7.0866	+0.0073	+0.0033	+0.0096	+0.0033	+0.0132	+0.0033	+0.0191	+0.0033	+0.0281	+0.0033
7.0866	9.8425	+0.0085	+0.0039	+0.0112	+0.0039	+0.0154	+0.0039	+0.0220	+0.0039	+0.0323	+0.0039
9.8425	12.4016	+0.0094	+0.0043	+0.0126	+0.0043	+0.0169	+0.0043	+0.0248	+0.0043	+0.0362	+0.0043
12.4016	15.7480	+0.0104	+0.0049	+0.0140	+0.0049	+0.0191	+0.0049	+0.0274	+0.0049	+0.0400	+0.0049
15.7480	19.6850	+0.0114	+0.0053	+0.0152	+0.0053	+0.0211	+0.0053	+0.0301	+0.0053	+0.0435	+0.0053

Diameter **in**		Deviations **in**							
		F5		F6		F7		F8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0006	+0.0004	+0.0007	+0.0004	+0.0009	+0.0004	+0.0011	+0.0004
0.2362	0.3937	+0.0007	+0.0005	+0.0009	+0.0005	+0.0011	+0.0005	+0.0014	+0.0005
0.3937	0.7087	+0.0009	+0.0006	+0.0011	+0.0006	+0.0013	+0.0006	+0.0017	+0.0006
0.7087	1.1811	+0.0011	+0.0008	+0.0013	+0.0008	+0.0016	+0.0008	+0.0021	+0.0008
1.1811	1.9685	+0.0014	+0.0010	+0.0016	+0.0010	+0.0020	+0.0010	+0.0025	+0.0010
1.9685	3.1496	+0.0017	+0.0012	+0.0019	+0.0012	+0.0024	+0.0012	+0.0030	+0.0012
3.1496	4.7244	+0.0020	+0.0014	+0.0023	+0.0014	+0.0028	+0.0014	+0.0035	+0.0014
4.7244	7.0866	+0.0024	+0.0017	+0.0027	+0.0017	+0.0033	+0.0017	+0.0042	+0.0017
7.0866	9.8425	+0.0028	+0.0020	+0.0031	+0.0020	+0.0038	+0.0020	+0.0048	+0.0020
9.8425	12.4016	+0.0031	+0.0022	+0.0035	+0.0022	+0.0043	+0.0022	+0.0054	+0.0022
12.4016	15.7480	+0.0034	+0.0024	+0.0039	+0.0024	+0.0047	+0.0024	+0.0059	+0.0024
15.7480	19.6850	+0.0037	+0.0027	+0.0043	+0.0027	+0.0052	+0.0027	+0.0065	+0.0027

ISO Tolerances for Holes – inch

Diameter **in**		Deviations **in**					
		G5		G6		G7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0004	+0.0002	+0.0005	+0.0002	+0.0006	+0.0002
0.2362	0.3937	+0.0004	+0.0002	+0.0006	+0.0002	+0.0008	+0.0002
0.3937	0.7087	+0.0006	+0.0002	+0.0007	+0.0002	+0.0009	+0.0002
0.7087	1.1811	+0.0006	+0.0003	+0.0008	+0.0003	+0.0011	+0.0003
1.1811	1.9685	+0.0008	+0.0004	+0.0010	+0.0004	+0.0013	+0.0004
1.9685	3.1496	+0.0009	+0.0004	+0.0011	+0.0004	+0.0016	+0.0004
3.1496	4.7244	+0.0011	+0.0005	+0.0013	+0.0005	+0.0019	+0.0005
4.7244	7.0866	+0.0013	+0.0006	+0.0015	+0.0006	+0.0021	+0.0006
7.0866	9.8425	+0.0014	+0.0006	+0.0017	+0.0006	+0.0024	+0.0006
9.8425	12.4016	+0.0016	+0.0007	+0.0019	+0.0007	+0.0027	+0.0007
12.4016	15.7480	+0.0017	+0.0007	+0.0021	+0.0007	+0.0030	+0.0007
15.7480	19.6850	+0.0019	+0.0008	+0.0024	+0.0008	+0.0033	+0.0008

Diameter **in**		Deviations **in**									
		H4		H5		H6		H7		H8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0002	0	+0.0002	0	+0.0003	0	+0.0005	0	+0.0007	0
0.2362	0.3937	+0.0002	0	+0.0002	0	+0.0004	0	+0.0006	0	+0.0009	0
0.3937	0.7087	+0.0002	0	+0.0003	0	+0.0004	0	+0.0007	0	+0.0011	0
0.7087	1.1811	+0.0002	0	+0.0004	0	+0.0005	0	+0.0008	0	+0.0013	0
1.1811	1.9685	+0.0003	0	+0.0004	0	+0.0006	0	+0.0010	0	+0.0015	0
1.9685	3.1496	+0.0003	0	+0.0005	0	+0.0007	0	+0.0012	0	+0.0018	0
3.1496	4.7244	+0.0004	0	+0.0006	0	+0.0009	0	+0.0014	0	+0.0021	0
4.7244	7.0866	+0.0005	0	+0.0007	0	+0.0010	0	+0.0016	0	+0.0025	0
7.0866	9.8425	+0.0006	0	+0.0008	0	+0.0011	0	+0.0018	0	+0.0028	0
9.8425	12.4016	+0.0006	0	+0.0009	0	+0.0013	0	+0.0020	0	+0.0032	0
12.4016	15.7480	+0.0007	0	+0.0010	0	+0.0014	0	+0.0022	0	+0.0035	0
15.7480	19.6850	+0.0008	0	+0.0011	0	+0.0016	0	+0.0025	0	+0.0038	0

Diameter **in**		Deviations **in**							
		H9		H10		H11		H12	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.0012	0	+0.0019	0	+0.0030	0	+0.0047	0
0.2362	0.3937	+0.0014	0	+0.0023	0	+0.0035	0	+0.0059	0
0.3937	0.7087	+0.0017	0	+0.0028	0	+0.0043	0	+0.0071	0
0.7087	1.1811	+0.0020	0	+0.0033	0	+0.0051	0	+0.0083	0
1.1811	1.9685	+0.0024	0	+0.0039	0	+0.0063	0	+0.0098	0
1.9685	3.1496	+0.0029	0	+0.0047	0	+0.0075	0	+0.0118	0
3.1496	4.7244	+0.0034	0	+0.0055	0	+0.0087	0	+0.0138	0
4.7244	7.0866	+0.0039	0	+0.0063	0	+0.0098	0	+0.0157	0
7.0866	9.8425	+0.0045	0	+0.0073	0	+0.0114	0	+0.0181	0
9.8425	12.4016	+0.0051	0	+0.0083	0	+0.0126	0	+0.0205	0
12.4016	15.7480	+0.0055	0	+0.0091	0	+0.0142	0	+0.0224	0
15.7480	19.6850	+0.0061	0	+0.0098	0	+0.0157	0	+0.0248	0

ISO Tolerances for Holes – inch

Diameter **in**		Deviations **in**						Deviations **in**					
		J6		J7		J8		K6		K7		K8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	+0.00020	-0.00012	+0.00024	-0.00024	+0.00039	-0.00031	+0.00008	-0.00024	+0.00012	-0.00035	+0.00020	-0.00051
0.2362	0.3937	+0.00020	-0.00016	+0.00031	-0.00028	+0.00047	-0.00039	+0.00008	-0.00028	+0.00020	-0.00039	+0.00024	-0.00063
0.3937	0.7087	+0.00024	-0.00020	+0.00039	-0.00031	+0.00059	-0.00047	+0.00008	-0.00035	+0.00024	-0.00047	+0.00031	-0.00075
0.7087	1.1811	+0.00031	-0.00020	+0.00047	-0.00035	+0.00079	-0.00051	+0.00008	-0.00043	+0.00024	-0.00059	+0.00039	-0.00091
1.1811	1.9685	+0.00039	-0.00024	+0.00055	-0.00043	+0.00094	-0.00059	+0.00012	-0.00051	+0.00028	-0.00071	+0.00047	-0.00106
1.9685	3.1496	+0.00051	-0.00024	+0.00071	-0.00047	+0.00110	-0.00071	+0.00016	-0.00059	+0.00035	-0.00083	+0.00055	-0.00126
3.1496	4.7244	+0.00063	-0.00024	+0.00087	-0.00051	+0.00134	-0.00079	+0.00016	-0.00071	+0.00039	-0.00098	+0.00063	-0.00150
4.7244	7.0866	+0.00071	-0.00028	+0.00102	-0.00055	+0.00161	-0.00087	+0.00016	-0.00083	+0.00047	-0.00110	+0.00079	-0.00169
7.0866	9.8425	+0.00087	-0.00028	+0.00118	-0.00063	+0.00185	-0.00098	+0.00020	-0.00094	+0.00051	-0.00130	+0.00087	-0.00197
9.8425	12.4016	+0.00098	-0.00028	+0.00142	-0.00063	+0.00217	-0.00102	+0.00020	-0.00106	+0.00063	-0.00142	+0.00098	-0.00220
12.4016	15.7480	+0.00114	-0.00028	+0.00154	-0.00071	+0.00236	-0.00114	+0.00028	-0.00114	+0.00067	-0.00157	+0.00110	-0.00240
15.7480	19.6850	+0.00130	-0.00028	+0.00169	-0.00079	+0.00259	-0.00122	+0.00031	-0.00126	+0.00071	-0.00177	+0.00114	-0.00268

Diameter **in**		Deviations **in**						Deviations **in**					
		M5		M6		M7		N6		N7		N8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	-0.00012	-0.00031	-0.00004	-0.00035	0	-0.00047	-0.0002	-0.0005	-0.0002	-0.0006	-0.0001	-0.0008
0.2362	0.3937	-0.00016	-0.00039	-0.00012	-0.00047	0	-0.00059	-0.0003	-0.0006	-0.0002	-0.0007	-0.0001	-0.0010
0.3937	0.7087	-0.00016	-0.00047	-0.00016	-0.00059	0	-0.00071	-0.0004	-0.0008	-0.0002	-0.0009	-0.0001	-0.0012
0.7087	1.1811	-0.00020	-0.00055	-0.00016	-0.00067	0	-0.00083	-0.0004	-0.0009	-0.0003	-0.0011	-0.0001	-0.0014
1.1811	1.9685	-0.00020	-0.00063	-0.00016	-0.00079	0	-0.00098	-0.0005	-0.0011	-0.0003	-0.0013	-0.0001	-0.0017
1.9685	3.1496	-0.00024	-0.00075	-0.00020	-0.00094	0	-0.00118	-0.0006	-0.0013	-0.0004	-0.0015	-0.0002	-0.0020
3.1496	4.7244	-0.00031	-0.00091	-0.00024	-0.00110	0	-0.00138	-0.0006	-0.0015	-0.0004	-0.0018	-0.0002	-0.0023
4.7244	7.0866	-0.00035	-0.00106	-0.00031	-0.00130	0	-0.00157	-0.0008	-0.0018	-0.0005	-0.0020	-0.0002	-0.0026
7.0866	9.8425	-0.00043	-0.00122	-0.00031	-0.00146	0	-0.00181	-0.0009	-0.0020	-0.0006	-0.0024	-0.0002	-0.0030
9.8425	12.4016	-0.00051	-0.00142	-0.00035	-0.00161	0	-0.00205	-0.0000	-0.0022	-0.0006	-0.0026	-0.0002	-0.0034
12.4016	15.7480	-0.00055	-0.00154	-0.00039	-0.00181	0	-0.00224	-0.0010	-0.0024	-0.0006	-0.0029	-0.0002	-0.0037
15.7480	19.6850	-0.00063	-0.00169	-0.00039	-0.00197	0	-0.00248	-0.0011	-0.0026	-0.0007	-0.0031	-0.0002	-0.0041

Diameter **in**		Deviations **in**				Deviations **in**					
		P6		P7		R6		R7		R8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.1181	0.2362	-0.0004	-0.0007	-0.0003	-0.0008	-0.0005	-0.0008	-0.0004	-0.0009	-0.0006	-0.0013
0.2362	0.3937	-0.0005	-0.0008	-0.0004	-0.0009	-0.0006	-0.0010	-0.0005	-0.0011	-0.0007	-0.0016
0.3937	0.7087	-0.0006	-0.0010	-0.0004	-0.0011	-0.0008	-0.0012	-0.0006	-0.0013	-0.0009	-0.0020
0.7087	1.1811	-0.0007	-0.0012	-0.0006	-0.0014	-0.0009	-0.0015	-0.0008	-0.0016	-0.0011	-0.0024
1.1811	1.9685	-0.0008	-0.0015	-0.0007	-0.0017	-0.0011	-0.0018	-0.0010	-0.0020	-0.0013	-0.0029
1.9685	2.5591	-0.0010	-0.0018	-0.0008	-0.0020	-0.0014	-0.0021	-0.0012	-0.0024	-0.0016	-0.0034
2.5591	3.1496	-0.0010	-0.0018	-0.0008	-0.0020	-0.0015	-0.0022	-0.0013	-0.0024	-0.0017	-0.0035
3.1496	3.9370	-0.0012	-0.0020	-0.0009	-0.0023	-0.0017	-0.0026	-0.0015	-0.0029	-0.0020	-0.0041
3.9370	4.7244	-0.0012	-0.0020	-0.0009	-0.0023	-0.0019	-0.0027	-0.0016	-0.0030	-0.0021	-0.0043
4.7244	5.5118	-0.0014	-0.0024	-0.0011	-0.0027	-0.0022	-0.0032	-0.0019	-0.0035	-0.0025	-0.0050
5.5118	6.2992	-0.0014	-0.0024	-0.0011	-0.0027	-0.0023	-0.0033	-0.0020	-0.0035	-0.0026	-0.0050
6.2992	7.0866	-0.0014	-0.0024	-0.0011	-0.0027	0.0024	-0.0034	-0.0021	-0.0037	-0.0027	-0.0052
7.0866	7.8740	-0.0016	-0.0028	-0.0013	-0.0031	-0.0027	-0.0038	-0.0024	-0.0042	-0.0030	-0.0059
7.8740	8.8583	-0.0016	-0.0028	-0.0013	-0.0031	0.0028	-0.0039	-0.0025	-0.0043	-0.0031	-0.0060
8.8583	9.8425	-0.0016	-0.0028	-0.0013	-0.0031	-0.0030	-0.0041	-0.0026	-0.0044	-0.0033	-0.0061
9.8425	11.0236	-0.0019	-0.0031	-0.0014	-0.0035	-0.0033	-0.0046	-0.0029	-0.0050	-0.0037	-0.0069
11.0236	12.4016	-0.0019	-0.0031	-0.0014	-0.0035	-0.0035	-0.0048	-0.0031	-0.0051	-0.0039	-0.0070
12.4016	13.9764	-0.0020	-0.0034	-0.0016	-0.0039	-0.0038	-0.0052	-0.0034	-0.0057	-0.0043	-0.0078
13.9764	15.7480	-0.0020	-0.0034	-0.0016	-0.0039	-0.0041	-0.0055	-0.0037	-0.0059	-0.0045	-0.0080
15.7480	17.7165	-0.0022	-0.0037	-0.0018	-0.0043	-0.0044	-0.0060	-0.0041	-0.0065	-0.0050	-0.0088
17.7165	19.6850	-0.0022	-0.0037	-0.0018	-0.0043	-0.0047	-0.0063	-0.0043	-0.0068	-0.0052	-0.0090

ISO Tolerances for Shafts – inch

Diameter **in**		Deviations **in**							
		a10		a11		a12		a13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
–	0.1181	-0.0106	-0.0122	-0.0106	-0.0130	-0.0106	-0.0146	-0.0106	-0.0161
0.1181	0.2362	-0.0106	-0.0125	-0.0106	-0.0136	-0.0106	-0.0154	-0.0106	-0.0177
0.2362	0.3937	-0.0110	-0.0133	-0.0110	-0.0146	-0.0110	-0.0169	-0.0110	-0.0197
0.3937	0.7087	-0.0114	-0.0142	-0.0114	-0.0157	-0.0114	-0.0185	-0.0114	-0.0220
0.7087	1.1811	-0.0118	-0.0151	-0.0118	-0.0169	-0.0118	-0.0201	-0.0118	-0.0248
1.1811	1.5748	-0.0122	-0.0161	-0.0122	-0.0185	-0.0122	-0.0220	-0.0122	-0.0276
1.5748	1.9685	-0.0126	-0.0165	-0.0126	-0.0189	-0.0126	-0.0224	-0.0126	-0.0280
1.9685	2.5591	-0.0134	-0.0181	-0.0134	-0.0209	-0.0134	-0.0252	-0.0134	-0.0315
2.5591	3.1496	-0.0142	-0.0189	-0.0142	-0.0217	-0.0142	-0.0260	-0.0142	-0.0323
3.1496	3.9370	-0.0150	-0.0205	-0.0150	-0.0236	-0.0150	-0.0287	-0.0150	-0.0362
3.9370	4.7244	-0.0161	-0.0217	-0.0161	-0.0248	-0.0161	-0.0299	-0.0161	-0.0374
4.7244	5.5118	-0.0181	-0.0244	-0.0181	-0.0280	-0.0181	-0.0339	-0.0181	-0.0429
5.5118	6.2992	-0.0205	-0.0268	-0.0205	-0.0303	-0.0205	-0.0362	-0.0205	-0.0453
6.2992	7.0866	-0.0228	-0.0291	-0.0228	-0.0327	-0.0228	-0.0386	-0.0228	-0.0476
7.0866	7.8740	-0.0260	-0.0333	-0.0260	-0.0374	-0.0260	-0.0441	-0.0260	-0.0543
7.8740	8.8583	-0.0291	-0.0364	-0.0291	-0.0406	-0.0291	-0.0472	-0.0291	-0.0575
8.8583	9.8425	-0.0323	-0.0396	-0.0323	-0.0437	-0.0323	-0.0504	-0.0323	-0.0606
9.8425	11.0236	-0.0362	-0.0445	-0.0362	-0.0488	-0.0362	-0.0567	-0.0362	-0.0681
11.0236	12.4016	-0.0413	-0.0496	-0.0413	-0.0539	-0.0413	-0.0618	-0.0413	-0.0732
12.4016	13.9764	-0.0472	-0.0563	-0.0472	-0.0614	-0.0472	-0.0697	-0.0472	-0.0823
13.9764	15.7480	-0.0531	-0.0622	-0.0531	-0.0673	-0.0531	-0.0756	-0.0531	-0.0882

Diameter **in**		Deviations **in**						Deviations **in**					
		c11		c12		c13		e11		e12		e13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	-0.0024	-0.0047	-0.0024	-0.0063	-0.0024	-0.0079	-0.0006	-0.0029	-0.0006	-0.0045	-0.0006	-0.0061
0.1181	0.2362	-0.0028	-0.0057	-0.0028	-0.0075	-0.0028	-0.0098	-0.0008	-0.0037	-0.0008	-0.0055	-0.0008	-0.0079
0.2362	0.3937	-0.0031	-0.0067	-0.0031	-0.0091	-0.0031	-0.0118	-0.0010	-0.0045	-0.0010	-0.0069	-0.0010	-0.0096
0.3937	0.7087	-0.0037	-0.0081	-0.0037	-0.0108	-0.0037	-0.0144	-0.0013	-0.0056	-0.0013	-0.0083	-0.0013	-0.0119
0.7087	1.1811	-0.0043	-0.0094	-0.0043	-0.0126	-0.0043	-0.0173	-0.0016	-0.0067	-0.0016	-0.0098	-0.0016	-0.0146
1.1811	1.5748	-0.0047	-0.0110	-0.0047	-0.0146	-0.0047	-0.0201	-0.0020	-0.0083	-0.0020	-0.0118	-0.0020	-0.0173
1.5748	1.9685	-0.0051	-0.0114	-0.0051	-0.0150	-0.0051	-0.0205	-0.0020	-0.0083	-0.0020	-0.0118	-0.0020	-0.0173
1.9685	2.5591	-0.0055	-0.0130	-0.0055	-0.0173	-0.0055	-0.0236	-0.0024	-0.0098	-0.0024	-0.0142	-0.0024	-0.0205
2.5591	3.1496	-0.0059	-0.0134	-0.0059	-0.0177	-0.0059	-0.0240	-0.0024	-0.0098	-0.0024	-0.0142	-0.0024	-0.0205
3.1496	3.9370	-0.0067	-0.0154	-0.0067	-0.0205	-0.0067	-0.0280	-0.0028	-0.0115	-0.0028	-0.0166	-0.0028	-0.0241
3.9370	4.7244	-0.0071	-0.0157	-0.0071	-0.0209	-0.0071	-0.0283	-0.0028	-0.0115	-0.0028	-0.0166	-0.0028	-0.0241
4.7244	5.5118	-0.0079	-0.0177	-0.0079	-0.0236	-0.0079	-0.0327	-0.0033	-0.0132	-0.0033	-0.0191	-0.0033	-0.0281
5.5118	6.2992	-0.0083	-0.0181	-0.0083	-0.0240	-0.0083	-0.0331	-0.0033	-0.0132	-0.0033	-0.0191	-0.0033	-0.0281
6.2992	7.0866	-0.0091	-0.0189	-0.0091	-0.0248	-0.0091	-0.0339	-0.0033	-0.0132	-0.0033	-0.0191	-0.0033	-0.0281
7.0866	7.8740	-0.0094	-0.0209	-0.0094	-0.0276	-0.0094	-0.0378	-0.0039	-0.0154	-0.0039	-0.0220	-0.0039	-0.0323
7.8740	8.8583	-0.0102	-0.0217	-0.0102	-0.0283	-0.0102	-0.0386	-0.0039	-0.0154	-0.0039	-0.0220	-0.0039	-0.0323
8.8583	9.8425	-0.0110	-0.0224	-0.0110	-0.0291	-0.0110	-0.0394	-0.0039	-0.0154	-0.0039	-0.0220	-0.0039	-0.0323
9.8425	11.0236	-0.0118	-0.0244	-0.0118	-0.0323	-0.0118	-0.0437	-0.0043	-0.0169	-0.0043	-0.0248	-0.0043	-0.0362
11.0236	12.4016	-0.0130	-0.0256	-0.0130	-0.0335	-0.0130	-0.0449	-0.0043	-0.0169	-0.0043	-0.0248	-0.0043	-0.0362
12.4016	13.9764	-0.0142	-0.0283	-0.0142	-0.0366	-0.0142	-0.0492	-0.0049	-0.0191	-0.0049	-0.0274	-0.0049	-0.0400
13.9764	15.7480	-0.0157	-0.0299	-0.0157	-0.0382	-0.0157	-0.0508	-0.0049	-0.0191	-0.0049	-0.0274	-0.0049	-0.0400

ISO Tolerances for Shafts – inch

Diameter **in**		Deviations **in**						Deviations **in**					
		f5		f6		f7		g5		g6		g7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	-0.0002	-0.0004	-0.0002	-0.0005	-0.0002	-0.0006	-0.0001	-0.0002	-0.0001	-0.0003	-0.0001	-0.0005
0.1181	0.2362	-0.0004	-0.0006	-0.0004	-0.0007	-0.0004	-0.0009	-0.0002	-0.0004	-0.0002	-0.0005	-0.0002	-0.0006
0.2362	0.3937	-0.0005	-0.0007	-0.0005	-0.0009	-0.0005	-0.0011	-0.0002	-0.0004	-0.0002	-0.0006	-0.0002	-0.0008
0.3937	0.7087	-0.0006	-0.0009	-0.0006	-0.0011	-0.0006	-0.0013	-0.0002	-0.0006	-0.0002	-0.0007	-0.0002	-0.0009
0.7087	1.1811	-0.0008	-0.0011	-0.0008	-0.0013	-0.0008	-0.0016	-0.0003	-0.0006	-0.0003	-0.0008	-0.0003	-0.0011
1.1811	1.9685	-0.0010	-0.0014	-0.0010	-0.0016	-0.0010	-0.0020	-0.0004	-0.0008	-0.0004	-0.0010	-0.0004	-0.0013
1.9685	3.1496	-0.0012	-0.0017	-0.0012	-0.0019	-0.0012	-0.0024	-0.0004	-0.0009	-0.0004	-0.0011	-0.0004	-0.0016
3.1496	4.7244	-0.0014	-0.0020	-0.0014	-0.0023	-0.0014	-0.0028	-0.0005	-0.0011	-0.0005	-0.0013	-0.0005	-0.0019
4.7244	7.0866	-0.0017	-0.0024	-0.0017	-0.0027	-0.0017	-0.0033	-0.0006	-0.0013	-0.0006	-0.0015	-0.0006	-0.0021
7.0866	9.8425	-0.0020	-0.0028	-0.0020	-0.0031	-0.0020	-0.0038	-0.0006	-0.0014	-0.0006	-0.0017	-0.0006	-0.0024
9.8425	12.4016	-0.0022	-0.0031	-0.0022	-0.0035	-0.0022	-0.0043	-0.0007	-0.0016	-0.0007	-0.0019	-0.0007	-0.0027
12.4016	15.7480	-0.0024	-0.0034	-0.0024	-0.0039	-0.0024	-0.0047	-0.0007	-0.0017	-0.0007	-0.0021	-0.0007	-0.0030

Diameter **in**		Deviations **in**									
		h4		h5		h6		h7		h8	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	0	-0.00012	0	-0.00016	0	-0.00024	0	-0.0004	0	-0.0006
0.1181	0.2362	0	-0.00016	0	-0.00020	0	-0.00031	0	-0.0005	0	-0.0007
0.2362	0.3937	0	-0.0002	0	-0.00024	0	-0.0004	0	-0.0006	0	-0.0009
0.3937	0.7087	0	-0.0002	0	-0.00031	0	-0.0004	0	-0.0007	0	-0.0011
0.7087	1.1811	0	-0.0002	0	-0.0004	0	-0.0005	0	-0.0008	0	-0.0013
1.1811	1.9685	0	-0.0003	0	-0.0004	0	-0.0006	0	-0.0010	0	-0.0015
1.9685	3.1496	0	-0.0003	0	-0.0005	0	-0.0007	0	-0.0012	0	-0.0018
3.1496	4.7244	0	-0.0004	0	-0.0006	0	-0.0009	0	-0.0014	0	-0.0021
4.7244	7.0866	0	-0.0005	0	-0.0007	0	-0.0010	0	-0.0016	0	-0.0025
7.0866	9.8425	0	-0.0006	0	-0.0008	0	-0.0011	0	-0.0018	0	-0.0028
9.8425	12.4016	0	-0.0006	0	-0.0009	0	-0.0013	0	-0.0020	0	-0.0032
12.4016	15.7480	0	-0.0007	0	-0.0010	0	-0.0014	0	-0.0022	0	-0.0035

Diameter **in**		Deviations **in**									
		h9		h10		h11		h12		h13	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	0	-0.0010	0	-0.0016	0	-0.0024	0	-0.0039	0	-0.0055
0.1181	0.2362	0	-0.0012	0	-0.0019	0	-0.0030	0	-0.0047	0	-0.0071
0.2362	0.3937	0	-0.0014	0	-0.0023	0	-0.0035	0	-0.0059	0	-0.0087
0.3937	0.7087	0	-0.0017	0	-0.0028	0	-0.0043	0	-0.0071	0	-0.0106
0.7087	1.1811	0	-0.0020	0	-0.0033	0	-0.0051	0	-0.0083	0	-0.0130
1.1811	1.9685	0	-0.0024	0	-0.0039	0	-0.0063	0	-0.0098	0	-0.0154
1.9685	3.1496	0	-0.0029	0	-0.0047	0	-0.0075	0	-0.0118	0	-0.0181
3.1496	4.7244	0	-0.0034	0	-0.0055	0	-0.0087	0	-0.0138	0	-0.0213
4.7244	7.0866	0	-0.0039	0	-0.0063	0	-0.0098	0	-0.0157	0	-0.0248
7.0866	9.8425	0	-0.0045	0	-0.0073	0	-0.0114	0	-0.0181	0	-0.0283
9.8425	12.4016	0	-0.0051	0	-0.0083	0	-0.0126	0	-0.0205	0	-0.0319
12.4016	15.7480	0	-0.0055	0	-0.0091	0	-0.0142	0	-0.0224	0	-0.0350

ISO Tolerances for Shafts – inch

Diameter **in**		Deviations **in**						Deviations **in**					
		j5		j6		j7		k5		k6		k7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	+0.00008	-0.00008	+0.00016	-0.00008	+0.00024	-0.00016	+0.00016	0	+0.00024	0	+0.00039	0
0.1181	0.2362	+0.00012	-0.00008	+0.00024	-0.00008	+0.00031	-0.00016	+0.00024	+0.00004	+0.00035	+0.00004	+0.00051	+0.00004
0.2362	0.3937	+0.00016	-0.00008	+0.00028	-0.00008	+0.00039	-0.00020	+0.00028	+0.00004	+0.00039	+0.00004	+0.00063	+0.00004
0.3937	0.7087	+0.00020	-0.00012	+0.00031	-0.00012	+0.00047	-0.00024	+0.00035	+0.00004	+0.00047	+0.00004	+0.00075	+0.00004
0.7087	1.1811	+0.00020	-0.00016	+0.00035	-0.00016	+0.00051	-0.00031	+0.00043	+0.00008	+0.00059	+0.00008	+0.00091	+0.00008
1.1811	1.9685	+0.00024	-0.00020	+0.00043	-0.00020	+0.00059	-0.00039	+0.00051	+0.00008	+0.00071	+0.00008	+0.00106	+0.00008
1.9685	3.1496	+0.00024	-0.00028	+0.00047	-0.00028	+0.00071	-0.00047	+0.00059	+0.00008	+0.00083	+0.00008	+0.00126	+0.00008
3.1496	4.7244	+0.00024	-0.00035	+0.00051	-0.00035	+0.00079	-0.00059	+0.00071	+0.00012	+0.00098	+0.00012	+0.00150	+0.00012
4.7244	7.0866	+0.00028	-0.00043	+0.00055	-0.00043	+0.00087	-0.00071	+0.00083	+0.00012	+0.00110	+0.00012	+0.00169	+0.00012
7.0866	9.8425	+0.00028	-0.00051	+0.00063	-0.00051	+0.00098	-0.00083	+0.00094	+0.00016	+0.00130	+0.00016	+0.00197	+0.00016
9.8425	12.4016	+0.00028	-0.00063	+0.00063	-0.00063	+0.00102	-0.00102	+0.00106	+0.00016	+0.00142	+0.00016	+0.00220	+0.00016
12.4016	15.7480	+0.00028	-0.00071	+0.00071	-0.00071	+0.00114	-0.00110	+0.00114	+0.00016	+0.00157	+0.00016	+0.00240	+0.00016

Diameter **in**		Deviations **in**						Deviations **in**					
		m5		m6		m7		n5		n6		n7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
—	0.1181	+0.00024	+0.00008	+0.00031	+0.00008	+0.00047	+0.00008	+0.0003	+0.0002	+0.0004	+0.0002	+0.0006	+0.0002
0.1181	0.2362	+0.00035	+0.00016	+0.00047	+0.00016	+0.00063	+0.00016	+0.0005	+0.0003	+0.0006	+0.0003	+0.0008	+0.0003
0.2362	0.3937	+0.00047	+0.00024	+0.00059	+0.00024	+0.00083	+0.00024	+0.0006	+0.0004	+0.0007	+0.0004	+0.0010	+0.0004
0.3937	0.7087	+0.00059	+0.00028	+0.00071	+0.00028	+0.00098	+0.00028	+0.0008	+0.0005	+0.0009	+0.0005	+0.0012	+0.0005
0.7087	1.1811	+0.00067	+0.00031	+0.00083	+0.00031	+0.00114	+0.00031	+0.0009	+0.0006	+0.0011	+0.0006	+0.0014	+0.0006
1.1811	1.9685	+0.00079	+0.00035	+0.00098	+0.00035	+0.00134	+0.00035	+0.0011	+0.0007	+0.0013	+0.0007	+0.0017	+0.0007
1.9685	3.1496	+0.00094	+0.00043	+0.00118	+0.00043	+0.00161	+0.00043	+0.0013	+0.0008	+0.0015	+0.0008	+0.0020	+0.0008
3.1496	4.7244	+0.00110	+0.00051	+0.00138	+0.00051	+0.00189	+0.00051	+0.0015	+0.0009	+0.0018	+0.0009	+0.0023	+0.0009
4.7244	7.0866	+0.00130	+0.00059	+0.00157	+0.00059	+0.00217	+0.00059	+0.0018	+0.0011	+0.0020	+0.0011	+0.0026	+0.0011
7.0866	9.8425	+0.00146	+0.00067	+0.00181	+0.00067	+0.00248	+0.00067	+0.0020	+0.0012	+0.0024	+0.0012	+0.0030	+0.0012
9.8425	12.4016	+0.00169	+0.00079	+0.00205	+0.00079	+0.00283	+0.00079	+0.0022	+0.0013	+0.0026	+0.0013	+0.0034	+0.0013
12.4016	15.7480	+0.00181	+0.00083	+0.00224	+0.00083	+0.00307	+0.00083	+0.0024	+0.0015	+0.0029	+0.0015	+0.0037	+0.0015

Diameter **in**		Deviations **in**					
		p6		r6		r7	
>	≤	Max.	Min.	Max.	Min.	Max.	Min.
3.1496	3.9370	+0.0023	+0.0015	-	-	-	-
3.9370	4.7244	+0.0023	+0.0015	-	-	-	-
4.7244	5.5118	+0.0027	+0.0017	+0.0035	+0.0026	-	-
5.5118	6.2992	+0.0027	+0.0017	+0.0035	+0.0026	-	-
6.2992	7.0866	+0.0027	+0.0017	+0.0035	+0.0026	-	-
7.0866	7.8740	+0.0031	+0.0020	+0.0042	+0.0030	-	-
7.8740	8.8583	+0.0031	+0.0020	+0.0043	+0.0031	+0.0050	+0.0031
8.8583	9.8425	+0.0031	+0.0020	+0.0044	+0.0033	+0.0051	+0.0033
9.8425	11.0236	+0.0035	+0.0022	+0.0050	+0.0037	+0.0057	+0.0037
11.0236	12.4016	+0.0035	+0.0022	+0.0051	+0.0039	+0.0059	+0.0039
12.4016	13.9764	+0.0039	+0.0024	+0.0057	+0.0043	+0.0065	+0.0043
13.9764	15.7480	+0.0039	+0.0024	+0.0059	+0.0045	+0.0067	+0.0045
15.7480	17.7165	+0.0043	+0.0027	+0.0065	+0.0050	+0.0074	+0.0050
17.7165	19.6850	+0.0043	+0.0027	+0.0068	+0.0052	+0.0077	+0.0052

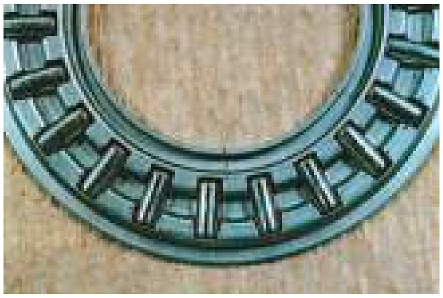
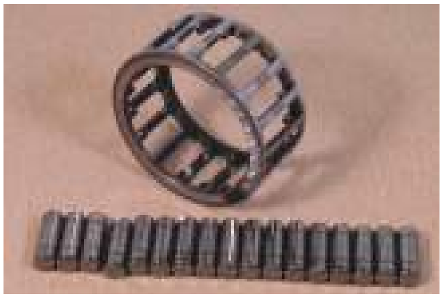
EXAMPLES OF BEARING FAILURES

Failures	Characteristics	
(1) Flaking	  	Flaking is a phenomenon that material is removed in flakes from a surface layer of the bearing raceways or rolling elements due to rolling fatigue. This phenomenon is generally attributed to the approaching end of bearing service life. However, if flaking occurs at early stages of bearing service life, it is necessary to determine causes and adopt countermeasures, since there is a possibility of abnormality in this case. Pitting Pitting is another type of failure caused by rolling fatigue, in which minute holes of approx. 0.1 mm in depth are generated on the raceway surface. Peeling (shown in middle figure) Peeling is a phenomenon in which the lubricant film separation is insufficient for complete surface separation (0.02 mm or less) of the rolling surfaces causing fatigue and peeling due to concentrated stress acting on microscopic peaks of surface roughness.
(2) Cracking Chipping	 	Cracking is mainly triggered by debris initiated defects due to wear of other system components, partial shape defects, and concentrated stress and overload caused by edge load. It may occur on bearing rings due to fatigue caused by repeated bend stress.

Damages	Causes	Countermeasures
Flaking occurring at an incipient stage	· Too small internal clearance · Improper or insufficient lubricant · Load too high · Rust	· Provide proper internal clearance. · Select proper lubricating method or lubricant.
Symmetrical flaking along circumference of raceway	· Inaccurate housing roundness	· Correct processing accuracy of housing bore. Especially for split housings, care should be taken to ensure processing accuracy.
Flaking occurring near the edge of the raceway or rolling contact surface	· Improper mounting · Shaft deflection · Inaccuracy of the shaft and housing	· Correct centering. · Correct squareness of shaft or housing shoulder.
Flaking on the raceway surface at the same interval as rolling element spacing	· Heavy impact load during mounting · A flaw caused during mounting · Rust generated while out of operation	· Improve mounting procedure. · Provide rust prevention treatment before long cessation of operation.
Cracking in outer ring, inner ring or race	· Excessive interference · Excessive fillet on shaft or housing · Heavy impact load · Advanced flaking or seizure · Impact on race during mounting	· Select proper fit. · Adjust fillet in the shaft or in the housing to smaller than that of the bearing chamfer dimension. · Re-examine load conditions. · Improve mounting procedures.
Cracking on rolling elements	· Heavy impact load · Advanced flaking	· Improve mounting and handling procedures. · Re-examine load conditions.

Failures	Characteristics	
(3) Brinelling Nicks		· Brinelling is a small surface indentation generated either on the raceway through plastic deformation at the contact point between the raceway and rolling elements, or on the rolling surfaces from insertion of foreign matter, when heavy load is applied while the bearing is stationary or rotating at a low rotation speed. · Nicks are indentations produced directly by rough handling such as hammering.
(4) Wear		Normally, wear of bearing is observed on sliding contact surfaces such as roller end faces and rib faces, cage pockets, the guide surface of cages and cage riding lands. Wear is not directly related to material fatigue. Wear caused by foreign matter and corrosion can affect not only sliding surfaces but rolling surfaces.
(5) Fretting		Fretting occurs to bearings which are subject to vibration while in stationary condition or which are exposed to minute vibrations. It is characterized by rust-colored wear particles. Since fretting on the raceways often appears similar to brinelling, it is sometimes called “false brinelling”.
(6) Creeping		Creeping is a phenomenon in which bearing rings move relative to the shaft or housing during operation.

Damages	Causes	Countermeasures
Brinelling on the raceway or rolling contact surface	· Entry of foreign matter	· Clean bearing and its peripheral parts. · Improve sealing devices.
Brinelling on the raceway surface at the same interval as the rolling element spacing	· Impact load during mounting · Excessive load applied while bearing is stationary	· Improve mounting procedure. · Improve machine handling.
Nicks on the raceway or rolling contact surface	· Careless handling	· Improve mounting and handling procedure.
Wear on the contact surfaces (cage pockets, cage riding land)	· Improper or insufficient lubricant	· Select proper lubricating method or lubricant. · Improve sealing device. · Clean the bearing and its peripheral parts.
Wear on raceways and rolling contact surfaces	· Entry of foreign matter · Improper or insufficient lubricant	
Rust-colored wear particles generated on the fitting surface (fretting corrosion)	· Insufficient interference	· Provide greater interference. · Apply lubricant to the fitting surface.
Brinelling on the raceway surface at the same interval as rolling element spacing (false brinelling)	· Vibration and oscillation when bearings are stationary.	· Improve fixing method of the shaft and housing.
Wear, discoloration, and scuffing caused by slipping on the fitting surfaces	· Insufficient interference · Insufficient tightening of sleeve	· Provide greater interference. · Proper tightening of sleeve.

Failures	Characteristics	
(7) Damage to Cages	 	Since cages are made of low hardness materials, external pressure and contact with other parts can easily produce flaws and distortion. In some cases, these are aggravated and become chips and cracks. Large chips and cracks are often accompanied by deformation, which may reduce the accuracy of the cage itself and may hinder the smooth movement of rolling elements.
(8) Seizing	 	A phenomenon caused by abnormal heating in bearings due to various reasons

Damages	Causes	Countermeasures
Flaws, distortion, chipping, cracking and excessive wear in cages.	· Extraordinary vibration, impact, moment · Improper or insufficient lubricant · Dents made during mounting	· Re-examine load conditions. · Select proper lubricating method or lubricant. · Re-examine cage types. · Improve mounting.
Discoloration, distortion, and melting together due to heating in bearings	· Too small internal clearance · Improper or insufficient lubricant · Excessive load · Aggravated by other bearing flaws	· Provide proper internal clearance. · Select proper lubricating method or lubricant. · Re-examine bearing type. · Earlier discovery of bearing flaws

NOTES

NEEDLE ROLLER BEARINGS

B

B NEEDLE ROLLER BEARINGS

NEEDLE ROLLER BEARINGS

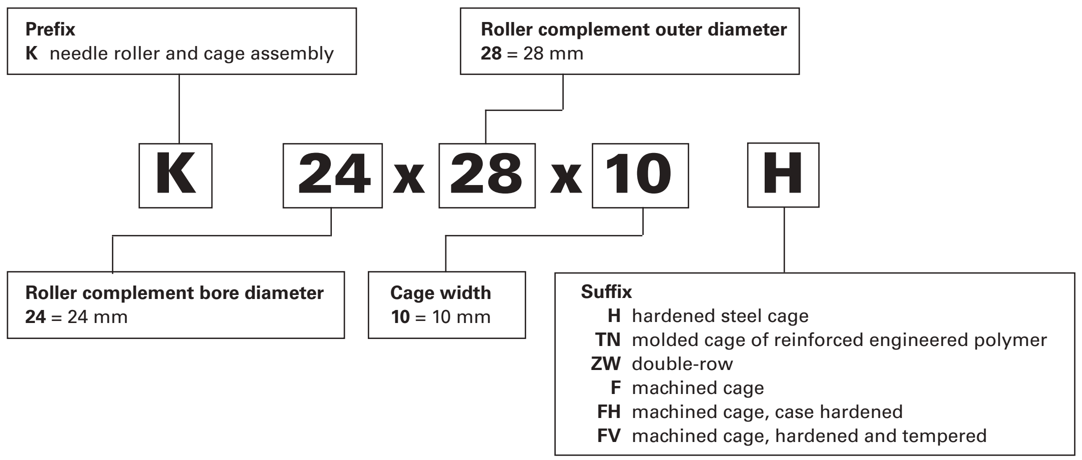
B

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

Overview: Needle roller and cage assemblies feature a complement of needles held in place by a cage with no inner or outer ring. The minimal cross section provides maximum load-carrying capability within the smallest envelope.

- **Catalog range:** 3 mm – 127 mm (0.1181 in – 5.0000 in) bore.
- **Markets:** Automotive and truck transmissions, agricultural and construction equipment, two-cycle engines, pumps and compressors.
- **Features and Benefits:**
  - Unitized design simplifies handling and installation while allowing for increased lube flow.
  - Split and segmented designs allow mounting at difficult positions on crankshafts and gear shafts.
  - Controlled contour rollers optimize contact stress distribution.
  - Special manufacturing processes help increase roller fatigue resistance and minimize axial drift effects in critical applications.
  - Optimized cage piloting geometry minimizes pressure velocity effects.
  - Steel or polymer cages are available to suit your application requirements.
  - Coatings are available to help avoid corrosion and improve wear resistance.

Radial Needle Roller and Cage Assemblies – Metric Nominal Dimensions



Prefix
K needle roller and cage assembly

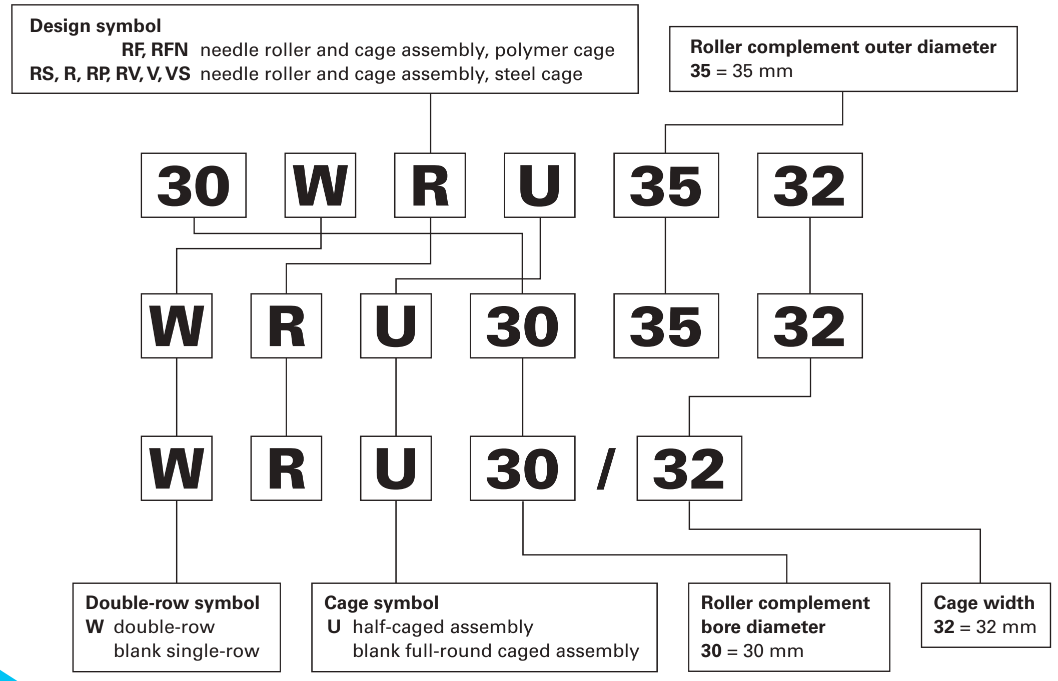
Roller complement outer diameter
28 = 28 mm

K **24** x **28** x **10** **H**

Roller complement bore diameter
24 = 24 mm

Cage width
10 = 10 mm

Suffix
H hardened steel cage
TN molded cage of reinforced engineered polymer
ZW double-row
F machined cage
FH machined cage, case hardened
FV machined cage, hardened and tempered



Design symbol
RF, RFN needle roller and cage assembly, polymer cage
RS, R, RP, RV, V, VS needle roller and cage assembly, steel cage

Roller complement outer diameter
35 = 35 mm

30 **W** **R** **U** **35** **32**

W **R** **U** **30** **35** **32**

W **R** **U** **30** / **32**

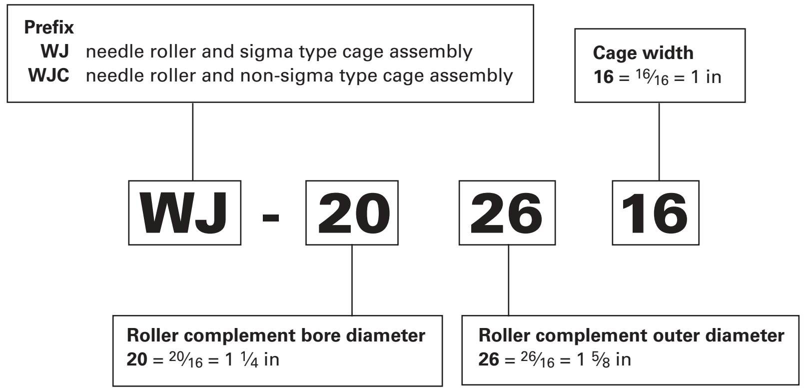
Double-row symbol
W double-row
blank single-row

Cage symbol
U half-caged assembly
blank full-round caged assembly

Roller complement bore diameter
30 = 30 mm

Cage width
32 = 32 mm

Inch Nominal Dimensions



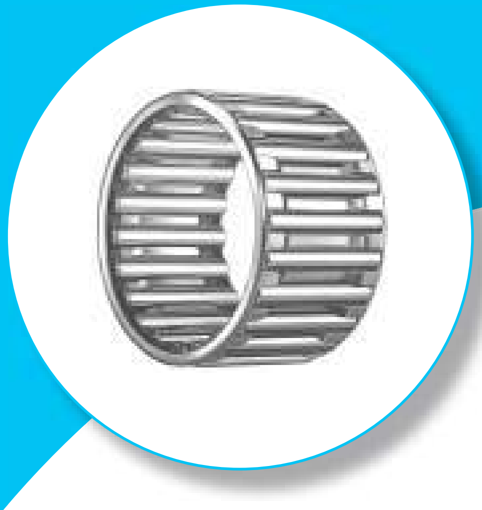
Prefix
WJ needle roller and sigma type cage assembly
WJC needle roller and non-sigma type cage assembly

Cage width
16 = $\frac{16}{16}$ = 1 in

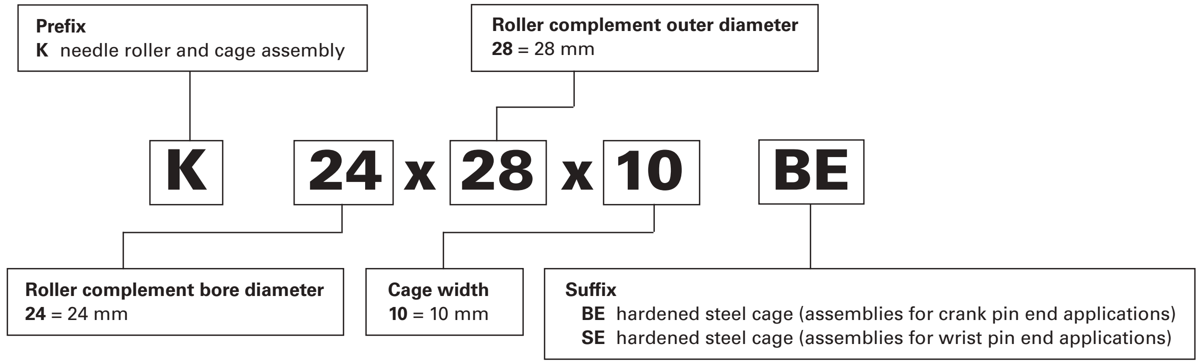
WJ - **20** **26** **16**

Roller complement bore diameter
20 = $\frac{20}{16}$ = 1 $\frac{1}{4}$ in

Roller complement outer diameter
26 = $\frac{26}{16}$ = 1 $\frac{5}{8}$ in



Radial Needle Roller and Cage Assemblies for Connecting Rod Applications – Nominal Dimensions



Prefix
K needle roller and cage assembly

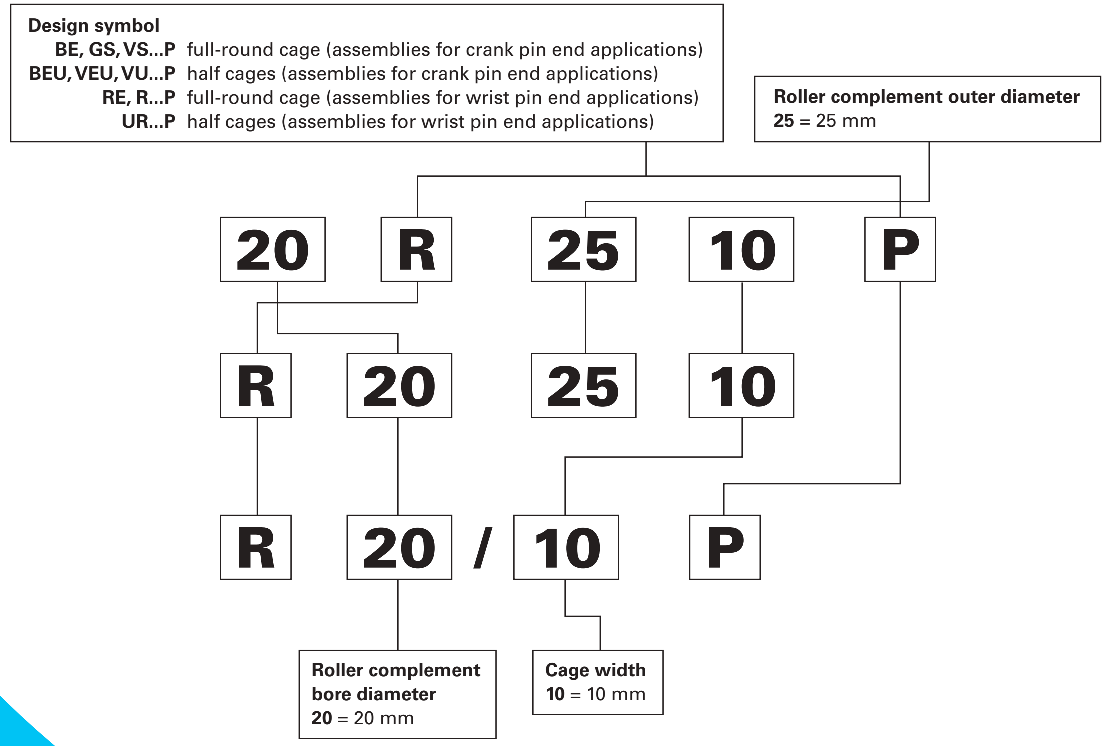
Roller complement outer diameter
28 = 28 mm

K **24** x **28** x **10** **BE**

Roller complement bore diameter
24 = 24 mm

Cage width
10 = 10 mm

Suffix
BE hardened steel cage (assemblies for crank pin end applications)
SE hardened steel cage (assemblies for wrist pin end applications)



Design symbol
BE, GS, VS…P full-round cage (assemblies for crank pin end applications)
BEU, VEU, VU…P half cages (assemblies for crank pin end applications)
RE, R…P full-round cage (assemblies for wrist pin end applications)
UR…P half cages (assemblies for wrist pin end applications)

Roller complement outer diameter
25 = 25 mm

20 **R** **25** **10** **P**

R **20** **25** **10**

R **20** / **10** **P**

Roller complement bore diameter
20 = 20 mm

Cage width
10 = 10 mm

Radial Needle Roller and Cage Assemblies

Single-Row, Double-Row Assemblies – Metric Series

Assemblies for Crank Pin End Applications – Metric Series

Assemblies for Wrist Pin End Applications – Metric Series

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

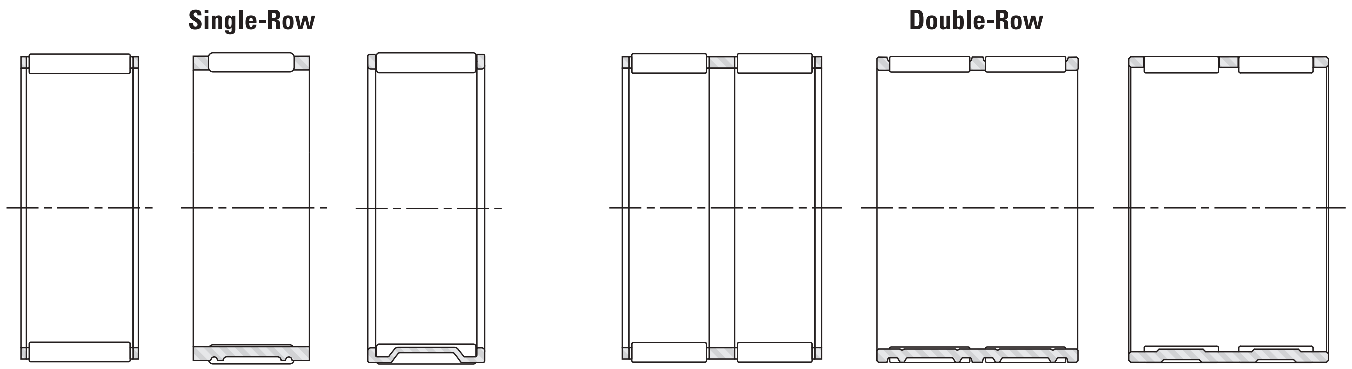
METRIC SERIES

Metric series radial needle roller and cage assemblies are available in a variety of sizes and designs. This catalog includes the most popular, standardized designs.

REFERENCE STANDARDS ARE:

- **ISO 3030** – needle roller bearings – radial needle roller and cage assemblies – boundary dimensions and tolerances.
- **DIN 5405 Part 1** – rolling bearings – needle roller bearings – radial needle roller and cage assemblies.
- **ANSI/ABMA 18.1** – needle roller bearings – radial, metric design.
- **JIS B 1536** – roller bearings – boundary dimensions and tolerances of needle roller bearings.

Before selecting specific metric series radial needle roller and cage assemblies, the engineering section should be reviewed.



K, RF, RFN **RS, R, RP** **RV, V, VS** **K ... ZW, WRF** **WR, WRS** **WRP**

Fig. B1-1. Types of Metric Series Radial Needle Roller and Cage Assemblies

CONSTRUCTION

Radial needle roller and cage assemblies have a steel cage that provides both inward and outward retention for the needle rollers. The designs provide maximum cage strength consistent with the inherent high load-ratings of needle roller bearings. Accurate guidance of the needle rollers by the cage bars allows for operation at high speeds. Needle roller and cage assemblies have either one or two rows of needle rollers.

Also listed are metric series needle roller and cage assemblies using molded, one-piece glass-reinforced engineered polymer cages. These operate well at temperatures up to 120° C (250° F) over extended periods. However, care should be exercised when these assemblies are lubricated with oils containing additives as service life may be reduced if the operating temperature exceeds 100° C (212° F). At such high temperatures oil can deteriorate with time and it is suggested that oil change intervals are observed.

Needle rollers with relieved ends used in these assemblies are made of high-carbon chrome steel, through-hardened, ground and lapped to close tolerances for diameter and roundness. See the engineering section for further discussion of relieved end rollers.

DIMENSIONAL ACCURACY

NEEDLE ROLLER GROUPS (GAGES)

Applicable: K, K .. ZW series

Metric series radial needle roller and cage assemblies are supplied with needle roller complements subdivided into groups (gages) shown in Table B1-1. This is in accordance with Grade G2 specified in ISO 3096 standard (see needle rollers, page B8-13). The group limits of the needle rollers are indicated on the package. Labels of identifying colors show the group limits of the needle rollers. The needle roller and cage assemblies of one shipment usually contain needle rollers with group limits of between 0.000 to -0.002 mm (0.0000 to -0.00008 in) and -0.005 to -0.007 mm (-0.0002 to -0.0003 in) [colors red, blue and white]. For additional information on needle roller and cage assemblies with needle rollers of different group limits contact your representative.

Applicable: RF, RFN, RS, R, RP, RV, V, VS, WRF, WR,
WRS, WRP series

The purchased group is 0.000 to -0.006 mm.

Table B1-1. Needle roller group limits (Grade G2)

Group tolerance		Marking gage
mm in	**mm** in	
0.000 0.0000	**-0.002** -0.00008	P0M2
-0.001 -0.00004	**-0.003** -0.00012	M1M3
-0.002 -0.00008	**-0.004** -0.0002	M2M4
-0.003 -0.00012	**-0.005** -0.0002	M3M5
-0.004 -0.0002	**-0.006** -0.0002	M4M6
-0.005 -0.0002	**-0.007** -0.0003	M5M7
-0.006 -0.0002	**-0.008** -0.0003	M6M8
-0.007 -0.0003	-0.009 -0.0004	M7M9
-0.008 -0.0003	**-0.010** -0.0004	M8M10
-0.009 -0.0004	**-0.011** -0.0004	M9M11

In the marking of the gages, P identifies zero (0) or plus (+), M identifies minus (-).

MOUNTING DIMENSIONS

DESIGN OF RACEWAYS

Radial needle roller and cage assemblies use the housing bore as the outer raceway and the shaft as the inner raceway. To realize full bearing load rating and life, the housing bore and the shaft raceways must have the correct geometric and metallurgical characteristics. The housing should be of sufficient cross section to maintain adequate roundness and running clearance under load. Additional design details for housings and shafts used as outer and inner raceways can be found in the engineering section. The only limit to precision of the radial clearance of a mounted assembly is the capability of the user to hold close tolerances on the inner and outer raceways. The suggested shaft tolerances listed in Table B1-2 are based on housing bore tolerance G6 and apply to metric series needle roller bearing and cage assemblies.

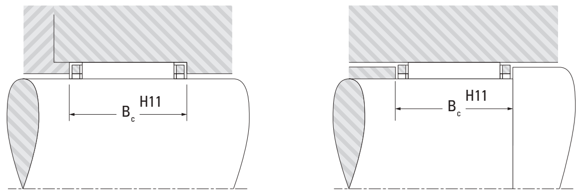
Table B1-2. Suggested shaft tolerances for housing bores machined to G6

Condition	Tolerance zone class		
	Axis		Housing hole
Radial clearance	Fw ≤ 50 mm	Fw > 50 mm	
Smaller than normal	j5	h5	G6
Normal	h5	g5	
Larger than normal	g6	f6	

AXIAL GUIDANCE REQUIREMENTS

Radial needle roller and cage assembly must be axially guided by shoulders or other suitable means. The end guiding surfaces should be hardened to minimize wear and must provide sufficient axial clearance to prevent end-locking of the assembly. Length tolerance H11 is suggested.

If end guidance is provided by a housing shoulder at one end and by a shaft shoulder at the other end, the shaft must be axially positioned to prevent end-locking of needle roller and cage assembly. The housing and shaft shoulder heights should be 70 percent to 90 percent of the needle roller diameter to provide proper axial guidance.



Guidance in the housing **Guidance in the shaft**

Fig. B1-2. Axial guidance requirements

MOUNTING IN SETS

Radial needle roller and cage assemblies that are mounted side by side must have needle rollers of the same group limits to ensure uniform load distribution.

LUBRICATION

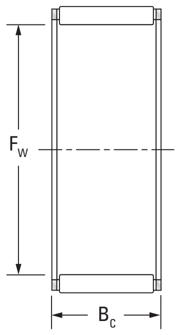
Oil is the preferred lubricant for most applications. In critical applications involving high speeds, ample oil flow must be provided. Where assemblies are subjected to high centrifugal forces – such as in epicyclic gearing, or inertia forces, as in the small end of a connecting rod – the contact pressure between the cage and the raceway guiding surface becomes critical. The allowable contact pressure depends on a combination of the induced force and the relative velocity between the cage and raceway and the rate of lubricant flow. Consult your representative when cages will be subjected to high induced forces.

SPECIAL DESIGNS

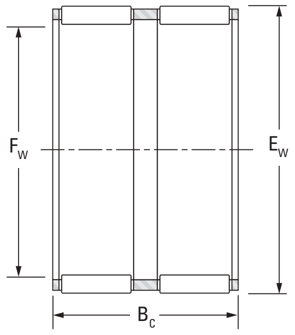
Radial needle roller and cage assemblies made to special dimensions or configurations – such as those which are split to assemble around a one-piece crankshaft – can be made available on special order. Special coated or plated cages to enhance life, under conditions of marginal lubrication and high induced forces, also can be made available.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

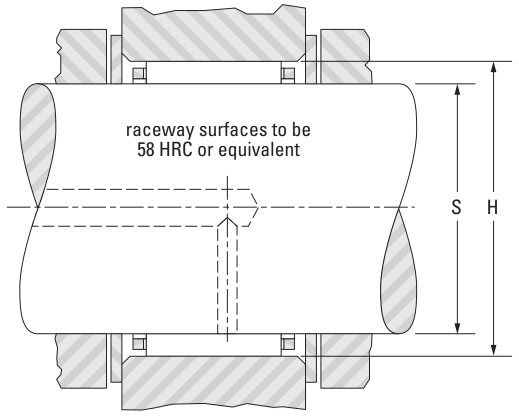
METRIC SERIES
K, K ZW SERIES



K



K ZW



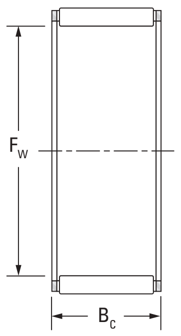
Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
3 0.1181	3 0.1181	5 0.1969	7 0.2756	K3X5X7TN	1.56 351	1.29 290	0.200	P	48000	74000	0.0002 0.0004	3.000 0.1181	2.996 0.1180	5.004 0.1970	5.012 0.1973
4 0.1575	4 0.1575	7 0.2756	7 0.276	K4X7X7TN	1.83 411	1.32 297	0.200	P	34000	52000	0.0005 0.001	4.000 0.1575	3.995 0.1573	7.014 0.2761	7.005 0.2758
5 0.1969	5 0.1969	8 0.315	8 0.315	K5X8X8TN	2.18 490	1.71 384	0.260	P	31000	47000	0.0007 0.002	5.000 0.1969	4.995 0.1967	8.014 0.3155	8.005 0.3152
	5 0.1969	8 0.315	10 0.394	K5X8X10TN	3.04 683	2.63 591	0.400	P	31000	47000	0.0008 0.002	5.000 0.1969	4.995 0.1967	8.014 0.3155	8.005 0.3152
	5 0.1969	9 0.3543	13 0.512	K5X9X13TN	4.29 964	3.55 798	0.540	P	26000	40000	0.002 0.004	5.000 0.1969	4.995 0.1967	9.014 0.3549	9.005 0.3545
6 0.2362	6 0.2362	9 0.3543	8 0.315	K6X9X8H	3.19 717	2.90 652	0.420	S	29000	44000	0.0008 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
	6 0.2362	9 0.3543	8 0.315	K6X9X8TN	2.47 555	2.07 465	0.310	P	29000	44000	0.001 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
	6 0.2362	9 0.3543	10 0.394	K6X9X10TN	3.07 690	2.74 616	0.420	P	29000	44000	0.001 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
7 0.2756	7 0.2756	10 0.3937	8 0.315	K7X10X8TN	2.74 616	2.44 549	0.370	P	28000	42000	0.001 0.002	7.000 0.2756	6.994 0.2754	10.014 0.3943	10.005 0.3939
	7 0.2756	10 0.3937	10 0.394	K7X10X10TN	3.40 764	3.22 724	0.490	P	28000	42000	0.001 0.002	7.000 0.2756	6.994 0.2754	10.014 0.3943	10.005 0.3939
	7 0.2756	11 0.4331	15 0.591	K7X11X15TN	6.44 1450	6.24 1400	0.940	P	23000	35000	0.003 0.007	7.000 0.2756	6.994 0.2754	11.017 0.4337	11.006 0.4333
8 0.3150	8 0.315	11 0.4331	8 0.315	K8X11X8FV	3.23 726	3.11 699	0.470	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	8 0.315	K8X11X8TN	2.34 526	2.05 461	0.300	P	26000	41000	0.001 0.002	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8X11X10H	4.57 1030	4.89 1100	0.740	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8X11X10FV	4.01 901	4.11 924	0.630	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8x11x10TN	3.84 864	3.91 880	0.600	P	26000	41000	0.001 0.002	8.000 0.3150	7.994 0.3147	11.006 0.4333	11.017 0.4337
	8 0.315	11 0.4331	13 0.512	K8x11x13TN	5.18 1170	5.75 1290	0.870	P	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.006 0.4333	11.017 0.4337
8 0.3150	8 0.315	11 0.4331	13 0.512	K8X11X13H	5.22 1170	5.78 1300	0.880	S	26000	41000	0.003 0.007	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
9 0.3543	9 0.3543	12 0.4724	10 0.394	K9X12X10FH	4.27 960	4.60 1030	0.700	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	10 0.394	K9X12X10FV	4.27 960	4.60 1030	0.700	S	26000	40000	0.002 0.004	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	13 0.512	K9X12X13FH	5.57 1250	6.47 1450	0.980	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	13 0.512	K9X12X13FV	5.57 1250	6.47 1450	0.980	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	13 0.5118	8 0.315	K9X13X8H	3.96 890	3.50 787	0.530	S	21000	32000	0.003 0.007	9.000 0.3543	8.994 0.3541	13.017 0.5125	13.006 0.5120
10 0.3937	10 0.3937	13 0.5118	10 0.394	K10X13X10H	5.40 1210	6.43 1450	0.980	S	25000	39000	0.002 0.004	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	10 0.394	K10X13X10TN	4.29 964	4.77 1070	0.730	P	25000	39000	0.002 0.004	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	13 0.512	K10X13X13	5.90 1330	7.16 1610	1.10	S	25000	39000	0.003 0.007	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	16 0.63	K10X13X16	7.43 1670	9.64 2170	1.50	S	25000	39000	0.004 0.009	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	14 0.5512	10 0.394	K10X14X10H	6.12 1380	6.29 1410	0.960	S	20000	31000	0.003 0.007	10.000 0.3937	9.994 0.3935	14.017 0.5519	14.006 0.5514
	10 0.3937	14 0.5512	13 0.512	K10X14X13H	7.88 1770	8.71 1960	1.35	S	20000	31000	0.004 0.009	10.000 0.3937	9.994 0.3935	14.017 0.5519	14.006 0.5514
	10 0.3937	16 0.6299	12 0.472	K10X16X12F	8.39 1890	7.47 1680	1.15	S	15000	24000	0.006 0.013	10.000 0.3937	9.994 0.3935	16.017 0.6306	16.006 0.6302
	10 0.3937	16 0.6299	12 0.472	K10X16X12TN	7.50 1690	6.40 1440	0.970	P	15000	24000	0.005 0.011	10.000 0.3937	9.994 0.3935	16.017 0.6306	16.006 0.6302
12 0.4724	12 0.4724	15 0.5906	10 0.394	K12X15X10H	5.85 1320	7.51 1690	1.15	S	24000	37000	0.003 0.007	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	15 0.5906	13 0.512	K12X15X13H	6.78 1520	9.03 2030	1.40	S	24000	37000	0.004 0.009	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	16 0.6299	13 0.512	K12X16X13H	7.49 1680	8.51 1910	1.60	S	19000	30000	0.006 0.013	12.000 0.4724	11.992 0.4721	16.017 0.6306	16.006 0.6302

(1) Cage material: P: polymer cage, S: steel cage

Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



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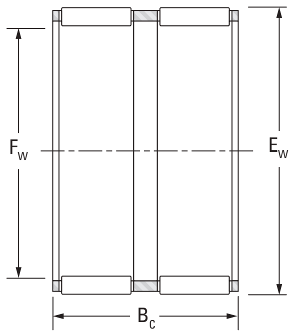
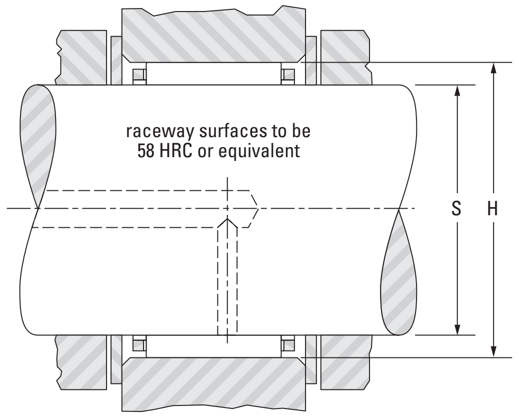


K ZW



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
12 0.4724	12 0.4724	17 0.6693	13 0.512	K12X17X13	8.93 2010	9.29 2090	1.20	S	16000	25000	0.008 0.018	12.000 0.4724	11.992 0.4721	17.017 0.6700	17.006 0.6695
	12 0.4724	18 0.7087	12 0.472	K12X18X12H	9.76 2190	9.40 2110	1.40	S	14000	22000	0.009 0.020	12.000 0.4724	11.992 0.4721	18.017 0.7093	18.006 0.7089
13 0.5118	13 0.5118	17 0.6693	10 0.394	K13X17X10	7.22 1620	8.33 1870	1.25	S	19000	29000	0.004 0.009	13.000 0.5118	12.992 0.5115	17.017 0.6700	17.006 0.6695
	13 0.5118	18 0.7087	15 0.591	K13X18X15F	10.8 2430	12.1 2720	1.85	S	16000	25000	0.008 0.01	13.000 0.5118	12.992 0.5115	18.017 0.7093	18.006 0.7089
14 0.5512	14 0.5512	18 0.7087	8 0.315	K14X18X8	5.39 1210	5.82 1310	0.880	S	19000	29000	0.004 0.009	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	10 0.394	K14X18X10	7.17 1 610	8.41 1890	1.30	S	19000	29000	0.005 0.011	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	13 0.512	K14X18X13	9.73 2190	12.5 2810	1.90	S	19000	29000	0.006 0.013	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	15 0.591	K14X18X15	10.5 2360	13.8 3100	2.15	S	19000	29000	0.007 0.015	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	17 0.669	K14X18X17H	12.4 2790	17.1 3840	2.65	S	19000	29000	0.008 0.018	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	19 0.748	13 0.512	K14X19X13H	10.2 2290	11.4 2560	1.75	S	16000	24000	0.008 0.018	14.000 0.5512	13.992 0.5509	19.020 0.7488	19.007 0.7483
	14 0.5512	19 0.748	18 0.709	K14X19X18F	13.2 2970	16.0 3600	2.50	S	16000	24000	0.011 0.024	14.000 0.5512	13.992 0.5509	19.020 0.7488	19.007 0.7483
	14 0.5512	20 0.7874	12 0.472	K14X20X12	10.5 2360	10.6 2380	1.60	S	14000	21000	0.009 0.020	14.000 0.5512	13.992 0.5509	20.020 0.7882	20.007 0.7877
15 0.5906	15 0.5906	18 0.7087	14 0.551	K15X18X14TN	7.92 1780	11.9 2680	1.80	P	13000	23000	0.003 0.007	15.000 0.5906	14.992 0.5902	18.017 0.7093	18.006 0.7089
	15 0.5906	18 0.7087	16 0.63	K15X18X16F	8.36 1880	12.6 2830	1.95	S	13000	23000	0.005 0.011	15.000 0.5906	14.992 0.5902	18.017 0.7093	18.006 0.7089
	15 0.5906	18 0.7087	17 0.669	K15X18X17	8.08 1820	12.1 2720	1.85	S	23000	36000	0.005 0.011	15.000 0.5906	14.992 0.5902	18.017 0.7093	18.006 0.7089
	15 0.5906	19 0.748	10 0.394	K15X19X10	7.87 1770	9.69 2180	1.45	S	18000	28000	0.005 0.011	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
	15 0.5906	19 0.748	13 0.512	K15X19X13	9.66 2170	12.6 2830	1.90	S	18000	28000	0.007 0.015	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
15 0.5906	15 0.5906	19 0.748	17 0.669	K15X19X17H	12.3 2770	17.2 3870	2.65	S	18000	28000	0.009 0.020	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
	15 0.5906	19 0.748	22 0.866	K15X19X22ZW	12.2 2740	17.0 3820	2.60	S	18000	28000	0.010 0.022	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
	15 0.5906	20 0.7874	13 0.512	K15X20X13H	9.93 2230	11.3 2540	1.80	S	16000	24000	0.008 0.018	15.000 0.5906	14.992 0.5902	20.020 0.7882	20.007 0.7877
	15 0.5906	21 0.8268	15 0.591	K15X21X15	13.4 3010	14.8 3330	2.30	S	14000	21000	0.013 0.029	15.000 0.5906	14.992 0.5902	21.020 0.8276	21.007 0.8270
	15 0.5906	21 0.8268	21 0.827	K15X21X21H	18.0 4050	21.7 4880	3.40	S	14000	21000	0.018 0.040	15.000 0.5906	14.992 0.5902	21.020 0.8276	21.007 0.8270
16 0.6299	16 0.6299	20 0.7874	8 0.315	K16X20X8F	6.37 1430	7.51 1690	1.15	S	18000	28000	0.005 0.011	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	10 0.394	K16X20X10H	7.82 1760	9.76 2190	1.50	S	18000	28000	0.006 0.013	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	13 0.512	K16X20X13	10.1 2270	13.5 3030	2.05	S	18000	28000	0.007 0.015	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	14 0.551	K16X20X14	10.8 2430	14.8 3330	2.25	S	18000	28000	0.007 0.015	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	17 0.669	K16X20X17H	12.9 2900	18.5 4160	2.85	S	18000	28000	0.008 0.018	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	20 0.787	K16X20X20	13.4 3010	19.5 4380	3.05	S	18000	28000	0.011 0.024	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	22 0.8661	12 0.472	K16X22X12	11.2 2520	11.9 2680	1.80	S	19000	29000	0.010 0.022	16.000 0.6299	15.992 0.6296	22.020 0.8669	22.007 0.8664
	16 0.6299	22 0.8661	16 0.63	K16X22X16H	14.9 3350	17.2 3870	2.70	S	19000	29000	0.014 0.031	16.000 0.6299	15.992 0.6296	22.020 0.8669	22.007 0.8664
	16 0.6299	22 0.8661	20 0.787	K16X22X20	18.6 4180	22.9 5150	3.60	S	19000	29000	0.017 0.037	16.000 0.6299	15.992 0.6296	22.020 0.8669	22.007 0.8664
	16 0.6299	24 0.9449	20 0.787	K16X24X20	20.2 4540	21.4 4810	3.45	S	20000	30000	0.025 0.055	16.000 0.6299	15.992 0.6296	24.020 0.9457	24.007 0.9452
17 0.6693	17 0.6693	20 0.7874	10 0.394	K17X20X10	5.96 1340	8.53 1920	1.30	S	16000	25000	0.004 0.009	17.000 0.6693	16.992 0.6690	20.020 0.7882	20.007 0.7877
	17 0.6693	21 0.8268	10 0.394	K17X21X10	8.12 1830	10.4 2340	1.60	S	17000	26000	0.006 0.013	17.000 0.6693	16.992 0.6690	21.020 0.8276	21.007 0.8270

(1) Cage material: P: polymer cage, S: steel cage

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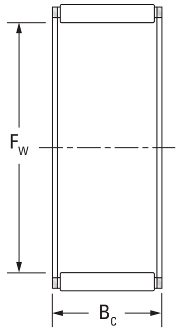
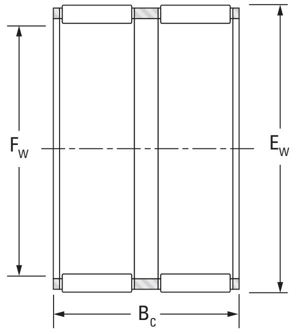
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



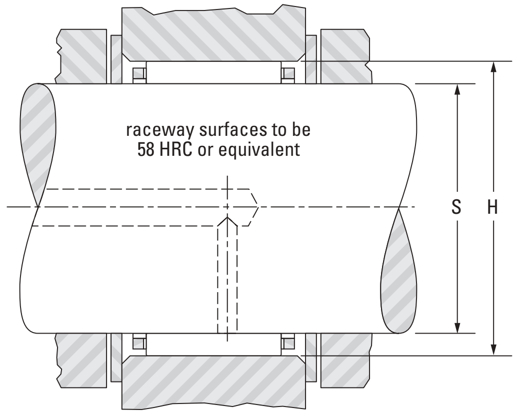
K



K ZW

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
17 0.6693	**17** 0.6693	**21** 0.8268	**13** 0.512	K17X21X13H	**10.5** 2360	**14.5** 3260	2.20	S	17000	26000	**0.008** 0.018	**17.000** 0.6693	**16.992** 0.6690	**21.020** 0.8276	**21.007** 0.8270
	17 0.6693	**21** 0.8268	**15** 0.591	K17X21X15	**11.4** 2560	**16.1** 3620	2.50	S	17000	26000	**0.008** 0.018	**17.000** 0.6693	**16.992** 0.6690	**21.020** 0.8276	**21.007** 0.8270
	17 0.6693	**21** 0.8268	**17** 0.669	K17X21X17H	**13.4** 3010	**19.8** 4450	3.05	S	17000	26000	**0.011** 0.024	**17.000** 0.6693	**16.992** 0.6690	**21.020** 0.8276	**21.007** 0.8270
	17 0.6693	**22** 0.8661	**20** 0.787	K17X22X20FH	**17.0** 3820	**23.3** 5240	3.65	S	17000	27000	**0.015** 0.033	**17.000** 0.6693	**16.992** 0.6690	**22.020** 0.8669	**22.007** 0.8664
	17 0.6693	**23** 0.9055	**15** 0.591	K17X23X15F	**14.1** 3170	**16.3** 3660	2.55	S	18000	27000	**0.010** 0.022	**17.000** 0.6693	**16.992** 0.6690	**23.020** 0.9063	**23.007** 0.9058
18 0.7087	**18** 0.7087	**22** 0.8661	**8** 0.315	K18X22X8F	**6.32** 1420	**7.70** 1730	1.15	S	16000	24000	**0.005** 0.011	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**10** 0.394	K18X22X10H	**8.41** 1890	**11.1** 2500	1.70	S	16000	24000	**0.006** 0.013	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**13** 0.512	K18X22X13H	**10.8** 2430	**15.4** 3460	2.35	S	16000	24000	**0.008** 0.018	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**14** 0.551	K18X22X14	**11.6** 2610	**16.8** 3780	2.55	S	16000	24000	**0.009** 0.020	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**14** 0.551	K18X22X14FV	**11.3** 2540	**16.3** 3660	2.45	S	16000	24000	**0.009** 0.020	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**17** 0.669	K18X22X17H	**13.3** 2990	**19.9** 4470	3.10	S	16000	24000	**0.009** 0.020	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**22** 0.8661	**20** 0.787	K18X22X20F	**15.0** 3370	**23.4** 5260	3.65	S	16000	24000	**0.011** 0.024	**18.000** 0.7087	**17.992** 0.7083	**22.020** 0.8669	**22.007** 0.8664
	18 0.7087	**24** 0.9449	**12** 0.472	K18X24X12	**11.8** 2650	**13.1** 2940	1.95	S	17000	25000	**0.011** 0.024	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
	18 0.7087	**24** 0.9449	**20** 0.787	K18X24X20H	**19.4** 4360	**24.9** 5600	3.90	S	16000	25000	**0.019** 0.042	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
	18 0.7087	**25** 0.9843	**22** 0.866	K18X25X22H	**23.3** 5240	**28.6** 6430	4.50	S	17000	26000	**0.025** 0.055	**18.000** 0.7087	**17.992** 0.7083	**25.020** 0.9850	**25.007** 0.9845
	18 0.7087	**26** 1.0236	**12** 0.472	K18X26X12FV	**13.8** 3100	**13.5** 3030	2.10	S	11000	17000	**0.020** 0.044	**18.000** 0.7087	**17.992** 0.7083	**26.020** 1.0244	**26.007** 1.0239
	18 0.7087	**26** 1.0236	**20** 0.787	K18X26X20F	**21.7** 4880	**24.1** 5420	3.85	S	17000	26000	**0.027** 0.060	**18.000** 0.7087	**17.992** 0.7083	**26.020** 1.0244	**26.007** 1.0239

(1) Cage material: P: polymer cage, S: steel cage



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
19 0.7480	**19** 0.748	**23** 0.9055	**13** 0.512	K19X23X13	**10.8** 2430	**15.5** 3480	2.35	S	15000	23000	**0.008** 0.018	**19.000** 0.7480	**18.991** 0.7477	**23.020** 0.9063	**23.007** 0.9058
	19 0.748	**23** 0.9055	**17** 0.669	K19X23X17	**13.4** 3010	**20.6** 4630	3.20	S	15000	23000	**0.011** 0.024	**19.000** 0.7480	**18.991** 0.7477	**23.020** 0.9063	**23.007** 0.9058
20 0.7874	**20** 0.7874	**24** 0.9449	**8** 0.315	K20X24X8F	**7.31** 1640	**9.60** 2160	1.50	S	14000	22000	**0.005** 0.011	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**10** 0.394	K20X24X10H	**8.97** 2020	**12.5** 2810	2.05	S	14000	22000	**0.006** 0.013	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**12** 0.472	K20X24X12	**10.7** 2410	**15.7** 3530	2.40	S	14000	22000	**0.008** 0.018	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**13** 0.512	K20X24X13H	**11.5** 2590	**17.3** 3890	1.30	S	14000	22000	**0.009** 0.020	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**14** 0.551	K20X24X14	**12.4** 2790	**18.9** 4250	2.85	S	14000	22000	**0.009** 0.020	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**24** 0.9449	**17** 0.669	K20X24X17H	**14.8** 3330	**23.7** 5330	3.65	S	14000	22000	**0.011** 0.024	**20.000** 0.7874	**19.991** 0.7870	**24.020** 0.9457	**24.007** 0.9452
	20 0.7874	**26** 1.0236	**12** 0.472	K20X26X12	**13.0** 2920	**15.3** 3440	2.30	S	15000	23000	**0.012** 0.026	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**26** 1.0236	**13** 0.512	K20X26X13H	**13.4** 3010	**15.9** 3570	2.35	S	15000	23000	**0.014** 0.031	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**26** 1.0236	**17** 0.669	K20X26X17H	**19.3** 4340	**25.5** 5730	4.00	S	15000	23000	**0.017** 0.037	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**26** 1.0236	**20** 0.787	K20X26X20	**20.3** 4560	**27.2** 6110	4.25	S	15000	23000	**0.020** 0.044	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**28** 1.1024	**20** 0.787	K20X28X20H	**24.6** 5530	**29.0** 6520	2.70	S	15000	23000	**0.028** 0.062	**20.000** 0.7874	**19.991** 0.7870	**28.020** 1.1031	**28.007** 1.1026
	20 0.7874	**28** 1.1024	**25** 0.984	K20X28X25H	**29.7** 6680	**37.0** 8320	5.80	S	15000	23000	**0.036** 0.079	**20.000** 0.7874	**19.991** 0.7870	**28.020** 1.1031	**28.007** 1.1026
	20 0.7874	**30** 1.1811	**30** 1.181	K20X30X30H	**38.9** 8750	**45.8** 10300	7.20	S	16000	24000	**0.055** 0.121	**20.000** 0.7874	**19.991** 0.7870	**30.020** 1.1819	**30.007** 1.1814
	20 0.7874	**32** 1.2598	**36** 1.417	K20X32X36H	**49.9** 11220	**57.0** 12810	9.15	S	16000	25000	**0.082** 0.181	**20.000** 0.7874	**19.991** 0.7870	**32.025** 1.2608	**32.009** 1.2602
21 0.8268	**21** 0.8268	**25** 0.9843	**17** 0.669	K21X25X17H	**14.3** 3210	**23.1** 5190	3.60	S	14000	21000	**0.013** 0.029	**21.000** 0.8268	**20.991** 0.8264	**25.020** 0.9850	**25.007** 0.9845

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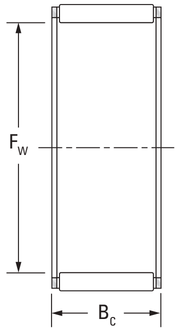
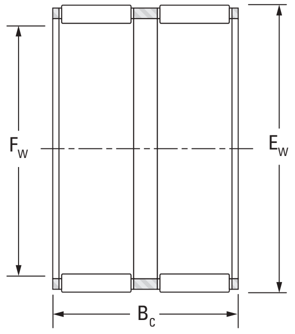
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



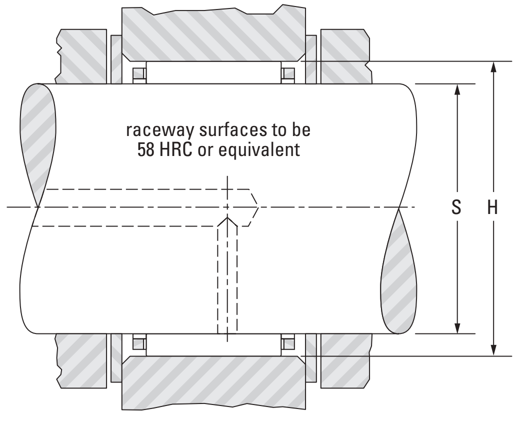
K



K ZW

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
22 0.8661	22 0.8661	26 1.0236	10 0.394	K22X26X10H	9.81 2210	14.5 3 260	2.20	S	13000	20000	0.007 0.015	22.000 0.8661	21.991 0.8658	26.020 1.0244	26.007 1.0239
	22 0.8661	26 1.0236	13 0.512	K22X26X13H	11.8 2650	18.3 4110	2.95	S	13000	20000	0.012 0.026	22.000 0.8661	21.991 0.8658	26.020 1.0244	26.007 1.0239
	22 0.8661	26 1.0236	17 0.669	K22X26X17H	15.6 3510	26.3 5910	4.05	S	13000	20000	0.012 0.026	22.000 0.8661	21.991 0.8658	26.020 1.0244	26.007 1.0239
	22 0.8661	26 1.0236	18 0.709	K22X26X18H	15.3 3440	25.5 5730	4.00	S	13000	20000	0.017 0.037	22.000 0.8661	21.991 0.8658	26.020 1.0244	26.007 1.0239
	22 0.8661	28 1.1024	13 0.512	K22X28X13	13.9 3120	17.1 3840	2.60	S	13000	20000	0.015 0.033	22.000 0.8661	21.991 0.8658	28.020 1.1031	28.007 1.1026
	22 0.8661	28 1.1024	17 0.669	K22X28X17H	18.2 4090	24.2 5440	3.80	S	13000	20000	0.020 0.044	22.000 0.8661	21.991 0.8658	28.020 1.1031	28.007 1.1026
	22 0.8661	30 1.1811	15 0.591	K22X30X15H	19.7 4430	22.3 5010	3.45	S	14000	21000	0.023 0.051	22.000 0.8661	21.991 0.8658	30.020 1.1819	30.007 1.1814
	22 0.8661	30 1.1811	20 0.787	K22X30X20FV	24.4 5490	29.4 6610	4.70	S	14000	21000	0.031 0.068	22.000 0.8661	21.991 0.8658	30.020 1.1819	30.007 1.1814
	22 0.8661	32 1.2598	24 0.945	K22X32X24F	33.1 7440	37.9 8520	6.05	S	14000	22000	0.046 0.101	22.000 0.8661	21.991 0.8658	32.025 1.2608	32.009 1.2602
	22 0.8661	32 1.2598	30 1.181	K22X32X30H	41.8 9400	51.3 11530	8.05	S	14000	22000	0.057 0.126	22.000 0.8661	21.991 0.8658	32.025 1.2608	32.009 1.2602
23 0.9055	23 0.9055	28 1.1024	24 0.945	K23X28X24F	22.4 5040	36.2 8140	5.70	S	12000	19000	0.023 0.051	23.000 0.9055	22.991 0.9052	28.020 1.1031	28.007 1.1026
	23 0.9055	35 1.378	16 0.63	K23X35X16H	25.9 5820	25.1 5640	3.90	S	14000	21000	0.040 0.088	23.000 0.9055	22.991 0.9052	35.025 1.3789	35.009 1.3783
24 0.9449	24 0.9449	28 1.1024	10 0.394	K24X28X10H	9.67 2170	14.6 3280	2.20	S	12000	18000	0.027 0.060	24.000 0.9449	23.991 0.9445	28.020 1.1031	28.007 1.1026
	24 0.9449	28 1.1024	13 0.512	K24X28X13H	12.5 2810	20.2 4540	3.05	S	12000	18000	0.010 0.022	24.000 0.9449	23.991 0.9445	28.020 1.1031	28.007 1.1026
	24 0.9449	28 1.1024	16 0.63	K24X28X16F	12.6 2830	20.4 4590	3.10	S	12000	18000	0.012 0.026	24.000 0.9449	23.991 0.9445	28.020 1.1031	28.007 1.1026
	24 0.9449	28 1.1024	17 0.669	K24X28X17H	15.4 3460	26.4 5930	4.10	S	12000	18000	0.013 0.029	24.000 0.9449	23.991 0.9445	28.020 1.1031	28.007 1.1026
	24 0.9449	30 1.1811	10 0.394	K24X30X10TN	11.3 2540	13.5 3030	2.05	P	12000	19000	0.008 0.018	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814

(1) Cage material: P: polymer cage, S: steel cage



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
24 0.9449	24 0.9449	30 1.1811	17 0.669	K24X30X17H	19.8 4450	27.7 6230	4.35	S	12000	19000	0.020 0.044	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814
	24 0.9449	30 1.1811	22 0.866	K24X30X22	25.0 5620	37.3 8390	5.80	S	12000	19000	0.024 0.053	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814
	24 0.9449	36 1.4173	23 0.906	K24X36X23H	37.1 8340	40.1 9010	6.40	S	13000	20000	0.070 0.154	24.000 0.9449	23.991 0.9445	36.025 1.4183	36.009 1.4177
25 0.9843	25 0.9843	29 1.1417	10 0.394	K25X29X10H	9.61 2160	14.6 3280	2.25	S	11000	17000	0.008 0.018	25.000 0.9843	24.991 0.9839	29.020 1.1425	29.007 1.1420
	25 0.9843	29 1.1417	13 0.512	K25X29X13H	12.8 2880	21.1 4740	3.20	S	11000	17000	0.010 0.022	25.000 0.9843	24.991 0.9839	29.020 1.1425	29.007 1.1420
	25 0.9843	29 1.1417	17 0.669	K25X29X17H	15.1 3390	26.2 5890	4.10	S	11000	17000	0.016 0.035	25.000 0.9843	24.991 0.9839	29.020 1.1425	29.007 1.1420
	25 0.9843	30 1.1811	13 0.512	K25X30X13	14.6 3280	21.4 4810	3.25	S	11000	17000	0.012 0.026	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	17 0.669	K25X30X17H	18.8 4230	29.8 6700	4.60	S	11000	17000	0.016 0.035	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	18 0.709	K25X30X18	20.6 4630	33.4 7510	5.30	S	11000	17000	0.017 0.037	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	20 0.787	K25X30X20H	21.9 4920	36.1 8120	5.65	S	11000	17000	0.019 0.042	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	24 0.945	K25X30X24H	24.8 5580	42.4 9530	6.60	S	11000	17000	0.024 0.053	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	26 1.024	K25X30X26ZW	23.0 5170	38.6 8680	5.90	S	11000	17000	0.027 0.060	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	31 1.2205	14 0.551	K25X31X14H	16.8 3780	22.7 5100	3.45	S	12000	18000	0.017 0.037	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	31 1.2205	17 0.669	K25X31X17H	19.7 4430	27.8 6250	4.35	S	12000	18000	0.020 0.044	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	31 1.2205	21 0.827	K25X31X21H	25.1 5640	38.0 8540	5.95	S	12000	18000	0.026 0.057	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	31 1.2205	24 0.945	K25X31X24FH	25.3 5690	38.5 8660	6.05	S	12000	18000	0.031 0.068	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	32 1.2598	16 0.63	K25X32X16	19.8 4450	25.3 5690	4.00	S	12000	18000	0.027 0.060	25.000 0.9843	24.991 0.9839	32.025 1.2608	32.009 1.2602

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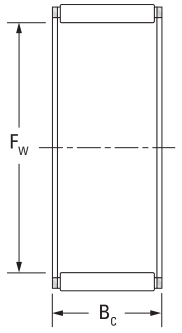
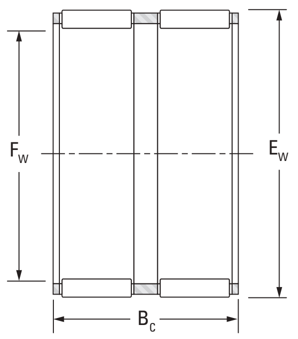
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

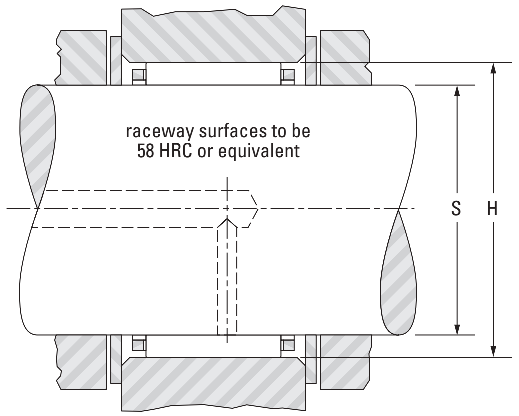
METRIC SERIES
K, K ZW SERIES



K



K ZW



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
25 0.9843	**25** 0.9843	**33** 1.2992	**20** 0.787	K25X33X20H	**28.8** 6470	**37.6** 8450	5.95	S	12000	18000	**0.035** 0.077	**25.000** 0.9843	**24.991** 0.9839	**33.025** 1.3002	**33.009** 1.2996
	25 0.9843	**33** 1.2992	**24** 0.945	K25X33X24H	**32.3** 7260	**43.5** 9780	6.85	S	12000	18000	**0.038** 0.084	**25.000** 0.9843	**24.991** 0.9839	**33.025** 1.3002	**33.009** 1.2996
	25 0.9843	**33** 1.2992	**25** 0.984	K25X33X25H	**33.0** 7420	**44.6** 10030	7.00	S	12000	18000	**0.041** 0.090	**25.000** 0.9843	**24.991** 0.9839	**33.025** 1.3002	**33.009** 1.2996
	25 0.9843	**35** 1.378	**23.7** 0.933	K25X35X23,7H	**35.9** 8070	**42.3** 9510	6.90	S	12000	19000	**0.050** 0.110	**25.000** 0.9843	**24.991** 0.9839	**35.025** 1.3789	**35.009** 1.3783
	25 0.9843	**35** 1.378	**25** 0.984	K25X35X25H	**37.8** 8500	**46.2** 10390	7.25	S	12000	19000	**0.054** 0.119	**25.000** 0.9843	**24.991** 0.9839	**35.025** 1.3789	**35.009** 1.3783
	25 0.9843	**35** 1.378	**30** 1.181	K25X35X30H	**44.6** 10030	**57.2** 12860	9.00	S	12000	19000	**0.060** 0.132	**25.000** 0.9843	**24.991** 0.9839	**35.025** 1.3789	**35.009** 1.3783
	25 0.9843	**35** 1.378	**36** 1.417	K25X35X36H	**52.4** 11780	**70.4** 15830	11.0	S	12000	19000	**0.074** 0.163	**25.000** 0.9843	**24.991** 0.9839	**35.025** 1.3789	**35.009** 1.3783
	25 0.9843	**37** 1.4567	**20** 0.787	K25X37X20H	**32.5** 7310	**34.1** 7670	5.45	S	12000	19000	**0.055** 0.121	**25.000** 0.9843	**24.991** 0.9839	**37.025** 1.4577	**37.009** 1.4570
26 1.0236	**26** 1.0236	**30** 1.1811	**10** 0.394	K26X30X10F	**9.46** 2130	**14.5** 3260	2.20	S	11000	16000	**0.007** 0.015	**26.000** 1.0236	**25.991** 1.0233	**30.020** 1.1819	**30.007** 1.1814
	26 1.0236	**30** 1.1811	**13** 0.512	K26X30X13	**12.3** 2770	**20.4** 4590	3.10	S	10000	16000	**0.011** 0.024	**26.000** 1.0236	**25.991** 1.0233	**30.020** 1.1819	**30.007** 1.1814
	26 1.0236	**30** 1.1811	**17** 0.669	K26X30X17	**15.0** 3370	**26.3** 5910	3.10	S	10000	16000	**0.014** 0.031	**26.000** 1.0236	**25.991** 1.0233	**30.020** 1.1819	**30.007** 1.1814
	26 1.0236	**30** 1.1811	**22** 0.866	K26X30X22ZW	**16.7** 3750	**30.2** 6790	4.60	S	10000	16000	**0.018** 0.040	**26.000** 1.0236	**25.991** 1.0233	**30.020** 1.1819	**30.007** 1.1814
28 1.1024	**28** 1.1024	**32** 1.2598	**21** 0.827	K28X32X21F	**18.7** 4200	**35.7** 8030	5.55	S	9900	15000	**0.018** 0.040	**28.000** 1.1024	**27.991** 1.1020	**32.025** 1.2608	**32.009** 1.2602
	28 1.1024	**33** 1.2992	**13** 0.512	K28X33X13F	**14.1** 3170	**21.4** 4810	3.25	S	10000	15000	**0.015** 0.033	**28.000** 1.1024	**27.991** 1.1020	**33.025** 1.3002	**33.009** 1.2996
	28 1.1024	**33** 1.2992	**17** 0.669	K28X33X17H	**19.8** 4450	**33.0** 7420	5.10	S	10000	15000	**0.018** 0.040	**28.000** 1.1024	**27.991** 1.1020	**33.025** 1.3002	**33.009** 1.2996
	28 1.1024	**33** 1.2992	**27** 1.063	K28X33X27	**29.0** 6520	**53.8** 12090	8.30	S	10000	15000	**0.027** 0.060	**28.000** 1.1024	**27.991** 1.1020	**33.025** 1.3002	**33.009** 1.2996
	28 1.1024	**34** 1.3386	**17** 0.669	K28X34X17	**21.1** 4740	**31.5** 7080	6.30	S	10000	16000	**0.022** 0.049	**28.000** 1.1024	**27.991** 1.1020	**34.025** 1.3396	**34.009** 1.3389
28 1.1024	**28** 1.1024	**34** 1.3386	**20** 0.787	K28X34X20H	**24.4** 5490	**37.8** 8500	7.65	S	10000	16000	**0.025** 0.055	**28.000** 1.1024	**27.991** 1.1020	**34.025** 1.3396	**34.009** 1.3389
	28 1.1024	**35** 1.378	**15** 0.591	K28X35X15H	**19.5** 4380	**25.6** 5760	3.95	S	10000	16000	**0.025** 0.055	**28.000** 1.1024	**27.991** 1.1020	**35.025** 1.3789	**35.009** 1.3783
	28 1.1024	**35** 1.378	**16** 0.63	K28X35X16H	**21.5** 4830	**29.1** 6540	4.60	S	10000	16000	**0.026** 0.057	**28.000** 1.1024	**27.991** 1.1020	**35.025** 1.3789	**35.009** 1.3783
	28 1.1024	**35** 1.378	**27** 1.063	K28X35X27H	**35.2** 7910	**54.7** 12300	8.50	S	10000	16000	**0.042** 0.093	**28.000** 1.1024	**27.991** 1.1020	**35.025** 1.3789	**35.009** 1.3783
	28 1.1024	**36** 1.4173	**20** 0.787	K28X36X20FV	**27.8** 6250	**37.0** 8320	5.95	S	10000	16000	**0.039** 0.086	**28.000** 1.1024	**27.991** 1.1020	**36.025** 1.4183	**36.009** 1.4177
	28 1.1024	**38** 1.4961	**25.5** 1.004	K28X38X25,5	**40.9** 9190	**52.7** 11850	8.25	S	11000	16000	**0.059** 0.130	**28.000** 1.1024	**27.991** 1.1020	**38.025** 1.4970	**38.009** 1.4964
	28 1.1024	**40** 1.5748	**18** 0.709	K28X40X18H	**33.6** 7550	**36.5** 8210	5.90	S	11000	17000	**0.060** 0.132	**28.000** 1.1024	**27.991** 1.1020	**40.025** 1.5758	**40.009** 1.5752
	28 1.1024	**40** 1.5748	**25** 0.984	K28X40X25H	**45.5** 10230	**54.0** 12140	8.55	S	11000	17000	**0.072** 0.159	**28.000** 1.1024	**27.991** 1.1020	**40.025** 1.5758	**40.009** 1.5752
	28 1.1024	**40** 1.5748	**30** 1.181	K28X40X30H	**54.3** 12210	**67.8** 15240	10.7	S	11000	17000	**0.100** 0.220	**28.000** 1.1024	**27.991** 1.1020	**40.025** 1.5758	**40.009** 1.5752
	28 1.1024	**41** 1.6142	**25** 0.984	K28X41X25H	**49.2** 11060	**57.1** 12840	9.05	S	11000	17000	**0.082** 0.181	**28.000** 1.1024	**27.991** 1.1020	**41.025** 1.6152	**41.009** 1.6145
29 1.1417	**29** 1.1417	**34** 1.3386	**27** 1.063	K29X34X27F	**28.9** 6500	**54.0** 12140	8.40	S	9700	15000	**0.033** 0.073	**29.000** 1.1417	**28.991** 1.1414	**34.025** 1.3396	**34.009** 1.3389
30 1.1811	**30** 1.1811	**34** 1.3386	**13** 0.512	K30X34X13	**13.5** 3030	**24.1** 5420	3.65	S	9200	14000	**0.011** 0.024	**30.000** 1.1811	**29.991** 1.1807	**34.025** 1.3396	**34.009** 1.3389
	30 1.1811	**35** 1.378	**13** 0.512	K30X35X13H	**15.6** 3510	**24.9** 5600	3.80	S	9300	14000	**0.017** 0.037	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**35** 1.378	**17** 0.669	K30X35X17H	**20.2** 4540	**34.6** 7780	5.35	S	9300	14000	**0.022** 0.049	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**35** 1.378	**20** 0.787	K30X35X20H	**23.5** 5280	**41.9** 9420	6.55	S	9300	14000	**0.023** 0.051	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**35** 1.378	**23** 0.906	K30X35X23F	**25.6** 5760	**46.8** 10520	7.40	S	9300	14000	**0.028** 0.062	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**35** 1.378	**27** 1.063	K30X35X27H	**30.6** 6880	**59.0** 13260	9.10	S	9300	14000	**0.032** 0.071	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783

(1) Cage material: P: polymer cage, S: steel cage

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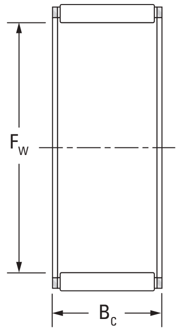
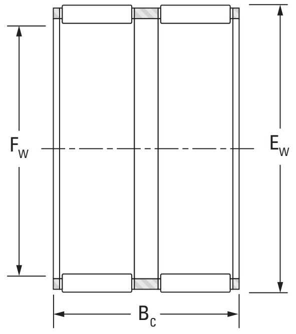
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



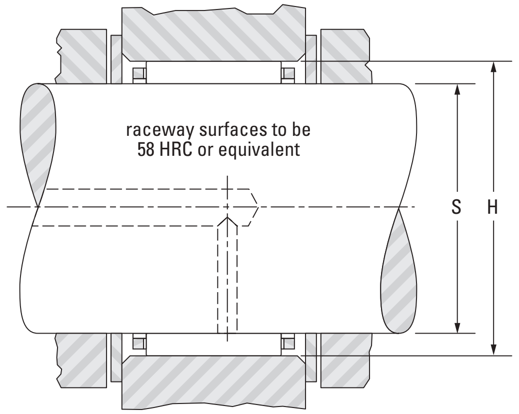
K



K ZW

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min-1		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
30 1.1811	**30** 1.1811	**35** 1.378	**27** 1.063	K30X35X27HZW	**19.9** 4470	**33.6** 7550	5.10	S	9300	14000	**0.033** 0.073	**30.000** 1.1811	**29.991** 1.1807	**35.025** 1.3789	**35.009** 1.3783
	30 1.1811	**36** 1.4173	**14** 0.551	K30X36X14	**18.0** 4050	**26.2** 5890	4.00	S	9500	15000	**0.020** 0.044	**30.000** 1.1811	**29.991** 1.1807	**36.025** 1.4183	**36.009** 1.4177
	30 1.1811	**37** 1.4567	**18** 0.709	K30X37X18	**24.3** 5460	**34.8** 7820	6.00	S	9600	15000	**0.033** 0.073	**30.000** 1.1811	**29.991** 1.1807	**37.025** 1.4577	**37.009** 1.4570
	30 1.1811	**40** 1.5748	**30** 1.181	K30X40X30H	**49.2** 11060	**67.8** 15240	10.6	S	9900	15000	**0.077** 0.170	**30.000** 1.1811	**29.991** 1.1807	**40.025** 1.5758	**40.009** 1.5752
	30 1.1811	**42** 1.6535	**30** 1.181	K30X42X30H	**54.2** 12180	**68.6** 15420	10.8	S	10000	16000	**0.096** 0.212	**30.000** 1.1811	**29.991** 1.1807	**42.025** 1.6545	**42.009** 1.6539
	30 1.1811	**44** 1.7323	**26** 1.024	K30X44X26H	**52.4** 11780	**59.9** 13470	9.55	S	10000	16000	**0.095** 0.209	**30.000** 1.1811	**29.991** 1.1807	**44.025** 1.7333	**44.009** 1.7326
32 1.2598	**32** 1.2598	**36** 1.4173	**15** 0.591	K32X36X15F	**11.6** 2610	**20.2** 4540	3.10	S	8600	13000	**0.015** 0.033	**32.000** 1.2598	**31.989** 1.2594	**36.025** 1.4183	**36.009** 1.4177
	32 1.2598	**37** 1.4567	**13** 0.512	K32X37X13	**15.2** 3420	**24.4** 5490	4.00	S	8700	13000	**0.018** 0.040	**32.000** 1.2598	**31.989** 1.2594	**37.025** 1.4577	**37.009** 1.4570
	32 1.2598	**37** 1.4567	**17** 0.669	K32X37X17H	**20.0** 4500	**34.8** 7820	5.40	S	8700	13000	**0.020** 0.044	**32.000** 1.2598	**31.989** 1.2594	**37.025** 1.4577	**37.009** 1.4570
	32 1.2598	**37** 1.4567	**27** 1.063	K32X37X27	**29.3** 6590	**56.8** 12770	8.85	S	8700	13000	**0.035** 0.077	**32.000** 1.2598	**31.989** 1.2594	**37.025** 1.4577	**37.009** 1.4570
	32 1.2598	**38** 1.4961	**20** 0.787	K32X38X20H	**27.3** 6140	**45.7** 10270	7.15	S	8800	14000	**0.030** 0.066	**32.000** 1.2598	**31.989** 1.2594	**38.025** 1.4970	**38.009** 1.4964
	32 1.2598	**38** 1.4961	**26** 1.024	K32X38X26H	**33.2** 7460	**58.8** 13220	9.15	S	8800	14000	**0.037** 0.082	**32.000** 1.2598	**31.989** 1.2594	**38.025** 1.4970	**38.009** 1.4964
	32 1.2598	**39** 1.5354	**16** 0.63	K32X39X16H	**23.0** 5170	**33.0** 7420	5.20	S	8900	14000	**0.030** 0.066	**32.000** 1.2598	**31.989** 1.2594	**39.025** 1.5364	**39.009** 1.5358
	32 1.2598	**39** 1.5354	**18** 0.709	K32X39X18H	**25.8** 5800	**38.2** 8590	6.05	S	8900	14000	**0.033** 0.073	**32.000** 1.2598	**31.989** 1.2594	**39.025** 1.5364	**39.009** 1.5358
	32 1.2598	**40** 1.5748	**25** 0.984	K32X40X25H	**37.9** 8520	**57.2** 12860	8.90	S	9000	14000	**0.052** 0.115	**32.000** 1.2598	**31.989** 1.2594	**40.025** 1.5758	**40.009** 1.5752
	32 1.2598	**40** 1.5748	**36** 1.417	K32X40X36H	**52.3** 11760	**86.4** 19420	13.6	S	9000	14000	**0.080** 0.176	**32.000** 1.2598	**31.989** 1.2594	**40.025** 1.5758	**40.009** 1.5752
	32 1.2598	**42** 1.6535	**42** 1.654	K32X42X42H	**69.2** 15560	**108** 24280	17.1	S	9200	14000	**0.110** 0.243	**32.000** 1.2598	**31.989** 1.2594	**42.025** 1.6545	**42.009** 1.6539

(1) Cage material: P: polymer cage, S: steel cage



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min-1		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
32 1.2598	**32** 1.2598	**46** 1.811	**18** 0.709	K32X46X18H	**39.2** 8810	**41.9** 9420	6.80	S	9600	15000	**0.075** 0.165	**32.000** 1.2598	**31.989** 1.2594	**46.025** 1.8120	**46.009** 1.8114
	32 1.2598	**46** 1.811	**32** 1.26	K32X46X32H	**67.0** 15060	**83.4** 18750	13.1	S	9600	15000	**0.140** 0.309	**32.000** 1.2598	**31.989** 1.2594	**46.025** 1.8120	**46.009** 1.8114
	32 1.2598	**46** 1.811	**40** 1.575	K32X46X40H	**81.7** 18370	**108** 24280	12.2	S	9600	15000	**0.158** 0.348	**32.000** 1.2598	**31.989** 1.2594	**46.025** 1.8120	**46.009** 1.8114
33 1.2992	**33** 1.2992	**51** 2.0079	**23** 0.906	K33X51X23H	**55.9** 12570	**57.6** 12950	9.35	S	9600	15000	**0.140** 0.309	**33.000** 1.2992	**32.989** 1.2988	**51.029** 2.0090	**51.010** 2.0083
34 1.3386	**34** 1.3386	**38** 1.4961	**11** 0.433	K34X38X11	**12.2** 2740	**21.9** 4920	3.35	S	8100	12000	**0.011** 0.024	**34.000** 1.3386	**33.989** 1.3381	**38.025** 1.4970	**38.009** 1.4964
	34 1.3386	**44** 1.7323	**26** 1.024	K34X44X26FH	**42.9** 9640	**58.9** 13240	9.40	S	8600	13000	**0.080** 0.176	**34.000** 1.3386	**33.989** 1.3381	**44.025** 1.7333	**44.009** 1.7326
35 1.3780	**35** 1.378	**40** 1.5748	**13** 0.512	K35X40X13H	**16.2** 3640	**27.2** 6110	4.15	S	7900	12000	**0.018** 0.040	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**40** 1.5748	**17** 0.669	K35X40X17H	**22.1** 4970	**40.8** 9170	6.35	S	7900	12000	**0.025** 0.055	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**40** 1.5748	**19** 0.748	K35X40X19H	**23.2** 5220	**43.2** 9710	6.80	S	7900	12000	**0.025** 0.055	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**40** 1.5748	**25** 0.984	K35X40X25H	**28.4** 6380	**56.2** 12630	8.70	S	7900	12000	**0.035** 0.077	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**40** 1.5748	**27** 1.063	K35X40X27H	**29.8** 6700	**59.6** 13400	9.20	S	7900	12000	**0.037** 0.082	**35.000** 1.3780	**34.989** 1.3775	**40.025** 1.5758	**40.009** 1.5752
	35 1.378	**42** 1.6535	**16** 0.63	K35X42X16AH	**24.5** 5510	**36.8** 8270	5.80	S	8100	12000	**0.031** 0.068	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539
	35 1.378	**42** 1.6535	**18** 0.709	K35X42X18	**27.5** 6180	**42.6** 9580	6.75	S	8100	12000	**0.035** 0.077	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539
	35 1.378	**42** 1.6535	**20** 0.787	K35X42X20H	**30.4** 6830	**48.5** 10900	7.65	S	8100	12000	**0.037** 0.082	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539
	35 1.378	**42** 1.6535	**30** 1.181	K35X42X30FH	**40.5** 9100	**70.0** 15740	10.9	S	8100	12000	**0.061** 0.134	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539
	35 1.378	**45** 1.7717	**20** 0.787	K35X45X20FH	**36.5** 8210	**49.9** 11220	8.00	S	8400	13000	**0.059** 0.130	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**45** 1.7717	**30** 1.181	K35X45X30F	**51.2** 11510	**74.5** 16750	11.7	S	8400	13000	**0.100** 0.220	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720

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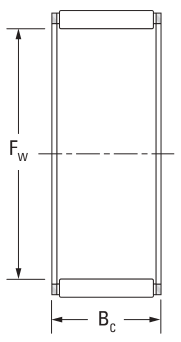
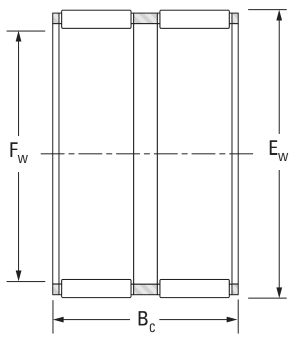
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

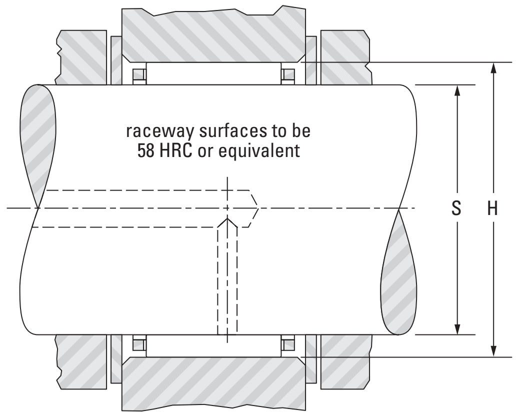
METRIC SERIES
K, K ZW SERIES



K



K ZW



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
35 1.3780	**35** 1.378	**45** 1.7717	**35** 1.378	K35X45X35H	**62.1** 13960	**95.5** 21470	15.0	S	8400	13000	**0.085** 0.187	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**45** 1.7717	**41** 1.614	K35X45X41	**70.8** 15920	**113** 25400	17.7	S	8400	13000	**0.120** 0.265	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**45** 1.7717	**49** 1.929	K35X45X49H	**82.5** 18550	**138** 31020	21.4	S	8400	13000	**0.143** 0.315	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**45** 1.7717	**49** 1.929	K35X45X49HZW	**71.8** 16140	**115** 25850	18.1	S	8400	13000	**0.143** 0.315	**35.000** 1.3780	**34.989** 1.3775	**45.025** 1.7726	**45.009** 1.7720
	35 1.378	**50** 1.9685	**23** 0.906	K35X50X23H	**53.0** 11910	**60.3** 13550	9.75	S	8700	13000	**0.110** 0.242	**35.000** 1.3780	**34.989** 1.3775	**50.025** 1.9695	**50.009** 1.9689
	35 1.378	**50** 1.9685	**40** 1.575	K35X50X40F	**79.7** 17920	**102** 22930	16.2	S	8700	13000	**0.200** 0.441	**35.000** 1.3780	**34.989** 1.3775	**50.025** 1.9695	**50.009** 1.9689
36 1.4173	**36** 1.4173	**40** 1.5748	**29** 1.142	K36X40X29TN	**21.2** 4770	**45.2** 10160	7.15	P	7600	12000	**0.029** 0.064	**36.000** 1.4173	**35.989** 1.4169	**40.025** 1.5758	**40.009** 1.5752
	36 1.4173	**42** 1.6535	**16** 0.63	K36X42X16	**22.8** 5130	**37.7** 8480	5.95	S	7800	12000	**0.027** 0.060	**36.000** 1.4173	**35.989** 1.4169	**42.025** 1.6545	**42.009** 1.6539
37 1.4567	**37** 1.4567	**42** 1.6535	**13** 0.512	K37X42X13H	**16.9** 3800	**29.4** 6610	4.50	S	7500	11000	**0.017** 0.037	**37.000** 1.4567	**36.989** 1.4563	**42.025** 1.6545	**42.009** 1.6539
	37 1.4567	**42** 1.6535	**17** 0.669	K37X42X17H	**21.9** 4920	**41.0** 9220	6.35	S	7500	11000	**0.025** 0.055	**37.000** 1.4567	**36.989** 1.4563	**42.025** 1.6545	**42.009** 1.6539
	37 1.4567	**42** 1.6535	**27** 1.063	K37X42X27F	**32.1** 7220	**66.9** 15040	10.4	S	7500	11000	**0.039** 0.086	**37.000** 1.4567	**36.989** 1.4563	**42.025** 1.6545	**42.009** 1.6539
	37 1.4567	**44** 1.7323	**19** 0.748	K37X44X19H	**29.7** 6680	**48.0** 10790	7.65	S	7600	12000	**0.039** 0.086	**37.000** 1.4567	**36.989** 1.4563	**44.025** 1.7333	**44.009** 1.7326
38 1.4961	**38** 1.4961	**41** 1.6142	**9** 0.354	K38X41X9TN	**5.93** 1330	**11.0** 2470	1.65	P	7100	11000	**0.004** 0.009	**38.000** 1.4961	**37.989** 1.4956	**41.025** 1.6152	**41.009** 1.6145
	38 1.4961	**43** 1.6929	**17** 0.669	K38X43X17H	**21.8** 4900	**41.0** 9220	6.35	S	7300	11000	**0.032** 0.071	**38.000** 1.4961	**37.989** 1.4956	**43.025** 1.6939	**43.009** 1.6933
	38 1.4961	**43** 1.6929	**27** 1.063	K38X43X27	**31.9** 7170	**67.0** 15060	10.4	S	7300	11000	**0.041** 0.090	**38.000** 1.4961	**37.989** 1.4956	**43.025** 1.6939	**43.009** 1.6933
	38 1.4961	**46** 1.811	**20** 0.787	K38X46X20H	**33.3** 7490	**51.0** 11470	8.10	S	7500	12000	**0.055** 0.121	**38.000** 1.4961	**37.989** 1.4956	**46.025** 1.8120	**46.009** 1.8114
	38 1.4961	**46** 1.811	**32** 1.26	K38X46X32H	**55.2** 12410	**98.1** 22050	15.3	S	7500	12000	**0.090** 0.198	**38.000** 1.4961	**37.989** 1.4956	**46.025** 1.8120	**46.009** 1.8114
38 1.4961	**38** 1.4961	**50** 1.9685	**25** 0.984	K38X50X25	**53.0** 11910	**70.8** 15920	11.2	S	7800	12000	**0.100** 0.220	**38.000** 1.4961	**37.989** 1.4956	**50.025** 1.9695	**50.009** 1.9689
	38 1.4961	**50** 1.9685	**33** 1.299	K38X50X33H	**68.3** 15350	**98.2** 22080	15.4	S	7800	12000	**0.126** 0.278	**38.000** 1.4961	**37.989** 1.4956	**50.025** 1.9695	**50.009** 1.9689
	38 1.4961	**50** 1.9685	**40** 1.575	K38X50X40FH	**76.2** 17130	**113** 25400	17.8	S	7800	12000	**0.170** 0.375	**38.000** 1.4961	**37.989** 1.4956	**50.025** 1.9695	**50.009** 1.9689
40 1.5748	**40** 1.5748	**45** 1.7717	**13** 0.512	K40X45X13H	**17.6** 3960	**31.7** 7130	4.80	S	6900	11000	**0.022** 0.049	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**18** 0.709	K40X45X18H	**25.1** 5640	**50.4** 11330	8.00	S	6900	11000	**0.031** 0.068	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**21** 0.827	K40X45X21H	**23.3** 5240	**45.2** 10160	8.50	S	6900	11000	**0.033** 0.073	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**27** 1.063	K40X45X27H	**32.7** 7350	**70.2** 15780	10.8	S	6900	11000	**0.040** 0.088	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**27** 1.063	K40X45X27TN	**33.3** 7490	**72.1** 16210	11.2	P	6900	11000	**0.030** 0.066	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**45** 1.7717	**29** 1.142	K40X45X29H	**34.7** 7800	**75.9** 17060	11.7	S	6900	11000	**0.050** 0.110	**40.000** 1.5748	**39.989** 1.5744	**45.025** 1.7726	**45.009** 1.7720
	40 1.5748	**46** 1.811	**17** 0.669	K40X46X17	**25.2** 5670	**44.0** 9890	6.95	S	7000	11000	**0.033** 0.073	**40.000** 1.5748	**39.989** 1.5744	**46.025** 1.8120	**46.009** 1.8114
	40 1.5748	**47** 1.8504	**18** 0.709	K40X47X18	**28.0** 6290	**45.6** 10250	7.25	S	7000	11000	**0.041** 0.090	**40.000** 1.5748	**39.989** 1.5744	**47.025** 1.8514	**47.009** 1.8507
	40 1.5748	**47** 1.8504	**20** 0.787	K40X47X20	**31.1** 6990	**52.1** 11710	8.25	S	7000	11000	**0.042** 0.093	**40.000** 1.5748	**39.989** 1.5744	**47.025** 1.8514	**47.009** 1.8507
	40 1.5748	**48** 1.8898	**20** 0.787	K40X48X20FV1	**35.5** 7980	**56.3** 12660	8.45	S	7100	11000	**0.052** 0.115	**40.000** 1.5748	**39.989** 1.5744	**48.025** 1.8907	**48.009** 1.8901
	40 1.5748	**48** 1.8898	**20** 0.787	K40X48X20H	**35.5** 7980	**56.3** 12660	8.95	S	7100	11000	**0.050** 0.110	**40.000** 1.5748	**39.989** 1.5744	**48.025** 1.8907	**48.009** 1.8901
	40 1.5748	**48** 1.8898	**35** 1.378	K40X48X35H	**57.3** 12880	**104** 23380	16.3	S	7100	11000	**0.098** 0.216	**40.000** 1.5748	**39.989** 1.5744	**48.025** 1.8907	**48.009** 1.8901
	40 1.5748	**50** 1.9685	**27** 1.063	K40X50X27H	**53.0** 11910	**81.0** 18210	12.7	S	7200	11000	**0.084** 0.185	**40.000** 1.5748	**39.989** 1.5744	**50.025** 1.9695	**50.009** 1.9689
	40 1.5748	**55** 2.1654	**45** 1.772	K40X55X45H	**103** 23160	**146** 32820	23.0	S	7500	12000	**0.221** 0.487	**40.000** 1.5748	**39.989** 1.5744	**55.029** 2.1665	**55.010** 2.1657

(1) Cage material: P: polymer cage, S: steel cage

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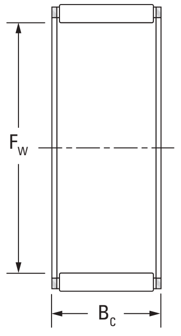
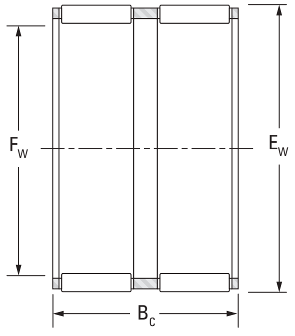
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



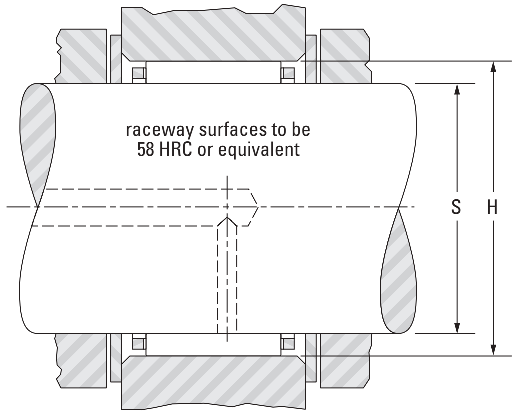
K



K ZW

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min⁻¹		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
40 1.5748	**40** 1.5748	**56** 2.2047	**26** 1.024	K40X56X26H	**63.7** 14320	**75.7** 17020	12.0	S	7600	12000	**0.138** 0.304	**40.000** 1.5748	**39.989** 1.5744	**56.029** 2.2059	**56.010** 2.2051
41 1.6142	**41** 1.6142	**48** 1.8898	**31** 1.22	K41X48X31HZW	**38.0** 8540	**68.1** 15310	10.6	S	6800	11000	**0.067** 0.148	**41.000** 1.6142	**40.989** 1.6137	**48.025** 1.8907	**48.009** 1.8901
42 1.6535	**42** 1.6535	**47** 1.8504	**13** 0.512	K42X47X13H	**18.7** 4200	**34.9** 7850	5.30	S	6500	10000	**0.027** 0.060	**42.000** 1.6535	**41.989** 1.6531	**47.025** 1.8514	**47.009** 1.8507
	42 1.6535	**47** 1.8504	**17** 0.669	K42X47X17H	**22.8** 5130	**45.2** 10160	7.30	S	6500	10000	**0.028** 0.062	**42.000** 1.6535	**41.989** 1.6531	**47.025** 1.8514	**47.009** 1.8507
	42 1.6535	**47** 1.8504	**27** 1.063	K42X47X27H	**33.8** 7600	**74.7** 16790	11.6	S	6500	10000	**0.041** 0.090	**42.000** 1.6535	**41.989** 1.6531	**47.025** 1.8514	**47.009** 1.8507
	42 1.6535	**48** 1.8898	**24** 0.945	K42X48X24F	**33.1** 7440	**63.9** 14370	10.1	S	6600	10000	**0.046** 0.101	**42.000** 1.6535	**41.989** 1.6531	**48.025** 1.8907	**48.009** 1.8901
	42 1.6535	**50** 1.9685	**13** 0.512	K42X50X13H	**20.9** 4700	**28.9** 6500	4.45	S	6700	10000	**0.035** 0.077	**42.000** 1.6535	**41.989** 1.6531	**50.025** 1.9695	**50.009** 1.9689
	42 1.6535	**50** 1.9685	**20** 0.787	K42X50X20H	**35.2** 7910	**56.6** 12720	9.00	S	6700	10000	**0.054** 0.119	**42.000** 1.6535	**41.989** 1.6531	**50.025** 1.9695	**50.009** 1.9689
	42 1.6535	**50** 1.9685	**30** 1.181	K42X50X30H	**51.3** 11530	**91.9** 20660	14.4	S	6700	10000	**0.080** 0.176	**42.000** 1.6535	**41.989** 1.6531	**50.025** 1.9695	**50.009** 1.9689
43 1.6929	**43** 1.6929	**48** 1.8898	**17** 0.669	K43X48X17FH	**23.0** 5170	**45.8** 10300	6.85	S	6400	9800	**0.036** 0.079	**43.000** 1.6929	**42.989** 1.6925	**48.025** 1.8907	**48.009** 1.8901
	43 1.6929	**48** 1.8898	**27** 1.063	K43X48X27H	**34.8** 7820	**78.0** 17540	12.1	S	6400	9800	**0.050** 0.110	**43.000** 1.6929	**42.989** 1.6925	**48.025** 1.8907	**48.009** 1.8901
44 1.7323	**44** 1.7323	**50** 1.9685	**22** 0.866	K44X50X22H	**31.6** 7100	**60.6** 13620	9.45	S	6400	9900	**0.046** 0.101	**44.000** 1.7323	**43.989** 1.7319	**50.025** 1.9695	**50.009** 1.9689
	44 1.7323	**50** 1.9685	**30** 1.201	K44X50X30,5HZW	**35.5** 7980	**70.5** 15850	10.7	S	6400	9900	**0.068** 0.150	**44.000** 1.7323	**43.989** 1.7319	**50.025** 1.9695	**50.009** 1.9689
45 1.7717	**45** 1.7717	**50** 1.9685	**13** 0.512	K45X50X13H	**18.4** 4140	**35.1** 7890	5.35	S	6100	9400	**0.022** 0.049	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**15** 0.591	K45X50X15H	**19.4** 4360	**37.3** 8390	5.75	S	6100	9400	**0.028** 0.062	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**17** 0.669	K45X50X17H	**24.9** 5600	**51.8** 11650	8.05	S	6100	9400	**0.030** 0.066	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**20** 0.787	K45X50X20F	**27.0** 6070	**57.4** 12900	9.00	S	6100	9400	**0.040** 0.088	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689

(1) Cage material: P: polymer cage, S: steel cage



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min⁻¹		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
45 1.7717	**45** 1.7717	**50** 1.9685	**21** 0.827	K45X50X21CH	**24.6** 5530	**50.4** 11330	7.85	S	6100	9400	**0.036** 0.079	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**27** 1.063	K45X50X27FH	**34.2** 7690	**77.4** 17400	12.0	S	6100	9400	**0.043** 0.095	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**50** 1.9685	**27** 1.063	K45X50X27TN	**31.8** 7150	**70.7** 15890	11.0	P	6100	9400	**0.048** 0.106	**45.000** 1.7717	**44.989** 1.7712	**50.025** 1.9695	**50.009** 1.9689
	45 1.7717	**52** 2.0472	**18** 0.709	K45X52X18H	**30.1** 6770	**52.0** 11690	8.25	S	6200	9500	**0.045** 0.099	**45.000** 1.7717	**44.989** 1.7712	**52.029** 2.0484	**52.010** 2.0476
	45 1.7717	**52** 2.0472	**21** 0.827	K45X52X21F	**35.0** 7870	**63.2** 14210	9.90	S	6200	9500	**0.055** 0.121	**45.000** 1.7717	**44.989** 1.7712	**52.029** 2.0484	**52.010** 2.0476
	45 1.7717	**53** 2.0866	**20** 0.787	K45X53X20H	**36.0** 8090	**59.5** 13380	9.45	S	6200	9600	**0.054** 0.119	**45.000** 1.7717	**44.989** 1.7712	**53.029** 2.0878	**53.010** 2.0870
	45 1.7717	**53** 2.0866	**25** 0.984	K45X53X25H	**45.9** 10320	**81.5** 18320	12.7	S	6200	9600	**0.072** 0.159	**45.000** 1.7717	**44.989** 1.7712	**53.029** 2.0878	**53.010** 2.0870
	45 1.7717	**53** 2.0866	**25** 0.984	K45X53X25F	**42.5** 9550	**73.7** 16570	11.7	S	6200	9600	**0.075** 0.165	**45.000** 1.7717	**44.989** 1.7712	**53.029** 2.0878	**53.010** 2.0870
	45 1.7717	**53** 2.0866	**28** 1.102	K45X53X28H	**49.3** 11080	**89.2** 20050	13.9	S	6200	9600	**0.078** 0.172	**45.000** 1.7717	**44.989** 1.7712	**53.029** 2.0878	**53.010** 2.0870
	45 1.7717	**55** 2.1654	**20** 0.787	K45X55X20H	**42.0** 9440	**62.2** 13980	10.0	S	6400	9800	**0.074** 0.163	**45.000** 1.7717	**44.989** 1.7712	**55.029** 2.1665	**55.010** 2.1657
	45 1.7717	**59** 2.3228	**18** 0.709	K45X59X18H	**47.8** 10750	**58.9** 13240	9.60	S	6600	10000	**0.107** 0.236	**45.000** 1.7717	**44.989** 1.7712	**59.029** 2.3240	**59.010** 2.3232
	45 1.7717	**59** 2.3228	**18** 0.709	K45X59X18TN	**45.7** 10270	**55.4** 12450	9.00	P	6600	10000	**0.097** 0.214	**45.000** 1.7717	**44.989** 1.7712	**59.029** 2.3240	**59.010** 2.3232
	45 1.7717	**59** 2.3228	**36** 1.417	K45X59X36H	**82.4** 18520	**118** 26530	18.6	S	6600	10000	**0.181** 0.399	**45.000** 1.7717	**44.989** 1.7712	**59.029** 2.3240	**59.010** 2.3232
	45 1.7717	**60** 2.3622	**30** 1.181	K45X60X30H	**75.5** 16970	**101** 22710	16.0	S	6600	10000	**0.171** 0.377	**45.000** 1.7717	**44.989** 1.7712	**60.029** 2.3633	**60.010** 2.3626
	45 1.7717	**60** 2.3622	**45** 1.772	K45X60X45H	**108** 24280	**160** 35970	25.2	S	6600	10000	**0.280** 0.617	**45.000** 1.7717	**44.989** 1.7712	**60.029** 2.3633	**60.010** 2.3626
46 1.8110	**46** 1.811	**53** 2.0866	**36** 1.417	K46X53X36HZW	**48.6** 10930	**96.7** 21740	15.3	S	6100	9300	**0.100** 0.220	**46.000** 1.8110	**45.989** 1.8106	**53.029** 2.0878	**53.010** 2.0870
47 1.8504	**47** 1.8504	**52** 2.0472	**15** 0.591	K47X52X15FH	**20.1** 4520	**39.8** 8950	6.15	S	5800	8900	**0.030** 0.066	**47.000** 1.8504	**46.989** 1.8500	**52.029** 2.0484	**52.010** 2.0476

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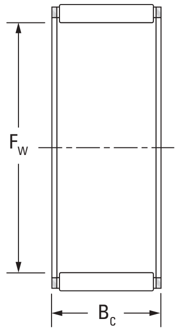
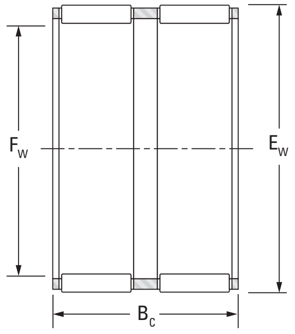
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

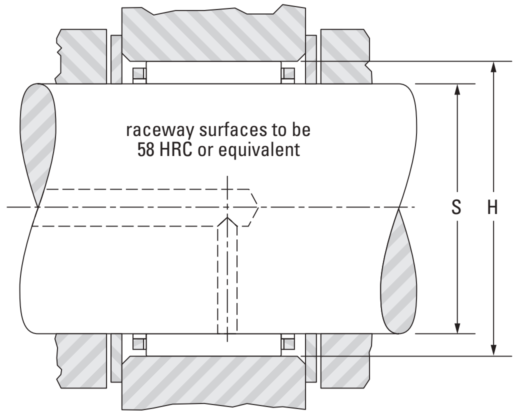
METRIC SERIES
K, K ZW SERIES



K



K ZW



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
47 1.8504	**47** 1.8504	**52** 2.0472	**17** 0.669	K47X52X17H	**24.2** 5440	**50.4** 11330	7.85	S	5800	8900	**0.032** 0.071	**47.000** 1.8504	**46.989** 1.8500	**52.029** 2.0484	**52.010** 2.0476
	47 1.8504	**52** 2.0472	**27** 1.063	K47X52X27H	**36.6** 8230	**85.9** 19310	13.3	S	5800	8900	**0.045** 0.099	**47.000** 1.8504	**46.989** 1.8500	**52.029** 2.0484	**52.010** 2.0476
	47 1.8504	**55** 2.1654	**28** 1.102	K47X55X28FV1	**48.9** 10990	**89.5** 20120	14.0	S	6000	9200	**0.092** 0.203	**47.000** 1.8504	**46.989** 1.8500	**55.029** 2.1665	**55.010** 2.1657
48 1.8898	**48** 1.8898	**53** 2.0866	**17** 0.669	K48X53X17H	**25.7** 5780	**54.9** 12340	8.55	S	5700	8700	**0.032** 0.071	**48.000** 1.8898	**47.989** 1.8893	**53.029** 2.0878	**53.010** 2.0870
	48 1.8898	**54** 2.126	**19** 0.748	K48X54X19H	**30.9** 6950	**61.2** 13760	9.85	S	5700	8800	**0.042** 0.093	**48.000** 1.8898	**47.989** 1.8893	**54.029** 2.1271	**54.010** 2.1264
49 1.9291	**49** 1.9291	**55** 2.1654	**32** 1.26	K49X55X32HZW	**40.2** 9040	**86.4** 19420	13.4	S	5600	8600	**0.080** 0.176	**49.000** 1.9291	**48.989** 1.9287	**55.029** 2.1665	**55.010** 2.1657
	49 1.9291	**65** 2.5591	**38** 1.496	K49X65X38H	**100** 22480	**142** 31920	22.7	S	6100	9300	**0.244** 0.538	**49.000** 1.9291	**48.989** 1.9287	**65.029** 2.5602	**65.010** 2.5594
50 1.9685	**50** 1.9685	**55** 2.1654	**17** 0.669	K50X55X17H	**25.5** 5730	**55.0** 12360	8.55	S	5400	8400	**0.032** 0.071	**50.000** 1.9685	**49.989** 1.9681	**55.029** 2.1665	**55.010** 2.1657
	50 1.9685	**55** 2.1654	**20** 0.787	K50X55X20H	**30.2** 6790	**68.5** 15400	10.7	S	5400	8400	**0.038** 0.084	**50.000** 1.9685	**49.989** 1.9681	**55.029** 2.1665	**55.010** 2.1657
	50 1.9685	**55** 2.1654	**30** 1.181	K50X55X30	**38.2** 8590	**92.4** 20770	14.4	S	5400	8400	**0.057** 0.120	**50.000** 1.9685	**49.989** 1.9681	**55.029** 2.1665	**55.010** 2.1657
	50 1.9685	**55** 2.1654	**30** 1.181	K50X55X30FV1	**38.2** 8590	**92.4** 20770	14.4	S	5400	8400	**0.057** 0.126	**50.000** 1.9685	**49.989** 1.9681	**55.029** 2.1665	**55.010** 2.1657
	50 1.9685	**56** 2.2047	**23** 0.906	K50X56X23	**35.5** 7980	**74.1** 16660	11.7	S	5500	8500	**0.051** 0.112	**50.000** 1.9685	**49.989** 1.9681	**56.029** 2.2059	**56.010** 2.2051
	50 1.9685	**57** 2.2441	**18** 0.709	K50X57X18FH	**31.3** 7040	**56.4** 12680	8.95	S	5500	8500	**0.050** 0.110	**50.000** 1.9685	**49.989** 1.9681	**57.029** 2.2452	**57.010** 2.2445
	50 1.9685	**58** 2.2835	**20** 0.787	K50X58X20H	**38.8** 8720	**67.8** 15240	10.8	S	5600	8600	**0.065** 0.143	**50.000** 1.9685	**49.989** 1.9681	**58.029** 2.2846	**58.010** 2.2839
	50 1.9685	**58** 2.2835	**25** 0.984	K50X58X25H	**46.5** 10450	**85.6** 19240	13.4	S	5600	8600	**0.081** 0.179	**50.000** 1.9685	**49.989** 1.9681	**58.029** 2.2846	**58.010** 2.2839
	50 1.9685	**58** 2.2835	**35** 1.378	K50X58X35H	**64.9** 14590	**131** 29450	20.6	S	5600	8600	**0.105** 0.231	**50.000** 1.9685	**49.989** 1.9681	**58.029** 2.2846	**58.010** 2.2839
	50 1.9685	**62** 2.4409	**30** 1.181	K50X62X30H	**64.6** 14520	**98.1** 22050	15.5	S	5800	8900	**0.136** 0.300	**50.000** 1.9685	**49.989** 1.9681	**62.029** 2.4421	**62.010** 2.4413
50 1.9685	**50** 1.9685	**66** 2.5984	**30** 1.181	K50X66X30H	**80.9** 18190	**109** 24500	17.4	S	5900	9100	**0.192** 0.423	**50.000** 1.9685	**49.989** 1.9681	**66.029** 2.5996	**66.010** 2.5988
	50 1.9685	**70** 2.7559	**32** 1.26	K50X70X32H	**103** 23160	**129** 29000	20.6	S	6100	9300	**0.224** 0.494	**50.000** 1.9685	**49.989** 1.9681	**70.029** 2.7570	**70.010** 2.7563
52 2.0472	**52** 2.0472	**57** 2.2441	**12** 0.472	K52X57X12	**18.4** 4140	**36.7** 8250	5.60	S	5200	8000	**0.022** 0.049	**52.000** 2.0472	**51.987** 2.0467	**57.029** 2.2452	**57.010** 2.2445
	52 2.0472	**57** 2.2441	**17** 0.669	K52X57X17H	**21.4** 4810	**44.3** 9960	6.90	S	5200	8000	**0.035** 0.077	**52.000** 2.0472	**51.987** 2.0467	**57.029** 2.2452	**57.010** 2.2445
	52 2.0472	**60** 2.3622	**24** 0.945	K52X60X24	**47.1** 10600	**88.3** 19900	13.9	S	5400	8200	**0.078** 0.172	**52.000** 2.0472	**51.987** 2.0467	**60.029** 2.3633	**60.010** 2.3626
55 2.1654	**55** 2.1654	**60** 2.3622	**17** 0.669	K55X60X17	**26.0** 5850	**58.3** 13100	9.10	S	4900	7600	**0.037** 0.082	**55.000** 2.1654	**54.987** 2.1648	**60.029** 2.3633	**60.010** 2.3626
	55 2.1654	**60** 2.3622	**20** 0.787	K55X60X20H	**30.7** 6900	**72.4** 16300	11.3	S	4900	7600	**0.042** 0.093	**55.000** 2.1654	**54.987** 2.1648	**60.029** 2.3633	**60.010** 2.3626
	55 2.1654	**60** 2.3622	**27** 1.063	K55X60X27H	**40.1** 9010	**102** 22900	15.7	S	4900	7600	**0.055** 0.121	**55.000** 2.1654	**54.987** 2.1648	**60.029** 2.3633	**60.010** 2.3626
	55 2.1654	**60** 2.3622	**30** 1.181	K55X60X30FH	**40.6** 9130	**103** 23200	16.1	S	4900	7600	**0.068** 0.150	**55.000** 2.1654	**54.987** 2.1648	**60.029** 2.3633	**60.010** 2.3626
	55 2.1654	**61** 2.4016	**26** 1.024	K55X61X26H	**44.3** 9960	**102** 22900	15.9	S	5000	7600	**0.063** 0.139	**55.000** 2.1654	**54.987** 2.1648	**61.029** 2.4027	**61.010** 2.4020
	55 2.1654	**62** 2.4409	**18** 0.709	K55X62X18H	**33.2** 7460	**62.8** 14100	10.0	S	5000	7700	**0.055** 0.121	**55.000** 2.1654	**54.987** 2.1648	**62.029** 2.4421	**62.010** 2.4413
	55 2.1654	**63** 2.4803	**15** 0.591	K55X63X15F	**30.5** 6860	**51.5** 11600	8.00	S	5000	7800	**0.054** 0.119	**55.000** 2.1654	**54.987** 2.1648	**63.029** 2.4815	**63.010** 2.4807
	55 2.1654	**63** 2.4803	**20** 0.787	K55X63X20	**40.3** 9060	**73.5** 16500	11.7	S	5000	7800	**0.072** 0.159	**55.000** 2.1654	**54.987** 2.1648	**63.029** 2.4815	**63.010** 2.4807
	55 2.1654	**63** 2.4803	**25** 0.984	K55X63X25	**49.8** 11200	**96.5** 21700	15.1	S	5000	7800	**0.080** 0.176	**55.000** 2.1654	**54.987** 2.1648	**63.029** 2.4815	**63.010** 2.4807
	55 2.1654	**63** 2.4803	**32** 1.26	K55X63X32	**62.3** 14000	**129** 29000	20.0	S	5000	7800	**0.108** 0.238	**55.000** 2.1654	**54.987** 2.1648	**63.029** 2.4815	**63.010** 2.4807
58 2.2835	**58** 2.2835	**63** 2.4803	**17** 0.669	K58X63X17F	**27.0** 6070	**62.6** 14100	9.80	S	4700	7200	**0.037** 0.082	**58.000** 2.2835	**57.987** 2.2830	**63.029** 2.4815	**63.010** 2.4807
	58 2.2835	**64** 2.5197	**19** 0.748	K58X64X19H	**32.9** 7400	**70.6** 15900	11.3	S	4700	7200	**0.037** 0.082	**58.000** 2.2835	**57.987** 2.2830	**64.029** 2.5208	**64.010** 2.5201

(1) Cage material: P: polymer cage, S: steel cage

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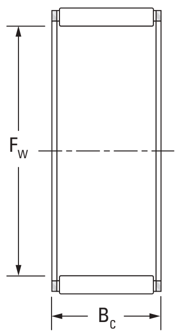
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



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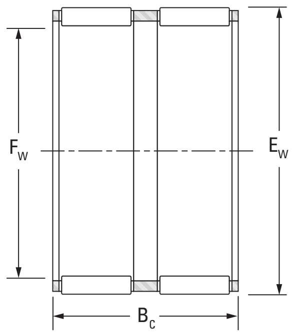
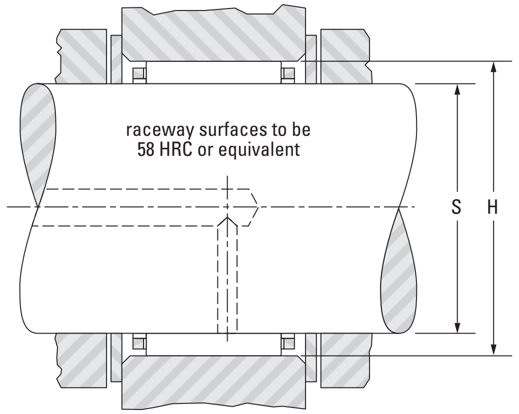


K ZW



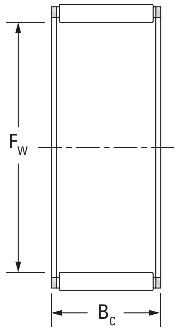
Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
58 2.2835	**58** 2.2835	**65** 2.5591	**18** 0.709	K58X65X18H	**34.3** 7710	**67.1** 15100	10.7	S	4700	7300	**0.058** 0.128	**58.000** 2.2835	**57.987** 2.2830	**65.029** 2.5602	**65.010** 2.5594
60 2.3622	**60** 2.3622	**65** 2.5591	**20** 0.787	K60X65X20H	**31.9** 7170	**78.1** 17600	12.2	S	4500	6900	**0.046** 0.101	**60.000** 2.3622	**59.987** 2.3617	**65.029** 2.5602	**65.010** 2.5594
	60 2.3622	**65** 2.5591	**27** 1.063	K60X65X27FH	**39.5** 8880	**103** 23200	16.0	S	4500	6900	**0.059** 0.130	**60.000** 2.3622	**59.987** 2.3617	**65.029** 2.5602	**65.010** 2.5594
	60 2.3622	**65** 2.5591	**30** 1.181	K60X65X30FH	**42.9** 9640	**114** 25600	17.8	S	4500	6900	**0.085** 0.187	**60.000** 2.3622	**59.987** 2.3617	**65.029** 2.5602	**65.010** 2.5594
	60 2.3622	**65** 2.5591	**30** 1.181	K60X65X30	**42.9** 9640	**114** 25600	17.8	S	4500	6900	**0.070** 0.154	**60.000** 2.3622	**59.987** 2.3617	**65.029** 2.5602	**65.010** 2.5594
	60 2.3622	**68** 2.6772	**17** 0.669	K60X68X17F	**34.2** 7690	**61.4** 13800	9.50	S	4600	7100	**0.066** 0.146	**60.000** 2.3622	**59.987** 2.3617	**68.029** 2.6783	**68.010** 2.6776
	60 2.3622	**68** 2.6772	**20** 0.787	K60X68X20H	**41.8** 9400	**79.2** 17800	12.6	S	4600	7100	**0.066** 0.146	**60.000** 2.3622	**59.987** 2.3617	**68.029** 2.6783	**68.010** 2.6776
	60 2.3622	**68** 2.6772	**23** 0.906	K60X68X23H	**49.0** 11000	**97.2** 21900	15.4	S	4600	7100	**0.089** 0.196	**60.000** 2.3622	**59.987** 2.3617	**68.029** 2.6783	**68.010** 2.6776
	60 2.3622	**68** 2.6772	**25** 0.984	K60X68X25	**51.6** 11600	**104** 23400	16.3	S	4600	7100	**0.091** 0.201	**60.000** 2.3622	**59.987** 2.3617	**68.029** 2.6783	**68.010** 2.6776
	60 2.3622	**68** 2.6772	**30** 1.181	K60X68X30ZW	**46.4** 10400	**90.1** 20300	13.9	S	4600	7100	**0.119** 0.262	**60.000** 2.3622	**59.987** 2.3617	**68.029** 2.6783	**68.010** 2.6776
63 2.4803	**63** 2.4803	**71** 2.7953	**20** 0.787	K63X71X20	**41.4** 9310	**79.4** 17800	12.7	S	4400	6700	**0.070** 0.154	**63.000** 2.4803	**62.987** 2.4798	**71.029** 2.7964	**71.010** 2.7957
64 2.5197	**64** 2.5197	**70** 2.7559	**16** 0.63	K64X70X16	**26.4** 5930	**55.1** 12400	8.55	S	4200	6500	**0.049** 0.108	**64.000** 2.5197	**63.987** 2.5192	**70.029** 2.7570	**70.010** 2.7563
65 2.5591	**65** 2.5591	**70** 2.7559	**20** 0.787	K65X70X20CH	**28.6** 6430	**69.2** 15600	10.8	S	4100	6400	**0.050** 0.110	**65.000** 2.5591	**64.987** 2.5585	**70.029** 2.7570	**70.010** 2.7563
	65 2.5591	**70** 2.7559	**30** 1.181	K65X70X30	**44.4** 9980	**123** 27700	19.1	S	4100	6400	**0.075** 0.165	**65.000** 2.5591	**64.987** 2.5585	**70.029** 2.7570	**70.010** 2.7563
	65 2.5591	**73** 2.874	**23** 0.906	K65X73X23H	**48.2** 10800	**97.7** 22000	15.5	S	4200	6500	**0.091** 0.201	**65.000** 2.5591	**64.987** 2.5585	**73.029** 2.8752	**73.010** 2.8744
	65 2.5591	**73** 2.874	**30** 1.181	K65X73X30H	**60.1** 13500	**129** 29100	20.3	S	4200	6500	**0.116** 0.256	**65.000** 2.5591	**64.987** 2.5585	**73.029** 2.8752	**73.010** 2.8744
68 2.6772	**68** 2.6772	**74** 2.9134	**20** 0.787	K68X74X20FH	**37.5** 8430	**88.1** 19800	13.2	S	4000	6100	**0.062** 0.137	**68.000** 2.6772	**67.987** 2.6767	**74.029** 2.9145	**74.010** 2.9138
68 2.6772	**68** 2.6772	**74** 2.9134	**28** 1.102	K68X74X28CH	**44.8** 10100	**110** 24700	17.1	S	4000	6100	**0.082** 0.181	**68.000** 2.6772	**67.987** 2.6767	**74.029** 2.9145	**74.010** 2.9138
	68 2.6772	**74** 2.9134	**30** 1.181	K68X74X30H	**47.6** 10700	**119** 26800	18.5	S	4000	6100	**0.098** 0.216	**68.000** 2.6772	**67.987** 2.6767	**74.029** 2.9145	**74.010** 2.9138
	68 2.6772	**74** 2.9134	**35** 1.378	K68X74X35HZW	**45.1** 10100	**111** 25000	17.1	S	4000	6100	**0.120** 0.265	**68.000** 2.6772	**67.987** 2.6767	**74.029** 2.9145	**74.010** 2.9138
	68 2.6772	**76** 2.9921	**20** 0.787	K68X76X20	**43.8** 9850	**87.8** 19700	14.0	S	4000	6200	**0.086** 0.190	**68.000** 2.6772	**67.987** 2.6767	**76.029** 2.9933	**76.010** 2.9925
70 2.7559	**70** 2.7559	**76** 2.9921	**20** 0.787	K70X76X20	**36.1** 8120	**84.7** 19000	13.5	S	3900	5900	**0.065** 0.143	**70.000** 2.7559	**69.987** 2.7554	**76.029** 2.9933	**76.010** 2.9925
	70 2.7559	**76** 2.9921	**30** 1.181	K70X76X30	**51.6** 11600	**134.0** 30100	20.9	S	3900	5900	**0.097** 0.214	**70.000** 2.7559	**69.987** 2.7554	**76.029** 2.9933	**76.010** 2.9925
	70 2.7559	**78** 3.0709	**20** 0.787	K70X78X20H	**43.6** 9800	**87.9** 19800	14.0	S	3900	6000	**0.090** 0.198	**70.000** 2.7559	**69.987** 2.7554	**78.029** 3.0720	**78.010** 3.0713
	70 2.7559	**78** 3.0709	**23** 0.906	K70X78X23F	**49.8** 11200	**104.0** 23400	16.6	S	3900	6000	**0.115** 0.254	**70.000** 2.7559	**69.987** 2.7554	**78.029** 3.0720	**78.010** 3.0713
	70 2.7559	**78** 3.0709	**24.8** 0.976	K70X78X25F	**49.8** 11200	**104.0** 23400	16.6	S	3900	6000	**0.115** 0.254	**70.000** 2.7559	**69.987** 2.7554	**78.029** 3.0720	**78.010** 3.0713
	70 2.7559	**78** 3.0709	**30** 1.181	K70X78X30H	**62.2** 14000	**139.0** 31200	21.8	S	3900	6000	**0.140** 0.309	**70.000** 2.7559	**69.987** 2.7554	**78.029** 3.0720	**78.010** 3.0713
	70 2.7559	**78** 3.0709	**46** 1.811	K70X78X46ZW	**78.4** 17600	**187.0** 42000	29.5	S	3900	6000	**0.188** 0.414	**70.000** 2.7559	**69.987** 2.7554	**78.029** 3.0720	**78.010** 3.0713
	70 2.7559	**85** 3.3465	**40** 1.575	K70X85X40F	**118** 26500	**203** 45600	32.4	S	4100	6300	**0.338** 0.745	**70.000** 2.7559	**69.987** 2.7554	**85.034** 3.3478	**85.012** 3.3469
	70 2.7559	**88** 3.4646	**30** 1.181	K70X88X30H	**115** 25900	**175** 39300	28.1	S	4100	6400	**0.205** 0.452	**70.000** 2.7559	**69.987** 2.7554	**88.034** 3.4659	**88.012** 3.4650
72 2.8346	**72** 2.8346	**80** 3.1496	**20** 0.787	K72X80X20	**44.4** 9980	**90.7** 20400	14.5	S	3800	5800	**0.084** 0.185	**72.000** 2.8346	**71.987** 2.8341	**80.029** 3.1507	**80.010** 3.1500
73 2.8740	**73** 2.874	**79** 3.1102	**20** 0.787	K73X79X20	**37.0** 8320	**88.7** 19900	14.1	S	3700	5700	**0.068** 0.150	**73.000** 2.8740	**72.987** 2.8735	**79.029** 3.1114	**79.010** 3.1106
75 2.9528	**75** 2.9528	**81** 3.189	**20** 0.787	K75X81X20F	**37.4** 8410	**90.7** 20400	14.5	S	3600	5500	**0.075** 0.165	**75.000** 2.9528	**74.987** 2.9522	**81.034** 3.1903	**81.012** 3.1894
	75 2.9528	**83** 3.2677	**23** 0.906	K75X83X23	**52.5** 11800	**114.0** 25600	18.2	S	3600	5600	**0.104** 0.229	**75.000** 2.9528	**74.987** 2.9522	**83.034** 3.2691	**83.012** 3.2682

(1) Cage material: P: polymer cage, S: steel cage

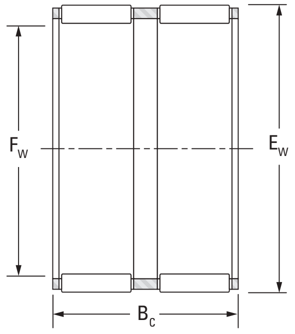
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

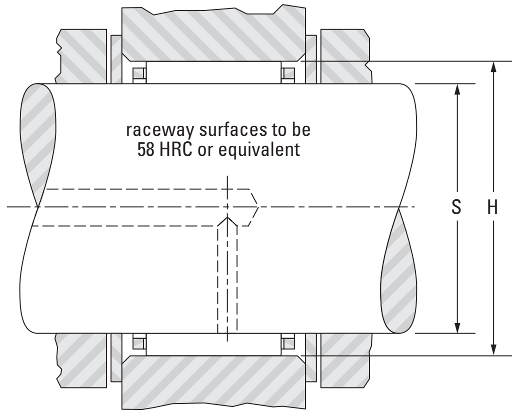
METRIC SERIES
K, K ZW SERIES



K



K ZW

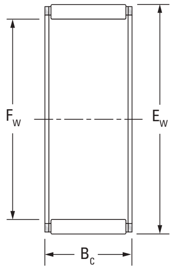


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
75 2.9528	75 2.9528	83 3.2677	30 1.181	K75X83X30	60.9 13700	138 31000	21.7	S	3600	5600	0.141 0.311	75.000 2.9528	74.987 2.9522	83.034 3.2691	83.012 3.2682
	75 2.9528	83 3.2677	30 1.181	K75X83X30FH	60.9 13700	138 31000	21.7	S	3600	5600	0.141 0.311	75.000 2.9528	74.987 2.9522	83.034 3.2691	83.012 3.2682
80 3.1496	80 3.1496	86 3.3858	20 0.787	K80X86X20H	38.6 8680	96.7 21700	15.4	S	3400	5200	0.072 0.159	80.000 3.1496	79.987 3.1491	86.034 3.3872	86.012 3.3863
	80 3.1496	88 3.4646	25 0.984	K80X88X25FV1	54.0 12100	121 27200	19.2	S	3400	5200	0.134 0.295	80.000 3.1496	79.987 3.1491	88.034 3.4659	88.012 3.4650
	80 3.1496	88 3.4646	30 1.181	K80X88X30	67.5 15200	161 36200	25.4	S	3400	5200	0.153 0.337	80.000 3.1496	79.987 3.1491	88.034 3.4659	88.012 3.4650
85 3.3465	85 3.3465	92 3.622	20 0.787	K85X92X20H	39.9 8970	91.7 20600	14.6	S	3200	4900	0.085 0.187	84.988 3.3460	84.973 3.3454	92.034 3.6234	92.012 3.6225
	85 3.3465	93 3.6614	25 0.984	K85X93X25F	58.8 13200	138 31000	21.7	S	3200	4900	0.128 0.282	84.988 3.3460	84.973 3.3454	93.034 3.6628	93.012 3.6619
	85 3.3465	93 3.6614	30 1.181	K85X93X30H	69.4 15600	170.4 38200	26.8	S	3200	4900	0.166 0.366	84.988 3.3460	84.973 3.3454	93.034 3.6628	93.012 3.6619
90 3.5433	90 3.5433	97 3.8189	20 0.787	K90X97X20	46.3 10400	114 25600	18.1	S	3000	4600	0.095 0.209	89.988 3.5428	89.973 3.5422	97.034 3.8202	97.012 3.8194
	90 3.5433	98 3.8583	25 0.984	K90X98X25F	54.8 12300	128 28800	20.3	S	3000	4600	0.134 0.295	89.988 3.5428	89.973 3.5422	98.034 3.8596	98.012 3.8587
	90 3.5433	98 3.8583	30 1.181	K90X98X30	63.6 14300	155 34800	24.3	S	3000	4600	0.168 0.370	89.988 3.5428	89.973 3.5422	98.034 3.8596	98.012 3.8587
95 3.7402	95 3.7402	103 4.0551	20 0.787	K95X103X20	49.3 11100	114 25600	18.3	S	2800	4400	0.130 0.287	94.988 3.7397	94.973 3.7391	103.034 4.0565	103.012 4.0556
	95 3.7402	103 4.0551	30 1.181	K95X103X30F	71.0 16000	183 41100	28.6	S	2800	4400	0.180 0.39	94.988 3.7397	94.973 3.7391	103.034 4.0565	103.012 4.0556
100 3.9370	100 3.937	108 4.252	30 1.181	K100X108X30	72.4 16300	191 42900	29.5	S	2700	4200	0.210 0.463	99.988 3.9365	99.973 3.9359	108.034 4.2533	108.012 4.2524
110 4.3307	110 4.3307	118 4.6457	24 0.945	K110X118X24	64.0 14400	168 37800	25.6	S	2400	3800	0.165 0.364	109.988 4.3302	109.973 4.3296	118.034 4.6470	118.012 4.6461
	110 4.3307	118 4.6457	30 1.181	K110X118X30H	75.3 16900	207 46500	31.2	S	2400	3800	0.200 0.441	109.988 4.3302	109.973 4.3296	118.034 4.6470	118.012 4.6461

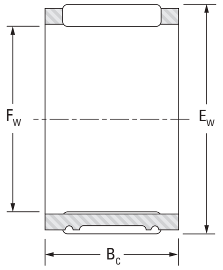
(1) Cage material: P: polymer cage, S: steel cage

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

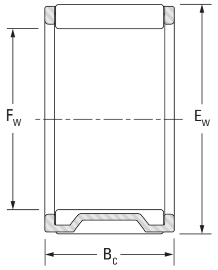
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



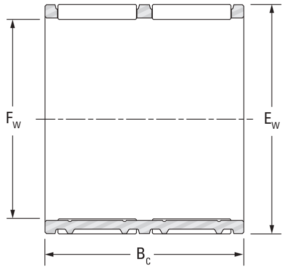
RS, R, RP



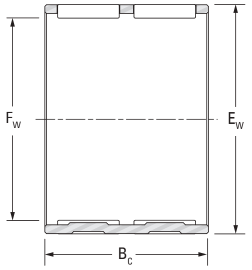
RV, V, VS

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
12 0.4724	**12**	**16**	**20**	12R1620A	**9.5**	**11.5**	1.80	S	20000	30000	**0.010**	**12.000**	**11.992**	**16.017**	**16.006**
	12	**17**	**11.5**	RV121712A-2	**8.25**	**8.4**	1.25	S	16000	25000	**0.007**	**12.000**	**11.992**	**17.017**	**17.006**
13 0.5118	**13**	**17**	**10**	RS131710-2	**5.85**	**6.35**	0.970	S	23000	29000	**0.006**	**13.000**	**12.992**	**17.017**	**17.006**
	13	**17**	**12**	RS131712	**7.25**	**8.35**	1.25	S	23000	29000	**0.007**	**13.000**	**12.992**	**17.017**	**17.006**
15 0.5906	**15**	**19**	**10**	R15/10-1	**6.3**	**7.2**	1.10	S	18000	28000	**0.006**	**15.000**	**14.992**	**19.02**	**19.007**
	15	**19**	**20**	R15/20	**12.6**	**17.7**	2.80	S	18000	28000	**0.012**	**15.000**	**14.992**	**19.02**	**19.007**
	15	**21**	**9**	RV152109-4	**7.65**	**7.15**	1.10	S	14000	21000	**0.008**	**15.000**	**14.992**	**21.02**	**21.007**
17 0.6693	**17**	**21**	**13**	R17/13	**9.4**	**12.6**	1.90	S	17000	26000	**0.009**	**17.000**	**16.992**	**21.02**	**21.007**
	17	**23**	**13**	RS17/13	**11.4**	**12.4**	1.90	S	18000	27000	**0.014**	**17.000**	**16.992**	**23.02**	**23.007**
18 0.7087	**18**	**22**	**16**	R18/16-8	**11.2**	**16**	2.45	S	16000	24000	**0.011**	**18.000**	**17.992**	**22.02**	**22.007**
	18	**22**	**17**	R18/17	**11.9**	**17.4**	2.65	S	16000	24000	**0.012**	**18.000**	**17.992**	**22.02**	**22.007**
	18	**24**	**17.2**	RS182417	**15.1**	**17.9**	2.75	S	16000	25000	**0.019**	**18.000**	**17.992**	**24.02**	**24.007**
	18	**26**	**21.9**	RF182622A-1	**19.1**	**20.3**	3.20	P	17000	26000	**0.019**	**18.000**	**17.992**	**26.02**	**26.007**
	18	**26**	**21.9**	RV182622A-2	**22.7**	**25.5**	4.00	S	17000	26000	**0.031**	**18.000**	**17.992**	**26.02**	**26.007**
	18	**27**	**11**	RF182711-1	**15.5**	**14.6**	2.25	P	18000	27000	**0.014**	**18.000**	**17.992**	**27.02**	**27.007**
20 0.7874	**20**	**24**	**10**	R20/10	**7.25**	**9.4**	1.45	S	14000	22000	**0.008**	**20.000**	**19.991**	**24.02**	**24.007**
	20	**25**	**25**	RF202525	**19.1**	**28.2**	4.45	P	14000	22000	**0.014**	**20.000**	**19.991**	**25.02**	**25.007**

(1) Cage material: P: polymer cage, S: steel cage



WR, WRS



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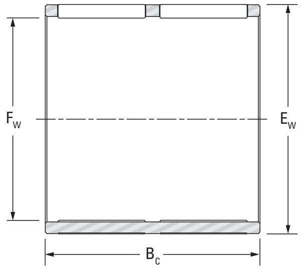
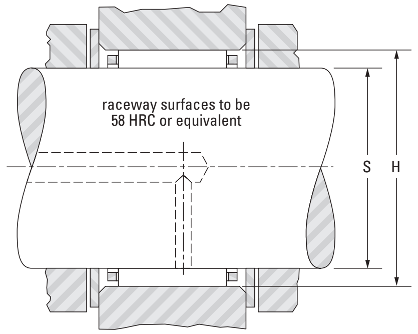


WRF

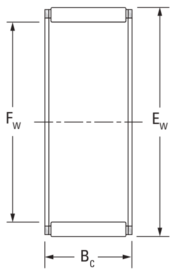


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 **-0.55** -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN		min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
20 0.7874	**20**	**25**	**26**	20WR2526	**15.8**	**22**	3.30	S	14000	22000	**0.027**	**20.000**	**19.991**	**25.02**	**25.007**
	20	**26**	**11.7**	20VS2612	**10.8**	**11.9**	1.85	S	15000	23000	**0.012**	**20.000**	**19.991**	**26.02**	**26.007**
	20	**26**	**12**	RV202612-4	**13.1**	**15.4**	2.35	S	15000	23000	**0.014**	**20.000**	**19.992**	**26.02**	**26.007**
	20	**27**	**15**	20V2715	**16.2**	**18.3**	2.80	S	15000	23000	**0.019**	**20.000**	**19.991**	**27.02**	**27.007**
	20	**28**	**20**	RP202820	**24.3**	**28.5**	4.55	S	15000	23000	**0.028**	**20.000**	**19.992**	**28.02**	**28.007**
22 0.8661	**22**	**26**	**17**	R22/17	**13**	**20.7**	3.15	S	13000	20000	**0.014**	**22.000**	**21.991**	**26.02**	**26.007**
	22	**28**	**17**	RS22/17	**16.2**	**20.7**	3.15	S	13000	20000	**0.022**	**22.000**	**21.991**	**28.02**	**28.007**
	22	**28**	**23.2**	VS22/23B	**24.3**	**35.1**	5.45	S	13000	20000	**0.025**	**22.000**	**21.991**	**28.02**	**28.007**
	22	**30**	**20**	RV223020-1	**24.2**	**29**	4.60	S	14000	21000	**0.031**	**22.000**	**21.991**	**30.02**	**30.007**
	22	**32**	**11**	RF223211-1	**19.5**	**19.3**	2.95	P	14000	22000	**0.019**	**22.000**	**21.991**	**32.025**	**32.009**
	22	**32**	**15**	RV223215	**21.8**	**22.1**	3.45	S	14000	22000	**0.032**	**22.000**	**21.991**	**32.025**	**32.009**
	22	**32**	**16**	RV223216	**21.8**	**22.1**	3.45	S	14000	22000	**0.035**	**22.000**	**21.991**	**32.025**	**32.009**
23 0.9055	**23**	**33**	**20.3**	23V3320-1	**27.6**	**30.2**	4.85	S	13000	20000	**0.044**	**23.000**	**22.991**	**33.025**	**33.009**
24 0.9449	**24**	**28**	**13**	RS242813-1	**11.2**	**17.6**	2.65	S	12000	18000	**0.012**	**24.000**	**23.991**	**28.02**	**28.007**
	24	**28**	**17**	R24/17A	**13.7**	**22.8**	3.45	S	12000	18000	**0.016**	**24.000**	**23.991**	**28.02**	**28.007**
	24	**28**	**34**	WR24/34	**22**	**41.6**	6.35	S	12000	18000	**0.031**	**24.000**	**23.991**	**28.02**	**28.007**
	24	**32**	**15**	RV243215-4	**20.2**	**23.4**	3.60	S	12000	19000	**0.027**	**24.000**	**23.991**	**32.025**	**32.009**

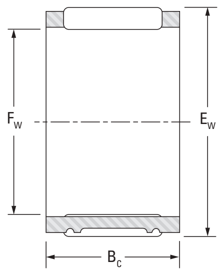
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

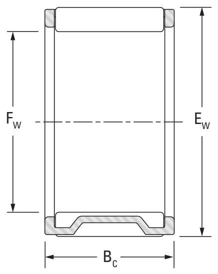
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



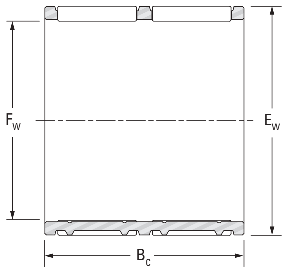
RS, R, RP



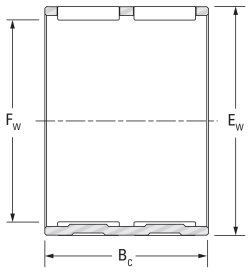
RV, V, VS

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
24.9 0.9803	24.9	29.9	26.8	RFU253027A	20.3	32.3	5.05	P	12000	18000	0.017	24.900	24.891	29.92	29.907
25 0.9843	25	29	10.1	R25/10A	7.25	10.1	1.55	S	11000	17000	0.010	25.000	24.991	29.02	29.007
	25	29	17	RF252917	14	23.7	3.70	P	11000	17000	0.009	25.000	24.991	29.02	29.007
	25	29	22	WR25/22	16	28.2	4.30	S	11000	17000	0.022	25.000	24.991	29.02	29.007
	25	30	12	25R3012	10.5	14.1	2.10	S	11000	17000	0.015	25.000	24.991	30.02	30.007
	25	30	20	RFU253020	17.7	27.4	4.35	P	11000	17000	0.014	25.000	24.991	30.02	30.007
	25	30	26	25WR3026	22.4	37.2	5.75	S	11000	17000	0.032	25.000	24.991	30.02	30.007
	25	31	24	25R3124	25.1	37.8	5.90	S	12000	18000	0.035	25.000	24.991	31.025	31.009
	25	32	16	25V3216	19.5	24.7	3.80	S	12000	18000	0.025	25.000	24.991	32.025	32.009
	25	32	32	RV253232	40	62.5	9.75	S	12000	18000	0.049	25.000	24.991	32.025	32.009
	25	33	24	25R3324B-1	30.3	40	6.35	S	12000	18000	0.048	25.000	24.991	33.025	33.009
	25	33	30	RF253330	38.7	54.8	8.50	P	12000	18000	0.041	25.000	24.991	33.025	33.009
	25	34	32	RV253432	46.1	63.9	10.0	S	12000	18000	0.066	25.000	24.991	34.025	34.009
	25	35	25	25R3525	32.5	38	6.00	S	12000	19000	0.065	25.000	24.991	35.025	35.009
	25	37	24	25V3724	34.4	36.6	5.85	S	12000	19000	0.072	25.000	24.991	37.025	37.009
	25	37	25	25V3725A	38.9	43.1	6.85	S	12000	19000	0.077	25.000	24.991	37.025	37.009
	25	37	33	RV253733	48.2	56.7	8.90	S	12000	19000	0.100	25.000	24.991	37.025	37.009

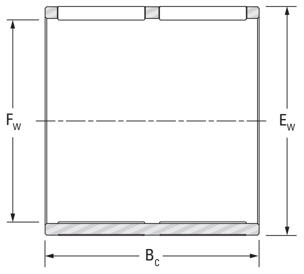
(1) Cage material: P: polymer cage, S: steel cage



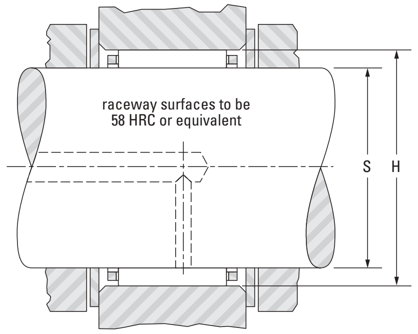
WR, WRS



WRP



WRF

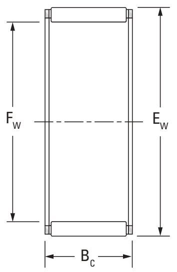


Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
26 1.0236	26	30	17	RFU263017	13.9	23.7	3.70	P	10000	16000	0.009	26.000	25.991	30.02	30.007
	26	30	20	RS263020	17.1	31.1	4.90	S	10000	16000	0.020	26.000	25.991	30.02	30.007
	26	30	21.9	RS263022A	16.9	30.4	4.75	S	10000	16000	0.022	26.000	25.991	30.02	30.007
	26	31	24	26WR3124-2	20.7	33.9	5.20	S	11000	17000	0.030	26.000	25.991	31.025	31.009
	26	33	34	RPU263334F	30.7	44.3	6.90	S	11000	17000	0.043	26.000	25.991	33.025	33.009
27 1.0630	27	31	23.8	WRS273124A	19.1	36.2	5.50	S	10000	16000	0.025	27.000	26.991	31.025	31.009
28 1.1024	28	32	26	28R3226	17.1	31.5	4.95	S	10000	15000	0.027	28.000	27.991	32.025	32.009
	28	32	27	RF283227	22	43.9	6.80	P	10000	15000	0.017	28.000	27.991	32.025	32.009
	28	33	17	28R3317	18	29	4.50	S	10000	15000	0.022	28.000	27.991	33.025	33.009
	28	33	20	RF283320	19.5	32.2	5.10	P	10000	15000	0.016	28.000	27.991	33.025	33.009
	28	33	27	R28/27	25.1	44.5	6.95	S	10000	15000	0.036	28.000	27.991	33.025	33.009
	28	34	20	RFU283420	20.2	29.6	4.70	P	10000	16000	0.018	28.000	27.991	34.025	34.009
	28	35	37.5	RPU283538A	37	57.9	9.05	S	10000	16000	0.048	28.000	27.991	35.025	35.009
	28	38	20	28VU3820	21.6	22.9	3.65	S	10000	16000	0.048	28.000	27.991	38.025	38.009
	28	38	24	RS283824	31.7	37.9	6.05	S	10000	16000	0.070	28.000	27.991	38.025	38.009
	28	41	25	RV284125	40.9	44.6	7.15	S	11000	17000	0.088	28.000	27.991	41.025	41.009
	28	42	50.5	RF284251A	89.5	118	18.4	P	11000	17000	0.182	28.000	27.991	42.025	42.009

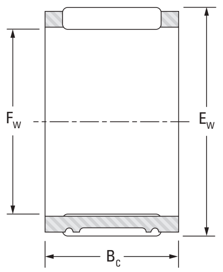
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

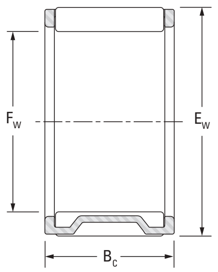
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



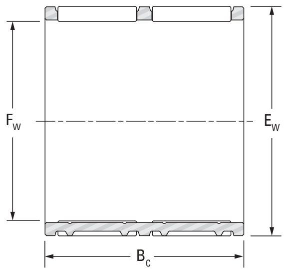
RS, R, RP



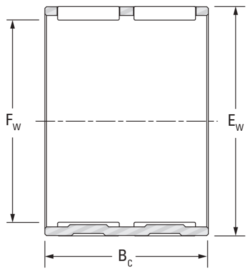
RV, V, VS

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
29 1.1417	29	34	22	R29/22A	17.3	27.6	4.30	S	10000	15000	0.030	29.000	28.991	34.025	34.009
	29	34	24.4	RFU293424A-1	19.9	33.2	5.15	P	10000	15000	0.017	29.000	28.991	34.025	34.009
	29	34	27	29R3427A-1	25.8	46.7	7.30	S	10000	15000	0.037	29.000	28.991	34.025	34.009
	29	43	43	RV294343	74.4	93.3	14.7	S	10000	16000	0.177	29.000	28.991	43.025	43.009
30 1.1811	30	34	29	30WR3429A	14.3	25.2	3.85	S	9100	14000	0.032	30.000	29.991	34.025	34.009
	30	34	29	RF303429	20.6	41.2	6.50	P	9100	14000	0.016	30.000	29.991	34.025	34.009
	30	35	16	RS303516	18	29.7	4.55	S	9100	14000	0.023	30.000	29.991	35.025	35.009
	30	35	17	R30/17-1	18	29.7	4.55	S	9100	14000	0.024	30.000	29.991	35.025	35.009
	30	35	21.1	RS303521A	22.4	39.5	6.20	S	9100	14000	0.030	30.000	29.991	35.025	35.009
	30	35	24	RS303524	24.8	44.8	7.05	S	9100	14000	0.034	30.000	29.991	35.025	35.009
	30	37	16	RV303716	21.9	30.3	4.65	S	10000	15000	0.029	30.000	29.991	37.025	37.009
	30	37	26	RV303726	35.2	55.8	8.75	S	10000	15000	0.047	30.000	29.991	37.025	37.009
	30	37	32	WRS30/32B	32.6	50.4	7.75	S	10000	15000	0.066	30.000	29.991	37.025	37.009
	30	40	15.5	RV304016A-4	27.5	32.3	4.90	S	10000	15000	0.046	30.000	29.991	40.025	40.009
	30	42	32.2	30V4232	53.3	67.1	10.6	S	10000	16000	0.108	30.000	29.991	42.025	42.009
	30	45	30	30V4530	55.1	61.2	9.75	S	10000	16000	0.134	30.000	29.991	45.025	45.009
31 1.2205	31	36	20.3	RFU313620A-1	20.1	34.7	5.40	P	9100	14000	0.017	31.000	30.989	36.025	36.009

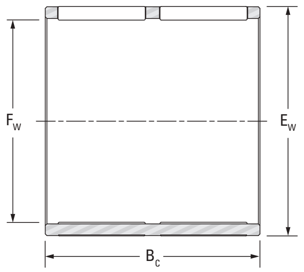
(1) Cage material: P: polymer cage, S: steel cage



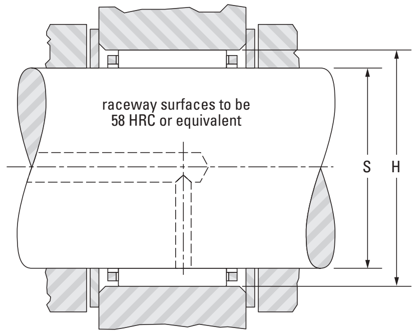
WR, WRS



WRP



WRF

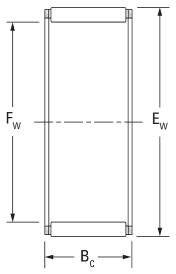


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
31 1.2205	31	36	24.4	RFU313624A	21.3	37.1	5.75	P	9100	14000	0.019	31.000	30.989	36.025	36.009
32 1.2598	32	37	17	R32/17-1	18.9	32.4	4.95	S	8500	13000	0.026	32.000	31.989	37.025	37.009
	32	37	35	WRS323735	33.1	66.5	10.3	S	8500	13000	0.053	32.000	31.989	37.025	37.009
	32	38	25.9	RP323826	27.6	46.1	7.20	S	9100	14000	0.034	32.000	31.989	38.025	38.009
	32	39	16	RS323916	20.8	28.9	4.40	S	9100	14000	0.035	32.000	31.989	39.025	39.009
	32	39	42	RVU323942	41.3	69.3	10.9	S	9100	14000	0.078	32.000	31.989	39.025	39.009
	32	42	16	RV324216	28.4	34.1	5.35	S	9100	14000	0.049	32.000	31.989	42.025	42.009
	32	42	20.5	RV324221-1	34.3	43.4	7.00	S	9100	14000	0.060	32.000	31.989	42.025	42.009
	32	45	28	32V4528	48.7	57.6	9.20	S	10000	15000	0.112	32.000	31.989	45.025	45.009
	32	46	18	RV324618-1	31.1	30.8	4.85	S	10000	15000	0.075	32.000	31.989	46.025	46.009
33 1.2992	33	37	26	RF333726	23	49.1	7.65	P	8500	13000	0.018	33.000	32.989	37.025	37.009
34 1.3386	34	39	20.3	RFU343920A	19.8	34.9	5.40	P	8500	13000	0.018	34.000	33.989	39.025	39.009
	34	39	62.1	WRFU343962A	46.6	105	16.3	P	8500	13000	0.052	34.000	33.989	39.025	39.009
	34	42	38.2	34R4238	49.5	81.9	12.8	S	8500	13000	0.098	34.000	33.989	42.025	42.009
35 1.3780	35	40	25	RS354025-1	27.2	53.2	8.40	S	7800	12000	0.041	35.000	34.989	40.025	40.009
	35	40	28	RF354028	28.7	56.9	8.90	P	7800	12000	0.027	35.000	34.989	40.025	40.009
	35	40	28.9	RP354029-1	30.6	61.7	9.50	S	7800	12000	0.033	35.000	34.989	40.025	40.009

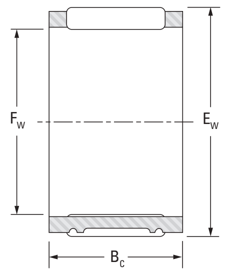
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

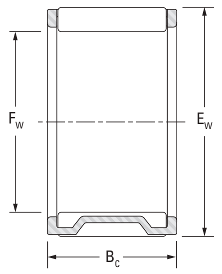
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



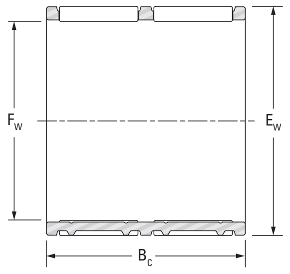
RS, R, RP



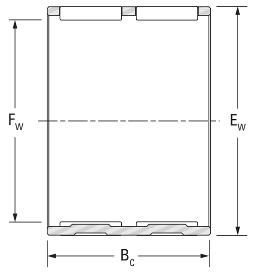
RV, V, VS

Shaft Dia.	Fw	Ew	Bc	Assembly Designation	Load Ratings		Fatigue Load Limit Cu	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
35 1.3780	35	40	31	RP354031	30.8	62.1	9.60	S	7800	12000	0.037	35.000	34.989	40.025	40.009
	35	40	33	RP354033-1	31.3	63.8	9.85	S	7800	12000	0.040	35.000	34.989	40.025	40.009
	35	40	35	RF354035	31.8	64.9	10.1	P	7800	12000	0.032	35.000	34.989	40.025	40.009
	35	42	20	VS35/20	27.5	42.6	6.80	S	7800	12000	0.042	35.000	34.989	42.025	42.009
	35	48	17.5	RF354818A-1	42.5	50	7.85	P	8500	13000	0.061	35.000	34.989	48.025	48.009
	35	48	17.5	RV354818A-4	38.7	44.1	6.90	S	8500	13000	0.081	35.000	34.989	48.025	48.009
36 1.4173	36	41	20	RS364120	22	40.9	6.35	S	7800	12000	0.034	36.000	35.989	41.025	41.009
	36	42	17	RS364217-K	20.5	32.8	5.05	S	7800	12000	0.035	36.000	35.989	42.025	42.009
	36	43	22.4	RFU364322A	26	39.8	6.30	P	7800	12000	0.029	36.000	35.989	43.025	43.009
37 1.4567	37	42	22	37R4222	24.1	46.3	7.25	S	7200	11000	0.038	37.000	36.989	42.025	42.009
	37	42	23	RF374223-1	24.1	46.1	7.20	P	7200	11000	0.022	37.000	36.989	42.025	42.009
38 1.4961	38.02	42.98	17	R38/17-1	18.6	33.6	5.15	S	7200	11000	0.032	38.000	37.989	43.025	43.009
	38	44	26	RF384426	28.9	51.7	8.15	P	7200	11000	0.031	38.000	37.989	44.025	44.009
	38	44	33	RP384433	38.1	74	11.5	S	7200	11000	0.055	38.000	37.989	44.025	44.009
	38	44	39.8	RP384440A	43.9	88.7	13.8	S	7200	11000	0.064	38.000	37.989	44.025	44.009
	38	44	40	WRPU384440F	44.1	89.3	14.2	S	7200	11000	0.075	38.000	37.989	44.025	44.009
	38	46	26	RS384626	36.8	57.8	9.10	S	7800	12000	0.077	38.000	37.989	46.025	46.009

(1) Cage material: P: polymer cage, S: steel cage



WR, WRS



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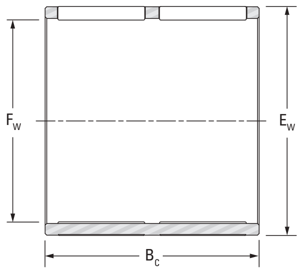
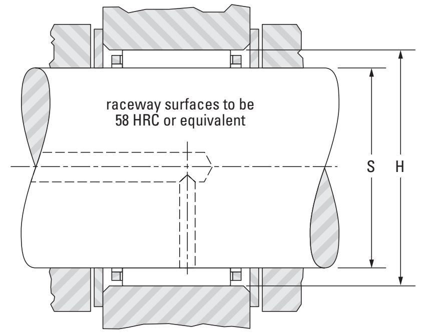


WRF

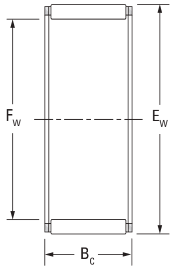


Shaft Dia.	Fw	Ew	Bc	Assembly Designation	Load Ratings		Fatigue Load Limit Cu	Cage material(1) P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
			-0.20 -0.008 -0.55 -0.022		Dynamic	Static						S		H	
					C	C0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
39 1.5354	39	44	43	WRS394443	41.3	94.3	14.9	S	7200	11000	0.075	39.000	38.989	44.025	44.009
	39	44	43.8	39WR4444	39.1	88	13.7	S	7200	11000	0.080	39.000	38.989	44.025	44.009
	39	46	32.8	39R4633	42.5	76.9	12.0	S	7200	11000	0.086	39.000	38.989	46.025	46.009
	39	46	37.8	RSU394638A	46.2	85.4	13.3	S	7200	11000	0.096	39.000	38.989	46.025	46.009
	39	46	44.3	WRP394644A	54.9	107	16.8	S	7200	11000	0.102	39.000	38.989	46.025	46.009
	39	55	20.5	RF395521A	56.1	64.2	10.5	P	7800	12000	0.098	39.000	38.989	55.029	55.01
40 1.5748	40	45	27	RS404527	30.3	63.6	9.90	S	7200	11000	0.049	40.000	39.989	45.025	45.009
	40	45	30	R40/30	30.8	64.9	10.1	S	7200	11000	0.055	40.000	39.989	45.025	45.009
	40	45	32	R40/32A	14.3	23.3	3.60	S	7200	11000	0.053	40.000	39.989	45.025	45.009
	40	47	20	RS40/20	27.7	44.8	7.00	S	7200	11000	0.054	40.000	39.989	47.025	47.009
	40	48	34	40V4834	50.5	88.3	13.7	S	7200	11000	0.087	40.000	39.989	48.025	48.009
	40	55	27.5	RF405528A-1	68.8	87.1	13.8	P	7800	12000	0.121	40.000	39.989	55.029	55.01
	40	55	30	RF405530	73.6	94.9	15.2	P	7800	12000	0.132	40.000	39.989	55.029	55.01
	40	56	20	RV405620-4	51.9	58.3	9.45	S	7800	12000	0.130	40.000	39.989	56.029	56.01
	40	60	31.5	RF406032A	95.2	112	17.8	P	7800	12000	0.214	40.000	39.989	60.029	60.01
41.3 1.6260	41.3	47.3	23.6	RFU414724A	27.9	50.8	7.95	P	6500	10000	0.030	41.300	41.289	47.325	47.309
42 1.6535	42	47	30	RSU424730F	32.3	70.4	11.0	S	6500	10000	0.058	42.000	41.989	47.025	47.009

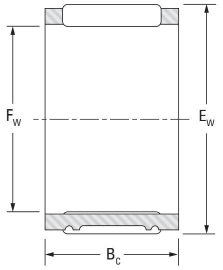
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

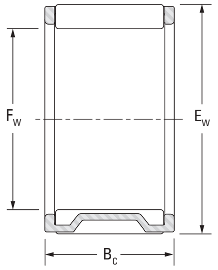
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



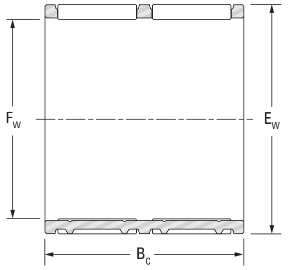
RS, R, RP



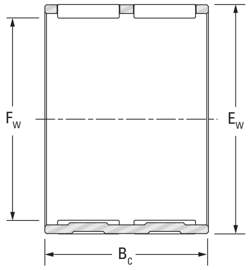
RV, V, VS

Shaft Dia.	F_w	E_w	B_c **-0.20** -0.008 **-0.55** -0.022	Assembly Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	S Min.	H Max.	H Min.
					C	C_0									
mm in	mm in	mm in	mm in		kN lbf		kN		min⁻¹		kg lbs	mm in	mm in	mm in	mm in
42 1.6535	**42**	**49**	**22**	RF424922	**29.7**	**49.7**	7.95	P	6500	10000	**0.035**	**42.000**	**41.989**	**49.025**	**49.009**
43.5 1.7126	**43.5**	**50.5**	**33.8**	RF445134A	**46.5**	**89.6**	13.9	P	6500	10000	**0.059**	**43.500**	**43.489**	**50.529**	**50.51**
44 1.7323	**44**	**50**	**27.5**	44RFN5028	**36**	**72.2**	11.3	P	6500	10000	**0.041**	**44.000**	**43.989**	**50.025**	**50.009**
	44	**50**	**39**	RP445039	**46.8**	**101**	15.6	S	6500	10000	**0.070**	**44.000**	**43.989**	**50.025**	**50.009**
44.5 1.7520	**44.5**	**51.5**	**36**	RP455236A	**49.1**	**96.6**	15.0	S	6500	10000	**0.075**	**44.500**	**44.489**	**51.529**	**51.51**
	44.5	**51.5**	**41.6**	RP455242A	**54**	**109**	17.1	S	6500	10000	**0.086**	**44.500**	**44.489**	**51.529**	**51.51**
45 1.7717	**45**	**49**	**25**	RFU454925	**25.3**	**61.5**	9.70	P	6000	9300	**0.023**	**45.000**	**44.989**	**49.025**	**49.009**
	45	**50**	**17**	RS455017	**23.1**	**46.8**	7.30	S	6100	9400	**0.035**	**45.000**	**44.989**	**50.025**	**50.009**
	45	**50**	**19**	R45/19	**24.2**	**49.7**	7.80	S	6100	9400	**0.039**	**45.000**	**44.989**	**50.025**	**50.009**
	45	**50**	**24**	RS455024	**29.4**	**63.9**	10.0	S	6100	9400	**0.050**	**45.000**	**44.989**	**50.025**	**50.009**
	45	**50**	**33**	R45/33	**37.1**	**86.1**	13.3	S	6100	9400	**0.068**	**45.000**	**44.989**	**50.025**	**50.009**
	45	**52**	**22**	RS455222	**35.4**	**63.9**	10.0	S	6200	9500	**0.066**	**45.000**	**44.989**	**52.029**	**52.01**
	45	**64**	**23**	RV456423-7	**65.2**	**72.1**	11.8	S	6500	10000	**0.191**	**45.000**	**44.989**	**64.029**	**64.01**
46 1.8110	**46**	**53**	**42.6**	RPU465343A	**48.3**	**95**	14.9	S	6000	9300	**0.084**	**46.000**	**45.989**	**53.029**	**53.01**
47 1.8504	**47**	**52**	**30**	R47/30H	**36.5**	**85.4**	13.2	S	5800	8900	**0.062**	**47.000**	**46.989**	**52.029**	**52.01**
	47	**53**	**28.8**	RP475329A	**35.6**	**72.7**	11.4	S	5900	9000	**0.054**	**47.000**	**46.989**	**53.029**	**53.01**
	47	**53**	**36**	RP475336	**47.4**	**105**	16.2	S	5900	9000	**0.068**	**47.000**	**46.989**	**53.029**	**53.01**

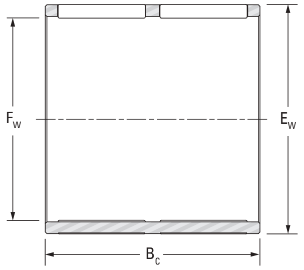
(1) Cage material: P: polymer cage, S: steel cage



WR, WRS



WRP



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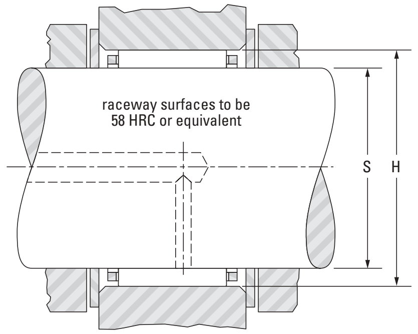
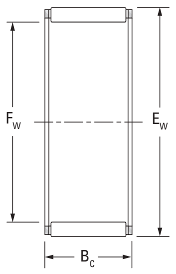


Shaft Dia.	F_w	E_w	B_c **-0.20** -0.008 **-0.55** -0.022	Assembly Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	S Min.	H Max.	H Min.
					C	C_0									
mm in	mm in	mm in	mm in		kN lbf		kN		min⁻¹		kg lbs	mm in	mm in	mm in	mm in
47 1.8504	**47**	**54**	**38.6**	WRP475439A	**49.1**	**98.4**	15.5	S	5900	9100	**0.107**	**47.000**	**46.989**	**54.029**	**54.01**
47.9 1.8858	**47.9**	**52.9**	**25**	RF485325A-1	**31.2**	**70.4**	10.9	P	5700	8800	**0.033**	**47.900**	**47.889**	**52.929**	**52.91**
	47.9	**52.9**	**33.8**	RF485334A-1	**23.7**	**48.3**	7.50	P	5700	8800	**0.030**	**47.900**	**47.889**	**52.929**	**52.91**
48 1.8898	**48**	**53**	**28**	48R5328	**34.2**	**79.2**	12.3	S	5700	8700	**0.060**	**48.000**	**47.989**	**53.029**	**53.01**
	48	**54**	**20**	48R5420-1	**29.4**	**57.3**	8.90	S	5700	8800	**0.054**	**48.000**	**47.989**	**54.029**	**54.01**
	48	**54**	**39**	48R5439	**48.5**	**109**	16.8	S	5700	8800	**0.106**	**48.000**	**47.989**	**54.029**	**54.01**
49 1.9291	**49**	**56**	**44.6**	RF495645A	**61.2**	**133**	20.7	P	5700	8700	**0.087**	**49.000**	**48.989**	**56.029**	**56.01**
50 1.9685	**50**	**55**	**27**	R50/27A	**11.5**	**18.9**	2.95	S	5500	8400	**0.056**	**50.000**	**49.989**	**55.029**	**55.01**
	50	**56**	**30**	RF505630	**41.2**	**89.6**	14.0	P	5500	8500	**0.050**	**50.000**	**49.989**	**56.029**	**56.01**
	50	**56**	**40**	50WR5640	**51.2**	**119**	18.5	S	5500	8500	**0.110**	**50.000**	**49.989**	**56.029**	**56.01**
	50	**57**	**33.5**	RP505734A	**48.1**	**97.9**	15.3	S	5500	8500	**0.080**	**50.000**	**49.989**	**57.029**	**57.01**
	50	**57**	**38.9**	RS505739A	**58.4**	**126**	19.7	S	5500	8500	**0.142**	**50.000**	**49.989**	**57.029**	**57.01**
	50	**58**	**25**	RF505825	**38.5**	**66.9**	10.6	P	5600	8600	**0.054**	**50.000**	**49.989**	**58.029**	**58.01**
	50	**70**	**36**	RF507036	**115**	**149**	23.9	P	6000	9300	**0.277**	**50.000**	**49.989**	**70.029**	**70.01**
50.8 2.0000	**50.8**	**64.8**	**50**	RF516550A	**124**	**207**	32.4	P	5700	8800	**0.258**	**50.800**	**50.787**	**64.829**	**64.81**
	50.8	**64.8**	**60**	RV516560	**138**	**237**	36.7	S	5700	8800	**0.369**	**50.800**	**50.787**	**64.829**	**64.81**
51.9 2.0433	**51.9**	**57.9**	**28**	RF525828A	**40.9**	**89.9**	14.0	P	5300	8100	**0.050**	**55.500**	**55.487**	**61.529**	**61.51**

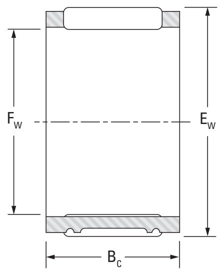
Continued on next page.

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

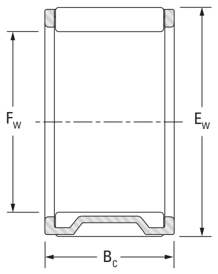
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



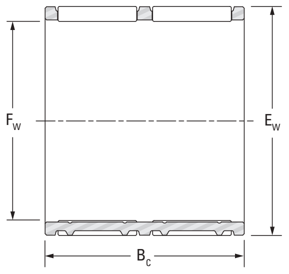
RS, R, RP



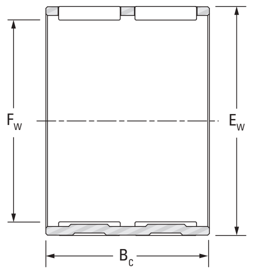
RV, V, VS

Shaft Dia.	F_w	E_w	B_c **-0.20** -0.008 **-0.55** -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
51.9 2.0433	**51.9**	**57.9**	**35.4**	RF525835A	**28.2**	**54.3**	8.45	P	5300	8100	**0.041**	**55.500**	**55.487**	**61.529**	**61.51**
53 2.0866	**53**	**58**	**25**	RF535825	**32.3**	**76**	11.9	P	5100	7900	**0.035**	**53.000**	**52.987**	**58.029**	**58.01**
54 2.1260	**54**	**60**	**36**	RP546036	**46**	**105**	16.5	S	5100	7800	**0.085**	**54.000**	**53.987**	**60.029**	**60.01**
	54	**61**	**35.8**	RFU546136A	**53.2**	**114**	17.8	P	5100	7900	**0.075**	**54.000**	**53.987**	**61.029**	**61.01**
	54	**61**	**41.3**	RF546141A	**63.5**	**143**	22.4	P	5100	7900	**0.092**	**54.000**	**53.987**	**61.029**	**61.01**
55 2.1654	**55**	**59**	**13**	55RFN5913A	**10.9**	**21.9**	3.35	P	4900	7500	**0.011**	**55.000**	**54.987**	**59.029**	**59.01**
56 2.2047	**56**	**61**	**33.5**	R56/34	**42.6**	**111**	17.2	S	4800	7400	**0.084**	**56.000**	**55.987**	**61.029**	**61.01**
	56	**63**	**47**	RPU566347	**60**	**135**	21.1	S	4900	7600	**0.119**	**56.000**	**55.987**	**63.029**	**63.01**
58 2.2835	**58**	**65**	**26.2**	58R6526	**42.2**	**87.1**	13.7	S	4700	7300	**0.099**	**58.000**	**57.987**	**65.029**	**65.01**
	58	**65**	**36.6**	58RFN6537A	**55.9**	**125**	19.5	P	4700	7300	**0.081**	**58.000**	**57.987**	**65.029**	**65.01**
	58	**65**	**36.6**	RS586537A-2	**56.7**	**127**	19.8	S	4700	7300	**0.157**	**58.000**	**57.987**	**65.029**	**65.01**
	58	**65**	**42.6**	WRP586543A	**60.1**	**137**	21.9	S	4700	7300	**0.144**	**58.000**	**57.987**	**65.029**	**65.01**
	58	**80**	**72**	RV588072	**233**	**361**	55.9	S	5200	8000	**0.889**	**58.000**	**57.987**	**80.029**	**80.01**
60 2.3622	**60**	**65**	**30**	R60/30	**40.1**	**105**	16.2	S	4500	6900	**0.081**	**60.000**	**59.987**	**65.029**	**65.01**
	60	**82**	**30**	RF608230	**120**	**155**	24.9	P	5000	7700	**0.340**	**60.000**	**59.987**	**82.034**	**82.012**
63 2.4803	**63**	**68**	**30**	R63/30	**41**	**110**	17.0	S	4300	6600	**0.083**	**63.000**	**62.987**	**68.029**	**68.01**
	63	**75**	**38.15**	RV637538-1	**121**	**240**	38.0	S	4500	6900	**0.270**	**63.000**	**62.987**	**75.029**	**75.01**

(1) Cage material: P: polymer cage, S: steel cage



WR, WRS



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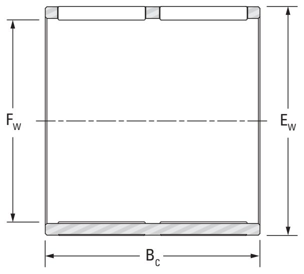
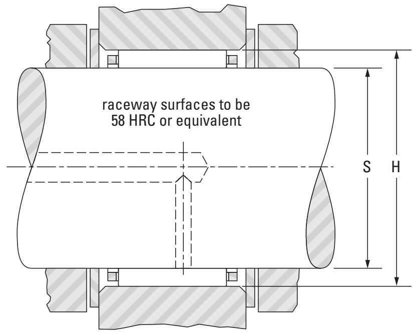


WRF



Shaft Dia.	F_w	E_w	B_c **-0.20** -0.008 **-0.55** -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
65 2.5591	**65**	**70**	**20**	R65/20A	**12.2**	**22.3**	3.50	S	4200	6400	**0.057**	**65.000**	**64.987**	**70.029**	**70.01**
	65	**70**	**24**	R65/24A	**12.5**	**22.9**	3.60	S	4200	6400	**0.067**	**65.000**	**64.987**	**70.029**	**70.01**
68 2.6772	**68**	**73**	**31.6**	WRS687332A	**45.7**	**129**	19.8	S	4000	6100	**0.095**	**68.000**	**67.987**	**73.029**	**73.01**
70 2.7559	**70**	**76**	**20**	70R7620	**34.8**	**80.8**	12.7	S	3800	5900	**0.077**	**70.000**	**69.987**	**76.029**	**76.01**
	70	**80**	**55**	70WR8055	**103**	**225**	35.5	S	4000	6100	**0.351**	**70.000**	**69.987**	**80.029**	**80.01**
71 2.7953	**71**	**79**	**30.15**	71V7930B	**61.5**	**138**	21.4	S	3800	5900	**0.135**	**71.000**	**70.987**	**79.029**	**79.01**
73 2.8740	**73**	**79**	**20**	R73/20	**36.4**	**86.8**	13.5	S	3700	5700	**0.084**	**73.000**	**72.987**	**79.029**	**79.01**
76.2 3.0000	**76.2**	**85.5**	**31.7**	76V8632A	**76.3**	**167**	26.1	S	3600	5600	**0.177**	**76.200**	**76.187**	**85.534**	**85.512**
	76.2	**85.5**	**33.2**	RV768633A	**78.5**	**173**	27.2	S	3600	5600	**0.187**	**76.200**	**76.187**	**85.534**	**85.512**
	76.2	**85.5**	**44.2**	RV768644A-2	**95.6**	**222**	34.8	S	3600	5600	**0.235**	**76.200**	**76.187**	**85.534**	**85.512**
	76.2	**88**	**34**	RV768834A	**91.1**	**177**	27.9	S	3600	5600	**0.250**	**76.200**	**76.187**	**88.034**	**88.012**

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CONNECTING ROD APPLICATIONS

METRIC SERIES

Connecting rods have two bearing positions: the crank pin or big end, and the wrist pin or small end.

In the crank pin position there may be severe operating conditions due to centrifugal forces, internal forces, accelerations and high rotational speeds, requiring the use of special radial needle roller and cage assemblies.

Similarly, in the wrist pin position the reciprocating inertia loads and high oscillating speeds dictate the use of special cage designs.

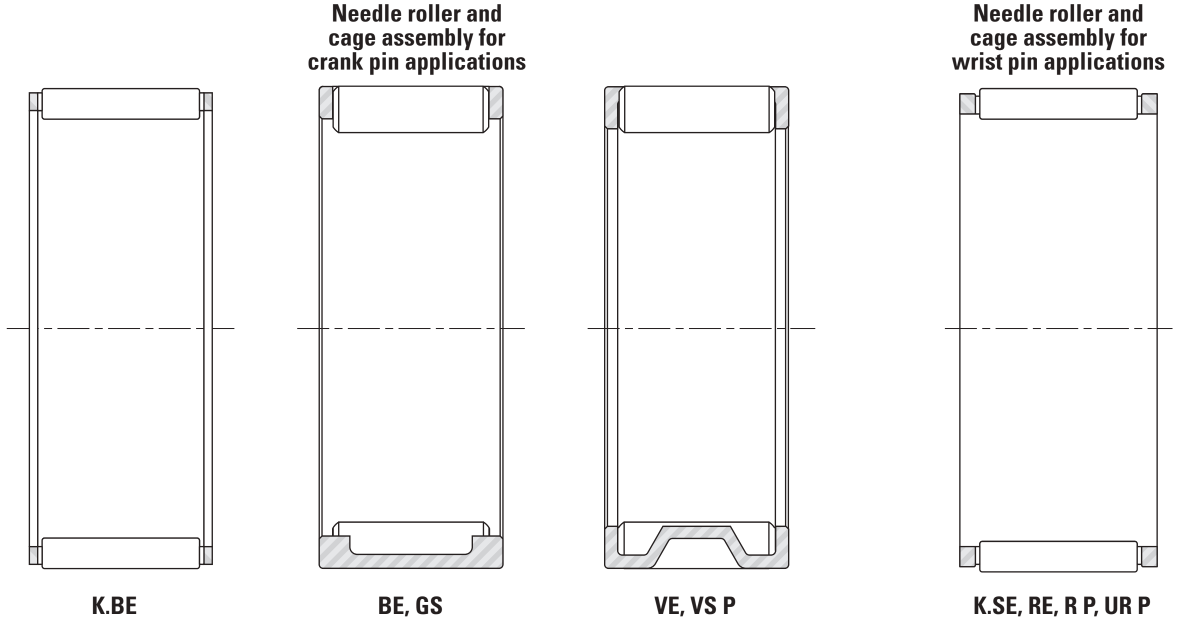


Fig. B1-3. Types of metric series radial needle roller and cage assemblies

CONSTRUCTION

METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CRANK PIN POSITIONS

Needle roller and cage assemblies for use in crank pin positions have cages with a large outside cylindrical surface to ensure optimum radial guidance in the connecting rod bore. Due to the inherent low weight and strength of the heat-treated cages, the needle roller and cage assemblies are well-suited for high-speed engine applications. When necessary, silver plating and copper plating can be applied for optimum performance during operation at high speeds.

METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR WRIST PIN POSITIONS

Reciprocating inertia loads and oscillating speeds require the cages used in the wrist pin positions to be heat-treated and to guide on the wrist pin.

These cages are available in a variety of widths to allow the selection of a needle roller and cage assembly with the length of needle rollers to match the connecting rod width.

SIZE SELECTION

In most instances, selection of a suitable size of a needle roller and cage assembly for typical connecting rod positions may be based on the cylinder displacement of the engine which in turn, dictates the crank pin and wrist pin diameters.

Suggestions, based on engine displacements, are listed in the following table.

Table B1-3. Crank pin and wrist pin diameters, determined by the cylinder displacement of the engine

		Cylinder displacement in cm^3						
Cylinder Displacement	>		40	60	100	150	200	300
	≤	40	60	100	150	200	300	

		Diameter						
		mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
Crank pin		**12/14** 0.4724/0.5512	**15/16/18** 0.5906/0.6299/0.7087	**18/20** 0.7087/0.7874	**18/20/22** 0.7087/0.7874/0.8661	**24/25/28** 0.9449/0.9843/1.1024	**28/30** 1.1024/1.1811	**35/40** 1.3780/1.5748
Wrist pin		**10/11** 0.3937/0.4331	**12/13** 0.4724/0.5118	**14/15** 0.5512/0.5906	**15/16** 0.5906/0.6299	**18** 0.7087	**20** 0.7874	**20** 0.7874

CONNECTING ROD GUIDANCE ARRANGEMENTS

End guidance of a connecting rod can be provided either at the crank pin or at the wrist pin end. Connecting-rod guidance is achieved at the crank pin end using a small clearance between the crank counterweights. Guidance at the wrist pin end is controlled by a small clearance between the piston bosses.

CRANK PIN END GUIDANCE

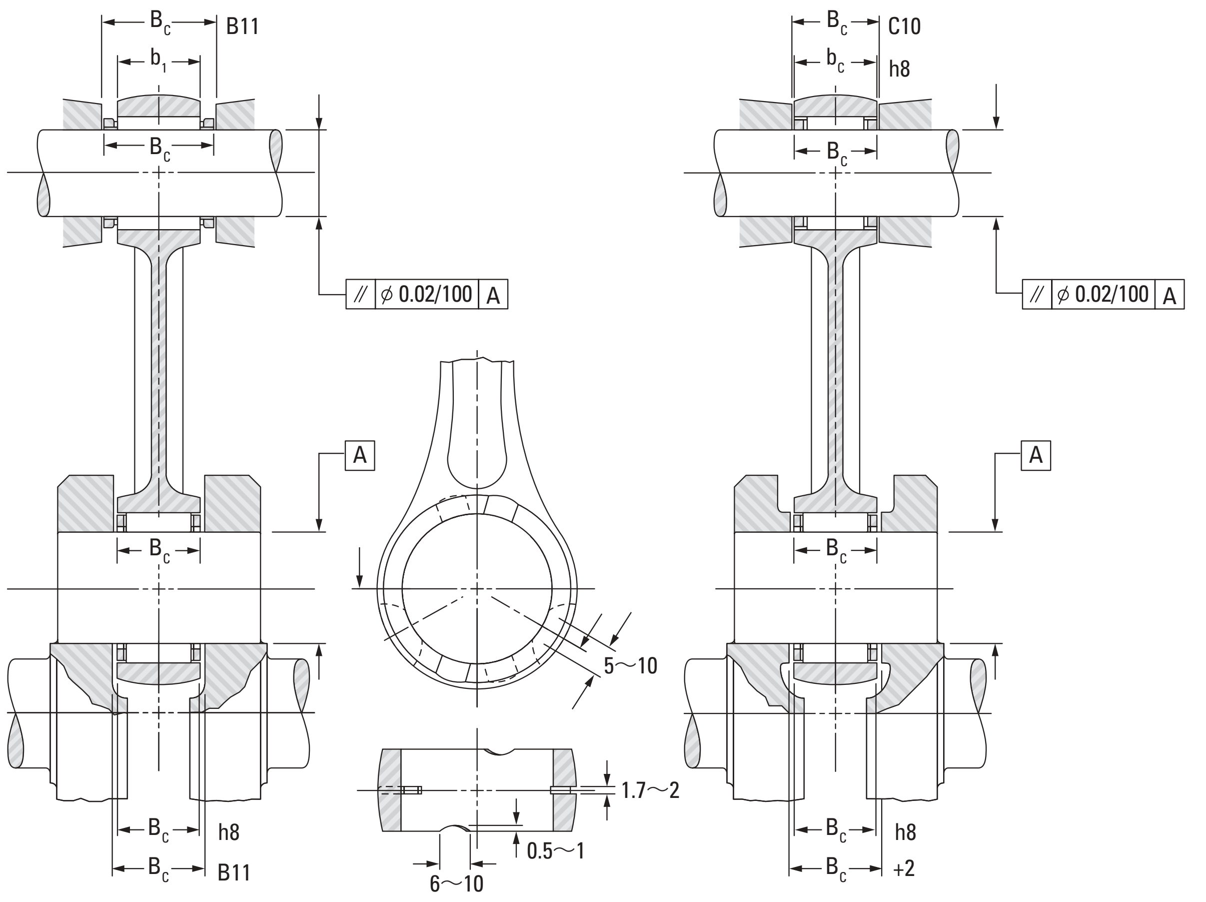
With crank pin end guidance, care must be taken that an adequate amount of lubricant is supplied to the crank pin bearing and the surfaces that guide the connecting rod. For this purpose, grooves in the connecting rod end faces, or slots in the connecting rod bore aligned with the incoming lubrication path, should be provided. Occasionally, bronze or hardened steel washers may be used for end guidance of the connecting rod.

At the wrist pin end, the needle roller and cage assembly is located axially between the piston bosses. It may be both economical and effective to machine the connecting rod at the wrist pin end and at the crank pin end to the same width. It is suggested that, at the wrist pin end, the needle roller length does not overhang the connecting rod width. Otherwise, the load rating of the needle roller and cage assembly will be reduced.

WRIST PIN END GUIDANCE

Wrist pin end will get the most effective axial guidance between the piston bosses. Grooves in the bottom of the piston bosses and a chamfer of small angle – on each side of the upper portion of the connecting rod small end – can improve the oil flow to the needle roller and cage assembly and its guiding surfaces.

The length of the needle roller and cage assembly and the connecting rod width at the crank pin end should be identical to ensure best possible radial piloting of cage in the bore of the connecting rod. The crank counterweights are recessed to allow proper axial alignment of the connecting rod. As a rule, it is not necessary to have an additional supply of lubricant. Only in engines with sparse lubrication should consideration be given to provide lubricating slots in the connecting rod bores as with crank pin end guidance.



Crank Pin End Guidance

Wrist Pin End Guidance

Fig. B1-4. Crank pin and wrist pin end guidance

SUITABLE MATERIALS AND HEAT TREATMENT

Connecting rod crank pin end and wrist pin end bores that serve as raceways:

> a case-hardening steel such as SNCM 420, 15 CrNi 6, 17 MnCr 5, or AISI 8620.

Crank pins:

> a case-hardening steel such as SCM 415, 15 Cr 3, AISI 8620, or AISI 1018; a through-hardening steel such as SUJ 2m, 100 Cr 6, or AISI 52100; or a similar substance.

Wrist pins:

> a case-hardening steel such as SCr 420, Ck 15, or 15 Cr 3; a through-hardening steel such as SUJ 2, 100 Cr 6, or AISI 52100; or a similar substance.

See Table B1-4 for the effective case depths of the raceways.

After hardening, the connecting rods must be stress-relieved.

FORM TOLERANCES

The recommended mounting specifications for crank pins, wrist pins, and connecting rods are listed in Table B1-4.

Table B1-4. Form tolerances

Classification		Connecting rod crank pin end and wrist pin end holes	Crank pin and wrist pin outer diameters
Surface roughness (Ra)		**0.16 a or less**	**0.1 a or less**
Hardness		**60 – 64 HRC**	
Hardening layer depth (mm) (depth to 550 HV)		**0.6 – 1.2 mm**	
Out-of-roundness (μm)	Greater than 9 and less than or equal to 18	**1.5**	**1**
	Greater than 18 and less than or equal to 30	**2**	**1.5**
	Greater than 30 and less than or equal to 40	**2.5**	**2**
Taper (μm)	Greater than 9 and less than or equal to 18	**2**	**1**
	Greater than 18 and less than or equal to 30	**3**	**2**
	Greater than 30 and less than or equal to 42	**4**	**3**
Parallelism		**0.02 mm or less per 100 mm**	

RADIAL CLEARANCE

METRIC SERIES CRANK PIN BEARINGS

The high speeds of modern production engines dictate the need for crank pin bearings with a relatively large radial clearance. As an approximation, the minimum clearance can be taken as the crank pin diameter/1000. The maximum radial clearance would be a result of the sorting plan shown in Table B1-6(1) on page B1-46.

As shown in the example of the matching scheme, the suggested mounting diameters for the crank pin position are G6 for the connecting rod bore diameters and h5 for the crank pin diameters. Axial location of the cage is shown on the crank pin end guidance arrangement.

Racing and sport engines operate at even higher speeds than production engines, requiring 50 percent larger radial clearances in the crank pin bearings. The larger radial clearances also should be used in bores of split connecting rods to avoid the danger of distortion – resulting from the unavoidable connecting rod deformation occurring in operation. Consult your representative for advice on such applications.

METRIC SERIES WRIST PIN BEARINGS

The radial clearance in wrist pin bearings should be held as small as possible. The minimum clearance should be aimed at 2 μm with the maximum clearance resulting from the proposed sorting plan in Table B1-6(2) on page B1-46. The maximum clearance should be held as close as possible to 12 μm for all wrist pin bearings based on sorting wrist pins made to a tolerance h5, small end bore diameter tolerance of K6 and needle roller grades as shown in Table B1-6(2) on page B1-46.

The recommended radial clearances for prefix BE, GS, VE, VSP, RE, RP, and URP bearings are shown in Table B1-5.

Table B1-5. Recommended radial clearances

Diameter classification		Crank pin end		Wrist pin end	
Over	Or less	Min.	Max.	Min.	Max.
mm		**μm**		**μm**	
—	10	9	25	3	14
10	18	9	25	3	14
18	30	10	25	5	17
30	40	18	33	—	—

METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CONNECTING ROD APPLICATIONS

MATCHING SCHEME FOR A CRANK PIN BEARING ARRANGEMENT

(three diameter ranges are specified for the connecting rod and crank pin)

Example: Satisfy conditions of Radial clearance 20 µm – 33 µm

Crank pin diameter	20 mm, tolerance h5
Connecting rod bore diameter	26 mm, tolerance G6
Needle roller and cage assembly	K20x26x12BE

Table B1-6(1). Radial clearance

		Connecting Rod Crank Pin End Bore Diameter 26 mm Tolerance range					
		+7 – +12		+12 – +16		+16 – +20	
		Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance
Crank Pin Diameter 20 mm Tolerance range	-3 – 0	-9 – -7	21 – 33	-6 – -4 -7 – -5	20 – 31 22 – 33	-4 – -2 -5 – -3	20 – 31 22 – 33
	-6 – -3	-7 – -5	20 – 32	-5 – -3	21 – 32	-3 – -1	21 – 32
	-9 – -6	-6 – -4	21 – 33	-3 – -1 -4 – -2	20 – 31 22 – 33	-2 – 0	22 – 33

MATCHING SCHEME FOR A WRIST PIN BEARING ARRANGEMENT

(three diameter ranges are specified for the connecting rod and wrist pin)

Example: Satisfy conditions of Radial clearance 2 µm – 16 µm

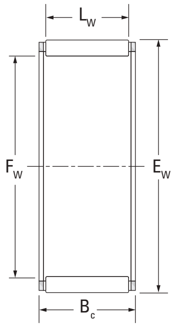
Wrist pin diameter	16 mm, tolerance h5
Connecting rod bore diameter	20 mm, tolerance K6
Needle roller and cage assembly	K16x20x20SE

Table B1-6(2). Radial clearance

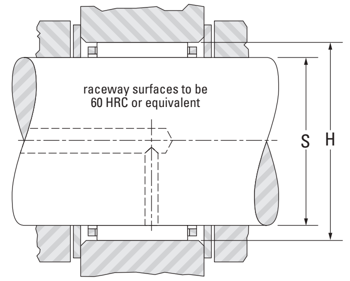
		Wrist Pin End Bore Diameter 20 mm Tolerance range					
		-11 – -6		-6 – -2		-2 – +2	
		Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance
Wrist Pin Diameter 16 mm Tolerance range	-3 – 0			-6 – -4 -7 – -5	2 – 13 4 – 15	-4 – -2 -5 – -3	2 – 13 4 – 15
	-6 – -3	-7 – -5	2 – 14	-5 – -3 -6 – -4	3 – 14 5 – 16	-3 – -1 -4 – -2	3 – 14 5 – 16
	-8 – -6	-6 – -4 -7 – -5	3 – 14 5 – 16	-3 – -1 -4 – -2	2 – 12 4 – 14	-2 – 0	4 – 10

ASSEMBLIES FOR CRANK PIN END APPLICATIONS

METRIC SERIES
K BE SERIES



K BE



Shaft Dia.	F_w	E_w	B_c **-0.20** -0.008 **-0.55** -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
12 0.4724	**12** 0.4724	**16** 0.6299	**10** 0.394	**7.8** 0.307	K12X16X10BE	**6.21** 1400	**6.70** 1510	1.00	**0.004** 0.009	**12.000** 0.4724	**11.992** 0.4721	**16.017** 0.6306	**16.006** 0.6302
	12 0.4724	**17** 0.6693	**10** 0.394	**7.8** 0.307	K12X17X10BE	**7.32** 1650	**7.21** 1620	1.10	**0.005** 0.011	**12.000** 0.4724	**11.992** 0.4721	**17.017** 0.6700	**17.006** 0.6695
14 0.5512	**14** 0.5512	**18** 0.7087	**10** 0.394	**7.8** 0.307	K14X18X10BE	**6.89** 1550	**7.98** 1790	1.20	**0.005** 0.011	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**20** 0.7874	**10** 0.394	**7.8** 0.307	K14X20X10BE	**8.90** 2000	**8.61** 1940	1.30	**0.007** 0.015	**14.000** 0.5512	**13.992** 0.5509	**20.020** 0.7882	**20.007** 0.7877
	14 0.5512	**20** 0.7874	**12** 0.472	**9.5** 0.374	K14X20X12BE	**10.50** 2360	**10.60** 2380	1.60	**0.009** 0.020	**14.000** 0.5512	**13.992** 0.5509	**20.020** 0.7882	**20.007** 0.7877
16 0.6299	**16** 0.6299	**21** 0.8268	**10** 0.394	**7.8** 0.307	K16X21X10BE	**8.17** 1840	**8.90** 2000	1.35	**0.007** 0.015	**16.000** 0.6299	**15.992** 0.6296	**21.020** 0.8276	**21.007** 0.8270
	16 0.6299	**22** 0.8661	**12** 0.472	**9.5** 0.374	K16X22X12BE	**11.20** 2520	**11.90** 2680	1.80	**0.011** 0.024	**16.000** 0.6299	**15.992** 0.6296	**22.020** 0.8669	**22.007** 0.8664
18 0.7087	**18** 0.7087	**24** 0.9449	**12** 0.472	**9.5** 0.374	K18X24X12BE	**11.80** 2650	**13.10** 2940	1.95	**0.011** 0.024	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
	18 0.7087	**24** 0.9449	**13** 0.512	**10.5** 0.413	WK18X24X13BE	**12.80** 2880	**14.60** 3280	2.20	**0.011** 0.024	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
	18 0.7087	**24** 0.9449	**15** 0.591	**11.8** 0.465	K18X24X15BE	**13.30** 2990	**15.20** 3420	2.35	**0.014** 0.031	**18.000** 0.7087	**17.992** 0.7083	**24.020** 0.9457	**24.007** 0.9452
19 0.748	**19** 0.748	**25** 0.9843	**15** 0.591	**12.5** 0.492	K19X25X15BE	**14.70** 3300	**17.60** 3960	2.70	**0.014** 0.031	**19.000** 0.7480	**18.991** 0.7477	**25.020** 0.9850	**25.007** 0.9845
20 0.7874	**20** 0.7874	**26** 1.0236	**12** 0.472	**9.8** 0.386	K20X26X12BE	**13.30** 2990	**15.80** 3550	2.40	**0.013** 0.029	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
	20 0.7874	**26** 1.0236	**17** 0.669	**13.8** 0.543	K20X26X17BE	**14.90** 3350	**18.20** 4090	2.85	**0.017** 0.037	**20.000** 0.7874	**19.991** 0.7870	**26.020** 1.0244	**26.007** 1.0239
22 0.8661	**22** 0.8661	**28** 1.1024	**13** 0.512	**9.8** 0.386	K22X28X13BE	**13.90** 3120	**17.10** 3840	2.60	**0.015** 0.033	**22.000** 0.8661	**21.991** 0.8658	**28.020** 1.1031	**28.007** 1.1026
	22 0.8661	**29** 1.1417	**16** 0.63	**12.8** 0.504	K22X29X16BE	**18.50** 4160	**22.30** 5010	3.45	**0.021** 0.046	**22.000** 0.8661	**21.991** 0.8658	**29.020** 1.1425	**29.007** 1.1420
24 0.9449	**24** 0.9449	**30** 1.1811	**13** 0.512	**9.8** 0.386	K24X30X13BE	**14.40** 3240	**18.40** 4140	2.80	**0.016** 0.035	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814
	24 0.9449	**30** 1.1811	**15** 0.591	**11.8** 0.465	K24X30X15BE	**15.30** 3440	**19.70** 4430	3.05	**0.018** 0.040	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814

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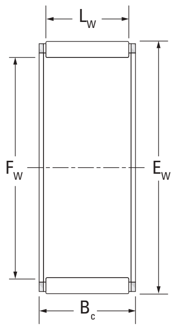
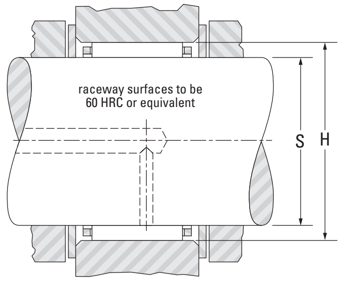
ASSEMBLIES FOR CRANK PIN END APPLICATIONS

METRIC SERIES
K BE SERIES



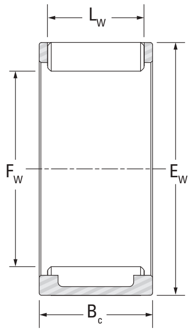
K BE



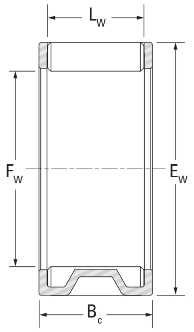
Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
24 0.9449	**24** 0.9449	**30** 1.1811	**17** 0.669	**13.8** 0.543	K24X30X17BE	**19.00** 4270	**26.30** 5910	4.15	**0.021** 0.040	**24.000** 0.9449	**23.991** 0.9445	**30.020** 1.1819	**30.007** 1.1814
25 0.9843	**25** 0.9843	**31** 1.2205	**19.8** 0.78	**17.8** 0.701	WK25X31X20BE	**23.30** 5240	**34.50** 7760	5.40	**0.024** 0.053	**25.000** 0.9843	**24.991** 0.9839	**31.025** 1.2215	**31.009** 1.2208
	25 0.9843	**32** 1.2598	**16** 0.63	**12.8** 0.504	K25X32X16BE	**19.20** 4320	**24.30** 5460	3.75	**0.022** 0.049	**25.000** 0.9843	**24.991** 0.9839	**32.025** 1.2608	**32.009** 1.2602
	25 0.9843	**32** 1.2598	**24** 0.945	**19.8** 0.780	K25X32X24BE	**27.50** 6180	**38.50** 8660	6.05	**0.035** 0.077	**25.000** 0.9843	**24.991** 0.9839	**32.025** 1.2608	**32.009** 1.2602
30 1.1811	**30** 1.1811	**37** 1.4567	**16** 0.63	**12.8** 0.504	K30X37X16BE	**21.60** 4860	**29.80** 6700	4.60	**0.029** 0.064	**30.000** 1.1811	**29.991** 1.1807	**37.025** 1.4577	**37.009** 1.4570
35 1.378	**35** 1.378	**42** 1.6535	**20** 0.787	**16.8** 0.661	K35X42X20BE	**29.70** 6680	**47.00** 10600	7.45	**0.039** 0.086	**35.000** 1.3780	**34.989** 1.3775	**42.025** 1.6545	**42.009** 1.6539

ASSEMBLIES FOR CRANK PIN END APPLICATIONS

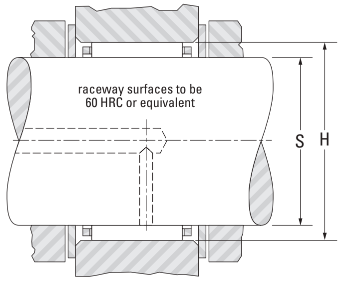
METRIC SERIES
BE, GS, VE, VS P SERIES



BE, GS



VE, VS P



Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
12 0.4724	**12**	**16**	**10**	**7.4**	12VS1610P-1	**5.95**	**6.35**	0.960	**0.004**				
16 0.6299	**16**	**22**	**11.8**	**8.8**	VE162212AB1-2	**9.65**	**9.8**	1.50	**0.011**				
	16	**22**	**13.2**	**9.8**	VE162213ASB1	**10.6**	**11**	1.70	**0.012**				
17 0.6693	**17**	**23**	**14**	**10.8**	17VS2314AP	**11.2**	**12.1**	1.85	**0.013**				
20 0.7874	**20**	**26**	**13.8**	**10.8**	BE202614BSB1	**15.2**	**18.7**	2.85	**0.017**				
	20	**26**	**14**	**10.8**	20VS2614CP-2	**13.3**	**15.7**	2.40	**0.015**				
	20	**26**	**14**	**10.8**	BE202614SY1B1	**13.3**	**15.7**	2.40	**0.016**				
22 0.8661	**22**	**28**	**14**	**10.8**	22VS2814FP	**13.2**	**15.9**	2.45	**0.016**				
	22	**28**	**15.7**	**12.8**	BE222816ASB1	**17.9**	**23.7**	3.65	**0.02**				
	22	**28**	**16**	**11.8**	VS22/16KP-1	**13.8**	**16.9**	2.55	**0.018**				
	22	**29**	**16**	**11.8**	22VS2916BP	**15.7**	**18**	2.75	**0.021**				
	22	**29**	**16.8**	**12.8**	BE222917ASY1B1-2	**18.7**	**22.7**	3.45	**0.027**				
23 0.9055	**23**	**28**	**12**	**8.8**	23VS2812AP	**11.6**	**15.5**	2.30	**0.013**				
25 0.9843	**25**	**32**	**15.8**	**12.8**	BE253216ASY1B1	**20.6**	**26.6**	4.10	**0.026**				
26 1.0236	**26**	**32**	**19.8**	**15.8**	BE263220ASB1	**22.9**	**34.2**	5.45	**0.03**				
27 1.0630	**27**	**36**	**18**	**13.8**	27VS3618P	**23.4**	**27.1**	4.15	**0.042**				
	27	**36**	**20.8**	**16.8**	VE273621AB1	**29.8**	**37.1**	5.90	**0.047**				

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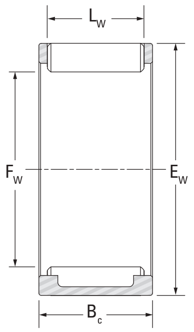
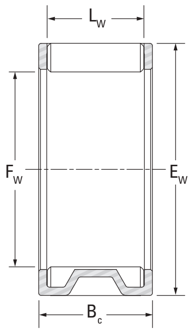
ASSEMBLIES FOR CRANK PIN END APPLICATIONS

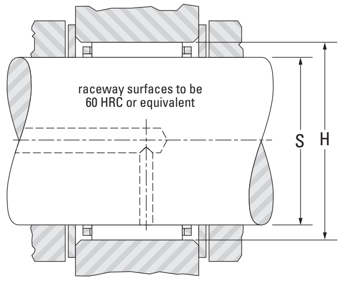
METRIC SERIES
BE, GS, VE, VS P SERIES



BE, GS



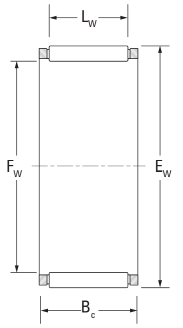
VE, VS P



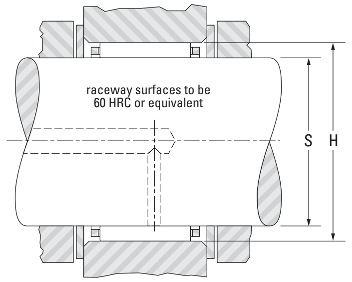
Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
30 1.1811	**30**	**37**	**16**	**12.8**	30VS3716AP-1	**20.8**	**28.3**	4.35	**0.03**				
	30	**37**	**20**	**15.8**	30VS3720P	**24.6**	**35.2**	5.50	**0.036**				
	30	**38**	**17.8**	**14.8**	VE303818AB1	**26.5**	**35.4**	5.60	**0.038**				
32 1.2598	**32**	**40**	**20**	**15.8**	VE324020SB1	**29.9**	**42.2**	6.75	**0.048**				
34 1.3386	**34**	**43**	**19.8**	**15.8**	BE344320ASB1	**34.2**	**47.2**	7.60	**0.059**				
	34	**43**	**22**	**17.8**	GS344322-1	**37.7**	**53.5**	8.45	**0.063**				
	34	**44**	**19.8**	**16.8**	BE344420ASY1B1	**38.6**	**51.5**	8.25	**0.064**				
35 1.378	**35**	**43**	**20**	**15.8**	35VS4320BP	**32**	**47.4**	7.60	**0.051**				
	35	**43**	**21.8**	**17.8**	BE354322ASB1	**36.6**	**56.4**	8.90	**0.057**				
	35	**45**	**21.8**	**17.8**	BE354522ASYB1	**43.5**	**60.7**	9.75	**0.081**				
	35	**45**	**24.8**	**20.8**	BE354525ASYB1	**48.6**	**70.0**	11.1	**0.088**				
37 1.4567	**37**	**47**	**25**	**20.8**	37VS4725P-1	**43.9**	**61.9**	9.80	**0.082**				
38 1.4961	**38**	**50**	**22.8**	**18.8**	BE385023ASY1B3-5	**51.4**	**68.2**	10.9	**0.113**				

ASSEMBLIES FOR WRIST PIN END APPLICATIONS

METRIC SERIES
K SE SERIES



K SE



Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in
9 0.3543	**9** 0.3543	**12** 0.4724	**11.5** 0.453	**8.4** 0.331	K9X12X11,5SE	**4.23** 951	**4.53** 1020	0.690	**0.003** 0.007	**9.000** 0.3543	**8.994** 0.3541	**12.017** 0.4731	**12.006** 0.4727
	9 0.3543	**13** 0.5118	**12.5** 0.492	**9.8** 0.386	K9X13X12,5SE	**5.58** 1250	**5.41** 1220	0.820	**0.005** 0.011	**9.000** 0.3543	**8.994** 0.3541	**13.017** 0.5125	**13.006** 0.5120
10 0.3937	**10** 0.3937	**13** 0.5118	**14.5** 0.571	**11.8** 0.465	K10X13X14,5SE	**5.93** 1330	**7.20** 1620	1.10	**0.004** 0.009	**10.000** 0.3937	**9.994** 0.3935	**13.017** 0.5125	**13.006** 0.5120
	10 0.3937	**14** 0.5512	**10** 0.394	**7.0** 0.276	K10X14X10SE	**4.62** 1040	**4.36** 980	0.640	**0.004** 0.009	**10.000** 0.3937	**9.994** 0.3935	**14.017** 0.5519	**14.006** 0.5514
12 0.4724	**12** 0.4724	**15** 0.5906	**13** 0.512	**9.8** 0.386	K12X15X13SE	**6.00** 1350	**7.72** 1740	1.20	**0.004** 0.009	**12.000** 0.4724	**11.992** 0.4721	**15.017** 0.5912	**15.006** 0.5908
	12 0.4724	**15** 0.5906	**15** 0.591	**11.8** 0.465	K12X15X15SE	**6.97** 1570	**9.36** 2100	1.40	**0.005** 0.011	**12.000** 0.4724	**11.992** 0.4721	**15.017** 0.5912	**15.006** 0.5908
	12 0.4724	**15** 0.5906	**17.5** 0.689	**12.8** 0.504	K12X15X17,5SE	**7.45** 1670	**10.2** 2290	1.60	**0.006** 0.013	**12.000** 0.4724	**11.992** 0.4721	**15.017** 0.5912	**15.006** 0.5908
	12 0.4724	**16** 0.6299	**13** 0.512	**9.8** 0.386	K12X16X13SE	**6.03** 1360	**6.38** 1430	0.970	**0.006** 0.013	**12.000** 0.4724	**11.992** 0.4721	**16.017** 0.6306	**16.006** 0.6302
	12 0.4724	**17** 0.6693	**13** 0.512	**9.8** 0.386	K12X17X13SE	**7.61** 1710	**7.54** 1700	1.15	**0.007** 0.015	**12.000** 0.4724	**11.992** 0.4721	**17.017** 0.6700	**17.006** 0.6695
	12 0.4724	**17** 0.6693	**15** 0.591	**12.5** 0.492	K12X17X15SE	**9.30** 2090	**9.75** 2190	1.50	**0.007** 0.015	**12.000** 0.4724	**11.992** 0.4721	**17.017** 0.6700	**17.006** 0.6695
13 0.5118	**13** 0.5118	**16** 0.6299	**14** 0.551	**9.8** 0.386	K13X16X14SE	**5.62** 1260	**7.23** 1630	1.10	**0.005** 0.011	**13.000** 0.5118	**12.992** 0.5115	**16.017** 0.6306	**16.006** 0.6302
	13 0.5118	**17** 0.6693	**17.7** 0.697	**13.8** 0.543	K13X17X17,7SE	**9.80** 2200	**12.3** 2770	1.90	**0.008** 0.018	**13.000** 0.5118	**12.992** 0.5115	**17.017** 0.6700	**17.006** 0.6695
	13 0.5118	**18** 0.7087	**15** 0.591	**12.5** 0.492	K13X18X15SE	**9.28** 2090	**9.88** 2220	1.50	**0.008** 0.018	**13.000** 0.5118	**12.992** 0.5115	**18.017** 0.7093	**18.006** 0.7089
14 0.5512	**14** 0.5512	**18** 0.7087	**13** 0.512	**9.8** 0.386	K14X18X13SE	**7.39** 1660	**8.69** 1950	1.30	**0.007** 0.015	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**18** 0.7087	**17** 0.669	**11.8** 0.465	K14X18X17SE	**8.59** 1930	**10.5** 2360	1.60	**0.009** 0.020	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
	14 0.5512	**18** 0.7087	**21** 0.827	**14.8** 0.583	K14X18X21SE	**10.3** 2320	**13.3** 2990	2.05	**0.011** 0.024	**14.000** 0.5512	**13.992** 0.5509	**18.017** 0.7093	**18.006** 0.7089
15 0.5906	**15** 0.5906	**19** 0.748	**17** 0.669	**11.8** 0.465	K15X19X17SE	**9.05** 2030	**11.5** 2590	1.75	**0.009** 0.020	**15.000** 0.5906	**14.992** 0.5902	**19.020** 0.7488	**19.007** 0.7483

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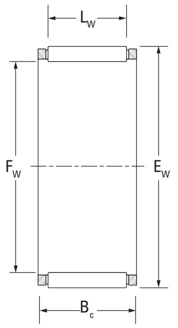
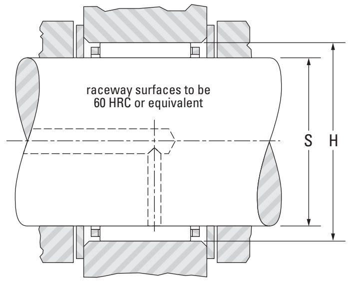
ASSEMBLIES FOR WRIST PIN END APPLICATIONS

METRIC SERIES
K SE SERIES



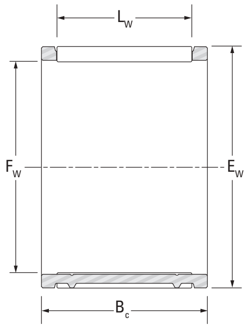
K SE



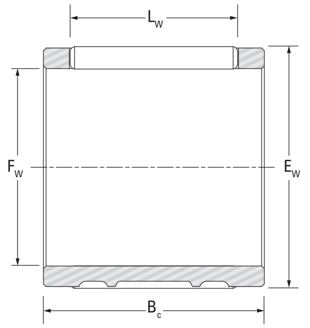
Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 -0.55 -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
15 0.5906	15 0.5906	19 0.748	19.5 0.768	15.8 0.622	K15X19X19,5SE	10.8 2430	14.3 3210	2.25	0.010 0.022	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
	15 0.5906	19 0.748	20 0.787	15.8 0.622	K15X19X20SE	10.8 2430	14.3 3210	2.25	0.010 0.022	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
16 0.6299	16 0.6299	20 0.7874	20 0.787	15.8 0.622	K16X20X20SE	12.0 2700	16.9 3800	2.60	0.011 0.024	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	23 0.906	15.8 0.622	K16X20X23SE	10.7 2410	14.5 3260	2.25	0.013 0.029	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
18 0.7087	18 0.7087	22 0.8661	22 0.866	17.8 0.701	K18X22X22SE	14.4 3240	22.0 4950	3.45	0.016 0.035	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	23 0.9055	20 0.787	15.8 0.622	K18X23X20SE	13.6 3060	17.6 3960	2.80	0.015 0.033	18.000 0.7087	17.992 0.7083	23.020 0.9063	23.007 0.9058
	18 0.7087	23 0.9055	23 0.906	17.8 0.701	K18X23X23SE	15.9 3570	21.6 4860	3.35	0.018 0.040	18.000 0.7087	17.992 0.7083	23.020 0.9063	23.007 0.9058
20 0.7874	20 0.7874	24 0.9449	23 0.906	17.8 0.701	K20X24X23SE	14.8 3330	23.7 5330	3.70	0.017 0.037	20.000 0.7874	19.991 0.7870	24.020 0.9457	24.007 0.9452
	20 0.7874	25 0.9843	22 0.866	16.8 0.661	K20X25X22SE	15.9 3570	22.2 4990	3.50	0.020 0.044	20.000 0.7874	19.991 0.7870	25.020 0.9850	25.007 0.9845
	20 0.7874	25 0.9843	23 0.906	17.8 0.701	K20X25X23SE	17.5 3930	25.2 5670	3.95	0.025 0.055	20.000 0.7874	19.991 0.7870	25.020 0.9850	25.007 0.9845

ASSEMBLIES FOR WRIST PIN END APPLICATIONS

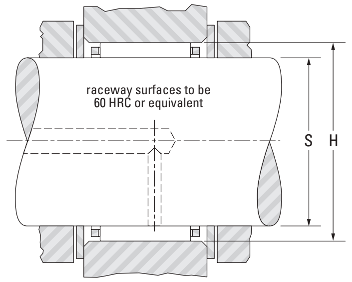
METRIC SERIES
R P, RE, UR P SERIES



R P



RE, UR P



Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 -0.55 -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
9 0.3543	9	12	12	8.8	9R1212P	4.95	5.55	0.830	0.004				
12 0.4724	12	16	14.8	11.8	12R1615CP	8.35	9.8	1.50	0.008				
	12	16	15.4	11.8	RE121615AL1	8.35	9.8	1.50	0.008				
	12	16	16	12.8	12UR1616P	7.7	8.75	1.35	0.008				
14 0.5512	14	18	15.8	11.8	RE141816AL1	8.9	11.1	1.70	0.01				
	14	18	16.5	12.8	RE141817AL2-2	9.45	11.9	1.80	0.01				
	14	18	17.5	11.8	14R1818P	8.3	10.1	1.55	0.011				
	14	18	20	13.8	UR14/20P	8.9	11	1.70	0.012				
15 0.5906	15	19	17.3	12.8	RE151917BL3	9.9	12.9	1.95	0.011				
	15	19	20	15.8	15R1920BP-1	12.1	16.6	2.60	0.013				
	15	20	17.8	13.8	RE152018BL2	12.3	14.7	2.30	0.014				
	15	20	19.8	15.8	RE152020CL2	13.1	16	2.50	0.016				
16 0.6299	16	20	18.8	14.8	R16/18.8AP-2	11	15.1	2.35	0.013				
	16	20	19.5	13.8	R16/19.5FP	9.95	13.2	2.05	0.014				
	16	20	19.5	13.8	RE162020AL2	9.95	13.2	2.05	0.013				
	16	20	22.5	14.8	R16/22.5EP	9.85	13	2.00	0.016				
	16	21	17.5	13.8	16R2118BP-2	12.2	14.8	2.30	0.016				

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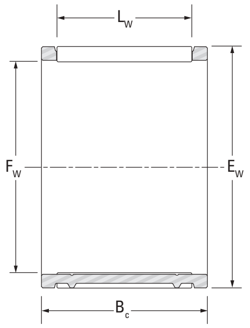
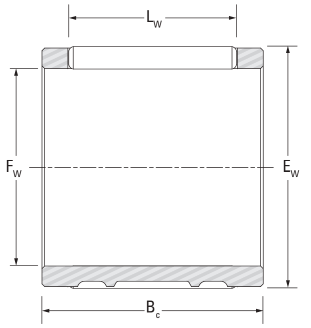
ASSEMBLIES FOR WRIST PIN END APPLICATIONS

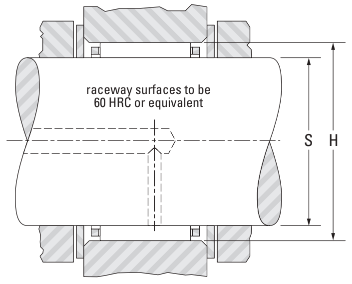
METRIC SERIES
R P, RE, UR P SERIES



R P



RE, UR P



Shaft Dia.	F_w	E_w	B_c	L_w	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines)			
			-0.20 -0.008 **-0.55** -0.022			Dynamic	Static			S		H	
						C	C_0			Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
16 0.6299	16	21	19.5	15.8	16R2120EP-2	13.5	16.9	2.65	0.017				
	16	21	22.5	16.8	RE162123AL2	15.4	20	3.15	0.02				
18 0.7087	18	22	19.65	13.8	RE182220AL1	10.9	15.4	2.40	0.015				
	18	22	22	15.8	18R2222P	12.1	17.6	2.70	0.017				
	18	22	23.6	17.8	RE182224AL2	13.3	20	3.10	0.017				
	18	23	22	15.8	18R2322P	14.2	18.6	2.90	0.021				
	18	23	23.8	17.8	RE182324AL2	16.5	22.7	3.55	0.024				
19 0.7480	19	24	24.8	18.8	RE192425AL1	18.3	26.2	4.10	0.026				
20 0.7874	20	24	13	9.8	R20/13P	9.85	14	2.15	0.01				
	20	25	13	9.8	20R2513P	11.2	14.1	2.15	0.013				
	20	25	21.8	16.8	RE202522AL2	17.6	25.3	4.00	0.024				
	20	25	23	18.8	RE202523L1	19.1	28.2	4.40	0.024				
	20	25	24	17.8	RE202524L2-1	16.3	23	3.60	0.026				
	20	25	27.8	21.8	RE202528AL1	21.7	33.2	5.15	0.03				

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

INCH SERIES

Inch series radial needle roller and cage assemblies are available in a variety of sizes and designs. This catalog includes the most popular, standardized designs.

REFERENCE STANDARDS:

- **ANSI/ABMA 18.2** – needle roller bearings – radial, inch design.

Before selecting specific inch series radial needle roller and cage assemblies, the engineering section should be reviewed.

WJ

WJC

Fig. B1-5 . Types of inch series radial needle roller and cage assemblies

There are two primary constructions of inch series needle roller and cage assemblies. WJ assemblies are heavy-duty compared to WJC assemblies due to the nature of the roller diameter.

CONSTRUCTION

Radial needle roller and cage assemblies have a steel cage that provides both inward and outward retention for the needle rollers. The designs provide maximum cage strength consistent with the inherent high load-ratings of needle roller bearings.

Accurate guidance of the needle rollers by the cage bars allows for operation at high speeds. Needle roller and cage assemblies have either one or two rows of needle rollers.

Also available (by request) are needle roller and cage assemblies using molded, one-piece glass-reinforced engineered polymer cages. These operate well at temperatures up to 250° F (120° C) over extended periods. However, care should be exercised when bearings are lubricated with oils containing additives, as service life may be reduced if the operating temperature exceeds 212° F (100˚ C). At such high temperatures, oil can deteriorate with time and it is suggested that oil change intervals are observed.

Needle rollers with relieved ends – used in these assemblies are made of high carbon chrome steel through-hardened, ground and lapped to close tolerances for diameter and roundness. See the engineering section for further discussion of relieved end rollers.

DIMENSIONAL ACCURACY

The nominal inch assemblies, WJ and WJC, contain needle rollers manufactured to only one diameter grade. Within any one assembly, the needle rollers have a total diameter tolerance of 0.0001 in (0.003 mm).

The limit to precision of the radial clearance of mounted needle roller and cage assemblies is the capability of the user to hold close tolerances on the inner and outer raceways.

The tolerance of the overall width of these assemblies is given in the bearing tables of this section.

MOUNTING DIMENSIONS

The needle roller and cage assembly normally uses the shaft and housing as the inner and outer raceways. To realize full bearing load rating and life, the shaft and housing must have the correct geometric and metallurgical characteristics.

The tables of dimensions for these assemblies list the suggested diameters for the shaft when used as the inner raceway. These are consistent with ISO h5 shaft raceway tolerances. Additional design details for shafts used as inner raceways can be found in the engineering section.

Since the housing normally serves as the outer raceway, it should be of sufficient cross section to maintain adequate roundness and running clearance under load. The tables of dimensions also list the suggested diameters for the housings when used as outer raceways. These are consistent with ISO G6 housing bore tolerances. Additional design details for housings used as outer raceways can be found in the engineering section.

The suggested mounting diameter tolerances for these needle roller and cage assemblies will provide correct running clearance for most applications.

The needle roller and cage assembly must be axially located by shoulders or other suitable means. End locating surfaces should be hardened to minimize wear. For satisfactory operation, minimum axial clearance should be 0.008 in (0.203 mm). When using type WJ assembly, fillets adjacent to the assembly must not exceed 0.03 in (0.762 mm) radius. When it is necessary to use fillets adjacent to WJC assembly, please consult your representative for suggestions.

LUBRICATION

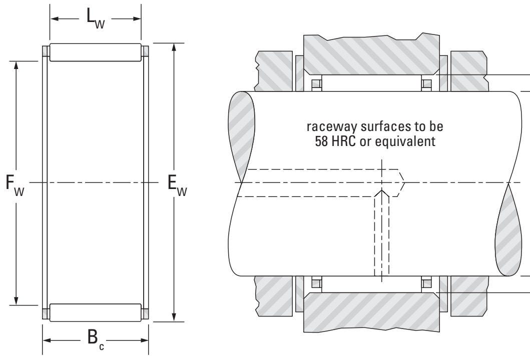
Oil is the preferred lubricant for most applications. In critical applications involving high speeds, ample oil flow must be provided. Where assemblies are subjected to high centrifugal forces, such as in epicyclic gearing, or inertia forces, as in the small end of a connecting rod, the contact pressure between the cage and the raceway guiding surface becomes critical. The allowable contact pressure depends on a combination of the induced force and the relative velocity between the cage and the raceway and the rate of lubricant flow. Consult your representative when cages will be subjected to high induced forces.

SPECIAL DESIGNS

Needle roller and cage assemblies made to special dimensions or configurations, such as those that are split to assemble around a one-piece crankshaft, can be made available on special order where quantities permit. Special plated cages to enhance life under conditions of high induced forces can also be made available.

SINGLE-ROW ASSEMBLIES

INCH SERIES



WJ, WJC

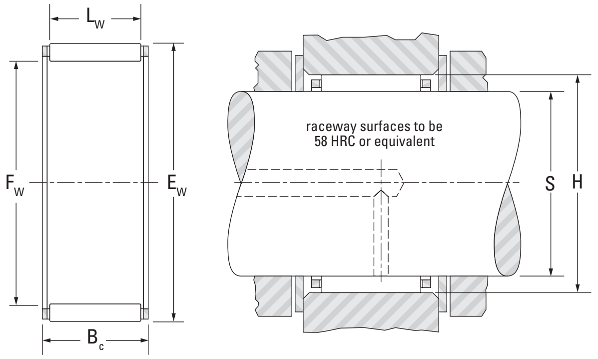
Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Mounting Dimensions				Approx. Wt.
			+0 -0.38 +0 -0.015		Dynamic	Static				S (ISO h5)		H (ISO G6)		
					C	C_0		Grease	Oil	Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
3⁄8	**9.525** 0.3750	**12.700** 0.5000	**9.53** 0.375	WJC-060806	**3.87** 870	**4.00** 900	0.600	24000	37000	**9.525** 0.3750	**9.520** 0.3748	**12.715** 0.5006	**12.705** 0.5002	**0.003** 0.006
1⁄2	**12.700** 0.5000	**15.875** 0.6250	**12.70** 0.500	WJC-081008	**6.23** 1400	**8.01** 1800	1.65	23000	35000	**12.700** 0.5000	**12.692** 0.4997	**15.890** 0.6256	**15.880** 0.6252	**0.005** 0.010
9⁄16	**14.288** 0.5625	**17.463** 0.6875	**12.70** 0.500	WJC-091108	**6.81** 1530	**9.25** 2080	1.40	22000	34000	**14.288** 0.5625	**14.280** 0.5622	**17.478** 0.6881	**17.468** 0.6877	**0.006** 0.013
5⁄8	**15.875** 0.6250	**19.050** 0.7500	**12.70** 0.500	WJC-101208	**7.03** 1580	**9.96** 2240	1.50	18000	27000	**15.875** 0.6250	**15.867** 0.6247	**19.070** 0.7508	**19.058** 0.7503	**0.006** 0.013
	15.875 0.6250	**22.225** 0.8750	**15.88** 0.625	WJ-101410	**15.6** 3510	**17.8** 3990	2.80	19000	29000	**15.875** 0.6250	**15.867** 0.6247	**22.245** 0.8758	**22.233** 0.8753	**0.012** 0.027
	15.875 0.6250	**22.225** 0.8750	**22.23** 0.875	WJ-101414	**21.3** 4780	**26.4** 5940	4.10	19000	29000	**15.875** 0.6250	**15.867** 0.6247	**22.245** 0.8758	**22.233** 0.8753	**0.017** 0.038
3⁄4	**19.050** 0.7500	**25.400** 1.0000	**25.40** 1.000	WJ-121616	**26.8** 6020	**37.2** 8370	5.80	16000	24000	**19.050** 0.7500	**19.040** 0.7496	**25.420** 1.0008	**25.408** 1.0003	**0.023** 0.051
13⁄16	**20.638** 0.8125	**26.988** 1.0625	**22.23** 0.875	WJ-131714	**25.1** 5650	**35.0** 7880	5.50	14000	22000	**20.638** 0.8125	**20.627** 0.8121	**27.008** 1.0633	**26.995** 1.0628	**0.021** 0.046
7⁄8	**22.225** 0.8750	**28.575** 1.1250	**25.40** 1.000	WJ-141816	**29.2** 6570	**43.5** 9770	6.75	13000	20000	**22.225** 0.8750	**22.215** 0.8746	**28.595** 1.1258	**28.583** 1.1253	**0.026** 0.058
1	**25.400** 1.0000	**33.338** 1.3125	**19.05** 0.750	WJ-162112	**28.1** 6320	**37.1** 8340	5.90	12000	18000	**25.400** 1.0000	**25.390** 0.9996	**33.363** 1.3135	**33.348** 1.3129	**0.029** 0.063
	25.400 1.0000	**33.338** 1.3125	**25.40** 1.000	WJ-162116	**36.8** 8270	**52.5** 11800	8.20	12000	18000	**25.400** 1.0000	**25.390** 0.9996	**33.363** 1.3135	**33.348** 1.3129	**0.038** 0.084
	25.400 1.0000	**33.338** 1.3125	**31.75** 1.250	WJ-162120	**44.5** 10000	**67.2** 15100	10.5	12000	18000	**25.400** 1.0000	**25.390** 0.9996	**33.363** 1.3135	**33.348** 1.3129	**0.048** 0.105
1 1⁄8	**28.575** 1.1250	**38.100** 1.5000	**25.40** 1.000	WJ-182416	**42.4** 9520	**57.8** 13000	9.05	10000	16000	**28.575** 1.1250	**28.565** 1.1246	**38.125** 1.5010	**38.110** 1.5004	**0.041** 0.090
	28.575 1.1250	**38.100** 1.5000	**31.75** 1.250	WJ-182420	**52** 11700	**74.7** 16800	11.7	10000	16000	**28.575** 1.1250	**28.565** 1.1246	**38.125** 1.5010	**38.110** 1.5004	**0.065** 0.143
1 1⁄4	**31.750** 1.2500	**41.275** 1.6250	**19.05** 0.750	WJ-202612	**33.4** 7520	**43.7** 9830	7.05	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.043** 0.094
	31.750 1.2500	**41.275** 1.6250	**25.40** 1.000	WJ-202616	**44.1** 9910	**62.3** 14000	9.80	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.061** 0.134
	31.750 1.2500	**41.275** 1.6250	**31.75** 1.250	WJ-202620	**53.8** 12100	**81.0** 18200	12.6	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.071** 0.156

Continued on next page.

· Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
· Minimum axial clearance should be 0.02 mm (0.008 in).

SINGLE-ROW ASSEMBLIES

INCH SERIES



WJ, WJC

Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Mounting Dimensions				Approx. Wt.
			+0 +0 **-0.38** -0.015		Dynamic	Static				S (ISO h5)		H (ISO G6)		
					C	C_0		Grease	Oil	Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
1¼	**31.750** 1.2500	**41.275** 1.6250	**38.10** 1.500	WJ-202624	**63.6** 14300	**99.6** 22400	15.6	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.085** 0.188
1⅜	**34.925** 1.3750	**44.450** 1.7500	**25.40** 1.000	WJ-222816	**45.8** 10300	**67.2** 15100	10.5	8300	13000	**34.925** 1.3750	**34.915** 1.3746	**44.475** 1.7510	**44.460** 1.7504	**0.067** 0.147
	34.925 1.3750	**44.450** 1.7500	**31.75** 1.250	WJ-222820	**56.0** 12600	**87.2** 19600	13.6	8300	13000	**34.925** 1.3750	**34.915** 1.3746	**44.475** 1.7510	**44.460** 1.7504	**0.077** 0.170
1½	**38.100** 1.5000	**47.625** 1.8750	**25.40** 1.000	WJ-243016	**47.2** 10600	**71.6** 16100	11.3	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.078** 0.172
	38.100 1.5000	**47.625** 1.8750	**31.75** 1.250	WJ-243020	**57.8** 13000	**93.0** 20900	14.5	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.083** 0.184
	38.100 1.5000	**47.625** 1.8750	**38.10** 1.500	WJ-243024	**68.1** 15300	**114.8** 25800	18.0	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.100** 0.220
	38.100 1.5000	**47.625** 1.8750	**44.45** 1.750	WJ-243028	**77.4** 17400	**135.7** 30500	21.2	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.134** 0.295
1¾	**44.450** 1.7500	**53.975** 2.1250	**19.05** 0.750	WJ-283412	**39.5** 8870	**59.6** 13400	9.60	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.058** 0.127
	44.450 1.7500	**53.975** 2.1250	**25.40** 1.000	WJ-283416	**52.0** 11700	**85.0** 19100	13.4	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.084** 0.185
	44.450 1.7500	**53.975** 2.1250	**38.10** 1.500	WJ-283424	**74.7** 16800	**136** 30600	21.3	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.115** 0.253
2	**50.800** 2.0000	**60.325** 2.3750	**19.05** 0.750	WJ-323812	**42.8** 9610	**69** 15500	11.1	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.065** 0.143
	50.800 2.0000	**60.325** 2.3750	**25.40** 1.000	WJ-323816	**56.5** 12700	**98** 22100	15.5	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.105** 0.231
	50.800 2.0000	**60.325** 2.3750	**31.75** 1.250	WJ-323820	**69.0** 15500	**127** 28700	20.0	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.108** 0.238
	50.800 2.0000	**60.325** 2.3750	**38.10** 1.500	WJ-323824	**81.0** 18200	**157** 35300	24.6	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.130** 0.286
2¹⁄₁₆	**52.388** 2.0625	**61.913** 2.4375	**25.40** 1.000	WJ-333916	**57.8** 13000	**102** 23100	16.2	5400	8300	**52.388** 2.0625	**52.375** 2.0620	**61.940** 2.4386	**61.923** 2.4379	**0.099** 0.218
2⅛	**53.975** 2.1250	**63.500** 2.5000	**25.40** 1.000	WJ-344016	**52.5** 11800	**92.08** 20700	14.6	5200	8000	**53.975** 2.1250	**53.962** 2.1245	**63.528** 2.5011	**63.510** 2.5004	**0.089** 0.196
	53.975 2.1250	**63.500** 2.5000	**38.10** 1.500	WJ-344024	**78.3** 17600	**153** 34500	24.0	5200	8000	**53.975** 2.1250	**53.962** 2.1245	**63.528** 2.5011	**63.510** 2.5004	**0.137** 0.302

· Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
· Minimum axial clearance should be 0.02 mm (0.008 in).

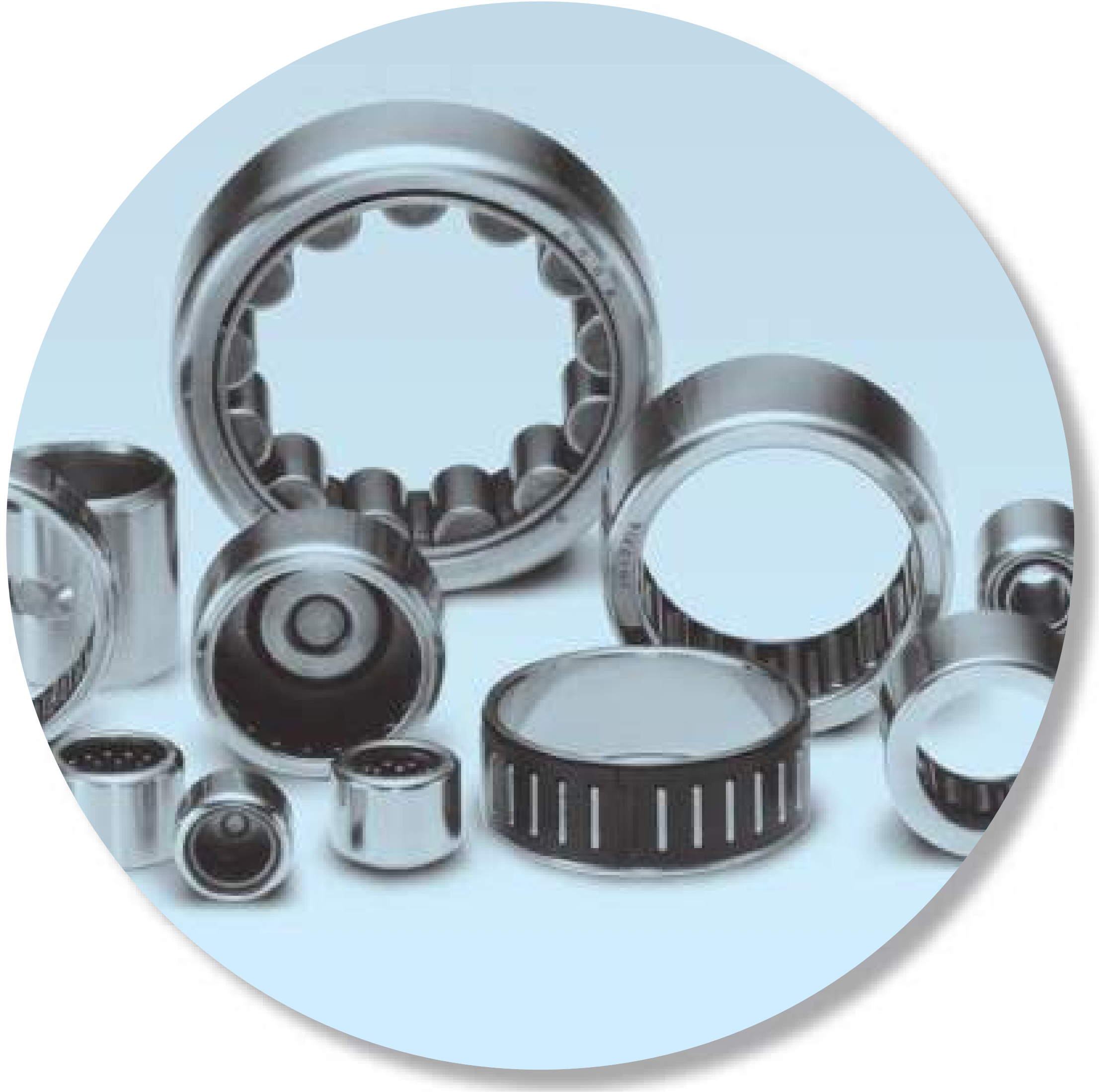
Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Mounting Dimensions				Approx. Wt.
			+0 +0 **-0.38** -0.015		Dynamic	Static				S (ISO h5)		H (ISO G6)		
					C	C_0		Grease	Oil	Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
2³⁄₁₆	**55.563** 2.1875	**65.088** 2.5625	**19.05** .750	WJ-354112	**44.5** 10000	**75.17** 16900	12.2	5000	7800	**55.563** 2.1875	**55.550** 2.1870	**65.115** 2.5636	**65.098** 2.5629	**0.070** 0.155
	55.563 2.1875	**65.088** 2.5625	**25.40** 1.000	WJ-354116	**57.8** 13000	**107** 24100	16.9	5000	7800	**55.563** 2.1875	**55.550** 2.1870	**65.115** 2.5636	**65.098** 2.5629	**0.094** 0.207
2¼	**57.150** 2.2500	**66.675** 2.6250	**25.40** 1.000	WJ-364216	**53.8** 12100	**96.08** 21600	15.2	4900	7500	**57.150** 2.2500	**57.137** 2.2495	**66.703** 2.6261	**66.685** 2.6254	**0.096** 0.212
	57.150 2.2500	**66.675** 2.6250	**31.75** 1.250	WJ-364220	**67.6** 15200	**128** 28900	20.1	4900	7500	**57.150** 2.2500	**57.137** 2.2495	**66.703** 2.6261	**66.685** 2.6254	**0.120** 0.265
2⅜	**60.325** 2.3750	**69.850** 2.7500	**38.10** 1.500	WJ-384424	**81.4** 18300	**167** 37600	26.1	4600	7100	**60.325** 2.3750	**60.312** 2.3745	**69.878** 2.7511	**69.860** 2.7504	**0.151** 0.334
2½	**63.500** 2.5000	**73.025** 2.8750	**25.40** 1.000	WJ-404616	**55.6** 12500	**104** 23400	16.5	4400	6700	**63.500** 2.5000	**63.487** 2.4995	**73.053** 2.8761	**73.035** 2.8754	**0.106** 0.234
	63.500 2.5000	**73.025** 2.8750	**31.75** 1.250	WJ-404620	**69.8** 15700	**139** 31400	21.8	4400	6700	**63.500** 2.5000	**63.487** 2.4995	**73.053** 2.8761	**73.035** 2.8754	**0.132** 0.292
	63.500 2.5000	**73.025** 2.8750	**38.10** 1.500	WJ-404624	**83.2** 18700	**173** 39100	27.2	4400	6700	**63.500** 2.5000	**63.487** 2.4995	**73.053** 2.8761	**73.035** 2.8754	**0.179** 0.395
2¾	**69.850** 2.7500	**79.375** 3.1250	**25.40** 1.000	WJ-445016	**57.8** 13000	**112.54** 25300	17.8	4000	6100	**69.850** 2.7500	**69.837** 2.7495	**79.403** 3.1261	**79.385** 3.1254	**0.116** 0.256
3	**76.200** 3.0000	**85.725** 3.3750	**25.40** 1.000	WJ-485416	**59.6** 13400	**120.55** 27100	19.1	3600	5600	**76.200** 3.0000	**76.187** 2.9995	**85.761** 3.3764	**85.738** 3.3755	**0.126** 0.278
	76.200 3.0000	**85.725** 3.3750	**38.10** 1.500	WJ-485424	**85.4** 19200	**191.72** 43100	29.9	3600	5600	**76.200** 3.0000	**76.187** 2.9995	**85.761** 3.3764	**85.738** 3.3755	**0.189** 0.416
3¼	**82.550** 3.2500	**92.075** 3.6250	**25.40** 1.000	WJ-525816	**61.4** 13800	**128.55** 28900	20.4	3300	5100	**82.550** 3.2500	**82.535** 3.2494	**92.111** 3.6264	**92.088** 3.6255	**0.136** 0.299
	82.550 3.2500	**92.075** 3.6250	**38.10** 1.500	WJ-525824	**88.1** 19800	**204.62** 46000	31.9	3300	5100	**82.550** 3.2500	**82.535** 3.2494	**92.111** 3.6264	**92.088** 3.6255	**0.220** 0.486
3½	**88.900** 3.5000	**98.425** 3.8750	**25.40** 1.000	WJ-566216	**63.2** 14200	**136.56** 30700	21.7	3100	4700	**88.900** 3.5000	**88.885** 3.4994	**98.461** 3.8764	**98.438** 3.8755	**0.146** 0.321
	88.900 3.5000	**101.600** 4.0000	**25.40** 1.000	WJ-566416	**79.6** 17900	**150.35** 33800	23.9	3100	4800	**88.900** 3.5000	**88.885** 3.4994	**101.636** 4.0014	**101.613** 4.0005	**0.197** 0.435
	88.900 3.5000	**101.600** 4.0000	**38.10** 1.500	WJ-566424	**113** 25600	**237.53** 53400	37.4	3100	4800	**88.900** 3.5000	**88.885** 3.4994	**101.636** 4.0014	**101.613** 4.0005	**0.296** 0.653
4	**101.600** 4.0000	**114.300** 4.5000	**25.40** 1.000	WJ-647216	**83.6** 18800	**166.59** 37450	30.9	2700	4200	**101.600** 4.0000	**101.585** 3.9994	**114.336** 4.5014	**114.313** 4.5005	**0.224** 0.493
	101.600 4.0000	**114.300** 4.5000	**38.10** 1.500	WJ-647224	**119** 26800	**263.33** 59200	40.6	2700	4200	**101.600** 4.0000	**101.585** 3.9994	**114.336** 4.5014	**114.313** 4.5005	**0.335** 0.739
5	**127.000** 5.0000	**152.400** 6.0000	**38.10** 1.500	WJ-809624	**211** 47600	**365.20** 82100	51.9	2200	3400	**127.000** 5.0000	**126.982** 4.9993	**152.438** 6.0015	**152.415** 6.0006	**1.018** 2.244

NOTES

DRAWN CUP NEEDLE ROLLER BEARINGS

Overview: Drawn cup needle roller bearings support radial loads and reduce friction between rotating components, with a drawn outer shell serving as a raceway for the rollers. The small cross section of the drawn cup bearing provides high load-carrying capability with minimum required space. Drawn cup bearings are easily installed with a press fit in the housing.

- **Catalog range:** 3 mm – 139.7 mm (0.1181 in – 5.5000 in) bore.
- **Markets:** Transmissions, transfer cases, engines, valve trains, steering and braking systems, axle supports, outboard engines, power tools, copiers, fax machines, paper-moving equipment and appliances.
- **Features:** Available in two basic designs: full complement and caged.
- **Benefits:** Full complement bearings handle high radial load-carrying capability. Caged bearings provide high speed and maximum lubricant-retention capability.



Drawn Cup Needle Roller Bearings – Metric Nominal Dimensions

Prefix
HK drawn cup bearing, caged, open ends
BK drawn cup bearing, caged, closed end

Width
12 = 12 mm

HK 10 12 AS1

Needle roller complement bore diameter
10 = 10 mm

Suffix[1]
RS lip contact seal on one side of the bearing
.2RS lip contact seal on each side of the bearing
AS1 lubricating hole

[1] These suffixes only apply to the HK and BK Series bearings.

Prefix
BTM, BHTM, BKM, BHKM, BSM drawn cup bearing, caged, open ends
BM, BHM, YM drawn cup bearing, full complement, open ends

Width
10 = 10 mm

BTM 17 10 UU

Needle roller complement bore diameter
17 = 17 mm

Suffix
UU lip contact seal on each side of the bearing
J bearing designed according to ISO standards

Prefix
BTM, BHTM, BKM, BHKM, BSM drawn cup bearing, caged, open ends
BM, BHM, YM drawn cup bearing, full complement, open ends

Width
12 = 12 mm

17 BKM 23 12 UU

BKM 17 23 12 UU

Needle roller complement bore diameter
17 = 17 mm

Outer diameter
23 = 23 mm

Suffix
UU lip contact seal on each side of the bearing
J bearing designed according to ISO standards

Inner Rings – Metric Nominal Dimensions

Prefix
JR inner ring
JRZ inner ring without mounting chamfers

Outer diameter
14 = 14 mm

Suffix
JS1 lubricating hole

JR 10 x 14 x 12 JS1

Bore diameter
10 = 10 mm

Width
12 = 12 mm

Drawn Cup Needle Roller Bearings – Inch Nominal Dimensions

Prefix
J, JH, JP, BT drawn cup bearing, caged, open ends
MJ, MJH drawn cup bearing, caged, closed end
JT drawn cup bearing, caged, one seal, open ends
JTT drawn cup bearing, caged, two seals, open ends
B, BH, Y drawn cup bearing, full complement, open ends
GB, GBH drawn cup bearing, full complement, open ends, extra precision
M, MH drawn cup bearing, full complement, closed end

Suffix 1
1 closed end
blank open ends

MJH - 18 16 1 - OH

Needle roller complement bore diameter
18 = $\frac{18}{16}$ = 1 $\frac{1}{8}$ in

Width
16 = $\frac{16}{16}$ = 1 in

Suffixes 2
OH, 2OH, OHE, GF Oil hole(s) or grease fitting, closed end
AS, NS, NSN, P Corrosion resistant coating
S, S2S, Z1S, Z1Y Corrosion resistant stainless
D, R Increased performance
F Plastic cage
T1, T2, T6 Sealed

Inner Rings (with four-digit number) Inch Nominal Dimensions

Prefix
IR regular width (for use with drawn cup bearings only)
IRA extended width (for use with drawn cup bearings only)

IR - 14 16

Bore diameter
14 = $\frac{14}{16}$ = $\frac{7}{8}$ in

Width (IR series only)
16 = $\frac{16}{16}$ = 1 in

Drawn Cup Needle Roller Bearings

Page

Caged, Open Ends, Closed One End – Metric Series

Sealed – Metric Series

Full Complement Open Ends, Closed One End – Metric Series

Full Complement Bearings Open Ends, Closed One End – Inch Series

Caged Bearings – Open Ends, Closed One End – Inch Series

DRAWN CUP NEEDLE ROLLER BEARINGS

METRIC SERIES

When a rolling bearing is needed for a compact and economic design and where it is not practical to harden and grind the housing bore, or where the housing materials are of low rigidity such as cast iron, aluminum or even plastics – drawn cup needle roller bearings should be considered.

REFERENCE STANDARDS ARE:

- **ISO 3245** – rolling bearings – needle roller bearings, drawn cup, without inner ring, boundary dimensions and tolerances.
- **ANSI/ABMA 18.1** – needle roller bearings – radial, metric design.
- **DIN 618** – needle roller bearings with cage – drawn cups with open end, drawn cup with closed end.
- **JIS B 1536** – rolling bearings – needle roller bearings – boundary dimensions and tolerances.

Before selecting specific drawn cup needle roller bearings, please review the engineering section of this catalog.

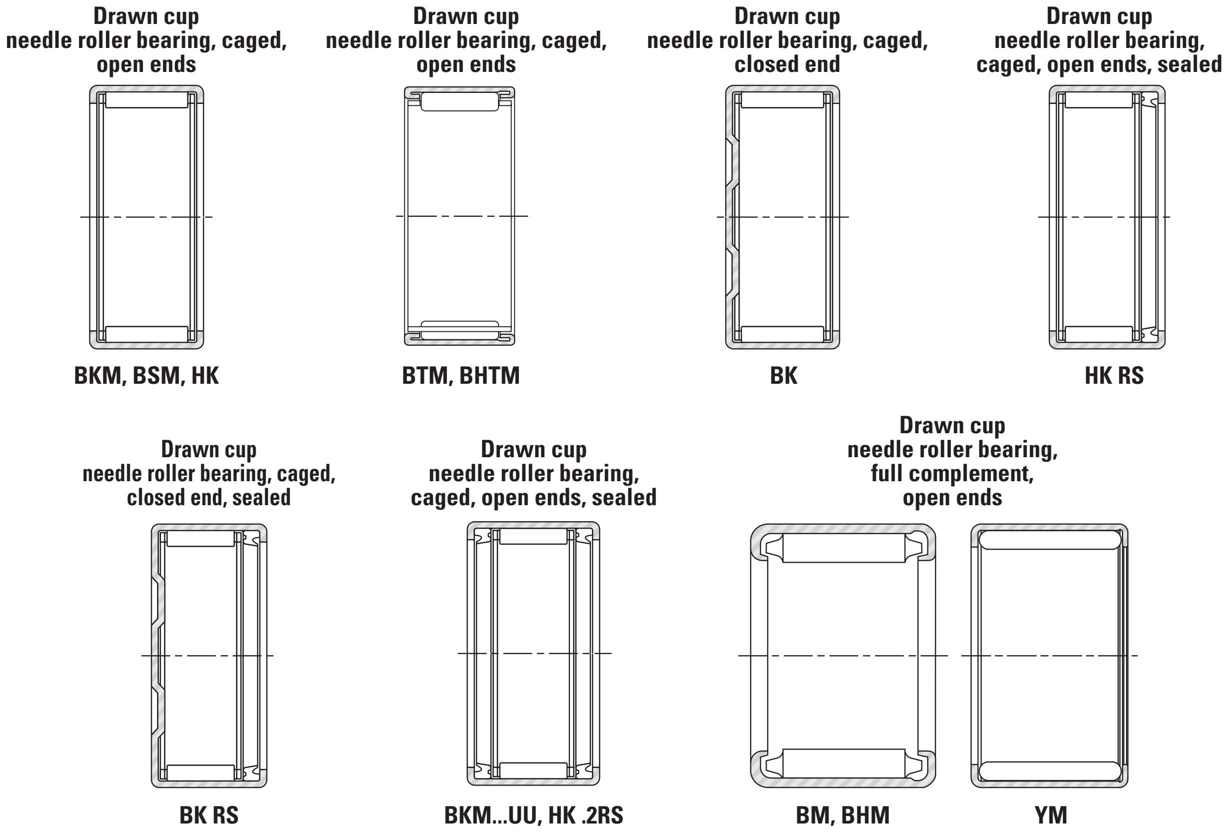


Fig. B2-1. Types of metric series drawn cup needle roller bearings

CONSTRUCTION

The prefix letters in metric series drawn cup bearing designations denote whether the bearings are made with a full complement of needle rollers or caged needle rollers. The use of a full complement of needle rollers is indicated by the prefix code letters **BM**, **BHM**, or **YM** and for use of caged needle rollers by the prefix code letters **HK**, **BKM**, **BTM**, **BHTM**, **BSM** or **BK**.

The outer ring, in the form of a cup, is accurately drawn and no subsequent machining is performed. Drawn cup needle roller bearings of series **HK**, **BKM**, **BTM**, **BHTM**, **BSM**, **BM**, **BHM** and **YM** have open ends. The **HK** and **BKM** series also are available with one seal, **HK RS**, and with two seals, **HK 2RS** and **BKM UU**. The stamped lip of a drawn cup needle roller bearing of series **HK RS** is at the seal end.

Drawn cup needle roller bearings of series **BK** is closed at one end. They are used for shaft-end mounting. The open end is typically not sealed.

The one-piece steel cage used in **HK**, **BKM** and **BK** series drawn cup bearings is designed to provide rigidity and minimize wear. This cage design separates the needle roller guiding and retention functions.

Drawn cup needle roller bearings also are available with two needle roller and cage assemblies. They have a lubricating hole in the outer ring. Metric series drawn cup bearings with one needle roller and cage assembly may be made available on request with a lubricating hole, indicated by suffix **AS1** and **JS1**.

SEALED BEARINGS

The HK and BKM series drawn cup bearings are offered with integral seals. The tables of dimensions on pages B-2-24 to B-2-26, indicate those sizes available with lip contact seals. The seal lip design achieves a light and constant contact with the inner raceway throughout the range of mounted bearing clearances, thereby ensuring positive sealing and low frictional drag.

Sealed drawn cup needle roller bearings are intended to retain grease or non-pressurized oil within a bearing while also preventing contaminants from entering the raceway area.

Details of shaft design for sealed bearings are given in the engineering section of this catalog.

The standard lip contact seals are compatible with common lubricating oils and petroleum based fuels; but, they are adversely affected by certain fire-resistant hydraulic fluids and most common solvents. Sealed drawn cup bearings are normally filled with a high-quality lithium soap-based general purpose grease. The seal material and grease properties limit the bearing operating temperature between -30° C and +100° C (-22° F and + 212° F).

If the operating temperature must be outside of the range for the seals mentioned here, or if the seals are exposed to unusual fluids, please consult your representative.

BEARING MOUNTING FITS AND INTERNAL CLEARANCE

Drawn cup needle roller bearings are manufactured to a degree of precision that will satisfy the radial clearance requirements of most applications. The total radial clearance for an installed drawn cup bearing results from the buildup of manufacturing tolerances of the housing bore, the inner raceway diameter and the bearing, as well as the minimum radial clearance required for the application (reference Table B2-1 on page B-2-8).

For metric series caged drawn cup needle roller bearings requiring close control of radial internal clearance, the suggested housing bore tolerance is N6 and h5 tolerance for the inner raceway diameter. When such exacting close control of radial internal clearance is not required, the user may select N7 housing bore and h6 inner raceway diameter tolerances.

For metric series full complement drawn cup bearings requiring close control of radial internal clearance, the suggested housing bore tolerance is H6 and h5 tolerance for the inner raceway diameter. When such exacting close control of radial internal clearance is not required, the user may select H7 housing bore and h6 inner raceway diameter tolerances.

TOLERANCES FOR HOUSING MATERIALS OF LOW RIGIDITY

The suggested housing bore tolerance for metric series caged drawn cup bearings used in housings made from materials of low rigidity or steel housings of small section is R6. To maintain normal radial internal clearance, the inner raceway diameter tolerance should be h5. When such exacting close control of radial internal clearance is not required, the user may select R7 housing bore and h6 inner raceway diameter tolerances.

The suggested housing bore tolerance for metric series full complement drawn cup bearings used in housings made from materials of low rigidity or steel housings of small section is M6. To maintain normal radial internal clearance, the inner raceway diameter tolerance should be h5. When such exacting close control of radial internal clearance is not required, the user may select M7 housing bore and h6 inner raceway diameter tolerances.

OUTER RING ROTATION

For metric series caged drawn cup bearing applications where the outer ring rotates with respect to the load, it is suggested that both the housing bore and the inner raceway diameter be reduced using R6 and f5 tolerance practice respectively. The user may select R7 housing bore and f6 inner raceway diameter tolerance when such exacting close control of radial internal clearance is not required.

For metric series full complement drawn cup bearings applications where the outer ring rotates with respect to the load, it is suggested that both the housing bore and the inner raceway diameter tolerance be reduced using is M6 and f5 tolerance practice respectively. The user may select M7 housing bore and f6 inner raceway diameter tolerances when such exacting close control of radial internal clearance is not required.

OSCILLATING MOTION

Metric series drawn cup needle roller bearing applications involving oscillating motion may require reduced radial internal clearances. This reduction may be accomplished by increasing the inner raceway diameter using j5 tolerance. When such exacting close control of radial clearance is not required, the user may select j6 inner raceway diameter tolerances.

Table B2-1. Metric mounting fits

Bearing type	Operating condition	Shaft fit (recommended internal radial clearances)	Housing fit (recommended internal radial clearances)
HK, BK, HKRS, HK.2RS, BTM, BHTM, BSM, BKM (caged)	One piece heavy section steel or cast iron housing	h5 (h6)	N6 (N7)
	Housing material of low rigidity	h5 (h6)	R6 (R7)
	Outer ring rotation (one piece heavy section steel or cast iron housing)	f5 (f6)	R6 (R7)
	Oscillating motion	j5 (j6)	(1)
BM, BHM, YM (full complement)	One piece heavy section steel or cast iron housing	h5 (h6)	H6 (H7)
	Housing material of low rigidity	h5 (h6)	M6 (M7)
	Outer ring rotation (one piece heavy section steel or cast iron housing)	f5 (f6)	M6 (M7)
	Oscillating motion	j5 (j6)	(1)

(1) Tolerance dependent on housing design.

INNER RINGS

When it becomes impractical to meet the shaft raceway design requirements (hardness, case depth, surface finish, etc.) outlined in the engineering section of this catalog, standard inner rings may be used with metric series drawn cup bearings. It is suggested that when metric series inner rings are used with metric series drawn cup bearings, they should be mounted with a loose transition fit on the shaft using g5 shaft diameter tolerance. The inner ring should be end-clamped against a shoulder. If a tight transition fit must be used (shaft diameter tolerance h5) to keep the inner ring from rotating relative to the shaft, the inner ring outer diameter, as mounted, must not exceed the raceway diameter required by the drawn cup bearing for the particular application. In case the outer diameter of the inner ring, when mounted on the shaft, exceeds the required raceway diameter for the matching drawn cup bearing, it should be ground to proper diameter while mounted on the shaft. When such exacting close control of radial internal clearance is not required the user may select g6 or h5 shaft diameter tolerances.

LOAD RATING FACTORS

DYNAMIC LOADS

Drawn cup needle roller bearings can accommodate only radial loads.

$P = F_r$

P = The maximum dynamic radial load that may be applied to a drawn cup bearing based on the dynamic load rating, C_r given in the bearing tables. This load should be $\leq C_r/3$.

STATIC LOADS

$$f_0 = \frac{C_0}{P_0}$$

f_0 = static load safety factor

C_0 = basic static load rating (kN)

P_0 = maximum applied static load (kN)

To ensure satisfactory operation of drawn cup needle roller bearings, under all types of conditions, the static load safety factor f_0 should be ≥ 3.

INSPECTION OF DRAWN CUP NEEDLE ROLLER BEARINGS

Although the bearing cup is accurately drawn from strip steel, because of its fairly thin section, it may go out-of-round during heat treatment. When the bearing is pressed into a true round housing, or ring gage of correct size and wall thickness, it becomes round and is sized properly. *For this reason, it is incorrect to inspect an unmounted drawn cup bearing by measuring the outer diameter.* The correct method for inspecting the bearing size is to:

1. Press the bearing into a ring gage of proper size.
2. Plug the bearing bore with the appropriate "go" and "no go" gages, or measure it with a tapered arbor (lathe mandrel).

- HK and BK series

The "go" gage size is the minimum needle roller complement bore diameter.

The "no go" gage size is larger than the maximum needle roller complement bore diameter by 0.002 mm (0.0001 in). (Table B2-2)

- BTM, BHTM, BSM, BKM, BM and YM series

The inspection gage (ring gage and plug gage) sizes are listed in Table B2-3.

NOTE

SPECIAL BEARINGS. There are bearings available with other cage designs, and materials such as reinforced engineered polymer for use where operating conditions permit.

Table B2-2. Caged bearing gage sizes

Nominal bore diameter	Ring gage[1]	Needle roller complement bore diameter	
		Max.	Min.
mm in	mm in	mm in	mm in
3.000 0.1181	6.484 0.2553	3.024 0.1191	3.006 0.1183
4.000 0.1575	7.984 0.3143	4.028 0.1586	4.010 0.1579
5.000 0.1969	8.984 0.3537	5.028 0.1980	5.010 0.1972
6.000 0.2362	9.984 0.3931	6.028 0.2373	6.010 0.2366
7.000 0.2756	10.980 0.4323	7.031 0.2768	7.013 0.2761
8.000 0.3150	11.980 0.4717	8.031 0.3162	8.013 0.3155
9.000 0.3543	12.980 0.5110	9.031 0.3555	9.013 0.3548
10.000 0.3937	13.980 0.5504	10.031 0.3949	10.013 0.3942
12.000 0.4724	15.980 0.6291	12.034 0.4738	12.016 0.4731
12.000 0.4724	17.980 0.7079	12.034 0.4738	12.016 0.4731
13.000 0.5118	18.976 0.7471	13.034 0.5131	13.016 0.5124
14.000 0.5512	19.976 0.7865	14.034 0.5525	14.016 0.5518
15.000 0.5906	20.976 0.8258	15.034 0.5919	15.016 0.5912
16.000 0.6299	21.976 0.8652	16.034 0.6313	16.016 0.6306
17.000 0.6693	22.976 0.9046	17.034 0.6706	17.016 0.6699
18.000 0.7087	23.976 0.9439	18.034 0.7100	18.016 0.7093
20.000 0.7874	25.976 1.0227	20.041 0.7890	20.020 0.7882
22.000 0.8661	27.976 1.1014	22.041 0.8678	22.020 0.8669
25.000 0.9843	31.972 1.2587	25.041 0.9859	25.020 0.9850
28.000 1.1024	34.972 1.3769	28.041 1.1040	28.020 1.1031
30.000 1.1811	36.972 1.4556	30.041 1.1827	30.020 1.1819
35.000 1.3780	41.972 1.6524	35.050 1.3799	35.025 1.3789
40.000 1.5750	46.972 1.8493	40.050 1.5768	40.025 1.5758
45.000 1.7717	51.967 2.0459	45.050 1.7736	45.025 1.7726
50.000 1.9685	57.967 2.2822	50.050 1.9705	50.025 1.9695
60.000 2.3622	67.967 2.6759	60.060 2.3646	60.030 2.3634

(1) The ring gage sizes are in accordance with ISO N6 lower limit.

Table B2-3. Needle roller bearing gage sizes (metric series)

Needle roller complement bore diameter Fw nominal size	Ring gage	Plug gage	
		Go	No go
mm	mm	mm	mm
4	7.996	4.023	4.048
5	8.996	5.023	5.048
6	9.996	6.028	6.053
7	10.995	7.031	7.056
8	11.995 14.995	8.031	8.056
9	12.995 15.995	9.031	9.056
10	13.995 16.995	10.031	10.056
12	15.995 17.995 18.993	12.031	12.056
13	18.993	13.034	13.059
14	18.993 19.993 21.993	14.034	14.059
15	19.993 20.993 21.993	15.034	15.059
16	21.993 23.993	16.034	16.059
17	21.972 22.972 23.972	17.013	17.038
18	23.972 24.972	18.013	18.038
19	26.972	19.013	19.038
20	25.972 26.972	20.013	20.038
22	27.972 28.972 29.972	22.013	22.038
24	29.972 30.967 34.967	24.013	24.038
25	31.967 32.967	25.013	25.038
26	33.967	26.013	26.038
28	33.967 34.967 36.967	28.013	28.038
30	36.967 37.967 39.967	30.013	30.038
32	37.967 39.967 41.967	32.013	32.038
35	41.967 44.967	35.013	35.038
36	41.967 43.967 47.967	36.013	36.038
37	42.967 46.967	37.013	37.038
38	47.967	38.013	38.038
40	46.967 49.967	40.013	40.043
45	51.961 54.961	45.013	45.043
50	57.961 61.961	50.013	50.043
55	62.961	55.013	55.051

INSTALLATION PROCEDURES

GENERAL INSTALLATION REQUIREMENTS

- A drawn cup needle roller bearing must be pressed into its housing.
- An installation tool, similar to the ones illustrated must be used in conjunction with a standard press.
- The bearing must not be hammered into its housing, even in conjunction with the proper assembly mandrel.
- The bearing must not be pressed tightly against a shoulder in the housing.
- If it is necessary to use a shouldered housing, the depth of the housing bore must be sufficient to ensure that the housing shoulder fillet, as well as the shoulder face, clears the bearing.
- The installation tool must be coaxial with the housing bore.

INSTALLATION OF OPEN ENDS CAGED BEARINGS

It is advisable to utilize a positive stop on the press tool to locate the bearing properly in the housing. The assembly tool should have a leader or a pilot, as shown, to aid in starting the bearing true in the housing. The "O" ring shown on the drawing may be used to assist in holding the bearing on the installation tool. The bearing should be installed with the stamped end (the end with the identification markings) against the angled shoulder of the pressing tool.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)
D – pilot length should be length of bearing less 0.80 mm (0.030 in)
E – approximately $\frac{1}{2}$ D

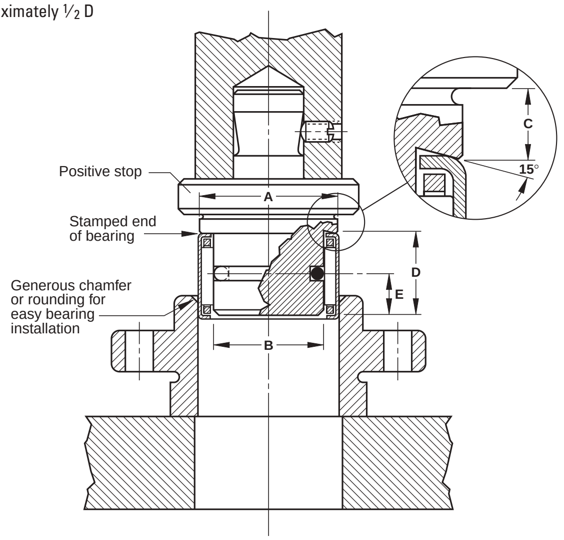


Fig. B2-2. Installation of open ends caged bearings

INSTALLATION OF CLOSED END CAGED BEARINGS

Bearing can be piloted from below for installation.

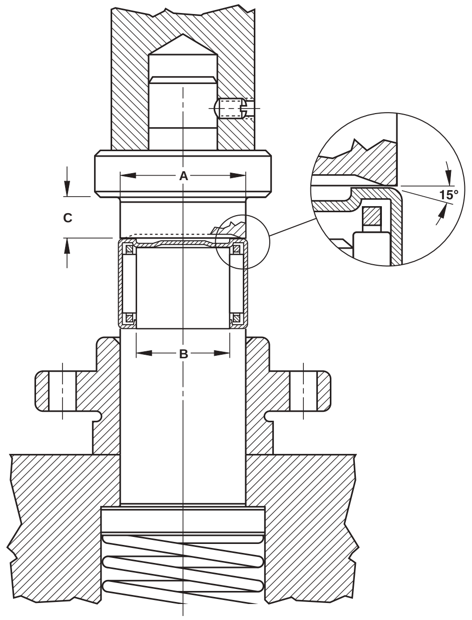


Fig. B2-3. Installation of closed end caged bearings

EXTRACTION FROM A STRAIGHT HOUSING (CAGED AND FULL COMPLEMENT BEARINGS)

Bearing can be extracted by pushing it through the housing. After extraction, the drawn cup needle roller bearing should not be reused.

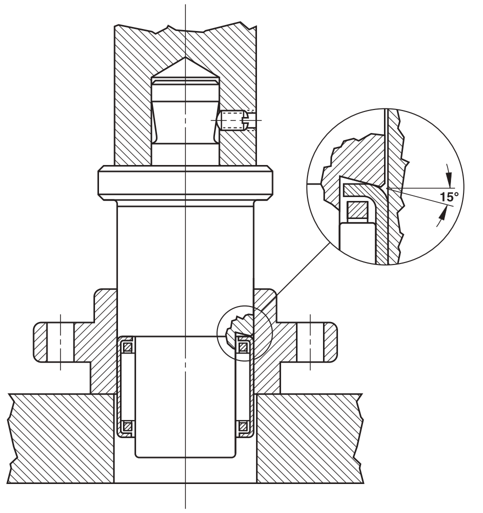


Fig. B2-4. Extraction from a straight housing

INSTALLATION OF OPEN ENDS FULL COMPLEMENT BEARINGS

It is advisable to utilize a positive stop on the press tool to locate the bearing properly in the housing. The assembly tool should have a leader or a pilot, as shown, to aid in starting the bearing true in the housing. The ball detent shown on the drawing is used to assist in aligning the rollers of a full complement bearing during installation and to hold the bearing on the installation tool. The bearing should be installed with the marked end (the end with identification markings) against the angled shoulder of the pressing tool.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)
D – pilot length should be length of bearing less 0.80 mm (0.030 in)
E – approximately 1⁄2 D

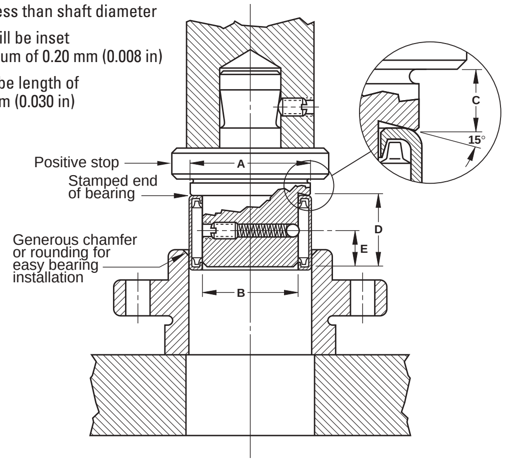


Fig. B2-5. Installation of open ends full complement bearings

INSTALLATION OF CLOSED END FULL COMPLEMENT BEARINGS

The installation tool combines all the features of the tool used to install open end bearings, but the pilot is spring loaded and is part of the press bed.

The angled shoulder of the pressing tool should bear against the closed end with the bearing held on the pilot to aid in starting the bearing true in the housing.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)

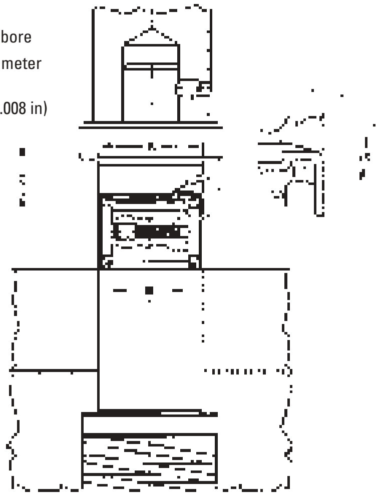


Fig. B2-6. Installation of closed end full complement bearings

EXTRACTION FROM A SHOULDERED OR DEAD END HOUSING (CAGED AND FULL COMPLEMENT BEARINGS) (with space between the bearing and the housing shoulder)

Bearings may be extracted from shouldered or dead end housings with a common bearing puller tool as shown. This type of tool is slotted in two places at right angles to form four prongs. The four puller prongs are pressed together and inserted into the space between the end of the bearing and the shoulder. The prongs are forced outward by inserting the expansion rod, and then the bearing is extracted. Do not reuse the bearing after extraction.

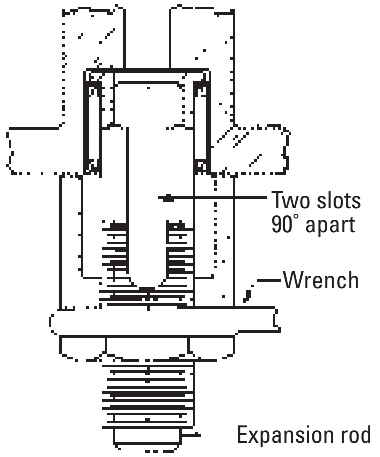


Fig. B2-7. Extraction from a shouldered or dead end housing

EXTRACTION FROM A SHOULDERED HOUSING (CAGED AND FULL COMPLEMENT BEARINGS) (with bearing pressed up close to the shoulder)

The tool to be used, as shown, is of a similar type described for a shouldered or dead end housing, but the rollers must first be removed from the bearing.

The four segment puller jaws are collapsed and slipped into the empty cup. The jaws are then forced outward into the cup bore by means of the tapered expansion rod. The jaws should bear on the lip as near as possible to the cup bore. The cup is then pressed out from the top.

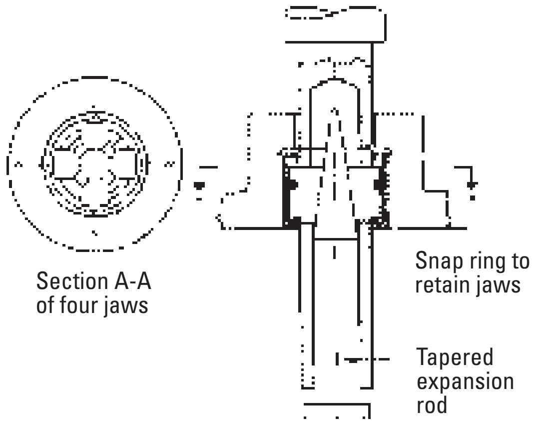
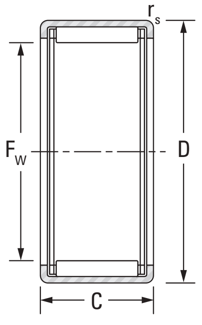


Fig. B2-8. Extraction from a shouldered housing

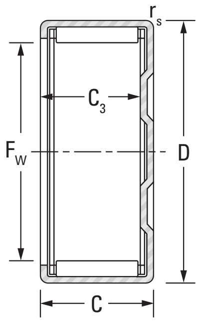
NOTES

DRAWN CUP NEEDLE ROLLER BEARINGS
CAGED,
OPEN ENDS,
CLOSED ONE END

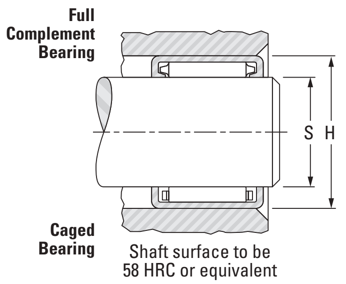
METRIC SERIES
HK, BK SERIES



HK



BK



Shaft Dia.	Fw	D	C	C3 min.	rs min.	Bearing Designation		Load Ratings		Fatigue Load Limit Cu	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012					Dynamic	Static					Shaft (h5)		Housing (N6)			
						Open Ends	Closed One End	C	C0		Grease	Oil		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min-1		kg lbs	mm in	mm in	mm in	mm in		
3 0.1181	3 0.1181	6.5 0.2559	6 0.236	5.20 0.205	0.30 0.012	—	BK0306	1.20 270	0.78 180	0.130	30000	46000	0.001 0.002	3.000 0.1181	2.996 0.118	6.493 0.2556	6.484 0.2553	Table B2-2	
	3 0.1181	6.5 0.2559	6 0.236	—	0.30 0.012	HK0306	—	1.20 270	0.78 180	0.130	30000	46000	0.001 0.002	3.000 0.1181	2.996 0.118	6.493 0.2556	6.484 0.2553	Table B2-2	
4 0.1575	4 0.1575	8 0.3150	8 0.315	6.40 0.252	0.40 0.016	—	BK0408	1.88 423	1.38 310	0.200	25000	39000	0.002 0.004	4.000 0.1575	3.995 0.1573	7.993 0.3147	7.984 0.3143	Table B2-2	
	4 0.1575	8 0.3150	8 0.315	—	0.40 0.016	HK0408	—	1.88 420	1.38 310	0.200	25000	39000	0.002 0.004	4.000 0.1575	3.995 0.1573	7.993 0.3147	7.984 0.3143	Table B2-2	
5 0.1969	5 0.1969	9 0.3543	9 0.354	7.40 0.291	0.40 0.016	—	BK0509	2.52 570	2.07 470	0.320	23000	36000	0.002 0.004	5.000 0.1969	4.995 0.1967	8.993 0.3541	8.984 0.3537	Table B2-2	
	5 0.1969	9 0.3543	9 0.354	—	0.40 0.016	HK0509	—	2.52 570	2.07 470	0.320	23000	36000	0.002 0.004	5.000 0.1969	4.995 0.1967	8.993 0.3541	8.984 0.3537	Table B2-2	
6 0.2362	6 0.2362	10 0.3937	8 0.315	6.40 0.252	0.40 0.016	—	BK0608	2.34 530	1.95 440	0.290	22000	33000	0.002 0.004	6.000 0.2362	5.995 0.236	9.993 0.3934	9.984 0.3931	Table B2-2	
	6 0.2362	10 0.3937	8 0.315	—	0.40 0.016	HK0608	—	2.34 530	1.95 440	0.290	22000	33000	0.002 0.004	6.000 0.2362	5.995 0.236	9.993 0.3934	9.984 0.3931	Table B2-2	
	6 0.2362	10 0.3937	9 0.354	7.40 0.291	0.40 0.016	—	BK0609	3.14 710	2.85 640	0.290	22000	33000	0.003 0.007	6.000 0.2362	5.995 0.236	9.993 0.3934	9.984 0.3931	Table B2-2	
	6 0.2362	10 0.3937	9 0.354	—	0.40 0.016	HK0609	—	3.14 710	2.85 640	0.290	22000	33000	0.002 0.004	6.000 0.2362	5.995 0.236	9.993 0.3934	9.984 0.3931	Table B2-2	
7 0.2756	7 0.2756	11 0.4331	9 0.354	7.40 0.291	0.40 0.016	—	BK0709	3.23 730	3.05 690	0.470	21000	32000	0.003 0.007	7.000 0.2756	6.994 0.2754	10.991 0.4327	10.980 0.4323	Table B2-2	
	7 0.2756	11 0.4331	9 0.354	—	0.40 0.016	HK0709	—	3.23 730	3.05 690	0.470	21000	32000	0.003 0.007	7.000 0.2756	6.994 0.2754	10.991 0.4327	10.980 0.4323	Table B2-2	
8 0.3150	8 0.3150	12 0.4724	8 0.315	6.40 0.252	0.40 0.016	—	BK0808	2.90 650	2.73 610	0.400	20000	31000	0.003 0.007	8.000 0.315	7.994 0.3147	11.991 0.4721	11.980 0.4717	Table B2-2	
	8 0.3150	12 0.4724	8 0.315	—	0.40 0.016	HK0808	—	2.90 650	2.73 610	0.400	20000	31000	0.003 0.007	8.000 0.315	7.994 0.3147	11.991 0.4721	11.980 0.4717	Table B2-2	
	8 0.3150	12 0.4724	10 0.394	8.40 0.331	0.40 0.016	—	BK0810	3.95 890	4.07 920	0.600	20000	31000	0.004 0.009	8.000 0.315	7.994 0.3147	11.991 0.4721	11.980 0.4717	Table B2-2	JR5x8x12
	8 0.3150	12 0.4724	10 0.394	—	0.40 0.016	HK0810	—	3.95 890	4.07 920	0.600	20000	31000	0.004 0.009	8.000 0.315	7.994 0.3147	11.991 0.4721	11.980 0.4717	Table B2-2	JR5x8x12
9 0.3543	9 0.3543	13 0.5118	10 0.394	8.40 0.331	0.40 0.016	—	BK0910	4.57 1030	5.07 1140	0.770	19000	30000	0.004 0.009	9.000 0.3543	8.994 0.3541	12.991 0.5115	12.980 0.5110	Table B2-2	JR6x9x12
9 0.3543	9 0.3543	13 0.5118	10 0.394	—	0.40 0.016	HK0910	—	4.57 1030	5.07 1140	0.770	19000	30000	0.004 0.009	9.000 0.3543	8.994 0.3541	12.991 0.5115	12.980 0.5110	Table B2-2	JR6x9x12
	9 0.3543	13 0.5118	12 0.472	10.40 0.409	0.40 0.016	—	BK0912	5.65 1270	6.65 1490	1.00	19000	30000	0.005 0.011	9.000 0.3543	8.994 0.3541	12.991 0.5115	12.980 0.5110	Table B2-2	JR6x9x12
	9 0.3543	13 0.5118	12 0.472	—	0.40 0.016	HK0912	—	5.65 1270	6.65 1490	1.00	19000	30000	0.005 0.011	9.000 0.3543	8.994 0.3541	12.991 0.5115	12.980 0.5110	Table B2-2	JR6x9x12
10 0.3937	10 0.3937	14 0.5512	10 0.394	8.40 0.331	0.40 0.016	—	BK1010	4.78 1070	5.51 1240	0.840	19000	29000	0.004 0.009	10.000 0.3937	9.994 0.3935	13.991 0.5508	13.980 0.5504	Table B2-2	JR7x10x10,5
	10 0.3937	14 0.5512	10 0.394	—	0.40 0.016	HK1010	—	4.78 1070	5.51 1240	0.840	19000	29000	0.004 0.009	10.000 0.3937	9.994 0.3935	13.991 0.5508	13.980 0.5504	Table B2-2	JR7x10x10,5
	10 0.3937	14 0.5512	12 0.472	10.40 0.409	0.40 0.016	—	BK1012	5.90 1330	7.23 1630	1.10	19000	29000	0.006 0.013	10.000 0.3937	9.994 0.3935	13.991 0.5508	13.980 0.5504	Table B2-2	JR7x10x12
	10 0.3937	14 0.5512	12 0.472	—	0.40 0.016	HK1012	—	5.90 1330	7.23 1630	1.10	19000	29000	0.005 0.011	10.000 0.3937	9.994 0.3935	13.991 0.5508	13.980 0.5504	Table B2-2	JR7x10x12
	10 0.3937	14 0.5512	15 0.591	13.40 0.528	0.40 0.016	—	BK1015	7.49 1680	9.81 2210	1.50	19000	29000	0.006 0.013	10.000 0.3937	9.994 0.3935	13.991 0.5508	13.980 0.5504	Table B2-2	JR7x10x16
	10 0.3937	14 0.5512	15 0.591	—	0.40 0.016	HK1015	—	7.49 1680	9.81 2210	1.50	19000	29000	0.006 0.013	10.000 0.3937	9.994 0.3935	13.991 0.5508	13.980 0.5504	Table B2-2	JR7x10x16
12 0.4724	12 0.4724	16 0.6299	10 0.394	8.40 0.331	0.40 0.016	—	BK1210	5.24 1180	6.55 1470	0.890	18000	28000	0.006 0.013	12.000 0.4724	11.992 0.4721	15.991 0.6296	15.980 0.6291	Table B2-2	JR8x12x10,5
	12 0.4724	16 0.6299	10 0.394	—	0.40 0.016	HK1210	—	5.24 1180	6.55 1470	0.890	18000	28000	0.006 0.013	12.000 0.4724	11.992 0.4721	15.991 0.6296	15.980 0.6291	Table B2-2	JR8x12x10,5
	12 0.4724	18 0.7087	12 0.472	9.30 0.366	1 0.039	—	BK1212	6.61 1490	7.29 1640	1.10	14000	22000	0.012 0.026	12.000 0.4724	11.992 0.4721	17.991 0.7083	17.980 0.7079	Table B2-2	JR8x12x12,5
	12 0.4724	18 0.7087	12 0.472	—	1 0.039	HK1212	—	6.61 1490	7.29 1640	1.10	14000	22000	0.01 0.022	12.000 0.4724	11.992 0.4721	17.991 0.7083	17.980 0.7079	Table B2-2	JR8x12x12,5
13 0.5118	13 0.5118	19 0.7480	12 0.472	9.30 0.366	1 0.039	—	BK1312	6.92 1560	7.89 1770	1.20	14000	22000	0.012 0.026	13.000 0.5118	12.992 0.5115	18.989 0.7476	18.976 0.7471	Table B2-2	JR10x13x12,5
	13 0.5118	19 0.7480	12 0.472	—	1 0.039	HK1312	—	6.92 1560	7.89 1770	1.20	14000	22000	0.01 0.022	13.000 0.5118	12.992 0.5115	18.989 0.7476	18.976 0.7471	Table B2-2	JR10x13x12,5
14 0.5512	14 0.5512	20 0.7874	12 0.472	9.30 0.366	1 0.039	—	BK1412	7.21 1620	8.50 1910	1.30	14000	21000	0.014 0.031	14.000 0.5512	13.992 0.5509	19.989 0.7870	19.976 0.7865	Table B2-2	JR10x14x12
	14 0.5512	20 0.7874	12 0.472	—	1 0.039	HK1412	—	7.21 1620	8.50 1910	1.30	14000	21000	0.011 0.024	14.000 0.5512	13.992 0.5509	19.989 0.7870	19.976 0.7865	Table B2-2	JR10x14x12
15 0.5906	15 0.5906	21 0.8268	12 0.472	9.30 0.366	1 0.039	—	BK1512	7.49 1680	9.11 2050	1.40	14000	21000	0.015 0.033	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x12,5
	15 0.5906	21 0.8268	12 0.472	—	1 0.039	HK1512	—	7.49 1680	9.11 2050	1.40	14000	21000	0.012 0.026	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x12,5
	15 0.5906	21 0.8268	16 0.630	13.30 0.524	1 0.039	—	BK1516	10.7 2410	14.4 3240	2.20	14000	21000	0.019 0.042	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x16,5
	15 0.5906	21 0.8268	16 0.630	—	1 0.039	HK1516	—	10.7 2410	14.4 3240	2.20	14000	21000	0.018 0.040	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x16,5
	15 0.5906	21 0.8268	22 0.866	19.30 0.760	1 0.039	—	BK1522[1]	13.5 3030	19.4 4360	2.95	14000	21000	0.022 0.049	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x22,5
	15 0.5906	21 0.8268	22 0.866	—	1 0.039	HK1522[1]	—	13.5 3030	19.4 4360	2.95	14000	21000	0.024 0.053	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x22,5
16 0.6299	16 0.6299	22 0.8661	12 0.472	9.30 0.366	1 0.039	—	BK1612	7.76 1740	9.72 2190	1.50	14000	21000	0.016 0.035	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x12

(1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.

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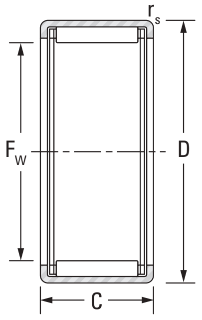
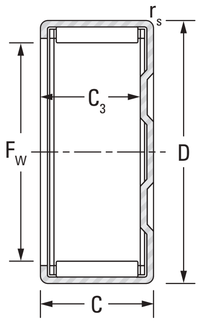
DRAWN CUP NEEDLE ROLLER BEARINGS
CAGED,
OPEN ENDS,
CLOSED ONE END

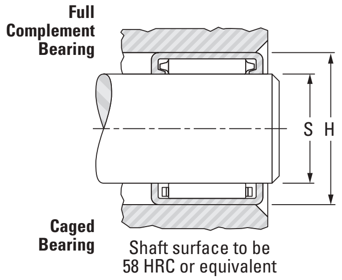
METRIC SERIES
HK, BK SERIES



HK



BK



Shaft Dia.	F_w	D	C +0 -0.3 / +0.000 -0.012	C_3 min.	r_s min.	Bearing Designation Open Ends	Bearing Designation Closed One End	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions Shaft (h5) Max.	Mounting Dimensions Shaft (h5) Min.	Mounting Dimensions Housing (N6) Max.	Mounting Dimensions Housing (N6) Min.	Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
16 0.6299	16 0.6299	22 0.8661	12 0.472	—	1 0.039	HK1612	—	7.76 1740	9.72 2190	1.50	14000	21000	0.012 0.026	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x12
	16 0.6299	22 0.8661	16 0.630	13.30 0.524	1 0.039	—	BK1616	11.1 2500	15.3 3440	2.35	14000	21000	0.02 0.044	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x16
	16 0.6299	22 0.8661	16 0.630	—	1 0.039	HK1616	—	11.1 2500	15.3 3440	2.35	14000	21000	0.016 0.035	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x16
	16 0.6299	22 0.8661	22 0.866	19.30 0.760	1 0.039	—	BK1622(1)	13.4 3010	19.5 4380	2.95	14000	21000	0.028 0.062	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x22
	16 0.6299	22 0.8661	22 0.866	—	1 0.039	HK1622(1)	—	13.4 3010	19.5 4380	2.95	14000	21000	0.022 0.049	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x22
17 0.6693	17 0.6693	23 0.9055	12 0.472	9.30 0.366	1 0.039	—	BK1712	8.12 1830	10.4 2340	1.60	13000	20000	0.018 0.040	17.000 0.6693	16.992 0.6690	22.989 0.9051	22.976 0.9046	Table B2-2	
	17 0.6693	23 0.9055	12 0.472	—	1 0.039	HK1712	—	8.12 1830	10.4 2340	1.60	13000	20000	0.013 0.029	17.000 0.6693	16.992 0.6690	22.989 0.9051	22.976 0.9046	Table B2-2	
18 0.7087	18 0.7087	24 0.9449	12 0.472	9.30 0.366	1 0.039	—	BK1812	8.41 1890	11.1 2500	1.70	12000	18000	0.017 0.037	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	
	18 0.7087	24 0.9449	12 0.472	—	1 0.039	HK1812	—	8.41 1890	11.1 2500	1.70	12000	18000	0.015 0.033	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	
	18 0.7087	24 0.9449	16 0.630	13.30 0.524	1 0.039	—	BK1816	11.6 2610	16.8 3780	2.55	12000	18000	0.022 0.049	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	JR15x18x16,5
	18 0.7087	24 0.9449	16 0.630	—	1 0.039	HK1816	—	11.6 2610	16.8 3780	2.55	12000	18000	0.018 0.040	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	JR15x18x16,5
20 0.7874	20 0.7874	26 1.0236	12 0.472	9.3 0.366	1 0.039	—	BK2012	8.97 2020	12.5 2810	1.90	11000	16000	0.017 0.037	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR15x20x12
	20 0.7874	26 1.0236	12 0.472	—	1 0.039	HK2012	—	8.97 2020	12.5 2810	1.90	11000	16000	0.015 0.033	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR15x20x12
	20 0.7874	26 1.0236	16 0.630	13.3 0.524	1 0.039	—	BK2016	12.4 2790	18.9 4250	2.85	11000	16000	0.024 0.053	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x16,5
	20 0.7874	26 1.0236	16 0.630	—	1 0.039	HK2016	—	12.4 2790	18.9 4250	2.85	11000	16000	0.022 0.049	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x16,5
	20 0.7874	26 1.0236	20 0.787	17.3 0.681	1 0.039	—	BK2020	15.5 3480	25.3 5690	3.95	11000	16000	0.027 0.060	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x20,5
	20 0.7874	26 1.0236	20 0.787	—	1 0.039	HK2020	—	15.5 3480	25.3 5690	3.95	11000	16000	0.025 0.055	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x20,5

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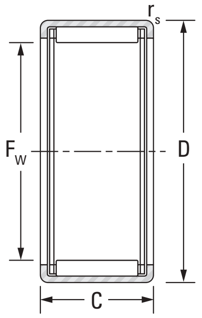
(1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.

Shaft Dia.	F_w	D	C +0 -0.3 / +0.000 -0.012	C_3 min.	r_s min.	Bearing Designation Open Ends	Bearing Designation Closed One End	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions Shaft (h5) Max.	Mounting Dimensions Shaft (h5) Min.	Mounting Dimensions Housing (N6) Max.	Mounting Dimensions Housing (N6) Min.	Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
20 0.7874	20 0.7874	26 1.0236	30 1.181	27.3 1.075	1 0.039	—	BK2030(1)	21.2 4770	37.8 8500	5.75	11000	16000	0.043 0.095	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x30,5
	20 0.7874	26 1.0236	30 1.181	—	1 0.039	HK2030(1)	—	21.2 4770	37.8 8500	5.75	11000	16000	0.041 0.090	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x30,5
22 0.8661	22 0.8661	28 1.1024	10 0.394	—	1 0.039	HK2210	—	7.06 1590	9.49 2130	1.45	9600	15000	0.013 0.029	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	
	22 0.8661	28 1.1024	12 0.472	9.3 0.366	1 0.039	—	BK2212	9.81 2210	14.5 3260	2.20	9600	15000	0.02 0.044	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x13
	22 0.8661	28 1.1024	12 0.472	—	1 0.039	HK2212	—	9.81 2210	14.5 3260	2.20	9600	15000	0.015 0.033	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x13
	22 0.8661	28 1.1024	16 0.630	13.3 0.524	1 0.039	—	BK2216	13.1 2940	20.9 4700	3.20	9600	15000	0.027 0.060	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x16
	22 0.8661	28 1.1024	16 0.630	—	1 0.039	HK2216	—	13.1 2940	20.9 4700	3.20	9600	15000	0.022 0.049	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x16
	22 0.8661	28 1.1024	20 0.787	17.3 0.681	1 0.039	—	BK2220	15.3 3440	25.5 5730	4.00	9600	15000	0.028 0.062	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x23
	22 0.8661	28 1.1024	20 0.787	—	1 0.039	HK2220	—	15.3 3440	25.5 5730	4.00	9600	15000	0.026 0.057	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x23
25 0.9843	25 0.9843	32 1.2598	12 0.472	9.30 0.366	1 0.039	—	BK2512	10.9 2450	14.7 3300	2.25	8500	13000	0.025 0.055	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	
	25 0.9843	32 1.2598	12 0.472	—	1 0.039	HK2512	—	10.9 2450	14.7 3300	2.25	8500	13000	0.021 0.046	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	
	25 0.9843	32 1.2598	16 0.630	13.3 0.524	1 0.039	—	BK2516	15.6 3510	23.5 5280	3.55	8500	13000	0.031 0.068	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x17
	25 0.9843	32 1.2598	16 0.630	—	1 0.039	HK2516	—	15.6 3510	23.5 5280	3.55	8500	13000	0.028 0.062	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x17
	25 0.9843	32 1.2598	20 0.787	17.3 0.681	1 0.039	—	BK2520	20.6 4630	33.4 7510	5.30	8500	13000	0.043 0.095	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x20,5
	25 0.9843	32 1.2598	20 0.787	—	1 0.039	HK2520	—	20.6 4630	33.4 7510	5.30	8500	13000	0.040 0.088	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x20,5
	25 0.9843	32 1.2598	26 1.024	23.3 0.917	1 0.039	—	BK2526	25.7 5780	44.4 9980	6.95	8500	13000	0.051 0.112	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x26,5
	25 0.9843	32 1.2598	26 1.024	—	1 0.039	HK2526	—	25.7 5780	44.4 9980	6.95	8500	13000	0.046 0.101	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x26,5
	25 0.9843	32 1.2598	38 1.496	35.3 1.390	1 0.039	—	BK2538(1)	35.3 7940	66.9 15000	10.6	8500	13000	0.077 0.170	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x38,5
	25 0.9843	32 1.2598	38 1.496	—	1 0.039	HK2538(1)	—	35.3 7940	66.9 15000	10.6	8500	13000	0.068 0.150	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x38,5
28 1.1024	28 1.1024	35 1.3780	16 0.630	—	1 0.039	HK2816	—	17.4 3910	28.1 6320	3.85	7500	12000	0.032 0.071	28.000 1.1024	27.991 1.1020	34.988 1.3775	34.972 1.3769	Table B2-2	JR22x28x17
	28 1.1024	35 1.3780	20 0.787	17.3 0.681	1 0.039	—	BK2820	20.9 4700	35.3 7940	5.60	7500	12000	0.047 0.104	28.000 1.1024	27.991 1.1020	34.988 1.3775	34.972 1.3769	Table B2-2	JR22x28x20,5
	28 1.1024	35 1.3780	20 0.787	—	1 0.039	HK2820	—	20.9 4700	35.3 7940	5.60	7500	12000	0.040 0.088	28.000 1.1024	27.991 1.1020	34.988 1.3775	34.972 1.3769	Table B2-2	JR22x28x20,5
30 1.1811	30 1.1811	37 1.4567	12 0.472	9.3 0.366	1 0.039	—	BK3012	12.0 2700	17.7 3980	2.90	7000	11000	0.031 0.068	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	
	30 1.1811	37 1.4567	12 0.472	—	1 0.039	HK3012	—	12.0 2700	17.7 3980	2.70	7000	11000	0.024 0.053	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	

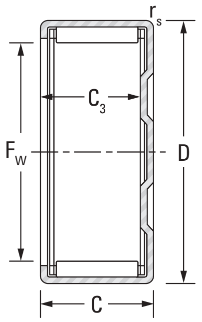
Continued on next page.

DRAWN CUP NEEDLE ROLLER BEARINGS CAGED, OPEN ENDS, CLOSED ONE END

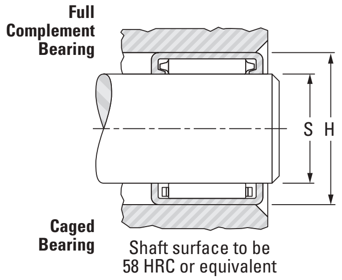
METRIC SERIES
HK, BK SERIES



HK



BK

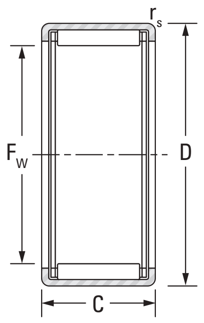


Shaft Dia.	F_w	D	C	$C_{3\,min.}$	$r_{s\,min.}$	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012					Dynamic	Static					Shaft (h5)		Housing (N6)			
						Open Ends	Closed One End	C	C_0		Grease	Oil		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
30 1.1811	**30** 1.1811	**37** 1.4567	**16** 0.630	**13.30** 0.524	**1** 0.039	—	BK3016	**16.8** 3780	**27.3** 6140	4.20	7000	11000	**0.041** 0.090	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x17
	30 1.1811	**37** 1.4567	**16** 0.630	—	**1** 0.039	HK3016	—	**16.8** 3780	**27.3** 6140	4.20	7000	11000	**0.032** 0.071	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x17
	30 1.1811	**37** 1.4567	**20** 0.787	**17.3** 0.681	**1** 0.039	—	BK3020	**22.4** 5040	**39.6** 8900	6.25	7000	11000	**0.053** 0.117	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x20,5
	30 1.1811	**37** 1.4567	**20** 0.787	—	**1** 0.039	HK3020	—	**22.4** 5040	**39.6** 8900	6.25	7000	11000	**0.042** 0.093	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x20,5
	30 1.1811	**37** 1.4567	**26** 1.024	**23.3** 0.917	**1** 0.039	—	BK3026	**27.4** 6160	**51.2** 11500	7.95	7000	11000	**0.067** 0.148	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x26,5
	30 1.1811	**37** 1.4567	**26** 1.024	—	**1** 0.039	HK3026	—	**27.4** 6160	**51.2** 11500	7.95	7000	11000	**0.054** 0.119	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x26,5
	30 1.1811	**37** 1.4567	**38** 1.496	**35.3** 1.390	**1** 0.039	—	BK3038(1)	**38.4** 8630	**79.2** 17800	12.5	7000	11000	**0.093** 0.205	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x38,5
	30 1.1811	**37** 1.4567	**38** 1.496	—	**1** 0.039	HK3038(1)	—	**38.4** 8630	**79.2** 17800	12.5	7000	11000	**0.075** 0.165	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	Table B2-2	JR25x30x38,5
35 1.3780	**35** 1.3780	**42** 1.6535	**12** 0.472	—	**1** 0.039	HK3512	—	**12.3** 2770	**19.2** 4320	2.90	5900	9100	**0.028** 0.062	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	
	35 1.3780	**42** 1.6535	**16** 0.630	—	**1** 0.039	HK3516	—	**18.7** 4200	**33.0** 7420	4.60	5900	9100	**0.037** 0.082	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x17
	35 1.3780	**42** 1.6535	**20** 0.787	**17.3** 0.681	**1** 0.039	—	BK3520	**24.5** 5510	**46.8** 10520	7.40	5900	9100	**0.065** 0.143	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x20,5
	35 1.3780	**42** 1.6535	**20** 0.787	—	**1** 0.039	HK3520	—	**24.5** 5510	**46.8** 10500	7.40	5900	9100	**0.049** 0.108	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	Table B2-2	JR30x35x20,5
40 1.5748	**40** 1.5748	**47** 1.8504	**12** 0.472	—	**1** 0.039	HK4012	—	**13.4** 3010	**22.4** 5040	3.40	5200	7900	**0.033** 0.073	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	
	40 1.5748	**47** 1.8504	**16** 0.630	—	**1** 0.039	HK4016	—	**18.9** 4250	**34.8** 7820	5.35	5200	7900	**0.042** 0.093	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x17
	40 1.5748	**47** 1.8504	**20** 0.787	**17.3** 0.681	**1** 0.039	—	BK4020	**25.1** 5640	**50.4** 11330	8.00	5200	7900	**0.070** 0.154	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x20,5
	40 1.5748	**47** 1.8504	**20** 0.787	—	**1** 0.039	HK4020	—	**25.1** 5640	**50.4** 11330	8.00	5200	7900	**0.060** 0.132	**40.000** 1.5748	**39.989** 1.5744	**46.988** 1.8499	**46.972** 1.8493	Table B2-2	JR35x40x20,5
45 1.7717	**45** 1.7717	**52** 2.0472	**12** 0.472	—	**1** 0.039	HK4512	—	**14.1** 3170	**24.8** 5580	3.75	4600	7000	**0.036** 0.079	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	
45 1.7717	**45** 1.7717	**52** 2.0472	**16** 0.630	—	**1** 0.039	HK4516	—	**19.8** 4450	**38.5** 8660	5.95	4600	7000	**0.048** 0.106	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	JR40x45x17
	45 1.7717	**52** 2.0472	**20** 0.787	**17.3** 0.681	**1** 0.039	—	BK4520	**27.2** 6110	**58.2** 13100	8.80	4600	7000	**0.079** 0.174	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	JR40x45x20,5
	45 1.7717	**52** 2.0472	**20** 0.787	—	**1** 0.039	HK4520	—	**27.2** 6110	**58.2** 13100	8.80	4600	7000	**0.059** 0.130	**45.000** 1.7717	**44.989** 1.7712	**51.986** 2.0467	**51.967** 2.0459	Table B2-2	JR40x45x20,5
50 1.9685	**50** 1.9685	**58** 2.2835	**12** 0.472	—	**1** 0.039	HK5012	—	**17.0** 3820	**28.7** 6450	4.40	4100	6300	**0.045** 0.099	**50.000** 1.9685	**49.989** 1.9681	**57.986** 2.2829	**57.967** 2.2822	Table B2-2	
	50 1.9685	**58** 2.2835	**20** 0.787	—	**1** 0.039	HK5020	—	**30.9** 6950	**62.2** 14000	8.80	4100	6300	**0.072** 0.159	**50.000** 1.9685	**49.989** 1.9681	**57.986** 2.2829	**57.967** 2.2822	Table B2-2	JR45x50x20
	50 1.9685	**58** 2.2835	**25** 0.984	—	**1** 0.039	HK5025	—	**35.5** 7980	**74.1** 16700	11.7	4100	6300	**0.092** 0.203	**50.000** 1.9685	**49.989** 1.9681	**57.986** 2.2829	**57.967** 2.2822	Table B2-2	JR45x50x25,5
55 2.1654	**55** 2.1654	**63** 2.4803	**20** 0.787	—	**1** 0.039	HK5520	—	**31.0** 6970	**64.4** 14480	10.0	3700	5700	**0.079** 0.174	**55.000** 2.1654	**54.987** 2.1648	**62.986** 2.4798	**62.967** 2.4790	Table B2-2	
60 2.3622	**60** 2.3622	**68** 2.6772	**12** 0.472	—	**1** 0.039	HK6012	—	**18.6** 6110	**34.4** 13100	5.25	3400	5200	**0.060** 0.132	**60.000** 2.3622	**59.987** 2.3617	**67.986** 2.6766	**67.967** 2.6759	Table B2-2	
	60 2.3622	**68** 2.6772	**20** 0.787	—	**1** 0.039	HK6020	—	**35.6** 8000	**79.5** 17870	10.9	3400	5200	**0.090** 0.198	**60.000** 2.3622	**59.987** 2.3617	**67.986** 2.6766	**67.967** 2.6759	Table B2-2	

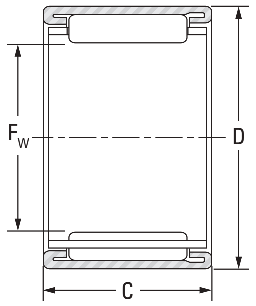
(1) Drawn cup needle roller bearings with two needle roller and cage assemblies and one lubricating hole.

DRAWN CUP NEEDLE ROLLER BEARINGS CAGED, OPEN ENDS

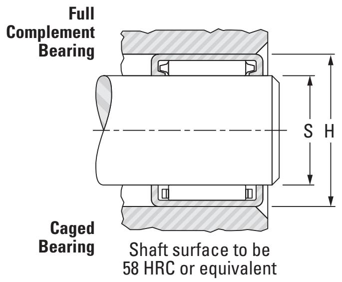
METRIC SERIES BSM, BKM, BTM, BHTM SERIES



BSM, BKM



BTM, BHTM



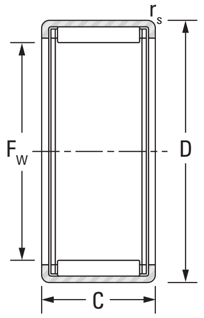
Shaft Dia.	F_w	D	C	$C_{3\,\text{min.}}$	$r_{s\,\text{min.}}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012				Dynamic	Static					Shaft (h5)		Housing (N6)			
						Open Ends	C	C_0		Grease	Oil		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
6 0.2362	6	10	9	—	—	6BTM109	2.65 600	2.40 540	0.350	23000	36000	0.003	6.000	5.995	9.993	9.984	Table B2-3	—
8 0.3150	8	12	10	—	—	8BTM1210	3.55 800	3.85 870	0.580	21000	33000	0.004	8.000	7.994	11.991	11.98	Table B2-3	—
	8	15	15	—	—	BHTM815	7.55 1700	6.55 1470	1.00	13000	20000	0.009	8.000	7.994	14.991	14.98	Table B2-3	—
9 0.3543	9	13	10	—	—	9BTM1310A	3.80 850	4.25 960	0.630	21000	32000	0.004	9.000	8.994	12.991	12.98	Table B2-3	—
9.8 0.3858	9.8	13.8	10	—	—	BTM101410A	3.75 840	4.25 960	0.640	21000	32000	0.004	9.800	9.794	13.791	13.78	Table B2-3	—
10 0.3937	10	14	10	—	—	10BTM1410	3.95 890	4.60 1030	0.690	20000	31000	0.004	10.000	9.994	13.991	13.98	Table B2-3	—
	10	17	20	—	—	BHTM1020	11.9 2680	12.6 2830	1.95	12000	19000	0.015	10.000	9.994	16.991	16.98	Table B2-3	—
12 0.4724	12	16	10	—	—	12BTM1610	4.45 1000	5.60 1260	0.860	20000	30000	0.005	12.000	11.992	15.991	15.98	Table B2-3	—
	12	18	12	—	—	12BTM1812	6.55 1470	6.70 1510	1.00	14000	21000	0.009	12.000	11.992	17.991	17.98	Table B2-3	—
13 0.5118	13	17	15	—	—	BKM131715J	5.65 1270	7.85 1760	1.20	20000	30000	0.007	13.000	12.992	16.991	16.98	Table B2-3	—
	13	19	14	—	—	BKM131914J	8.60 1930	9.95 2240	1.50	14000	21000	0.011	13.000	12.992	18.989	18.976	Table B2-3	—
	13	20	12	—	—	13BTM2012J	8.25 1860	8.40 1890	1.30	12000	18000	0.012	13.000	12.992	19.989	19.976	Table B2-3	—
	13	21	14	—	—	BKM132114BJ	10.8 2430	10.5 2360	1.60	10000	16000	0.015	13.000	12.992	20.989	20.976	Table B2-3	—
13.5 0.5315	13.5	19	12	—	—	BTM141912A	6.70 1510	7.60 1710	1.15	14000	22000	0.010	13.500	13.492	18.989	18.976	Table B2-3	—
14 0.5512	14	19	16	—	—	14BTM1916B-1	8.80 1980	11.9 2680	1.80	16000	24000	0.011	14.000	13.992	18.989	18.976	Table B2-3	—
	14	20	12	—	—	14BTM2012	6.95 1560	7.50 1690	1.15	13000	20000	0.010	14.000	13.992	19.989	19.976	Table B2-3	—
14.5 0.5709	14.5	19.5	13.5	—	—	BTM152014A	8.35 1880	10.9 2450	1.65	15000	23000	0.009	14.500	14.492	19.489	19.476	Table B2-3	—

Shaft Dia.	F_w	D	C	$C_{3\,\text{min.}}$	$r_{s\,\text{min.}}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 -0.3 -0.012				Dynamic	Static					Shaft (h5)		Housing (N6)			
						Open Ends	C	C_0		Grease	Oil		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs	mm in	mm in	mm in	mm in		
14.975 0.5896	14.975	21	10	—	—	BTM152110JA	5.80 1300	6.25 1410	0.950	13000	20000	0.009	14.975	14.967	20.989	20.976	Table B2-3	—
15 0.5906	15	20	16	—	—	15BTM2016C-2	9.05 2030	12.6 2830	1.90	15000	23000	0.012	15.000	14.992	19.989	19.976	Table B2-3	—
	15	21	16	—	—	15BTM2116	10.8 2430	13.6 3060	2.05	12000	19000	0.014	15.000	14.992	20.989	20.976	Table B2-3	—
	15	21	22	—	—	15BTM2122	14.3 3220	19.5 4380	3.05	12000	19000	0.020	15.000	14.992	20.989	20.976	Table B2-3	—
	15	22	15	—	—	BHTM1515-1	11.9 2680	13.3 2990	2.05	10000	16000	0.015	15.000	14.992	21.989	21.976	Table B2-3	—
17 0.6693	17	21.5	15	—	—	17BTM2215	6.80 1530	9.60 2160	1.45	12000	19000	0.010	17.000	16.992	21.489	21.476	Table B2-3	—
	17	23	12	—	—	BTM172312	8.45 1900	10.2 2290	1.55	13000	20000	0.012	17.000	16.992	22.989	22.976	Table B2-3	—
	17	24	15	—	—	BHTM1715-1	12.4 2790	14.8 3330	2.25	13000	20000	0.017	17.000	16.992	23.989	23.976	Table B2-3	—
	17	24	20	—	—	BHTM1720-1	16.8 3780	21.9 4920	3.40	13000	20000	0.023	17.000	16.992	23.989	23.976	Table B2-3	—
	17	25	15	—	—	BTM172515	13.2 2970	14.9 3350	2.25	13000	20000	0.020	17.000	16.992	24.989	24.976	Table B2-3	—
18 0.7087	18	24	11.6	—	—	18BTM2412	8.75 1970	10.9 2450	1.65	12000	18000	0.012	18.000	17.992	23.989	23.976	Table B2-3	—
	18	24	16	—	—	BTM182416	12.3 2770	16.8 3780	2.55	12000	18000	0.017	18.000	17.992	23.989	23.976	Table B2-3	—
	18	25	20	—	—	BTM1820	16.7 3750	22.0 4950	3.50	12000	19000	0.024	18.000	17.992	24.989	24.976	Table B2-3	—
	18	25	20	—	—	BTM182520	16.8 3780	22.1 4970	3.45	12000	19000	0.024	18.000	17.992	24.989	24.976	Table B2-3	—
20 0.7874	20	26	16	—	—	BTM202616	13.3 2990	19.6 4410	3.00	10000	16000	0.019	20.000	19.991	25.989	25.976	Table B2-3	—
	20	27	20	—	—	BTM202720-2	19.6 4410	27.6 6200	4.35	11000	17000	0.027	20.000	19.991	26.989	26.976	Table B2-3	—
	20	27	25	—	—	BTM2025	24.3 5460	36.4 8180	5.70	11000	17000	0.033	20.000	19.991	26.989	26.976	Table B2-3	—
	20	27	30	—	—	BTM202730	28.1 6320	43.8 9850	6.80	11000	17000	0.040	20.000	19.991	26.989	26.976	Table B2-3	—
21.6 0.8504	21.6	26.645	12.4	—	—	BTM222712A	9.15 2060	13.9 3130	2.10	9800	15000	0.012	21.600	21.591	26.634	26.621	Table B2-3	—
22 0.8661	22	28	12	—	—	22BTM2812	10.0 2250	13.5 3040	2.05	9800	15000	0.014	22.000	21.991	27.989	27.976	Table B2-3	—
24 0.9449	24	30	13	—	—	BTM243013J	10.5 2360	15.7 3530	2.35	9100	14000	0.018	24.000	23.991	29.989	29.976	Table B2-3	—
25 0.9843	25	31	19	—	—	25BTM3119A	17.9 4020	30.1 6770	4.65	8500	13000	0.026	25.000	24.991	30.988	30.972	Table B2-3	—
	25	32	12	—	—	BTM2512	10.2 2290	12.8 2880	1.95	8500	13000	0.019	25.000	24.991	31.988	31.972	Table B2-3	—
	25	33	20	—	—	BHTM2520-1	21.3 4790	29.7 6680	4.60	8500	13000	0.037	25.000	24.991	32.988	32.972	Table B2-3	—

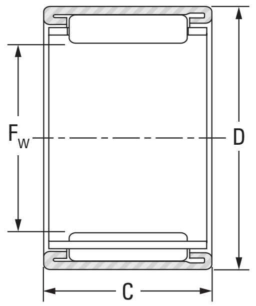
Continued on next page.

DRAWN CUP NEEDLE ROLLER BEARINGS CAGED, OPEN ENDS

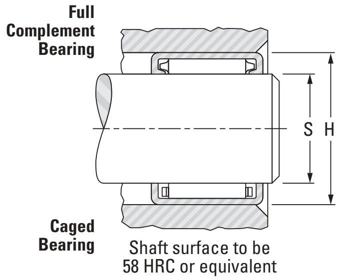
METRIC SERIES
BSM, BKM, BTM, BHTM SERIES



BSM, BKM



BTM, BHTM

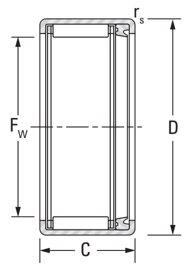


Shaft surface to be 58 HRC or equivalent

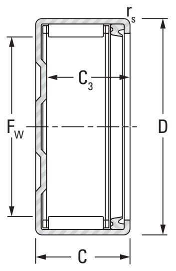
Shaft Dia.	Fw	D	C +0 +0.000 / -0.3 -0.012	C3 min.	rs min.	Bearing Designation Open Ends	Load Ratings Dynamic C	Load Ratings Static C0	Fatigue Load Limit Cu	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions Shaft (h5) Max.	Shaft (h5) Min.	Housing (N6) Max.	Housing (N6) Min.	Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
mm in	mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN	min-1	min-1	kg lbs	mm in	mm in	mm in	mm in		
25 0.9843	25	33	30	—	—	BHTM2530-1	31.0 6970	48.0 10790	7.55	8500	13000	0.054	25.000	24.991	32.988	32.972	Table B2-3	—
25.8 1.0157	25.8	33	16	—	—	BTM263316A	15.7 3530	22.4 5040	3.40	8500	13000	0.028	25.800	25.791	32.988	32.972	Table B2-3	—
26 1.0236	26	31.4	12	—	—	BKM263112A	9.45 2120	14.5 3260	2.20	7800	12000	0.014	26.000	25.991	31.388	31.372	Table B2-3	—
28 1.1024	28	33	12	—	—	BTM283312J	9.50 2140	15.8 3550	2.40	7200	11000	0.015	28.000	27.991	32.988	32.972	Table B2-3	—
	28	35	20	—	—	28BTM3520	21.1 4740	33.4 7510	5.20	7800	12000	0.035	28.000	27.991	34.988	34.972	Table B2-3	—
	28	36	20.75	—	—	BTM283621JA	25.3 5690	39.3 8840	6.15	7800	12000	0.044	28.000	27.991	35.988	35.972	Table B2-3	—
	28	37	20	—	—	BTM283720	24.2 5440	33.5 7530	5.30	7800	12000	0.046	28.000	27.991	36.988	36.972	Table B2-3	—
	28	37	30	—	—	BHTM2830	36.3 8160	56.5 12700	8.75	7800	12000	0.069	28.000	27.991	36.988	36.972	Table B2-3	—
30 1.1811	30	37	12	—	—	BTM303712	13.3 2990	18.8 4230	2.90	7200	11000	0.022	30.000	29.991	36.988	36.972	Table B2-3	—
	30	37	16	—	—	30BTM3716BM	18.8 4230	29.3 6590	4.45	7200	11000	0.030	30.000	29.991	36.988	36.972	Table B2-3	—
	30	37	20	—	—	30BTM3720	22.7 5100	40.1 9010	6.35	7200	11000	0.040	30.000	29.991	36.988	36.972	Table B2-3	—
	30	40	25	—	—	BHTM3025-1	32.7 7350	46.8 10520	7.35	7200	11000	0.069	30.000	29.991	39.988	39.972	Table B2-3	—
	30	40	30	—	—	BHTM3030-1A	39.2 8810	59.0 13260	9.15	7200	11000	0.083	30.000	29.991	39.988	39.972	Table B2-3	—
31 1.2205	31	39	17.8	—	—	31BTM3918A	22.9 5150	34.8 7820	5.50	7200	11000	0.039	31.000	30.989	38.988	38.972	Table B2-3	—
32 1.2598	32	38	11	—	—	32BTM3811A	5.40 1210	6.75 1520	1.05	6500	10000	0.017	32.000	31.989	37.988	37.972	Table B2-3	—
	32	42	20	—	—	BHTM3220A	26.1 5870	35.1 7890	5.60	6500	10000	0.058	32.000	31.989	41.988	41.972	Table B2-3	—
	32	42	30	—	—	BHTM3230	40.5 9100	61.9 13920	9.65	6500	10000	0.086	32.000	31.989	41.988	41.972	Table B2-3	—
33.5 1.3189	33.5	40	17	—	—	BTM344017A	18.5 4160	33.5 7530	5.25	6200	9500	0.034	33.500	33.489	39.988	39.972	Table B2-3	—
35 1.3780	35	42	16	—	—	BTM3516	20.3 4560	34.7 7800	5.35	6000	9200	0.035	35.000	34.989	41.988	41.972	Table B2-3	—
	35	45	20	—	—	BHTM3520	28.8 6470	41.7 9370	6.60	6100	9400	0.065	35.000	34.989	44.988	44.972	Table B2-3	—
	35	45	30	—	—	BHTM3530	43.8 9850	71.5 16070	11.2	6100	9400	0.096	35.000	34.989	44.988	44.972	Table B2-3	—
37 1.4567	37	43	12	—	—	37BTM4312A	8.80 1980	13.6 3060	2.05	5600	8600	0.022	37.000	36.989	42.988	42.972	Table B2-3	—
38 1.4961	38	45	12	—	—	BTM384512A	14.2 3190	23.3 5240	3.55	5500	8400	0.029	38.000	37.989	44.988	44.972	Table B2-3	—
	38	48	30	—	—	BTM3830PL	45.6 10250	76.5 17200	11.9	5600	8600	0.102	38.000	37.989	47.988	47.972	Table B2-3	—
40 1.5748	40	51	30	—	—	40BTM5130J	48.6 10930	77.5 17420	12.1	5400	8300	0.112	40.000	39.989	50.986	50.967	Table B2-3	—
41.5 1.6339	41.5	46.5	8.5	—	—	BTM424709AJ	7.75 1740	13.9 3120	2.10	4900	7500	0.015	41.500	41.489	46.488	46.472	Table B2-3	—
42 1.6535	42	53	30	—	—	BTM425330J	51.0 11470	85.0 19110	13.3	5100	7800	0.121	42.000	41.989	52.986	52.967	Table B2-3	—
43.52 1.7134	43.52	48.52	14	—	—	44BTM4914A	13.3 2990	29.0 6520	4.35	4700	7200	0.027	43.520	43.509	48.508	48.492	Table B2-3	—
45 1.7717	45	52	12	—	—	45BTM5212A	15.2 3420	27.3 6140	4.15	4600	7000	0.034	45.000	44.989	51.986	51.967	Table B2-3	—
48 1.8898	48	56	30	—	—	BTM485630J	45.4 10210	100 22480	15.6	4300	6600	0.103	48.000	47.989	55.986	55.967	Table B2-3	—
50 1.9685	50	58	20	—	—	50BTM5820J	31.7 7130	61.9 13920	9.65	4200	6400	0.068	50.000	49.989	57.986	57.967	Table B2-3	—
	50	62	25	—	—	BTM5025	49.3 11080	79.5 17870	12.7	4200	6500	0.125	50.000	49.989	61.986	61.967	Table B2-3	—
55 2.1654	55	63	20	—	—	55BTM6320	32.5 7310	66.0 14840	10.3	3700	5700	0.073	55.000	54.987	62.986	62.967	Table B2-3	—
55.254 2.1754	55.254	60.3	14	—	—	BSM5514BJ-2	16.7 3750	41.0 9220	6.30	3600	5600	0.035	55.254	55.241	60.286	60.267	Table B2-3	—
64 2.5197	64	73.178	21.1	—	—	64BTM7321A	40.3 9060	84.9 19090	13.5	3200	4900	0.110	64.000	63.987	73.164	73.145	Table B2-3	—

DRAWN CUP NEEDLE ROLLER BEARINGS
SEALED

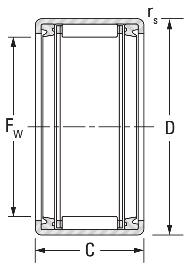
METRIC SERIES
HK RS, BK RS,
HK.2RS SERIES



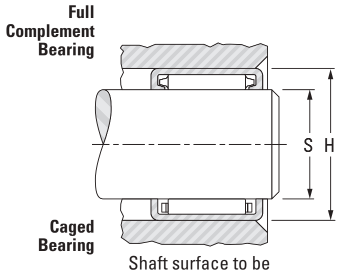
HK RS



BK RS



HK.2RS

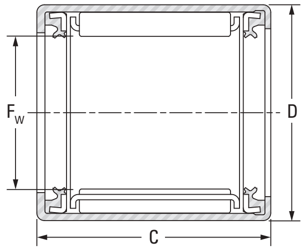


Shaft surface to be 58 HRC or equivalent

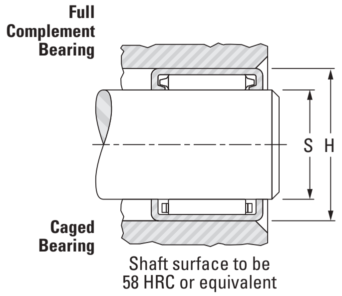
Shaft Dia.	F_w	D	C	$C_{3\,\text{min.}}$	$r_{s\,\text{min.}}$	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 **-0.3** -0.012					Dynamic	Static				Shaft (h5)		Housing (N6)			
						Open Ends	Closed One End	C	C_0		Grease		Max.	Min.	Max.	Min.		
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}	kg lbs	mm in	mm in	mm in	mm in		
8 0.3150	8 0.3150	12 0.4724	10 0.394	—	0.4 0.016	HK0810RS	—	2.90 650	2.73 610	0.400	20000	0.004 0.009	8.000 0.3150	7.994 0.3147	11.991 0.4721	11.980 0.4717	Table B2-2	
10 0.3937	10 0.3937	14 0.5512	12 0.472	—	0.4 0.016	HK1012RS	—	4.78 1070	5.51 1240	0.840	19000	0.006 0.013	10.000 0.3937	9.994 0.3935	13.991 0.5508	13.980 0.5504	Table B2-2	
12 0.4724	12 0.4724	18 0.7087	14 0.551	—	1 0.039	HK1214RS	—	6.61 1490	7.29 1640	1.10	14000	0.013 0.029	12.000 0.4724	11.992 0.4721	17.991 0.7083	17.980 0.7079	Table B2-2	
	12 0.4724	18 0.7087	16 0.630	—	1 0.039	HK1216.2RS	—	6.87 1540	7.65 1720	1.15	14000	0.016 0.035	12.000 0.4724	11.992 0.4721	17.991 0.7083	17.980 0.7079	Table B2-2	
14 0.5512	14 0.5512	20 0.7874	14 0.551	11.6 0.457	1 0.039	—	BK1414RS	7.17 1610	8.41 1890	1.30	14000	0.014 0.031	14.000 0.5512	13.992 0.5509	19.989 0.7870	19.976 0.7865	Table B2-2	
	14 0.5512	20 0.7874	14 0.551	—	1 0.039	HK1414RS	—	7.17 1610	8.41 1890	1.30	14000	0.015 0.033	14.000 0.5512	13.992 0.5509	19.989 0.7870	19.976 0.7865	Table B2-2	JR10x14x16
	14 0.5512	20 0.7874	16 0.630	—	1 0.039	HK1416.2RS	—	7.17 1610	8.41 1890	1.30	14000	0.014 0.031	14.000 0.5512	13.992 0.5509	19.989 0.7870	19.976 0.7865	Table B2-2	JR10x14x20
15 0.5906	15 0.5906	21 0.8268	14 0.551	11.3 0.445	1 0.039	—	BK1514RS	7.87 1770	9.69 2180	1.45	13000	0.017 0.037	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x16,5
	15 0.5906	21 0.8268	14 0.551	—	1 0.039	HK1514RS	—	7.87 1770	9.69 2180	1.45	13000	0.016 0.035	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x16,5
	15 0.5906	21 0.8268	16 0.630	—	1 0.039	HK1516.2RS	—	7.87 1770	9.69 2180	1.45	13000	0.019 0.042	15.000 0.5906	14.992 0.5902	20.989 0.8263	20.976 0.8258	Table B2-2	JR12x15x16,5
16 0.6299	16 0.6299	22 0.8661	14 0.551	—	1 0.039	HK1614RS	—	7.76 1740	9.76 2190	1.50	12000	0.014 0.031	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x16
	16 0.6299	22 0.8661	16 0.630	—	1 0.039	HK1616.2RS	—	7.82 1760	9.76 2190	1.50	12000	0.015 0.033	16.000 0.6299	15.992 0.6296	21.989 0.8657	21.976 0.8652	Table B2-2	JR12x16x20
18 0.7087	18 0.7087	24 0.9449	14 0.551	—	1 0.039	HK1814RS	—	8.41 1890	11.10 2500	1.70	11000	0.018 0.040	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	JR15x18x16,5
	18 0.7087	24 0.9449	16 0.630	—	1 0.039	HK1816.2RS	—	8.41 1890	11.10 2500	1.70	11000	0.017 0.037	18.000 0.7087	17.992 0.7083	23.989 0.9444	23.976 0.9439	Table B2-2	JR15x18x16,5
20 0.7874	20 0.7874	26 1.0236	16 0.630	—	1 0.039	HK2016.2RS	—	8.97 2020	12.50 2810	1.90	9700	0.023 0.051	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x16,5
	20 0.7874	26 1.0236	18 0.709	—	1 0.039	HK2018RS	—	12.40 2790	18.90 4250	2.85	9700	0.025 0.055	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x20,5
	20 0.7874	26 1.0236	20 0.787	—	1 0.039	HK2020.2RS	—	12.40 2790	18.90 4250	2.85	9700	0.028 0.062	20.000 0.7874	19.991 0.7870	25.989 1.0232	25.976 1.0227	Table B2-2	JR17x20x20,5
22 0.8661	22 0.8661	28 1.1024	16 0.630	—	1 0.039	HK2216.2RS	—	9.81 2210	14.50 3260	2.20	8800	0.025 0.055	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	
	22 0.8661	28 1.1024	18 0.709	—	1 0.039	HK2218RS	—	13.10 2950	20.90 4700	3.20	8800	0.027 0.060	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x23
	22 0.8661	28 1.1024	20 0.787	—	1 0.039	HK2220.2RS	—	13.10 2950	20.90 4700	3.20	8800	0.026 0.057	22.000 0.8661	21.991 0.8658	27.989 1.1019	27.976 1.1014	Table B2-2	JR17x22x23
25 0.9843	25 0.9843	32 1.2598	16 0.630	—	1 0.039	HK2516.2RS	—	11.10 2500	15.10 3390	2.30	7800	0.030 0.066	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x17
	25 0.9843	32 1.2598	18 0.709	—	1 0.039	HK2518RS	—	15.6 3510	24.60 5530	3.80	7800	0.034 0.075	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x20,5
	25 0.9843	32 1.2598	20 0.787	—	1 0.039	HK2520.2RS	—	16.20 3640	24.60 5530	3.80	7800	0.033 0.073	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x20,5
	25 0.9843	32 1.2598	22 0.866	—	1 0.039	HK2522RS	—	20.60 4630	33.40 7510	5.30	7800	0.042 0.093	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x26
	25 0.9843	32 1.2598	24 0.945	—	1 0.039	HK2524.2RS	—	20.6 4630	33.4 7510	5.30	7800	0.047 0.104	25.000 0.9843	24.991 0.9839	31.988 1.2594	31.972 1.2587	Table B2-2	JR20x25x26
28 1.1024	28 1.1024	35 1.3780	20 0.787	—	1 0.039	HK2820.2RS	—	15.9 3570	24.9 5600	3.85	6900	0.042 0.093	28.000 1.1024	27.991 1.1020	34.988 1.3775	34.972 1.3769	Table B2-2	JR22x28x20,5
30 1.1811	30 1.1811	37 1.4567	16 0.63	—	1 0.039	HK3016.2RS	—	11.6 2610	16.8 3780	2.55	6500	0.030 0.066	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	JR25x30x17
	30 1.1811	37 1.4567	18 0.709	—	1 0.039	HK3018RS	—	16.8 3780	27.3 6140	4.20	6500	0.042 0.093	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	JR25x30x20,5
	30 1.1811	37 1.4567	20 0.787	—	1 0.039	HK3020.2RS	—	16.8 3780	27.3 6140	4.20	6500	0.040 0.088	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	JR25x30x20,5
	30 1.1811	37 1.4567	22 0.866	—	1 0.039	HK3022RS	—	22.4 5040	39.6 8900	6.25	6500	0.051 0.112	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	JR25x30x26
	30 1.1811	37 1.4567	24 0.945	—	1 0.039	HK3024.2RS	—	22.4 5040	39.6 8900	6.25	6500	0.057 0.126	30.000 1.1811	29.991 1.1807	36.988 1.4562	36.972 1.4556	Table B2-2	JR25x30x26
35 1.3780	35 1.3780	42 1.6535	16 0.630	—	1 0.039	HK3516.2RS	—	13.4 3010	21.4 4810	3.25	5500	0.047 0.104	35.000 1.3780	34.989 1.3775	41.988 1.6531	41.972 1.6524	Table B2-2	JR30x35x17
	35 1.3780	42 1.6535	18 0.709	—	1 0.039	HK3518RS	—	17.4 3910	29.9 6720	4.60	5500	0.054 0.119	35.000 1.3780	34.989 1.3775	41.988 1.6531	41.972 1.6524	Table B2-2	JR30x35x20,5
	35 1.3780	42 1.6535	20 0.787	—	1 0.039	HK3520.2RS	—	17.4 3910	29.9 6720	4.60	5500	0.044 0.097	35.000 1.3780	34.989 1.3775	41.988 1.6531	41.972 1.6524	Table B2-2	JR30x35x20,5
40 1.5748	40 1.5748	47 1.8504	16 0.630	—	1 0.039	HK4016.2RS	—	13.4 3010	22.4 5040	3.40	4900	0.037 0.082	40.000 1.5748	39.989 1.5744	46.988 1.8499	46.972 1.8493	Table B2-2	JR35x40x20
	40 1.5748	47 1.8504	18 0.709	—	1 0.039	HK4018RS	—	18.9 4250	34.8 7820	5.35	4900	0.057 0.126	40.000 1.5748	39.989 1.5744	46.988 1.8499	46.972 1.8493	Table B2-2	JR35x40x20,5
	40 1.5748	47 1.8504	20 0.787	—	1 0.039	HK4020.2RS	—	18.9 4250	34.8 7820	5.35	4900	0.053 0.117	40.000 1.5748	39.989 1.5744	46.988 1.8499	46.972 1.8493	Table B2-2	JR35x40x20,5
45 1.7717	45 1.7717	52 2.0472	18 0.709	—	1 0.039	HK4518RS	—	19.8 4450	38.5 8660	5.95	4300	0.064 0.141	45.000 1.7717	44.989 1.7712	51.986 2.0467	51.967 2.0459	Table B2-2	JR40x45x20,5
	45 1.7717	52 2.0472	20 0.787	—	1 0.039	HK4520.2RS	—	19.8 4450	38.5 8660	5.95	4300	0.055 0.121	45.000 1.7717	44.989 1.7712	51.986 2.0467	51.967 2.0459	Table B2-2	JR40x45x20,5
50 1.9685	50 1.9685	58 2.2835	22 0.866	—	1 0.039	HK5022RS	—	28.8 6470	56.6 12700	8.80	3900	0.097 0.214	50.000 1.9685	49.989 1.9681	57.986 2.2829	57.967 2.2822	Table B2-2	JR45x50x25,5
	50 1.9685	58 2.2835	24 0.945	—	1 0.039	HK5024.2RS	—	28.8 6470	56.6 12700	8.80	3900	0.083 0.183	50.000 1.9685	49.989 1.9681	57.986 2.2829	57.967 2.2822	Table B2-2	JR45x50x25,5

DRAWN CUP NEEDLE ROLLER BEARINGS SEALED

METRIC SERIES
BKM UU, BHKM UU SERIES



BKM UU, BHKM UU



Shaft Dia.	F_w	D	C	C_3 min.	r_s min.	Bearing Designation	Load Ratings		Fatigue Load Limit	Speed Rating	Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-28 to B-2-37)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static				Shaft (h5)		Housing (N6)			
						Open Ends	C	C_0	C_u	Grease		Max.	Min.	Max.	Min.		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}	**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in		
17 0.6693	**17**	**24**	**26**	—	—	BHKM1726JUU	**17.6** 3960	**23.3** 5240	3.65	13000	**0.029**	**17.000**	**16.992**	**23.989**	**23.976**	Table B2-3	—
20 0.7874	**20**	**27**	**26**	—	—	BKM2026JUU	**20.5** 4610	**29.2** 6560	4.60	11000	**0.033**	**20.000**	**19.991**	**26.989**	**26.976**	Table B2-3	—
	20	**27**	**30**	—	—	BKM2030JUU	**24.3** 5460	**36.4** 8180	5.70	11000	**0.038**	**20.000**	**19.991**	**26.989**	**26.976**	Table B2-3	—
	20	**27**	**35**	—	—	BKM2035JUU	**28.9** 6500	**45.4** 10210	7.05	11000	**0.045**	**20.000**	**19.991**	**26.989**	**26.976**	Table B2-3	—

INNER RINGS

METRIC SERIES

When it is impractical to meet the shaft raceway design requirements (hardness, surface finish, case depth, etc.) outlined in the engineering section of this catalog, standard inner rings may be used.

Inner rings are made of rolling bearing steel and after hardening, their bores, raceways and end surfaces are ground. Metric series inner rings may be used to provide inner raceway surfaces for metric series radial needle roller and cage assemblies, metric series needle roller bearings and metric series drawn cup needle roller bearings. The extended inner rings are suitable for use with bearings containing lip contact seals and for applications in which axial movement may be present.

CONSTRUCTION

Metric series inner rings are available in four basic designs and differ only by the chamfers at the ends of the raceway surfaces, the lubricant access holes and the raceway profile. Inner rings of series JR have chamfers to assist in bearing installation but are without lubricating holes. Inner rings of series JR.JS1 have bearing installation chamfers and lubricating holes (bore diameters 5 to 180 mm [0.1969 in to 7.0866 in]). Inner rings of series JRZ.JS1 are without installation chamfers, allowing for maximum possible raceway contact.

DIMENSIONAL ACCURACY

The tolerances of size, form, and runout for metric series inner rings meet the requirements of ISO normal tolerance class for radial bearings (see the engineering section). Most metric series inner rings are produced with outside diameter raceway tolerance in accordance with h5 which, in most cases, is suitable for combining the metric series needle roller bearings to give the normal clearance class, and for use with drawn cup bearings. Other raceway tolerances may also be found on inner rings for combining with needle roller bearings to give one of the clearance requirements.

MOUNTING OF INNER RINGS

Inner rings may be mounted on the shaft with either a loose transition fit or an interference fit. These fits used in conjunction with the proper fit of the bearing outer ring, will provide the correct operating clearances for most applications.

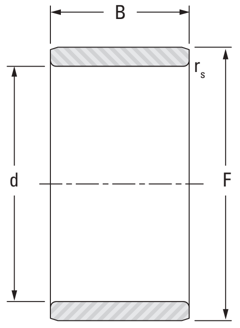
Regardless of the fit of the inner ring on the shaft, the inner ring should be axially located by shaft shoulders or other positive means. The shaft shoulder diameter adjacent to the inner ring must not exceed the inner ring outside diameter (per suggestions on pages B-4-9 and B-4-10 of the metric series needle roller bearing section).

When metric series inner rings are to be used with the metric series needle roller bearings, appropriate shaft tolerances should be selected from Table B4-3 on page B-4-9 in the metric series needle roll bearing section. When Metric series inner rings are to be used with drawn cup bearings the suggested shaft tolerances are given in the "Inner ring" discussion on page B-2-8 of the "metric series drawn cup needle roller bearings" section of this catalog.

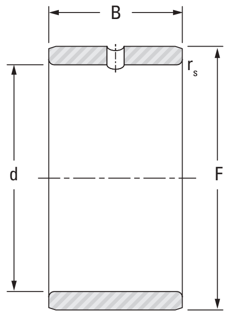
INCH SERIES INNER RINGS

Inch series inner rings for use with inch series drawn cup bearings are tabulated on page B-2-68 of this catalog.

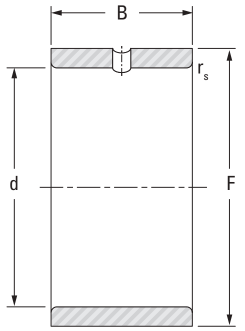
INNER RINGS



JR



JR.JS1

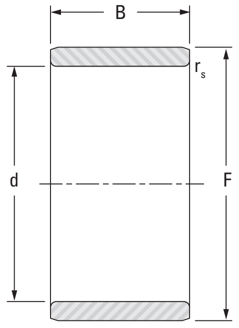


JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
5 0.1969	**5** 0.1969	**8** 0.3150	**8** 0.3150	**0.3** 0.01	JR5x8x8JS1	**0.002** 0.004
	5 0.1969	**8** 0.3150	**12** 0.4724	**0.3** 0.01	JR5x8x12	**0.003** 0.007
	5 0.1969	**8** 0.3150	**16** 0.630	**0.3** 0.01	JR5x8x16	**0.004** 0.009
6 0.2362	**6** 0.2362	**9** 0.3543	**8** 0.315	**0.3** 0.01	JR6x9x8JS1	**0.002** 0.004
	6 0.2362	**9** 0.3543	**12** 0.4724	**0.3** 0.01	JR6x9x12	**0.003** 0.007
	6 0.2362	**9** 0.3543	**16** 0.630	**0.3** 0.01	JR6x9x16	**0.004** 0.009
	6 0.2362	**10** 0.3937	**10** 0.394	**0.3** 0.01	JR6x10x10	**0.004** 0.009
	6 0.2362	**10** 0.3937	**10** 0.394	**0.3** 0.01	JR6x10x10JS1	**0.004** 0.009
	6 0.2362	**10** 0.3937	**12** 0.4724	**0.3** 0.01	JRZ6x10x12JS1	**0.005** 0.011
7 0.2756	**7** 0.2756	**10** 0.3937	**10.5** 0.413	**0.3** 0.01	JR7x10x10,5	**0.003** 0.007
	7 0.2756	**10** 0.3937	**12** 0.4724	**0.3** 0.01	JR7x10x12	**0.004** 0.009
	7 0.2756	**10** 0.3937	**16** 0.630	**0.3** 0.01	JR7x10x16	**0.005** 0.011
8 0.3150	**8** 0.3150	**12** 0.4724	**10** 0.394	**0.3** 0.01	JR8x12x10	**0.005** 0.011
	8 0.3150	**12** 0.4724	**10** 0.394	**0.3** 0.01	JR8x12x10JS1	**0.005** 0.011
	8 0.3150	**12** 0.4724	**10.5** 0.413	**0.3** 0.01	JR8x12x10,5	**0.005** 0.011
	8 0.3150	**12** 0.4724	**12** 0.472	**0.3** 0.01	JRZ8xl2x12JS1	**0.006** 0.013
	8 0.3150	**12** 0.4724	**12.5** 0.492	**0.3** 0.01	JR8x12x12,5	**0.006** 0.013
9 0.3543	**9** 0.3543	**12** 0.4724	**12** 0.4724	**0.3** 0.01	JR9x12x12	**0.005** 0.011
	9 0.3543	**12** 0.4724	**16** 0.630	**0.3** 0.01	JR9x12x16	**0.006** 0.013
10 0.3937	**10** 0.3937	**13** 0.5118	**12.5** 0.492	**0.3** 0.01	JR10x13x12,5	**0.005** 0.011
	10 0.3937	**14** 0.5512	**11** 0.433	**0.3** 0.01	JR10x14x11JS1	**0.007** 0.015
	10 0.3937	**14** 0.5512	**12** 0.4724	**0.3** 0.01	JR10x14x12	**0.007** 0.015
	10 0.3937	**14** 0.5512	**12** 0.4724	**0.3** 0.01	JR10x14x12JS1	**0.007** 0.015
	10 0.3937	**14** 0.5512	**13** 0.512	**0.3** 0.01	JR10x14x13	**0.007** 0.015

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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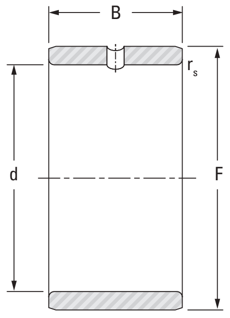
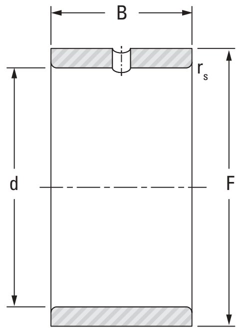


JR.JS1



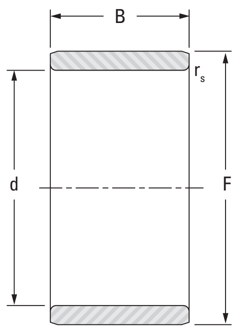
JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
10 0.3937	**10** 0.3937	**14** 0.5512	**14** 0.551	**0.3** 0.01	JRZ10x14x14JS1	**0.008** 0.018
	10 0.3937	**14** 0.5512	**16** 0.630	**0.3** 0.01	JR10x14x16	**0.009** 0.020
	10 0.3937	**14** 0.5512	**20** 0.787	**0.3** 0.01	JR10x14x20	**0.012** 0.026
12 0.4724	**12** 0.4724	**15** 0.5906	**12.5** 0.492	**0.3** 0.01	JR12x15x12,5	**0.006** 0.013
	12 0.4724	**15** 0.5906	**16** 0.630	**0.3** 0.01	JR12x15x16	**0.008** 0.018
	12 0.4724	**15** 0.5906	**16.5** 0.650	**0.3** 0.01	JR12x15x16,5	**0.008** 0.018
	12 0.4724	**15** 0.5906	**18.5** 0.728	**0.3** 0.01	JR12x15x18,5	**0.009** 0.020
	12 0.4724	**15** 0.5906	**22.5** 0.886	**0.3** 0.01	JR12x15x22,5	**0.011** 0.024
	12 0.4724	**16** 0.6299	**12** 0.472	**0.3** 0.01	JR12x16x12	**0.008** 0.018
	12 0.4724	**16** 0.6299	**12** 0.472	**0.3** 0.01	JR12x16x12JS1	**0.008** 0.018
	12 0.4724	**16** 0.6299	**13** 0.512	**0.3** 0.01	JR12x16x13	**0.008** 0.018
	12 0.4724	**16** 0.6299	**14** 0.551	**0.3** 0.01	JRZ12x16x14JS1	**0.010** 0.022
	12 0.4724	**16** 0.6299	**16** 0.630	**0.3** 0.01	JR12x16x16	**0.011** 0.024
	12 0.4724	**16** 0.6299	**20** 0.787	**0.3** 0.01	JR12x16x20	**0.014** 0.031
	12 0.4724	**16** 0.6299	**22** 0.866	**0.3** 0.01	JR12x16x22	**0.015** 0.033
14 0.5512	**14** 0.5512	**17** 0.6693	**17** 0.669	**0.3** 0.01	JR14x17x17	**0.009** 0.020
15 0.5906	**15** 0.5906	**18** 0.7087	**16.5** 0.650	**0.3** 0.01	JR15x18x16,5	**0.010** 0.022
	15 0.5906	**19** 0.7480	**16** 0.630	**0.3** 0.01	JR15x19x16	**0.013** 0.029
	15 0.5906	**19** 0.7480	**20** 0.787	**0.3** 0.01	JR15x19x20	**0.017** 0.037
	15 0.5906	**20** 0.7874	**12** 0.472	**0.3** 0.01	JR15x20x12	**0.012** 0.026
	15 0.5906	**20** 0.7874	**12** 0.472	**0.3** 0.01	JR15x20x12JS1	**0.012** 0.026
	15 0.5906	**20** 0.7874	**13** 0.512	**0.3** 0.01	JR15x20x13	**0.014** 0.031
	15 0.5906	**20** 0.7874	**14** 0.551	**0.3** 0.01	JRZ15x20x14JS1	**0.015** 0.033
	15 0.5906	**20** 0.7874	**16** 0.630	**0.3** 0.01	JR15x20x16	**0.017** 0.037

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

Continued on next page.

INNER RINGS



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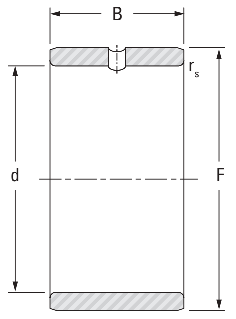
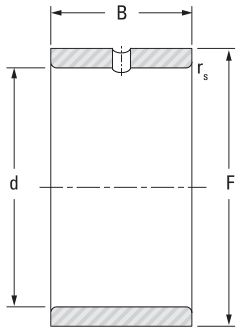


JR.JS1

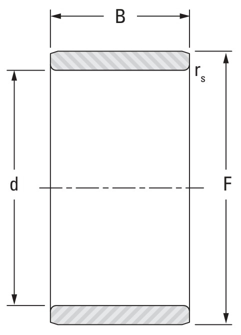


JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
15 0.5906	**15** 0.5906	**20** 0.7874	**23** 0.906	**0.3** 0.01	JR15x20x23	**0.025** 0.055
	15 0.5906	**20** 0.7874	**26** 1.024	**0.3** 0.01	JR15x20x26	**0.028** 0.062
17 0.6693	**17** 0.6693	**20** 0.7874	**16.5** 0.650	**0.3** 0.01	JR17x20x16,5	**0.011** 0.024
	17 0.6693	**20** 0.7874	**20** 0.787	**0.3** 0.01	JR17x20x20	**0.014** 0.031
	17 0.6693	**20** 0.7874	**20.5** 0.807	**0.3** 0.01	JR17x20x20,5	**0.014** 0.031
	17 0.6693	**20** 0.7874	**30.5** 1.201	**0.3** 0.01	JR17x20x30,5	**0.021** 0.046
	17 0.6693	**21** 0.8268	**16** 0.630	**0.3** 0.01	JR17x21x16	**0.015** 0.033
	17 0.6693	**21** 0.8268	**20** 0.787	**0.3** 0.01	JR17x21x20	**0.019** 0.042
	17 0.6693	**22** 0.8661	**13** 0.512	**0.3** 0.01	JR17x22x13	**0.015** 0.033
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JR17x22x16	**0.019** 0.042
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JR17x22x16JS1	**0.019** 0.042
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JRZ17x22x16JS1	**0.019** 0.042
	17 0.6693	**22** 0.8661	**23** 0.906	**0.3** 0.01	JR17x22x23	**0.028** 0.062
	17 0.6693	**22** 0.8661	**26** 1.024	**0.3** 0.01	JR17x22x26	**0.031** 0.068
	17 0.6693	**22** 0.8661	**32** 1.260	**0.3** 0.01	JR17x22x32	**0.038** 0.084
20 0.7874	**20** 0.7874	**24** 0.9449	**16** 0.630	**0.3** 0.01	JR20x24x16	**0.018** 0.040
	20 0.7874	**24** 0.9449	**20** 0.787	**0.3** 0.01	JR20x24x20	**0.022** 0.049
	20 0.7874	**25** 0.9843	**16** 0.630	**0.3** 0.01	JR20x25x16	**0.022** 0.049
	20 0.7874	**25** 0.9843	**16** 0.630	**0.3** 0.01	JR20x25x16JS1	**0.022** 0.049
	20 0.7874	**25** 0.9843	**17** 0.669	**0.3** 0.01	JR20x25x17	**0.023** 0.051
	20 0.7874	**25** 0.9843	**18** 0.709	**0.3** 0.01	JRZ20x25x18JS1	**0.025** 0.055
	20 0.7874	**25** 0.9843	**20** 0.787	**0.3** 0.01	JR20x25x20	**0.028** 0.062
	20 0.7874	**25** 0.9843	**20.5** 0.807	**0.3** 0.01	JR20x25x20,5	**0.029** 0.064
	20 0.7874	**25** 0.9843	**26** 1.024	**0.3** 0.01	JR20x25x26	**0.036** 0.079

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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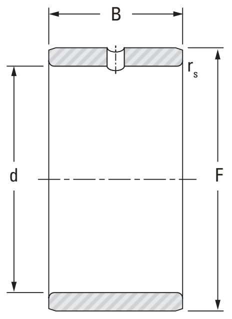
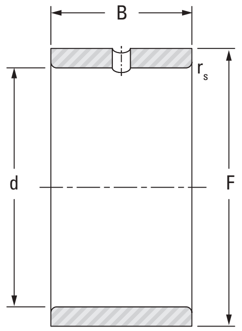


JR.JS1



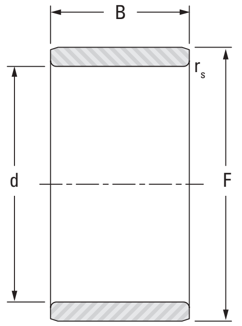
JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
20 0.7874	**20** 0.7874	**25** 0.9843	**26.5** 1.043	**0.3** 0.01	JR20x25x26,5	**0.037** 0.082
	20 0.7874	**25** 0.9843	**30** 1.181	**0.3** 0.01	JR20x25x30	**0.042** 0.093
	20 0.7874	**25** 0.9843	**32** 1.260	**0.3** 0.01	JR20x25x32	**0.044** 0.097
	20 0.7874	**25** 0.9843	**38.5** 1.516	**0.3** 0.01	JR20x25x38,5	**0.054** 0.119
22 0.8661	**22** 0.8661	**26** 1.0236	**16** 0.630	**0.3** 0.01	JR22x26x16	**0.019** 0.042
	22 0.8661	**26** 1.0236	**20** 0.787	**0.3** 0.01	JR22x26x20	**0.023** 0.051
	22 0.8661	**28** 1.1024	**17** 0.669	**0.3** 0.01	JR22x28x17	**0.030** 0.066
	22 0.8661	**28** 1.1024	**20.5** 0.807	**0.3** 0.01	JR22x28x20,5	**0.038** 0.084
	22 0.8661	**28** 1.1024	**30** 1.181	**0.3** 0.01	JR22x28x30	**0.056** 0.123
25 0.9843	**25** 0.9843	**29** 1.1417	**20** 0.787	**0.3** 0.01	JR25x29x20	**0.027** 0.060
	25 0.9843	**29** 1.1417	**30** 1.181	**0.3** 0.01	JR25x29x30	**0.040** 0.088
	25 0.9843	**30** 1.1811	**16** 0.630	**0.3** 0.01	JR25x30x16	**0.027** 0.060
	25 0.9843	**30** 1.1811	**16** 0.630	**0.3** 0.01	JR25x30x16JS1	**0.027** 0.060
	25 0.9843	**30** 1.1811	**17** 0.669	**0.3** 0.01	JR25x30x17	**0.028** 0.062
	25 0.9843	**30** 1.1811	**18** 0.709	**0.3** 0.01	JRZ25x30x18JS1	**0.031** 0.068
	25 0.9843	**30** 1.1811	**20** 0.787	**0.3** 0.01	JR25x30x20	**0.034** 0.075
	25 0.9843	**30** 1.1811	**20.5** 0.807	**0.3** 0.01	JR25x30x20,5	**0.035** 0.077
	25 0.9843	**30** 1.1811	**26** 1.024	**0.3** 0.01	JR25x30x26	**0.044** 0.097
	25 0.9843	**30** 1.1811	**26.5** 1.043	**0.3** 0.01	JR25x30x26,5	**0.045** 0.099
	25 0.9843	**30** 1.1811	**30** 1.181	**0.3** 0.01	JR25x30x30	**0.051** 0.112
	25 0.9843	**30** 1.1811	**32** 1.260	**0.3** 0.01	JR25x30x32	**0.054** 0.119
	25 0.9843	**30** 1.1811	**38.5** 1.516	**0.3** 0.01	JR25x30x38,5	**0.066** 0.146
28 1.1024	**28** 1.1024	**32** 1.2598	**17** 0.669	**0.3** 0.01	JR28x32x17	**0.028** 0.062
	28 1.1024	**32** 1.2598	**20** 0.787	**0.3** 0.01	JR28x32x20	**0.030** 0.066

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

Continued on next page.

INNER RINGS



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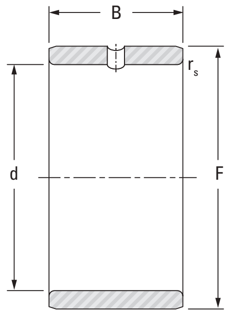
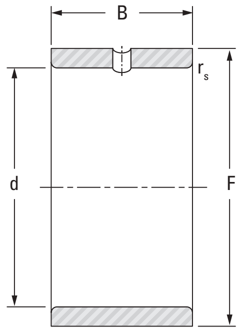


JR.JS1

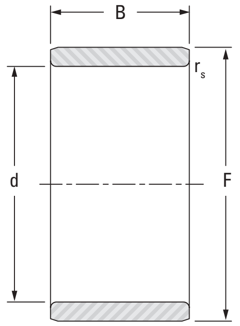


JRZ.JS1

Shaft Dia.	d	F(1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
28 1.1024	**28** 1.1024	**32** 1.2598	**30** 1.181	**0.3** 0.01	JR28x32x30	**0.044** 0.097
30 1.1811	**30** 1.1811	**35** 1.3780	**16** 0.630	**0.3** 0.01	JR30x35x16	**0.031** 0.068
	30 1.1811	**35** 1.3780	**17** 0.669	**0.3** 0.01	JR30x35x17	**0.033** 0.073
	30 1.1811	**35** 1.3780	**18** 0.709	**0.3** 0.01	JRZ30x35x18JS1	**0.036** 0.079
	30 1.1811	**35** 1.3780	**20** 0.787	**0.3** 0.01	JR30x35x20	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20** 0.787	**0.3** 0.01	JRZ30x35x20JS1	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20.5** 0.807	**0.3** 0.01	JR30x35x20,5	**0.040** 0.088
	30 1.1811	**35** 1.3780	**26** 1.024	**0.3** 0.01	JR30x35x26	**0.054** 0.119
	30 1.1811	**35** 1.3780	**30** 1.181	**0.3** 0.01	JR30x35x30	**0.057** 0.126
	30 1.1811	**35** 1.3780	**32** 1.260	**0.3** 0.01	JR30x35x32	**0.062** 0.137
	30 1.1811	**38** 1.4961	**20** 0.787	**0.6** 0.02	JR30x38x20JS1	**0.067** 0.148
32 1.2598	**32** 1.2598	**37** 1.4567	**20** 0.787	**0.3** 0.01	JR32x37x20	**0.043** 0.095
	32 1.2598	**37** 1.4567	**30** 1.181	**0.3** 0.01	JR32x37x30	**0.064** 0.141
	32 1.2598	**40** 1.5748	**20** 0.787	**0.6** 0.02	JR32x40x20	**0.069** 0.152
	32 1.2598	**40** 1.5748	**36** 1.417	**0.6** 0.02	JR32x40x36	**0.128** 0.282
35 1.3780	**35** 1.3780	**40** 1.5748	**17** 0.669	**0.3** 0.01	JR35x40x17	**0.040** 0.088
	35 1.3780	**40** 1.5748	**20** 0.787	**0.3** 0.01	JR35x40x20	**0.046** 0.101
	35 1.3780	**40** 1.5748	**20.5** 0.807	**0.3** 0.01	JR35x40x20,5	**0.049** 0.108
	35 1.3780	**40** 1.5748	**22** 0.866	**0.3** 0.01	JR35x40x22	**0.052** 0.115
	35 1.3780	**40** 1.5748	**30** 1.181	**0.3** 0.01	JR35x40x30	**0.071** 0.157
	35 1.3780	**40** 1.5748	**34** 1.339	**0.3** 0.01	JR35x40x34	**0.080** 0.176
	35 1.3780	**40** 1.5748	**40** 1.575	**0.3** 0.01	JR35x40x40	**0.094** 0.207
	35 1.3780	**42** 1.6535	**20** 0.787	**0.6** 0.02	JR35x42x20	**0.065** 0.143
	35 1.3780	**42** 1.6535	**20** 0.787	**0.6** 0.02	JR35x42x20JS1	**0.065** 0.143

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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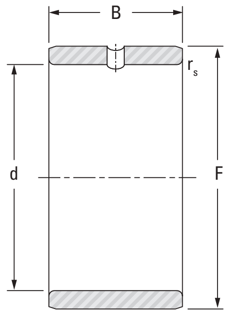
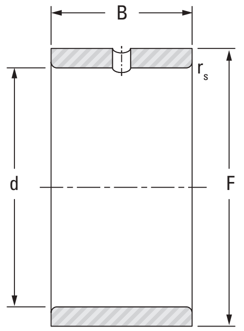


JR.JS1



JRZ.JS1

Shaft Dia.	d	F(1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
35 1.3780	**35** 1.3780	**42** 1.6535	**23** 0.906	**0.6** 0.02	JRZ35x42x23JS1	**0.074** 0.163
	35 1.3780	**42** 1.6535	**36** 1.417	**0.6** 0.02	JR35x42x36	**0.122** 0.269
	35 1.3780	**44** 1.7323	**22** 0.866	**0.6** 0.02	JR35x44x22	**0.097** 0.214
38 1.4961	**38** 1.4961	**43** 1.6929	**20** 0.787	**0.3** 0.01	JR38x43x20	**0.050** 0.110
	38 1.4961	**43** 1.6929	**30** 1.181	**0.3** 0.01	JR38x43x30	**0.075** 0.165
40 1.5748	**40** 1.5748	**45** 1.7717	**17** 0.669	**0.3** 0.01	JR40x45x17	**0.044** 0.097
	40 1.5748	**45** 1.7717	**20** 0.787	**0.3** 0.01	JR40x45x20	**0.052** 0.115
	40 1.5748	**45** 1.7717	**20.5** 0.807	**0.3** 0.01	JR40x45x20,5	**0.054** 0.119
	40 1.5748	**45** 1.7717	**30** 1.181	**0.3** 0.01	JR40x45x30	**0.078** 0.172
	40 1.5748	**45** 1.7717	**34** 1.339	**0.3** 0.01	JR40x45x34	**0.089** 0.196
	40 1.5748	**45** 1.7717	**40** 1.575	**0.3** 0.01	JR40x45x40	**0.115** 0.254
	40 1.5748	**48** 1.8898	**22** 0.866	**0.6** 0.02	JR40x48x22	**0.094** 0.207
	40 1.5748	**48** 1.8898	**23** 0.906	**0.6** 0.02	JRZ40x48x23JS1	**0.100** 0.220
	40 1.5748	**48** 1.8898	**40** 1.575	**0.6** 0.02	JR40x48x40	**0.173** 0.381
	40 1.5748	**50** 1.9685	**20** 0.787	**1** 0.04	JR40x50x20	**0.110** 0.243
42 1.6535	**42** 1.6535	**47** 1.8504	**20** 0.787	**0.3** 0.01	JR42x47x20	**0.055** 0.121
	42 1.6535	**47** 1.8504	**30** 1.181	**0.3** 0.01	JR42x47x30	**0.083** 0.183
45 1.7717	**45** 1.7717	**50** 1.9685	**20** 0.787	**0.3** 0.01	JR45x50x20	**0.058** 0.128
	45 1.7717	**50** 1.9685	**25** 0.984	**0.6** 0.02	JR45x50x25	**0.073** 0.161
	45 1.7717	**50** 1.9685	**25.5** 1.004	**0.3** 0.01	JR45x50x25,5	**0.075** 0.165
	45 1.7717	**50** 1.9685	**35** 1.378	**0.6** 0.02	JR45x50x35	**0.103** 0.227
	45 1.7717	**50** 1.9685	**40** 1.575	**0.3** 0.01	JR45x50x40	**0.117** 0.258
	45 1.7717	**52** 2.0472	**22** 0.866	**0.6** 0.02	JR45x52x22	**0.090** 0.198
	45 1.7717	**52** 2.0472	**23** 0.906	**0.6** 0.02	JR45x52x23	**0.096** 0.212

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

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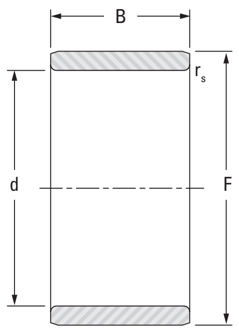
INNER RINGS



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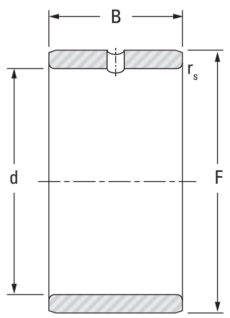
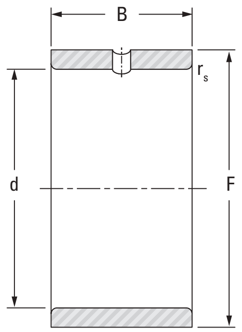


JR.JS1

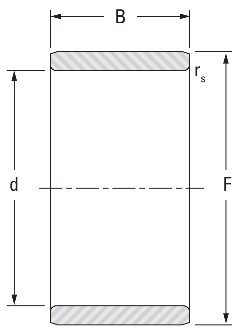


JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
45 1.7717	**45** 1.7717	**52** 2.0472	**23** 0.906	**0.6** 0.02	JRZ45x52x23JS1	**0.096** 0.212
	45 1.7717	**52** 2.0472	**40** 1.575	**0.6** 0.02	JR45x52x40	**0.167** 0.368
	45 1.7717	**55** 2.1654	**20** 0.787	**1** 0.04	JR45x55x20	**0.133** 0.293
	45 1.7717	**55** 2.1654	**20** 0.787	**1** 0.04	JR45x55x20JS1	**0.133** 0.293
	45 1.7717	**55** 2.1654	**22** 0.866	**1** 0.04	JR45x55x22	**0.135** 0.298
	45 1.7717	**55** 2.1654	**40** 1.575	**1** 0.04	JR45x55x40	**0.247** 0.545
50 1.9685	**50** 1.9685	**55** 2.1654	**20** 0.787	**0.3** 0.01	JR50x55x20	**0.065** 0.143
	50 1.9685	**55** 2.1654	**25** 0.984	**0.6** 0.02	JR50x55x25	**0.081** 0.179
	50 1.9685	**55** 2.1654	**35** 1.378	**0.6** 0.02	JR50x55x35	**0.113** 0.249
	50 1.9685	**55** 2.1654	**40** 1.575	**0.3** 0.01	JR50x55x40	**0.130** 0.287
	50 1.9685	**58** 2.2835	**22** 0.866	**0.6** 0.02	JR50x58x22	**0.117** 0.258
	50 1.9685	**58** 2.2835	**23** 0.906	**0.6** 0.02	JRZ50x58x23JS1	**0.122** 0.269
	50 1.9685	**58** 2.2835	**40** 1.575	**0.6** 0.02	JR50x58x40	**0.213** 0.470
	50 1.9685	**60** 2.3622	**20** 0.787	**1** 0.04	JR50x60x20	**0.155** 0.342
	50 1.9685	**60** 2.3622	**20** 0.787	**1** 0.04	JR50x60x20JS1	**0.155** 0.342
	50 1.9685	**60** 2.3622	**25** 0.984	**1** 0.04	JR50x60x25	**0.170** 0.375
	50 1.9685	**60** 2.3622	**40** 1.575	**1** 0.04	JR50x60x40	**0.310** 0.683
55 2.1654	**55** 2.1654	**60** 2.3622	**25** 0.984	**0.6** 0.02	JR55x60x25	**0.088** 0.194
	55 2.1654	**60** 2.3622	**35** 1.378	**0.6** 0.02	JR55x60x35	**0.124** 0.273
	55 2.1654	**63** 2.4803	**25** 0.984	**1** 0.04	JR55x63x25	**0.141** 0.311
	55 2.1654	**63** 2.4803	**45** 1.772	**1** 0.04	JR55x63x45	**0.286** 0.631
	55 2.1654	**65** 2.5591	**30** 1.181	**1** 0.04	JR55x65x30	**0.222** 0.489
	55 2.1654	**65** 2.5591	**60** 2.362	**1** 0.04	JR55x65x60	**0.444** 0.979
60 2.3622	**60** 2.3622	**68** 2.6772	**25** 0.984	**0.6** 0.02	JR60x68x25	**0.153** 0.337

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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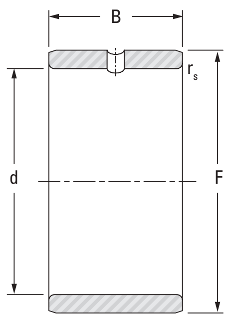
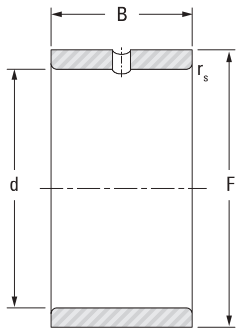


JR.JS1



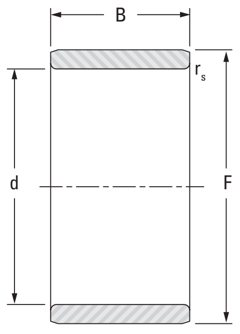
JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
60 2.3622	**60** 2.3622	**68** 2.6772	**35** 1.378	**0.6** 0.02	JR60x68x35	**0.220** 0.485
	60 2.3622	**68** 2.6772	**45** 1.772	**1** 0.04	JR60x68x45	**0.284** 0.626
	60 2.3622	**70** 2.7559	**25** 0.984	**1** 0.04	JR60x70x25	**0.200** 0.441
	60 2.3622	**70** 2.7559	**30** 1.181	**1** 0.04	JR60x70x30	**0.240** 0.529
	60 2.3622	**70** 2.7559	**60** 2.362	**1** 0.04	JR60x70x60	**0.480** 1.058
65 2.5591	**65** 2.5591	**72** 2.8346	**25** 0.984	**1** 0.04	JR65x72x25	**0.143** 0.315
	65 2.5591	**72** 2.8346	**45** 1.772	**1** 0.04	JR65x72x45	**0.266** 0.586
	65 2.5591	**73** 2.8740	**25** 0.984	**0.6** 0.02	JR65x73x25	**0.170** 0.375
	65 2.5591	**73** 2.8740	**35** 1.378	**0.6** 0.02	JR65x73x35	**0.240** 0.529
	65 2.5591	**75** 2.9528	**28** 1.102	**1** 0.04	JR65x75x28	**0.240** 0.529
	65 2.5591	**75** 2.9528	**30** 1.181	**1** 0.04	JR65x75x30	**0.260** 0.573
	65 2.5591	**75** 2.9528	**60** 2.362	**1** 0.04	JR65x75x60	**0.520** 1.146
70 2.7559	**70** 2.7559	**80** 3.1496	**25** 0.984	**1** 0.04	JR70x80x25	**0.230** 0.507
	70 2.7559	**80** 3.1496	**30** 1.181	**1** 0.04	JR70x80x30	**0.270** 0.595
	70 2.7559	**80** 3.1496	**35** 1.378	**1** 0.04	JR70x80x35	**0.320** 0.705
	70 2.7559	**80** 3.1496	**54** 2.126	**1** 0.04	JR70x80x54	**0.500** 1.102
	70 2.7559	**80** 3.1496	**60** 2.362	**1** 0.04	JR70x80x60	**0.556** 1.226
75 2.9528	**75** 2.9528	**85** 3.3465	**25** 0.984	**1** 0.04	JR75x85x25	**0.240** 0.529
	75 2.9528	**85** 3.3465	**30** 1.181	**1** 0.04	JR75x85x30	**0.289** 0.637
	75 2.9528	**85** 3.3465	**35** 1.378	**1** 0.04	JR75x85x35	**0.338** 0.745
	75 2.9528	**85** 3.3465	**54** 2.126	**1** 0.04	JR75x85x54	**0.530** 1.168
80 3.1496	**80** 3.1496	**90** 3.5433	**25** 0.984	**1** 0.04	JR80x90x25	**0.260** 0.573
	80 3.1496	**90** 3.5433	**30** 1.181	**1** 0.04	JR80x90x30	**0.306** 0.675
	80 3.1496	**90** 3.5433	**35** 1.378	**1** 0.04	JR80x90x35	**0.355** 0.783

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

Continued on next page.

INNER RINGS



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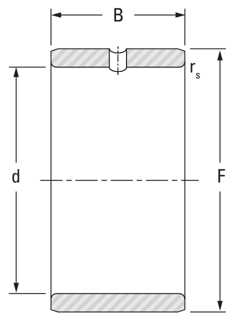

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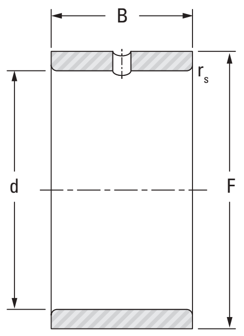
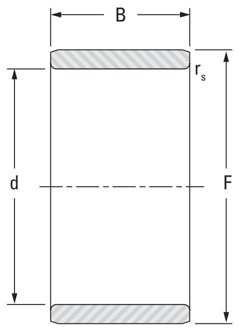


JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
80 3.1496	**80** 3.1496	**90** 3.5433	**54** 2.126	**1** 0.04	JR80x90x54	**0.565** 1.246
85 3.3465	**85** 3.3465	**95** 3.7402	**26** 1.024	**1** 0.04	JR85x95x26	**0.290** 0.639
	85 3.3465	**95** 3.7402	**30** 1.181	**1** 0.04	JR85x95x30	**0.334** 0.736
	85 3.3465	**95** 3.7402	**36** 1.417	**1** 0.04	JR85x95x36	**0.397** 0.875
	85 3.3465	**100** 3.9370	**35** 1.378	**1.1** 0.04	JR85x100x35	**0.595** 1.312
	85 3.3465	**100** 3.9370	**63** 2.480	**1.1** 0.04	JR85x100x63	**1.080** 2.381
90 3.5433	**90** 3.5433	**100** 3.9370	**26** 1.024	**1** 0.04	JR90x100x26	**0.300** 0.661
	90 3.5433	**100** 3.9370	**30** 1.181	**1** 0.04	JR90x100x30	**0.350** 0.772
	90 3.5433	**100** 3.9370	**36** 1.417	**1** 0.04	JR90x100x36	**0.422** 0.930
	90 3.5433	**105** 4.1339	**32** 1.260	**1.1** 0.04	JR90x105x32	**0.580** 1.279
	90 3.5433	**105** 4.1339	**35** 1.378	**1.1** 0.04	JR90x105x35	**0.624** 1.376
	90 3.5433	**105** 4.1339	**63** 2.480	**1.1** 0.04	JR90x105x63	**1.140** 2.513
95 3.7402	**95** 3.7402	**105** 4.1339	**26** 1.024	**1** 0.04	JR95x105x26	**0.310** 0.683
	95 3.7402	**105** 4.1339	**36** 1.417	**1** 0.04	JR95x105x36	**0.430** 0.948
	95 3.7402	**110** 4.3307	**35** 1.378	**1.1** 0.04	JR95x110x35	**0.653** 1.440
	95 3.7402	**110** 4.3307	**63** 2.480	**1.1** 0.04	JR95x110x63	**1.200** 2.646
100 3.9370	**100** 3.9370	**110** 4.3307	**30** 1.181	**1.1** 0.04	JR100x110x30	**0.384** 0.847
	100 3.9370	**110** 4.3307	**40** 1.575	**1.1** 0.04	JR100x110x40	**0.510** 1.124
	100 3.9370	**115** 4.5276	**40** 1.575	**1.1** 0.04	JR100x115x40	**0.790** 1.742
110 4.3307	**110** 4.3307	**120** 4.7244	**30** 1.181	**1** 0.04	JR110x120x30	**0.425** 0.937
	110 4.3307	**125** 4.9213	**40** 1.575	**1.1** 0.04	JR110x125x40	**0.870** 1.918
120 4.7244	**120** 4.7244	**130** 5.1181	**30** 1.181	**1** 0.04	JR120x130x30	**0.460** 1.014
	120 4.7244	**135** 5.3150	**45** 1.772	**1.1** 0.04	JR120x135x45	**1.060** 2.337
130 5.1181	**130** 5.1181	**145** 5.7087	**35** 1.378	**1.1** 0.04	JR130x145x35	**0.890** 1.962

(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

INNER RINGS



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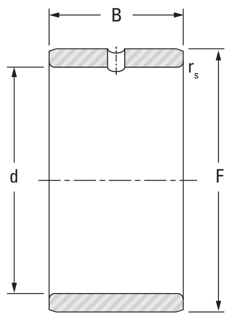

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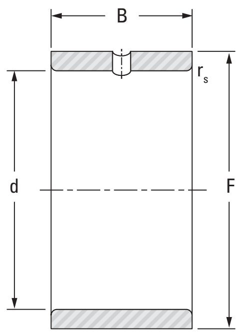


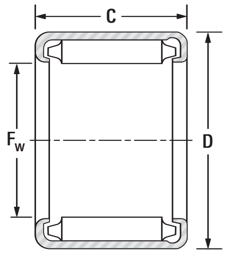
JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
130 5.1181	**130** 5.1181	**150** 5.9055	**50** 1.969	**1.5** 0.06	JR130x150x50	**1.730** 3.814
140 5.5118	**140** 5.5118	**155** 6.1024	**35** 1.378	**1.1** 0.04	JR140x155x35	**0.955** 2.105
	140 5.5118	**160** 6.2992	**50** 1.969	**1.5** 0.06	JR140x160x50	**1.860** 4.101
150 5.9055	**150** 5.9055	**165** 6.4961	**40** 1.575	**1.1** 0.04	JR150x165x40	**1.170** 2.579
160 6.2992	**160** 6.2992	**175** 6.8898	**40** 1.575	**1.1** 0.04	JR160x175x40	**1.240** 2.734
170 6.6929	**170** 6.6929	**185** 7.2835	**45** 1.772	**1.1** 0.04	JR170x185x45	**1.480** 3.263
180 7.0866	**180** 7.0866	**195** 7.6772	**45** 1.772	**1.1** 0.04	JR180x195x45	**1.560** 3.439

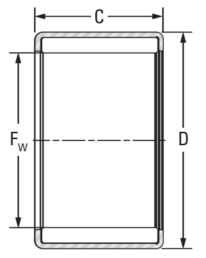
(1) Inner rings for metric full complement needle roller bearings are produced with outside diameter tolerance g5.

DRAWN CUP NEEDLE ROLLER BEARINGS
FULL COMPLEMENT
OPEN ENDS

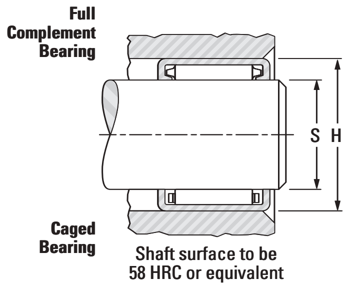
METRIC SERIES
BM, BHM, YM SERIES



BM, BHM



YM



Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C	$C_{3\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions				Inspection gage
			+0 +0.000 -0.3 -0.012		Open Ends	Dynamic	Static			Shaft (h5)		Housing (H6)		
						C	C_0			Max.	Min.	Max.	Min.	
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in	
3.5 0.1378	3.5	8	11	—	YM040811A	4.50 1010	4.20 940	0.62	0.003	3.500	3.495	8.009	8.000	Table B2-3
6.13 0.2413	6.13	11	9.7	—	6YM1110BM	5.20 1170	5.80 1300	0.88	0.004	6.130	6.124	11.011	11.000	Table B2-3
8 0.3150	8	12	10	—	YM081210	6.70 1510	8.80 1980	1.35	0.004	8.000	7.994	12.011	12.000	Table B2-3
	8	13	10	—	YM081310AM	6.20 1390	7.70 1730	1.15	0.006	8.000	7.994	13.011	13.000	Table B2-3
10 0.3937	10	14	10	—	10BM1410	7.20 1620	9.50 2140	1.45	0.004	10.000	9.994	14.011	14.000	Table B2-3
12 0.4724	12	18	12	—	12BM1812	10.7 2410	12.8 2880	1.90	0.010	12.000	11.992	18.011	18.000	Table B2-3
14 0.5512	14	20	12	—	14BM2012	11.6 2610	14.8 3330	2.25	0.011	14.000	13.992	20.013	20.000	Table B2-3
15 0.5906	15	21	10	—	15BM2110	9.75 2190	12.0 2700	1.85	0.009	15.000	14.992	21.013	21.000	Table B2-3
	15	21	12	—	15BM2112	12.3 2770	16.1 3620	2.45	0.012	15.000	14.992	21.013	21.000	Table B2-3
	15	21	16	—	15BM2116	16.9 3800	24.4 5490	3.70	0.016	15.000	14.992	21.013	21.000	Table B2-3
16 0.6299	16	22	12	—	16BM2212	12.9 2900	17.3 3890	2.65	0.012	16.000	15.992	22.013	22.000	Table B2-3
17 0.6693	17	23	12	—	17BM2312	13.0 2920	18.2 4090	2.70	0.013	17.000	16.992	23.013	23.000	Table B2-3
	17	24	12	—	YM172412-1	16.3 3660	21.5 4830	3.25	0.016	17.000	16.992	24.013	24.000	Table B2-3
	17	24	17	—	BM172417-1	20.1 4520	28.2 6340	4.30	0.023	17.000	16.992	24.013	24.000	Table B2-3
	17	24	20	—	BHM1720A	23.9 5370	35.1 7890	5.55	0.026	17.000	16.992	24.013	24.000	Table B2-3
	17	24	25	—	BHM1725	29.9 6720	46.9 10540	7.30	0.034	17.000	16.992	24.013	24.000	Table B2-3
18 0.7087	18	24	16	—	18BM2416	18.9 4250	29.4 6610	4.45	0.018	18.000	17.992	24.013	24.000	Table B2-3
20 0.7874	20	26	14	—	YM202614	19.0 4270	31.4 7060	4.75	0.019	20.000	19.991	26.013	26.000	Table B2-3
	20	26	16	—	20BM2616	18.7 4200	31.7 7130	4.85	0.021	20.000	19.991	26.013	26.000	Table B2-3
20 0.7874	20	26	20	—	20BM2620	23.6 5310	42.7 9600	6.70	0.026	20.000	19.991	26.013	26.000	Table B2-3
	20	27	15	—	BM2015	19.6 4410	28.0 6290	4.25	0.022	20.000	19.991	27.013	27.000	Table B2-3
	20	27	26	—	BM2026	34.7 7800	58.3 13110	9.10	0.040	20.000	19.991	27.013	27.000	Table B2-3
21 0.8268	21	27	20	—	21YM2720J	25.6 5750	47.6 10700	7.45	0.029	21.000	20.991	27.013	27.000	Table B2-3
22 0.8661	22	29	25	—	BM222925	33.5 7530	60.1 13510	9.40	0.043	22.000	21.991	29.013	29.000	Table B2-3
25 0.9843	25	32	16	—	BM2516	23.6 5310	38.3 8610	5.85	0.028	25.000	24.991	32.016	32.000	Table B2-3
	25	32	20	—	BM2520	30.0 6740	52.0 11690	8.15	0.036	25.000	24.991	32.016	32.000	Table B2-3
	25	32	26	—	BM2526	38.9 8740	72.7 16340	11.4	0.048	25.000	24.991	32.016	32.000	Table B2-3
	25	33	25	—	BHM2525	39.3 8830	66.6 14970	10.4	0.053	25.000	24.991	33.016	33.000	Table B2-3
28 1.1024	28	34	17	—	BM2817	26.0 5840	50.0 11240	7.80	0.029	28.000	27.991	34.016	34.000	Table B2-3
	28	34	24	—	BM2824	36.3 8160	77.1 17330	12.1	0.042	28.000	27.991	34.016	34.000	Table B2-3
	28	37	30	—	28BHM3730	54.8 12320	95.1 21380	14.9	0.080	28.000	27.991	37.016	37.000	Table B2-3
	28	39	30	—	BM283930A	55.8 12540	86.3 19400	13.5	0.101	28.000	27.991	39.016	39.000	Table B2-3
30 1.1811	30	37	20	—	30BM3720	33.6 7550	62.9 14140	10.0	0.042	30.000	29.991	37.016	37.000	Table B2-3
	30	37	26	—	30BM3726	43.6 9800	87.7 19710	13.7	0.056	30.000	29.991	37.016	37.000	Table B2-3
34 1.3386	34	42	25	—	34YM4225L	46.3 10410	94.1 21150	14.7	0.075	34.000	33.989	42.016	42.000	Table B2-3
38 1.4961	38	48	20	—	YM3820PL	48.1 10810	83.3 18730	13.3	0.082	38.000	37.989	48.016	48.000	Table B2-3
40 1.5748	40	53	20	—	YM405320JM	59.6 13400	89.9 20210	14.4	0.116	40.000	39.989	53.019	53.000	Table B2-3

Note) · For information on the speed ratings, contact JTEKT.

DRAWN CUP NEEDLE ROLLER BEARINGS

INCH SERIES

When a rolling bearing is needed for a compact and economical design, where it is not practical to harden and grind the housing bore, or where the housing materials are of low rigidity such as cast iron, aluminum or even plastics – drawn cup needle roller bearings should be considered.

REFERENCE STANDARDS

- **ANSI/ABMA 18.2** – needle roller bearings - radial, inch design.
- **JIS B 1536** – rolling bearings – needle roller bearings – boundary dimensions and tolerances.

Full complement bearings

Caged bearings

Fig. B2-9. Types of inch series drawn cup needle roller bearings

CONSTRUCTION

FULL COMPLEMENT BEARINGS

The original drawn cup needle roller bearing employs a full complement of needle rollers. The full complement drawn cup bearing combines maximum load-carrying capability with the advantages of the drawn outer ring.

The inward turned lips of the cup are used to mechanically retain the full complement of needle rollers, providing their positive radial retention – even though it may be necessary to remove the shaft repeatedly during servicing of the mechanism employing the bearing.

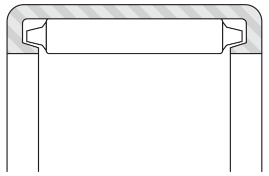


Fig. B2-10. Full complement bearing

CAGED BEARINGS

The one-piece steel cage, used in most caged drawn cup bearings, is designed to provide rigidity and minimize wear. This cage design separates the roller guiding and roller retainment functions. The portions of the cage that retain the rollers cannot contact the rollers while the bearing is operating. Thus, there is no wear which might affect roller retention.

The cage contacts the rollers only near their ends at the roller pitch line, so accurate guidance is achieved with least effort. Pitch line guidance at the ends of the rollers prevents skewing and assures roller stability, with little stress on the cage itself. The design minimizes the contact area and force required for roller guidance, and thus minimizes drag between cage and rollers.

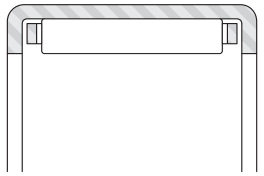


Fig. B2-11. Caged bearing

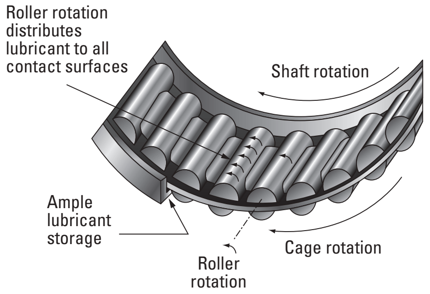


Fig. B2-12. Cage design

The same design feature that assures no contact between roller retention bars and rollers while the bearing is operating, also provides ample clearance along the length of the roller to enhance the circulation of lubricant.

There are bearings with other cage designs. Bearings with engineered polymer cages are for use where operating conditions permit. Before applying bearings with engineered polymer cages, please consult your representative.

SEALED BEARINGS

Drawn cup caged needle roller bearings are offered with integral seals. The tables of dimensions on pages B-2-66 and B-2-67 indicate those sizes available with lip contact seals. The seal lip design achieves a light and constant contact with the shaft throughout the range of mounting bearing clearances thereby ensuring positive sealing and low frictional drag.

Sealed drawn cup bearings are intended to retain grease or non-pressurized oil within a bearing while also preventing contaminants from entering the raceway area.

Details of shaft design for sealed bearings are given in the engineering section.

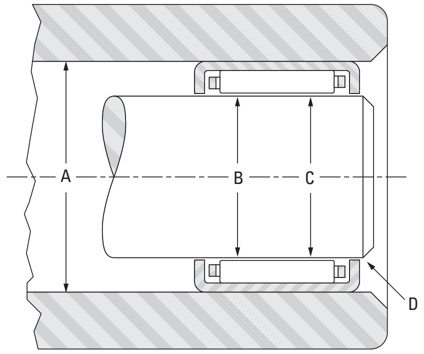
The standard lip contact seals are compatible with common lubricating oils and petroleum based fuels. But they are adversely affected by certain fire-resistant hydraulic fluids and most common solvents.

If the operating temperature must be outside of the specified range, or if the seals are exposed to unusual fluids, please consult your representative.

DIMENSIONAL ACCURACY AND MOUNTING DIMENSIONS

MANUFACTURING TOLERANCES AND RESULTING CLEARANCES

Reference: J-1616 bearing



A. Housing bore tolerance 0.025 mm (0.0010in)
B. Manufacturing tolerance for bearing 0.023 mm (0.0009 in)
C. Shaft diameter tolerance 0.013 mm (0.0005 in)
D. Min. Initial radial clearance 0.013 mm (0.0005 in)

Fig. B2-13. Manufacturing tolerances and resulting clearances

BEARING MOUNTING FITS AND RADIAL INTERNAL CLEARANCE

Drawn cup bearings are manufactured to a degree of precision that will satisfy the radial clearance requirements of most applications. The total radial clearance of an installed drawn cup bearing results from the buildup of manufacturing tolerances of the housing bore, inner raceway O.D., and the bearing – as well as the minimum radial clearance required for the application.

For bearings of nominal inch dimensions, the suggested mounting dimensions will provide correct running clearance for most applications. Closer control of radial clearance would be governed by the user's capability of holding housing and shaft raceway dimensional tolerances tighter than the limits shown in the bearing tables.

The drawing illustrates the manufacturing tolerances and resulting clearances applying to medium size drawn cup bearings, in rotating applications, when using the suggested tabulated mounting dimensions.

Radial clearance in a mounted bearing may be more closely controlled by reducing the manufacturing tolerances of the housing bore and inner raceway diameter. Where extremely close control of radial clearance is required for bearings of nominal inch dimensions, extra-precision full complement bearings are available (see page B-2-57).

TOLERANCES FOR HOUSING MATERIALS OF LOW RIGIDITY

For housing materials of low rigidity, or steel housings of small section, it is suggested that for initial trial the housing bore diameters given in the bearing tables be reduced by the amounts shown in Table B2-4. To maintain normal radial internal clearance, the inner raceway diameter tolerance given in the bearing tables should be used.

Table B2-4. Low Rigidity Housing Bore

Nom. housing bore				Subtract	
Over	Incl.	Over	Incl.		
mm		in		mm	in
0.0	**9.5**	0.00	0.38	**0.010**	0.0004
9.5	**25.4**	0.38	1.00	**0.015**	0.0006
25.4	**50.8**	1.00	2.00	**0.025**	0.0010
50.8	**76.2**	2.00	3.00	**0.030**	0.0012
76.2	**152.4**	3.00	6.00	**0.036**	0.0014

OUTER RING ROTATION

For applications where the outer ring rotates with respect to the load, it is suggested that both the housing bore and inner raceway diameter be reduced. Bearings of nominal inch dimensions should have the housing bore and inner raceway diameters reduced by 0.013 mm (0.0005 in)

OSCILLATING MOTION

Applications involving oscillating motion often require reduced radial clearances. This reduction is accomplished by increasing the shaft raceway diameters as shown in Table B2-5.

Table B2-5. Nominal inch bearing oscillating shaft size

Shaft size		Add	
mm	in	mm	in
2.38 to 4.76	0.094 to 0.188	**0.008**	0.0003
6.35 to 47.62	0.250 to 1.875	**0.013**	0.0005
50.8 to 139.70	2.000 to 5.500	**0.015**	0.0006

For information on fits to housing materials of low rigidity and on fits during outer ring rotation and during oscillation rotation, contact JTEKT.

INNER RINGS

Where it becomes impractical to meet the shaft raceway design requirements (hardness, case depth, surface finish, etc.) outlined in the engineering section, standard inner rings for drawn cup bearings are available. These are tabulated on pages B-2-68 to B-2-70 of the drawn cup section.

Inner rings for drawn cup bearings are designed to be a loose transition fit on the shaft and should be clamped against a shoulder. If a tight transition fit must be used to keep the inner ring from rotating relative to the shaft, the inner ring O.D., as mounted, must not exceed the raceway diameters required by the drawn cup bearing for the particular application.

LOAD RATING FACTORS

Dynamic Loads

Drawn cup needle roller bearings can accommodate only radial loads.

$P = F_r$

P = The maximum dynamic radial load that may be applied to a drawn cup bearing based on the dynamic load rating, C_r given in the bearing tables. This load should be $\leq C_r/3$.

Static Loads

$$f_0 = \frac{C_0}{P_0}$$

f_0 = static load safety factor

C_0 = basic static load rating

P_0 = maximum applied static load

To ensure satisfactory operation of drawn cup needle roller bearings under all types of conditions the static load safety factor f_0 should be ≥ 3.

INSPECTION PROCEDURES

Although the bearing cup (outer ring) is accurately drawn from strip steel it may go out of round during heat treatment. When the bearing is pressed into a true, round housing or ring gage of correct size and wall thickness, it becomes round and is sized properly. For this reason, it is incorrect to inspect an unmounted drawn cup bearing by measuring the O.D. The correct method for inspecting the bearing size is to:

1. Press the bearing into a ring gage of proper size.
2. Plug the bearing bore with the appropriate "go" and "no go" gages.

Tables B2-6 and B2-7 starting on page B-2-44 provide the correct ring and plug gage diameters for inspecting drawn cup needle roller bearings.

When the letter **H** appears in the columns headed "Bearing Bore Designation" and "Nominal Shaft Diameter" in Table B2-6, the gage sizes listed are for the larger cross section bearings, which include **H** in their bearing designation prefix.

Example

Find the ring gage and plug gage dimensions for a BH-68 bearing.

The nominal bore diameter (F_w) for this bearing, as shown in the table of dimensions on page B-2-49, is 9.525 mm (0.3750 in). Since the letter H appears in the bearing designation, the following information will be found opposite H6 9.525 mm (0.3750 in) in Table B2-6 on page B-2-44.

	in
ring gage	0.6255
diameter under needle rollers, min.	0.3765
diameter under needle rollers, max.	0.3774

The "go" plug gage is the same size as the minimum needle roller complement bore diameter and the "no go" plug gage size is 0.002 mm (0.0001 in) larger than the maximum bore diameter. Therefore the correct ring and plug gage dimensions are:

	in
ring gage	0.6255
plug gage, "go"	0.3765
plug gage, "no go"	0.3775

These same gage dimensions also apply to JH-68.

Table B2-6 applies to the Y, B, M, J and JTT series. Table B2-7 applies to the BT.

Table B2-6. Ring and plug gage dimensions

Bearing bore designation	Nominal shaft diameter	Nominal. bore diameter	Ring gage	Needle roller complement bore diameter	
				Max.	Min.
	mm in	mm in	mm in	mm in	mm in
2	**3.175** 1/8	**3.175** 0.1250	**6.363** 0.2505	**3.218** 0.1267	**3.195** 0.1258
2 1/2	**3.970** 5/32	**3.967** 0.1562	**7.155** 0.2817	**4.013** 0.1580	**3.99** 0.1571
3	**4.763** 3/16	**4.763** 0.1875	**8.730** 0.3437	**4.806** 0.1892	**4.783** 0.1883
4	**6.350** 1/4	**6.350** 0.2500	**11.125** 0.4380	**6.411** 0.2524	**6.388** 0.2515
5	**7.938** 5/16	**7.938** 0.3125	**12.713** 0.5005	**7.998** 0.3149	**7.976** 0.3140
H 5	**H 7.938** H 5/16	**7.938** 0.3125	**14.300** 0.5630	**7.998** 0.3149	**7.976** 0.3140
6	**9.525** 3/8	**9.525** 0.3750	**14.300** 0.5630	**9.586** 0.3774	**9.563** 0.3765
H 6	**H 9.525** H 3/8	**9.525** 0.3750	**15.888** 0.6255	**9.586** 0.3774	**9.563** 0.3765
7	**11.113** 7/16	**11.113** 0.4375	**15.888** 0.6255	**11.174** 0.4399	**11.151** 0.4390
H 7	**H 11.113** H 7/16	**11.113** 0.4375	**17.475** 0.6880	**11.174** 0.4399	**11.151** 0.4390
8	**12.700** 1/2	**12.700** 0.5000	**17.475** 0.6880	**12.761** 0.5024	**12.738** 0.5015
H 8	**H12.700** H 1/2	**12.700** 0.5000	**19.063** 0.7505	**12.761** 0.5024	**12.738** 0.5015
9	**14.288** 9/16	**14.288** 0.5625	**19.063** 0.7505	**14.349** 0.5649	**14.326** 0.5640
H 9	**H 14.288** H 9/16	**14.288** 0.5625	**20.650** 0.8130	**14.349** 0.5649	**14.326** 0.5640
10	**15.875** 5/8	**15.875** 0.6250	**20.650** 0.8130	**14.349** 0.6274	**15.913** 0.6265
H 10	**H 15.875** H 5/8	**15.875** 0.6250	**22.238** 0.8755	**14.349** 0.6274	**15.913** 0.6265
11	**17.463** 11/16	**17.463** 0.6875	**22.238** 0.8755	**17.524** 0.6899	**17.501** 0.6890
H 11	**H 17.463** H 11/16	**17.463** 0.6875	**23.825** 0.9380	**17.524** 0.6899	**17.501** 0.6890
12	**19.050** 3/4	**19.050** 0.7500	**25.387** 0.9995	**19.086** 0.7514	**19.063** 0.7505
H 12	**H 19.050** H 3/4	**19.050** 0.7500	**26.975** 1.0620	**19.086** 0.7514	**19.063** 0.7505
13	**20.638** 13/16	**20.638** 0.8125	**26.975** 1.0620	**20.673** 0.8139	**20.650** 0.8130
H 13	**H 20.638** H 13/16	**20.638** 0.8125	**28.562** 1.1245	**20.673** 0.8139	**20.650** 0.8130
14	**22.225** 7/8	**22.225** 0.8750	**28.562** 1.1245	**22.261** 0.8764	**22.238** 0.8755
H 14	**H 22.225** H 7/8	**22.225** 0.8750	**30.150** 1.1870	**22.261** 0.8764	**22.238** 0.8755
15	**23.813** **15/16**	**23.813** 0.9375	**30.150** 1.1870	**23.848** 0.9389	**23.825** 0.9380
16	**25.400** 1	**25.400** 1.0000	**31.737** 1.2495	**25.436** 1.0014	**25.413** 1.0005
H 16	**H 25.400** H 1	**25.400** 1.0000	**33.325** 1.3120	**25.436** 1.0014	**25.413** 1.0005
17	**26.988** 1 1/16	**26.988** 1.0625	**33.325** 1.3120	**27.023** 1.0639	**27.000** 1.0630
18	**28.575** 1 1/8	**28.575** 1.1250	**34.912** 1.3745	**28.611** 1.1264	**28.588** 1.1255
H 18	**H 28.575** H 1 1/8	**28.575** 1.1250	**38.087** 1.4995	**28.611** 1.1264	**28.588** 1.1255
19	**30.163** 1 3/16	**30.163** 1.1875	**38.087** 1.4995	**30.198** 1.1889	**30.175** 1.1880
20	**31.750** 1 1/4	**31.750** 1.2500	**38.087** 1.4995	**31.786** 1.2514	**31.763** 1.2505
H 20	**H 31.750** H 1 1/4	**31.750** 1.2500	**41.262** 1.6245	**31.786** 1.2514	**31.763** 1.2505
21	**33.338** 1 5/16	**33.338** 1.3125	**41.262** 1.6245	**33.376** 1.3140	**33.350** 1.3130
22	**34.925** 1 3/8	**34.925** 1.3750	**41.262** 1.6245	**34.963** 1.3765	**34.938** 1.3755
H 22	**H 34.925** H1 3/8	**34.925** 1.3750	**44.437** 1.7495	**34.963** 1.3765	**34.938** 1.3755
24	**38.100** 1 1/2	**38.100** 1.5000	**47.612** 1.8745	**38.141** 1.5016	**38.113** 1.5005
26	**41.275** 1 5/8	**41.275** 1.6250	**50.787** 1.9995	**41.316** 1.6266	**41.288** 1.6255
28	**44.450** 1 3/4	**44.450** 1.7500	**53.962** 2.1245	**44.493** 1.7517	**44.463** 1.7505
30	**47.625** 1 7/8	**47.625** 1.8750	**57.137** 2.2495	**47.668** 1.8767	**47.638** 1.8755
32	**50.800** 2	**50.800** 2.0000	**60.312** 2.3745	**50.846** 2.0018	**50.815** 2.0006
H 33	**H 52.388** H 2 1/16	**52.388** 2.0625	**64.280** 2.5307	**52.436** 2.0644	**52.400** 2.0630
34	**53.975** 2 1/8	**53.975** 2.1250	**63.487** 2.4995	**54.026** 2.1270	**53.990** 2.1256
36	**57.150** 2 1/4	**57.150** 2.2500	**66.662** 2.6245	**57.201** 2.2520	**57.165** 2.2506
42	**66.675** 2 5/8	**66.675** 2.6250	**76.187** 2.9995	**66.736** 2.6274	**66.700** 2.6260
44	**69.850** 2 3/4	**69.850** 2.7500	**79.362** 3.1245	**69.911** 2.7524	**69.875** 2.7510
56	**88.900** 3 1/2	**88.900** 3.5000	**101.587** 3.9995	**88.961** 3.5024	**88.925** 3.5010
88	**139.700** 5 1/2	**139.700** 5.5000	**152.375** 5.9990	**139.774** 5.5029	**139.725** 5.5010

Bearing bore should be checked with “go” and “no go” plug gages. The “go” gage size is the minimum needle roller complement bore diameter. The “no go” gage size is larger than the maximum needle roller complement bore diameter by 0.0001 in

Table B2-7. Ring and plug gage dimensions[1]

Needle roller complement bore diameter F_w nominal size	Ring gage	Plug gage	
		Go	No go
mm (in)	**mm**	**mm**	**mm**
4.762(3/16)	8.730	4.783	4.808
6.350(1/4)	11.125	6.388	6.413
7.938(5/16)	12.713 14.300	7.976	8.001
9.525(3/8)	14.300 15.888	9.563	9.588
11.112(7/16)	15.888 17.475	11.151	11.176
12.700(1/2)	17.475 19.063	12.738	12.763
14.288(9/16)	19.063 20.650	14.326	14.351
15.875(5/8)	20.650 22.237	15.913	15.938
17.462(11/16)	22.237 23.825	17.501	17.526
19.050(3/4)	25.387	19.063	19.088
20.638(13/16)	26.975 28.562	20.650	20.675
22.225(7/8)	28.562 30.150	22.238	22.263
23.812(15/16)	30.150	23.825	23.850
25.400(1)	31.737 33.325	25.413	25.438
26.988(1 1/16)	33.325	27.000	27.025
28.575(1 1/8)	34.912 38.087	28.588	28.613
30.162(1 3/16)	38.087	30.175	30.200
31.750(1 1/4)	38.087 41.262	31.763	31.788
33.338(1 5/16)	41.262	33.350	33.378
34.925(1 3/8)	41.262 44.437	34.938	34.966
38.100(1 1/2)	47.612	38.113	38.143
41.275(1 5/8)	50.787	41.288	41.318
44.450(1 3/4)	53.962	44.463	44.496
47.625(1 7/8)	57.137	47.638	47.671
50.800(2)	60.312	50.815	50.848
52.388(2 1/16)	64.280	52.413	52.451
53.975(2 1/8)	63.487	53.990	54.028
57.150(2 1/4)	66.662	57.165	57.203
63.500(2 1/2)	73.139	63.515	63.553
66.675(2 5/8)	76.187	66.700	66.738
69.850(2 3/4)	79.362	69.875	69.913
88.900(3 1/2)	101.587	88.925	88.963

1) These values apply to the needle roller bearings of the BT series with inch nominal dimensions.

INSTALLATION OF DRAWN CUP NEEDLE ROLLER BEARINGS

GENERAL INSTALLATION REQUIREMENTS

- A drawn cup needle roller bearing must be pressed into its housing.
- An installation tool, similar to the ones shown, must be used in conjunction with a standard press.
- The bearing must not be hammered into its housing – even in conjunction with the proper assembly mandrel.
- The bearing must not be pressed tightly against a shoulder in the housing.
- If it is necessary to use a shouldered housing, the depth of the housing bore must be sufficient to ensure the housing shoulder fillet, and the shoulder face, clear the bearing.
- The installation tool must be coaxial with the housing bore.

INSTALLATION OF OPEN END BEARINGS

It is advisable to utilize a positive stop on the press tool to locate the bearing properly in the housing. The assembly tool should have a leader or a pilot, as shown, to aid in starting the bearing true in the housing. The ball detent shown on the drawing is used to assist in aligning the rollers of a full complement bearing during installation and to hold the bearing on the installation tool. A caged-type drawn cup bearing does not require a ball detent to align its rollers. The ball detent may still be used to hold the bearing on the installation tool or an "O" ring may be used as shown in the drawing on this page. The bearing should be installed with the marked end (the end with identification markings) against the angled shoulder of the pressing tool.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)
D – pilot length should be length of bearing less 0.80 mm (0.030 in)
E – approximately 1⁄2 D

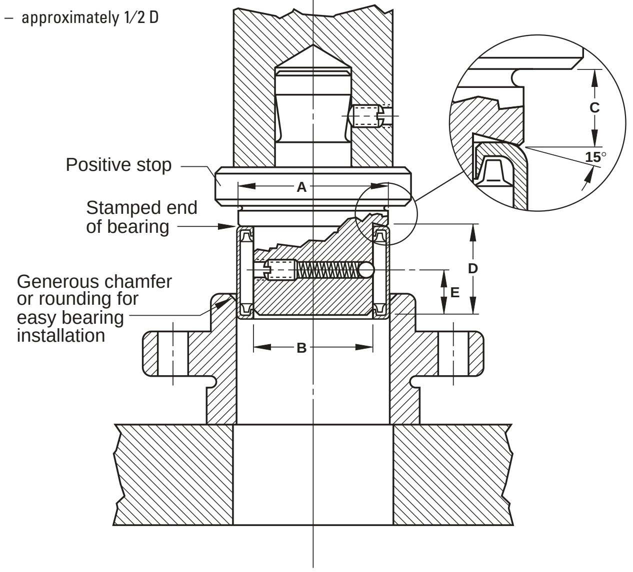


Fig. B2-14. Installation of open ends full complement bearings

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)
D – pilot length should be length of bearing less 0.80 mm (0.030 in)
E – approximately 1⁄2 D

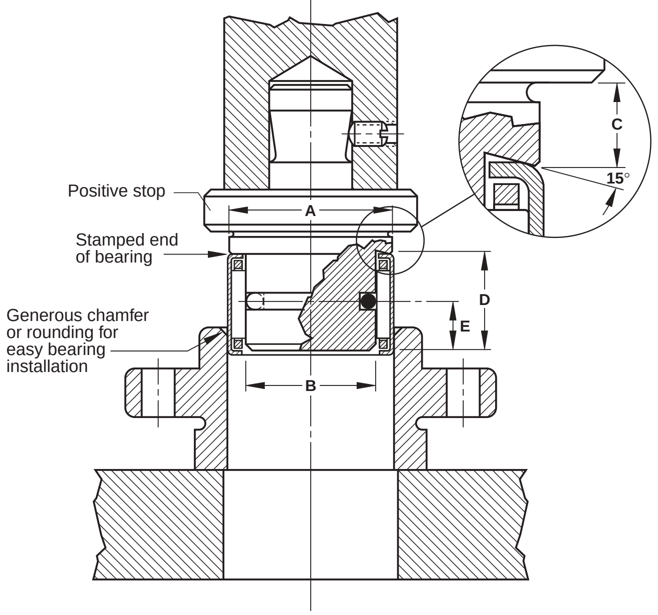


Fig. B2-15. Installation of open ends caged bearings

INSTALLATION OF CLOSED END BEARINGS

The installation tool combines all the features of the tool used to install open end bearings. But the pilot is spring loaded and is part of the press bed.

The angled shoulder of the pressing tool should bear against the closed end, with the bearing held on the pilot, to aid in starting the bearing true in the housing.

A – 0.40 mm (0.016 in) less than housing bore
B – 0.08 mm (0.003 in) less than shaft diameter
C – distance bearing will be inset into housing, minimum of 0.20 mm (0.008 in)

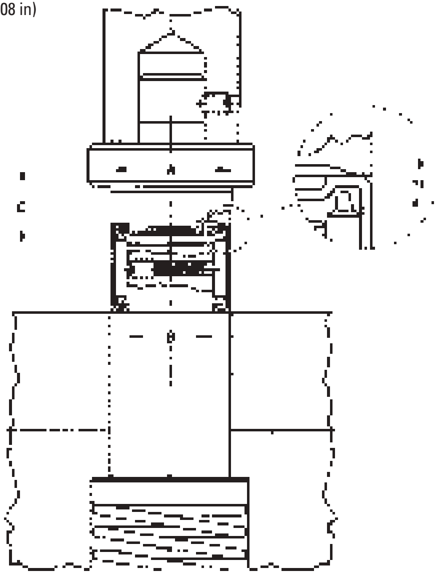


Fig. B2-16. Installation of closed end bearings

EXTRACTION OF DRAWN CUP NEEDLE ROLLER BEARINGS

The need to extract a drawn cup needle roller bearing does not arise often. Standard extractor tools may be purchased from a reputable manufacturer. Customers may produce the special extraction tools at their own facilities. After extraction, the drawn cup needle roller bearing should not be reused.

EXTRACTION FROM A STRAIGHT HOUSING

When it is necessary to extract a drawn cup needle roller bearing from a straight housing, a similar tool to the installation tool – but without the stop – may be used. To avoid damage to the bearing, pressure should be applied against the marked end of the bearing, just as it is done at installation.

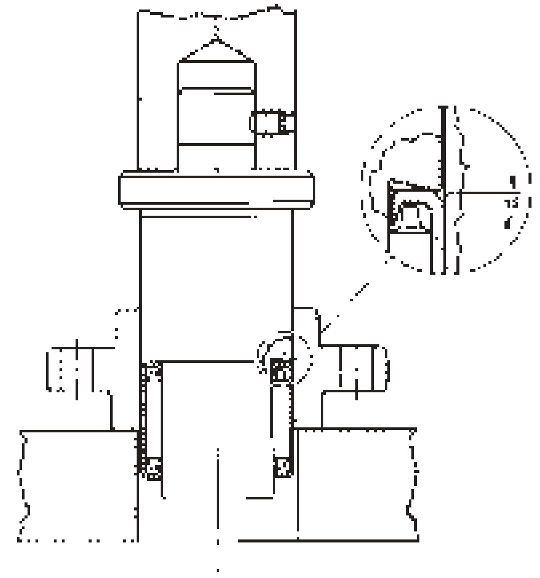


Fig. B2-17. Extraction from a straight housing

EXTRACTION FROM A SHOULDERED HOUSING

(with bearing pressed up close to the shoulder)

The tool to be used, as shown, is of a similar type described for a shouldered or dead end housing. But the rollers must first be removed from the bearing.

The four segment puller jaws are collapsed and slipped into the empty cup. The jaws are then forced outward into the cup bore, by means of the tapered expansion rod. The jaws should bear on the lip as near as possible to the cup bore. The cup is then pressed out from the top.

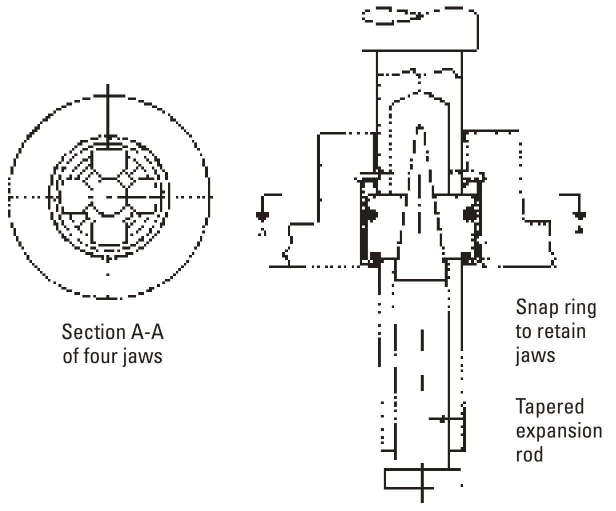


Fig. B2-18. Extraction from a shouldered housing

EXTRACTION FROM A SHOULDERED OR DEAD END HOUSING

(with space between the bearing and the housing shoulder)

Bearings may be extracted from shouldered or dead end housings with a common bearing puller tool as shown. This type of tool is slotted in two places, at right angles, to form four prongs. The four puller prongs are pressed together and inserted into the space between the end of the bearing and the shoulder. The prongs are forced outward by inserting the expansion rod, and then the bearing is extracted. Do not reuse the bearing after extraction.

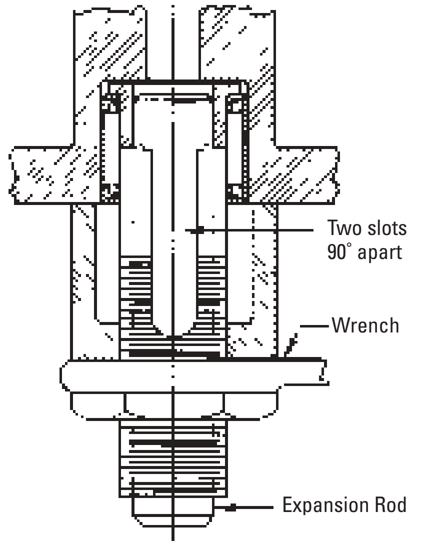
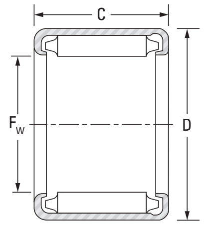


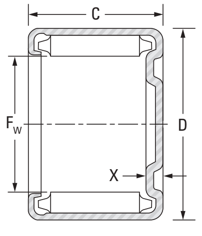
Fig. B2-19. Extraction from a shouldered or dead end housing

FULL COMPLEMENT BEARINGS
OPEN ENDS, CLOSED ONE END

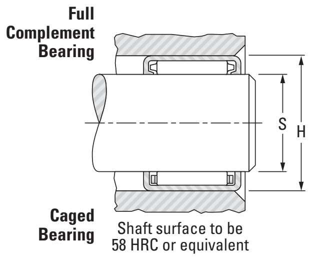
INCH SERIES
B, BH, NB, NBH, M- 1, MH- 1 SERIES



B, BH, NB, NBH



M- 1, MH- 1



Shaft Dia.	Fw	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 -0.3 -0.012		Open Ends	Closed One End	Dynamic C	Static C0	Cu	Open Ends	Closed One End	Shaft Max.	Shaft Min.	Housing Max.	Housing Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
1/8	**3.175** 0.1250	**6.350** 0.2500	**6.35** 0.250	—	B-24	—	**1.73** 390	**1.65** 370	0.24	**0.001** 0.002	—	**3.175** 0.1250	**3.167** 0.1247	**6.363** 0.2505	**6.350** 0.2500	Table B2-6	
5/32	**3.970** 0.1563	**7.142** 0.2812	**6.35** 0.250	—	B-2 1/2 4	—	**2.00** 450	**2.00** 450	0.31	**0.001** 0.002	—	**3.970** 0.1563	**3.962** 0.1560	**7.155** 0.2817	**7.142** 0.2812	Table B2-6	
	3.970 0.1563	**7.142** 0.2812	**7.92** 0.312	—	B-2 1/2 5	—	**2.58** 580	**2.80** 630	0.42	**0.001** 0.003	—	**3.970** 0.1563	**3.962** 0.1560	**7.155** 0.2817	**7.142** 0.2812	Table B2-6	
3/16	**4.763** 0.1875	**8.733** 0.3438	**6.35** 0.250	**1.78** 0.070	B-34	M-341	**2.20** 490	**2.12** 480	0.36	**0.001** 0.003	**0.002** 0.004	**4.763** 0.1875	**4.755** 0.1872	**8.730** 0.3437	**8.717** 0.3432	Table B2-6	
	4.763 0.1875	**8.733** 0.3438	**9.53** 0.375	**1.78** 0.070	B-36	M-361	**3.78** 850	**4.23** 950	0.64	**0.002** 0.005	**0.003** 0.006	**4.763** 0.1875	**4.755** 0.1872	**8.730** 0.3437	**8.717** 0.3432	Table B2-6	
1/4	**6.350** 0.2500	**11.113** 0.4375	**6.35** 0.250	**2.03** 0.080	B-44	M-441	**2.74** 620	**2.63** 590	0.45	**0.002** 0.005	**0.003** 0.006	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	Table B2-6	
	6.350 0.2500	**11.113** 0.4375	**7.92** 0.312	**2.03** 0.080	B-45	M-451	**3.55** 800	**3.68** 830	0.56	**0.003** 0.007	**0.004** 0.008	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	Table B2-6	
	6.350 0.2500	**11.113** 0.4375	**9.53** 0.375	—	B-46	—	**4.55** 1020	**5.06** 1140	0.77	**0.004** 0.008	—	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	Table B2-6	
	6.350 0.2500	**11.113** 0.4375	**11.13** 0.438	**2.03** 0.080	B-47	M-471	**5.51** 1240	**6.46** 1450	0.98	**0.004** 0.009	**0.005** 0.011	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	Table B2-6	
5/16	**7.938** 0.3125	**12.700** 0.5000	**7.92** 0.312	**2.03** 0.080	B-55	M-551	**4.08** 920	**4.60** 1030	0.70	**0.004** 0.008	**0.004** 0.009	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	Table B2-6	
	7.938 0.3125	**12.700** 0.5000	**9.53** 0.375	—	B-56	—	**5.23** 1180	**6.33** 1420	0.97	**0.005** 0.010	—	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	Table B2-6	
	7.938 0.3125	**12.700** 0.5000	**11.13** 0.438	**2.03** 0.080	B-57	M-571	**6.33** 1420	**8.09** 1820	1.20	**0.005** 0.011	**0.006** 0.013	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	Table B2-6	
	7.938 0.3125	**12.700** 0.5000	**14.27** 0.562	—	B-59	—	**8.37** 1880	**11.6** 2600	1.75	**0.006** 0.014	—	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	Table B2-6	
	7.938 0.3125	**14.288** 0.5625	**11.13** 0.438	**2.29** 0.090	BH-57	MH-571	**7.01** 1580	**7.33** 1650	1.10	**0.007** 0.016	**0.008** 0.018	**7.938** 0.3125	**7.925** 0.3120	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	
	7.938 0.3125	**14.288** 0.5625	**14.27** 0.562	—	BH-59	—	**9.46** 2130	**10.8** 2420	1.65	**0.009** 0.020	—	**7.938** 0.3125	**7.925** 0.3120	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	
21/64	**8.331** 0.3280	**14.288** 0.5625	**12.70** 0.500	—	NB-3	—	**8.10** 1820	**9.56** 2150	1.45	**0.008** 0.018	—	**8.331** 0.3280	**8.319** 0.3275	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	
3/8	**9.525** 0.3750	**14.288** 0.5625	**7.92** 0.312	**2.03** 0.080	B-65	M-651	**4.55** 1020	**5.53** 1240	0.84	**0.004** 0.009	**0.005** 0.010	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	IRA-3
	9.525 0.3750	**14.288** 0.5625	**9.53** 0.375	**2.03** 0.080	B-66	M-661	**5.83** 1310	**7.61** 1710	1.15	**0.005** 0.011	**0.005** 0.012	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	IRA-3
	9.525 0.3750	**14.288** 0.5625	**11.13** 0.438	—	B-67	—	**7.06** 1590	**9.72** 2190	1.45	**0.006** 0.013	—	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	IRA-3

Note) · For information on the speed ratings, contact JTEKT.

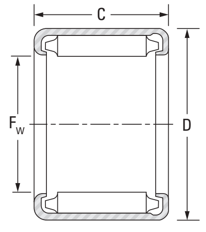
(1) IRA inner ring provides additional length if required.

Shaft Dia.	Fw	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 -0.3 -0.012		Open Ends	Closed One End	Dynamic C	Static C0	Cu	Open Ends	Closed One End	Shaft Max.	Shaft Min.	Housing Max.	Housing Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
3/8	**9.525** 0.3750	**14.288** 0.5625	**12.70** 0.500	**2.03** 0.080	B-68	M-681	**8.21** 1850	**11.8** 2650	1.80	**0.007** 0.015	**0.008** 0.017	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	IRA-3
	9.525 0.3750	**14.288** 0.5625	**14.27** 0.562	—	B-69	—	**9.33** 2100	**13.9** 3130	2.10	**0.007** 0.016	—	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	
	9.525 0.3750	**14.288** 0.5625	**15.88** 0.625	**2.03** 0.080	B-610	M-6101	**10.4** 2340	**16.0** 3590	2.40	**0.008** 0.018	**0.010** 0.021	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	
	9.525 0.3750	**15.875** 0.6250	**12.70** 0.500	—	BH-68	—	**9.35** 2100	**10.9** 2460	1.65	**0.010** 0.021	—	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	Table B2-6	IRA-3
7/16	**11.113** 0.4375	**15.875** 0.6250	**9.53** 0.375	—	B-76	—	**6.37** 1430	**8.88** 2000	1.35	**0.005** 0.012	—	**11.113** 0.4375	**11.100** 0.4370	**15.888** 0.6255	**15.862** 0.6245	Table B2-6	IRA-4
	11.113 0.4375	**15.875** 0.6250	**11.13** 0.438	—	B-77	—	**7.71** 1730	**11.3** 2550	1.70	**0.007** 0.015	—	**11.113** 0.4375	**11.100** 0.4370	**15.888** 0.6255	**15.862** 0.6245	Table B2-6	IRA-4
	11.113 0.4375	**15.875** 0.6250	**12.70** 0.500	**2.03** 0.080	B-78	M-781	**8.97** 2020	**13.8** 3100	2.10	**0.008** 0.017	**0.009** 0.019	**11.113** 0.4375	**11.100** 0.4370	**15.888** 0.6255	**15.862** 0.6245	Table B2-6	IRA-4
	11.113 0.4375	**15.875** 0.6250	**15.88** 0.625	—	B-710	—	**11.4** 2560	**18.7** 4200	2.80	**0.010** 0.021	—	**11.113** 0.4375	**11.100** 0.4370	**15.888** 0.6255	**15.862** 0.6245	Table B2-6	
	11.113 0.4375	**17.463** 0.6875	**12.70** 0.500	—	BH-78	—	**10.3** 2320	**12.8** 2870	1.95	**0.010** 0.023	—	**11.113** 0.4375	**11.100** 0.4370	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	IRA-4
0.439	**11.151** 0.439	**15.908** 0.6263	**12.70** 0.500	—	NB-38		**9.00** 2020	**13.8** 3100	2.10	**0.032** 0.071	—	**11.151** 0.4390	**11.143** 0.4387	**15.908** 0.6263	**15.9** 0.6260	Table B2-6	
1/2	**12.700** 0.5000	**17.463** 0.6875	**7.92** 0.312	**2.03** 0.080	B-85	M-851	**5.36** 1200	**7.38** 1660	1.15	**0.005** 0.012	**0.006** 0.014	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	IRA-5
	12.700 0.5000	**17.463** 0.6875	**9.53** 0.375	**2.03** 0.080	B-86	M-861	**6.87** 1540	**10.2** 2290	1.55	**0.006** 0.014	**0.007** 0.016	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	IRA-5
	12.700 0.5000	**17.463** 0.6875	**11.13** 0.438	**2.03** 0.080	B-87	M-871	**8.31** 1870	**13.0** 2920	1.95	**0.007** 0.016	**0.008** 0.018	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	IRA-5
	12.700 0.5000	**17.463** 0.6875	**12.70** 0.500	**2.03** 0.080	B-88	—	**9.63** 2160	**15.7** 3530	2.40	**0.009** 0.019	**0.010** 0.021	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	IRA-5
	12.700 0.5000	**17.463** 0.6875	**12.70** 0.500	**2.03** 0.080	—	M-881	**9.66** 2170	**15.8** 3550	2.40	—	**0.010** 0.021	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	
	12.700 0.5000	**17.463** 0.6875	**15.88** 0.625	**2.03** 0.080	B-810	M-8101	**12.2** 2750	**21.3** 4800	3.20	**0.010** 0.023	**0.012** 0.026	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	
	12.700 0.5000	**17.463** 0.6875	**19.05** 0.750	**2.03** 0.080	B-812	M-8121	**14.7** 3300	**26.9** 6050	4.20	**0.013** 0.028	**0.014** 0.031	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	
	12.700 0.5000	**19.050** 0.7500	**11.13** 0.438	—	BH-87	—	**9.46** 2130	**11.8** 2650	1.80	**0.010** 0.023	—	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IRA-5
	12.700 0.5000	**19.050** 0.7500	**12.70** 0.500	—	BH-88	—	**11.2** 2510	**14.6** 3280	2.20	**0.012** 0.026	—	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IRA-5
	12.700 0.5000	**19.050** 0.7500	**15.88** 0.625	—	BH-810	—	**14.4** 3230	**20.2** 4540	3.05	**0.015** 0.033	—	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	
	12.700 0.5000	**19.050** 0.7500	**19.05** 0.750	**2.29** 0.090	BH-812	MH-8121	**17.4** 3910	**25.8** 5790	3.95	**0.018** 0.039	**0.020** 0.044	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	
9/16	**14.288** 0.5625	**19.050** 0.7500	**7.92** 0.312	**2.03** 0.080	B-95	M-951	**5.72** 1290	**8.31** 1870	1.25	**0.006** 0.013	**0.006** 0.014	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-68
	14.288 0.5625	**19.050** 0.7500	**9.53** 0.375	**2.03** 0.080	B-96	M-961	**7.33** 1650	**11.4** 2570	1.75	**0.007** 0.015	**0.008** 0.018	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-68
	14.288 0.5625	**19.050** 0.7500	**11.13** 0.438	**2.03** 0.080	B-97	M-971	**8.87** 1990	**14.6** 3280	2.20	**0.008** 0.018	**0.010** 0.021	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-68
	14.288 0.5625	**19.050** 0.7500	**12.70** 0.500	**2.03** 0.080	B-98	M-981	**10.3** 2320	**17.7** 3990	2.70	**0.009** 0.020	**0.010** 0.023	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-68
	14.288 0.5625	**19.050** 0.7500	**15.88** 0.625	**2.03** 0.080	B-910	M-9101	**13.1** 2940	**24.0** 5400	3.60	**0.012** 0.026	**0.013** 0.029	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-612[1]

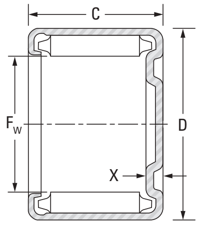
Continued on next page.

FULL COMPLEMENT BEARINGS
OPEN ENDS, CLOSED ONE END

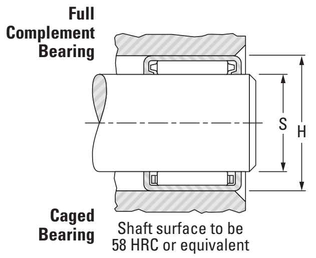
INCH SERIES
B, BH, NB, NBH, M- 1, MH- 1 SERIES



B, BH, NB, NBH



M- 1, MH- 1



Shaft Dia.	F_w	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
9/16	**14.288** 0.5625	**19.050** 0.7500	**19.05** 0.750	**2.03** 0.080	B-912	M-9121	**15.6** 3510	**30.3** 6820	4.70	**0.014** 0.031	**0.015** 0.034	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-612(1)
	14.288 0.5625	**20.638** 0.8125	**12.70** 0.500	—	BH-98	—	**12.0** 2690	**16.4** 3690	2.50	**0.013** 0.029	—	**14.288** 0.5625	**14.275** 0.5620	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-68
	14.288 0.5625	**20.638** 0.8125	**15.88** 0.625	—	BH-910	—	**15.4** 3460	**22.7** 5110	3.45	**0.016** 0.036	—	**14.288** 0.5625	**14.275** 0.5620	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-612(1)
	14.288 0.5625	**20.638** 0.8125	**19.05** 0.750	—	BH-912	—	**18.6** 4190	**29.0** 6520	4.45	**0.020** 0.043	—	**14.288** 0.5625	**14.275** 0.5620	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-612(1)
5/8	**15.875** 0.6250	**20.638** 0.8125	**7.92** 0.312	**2.03** 0.080	B-105	M-1051	**6.05** 1360	**9.24** 2080	1.40	**0.006** 0.014	**0.007** 0.016	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-68-1
	15.875 0.6250	**20.638** 0.8125	**11.13** 0.438	**2.03** 0.080	B-107	M-1071	**9.39** 2110	**16.2** 3650	2.45	**0.009** 0.020	**0.010** 0.022	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-68-1
	15.875 0.6250	**20.638** 0.8125	**12.70** 0.500	**2.03** 0.080	B-108	M-1081	**10.9** 2450	**19.7** 4430	3.00	**0.010** 0.022	**0.012** 0.026	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-68-1
	15.875 0.6250	**20.638** 0.8125	**15.88** 0.625	**2.03** 0.080	B-1010	M-10101	**13.80** 3110	**26.7** 6000	4.00	**0.013** 0.028	**0.015** 0.032	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-612-1
	15.875 0.6250	**20.638** 0.8125	**19.05** 0.750	**2.03** 0.080	B-1012	M-10121	**16.6** 3720	**33.7** 7580	5.25	**0.015** 0.034	**0.017** 0.038	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**12.70** 0.500	**2.29** 0.090	BH-108	MH-1081	**12.7** 2860	**18.3** 4110	2.75	**0.014** 0.031	**0.016** 0.035	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	IR-68-1
	15.875 0.6250	**22.212** 0.8745	**15.88** 0.625	—	BH-1010	—	**16.4** 3680	**25.3** 5680	3.85	**0.018** 0.039	—	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**19.05** 0.750	—	BH-1012	—	**19.8** 4450	**32.3** 7250	4.95	**0.021** 0.047	—	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**25.40** 1.000	—	BH-1016	—	**26.2** 5890	**46.2** 10390	7.10	**0.028** 0.062	—	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	
11/16	**17.463** 0.6875	**22.212** 0.8745	**9.53** 0.375	**2.03** 0.080	B-116	M-1161	**8.17** 1840	**14.0** 3140	2.15	**0.008** 0.018	**0.009** 0.020	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	
	17.463 0.6875	**22.212** 0.8745	**12.70** 0.500	**2.03** 0.080	B-118	M-1181	**11.5** 2580	**21.7** 4880	3.30	**0.011** 0.024	**0.012** 0.027	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	
	17.463 0.6875	**22.212** 0.8745	**15.88** 0.625	**2.03** 0.080	B-1110	M-11101	**14.6** 3270	**29.4** 6610	4.40	**0.014** 0.030	**0.015** 0.034	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	
	17.463 0.6875	**22.212** 0.8745	**19.05** 0.750	**2.03** 0.080	B-1112	M-11121	**17.4** 3920	**37.1** 8340	5.75	**0.016** 0.036	**0.019** 0.041	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	
	17.463 0.6875	**23.813** 0.9375	**11.13** 0.438	—	BH-117	—	**11.4** 2560	**16.2** 3650	2.45	**0.014** 0.030	—	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-6	
	17.463 0.6875	**23.813** 0.9375	**15.88** 0.625	**2.29** 0.090	BH-1110	MH-11101	**17.3** 3890	**27.8** 6250	4.25	**0.019** 0.042	**0.021** 0.047	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-6	

Note) · For information on the speed ratings, contact JTEKT.

(1) IRA inner ring provides additional length if required.

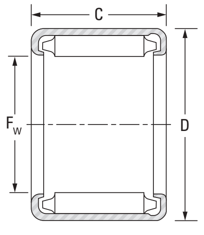
Shaft Dia.	F_w	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
11/16	**17.463** 0.6875	**23.813** 0.9375	**19.05** 0.750	—	BH-1112	—	**20.9** 4700	**35.5** 7980	5.45	**0.023** 0.051	—	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-6	
3/4	**19.050** 0.7500	**25.400** 1.0000	**9.53** 0.375	**2.29** 0.090	B-126	M-1261	**9.70** 2180	**13.6** 3050	2.10	**0.012** 0.027	**0.014** 0.031	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-6	IR-88
	19.050 0.7500	**25.400** 1.0000	**12.70** 0.500	**2.29** 0.090	B-128	M-1281	**14.1** 3170	**22.0** 4940	3.30	**0.016** 0.036	**0.019** 0.041	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-6	IR-88
	19.050 0.7500	**25.400** 1.0000	**15.88** 0.625	**2.29** 0.090	B-1210	M-12101	**18.1** 4070	**30.4** 6830	4.60	**0.020** 0.045	**0.024** 0.052	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-6	IR-812(1)
	19.050 0.7500	**25.400** 1.0000	**19.05** 0.750	**2.29** 0.090	B-1212	M-12121	**21.9** 4930	**38.7** 8710	5.95	**0.024** 0.054	**0.028** 0.062	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-6	IR-812(1)
13/16	**20.638** 0.8125	**26.988** 1.0625	**9.53** 0.375	—	B-136	—	**10.1** 2280	**14.7** 3300	2.25	**0.013** 0.029	—	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-6	
	20.638 0.8125	**26.988** 1.0625	**12.70** 0.500	**2.29** 0.090	B-138	M-1381	**14.7** 3300	**23.8** 5350	3.60	**0.018** 0.039	**0.020** 0.044	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-6	
	20.638 0.8125	**26.988** 1.0625	**22.23** 0.875	**2.29** 0.090	B-1314	M-13141	**26.7** 6010	**51.1** 11490	7.90	**0.031** 0.068	**0.035** 0.077	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-6	
	20.638 0.8125	**26.988** 1.0625	**25.40** 1.000	**2.29** 0.090	B-1316	M-13161	**30.3** 6820	**60.2** 13530	9.25	**0.035** 0.078	**0.040** 0.088	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-6	
	20.638 0.8125	**26.988** 1.0625	**31.75** 1.250	—	B-1320	—	**37.3** 8380	**78.4** 17620	12.0	**0.044** 0.098	—	**20.638** 0.8125	**20.625** 0.8120	**27.000** 1.0630	**26.975** 1.0620	Table B2-6	
	20.638 0.8125	**28.575** 1.1250	**12.70** 0.500	**2.79** 0.110	BH-138	MH-1381	**14.8** 3330	**20.8** 4680	3.10	**0.023** 0.050	**0.026** 0.057	**20.638** 0.8125	**20.625** 0.8120	**28.588** 1.1255	**28.562** 1.1245	Table B2-6	
	20.638 0.8125	**28.575** 1.1250	**15.88** 0.625	**2.79** 0.110	BH-1310	MH-13101	**19.7** 4430	**29.9** 6720	4.50	**0.029** 0.063	**0.032** 0.071	**20.638** 0.8125	**20.625** 0.8120	**28.588** 1.1255	**28.562** 1.1245	Table B2-6	
	20.638 0.8125	**28.575** 1.1250	**19.05** 0.750	**2.79** 0.110	BH-1312	MH-13121	**24.2** 5440	**39.0** 8760	6.10	**0.034** 0.076	**0.039** 0.086	**20.638** 0.8125	**20.625** 0.8120	**28.588** 1.1255	**28.562** 1.1245	Table B2-6	
7/8	**22.225** 0.8750	**28.575** 1.1250	**9.53** 0.375	**2.29** 0.090	B-146	M-1461	**10.6** 2380	**15.8** 3560	2.45	**0.014** 0.031	**0.016** 0.035	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-6	
	22.225 0.8750	**28.575** 1.1250	**12.70** 0.500	**2.29** 0.090	B-148	M-1481	**15.4** 3450	**25.6** 5760	3.85	**0.019** 0.042	**0.022** 0.048	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-6	IR-1012(1)
	22.225 0.8750	**28.575** 1.1250	**19.05** 0.750	**2.29** 0.090	B-1412	M-14121	**23.9** 5370	**45.2** 10160	6.95	**0.028** 0.062	**0.032** 0.070	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-6	IR-1012(1)
	22.225 0.8750	**28.575** 1.1250	**25.40** 1.000	**2.29** 0.090	B-1416	M-14161	**31.6** 7100	**64.8** 14570	10.0	**0.038** 0.083	**0.043** 0.094	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-6	IR-1016
	22.225 0.8750	**28.575** 1.1250	**28.58** 1.125	—	B-1418	—	**35.2** 7920	**74.6** 16770	11.4	**0.043** 0.094	—	**22.225** 0.8750	**22.212** 0.8745	**28.588** 1.1255	**28.562** 1.1245	Table B2-6	
	22.225 0.8750	**30.163** 1.1875	**15.88** 0.625	**2.79** 0.110	BH-1410	MH-14101	**20.3** 4570	**32.2** 7240	4.85	**0.030** 0.067	**0.035** 0.076	**22.225** 0.8750	**22.212** 0.8745	**30.175** 1.1880	**30.150** 1.1870	Table B2-6	IR-1012(1)
	22.225 0.8750	**30.163** 1.1875	**19.05** 0.750	**2.79** 0.110	BH-1412	MH-14121	**25.0** 5620	**42.0** 9440	6.55	**0.036** 0.080	**0.041** 0.091	**22.225** 0.8750	**22.212** 0.8745	**30.175** 1.1880	**30.150** 1.1870	Table B2-6	IR-1012(1)
	22.225 0.8750	**30.163** 1.1875	**25.40** 1.000	—	BH-1416	—	**33.7** 7570	**61.6** 13850	9.60	**0.049** 0.107	—	**22.225** 0.8750	**22.212** 0.8745	**30.175** 1.1880	**30.150** 1.1870	Table B2-6	IR-1016
15/16	**23.813** 0.9375	**30.163** 1.1875	**12.70** 0.500	—	B-158	—	**15.9** 3580	**27.5** 6180	4.15	**0.020** 0.044	—	**23.813** 0.9375	**23.800** 0.9370	**30.175** 1.1880	**30.150** 1.1870	Table B2-6	
	23.813 0.9375	**30.163** 1.1875	**25.40** 1.000	**2.29** 0.090	B-1516	M-15161	**32.8** 7370	**69.5** 15620	10.7	**0.040** 0.088	**0.045** 0.100	**23.813** 0.9375	**23.800** 0.9370	**30.175** 1.1880	**30.150** 1.1870	Table B2-6	
1	**25.400** 1.0000	**31.750** 1.2500	**9.53** 0.375	—	B-166	—	**11.3** 2550	**18.1** 4070	2.80	**0.016** 0.035	—	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	Table B2-6	IR-128
	25.400 1.0000	**31.750** 1.2500	**11.13** 0.438	**2.29** 0.090	B-167	M-1671	**14.0** 3140	**23.7** 5320	3.60	**0.019** 0.041	**0.021** 0.046	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	Table B2-6	IR-128
	25.400 1.0000	**31.750** 1.2500	**12.70** 0.5000	**2.29** 0.090	B-168	M-1681	**16.5** 3710	**29.3** 6590	4.45	**0.021** 0.047	**0.024** 0.053	**25.400** 1.0000	**25.387** 0.9995	**31.763** 1.2505	**31.737** 1.2495	Table B2-6	IR-128

Continued on next page.

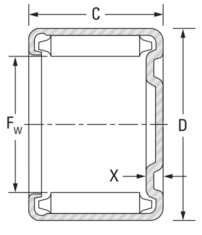
FULL COMPLEMENT BEARINGS OPEN ENDS, CLOSED ONE END

INCH SERIES

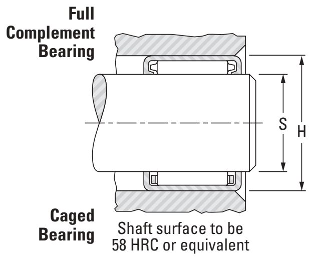
B, BH, NB, NBH, M- 1, MH- 1 SERIES



B, BH, NB, NBH



M- 1, MH- 1



Shaft Dia.	F_w	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 -0.3 -0.012				Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0	C_u	Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
1	25.400 1.0000	31.750 1.2500	15.88 0.625	2.29 0.090	B-1610	M-16101	21.2 4770	40.5 9110	6.15	0.026 0.058	0.030 0.066	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	Table B2-6	IR-1212
	25.400 1.0000	31.750 1.2500	19.05 0.750	2.29 0.090	B-1612	M-16121	25.7 5770	51.7 11620	7.95	0.032 0.070	0.036 0.080	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	Table B2-6	IR-1212
	25.400 1.0000	31.750 1.2500	25.40 1.000	2.29 0.090	B-1616	M-16161	34.0 7640	74.1 16660	11.4	0.043 0.094	0.048 0.106	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	Table B2-6	IR-1216(1)
	25.400 1.0000	33.338 1.3125	12.70 0.500	2.79 0.110	BH-168	MH-1681	16.6 3740	25.6 5760	3.80	0.027 0.060	0.031 0.068	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-128
	25.400 1.0000	33.338 1.3125	15.88 0.625	—	BH-1610	—	22.0 4950	36.8 8280	5.50	0.034 0.075	—	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-1212
	25.400 1.0000	33.338 1.3125	19.05 0.750	2.79 0.110	BH-1612	MH-16121	27.1 6090	48.0 10800	7.45	0.041 0.090	0.046 0.102	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-1212
	25.400 1.0000	33.338 1.3125	22.23 0.875	—	BH-1614	—	31.9 7170	59.2 13300	9.15	0.048 0.105	—	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-1216(1)
	25.400 1.0000	33.338 1.3125	25.40 1.000	2.79 0.110	BH-1616	MH-16161	36.5 8200	70.4 15830	10.9	0.054 0.120	0.062 0.136	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-1216(1)
	25.400 1.0000	33.338 1.3125	31.75 1.250	—	BH-1620	—	45.2 10160	92.8 20860	14.2	0.068 0.150	—	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-1220
	25.400 1.0000	33.338 1.3125	38.10 1.500	2.79 0.110	BH-1624	MH-16241	53.5 12030	115 25900	17.7	0.082 0.180	0.093 0.204	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-1224
1 1/16	26.988 1.0625	33.338 1.3125	15.88 0.625	2.29 0.090	B-1710	M-17101	21.9 4930	43.1 9680	6.55	0.028 0.062	0.032 0.070	26.988 1.0625	26.975 1.0620	33.350 1.3130	33.325 1.3120	Table B2-6	
	26.988 1.0625	34.925 1.3750	19.05 0.750	—	BH-1712	—	29.5 6630	52.4 11780	8.05	0.035 0.078	—	26.988 1.0625	26.975 1.0620	34.938 1.3755	34.912 1.3745	Table B2-6	
1 1/8	28.575 1.1250	34.925 1.3750	9.53 0.375	2.29 0.090	B-186	M-1861	12.1 2720	20.4 4580	3.10	0.018 0.039	0.020 0.044	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-6	IR-1416(1)
	28.575 1.1250	34.925 1.3750	12.70 0.500	2.29 0.090	B-188	M-1881	17.6 3950	33.0 7420	4.95	0.024 0.052	0.027 0.059	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-6	IR-1416(1)
	28.575 1.1250	34.925 1.3750	15.88 0.625	—	B-1810	—	22.6 5080	45.6 10250	6.90	0.029 0.065	—	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-6	IR-1416(1)
	28.575 1.1250	34.925 1.3750	19.05 0.750	2.29 0.090	B-1812	M-18121	27.3 6140	58.2 13080	8.90	0.035 0.078	0.040 0.088	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-6	IR-1416(1)
	28.575 1.1250	34.925 1.3750	25.40 1.000	2.29 0.090	B-1816	M-18161	36.1 8120	83.4 18750	12.8	0.047 0.104	0.054 0.118	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-6	IR-1416(1)
	28.575 1.1250	38.100 1.5000	19.05 0.750	3.05 0.120	BH-1812	MH-18121	31.5 7090	52.9 11900	8.30	0.056 0.123	0.063 0.138	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1416(1)
	28.575 1.1250	38.100 1.5000	25.40 1.000	3.05 0.120	BH-1816	MH-18161	42.5 9560	77.8 17500	12.0	0.074 0.164	0.084 0.186	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1416(1)
1 1/8	28.575 1.1250	38.100 1.5000	31.75 1.250	3.05 0.120	BH-1820	MH-18201	53.0 11910	103 23200	15.8	0.093 0.205	0.105 0.232	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-6	
1 3/16	30.163 1.1875	38.100 1.5000	15.88 0.625	2.79 0.110	B-1910	M-19101	24.1 5420	43.8 9840	6.55	0.040 0.088	0.045 0.099	30.163 1.1875	30.150 1.1870	38.113 1.5005	38.087 1.4995	Table B2-6	
	30.163 1.1875	38.100 1.5000	25.40 1.000	—	B-1916	—	39.9 8970	83.7 18820	13.0	0.064 0.140	—	30.163 1.1875	30.150 1.1870	38.113 1.5005	38.087 1.4995	Table B2-6	
1 1/4	31.750 1.2500	38.100 1.5000	12.70 0.500	2.29 0.090	B-208	M-2081	18.6 4170	36.7 8250	5.50	0.026 0.057	0.029 0.065	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1612
	31.750 1.2500	38.100 1.5000	15.88 0.625	2.29 0.090	B-2010	M-20101	23.9 5370	50.7 11400	7.70	0.032 0.071	0.044 0.097	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1612
	31.750 1.2500	38.100 1.5000	19.05 0.750	2.29 0.090	B-2012	M-20121	28.9 6490	64.7 14540	9.90	0.039 0.086	0.045 0.099	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1612
	31.750 1.2500	38.100 1.5000	25.40 1.000	2.29 0.090	B-2016	M-20161	38.2 8590	92.7 20840	14.2	0.052 0.114	0.059 0.130	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1616(1)
	31.750 1.2500	38.100 1.5000	31.75 1.250	2.29 0.090	B-2020	M-20201	46.9 10540	121 27200	18.4	0.065 0.143	0.073 0.162	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-6	
	31.750 1.2500	41.275 1.6250	12.70 0.500	3.05 0.120	BH-208	MH-2081	19.7 4420	30.0 6750	4.50	0.041 0.090	0.046 0.102	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1612
	31.750 1.2500	41.275 1.6250	19.05 0.750	3.05 0.120	BH-2012	MH-20121	33.1 7440	58.6 13170	9.10	0.061 0.135	0.069 0.153	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1612
	31.750 1.2500	41.275 1.6250	25.40 1.000	3.05 0.120	BH-2016	MH-20161	44.9 10100	86.6 19470	13.4	0.081 0.179	0.092 0.203	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1616(1)
	31.750 1.2500	41.275 1.6250	31.75 1.250	3.05 0.120	BH-2020	MH-20201	55.9 12570	115 25800	17.6	0.102 0.224	0.115 0.254	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-6	
1 5/16	33.338 1.3125	41.275 1.6250	12.70 0.500	2.79 0.110	B-218	M-2181	19.3 4330	33.7 7570	5.00	0.034 0.076	0.039 0.086	33.338 1.3125	33.325 1.3120	41.288 1.6255	41.262 1.6245	Table B2-6	
	33.338 1.3125	41.275 1.6250	15.88 0.625	2.79 0.110	B-2110	M-21101	25.5 5740	48.4 10880	7.25	0.043 0.095	0.049 0.108	33.338 1.3125	33.325 1.3120	41.288 1.6255	41.262 1.6245	Table B2-6	
	33.338 1.3125	41.275 1.6250	31.75 1.250	—	B-2120	—	52.6 11820	123 27650	18.8	0.087 0.191	—	33.338 1.3125	33.325 1.3120	41.288 1.6255	41.262 1.6245	Table B2-6	
1 3/8	34.925 1.3750	41.275 1.6250	12.70 0.500	2.29 0.090	B-228	M-2281	19.5 4390	40.3 9060	6.05	0.028 0.062	0.032 0.070	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1812
	34.925 1.3750	41.275 1.6250	19.05 0.750	2.29 0.090	B-2212	M-22121	30.4 6830	71.2 16000	10.9	0.043 0.094	0.049 0.107	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1812
	34.925 1.3750	41.275 1.6250	25.40 1.000	2.29 0.090	B-2216	M-22161	40.2 9030	102 22900	15.7	0.057 0.125	0.064 0.142	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1816
	34.925 1.3750	41.275 1.6250	31.75 1.250	2.29 0.090	B-2220	M-22201	49.3 11080	133 29900	20.3	0.071 0.156	0.080 0.177	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1820
	34.925 1.3750	44.450 1.7500	12.70 0.500	—	BH-228	—	21.2 4770	33.5 7540	5.15	0.044 0.098	—	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-6	IR-1812
	34.925 1.3750	44.450 1.7500	15.88 0.625	—	BH-2210	—	28.5 6410	48.9 11000	7.45	0.055 0.122	—	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-6	IR-1812
	34.925 1.3750	44.450 1.7500	19.05 0.750	3.05 0.120	BH-2212	MH-22121	35.3 7930	64.3 14450	10.0	0.066 0.146	0.075 0.165	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-6	IR-1812
	34.925 1.3750	44.450 1.7500	25.40 1.000	3.05 0.120	BH-2216	MH-22161	47.6 10700	94.8 21300	14.7	0.088 0.195	0.100 0.221	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-6	IR-1816
	34.925 1.3750	44.450 1.7500	31.75 1.250	—	BH-2220	—	59.4 13350	126 28300	19.4	0.111 0.244	0.125 0.276	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-6	IR-1820
1 1/2	38.100 1.5000	47.625 1.8750	12.70 0.500	3.05 0.120	B-248	M-2481	22.3 5020	37.1 8340	5.60	0.048 0.105	0.054 0.119	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1916
	38.100 1.5000	47.625 1.8750	15.88 0.625	3.05 0.120	B-2410	M-24101	29.9 6720	53.9 12120	8.10	0.060 0.132	0.068 0.150	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1916

Note) · For information on the speed ratings, contact JTEKT.

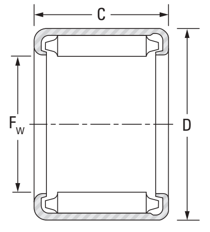
(1) IRA inner ring provides additional length if required.

Continued on next page.

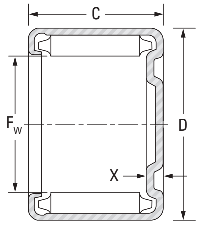
FULL COMPLEMENT BEARINGS OPEN ENDS, CLOSED ONE END

INCH SERIES

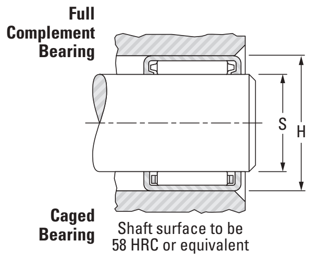
B, BH, NB, NBH, M- 1, MH- 1 SERIES



B, BH, NB, NBH



M- 1, MH- 1



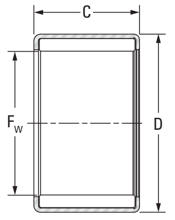
Shaft Dia.	F_w	D	C	X max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 -0.3 -0.012				Dynamic	Static				Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	kg lbs		mm in	mm in	mm in	mm in		
1 1/2	38.100 1.5000	47.625 1.8750	19.05 0.750	3.05 0.120	B-2412	M-24121	36.9 8290	70.7 15900	11.1	0.072 0.158	0.081 0.179	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1916
	38.100 1.5000	47.625 1.8750	22.23 0.875	3.05 0.120	B-2414	M-24141	43.5 9780	87.5 19670	13.6	0.083 0.184	0.095 0.209	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1916
	38.100 1.5000	47.625 1.8750	25.40 1.000	3.05 0.120	B-2416	M-24161	49.7 11170	104 23380	16.1	0.096 0.211	0.108 0.239	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1916
	38.100 1.5000	47.625 1.8750	31.75 1.250	3.05 0.120	B-2420	M-24201	62.0 13940	138 31000	21.2	0.119 0.263	0.135 0.298	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1920
1 5/8	41.275 1.6250	50.800 2.0000	12.70 0.500	—	B-268	—	22.7 5100	39.2 8820	5.85	0.051 0.113	—	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-6	IR-2020(1)
	41.275 1.6250	50.800 2.0000	15.88 0.625	3.05 0.120	B-2610	M-26101	30.6 6890	57.4 12900	8.60	0.064 0.141	0.073 0.160	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-6	IR-2020(1)
	41.275 1.6250	50.800 2.0000	25.40 1.000	—	B-2616	—	51.4 11550	112 25200	17.4	0.103 0.226	—	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-6	IR-2020(1)
	41.275 1.6250	50.800 2.0000	31.75 1.250	3.05 0.120	B-2620	M-26201	64.0 14400	148 33270	22.9	0.128 0.282	0.145 0.320	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-6	IR-2220(1)
1 3/4	44.450 1.7500	53.975 2.1250	19.05 0.750	3.05 0.120	B-2812	M-28121	39.3 8830	81.5 18320	12.8	0.082 0.181	0.093 0.205	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-6	IR-2316
	44.450 1.7500	53.975 2.1250	25.40 1.000	3.05 0.120	B-2816	M-28161	53.3 11980	121 27100	18.8	0.110 0.242	0.124 0.274	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-6	IR-2316
	44.450 1.7500	53.975 2.1250	31.75 1.250	—	B-2820	—	66.4 14930	160 36000	24.7	0.137 0.302	—	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-6	IR-2324
	44.450 1.7500	53.975 2.1250	38.10 1.500	3.05 0.120	B-2824	M-26241	78.7 17700	199 44800	30.5	0.165 0.363	0.186 0.411	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-6	IR-2324
1 7/8	47.625 1.8750	57.150 2.2500	12.70 0.500	3.05 0.120	B-308	M-3081	25.1 5650	46.4 10430	7.00	0.059 0.129	0.066 0.146	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-6	
	47.625 1.8750	57.150 2.2500	15.888 0.625	—	B-3010	—	33.6 7550	67.4 15150	10.2	0.073 0.161	—	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-6	
	47.625 1.8750	57.150 2.2500	19.05 0.750	—	B-3012	—	41.5 9330	88.4 19870	13.9	0.088 0.193	—	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-6	
	47.625 1.8750	57.150 2.2500	25.40 1.000	3.05 0.120	B-3016	M-30161	56.0 12600	130 29200	20.1	0.117 0.258	0.132 0.292	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-6	
2	50.800 2.0000	60.325 2.3750	12.70 0.500	3.05 0.120	B-328	M-3281	25.4 5710	48.2 10840	7.20	0.062 0.136	0.070 0.154	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-6	
	50.800 2.0000	60.325 2.3750	15.88 0.625	—	B-3210	—	34.2 7680	70.7 15900	10.6	0.078 0.171	—	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-6	
	50.800 2.0000	60.325 2.3750	22.23 0.875	—	B-3214	—	50.1 11260	116 26080	18.0	0.108 0.239	—	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-6	
2	50.800 2.0000	60.325 2.3750	25.40 1.000	3.05 0.120	B-3216	M-32161	57.5 12930	138 31000	21.5	0.124 0.273	0.140 0.309	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-6	
	50.800 2.0000	60.325 2.3750	31.75 1.250	3.05 0.120	B-3220	M-32201	71.5 16070	183 41100	28.3	0.155 0.341	0.175 0.386	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-6	
	50.800 2.0000	60.325 2.3750	38.10 1.500	3.05 0.120	B-3224	M-32241	84.8 19060	228 51200	34.9	0.186 0.410	0.211 0.465	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-6	
	50.800 2.0000	60.325 2.3750	44.45 1.750	3.05 0.120	B-3228	M-32281	97.6 21940	272 61150	41.9	0.217 0.478	0.245 0.541	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-6	
2 1/16	52.388 2.0625	64.292 2.5312	19.05 0.750	—	BH-3312	—	46.1 10360	86.9 19540	13.4	0.122 0.269	—	52.388 2.0625	52.372 2.0619	64.305 2.5317	64.280 2.5307	Table B2-6	IR-2916
	52.388 2.0625	64.292 2.5312	25.40 1.000	3.56 0.140	BH-3316	MH-33161	64.2 14430	133 29900	20.7	0.162 0.358	0.184 0.406	52.388 2.0625	52.372 2.0619	64.305 2.5317	64.280 2.5307	Table B2-6	IR-2916
	52.388 2.0625	64.292 2.5312	38.10 1.500	3.56 0.140	BH-3324	MH-33241	96.8 21760	226 50700	34.8	0.244 0.537	0.276 0.609	52.388 2.0625	52.372 2.0619	64.305 2.5317	64.280 2.5307	Table B2-6	IR-2924
2 1/8	53.975 2.1250	63.500 2.5000	12.70 0.500	—	B-348	—	26.1 5870	51.3 11530	7.65	0.065 0.144	—	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-6	IR-3024
	53.975 2.1250	63.500 2.5000	19.05 0.750	—	B-3412	—	43.6 9790	99.0 22260	15.5	0.098 0.216	—	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-6	IR-3024
	53.975 2.1250	63.500 2.5000	25.40 1.000	3.05 0.120	B-3416	M-34161	59.1 13290	147 33000	22.8	0.131 0.289	0.148 0.327	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-6	IR-3024
	53.975 2.1250	63.500 2.5000	31.75 1.250	—	B-3420	—	73.6 16550	194 43700	30.1	0.164 0.361	—	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-6	IR-3024
	53.975 2.1250	63.500 2.5000	38.10 1.500	3.05 0.120	B-3424	M-34241	87.3 19630	242 54400	37.1	0.196 0.433	0.223 0.491	53.975 2.1250	53.960 2.1244	63.513 2.5005	63.487 2.4995	Table B2-6	IR-3024
2 1/4	57.150 2.2500	66.675 2.6250	19.05 0.750	3.30 0.130	B-3612	M-36121	46 10340	105 23700	16.5	0.103 0.228	0.117 0.258	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-6	
	57.150 2.2500	66.675 2.6250	25.40 1.000	—	B-3616	—	62.3 14010	155.6 35000	24.2	0.138 0.304	—	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-6	
	57.150 2.2500	66.675 2.6250	31.75 1.250	—	B-3620	—	77.5 17420	206 46400	31.8	0.172 0.380	—	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-6	
	57.150 2.2500	66.675 2.6250	38.10 1.500	3.30 0.130	B-3624	M-36241	91.9 20660	257 57700	39.6	0.207 0.456	0.235 0.517	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-6	
2 1/2	63.500 2.5000	73.020 2.8750	19.05 0.750	—	NB-4012	—	48.1 10800	117 26300	18.4	0.116 0.255	—	63.500 2.5000	63.485 2.4994	73.165 2.8805	73.139 2.8795	Table B2-6	
	63.500 2.5000	73.020 2.8750	28.58 1.125	—	NB-4018	—	73.3 16500	201 45200	31.2	0.174 0.383	—	63.500 2.5000	63.485 2.4994	73.165 2.8805	73.139 2.8795	Table B2-6	
	63.500 2.5000	73.020 2.8750	38.10 1.500	—	NB-4024	—	96.2 21600	285 64100	44.5	0.231 0.508	—	63.500 2.5000	63.485 2.4994	73.165 2.8805	73.139 2.8795	Table B2-6	
2 5/8	66.675 2.6250	76.200 3.0000	25.40 1.000	3.30 0.130	B-4216	M-42161	66.7 15000	182 40900	23.9	0.159 0.351	0.181 0.398	66.675 2.6250	66.660 2.6244	76.213 3.0005	76.187 2.9995	Table B2-6	
2 3/4	69.850 2.7500	79.375 3.1250	15.88 0.625	—	B-4410	—	41.0 9210	98.0 22000	14.9	0.104 0.229	—	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-6	IR-4016
	69.850 2.7500	79.375 3.1250	19.050 0.7500	—	B-4412	—	50.7 11400	129 29000	20.1	0.124 0.274	—	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-6	IR-4016
	69.850 2.7500	79.375 3.1250	25.40 1.000	—	B-4416	—	68.8 15470	191 42940	29.5	0.166 0.366	—	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-6	IR-4016
	69.850 2.7500	79.375 3.1250	31.75 1.250	3.30 0.130	B-4420	M-44201	85.5 19220	252 56700	38.9	0.208 0.458	0.235 0.519	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-6	
3	76.200 3.0000	88.900 3.5000	19.05 0.750	—	NBH-4812	—	59.3 13300	127 28600	19.7	0.186 0.409	—	76.200 3.0000	76.185 2.9994	89.040 3.5055	89.014 3.5045	Table B2-6	
	76.200 3.0000	88.900 3.5000	38.10 1.500	—	NBH-4824	—	124 27900	329 74000	51.4	0.372 0.818	—	76.200 3.0000	76.185 2.9994	89.040 3.5055	89.014 3.5045	Table B2-6	
3 1/2	88.900 3.5000	101.600 4.0000	19.05 0.750	—	B-5612	—	65.1 14630	150 33700	22.9	0.212 0.468	—	88.900 3.5000	88.885 3.4994	101.613 4.0005	101.587 3.9995	Table B2-6	
5 1/2	139.700 5.5000	152.400 6.0000	19.05 0.750	—	B-8812	—	76.8 17260	231 52000	31.6	0.325 0.717	—	139.700 5.5000	139.682 5.4993	152.425 6.0010	152.375 5.9990	Table B2-6	

Note) · For information on the speed ratings, contact JTEKT.

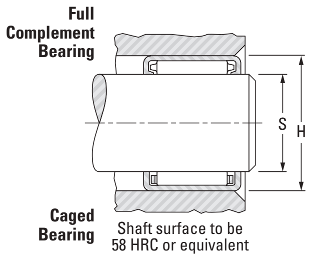
(1) IRA inner ring provides additional length if required.

FULL COMPLEMENT BEARINGS OPEN ENDS

INCH SERIES
Y SERIES



Y



Shaft Dia.	F_w	D	C	X max.	Bearing Designation	Load Ratings		Fatigue Load Limit	Approx. Wt.	Mounting Dimensions				Inspection gage
			+0 +0.000 -0.3 -0.012			Dynamic	Static			Shaft		Housing		
					Open Ends	C	C_0	C_u	Open Ends	Max.	Min.	Max.	Min.	
in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in	
5/32	**3.970** 0.1563	**7.142** 0.2812	**3.96** 0.156	—	Y-2 1/2 2 1/2	**1.29** 290	**1.14** 260	—	**0.001** 0.002	**3.970** 0.1563	**3.962** 0.1560	**7.155** 0.2817	**7.142** 0.2812	Table B2-6
3/8	**9.525** 0.3750	**14.288** 0.5625	**9.53** 0.375	—	Y-66	**6.67** 1500	**9.04** 2030	1.45	**0.005** 0.011	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6
	9.525 0.3750	**14.288** 0.5625	**19.05** 0.750	—	Y-612	**13.2** 2970	**21.6** 4860	3.5	**0.010** 0.022	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6
7/16	**11.113** 0.4375	**15.875** 0.625	**9.53** 0.375	—	Y-76	**7.29** 1640	**10.6** 2380	1.7	**0.005** 0.012	**11.113** 0.4375	**11.100** 0.4370	**15.888** 0.6255	**15.862** 0.6245	Table B2-6
9/16	**14.288** 0.5625	**19.050** 0.7500	**9.53** 0.375	—	Y-96	**8.38** 1880	**13.6** 3060	2.2	**0.007** 0.015	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6
	14.288 0.5625	**19.050** 0.7500	**12.70** 0.500	—	Y-98	**11.3** 2540	**19.9** 4470	3.2	**0.009** 0.020	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6
	14.288 0.5625	**19.050** 0.7500	**15.88** 0.625	—	Y-910	**14.0** 3150	**26.2** 5890	4.2	**0.012** 0.026	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6
	14.288 0.5625	**19.050** 0.7500	**19.05** 0.750	—	Y-912	**16.5** 3710	**32.5** 7310	5.25	**0.014** 0.031	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6
5/8	**15.875** 0.6250	**20.638** 0.8125	**15.88** 0.625	—	Y-1010	**14.8** 3330	**29.2** 6560	4.7	**0.013** 0.029	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6
11/16	**17.463** 0.6875	**22.212** 0.8745	**6.35** 0.250	—	Y-114	**5.76** 1290	**8.92** 2010	1.55	**0.005** 0.012	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-6

Note) · For information on the speed ratings, contact JTEKT.

EXTRA-PRECISION BEARINGS

INCH SERIES

Open-end full-complement mechanically retained drawn cup needle roller bearings, manufactured to inch standards, are offered with extra-precision specifications. The manufacturing tolerance of these bearings is one-third that of the standard precision bearings. In production operations, using closer tolerances on shaft and housing, they will assemble with consistently lower radial internal clearances than can be expected with the standard precision series bearings.

Extra-precision bearings are suitable for those applications requiring close control of radial play and eccentricity. They are also preferred when two bearings are mounted adjacent to each other because greater accuracy in manufacture will provide better load distribution between the bearings.

Nominal dimensions, load ratings, speed ratings and other general specifications for extra-precision bearings are the same as for the corresponding "B" or "BH" sizes of drawn cup needle roller bearings. Consequently, the data on pages B-2-48 to B-2-55 can be used in bearing size selection.

When ordering an extra-precision bearing, add the prefix letter "G" to the bearing designation. For example, after following the size selection procedure outlined in the engineering section, bearing B-1212 is selected – but extra-precision tolerances are required. These are designated by ordering a GB-1212 bearing.

To realize the advantages of the expected closer radial internal clearance of the extra-precision bearing, the user must have the capability of producing housing bore and shaft raceway diameters to the close tolerances indicated by the bearing tables on page B-2-59.

The resulting total radial internal clearance, within the installed GB-1212 extra-precision drawn cup needle roller bearing, will lie in the range from 0.005 mm to 0.030 mm (0.0002 in to 0.0012 in)

Inspection dimensions for the extra-precision bearings are given in table on page B-2-58. Note that these bearings must be inspected while mounted in the specified ring gage. Bearing bores are checked with "go" and "no go" plug gages. The "go" gage size is the minimum diameter inside the needle rollers. The "no go" gage size is 0.002 mm (0.0001 in) larger than the maximum diameter inside the needle rollers.

Procedures for selecting ring and plug gage dimensions are the same as for those involving standard precision needle roller bearings – except that the ring gage diameters and diameters inside the needle rollers must be drawn from the table on page B-2-58.

Table B2-8. Inspection for extra-precision drawn cup needle roller bearings – inch series

Nominal shaft diameter	Gaging		
	Ring gage	Diameter inside needle rollers	
		Max.	Min.
mm in	mm in	mm in	mm in
3.175 1/8	**6.281** 0.2473	**3.200** 0.1260	**3.190** 0.1256
3.970 5/32	**7.074** 0.2785	**3.995** 0.1573	**3.985** 0.1569
4.763 3/16	**8.611** 0.3390	**4.788** 0.1885	**4.777** 0.1881
6.350 1/4	**10.993** 0.4328	**6.375** 0.2510	**6.365** 0.2506
7.938 5/16	**12.581** 0.4953	**7.963** 0.3135	**7.953** 0.3131
H 7.938 H 5/16	**14.168** 0.5578	**7.963** 0.3135	**7.953** 0.3131
9.525 3/8	**14.168** 0.5578	**9.550** 0.3760	**9.540** 0.3756
H 9.525 H 3/8	**15.756** 0.6203	**9.550** 0.3760	**9.540** 0.3756
11.113 7/16	**15.756** 0.6203	**11.138** 0.4385	**11.127** 0.4381
H 11.113 H 7/16	**17.343** 0.6828	**11.138** 0.4385	**11.127** 0.4381
12.700 1/2	**17.343** 0.6828	**12.725** 0.5010	**12.715** 0.5006
H 12.700 H 1/2	**18.931** 0.7453	**12.725** 0.5010	**12.715** 0.5006
14.288 9/16	**18.931** 0.7453	**14.313** 0.5635	**14.303** 0.5631
H 14.288 H 9/16	**20.518** 0.8078	**14.313** 0.5635	**14.303** 0.5631
15.875 5/8	**20.518** 0.8078	**15.900** 0.6260	**15.890** 0.6256
H 15.875 H 5/8	**22.106** 0.8703	**15.900** 0.6260	**15.890** 0.6256
17.463 11/16	**22.106** 0.8703	**17.488** 0.6885	**17.478** 0.6881
H 17.463 H 11/16	**23.693** 0.9328	**17.488** 0.6885	**17.478** 0.6881
19.050 3/4	**25.273** 0.9950	**19.068** 0.7507	**19.058** 0.7503
H 19.050 H 3/4	**26.861** 1.0575	**19.068** 0.7507	**19.058** 0.7503
20.638 13/16	**26.861** 1.0575	**20.655** 0.8132	**20.645** 0.8128
H 20.638 H 13/16	**28.448** 1.1200	**20.655** 0.8132	**20.645** 0.8128
22.225 7/8	**28.448** 1.1200	**22.243** 0.8757	**22.233** 0.8753
H 22.225 H 7/8	**30.036** 1.1825	**22.243** 0.8757	**22.233** 0.8753
23.813 15/16	**30.036** 1.1825	**23.830** 0.9382	**23.820** 0.9378
25.400 1	**31.623** 1.2450	**25.418** 1.0007	**25.408** 1.0003
H 25.400 H 1	**33.211** 1.3075	**25.418** 1.0007	**25.408** 1.0003
26.988 1 1/16	**33.211** 1.3075	**27.005** 1.0632	**26.995** 1.0628
28.575 1 1/8	**34.798** 1.3700	**28.593** 1.1257	**28.583** 1.1253
H 28.575 H 1 1/8	**37.973** 1.4950	**28.593** 1.1257	**28.583** 1.1253
30.163 1 3/16	**37.973** 1.4950	**30.180** 1.1882	**30.170** 1.1878
31.750 1 1/4	**37.973** 1.4950	**31.768** 1.2507	**31.758** 1.2503
H 31.750 H 1 1/4	**41.148** 1.6200	**31.768** 1.2507	**31.758** 1.2503
33.338 1 5/16	**41.148** 1.6200	**33.355** 1.3132	**33.345** 1.3128
34.925 1 3/8	**41.148** 1.6200	**34.943** 1.3757	**34.933** 1.3753
H 34.925 H 1 3/8	**44.323** 1.7450	**34.943** 1.3757	**34.933** 1.3753
38.100 1 1/2	**47.498** 1.8700	**38.120** 1.5008	**38.108** 1.5003
41.275 1 5/8	**50.673** 1.9950	**41.295** 1.6258	**41.283** 1.6253
44.450 1 3/4	**53.848** 2.1200	**44.470** 1.7508	**44.458** 1.7503
47.625 1 7/8	**57.023** 2.2450	**47.645** 1.8758	**47.633** 1.8753
50.800 2	**60.198** 2.3700	**50.820** 2.0008	**50.808** 2.0003
H 52.388 H 2 1/16	**64.166** 2.5262	**52.408** 2.0633	**52.395** 2.0628
53.975 2 1/8	**63.373** 2.4950	**53.995** 2.1258	**53.983** 2.1253
57.150 2 1/4	**66.548** 2.6200	**57.170** 2.2508	**57.158** 2.2503
66.675 2 5/8	**76.073** 2.9950	**66.700** 2.6260	**66.685** 2.6254
69.850 2 3/4	**79.248** 3.1200	**69.875** 2.7510	**69.860** 2.7504
88.900 3 1/2	**101.473** 3.9950	**88.925** 3.5010	**88.710** 3.5004

Table B2-9. Mounting dimensions for extra-precision drawn cup needle roller bearings – inch series

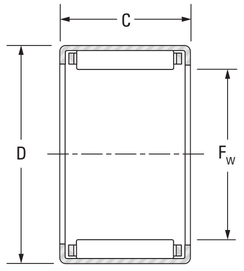
Bearing bore designation	Mounting					
	Nominal bore	Nominal O.D.	Shaft raceway diameter		Housing bore	
			Max.	Min.	Max.	Min.
	mm in	mm in	mm in	mm in	mm in	mm in
GB-2	**3.175** 0.1250	**6.350** 0.2500	**3.178** 0.1251	**3.170** 0.1248	**6.281** 0.2473	**6.274** 0.2470
GB-2 1/2	**3.967** 0.1562	**7.142** 0.2812	**3.973** 0.1564	**3.965** 0.1561	**7.074** 0.2785	**7.066** 0.2782
GB-3	**4.763** 0.1875	**8.733** 0.3438	**4.765** 0.1876	**4.757** 0.1873	**8.611** 0.3390	**8.603** 0.3387
GB-4	**6.350** 0.2500	**11.113** 0.4375	**6.353** 0.2501	**6.345** 0.2498	**10.993** 0.4328	**10.986** 0.4325
GB-5	**7.938** 0.3125	**12.700** 0.5000	**7.940** 0.3126	**7.932** 0.3123	**12.581** 0.4953	**12.573** 0.4950
GBH-5	**7.938** 0.3125	**14.288** 0.5625	**7.940** 0.3126	**7.932** 0.3123	**14.168** 0.5578	**14.161** 0.5575
GB-6	**9.525** 0.3750	**14.288** 0.5625	**9.528** 0.3751	**9.520** 0.3748	**14.168** 0.5578	**14.161** 0.5575
GBH-6	**9.525** 0.3750	**15.875** 0.6250	**9.528** 0.3751	**9.520** 0.3748	**15.756** 0.6203	**15.748** 0.6200
GB-7	**11.113** 0.4375	**15.875** 0.6250	**11.115** 0.4376	**11.107** 0.4373	**15.756** 0.6203	**15.748** 0.6200
GBH-7	**11.113** 0.4375	**17.463** 0.6875	**11.115** 0.4376	**11.107** 0.4373	**17.343** 0.6828	**17.336** 0.6825
GB-8	**12.700** 0.5000	**17.463** 0.6875	**12.703** 0.5001	**12.695** 0.4998	**17.343** 0.6828	**17.336** 0.6825
GBH-8	**12.700** 0.5000	**19.050** 0.7500	**12.703** 0.5001	**12.695** 0.4998	**18.931** 0.7453	**18.923** 0.7450
GB-9	**14.288** 0.5625	**19.050** 0.7500	**14.290** 0.5626	**14.282** 0.5623	**18.931** 0.7453	**18.923** 0.7450
GBH-9	**14.288** 0.5625	**20.638** 0.8125	**14.290** 0.5626	**14.282** 0.5623	**20.518** 0.8078	**20.511** 0.8075
GB-10	**15.875** 0.6250	**20.638** 0.8125	**14.878** 0.6251	**15.870** 0.6248	**20.518** 0.8078	**20.511** 0.8075
GBH-10	**15.875** 0.6250	**22.225** 0.8750	**14.878** 0.6251	**15.870** 0.6248	**22.106** 0.8703	**22.098** 0.8700
GB-11	**17.463** 0.6875	**22.225** 0.8750	**17.465** 0.6876	**17.457** 0.6873	**22.106** 0.8703	**22.098** 0.8700
GBH-11	**17.463** 0.6875	**23.813** 0.9375	**17.465** 0.6876	**17.457** 0.6873	**23.693** 0.9328	**23.686** 0.9325
GB-12	**19.050** 0.7500	**25.400** 1.0000	**19.053** 0.7501	**19.045** 0.7498	**25.281** 0.9953	**25.273** 0.9950
GBH-12	**19.050** 0.7500	**26.988** 1.0625	**19.053** 0.7501	**19.045** 0.7498	**26.868** 1.0578	**26.861** 1.0575
GB-13	**20.638** 0.8125	**26.988** 1.0625	**20.640** 0.8126	**20.632** 0.8123	**26.868** 1.0578	**26.861** 1.0575
GBH-13	**20.638** 0.8125	**28.575** 1.1250	**20.640** 0.8126	**20.632** 0.8123	**28.456** 1.1203	**28.448** 1.1200
GB-14	**22.225** 0.8750	**28.575** 1.1250	**22.228** 0.8751	**22.220** 0.8748	**28.456** 1.1203	**28.448** 1.1200
GBH-14	**22.225** 0.8750	**30.163** 1.1875	**22.228** 0.8751	**22.220** 0.8748	**30.046** 1.1829	**30.036** 1.1825
GB-15	**23.813** 0.9375	**30.163** 1.1875	**23.815** 0.9376	**23.807** 0.9373	**30.046** 1.1829	**30.036** 1.1825
GB-16	**25.400** 1.0000	**31.750** 1.2500	**25.403** 1.0001	**25.395** 0.9998	**31.633** 1.2454	**31.623** 1.2450
GBH-16	**25.400** 1.0000	**33.338** 1.3125	**25.403** 1.0001	**25.395** 0.9998	**33.221** 1.3079	**33.211** 1.3075
GB-17	**26.988** 1.0625	**33.338** 1.3125	**26.990** 1.0626	**26.982** 1.0623	**33.221** 1.3079	**33.211** 1.3075
GB-18	**28.575** 1.1250	**34.925** 1.3750	**28.578** 1.1251	**28.570** 1.1248	**34.808** 1.3704	**34.798** 1.3700
GBH-18	**28.575** 1.1250	**38.100** 1.5000	**28.578** 1.1251	**28.570** 1.1248	**37.986** 1.4955	**37.973** 1.4950
GB-19	**30.163** 1.1875	**38.100** 1.5000	**30.165** 1.1876	**30.157** 1.1873	**37.986** 1.4955	**37.973** 1.4950
GB-20	**31.750** 1.2500	**38.100** 1.5000	**31.753** 1.2501	**31.745** 1.2498	**37.986** 1.4955	**37.973** 1.4950
GBH-20	**31.750** 1.2500	**41.275** 1.6250	**31.753** 1.2501	**31.745** 1.2498	**41.161** 1.6205	**41.148** 1.6200
GB-21	**33.338** 1.3125	**41.275** 1.6250	**33.340** 1.3126	**33.332** 1.3123	**41.161** 1.6205	**41.148** 1.6200
GB-22	**34.925** 1.3750	**41.275** 1.6250	**34.925** 1.3750	**34.917** 1.3747	**41.161** 1.6205	**41.148** 1.6200
GBH-22	**34.925** 1.3750	**44.450** 1.7500	**34.925** 1.3750	**34.917** 1.3747	**44.336** 1.7455	**44.323** 1.7450
GB-24	**38.100** 1.5000	**47.625** 1.8750	**38.100** 1.5000	**38.092** 1.4997	**47.511** 1.8705	**47.498** 1.8700
GB-26	**41.275** 1.6250	**50.800** 2.0000	**41.275** 1.6250	**41.267** 1.6247	**50.686** 1.9955	**50.673** 1.9950
GB-28	**44.450** 1.7500	**53.975** 2.1250	**44.450** 1.7500	**44.442** 1.7497	**53.861** 2.1205	**53.848** 2.1200
GB-30	**47.625** 1.8750	**57.150** 2.2500	**47.625** 1.8750	**47.617** 1.8747	**57.036** 2.2455	**57.023** 2.2450
GB-32	**50.800** 2.0000	**60.325** 2.3750	**50.800** 2.0000	**50.792** 1.9997	**60.211** 2.3705	**60.198** 2.3700
GBH-33	**52.388** 2.0625	**64.293** 2.5312	**52.385** 2.0624	**52.377** 2.0621	**64.178** 2.5267	**64.166** 2.5262
GB-34	**53.975** 2.1250	**63.500** 2.5000	**53.973** 2.1249	**53.965** 2.1246	**63.386** 2.4955	**63.373** 2.4950
GB-36	**57.150** 2.2500	**66.675** 2.6250	**57.148** 2.2499	**57.140** 2.2496	**66.561** 2.6205	**66.548** 2.6200
GB-42	**66.675** 2.6250	**76.200** 3.0000	**66.670** 2.6248	**66.662** 2.6245	**76.088** 2.9956	**76.073** 2.9950
GB-44	**69.850** 2.7500	**79.375** 3.1250	**69.845** 2.7498	**69.837** 2.7495	**79.263** 3.1206	**79.248** 3.1200
GB-56	**88.900** 3.5000	**101.600** 4.0000	**88.895** 3.4998	**88.887** 3.4995	**101.488** 3.9956	**101.473** 3.9950

NOTE

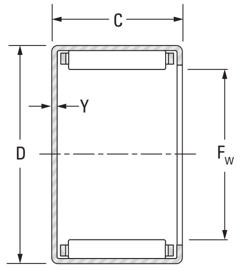
Check for availability as not every size may be in production.

CAGED BEARINGS – OPEN ENDS, CLOSED ONE END

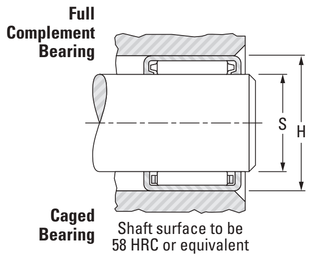
INCH SERIES
J, JH, MJ- 1, MJH- 1 SERIES



J, JH



MJ- 1, MJH- 1



Shaft Dia.	F_w	D	C	Y max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 **-0.3** -0.012				Dynamic	Static						Shaft		Housing			
					Open Ends	Closed One End	C	C_0		Grease	Oil	Open Ends	Closed One End	Max.	Min.	Max.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		kN	min^{-1}		**kg** lbs		**mm** in	**mm** in	**mm** in	**mm** in		
1/8	**3.175** 0.1250	**6.350** 0.2500	**4.78** 0.188	—	JP-23-F	—	**0.90** 200	**0.61** 140	0.100	33000	51000	**0.001** 0.001	—	**3.175** 0.1250	**3.167** 0.1247	**6.363** 0.2505	**6.350** 0.2500	Table B2-6	
	3.175 0.1250	**6.350** 0.2500	**6.35** 0.250	—	JP-24-F	—	**1.33** 300	**1.01** 230	0.150	33000	51000	**0.001** 0.001	—	**3.175** 0.1250	**3.167** 0.1247	**6.363** 0.2505	**6.350** 0.2500	Table B2-6	
5/32	**3.970** 0.1563	**7.142** 0.2812	**4.78** 0.188	—	JP-2 1/2 3F	—	**0.91** 200	**0.62** 140	0.110	31000	47000	**0.001** 0.001	—	**3.970** 0.1563	**3.962** 0.1560	**7.155** 0.2817	**7.142** 0.2812	Table B2-6	
3/16	**4.763** 0.1875	**8.733** 0.3438	**4.77** 0.188	—	JP-33-F	—	**1.07** 240	**0.73** 160	0.120	25000	38000	**0.001** 0.002	—	**4.763** 0.1875	**4.755** 0.1872	**8.730** 0.3437	**8.717** 0.3432	Table B2-6	
	4.763 0.1875	**8.733** 0.3438	**6.35** 0.250	—	JP-34-F	—	**1.72** 390	**1.34** 300	0.200	25000	38000	**0.001** 0.002	—	**4.763** 0.1875	**4.755** 0.1872	**8.730** 0.3437	**8.717** 0.3432	Table B2-6	
	4.763 0.1875	**8.733** 0.3438	**9.53** 0.375	**1.02** 0.040	J-36	MJ-361	**2.28** 510	**1.92** 430	0.290	25000	38000	**0.002** 0.004	**0.002** 0.005	**4.763** 0.1875	**4.755** 0.1872	**8.730** 0.3437	**8.717** 0.3432	Table B2-6	
1/4	**6.350** 0.2500	**11.113** 0.4375	**7.92** 0.312	**1.02** 0.040	J-45	MJ-451	**2.21** 500	**1.74** 390	0.300	20000	30000	**0.003** 0.006	**0.003** 0.007	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	Table B2-6	
	6.350 0.2500	**11.113** 0.4375	**11.13** 0.438	**1.02** 0.040	J-47	MJ-471	**3.40** 760	**3.01** 680	0.450	20000	30000	**0.004** 0.008	**0.004** 0.009	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	Table B2-6	
5/16	**7.938** 0.3125	**12.700** 0.5000	**7.92** 0.312	—	J-55	—	**2.40** 540	**2.01** 450	0.340	18000	28000	**0.003** 0.007	—	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	Table B2-6	
	7.938 0.3125	**12.700** 0.5000	**11.13** 0.438	**1.02** 0.040	J-57	MJ-571	**4.03** 910	**3.92** 880	0.590	18000	28000	**0.004** 0.009	**0.005** 0.011	**7.938** 0.3125	**7.925** 0.3120	**12.713** 0.5005	**12.687** 0.4995	Table B2-6	
	7.938 0.3125	**14.288** 0.5625	**11.13** 0.438	**1.02** 0.040	JH-57	MJH-571	**4.65** 1050	**3.76** 850	0.570	14000	22000	**0.006** 0.013	**0.007** 0.016	**7.938** 0.3125	**7.925** 0.3120	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	
3/8	**9.525** 0.3750	**14.288** 0.5625	**7.92** 0.312	**1.02** 0.040	J-65	MJ-651	**2.73** 610	**2.49** 560	0.430	18000	27000	**0.004** 0.008	**0.004** 0.009	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	IRA-3
	9.525 0.3750	**14.288** 0.5625	**9.53** 0.375	**1.02** 0.040	J-66	MJ-661	**3.53** 790	**3.46** 780	0.530	18000	27000	**0.004** 0.009	**0.005** 0.010	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	IRA-3
	9.525 0.3750	**14.288** 0.5625	**12.70** 0.500	**1.02** 0.040	J-68	MJ-681	**5.22** 1170	**5.72** 1290	0.860	18000	27000	**0.005** 0.012	**0.006** 0.013	**9.525** 0.3750	**9.512** 0.3745	**14.300** 0.5630	**14.275** 0.5620	Table B2-6	IRA-3
	9.525 0.3750	**15.875** 0.6250	**12.70** 0.500	—	JH-68	—	**6.59** 1480	**6.08** 1370	0.920	13000	20000	**0.008** 0.017	—	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	Table B2-6	IRA-3
7/16	**11.113** 0.4375	**15.875** 0.6250	**12.70** 0.500	**1.02** 0.040	J-78	MJ-781	**6.34** 1430	**7.67** 1720	1.15	17000	26000	**0.006** 0.014	**0.007** 0.016	**11.113** 0.4375	**11.100** 0.4370	**15.888** 0.6255	**15.862** 0.6245	Table B2-6	
	11.113 0.4375	**17.463** 0.6875	**12.70** 0.500	—	JH-78	—	**7.10** 1600	**6.89** 1550	1.05	13000	19000	**0.009** 0.019	—	**11.113** 0.4375	**11.100** 0.4370	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	
1/2	**12.700** 0.5000	**17.463** 0.6875	**7.92** 0.312	**1.02** 0.040	J-85	MJ-851	**3.46** 780	**3.66** 820	0.630	16000	25000	**0.005** 0.010	**0.005** 0.012	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	IRA-5
	12.700 0.5000	**17.463** 0.6875	**9.53** 0.375	**1.02** 0.040	J-86	MJ-861	**4.67** 1050	**5.39** 1210	0.830	16000	25000	**0.005** 0.011	**0.006** 0.013	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	IRA-5
	12.700 0.5000	**17.463** 0.6875	**12.70** 0.500	**1.02** 0.040	J-88	MJ-881	**6.32** 1420	**7.92** 1780	1.20	16000	25000	**0.007** 0.015	**0.008** 0.018	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	IRA-5
	12.700 0.5000	**17.463** 0.6875	**19.05** 0.750	—	J-812	—	**10.2** 2290	**14.7** 3300	2.25	16000	25000	**0.010** 0.023	—	**12.700** 0.5000	**12.687** 0.4995	**17.475** 0.6880	**17.450** 0.6870	Table B2-6	
	12.700 0.5000	**19.050** 0.7500	**11.13** 0.438	**1.02** 0.040	JH-87	MJH-871	**6.39** 1440	**6.20** 1390	0.950	12000	19000	**0.009** 0.019	**0.010** 0.023	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IRA-5
	12.700 0.5000	**19.050** 0.7500	**12.70** 0.500	**1.02** 0.040	JH-88	MJH-881	**7.56** 1700	**7.69** 1730	1.15	12000	19000	**0.010** 0.022	**0.012** 0.026	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IRA-5
	12.700 0.5000	**19.050** 0.7500	**19.05** 0.750	—	JH-812	—	**12.3** 2770	**14.4** 3240	2.25	12000	19000	**0.015** 0.032	—	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	
9/16	**14.288** 0.5625	**19.050** 0.750	**11.13** 0.438	**1.02** 0.040	J-97	MJ-971	**5.47** 1230	**6.80** 1530	1.05	16000	25000	**0.007** 0.016	**0.009** 0.019	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-68
	14.288 0.5625	**19.050** 0.7500	**12.70** 0.500	**1.02** 0.040	J-98	MJ-981	**6.23** 1400	**8.03** 1810	1.20	16000	25000	**0.008** 0.017	**0.009** 0.020	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-68
	14.288 0.5625	**19.050** 0.7500	**15.88** 0.625	—	J-910	—	**8.27** 1860	**11.6** 2610	1.75	16000	25000	**0.010** 0.021	—	**14.288** 0.5625	**14.275** 0.5620	**19.063** 0.7505	**19.037** 0.7495	Table B2-6	IR-612(1)
	14.288 0.5625	**20.638** 0.8125	**12.70** 0.500	**1.02** 0.040	JH-98	MJH-981	**7.98** 1790	**8.49** 1910	1.30	12000	18000	**0.011** 0.025	**0.014** 0.030	**14.288** 0.5625	**14.275** 0.5620	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-68
5/8	**15.875** 0.6250	**20.638** 0.8125	**12.70** 0.500	**1.02** 0.040	J-108	MJ-1081	**6.71** 1510	**9.13** 2050	1.40	13000	21000	**0.009** 0.019	**0.010** 0.023	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-68-1
	15.875 0.6250	**20.638** 0.8125	**15.88** 0.625	**1.02** 0.040	J-1010	MJ-10101	**8.80** 1980	**12.9** 2900	1.95	13000	21000	**0.010** 0.023	**0.013** 0.028	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-612-1
	15.875 0.6250	**20.638** 0.8125	**19.05** 0.750	**1.02** 0.040	J-1012	MJ-10121	**11.8** 2650	**18.9** 4250	2.90	13000	21000	**0.013** 0.028	**0.015** 0.033	**15.875** 0.6250	**15.862** 0.6245	**20.650** 0.8130	**20.625** 0.8120	Table B2-6	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**15.88** 0.625	**1.02** 0.040	JH-1010	MJH-10101	**11.6** 2610	**14.1** 3170	2.15	14000	21000	**0.015** 0.032	**0.017** 0.037	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	IR-612-1
	15.875 0.6250	**22.212** 0.8745	**25.40** 1.000	**1.02** 0.040	JH-1016	MJH-10161	**19.8** 4450	**28.1** 6320	4.35	14000	21000	**0.024** 0.052	**0.028** 0.062	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	
11/16	**17.463** 0.6875	**22.212** 0.8745	**19.05** 0.750	**1.02** 0.040	J-1112	MJ-11121	**12.5** 2800	**20.9** 4700	3.20	12000	19000	**0.014** 0.030	**0.016** 0.036	**17.463** 0.6875	**17.450** 0.6870	**22.238** 0.8755	**22.212** 0.8745	Table B2-6	
	17.463 0.6875	**23.813** 0.9375	**15.88** 0.625	**1.02** 0.040	JH-1110	MJH-11101	**12.1** 2710	**15.2** 3420	2.30	13000	19000	**0.016** 0.035	**0.019** 0.042	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-6	
	17.463 0.6875	**23.813** 0.9375	**19.05** 0.750	—	JH-1112	—	**16.1** 3620	**22.2** 4990	3.10	13000	19000	**0.019** 0.042	—	**17.463** 0.6875	**17.450** 0.6870	**23.825** 0.9380	**23.800** 0.9370	Table B2-6	
3/4	**19.050** 0.7500	**25.400** 1.0000	**9.53** 0.375	—	J-126	—	**6.49** 1460	**7.05** 1580	1.10	11000	18000	**0.010** 0.022	—	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-6	IR-88
	19.050 0.7500	**25.400** 1.0000	**12.70** 0.500	—	J-128	—	**9.94** 2230	**12.2** 2740	1.85	11000	18000	**0.014** 0.030	—	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-6	IR-88
	19.050 0.7500	**25.400** 1.0000	**15.88** 0.625	**1.02** 0.040	J-1210	MJ-12101	**12.5** 2810	**16.3** 3670	2.50	11000	18000	**0.017** 0.038	**0.020** 0.045	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-6	IR-812(1)
	19.050 0.7500	**25.400** 1.0000	**19.05** 0.750	**1.02** 0.040	J-1212	MJ-12121	**15.5** 3490	**21.6** 4860	3.35	11000	18000	**0.020** 0.045	**0.025** 0.054	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	Table B2-6	IR-812(1)
	19.050 0.7500	**26.988** 1.0625	**19.05** 0.750	**1.02** 0.040	JH-1212	MJH-12121	**19.1** 4290	**23.6** 5300	3.70	12000	18000	**0.026** 0.058	**0.031** 0.069	**19.050** 0.7500	**19.037** 0.7495	**27.000** 1.0630	**26.975** 1.0620	Table B2-6	IR-812(1)

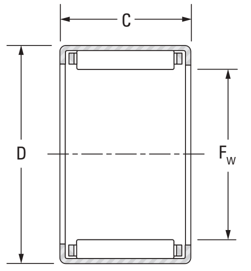
(1) IRA inner ring provides additional length if required.

Continued on next page.

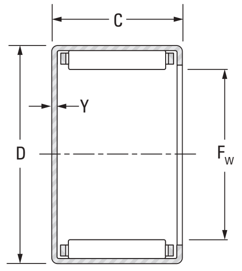
CAGED BEARINGS – OPEN ENDS, CLOSED ONE END

INCH SERIES

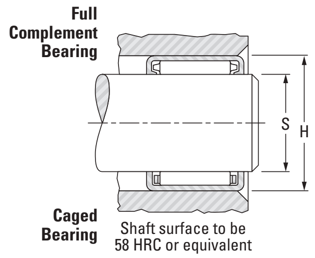
J, JH, MJ- 1, MJH- 1 SERIES



J, JH



MJ- 1, MJH- 1

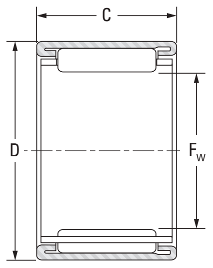


Shaft Dia.	F_w	D	C	Y max.	Bearing Designation		Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.		Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 -0.3 -0.012		Open Ends	Closed One End	Dynamic	Static		Grease	Oil	Open Ends	Closed One End	Shaft		Housing			
							C	C_0						Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs		mm in	mm in	mm in	mm in		
$^{13}/_{16}$	20.638 0.8125	26.988 1.0625	22.23 0.875	—	J-1314	—	19.3 4340	29.31 6590	4.55	10000	16000	0.025 0.056	—	20.638 0.8125	20.625 0.8120	27.000 1.0630	26.975 1.0620	Table B2-6	
	20.638 0.8125	28.575 1.1250	19.05 0.750	1.27 0.050	JH-1312	MJH-13121	18.8 4220	24.5 5510	3.85	11000	16000	0.028 0.062	0.034 0.074	20.638 0.8125	20.625 0.8120	28.588 1.1255	28.562 1.1245	Table B2-6	
$^{7}/_{8}$	22.225 0.8750	28.575 1.1250	9.53 0.375	—	J-146	—	7.20 1620	8.43 1900	1.30	9700	15000	0.012 0.026	—	22.225 0.8750	22.212 0.8745	28.588 1.1255	28.562 1.1245	Table B2-6	IR-1012(1)
	22.225 0.8750	28.575 1.1250	12.70 0.500	—	J-148	—	10.9 2460	14.5 3260	2.20	9700	15000	0.015 0.034	—	22.225 0.8750	22.212 0.8745	28.588 1.1255	28.562 1.1245	Table B2-6	IR-1012(1)
	22.225 0.8750	28.575 1.1250	19.05 0.750	1.02 0.040	J-1412	MJ-14121	17.9 4020	24.5 5510	4.20	9700	15000	0.024 0.052	0.028 0.062	22.225 0.8750	22.212 0.8745	28.588 1.1255	28.562 1.1245	Table B2-6	IR-1012(1)
	22.225 0.8750	28.575 1.1250	25.40 1.000	1.02 0.040	J-1416	MJ-14161	23.7 5320	39.0 8760	6.05	9700	15000	0.031 0.069	0.059 0.129	22.225 0.8750	22.212 0.8745	28.588 1.1255	28.562 1.1245	Table B2-6	IR-1016
	22.225 0.8750	30.163 1.1875	19.05 0.750	1.27 0.050	JH-1412	MJH-14121	18.3 4120	24.5 5510	3.75	9800	15000	0.030 0.066	0.036 0.079	22.225 0.8750	22.212 0.8745	30.175 1.1880	30.150 1.1870	Table B2-6	IR-1012(1)
	22.225 0.8750	30.163 1.1875	25.40 1.000	1.27 0.050	JH-1416	MJH-14161	25.4 5710	37.4 8400	5.80	9800	15000	0.040 0.089	0.048 0.106	22.225 0.8750	22.212 0.8745	30.175 1.1880	30.150 1.1870	Table B2-6	IR-1016
1	25.400 1.0000	31.750 1.2500	19.05 0.750	—	J-1612	—	18.1 4070	28.8 6480	4.45	8400	13000	0.026 0.058	—	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	Table B2-6	IR-1212
	25.400 1.0000	31.750 1.2500	25.40 1.000	1.02 0.040	J-1616	MJ-16161	25.0 5610	43.4 9760	6.75	8400	13000	0.035 0.077	0.042 0.092	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	Table B2-6	IR-1216(1)
	25.400 1.0000	33.338 1.3125	19.05 0.750	1.27 0.050	JH-1612	MJH-16121	20.7 4650	29.6 6650	4.60	8500	13000	0.034 0.074	0.040 0.088	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-1212
	25.400 1.0000	33.338 1.3125	25.40 1.000	1.27 0.050	JH-1616	MJH-16161	27.6 6200	42.9 9640	6.65	8500	13000	0.045 0.099	0.054 0.119	25.400 1.0000	25.387 0.9995	33.350 1.3130	33.325 1.3120	Table B2-6	IR-1216(1)
$1\ ^{1}/_{8}$	28.575 1.1250	34.925 1.3750	12.70 0.500	1.02 0.040	J-188	MJ-1881	11.7 2620	16.9 3800	2.55	7400	11000	0.020 0.043	0.023 0.050	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-6	IR-1416(1)
	28.575 1.1250	34.925 1.3750	19.05 0.750	1.02 0.040	J-1812	MJ-18121	19.0 4280	31.8 7140	4.90	7400	11000	0.029 0.064	0.035 0.076	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-6	IR-1416(1)
	28.575 1.1250	34.925 1.3750	25.40 1.000	1.02 0.040	J-1816	MJ-18161	26.2 5880	47.8 10750	7.40	7400	11000	0.039 0.086	0.047 0.103	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	Table B2-6	IR-1416(1)
	28.575 1.1250	38.100 1.5000	19.05 0.750	1.27 0.050	JH-1812	MJH-18121	23.3 5240	31.3 7040	4.75	7600	12000	0.046 0.101	0.055 0.121	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1416(1)
	28.575 1.1250	38.100 1.5000	25.40 1.000	1.27 0.050	JH-1816	MJH-18161	33.1 7450	49.2 11060	7.70	7600	12000	0.061 0.135	0.074 0.162	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1416(1)
$1\ ^{1}/_{8}$	28.575 1.1250	38.100 1.5000	28.58 1.125	1.27 0.050	JH-1818	MJH-18181	36.3 8160	55.3 12430	8.60	7600	12000	0.069 0.152	0.082 0.181	28.575 1.1250	28.562 1.1245	38.113 1.5005	38.087 1.4995	Table B2-6	
$1\ ^{1}/_{4}$	31.750 1.2500	38.100 1.5000	19.05 0.750	1.02 0.040	J-2012	MJ-20121	19.8 4460	34.7 7800	5.35	6600	10000	0.036 0.080	0.043 0.095	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1612
	31.750 1.2500	38.100 1.5000	25.40 1.000	1.02 0.040	J-2016	MJ-20161	28.8 6480	56.3 12660	8.70	6600	10000	0.043 0.094	0.051 0.113	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	Table B2-6	IR-1616(1)
	31.750 1.2500	41.275 1.6250	19.05 0.750	—	JH-2012	—	24.1 5420	34.0 7640	5.80	6800	10000	0.050 0.111	—	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1612
	31.750 1.2500	41.275 1.6250	25.40 1.000	—	JH-2016	—	34.0 7640	52.8 11870	8.20	6800	10000	0.067 0.148	—	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1616(1)
	31.750 1.2500	41.275 1.6250	31.75 1.250	—	JH-2020	—	43.4 9750	72.3 16250	10.8	6800	10000	0.084 0.185	—	31.750 1.2500	31.737 1.2495	41.288 1.6255	41.262 1.6245	Table B2-6	
$1\ ^{3}/_{8}$	34.925 1.3750	41.275 1.6250	12.70 0.500	1.02 0.040	J-228	MJ-2281	14.0 3140	22.9 5150	3.50	6000	9200	0.024 0.052	0.028 0.062	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1812
	34.925 1.3750	41.275 1.6250	19.05 0.750	—	J-2212	—	22.8 5130	43.0 9660	6.65	6000	9200	0.035 0.077	—	34.925 1.3750	34.912 1.3745	41.288 1.6255	41.262 1.6245	Table B2-6	IR-1812
	34.925 1.3750	44.450 1.7500	19.05 0.750	1.27 0.050	JH-2212	MJH-22121	26.2 5900	38.4 8640	5.90	6100	9400	0.055 0.121	0.065 0.144	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-6	IR-1812
	34.925 1.3750	44.450 1.7500	25.40 1.000	1.27 0.050	JH-2216	MJH-22161	36.5 8210	58.8 13220	9.20	6100	9400	0.073 0.161	0.087 0.192	34.925 1.3750	34.912 1.3745	44.463 1.7505	44.437 1.7495	Table B2-6	IR-1816
$1\ ^{1}/_{2}$	38.100 1.5000	47.625 1.8750	19.05 0.750	1.27 0.050	J-2412	MJ-24121	29.9 6720	47.1 10590	7.40	5600	8600	0.059 0.131	0.094 0.208	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1916
	38.100 1.5000	47.625 1.8750	25.40 1.000	1.27 0.050	J-2416	MJ-24161	39.3 8840	66.9 15040	10.4	5600	8600	0.079 0.174	0.094 0.208	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1916
	38.100 1.5000	47.625 1.8750	31.75 1.250	—	J-2420	—	49.5 11130	90.0 20230	14.0	5600	8600	0.099 0.218	—	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	Table B2-6	IR-1920
$1\ ^{5}/_{8}$	41.275 1.6250	50.800 2.0000	15.88 0.625	—	J-2610	—	26.1 5870	41.0 9210	6.25	5100	7900	0.053 0.117	—	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-6	IR-2020(1)
	41.275 1.6250	50.800 2.0000	25.40 1.000	1.27 0.050	J-2616	M-26161	39.3 8830	69.0 15500	10.8	5100	7900	0.085 0.187	0.101 0.223	41.275 1.6250	41.262 1.6245	50.813 2.0005	50.787 1.9995	Table B2-6	IR-2020(1)
$1\ ^{3}/_{4}$	44.450 1.7500	53.975 2.1250	19.05 0.750	1.27 0.050	J-2812	MJ-28121	29.6 6650	49.3 11080	7.45	4700	7300	0.068 0.150	0.081 0.179	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-6	IR-2316
	44.450 1.7500	53.975 2.1250	25.40 1.000	1.27 0.050	J-2816	MJ-28161	40.1 9010	72.9 16390	11.4	4700	7300	0.091 0.200	0.108 0.239	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-6	IR-2316
	44.450 1.7500	53.975 2.1250	38.10 1.500	1.27 0.050	J-2824	MJ-28241	59.8 13440	122 27400	18.9	4700	7300	0.136 0.300	0.162 0.358	44.450 1.7500	44.437 1.7495	53.988 2.1255	53.962 2.1245	Table B2-6	IR-2324
$1\ ^{7}/_{8}$	47.625 1.8750	57.150 2.2500	25.40 1.000	1.27 0.050	J-3016	MJ-30161	41.1 9240	76.0 17080	11.9	4400	6800	0.097 0.213	0.115 0.254	47.625 1.8750	47.612 1.8745	57.163 2.2505	57.137 2.2495	Table B2-6	
2	50.800 2.0000	60.325 2.3750	25.40 1.000	1.27 0.050	J-3216	MJ-32161	42.4 9530	81.2 18250	12.7	4100	6300	0.103 0.226	0.137 0.301	50.800 2.0000	50.785 1.9994	60.338 2.3755	60.312 2.3745	Table B2-6	
$2\ ^{1}/_{4}$	57.150 2.2500	66.675 2.6250	19.05 0.750	—	J-3612	—	35.4 7960	65.9 14810	10.0	3600	5600	0.086 0.189	—	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-6	
	57.150 2.2500	66.675 2.6250	25.40 1.000	—	J-3616	—	46.1 10360	92.3 20750	14.4	3600	5600	0.114 0.252	—	57.150 2.2500	57.135 2.2494	66.688 2.6255	66.662 2.6245	Table B2-6	
$2\ ^{3}/_{4}$	69.850 2.7500	79.375 3.1250	19.05 0.750	—	J-4412	—	36.2 8140	72.9 16390	11.3	2900	4500	0.103 0.227	—	69.850 2.7500	69.835 2.7494	79.388 3.1255	79.362 3.1245	Table B2-6	IR-4016

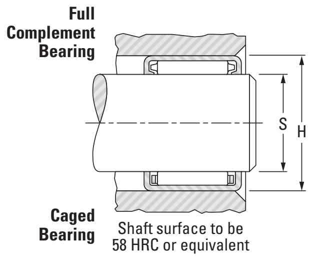
(1) IRA inner ring provides additional length if required.

CAGED BEARINGS – OPEN ENDS

INCH SERIES
BT SERIES



BT



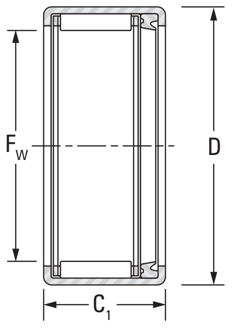
Shaft Dia.	F_w	D	C	Y max.	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.	Mounting Dimensions				Inspection gage	Mounting inner ring (pages B-2-68 to B-2-70)
			+0 +0.000 **-0.3** -0.012			Dynamic	Static					Shaft		Housing			
					Open Ends	C	C_0		Grease	Oil	Open Ends	Max.	Min.	Max.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in		
11/16	**17.462** 0.6870	**22.225** 0.875	**19.05** 0.750	—	BT1112-1	**12.7** 2850	**21.2** 4770	3.30	12000	19000	**0.015** 0.033	**17.462** 0.6875	**17.451** 0.6870	**22.237** 0.8755	**22.216** 0.8746	Table B2-7	—
7/8	**22.225** 0.875	**28.575** 1.125	**9.525** 0.375	—	BT146P	**7.05** 1580	**8.55** 1920	1.35	9800	15000	**0.012** 0.027	**22.225** 0.8750	**22.212** 0.8745	**28.587** 1.1255	**28.566** 1.1246	Table B2-7	—
1	**25.400** 1.0000	**31.750** 1.250	**9.525** 0.375	—	BT166	**7.45** 1670	**9.50** 2140	1.50	8500	13000	**0.014** 0.031	**25.400** 1.0000	**25.387** 0.9995	**31.764** 1.2506	**31.739** 1.2496	Table B2-7	—
1 1/8	**28.575** 1.125	**34.925** 1.375	**12.70** 0.500	—	BT188	**13.1** 2940	**20.3** 4560	3.10	7200	11000	**0.021** 0.047	**28.575** 1.1250	**28.562** 1.1245	**34.939** 1.3756	**34.914** 1.3746	Table B2-7	—
1 3/16	**30.162** 1.187	**38.100** 1.500	**25.40** 1.000	—	BT1916M	**31.5** 7080	**51.9** 11670	8.15	7200	11000	**0.054** 0.119	**30.162** 1.1875	**30.146** 1.1869	**38.114** 1.5006	**38.089** 1.4996	Table B2-7	—
1 1/4	**31.750** 1.250	**38.100** 1.500	**19.05** 0.750	—	BT2012	**21.2** 4770	**38.7** 8700	6.00	6500	10000	**0.035** 0.077	**31.750** 1.2500	**31.734** 1.2494	**38.114** 1.5006	**38.089** 1.4996	Table B2-7	—
1 5/8	**41.275** 1.625	**50.800** 2.000	**22.225** 0.875	—	BT2614	**34.1** 7670	**56.9** 12790	9.00	5100	7900	**0.082** 0.180	**41.275** 1.6250	**41.259** 1.6244	**50.818** 2.0007	**50.788** 1.9995	Table B2-7	—
1 7/8	**47.625** 1.875	**57.150** 2.250	**15.875** 0.625	—	BT3010-1	**25.2** 5660	**40.1** 9010	6.20	4400	6800	**0.064** 0.140	**47.625** 1.8750	**47.609** 1.8744	**57.168** 2.2507	**57.138** 2.2495	Table B2-7	—

NOTES

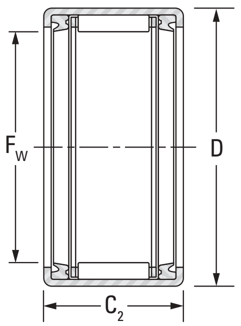
SEALED DRAWN CUP BEARINGS

INCH SERIES

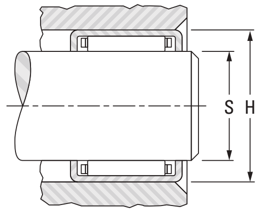
- Check for availability. Not all bearings are in production.
- Pre-packed with general purpose ball and roller bearing grease unless otherwise specified.
- Bearing operating temperature limited between -30° C and +110° C (-25° F and +225° F).
- Consult your representative for operating temperatures outside the above range or if seals have been exposed to unusual fluids.
- Speed rating based on shaft contact speed of 610 m/min. (2000 fpm).
- Reduce the listed speed rating by one-half for outer ring rotation.



JT – One Seal



JTT – Two Seals



Shaft surface to be 58 HRC or equivalent

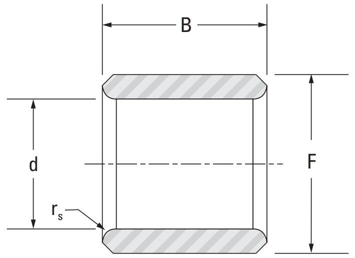
Drawn cup bearings of nominal inch dimensions, with one closed end, that are not tabulated, may be made available upon request.

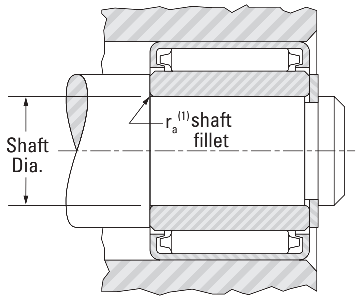
Mounting dimensions are based on the inner ring rotating and the outer ring being stationary, relative to the load. The housing should be of high strength material.

Shaft Dia.	F_w	D	Bearings With One Seal: C_1 +0 +0.000 -0.3 -0.010	Bearings With One Seal: Bearing Designation	Bearings With One Seal: Approx. Wt.	Bearings With Two Seals: C_2 +0 +0.000 -0.3 -0.010	Bearings With Two Seals: Bearing Designation	Bearings With Two Seals: Approx. Wt.	Load Ratings: Dynamic C	Load Ratings: Static C_0	Fatigue Load Limit C_u	Approx. Speed Rating (Grease)	Mounting Dimensions: S Max.	Mounting Dimensions: S Min.	Mounting Dimensions: H Max.	Mounting Dimensions: H Min.	Inspection: Ring Gage	Inspection: Plug Gage go	Inspection: Plug Gage no go	Shaft Dia.
in	mm in	mm in	mm in		kg lbs			kg lbs	kN lbf	kN lbf	kN	min^{-1}	mm in	mm in	mm in	mm in				in
5/16	7.938 0.3125	12.700 0.5000	9.53 0.375	JT-56	0.004 0.008	11.13 0.438	JTT-57	0.004 0.009	2.40 540	2.00 450	0.340	18000	7.938 0.3125	7.925 0.3120	12.713 0.5005	12.687 0.4995	12.713 0.5005	7.976 0.3140	8.001 0.3150	5/16
	7.938 0.3125	12.700 0.5000	—	—	—	14.27 0.562	JTT-59	0.005 0.012	4.05 910	3.91 880	0.590	18000	7.938 0.3125	7.925 0.3120	12.713 0.5005	12.687 0.4995	12.713 0.5005	7.976 0.3140	8.001 0.3150	
3/8	9.525 0.3750	14.288 0.5625	9.53 0.375	JT-66	0.004 0.009	11.13 0.438	JTT-67	0.005 0.011	2.74 615	2.49 560	0.430	18000	9.525 0.3750	9.512 0.3745	14.300 0.5630	14.275 0.5620	14.300 0.5630	9.563 0.3765	9.589 0.3775	3/8
	9.525 0.3750	14.288 0.5625	14.27 0.562	JT-69	0.006 0.014	—	—	—	5.20 1 170	5.74 1 290	0.860	18000	9.525 0.3750	9.512 0.3745	14.300 0.5630	14.275 0.5620	14.300 0.5630	9.563 0.3765	9.589 0.3775	
1/2	12.700 0.5000	17.463 0.6875	9.53 0.375	JT-86	0.005 0.012	11.13 0.438	JTT-87	0.006 0.013	3.47 780	3.65 820	0.630	15000	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	17.475 0.6880	12.738 0.5015	12.764 0.5025	1/2
	12.700 0.5000	17.463 0.6875	14.27 0.562	JT-89	0.008 0.017	15.88 0.625	JTT-810	0.009 0.019	6.32 1 420	7.92 1 780	1.20	15000	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	17.475 0.6880	12.738 0.5015	12.764 0.5025	
	12.700 0.5000	17.463 0.6875	—	—	—	22.23 0.875	JTT-814	0.012 0.027	10.2 2 300	14.7 3 310	2.25	15000	12.700 0.5000	12.687 0.4995	17.475 0.6880	17.450 0.6870	17.475 0.6880	12.738 0.5015	12.764 0.5025	
9/16	14.288 0.5625	19.050 0.7500	14.27 0.562	JT-99	0.009 0.019	15.88 0.625	JTT-910	0.010 0.021	6.23 1 400	8.01 1 800	1.20	14000	14.288 0.5625	14.275 0.5620	19.063 0.7505	19.037 0.7495	19.063 0.7505	14.326 0.5640	14.351 0.5650	9/16
	14.288 0.5625	19.050 0.7500	—	—	—	19.05 0.750	JTT-912	0.011 0.025	8.18 1 840	11.4 2 560	1.70	14000	14.288 0.5625	14.275 0.5620	19.063 0.7505	19.037 0.7495	19.063 0.7505	14.326 0.5640	14.351 0.5650	
5/8	15.875 0.6250	20.638 0.8125	14.27 0.562	JT-109	0.010 0.021	15.88 0.625	JTT-1010	0.010 0.023	6.72 1 510	9.12 2 050	1.40	12000	15.875 0.6250	15.862 0.6245	20.650 0.8130	20.625 0.8120	20.650 0.8130	15.913 0.6265	15.939 0.6275	5/8
	15.875 0.6250	20.638 0.8125	—	—	—	19.05 0.750	JTT-1012	0.013 0.028	8.81 1 980	12.9 2 910	1.95	12000	15.875 0.6250	15.862 0.6245	20.650 0.8130	20.625 0.8120	20.650 0.8130	15.913 0.6265	15.939 0.6275	
	15.875 0.6250	20.638 0.8125	—	—	—	22.23 0.875	JTT-1014	0.015 0.032	11.7 2 640	18.9 4 240	2.90	12000	15.875 0.6250	15.862 0.6245	20.650 0.8130	20.625 0.8120	20.650 0.8130	15.913 0.6265	15.939 0.6275	
11/16	17.463 0.6875	22.225 0.8750	—	—	—	22.23 0.875	JTT-1114	0.016 0.035	12.5 2 800	20.9 4 700	3.20	11000	17.463 0.6875	17.450 0.6870	22.238 0.8755	22.212 0.8745	22.238 0.8755	17.501 0.6890	17.526 0.6900	11/16
3/4	19.050 0.7500	25.400 1.0000	14.27 0.562	JT-129	0.015 0.034	15.88 0.625	JTT-1210	0.017 0.038	9.92 2 230	12.2 2 740	1.85	10000	19.050 0.7500	19.037 0.7495	25.413 1.0005	25.387 0.9995	25.387 0.9995	19.063 0.7505	19.088 0.7515	3/4
	19.050 0.7500	25.400 1.0000	17.48 0.688	JT-1211	0.019 0.041	—	—	—	12.5 2 810	16.3 3 670	2.50	10000	19.050 0.7500	19.037 0.7495	25.413 1.0005	25.387 0.9995	25.387 0.9995	19.063 0.7505	19.088 0.7515	
	19.050 0.7500	25.400 1.0000	20.62 0.812	JT-1213	0.022 0.049	22.23 0.875	JTT-1214	0.024 0.053	15.5 3 490	21.6 4 860	3.35	10000	19.050 0.7500	19.037 0.7495	25.413 1.0005	25.387 0.9995	25.387 0.9995	19.063 0.7505	19.088 0.7515	
7/8	22.225 0.8750	28.575 1.1250	14.27 0.562	JT-149	0.018 0.039	15.88 0.625	JTT-1410	0.020 0.043	10.9 2 460	14.5 3 260	2.20	8700	22.225 0.8750	22.212 0.8745	28.588 1.1255	28.562 1.1245	28.562 1.1245	22.238 0.8755	22.263 0.8765	7/8
	22.225 0.8750	28.575 1.1250	26.97 1.062	JT-1417	0.033 0.073	—	—	—	23.7 5 320	39.0 8 760	6.05	8700	22.225 0.8750	22.212 0.8745	28.588 1.1255	28.562 1.1245	28.562 1.1245	22.238 0.8755	22.263 0.8765	
1	25.400 1.0000	31.750 1.2500	20.62 0.812	JT-1613	0.029 0.063	22.23 0.875	JTT-1614	0.031 0.068	18.1 4 080	28.8 6 480	4.45	7600	25.400 1.0000	25.387 0.9995	31.763 1.2505	31.737 1.2495	31.737 1.2495	25.413 1.0005	25.438 1.0015	1
1 1/8	28.575 1.1250	34.925 1.3750	20.62 0.812	JT-1813	0.032 0.070	22.23 0.875	JTT-1814	0.034 0.075	19.0 4 280	31.8 7 140	4.90	6800	28.575 1.1250	28.562 1.1245	34.938 1.3755	34.912 1.3745	34.912 1.3745	28.588 1.1255	28.613 1.1265	1 1/8
1 1/4	31.750 1.2500	38.100 1.5000	20.62 0.812	JT-2013	0.035 0.077	—	—	—	19.8 4 460	34.7 7 800	5.35	6100	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	38.087 1.4995	31.763 1.2505	31.788 1.2515	1 1/4
	31.750 1.2500	38.100 1.5000	—	—	—	28.58 1.125	JTT-2018	0.048 0.106	28.8 6 480	56.5 12 700	8.70	6100	31.750 1.2500	31.737 1.2495	38.113 1.5005	38.087 1.4995	38.087 1.4995	31.763 1.2505	31.788 1.2515	
1 1/2	38.100 1.5000	47.625 1.8750	33.32 1.312	JT-2421	0.104 0.229	—	—	—	49.4 11 100	89.9 20 200	14.0	5100	38.100 1.5000	38.087 1.4995	47.638 1.8755	47.612 1.8745	47.612 1.8745	38.113 1.5005	38.143 1.5017	1 1/2

INNER RINGS FOR INCH SERIES DRAWN CUP BEARINGS

- Check for availability.
- Ideal choice when shaft is not practical to use as inner raceway.
- Provided in inch (IR, IRA) nominal dimensions for use with inch series drawn cup bearings.
- Designed to meet established inch tolerances.
- Designed to be wider than matching drawn cup bearing.
- Maximum shaft fillet radius ($r_{a\,max.}$) cannot exceed inner ring bore chamfer ($r_{s\,min.}$) as shown.
- Optional centralized lubrication groove (bore) and thru-hole available – specify when ordering.
- Designed to provide a loose transition fit on the shaft and should be axially clamped against a shoulder.
- If a tight transition fit must be used to keep the inner ring from rotating relative to the shaft, the inner ring O.D. must not exceed the raceway diameter for the matching drawn cup bearing after being mounted on the shaft.
- See tables for bearing raceway diameter dimensions.
- After mounting, if O.D. of inner ring exceeds required raceway diameter for matching bearing, ring should be ground to proper diameter while mounted on shaft.





Shaft Dia.	d		F		B		$r_{s\,min.}$	Inner Ring Designation	Mounting Dimensions Transition Fit				Approx. Wt.
									Loose		Tight		
	Max.	Min.	Max.	Min.	Max.	Min.	Min.		Max.	Min.	Max.	Min.	
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	kg lbs
$^{3}/_{16}$	**4.826** 0.1900	**4.813** 0.1895	**9.525** 0.3750	**9.512** 0.3745	**13.61** 0.536	**13.36** 0.526	**0.64** 0.025	IRA-3	**4.818** 0.1897	**4.806** 0.1892	**4.829** 0.1901	**4.816** 0.1896	**0.005** 0.012
$^{1}/_{4}$	**6.350** 0.2500	**6.337** 0.2495	**11.113** 0.4375	**11.100** 0.4370	**13.61** 0.536	**13.36** 0.526	**0.64** 0.025	IRA-4	**6.342** 0.2497	**6.330** 0.2492	**6.353** 0.2501	**6.340** 0.2496	**0.006** 0.014
$^{5}/_{16}$	**7.938** 0.3125	**7.925** 0.3120	**12.700** 0.5000	**12.687** 0.4995	**13.61** 0.536	**13.36** 0.526	**0.64** 0.025	IRA-5	**7.930** 0.3122	**7.917** 0.3117	**7.940** 0.3126	**7.927** 0.3121	**0.008** 0.017
$^{3}/_{8}$	**9.525** 0.3750	**9.512** 0.3745	**14.288** 0.5625	**14.275** 0.5620	**13.08** 0.515	**12.83** 0.505	**0.64** 0.025	IR-68	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.009** 0.019
	9.525 0.3750	**9.512** 0.3745	**14.288** 0.5625	**14.275** 0.5620	**19.43** 0.765	**19.18** 0.755	**0.64** 0.025	IR-612	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.013** 0.028
	9.525 0.3750	**9.512** 0.3745	**14.288** 0.5625	**14.275** 0.5620	**19.96** 0.786	**19.71** 0.776	**0.64** 0.025	IRA-6	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.013** 0.029
	9.525 0.3750	**9.512** 0.3745	**15.875** 0.6250	**15.862** 0.6245	**13.08** 0.515	**12.83** 0.505	**0.64** 0.025	IR-68-1	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.012** 0.027
	9.525 0.3750	**9.512** 0.3745	**15.875** 0.6250	**15.862** 0.6245	**19.43** 0.765	**19.18** 0.755	**0.64** 0.025	IR-612-1	**9.517** 0.3747	**9.505** 0.3742	**9.528** 0.3751	**9.515** 0.3746	**0.018** 0.040
$^{7}/_{16}$	**11.113** 0.4375	**11.100** 0.4370	**15.875** 0.6250	**15.862** 0.6245	**19.96** 0.786	**19.71** 0.776	**0.64** 0.025	IRA-7	**11.105** 0.4372	**11.092** 0.4367	**11.115** 0.4376	**11.102** 0.4371	**0.015** 0.033
$^{1}/_{2}$	**12.700** 0.5000	**12.687** 0.4995	**19.050** 0.7500	**19.037** 0.7495	**13.08** 0.515	**12.83** 0.505	**1.02** 0.040	IR-88	**12.692** 0.4997	**12.680** 0.4992	**12.703** 0.5001	**12.690** 0.4996	**0.015** 0.033
	12.700 0.5000	**12.687** 0.4995	**19.050** 0.7500	**19.037** 0.7495	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-812	**12.692** 0.4997	**12.680** 0.4992	**12.703** 0.5001	**12.690** 0.4996	**0.023** 0.050

Bore and O.D. tolerance limits correspond to the single mean diameter (the arithmetical mean of the largest and smallest diameters in a single radial plane).

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(1) $r_{a\,max.}$ is equal to minimum inner ring bore chamfer ($r_{s\,min.}$).

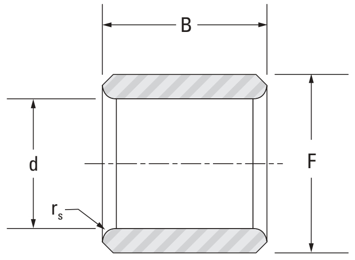
Shaft Dia.	d		F		B		$r_{s\,min.}$	Inner Ring Designation	Mounting Dimensions Transition Fit				Approx. Wt.
									Loose		Tight		
	Max.	Min.	Max.	Min.	Max.	Min.	Min.		Max.	Min.	Max.	Min.	
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	kg lbs
$^{1}/_{2}$	**12.700** 0.5000	**12.687** 0.4995	**19.050** 0.7500	**19.037** 0.7495	**19.96** 0.786	**19.71** 0.776	**1.02** 0.040	IRA-8	**12.692** 0.4997	**12.680** 0.4992	**12.703** 0.5001	**12.690** 0.4996	**0.023** 0.051
$^{5}/_{8}$	**15.875** 0.6250	**15.862** 0.6245	**22.225** 0.8750	**22.212** 0.8745	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1012	**15.867** 0.6247	**15.855** 0.6242	**15.878** 0.6251	**15.865** 0.6246	**0.027** 0.060
	15.875 0.6250	**15.862** 0.6245	**22.225** 0.8750	**22.212** 0.8745	**19.96** 0.786	**19.71** 0.776	**1.02** 0.040	IRA-10	**15.867** 0.6247	**15.855** 0.6242	**15.878** 0.6251	**15.865** 0.6246	**0.028** 0.062
	15.875 0.6250	**15.862** 0.6245	**22.225** 0.8750	**22.212** 0.8745	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1016	**15.867** 0.6247	**15.855** 0.6242	**15.878** 0.6251	**15.865** 0.6246	**0.036** 0.080
$^{3}/_{4}$	**19.050** 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**13.08** 0.515	**12.83** 0.505	**1.02** 0.040	IR-128	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.021** 0.047
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1212	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.032** 0.070
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1216	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.042** 0.093
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**26.31** 1.036	**26.06** 1.026	**1.02** 0.040	IRA-12	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.043** 0.095
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**32.13** 1.265	**31.88** 1.255	**1.02** 0.040	IR-1220	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.053** 0.116
	19.050 0.7500	**19.037** 0.7495	**25.400** 1.0000	**25.387** 0.9995	**38.48** 1.515	**38.23** 1.505	**1.02** 0.040	IR-1224	**19.042** 0.7497	**19.030** 0.7492	**19.053** 0.7501	**19.040** 0.7496	**0.063** 0.139
$^{13}/_{16}$	**20.638** 0.8125	**20.625** 0.8120	**25.400** 1.0000	**25.387** 0.9995	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1312	**20.630** 0.8122	**20.617** 0.8117	**20.640** 0.8126	**20.627** 0.8121	**0.024** 0.054
	20.638 0.8125	**20.625** 0.8120	**25.400** 1.0000	**25.387** 0.9995	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1316	**20.630** 0.8122	**20.617** 0.8117	**20.640** 0.8126	**20.627** 0.8121	**0.033** 0.072
$^{7}/_{8}$	**22.225** 0.8750	**22.212** 0.8745	**28.575** 1.1250	**28.562** 1.1245	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1416	**22.217** 0.8747	**22.205** 0.8742	**22.228** 0.8751	**22.215** 0.8746	**0.050** 0.111
	22.225 0.8750	**22.212** 0.8745	**28.575** 1.1250	**28.562** 1.1245	**26.31** 1.036	**26.06** 1.026	**1.02** 0.040	IRA-14	**22.217** 0.8747	**22.205** 0.8742	**22.228** 0.8751	**22.215** 0.8746	**0.050** 0.111
$^{15}/_{16}$	**23.813** 0.9375	**23.800** 0.9370	**28.575** 1.1250	**28.562** 1.1245	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1516	**23.805** 0.9372	**23.792** 0.9367	**23.815** 0.9376	**23.802** 0.9371	**0.037** 0.082
1	**25.400** 1.0000	**25.387** 0.9995	**31.750** 1.2500	**31.737** 1.2495	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1612	**25.392** 0.9997	**25.380** 0.9992	**25.403** 1.0001	**25.390** 0.9996	**0.041** 0.090
	25.400 1.0000	**25.387** 0.9995	**31.750** 1.2500	**31.737** 1.2495	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1616	**25.392** 0.9997	**25.380** 0.9992	**25.403** 1.0001	**25.390** 0.9996	**0.057** 0.125
	25.400 1.0000	**25.387** 0.9995	**31.750** 1.2500	**31.737** 1.2495	**26.31** 1.036	**26.06** 1.026	**1.02** 0.040	IRA-16	**25.392** 0.9997	**25.380** 0.9992	**25.403** 1.0001	**25.390** 0.9996	**0.056** 0.124
1 $^{1}/_{8}$	**28.575** 1.1250	**28.562** 1.1245	**34.925** 1.3750	**34.912** 1.3745	**19.43** 0.765	**19.18** 0.755	**1.02** 0.040	IR-1812	**28.567** 1.1247	**28.555** 1.1242	**28.578** 1.1251	**28.565** 1.1246	**0.045** 0.100
	28.575 1.1250	**28.562** 1.1245	**34.925** 1.3750	**34.912** 1.3745	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1816	**28.567** 1.1247	**28.555** 1.1242	**28.578** 1.1251	**28.565** 1.1246	**0.060** 0.133
	28.575 1.1250	**28.562** 1.1245	**34.925** 1.3750	**34.912** 1.3745	**32.13** 1.265	**31.88** 1.255	**1.02** 0.040	IR-1820	**28.567** 1.1247	**28.555** 1.1242	**28.578** 1.1251	**28.565** 1.1246	**0.075** 0.166
1 $^{3}/_{16}$	**30.163** 1.1875	**30.150** 1.1870	**38.100** 1.5000	**38.087** 1.4995	**25.78** 1.015	**25.53** 1.005	**1.02** 0.040	IR-1916	**30.155** 1.1872	**30.142** 1.1867	**30.165** 1.1876	**30.152** 1.1871	**0.084** 0.186
	30.163 1.1875	**30.150** 1.1870	**38.100** 1.5000	**38.087** 1.4995	**32.13** 1.265	**31.88** 1.255	**1.02** 0.040	IR-1920	**30.155** 1.1872	**30.142** 1.1867	**30.165** 1.1876	**30.152** 1.1871	**0.101** 0.223
1 $^{1}/_{4}$	**31.750** 1.2500	**31.737** 1.2495	**38.100** 1.5000	**38.087** 1.4995	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-2016	**31.742** 1.2497	**31.730** 1.2492	**31.753** 1.2501	**31.740** 1.2496	**0.069** 0.152
	31.750 1.2500	**31.737** 1.2495	**38.100** 1.5000	**38.087** 1.4995	**32.13** 1.265	**31.88** 1.255	**1.52** 0.060	IR-2020	**31.742** 1.2497	**31.730** 1.2492	**31.753** 1.2501	**31.740** 1.2496	**0.086** 0.190

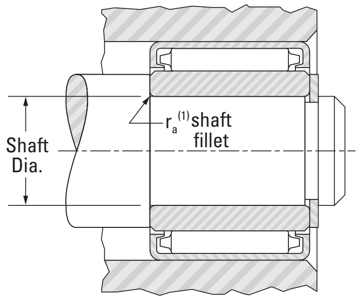
Bore and O.D. tolerance limits correspond to the single mean diameter (the arithmetical mean of the largest and smallest diameters in a single radial plane).

Continued on next page.

INNER RINGS FOR INCH SERIES DRAWN CUP BEARINGS

- Check for availability.
- Ideal choice when shaft is not practical to use as inner raceway.
- Provided in inch (IR, IRA) nominal dimensions for use with inch series drawn cup bearings.
- Designed to meet established inch tolerances.
- Designed to be wider than matching drawn cup bearing.
- Maximum shaft fillet radius ($r_{a\ max.}$) cannot exceed inner ring bore chamfer ($r_{s\ min.}$) as shown.
- Optional centralized lubrication groove (bore) and thru-hole available – specify when ordering.
- Designed to provide a loose transition fit on the shaft and should be axially clamped against a shoulder.
- If a tight transition fit must be used to keep the inner ring from rotating relative to the shaft, the innr ring O.D. must not exceed the raceway diameter for the matching drawn cup bearing after being mounted on the shaft.
- See tables for bearing raceway diameter dimensions.
- After mounting, if O.D. of inner ring exceeds required raceway diameter for matching bearing, ring should be ground to proper diameter while mounted on shaft.





Shaft Dia.	d		F		B		$r_{s\ min.}$	Inner Ring Designation	Mounting Dimensions Transition Fit				Approx. Wt.
									Loose		Tight		
	Max.	Min.	Max.	Min.	Max.	Min.	Min.		Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
1 1/4	**31.750** 1.2500	**31.737** 1.2495	**38.100** 1.5000	**38.087** 1.4995	**32.66** 1.286	**32.41** 1.276	**1.52** 0.060	IRA-20	**31.742** 1.2497	**31.730** 1.2492	**31.753** 1.2501	**31.740** 1.2496	**0.086** 0.190
1 3/8	**34.925** 1.3750	**34.912** 1.3745	**41.275** 1.6250	**41.262** 1.6245	**32.13** 1.265	**31.88** 1.255	**1.52** 0.060	IR-2220	**34.917** 1.3747	**34.905** 1.3742	**34.928** 1.3751	**34.915** 1.3746	**0.094** 0.208
1 7/16	**36.513** 1.4375	**36.500** 1.4370	**44.450** 1.7500	**44.437** 1.7495	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-2316	**36.505** 1.4372	**36.492** 1.4367	**36.515** 1.4376	**36.502** 1.4371	**0.100** 0.220
	36.513 1.4375	**36.500** 1.4370	**44.450** 1.7500	**44.437** 1.7495	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2324	**36.505** 1.4372	**36.492** 1.4367	**36.515** 1.4376	**36.502** 1.4371	**0.150** 0.331
1 1/2	**38.100** 1.5000	**38.087** 1.4995	**44.450** 1.7500	**44.437** 1.7495	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-2416	**38.092** 1.4997	**38.080** 1.4992	**38.103** 1.5001	**38.090** 1.4996	**0.078** 0.173
	38.100 1.5000	**38.087** 1.4995	**44.450** 1.7500	**44.437** 1.7495	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2424	**38.092** 1.4997	**38.080** 1.4992	**38.103** 1.5001	**38.090** 1.4996	**0.122** 0.270
1 11/16	**42.863** 1.6875	**42.850** 1.6870	**52.388** 2.0625	**52.375** 2.0620	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2724	**42.855** 1.6872	**42.842** 1.6867	**42.865** 1.6876	**42.852** 1.6871	**0.212** 0.468
1 3/4	**44.450** 1.7500	**44.437** 1.7495	**52.388** 2.0625	**52.375** 2.0620	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2824	**44.442** 1.7497	**44.430** 1.7492	**44.453** 1.7501	**44.440** 1.7496	**0.180** 0.396
1 13/16	**46.038** 1.8125	**46.025** 1.8120	**52.388** 2.0625	**52.375** 2.0620	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-2916	**46.030** 1.8122	**46.017** 1.8117	**46.040** 1.8126	**46.027** 1.8121	**0.097** 0.214
	46.038 1.8125	**46.025** 1.8120	**52.388** 2.0625	**52.375** 2.0620	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-2924	**46.030** 1.8122	**46.017** 1.8117	**46.040** 1.8126	**46.027** 1.8121	**0.146** 0.322
1 7/8	**47.625** 1.8750	**47.612** 1.8745	**53.975** 2.1250	**53.962** 2.1245	**38.48** 1.515	**38.23** 1.505	**1.52** 0.060	IR-3024	**47.617** 1.8747	**47.605** 1.8742	**47.628** 1.8751	**47.615** 1.8746	**0.145** 0.319
2 1/2	**63.500** 2.5000	**63.487** 2.4995	**69.850** 2.7500	**69.837** 2.7495	**25.78** 1.015	**25.53** 1.005	**1.52** 0.060	IR-4016	**63.495** 2.4998	**63.477** 2.4991	**63.505** 2.5002	**63.487** 2.4995	**0.132** 0.290

Bore and O.D. tolerance limits correspond to the single mean diameter (the arithmetical mean of the largest and smallest diameters in a single radial plane).

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(1) $r_{a\ max.}$ is equal to minimum inner ring bore chamfer ($r_{s\ min.}$).

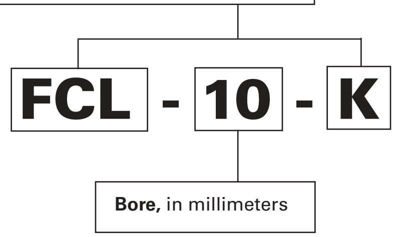
DRAWN CUP ROLLER CLUTCHES

Overview: Drawn cup needle roller clutches are similar to drawn cup needle roller bearings in design; however, they allow free rotation in only one direction while transmitting torque in the opposite direction. These designs use the same small radial section as drawn cup needle roller bearings and are offered as clutch-only units or as clutch and bearing assemblies.

- **Catalog range:** 3.175 mm – 35 mm (0.1250 in – 1.3780 in) bore.
- **Markets:** Office equipment, paper-towel dispensers, exercise equipment, appliances and two-speed gearboxes.
- **Features:** Compact, lightweight and operate directly on a hardened shaft.
- **Benefits:** Installation is easily accomplished with a simple press fit.

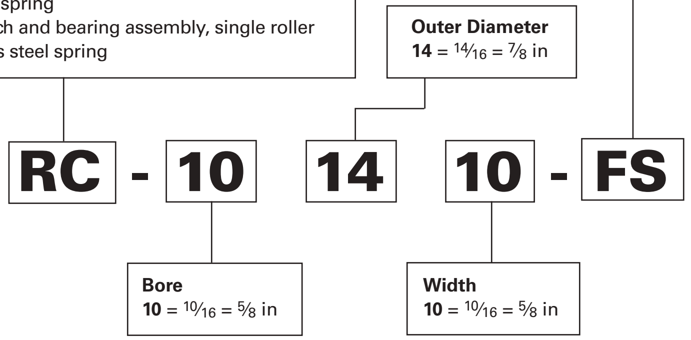
Drawn Cup Roller Clutches
Metric Series

FCS, FC-K	regular clutch, single roller per stainless steel spring
FC	regular clutch, multi-roller per stainless steel spring
FCL-K	light series clutch, single roller per stainless steel spring
FCB	regular clutch and bearing assembly, multi-roller per stainless steel spring
FCBL-K, FCBN-K	light series clutch and bearing assembly, single roller per stainless steel spring



Inch Series

RC	regular clutch, single roller per integral spring
RC-FS	regular clutch, single roller per stainless steel spring
RCB	regular clutch and bearing assembly, single roller per integral spring
RCB-FS	regular clutch and bearing assembly, single roller per stainless steel spring



Drawn Cup Roller Clutches

Page

DRAWN CUP ROLLER CLUTCHES

METRIC AND INCH SERIES

Drawn cup roller clutch transmits torque between shaft and housing in one direction and allows free overrun in the opposite direction. When transmitting torque, either the shaft or the housing can be the input member. Applications are generally described as indexing, backstopping or overrunning.

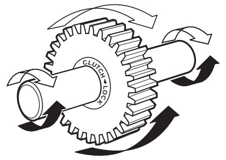


Fig. B3-1.
Lock function: shaft drives gear clockwise (white arrows) or gear can drive shaft counterclockwise (black arrows)

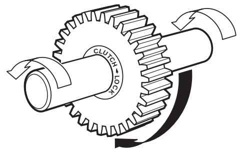


Fig. B3-2.
Overrun function: shaft overruns in gear counter-clockwise (white arrows) or gear overruns on shaft clockwise (black arrow)

IDENTIFICATION

The prefix letters in the designation of the drawn cup roller clutches and drawn cup roller clutch and bearing assemblies denote whether these are manufactured to metric or inch nominal dimensions. Designation codes for clutches and clutch and bearing assemblies with metric nominal dimensions begin with the letter "F." Designation codes for clutches and clutch and bearing assemblies with inch nominal dimensions begin with the letter "R."

The basic types of clutches and clutch and bearing assemblies are listed below:

METRIC SERIES TYPES

FCS, FC-K	Regular clutch, single roller per stainless steel spring.
FC	Regular clutch, multi-roller per stainless steel spring.
FCB	Regular clutch and bearing assembly, multi-roller per stainless steel spring.
FCL-K	Light series clutch, single roller per stainless steel spring.
FCBL-K, FCBN-K	Light series clutch and bearing assembly. Single roller per stainless steel spring.

INCH SERIES TYPES

RC	Regular clutch, single roller per integral spring.
RC-FS	Regular clutch, single roller per stainless steel spring.
RCB	Regular clutch and bearing assembly, single roller per integral spring.
RCB-FS	Regular clutch and bearing assembly, single roller per stainless steel spring.

Drawn cup roller clutch type FC with stainless steel springs

Drawn cup clutch and bearing assembly type FCB with stainless steel springs

Drawn cup roller clutch, types FCS, FC-K, FCL-K, and RC-FS with stainless steel springs

Drawn cup clutch and bearing assembly types FCBL-K, FCBN-K and RCB-FS with stainless steel springs

Drawn cup roller clutch, type RC with integral springs

Drawn cup clutch and bearing assembly type RCB with integral springs

Fig. B3-3. Types of clutches and clutch and bearing assemblies

CONSTRUCTION

In many respects, construction is similar to that of drawn cup bearings. Design and manufacture of drawn cup clutches – just as with drawn cup bearings – was pioneered and developed by JTEKT. The well-established design utilizes the same low-profile radial section as drawn cup bearings. The precisely formed interior ramps provide surfaces against which the needle rollers wedge. These positively lock the clutch with the shaft when rotated in the proper direction. These ramps, formed during the operation of drawing the cup, are case hardened for wear resistance. The incorporation of ramp forming into the cup drawing operation is a manufacturing innovation that contributes to the low cost of the unit.

Two designs of precision molded clutch cages are employed. Clutch and clutch and bearing assembly types – FC, FC-K, FCS, FCL-K, RC-FS, FCB, FCBN-K, FCBL-K and RCB-FS – use a glass fiber, reinforced nylon cage, equipped with inserted stainless steel leaf springs. The stainless steel springs permit higher rates of clutch engagement and achieve greater spring life. The nylon cage permits operation at higher temperatures. Clutch types RC and RCB utilize a one-piece cage of acetyl resin polymer with integral leaf style springs. They are used for lower temperatures than permitted for the units with nylon cages.

Types FCB, FCBL-K, FCBN-K, RCB and RCB-FS clutch and bearing assemblies have cages, for retention and guidance of the needle rollers in the bearings, located on both sides of the clutch unit.

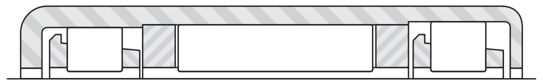


Fig. B3-4. Clutch and bearing assembly

Types FC, FC-K, FCS, FCL-K, RC and RC-FS are of clutch-only configurations for use with external radial support (usually two drawn cup needle roller bearings). Separate bearings position the shaft and housing concentrically and carry the radial load during overrun.

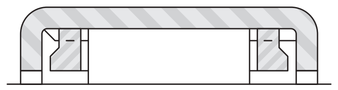


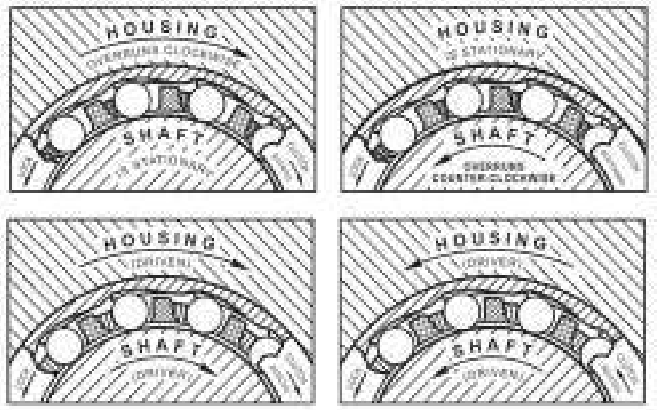
Fig. B3-5. Clutch only

OPERATION

Operation is in two modes: the overrun mode and the lock mode. Operational mode is controlled by the direction of the clutch or shaft rotation with respect to the locking ramps.

In the overrun mode, shown in the drawings below, the relative rotation between the housed clutch and the shaft causes the rollers to move away from their locking position against the locking ramps in the drawn cup. The housing and the clutch are then free to overrun in one direction, or the shaft is free to overrun in the other direction.

In the lock mode, shown in the drawings below, the relative rotation between the housed clutch and the shaft is opposite to that in the overrun mode. The rollers, assisted by the leaf-type springs, become wedged between the locking ramps and the shaft to transmit torque between the two members. Either the member housing the clutch drives the shaft in one direction, or the shaft can drive the clutch and its housing member in the other direction.



Clearance between the rollers and cup ramps is exaggerated in these drawings.

Fig. B3-6. Overrun mode and lock mode

APPLICATION

Clutches and clutch and bearing assemblies are successfully applied in a wide range of commercial products where indexing, backstopping and overrunning operations must be performed reliably. The sketches on these pages illustrate some of the many possible uses.

When applying the clutch-only unit, separate bearings on each side of the clutch are required to position the shaft concentrically with the housing, and to carry the radial loads during overrun. Drawn cup needle roller bearings, with the same radial section as the clutch, should be used in the through-bored housings for simplicity and economy. Two clutches can be used side by side for greater torque capacity.

Where the radial loads are light, the clutch and bearing assembly can be used without additional support bearings. This reduces the overall assembly width, the number of stocked and ordered parts and assembly costs, as well.

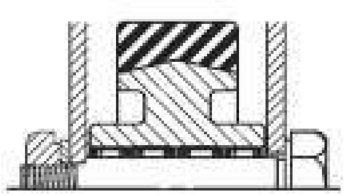


Fig. B3-7. Clutch and bearing arrangement for heavy loads

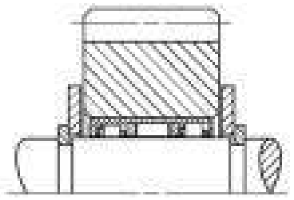


Fig. B3-8. Clutch and bearing assembly for light loads

Drawn cup roller clutches are manufactured to commercial hardware standards and are used extensively in appliances, business machines, industrial and recreation equipment and a wide range of other applications.

In any application where our clutch may be considered, it will be part of a system in which the operating conditions and the clutch mounting will affect its function. Before any clutch selection is made, it is important that the following catalog section be carefully studied to understand the effects of these factors. Consideration should be given to operating conditions such as:

- Magnitude of externally applied torque, as well as inertial torque.
- Magnitude of applied radial loads during overrunning.
- Potential for vibration or axial shaft movement within the clutch during engagement.
- Engagement rate, as it pertains to the selection of stainless steel or plastic leaf springs.
- Oil lubricant supply during high overrunning speeds.
- External and internal environmental temperatures that can affect clutch performance.
- Lubricant selection effect on clutch engagement.
- Indexing inaccuracies resulting from backlash (lost motion).

Consideration should be given to the shaft and housing design requirements such as:

- Shaft hardness and strength particularly when approaching torque rating limits.
- Shaft roundness, taper and surface finish necessary to ensure sufficient fatigue life and torque-carrying ability.
- Housing strength (hardness and cross section) to support the applied torque loads.
- Housing roundness, taper and surface finish necessary to ensure uniform torque and load distribution.

A test program under all expected operating conditions should be carried out before putting a new application into production. Customer engineers are constantly working with and testing new applications, and their experience can be of great help to the designer considering the use of a drawn cup roller clutch.

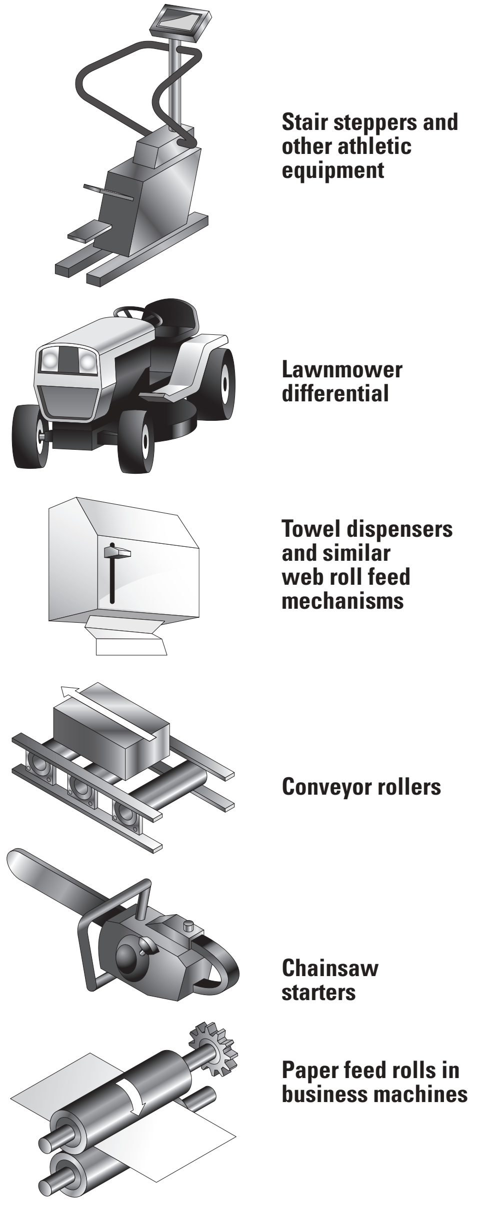


Fig. B3-9(1). Drawn cup clutches and clutch and bearing assembly applications

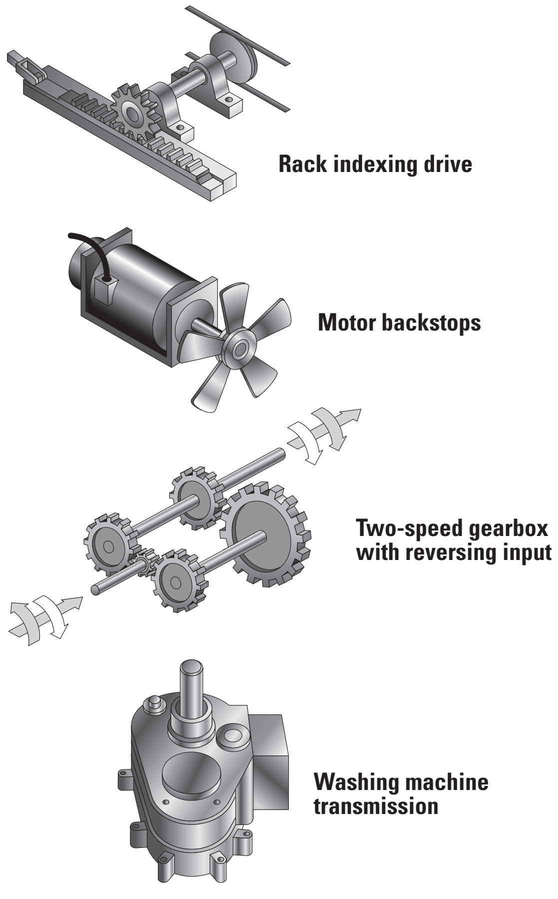


Fig. B3-9(2). Drawn cup clutches and clutch and bearing assembly applications

HOUSING DESIGN

Drawn cup clutches and clutch and bearing assemblies are mounted with a simple press fit in their housings. Through-bored and chamfered housings are preferred. A 30 degree angle is suggested and care should be taken to round the edge where the chamfer meets the housing bore. A sharp edge at this location can greatly increase installation forces. Provisions for axial location, such as shoulders or snap rings, are not required. The case hardened cups must be properly supported. Steel housings are preferred and must be used for applications involving high-torque loads to prevent radial expansion of the clutch cups. The suggested minimum housing outer diameters in the tables of dimensions are for steel.

The housing bore should be round within one-half of the diameter tolerance.

The taper within the length of the outer ring should not exceed 0.013 mm (0.0005 in).

The surface finish of the housing bore should not exceed 1.6 µm R_a (63 µin R_a).

The torque ratings, given in the clutch tables, are based on a steel housing of a large section. When other housing material must be used (such as aluminum, powdered metal and plastics), the torque rating of the clutch will be reduced. Such housings may be satisfactory for lightly torqued applications. But, your representative should be consulted for appropriate housing and shaft suggestions. Otherwise, an insufficient press fit and use of a lower strength housing material can result in more internal clearance and reduced performance of the clutch.

When using non-steel housings, thorough testing of the design is suggested.

Adhesive compounds can be used to prevent creeping rotation of the clutch in plastic housings with low friction properties. Adhesives will not provide proper support in oversized metal housings. When using adhesives, care must be taken to keep the adhesive out of the clutches and bearings.

SHAFT DESIGN

The clutch or clutch and bearing assembly operates directly on the shaft whose specifications of dimension, hardness and surface finish are well within standard manufacturing limits.

Either case-hardening or through-hardening grades of good bearing-quality steel are satisfactory for raceways. Steels modified for free machining, such as those high in sulfur content and particularly those containing lead, are seldom satisfactory for raceways.

For long fatigue life, the shaft raceway must have a hardness equivalent to 58 HRC minimum and must be ground to the suggested diameter shown in the tables of dimensions. It may be through-hardened, or it may be case hardened with an effective case depth of 0.40 mm (0.015 in). Effective case depth is defined as the distance from the surface inward to the equivalent of 50 HRC hardness level after grinding.

Taper within the length of the raceway should not exceed 0.008 mm (0.0003 in), or one-half the diameter tolerance – whichever is smaller. The radial deviation from true circular form of the raceway should not exceed 0.0025 mm (0.0001 in) for diameters up to and including 25 mm (1.0 in). For raceways greater than 25 mm (1.0 in), the allowable radial deviation should not exceed 0.0025 mm (0.0001 in) multiplied by a factor of the raceway diameter divided by 25 mm (1.0 in). Surface finish on the raceway should not exceed 0.4 µm (16 µin) R_a. Deviations will reduce the load capacity and fatigue life of the shaft.

INSTALLATION

Simplicity of installation promotes additional cost savings. The drawn cup roller clutch or the clutch and bearing assembly must be pressed into its housing. Procedures are virtually identical with those for installing drawn cup bearings, as detailed on pages B-2-11and B-2-46. The unit is pressed into the bore of a gear or pulley hub or housing of the proper size. No shoulders, splines, keys, screws or snap rings are required.

Installation procedures are summarized in the following sketches:

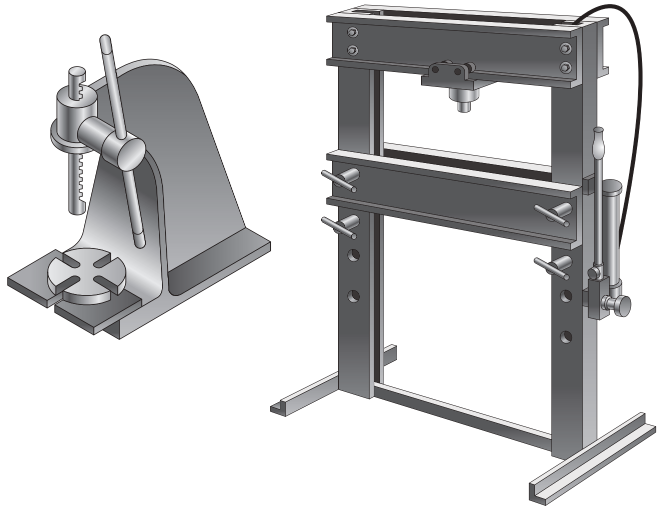


Fig. B3-10. Arbor press and hydraulic ram press

Use an arbor press or hydraulic ram press to exert steady pressure. Never use a hammer, or other tool requiring pounding to drive the clutch into its housing.

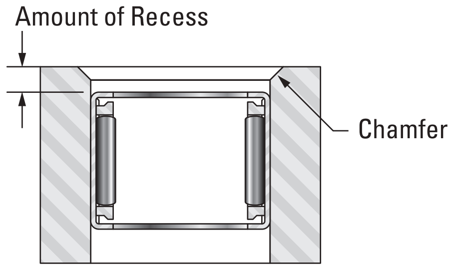


Fig. B3-11. Chamfered housing bore

Make sure that the housing bore is chamfered to permit easy introduction of the clutch and bearing or the clutch unit. Press unit slightly beyond the chamfer in the housing bore to assure full seating. Through-bored housings are always preferred. If the housing has a shoulder, never seat the clutch against the shoulder. For further details, see pages B-2-11 and B-2-46.

Fig. B3-12. Lock marking

IMPORTANT: The mounted clutch or clutch and bearing assembly engages when the housing is rotated relative to the shaft in the direction of the arrow and lock marking (◄ LOCK) stamped on the cup. Make sure that the unit is oriented properly before pressing it into its housing.

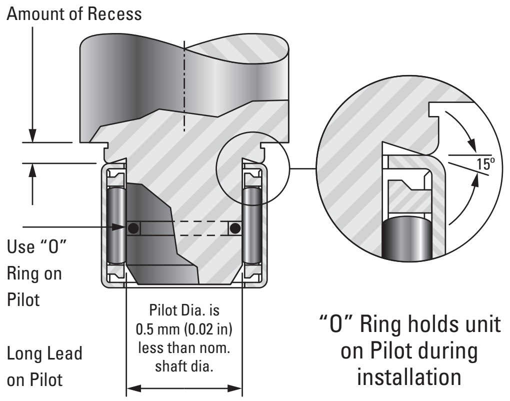


Fig. B3-13. Installation tool

Use an installation tool as shown in Fig. B3-13. If the clutch is straddled by needle roller bearings, press units into position – in proper sequence – and preferably leave a small clearance between units.

When assembling the shaft, it should be rotated in the overrun direction during insertion. The end of the shaft should have a large chamfer or rounding.

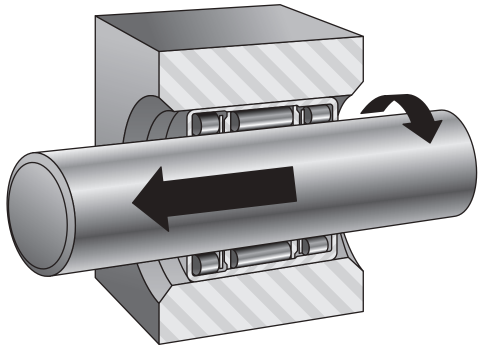


Fig. B3-14. Rotate shaft in the overrun direction during insertion

APPLIED LOADS

The clutch-only unit is designed to transmit purely torque loads. Applied torque should not exceed the catalog ratings, which are based on the compressive strength of well-aligned clutch components. Bearings on either side of the clutch are to assure concentricity between the shaft and the housing to support radial loads during clutch overrun. Integral clutch and bearing assemblies are available for this purpose, especially where the radial loads are light. The total maximum dynamic radial load that may be shared by the two needle roller and cage radial bearing assemblies should not be greater than Cr/3.

In determining the total torque load on a clutch, it is essential to consider the torque, due to inertial forces developed in the mechanism, in addition to the externally applied torque. The larger the clutch, and the greater the mass of the mechanism controlled by it, the more important this consideration becomes.

Clutch lockup depends on friction. For this reason, applications involving severe vibrations or axial motion of the shaft within the clutch are to be avoided. Applications where overhanging or overturning loads occur should incorporate bearings that will maintain alignment between the shaft and the clutch housing. Consult your representative for suggestions.

LUBRICATION

Oil is the preferred lubricant; it minimizes wear and heat generation. For those applications where oil is not practical, clutches are packed with a soft grease containing mineral oil. Thick grease will retard roller engagement and can cause individual rollers to slip, possibly overloading any engaged rollers.

TEMPERATURE

Temperature extremes can cause clutch malfunctions and failure. The molded plastic cage with integral springs holds its necessary resiliency and strength when the operating temperature within the clutch is kept below 90° C (200° F). The clutch with reinforced nylon cage and separate steel springs operates well at temperatures up to 120° C (250° F) continuously and to 150° C (300° F) intermittently. Excessive thickening of the lubricant at low temperatures may prevent some, or all, of the rollers from engaging. New applications should be tested under expected operating conditions to determine whether or not temperature problems exist.

BACKLASH

Backlash, or lost motion, prior to engagement is minimal. The variation in backlash from one cycle to another is extremely low. Grease lubrication, or improper fit (housing bore and shaft diameter), may increase backlash. Angular displacement between the shaft and housing increases as an applied torque load is increased.

RATE OF ENGAGEMENT

Clutch lockup depends upon static friction. Axial motion between shaft and clutch rollers prevents lockup.

Clutches with integral springs engage satisfactorily at cyclic rates up to 200 engagements per minute. Intermittent operation at higher rates has been successful. The steel spring type clutches have proven dependability at rates up to 6000 or 7000 engagements per minute. Even higher cyclic rates may be practical. Because grease may impair engagement at high cyclic rates, a light oil should be used.

OVERRUN LIMIT SPEED RATING

Exact limiting speed ratings are not easily predictable. The value for each clutch given in the bearing tables is not absolute but serves as a guide for the designer. Oil lubrication is absolutely necessary for high speed operations. Consult your representative when overrunning speeds are high.

INSPECTION

Although the outer cup of the clutch is accurately drawn from strip steel, it can go slightly out of round during heat treat. When the assembly is pressed into a ring gage, or properly prepared housing of correct size and wall thickness, it becomes round and properly sized. Direct measurement of the outer diameter of a drawn cup assembly is an incorrect procedure. The proper inspection procedure is as follows:

1. Press the assembly into a ring gage of the proper size, as given in the tables.
2. Gage the bore with the specified plug gages of the proper size, as given in the tables of dimensions.
    a. The locking plug is rotated to ensure lockup when the clutch is operated on a low-limit shaft and is mounted in a high-limit housing, strong enough to properly size the clutch.
    b. The overrun plug is rotated to ensure free overrunning when the clutch is operated on a high-limit shaft and is mounted in a low-limit housing.
    c. The "go" plug and "no go" plug ensure proper size of the bearings in the clutch and bearing assemblies.

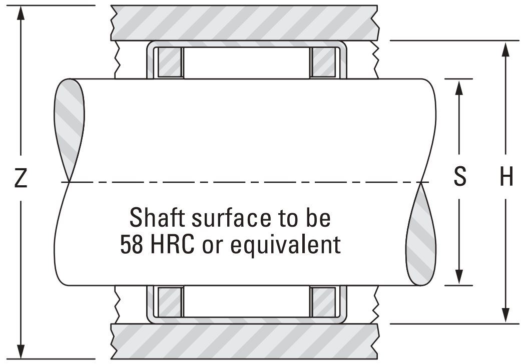
Gage sizes are listed in the tables of dimensions. Plug gage sizes reflect adjustment for the loose and tight conditions resulting from high or low housings or shafts.

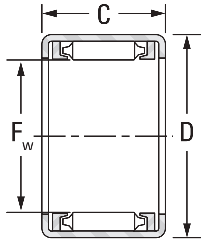
DRAWN CUP ROLLER CLUTCHES

METRIC SERIES

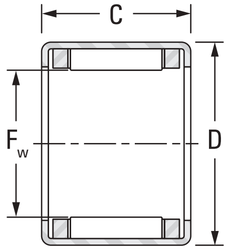
- For proper application, separate bearings are suggested (adjacent to clutch) to carry radial loads and assure concentricity between shaft and housing.
- The clutch engages when housing is rotated relative to the shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-3-9.
- Full details on installation are given on page B-3-8.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Types FC, FCS, FC-K and FCL-K clutches have stainless steel springs inserted in molded cage to position rollers for lockup.

The mounted clutch engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.





FC



FCS, FCL-K and FC-K

Shaft Diameter	F_w	D	C	Clutch Designation	Torque Rating	Minimum O.D. of Steel Housing for Rated Torque	Overrun Limiting Speed Rating for Rotating Shaft[1]	Suitable Drawn Cup Bearing[2]
			-0.30 mm -0.012 in			Z		
mm in	mm in	mm in	mm in		N-m lbf-in	mm in	min⁻¹	
4 0.1575	**4** 0.1575	**8** 0.3150	**6** 0.236	FC-4-K	**0.349** 3.09	**11** 0.433	26000	HK0408
6 0.2362	**6** 0.2362	**10** 0.3937	**12** 0.472	FCS-6	**2.15** 19.0	**14** 0.551	22000	HK0608
	6 0.2362	**10** 0.3937	**12** 0.472	FC-6	**2.63** 23.3	**14** 0.551	22000	HK0608
8 0.3150	**8** 0.3150	**12** 0.4724	**12** 0.472	FCL-8-K	**3.39** 30.0	**17** 0.669	21000	HK0808
	8 0.3150	**14** 0.5512	**12** 0.472	FC-8	**4.42** 39.1	**20** 0.787	21000	—
10 0.3937	**10** 0.3937	**14** 0.5512	**12** 0.472	FCL-10-K	**4.60** 40.7	**20** 0.787	19000	HK1010
	10 0.3937	**16** 0.6299	**12** 0.472	FC-10	**5.82** 51.5	**25** 0.984	19000	—
12 0.4724	**12** 0.4724	**18** 0.7087	**16** 0.630	FC-12	**14.0** 124	**27** 1.063	19000	HK1212
16 0.6299	**16** 0.6299	**22** 0.8661	**16** 0.630	FC-16	**21.7** 192	**31** 1.22	14000	HK1612
20 0.7874	**20** 0.7874	**26** 1.0236	**16** 0.630	FC-20	**32.6** 289	**38** 1.496	11000	HK2012
25 0.9843	**25** 0.9843	**32** 1.2598	**20** 0.787	FC-25	**71.0** 628	**46** 1.811	8700	HK2512
30 1.1811	**30** 1.1811	**37** 1.4567	**20** 0.787	FC-30	**99.1** 877	**51** 2.008	7300	HK3012
35 1.3780	**35** 1.3780	**42** 1.6535	**20** 0.787	FCS-35	**107.0** 947	**56** 2.205	6100	HK3512

Gaging			Mounting				Approx. Wt.
			Shaft Raceway Diameter		Housing Bore		
Ring Gage	Clutch Locking Plug	Clutch Overrun Plug	S		H		
			Max.	Min.	Max.	Min.	
mm in	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
7.984 0.3143	**3.980** 0.1567	**4.004** 0.1576	**4.000** 0.1575	**3.995** 0.1573	**7.993** 0.3147	**7.984** 0.3143	**0.001** 0.002
9.984 0.3931	**5.980** 0.2354	**6.004** 0.2364	**6.000** 0.2362	**5.995** 0.2360	**9.993** 0.3934	**9.984** 0.3931	**0.003** 0.007
9.984 0.3931	**5.980** 0.2354	**6.004** 0.2364	**6.000** 0.2362	**5.995** 0.2360	**9.993** 0.3934	**9.984** 0.3931	**0.004** 0.009
11.980 0.4717	**7.976** 0.3140	**8.005** 0.3152	**8.000** 0.3150	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	**0.003** 0.007
13.980 0.5504	**7.976** 0.3140	**8.005** 0.3152	**8.000** 0.3150	**7.994** 0.3147	**13.991** 0.5508	**13.980** 0.5504	**0.007** 0.015
13.980 0.5504	**9.976** 0.3928	**10.005** 0.3939	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	**0.004** 0.009
15.980 0.6291	**9.976** 0.3928	**10.005** 0.3939	**10.000** 0.3937	**9.994** 0.3935	**15.991** 0.6296	**15.980** 0.6291	**0.009** 0.020
17.980 0.7079	**11.974** 0.4714	**12.006** 0.4727	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	**0.012** 0.026
21.976 0.8652	**15.972** 0.6288	**16.006** 0.6302	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	**0.018** 0.040
25.976 1.0227	**19.970** 0.7862	**20.007** 0.7877	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	**0.021** 0.046
31.972 1.2587	**24.967** 0.9830	**25.007** 0.9845	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	**0.034** 0.075
36.972 1.4556	**29.967** 1.1798	**30.007** 1.1814	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	**0.042** 0.093
41.972 1.6524	**34.964** 1.3765	**35.009** 1.3783	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	**0.048** 0.106

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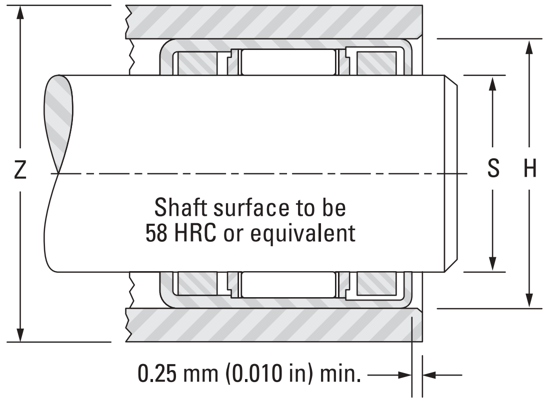
[1] Indicates the number of relative rotations allowed when the shaft idles.
[2] See pages B-2-14 to B-2-25 for suitable bearing types and sizes.

DRAWN CUP ROLLER CLUTCHES AND BEARING ASSEMBLIES

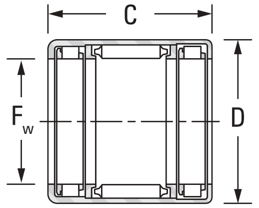
METRIC SERIES

- The clutch and bearing assembly engages when the housing is rotated relative to shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-3-9.
- Full details on installation are given on page B-3-8.
- Types FCB, FCBL-K and FCBN-K clutch and bearing assemblies have stainless steel springs inserted in molded cage to position rollers for lockup.

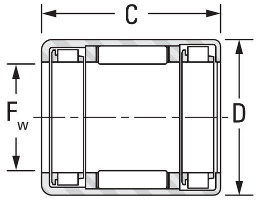
The mounted clutch and bearing assembly engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.



Clutch and bearing assemblies



FCB



FCBL-K and FCBN-K

Shaft Diameter	F_w	D	C	Clutch and Bearing Assembly Designation	Torque Rating	Minimum O.D. of Steel Housing for Rated Torque	Load Ratings[1]		Fatigue Load Limit C_u	Overrun Limiting Speed Rating for Rotating Shaft[2]	Gaging				Mounting				Approx. Wt.
			-0.30 mm -0.012 in				Dynamic	Static			Ring Gage	Clutch Locking Plug	Clutch Overrun and Bearing Go Plug	Bearing No Go Plug	S		H		
						Z	C	C_0							Max.	Min.	Max.	Min.	
mm in	**mm** in	**mm** in	**mm** in		**N-m** lbf-in		**kN** lbf	**kN** lbf	kN	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
4 0.1575	**4** 0.1575	**10** 0.3937	**9** 0.354	FCBN-4-K	**0.19** 1.68	**16** 0.630	**1.86** 418	**0.99** 223	0.160	26000	**9.984** 0.3931	**3.980** 0.1567	**4.004** 0.1576	**4.030** 0.1587	**4.000** 0.1575	**3.995** 0.1573	**9.993** 0.3934	**9.984** 0.3931	**0.003** 0.007
6 0.2362	**6** 0.2362	**12** 0.4724	**10** 0.394	FCBN-6-K	**0.56** 4.96	**18** 0.709	**2.48** 558	**1.48** 333	0.240	22000	**11.980** 0.4717	**5.980** 0.2354	**6.004** 0.2364	**6.030** 0.2374	**6.000** 0.2362	**5.995** 0.2360	**11.991** 0.4721	**11.980** 0.4717	**0.004** 0.009
8 0.3150	**8** 0.3150	**12** 0.4724	**22** 0.866	FCBL-8-K	**3.39** 30.0	**17** 0.669	**3.62** 814	**3.28** 737	0.520	21000	**11.980** 0.4717	**7.976** 0.3140	**8.005** 0.3152	**8.033** 0.3163	**8.000** 0.3150	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	**0.005** 0.011
	8 0.3150	**14** 0.5512	**20** 0.787	FCB-8	**4.42** 39.1	**20** 0.787	**4.22** 949	**3.04** 683	0.500	21000	**13.980** 0.5504	**7.976** 0.3140	**8.005** 0.3152	**8.033** 0.3163	**8.000** 0.3150	**7.994** 0.3147	**13.991** 0.5508	**13.980** 0.5504	**0.011** 0.024
10 0.3937	**10** 0.3937	**16** 0.6299	**20** 0.787	FCB-10	**5.82** 51.5	**25** 0.984	**4.84** 1090	**3.80** 854	0.630	19000	**15.980** 0.6291	**9.976** 0.3928	**10.005** 0.3939	**10.033** 0.3950	**10.000** 0.3937	**9.994** 0.3935	**15.991** 0.6296	**15.980** 0.6291	**0.013** 0.029
12 0.4724	**12** 0.4724	**18** 0.7087	**26** 1.024	FCB-12	**14.0** 124	**27** 1.063	**6.30** 1420	**5.84** 1310	0.970	19000	**17.980** 0.7079	**11.974** 0.4714	**12.006** 0.4727	**12.036** 0.4739	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	**0.018** 0.040
16 0.6299	**16** 0.6299	**22** 0.8661	**26** 1.024	FCB-16	**21.7** 192	**31** 1.220	**6.64** 1490	**7.12** 1600	1.20	14000	**21.976** 0.8652	**15.972** 0.6288	**16.006** 0.6302	**16.036** 0.6313	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	**0.024** 0.053
20 0.7874	**20** 0.7874	**26** 1.0236	**26** 1.024	FCB-20	**32.6** 289	**38** 1.496	**8.16** 1830	**9.46** 2130	1.55	11000	**25.976** 1.0227	**19.970** 0.7862	**20.007** 0.7877	**20.043** 0.7891	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	**0.028** 0.062
25 0.9843	**25** 0.9843	**32** 1.2598	**30** 1.181	FCB-25	**71.0** 628	**46** 1.811	**11.3** 2540	**13.1** 2940	2.20	8700	**31.972** 1.2587	**24.967** 0.9830	**25.007** 0.9845	**25.043** 0.9859	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	**0.048** 0.106
30 1.1811	**30** 1.1811	**37** 1.4567	**30** 1.181	FCB-30	**99.1** 877	**51** 2.008	**11.5** 2590	**14.9** 3350	2.50	7300	**36.972** 1.4556	**29.967** 1.1798	**30.007** 1.1814	**30.043** 1.1828	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	**0.054** 0.119

---

[1] Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
[2] Indicates the number of relative rotations allowed when the shaft idles.

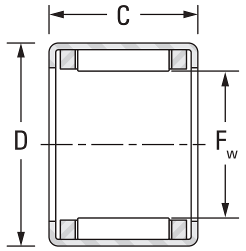
DRAWN CUP ROLLER CLUTCHES

INCH SERIES

- For proper application, separate bearings are suggested (adjacent to clutch) to carry radial loads and assure concentricity between shaft and housing.
- The clutch engages when housing is rotated relative to the shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-3-9.
- Full details on installation are given on page B-3-8.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Type RC clutches have springs integrally molded with the cage to position the rollers for lockup.

  Type RC-FS clutches have stainless steel springs inserted into the molded cage to position the rollers for lockup.

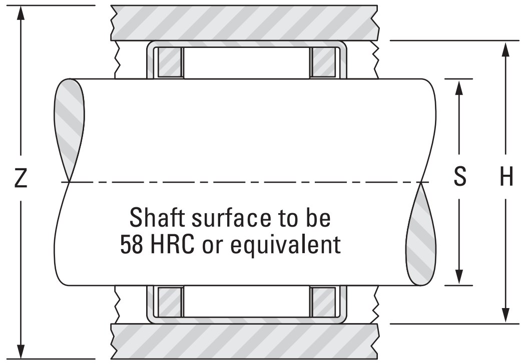
The mounted clutch engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.



RC and RC-FS

Shaft Diameter	Fw	D	C	Clutch Designations		Torque Rating	Minimum O.D. of Steel Housing for Rated Torque	Overrun Limiting Speed Rating for Rotating Shaft[1]
			-0.25 mm -0.010 in	With Stainless Steel Springs	With Integral Springs		Z	
mm in	**mm** in	**mm** in	**mm** in			**N-m** lbs-in		min^{-1}
3.175 0.1250	**3.18** 0.125	**7.14** 0.281	**6.35** 0.250	—	RC-02	**0.323** 2.86	**11.2** 0.44	34000
6.350 0.2500	**6.35** 0.250	**11.13** 0.438	**12.70** 0.500	RC-040708-FS[2]	RC-040708	**1.94** 17.2	**15.7** 0.62	20000
9.525 0.3750	**9.53** 0.375	**15.88** 0.625	**12.70** 0.500	RC-061008-FS[2]	RC-061008	**5.45** 48.2	**22.4** 0.88	18000
12.700 0.5000	**12.70** 0.500	**19.05** 0.750	**12.70** 0.500	RC-081208-FS[2]	RC-081208	**8.85** 78.3	**27.9** 1.10	17000
15.875 0.6250	**15.88** 0.625	**22.23** 0.875	**15.88** 0.625	RC-101410-FS[2]	RC-101410	**16.8** 149	**30.5** 1.20	14000
19.050 0.7500	**19.05** 0.750	**25.40** 1.000	**15.88** 0.625	RC-121610-FS[2]	RC-121610	**23.3** 206	**35.6** 1.40	12000
25.400 1.0000	**25.40** 1.000	**33.35** 1.313	**15.88** 0.625	RC-162110-FS[2]	RC-162110	**49.6** 439	**48.3** 1.90	8700

[1] Indicates the number of relative rotations allowed when the shaft idles.
[2] Suffix "-FS" is not always stamped on the clutch cup. Type RC-FS with stainless steel springs are always readily identified by RED clutch cage.
[3] See pages B-2-60 to B-2-63 for other suitable bearing types and sizes.



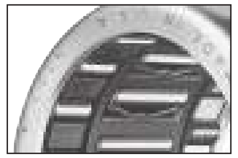
Suitable Drawn Cup Bearing[3]	Gaging			Mounting				Approx. Wt.
				Shaft Raceway Diameter		Housing Bore		
	Ring Gage	Clutch Locking Plug	Clutch Overrun Plug	S		H		
				Max.	Min.	Max.	Min.	
	mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs
—	**7.155** 0.2817	**3.160** 0.1244	**3.195** 0.1258	**3.175** 0.1250	**3.167** 0.1247	**7.155** 0.2817	**7.142** 0.2812	**0.001** 0.002
J-45	**11.125** 0.4380	**6.337** 0.2495	**6.383** 0.2513	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	**0.004** 0.008
JH-68	**15.888** 0.6255	**9.512** 0.3745	**9.558** 0.3763	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	**0.008** 0.017
JH-87	**19.063** 0.7505	**12.687** 0.4995	**12.733** 0.5013	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	**0.009** 0.020
JH-1010	**22.238** 0.8755	**15.862** 0.6245	**15.908** 0.6263	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	**0.014** 0.030
J-126	**25.387** 0.9995	**19.012** 0.7485	**19.058** 0.7503	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**0.015** 0.034
JH-1612	**33.325** 1.3120	**25.362** 0.9985	**25.408** 1.0003	**25.400** 1.0000	**25.387** 0.9995	**33.350** 1.3130	**33.325** 1.3120	**0.026** 0.058

DRAWN CUP ROLLER CLUTCH AND BEARING ASSEMBLIES

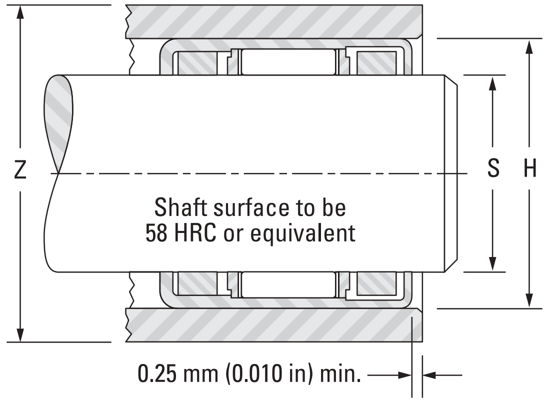
INCH SERIES

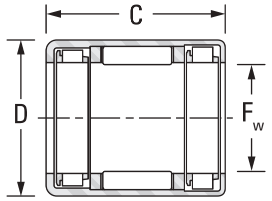
- Clutch and bearing assembly engages when the housing is rotated relative to shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-3-9.
- Full details on installation are given on page B-3-8.
- Type RCB clutch and bearing assemblies have springs integrally molded with the cage to position the rollers for lockup.

  Type RCB-FS clutch and bearing assemblies have stainless steel springs inserted into the molded cage to position the rollers for lockup.



The mounted clutch and bearing assembly engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.





RCB and RCB-FS

Shaft Diameter	F_w	D	C	Clutch and Bearing Designations		Torque Rating	Minimum O.D. of Steel Housing for Rated Torque	Load Ratings[2]		Fatigue Load Limit C_u	Overrun Limiting Speed Rating for Rotating Shaft[3]	Gaging				Mounting				Approx. Wt.
			-0.25 mm -0.010 in	With Stainless Steel Springs	With Integral Springs		Z	Dynamic C	Static C_0			Ring Gage	Clutch Locking Plug	Clutch Overrun and Bearing Go Plug	Bearing No Go Plug	Shaft Raceway Diameter S Max.	Shaft Raceway Diameter S Min.	Housing Bore H Max.	Housing Bore H Min.	
mm in	mm in	mm in	mm in			N-m lbf-in		kN lbf	kN lbf	kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
9.525 0.3750	**9.53** 0.375	**15.88** 0.625	**22.23** 0.875	RCB-061014-FS[1]	RCB-061014	**5.45** 48.2	**22.4** 0.88	**6.01** 1350	**4.89** 1100	0.800	18000	**15.888** 0.6255	**9.512** 0.3745	**9.553** 0.3761	**9.589** 0.3775	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	**0.014** 0.030
12.700 0.5000	**12.70** 0.500	**19.05** 0.750	**22.23** 0.875	RCB-081214-FS[1]	RCB-081214	**8.85** 78.3	**27.9** 1.1	**7.12** 1600	**6.49** 1460	1.05	17000	**19.063** 0.7505	**12.687** 0.4995	**12.728** 0.5011	**12.764** 0.5025	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	**0.016** 0.036
15.875 0.6250	**15.88** 0.625	**22.23** 0.875	**25.40** 1.000	RCB-101416-FS[1]	RCB-101416	**16.8** 149	**30.5** 1.2	**8.05** 1810	**8.14** 1830	1.35	14000	**22.238** 0.8755	**15.862** 0.6245	**15.903** 0.6261	**15.939** 0.6275	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	**0.023** 0.050
19.050 0.7500	**19.05** 0.750	**25.40** 1.000	**25.40** 1.000	RCB-121616-FS[1]	RCB-121616	**23.3** 206	**35.6** 1.4	**8.90** 2000	**9.79** 2200	1.60	12000	**25.387** 0.9995	**19.012** 0.7485	**19.053** 0.7501	**19.088** 0.7515	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**0.026** 0.057
25.400 1.0000	**25.40** 1.000	**33.35** 1.313	**27.00** 1.063	RCB-162117-FS[1]	RCB-162117	**49.6** 439	**48.3** 1.9	**15.4** 3460	**17.6** 3960	2.85	8700	**33.325** 1.3120	**25.362** 0.9985	**25.403** 1.0001	**25.438** 1.0015	**25.400** 1.0000	**25.387** 0.9995	**33.350** 1.3130	**33.325** 1.3120	**0.045** 0.100

[1] Suffix "-FS" is not always stamped on the clutch cup. Type RC-FS with stainless steel springs are always readily identified by RED clutch cage.
[2] Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
[3] Indicates the number of relative rotations allowed when the shaft idles.

INTRODUCTION

OTHER AVAILABLE CLUTCHES

In addition to the metric and inch sizes of drawn cup clutches and clutch and bearing assemblies already discussed, JTEKT offers other types of drawn cup clutches to address special customer needs:

CHARACTERISTICS

- Locking protrusions are provided around the drawn cup, so that creeping can be prevented without having to hold the surface dimensional accuracy precisely.
- Pre-lubricated with optimum grease, so that no lubrication is necessary under normal operating conditions.
- Unit products with a synthetic resin housing are also available.
  They are compatible with components of various types, such as gears, timing pulleys, cams and rubber rollers. Consult with JTEKT for further information.

Fig. B3-15. 1WC series

Fig. B3-16. EWC series

Fig. B3-17. Various housings and unit products

STRUCTURE AND PRINCIPLES

WHEN THE CLUTCH SYSTEM WORKS

When the shaft rotates clockwise as in cross section A-A', rollers are locked while engaged with the drawn cup cam surfaces by the effect of springs (wedging of the shaft by the cam surfaces). The drawn cup is driven as a consequence.

CLUTCH IDLE RUNNING

When the shaft rotates counter-clockwise as in cross section A-A', rollers move away from the drawn cup cam surfaces and rotate freely.

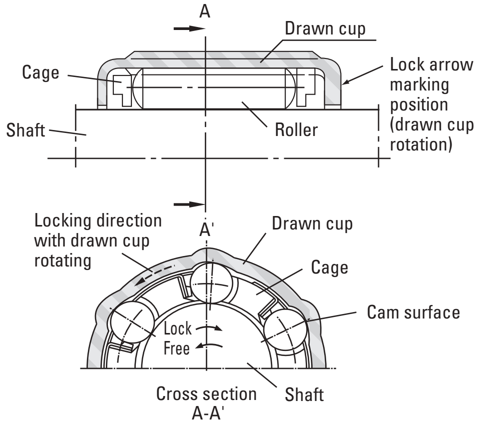


Fig. B3-18.

Table B3-1. Miniature one-way clutch types and characteristics

	1WC series (with metal springs)	EWC series (with synthetic resin springs)	
	Heavy load type	Heavy load type	Light load type
	1WC...	EWC...C	EWC...A
Torque capacity	Heavy load	Heavy load	Light load
Operating temperature range	– 10 to + 90°C	– 10 to + 70°C	
Locking life	Locking system can function more than one million. (Note : this estimation is valid as long as torque magnitude does not exceed the torque capacity shown in the specification table.)		
Insert molding	Possible	Impossible	
Delivery of clutch only	Possible		
Unit delivery	Possible		

Table B3-2. Shaft tolerance

	Heavy load type (1WC... , EWC...C)	Light load type (EWC...A)
Shaft tolerance class	h 8	
Surface hardness	50 HRC or harder	30 HRC or harder
Roughness (Ra)	0.3 a or less	0.8 a or less
Roundness and cylindricity	0.005 mm or less	

[Remarks] In some operating conditions, shafts need not be as accurate as shown here.
For example :

1. When clutch engaging accuracy is considered unimportant, or when a radial load or moment is not generated, the shaft diameter tolerance can be :
   - **shaft diameter 6 mm or less, and EWC0809 (C, A)** ······ 0 to – 0.040 mm
   - **shaft diameter 8 mm or more** ································· h 10
2. When the loaded torque is smaller than the torque capacity, shaft surface hardness can be determined as follows :
   - The diagram on the right shows approximate shaft surface hardness relative to torque ratio A.

$$\textbf{Torque ratio (A)} = \frac{\textbf{Loaded torque}}{\textbf{Heavy load type torque capacity}}$$

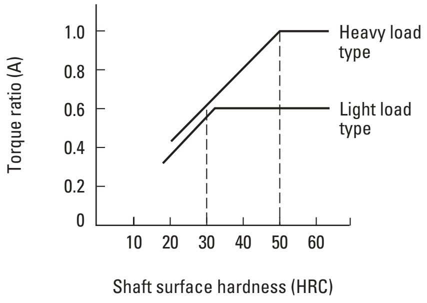
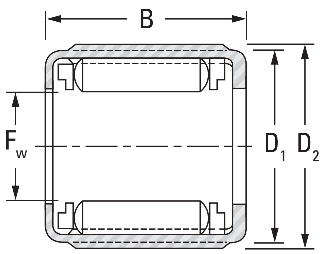
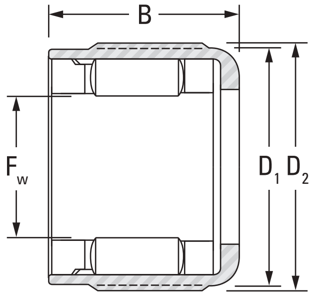


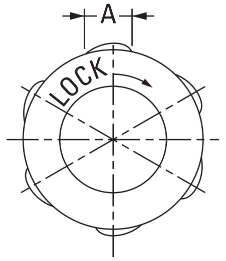
Fig. B3-19.

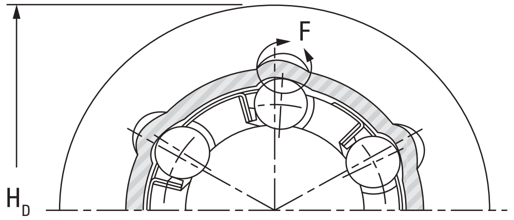


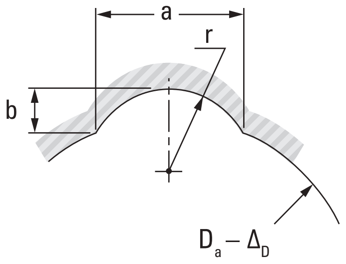
1WC Series



EWC Series







Details of Section F

Shaft Diameter	F_w	D_1	D_2	B	A	Torque Capacity	Designations		No. of [1] Outer Ring Protrusion	Recommended Housing Dimensions						Approx. Wt.	
							1WC Series (With Metal Springs)	EWC Series (With Resin Springs)		H_D	a	b	r	D_a	Δ_D [2]	1WC	EWC
mm in	mm in	mm in	mm in	mm in	mm in	N-m				mm in	mm in	mm in	mm in	mm in	mm in	g	
4	4	8	8.4	6	2.6	0.08	—	EWC0406A	4	12	2.65	0.50	2	8	0.06	—	1.0
	4	8	8.4	6	2.6	0.15	—	EWC0406C	4	12	2.65	0.50	2	8	0.06	—	1.0
6	6	10	10.4	8	2.8	0.25	—	EWC0608A	6	14	2.8	0.57	2	10	0.08	—	1.7
	6	10	10.4	8	2.8	0.44	—	EWC0608C	6	14	2.8	0.57	2	10	0.08	—	1.7
	6	10	10.4	8	2.8	0.44	1WC0608	—	6	14	2.8	0.57	2	10	0.08	2.0	—
	6	10	10.4	12	2.8	0.88	1WC0612	—	6	14	2.8	0.57	2	10	0.08	3.0	—
8	8	12	12.4	9	2.6	0.49	—	EWC0809A	6	16	2.6	0.48	2	12	0.10	—	2.4
	8	12	12.4	9	2.6	0.88	—	EWC0809C	6	16	2.6	0.48	2	12	0.10	—	2.4
	8	14.2	15	12	3.6	1.18	—	EWC0812A	6	18.5	3.6	0.87	2.3	14.2	0.11	—	5.8
	8	14.2	15	12	3.6	1.96	—	EWC0812C	6	18.5	3.6	0.87	2.3	14.2	0.11	—	5.8
	8	14.2	15	12	3.6	1.96	1WC0812	—	6	18.5	3.6	0.87	2.3	14.2	0.11	7.0	—
	8	14.2	15	14.5	3.6	2.65	1WC0815	—	6	18.5	3.6	0.87	2.3	14.2	0.11	8.0	—
10	10	16	17	10	5	1.18	—	EWC1010A	6	21	5.0	1.20	3.2	16	0.13	—	6.0
	10	16	17	10	5	1.96	—	EWC1010C	6	21	5.0	1.20	3.2	16	0.13	—	6.0
	10	16	17	12	5	1.37	—	EWC1012A	6	21	5.0	1.20	3.2	16	0.13	—	6.8
	10	16	17	12	5	2.35	—	EWC1012C	6	21	5.0	1.20	3.2	16	0.13	—	6.8
	10	16	17	12	5	2.35	1WC1012	—	6	21	5.0	1.20	3.2	16	0.13	8.0	—
12	12	18	19	16	5.1	6.28	1WC1216	—	8	23	5.1	1.20	3.3	18	0.14	12	—

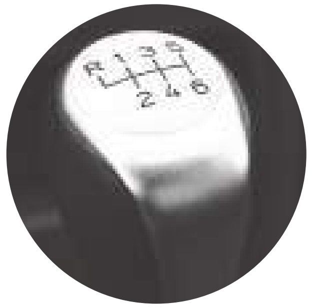
(1) Provided at equal intervals.
(2) Recommended interference when polyacetal resin housing is used.

NOTES

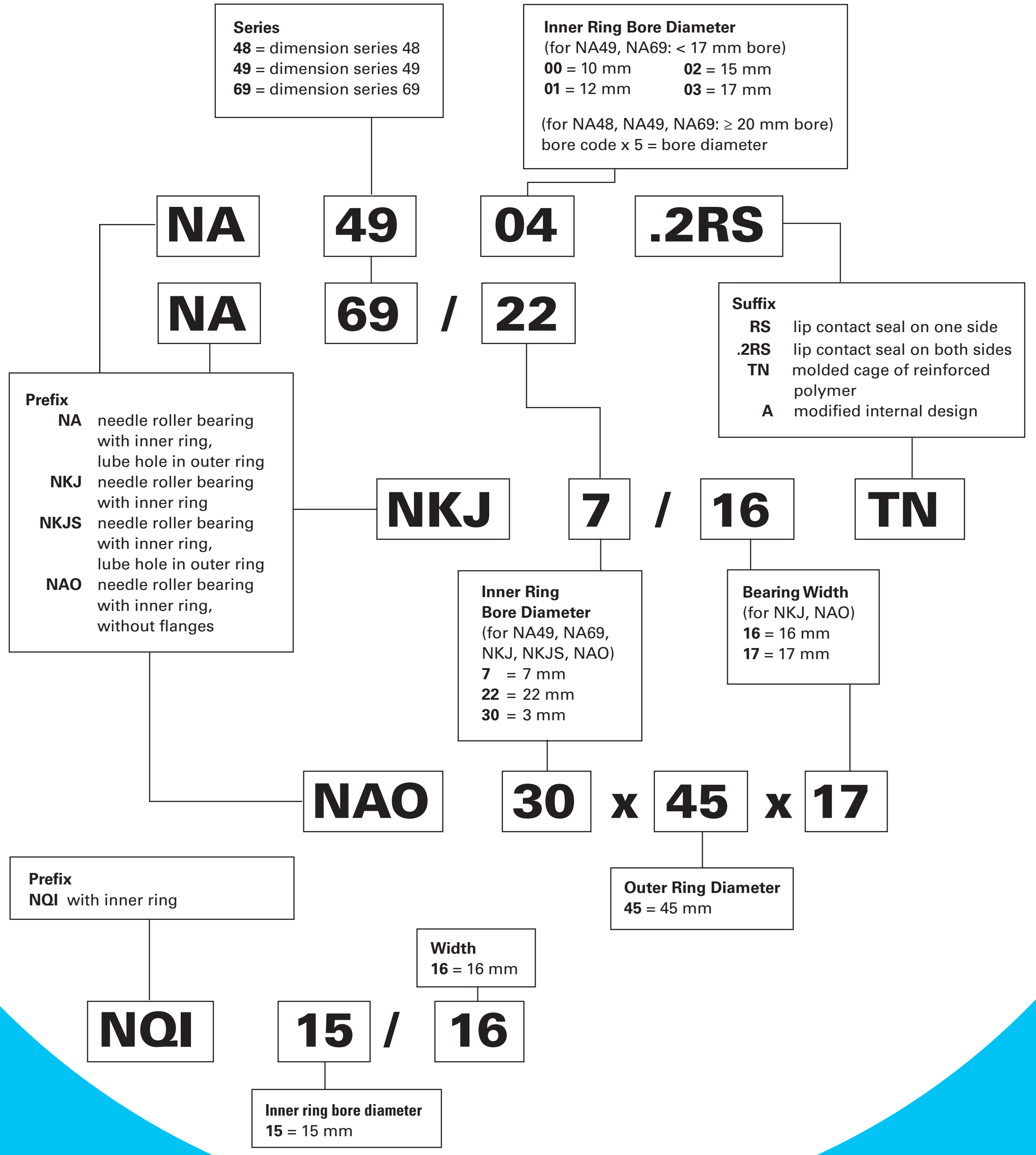
HEAVY-DUTY NEEDLE ROLLER BEARINGS

Overview: Heavy-duty needle roller bearings consist of a machined and ground channel-shaped outer ring with a complement of needle rollers, and a cage. The high-strength cage retains and guides the rollers. An optional lubrication groove and hole in the outer ring facilitates re-lubrication. These bearings can be used with or without a machined and ground inner ring, depending on the suitability of the shaft as a raceway surface.

- **Catalog range:** 5 mm – 175 mm (0.1969 in – 6.8898 in) bore.
- **Markets:** Gear pumps, sheaves, automotive transmissions and two-cycle engines.
- **Features:** Thick outer ring provides maximum load capacity and shock resistance with a relatively small radial cross section.
- **Benefits:** Optimum speed and lubrication-retention capability.



Needle Roller Bearings with Inner Rings – Metric Nominal Dimensions



NA 49 04 .2RS

NA 69 / 22

NKJ 7 / 16 TN

NAO 30 x 45 x 17

NQI 15 / 16

Series
48 = dimension series 48
49 = dimension series 49
69 = dimension series 69

Inner Ring Bore Diameter
(for NA49, NA69: < 17 mm bore)
00 = 10 mm **02** = 15 mm
01 = 12 mm **03** = 17 mm

(for NA48, NA49, NA69: ≥ 20 mm bore)
bore code x 5 = bore diameter

Suffix
RS lip contact seal on one side
.2RS lip contact seal on both sides
TN molded cage of reinforced polymer
A modified internal design

Prefix
NA needle roller bearing with inner ring, lube hole in outer ring
NKJ needle roller bearing with inner ring
NKJS needle roller bearing with inner ring, lube hole in outer ring
NAO needle roller bearing with inner ring, without flanges

Inner Ring Bore Diameter
(for NA49, NA69, NKJ, NKJS, NAO)
7 = 7 mm
22 = 22 mm
30 = 3 mm

Bearing Width
(for NKJ, NAO)
16 = 16 mm
17 = 17 mm

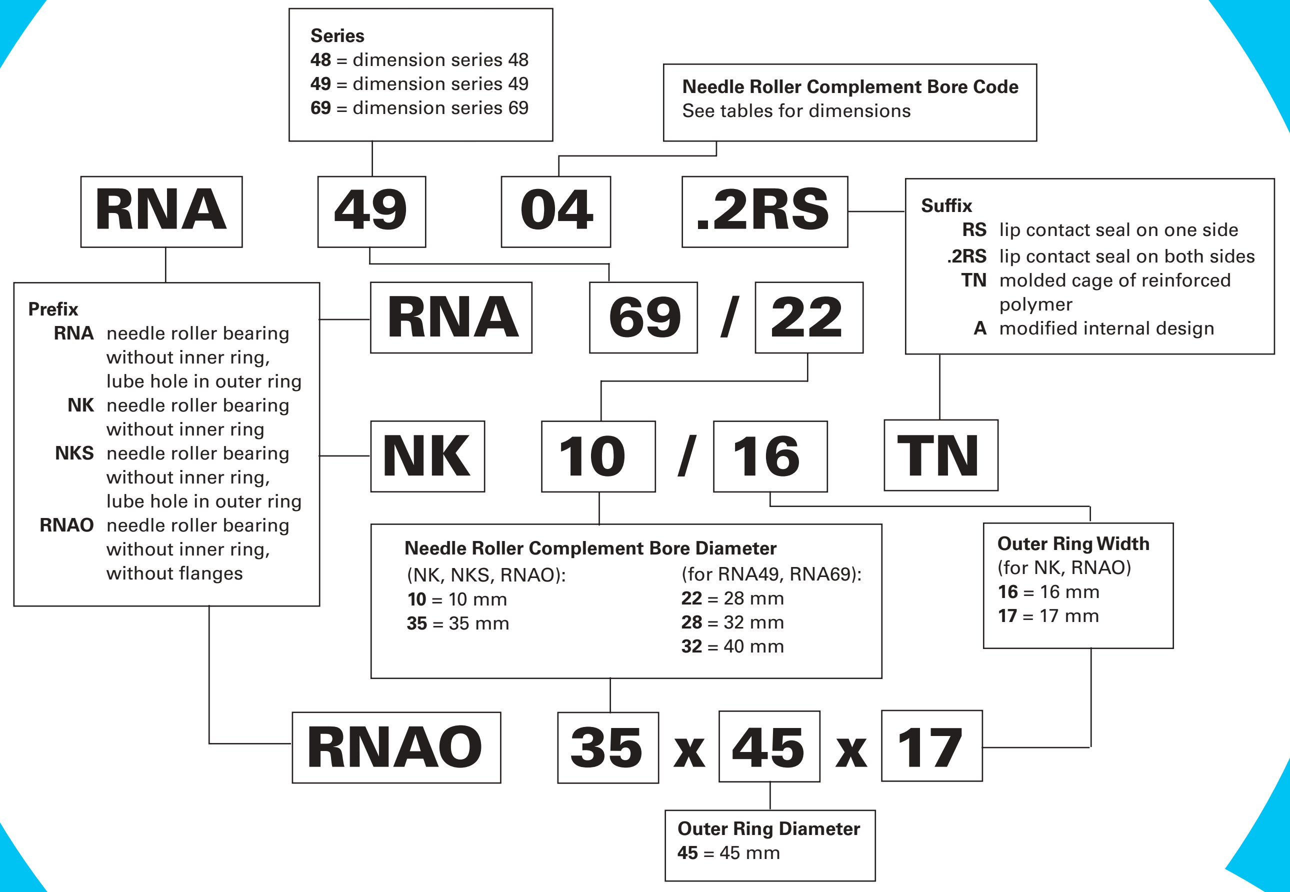
Outer Ring Diameter
45 = 45 mm

Prefix
NQI with inner ring

Width
16 = 16 mm

Inner ring bore diameter
15 = 15 mm

Needle Roller Bearings without Inner Rings – Metric Nominal Dimensions



RNA 49 04 .2RS

RNA 69 / 22

NK 10 / 16 TN

RNAO 35 x 45 x 17

Series
48 = dimension series 48
49 = dimension series 49
69 = dimension series 69

Needle Roller Complement Bore Code
See tables for dimensions

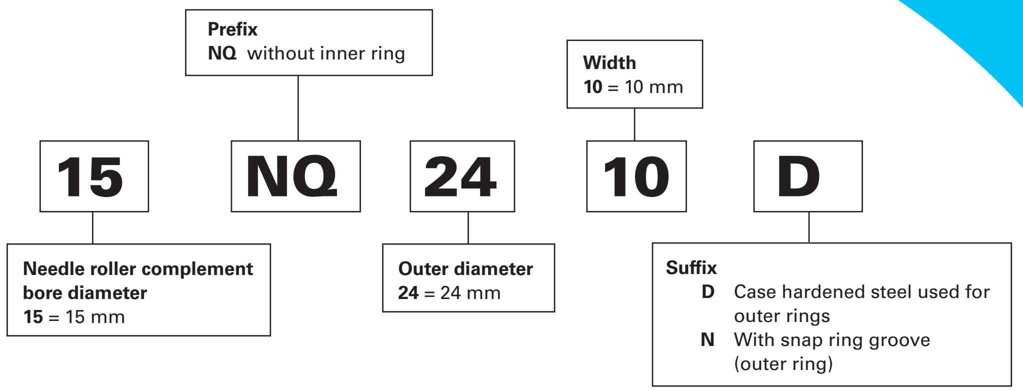
Suffix
RS lip contact seal on one side
.2RS lip contact seal on both sides
TN molded cage of reinforced polymer
A modified internal design

Prefix
RNA needle roller bearing without inner ring, lube hole in outer ring
NK needle roller bearing without inner ring
NKS needle roller bearing without inner ring, lube hole in outer ring
RNAO needle roller bearing without inner ring, without flanges

Needle Roller Complement Bore Diameter
(NK, NKS, RNAO):
10 = 10 mm
35 = 35 mm
(for RNA49, RNA69):
22 = 28 mm
28 = 32 mm
32 = 40 mm

Outer Ring Width
(for NK, RNAO)
16 = 16 mm
17 = 17 mm

Outer Ring Diameter
45 = 45 mm



15 NQ 24 10 D

Prefix
NQ without inner ring

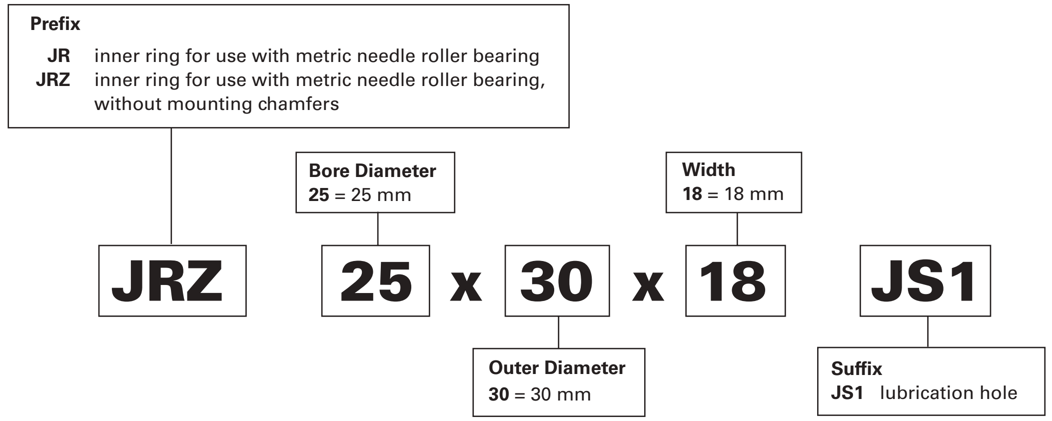
Width
10 = 10 mm

Needle roller complement bore diameter
15 = 15 mm

Outer diameter
24 = 24 mm

Suffix
D Case hardened steel used for outer rings
N With snap ring groove (outer ring)

Inner Rings for Needle Roller Bearings – Metric Nominal Dimensions



JRZ 25 x 30 x 18 JS1

Prefix
JR inner ring for use with metric needle roller bearing
JRZ inner ring for use with metric needle roller bearing, without mounting chamfers

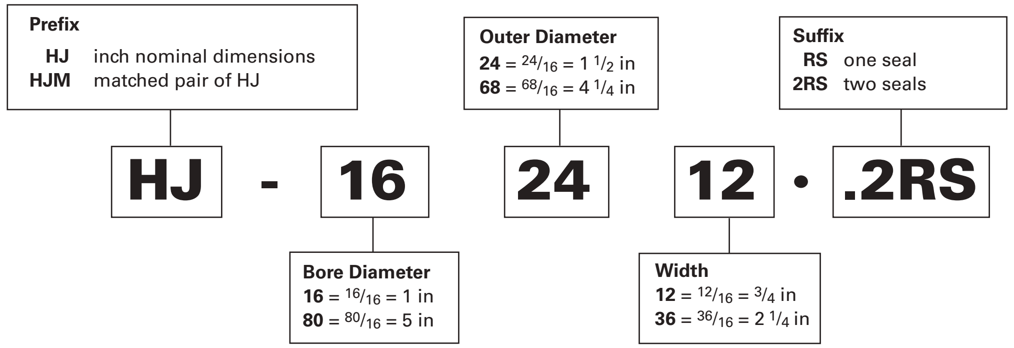
Bore Diameter
25 = 25 mm

Width
18 = 18 mm

Outer Diameter
30 = 30 mm

Suffix
JS1 lubrication hole

Needle Roller Bearings – Inch Nominal Dimensions



Prefix
HJ inch nominal dimensions
HJM matched pair of HJ

Outer Diameter
24 = $^{24}/_{16} = 1\,^{1}/_{2}$ in
68 = $^{68}/_{16} = 4\,^{1}/_{4}$ in

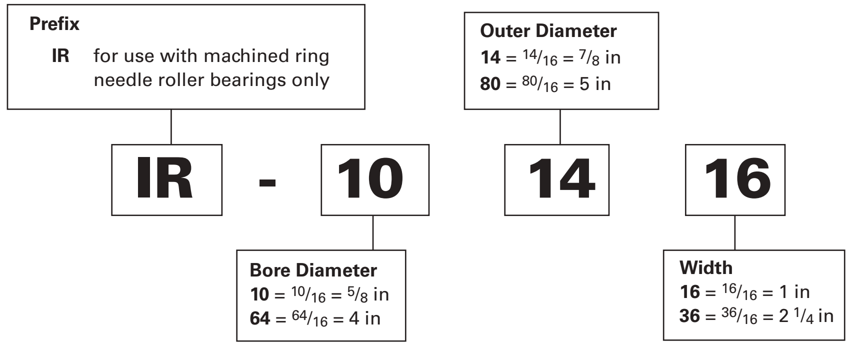
Suffix
RS one seal
2RS two seals

HJ - 16 24 12 • .2RS

Bore Diameter
16 = $^{16}/_{16} = 1$ in
80 = $^{80}/_{16} = 5$ in

Width
12 = $^{12}/_{16} = ^{3}/_{4}$ in
36 = $^{36}/_{16} = 2\,^{1}/_{4}$ in

Inner Rings (six-digit number) – Inch Nominal Dimensions



Prefix
IR for use with machined ring needle roller bearings only

Outer Diameter
14 = $^{14}/_{16} = ^{7}/_{8}$ in
80 = $^{80}/_{16} = 5$ in

IR - 10 14 16

Bore Diameter
10 = $^{10}/_{16} = ^{5}/_{8}$ in
64 = $^{64}/_{16} = 4$ in

Width
16 = $^{16}/_{16} = 1$ in
36 = $^{36}/_{16} = 2\,^{1}/_{4}$ in

Heavy-Duty Needle Roller Bearings

Page

NEEDLE ROLLER BEARINGS – METRIC SERIES

NEEDLE ROLLER BEARINGS – INCH SERIES

NEEDLE ROLLER BEARINGS

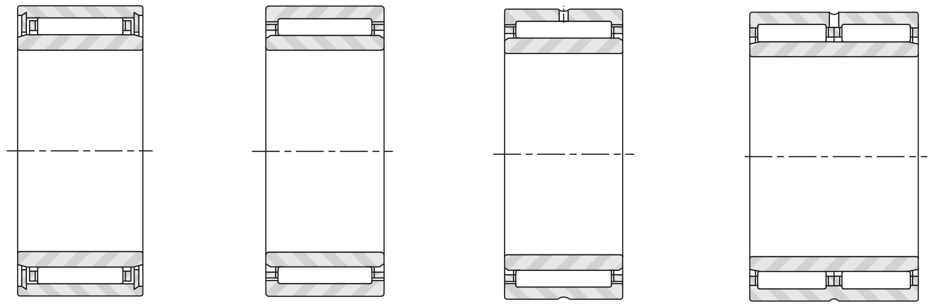
METRIC SERIES

When applications involve very heavy dynamic, static or even shock load conditions, the needle roller bearing may be found to give best results.

REFERENCE STANDARDS ARE:

- **ISO 1206** – needle roller bearings – light and medium series – dimensions and tolerances.
- **DIN 617** – rolling bearings – needle roller bearings with cage – dimension Series 48 and 49.
- **JIS B 1536** – rolling bearings – needle roller bearings – boundary dimensions and precision.

TYPES OF METRIC SERIES NEEDLE ROLLER BEARINGS



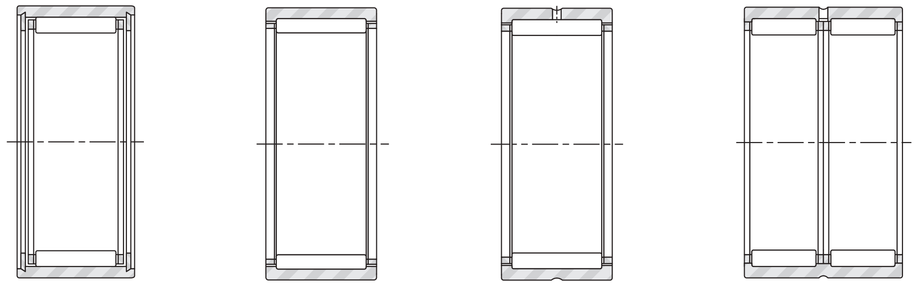
NKJ
(d ≤ 7 mm [0.2756 in])

NQI

NKJ, NKJS
(d ≥ 9 mm [0.3543 in])
NA48, NA49
NA69 (d ≤ 30 mm [1.1811 in])

NA69
(d ≥ 32 mm [1.2598 in])

Fig. B4-1. Needle roller bearings with inner rings



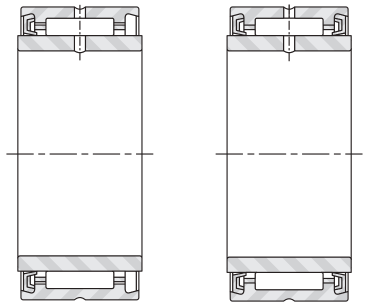
NK
(F_W ≤ 10 mm [0.03937 in])

NQ

NK (F_W ≥ 12 mm [0.4724 in])
NKS, RNA48, RNA49
RNA69 (F_W ≤ 35 mm [1.3780 in])

RNA69
(F_W ≥ 40 mm [1.5748 in])

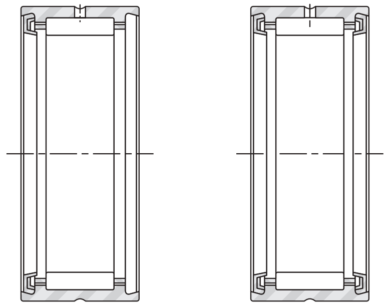
Fig. B4-2. Needle roller bearings without inner rings



NA49RS

NA49.2RS

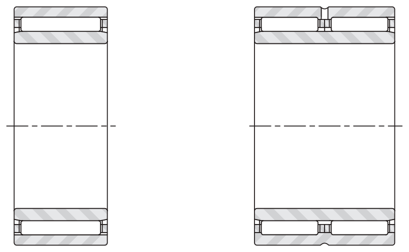
Fig. B4-3. Sealed needle roller bearings with inner rings



RNA49RS

RNA49.2RS

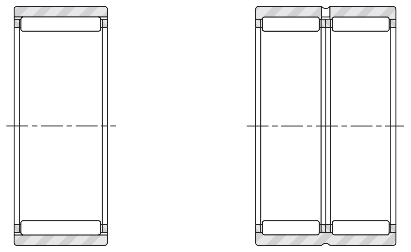
Fig. B4-4. Sealed needle roller bearings without inner rings



NAO

NAO

Fig. B4-5. Needle roller bearings without flanges, with inner rings



RNAO

RNAO

Fig. B4-6. Needle roller bearings without flanges, without inner rings

CONSTRUCTION

The basic constructions of metric series needle roller bearings are:

- With integral end flanges on the one-piece, channel-shaped outer rings (F_W ≥ 12.000 mm[0.4724 in]).
- With inserted-end washers to provide axial retention of the needle roller and cage assemblies (F_W ≤ 10.000 mm 0.3937 in).
- Without flanges where separate end washers or housing shoulders are required to provide axial retention of the needle roller and cage assemblies.
- Full, outer ring piloted complement of needle rollers (with or without inner ring).

METRIC SERIES NEEDLE ROLLER BEARINGS WITH INNER RINGS

This applies to the NKJ, NA, and NAO series.

When it is impractical to finish the shaft to meet the desired raceway design requirements, an inner ring may be used. Standard needle roller bearings are available with inner rings (such as the NA Series) to form complete bearings. Bearings furnished with inner rings meet the quality requirements in accordance with ISO standards.

- For inner- and outer-ring tolerances, the metric series bearings follow the normal tolerance class in ISO Standard 1206 covering radial bearings. Bearings to more precise tolerance classes, P6 and P5, may be obtained upon request.
- The metric series bearings may be obtained with radial internal clearance in accordance with ISO Standard 5753, also specified for cylindrical roller bearings. Mostly, they follow the normal (C0) radial clearance group, although bearings to clearance groups C2, C3 and C4 may be made available on request.
- Inner ring and outer ring chamfer dimensions meet the requirements of ISO Standard 582.

METRIC SERIES NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

Whenever the shaft can be used as the inner raceway, needle roller bearings without inner rings provide advantages of economy and close control of radial internal clearance in operation. Tolerance class F6 is the normal specification for the metric series needle roller complement bore diameter of an unmounted bearing, as shown in Table B4-1 on page B-4-7. In the case of needle roller bearings of series RNAO, without flanges and without inner rings, the outer rings and needle roller and cage assemblies are not interchangeable.

Table B4-1. Metric series caged needle roller complement bore diameter for bearings without inner rings

F_W		ΔF_W min.	
>	≤	Max.	Min.
mm in	mm in	mm in	mm in
3.000 0.1181	**6.000** 0.2362	**+0.018** +0.0007	**+0.010** +0.0004
6.000 0.2362	**10.000** 0.3937	**+0.022** +0.0009	**+0.013** +0.0005
10.000 0.3937	**18.000** 0.7087	**+0.027** +0.0011	**+0.016** +0.0006
18.000 0.7087	**30.000** 1.1811	**+0.033** +0.0013	**+0.020** +0.0008
30.000 1.1811	**50.000** 1.9685	**+0.041** +0.0016	**+0.025** +0.0010
50.000 1.9685	**80.000** 3.1496	**+0.049** +0.0019	**+0.030** +0.0012
80.000 3.1496	**120.000** 4.7244	**+0.058** +0.0023	**+0.036** +0.0014
120.000 4.7244	**180.000** 7.0866	**+0.068** +0.0027	**+0.043** +0.0017
180.000 7.0866	**250.000** 9.8425	**+0.079** +0.0031	**+0.050** +0.0020
250.000 9.8425	**315.000** 12.4016	**+0.088** +0.0035	**+0.056** +0.0022
315.000 12.4016	**400.000** 15.7480	**+0.098** +0.0039	**+0.062** +0.0024

METRIC SERIES NEEDLE ROLLER BEARINGS WITH INTEGRAL FLANGES

The needle roller bearing has a one-piece, channel-shaped outer ring of bearing-quality steel heat treated to yield maximum load rating. The integral end flanges provide axial location for the needle rollers. The bores of the end flanges serve as piloting surfaces for the cage.

A steel cage provides inward retention for the needle rollers, and the design assures roller stability and minimizes friction between the cage and the needle rollers. The cage has maximum strength consistent with the inherent high-load ratings of needle roller bearings.

Needle roller bearings of series NKJ, NQI, NKJS, NA48 and NA49 contain one needle roller and cage assembly. Bearings of series NA69, with bearing bores of 32.000 mm (1.2598 in) and above, have two needle roller and cage assemblies.

The outer ring has a lubricating groove and a lubricating hole for more convenient lubrication of the bearing. However, the smaller bearings of series **NKJ** and **NK** ($F_w < 12$ mm [0.4724 in]) do not have a lubricating groove or a lubricating hole.

METRIC SERIES NEEDLE ROLLER BEARINGS WITH INSERTED END WASHERS

Some metric series needle roller bearings have inserted end washers to provide axial retention of the needle roller and cage assembly. The radial needle roller and cage assemblies, consistent with other designs, provide inward and outward retention for the needle rollers.

METRIC SERIES NEEDLE ROLLER BEARINGS WITHOUT FLANGES

The radial needle roller and cage assembly, used in the metric series needle roller bearings without flanges, is slightly narrower than the inner and outer rings to ensure unobstructed operation. Separate end washers are required to provide axial retention of the radial needle roller and cage assembly. Wide needle roller bearings, using two needle roller and cage assemblies, have a lubricating groove and one lubricating hole in the outer ring to facilitate re-lubrication of the bearing. Narrow needle roller bearings do not have a lubricating groove or a lubricating hole in the outer ring.

SEALED METRIC SERIES NEEDLE ROLLER BEARINGS OF DIMENSION SERIES 49

Needle roller bearings of Series 49 are available with one or two integral lip-contact seals, as listed on page B-4-30. One seal is designated by suffix letters RS. Two seals are designated by .2RS. When combining sealed metric series needle roller bearings with inner rings, it is suggested to use inner rings, shown on pages B-2-28 and B-8-22, with designation JRZ because they are wider than the outer rings to ensure positive seal contact.

Sealed bearings are normally packed with a high quality lithium soap-based grease suitable up to 120° C (248° F) for short periods of operation.

The speed rating specified for sealed bearings listed in the bearing tables is based on operating conditions determined by testing. Optimum performance may be expected providing the bearing is properly installed with appropriate internal clearances and subjected to a load of low magnitude. Care should be taken that overheating will not occur, thus preventing breakdown of the grease and eventual bearing failure.

BEARING MOUNTING

MOUNTING DIMENSIONS

It is suggested that needle roller bearings are mounted in their housings with a clearance fit, if the load is stationary relative to the housing, or with a tight transition fit, if the load rotates relative to the housing. Table B4-2 lists the suggested tolerances for the housing bore and the shaft raceway for metric series bearings without inner rings. Table B4-3 lists the suggested shaft tolerances for the above two mounting conditions when the metric series bearings are used with inner rings. The suggested housing bore tolerances for metric series bearings with inner rings is the same as the housing bore tolerance listed in Table B4-2 for metric series bearings without inner rings. Other quality requirements for shafts and housings are given in the engineering section.

Other mounting dimensions may be required for special operating conditions such as:

1. Extremely heavy radial loads.
2. Shock loads.
3. Temperature gradient across bearing.
4. Housing material with heat expansion coefficient different than that of the bearing.
5. Oscillating motion applications.

Table B4-2. Mounting tolerances for metric series bearings without inner ring

Rotation conditions	Nominal housing bore diameter D	ISO tolerance zone for housing		Nominal shaft diameter F shaft	ISO tolerance zone for shaft	
	mm	caged	full	mm	caged	full
Load stationary relative to housing	all diameters	H7 (J7)	J6	all diameters	**h6 (h5)**	**h5**
General work with larger clearance		K7	—		**g6**	—
Load rotates relative to housing		N7	M6		**f6**	**g5**

Care should be taken that the selected bearing internal clearance is appropriate for the operating conditions.

Table B4-3. Shaft tolerances for metric series bearings with inner rings (use housing tolerance shown in Table B4-2)

Rotation conditions	Nominal shaft diameter, d		ISO tolerance zone for shaft	
	mm in	**mm** in	caged	full
Load rotates relative to housing	all diameters		g6	h5 (h6)
Load stationary relative to housing	>	≤		
		40.000 1.5748	k6	k5
	40.000 1.5748	**100.000** 3.9370	m6	m5
	100.000 3.9370	**140.000** 5.5118	m6	m5
	140.000 5.5118		n6	n6

Care should be taken that the selected bearing internal clearance is appropriate for the operating conditions.

Regardless of the fit of the bearing outer ring in the housing, the outer ring should be axially located by housing shoulders or other positive means. The bearing rings should closely fit against the shaft and housing shoulders and must not contact the fillet radius. The maximum shaft or housing fillet $r_{a\ max}$ should be no greater than the minimum bearing chamfer $r_{s\ min}$, as shown in Table B4-4 on page B-4-10.

In order to permit mounting and dismounting of the shaft, the maximum diameter D_1 in Table B4-5 on page B-4-10 must not be exceeded. F_W is shown in the bearing tables.

Needle roller bearings without flanges of series RNAO and NAO must have the radial needle roller and cage assembly properly end-guided by shoulders, as shown in Table B4-6(1) on page B-4-11 and Table B4-6(2) on page B-4-12, or other suitable means, such as spring steel washers (SNSH) shown on page B-8-30. These end-guiding surfaces should be hardened and precision turned, or ground to minimize wear, and should properly fit against the outer rings and the inner rings to provide the desired end clearance for the needle roller and cage assembly.

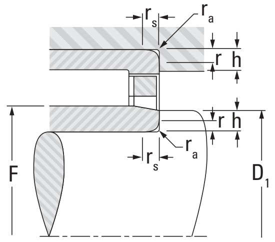


Fig. B4-7. Fillet

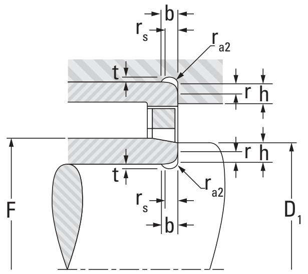


Fig. B4-8. Undercut

Table B4-4. Fillets, undercuts, and shoulder heights for metric series bearings

r_s[1]	r_a	t	r_{a2}	b	h
Min.	Max.		Min.		Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
0.15 0.0059	**0.15** 0.0059				**0.6** 0.0236
0.3 0.0118	**0.3** 0.0118				**1** 0.0394
0.6 0.0236	**0.6** 0.0236				**2** 0.0787
1 0.0394	**1** 0.0394	**0.2** 0.0079	**1.3** 0.0512	**2** 0.0787	**2.5** 0.0984
1.1 0.0433	**1** 0.0394	**0.3** 0.0118	**2** 0.0787	**3** 0.1181	**3.25** 0.1280
1.5 0.0591	**1.5** 0.0591	**0.4** 0.0158	**2** 0.0787	**3.2** 0.1260	**4** 0.1575
2 0.0787	**2** 0.0787	**0.5** 0.0197	**2.5** 0.0984	**4** 0.1575	**5** 0.1969
2.1 0.0827	**2.1** 0.0827	**0.5** 0.0197	**3** 0.1181	**4.7** 0.1850	**5.5** 0.2165
3 0.1181	**2.5** 0.0984	**0.5** 0.0197	**3.5** 0.1378	**5.3** 0.2087	**6** 0.2362

[1] r_s : Bearing component corner rounding.

Table B4-5. Shoulder diameter $D_{1\,max.}$ for metric series bearings

		mm in	**mm** in	**mm** in	**mm** in	**mm** in
Needle roller complement bore diameter F_w	>		**20.000** 0.7874	**55.000** 2.1653	**100.000** 3.9370	**250.000** 9.8425
	≤	**20.000** 0.7874	**55.000** 2.1653	**100.000** 3.9370	**250.000** 9.8425	
Diameter	D_{1max}	F_w -0.3	F_w -0.5	F_w -0.7	F_w -1.0	F_w -1.5

LOAD RATING FACTORS

DYNAMIC LOADS

Needle roller bearings can accommodate only radial loads.

$$P = F_r \qquad \text{(kN)}$$

P = The maximum dynamic radial load that may be applied to a needle roller bearing based on the dynamic load rating, C_r, given in the bearing tables. This load should be $\leq C_r/3$.

STATIC LOADS

Needle roller bearings can accommodate only radial loads.

$$P_0 = F_r \qquad \text{(kN)}$$

MOUNTING IN SETS

Radial needle roller and cage assemblies that are mounted side by side must have needle rollers of the same group limits to ensure uniform load distribution.

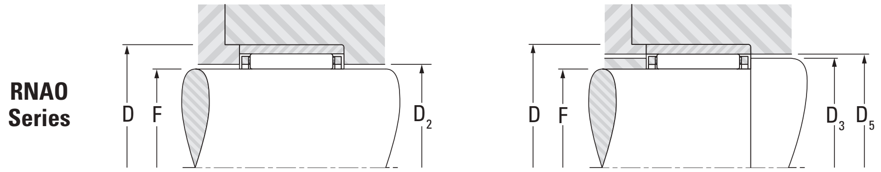


Fig. B4-9. Guidance in the housing (left) and on the shaft (right)

Table B4-6(1). Mounting dimensions for metric series needle roller bearings without flanges

Dimensions	Bearing series RNAO		
	D_3	D_2	D_5
FxD	Max.	Min.	Min.
mm in	**mm** in	**mm** in	**mm** in
10x17 0.3937x0.6693	**12.7** 0.5000	**10.3** 0.4055	**13.3** 0.5236
12x19 0.4724x0.7480	**14.7** 0.5787	**12.3** 0.4843	**15.3** 0.6024
14x22 0.5512x0.8661	**17.6** 0.6929	**14.4** 0.5669	**18.3** 0.7205
15x23 0.5906x0.9055	**18.6** 0.7323	**15.4** 0.6063	**19.3** 0.7598
16x24 0.6299x0.9499	**19.6** 0.7717	**16.4** 0.6457	**20.3** 0.7992
17x25 0.6693x0.9843	**20.6** 0.8110	**17.4** 0.6850	**21.3** 0.8386
18x26 0.7087x1.0236	**21.6** 0.8504	**18.4** 0.7244	**22.3** 0.8780
18x30 0.7087x1.1811	**23.6** 0.9291	**18.6** 0.7323	**24.5** 0.9646
20x28 0.7874x1.1024	**23.6** 0.9291	**20.4** 0.8032	**24.3** 0.9567
20x32 0.7874x1.2598	**25.6** 1.0079	**20.6** 0.8110	**26.5** 1.0433
22x30 0.8661x1.1811	**25.6** 1.0079	**22.4** 0.8819	**26.3** 0.9291
22x35 0.8661x1.3780	**28.4** 1.1181	**22.8** 0.8976	**29.5** 1.1614
25x35 0.9843x1.3780	**29.4** 1.1575	**25.6** 1.0079	**30.5** 1.2008
25x37 0.9843x1.4567	**31.4** 1.2362	**25.8** 1.0158	**32.5** 1.2795
28x40 1.1024x1.5748	**34.4** 1.3543	**28.8** 1.1339	**35.5** 1.3976
30x40 1.1811x1.5748	**34.4** 1.3543	**30.6** 1.2047	**35.5** 1.3976
30x42 1.1811x1.6535	**36.4** 1.4331	**30.8** 1.2126	**37.5** 1.4764
35x45 1.3780x1.7717	**39.4** 1.5512	**35.6** 1.4016	**40.5** 1.5945
35x47 1.3780x1.8504	**41.4** 1.6299	**35.8** 1.4096	**42.5** 1.6732
40x50 1.5748x1.9685	**44.4** 1.7480	**40.6** 1.5984	**45.5** 1.7913
40x55 1.5748x2.1654	**47.2** 1.8582	**41** 1.6142	**48.5** 1.9095
45x55 1.7717x2.1654	**49.4** 1.9449	**45.6** 1.7953	**50.5** 1.9882
45x62 1.7717x2.4409	**52.2** 2.0551	**46** 1.8110	**53.5** 2.1063
50x62 1.9685x2.4409	**54.4** 2.1417	**50.6** 1.9921	**55.8** 2.1969
50x65 1.9685x2.5591	**57.2** 2.2520	**51** 2.0079	**58.8** 2.3032
55x68 2.1654x2.6772	**59.4** 2.3386	**55.6** 2.1890	**60.8** 2.3937
55x72 2.1654x2.8347	**62.2** 2.4488	**56** 2.2047	**63.8** 2.5118
60x78 2.3622x3.0709	**67.2** 2.6457	**61** 2.4016	**68.8** 2.7087
65x85 2.5591x3.3465	**72.2** 2.8425	**66** 2.5984	**73.8** 2.9055
70x90 2.7559x3.5433	**77.2** 3.0394	**71** 2.7953	**78.8** 3.1024
75x95 2.9528x3.7402	**82.2** 3.2362	**76** 2.9921	**84** 3.3071
80x100 3.1496x3.9370	**87.2** 3.4331	**81** 3.1890	**89** 3.5039
85x105 3.3465x4.1339	**92.2** 3.6299	**86** 3.3858	**94** 3.7008
90x110 3.5433x4.3307	**97.2** 3.8268	**91** 3.5827	**99** 3.8976
95x115 3.7402x4.5276	**102.2** 4.0236	**96** 3.7795	**104** 4.0945
100x120 3.9370x4.7244	**107.2** 4.2205	**101** 3.9764	**109** 4.2913

NAO Series

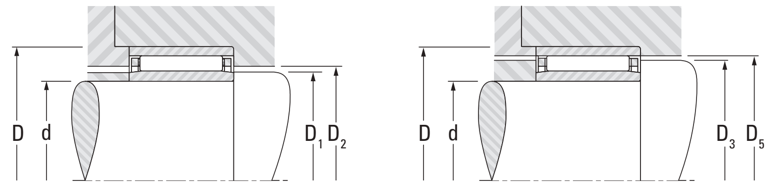


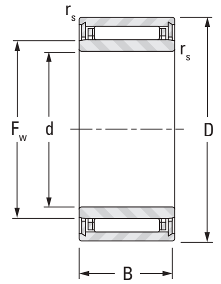
Fig. B4-10. Guidance in the housing (left) and on the shaft (right)

Table B4-6(2). Mounting dimensions for metric series needle roller bearings without flanges

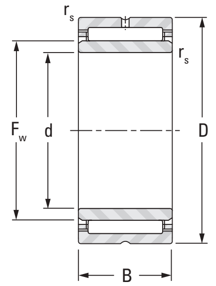
Dimensions	Bearing series NAO			
	D₁	D₂	D₃	D₅
dxD	Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in
6x17 0.2362x'0.6693	**9.7** 0.3819	**10.3** 0.4055	**12.7** 0.5000	**13.3** 0.5236
8x19 0.3150x'0.7480	**11.7** 0.4606	**12.3** 0.4843	**14.7** 0.5787	**15.3** 0.6024
10x22 0.3937x'0.8661	**13.7** 0.5394	**14.4** 0.5669	**17.6** 0.6929	**18.3** 0.7205
10x26 0.3937x1.0236	**13.7** 0.5394	**14.6** 0.5748	**19.6** 0.7717	**20.3** 0.7992
12x24 0.4724x'0.9449	**15.7** 0.6181	**16.4** 0.6457	**19.6** 0.7717	**20.3** 0.7992
12x28 0.4724x1.1024	**15.7** 0.6181	**16.6** 0.6535	**21.6** 0.8504	**22.3** 0.878
15x28 0.5906x1.1024	**19.5** 0.7677	**20.4** 0.8032	**23.6** 0.9291	**24.3** 0.9567
15x32 0.5906x1.2598	**19.5** 0.7677	**20.6** 0.811	**25.6** 1.0079	**26.5** 1.0433
17x30 0.6693x1.1811	**21.5** 0.8465	**22.4** 0.8819	**25.6** 1.0079	**26.3** 1.0354
17x35 0.6693x1.3780	**21.5** 0.8465	**22.8** 0.8976	**28.4** 1.1181	**29.5** 1.1614
20x35 0.7874x1.3780	**24.5** 0.9646	**25.6** 1.0079	**29.4** 1.1575	**30.5** 1.2008
20x37 0.7874x1.4567	**24.5** 0.9646	**25.8** 1.0158	**31.4** 1.2362	**32.5** 1.2795
25x40 0.9843x1.5748	**29.5** 1.1614	**30.6** 1.2047	**34.4** 1.3543	**35.5** 1.3976
25x42 0.9843x1.6535	**29.5** 1.1614	**30.8** 1.2126	**36.4** 1.4331	**37.5** 1.4764
30x45 1.1811x1.7717	**34.5** 1.3583	**35.6** 1.4016	**39.4** 1.5512	**40.5** 1.5945
30x47 1.1811x1.8504	**34.5** 1.3583	**35.8** 1.4095	**41.4** 1.6299	**42.5** 1.6732
35x50 1.3780x1.9685	**39.5** 1.5551	**40.6** 1.5984	**44.4** 1.748	**45.5** 1.7913
35x55 1.3780x2.1654	**39.5** 1.5551	**41** 1.6142	**47.2** 1.8583	**48.5** 1.9095
40x55 1.5748x2.1654	**44.5** 1.7520	**45.6** 1.7952	**49.4** 1.9449	**50.5** 1.9882
40x62 1.5748x2.4409	**44.5** 1.7520	**46** 1.8110	**52.2** 2.0551	**53.5** 2.1063
45x62 1.7717x2.4409	**49.5** 1.9488	**50.6** 1.9921	**54.4** 2.1417	**55.8** 2.1969
45x72 1.7717x2.8347	**54.5** 2.1457	**56** 2.2047	**62.2** 2.4488	**63.8** 2.5118
50x68 1.9685x2.6772	**54.5** 2.1457	**55.6** 2.1890	**59.4** 2.3386	**60.8** 2.3937
50x78 1.9685x3.0709	**59.3** 2.3347	**61** 2.4016	**67.2** 2.6457	**68.8** 2.7087
55x85 2.1654x3.3465	**64.3** 2.5315	**66** 2.5984	**72.2** 2.8425	**73.8** 2.9055
60x90 2.3622x3.5433	**69.3** 2.7284	**71** 2.7953	**77.2** 3.0394	**78.8** 3.1024
65x95 2.5591x3.7402	**74.3** 2.9252	**76** 2.9921	**82.2** 3.2362	**84** 3.3071
70x100 2.7559x3.9370	**79.3** 3.1221	**81** 3.1890	**87.2** 3.4331	**89** 3.5039
75x105 2.9528x4.1339	**84.3** 3.3189	**86** 3.3858	**92.2** 3.6299	**94** 3.7008
80x110 3.1496x4.3307	**89.3** 3.5158	**91** 3.5827	**97.2** 3.8268	**99** 3.8976
85x115 3.3465x4.5276	**94.3** 3.7126	**96** 3.7795	**102.2** 4.0236	**104** 4.0945
90x120 3.5433x4.7244	**99.3** 3.9095	**101** 3.9764	**107.2** 4.2205	**109** 4.2913

NEEDLE ROLLER BEARINGS WITH INNER RINGS

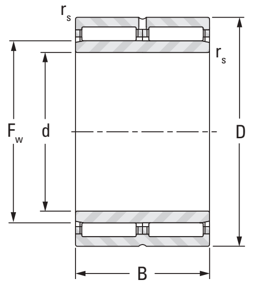
METRIC SERIES
NKJ, NKJS, NA48
NA49, NA69 SERIES



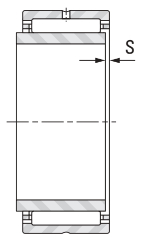
NKJ (d ≤ 7)



**NKJ (d ≥ 9),
NKJS, NA48, NA49,
NA69 (d ≤ 30)**



**NA69
(d ≥ 32)**



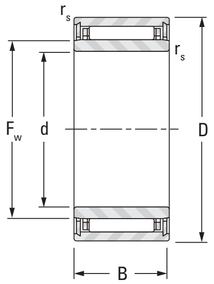
Shaft Dia.	d	D	B	F_w	$r_{s\,min.}$	s[1]	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								Dynamic	Static		Grease	Oil	
								C	C_0				
mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min⁻¹		kg lbs
5 0.1969	**5** 0.1969	**15** 0.5906	**12** 0.472	**8** 0.315	**0.3** 0.012	**1.5** 0.059	NKJ5/12	**4.57** 1030	**4.89** 1100	0.740	26000	41000	**0.014** 0.031
	5 0.1969	**15** 0.5906	**16** 0.63	**8** 0.315	**0.3** 0.012	**1.5** 0.059	NKJ5/16	**5.22** 1170	**5.78** 1300	0.880	26000	41000	**0.017** 0.037
6 0.2362	**6** 0.2362	**16** 0.6299	**12** 0.472	**9** 0.3543	**0.3** 0.012	**1.5** 0.059	NKJ6/12	**4.27** 960	**4.6** 1030	0.700	26000	40000	**0.015** 0.033
	6 0.2362	**16** 0.6299	**16** 0.63	**9** 0.3543	**0.3** 0.012	**1.5** 0.059	NKJ6/16	**5.57** 1250	**6.47** 1450	0.980	26000	40000	**0.019** 0.042
7 0.2756	**7** 0.2756	**17** 0.6693	**12** 0.472	**10** 0.3937	**0.3** 0.012	**1.5** 0.059	NKJ7/12	**5.4** 1210	**6.43** 1450	0.980	25000	39000	**0.017** 0.037
	7 0.2756	**17** 0.6693	**16** 0.63	**10** 0.3937	**0.3** 0.012	**1.5** 0.059	NKJ7/16TN	**5.3** 1190	**6.27** 1410	0.940	25000	39000	**0.021** 0.046
9 0.3543	**9** 0.3543	**19** 0.748	**12** 0.472	**12** 0.4724	**0.3** 0.012	**1.5** 0.059	NKJ9/12A	**6.86** 1540	**7.6** 1710	1.15	19000	30000	**0.018** 0.04
	9 0.3543	**19** 0.748	**16** 0.63	**12** 0.4724	**0.3** 0.012	**1.5** 0.059	NKJ9/16	**6.78** 1520	**9.03** 2030	1.40	19000	30000	**0.024** 0.053
10 0.3937	**10** 0.3937	**22** 0.8661	**13** 0.512	**14** 0.5512	**0.3** 0.012	**1** 0.039	NA4900	**9.39** 2110	**10.3** 2320	1.55	16000	24000	**0.025** 0.055
	10 0.3937	**22** 0.8661	**16** 0.63	**14** 0.5512	**0.3** 0.012	**1.5** 0.059	NKJ10/16A	**12.4** 2790	**14.8** 3330	2.10	16000	24000	**0.032** 0.071
	10 0.3937	**22** 0.8661	**20** 0.787	**14** 0.5512	**0.3** 0.012	**1.5** 0.059	NKJ10/20A	**14.7** 3300	**18.4** 4140	2.75	16000	24000	**0.04** 0.088
12 0.4724	**12** 0.4724	**24** 0.9449	**13** 0.512	**16** 0.6299	**0.3** 0.012	**1** 0.039	NA4901	**10.5** 2360	**12.3** 2770	1.90	18000	28000	**0.028** 0.062
	12 0.4724	**24** 0.9449	**16** 0.63	**16** 0.6299	**0.3** 0.012	**1.5** 0.059	NKJ12/16A	**13** 2920	**16.2** 3640	2.50	18000	28000	**0.036** 0.079
	12 0.4724	**24** 0.9449	**20** 0.787	**16** 0.6299	**0.3** 0.012	**1.5** 0.059	NKJ12/20A	**15.4** 3460	**20.2** 4540	3.20	18000	28000	**0.046** 0.101
	12 0.4724	**24** 0.9449	**22** 0.866	**16** 0.6299	**0.3** 0.012	**1** 0.039	NA6901A	**16.1** 3620	**21.3** 4790	3.55	18000	28000	**0.051** 0.11
15 0.5906	**15** 0.5906	**27** 1.063	**16** 0.63	**19** 0.748	**0.3** 0.012	**1.5** 0.059	NKJ15/16A	**14.1** 3170	**19** 4270	2.90	15000	24000	**0.042** 0.093
	15 0.5906	**27** 1.063	**20** 0.787	**19** 0.748	**0.3** 0.012	**1.5** 0.059	NKJ15/20A	**16.8** 3780	**23.6** 5310	3.75	15000	24000	**0.054** 0.119
	15 0.5906	**28** 1.1024	**13** 0.512	**20** 0.7874	**0.3** 0.012	**1** 0.039	NA4902	**11.8** 2650	**15.3** 3440	2.35	14000	22000	**0.037** 0.082
	15 0.5906	**28** 1.1024	**23** 0.906	**20** 0.7874	**0.3** 0.012	**1.5** 0.059	NA6902A	**18.4** 4140	**26.9** 6050	4.20	14000	22000	**0.067** 0.148
17 0.6693	**17** 0.6693	**29** 1.1417	**16** 0.63	**21** 0.8268	**0.3** 0.012	**2** 0.079	NKJ17/16A	**15.3** 3440	**21.6** 4860	3.30	14000	21000	**0.047** 0.104

[1] Max. axial displacement

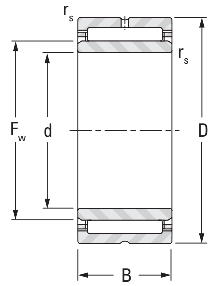
Continued on next page.

NEEDLE ROLLER BEARINGS WITH INNER RINGS

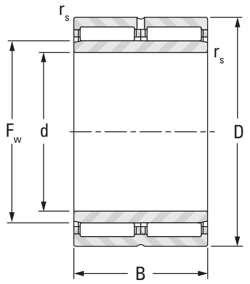
METRIC SERIES
NKJ, NKJS, NA48
NA49, NA69 SERIES



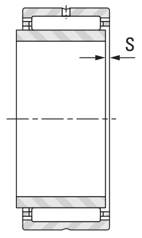
NKJ (d ≤ 7)



NKJ (d ≥ 9),
NKJS, NA48, NA49,
NA69 (d ≤ 30)



NA69
(d ≥ 32)



Shaft Dia.	d	D	B	F_w	$r_{s\,min.}$	$s^{(1)}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
17 0.6693	**17** 0.6693	**29** 1.1417	**20** 0.787	**21** 0.8268	**0.3** 0.012	**1.5** 0.059	NKJ17/20A	**18.1** 4070	**26.9** 6050	4.80	14000	21000	**0.059** 0.13
	17 0.6693	**30** 1.1811	**13** 0.512	**22** 0.8661	**0.3** 0.012	**1** 0.039	NA4903	**12.2** 2740	**16.4** 3690	2.50	13000	20000	**0.04** 0.088
	17 0.6693	**30** 1.1811	**23** 0.906	**22** 0.8661	**0.3** 0.012	**1** 0.039	NA6903A	**19.8** 4450	**30.6** 6880	4.75	13000	20000	**0.084** 0.185
	17 0.6693	**37** 1.4567	**20** 0.787	**24** 0.9449	**0.6** 0.024	**1** 0.039	NKJS17A	**29.1** 6540	**32.8** 7370	5.30	13000	20000	**0.108** 0.238
20 0.7874	**20** 0.7874	**32** 1.2598	**16** 0.63	**24** 0.9449	**0.3** 0.012	**1.5** 0.059	NKJ20/16A	**16.2** 3640	**24.3** 5460	3.70	12000	18000	**0.053** 0.117
	20 0.7874	**32** 1.2598	**20** 0.787	**24** 0.9449	**0.3** 0.012	**1.5** 0.059	NKJ20/20A	**19.3** 4340	**30.3** 6810	4.80	12000	18000	**0.067** 0.148
	20 0.7874	**37** 1.4567	**17** 0.669	**25** 0.9843	**0.3** 0.012	**1.5** 0.059	NA4904	**21.3** 4790	**25.5** 5730	6.75	12000	18000	**0.084** 0.185
	20 0.7874	**37** 1.4567	**30** 1.181	**25** 0.9843	**0.3** 0.012	**1.5** 0.059	NA6904A	**36.6** 8230	**51** 11500	7.95	12000	18000	**0.133** 0.293
	20 0.7874	**42** 1.6535	**20** 0.787	**28** 1.1024	**0.6** 0.024	**1** 0.039	NKJS20A	**30.3** 6810	**38.4** 8630	6.15	11000	16000	**0.13** 0.287
22 0.8661	**22** 0.8661	**34** 1.3386	**16** 0.63	**26** 1.0236	**0.3** 0.012	**1.5** 0.059	NKJ22/16A	**16.6** 3730	**25.7** 5780	3.95	11000	17000	**0.058** 0.128
	22 0.8661	**34** 1.3386	**20** 0.787	**26** 1.0236	**0.3** 0.012	**2** 0.079	NKJ22/20A	**19.7** 4430	**32** 7190	5.05	11000	17000	**0.071** 0.157
	22 0.8661	**39** 1.5354	**17** 0.669	**28** 1.1024	**0.3** 0.012	**1.5** 0.059	NA49/22	**23.3** 5240	**29.6** 6650	4.55	10000	16000	**0.089** 0.196
	22 0.8661	**39** 1.5354	**30** 1.181	**28** 1.1024	**0.3** 0.012	**1** 0.039	NA69/22A	**30.6** 6880	**50.7** 11400	7.85	10000	16000	**0.163** 0.359
25 0.9843	**25** 0.9843	**38** 1.4961	**20** 0.787	**29** 1.1417	**0.3** 0.012	**2** 0.079	NKJ25/20A	**23.4** 5260	**36.4** 8180	5.80	9800	15000	**0.086** 0.19
	25 0.9843	**38** 1.4961	**30** 1.181	**29** 1.1417	**0.3** 0.012	**2** 0.079	NKJ25/30A	**29.8** 6700	**56.4** 12700	8.70	9800	15000	**0.13** 0.287
	25 0.9843	**42** 1.6535	**17** 0.669	**30** 1.1811	**0.3** 0.012	**1.5** 0.059	NA4905	**24.3** 5460	**31.7** 7130	4.90	9700	15000	**0.099** 0.218
	25 0.9843	**42** 1.6535	**30** 1.181	**30** 1.1811	**0.3** 0.012	**1.5** 0.059	NA6905A	**39.7** 8920	**59.6** 13400	9.30	9700	15000	**0.178** 0.392
	25 0.9843	**47** 1.8504	**22** 0.866	**32** 1.2598	**0.6** 0.024	**1.5** 0.059	NKJS25A	**36** 8090	**36.2** 8140	7.40	9200	14000	**0.174** 0.384
28 1.1024	**28** 1.1024	**42** 1.6535	**20** 0.787	**32** 1.2598	**0.3** 0.012	**2** 0.079	NKJ28/20A	**24.8** 5580	**40.4** 9080	6.45	8800	14000	**0.104** 0.229
	28 1.1024	**42** 1.6535	**30** 1.181	**32** 1.2598	**0.3** 0.012	**2** 0.079	NKJ28/30A	**38.9** 8750	**72.2** 16200	11.2	8800	14000	**0.156** 0.344

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(1) Max. axial displacement

Shaft Dia.	d	D	B	F_w	$r_{s\,min.}$	$s^{(1)}$	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
28 1.1024	**28** 1.1024	**45** 1.7717	**17** 0.669	**32** 1.2598	**0.3** 0.012	**1.5** 0.059	NA49/28	**25.1** 5640	**33.8** 7600	5.20	9000	14000	**0.108** 0.238
	28 1.1024	**45** 1.7717	**30** 1.181	**32** 1.2598	**0.3** 0.012	**1.5** 0.059	NA69/28A	**43.2** 9700	**62.5** 14100	11.0	9000	14000	**0.19** 0.419
30 1.1811	**30** 1.1811	**45** 1.7717	**20** 0.787	**35** 1.378	**0.3** 0.012	**1.5** 0.059	NKJ30/20A	**26.1** 5870	**44.4** 9980	7.05	8000	12000	**0.12** 0.265
	30 1.1811	**45** 1.7717	**30** 1.181	**35** 1.378	**0.3** 0.012	**1.5** 0.059	NKJ30/30A	**37.4** 8410	**70.6** 15900	11.0	8000	12000	**0.179** 0.395
	30 1.1811	**47** 1.8504	**17** 0.669	**35** 1.378	**0.3** 0.012	**1.5** 0.059	NA4906	**25.9** 5820	**36** 8090	5.55	8200	13000	**0.114** 0.251
	30 1.1811	**47** 1.8504	**30** 1.181	**35** 1.378	**0.3** 0.012	**1** 0.039	NA6906A	**42.6** 9580	**68.2** 15300	10.6	8200	13000	**0.205** 0.452
	30 1.1811	**52** 2.0472	**22** 0.866	**37** 1.4567	**0.6** 0.024	**1.5** 0.059	NKJS30A	**39** 8770	**53.4** 12000	8.55	7900	12000	**0.198** 0.437
32 1.2598	**32** 1.2598	**47** 1.8504	**20** 0.787	**37** 1.4567	**0.3** 0.012	**2** 0.079	NKJ32/20A	**26.6** 6000	**46.4** 10400	7.20	7600	12000	**0.127** 0.28
	32 1.2598	**47** 1.8504	**30** 1.181	**37** 1.4567	**0.3** 0.012	**1.5** 0.059	NKJ32/30A	**38.2** 8590	**73.9** 16600	11.5	7600	12000	**0.192** 0.423
	32 1.2598	**52** 2.0472	**20** 0.787	**40** 1.5748	**0.6** 0.024	**1.5** 0.059	NA49/32	**32** 7190	**49.3** 11100	7.85	7100	11000	**0.169** 0.373
	32 1.2598	**52** 2.0472	**36** 1.417	**40** 1.5748	**0.6** 0.024	**1** 0.039	NA69/32A	**48.6** 10900	**84.5** 19000	13.1	7100	11000	**0.313** 0.69
35 1.378	**35** 1.378	**50** 1.9685	**20** 0.787	**40** 1.5748	**0.3** 0.012	**2** 0.079	NKJ35/20A	**27.8** 6250	**50.4** 11300	8.05	7000	11000	**0.135** 0.298
	35 1.378	**50** 1.9685	**30** 1.181	**40** 1.5748	**0.3** 0.012	**1.5** 0.059	NKJ35/30A	**40** 8990	**80.2** 18000	12.4	7000	11000	**0.208** 0.459
	35 1.378	**55** 2.1654	**20** 0.787	**42** 1.6535	**0.6** 0.024	**1.5** 0.059	NA4907	**32.8** 7370	**51.7** 11600	8.25	6700	10000	**0.179** 0.395
	35 1.378	**55** 2.1654	**36** 1.417	**42** 1.6535	**0.6** 0.024	**1** 0.039	NA6907A	**49.9** 11200	**88.7** 19900	13.7	6700	10000	**0.34** 0.75
	35 1.378	**58** 2.2835	**22** 0.866	**43** 1.6929	**0.6** 0.024	**1** 0.039	NKJS35A	**41.6** 9350	**60.7** 13600	9.75	6700	10000	**0.235** 0.518
38 1.4961	**38** 1.4961	**53** 2.0866	**20** 0.787	**43** 1.6929	**0.3** 0.012	**2** 0.079	NKJ38/20A	**29** 6520	**54.4** 12200	8.65	6400	9900	**0.146** 0.322
	38 1.4961	**53** 2.0866	**30** 1.181	**43** 1.6929	**0.3** 0.012	**1.5** 0.059	NKJ38/30A	**41.6** 9350	**86.6** 19500	13.4	6400	9900	**0.196** 0.432
40 1.5748	**40** 1.5748	**55** 2.1654	**20** 0.787	**45** 1.7717	**0.3** 0.012	**2** 0.079	NKJ40/20A	**29.5** 6630	**56.4** 12700	9.00	6100	9400	**0.152** 0.335
	40 1.5748	**55** 2.1654	**30** 1.181	**45** 1.7717	**0.3** 0.012	**1.5** 0.059	NKJ40/30A	**42.3** 9510	**89.8** 20200	13.9	6100	9400	**0.229** 0.505
	40 1.5748	**62** 2.4409	**22** 0.866	**48** 1.8898	**0.6** 0.024	**1.5** 0.059	NA4908	**44.2** 9940	**67.8** 15200	10.9	5900	9100	**0.248** 0.547
	40 1.5748	**62** 2.4409	**40** 1.575	**48** 1.8898	**0.6** 0.024	**1.5** 0.059	NA6908A	**70.8** 15900	**124** 27900	19.8	5900	9100	**0.473** 1.043
	40 1.5748	**65** 2.5591	**22** 0.866	**50** 1.9685	**1** 0.039	**1** 0.039	NKJS40A	**45.5** 10200	**71.3** 16000	11.4	5700	8700	**0.292** 0.644
42 1.6535	**42** 1.6535	**57** 2.2441	**20** 0.787	**47** 1.8504	**0.3** 0.012	**2** 0.079	NKJ42/20A	**30** 6740	**58.5** 13200	9.30	5900	9000	**0.159** 0.351
	42 1.6535	**57** 2.2441	**30** 1.181	**47** 1.8504	**0.3** 0.012	**1.5** 0.059	NKJ42/30A	**43** 9670	**93.1** 20900	14.4	5900	9000	**0.241** 0.531
45 1.7717	**45** 1.7717	**62** 2.4409	**25** 0.984	**50** 1.9685	**0.6** 0.024	**3** 0.118	NKJ45/25A	**40.7** 9150	**79.3** 17800	12.5	5500	8500	**0.223** 0.492

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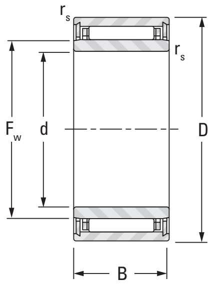
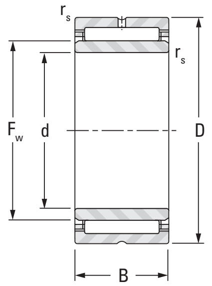
NEEDLE ROLLER BEARINGS WITH INNER RINGS

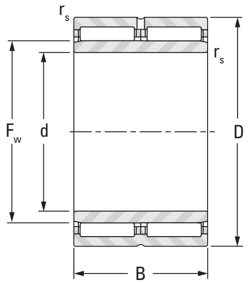
METRIC SERIES
NKJ, NKJS, NA48
NA49, NA69 SERIES



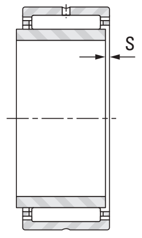
NKJ (d ≤ 7)



NKJ (d ≥ 9),
NKJS, NA48, NA49,
NA69 (d ≤ 30)



NA69
(d ≥ 32)



Shaft Dia.	d	D	B	F_w	$r_{s\,min.}$	s[1]	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
45 1.7717	**45** 1.7717	**62** 2.4409	**35** 1.378	**50** 1.9685	**0.6** 0.024	**3** 0.118	NKJ45/35A	**55** 12400	**117** 26300	18.2	5500	8500	**0.345** 0.761
	45 1.7717	**68** 2.6772	**22** 0.866	**52** 2.0472	**0.6** 0.024	**2** 0.079	NA4909	**46.8** 10500	**74.8** 16800	12.0	5400	8400	**0.291** 0.642
	45 1.7717	**68** 2.6772	**40** 1.575	**52** 2.0472	**0.6** 0.024	**1.5** 0.059	NA6909A	**74.7** 16800	**137** 30800	21.7	5400	8400	**0.55** 1.232
	45 1.7717	**72** 2.8346	**22** 0.866	**55** 2.1654	**1** 0.039	**1** 0.039	NKJS45A	**47.9** 10800	**78.4** 17600	12.6	5100	7900	**0.36** 0.794
50 1.9685	**50** 1.9685	**68** 2.6772	**25** 0.984	**55** 2.1654	**0.6** 0.024	**3** 0.118	NKJ50/25A	**46.1** 10400	**87.3** 19600	13.9	5000	7800	**0.288** 0.635
	50 1.9685	**68** 2.6772	**35** 1.378	**55** 2.1654	**0.6** 0.024	**3** 0.118	NKJ50/35A	**62.3** 14000	**129** 29000	20.0	5000	7800	**0.406** 0.895
	50 1.9685	**72** 2.8346	**22** 0.866	**58** 2.2835	**0.6** 0.024	**2** 0.079	NA4910	**49** 11000	**82** 18400	13.2	4800	7400	**0.296** 0.653
	50 1.9685	**72** 2.8346	**40** 1.575	**58** 2.2835	**0.6** 0.024	**1.5** 0.059	NA6910A	**75.7** 17000	**144** 32400	22.8	4800	7400	**0.577** 1.272
	50 1.9685	**80** 3.1496	**28** 1.102	**60** 2.3622	**1.1** 0.043	**1.5** 0.059	NKJS50A	**66.9** 15000	**103** 23200	16.5	4800	7300	**0.523** 1.153
55 2.1654	**55** 2.1654	**72** 2.8346	**25** 0.984	**60** 2.3622	**0.6** 0.024	**3** 0.118	NKJ55/25A	**44.3** 9960	**94** 21100	14.9	4600	7000	**0.29** 0.639
	55 2.1654	**72** 2.8346	**35** 1.378	**60** 2.3622	**0.6** 0.024	**3** 0.118	NKJ55/35A	**59.9** 13500	**139** 31200	21.5	4600	7000	**0.41** 0.904
	55 2.1654	**80** 3.1496	**25** 0.984	**63** 2.4803	**1** 0.039	**2.5** 0.098	NA4911	**62** 13900	**107** 24100	17.1	4500	6900	**0.426** 0.939
	55 2.1654	**80** 3.1496	**45** 1.772	**63** 2.4803	**1** 0.039	**2.5** 0.098	NA6911A	**94.2** 21200	**172** 38700	27.8	4500	6900	**0.8** 1.764
	55 2.1654	**85** 3.3465	**28** 1.102	**65** 2.5591	**1.1** 0.043	**1.5** 0.059	NKJS55A	**71** 16000	**114** 25600	18.3	4400	6700	**0.569** 1.254
60 2.3622	**60** 2.3622	**82** 3.2283	**25** 0.984	**68** 2.6772	**0.6** 0.024	**2** 0.079	NKJ60/25A	**49** 11000	**101** 22700	16.1	4000	6200	**0.44** 0.97
	60 2.3622	**82** 3.2283	**35** 1.378	**68** 2.6772	**0.6** 0.024	**2.5** 0.098	NKJ60/35A	**66.2** 14900	**149** 33500	23.2	4000	6200	**0.52** 1.146
	60 2.3622	**85** 3.3465	**25** 0.984	**68** 2.6772	**1** 0.039	**1.5** 0.059	NA4912	**64.8** 14600	**116** 26100	18.6	4100	6300	**0.457** 1.008
	60 2.3622	**85** 3.3465	**45** 1.772	**68** 2.6772	**1** 0.039	**2** 0.079	NA6912A	**99.3** 22300	**189** 42500	30.5	4100	6400	**0.829** 1.828
	60 2.3622	**90** 3.5433	**28** 1.102	**70** 2.7559	**1.1** 0.043	**1.5** 0.059	NKJS60A	**72.6** 16300	**120** 27000	19.3	4000	6200	**0.607** 1.338
65 2.5591	**65** 2.5591	**90** 3.5433	**25** 0.984	**72** 2.8346	**1** 0.039	**1.5** 0.059	NA4913	**66** 14800	**121** 27200	19.4	3900	5900	**0.489** 1.078

Shaft Dia.	d	D	B	F_w	$r_{s\,min.}$	s[1]	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
65 2.5591	**65** 2.5591	**90** 3.5433	**25** 0.984	**73** 2.874	**0.6** 0.024	**2** 0.079	NKJ65/25A	**61.5** 13800	**119** 26800	19.0	3800	5800	**0.5** 1.102
	65 2.5591	**90** 3.5433	**35** 1.378	**73** 2.874	**0.6** 0.024	**2** 0.079	NKJ65/35A	**82.5** 18500	**173** 38900	27.1	3800	5800	**0.69** 1.521
	65 2.5591	**90** 3.5433	**45** 1.772	**72** 2.8346	**1** 0.039	**2** 0.079	NA6913A	**107** 24100	**213** 47900	34.5	3900	6000	**0.945** 2.083
	65 2.5591	**95** 3.7402	**28** 1.102	**75** 2.9528	**1.1** 0.043	**1.5** 0.059	NKJS65A	**76.5** 17200	**132** 29700	21.1	3700	5800	**0.655** 1.444
70 2.7559	**70** 2.7559	**95** 3.7402	**25** 0.984	**80** 3.1496	**1** 0.039	**2** 0.079	NKJ70/25A	**66.4** 14900	**130** 29200	20.8	3400	5300	**0.561** 1.237
	70 2.7559	**95** 3.7402	**35** 1.378	**80** 3.1496	**1** 0.039	**3.5** 0.138	NKJ70/35A	**79.7** 17900	**184** 41400	28.7	3400	5300	**0.779** 1.717
	70 2.7559	**100** 3.937	**28** 1.102	**80** 3.1496	**1.1** 0.043	**1.5** 0.059	NKJS70A	**80.1** 18000	**143** 32100	22.9	3500	5400	**0.772** 1.702
	70 2.7559	**100** 3.937	**30** 1.181	**80** 3.1496	**1** 0.039	**2.5** 0.098	NA4914	**86.3** 19400	**157** 35300	25.1	3500	5400	**0.772** 1.702
	70 2.7559	**100** 3.937	**54** 2.126	**80** 3.1496	**1** 0.039	**2** 0.079	NA6914A	**137** 30800	**286** 64300	45.7	3500	5400	**1.45** 3.197
75 2.9528	**75** 2.9528	**105** 4.1339	**25** 0.984	**85** 3.3465	**1** 0.039	**2** 0.079	NKJ75/25A	**76.4** 17200	**137** 30800	22.2	3300	5000	**0.64** 1.411
	75 2.9528	**105** 4.1339	**30** 1.181	**85** 3.3465	**1** 0.039	**2.5** 0.098	NA4915	**92.4** 20800	**175** 39300	28.0	3300	5000	**0.817** 1.801
	75 2.9528	**105** 4.1339	**35** 1.378	**85** 3.3465	**1** 0.039	**2** 0.079	NKJ75/35A	**108** 24300	**214** 48100	33.6	3300	5000	**1.05** 2.315
	75 2.9528	**105** 4.1339	**54** 2.126	**85** 3.3465	**1** 0.039	**2** 0.079	NA6915A	**143** 32100	**308** 69200	49.3	3300	5000	**1.554** 3.426
	75 2.9528	**110** 4.3307	**32** 1.26	**90** 3.5433	**1.1** 0.043	**1.5** 0.059	NKJS75A	**91.5** 20600	**176** 39600	28.1	3100	4700	**1.06** 2.337
80 3.1496	**80** 3.1496	**110** 4.3307	**25** 0.984	**90** 3.5433	**1** 0.039	**2** 0.079	NKJ80/25A	**79.5** 17900	**147** 33000	23.8	3100	4700	**0.79** 1.742
	80 3.1496	**110** 4.3307	**30** 1.181	**90** 3.5433	**1** 0.039	**2.5** 0.098	NA4916	**91.5** 20600	**176** 39600	28.1	3100	4700	**0.862** 1.9
	80 3.1496	**110** 4.3307	**35** 1.378	**90** 3.5433	**1** 0.039	**2** 0.079	NKJ80/35A	**113** 25400	**230** 51700	36.1	3100	4700	**0.98** 2.161
	80 3.1496	**110** 4.3307	**54** 2.126	**90** 3.5433	**1** 0.039	**2** 0.079	NA6916	**126** 28300	**320** 71900	50.8	3000	4700	**1.615** 3.56
	80 3.1496	**115** 4.5276	**32** 1.26	**95** 3.7402	**1.1** 0.043	**2** 0.079	NKJS80A	**95.1** 21400	**188** 42300	30.0	2900	4500	**1.14** 2.513
85 3.3465	**85** 3.3465	**115** 4.5276	**26** 1.024	**95** 3.7402	**1** 0.039	**3** 0.118	NKJ85/26A	**80.7** 18100	**152** 34200	32.8	2800	4400	**0.862** 1.9
	85 3.3465	**115** 4.5276	**36** 1.417	**95** 3.7402	**1** 0.039	**2** 0.079	NKJ85/36A	**114** 25600	**238** 53500	37.3	2800	4400	**1.04** 2.293
	85 3.3465	**120** 4.7244	**35** 1.378	**100** 3.937	**1.1** 0.043	**2.5** 0.098	NA4917	**110** 24700	**230** 51700	36.0	2800	4200	**1.31** 2.888
	85 3.3465	**120** 4.7244	**63** 2.48	**100** 3.937	**1.1** 0.043	**2** 0.079	NA6917A	**150** 33700	**416** 93500	64.2	2700	4200	**2.427** 5.351
90 3.5433	**90** 3.5433	**120** 4.7244	**26** 1.024	**100** 3.937	**1** 0.039	**3** 0.118	NKJ90/26A	**83.6** 18800	**163** 36600	25.8	2800	4200	**0.78** 1.72
	90 3.5433	**120** 4.7244	**36** 1.417	**100** 3.937	**1** 0.039	**2.5** 0.098	NKJ90/36A	**118** 26500	**254** 57100	39.1	2800	4200	**1.08** 2.381
	90 3.5433	**125** 4.9213	**35** 1.378	**105** 4.1339	**1.1** 0.043	**2.5** 0.098	NA4918	**114** 25600	**245** 55100	37.8	2600	4000	**1.37** 3.02

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[1] Max. axial displacement

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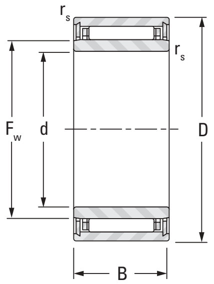
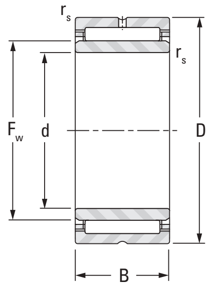
NEEDLE ROLLER BEARINGS WITH INNER RINGS

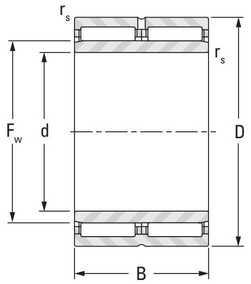
METRIC SERIES
NKJ, NKJS, NA48
NA49, NA69 SERIES



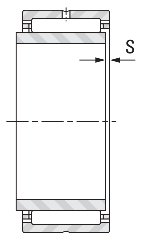
NKJ (d ≤ 7)



NKJ (d ≥ 9),
NKJS, NA48, NA49,
NA69 (d ≤ 30)



NA69
(d ≥ 32)



Shaft Dia.	d	D	B	F_w	$r_{s\,min.}$	s(1)	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
90 3.5433	90 3.5433	125 4.9213	63 2.48	105 4.1339	1.1 0.043	2 0.079	NA6918A	175 39300	427 96000	66.0	2600	4000	2.64 5.82
95 3.7402	95 3.7402	125 4.9213	26 1.024	105 4.1339	1 0.039	2.5 0.098	NKJ95/26A	84.7 19000	168 37800	26.3	2600	3900	0.935 2.061
	95 3.7402	130 5.1181	35 1.378	110 4.3307	1.1 0.043	2.5 0.098	NA4919	115 25900	253 56900	38.4	2500	3800	1.43 3.153
	95 3.7402	130 5.1181	63 2.48	110 4.3307	1.1 0.043	2 0.079	NA6919A	180 40500	452 102000	68.6	2500	3800	2.67 5.88
100 3.937	100 3.937	130 5.1181	30 1.181	110 4.3307	1.1 0.043	2 0.079	NKJ100/30A	103 23200	220 49500	33.6	2500	3800	0.984 2.169
	100 3.937	130 5.1181	40 1.575	110 4.3307	1.1 0.043	2 0.079	NKJ100/40A	130 29200	296 66500	44.8	2500	3800	1.41 3.109
	100 3.937	135 5.315	32 1.26	115 4.5276	1.1 0.043	2 0.079	NKJS100A	104 23400	226 50800	34.1	2400	3700	2.01 4.431
	100 3.937	140 5.5118	40 1.575	115 4.5276	1.1 0.043	3.5 0.138	NA4920	152 34200	332 74600	49.2	2400	3700	2.01 4.431
110 4.3307	110 4.3307	140 5.5118	30 1.181	120 4.7244	1 0.039	0.5 0.02	NA4822	90.3 20300	230 51700	33.7	2300	3500	1.21 2.668
	110 4.3307	150 5.9055	40 1.575	125 4.9213	1.1 0.043	3.5 0.138	NA4922	147 33000	325 73100	47.0	2200	3400	2.19 4.828
120 4.7244	120 4.7244	150 5.9055	30 1.181	130 5.1181	1 0.039	0.5 0.02	NA4824	94.2 21200	249 56000	35.7	2100	3200	1.31 2.888
	120 4.7244	165 6.4961	45 1.772	135 5.315	1.1 0.043	3.5 0.138	NA4924	177 39800	407 91500	58.5	2000	3100	3.04 6.702
130 5.1181	130 5.1181	165 6.4961	35 1.378	145 5.7087	1.1 0.043	1 0.039	NA4826	112 25200	323 72600	44.8	1900	2900	1.99 4.387
	130 5.1181	180 7.0866	50 1.969	150 5.9055	1.5 0.059	3 0.118	NA4926	201 45200	495 111000	68.7	1800	2800	4.14 9.127
140 5.5118	140 5.5118	175 6.8898	35 1.378	155 6.1024	1.1 0.043	1 0.039	NA4828	116 26100	346 77800	47.1	1700	2700	2.12 4.674
	140 5.5118	190 7.4803	50 1.969	160 6.2992	1.5 0.059	3 0.118	NA4928	214 48100	549 123000	74.8	1700	2600	4.41 9.72
150 5.9055	150 5.9055	190 7.4803	40 1.575	165 6.4961	1.1 0.043	2 0.079	NA4830A	142 31900	402 90400	53.5	1600	2500	2.7 5.952
160 6.2992	160 6.2992	200 7.874	40 1.575	175 6.8898	1.1 0.043	2 0.079	NA4832A	146 32800	425 95500	46.6	1500	2400	3.15 6.944

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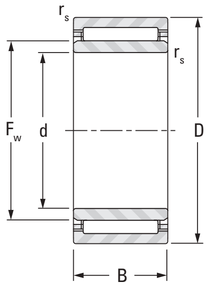
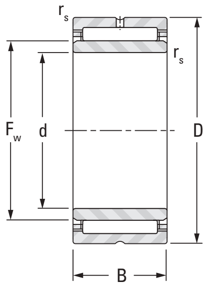
(1) Max. axial displacement

NEEDLE ROLLER BEARINGS WITH INNER RINGS

METRIC SERIES
NQI, NA49 SERIES



NQI



NA49

Shaft Dia.	d	D	B	F_w	$r_{s\,min.}$	s(1)	Bearing Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
12 0.4724	12	24	13	16	0.3	—	NA4901C3	8.65	11.1	1.70	—	28000	0.027
20 0.7874	20	32	20	24	0.3	—	NQI203220AD	17.4	26.5	4.15	—	18000	0.062
	20	37	17	25	0.3	—	NA4904NA	16.2	21.5	3.25	—	18000	0.083
25 0.9843	25	44	25	30	0.3	—	25NQI4425A(2)	36.6	49.6	7.90	—	15000	0.161
30 1.1811	30	47	17	35	0.3	—	NA4906D	20.2	31.9	4.85	—	12000	0.114
38 1.4961	38	53	30	43	0.6	—	NQI38/30	41.3	85.9	13.4	—	9900	0.205

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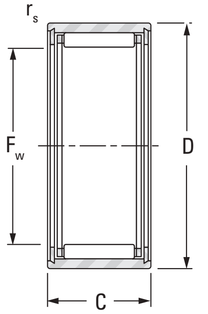
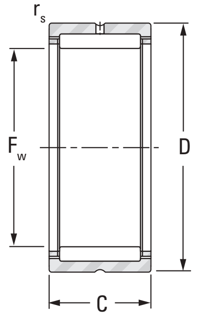
(1) Max. axial displacement
(2) Inner ring width 25.5mm

NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

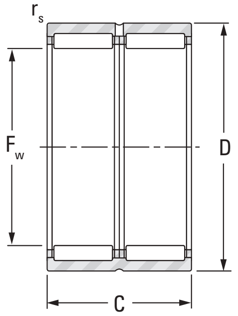
METRIC SERIES
NK, NKS, RNA48, RNA49
RNA69 SERIES



NK (Fw ≤ 10)



NK (Fw ≥ 12), NKS, RNA48, RNA49, RNA69 (Fw ≤ 35)



RNA69 (Fw ≥ 40)

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic C	Static C_0		Grease	Oil	
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
5 0.1969	**5** 0.1969	**10** 0.3937	**10** 0.394	**0.2** 0.006	NK5/10TN	**2.18** 490	**1.71** 384	0.260	31000	47000	**0.004** 0.009
	5 0.1969	**10** 0.3937	**12** 0.472	**0.2** 0.006	NK5/12TN	**3.04** 683	**2.63** 591	0.400	31000	47000	**0.004** 0.009
6 0.2362	**6** 0.2362	**12** 0.4724	**10** 0.394	**0.2** 0.006	NK6/10	**3.19** 717	**2.9** 652	0.420	29000	44000	**0.005** 0.011
	6 0.2362	**12** 0.4724	**12** 0.472	**0.2** 0.006	NK6/12TN	**3.07** 690	**2.74** 616	0.420	29000	44000	**0.006** 0.013
7 0.2756	**7** 0.2756	**14** 0.5512	**10** 0.394	**0.3** 0.012	NK7/10TN	**2.74** 616	**2.44** 549	0.370	28000	42000	**0.007** 0.015
	7 0.2756	**14** 0.5512	**12** 0.472	**0.3** 0.012	NK7/12TN	**3.4** 764	**3.22** 724	0.490	28000	42000	**0.009** 0.020
8 0.315	**8** 0.315	**15** 0.5906	**12** 0.472	**0.3** 0.012	NK8/12	**4.57** 1030	**4.89** 1 100	0.740	26000	41000	**0.011** 0.024
	8 0.315	**15** 0.5906	**12** 0.472	**0.3** 0.012	NK8/12ASR1	**4.57** 1030	**4.89** 1100	0.740	26000	41000	**0.011** 0.024
	8 0.315	**15** 0.5906	**16** 0.63	**0.3** 0.012	NK8/16	**5.22** 1170	**5.78** 1300	0.880	26000	41000	**0.013** 0.029
9 0.3543	**9** 0.3543	**16** 0.6299	**12** 0.472	**0.3** 0.012	NK9/12	**4.27** 960	**4.6** 1030	0.700	26000	40000	**0.012** 0.026
	9 0.3543	**16** 0.6299	**16** 0.63	**0.3** 0.012	NK9/16	**5.57** 1250	**6.47** 1450	0.980	26000	40000	**0.015** 0.033
10 0.3937	**10** 0.3937	**17** 0.6693	**12** 0.472	**0.3** 0.012	NK10/12	**5.4** 1210	**6.43** 1450	0.980	25000	39000	**0.013** 0.029
	10 0.3937	**17** 0.6693	**16** 0.63	**0.3** 0.012	NK10/16TN	**5.3** 1190	**6.27** 1410	0.940	25000	39000	**0.015** 0.033
12 0.4724	**12** 0.4724	**19** 0.748	**12** 0.472	**0.3** 0.012	NK12/12A	**6.86** 1540	**7.6** 1710	1.15	19000	30000	**0.013** 0.029
	12 0.4724	**19** 0.748	**16** 0.63	**0.3** 0.012	NK12/16	**6.78** 1520	**9.03** 2030	1.40	24000	37000	**0.018** 0.040
14 0.5512	**14** 0.5512	**22** 0.8661	**13** 0.512	**0.3** 0.012	RNA4900	**9.39** 2110	**10.3** 2320	1.55	16000	24000	**0.018** 0.040
	14 0.5512	**22** 0.8661	**16** 0.63	**0.3** 0.012	NK14/16A	**12.4** 2790	**14.8** 3330	2.25	16000	24000	**0.023** 0.051
	14 0.5512	**22** 0.8661	**20** 0.787	**0.3** 0.012	NK14/20A	**14.7** 3300	**18.4** 4140	2.90	16000	24000	**0.028** 0.060
15 0.5906	**15** 0.5906	**23** 0.9055	**16** 0.63	**0.3** 0.012	NK15/16A	**12.4** 2790	**15** 3370	2.30	15000	24000	**0.024** 0.053
	15 0.5906	**23** 0.9055	**20** 0.787	**0.3** 0.012	NK15/20A	**14.7** 3300	**18.6** 4180	2.95	15000	24000	**0.031** 0.068
16 0.6299	**16** 0.6299	**24** 0.9449	**13** 0.512	**0.3** 0.012	RNA4901	**10.5** 2360	**12.3** 2770	1.85	18000	28000	**0.020** 0.044
	16 0.6299	**24** 0.9449	**16** 0.63	**0.3** 0.012	NK16/16A	**13** 2920	**16.2** 3640	2.50	18000	28000	**0.025** 0.055

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic C	Static C_0		Grease	Oil	
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
16 0.6299	**16** 0.6299	**24** 0.9449	**20** 0.787	**0.3** 0.012	NK16/20A	**15.4** 3460	**20.2** 4540	3.20	18000	28000	**0.036** 0.079
	16 0.6299	**24** 0.9449	**22** 0.866	**0.3** 0.012	RNA6901	**16.1** 3620	**21.3** 4790	3.30	18000	28000	**0.036** 0.079
17 0.6693	**17** 0.6693	**25** 0.9843	**16** 0.63	**0.3** 0.012	NK17/16A	**13.6** 3060	**17.5** 3930	2.70	17000	27000	**0.027** 0.060
	17 0.6693	**25** 0.9843	**20** 0.787	**0.3** 0.012	NK17/20A	**15.4** 3460	**20.4** 4590	3.25	17000	27000	**0.034** 0.075
18 0.7087	**18** 0.7087	**26** 1.0236	**16** 0.63	**0.3** 0.012	NK18/16A	**13.6** 3060	**17.7** 3980	2.70	16000	25000	**0.028** 0.062
	18 0.7087	**26** 1.0236	**20** 0.787	**0.3** 0.012	NK18/20A	**16.1** 3620	**22.0** 4950	3.50	16000	25000	**0.035** 0.077
	18 0.7087	**30** 1.1811	**16** 0.63	**0.3** 0.012	NKS18A	**15.9** 3570	**16.2** 3640	2.45	17000	26000	**0.045** 0.099
19 0.748	**19** 0.748	**27** 1.063	**16** 0.63	**0.3** 0.012	NK19/16A	**14.1** 3170	**19.0** 4270	2.90	15000	24000	**0.029** 0.064
	19 0.748	**27** 1.063	**20** 0.787	**0.3** 0.012	NK19/20A	**18.8** 4230	**23.6** 5310	3.75	15000	24000	**0.037** 0.082
20 0.7874	**20** 0.7874	**28** 1.1024	**13** 0.512	**0.3** 0.012	RNA4902	**11.8** 2650	**15.3** 3440	2.35	14000	22000	**0.023** 0.051
	20 0.7874	**28** 1.1024	**16** 0.63	**0.3** 0.012	NK20/16A	**14.1** 3170	**19.1** 4290	2.90	14000	22000	**0.030** 0.066
	20 0.7874	**28** 1.1024	**20** 0.787	**0.3** 0.012	NK20/20A	**17.5** 3930	**25.3** 5690	4.00	14000	22000	**0.038** 0.084
	20 0.7874	**28** 1.1024	**23** 0.906	**0.3** 0.012	RNA6902A	**18.4** 4140	**26.9** 6050	4.20	14000	22000	**0.042** 0.093
	20 0.7874	**32** 1.2598	**20** 0.787	**0.6** 0.024	NKS20A	**24.4** 5490	**26.7** 6000	4.30	15000	24000	**0.058** 0.128
21 0.8268	**21** 0.8268	**29** 1.1417	**16** 0.63	**0.3** 0.012	NK21/16A	**15.3** 3440	**21.6** 4860	3.30	14000	21000	**0.032** 0.071
	21 0.8268	**29** 1.1417	**20** 0.787	**0.3** 0.012	NK21/20A	**18.1** 4070	**26.9** 6050	4.25	14000	21000	**0.040** 0.088
22 0.8661	**22** 0.8661	**30** 1.1811	**13** 0.512	**0.3** 0.012	RNA4903	**12.2** 2740	**16.4** 3690	2.50	13000	20000	**0.025** 0.055
	22 0.8661	**30** 1.1811	**16** 0.63	**0.3** 0.012	NK22/16A	**15.2** 3420	**21.7** 4880	3.30	13000	20000	**0.033** 0.073
	22 0.8661	**30** 1.1811	**20** 0.787	**0.3** 0.012	NK22/20A	**18** 4050	**27** 6070	4.30	13000	20000	**0.041** 0.090
	22 0.8661	**30** 1.1811	**23** 0.906	**0.3** 0.012	RNA6903A	**19.8** 4450	**30.6** 6880	4.75	13000	20000	**0.056** 0.123
	22 0.8661	**35** 1.378	**20** 0.787	**0.6** 0.024	NKS22A	**22.9** 5150	**27.1** 6090	4.30	14000	21000	**0.069** 0.152
24 0.9449	**24** 0.9449	**32** 1.2598	**16** 0.63	**0.3** 0.012	NK24/16A	**16.2** 3640	**24.3** 5460	3.70	12000	18000	**0.035** 0.077
	24 0.9449	**32** 1.2598	**20** 0.787	**0.3** 0.012	NK24/20A	**19.3** 4340	**30.3** 6810	4.80	12000	18000	**0.045** 0.099
	24 0.9449	**37** 1.4567	**20** 0.787	**0.6** 0.024	NKS24A	**29.1** 6540	**32.8** 7370	5.30	13000	20000	**0.073** 0.161
25 0.9843	**25** 0.9843	**33** 1.2992	**16** 0.63	**0.3** 0.012	NK25/16A	**16.1** 3620	**24.4** 5490	3.75	11000	17000	**0.037** 0.082
	25 0.9843	**33** 1.2992	**20** 0.787	**0.3** 0.012	NK25/20A	**19.1** 4290	**30.4** 6830	4.80	11000	17000	**0.047** 0.104
	25 0.9843	**37** 1.4567	**17** 0.669	**0.3** 0.012	RNA4904	**21.3** 4790	**25.5** 5730	3.95	12000	18000	**0.061** 0.134
	25 0.9843	**37** 1.4567	**30** 1.181	**0.3** 0.012	RNA6904A	**36.6** 8230	**51.0** 11500	7.95	12000	18000	**0.091** 0.201

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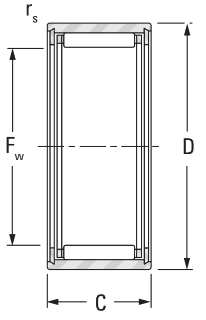
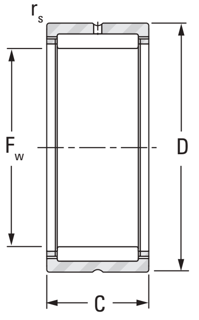
NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

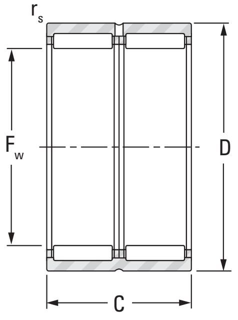
METRIC SERIES
NK, NKS, RNA48, RNA49
RNA69 SERIES



NK (Fw ≤ 10)



NK (Fw ≥ 12),
NKS, RNA48, RNA49,
RNA69 (Fw ≤ 35)



RNA69
(Fw ≥ 40)

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static		Grease	Oil	
						C	C_0				
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
25 0.9843	**25** 0.9843	**38** 1.4961	**20** 0.787	**0.6** 0.024	NKS25A	**29.1** 6540	**33** 7420	5.30	12000	19000	**0.076** 0.168
26 1.0236	**26** 1.0236	**34** 1.3386	**16** 0.63	**0.3** 0.012	NK26/16A	**16.6** 3730	**25.7** 5780	3.95	11000	17000	**0.039** 0.086
	26 1.0236	**34** 1.3386	**20** 0.787	**0.3** 0.012	NK26/20A	**19.7** 4430	**32** 7190	5.05	11000	17000	**0.048** 0.106
28 1.1024	**28** 1.1024	**37** 1.4567	**20** 0.787	**0.3** 0.012	NK28/20A	**22.6** 5080	**34.4** 7730	5.50	10000	16000	**0.057** 0.126
	28 1.1024	**37** 1.4567	**30** 1.181	**0.3** 0.012	NK28/30A	**29** 6520	**53.8** 12100	8.30	10000	16000	**0.088** 0.194
	28 1.1024	**39** 1.5354	**17** 0.669	**0.3** 0.012	RNA49/22	**23.3** 5240	**29.6** 6650	4.55	10000	16000	**0.059** 0.130
	28 1.1024	**39** 1.5354	**30** 1.181	**0.3** 0.012	RNA69/22A	**30.6** 6880	**50.7** 11400	3.95	10000	16000	**0.107** 0.236
	28 1.1024	**42** 1.6535	**20** 0.787	**0.6** 0.024	NKS28A	**30.3** 6810	**38.4** 8630	6.15	11000	16000	**0.094** 0.207
29 1.1417	**29** 1.1417	**38** 1.4961	**20** 0.787	**0.3** 0.012	NK29/20A	**23.4** 5260	**36.4** 8180	5.80	9800	15000	**0.059** 0.130
	29 1.1417	**38** 1.4961	**30** 1.181	**0.3** 0.012	NK29/30A	**29.8** 6700	**56.4** 12700	8.70	9700	15000	**0.090** 0.198
30 1.1811	**30** 1.1811	**40** 1.5748	**20** 0.787	**0.3** 0.012	NK30/20A	**24.2** 5440	**38.3** 8610	6.10	9500	15000	**0.071** 0.157
	30 1.1811	**40** 1.5748	**30** 1.181	**0.3** 0.012	NK30/30A	**34.7** 7800	**61** 13700	9.45	9500	15000	**0.107** 0.236
	30 1.1811	**42** 1.6535	**17** 0.669	**0.3** 0.012	RNA4905	**24.3** 5460	**31.7** 7130	4.90	9700	15000	**0.071** 0.157
	30 1.1811	**42** 1.6535	**30** 1.181	**0.3** 0.012	RNA6905A	**39.7** 8920	**59.6** 13400	9.30	9700	15000	**0.127** 0.280
	30 1.1811	**45** 1.7717	**22** 0.866	**0.6** 0.024	NKS30A	**34.3** 7710	**42.8** 9620	6.85	9900	15000	**0.114** 0.251
32 1.2598	**32** 1.2598	**42** 1.6535	**20** 0.787	**0.3** 0.012	NK32/20A	**24.8** 5580	**40.4** 9080	6.45	8800	14000	**0.074** 0.163
	32 1.2598	**42** 1.6535	**30** 1.181	**0.3** 0.012	NK32/30A	**35.6** 8000	**64.3** 14500	9.95	8800	14000	**0.112** 0.247
	32 1.2598	**45** 1.7717	**17** 0.669	**0.3** 0.012	RNA49/28	**25.1** 5640	**33.8** 7600	5.20	9000	14000	**0.080** 0.176
	32 1.2598	**45** 1.7717	**30** 1.181	**0.3** 0.012	RNA69/28A	**43.2** 9710	**62.5** 14100	9.75	9100	14000	**0.140** 0.309
	32 1.2598	**47** 1.8504	**22** 0.866	**0.6** 0.024	NKS32A	**36** 8090	**46.2** 10400	7.40	9200	14000	**0.120** 0.265
35 1.378	**35** 1.378	**45** 1.7717	**20** 0.787	**0.3** 0.012	NK35/20A	**26.1** 5870	**44.4** 9980	7.05	8000	12000	**0.081** 0.179
	35 1.378	**45** 1.7717	**30** 1.181	**0.3** 0.012	NK35/30A	**37.4** 8410	**70.6** 15900	11.0	8000	12000	**0.122** 0.269
35 1.378	**35** 1.378	**47** 1.8504	**18** 0.709	**0.3** 0.012	RNA4906	**25.9** 5820	**36** 8090	5.55	8200	13000	**0.081** 0.179
	35 1.378	**47** 1.8504	**30** 1.181	**0.3** 0.012	RNA6906A	**42.6** 9580	**68.2** 15300	10.6	8200	13000	**0.148** 0.326
	35 1.378	**50** 1.9685	**22** 0.866	**0.6** 0.024	NKS35A	**37.5** 8430	**49.9** 11200	8.00	8400	13000	**0.130** 0.287
37 1.4567	**37** 1.4567	**47** 1.8504	**20** 0.787	**0.3** 0.012	NK37/20A	**26.6** 5980	**46.4** 10400	7.40	7600	12000	**0.084** 0.185
	37 1.4567	**47** 1.8504	**30** 1.181	**0.3** 0.012	NK37/30A	**38.2** 8590	**73.9** 16600	11.5	7600	12000	**0.128** 0.282
	37 1.4567	**52** 2.0472	**22** 0.866	**0.6** 0.024	NKS37A	**39** 8770	**53.4** 12000	8.55	7900	12000	**0.134** 0.295
38 1.4961	**38** 1.4961	**48** 1.8898	**20** 0.787	**0.3** 0.012	NK38/20A	**21.7** 4880	**40.9** 9190	6.40	7300	11000	**0.087** 0.192
	38 1.4961	**48** 1.8898	**30** 1.181	**0.3** 0.012	NK38/30A	**31.9** 7170	**67** 15100	10.4	7300	11000	**0.131** 0.289
40 1.5748	**40** 1.5748	**50** 1.9685	**20** 0.787	**0.3** 0.012	NK40/20A	**27.8** 6250	**50.4** 11300	8.05	7000	11000	**0.089** 0.196
	40 1.5748	**50** 1.9685	**30** 1.181	**0.3** 0.012	NK40/30A	**40** 8990	**80.2** 18000	12.4	7000	11000	**0.137** 0.302
	40 1.5748	**52** 2.0472	**20** 0.787	**0.6** 0.024	RNA49/32	**32** 7190	**49.3** 11100	7.85	7100	11000	**0.100** 0.220
	40 1.5748	**52** 2.0472	**36** 1.417	**0.6** 0.024	RNA69/32A	**48.6** 10900	**84.5** 19000	26.1	7100	11000	**0.185** 0.408
	40 1.5748	**55** 2.1654	**22** 0.866	**0.6** 0.024	NKS40A	**40.3** 9060	**57** 12800	9.15	7200	11000	**0.140** 0.309
42 1.6535	**42** 1.6535	**52** 2.0472	**20** 0.787	**0.3** 0.012	NK42/20A	**28.3** 6360	**52.4** 11800	8.35	6600	10000	**0.085** 0.187
	42 1.6535	**52** 2.0472	**30** 1.181	**0.3** 0.012	NK42/30A	**40.7** 9150	**83.5** 18800	13.0	6600	10000	**0.141** 0.311
	42 1.6535	**55** 2.1654	**20** 0.787	**0.6** 0.024	RNA4907	**32.8** 7370	**51.7** 11600	8.25	6700	10000	**0.114** 0.251
	42 1.6535	**55** 2.1654	**36** 1.417	**0.6** 0.024	RNA6907A	**49.9** 11200	**88.7** 19900	13.7	6700	10000	**0.218** 0.481
43 1.6929	**43** 1.6929	**53** 2.0866	**20** 0.787	**0.3** 0.012	NK43/20A	**29** 6520	**54.4** 12200	8.65	6400	9900	**0.096** 0.212
	43 1.6929	**53** 2.0866	**30** 1.181	**0.3** 0.012	NK43/30A	**41.6** 9350	**86.6** 19500	13.4	6400	9900	**0.134** 0.295
	43 1.6929	**58** 2.2835	**22** 0.866	**0.6** 0.024	NKS43A	**41.6** 9350	**60.7** 13600	9.75	6700	10000	**0.150** 0.331
45 1.7717	**45** 1.7717	**55** 2.1654	**20** 0.787	**0.3** 0.012	NK45/20A	**29.5** 6630	**56.4** 12700	9.00	6100	9400	**0.100** 0.220
	45 1.7717	**55** 2.1654	**30** 1.181	**0.3** 0.012	NK45/30A	**42.3** 9510	**89.8** 20200	13.9	6100	9400	**0.151** 0.333
	45 1.7717	**60** 2.3622	**22** 0.866	**0.6** 0.024	NKS45A	**43** 9670	**64.2** 14400	10.3	6400	9800	**0.156** 0.344
47 1.8504	**47** 1.8504	**57** 2.2441	**20** 0.787	**0.3** 0.012	NK47/20A	**30** 6740	**58.5** 13200	9.30	5900	9000	**0.104** 0.229
	47 1.8504	**57** 2.2441	**30** 1.181	**0.3** 0.012	NK47/30A	**43** 9670	**93.1** 20900	14.4	5900	9000	**0.158** 0.348
48 1.8898	**48** 1.8898	**62** 2.4409	**22** 0.866	**0.6** 0.024	RNA4908	**44.2** 9940	**67.8** 15200	10.9	5900	9100	**0.154** 0.340
	48 1.8898	**62** 2.4409	**40** 1.575	**0.6** 0.024	RNA6908A	**70.8** 15900	**124** 27900	19.8	5900	9100	**0.300** 0.661
50 1.9685	**50** 1.9685	**62** 2.4409	**25** 0.984	**0.3** 0.012	NK50/25A	**40.7** 9150	**79.3** 17800	12.5	5500	8500	**0.171** 0.377

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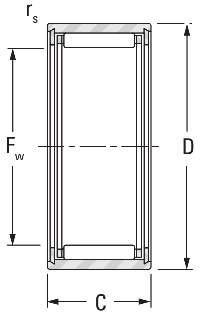
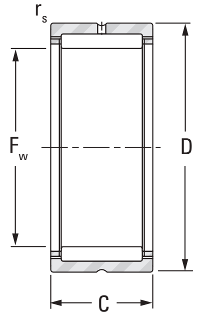
NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

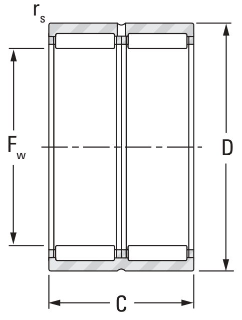
METRIC SERIES
NK, NKS, RNA48, RNA49
RNA69 SERIES



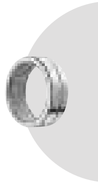
NK (Fw ≤ 10)



NK (Fw ≥ 12),
NKS, RNA48, RNA49,
RNA69 (Fw ≤ 35)



RNA69
(Fw ≥ 40)



Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static		Grease	Oil	
						C	C_0				
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
50 1.9685	**50** 1.9685	**62** 2.4409	**35** 1.378	**0.6** 0.024	NK50/35A	**55** 12400	**117** 26300	18.2	5500	8500	**0.242** 0.534
	50 1.9685	**65** 2.5591	**22** 0.866	**1** 0.039	NKS50A	**45.5** 10200	**71.3** 16000	11.4	5700	8700	**0.170** 0.375
52 2.0472	**52** 2.0472	**68** 2.6772	**22** 0.866	**0.6** 0.024	RNA4909	**46.8** 10500	**74.8** 16800	12.0	5400	8400	**0.201** 0.443
	52 2.0472	**68** 2.6772	**40** 1.575	**0.6** 0.024	RNA6909A	**74.7** 16800	**137** 30800	21.7	5400	8400	**0.392** 0.864
55 2.1654	**55** 2.1654	**68** 2.6772	**25** 0.984	**0.6** 0.024	NK55/25A	**46.1** 10400	**87.3** 19600	13.9	5000	7800	**0.207** 0.456
	55 2.1654	**68** 2.6772	**35** 1.378	**0.6** 0.024	NK55/35A	**62.3** 14000	**129** 29000	20.0	5000	7800	**0.293** 0.646
	55 2.1654	**72** 2.8346	**22** 0.866	**1** 0.039	NKS55A	**47.9** 10800	**78.4** 17600	12.6	5100	7900	**0.225** 0.496
58 2.2835	**58** 2.2835	**72** 2.8346	**22** 0.866	**0.6** 0.024	RNA4910	**48.9** 11000	**82** 18400	13.2	4800	7400	**0.179** 0.395
	58 2.2835	**72** 2.8346	**40** 1.575	**0.6** 0.024	RNA6910A	**75.7** 17000	**144** 32400	22.8	4800	7400	**0.364** 0.802
60 2.3622	**60** 2.3622	**72** 2.8346	**25** 0.984	**0.6** 0.024	NK60/25A	**44.3** 9960	**94** 21100	14.9	4400	7000	**0.202** 0.445
	60 2.3622	**72** 2.8346	**35** 1.378	**0.6** 0.024	NK60/35A	**59.9** 13500	**139** 31200	21.5	4400	7000	**0.286** 0.631
	60 2.3622	**80** 3.1496	**28** 1.102	**1.1** 0.043	NKS60A	**66.9** 15000	**103** 23200	16.5	4800	7300	**0.337** 0.743
63 2.4803	**63** 2.4803	**80** 3.1496	**25** 0.984	**1** 0.039	RNA4911	**62** 13900	**107** 24100	17.1	4500	6900	**0.285** 0.628
	63 2.4803	**80** 3.1496	**45** 1.772	**1** 0.039	RNA6911A	**94.2** 21200	**172** 38700	27.8	4500	6900	**0.540** 1.190
65 2.5591	**65** 2.5591	**78** 3.0709	**25** 0.984	**0.6** 0.024	NK65/25A	**48.2** 10800	**97.7** 22000	15.5	4200	6500	**0.257** 0.567
	65 2.5591	**78** 3.0709	**35** 1.378	**0.6** 0.024	NK65/35A	**65.2** 14700	**144** 32400	22.4	4200	6500	**0.298** 0.657
	65 2.5591	**85** 3.3465	**28** 1.102	**1.1** 0.043	NKS65A	**71** 16000	**114** 25600	18.3	4200	6700	**0.362** 0.798
68 2.6772	**68** 2.6772	**82** 3.2283	**25** 0.984	**0.6** 0.024	NK68/25A	**49** 11000	**101** 22700	16.1	4000	6200	**0.287** 0.633
	68 2.6772	**82** 3.2283	**35** 1.378	**0.6** 0.024	NK68/35A	**66.2** 14900	**149** 33500	23.2	4000	6200	**0.350** 0.772
	68 2.6772	**85** 3.3465	**25** 0.984	**1** 0.039	RNA4912	**64.8** 14600	**116** 26100	18.6	4100	6300	**0.304** 0.670
	68 2.6772	**85** 3.3465	**45** 1.772	**1** 0.039	RNA6912A	**99.3** 22300	**189** 42500	30.5	4100	6300	**0.546** 1.204
70 2.7559	**70** 2.7559	**85** 3.3465	**25** 0.984	**0.6** 0.024	NK70/25A	**43.6** 9800	**87.9** 19800	16.6	3900	6000	**0.298** 0.657
70 2.7559	**70** 2.7559	**85** 3.3465	**35** 1.378	**0.6** 0.024	NK70/35A	**62.2** 14000	**139** 31200	24.0	3900	6000	**0.411** 0.906
	70 2.7559	**90** 3.5433	**28** 1.102	**1.1** 0.043	NKS70A	**72.6** 16300	**120** 27000	19.3	4000	6200	**0.383** 0.844
72 2.8346	**72** 2.8346	**90** 3.5433	**25** 0.984	**1** 0.039	RNA4913	**66** 14800	**121** 27200	19.4	3900	5900	**0.346** 0.763
	72 2.8346	**90** 3.5433	**45** 1.772	**1** 0.039	RNA6913A	**107** 24100	**213** 47900	34.5	3900	5900	**0.679** 1.497
73 2.874	**73** 2.874	**90** 3.5433	**25** 0.984	**0.6** 0.024	NK73/25A	**61.5** 13800	**119** 26800	19.0	3800	5800	**0.320** 0.705
	73 2.874	**90** 3.5433	**35** 1.378	**0.6** 0.024	NK73/35A	**82.5** 18500	**173** 38900	27.1	3800	5800	**0.450** 0.992
75 2.9528	**75** 2.9528	**92** 3.622	**25** 0.984	**0.6** 0.024	NK75/25A	**43.7** 9820	**90.2** 20300	19.0	3600	5600	**0.364** 0.802
	75 2.9528	**92** 3.622	**35** 1.378	**0.6** 0.024	NK75/35A	**60.9** 13700	**138** 31000	27.1	3600	5600	**0.518** 1.142
	75 2.9528	**95** 3.7402	**28** 1.102	**1.1** 0.043	NKS75A	**76.5** 17200	**132** 29700	21.1	3700	5800	**0.413** 0.911
80 3.1496	**80** 3.1496	**95** 3.7402	**25** 0.984	**1** 0.039	NK80/25A	**65** 14600	**131** 29400	21.0	3400	5300	**0.331** 0.730
	80 3.1496	**95** 3.7402	**35** 1.378	**1** 0.039	NK80/35A	**79.7** 17900	**184** 41400	28.7	3400	5300	**0.380** 0.838
	80 3.1496	**100** 3.937	**30** 1.181	**1** 0.039	RNA4914	**86.3** 19400	**157** 35300	25.1	3500	5400	**0.502** 1.107
	80 3.1496	**100** 3.937	**54** 2.126	**1** 0.039	RNA6914A	**137** 30800	**286** 64300	45.7	3500	5400	**0.946** 2.086
85 3.3465	**85** 3.3465	**105** 4.1339	**25** 0.984	**1** 0.039	NK85/25A	**76.4** 17200	**137** 30800	22.2	3300	5000	**0.506** 1.116
	85 3.3465	**105** 4.1339	**30** 1.181	**1** 0.039	RNA4915	**92.4** 20800	**175** 39300	28.0	3300	5000	**0.528** 1.164
	85 3.3465	**105** 4.1339	**35** 1.378	**1** 0.039	NK85/35A	**108** 24300	**214** 48100	34.7	3300	5000	**0.610** 1.345
	85 3.3465	**105** 4.1339	**54** 2.126	**1** 0.039	RNA6915A	**143** 32100	**308** 69200	49.3	3300	5000	**1.020** 2.249
90 3.5433	**90** 3.5433	**110** 4.3307	**25** 0.984	**1** 0.039	NK90/25A	**79.5** 17900	**147** 33000	23.8	3100	4700	**0.450** 0.992
	90 3.5433	**110** 4.3307	**30** 1.181	**1** 0.039	RNA4916	**91.5** 20600	**176** 39600	28.1	3100	4700	**0.556** 1.226
	90 3.5433	**110** 4.3307	**35** 1.378	**1** 0.039	NK90/35A	**113** 25400	**230** 51700	36.1	3100	4700	**0.745** 1.642
	90 3.5433	**110** 4.3307	**54** 2.126	**1** 0.039	RNA6916A	**126** 28300	**320** 71900	50.8	3100	4700	**1.050** 2.315
95 3.7402	**95** 3.7402	**115** 4.5276	**26** 1.024	**1** 0.039	NK95/26A	**49.3** 11100	**114** 25600	24.6	2800	4400	**0.572** 1.261
	95 3.7402	**115** 4.5276	**36** 1.417	**1** 0.039	NK95/36A	**114** 25600	**238** 53500	37.3	2900	4500	**0.803** 1.770
100 3.937	**100** 3.937	**120** 4.7244	**26** 1.024	**1** 0.039	NK100/26A	**83.6** 18800	**163** 36600	25.8	2800	4200	**0.530** 1.168
	100 3.937	**120** 4.7244	**35** 1.378	**1.1** 0.043	RNA4917	**110** 24700	**230** 51700	36.0	2800	4200	**0.715** 1.576
	100 3.937	**120** 4.7244	**36** 1.417	**1** 0.039	NK100/36A	**118** 26500	**254** 57100	39.1	2800	4200	**0.658** 1.451
	100 3.937	**120** 4.7244	**63** 2.48	**1.1** 0.043	RNA6917A	**150** 33700	**416** 93500	63.0	2800	4200	**1.350** 2.976
105 4.1339	**105** 4.1339	**125** 4.9213	**26** 1.024	**1** 0.039	NK105/26A	**52.2** 11700	**127** 28600	19.9	2600	3900	**0.595** 1.312

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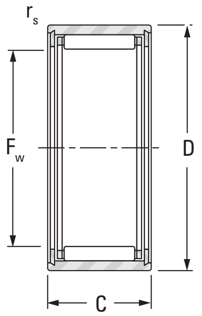
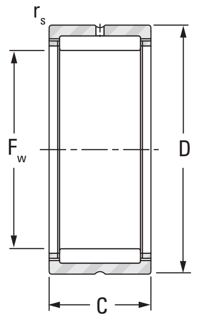
NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

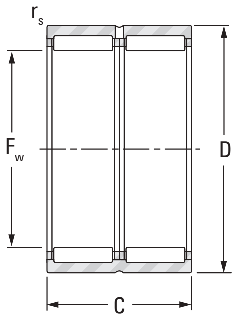
METRIC SERIES
NK, NKS, RNA48, RNA49
RNA69 SERIES



NK ($F_w \leq 10$)



NK ($F_w \geq 12$),
NKS, RNA48, RNA49,
RNA69 ($F_w \leq 35$)

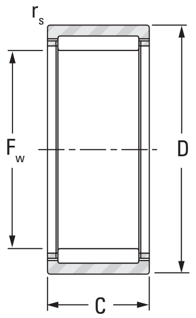


RNA69
($F_w \geq 40$)

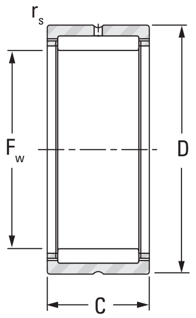
Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static		Grease	Oil	
						C	C_0				
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
105 4.1339	**105** 4.1339	**125** 4.9213	**35** 1.378	**1.1** 0.043	RNA4918	**114** 25600	**245** 55100	37.8	2600	4000	**0.746** 1.645
	105 4.1339	**125** 4.9213	**63** 2.48	**1.1** 0.043	RNA6918A	**154** 34600	**437** 98200	66.0	2600	4000	**1.500** 3.300
110 4.3307	**110** 4.3307	**130** 5.1181	**30** 1.181	**1.1** 0.043	NK110/30A	**103** 23200	**220** 49500	33.6	2500	3800	**0.660** 1.455
	110 4.3307	**130** 5.1181	**35** 1.378	**1.1** 0.043	RNA4919	**115** 25900	**253** 56900	38.4	2500	3800	**0.777** 1.713
	110 4.3307	**130** 5.1181	**40** 1.575	**1.1** 0.043	NK110/40A	**132** 29700	**301** 67700	45.7	2500	3800	**0.900** 1.984
	110 4.3307	**130** 5.1181	**63** 2.48	**1.1** 0.043	RNA6919A	**158** 35500	**458** 103000	68.8	2500	3800	**1.470** 3.241
115 4.5276	**115** 4.5276	**140** 5.5118	**40** 1.575	**1.1** 0.043	RNA4920	**139** 31200	**296** 66500	43.9	2400	3700	**1.220** 2.690
120 4.7244	**120** 4.7244	**140** 5.5118	**30** 1.181	**1** 0.039	RNA4822	**90.3** 20300	**230** 51700	33.7	2300	3500	**0.785** 1.731
125 4.9213	**125** 4.9213	**150** 5.9055	**40** 1.575	**1.1** 0.043	RNA4922	**147** 33000	**325** 73100	47.0	2200	3400	**1.320** 2.910
130 5.1181	**130** 5.1181	**150** 5.9055	**30** 1.181	**1** 0.039	RNA4824	**94.1** 21200	**249** 56000	35.7	2100	3200	**0.850** 1.874
135 5.315	**135** 5.315	**165** 6.4961	**45** 1.772	**1.1** 0.043	RNA4924	**177** 39800	**407** 91500	58.5	2000	3100	**1.980** 4.365
145 5.7087	**145** 5.7087	**165** 6.4961	**35** 1.378	**1** 0.039	RNA4826	**112** 25200	**323** 72600	44.8	1900	2900	**1.100** 2.425
150 5.9055	**150** 5.9055	**180** 7.0866	**50** 1.969	**1.5** 0.059	RNA4926	**201** 45200	**495** 111000	68.7	1800	2800	**2.420** 5.335
155 6.1024	**155** 6.1024	**175** 6.8898	**35** 1.378	**1.1** 0.043	RNA4828	**116** 26100	**346** 77800	47.1	1700	2700	**1.170** 2.579
160 6.2992	**160** 6.2992	**190** 7.4803	**50** 1.969	**1.5** 0.059	RNA4928	**214** 48100	**549** 123000	74.8	1700	2600	**2.560** 5.644
165 6.4961	**165** 6.4961	**190** 7.4803	**40** 1.575	**1.1** 0.043	RNA4830A	**142** 31900	**402** 90400	53.5	1600	2500	**1.540** 3.395
175 6.8898	**175** 6.8898	**200** 7.874	**40** 1.575	**1.1** 0.043	RNA4832A	**146** 32800	**425** 95500	55.6	1500	2400	**1.910** 4.211

NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

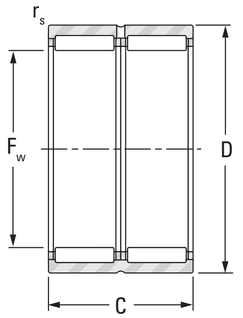
METRIC SERIES
NQ, RNA49, RNA69 SERIES



NQ



RNA49



RNA69

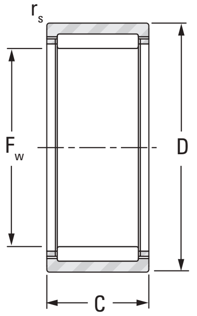
Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static		Grease	Oil	
						C	C_0				
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		kg lbs
12 0.4724	**12**	**19**	**12**	**0.3**	NQ12/12AD	**5.3**	**5.45**	0.820	—	30000	**0.012**
	12	**24**	**9.8**	**0.3**	12NQ2410A	**5.9**	**6.3**	0.960	—	30000	**0.023**
13 0.5118	**13**	**21**	**12**	**0.3**	NQ132112	**8.25**	**8.4**	1.30	—	24000	**0.015**
14 0.5512	**14**	**22**	**16**	**0.5**	NQ14/16D	**11.8**	**13.8**	2.10	—	24000	**0.021**
15 0.5906	**15**	**23**	**16**	**0.5**	NQ15/16B	**15.2**	**17.4**	2.65	—	21000	**0.021**
	15	**24**	**10**	**0.3**	15NQ2410D	**8.65**	**8.45**	1.30	—	21000	**0.016**
	15	**24**	**12**	**0.3**	15NQ2412A	**9.7**	**9.75**	1.50	—	21000	**0.019**
	15	**25**	**12**	**0.6**	NQ152512	**10.7**	**11.1**	1.70	—	21000	**0.022**
	15	**25**	**16**	**0.5**	NQ152516(1)	**11.8**	**14**	2.10	—	24000	**0.032**
	15	**28**	**12**	**0.6**	15NQ2812	**10.7**	**11.1**	1.70	—	21000	**0.034**
	15	**28**	**12**	**0.6**	NQ152812-1	**10.7**	**11.1**	1.70	—	21000	**0.034**
	15	**28**	**15**	**1.0**	15NQ2815	**12.7**	**13.7**	2.10	—	21000	**0.042**
16 0.6299	**16**	**23**	**16**	**0.5**	16NQ2316	**13**	**16.2**	2.50	—	23000	**0.019**
	16	**23**	**22**	**0.5**	16NQ2322A	**17**	**22.9**	3.55	—	23000	**0.026**
17 0.6693	**17**	**25**	**16**	**0.5**	NQ17/16D	**11.4**	**16.2**	2.45	—	26000	**0.026**
	17	**30**	**13**	**0.3**	17NQ3013D	**10.2**	**10.8**	1.65	—	27000	**0.041**
	17	**32**	**16**	**0.6**	17NQ3216D	**18.5**	**17.1**	2.65	—	29000	**0.053**
18 0.7087	**18**	**29**	**25**	**0.3**	NQ182925-1	**24.2**	**27.5**	4.30	—	26000	**0.056**
	18	**34**	**20**	**0.3**	18NQ3420AD	**17.1**	**21.2**	3.35	—	25000	**0.090**
20 0.7874	**20**	**28**	**16**	**0.3**	NQ20/16D	**12.1**	**18.2**	2.75	—	22000	**0.030**
	20	**28**	**23**	**0.3**	NQ202823	**18.5**	**27.1**	4.25	—	22000	**0.040**
	20	**30**	**15**	**0.6**	20NQ3015ED	**11.4**	**15.4**	2.35	—	22000	**0.037**

(1) With outer ring groove

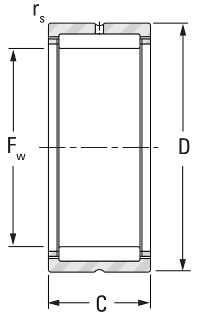
Continued on next page.

NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

METRIC SERIES
NQ, RNA49, RNA69 SERIES



NQ



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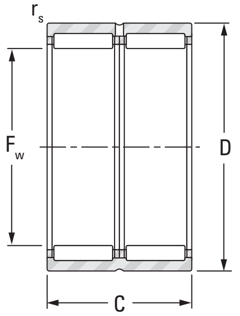


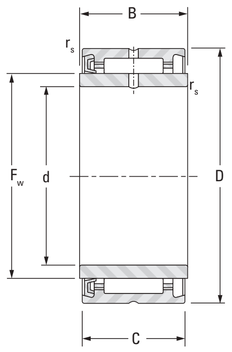
RNA69

Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
						Dynamic	Static				
						C	C_0		Grease	Oil	
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}		**kg** lbs
20 0.7874	**20**	**30**	**20**	**0.3**	20NQ3020	**19.9**	**26.4**	4.10	—	23000	**0.048**
	20	**32**	**12**	**0.3**	20NQ3212	**11.9**	**11.3**	1.70	—	23000	**0.033**
	20	**32**	**18**	**0.3**	NQ203218	**21.2**	**26.1**	4.05	—	23000	**0.053**
	20	**32**	**20**	**0.3**	NQ203220	**23**	**26.6**	4.20	—	23000	**0.057**
	20	**33**	**15**	**0.3**	20NQ3315NE(1)	**13.8**	**16.5**	2.50	—	23000	**0.053**
	20	**34**	**18**	**0.6**	20NQ3418D	**21.6**	**21.5**	3.35	—	24000	**0.060**
22 0.8661	**22**	**30**	**20**	**0.3**	NQ22/20	**15.3**	**25.6**	3.95	—	20000	**0.041**
	22	**35**	**20**	**0.3**	NQS22/20D	**21.8**	**25.4**	4.05	—	21000	**0.071**
24 0.9449	**24**	**32**	**20**	**0.3**	NQ24/20AD	**17.4**	**26.5**	4.15	—	18000	**0.041**
25 0.9843	**25**	**37**	**17**	**1.0**	25NQ3717AD-1	**19.4**	**22.5**	3.45	—	18000	**0.056**
	25	**37**	**17**	**0.9**	RNA4904ARD	**21.5**	**25.7**	3.95	—	18000	**0.057**
28 1.1024	**28**	**37**	**20**	**0.3**	NQ283720D	**20.7**	**34.9**	5.40	—	15000	**0.056**
	28	**39**	**17**	**0.3**	RNA49/22R	**22.2**	**30.3**	4.80	—	16000	**0.055**
30 1.1811	**30**	**42**	**30**	**0.6**	NQ304230	**40.6**	**61.2**	9.60	—	15000	**0.118**
35 1.378	**35**	**45**	**14**	**0.6**	NQ354514	**16.9**	**29**	4.40	—	12000	**0.055**
	35	**47**	**17**	**0.3**	RNA4906D	**20.2**	**31.9**	4.85	—	12000	**0.081**
	35	**47**	**30**	**0.3**	RNA6906	**43.1**	**69.3**	10.8	—	13000	**0.131**
37 1.4567	**37**	**47**	**20**	**0.3**	NQ37/20D	**26.3**	**45.7**	7.10	—	12000	**0.079**
40 1.5748	**40**	**48**	**20**	**0.3**	NQ404820	**21.2**	**40.4**	6.20	—	11000	**0.064**
	40	**50**	**15**	**0.3**	NQ40/15AD	**21.3**	**35.8**	5.45	—	11000	**0.063**
	40	**52**	**20**	**0.6**	RNA49/32R-1(2)	**32.4**	**50**	7.85	—	11000	**0.100**
	40	**60**	**25**	**1.0**	NQ406025	**54.2**	**66.8**	10.7	—	11000	**0.213**
45 1.7717	**45**	**58**	**20**	**0.6**	RNA49/38R-1(2)	**36.7**	**56.2**	8.90	—	9700	**0.116**
48 1.8898	**48**	**62**	**22**	**0.6**	RNA4908R-2(2)	**44.3**	**67.8**	10.9	—	9100	**0.142**

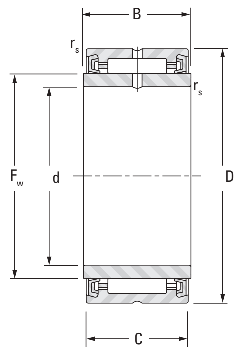
(1) With outer ring groove
(2) Without outer ring lubrication holes

SEALED NEEDLE ROLLER BEARINGS WITH INNER RINGS

METRIC SERIES



NA49RS

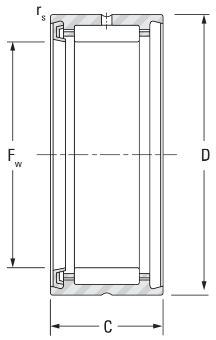


NA49.2RS

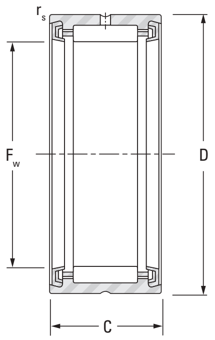
Shaft Dia.	d	D	B	C	F_w	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating Grease	Approx. Wt.
								Dynamic	Static			
								C	C_0			
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}	**kg** lbs
10 0.3937	**10** 0.3937	**22** 0.8661	**14** 0.551	**13** 0.512	**14** 0.5512	**0.3** 0.012	NA4900ARS	**7.76** 1740	**8.06** 1810	1.20	14000	**0.027** 0.060
	10 0.3937	**22** 0.8661	**14** 0.551	**13** 0.512	**14** 0.5512	**0.3** 0.012	NA4900A.2RS	**7.76** 1740	**8.06** 1810	1.20	14000	**0.027** 0.060
12 0.4724	**12** 0.4724	**24** 0.9449	**14** 0.551	**13** 0.512	**16** 0.6299	**0.3** 0.012	NA4901ARS	**8.64** 1940	**9.59** 2160	1.45	12000	**0.031** 0.068
	12 0.4724	**24** 0.9449	**14** 0.551	**13** 0.512	**16** 0.6299	**0.3** 0.012	NA4901A.2RS	**8.64** 1940	**9.59** 2160	1.45	12000	**0.031** 0.068
15 0.5906	**15** 0.5906	**28** 1.1024	**14** 0.551	**13** 0.512	**20** 0.7874	**0.3** 0.012	NA4902ARS	**9.77** 2200	**12.0** 2700	1.80	9700	**0.041** 0.090
	15 0.5906	**28** 1.1024	**14** 0.551	**13** 0.512	**20** 0.7874	**0.3** 0.012	NA4902A.2RS	**9.77** 2200	**12.0** 2700	1.80	9700	**0.041** 0.090
17 0.6693	**17** 0.6693	**30** 1.1811	**14** 0.551	**13** 0.512	**22** 0.8661	**0.3** 0.012	NA4903ARS	**10.1** 2270	**12.8** 2880	1.95	8800	**0.044** 0.097
	17 0.6693	**30** 1.1811	**14** 0.551	**13** 0.512	**22** 0.8661	**0.3** 0.012	NA4903A.2RS	**10.1** 2270	**12.8** 2880	1.95	8800	**0.044** 0.097
20 0.7874	**20** 0.7874	**37** 1.4567	**18** 0.709	**17** 0.669	**25** 0.9843	**0.3** 0.012	NA4904ARS	**18.5** 4160	**21.2** 4770	3.30	7800	**0.087** 0.192
	20 0.7874	**37** 1.4567	**18** 0.709	**17** 0.669	**25** 0.9843	**0.3** 0.012	NA4904A.2RS	**18.5** 4160	**21.2** 4770	3.30	7800	**0.087** 0.192
25 0.9843	**25** 0.9843	**42** 1.6535	**18** 0.709	**17** 0.669	**30** 1.1811	**0.3** 0.012	NA4905ARS	**21.0** 4720	**26.4** 5930	4.10	6500	**0.106** 0.234
	25 0.9843	**42** 1.6535	**18** 0.709	**17** 0.669	**30** 1.1811	**0.3** 0.012	NA4905A.2RS	**21.0** 4720	**26.4** 5930	4.10	6500	**0.106** 0.234
30 1.1811	**30** 1.1811	**47** 1.8504	**18** 0.709	**17** 0.669	**35** 1.3780	**0.3** 0.012	NA4906ARS	**22.5** 5060	**30.0** 6740	4.65	5500	**0.119** 0.262
	30 1.1811	**47** 1.8504	**18** 0.709	**17** 0.669	**35** 1.3780	**0.3** 0.012	NA4906A.2RS	**22.5** 5060	**30.0** 6740	4.65	5500	**0.119** 0.262
35 1.3780	**35** 1.3780	**55** 2.1654	**21** 0.827	**20** 0.787	**42** 1.6535	**0.6** 0.024	NA4907ARS	**29.1** 6540	**44.4** 9980	6.85	4600	**0.198** 0.437
	35 1.3780	**55** 2.1654	**21** 0.827	**20** 0.787	**42** 1.6535	**0.6** 0.024	NA4907A.2RS	**29.1** 6540	**44.4** 9980	6.85	4600	**0.198** 0.437
40 1.5748	**40** 1.5748	**62** 2.4409	**23** 0.906	**22** 0.866	**48** 1.8898	**0.6** 0.024	NA4908ARS	**38.6** 8680	**57.0** 12800	9.10	4000	**0.263** 0.580
	40 1.5748	**62** 2.4409	**23** 0.906	**22** 0.866	**48** 1.8898	**0.6** 0.024	NA4908A.2RS	**38.6** 8680	**57.0** 12800	9.10	4000	**0.263** 0.580
45 1.7717	**45** 1.7717	**68** 2.6772	**23** 0.906	**22** 0.866	**52** 2.0472	**0.6** 0.024	NA4909ARS	**39.4** 8860	**60.0** 13500	9.60	3700	**0.303** 0.668
	45 1.7717	**68** 2.6772	**23** 0.906	**22** 0.866	**52** 2.0472	**0.6** 0.024	NA4909A.2RS	**39.4** 8860	**60.0** 13500	9.60	3700	**0.303** 0.668
50 1.9685	**50** 1.9685	**72** 2.8346	**23** 0.906	**22** 0.866	**58** 2.2835	**0.6** 0.024	NA4910ARS	**41.2** 9260	**65.8** 14800	10.5	3300	**0.309** 0.681
	50 1.9685	**72** 2.8346	**23** 0.906	**22** 0.866	**58** 2.2835	**0.6** 0.024	NA4910A.2RS	**41.2** 9260	**65.8** 14800	10.5	3300	**0.309** 0.681

SEALED NEEDLE ROLLER BEARINGS WITHOUT INNER RINGS

METRIC SERIES



RNA49RS

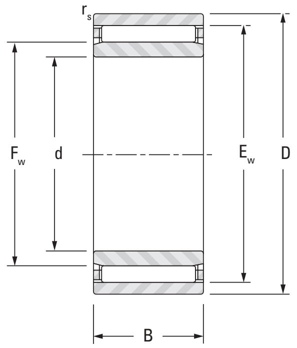


RNA49.2RS

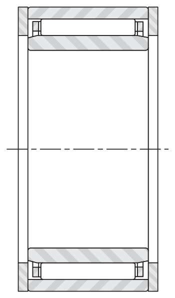
Shaft Dia.	F_w	D	C	$r_{s\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating Grease	Approx. Wt.
						Dynamic	Static			
						C	C_0			
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}	**kg** lbs
14 0.5512	**14** 0.5512	**22** 0.8661	**13** 0.512	**0.3** 0.012	RNA4900ARS	**7.76** 1740	**8.06** 1810	1.20	14000	**0.019** 0.042
	14 0.5512	**22** 0.8661	**13** 0.512	**0.3** 0.012	RNA4900A.2RS	**7.76** 1740	**8.06** 1810	1.20	14000	**0.019** 0.042
16 0.6299	**16** 0.6299	**24** 0.9449	**13** 0.512	**0.3** 0.012	RNA4901ARS	**8.64** 1940	**9.59** 2160	1.45	12000	**0.021** 0.046
	16 0.6299	**24** 0.0449	**13** 0.512	**0.3** 0.012	RNA4901A.2RS	**8.64** 1940	**9.59** 2160	1.45	12000	**0.021** 0.046
20 0.7874	**20** 0.7874	**28** 1.1024	**13** 0.512	**0.3** 0.012	RNA4902ARS	**9.70** 2180	**12.0** 2700	1.80	9700	**0.026** 0.057
	20 0.7874	**28** 1.1024	**13** 0.512	**0.3** 0.012	RNA4902A.2RS	**9.70** 2180	**12.0** 2700	1.80	9700	**0.026** 0.057
22 0.8661	**22** 0.8661	**30** 1.1811	**13** 0.512	**0.3** 0.012	RNA4903ARS	**10.1** 2270	**12.8** 2880	1.95	8800	**0.027** 0.060
	22 0.8661	**30** 1.1811	**13** 0.512	**0.3** 0.012	RNA4903A.2RS	**10.1** 2270	**12.8** 2880	1.95	8800	**0.027** 0.060
25 0.9843	**25** 0.9843	**37** 1.4567	**17** 0.669	**0.3** 0.012	RNA4904ARS	**18.5** 4160	**21.2** 4770	3.30	7800	**0.062** 0.137
	25 0.9843	**37** 1.4567	**17** 0.669	**0.3** 0.012	RNA4904A.2RS	**18.5** 4160	**21.2** 4770	3.30	7800	**0.062** 0.137
30 1.1811	**30** 1.1811	**42** 1.6535	**17** 0.669	**0.3** 0.012	RNA4905ARS	**21.0** 4720	**26.4** 5930	4.10	6500	**0.075** 0.165
	30 1.1811	**42** 1.6535	**17** 0.669	**0.3** 0.012	RNA4905A.2RS	**21.0** 4720	**26.4** 5930	4.10	6500	**0.075** 0.165
35 1.3780	**35** 1.3780	**47** 1.864	**17** 0.669	**0.3** 0.012	RNA4906ARS	**22.5** 5060	**30.0** 6740	4.65	5500	**0.083** 0.183
	35 1.3780	**47** 1.8504	**17** 0.669	**0.3** 0.012	RNA4906A.2RS	**22.5** 5060	**30.0** 6740	4.65	5500	**0.083** 0.183
42 1.6535	**42** 1.6535	**55** 2.1654	**20** 0.787	**0.6** 0.024	RNA4907ARS	**29.1** 6540	**44.4** 9980	6.85	4600	**0.130** 0.287
	42 1.6535	**55** 2.1654	**20** 0.787	**0.6** 0.024	RNA4907A.2RS	**29.1** 6540	**44.4** 9980	6.85	4600	**0.130** 0.287
48 1.8898	**48** 1.8898	**62** 2.4409	**22** 0.866	**0.6** 0.024	RNA4908ARS	**38.6** 8680	**57.0** 12800	9.10	4000	**0.163** 0.359
	48 1.8898	**62** 2.4409	**22** 0.866	**0.6** 0.024	RNA4908A.2RS	**38.6** 8680	**57.0** 12800	9.10	4000	**0.163** 0.359
52 2.0472	**52** 2.0472	**68** 2.6772	**22** 0.866	**0.6** 0.024	RNA4909ARS	**39.4** 8860	**60.0** 13500	9.60	3700	**0.207** 0.456
	52 2.0472	**68** 2.6772	**22** 0.866	**0.6** 0.024	RNA4909A.2RS	**39.4** 8860	**60.0** 13500	9.60	3700	**0.207** 0.456
58 2.2835	**58** 2.2835	**72** 2.8346	**22** 0.866	**0.6** 0.024	RNA4910ARS	**41.2** 9260	**65.8** 14800	10.5	3300	**0.187** 0.412
	58 2.2835	**72** 2.8346	**22** 0.866	**0.6** 0.024	RNA4910A.2RS	**41.2** 9260	**65.8** 14800	10.5	3300	**0.187** 0.412

NEEDLE ROLLER BEARINGS WITHOUT FLANGES WITH INNER RINGS

METRIC SERIES



NAO



SNSH

Shaft Dia.	d	D	B	F$_w$	E$_w$	r$_{s\ min.}$	s[1]	Bearing Designation	End Washer Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit C$_u$	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
										C	C$_0$				
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs
6 0.2362	**6** 0.2362	**17** 0.6693	**10** 0.394	**10** 0.3937	**13** 0.5118	**0.3** 0.012	**0.5** 0.020	NAO6X17X10	SNSH10,5X17X0,5	**5.40** 1210	**6.43** 1450	0.980	25000	39000	**0.014** 0.031
	8 0.3150	**19** 0.7480	**10** 0.394	**12** 0.4724	**15** 0.5906	**0.3** 0.012	**0.5** 0.020	NAO8X19X10	SNSH12,5X19X0,5	**5.85** 1320	**7.51** 1690	1.15	24000	37000	**0.017** 0.037
10 0.3937	**10** 0.3937	**22** 0.8661	**13** 0.512	**14** 0.5512	**18** 0.7087	**0.3** 0.012	**1.0** 0.039	NAO10X22X13	SNSH14,5X22X0,5	**9.73** 2190	**12.5** 2810	1.90	19000	29000	**0.026** 0.057
	10 0.3937	**22** 0.8661	**20** 0.787	**14** 0.5512	**18** 0.7087	**0.3** 0.012	**0.5** 0.020	NAO10X22X20	SNSH14,5X22X0,5	**12.3** 2770	**16.8** 3780	1.30	19000	29000	**0.041** 0.090
	10 0.3937	**26** 1.0236	**12** 0.472	**14** 0.5512	**20** 0.7874	**0.3** 0.012	**0.7** 0.028	NAO10X26X12	SNSH14,5X26X0,5	**10.5** 2360	**10.6** 2380	1.60	14000	21000	**0.036** 0.079
12 0.4724	**12** 0.4724	**24** 0.9449	**13** 0.512	**16** 0.6299	**20** 0.7874	**0.3** 0.012	**1.0** 0.039	NAO12X24X13	SNSH16,5X24X0,5	**10.1** 2270	**13.5** 3030	2.05	18000	28000	**0.030** 0.066
	12 0.4724	**24** 0.9449	**20** 0.787	**16** 0.6299	**20** 0.7874	**0.3** 0.012	**0.5** 0.020	NAO12X24X20	SNSH16,5X24X0,5	**13.4** 3010	**19.5** 4380	2.95	18000	28000	**0.046** 0.101
	12 0.4724	**28** 1.1024	**12** 0.472	**16** 0.6299	**22** 0.8661	**0.3** 0.012	**0.7** 0.028	NAO12X28X12	SNSH16,5X28X0,5	**11.2** 2520	**11.9** 2680	1.80	19000	29000	**0.041** 0.090
15 0.5906	**15** 0.5906	**28** 1.1024	**13** 0.512	**20** 0.7874	**24** 0.9449	**0.3** 0.012	**1.0** 0.039	NAO15X28X13	SNSH20,5X28X0,5	**11.5** 2590	**17.3** 3890	2.65	14000	22000	**0.039** 0.086
	15 0.5906	**28** 1.1024	**26** 1.024	**20** 0.7874	**24** 0.9449	**0.3** 0.012	**1.0** 0.039	NAO15X28X26	SNSH20,5X28X0,5	**19.8** 4450	**34.6** 7780	5.25	14000	22000	**0.078** 0.172
	15 0.5906	**32** 1.2598	**12** 0.472	**20** 0.7874	**26** 1.0236	**0.3** 0.012	**0.7** 0.028	NAO15X32X12	SNSH20,5X32X0,5	**13.0** 2920	**15.0** 3370	2.30	15000	23000	**0.050** 0.110
17 0.6693	**17** 0.6693	**30** 1.1811	**13** 0.512	**22** 0.8661	**26** 1.0236	**0.3** 0.012	**1.0** 0.039	NAO17X30X13	SNSH22,5X30X0,5	**11.8** 2650	**18.3** 4110	2.80	13000	20000	**0.043** 0.095
	17 0.6693	**30** 1.1811	**26** 1.024	**22** 0.8661	**26** 1.0236	**0.3** 0.012	**1.0** 0.039	NAO17X30X26	SNSH22,5X30X0,5	**20.2** 4540	**36.6** 8230	5.55	13000	20000	**0.084** 0.185
	17 0.6693	**35** 1.3780	**16** 0.630	**22** 0.8661	**29** 1.1417	**0.3** 0.012	**1.5** 0.059	NAO17X35X16	SNSH22,5X35X0,5	**19.0** 4270	**23.3** 5240	3.70	13000	20000	**0.078** 0.172
	17 0.6693	**35** 1.3780	**32** 1.260	**22** 0.8661	**29** 1.1417	**0.3** 0.012	**1.5** 0.059	NAO17X35X32	SNSH22,5X35X0,5	**32.7** 7350	**46.5** 10500	7.35	13000	20000	**0.154** 0.340
20 0.7874	**20** 0.7874	**35** 1.3780	**17** 0.669	**25** 0.9843	**30** 1.1811	**0.3** 0.012	**1.2** 0.047	NAO20X35X17	SNSH25,5X35X0,5	**18.8** 4230	**29.8** 6700	4.60	11000	17000	**0.073** 0.161
	20 0.7874	**35** 1.3780	**26** 1.024	**25** 0.9843	**30** 1.1811	**0.3** 0.012	**1.2** 0.047	NAO20X35X26	SNSH25,5X35X0,5	**25.0** 5620	**42.8** 9620	6.50	11000	17000	**0.112** 0.247
	20 0.7874	**37** 1.4567	**16** 0.630	**25** 0.9843	**32** 1.2598	**0.3** 0.012	**1.5** 0.059	NAO20X37X16	SNSH25,5X37X0,5	**19.8** 4450	**25.3** 5690	4.10	11000	17000	**0.080** 0.176

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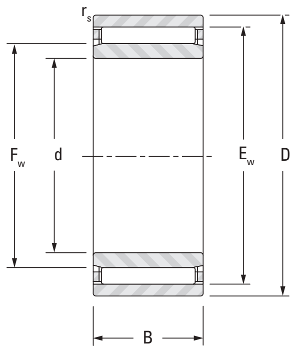
[1] Max. axial displacement.

Shaft Dia.	d	D	B	F$_w$	E$_w$	r$_{s\ min.}$	s[1]	Bearing Designation	End Washer Designation	Load Ratings Dynamic	Load Ratings Static	Fatigue Load Limit C$_u$	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.
										C	C$_0$				
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs
20 0.7874	**20** 0.7874	**37** 1.4567	**32** 1.260	**25** 0.9843	**32** 1.2598	**0.3** 0.012	**1.5** 0.059	NAO20X37X32	SNSH25,5X37X0,5	**34.0** 7640	**50.7** 11400	8.00	11000	17000	**0.162** 0.357
25 0.9843	**25** 0.9843	**40** 1.5748	**17** 0.669	**30** 1.1811	**35** 1.3780	**0.3** 0.012	**1.2** 0.047	NAO25X40X17	SNSH30,5X40X0,5	**20.2** 4540	**34.9** 7850	5.35	9300	14000	**0.088** 0.194
	25 0.9843	**40** 1.5748	**26** 1.024	**30** 1.1811	**35** 1.3780	**0.3** 0.012	**1.2** 0.047	NAO25X40X26	SNSH30,5X40X0,5	**26.8** 6020	**49.7** 11200	7.55	9300	14000	**0.132** 0.291
	25 0.9843	**42** 1.6535	**16** 0.630	**30** 1.1811	**37** 1.4567	**0.3** 0.012	**1.5** 0.059	NAO25X42X16		**22.4** 5040	**31.0** 6970	4.90	9600	15000	**0.096** 0.212
	25 0.9843	**42** 1.6535	**32** 1.260	**30** 1.1811	**37** 1.4567	**0.3** 0.012	**1.5** 0.059	NAO25X42X32		**38.2** 8590	**62.1** 14000	9.85	9600	15000	**0.185** 0.408
30 1.1811	**30** 1.1811	**45** 1.7717	**17** 0.669	**35** 1.3780	**40** 1.5748	**0.3** 0.012	**1.2** 0.047	NAO30X45X17		**22.1** 4970	**40.8** 9170	6.35	7900	12000	**0.102** 0.225
	30 1.1811	**45** 1.7717	**26** 1.024	**35** 1.3780	**40** 1.5748	**0.3** 0.012	**1.2** 0.047	NAO30X45X26		**27.7** 6230	**54.5** 12300	8.95	7900	12000	**0.155** 0.342
	30 1.1811	**47** 1.8504	**16** 0.630	**35** 1.3780	**42** 1.6535	**0.3** 0.012	**1.5** 0.059	NAO30X47X16	SNSH35,5X47X0,5	**24.5** 5510	**36.8** 8270	5.80	8100	12000	**0.106** 0.234
	30 1.1811	**47** 1.8504	**32** 1.260	**35** 1.3780	**42** 1.6535	**0.3** 0.012	**1.5** 0.059	NAO30X47X32	SNSH35,5X47X0,5	**42.0** 9440	**73.5** 16500	11.6	8100	12000	**0.218** 0.481
35 1.3780	**35** 1.3780	**50** 1.9685	**17** 0.669	**40** 1.5748	**45** 1.7717	**0.3** 0.012	**1.2** 0.047	NAO35X50X17		**23.8** 5350	**47.0** 10600	7.30	6900	11000	**0.126** 0.278
	35 1.3780	**50** 1.9685	**34** 1.339	**40** 1.5748	**45** 1.7717	**0.3** 0.012	**0.7** 0.028	NAO35X50X34	SNSH40,5X50X0,5	**40.9** 9190	**94.1** 21200	14.6	6900	11000	**0.232** 0.511
	35 1.3780	**55** 2.1654	**20** 0.787	**40** 1.5748	**48** 1.8898	**0.3** 0.012	**1.5** 0.059	NAO35X55X20	SNSH41X55X1	**35.5** 7980	**56.3** 12700	8.95	7100	11000	**0.185** 0.408
	35 1.3780	**55** 2.1654	**40** 1.575	**40** 1.5748	**48** 1.8898	**0.3** 0.012	**1.7** 0.067	NAO35X55X40		**60.8** 13700	**113** 25400	17.9	7100	11000	**0.370** 0.816
40 1.5748	**40** 1.5748	**55** 2.1654	**17** 0.669	**45** 1.7717	**50** 1.9685	**0.3** 0.012	**0.7** 0.028	NAO40X55X17	SNSH45,5X55X0,5	**24.9** 5600	**51.8** 11600	8.05	6100	9400	**0.133** 0.293
	40 1.5748	**55** 2.1654	**34** 1.339	**45** 1.7717	**50** 1.9685	**0.3** 0.012	**0.7** 0.028	NAO40X55X34	SNSH45,5X55X0,5	**42.7** 9600	**104** 23400	16.1	6100	9400	**0.257** 0.567
	40 1.5748	**62** 2.4409	**20** 0.787	**45** 1.7717	**53** 2.0866	**0.3** 0.012	**1.5** 0.059	NAO40X62X20	SNSH46X62X1	**36.0** 8090	**59.5** 13400	9.05	6200	9600	**0.215** 0.474
	40 1.5748	**62** 2.4409	**40** 1.575	**45** 1.7717	**53** 2.0866	**0.3** 0.012	**1.7** 0.067	NAO40X62X40	SNSH46X62X1	**61.7** 13900	**119** 26800	18.1	6200	9600	**0.440** 0.970
45 1.7717	**45** 1.7717	**62** 2.4409	**20** 0.787	**50** 1.9685	**55** 2.1654	**0.3** 0.012	**0.7** 0.028	NAO45X62X20		**30.2** 6790	**68.5** 15400	10.7	5400	8400	**0.200** 0.441
	45 1.7717	**62** 2.4409	**40** 1.575	**50** 1.9685	**55** 2.1654	**0.3** 0.012	**0.5** 0.020	NAO45X62X40		**50.7** 11400	**137** 30800	21.4	5400	8400	**0.386** 0.851
	45 1.7717	**72** 2.8346	**20** 0.787	**55** 2.1654	**63** 2.4803	**1.0** 0.039	**1.5** 0.059	NAO45X72X20	SNSH56X72X1	**40.3** 9060	**73.5** 16500	11.7	5000	7800	**0.345** 0.761
	45 1.7717	**72** 2.8346	**40** 1.575	**55** 2.1654	**63** 2.4803	**1.0** 0.039	**1.7** 0.067	NAO45X72X40	SNSH56X72X1	**69.1** 15500	**147** 33000	23.4	5000	7800	**0.680** 1.499
50 1.9685	**50** 1.9685	**68** 2.6772	**20** 0.787	**55** 2.1654	**60** 2.3622	**0.3** 0.012	**0.7** 0.028	NAO50X68X20		**30.7** 6900	**72.4** 16300	11.3	4900	7600	**0.230** 0.507
	50 1.9685	**68** 2.6772	**40** 1.575	**55** 2.1654	**60** 2.3622	**0.3** 0.012	**0.5** 0.020	NAO50X68X40		**52.7** 11800	**145** 32600	22.6	4900	7600	**0.450** 0.992
	50 1.9685	**78** 3.0709	**20** 0.787	**60** 2.3622	**68** 2.6772	**1.0** 0.039	**1.5** 0.059	NAO50X78X20	SNSH61X78X1	**41.8** 9400	**79.2** 17800	12.6	4600	7100	**0.385** 0.849

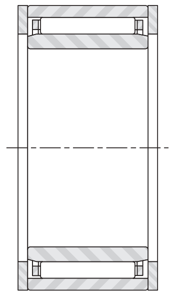
Continued on next page.

NEEDLE ROLLER BEARINGS WITHOUT FLANGES WITH INNER RINGS

METRIC SERIES



NAO



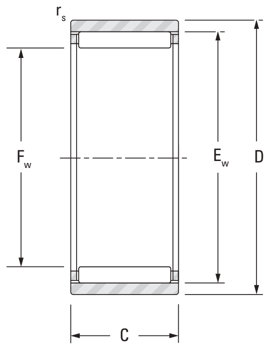
SNSH

Shaft Dia.	d	D	B	F_w	E_w	$r_{s\,min.}$	s(1)	Bearing Designation	End Washer Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
										Dynamic	Static		Grease	Oil	
										C	C_0				
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		kN	min^{-1}		**kg** lbs
50 1.9685	**50** 1.9685	**78** 3.0709	**40** 1.575	**60** 2.3622	**68** 2.6772	**1.0** 0.039	**1.7** 0.067	NAO50X78X40	SNSH61X78X1	**71.7** 16100	**158** 35500	25.2	4600	7100	**0.746** 1.645
55 2.1654	**55** 2.1654	**85** 3.3465	**30** 1.181	**65** 2.5591	**73** 2.8740	**1.0** 0.039	**2.0** 0.079	NAO55X85X30	SNSH66X85X1	**60.1** 13500	**129** 29000	20.3	4200	6500	**0.690** 1.521
	55 2.1654	**85** 3.3465	**60** 2.362	**65** 2.5591	**73** 2.8740	**1.0** 0.039	**1.5** 0.059	NAO55X85X60	SNSH66X85X1	**103** 23200	**259** 58200	40.7	4200	6500	**1.320** 2.910
60 2.3622	**60** 2.3622	**90** 3.5433	**30** 1.181	**70** 2.7559	**78** 3.0709	**1.0** 0.039	**2.0** 0.079	NAO60X90X30		**62.2** 14000	**139** 31200	21.8	3900	6000	**0.745** 1.642
	60 2.3622	**90** 3.5433	**60** 2.362	**70** 2.7559	**78** 3.0709	**1.0** 0.039	**1.7** 0.067	NAO60X90X60		**107** 24100	**277** 62300	43.6	3900	6000	**1.405** 3.097
65 2.5591	**65** 2.5591	**95** 3.7402	**30** 1.181	**75** 2.9528	**83** 3.2677	**1.0** 0.039	**2.0** 0.079	NAO65X95X30		**60.9** 13700	**138** 31000	21.7	3600	5600	**0.770** 1.698
	65 2.5591	**95** 3.7402	**60** 2.362	**75** 2.9528	**83** 3.2677	**1.0** 0.039	**1.7** 0.067	NAO65X95X60		**116** 26100	**277** 62300	43.3	3600	5600	**1.500** 3.307
70 2.7559	**70** 2.7559	**100** 3.9370	**30** 1.181	**80** 3.1496	**88** 3.4646	**1.0** 0.039	**2.0** 0.079	NAO70X100X30		**67.5** 15200	**161** 36200	25.4	3400	5200	**0.850** 1.874
	70 2.7559	**100** 3.9370	**60** 2.362	**80** 3.1496	**88** 3.4646	**1.0** 0.039	**1.7** 0.067	NAO70X100X60		**116** 26100	**322** 72400	50.7	3400	5200	**1.600** 3.527
80 3.1496	**80** 3.1496	**110** 4.3307	**30** 1.181	**90** 3.5433	**98** 3.8583	**1.0** 0.039	**2.0** 0.079	NAO80X110X30		**63.6** 14300	**155** 34800	24.3	3000	4600	**0.920** 2.028
85 3.3465	**85** 3.3465	**115** 4.5276	**30** 1.181	**95** 3.7402	**103** 4.0551	**1.0** 0.039	**2.0** 0.079	NAO85X115X30		**71.0** 16000	**183** 41100	28.6	2800	4400	**0.985** 2.172
90 3.5433	**90** 3.5433	**120** 4.7244	**30** 1.181	**100** 3.9370	**108** 4.2520	**1.0** 0.039	**2.0** 0.079	NAO90X120X30		**72.4** 16300	**191** 42900	29.5	2700	4200	**1.010** 2.22

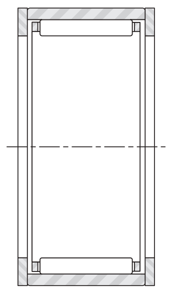
(1) Max. axial displacement.

NEEDLE ROLLER BEARINGS WITHOUT FLANGES WITHOUT INNER RINGS

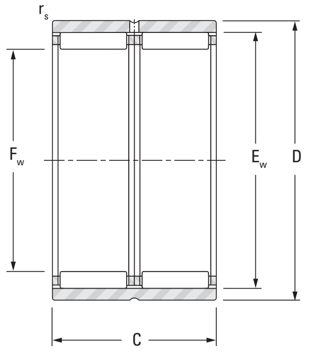
METRIC SERIES



RNAO



SNSH



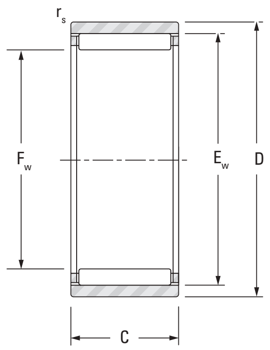
RNAO

Shaft Dia.	F_w	D	C	E_w	$r_{s\,min.}$	Bearing Designation	End Washer Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								Dynamic	Static		Grease	Oil	
								C	C_0				
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		kN	min^{-1}		**kg** lbs
6 0.2362	**6** 0.2362	**13** 0.5118	**8** 0.315	**9** 0.3543	**0.3** 0.012	RNAO6X13X8TN		**2.47** 560	**2.07** 470	0.310	29000	44000	**0.005** 0.011
7 0.2756	**7** 0.2756	**14** 0.5512	**8** 0.315	**10** 0.3937	**0.3** 0.012	RNAO7X14X8TN		**2.74** 620	**2.44** 550	0.370	28000	42000	**0.007** 0.015
8 0.3150	**8** 0.3150	**15** 0.5906	**10** 0.394	**11** 0.4331	**0.3** 0.012	RNAO8X15X10	SNSH8,5X15X0,5	**4.57** 1030	**4.89** 1100	0.740	26000	41000	**0.008** 0.018
9 0.3543	**9** 0.3543	**16** 0.6299	**10** 0.394	**12** 0.4724	**0.3** 0.012	RNAO9X16X10		**4.27** 960	**4.60** 1030	0.700	26000	40000	**0.009** 0.020
10 0.3937	**10** 0.3937	**17** 0.6693	**10** 0.394	**13** 0.5118	**0.3** 0.012	RNAO10X17X10	SNSH10,5X17X0,5	**5.40** 1210	**6.43** 1450	0.980	25000	39000	**0.010** 0.022
	10 0.3937	**17** 0.6693	**20** 0.787	**13** 0.5118	**0.3** 0.012	RNAO10X17X20	SNSH10,5X17X0,5	**9.25** 2080	**12.9** 2900	0.980	25000	39000	**0.019** 0.042
12 0.4724	**12** 0.4724	**19** 0.7480	**10** 0.394	**15** 0.5906	**0.3** 0.012	RNAO12X19X10	SNSH12,5X19X0,5	**5.85** 1320	**7.51** 1690	1.15	24000	37000	**0.012** 0.026
14 0.5512	**14** 0.5512	**22** 0.8661	**13** 0.512	**18** 0.7087	**0.3** 0.012	RNAO14X22X13	SNSH14,5X22X0,5	**9.73** 2190	**12.5** 2810	1.90	19000	29000	**0.018** 0.040
	14 0.5512	**22** 0.8661	**20** 0.787	**18** 0.7087	**0.3** 0.012	RNAO14X22X20	SNSH14,5X22X0,5	**12.3** 2770	**16.8** 3780	1.30	19000	29000	**0.029** 0.064
	14 0.5512	**26** 1.0236	**12** 0.472	**20** 0.7874	**0.3** 0.012	RNAO14X26X12	SNSH14,5X26X0,5	**10.5** 2360	**10.6** 2380	1.60	14000	21000	**0.029** 0.064
15 0.5906	**15** 0.5906	**23** 0.9055	**13** 0.512	**19** 0.7480	**0.3** 0.012	RNAO15X23X13	SNSH15,5X23X0,5	**9.66** 2170	**12.6** 2830	1.90	18000	28000	**0.019** 0.042
	15 0.5906	**23** 0.9055	**20** 0.787	**19** 0.7480	**0.3** 0.012	RNAO15X23X20	SNSH15,5X23X0,5	**13.5** 3030	**19.4** 4360	1.45	18000	28000	**0.029** 0.064
16 0.6299	**16** 0.6299	**24** 0.9449	**13** 0.512	**20** 0.7874	**0.3** 0.012	RNAO16X24X13	SNSH16,5X24X0,5	**10.1** 2270	**13.5** 3030	2.10	18000	28000	**0.022** 0.049
	16 0.6299	**24** 0.9449	**20** 0.787	**20** 0.7874	**0.3** 0.012	RNAO16X24X20	SNSH16,5X24X0,5	**13.4** 3010	**19.5** 4380	2.95	18000	28000	**0.032** 0.071
	16 0.6299	**28** 1.1024	**12** 0.472	**22** 0.8661	**0.3** 0.012	RNAO16X28X12	SNSH16,5X28X0,5	**11.2** 2520	**11.9** 2680	1.80	19000	29000	**0.033** 0.073
17 0.6693	**17** 0.6693	**25** 0.9843	**13** 0.512	**21** 0.8268	**0.3** 0.012	RNAO17X25X13	SNSH17,5X25X0,5	**10.5** 2360	**14.5** 3260	2.20	17000	26000	**0.022** 0.049
	17 0.6693	**25** 0.9843	**20** 0.787	**21** 0.8268	**0.3** 0.012	RNAO17X25X20	SNSH17,5X25X0,5	**14.7** 3300	**22.5** 5060	3.20	17000	26000	**0.032** 0.071
18 0.7087	**18** 0.7087	**26** 1.0236	**13** 0.512	**22** 0.8661	**0.3** 0.012	RNAO18X26X13	SNSH18,5X26X0,5	**10.8** 2430	**15.4** 3460	2.35	16000	24000	**0.024** 0.053
	18 0.7087	**26** 1.0236	**13** 0.512	**22** 0.8661	**0.3** 0.012	RNAO18X26X13ASR1	SNSH18,5X26X0,5	**10.8** 2430	**15.4** 3460	2.35	16000	24000	**0.024** 0.053
	18 0.7087	**26** 1.0236	**20** 0.787	**22** 0.8661	**0.3** 0.012	RNAO18X26X20	SNSH18,5X26X0,5	**14.4** 3240	**22.2** 4990	3.40	16000	24000	**0.034** 0.075
	18 0.7087	**30** 1.1811	**24** 0.945	**24** 0.9449	**0.3** 0.012	RNAO18X30X24		**20.2** 4540	**26.2** 5890	3.95	17000	25000	**0.070** 0.154
20 0.7874	**20** 0.7874	**28** 1.1024	**13** 0.512	**24** 0.9449	**0.3** 0.012	RNAO20X28X13	SNSH20,5X28X0,5	**11.5** 2590	**17.3** 3890	1.45	14000	22000	**0.025** 0.055

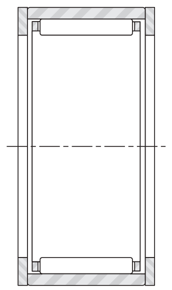
Continued on next page.

NEEDLE ROLLER BEARINGS WITHOUT FLANGES WITHOUT INNER RINGS

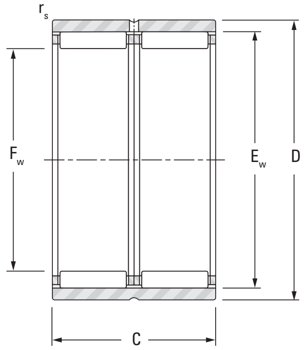
METRIC SERIES



RNAO



SNSH



RNAO

Shaft Dia.	F_w	D	C	E_w	$r_{s\,min.}$	Bearing Designation	End Washer Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								Dynamic	Static		Grease	Oil	
								C	C_0				
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs
20 0.7874	**20** 0.7874	**28** 1.1024	**26** 1.024	**24** 0.9449	**0.3** 0.012	RNAO20X28X26	SNSH20,5X28X0,5	**19.8** 4450	**34.6** 7780	2.90	14000	22000	**0.050** 0.110
	20 0.7874	**32** 1.2598	**12** 0.472	**26** 1.0236	**0.3** 0.012	RNAO20X32X12	SNSH20,5X32X0,5	**13.0** 2920	**15.3** 3440	2.30	15000	23000	**0.038** 0.084
	20 0.7874	**32** 1.2598	**24** 0.945	**26** 1.0236	**0.3** 0.012	RNAO20X32X24	SNSH20,5X32X0,5	**22.3** 5010	**30.6** 6880	4.60	15000	23000	**0.080** 0.176
22 0.8661	**22** 0.8661	**30** 1.1811	**13** 0.512	**26** 1.0236	**0.3** 0.012	RNAO22X30X13	SNSH22,5X30X0,5	**11.8** 2650	**18.3** 4110	2.80	13000	20000	**0.028** 0.062
	22 0.8661	**30** 1.1811	**26** 1.024	**26** 1.0236	**0.3** 0.012	RNAO22X30X26	SNSH22,5X30X0,5	**20.2** 4540	**36.6** 8230	5.55	13000	20000	**0.053** 0.117
	22 0.8661	**35** 1.3780	**16** 0.630	**29** 1.1417	**0.3** 0.012	RNAO22X35X16	SNSH22,5X35X0,5	**19.1** 4290	**23.3** 5240	3.70	13000	21000	**0.059** 0.130
	22 0.8661	**35** 1.3780	**32** 1.260	**29** 1.1417	**0.3** 0.012	RNAO22X35X32	SNSH22,5X35X0,5	**32.7** 7350	**46.5** 10500	7.35	13000	21000	**0.116** 0.256
25 0.9843	**25** 0.9843	**35** 1.3780	**17** 0.669	**30** 1.1811	**0.3** 0.012	RNAO25X35X17	SNSH25,5X35X0,5	**18.8** 4230	**29.8** 6700	4.60	11000	17000	**0.050** 0.110
	25 0.9843	**35** 1.3780	**26** 1.024	**30** 1.1811	**0.3** 0.012	RNAO25X35X26	SNSH25,5X35X0,5	**25.0** 5620	**42.8** 9620	6.50	11000	17000	**0.076** 0.168
	25 0.9843	**37** 1.4567	**16** 0.630	**32** 1.2598	**0.3** 0.012	RNAO25X37X16	SNSH25,5X37X0,5	**19.8** 4450	**25.3** 5690	4.00	12000	18000	**0.058** 0.128
	25 0.9843	**37** 1.4567	**32** 1.260	**32** 1.2598	**0.3** 0.012	RNAO25X37X32	SNSH25,5X37X0,5	**19.2** 4320	**23.6** 5310	8.00	12000	18000	**0.118** 0.260
28 1.1024	**28** 1.1024	**40** 1.5748	**16** 0.630	**35** 1.3780	**0.3** 0.012	RNAO28X40X16	SNSH28,5X40X0,5	**20.9** 4700	**27.9** 6270	4.30	10000	16000	**0.063** 0.139
	28 1.1024	**40** 1.5748	**32** 1.260	**35** 1.3780	**0.3** 0.012	RNAO28X40X32	SNSH28,5X40X0,5	**35.8** 8050	**55.9** 12600	8.60	10000	16000	**0.128** 0.282
30 1.1811	**30** 1.1811	**40** 1.5748	**17** 0.669	**35** 1.3780	**0.3** 0.012	RNAO30X40X17	SNSH30,5X40X0,5	**20.2** 4540	**34.6** 7780	5.35	9300	14000	**0.060** 0.132
	30 1.1811	**40** 1.5748	**26** 1.024	**35** 1.3780	**0.3** 0.012	RNAO30X40X26	SNSH30,5X40X0,5	**26.8** 6020	**49.7** 11200	7.55	9300	14000	**0.088** 0.194
	30 1.1811	**42** 1.6535	**16** 0.630	**37** 1.4567	**0.3** 0.012	RNAO30X42X16		**22.3** 5010	**31.0** 6970	4.90	9600	15000	**0.069** 0.152
	30 1.1811	**42** 1.6535	**32** 1.260	**37** 1.4567	**0.3** 0.012	RNAO30X42X32		**38.2** 8590	**62.1** 14000	9.85	9600	15000	**0.131** 0.289
35 1.3780	**35** 1.3780	**45** 1.7717	**17** 0.669	**40** 1.5748	**0.3** 0.012	RNAO35X45X17		**22.1** 4970	**40.8** 9170	6.35	7900	12000	**0.069** 0.152
	35 1.3780	**45** 1.7717	**26** 1.024	**40** 1.5748	**0.3** 0.012	RNAO35X45X26		**27.7** 6230	**54.5** 12300	8.30	7900	12000	**0.091** 0.201
	35 1.3780	**47** 1.8504	**16** 0.630	**41** 1.6142	**0.3** 0.012	RNAO35X47X16	SNSH35,5X47X0,5	**24.5** 5510	**36.8** 8270	5.80	8100	12000	**0.075** 0.165
	35 1.3780	**47** 1.8504	**32** 1.260	**42** 1.6535	**0.3** 0.012	RNAO35X47X32	SNSH35,5X47X0,5	**42.0** 9440	**73.5** 16500	11.6	8100	12000	**0.156** 0.344
40 1.5748	**40** 1.5748	**50** 1.9685	**17** 0.669	**45** 1.7717	**0.3** 0.012	RNAO40X50X17	SNSH40,5X50X0,5	**23.8** 5350	**47.0** 10600	7.30	6900	11000	**0.086** 0.190

Shaft Dia.	F_w	D	C	E_w	$r_{s\,min.}$	Bearing Designation	End Washer Designation	Load Ratings		Fatigue Load Limit C_u	Speed Ratings		Approx. Wt.
								Dynamic	Static		Grease	Oil	
								C	C_0				
mm in	mm in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		kg lbs
40 1.5748	**40** 1.5748	**50** 1.9685	**34** 1.339	**45** 1.7717	**0.3** 0.012	RNAO40X50X34	SNSH40,5X50X0,5	**40.9** 9190	**94.1** 21200	14.6	6900	11000	**0.152** 0.335
	40 1.5748	**55** 2.1654	**20** 0.787	**48** 1.8898	**0.3** 0.012	RNAO40X55X20	SNSH41X55X1	**35.5** 7980	**56.3** 12700	8.95	7100	11000	**0.139** 0.306
	40 1.5748	**55** 2.1654	**40** 1.575	**48** 1.8898	**0.3** 0.012	RNAO40X55X40	SNSH41X55X1	**60.8** 13700	**113** 25400	17.9	7100	11000	**0.276** 0.608
45 1.7717	**45** 1.7717	**55** 2.1654	**17** 0.669	**50** 1.9685	**0.3** 0.012	RNAO45X55X17	SNSH45,5X55X0,5	**24.9** 5600	**51.8** 11600	8.05	6100	9400	**0.089** 0.196
	45 1.7717	**55** 2.1654	**34** 1.339	**50** 1.9685	**0.3** 0.012	RNAO45X55X34	SNSH45,5X55X0,5	**42.7** 9600	**104** 23400	16.1	6100	9400	**0.168** 0.370
	45 1.7717	**62** 2.4409	**20** 0.787	**53** 2.0866	**0.3** 0.012	RNAO45X62X20	SNSH46X62X1	**30.8** 6920	**68.1** 15300	9.05	6100	9400	**0.163** 0.359
	45 1.7717	**62** 2.4409	**40** 1.575	**53** 2.0866	**0.3** 0.012	RNAO45X62X40	SNSH46X62X1	**61.7** 13900	**119** 26800	18.1	6200	9600	**0.325** 0.717
50 1.9685	**50** 1.9685	**62** 2.4409	**20** 0.787	**55** 2.1654	**0.3** 0.012	RNAO50X62X20		**30.2** 6790	**68.5** 15400	10.7	5400	8400	**0.142** 0.313
	50 1.9685	**62** 2.4409	**40** 1.575	**55** 2.1654	**0.3** 0.012	RNAO50X62X40		**51.7** 11600	**137** 30800	21.4	5400	8400	**0.269** 0.593
	50 1.9685	**65** 2.5591	**20** 0.787	**58** 2.2835	**0.3** 0.012	RNAO50X65X20	SNSH51X65X1	**38.8** 8720	**67.8** 15200	10.8	5600	8600	**0.167** 0.368
	50 1.9685	**65** 2.5591	**40** 1.575	**58** 2.2835	**0.3** 0.012	RNAO50X65X40		**66.5** 14900	**136** 30600	21.6	5600	8600	**0.342** 0.754
55 2.1654	**55** 2.1654	**68** 2.6772	**20** 0.787	**60** 2.3622	**0.3** 0.012	RNAO55X68X20		**30.7** 6900	**72.4** 16300	11.3	4900	7600	**0.165** 0.364
	55 2.1654	**68** 2.6772	**40** 1.575	**60** 2.3622	**0.3** 0.012	RNAO55X68X40		**52.7** 11800	**145** 32600	22.6	4900	7600	**0.320** 0.705
	55 2.1654	**72** 2.8346	**20** 0.787	**63** 2.4803	**1.0** 0.039	RNAO55X72X20	SNSH56X72X1	**40.3** 9060	**73.5** 16500	11.7	5000	7800	**0.212** 0.467
	55 2.1654	**72** 2.8346	**40** 1.575	**63** 2.4803	**1.0** 0.039	RNAO55X72X40	SNSH56X72X1	**69.1** 15500	**127** 28600	23.4	5000	7800	**0.433** 0.955
60 2.3622	**60** 2.3622	**78** 3.0709	**20** 0.787	**68** 2.6772	**1.0** 0.039	RNAO60X78X20	SNSH61X78X1	**41.8** 9400	**79.2** 17800	12.6	4600	7100	**0.230** 0.507
	60 2.3622	**78** 3.0709	**40** 1.575	**68** 2.6772	**1.0** 0.039	RNAO60X78X40	SNSH61X78X1	**71.7** 16100	**158** 35500	25.2	4600	7100	**0.436** 0.961
65 2.5591	**65** 2.5591	**85** 3.3465	**30** 1.181	**73** 2.8740	**1.0** 0.039	RNAO65X85X30	SNSH66X85X1	**60.1** 13500	**129** 29000	20.3	4200	6500	**0.468** 1.032
	65 2.5591	**85** 3.3465	**60** 2.362	**73** 2.8740	**1.0** 0.039	RNAO65X85X60	SNSH66X85X1	**103** 23200	**259** 58200	40.7	4200	6500	**0.876** 1.931
70 2.7559	**70** 2.7559	**90** 3.5433	**30** 1.181	**78** 3.0709	**1.0** 0.039	RNAO70X90X30		**62.2** 14000	**139** 31200	21.8	3900	6000	**0.505** 1.113
	70 2.7559	**90** 3.5433	**60** 2.362	**78** 3.0709	**1.0** 0.039	RNAO70X90X60		**107** 24100	**277** 62300	43.6	3900	6000	**0.925** 2.039
75 2.9528	**75** 2.9528	**95** 3.7402	**30** 1.181	**83** 3.2677	**1.0** 0.039	RNAO75X95X30		**60.9** 13700	**138** 31000	21.7	3600	5600	**0.510** 1.124
	75 2.9528	**95** 3.7402	**60** 2.362	**83** 3.2677	**1.0** 0.039	RNAO75X95X60		**104** 23400	**277** 62300	43.3	3600	5600	**0.980** 2.161
80 3.1496	**80** 3.1496	**100** 3.9370	**30** 1.181	**88** 3.4646	**1.0** 0.039	RNAO80X100X30		**67.5** 15200	**161** 36200	25.4	3400	5200	**0.580** 1.279
	80 3.1496	**100** 3.9370	**60** 2.362	**88** 3.4646	**1.0** 0.039	RNAO80X100X60		**116** 26100	**322** 72400	50.7	3400	5200	**1.044** 2.30
85 3.3465	**85** 3.3465	**105** 4.1339	**30** 1.181	**93** 3.6614	**1.0** 0.039	RNAO85X105X30		**69.4** 15600	**170** 38200	26.8	3000	4600	**0.586** 1.292
100 3.9370	**100** 3.9370	**120** 4.7244	**30** 1.181	**108** 4.2520	**1.0** 0.039	RNAO100X120X30		**72.4** 16300	**191** 42900	29.5	2700	4200	**0.660** 1.455

NEEDLE ROLLER BEARINGS

INCH SERIES

When there is a requirement for a rolling bearing to support very high dynamic, static or even shock loads with a restricted mounting space – the needle roller bearing may give best results.

REFERENCE STANDARDS ARE:

- **ANSI/ABMA Standard 18.2** – needle roller bearings – radial, inch design.
- **ASTM Standard F 2246** – standard specification for bearing, roller, needle: thick outer ring with rollers and cage.
- **Military Standard MS 51961** – bearing, roller, needle: thick outer ring with rollers and cage.
- **ASTM Standard F2431** – standard specification for ring, bearing, inner: needle roller bearing with thick outer ring.

IDENTIFICATION

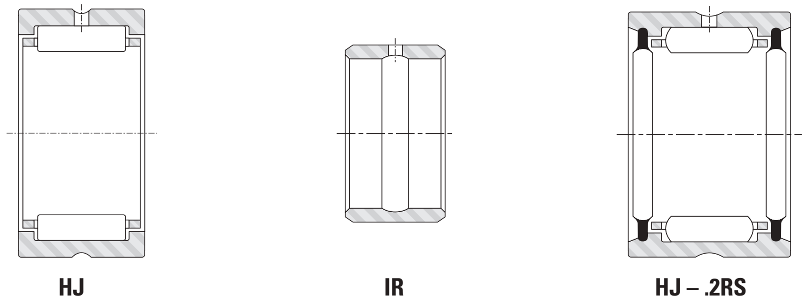

HJ IR HJ – .2RS

Fig. B4-11. Construction of inch series heavy-duty needle roller bearings

The prefix letters HJ in the needle roller bearing designation denote that the bearing is manufactured to inch nominal dimensions.

Bearings are available with one or two lip-contact seals, as listed on pages B-4-46 and B-4-47. One seal is designated by suffix letters RS. Two seals are designated by .2RS.

Inner rings can be used with HJ Series needle roller bearings for applications where it is impractical to use the shaft as the inner raceway. These inch series inner rings are identified by the prefix letters IR.

Because the entire identification code may not appear on the bearing itself, the manufacturer's parts list or another reliable source should always be consulted when ordering bearings for service or field replacement to make certain that the correct bearing with the correct lubricant is used.

CONSTRUCTION

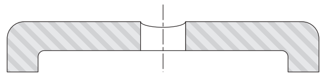


Fig. B4-12. One-piece, channel-shaped outer ring


Fig. B4-13. Steel cage

The HJ Series needle roller bearing has a one-piece channel-shaped outer ring of bearing-quality steel heat treated to provide maximum load rating. The integral end flanges provide axial location for the needle rollers. The bores of the end flanges serve as piloting surfaces for the cage, locating it to prevent removal of the lubricant film on the raceway.

These bearings have a steel cage, which provides inward retention for the needle rollers. The design assures roller stability and minimizes friction between the cage and the needle rollers. The cage has a maximum strength consistent with the inherent high load ratings of needle roller bearings.

The needle rollers are made from high-carbon chrome steel, through-hardened, ground and lapped to close tolerance with controlled contour for optimum load distribution.

SEALS

Shaft contact seals, which fit into the same housing bore as the heavy-duty needle roller bearings, may be obtained from recognized seal manufacturers. Bearings can also be made available with one or two integral seals. For information and listing of sealed bearings, see pages B-4-46 and B-4-47.

LUBRICATION

The outer rings of the HJ bearings are supplied with a lubrication groove on the O.D. and a lubrication hole in this groove to facilitate re-lubrication through the outer ring. The IR inner rings have lubrication grooves in the bore and a re-lubrication hole to facilitate re-lubrication through the inner ring.

HJ Series bearings (with or without seals) are typically shipped protected with a corrosion-preventive compound that is not a lubricant. When specified by the customer, HJ Series bearings may be ordered prelubricated with suitable greases and oils.

MOUNTING DIMENSIONS

HJ needle roller bearings are normally mounted in their housings with a clearance fit if the load is stationary relative to the housing, and with a tight transition fit if the load rotates relative to the housing. Because the tight transition fit of the bearing in its housing may result in a reduction of the needle roller complement bore diameter, the shaft raceway diameter should be reduced to a like amount.

The mounting dimensions in the bearing tables (pages B-4-42 to B-4-47) list the suggested ISO H7 tolerances for the housing bore and the suggested ISO h6 tolerances for the shaft raceway when the outer ring is to be mounted with a clearance fit. The tables also list the suggested ISO N7 tolerances for the housing bore and the suggested ISO f6 tolerances for the shaft raceway when the outer ring is to be mounted with a tight transition fit.

Other mounting dimensions may be required for special conditions such as:

1. Extremely heavy radial loads.
2. Shock loads.
3. Load rotating relative to both inner and outer rings.
4. Temperature gradient across bearing.
5. Housing with heat expansion coefficient differing from that of the bearing.

If these conditions are expected, please consult your representative.

DIMENSIONAL ACCURACY, BEARINGS

HJ SERIES

Tolerances for the HJ bearings are given in Tables B4-7 and B4-8. Pages B-4-42 to B-4-47 list the nominal outer diameter, width and needle roller complement bore diameter for the HJ bearings.

Table B4-7. Outer diameter and width tolerances, HJ bearings

D				Deviaiton from nominal							
Nominal outer diameter				of single mean outer diameter, D_{mp}[1]				of width, C			
>	≤	>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
mm	**mm**	in	in	**mm**	**mm**	in	in	**mm**	**mm**	in	in
19.050	**50.800**	0.7500	2.0000	**+0**	**-0.013**	+0	-0.0005	**+0**	**-0.013**	+0	-0.005
50.800	**82.550**	2.0000	3.2500	**+0**	**-0.015**	+0	-0.0006	**+0**	**-0.013**	+0	-0.005
82.550	**120.650**	3.2500	4.7500	**+0**	**-0.020**	+0	-0.0008	**+0**	**-0.013**	+0	-0.005

[1] "Single mean diameter" is defined as the mean diameter in a single radial plane.

Table B4-8. Roller complement bore tolerance, HJ bearings

F_w				Deviaiton from nominal of the smallest single diameter of the roller complement bore, F_m[1]			
Nominal roller complement bore diameter							
>	≤	>	≤	Max.	Min.	Max.	Min.
mm	**mm**	in	in	**mm**	**mm**	in	in
12.700	**15.875**	0.5000	0.6250	**+0.043**	**+0.020**	+0.0017	+0.0008
15.875	**28.575**	0.6250	1.1250	**+0.046**	**+0.023**	+0.0018	+0.0009
28.575	**41.275**	1.1250	1.6250	**+0.048**	**+0.025**	+0.0019	+0.0010
41.275	**47.625**	1.6250	1.8750	**+0.050**	**+0.025**	+0.0020	+0.0010
47.625	**69.850**	1.8750	2.7500	**+0.053**	**+0.028**	+0.0021	+0.0011
69.850	**76.200**	2.7500	3.0000	**+0.058**	**+0.028**	+0.0023	+0.0011
76.200	**101.600**	3.0000	4.0000	**+0.060**	**+0.030**	+0.0024	+0.0012

[1] "The smallest single diameter of the roller complement bore" is defined as the diameter of the cylinder which, when used as a bearing inner ring, results in zero radial internal clearance in the bearing on at least one diameter.

DIMENSIONAL ACCURACY, INNER RINGS

IR SERIES

Tolerances for the IR inner rings are given in Tables B4-9 and B4-10. Pages B-4-48 to B-4-51 list the nominal outer diameter, width and bore diameter for the IR series inner rings.

Table B4-9. Bore and width tolerances, IR inner rings

d				Deviaiton from nominal							
Nominal bore diameter				of single mean bore diameter, d_{mp}(1)				of width, B			
>	≤	>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
mm	mm	in	in	mm	mm	in	in	mm	mm	in	in
7.938	**19.050**	0.3125	0.7500	**+0**	**-0.010**	+0	-0.0004	**+0.25**	**+0.12**	+0.010	+0.005
19.050	**50.800**	0.7500	2.0000	**+0**	**-0.013**	+0	-0.0005	**+0.25**	**+0.12**	+0.010	+0.005
50.800	**82.550**	2.0000	3.2500	**+0**	**-0.015**	+0	-0.0006	**+0.25**	**+0.12**	+0.010	+0.005

(1) "Single mean diameter" is defined as the mean diameter in a single radial plane.

Table B4-10. Outer diameter tolerance, IR inner rings

F				Deviaiton from nominal of single mean outer diameter, F_{mp}(1)			
Nominal outer diameter							
>	≤	>	≤	Max.	Min.	Max.	Min.
mm	mm	in	in	mm	mm	in	in
12.700	**15.875**	0.5000	0.6250	**-0.013**	**-0.023**	-0.0005	-0.0009
15.875	**25.400**	0.6250	1.0000	**-0.018**	**-0.031**	-0.0007	-0.0012
25.400	**28.575**	1.0000	1.1250	**-0.023**	**-0.036**	-0.0009	-0.0014
28.575	**34.925**	1.1250	1.3750	**-0.023**	**-0.036**	-0.0009	-0.0015
34.925	**47.625**	1.3750	1.8750	**-0.025**	**-0.038**	-0.0010	-0.0016
47.625	**76.200**	1.8750	3.0000	**-0.028**	**-0.040**	-0.0011	-0.0018
76.200	**95.250**	3.0000	3.7500	**-0.033**	**-0.046**	-0.0013	-0.0022

(1) "Single mean diameter" is defined as the mean diameter in a single radial plane.

LOAD RATING FACTORS

DYNAMIC LOADS

Needle roller bearings can accommodate only radial loads.

$$P = F_r$$

P = The maximum dynamic radial load that may be applied to a needle roller bearing based on the dynamic load rating, C_r, given in the bearing tables. This load should be $\leq C_r/3$.

STATIC LOADS

Needle roller bearings can accommodate only radial loads.

$$P_0 = F_r$$

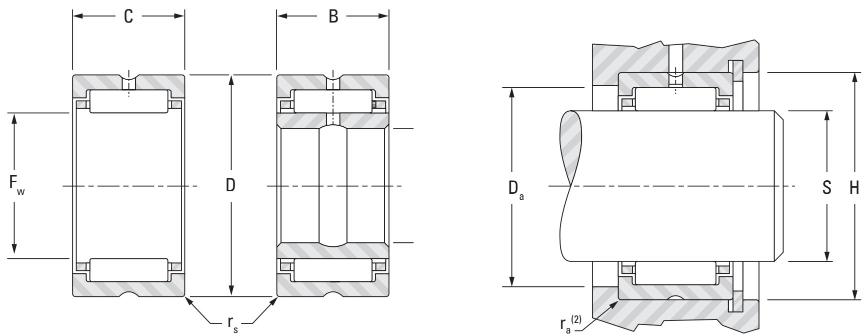
SPECIAL BEARINGS

For needle roller bearings with special dimensions or special features, such as split outer ring, consult your representative.

HJ TYPE

INCH SERIES

- Check for availability.
- Nominal bearing diameters and widths shown.
- Tolerance tables found on page B-4-39.
- Clearance fit suggested for outer ring when housing is stationary relative to load.
- Tight transition fit suggested if housing rotates relative to load.
- Consult your representative for oscillating applications (e.g., low radial clearance concerns).
- Unmarked end of outer ring should be assembled against housing shoulder to clear maximum allowed housing fillet.
- Meets Military Standard MS 51961 and ASTM F2246.



HJ **HJ with IR**

Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C (B)	$r_{s\,min.}$	Bearing Designation	Used With Inner Ring Designation[1]	Load Ratings		Fatigue Load Limit C_u	Speed Ratings	
							Dynamic	Static			
							C	C_0		Grease	Oil
in	mm in	mm in	mm in	mm in			kN lbf		kN	min^{-1}	
5/8	15.875 0.6250	28.575 1.1250	19.050 0.750	0.64 0.025	HJ-101812	IR-061012	19.3 4350	20.7 4650	3.25	20000	30000
3/4	19.050 0.7500	31.750 1.2500	19.050 0.750	1.02 0.04	HJ-122012	IR-081212	20.7 4650	23.3 5240	3.65	16000	25000
	19.050 0.7500	31.750 1.2500	25.400 1.000	1.02 0.04	HJ-122016	IR-081216	27.8 6250	33.8 7600	5.30	16000	25000
7/8	22.225 0.8750	34.925 1.3750	19.050 0.750	1.02 0.04	HJ-142212	IR-101412	23.1 5180	27.9 6270	4.35	13000	21000
	22.225 0.8750	34.925 1.3750	25.400 1.000	1.02 0.04	HJ-142216	IR-101416	31.0 6970	40.5 9100	6.35	13000	21000
1	25.400 1.0000	38.100 1.5000	19.050 0.750	1.02 0.04	HJ-162412	IR-121612	25.2 5680	32.5 7300	5.10	12000	18000
	25.400 1.0000	38.100 1.5000	25.400 1.000	1.02 0.04	HJ-162416	IR-121616 IR-131616	34.0 7640	47.2 10600	7.40	12000	18000
1 1/8	28.575 1.1250	41.275 1.6250	25.400 1.000	1.02 0.04	HJ-182616	IR-141816 IR-151816	36.3 8170	53.8 12100	8.45	10000	16000
	28.575 1.1250	41.275 1.6250	31.750 1.250	1.02 0.04	HJ-182620	IR-141820 IR-151820	44.9 10100	70.3 15800	10.9	10000	16000
1 1/4	31.750 1.2500	44.450 1.7500	25.400 1.000	1.02 0.04	HJ-202816	IR-162016	37.4 8410	57.4 12900	9.00	9100	14000
	31.750 1.2500	44.450 1.7500	31.750 1.250	1.02 0.04	HJ-202820	IR-162020	46.3 10400	75.2 16900	11.7	9100	14000
1 3/8	34.925 1.3750	47.625 1.8750	25.400 1.000	1.02 0.04	HJ-223016	IR-182216	39.8 8950	64.1 14400	10.1	8200	13000
	34.925 1.3750	47.625 1.8750	31.750 1.250	1.02 0.04	HJ-223020	IR-182220	49.4 11100	84.1 18900	13.0	8200	13000
1 1/2	38.100 1.5000	52.388 2.0625	25.400 1.000	1.52 0.06	HJ-243316	IR-202416	47.6 10700	72.5 16300	11.4	7600	12000
	38.100 1.5000	52.388 2.0625	31.750 1.250	1.52 0.06	HJ-243320	IR-192420 IR-202420	58.7 13200	95.2 21400	14.9	7600	12000
1 5/8	41.275 1.6250	55.563 2.1875	25.400 1.000	1.52 0.06	HJ-263516	IR-212616	48.5 10900	76.5 17200	12.1	7000	11000
	41.275 1.6250	55.563 2.1875	31.750 1.250	1.52 0.06	HJ-263520	IR-212620 IR-222620	60.1 13500	100.5 22600	15.7	7000	11000
1 3/4	44.450 1.7500	58.738 2.3125	25.400 1.000	1.52 0.06	HJ-283716	IR-232816 IR-242816	49.8 11200	81.0 18200	12.8	6400	9900

Approx. Wt.	Mounting Dimensions Clearance Fit				Bearing Designation	Mounting Dimensions Tight Transition Fit				Shoulder Dia.	Shaft Dia.
	S (ISO h6)		H (ISO H7)			S (ISO f6)		H (ISO N7)		D_a	
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.	±0.38 ±0.015	
kg lbs	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	mm in	in
0.050 0.11	15.875 0.6250	15.865 0.6246	28.595 1.1258	28.575 1.1250	HJ-101812	15.860 0.6244	15.850 0.6240	28.567 1.1247	28.547 1.1239	23.83 0.938	5/8
0.059 0.13	19.050 0.7500	19.037 0.7495	31.775 1.2510	31.750 1.2500	HJ-122012	19.030 0.7492	19.017 0.7487	31.742 1.2497	31.717 1.2487	26.97 1.062	3/4
0.077 0.17	19.050 0.7500	19.037 0.7495	31.775 1.2510	31.750 1.2500	HJ-122016	19.030 0.7492	19.017 0.7487	31.742 1.2497	31.717 1.2487	26.97 1.062	
0.064 0.14	22.225 0.8750	22.212 0.8745	34.950 1.3760	34.925 1.3750	HJ-142212	22.205 0.8742	22.192 0.8737	34.917 1.3747	34.892 1.3737	30.18 1.188	7/8
0.086 0.19	22.225 0.8750	22.212 0.8745	34.950 1.3760	34.925 1.3750	HJ-142216	22.205 0.8742	22.192 0.8737	34.917 1.3747	34.892 1.3737	30.18 1.188	
0.073 0.16	25.400 1.0000	25.387 0.9995	38.125 1.5010	38.100 1.5000	HJ-162412	25.380 0.9992	25.367 0.9987	38.092 1.4997	38.067 1.4987	33.32 1.312	1
0.095 0.21	25.400 1.0000	25.387 0.9995	38.125 1.5010	38.100 1.5000	HJ-162416	25.380 0.9992	25.367 0.9987	38.092 1.4997	38.067 1.4987	33.32 1.312	
0.104 0.23	28.575 1.1250	28.562 1.1245	41.300 1.6260	41.275 1.6250	HJ-182616	28.555 1.1242	28.542 1.1237	41.267 1.6247	41.242 1.6237	36.53 1.438	1 1/8
0.132 0.29	28.575 1.1250	28.562 1.1245	41.300 1.6260	41.275 1.6250	HJ-182620	28.555 1.1242	28.542 1.1237	41.267 1.6247	41.242 1.6237	36.53 1.438	
0.113 0.25	31.750 1.2500	31.735 1.2494	44.475 1.7510	44.450 1.7500	HJ-202816	31.725 1.2490	31.709 1.2484	44.442 1.7497	44.417 1.7487	39.67 1.562	1 1/4
0.145 0.32	31.750 1.2500	31.735 1.2494	44.475 1.7510	44.450 1.7500	HJ-202820	31.725 1.2490	31.709 1.2484	44.442 1.7497	44.417 1.7487	39.67 1.562	
0.127 0.28	34.925 1.3750	34.910 1.3744	47.650 1.8760	47.625 1.8750	HJ-223016	34.900 1.374	34.884 1.3734	47.617 1.8747	47.592 1.8737	42.88 1.688	1 3/8
0.159 0.35	34.925 1.3750	34.910 1.3744	47.650 1.8760	47.625 1.8750	HJ-223020	34.900 1.3740	34.884 1.3734	47.617 1.8747	47.592 1.8737	42.88 1.688	
0.154 0.34	38.100 1.5000	38.085 1.4994	52.418 2.0637	52.388 2.0625	HJ-243316	38.075 1.4990	38.059 1.4984	52.380 2.0622	52.349 2.0610	47.63 1.875	1 1/2
0.195 0.43	38.100 1.5000	38.085 1.4994	52.418 2.0637	52.388 2.0625	HJ-243320	38.075 1.4990	38.059 1.4984	52.380 2.0622	52.349 2.0610	47.63 1.875	
0.163 0.36	41.275 1.6250	41.260 1.6244	55.593 2.1887	55.563 2.1875	HJ-263516	41.250 1.6240	41.234 1.6234	55.555 2.1872	55.524 2.1860	50.80 2.000	1 5/8
0.209 0.46	41.275 1.6250	41.260 1.6244	55.593 2.1887	55.563 2.1875	HJ-263520	41.250 1.6240	41.234 1.6234	55.555 2.1872	55.524 2.1860	50.80 2.000	
0.177 0.39	44.450 1.7500	44.435 1.7494	58.768 2.3137	58.738 2.3125	HJ-283716	44.425 1.7490	44.409 1.7484	58.730 2.3122	58.699 2.3110	53.98 2.125	1 3/4

[1] See pages B-4-48 to B-4-51 for inch series inner rings. Order inner rings separately.

[2] $r_{a\,max.}$ is equal to the minimum bearing chamfer ($r_{s\,min.}$) at unmarked end.

Continued on next page.

HJ TYPE

INCH SERIES

- Check for availability.
- Nominal bearing diameters and widths shown.
- Tolerance tables found on page B-4-39.
- Clearance fit suggested for outer ring when housing is stationary relative to load.
- Tight transition fit suggested if housing rotates relative to load.
- Consult your representative for oscillating applications (e.g., low radial clearance concerns).
- Unmarked end of outer ring should be assembled against housing shoulder to clear maximum allowed housing fillet ($r_{a\ max.}$[2]).
- Meets Military Standard MS 51961 and ASTM F2246.

Shaft Dia.	F_w	D	C (B)	$r_{s\ min.}$	Bearing Designation	Used With Inner Ring Designation[1]	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil
in	mm in	mm in	mm in	mm in			kN lbf	kN lbf	kN	min-1	min-1
1 3/4	**44.450** 1.7500	**58.738** 2.3125	**31.750** 1.250	**1.52** 0.06	HJ-283720	IR-222820 IR-232820 IR-242820	**61.8** 13900	**106** 23900	16.6	6400	9900
1 7/8	**47.625** 1.8750	**61.913** 2.4375	**31.750** 1.250	**1.52** 0.06	HJ-303920	IR-253020	**65.4** 14700	**117** 26300	18.1	6000	9200
2	**50.800** 2.0000	**65.088** 2.5625	**25.400** 1.000	**1.52** 0.06	HJ-324116	IR-273216	**53.8** 12100	**93.0** 20900	14.7	5600	8600
	50.800 2.0000	**65.088** 2.5625	**31.750** 1.250	**1.52** 0.06	HJ-324120	IR-243220 IR-253220 IR-263220 IR-273220	**66.7** 15000	**122** 27500	19.1	5600	8600
2 1/4	**57.150** 2.2500	**76.200** 3.0000	**38.100** 1.500	**1.52** 0.06	HJ-364824	IR-283624	**89.9** 20200	**164** 36900	25.7	5000	7600
	57.150 2.2500	**76.200** 3.0000	**44.450** 1.750	**1.52** 0.06	HJ-364828	IR-283628	**104** 23400	**198** 44500	30.8	5000	7600
2 1/2	**63.500** 2.5000	**82.550** 3.2500	**38.100** 1.500	**2.03** 0.08	HJ-405224	IR-314024 IR-324024	**97.0** 21800	**187** 42100	29.4	4400	6800
	63.500 2.5000	**82.550** 3.2500	**44.450** 1.750	**2.03** 0.08	HJ-405228	IR-314028 IR-324028	**112** 25200	**226** 50800	35.2	4400	6800
2 3/4	**69.850** 2.7500	**88.900** 3.5000	**25.400** 1.000	**2.03** 0.08	HJ-445616	—	**67.2** 15100	**120** 27000	19.1	4000	6200
	69.850 2.7500	**88.900** 3.5000	**38.100** 1.500	**2.03** 0.08	HJ-445624	IR-364424	**101** 22700	**203** 45700	31.9	4000	6200
	69.850 2.7500	**88.900** 3.5000	**44.450** 1.750	**2.03** 0.08	HJ-445628	IR-354428 IR-364428	**117** 26300	**245** 55100	38.2	4000	6200
3	**76.200** 3.0000	**95.250** 3.7500	**38.100** 1.500	**2.03** 0.08	HJ-486024	IR-404824	**107** 24100	**226** 50900	35.5	3700	5600
	76.200 3.0000	**95.250** 3.7500	**44.450** 1.750	**2.03** 0.08	HJ-486028	IR-384828 IR-404828	**124** 27900	**273** 61400	42.5	3700	5600
3 1/4	**82.550** 3.2500	**107.950** 4.2500	**44.450** 1.750	**2.03** 0.08	HJ-526828	IR-445228	**163** 36600	**307** 69000	48.3	3400	5300
	82.550 3.2500	**107.950** 4.2500	**50.800** 2.000	**2.03** 0.08	HJ-526832	IR-445232	**184** 41300	**360** 80900	56.2	3400	5300
3 1/2	**88.900** 3.5000	**114.300** 4.5000	**50.800** 2.000	**2.03** 0.08	HJ-567232	IR-475632 IR-485632	**188** 42200	**377** 84700	58.9	3200	4900

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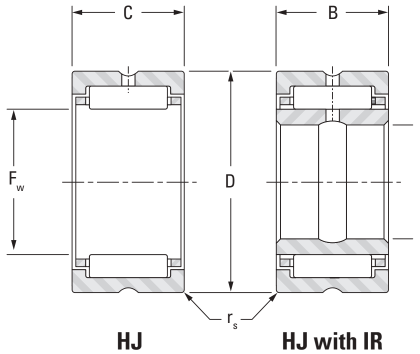
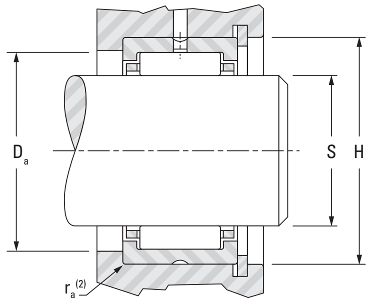
[1] See pages B-4-48 to B-4-51 for inch series inner rings. Order inner rings separately.

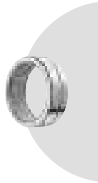
[2] $r_{a\ max.}$ is equal to the minimum bearing chamfer ($r_{s\ min.}$) at unmarked end.



HJ HJ with IR



Shaft surface to be 58 HRC or equivalent

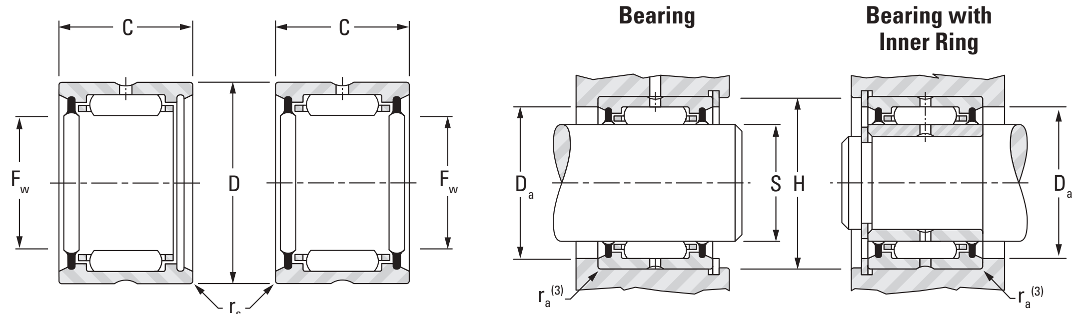


Approx. Wt.	Mounting Dimensions Clearance Fit S (ISO h6) Max.	Mounting Dimensions Clearance Fit S (ISO h6) Min.	Mounting Dimensions Clearance Fit H (ISO H7) Max.	Mounting Dimensions Clearance Fit H (ISO H7) Min.	Bearing Designation	Mounting Dimensions Tight Transition Fit S (ISO f6) Max.	Mounting Dimensions Tight Transition Fit S (ISO f6) Min.	Mounting Dimensions Tight Transition Fit H (ISO N7) Max.	Mounting Dimensions Tight Transition Fit H (ISO N7) Min.	Shoulder Dia. D_a **±0.38** ±0.015	Shaft Dia.
kg lbs	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	mm in	in
0.222 0.49	**44.450** 1.7500	**44.435** 1.7494	**58.768** 2.3137	**58.738** 2.3125	HJ-283720	**44.425** 1.7490	**44.409** 1.7484	**58.730** 2.3122	**58.699** 2.3110	**53.98** 2.125	
0.236 0.52	**47.625** 1.8750	**47.610** 1.8744	**61.943** 2.4387	**61.913** 2.4375	HJ-303920	**47.600** 1.8740	**47.584** 1.8734	**61.905** 2.4372	**61.874** 2.4360	**57.15** 2.250	1 7/8
0.200 0.44	**50.800** 2.0000	**50.782** 1.9993	**65.118** 2.5637	**65.088** 2.5625	HJ-324116	**50.770** 1.9988	**50.752** 1.9981	**65.080** 2.5622	**65.049** 2.5610	**60.33** 2.375	
0.249 0.55	**50.800** 2.0000	**50.782** 1.9993	**65.118** 2.5637	**65.088** 2.5625	HJ-324120	**50.770** 1.9988	**50.752** 1.9981	**65.080** 2.5622	**65.049** 2.5610	**60.33** 2.375	2
0.458 1.01	**57.150** 2.2500	**57.132** 2.2493	**76.230** 3.0012	**76.200** 3.0000	HJ-364824	**57.120** 2.2488	**57.102** 2.2481	**76.192** 2.9997	**76.162** 2.9985	**68.28** 2.688	2 1/4
0.531 1.17	**57.150** 2.2500	**57.132** 2.2493	**76.230** 3.0012	**76.200** 3.0000	HJ-364828	**57.120** 2.2488	**57.102** 2.2481	**76.192** 2.9997	**76.162** 2.9985	**68.28** 2.688	
0.499 1.10	**63.500** 2.5000	**63.482** 2.4993	**82.586** 3.2514	**82.550** 3.2500	HJ-405224	**63.470** 2.4988	**63.452** 2.4981	**82.537** 3.2495	**82.502** 3.2481	**74.63** 2.938	2 1/2
0.499 1.29	**63.500** 2.5000	**63.482** 2.4993	**82.586** 3.2514	**82.550** 3.2500	HJ-405228	**63.470** 2.4988	**63.452** 2.4981	**82.537** 3.2495	**82.502** 3.2481	**74.63** 2.938	
0.363 0.80	**69.850** 2.7500	**69.832** 2.7493	**88.936** 3.5014	**88.900** 3.5000	HJ-445616	**69.820** 2.7488	**69.802** 2.7481	**88.887** 3.4995	**88.852** 3.4981	**80.98** 3.188	
0.544 1.20	**69.850** 2.7500	**69.832** 2.7493	**88.936** 3.5014	**88.900** 3.5000	HJ-445624	**69.820** 2.7488	**69.802** 2.7481	**88.887** 3.4995	**88.852** 3.4981	**80.98** 3.188	2 3/4
0.635 1.40	**69.850** 2.7500	**69.832** 2.7493	**88.936** 3.5014	**88.900** 3.5000	HJ-445628	**69.820** 2.7488	**69.802** 2.7481	**88.887** 3.4995	**88.852** 3.4981	**80.98** 3.188	
0.585 1.29	**76.200** 3.0000	**76.182** 2.9993	**95.286** 3.7514	**95.250** 3.7500	HJ-486024	**76.170** 2.9988	**76.152** 2.9981	**95.237** 3.7495	**95.202** 3.7481	**87.33** 3.438	3
0.685 1.51	**76.200** 3.0000	**76.182** 2.9993	**95.286** 3.7514	**95.250** 3.7500	HJ-486028	**76.170** 2.9988	**76.152** 2.9981	**95.237** 3.7495	**95.202** 3.7481	**87.33** 3.438	
1.016 2.24	**82.550** 3.2500	**82.527** 3.2491	**107.986** 4.2514	**107.950** 4.2500	HJ-526828	**82.514** 3.2486	**82.492** 3.2477	**107.937** 4.2495	**107.902** 4.2481	**98.43** 3.875	3 1/4
1.161 2.56	**82.550** 3.2500	**82.527** 3.2491	**107.986** 4.2514	**107.950** 4.2500	HJ-526832	**82.514** 3.2486	**82.492** 3.2477	**107.937** 4.2495	**107.902** 4.2481	**98.43** 3.875	
1.238 2.73	**88.900** 3.5000	**88.877** 3.4991	**114.336** 4.5014	**114.300** 4.5000	HJ-567232	**88.864** 3.4986	**88.842** 3.4977	**114.287** 4.4995	**114.252** 4.4981	**104.78** 4.125	3 1/2

SEALED HEAVY-DUTY NEEDLE ROLLER BEARINGS

INCH SERIES

- Bearing diameters and widths listed are nominal.
- For inspection purposes, see tolerance tables on page B-4-39.
- Available with one or two lip-contact seals designed to retain lubricant and exclude foreign material.
- Single seals are normally installed in the stamped end of bearing.
- Seals limit the bearing operating temperature between -30° C and +110° C (-25° F and +225° F).
- For operating temperature outside of the above range or if seals are exposed to unusual fluids, please consult your representative.



Shaft surface to be 58 HRC or equivalent

Shaft Dia.	F_w	D	C (B)	$r_{s\,min.}$	Bearing Designation		Used With Inner Ring(1)	Load Ratings		Fatigue Load Limit C_u	Speed Rating(2)
					One Seal	Two Seals		Dynamic C	Static C_0		
in	mm in	mm in	mm in	mm in				kN lbf	kN lbf	kN	min^{-1}
5/8	15.875 0.6250	28.575 1.1250	25.40 1.000	0.64 0.03	HJ-101816RS	HJ-101816.2RS	—	19.3 4350	20.7 4650	3.25	12000
3/4	19.050 0.7500	31.750 1.2500	25.40 1.000	1.02 0.04	HJ-122016RS	HJ-122016.2RS	IR-081216	20.7 4650	23.3 5240	3.65	10000
7/8	22.225 0.8750	34.925 1.3750	25.40 1.000	1.02 0.04	HJ-142216RS	HJ-142216.2RS	IR-101416	23.0 5180	27.9 6270	4.35	8700
1	25.400 1.0000	38.100 1.5000	25.40 1.000	1.02 0.04	HJ-162416RS	HJ-162416.2RS	IR-121616 IR-131616	25.3 5680	32.5 7300	5.10	7600
1 1/8	28.575 1.1250	41.275 1.6250	31.75 1.250	1.02 0.04	HJ-182620RS	HJ-182620.2RS	IR-141820	36.3 8170	53.8 12100	8.45	6800
1 1/4	31.750 1.2500	44.450 1.7500	31.75 1.250	1.02 0.04	HJ-202820RS	HJ-202820.2RS	IR-162020	37.4 8410	57.4 12900	9.00	6100
1 3/8	34.925 1.3750	47.625 1.8750	31.75 1.250	1.02 0.04	HJ-223020RS	HJ-223020.2RS	IR-182220	39.8 8950	64.1 14400	10.1	5600
1 1/2	38.100 1.5000	52.388 2.0625	31.75 1.250	1.52 0.06	HJ-243320RS	HJ-243320.2RS	IR-192420	47.6 10700	72.5 16300	11.4	5100
1 5/8	41.275 1.6250	55.563 2.1875	31.75 1.250	1.52 0.06	HJ-263520RS	HJ-263520.2RS	IR-212620	48.5 10900	76.5 17200	12.1	2400
1 3/4	44.450 1.7500	58.738 2.3125	31.75 1.250	1.52 0.06	HJ-283720RS	HJ-283720.2RS	IR-222820 IR-232820 IR-242820	49.8 11200	81.0 18200	12.8	4400
2	50.800 2.0000	65.088 2.5625	31.75 1.250	1.52 0.06	HJ-324120RS	HJ-324120.2RS	IR-243220 IR-253220 IR-263220 IR-273220	53.8 12100	93.0 20900	14.7	3800
2 1/4	57.150 2.2500	76.200 3.0000	44.45 1.750	1.52 0.06	HJ-364828RS	HJ-364828.2RS	IR-283628	89.9 20200	164.1 36900	25.7	1700
2 1/2	63.500 2.5000	82.550 3.2500	44.45 1.750	2.03 0.08	HJ-405228RS	HJ-405228.2RS	IR-314028 IR-324028	97.0 21800	187.3 42100	29.4	3100
2 3/4	69.850 2.7500	88.900 3.5000	44.45 1.750	2.03 0.08	HJ-445628RS	HJ-445628.2RS	IR-354428 IR-364428	101.0 22700	203.3 45700	31.9	1400
3	76.200 3.0000	95.250 3.7500	44.45 1.750	2.03 0.08	HJ-486028RS	HJ-486028.2RS	IR-384828 IR-404828	107.2 24100	226.4 50900	35.5	2500

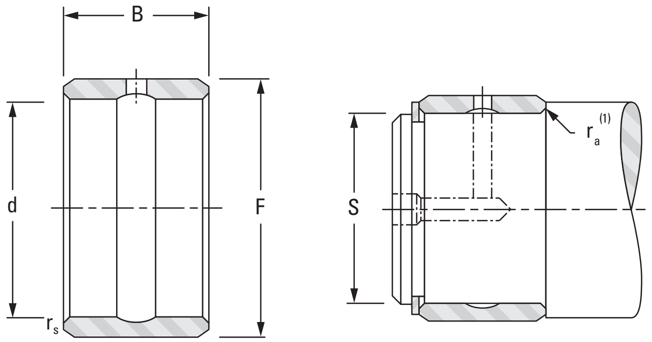
Approx. Wt.	Mounting Dimensions Clearance Fit				Bearing Designation	Mounting Dimensions Tight Transition Fit				Shoulder Dia.	Shaft Dia.
	S (ISO h6)		H (ISO H7)			S (ISO f6)		H (ISO N7)		D_a	
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.	±0.38 ±0.015	
kg lbs	mm in	mm in	mm in	mm in		mm in	mm in	mm in	mm in	mm in	in
0.07 0.15	15.875 0.6250	15.865 0.6246	28.595 1.1258	28.575 1.1250	HJ-101816-	15.860 0.6244	15.850 0.6240	28.567 1.1247	28.547 1.1239	23.83 0.938	5/8
0.08 0.17	19.050 0.7500	19.037 0.7495	31.775 1.2510	31.750 1.2500	HJ-122016-	19.030 0.7492	19.017 0.7487	31.742 1.2497	31.717 1.2487	26.97 1.062	3/4
0.09 0.19	22.225 0.8750	22.212 0.8745	34.950 1.3760	34.925 1.3750	HJ-142216-	22.205 0.8742	22.192 0.8737	34.917 1.3747	34.892 1.3737	30.18 1.188	7/8
0.10 0.21	25.400 1.0000	25.387 0.9995	38.125 1.5010	38.100 1.5000	HJ-162416-	25.380 0.9992	25.367 0.9987	38.092 1.4997	38.067 1.4987	33.32 1.312	1
0.13 0.29	28.575 1.1250	28.562 1.1245	41.300 1.6260	41.275 1.6250	HJ-182620-	28.555 1.1242	28.542 1.1237	41.267 1.6247	41.242 1.6237	36.53 1.438	1 1/8
0.15 0.32	31.750 1.2500	31.735 1.2494	44.475 1.7510	44.450 1.7500	HJ-202820-	31.725 1.2490	31.709 1.2484	44.442 1.7497	44.417 1.7487	39.67 1.562	1 1/4
0.16 0.35	34.925 1.3750	34.910 1.3744	47.650 1.8760	47.625 1.8750	HJ-223020-	34.900 1.3740	34.884 1.3734	47.617 1.8747	47.592 1.8737	42.88 1.688	1 3/8
0.20 0.43	38.100 1.5000	38.085 1.4994	52.418 2.0637	52.388 2.0625	HJ-243320-	38.075 1.4990	38.059 1.4984	52.380 2.0622	52.349 2.0610	47.63 1.875	1 1/2
0.21 0.46	41.275 1.6250	41.260 1.6244	55.593 2.1887	55.563 2.1875	HJ-263520-	41.250 1.6240	41.234 1.6234	55.555 2.1872	55.524 2.1860	50.80 2.000	1 5/8
0.22 0.49	44.450 1.7500	44.435 1.7494	58.768 2.3137	58.738 2.3125	HJ-283720-	44.425 1.7490	44.409 1.7484	58.730 2.3122	58.699 2.3110	53.98 2.125	1 3/4
0.25 0.55	50.800 2.0000	50.782 1.9993	65.118 2.5637	65.088 2.5625	HJ-324120-	50.770 1.9988	50.752 1.9981	65.080 2.5622	65.049 2.5610	60.33 2.375	2
0.53 1.17	57.150 2.2500	57.132 2.2493	76.230 3.0012	76.200 3.0000	HJ-364828-	57.120 2.2488	57.102 2.2481	76.192 2.9997	76.162 2.9985	68.28 2.688	2 1/4
0.59 1.29	63.500 2.5000	63.482 2.4993	82.586 3.2514	82.550 3.2500	HJ-405228-	63.470 2.4988	63.452 2.4981	82.537 3.2495	82.502 3.2481	74.63 2.938	2 1/2
0.64 1.40	69.850 2.7500	69.832 2.7493	88.936 3.5014	88.900 3.5000	HJ-445628-	69.820 2.7488	69.802 2.7481	88.887 3.4995	88.852 3.4981	80.98 3.188	2 3/4
0.68 1.51	76.200 3.0000	76.182 2.9993	95.286 3.7514	95.250 3.7500	HJ-486028-	76.170 2.9988	76.152 2.9981	95.237 3.7495	95.202 3.7481	87.33 3.438	3

(1) See pages B-4-48 to B-4-51 for inch series inner rings. Order inner rings separately.
(2) Based on standard seal shaft contact speed of 5 m/sec., 1000 ft./min.
(3) $r_{a\,max.}$ is equal to the minimum bearing chamfer ($r_{s\,min.}$) at unmarked end.

INNER RINGS

INCH SERIES

- Check for availability.
- Ideal choice when shaft is not practical to use as inner raceway.
- Provided in inch nominal dimensions for use with inch series heavy-duty needle roller bearings.
- Designed to meet established inch tolerances.
- Selected size should be wider than matching needle roller bearing.
- Maximum shaft fillet radius ($r_{a\ max.}$) cannot exceed inner ring bore chamfer ($r_{s\ min.}$) as shown.
- Optional centralized lubrication groove (bore) or through-hole available. Specify when ordering.
- Designed to be axially clamped against shoulder for loose transition fit on shaft.
- After mounting, for tight transition fit (keeping inner ring from rotating relative to shaft), inner ring O.D. must not exceed raceway diameter on matching bearing. (See mounting dimensions in the bearing table for the required raceway diameter.)
- After mounting, if O.D. of inner ring exceeds the required raceway diameter for matching bearing, ring should be ground to proper diameter while mounted on shaft.
- Meets ASTMF-2431.



Shaft Dia.	d	F	B	$r_{s\ min.}$	Bearing Designation	Approx. Wt.	Loose Transition Fit		Interference Fit		Used With Bearing Designation
							S		S		
							Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in	
3/8	**9.525** 0.3750	**15.875** 0.6250	**19.05** 0.750	**0.64** 0.025	IR-061012	**0.018** 0.040	**9.520** 0.3748	**9.510** 0.3744	**9.538** 0.3755	**9.530** 0.3752	HJ-101812
1/2	**12.700** 0.5000	**19.050** 0.7500	**19.05** 0.750	**1.02** 0.04	IR-081212	**0.023** 0.050	**12.692** 0.4997	**12.682** 0.4993	**12.715** 0.5006	**12.708** 0.5003	HJ-122012
	12.700 0.5000	**19.050** 0.7500	**25.40** 1.000	**1.02** 0.04	IR-081216	**0.032** 0.070	**12.692** 0.4997	**12.682** 0.4993	**12.715** 0.5006	**12.708** 0.5003	HJ-122016
5/8	**15.875** 0.6250	**22.225** 0.8750	**19.05** 0.750	**1.02** 0.04	IR-101412	**0.027** 0.060	**15.867** 0.6247	**15.857** 0.6243	**15.890** 0.6256	**15.883** 0.6253	HJ-142212
	15.875 0.6250	**22.225** 0.8750	**25.40** 1.000	**1.02** 0.04	IR-101416	**0.036** 0.080	**15.867** 0.6247	**15.857** 0.6243	**15.890** 0.6256	**15.883** 0.6253	HJ-142216
11/16	**17.463** 0.6875	**22.225** 0.8750	**19.05** 0.750	**1.02** 0.04	IR-111412	**0.023** 0.050	**17.455** 0.6872	**17.445** 0.6868	**17.478** 0.6881	**17.470** 0.6878	HJ-142212
3/4	**19.050** 0.7500	**25.400** 1.0000	**19.05** 0.750	**1.02** 0.04	IR-121612	**0.032** 0.070	**19.042** 0.7497	**19.030** 0.7492	**19.068** 0.7507	**19.058** 0.7503	HJ-162412
	19.050 0.7500	**25.400** 1.0000	**25.40** 1.000	**1.02** 0.04	IR-121616	**0.041** 0.090	**19.042** 0.7497	**19.030** 0.7492	**19.068** 0.7507	**19.058** 0.7503	HJ-162416
13/16	**20.638** 0.8125	**25.400** 1.0000	**25.40** 1.000	**1.02** 0.04	IR-131616	**0.032** 0.070	**20.630** 0.8122	**20.617** 0.8117	**20.655** 0.8132	**20.645** 0.8128	HJ-162416
7/8	**22.225** 0.8750	**28.575** 1.1250	**25.40** 1.000	**1.02** 0.04	IR-141816	**0.050** 0.110	**22.217** 0.8747	**22.205** 0.8742	**22.243** 0.8757	**22.233** 0.8753	HJ-182616
	22.225 0.8750	**28.575** 1.1250	**31.75** 1.250	**1.02** 0.04	IR-141820	**0.059** 0.130	**22.217** 0.8747	**22.205** 0.8742	**22.243** 0.8757	**22.233** 0.8753	HJ-182620
15/16	**23.813** 0.9375	**28.575** 1.1250	**25.40** 1.000	**1.02** 0.04	IR-151816	**0.036** 0.080	**23.805** 0.9372	**23.792** 0.9367	**23.830** 0.9382	**23.820** 0.9378	HJ-182616
	23.813 0.9375	**28.575** 1.1250	**31.75** 1.250	**1.02** 0.04	IR-151820	**0.045** 0.100	**23.805** 0.9372	**23.792** 0.9367	**23.830** 0.9382	**23.820** 0.9378	HJ-182620
1	**25.400** 1.0000	**31.750** 1.2500	**25.40** 1.000	**1.02** 0.04	IR-162016	**0.054** 0.120	**25.392** 0.9997	**25.380** 0.9992	**25.418** 1.0007	**25.408** 1.0003	HJ-202816
	25.400 1.0000	**31.750** 1.2500	**31.75** 1.250	**1.02** 0.04	IR-162020	**0.068** 0.150	**25.392** 0.9997	**25.380** 0.9992	**25.418** 1.0007	**25.408** 1.0003	HJ-202820
1 1/8	**28.575** 1.1250	**34.925** 1.3750	**25.40** 1.000	**1.02** 0.04	IR-182216	**0.059** 0.130	**28.567** 1.1247	**28.555** 1.1242	**28.593** 1.1257	**28.583** 1.1253	HJ-223016
	28.575 1.1250	**34.925** 1.3750	**31.75** 1.250	**1.02** 0.04	IR-182220	**0.077** 0.170	**28.567** 1.1247	**28.555** 1.1242	**28.593** 1.1257	**28.583** 1.1253	HJ-223020
1 3/16	**30.163** 1.1875	**38.100** 1.5000	**31.75** 1.250	**1.52** 0.06	IR-192420	**0.100** 0.220	**30.155** 1.1872	**30.142** 1.1867	**30.180** 1.1882	**30.170** 1.1878	HJ-243320
1 1/4	**31.750** 1.2500	**38.100** 1.5000	**25.40** 1.000	**1.52** 0.06	IR-202416	**0.068** 0.150	**31.740** 1.2496	**31.725** 1.2490	**31.770** 1.2508	**31.760** 1.2504	HJ-243316
1 1/4	**31.750** 1.2500	**38.100** 1.5000	**31.75** 1.250	**1.52** 0.06	IR-202420	**0.082** 0.180	**31.740** 1.2496	**31.725** 1.2490	**31.770** 1.2508	**31.760** 1.2504	HJ-243320
1 5/16	**33.338** 1.3125	**41.275** 1.6250	**25.40** 1.000	**1.52** 0.06	IR-212616	**0.086** 0.190	**33.327** 1.3121	**33.312** 1.3115	**33.358** 1.3133	**33.348** 1.3129	HJ-263516
	33.338 1.3125	**41.275** 1.6250	**31.75** 1.250	**1.52** 0.06	IR-212620	**0.109** 0.240	**33.327** 1.3121	**33.312** 1.3115	**33.358** 1.3133	**33.348** 1.3129	HJ-263520
1 3/8	**34.925** 1.3750	**41.275** 1.6250	**31.75** 1.250	**1.52** 0.06	IR-222620	**0.091** 0.200	**34.915** 1.3746	**34.900** 1.3740	**34.945** 1.3758	**34.935** 1.3754	HJ-263520
	34.925 1.3750	**44.450** 1.7500	**31.75** 1.250	**1.52** 0.06	IR-222820	**0.141** 0.310	**34.915** 1.3746	**34.900** 1.3740	**34.945** 1.3758	**34.935** 1.3754	HJ-283720
1 7/16	**36.513** 1.4375	**44.450** 1.7500	**25.40** 1.000	**1.52** 0.06	IR-232816	**0.095** 0.210	**36.502** 1.4371	**36.487** 1.4365	**36.533** 1.4383	**36.523** 1.4379	HJ-283716
	36.513 1.4375	**44.450** 1.7500	**31.75** 1.250	**1.52** 0.06	IR-232820	**0.118** 0.260	**36.502** 1.4371	**36.487** 1.4365	**36.533** 1.4383	**36.523** 1.4379	HJ-283720
1 1/2	**38.100** 1.5000	**44.450** 1.7500	**25.40** 1.000	**1.52** 0.06	IR-242816	**0.077** 0.170	**38.090** 1.4996	**38.075** 1.4990	**38.120** 1.5008	**38.110** 1.5004	HJ-283716
	38.100 1.5000	**44.450** 1.7500	**31.75** 1.250	**1.52** 0.06	IR-242820	**0.095** 0.210	**38.090** 1.4996	**38.075** 1.4990	**38.120** 1.5008	**38.110** 1.5004	HJ-283720
	38.100 1.5000	**50.800** 2.0000	**31.75** 1.250	**1.52** 0.06	IR-243220	**0.209** 0.460	**38.090** 1.4996	**38.075** 1.4990	**38.120** 1.5008	**38.110** 1.5004	HJ-324120
1 9/16	**39.688** 1.5625	**47.625** 1.8750	**31.75** 1.250	**1.52** 0.06	IR-253020	**0.127** 0.280	**39.677** 1.5621	**39.662** 1.5615	**39.708** 1.5633	**39.698** 1.5629	HJ-303920
	39.688 1.5625	**50.800** 2.0000	**31.75** 1.250	**1.52** 0.06	IR-253220	**0.186** 0.410	**39.677** 1.5621	**39.662** 1.5615	**39.708** 1.5633	**39.698** 1.5629	HJ-324120
1 5/8	**41.275** 1.6250	**50.800** 2.0000	**31.75** 1.250	**1.52** 0.06	IR-263220	**0.163** 0.360	**41.265** 1.6246	**41.250** 1.6240	**41.295** 1.6258	**41.285** 1.6254	HJ-324120
1 11/16	**42.863** 1.6875	**50.800** 2.0000	**25.40** 1.000	**1.52** 0.06	IR-273216	**0.109** 0.240	**42.852** 1.6871	**42.837** 1.6865	**42.883** 1.6883	**42.873** 1.6879	HJ-324116
	42.863 1.6875	**50.800** 2.0000	**31.75** 1.250	**1.52** 0.06	IR-273220	**0.136** 0.300	**42.852** 1.6871	**42.837** 1.6865	**42.883** 1.6883	**42.873** 1.6879	HJ-324120
1 3/4	**44.450** 1.7500	**57.150** 2.2500	**38.10** 1.500	**1.52** 0.06	IR-283624	**0.286** 0.630	**44.440** 1.7496	**44.425** 1.7490	**44.470** 1.7508	**44.460** 1.7504	HJ-364824
	44.450 1.7500	**57.150** 2.2500	**44.45** 1.750	**1.52** 0.06	IR-283628	**0.336** 0.740	**44.440** 1.7496	**44.425** 1.7490	**44.470** 1.7508	**44.460** 1.7504	HJ-364828
1 15/16	**49.213** 1.9375	**63.500** 2.5000	**38.10** 1.500	**2.03** 0.08	IR-314024	**0.358** 0.790	**49.202** 1.9371	**49.187** 1.9365	**49.233** 1.9383	**49.223** 1.9379	HJ-405224
	49.213 1.9375	**63.500** 2.5000	**44.45** 1.750	**2.03** 0.08	IR-314028	**0.417** 0.920	**49.202** 1.9371	**49.187** 1.9365	**49.233** 1.9383	**49.223** 1.9379	HJ-405228

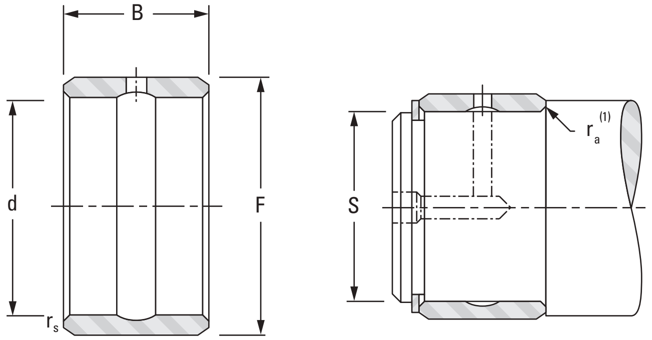
[1] $r_{a\ max.}$ is equal to the minimum bearing chamfer ($r_{s\ min.}$).

Continued on next page.

INNER RINGS

INCH SERIES

- Check for availability.
- Ideal choice when shaft is not practical to use as inner raceway.
- Provided in inch nominal dimensions for use with inch series heavy-duty needle roller bearings.
- Designed to meet established inch tolerances.
- Selected size should be wider than matching needle roller bearing.
- Maximum shaft fillet radius ($r_{a\,max.}$) cannot exceed inner ring bore chamfer ($r_{s\,min.}$) as shown.
- Optional centralized lubrication groove (bore) or through-hole available. Specify when ordering.
- Designed to be axially clamped against shoulder for loose transition fit on shaft.
- After mounting, for tight transition fit (keeping inner ring from rotating relative to shaft), inner ring O.D. must not exceed raceway diameter on matching bearing. (See mounting dimensions in the bearing table for the required raceway diameter).
- After mounting, if O.D. of inner ring exceeds the required raceway diameter for matching bearing, ring should be ground to proper diameter while mounted on shaft.
- Meets ASTMF-2431.



Shaft Dia.	d	F	B	$r_{s\,min.}$	Bearing Designation	Approx. Wt.	Loose Transition Fit		Interference Fit		Used With Bearing Designation
							S		S		
							Max.	Min.	Max.	Min.	
in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs	**mm** in	**mm** in	**mm** in	**mm** in	
2	**50.800** 2.0000	**63.500** 2.5000	**38.10** 1.500	**2.03** 0.08	IR-324024	**0.322** 0.710	**50.790** 1.9996	**50.772** 1.9989	**50.823** 2.0009	**50.810** 2.0004	HJ-405224
	50.800 2.0000	**63.500** 2.5000	**44.45** 1.750	**2.03** 0.08	IR-324028	**0.376** 0.830	**50.790** 1.9996	**50.772** 1.9989	**50.823** 2.0009	**50.810** 2.0004	HJ-405228
2 3/16	**55.563** 2.1875	**69.850** 2.7500	**44.45** 1.750	**2.03** 0.08	IR-354428	**0.467** 1.030	**55.552** 2.1871	**55.535** 2.1864	**55.585** 2.1884	**55.573** 2.1879	HJ-445628
2 1/4	**57.150** 2.2500	**69.850** 2.7500	**38.10** 1.500	**2.03** 0.08	IR-364424	**0.358** 0.790	**57.140** 2.2496	**57.122** 2.2489	**57.173** 2.2509	**57.160** 2.2504	HJ-445624
	57.150 2.2500	**69.850** 2.7500	**44.45** 1.750	**2.03** 0.08	IR-364428	**0.417** 0.920	**57.140** 2.2496	**57.122** 2.2489	**57.173** 2.2509	**57.160** 2.2504	HJ-445628
2 3/8	**60.325** 2.3750	**76.200** 3.0000	**44.45** 1.750	**2.03** 0.08	IR-384828	**0.562** 1.240	**60.315** 2.3746	**60.297** 2.3739	**60.348** 2.3759	**60.335** 2.3754	HJ-486028
2 1/2	**63.500** 2.5000	**76.200** 3.0000	**38.10** 1.500	**2.03** 0.08	IR-404824	**0.395** 0.870	**63.490** 2.4996	**63.472** 2.4989	**63.523** 2.5009	**63.510** 2.5004	HJ-486024
	63.500 2.5000	**76.200** 3.0000	**44.45** 1.750	**2.03** 0.08	IR-404828	**0.463** 1.020	**63.490** 2.4996	**63.472** 2.4989	**63.523** 2.5009	**63.510** 2.5004	HJ-486028
2 3/4	**69.850** 2.7500	**82.550** 3.2500	**44.45** 1.750	**2.03** 0.08	IR-445228	**0.503** 1.110	**69.840** 2.7496	**69.822** 2.7489	**69.873** 2.7509	**69.860** 2.7504	HJ-526828
	69.850 2.7500	**82.550** 3.2500	**50.80** 2.000	**2.03** 0.08	IR-445232	**0.576** 1.270	**69.840** 2.7496	**69.822** 2.7489	**69.873** 2.7509	**69.860** 2.7504	HJ-526832
2 15/16	**74.613** 2.9375	**88.900** 3.5000	**50.80** 2.000	**2.03** 0.08	IR-475632	**0.694** 1.530	**74.602** 2.9371	**74.585** 2.9364	**74.635** 2.9384	**74.623** 2.9379	HJ-567232
3	**76.200** 3.0000	**88.900** 3.5000	**50.80** 2.000	**2.03** 0.08	IR-485632	**0.621** 1.370	**76.190** 2.9996	**76.172** 2.9989	**76.223** 3.0009	**76.210** 3.0004	HJ-567232

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(1) $r_{a\,max.}$ is equal to the minimum bearing chamfer ($r_{s\,min.}$).

NOTES

TRACK ROLLERS

Overview: Track rollers (also known as cam followers) are characterized by their thick-walled outer rings that run directly on a track. The thick outer rings permit high load-carrying capability while minimizing both distortion and bending stresses. Sealed designs with internal thrust washers help extend service life under conditions of infrequent lubrication.

- **Catalog range:** Stud-Type: 12.7 mm – 152.4 mm (0.5 in – 6 in) O.D.
  Yoke-Type: 16 mm – 152.4 mm (0.6299 in – 6 in) O.D.
- **Markets:** Ram support rollers, material handling and indexing equipment.
- **Features:** Available in two basic designs: with an inner ring for straddle mounting in a yoke or with an integral stud for cantilever mounting.
- **Benefits:** High load-carrying capability with minimized distortion and bending stresses.
  Extended service life under conditions of infrequent re-lubrication.

Caged Yoke-Type Track Rollers – Metric Nominal Dimensions

Bore diameter from 10 mm to 17 mm (for NA22)

00 = 10 mm	**02** = 15 mm
01 = 12 mm	**03** = 17 mm

Bore diameter > 17 mm (for NA22)
05 = 25 mm

NA22 05 2RS

Prefix

NA22	track roller, yoke-type, profiled outer diameter, with inner ring, sealed
RNA22	track roller, yoke-type, profiled outer diameter, without inner ring, sealed
RSTO	track roller, yoke-type, profiled outer diameter, without inner ring, without washers
STO	track roller, yoke-type, profiled outer diameter, with inner ring, without washers
NATR	track roller, yoke-type, profiled outer diameter, with inner ring, with washers

Suffix

TN	molded cage of reinforced, engineered polymer
DZ	cylindrical outer diameter
ZZ	two washers for track rollers used for axial location
.2RS	lip contact seal on each side of the bearing
ZZ.DZ	two washers for track rollers used for axial location; cylindrical outer diameter
DZ.TN	cylindrical outer diameter; molded cage of reinforced, engineered polymer
.2RS.DZ	lip contact seal on each side of bearing; cylindrical outer diameter

STO 25 DZ

Bore diameter for STO, NATR
25 = 25 mm
45 = 45 mm

Caged Stud-Type Track Rollers – Metric Nominal Dimensions

Prefix Modification
E eccentric stud

Suffix

SK	hexagonal wrench socket in stud head
.2RS	lip contact seal on each side of the bearing

KR E 22 .2RS

Prefix
KR track roller, stud-type with cage, profiled outer diameter

Outer Diameter
22 = 22 mm

Full Complement Track Rollers – Inch Nominal Dimensions

Prefix

CR	stud-type
YCR	yoke-type

Outer Diameter

8 = 8⁄16 = 1⁄2 in	**32** = 32⁄16 = 2 in
16 = 16⁄16 = 1 in	**36** = 36⁄16 = 2 1⁄4 in

CR S B E - 16

Design Modifications

S	seals with internal thrust washers
B	hex wrench socket (CR Type only)
C	crowned O.D.
E	eccentric stud (CR Type only)
H	heavy stud (CR Type only)

Full Complement Yoke-Type Track Rollers – Metric Nominal Dimensions

Prefix
NUTR track roller, yoke-type, crowned outer diameter with inner ring and washers (two paths of cylindrical rollers)

NUTR 45 100 .DZ

Suffix
.DZ cylindrical outer diameter (NUTR styles only)

Bore Diameter
6 = 6 mm
45 = 45 mm

Outer Diameter
19 = 19 mm
100 = 100 mm

Full Complement Stud-Type Track Rollers – Metric Nominal Dimensions

Outer Diameter
16 = 16 mm
19 = 19 mm
62 = 62 mm

Prefix

NUKR	track roller, stud-type, crowned outer diameter (two paths of cylindrical rollers)
KRV	track roller, stud-type, crowned outer diameter with full complement of needle rollers

KRV 16

NUKR E 62 .2SK

Prefix Modification
E eccentric stud (NUKR style only)

Suffix
.2SK hexagonal socket in stud head (NUKR styles only)

Track Rollers

STUD-TYPE AND YOKE-TYPE TRACK ROLLERS METRIC SERIES **Page**

STUD-TYPE METRIC SERIES

YOKE-TYPE METRIC SERIES

STUD-TYPE AND YOKE-TYPE TRACK ROLLERS-FULL COMPLEMENT INCH SERIES **Page**

STUD-TYPE AND YOKE-TYPE TRACK ROLLERS

METRIC SERIES

JTEKT track rollers listed in this catalog have been designed with outer rings of a large radial cross section to withstand heavy rolling and shock loads on track-type or cam-controlled equipment. The outer diameters of the outer rings are either crowned or cylindrical. Crowned track rollers are designed to alleviate uneven bearing loading resulting from deflection, bending or misalignment in mounting.

Stud-type track rollers are available in various open designs, as well as with lip contact seals or metal shields.

Yoke-type track rollers are designed for straddle mounting. The various metric series designs are grouped and organized on page B-5-7 and page B-5-8.

REFERENCE STANDARDS ARE:

- **ISO 7063** – needle roller bearings – track rollers – boundary dimensions.
- **ISO 492** – Rolling bearing – Radial bearing – Geometrical product specifications (GPS) and tolerance values.
- **DIN 620** – tolerances of ball and roller bearings.
- **ISO 281** – rolling bearings – dynamic load ratings and rating life.

Fig. B5-1. Stud-type track rollers

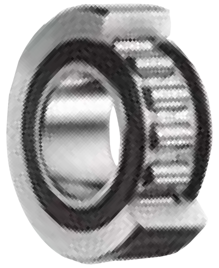


Fig. B5-2. Yoke-type track rollers

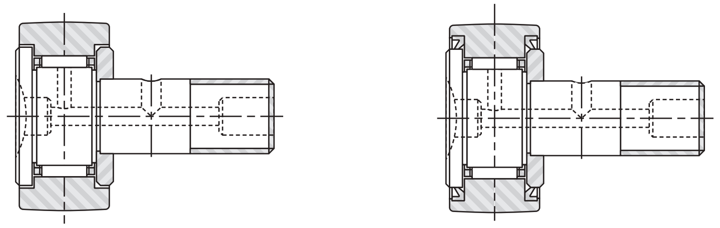
Suffixes – Stud-Type, Metric Series

.2RS	two seals
SK	hexagonal socket in flange end
2SK	hexagonal socket in both flange and stud ends

Suffixes – Yoke-Type, Metric Series

DZ.TN	cylindrical outer diameter • molded cage of reinforced engineered polymer
TN	molded cage of reinforced engineered polymer
DZ	cylindrical outer diameter
ZZ	two end washers for the outer ring
ZZ.DZ	two end washers for the outer ring • cylindrical outer diameter
.2RS	two seals
.2RS.DZ	two seals • cylindrical outer diameter

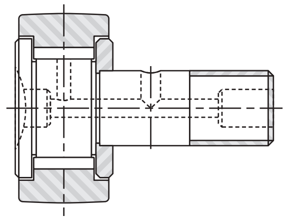
STUD-TYPE METRIC SERIES TRACK ROLLER TYPES



KR.2SK
KR.SK (D≤19 mm(0.7480 in))

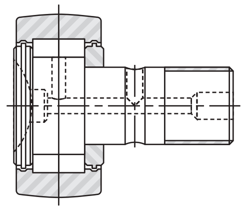
KR.2RS.2SK
KR.2RS.SK (D≤19 mm(0.7480 in))

Fig. B5-3. Stud-type track rollers, caged needle rollers



KRV.2SK
KRV.SK (D≤19 mm(0.7480 in))

Fig. B5-4. Stud-type track rollers, full complement needle rollers



NUKR.2SK

Fig. B5-5. Stud-type track rollers, full complement cylindrical rollers

TYPES OF METRIC SERIES YOKE-TYPE TRACK ROLLERS

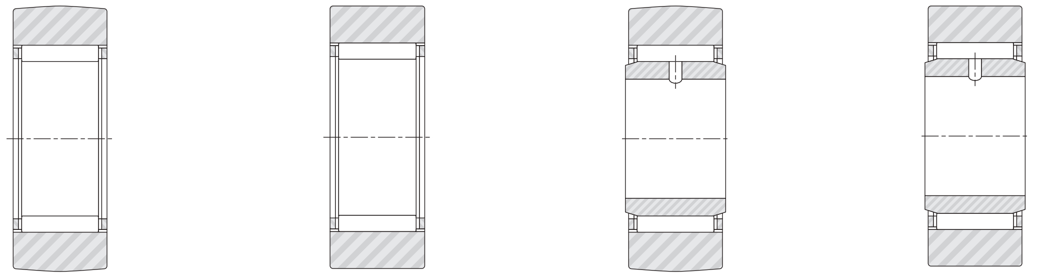

RSTO RSTO.DZ STO STO.DZ

Fig. B5-6. Yoke-type track rollers without end washers

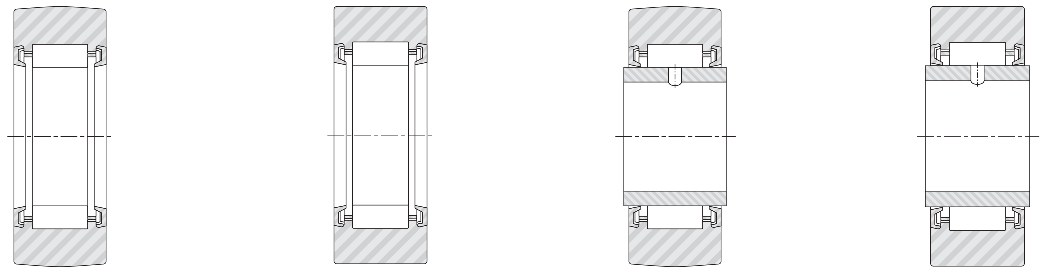

RNA22.2RS RNA22.2RS.DZ NA22.2RS NA22.2RS.DZ

Fig. B5-7. Sealed yoke-type track rollers without end washers

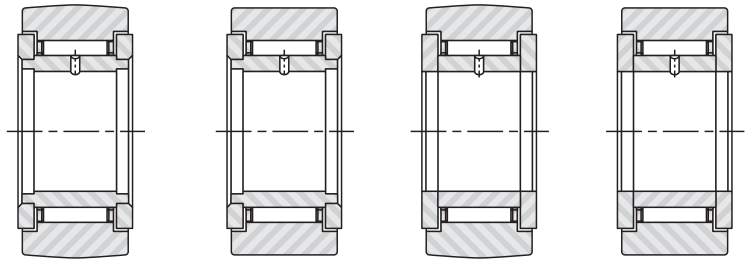

NATR NATR.DZ STO.ZZ STO.ZZ.DZ

Fig. B5-8. Yoke-type track rollers with end washers

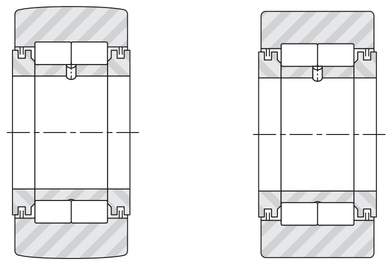

NUTR NUTR.DZ

Fig. B5-9. Yoke-type track rollers with end washers, full complement of cylindrical rollers

CONSTRUCTION

STUD-TYPE TRACK ROLLERS

The metric series stud-type track roller is a non-separable unit – consisting of a large radial cross section outer ring, radial needle roller and cage assembly, or a full complement of needle or cylindrical rollers, a stud and a retaining washer securely fastened to the stud.

The seals on the sealed stud-type track rollers are located in the counterbores of the outer ring and seal against the stud flange and the retaining washer, providing good retention of lubricant and exclusion of foreign material. The seals are thermally stable in a temperature range between -30˚ C and 110˚ C (-25˚ F and 225˚ F).

A screwdriver slot (standard) or a hexagonal wrench socket (customer requested) in the head of the stud facilitates mounting. Metric series hexagonal socket sizes are listed in Table B5-1.

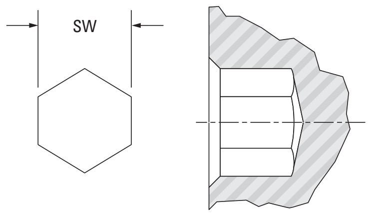


Fig. B5-10. Hexagonal socket – metric series.

Table B5-1. Hexagonal socket wrench sizes

Stud-type track roller O.D.		
>	≤	SW
mm in	**mm** in	**mm** in
- -	**16.000** 0.6299	**3.000** 0.1181
16.000 0.6299	**19.000** 0.7480	**4.000** 0.1575
19.000 0.7480	**26.000** 1.0236	**5.000** 0.1969
26.000 1.0236	**32.000** 1.2598	**6.000** 0.2362
32.000 1.2598	**40.000** 1.5748	**8.000** 0.3150
40.000 1.5748	**52.000** 2.0472	**10.000** 0.3937
52.000 2.0472	**-** -	**14.000** 0.5511

ECCENTRIC STUDS FOR STUD-TYPE TRACK ROLLERS

To provide radial adjustment of the outer ring toward the track or cam surface at the time of installation, some metric series stud-type track rollers are available with eccentric studs – specified by adding the letter "E" to the designation letters: KRE and NUKRE. Appropriate dimensions of the eccentric stud bushing are listed in Table B5-2 on page B-5-9.

Since a track roller with an eccentric stud is usually adjusted upon installation by turning the stud in the mounting hole, a close clearance fit between the outer diameter of the bushing and the mounting hole is necessary. For turning the stud, a hexagonal wrench is generally more convenient than a screwdriver. Thus, the option of a hexagonal wrench socket in the head of the stud should be exercised.

Some applications may require more secure positioning than provided by the tightened stud nut. If so, it is recommended that the mounting hole and the eccentric bushing be drilled at the time of installation to accept a locating dowel pin.

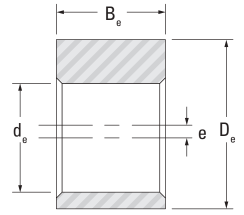


Fig. B5-11. Eccentric bushing dimensions – metric series

Table B5-2. Eccentric bushing dimensions – metric series

Stud-type track roller O.D.		d_e	D_e	B_e	e
>	≤	Eccentric bushing dimensions			
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
19.000 07480	**19.000** 0.7480	**8.000** 0.3150	**11.000** 0.4331	**9.000** 0.3543	**0.500** 0.0197
22.000 0.8661	**26.000** 1.10236	**10.000** 0.3937	**13.000** 0.5118	**10.000** 0.3937	**0.500** 0.0197
30.000 1.1811	**32.000** 1.2598	**12.000** 0.4724	**15.000** 0.5905	**11.000** 0.4331	**0.500** 0.0197
35.000 1.3779	**35.000** 1.3779	**16.000** 0.6299	**20.000** 0.7874	**14.000** 0.5512	**1.000** 0.0394
40.000 1.5748	**40.000** 1.5748	**18.000** 0.7087	**22.000** 0.8661	**16.000** 0.6299	**1.000** 0.0394
47.000 1.8504	**52.000** 2.0472	**20.000** 0.7874	**24.000** 0.9449	**18.000** 0.7087	**1.000** 0.0394
62.000 2.4409	**72.000** 2.8346	**24.000** 0.9449	**28.000** 1.1024	**22.000** 0.8661	**1.000** 0.0394
80.000 3.1496	**90.000** 3.5433	**30.000** 1.1811	**35.000** 1.3779	**29.000** 1.1417	**1.500** 0.0591

METRIC SERIES YOKE-TYPE TRACK ROLLERS WITHOUT END WASHERS

These yoke-type track rollers are available with a profiled or a cylindrical outer diameter of the outer ring, and with or without a separable inner ring. Since they are supplied without end washers, their outer rings must be guided by the adjacent end locating surfaces. Tolerance class F6 is the normal specification for the bore of the metric series radial needle roller and cage assemblies used with these yoke-type track rollers.

YOKE-TYPE TRACK ROLLERS – SERIES RSTO AND STO

Series STO have a separable inner ring and when the inner ring is removed they become series RSTO. They run directly on a hardened and ground inner raceway. Quality requirements for inner raceways are given in the engineering section of this catalog.

SEALED YOKE-TYPE TRACK ROLLERS WITHOUT END WASHERS – SERIES RNA 22.2RS AND NA22.2RS

These yoke-type track rollers have the same bore diameter and outer diameter as most of the other metric series yoke-type track rollers listed in this catalog. The thick section outer ring is made of one-piece channel-shaped bearing-quality steel – heat-treated to yield maximum load-carrying capability. The integral end flanges provide axial guidance for the large diameter needle rollers, and a cage supplies their inward retention. These track rollers have two integral lip contact seals designated by .2RS. The seals are thermally stable in a temperature range between -30° C and 110° C (-25° F and 225° F). Care should be exercised when mounting track rollers without inner rings onto inner raceways, to avoid damage to the seals.

METRIC SERIES YOKE-TYPE TRACK ROLLERS WITH END WASHERS

These yoke-type track rollers are available with a crowned or a cylindrical outer diameter to the outer ring. Metric series yoke-type track rollers with end washers – depending on the internal construction – may be end guided, either through the end washers or between the end faces of the rollers and the inside faces of the outer ring flanges.

YOKE-TYPE TRACK ROLLERS – SERIES NATR AND STO.ZZ

The series NATR yoke-type track rollers are of non-separable design, consisting of a crowned or a cylindrical outer ring, caged needle rollers, an inner ring and two retaining end washers securely fastened to the inner ring. The series STO.ZZ yoke-type track rollers are of separable design with two loose end washers. These end washers, placed in the counter bores of the outer ring, form very effective labyrinth-type shields, providing good retention of lubricant and exclusion of foreign material. A lubrication hole in the inner ring enables re-lubrication when a cross-drilled bolt or shaft – which can be serviced from the end – is used.

YOKE-TYPE TRACK ROLLERS – SERIES NUTR

The series NUTR yoke-type track rollers are of non-separable design consisting of a crowned or cylindrical outer ring, two rows of full complements of cylindrical rollers, an inner ring, two retaining end washers and two shields. The outer ring is located axially through the cylindrical rollers.

A lubricating hole in the inner ring enables re-lubrication when a cross-drilled bolt or shaft, which can be serviced from the end, is used.

The smallest track roller of this series has an outer diameter of 35.000 mm (1.3780 in). NUTR yoke-type track rollers are well-suited to carry high loads and designs with a thicker outer ring and particularly suitable for high shock loads. Designs with thicker outer rings have a larger outer diameter which can be identified by the bearing designation (e.g., NUTR 1542).

DIMENSIONAL ACCURACY

The tolerances of the basic metric series caged roller and NUKR stud-type and yoke-type track rollers, whose outer rings have a cylindrical outer diameter, correspond to tolerances specified in ISO 492 Radial bearings tolerances. The outer ring tolerances given in Table B5-3 apply to the outer rings used in the caged roller and NUKR stud-type and caged roller and NUTR yoke-type, metric series, track rollers. Metric series track rollers with a crowned outer diameter are the exception – their outer diameter tolerance is 0-0.05 for all caged roller sizes and NUTR, NUKR types. The remaining types have h9 tolerance on profiled outer diameters and h7 for straight diameters. Stud diameter and stud length tolerances are given in Table B5-4. The inner ring tolerances, given in Table B5-5 on page B-5-12, apply to inner rings used in metric series caged roller, NUKR Series yoke-type track rollers.

MOUNTING

STUD-TYPE TRACK ROLLERS

When the stud shank of a metric series stud-type track roller is mounted in a hole of tolerance H7, the installation force should be applied only to the center portion of the flanged end of the stud – preferably with an arbor press. The surface of the hole in the machine element which supports the stud must not deform under the expected load. And the support should be sufficiently rigid to resist bending loads. Deformation and bending will cause uneven loading of the outer ring.

Table B5-4. Tolerances for stud diameter and stud length – metric series

d_1		Δd_{1s}		B_2	ΔB_2	
Stud diameters				Stud lengths		
>	≤	Max.	Min.		Max.	Min.
mm		µm		mm		
3	**6**	**0**	**-12**	all lengths	**0**	**-1**
6	**10**	**0**	**-15**			
10	**18**	**0**	**-18**			
18	**30**	**0**	**-21**			
30	**50**	**0**	**-25**			
50	**80**	**0**	**-30**			
80	**100**	**0**	**-35**			

Table B5-3. Outer ring – metric series (caged roller and NUKR, NUTR types)

Nominal outside dia. D		Single plane mean outside diameter deviation ΔDmp				Deviation of a single outer ring width ΔCs		Radial runout of assembled bearing outer ring Kea
		Cylindrical		Crowned				
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
10.000 0.3937	**18.000** 0.7087	**0.000** 0.0000	**-0.008** -0.0003	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.015** 0.0006
18.000 0.7087	**30.000** 1.1811	**0.000** 0.0000	**-0.009** -0.00035	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.015** 0.0006
30.000 1.1811	**50.000** 1.9685	**0.000** 0.0000	**-0.011** -0.0004	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.020** 0.0008
50.000 1.9685	**80.000** 3.1496	**0.000** 0.0000	**-0.013** -0.0005	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.025** 0.0010
80.000 3.1496	**120.000** 4.7244	**0.000** 0.0000	**-0.015** -0.0006	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.035** 0.0014
120.000 4.7244	**150.000** 5.9055	**0.000** 0.0000	**-0.018** -0.0007	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.120** -0.0047	**0.040** 0.0016
150.000 5.9055	**180.000** 7.0866	**0.000** 0.0000	**-0.025** -0.0010	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.150** -0.0059	**0.045** 0.0018
180.000 7.0866	**240.000** 9.4488	**0.000** 0.0000	**-0.030** -0.0012	**0.000** 0.0000	**-0.050** -0.0020	**0.000** 0.0000	**-0.200** -0.0079	**0.050** 0.0020

Table B5-5. Inner ring – metric series (caged roller types)

Nominal bore diameter d		Single plane mean bore diameter deviation Δdmp		Single inner ring width ΔBs	
>	≤	Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in
2.500 0.0984	**18.000** 0.7087	**0.000** 0.0000	**-0.008** -0.0003	**0.000** 0.0000	**-0.180** -0.0071
18.000 0.7087	**30.000** 1.1811	**0.000** 0.0000	**0.010** -0.0004	**0.000** 0.0000	**-0.210** -0.0083
30.000 1.1811	**50.000** 1.9685	**0.000** 0.0000	**-0.012** -0.0005	**0.000** 0.0000	**-0.250** -0.0098
50.000 1.9685	**80.000** 3.1496	**0.000** 0.0000	**-0.015** '-0.0006	**0.000** 0.0000	**-0.300** -0.0118
80.000 3.1496	**120.000** 4.7244	**0.000** 0.0000	**-0.020** -0.0008	**0.000** 0.0000	**-0.350** -0.0138

In mounting the stud-type track roller, the retaining washer must be firmly backed up by a flat shoulder which is square with the stud center line. The shoulder diameter must be no smaller than the minimum clamping diameter, d_a listed in the bearing tables.

The maximum inherent strength of the stud is obtained when the track roller is supported, as close as possible, to the retaining washer – which minimizes the bending moment. For this reason the edge of the housing – which supports the stud shank – should be kept as sharp as practical but free from burrs.

The clamping nut should not be tightened with a torque value higher than the maximum listed. A screwdriver slot, or hexagonal wrench socket in the flanged end of the stud, is provided for a tool to prevent the stud from turning when the nut is being tightened. Since the bottom of the screwdriver slot is not flat, it is helpful to put a radius on the tip of the screwdriver being used to hold the stud more securely. Hexagonal nuts are supplied with all metric series stud-type track rollers.

YOKE-TYPE TRACK ROLLERS

The machine element with the holes in which the mounting bolt or shaft is supported must be sufficiently rigid to resist local crushing under the applied load and to resist bending which can cause uneven loading of the needle rollers.

When applied loads are high, the h6 or j6 tolerance should be used in conjunction with a high strength shaft or bolt for mounting metric series yoke-type track rollers. When loads are moderate, a g6 tolerance may be used with a high strength shaft or bolt. For light loads, the loose transition fit with the f6 tolerance may be used with an unhardened shaft or bolt.

The yoke-type track rollers with inner rings – including those with end washers as well as inner rings – should be clamped endwise between parallel faces, perpendicular to the axis to prevent the retaining washers from coming off under load. The dimensions of machine parts, adjoining the metric series yoke-type track rollers, should be based on the minimum clamping diameter d_a to ensure that the washers are adequately supported. If the track roller cannot be end clamped, a close axial fit in the yoke is required. Care should be taken to assure that the lubricating hole is located in the unloaded zone of the raceway.

The metric series yoke-type track rollers without inner rings require a hardened and ground shaft, or bolt with a k5 tolerance. Inner raceway quality requirements are given in the engineering section.

LOAD RATINGS

DYNAMIC LOADING AS A TRACK ROLLER

When the outer ring of a stud-type or yoke-type track roller runs on a track, the contact – under a radial load – causes elastic (oval) deformation of the outer ring. As a result, a smaller zone of the raceway is loaded and the load is distributed on fewer needle rollers. This, in turn, affects the dynamic and static load ratings of the track rollers. Also, this deformation generates bending stress in the outer ring which must not exceed the maximum permitted for the material of the outer ring. The maximum permissible dynamic ($F_{r\ perm}$) radial load condition is determined by this requirement.

The rating life of stud-type or yoke-type track rollers should be calculated using the dynamic load ratings, C_w, shown in the following tables. The tables also show the maximum permissible radial load, $F_{r\ perm}$, that can be dynamically applied on stud-type or yoke-type track rollers. However, to calculate the L_{10} life of a track roller, the applied radial load must not be greater than $C_w/2$ based on ideal operating conditions of alignment, lubrication, temperature, speed and accelerations.

Example:

Given: A track roller application for a linear slide in which each roller supports a 4.45 kN (1000 lbf.) load and travels at 609.600 mm (24.0000 in) per second.

Select a track roller and calculate the L_{10} life in hours assuming continuous operation at the given speed. Assume conditions of alignment, lubrication and temperature are ideal.

Solution: Calculate the minimum C_w required.

The applied radial load must not be greater than $C_w/2$ based on ideal operating conditions.

Therefore, $Fr < C_w/2$ or $C_w > 8.9$ kN (2000 lbf.)

For a KRV30, $C_w = 9.85$ kN (2210 lbf.)

To calculate the speed in min^{-1}, V = Pi · D · n

Where:

V = linear velocity
Pi = 3.14
D = outside diameter of the track roller assembly

Therefore, 609.600 mm (24.000 in)/sec. = 3.14 · 30.000 mm · n

Making appropriate substitutions and solving for n yields a value of approximately 388 min^{-1}.

The standard catalog life equation of a roller bearing is:

$$L_{10} = (C/P)10/3 \cdot (16667/n)$$

Where:

L_{10} = calculated fatigue life in hours
C = the dynamic radial load ratings based on 1000000 revolutions
P = the dynamic equivalent radial load
n = speed in min^{-1}

Substituting C_w for C and solving:

$$L_{10} = (9.85/4.45)\ 10/3 \cdot (16667/388) = 604 \text{ hours}$$

STATIC RATING AS A TRACK ROLLER

In addition to the basic static load rating, C_0, the tables also list the maximum permissible static radial load, $F_{0r\ perm}$, that may be applied to a stud-type or yoke-type metric series track roller. The values of $F_{0r\ perm}$ result in a calculated minimum static factor f_s of 0.7 for the worst condition of internal load distribution in metric series track roller operation. The $F_{0r\ perm}$ values must not be exceeded. Exceeding $F_{0r\ perm}$ may cause permanent damage to the track roller. A damaged track roller could cause the equipment in which the track roller is installed to malfunction. The static factor f_s can be calculated using the following formula:

$$f_s \geq 0.7 \left(\frac{F_{0r\ perm}}{P_{0r}} \right)$$

Where:

$F_{0r\ perm}$ = Maximum permissible static radial load
P_{0r} = Equivalent static load (F_{0r} for yoke-type track rollers)
F_{0r} = Static radial load
f_s = Static factor whose values should not be smaller than those suggested in Table B5-6.

Table B5-6. Suggested values for static factors f_s for metric series track rollers

Requirements for yoke – type track rollers and stud – type track rollers	Suggested f_s values	
	Max.	Min.
High shock-type loads Quiet running	2.5	1.5
Normal loading Normal quietness of running	1.5	1
Minor impact loads and rotary motion particularly quiet running not required	1	0.7

LUBRICATION OF STUD-TYPE TRACK ROLLERS

JTEKT metric series stud-type track rollers are supplied with a lithium soap-based, general-purpose grease. When the caged KR Series track rollers are operated at low speeds, with light loads and in clean environments, there is often no need to re-lubricate the track roller. In other applications, periodic re-lubrication may be necessary to obtain optimum performance. The full complement series of track rollers have less internal volume available for grease storage. Therefore, they may require more frequent lubrication than caged-type track rollers. Stud-type track rollers – with a screwdriver slot in the flanged end of the stud – have provisions for re-lubrication through the flanged end of the stud. Metric series stud-type track rollers, with hexagonal sockets, can not be re-lubricated from the flanged end of the stud. Both types of metric series stud-type track rollers – with outer diameters larger than 22.000 mm (0.8661 in) – allow for re-lubrication through the threaded end of the stud. In addition, caged roller and NUKR Series stud-type track rollers – with 30.000 mm (1.8110 in) and larger outer diameters – allow for re-lubrication through a cross-drilled hole in the stud shank. The ends of the axial holes are counterbored to accept press-fit grease fittings of series VENN. The grease fittings are supplied with metric series stud-type track rollers. Hole diameters (d_4) for these grease fittings are listed in the tables of dimensions on pages later in this chapter as it applies.

One or more plugs are supplied with every metric series stud-type track roller, to close off unused holes. At the flanged end, the plug must not be pushed in too deeply, as it may cover the cross-drilled lubricating hole. The plug should be pressed in using an installation tool whose dimensions are given in Table B5-8. If the cross-drilled hole in the stud shank is not used, it will be covered when the track roller is properly installed.

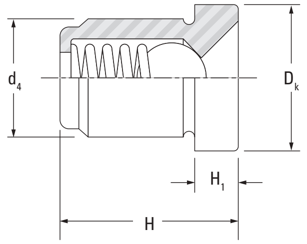


Fig. B5-12. Metric series grease fittings

Table B5-7. Metric series grease fittings, series VENN

Designation	d_4	D_k	H	H_1	Approx. wt.
	mm in	**mm** in	**mm** in	**mm** in	**g** lbs
VENN 4	**4.000** 0.1575	**6.000** 0.2362	**6.000** 0.2362	**1.500** 0.0591	**0.4** 0.0009
VENN 6	**6.000** 0.2362	**8.000** 0.3147	**7.000** 0.2756	**2.000** 0.0787	**1.6** 0.0035
VENN 8	**8.000** 0.3150	**10.000** 0.3937	**12.000** 0.4724	**3.000** 0.1181	**4.7** 0.0104

During installation of the track roller it is desirable to ensure that the cross-drilled hole is positioned in the unloaded zone of the track roller raceway. The location of the cross-drilled hole can be best recognized by its alignment with the manufacturer's stamp, parallel to the screwdriver slot (when applicable).

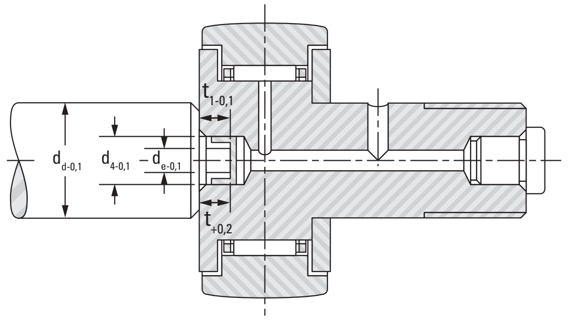


Fig. B5-13. Installation tool for metric series plug

Table B5-8. Installation tool for metric series plug

Stud-type track rollers O.D.		d_4	d_d	d_e	t	t_1
>	≤					
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
16.000 0.6299	**26.000** 1.0236	**3.900** 0.1535	**10.000** 0.3937	**2.700** 0.1063	**3.700** 0.1457	**4.500** 0.1772
30.000 1.1811	**40.000** 1.5748	**5.900** 0.2323	**12.000** 0.4724	**4.700** 0.1850	**4.700** 0.1850	**7.000** 0.2756
47.000 1.8504	**90.000** 3.5433	**7.900** 0.3110	**15.000** 0.5905	**6.700** 0.2638	**6.700** 0.2638	**10.000** 0.3937

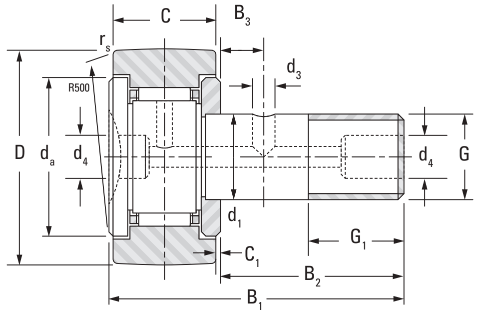
LUBRICATION OF YOKE-TYPE TRACK ROLLERS

Yoke-type track rollers are produced with a lubricating hole in the inner ring so they can be re-lubricated through a cross-drilled hole in the supporting shaft or bolt. When mounting yoke-type track rollers, care should be taken that the lubrication hole is located in the unloaded raceway zone.

Oil is the preferred lubricant for yoke-type track rollers. Continuous oil lubrication, or frequent grease lubrication should be used for steady rotating conditions. Applications involving slow, intermittent oscillations are not as critical, and longer intervals between re-lubrication are permitted. Sealed yoke-type track rollers are normally supplied with an initial charge of a medium-temperature grease. Caged yoke-type track rollers have maximum grease storage capacity and, consequently, longer pregreased life than full complement types.

NEEDLE ROLLER AND CAGE ASSEMBLIES, STUD-TYPE (KR SERIES)

METRIC SERIES



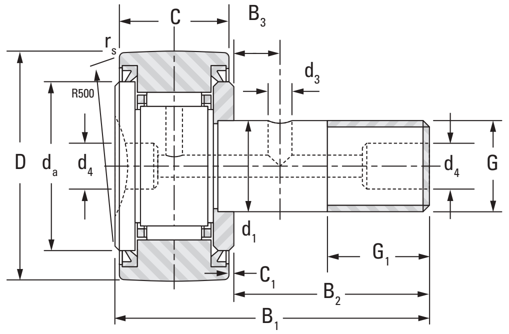
KR.2SK
KR.SK (D≤19 mm(0.7480 in))

Outer Dia.	d_1 h7	D	C	$r_{s\,min.}$	B_1	B_2	B_3	G_1	d_4	d_3	Thread	C_1	d_a
											G		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**mm** in	**mm** in
16 0.6299	**6** 0.2362	**16** 0.6299	**11** 0.433	**0.3** 0.012	**28.2** 1.110	**16** 0.630		**8** 0.315	**4** 0.157		M6x1	**0.6** 0.024	**11** 0.433
19 0.7480	**8** 0.3150	**19** 0.7480	**11** 0.433	**0.3** 0.012	**32.2** 1.268	**20** 0.787		**10** 0.394	**4** 0.157		M8x1.25	**0.6** 0.024	**13** 0.512
22 0.8661	**10** 0.3937	**22** 0.8661	**12** 0.472	**0.3** 0.012	**36.0** 1.417	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
26 1.0236	**10** 0.3937	**26** 1.0236	**12** 0.472	**0.3** 0.012	**36.0** 1.417	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
30 0.551	**12** 0.4724	**30** 1.1811	**14** 0.551	**0.6** 0.024	**40.0** 1.575	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827
32 0.551	**12** 0.4724	**32** 1.2598	**14** 0.551	**0.6** 0.024	**40.0** 1.575	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827

Crowned Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Approx. Wt.
	As a Bearing		As a Track Roller					
	Dynamic	Static	Dynamic		Static			
	C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$			
	kN lbf		**kN** lbf			**N-m** lb-in	min^{-1}	**kg** lbs
KR16.SK	**3.60** 810	**3.58** 800	**2.97** 670	**2.85** 640	**3.58** 800	**7** 62.0	17000	**0.019** 0.042
KR19.SK	**4.18** 940	**4.65** 1050	**3.28** 740	**3.29** 740	**4.22** 950	**16** 142	13000	**0.031** 0.068
KR22.2SK	**5.35** 1200	**6.79** 1530	**3.94** 890	**4.04** 910	**5.45** 1230	**28** 248	10000	**0.046** 0.101
KR26.2SK	**5.35** 1200	**6.79** 1530	**4.55** 1020	**6.78** 1520	**7.24** 1630	**28** 248	10000	**0.059** 0.130
KR30.2SK	**7.89** 1770	**9.79** 2200	**6.32** 1420	**7.74** 1740	**9.31** 2090	**45** 398	8200	**0.087** 0.192
KR32.2SK	**7.89** 1770	**9.79** 2200	**6.65** 1490	**9.62** 2160	**10.3** 2320	**45** 398	8200	**0.095** 0.209

NEEDLE ROLLER AND CAGE ASSEMBLIES, SEALED, STUD-TYPE (KR...2S SERIES)

METRIC SERIES



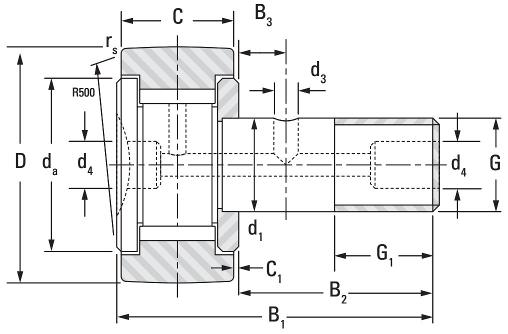
KR.2RS.2SK
KR.2RS.SK (D≤19 mm(0.7480 in))

Outer Dia.	d_1 h7	D	C	$r_{s\ min.}$	B_1	B_2	B_3	G_1	d_4	d_3	Thread	C_1	d_a
											G		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**mm** in	**mm** in
16 0.6299	**6** 0.2362	**16** 0.6299	**11** 0.433	**0.3** 0.012	**28.2** 1.110	**16** 0.630		**8** 0.315	**4** 0.157		M6x1	**0.6** 0.024	**11** 0.433
19 0.7480	**8** 0.3150	**19** 0.7480	**11** 0.433	**0.3** 0.012	**32.2** 1.268	**20** 0.787		**10** 0.394	**4** 0.157		M8x1.25	**0.6** 0.024	**13** 0.512
22 0.8661	**10** 0.3937	**22** 0.8661	**12** 0.472	**0.3** 0.012	**36.2** 1.425	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
26 1.0236	**10** 0.3937	**26** 1.0236	**12** 0.472	**0.3** 0.012	**36.2** 1.425	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591
30 1.1811	**12** 0.4724	**30** 1.1811	**14** 0.551	**0.6** 0.024	**40.2** 1.583	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827
32 1.2598	**12** 0.4724	**32** 1.2598	**14** 0.551	**0.6** 0.024	**40.2** 1.583	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827

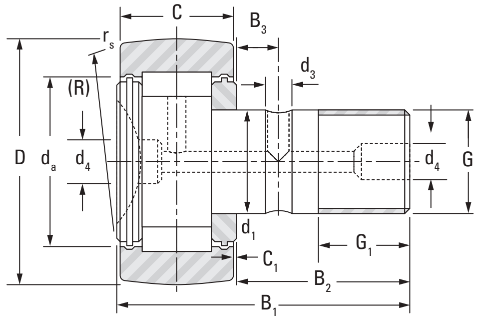
Crowned Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Approx. Wt.
	As a Bearing		As a Track Roller					
	Dynamic	Static	Dynamic		Static			
	C	C_o	C_w	$F_{r\ perm}$	$F_{0r\ perm}$			
	kN lbf		**kN** lbf			**N-m** lb-in	min^{-1}	**kg** lbs
KR16.2RS.SK	**3.60** 810	**3.58** 800	**2.97** 670	**2.85** 640	**3.58** 800	**7.0** 61.96	17000	**0.019** 0.042
KR19.2RS.SK	**4.18** 940	**4.65** 1050	**3.28** 740	**3.29** 740	**4.22** 950	**16** 141.61	13000	**0.031** 0.068
KR22.2RS.2SK	**5.35** 1200	**6.79** 1530	**3.94** 890	**4.04** 910	**5.45** 1230	**28** 247.82	10000	**0.046** 0.101
KR26.2RS.2SK	**5.35** 1200	**6.79** 1530	**4.55** 1020	**6.78** 1520	**7.24** 1630	**28** 247.82	10000	**0.059** 0.130
KR30.2RS.2SK	**7.89** 1770	**9.79** 2200	**6.32** 1420	**7.74** 1740	**9.31** 2090	**45** 398.28	8200	**0.087** 0.192
KR32.2RS.2SK	**7.89** 1770	**9.79** 2200	**6.65** 1490	**9.62** 2160	**10.3** 2320	**45** 398.28	8200	**0.098** 0.216

FULL COMPLEMENT WITH NEEDLE ROLLERS (KRV SERIES) OR CYLINDRICAL ROLLERS, STUD-TYPE (NUKR SERIES)

METRIC SERIES



KRV.2SK
KRV.SK (D≤19 mm(0.7480 in))

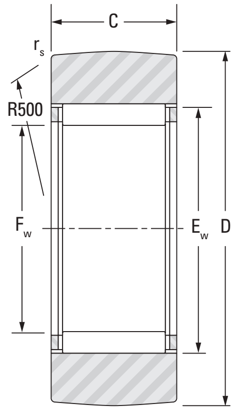


NUKR.2SK

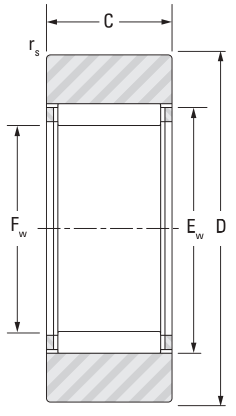
Outer Dia.	d_1 h7	D	C	$r_{s\,min.}$	B_1	B_2	B_3	G_1	d_4	d_3	Thread	C_1	d_a	Crowned Designation	Load Ratings					Tightening Torque	Speed Rating Grease	Approx. Wt.
															As a Bearing		As a Track Roller					
															Dynamic	Static	Dynamic		Static			
											G				C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$			
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**mm** in	**mm** in		**kN** lbf		**kN** lbf			**N-m** lb-in	min^{-1}	**kg** lbs
16 0.6299	**6** 0.2362	**16** 0.6299	**11** 0.433	**0.3** 0.012	**28.2** 1.110	**16** 0.630		**8** 0.315	**4** 0.157		M6x1	**0.6** 0.024	**11** 0.433	KRV16.SK	**6.90** 1550	**8.40** 1890	**5.11** 1150	**3.49** 780	**6.28** 1410	**7** 62.0	5700	**0.019** 0.042
19 0.7480	**8** 0.3150	**19** 0.7480	**11** 0.433	**0.3** 0.012	**32.2** 1.268	**20** 0.787		**10** 0.394	**4** 0.157		M8x1.25	**0.6** 0.024	**13** 0.512	KRV19.SK	**8.08** 1820	**11.0** 2470	**5.66** 1270	**4.13** 930	**7.43** 1670	**16** 142	4300	**0.031** 0.068
22 0.8661	**10** 0.3937	**22** 0.8661	**12** 0.472	**0.3** 0.012	**36.2** 1.425	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591	KRV22.2SK	**9.45** 2120	**14.3** 3210	**6.32** 1420	**5.04** 1130	**9.07** 2040	**28** 248	3400	**0.046** 0.101
26 1.0236	**10** 0.3937	**26** 1.0236	**12** 0.472	**0.3** 0.012	**36.2** 1.425	**23** 0.906		**12** 0.472	**4** 0.157		M10x1	**0.6** 0.024	**15** 0.591	KRV26.2SK	**9.45** 2120	**14.3** 3210	**7.30** 1640	**8.60** 1930	**12.7** 2860	**28** 248	3400	**0.059** 0.130
30 1.1811	**12** 0.4724	**30** 1.1811	**14** 0.551	**0.6** 0.024	**40.2** 1.583	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827	KRV30.2SK	**13.4** 3010	**19.8** 4450	**9.85** 2210	**9.20** 2070	**15.7** 3530	**45** 398	2800	**0.087** 0.192
32 1.2598	**12** 0.4724	**32** 1.2598	**14** 0.551	**0.6** 0.024	**40.2** 1.583	**25** 0.984	**6** 0.236	**13** 0.512	**6** 0.236	**3** 0.118	M12x1.5	**0.6** 0.024	**21** 0.827	KRV32.2SK	**13.4** 3010	**19.8** 4450	**10.4** 2340	**11.3** 2540	**17.4** 3910	**45** 398	2800	**0.098** 0.216
35 1.3780	**16** 0.6299	**35** 1.3780	**18** 0.709	**0.6** 0.024	**52** 2.047	**32.5** 1.280	**8** 0.315	**17** 0.669	**6** 0.236	**3** 0.118	M16x1.5	**0.8** 0.031	**25** 0.984	NUKR35.2SK	**24.7** 5550	**29.4** 6610	**16.2** 3640	**10.1** 2270	**16.1** 3620	**53.2** 471	6100	**0.170** 0.375
40 1.5748	**18** 0.7087	**40** 1.5748	**20** 0.787	**1** 0.039	**58** 2.283	**36.5** 1.437	**8** 0.315	**19** 0.748	**6** 0.236	**3** 0.118	M18x1.5	**0.8** 0.031	**27** 1.063	NUKR40.2SK	**26.6** 5980	**33.3** 7490	**18.7** 4200	**15.0** 3370	**23.9** 5370	**77.5** 686	5300	**0.250** 0.551
47 1.8504	**20** 0.7874	**47** 1.8504	**24** 0.945	**1** 0.039	**66** 2.598	**40.5** 1.594	**9** 0.354	**21** 0.827	**6** 0.236	**4** 0.157	M20x1.5	**0.8** 0.031	**33** 1.299	NUKR47.2SK	**41.4** 9310	**53.2** 12000	**28.1** 6320	**20.5** 4610	**32.7** 7350	**109** 965	4500	**0.380** 0.838
52 2.0472	**20** 0.7874	**52** 2.0472	**24** 0.945	**1** 0.039	**66** 2.598	**40.5** 1.594	**9** 0.354	**21** 0.827	**6** 0.236	**4** 0.157	M20x1.5	**0.8** 0.031	**37** 1.457	NUKR52.2SK	**45.8** 10300	**63.1** 14200	**29.6** 6650	**22.2** 4990	**35.4** 7960	**109** 965	3700	**0.461** 1.016
62 2.4409	**24** 0.9449	**62** 2.4409	**29** 1.142	**1** 0.039	**80** 3.150	**49.5** 1.949	**11** 0.433	**25** 0.984	**8** 0.315	**4** 0.157	M24x1.5	**0.8** 0.031	**45** 1.772	NUKR62.2SK	**62.7** 14100	**83.1** 18700	**40.9** 9190	**29.6** 6650	**47.2** 10600	**193** 1708	3200	**0.790** 1.742
72 2.8346	**24** 0.9449	**72** 2.8346	**29** 1.142	**1.1** 0.043	**80** 3.150	**49.5** 1.949	**11** 0.433	**25** 0.984	**8** 0.315	**4** 0.157	M24x1.5	**0.8** 0.031	**51** 2.008	NUKR72.2SK	**68.9** 15500	**97.8** 22000	**46.1** 10400	**39.6** 8900	**63.1** 14200	**193** 1708	2600	**1.040** 2.293
80 3.1496	**30** 1.1811	**80** 3.1496	**35** 1.378	**1.1** 0.043	**100** 3.937	**63** 2.480	**15** 0.591	**32** 1.260	**8** 0.315	**4** 0.157	M30x1.5	**1.0** 0.039	**52** 2.047	NUKR80.2SK	**95.4** 21400	**130** 29200	**69.7** 15700	**63.2** 14200	**101** 22700	**390** 3452	2900	**1.550** 3.417
90 3.5433	**30** 1.1811	**90** 3.5433	**35** 1.378	**1.1** 0.043	**100** 3.937	**63** 2.480	**15** 0.591	**32** 1.260	**8** 0.315	**4** 0.157	M30x1.5	**1.0** 0.039	**52** 2.047	NUKR90.2SK	**95.4** 21400	**130** 29200	**77.8** 17500	**97.8** 22000	**128** 28800	**390** 3452	2900	**2.020** 4.453

CAGED, WITHOUT INNER RING, NO END WASHERS, YOKE-TYPE (RSTO SERIES)

METRIC SERIES



RSTO

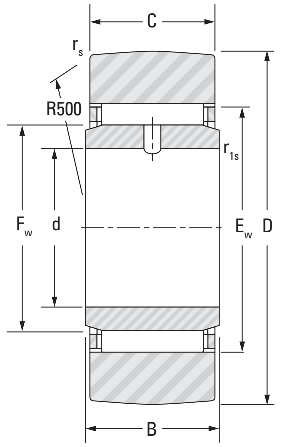


RSTO.DZ

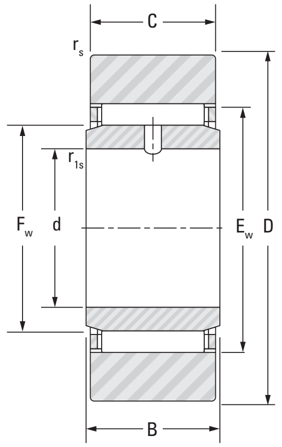
Outer Dia.	D	C	F$_w$	E$_w$	r$_{s\ min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
						Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
								Dynamic	Static	Dynamic		Static		
								C	C$_0$	C$_w$	F$_{r\ perm}$	F$_{0r\ perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
16 0.6299	**16** 0.6299	**7.8** 0.307	**7** 0.2756	**10** 0.394	**0.3** 0.012	RSTO5A.TN	RSTO5ADZ.TN	**2.74** 616	**2.44** 549	**2.49** 560	**2.97** 668	**2.44** 549	19000	**0.009** 0.020
19 0.7480	**19** 0.7480	**9.8** 0.386	**10** 0.3937	**13** 0.512	**0.3** 0.012	RSTO6	RSTO6DZ	**5.40** 1210	**6.43** 1450	**4.15** 933	**4.04** 908	**5.63** 1270	13000	**0.014** 0.031
24 0.9449	**24** 0.9449	**9.8** 0.386	**12** 0.4724	**15** 0.591	**0.3** 0.012	RSTO8	RSTO8DZ	**5.85** 1320	**7.51** 1690	**4.79** 1080	**6.67** 1500	**7.44** 1670	10000	**0.023** 0.051
30 1.1811	**30** 1.1811	**11.8** 0.465	**14** 0.5512	**20** 0.787	**0.3** 0.012	RSTO10	RSTO10DZ	**10.40** 2340	**10.6** 2380	**8.62** 1940	**7.69** 1730	**10.6** 2380	9400	**0.044** 0.097
32 1.2598	**32** 1.2598	**11.8** 0.465	**16** 0.6299	**22** 0.866	**0.3** 0.012	RSTO12	RSTO12DZ	**11.20** 2520	**11.9** 2680	**8.80** 1980	**7.65** 1720	**10.9** 2450	8100	**0.049** 0.108
35 1.3780	**35** 1.3780	**11.8** 0.465	**20** 0.7874	**26** 1.024	**0.3** 0.012	RSTO15	RSTO15DZ	**12.90** 2900	**15.3** 3440	**9.13** 2050	**6.95** 1560	**11.2** 2520	6300	**0.052** 0.115
40 1.5748	**40** 1.5748	**15.8** 0.622	**22** 0.8661	**29** 1.142	**0.3** 0.012	RSTO17	RSTO17DZ	**19.00** 4270	**23.3** 5240	**13.8** 3100	**11.4** 2560	**18.2** 4090	5800	**0.095** 0.209
47 1.8504	**47** 1.8504	**15.8** 0.622	**25** 0.9843	**32** 1.260	**0.3** 0.012	RSTO20	RSTO20DZ	**20.00** 4500	**25.3** 5690	**15.3** 3440	**16.5** 3710	**22.2** 4990	5000	**0.134** 0.295
52 2.0472	**52** 2.0472	**15.8** 0.622	**30** 1.1811	**37** 1.457	**0.3** 0.012	RSTO25	RSTO25DZ	**22.40** 5040	**31.0** 6970	**16.0** 3600	**16.9** 3800	**23.7** 5330	4100	**0.155** 0.342
62 2.4409	**62** 2.4409	**19.8** 0.780	**38** 1.4961	**46** 1.811	**0.6** 0.024	RSTO30	RSTO30DZ	**33.30** 7490	**51.0** 11470	**22.3** 5010	**23.2** 5220	**34.2** 7690	3200	**0.258** 0.569
72 2.8346	**72** 2.8346	**19.8** 0.780	**42** 1.6535	**50** 1.969	**0.6** 0.024	RSTO35	RSTO35DZ	**35.20** 7910	**56.6** 12720	**25.2** 5670	**33.3** 7490	**43.0** 9670	2900	**0.37** 0.816
80 3.1496	**80** 3.1496	**19.8** 0.780	**50** 1.9685	**58** 2.283	**0.6** 0.024	RSTO40	RSTO40DZ	**38.80** 8720	**67.8** 15240	**25.9** 5820	**34.7** 7800	**45.0** 10120	2400	**0.430** 0.948
85 3.3465	**85** 3.3465	**19.8** 0.780	**55** 2.1654	**63** 2.480	**0.6** 0.024	RSTO45		**40.30** 9060	**73.5** 16520	**26.0** 5850	**35.8** 8050	**45.5** 10230	2200	**0.447** 0.985
90 3.5433	**90** 3.5433	**19.8** 0.780	**60** 2.3622	**68** 2.677	**0.6** 0.024	RSTO50		**41.80** 9400	**79.2** 17800	**26.0** 5850	**37.1** 8340	**45.8** 10300	2000	**0.495** 1.091

CAGED, WITH INNER RING, NO END WASHERS YOKE-TYPE (STO SERIES)

METRIC SERIES



STO

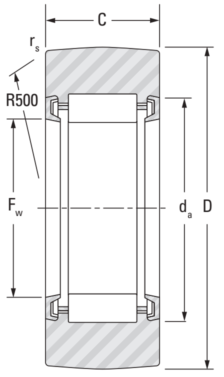


STO.DZ

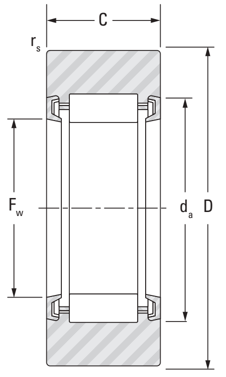
Outer Dia.	D	d	B	C	F$_w$	E$_w$	r$_s$	r$_{1s\ min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
									Crowned Track Roller	Cylindrical Track Roller	As a Bearing		As a Track Roller				
											Dynamic	Static	Dynamic		Static		
											C	C$_0$	C$_w$	F$_{r\ perm}$	F$_{0r\ perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
19 0.7480	**19** 0.7480	**6** 0.2362	**10** 0.394	**9.8** 0.386	**10** 0.3937	**13** 0.5118	**0.3** 0.012	**0.3** 0.012	STO6	STO6DZ	**5.40** 1210	**6.43** 1450	**4.15** 933	**4.04** 908	**5.63** 1270	9400	**0.018** 0.040
24 0.9449	**24** 0.9449	**8** 0.3150	**10** 0.394	**9.8** 0.386	**12** 0.4724	**15** 0.5906	**0.3** 0.012	**0.3** 0.012	STO8	STO8DZ	**5.85** 1320	**7.51** 1690	**4.79** 1080	**6.67** 1500	**7.44** 1670	8100	**0.028** 0.062
30 1.1811	**30** 1.1811	**10** 0.3937	**12** 0.472	**11.8** 0.465	**14** 0.5512	**20** 0.7874	**0.3** 0.012	**0.3** 0.012	STO10	STO10DZ	**10.4** 2340	**10.6** 2380	**8.62** 1940	**7.69** 1730	**10.6** 2380	6300	**0.065** 0.143
32 1.2598	**32** 1.2598	**12** 0.4724	**12** 0.472	**11.8** 0.465	**16** 0.6299	**22** 0.8661	**0.3** 0.012	**0.3** 0.012	STO12	STO12DZ	**11.2** 2520	**11.9** 2680	**8.80** 1980	**7.65** 1720	**10.9** 2450	5800	**0.114** 0.251
35 1.3780	**35** 1.3780	**15** 0.5906	**12** 0.472	**11.8** 0.465	**20** 0.7874	**26** 1.0236	**0.3** 0.012	**0.3** 0.012	STO15	STO15DZ	**12.9** 2900	**15.3** 3440	**9.13** 2050	**6.95** 1560	**11.2** 2520	5000	**0.065** 0.143
40 1.5748	**40** 1.5748	**17** 0.6693	**16** 0.630	**15.8** 0.622	**22** 0.8661	**29** 1.1417	**0.3** 0.012	**0.3** 0.012	STO17	STO17DZ	**19.1** 4290	**23.3** 5240	**13.8** 3100	**11.4** 2560	**18.2** 4090	4100	**0.114** 0.251
47 1.8504	**47** 1.8504	**20** 0.7874	**16** 0.630	**15.8** 0.622	**25** 0.9843	**32** 1.2598	**0.3** 0.012	**0.3** 0.012	STO20	STO20DZ	**19.8** 4450	**25.3** 5690	**15.3** 3440	**16.5** 3710	**22.2** 4990	3200	**0.160** 0.353
52 2.0472	**52** 2.0472	**25** 0.9843	**16** 0.630	**15.8** 0.622	**30** 1.1811	**37** 1.4567	**0.3** 0.012	**0.3** 0.012	STO25	STO25DZ	**22.4** 5040	**31.0** 6970	**16.0** 3600	**16.9** 3800	**23.7** 5330	2900	**0.435** 0.959
62 2.4409	**62** 2.4409	**30** 1.1811	**20** 0.787	**19.8** 0.780	**38** 1.4961	**46** 1.8110	**0.6** 0.024	**0.6** 0.024	STO30	STO30DZ	**33.3** 7490	**51.0** 11470	**22.3** 5010	**23.2** 5220	**34.2** 7690	2400	**0.325** 0.717
72 2.8346	**72** 2.8346	**35** 1.3780	**20** 0.787	**19.8** 0.780	**42** 1.6535	**50** 1.9685	**0.6** 0.024	**0.6** 0.024	STO35	STO35DZ	**35.2** 7910	**56.6** 12720	**25.2** 5670	**33.3** 7490	**43.0** 9670	2200	**0.435** 0.959
80 3.1496	**80** 3.1496	**40** 1.5748	**20** 0.787	**19.8** 0.780	**50** 1.9685	**58** 2.2835	**0.6** 0.024	**1.0** 0.039	STO40	STO40DZ	**38.8** 8720	**67.8** 15240	**25.9** 5820	**34.7** 7800	**45.0** 10120	2400	**0.540** 1.190
85 3.3465	**85** 3.3465	**45** 1.7717	**20** 0.787	**19.8** 0.780	**55** 2.1654	**63** 2.4803	**0.6** 0.024	**1.0** 0.039	STO45	STO45DZ	**40.3** 9060	**73.5** 16520	**26.0** 5850	**35.8** 8050	**45.5** 10230	2200	**0.580** 1.279
90 3.5433	**90** 3.5433	**50** 1.9685	**20** 0.787	**19.8** 0.780	**60** 2.3622	**68** 2.6772	**0.6** 0.024	**1.0** 0.039	STO50	STO50DZ	**41.8** 9400	**79.2** 17800	**26.0** 5850	**37.1** 8340	**45.8** 10300	2000	**0.650** 1.433

CAGED, WITHOUT INNER RING, NO END WASHERS, SEALED, YOKE-TYPE (RNA22 SERIES)

METRIC SERIES



RNA22.2RS

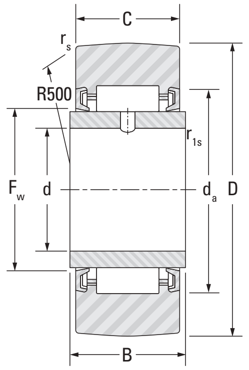


RNA22.2RS.DZ

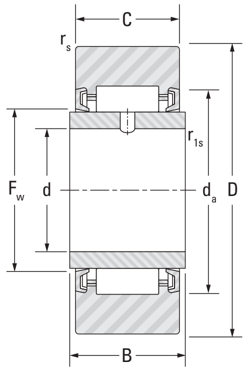
Outer Dia.	D	C	F_w	d_a	$r_{s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
								As a Bearing		As a Track Roller				
						Crowned Track Roller	Cylindrical Track Roller	Dynamic	Static	Dynamic		Static		
								C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
19 0.7480	**19** 0.7480	**11.8** 0.465	**10** 0.3937	**14** 0.551	**0.3** 0.012	RNA22/6.2RS	RNA22/6.2RS.DZ	**4.70** 1060	**5.43** 1220	**4.13** 928	**3.06** 688	**4.59** 1030	13000	**0.014** 0.031
24 0.9449	**24** 0.9449	**11.8** 0.465	**12** 0.4724	**18** 0.709	**0.3** 0.012	RNA22/8.2RS	RNA22/8.2RS.DZ	**6.70** 1510	**6.08** 1370	**5.31** 1190	**3.37** 758	**5.22** 1170	11000	**0.025** 0.055
30 1.1811	**30** 1.1811	**13.8** 0.543	**14** 0.5512	**20** 0.787	**0.6** 0.024	RNA2200.2RS	RNA2200.2RS.DZ	**8.50** 1910	**9.45** 2120	**8.03** 1810	**7.85** 1760	**9.45** 2120	9400	**0.049** 0.108
32 1.2598	**32** 1.2598	**13.8** 0.543	**16** 0.6299	**22** 0.866	**0.6** 0.024	RNA2201.2RS	RNA2201.2RS.DZ	**9.00** 2020	**10.5** 2360	**8.2** 1840	**7.78** 1750	**10.1** 2270	8100	**0.053** 0.117
35 1.3780	**35** 1.3780	**13.8** 0.543	**20** 0.7874	**27** 1.063	**0.6** 0.024	RNA2202.2RS	RNA2202.2RS.DZ	**12.2** 2740	**14.5** 3260	**9.24** 2080	**6.00** 1350	**10.2** 2290	6300	**0.055** 0.121
40 1.5748	**40** 1.5748	**15.8** 0.622	**22** 0.8661	**30** 1.181	**1.0** 0.039	RNA2203.2RS	RNA2203.2RS.DZ	**16.3** 3660	**17.8** 4000	**11.9** 2680	**8.50** 1910	**13.7** 3080	5900	**0.090** 0.198
47 1.8504	**47** 1.8504	**17.8** 0.701	**25** 0.9843	**35** 1.378	**1.0** 0.039	RNA2204.2RS	RNA2204.2RS.DZ	**19.6** 4410	**20.2** 4540	**14.8** 3330	**11.0** 2470	**16.7** 3750	5200	**0.150** 0.331
52 2.0472	**52** 2.0472	**17.8** 0.701	**30** 1.1811	**40** 1.575	**1.0** 0.039	RNA2205.2RS	RNA2205.2RS.DZ	**21.6** 4860	**24.3** 5460	**15.5** 3480	**11.3** 2540	**17.7** 3980	4300	**0.171** 0.377
62 2.4409	**62** 2.4409	**19.8** 0.780	**35** 1.3780	**47** 1.850	**1.0** 0.039	RNA2206.2RS	RNA2206.2RS.DZ	**29.0** 6520	**32.8** 7370	**21.2** 4770	**15.8** 3550	**24.8** 5580	3700	**0.285** 0.628
72 2.8346	**72** 2.8346	**22.8** 0.898	**42** 1.6535	**54** 2.126	**1.1** 0.043	RNA2207.2RS	RNA2207.2RS.DZ	**40.5** 9100	**52.5** 11800	**28.6** 6430	**24.2** 5440	**37.9** 8520	3000	**0.490** 1.080
80 3.1496	**80** 3.1496	**22.8** 0.898	**48** 1.8898	**60** 2.362	**1.1** 0.043	RNA2208.2RS	RNA2208.2RS.DZ	**44.0** 9890	**60.0** 13490	**30.4** 6830	**27.8** 6250	**42.0** 9440	2600	**0.515** 1.135
85 3.3465	**85** 3.3465	**22.8** 0.898	**52** 2.0472	**64** 2.520	**1.1** 0.043	RNA2209.2RS	RNA2209.2RS.DZ	**45.6** 10250	**63.9** 14370	**30.9** 6950	**29.7** 6680	**43.7** 9820	2400	**0.565** 1.246
90 3.5433	**90** 3.5433	**22.8** 0.898	**58** 2.2835	**70** 2.756	**1.1** 0.043	RNA2210.2RS	RNA2210.2RS.DZ	**48.5** 10900	**71.3** 16030	**31.0** 6970	**29.4** 6610	**43.4** 9760	2100	**0.590** 1.301

CAGED, WITH INNER RING, NO END WASHERS, SEALED, YOKE-TYPE (NA22 SERIES)

METRIC SERIES



NA22.2RS

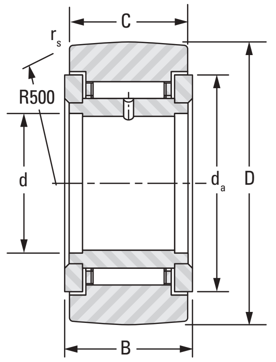


NA22.2RS.DZ

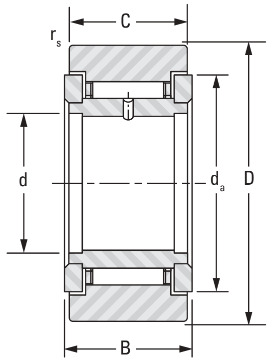
Outer Dia.	D	d	B	C	F_w	d_a	r_s	$r_{1s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
											As a Bearing		As a Track Roller				
									Crowned Track Roller	Cylindrical Track Roller	Dynamic	Static	Dynamic		Static		
											C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min^{-1}	**kg** lbs
19 0.7480	**19** 0.7480	**6** 0.2362	**12** 0.472	**11.8** 0.465	**10** 0.3937	**14** 0.5512	**0.3** 0.012	**0.3** 0.012	NA22/6.2RS	NA22/6.2RS.DZ	**4.70** 1060	**5.43** 1220	**4.13** 928	**3.06** 688	**4.59** 1030	13000	**0.018** 0.040
24 0.9449	**24** 0.9449	**8** 0.3150	**12** 0.472	**11.8** 0.465	**12** 0.4724	**18** 0.7087	**0.3** 0.012	**0.3** 0.012	NA22/8.2RS	NA22/8.2RS.DZ	**6.70** 1510	**6.08** 1370	**5.31** 1190	**3.37** 758	**5.22** 1170	11000	**0.031** 0.068
30 1.1811	**30** 1.1811	**10** 0.3937	**14** 0.551	**13.8** 0.543	**14** 0.5512	**20** 0.7874	**0.6** 0.024	**0.3** 0.012	NA2200.2RS	NA2200.2RS.DZ	**8.50** 1910	**9.45** 2120	**8.03** 1810	**7.85** 1760	**9.45** 2120	9400	**0.057** 0.126
32 1.2598	**32** 1.2598	**12** 0.4724	**14** 0.551	**13.8** 0.543	**16** 0.6299	**22** 0.8661	**0.6** 0.024	**0.3** 0.012	NA2201.2RS	NA2201.2RS.DZ	**9.00** 2020	**10.5** 2360	**8.20** 1840	**7.78** 1750	**10.1** 2270	8100	**0.063** 0.139
35 1.3780	**35** 1.3780	**15** 0.5906	**14** 0.551	**13.8** 0.543	**20** 0.7874	**27** 1.0630	**0.6** 0.024	**0.3** 0.012	NA2202.2RS	NA2202.2RS.DZ	**12.2** 2740	**14.5** 3260	**9.24** 2080	**6.00** 1350	**10.2** 2290	6300	**0.070** 0.154
40 1.5748	**40** 1.5748	**17** 0.6693	**16** 0.630	**15.8** 0.622	**22** 0.8661	**30** 1.1811	**1.0** 0.039	**0.3** 0.012	NA2203.2RS	NA2203.2RS.DZ	**16.3** 3660	**17.8** 4000	**11.9** 2680	**8.50** 1910	**13.7** 3080	5900	**0.107** 0.236
47 1.8504	**47** 1.8504	**20** 0.7874	**18** 0.709	**17.8** 0.701	**25** 0.9843	**35** 1.3780	**1.0** 0.039	**0.3** 0.012	NA2204.2RS	NA2204.2RS.DZ	**19.6** 4410	**20.2** 4540	**14.8** 3330	**11.0** 2470	**16.7** 3750	5200	**0.175** 0.386
52 2.0472	**52** 2.0472	**25** 0.9843	**18** 0.709	**17.8** 0.701	**30** 1.1811	**40** 1.5748	**1.0** 0.039	**0.3** 0.012	NA2205.2RS	NA2205.2RS.DZ	**21.6** 4860	**24.3** 5460	**15.5** 3480	**11.3** 2540	**17.7** 3980	4300	**0.202** 0.445
62 2.4409	**62** 2.4409	**30** 1.1811	**20** 0.787	**19.8** 0.780	**35** 1.3780	**47** 1.8504	**1.0** 0.039	**0.3** 0.012	NA2206.2RS	NA2206.2RS.DZ	**29.0** 6520	**32.8** 7370	**21.2** 4770	**15.8** 3550	**24.8** 5580	3700	**0.324** 0.714
72 2.8346	**72** 2.8346	**35** 1.3780	**23** 0.906	**22.8** 0.898	**42** 1.6535	**54** 2.1260	**1.1** 0.043	**0.6** 0.024	NA2207.2RS	NA2207.2RS.DZ	**40.5** 9100	**52.5** 11800	**28.6** 6430	**24.2** 5440	**37.9** 8520	3000	**0.490** 1.080
80 3.1496	**80** 3.1496	**40** 1.5748	**23** 0.906	**22.8** 0.898	**48** 1.8898	**60** 2.3622	**1.1** 0.043	**0.6** 0.024	NA2208.2RS	NA2208.2RS.DZ	**44.0** 9890	**60.0** 13500	**30.4** 6830	**27.8** 6250	**42.0** 9440	2600	**0.615** 1.356
85 3.3465	**85** 3.3465	**45** 1.7717	**23** 0.906	**22.8** 0.898	**52** 2.0472	**64** 2.5197	**1.1** 0.043	**0.6** 0.024	NA2209.2RS	NA2209.2RS.DZ	**45.0** 10100	**63.9** 14400	**30.9** 6950	**29.7** 6680	**43.7** 9820	2400	**0.661** 1.457
90 3.5433	**90** 3.5433	**50** 1.9685	**23** 0.906	**22.8** 0.898	**58** 2.2835	**70** 2.7559	**1.1** 0.043	**0.6** 0.024	NA2210.2RS	NA2210.2RS.DZ	**48.0** 10800	**71.3** 16000	**31.0** 6970	**29.4** 6610	**43.4** 9760	2100	**0.712** 1.570

CAGED, WITH INNER RING, WITH END WASHERS, YOKE-TYPE (NATR, STO...ZZ SERIES)

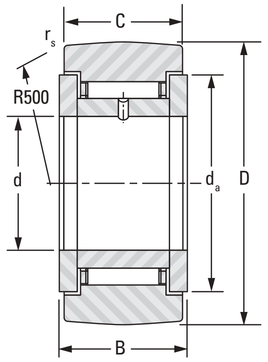
METRIC SERIES



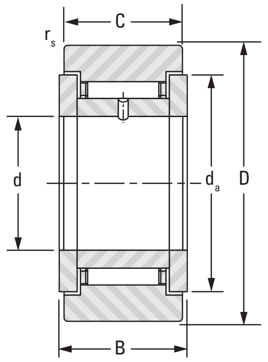
NATR



NATR.DZ



STO.ZZ

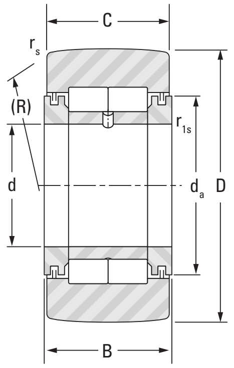


STO.ZZ.DZ

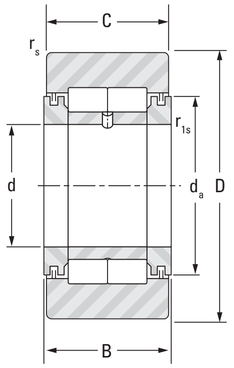
Outer Dia.	D	d	B	C	d_a	$r_{s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
									As a Bearing		As a Track Roller				
									Dynamic	Static	Dynamic		Static		
							Crowned Track Roller	Cylindrical Track Roller	C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min⁻¹	**kg** lbs
16 0.6299	**16** 0.6299	**5** 0.1969	**12** 0.472	**11.0** 0.433	**13** 0.512	**0.3** 0.012	NATR5	NATR5DZ	**4.62** 1040	**5.19** 1170	**3.34** 751	**2.62** 589	**4.01** 901	13000	**0.017** 0.037
19 0.7480	**19** 0.7480	**6** 0.2362	**12** 0.472	**11.0** 0.433	**16** 0.630	**0.3** 0.012	NATR6	NATR6DZ	**4.84** 1090	**5.66** 1270	**3.84** 863	**4.28** 962	**5.28** 1190	12000	**0.022** 0.049
	19 0.7480	**6** 0.2362	**14** 0.551	**13.8** 0.543	**15** 0.591	**0.3** 0.012	STO6ZZ	STO6ZZ.DZ	**5.37** 1210	**6.47** 1450	**4.31** 969	**5.23** 1180	**6.17** 1390	12000	**0.024** 0.053
24 0.9449	**24** 0.9449	**8** 0.3150	**14** 0.551	**13.8** 0.543	**18** 0.709	**0.3** 0.012	STO8ZZ	STO8ZZ.DZ	**5.82** 1310	**7.54** 1700	**4.97** 1120	**7.54** 1700	**8.14** 1830	9900	**0.040** 0.088
	24 0.9449	**8** 0.3150	**15** 0.591	**14.0** 0.551	**20** 0.787	**0.3** 0.012	NATR8	NATR8DZ	**8.39** 1890	**8.67** 1950	**6.66** 1500	**5.79** 1300	**8.08** 1820	10000	**0.043** 0.095
30 1.1811	**30** 1.1811	**10** 0.3937	**15** 0.591	**14.0** 0.551	**24** 0.945	**0.6** 0.024	NATR10	NATR10DZ	**9.57** 2150	**9.45** 2120	**8.15** 1830	**8.58** 1930	**10.1** 2270	9400	**0.068** 0.150
	30 1.1811	**10** 0.3937	**16** 0.630	**15.8** 0.622	**23** 0.906	**0.3** 0.012	STO10ZZ	STO10ZZ.DZ	**10.4** 2340	**10.6** 2380	**8.94** 2010	**9.64** 2170	**11.4** 2560	9400	**0.071** 0.157
32 1.2598	**32** 1.2598	**12** 0.4724	**15** 0.591	**14.0** 0.551	**26** 1.024	**0.6** 0.024	NATR12	NATR12DZ	**10.2** 2290	**10.5** 2360	**8.32** 1870	**8.50** 1910	**10.4** 2340	8100	**0.075** 0.165
	32 1.2598	**12** 0.4724	**16** 0.630	**15.8** 0.622	**25** 0.984	**0.3** 0.012	STO12ZZ	STO12ZZ.DZ	**11.2** 2520	**11.9** 2680	**9.13** 2050	**9.54** 2140	**11.7** 2630	8100	**0.078** 0.172
35 1.3780	**35** 1.3780	**15** 0.5906	**16** 0.630	**15.8** 0.622	**30** 1.181	**0.3** 0.012	STO15ZZ	STO15ZZ.DZ	**12.9** 2900	**15.3** 3440	**9.47** 2130	**8.52** 1920	**12.1** 2720	6300	**0.089** 0.196
40 1.5748	**40** 1.5748	**17** 0.6693	**20** 0.787	**19.8** 0.780	**33** 1.299	**0.3** 0.012	STO17ZZ	STO17ZZ.DZ	**19.0** 4270	**23.3** 5240	**14.2** 3190	**13.4** 3010	**19.3** 4340	5600	**0.145** 0.320
47 1.8504	**47** 1.8504	**20** 0.7874	**20** 0.787	**19.8** 0.780	**37** 1.457	**0.3** 0.012	STO20ZZ	STO20ZZ.DZ	**20.0** 4500	**25.4** 5710	**15.7** 3530	**19.5** 4380	**23.5** 5280	4900	**0.200** 0.441
52 2.0472	**52** 2.0472	**25** 0.9843	**20** 0.787	**19.8** 0.780	**42** 1.654	**0.3** 0.012	STO25ZZ	STO25ZZ.DZ	**22.4** 5040	**31.1** 6990	**16.4** 3690	**19.8** 4450	**25.1** 5640	4100	**0.240** 0.529
62 2.4409	**62** 2.4409	**30** 1.1811	**25** 0.984	**24.8** 0.976	**52** 2.047	**0.6** 0.024	STO30ZZ	STO30ZZ.DZ	**33.3** 7490	**51.0** 11500	**23.0** 5170	**26.9** 6050	**36.2** 8140	3200	**0.412** 0.908
72 2.8346	**72** 2.8346	**35** 1.3780	**25** 0.984	**24.8** 0.976	**56** 2.205	**0.6** 0.024	STO35ZZ	STO35ZZ.DZ	**35.2** 7910	**56.6** 12700	**25.9** 5820	**39.2** 8810	**45.5** 10200	2900	**0.555** 1.224
80 3.1496	**80** 3.1496	**40** 1.5748	**26** 1.024	**25.8** 1.016	**64** 2.520	**0.6** 0.024	STO40ZZ	STO40ZZ.DZ	**38.8** 8720	**67.8** 15200	**26.8** 6020	**41.5** 9330	**48.1** 10800	2400	**0.700** 1.543
85 3.3465	**85** 3.3465	**45** 1.7717	**26** 1.024	**25.8** 1.016	**69** 2.717	**0.6** 0.024	STO45ZZ	STO45ZZ.DZ	**40.3** 9060	**73.5** 16500	**26.9** 6050	**42.4** 9530	**48.6** 10900	2200	**0.770** 1.698

FULL COMPLEMENT, WITH INNER RING, WITH END WASHERS, CYLINDRICAL ROLLERS, YOKE-TYPE (NUTR SERIES)

METRIC SERIES



NUTR



NUTR.DZ

Outer Dia.	D	d	B	C	d_a	r_s	$r_{1s\,min.}$	Bearing Designation		Load Ratings					Speed Rating Grease	Approx. Wt.
										As a Bearing		As a Track Roller				
										Dynamic	Static	Dynamic		Static		
								Crowned Track Roller	Cylindrical Track Roller	C	C_o	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in			**kN** lbf		**kN** lbf			min⁻¹	**kg** lbs
35 1.3780	**35** 1.3780	**15** 0.5906	**19** 0.748	**18** 0.709	**24** 0.945	**0.6** 0.024	**0.3** 0.012	NUTR15	NUTR15DZ	**24.7** 5550	**29.3** 6590	**16.2** 3640	**10.1** 2270	**16.1** 3620	6100	**0.105** 0.231
40 1.5748	**40** 1.5748	**17** 0.6693	**21** 0.827	**20** 0.787	**27** 1.063	**1.0** 0.039	**0.3** 0.012	NUTR17	NUTR17DZ	**26.6** 5980	**33.4** 7510	**18.7** 4200	**15.0** 3370	**23.9** 5370	5300	**0.154** 0.340
42 1.6535	**42** 1.6535	**15** 0.5906	**19** 0.748	**18** 0.709	**24** 0.945	**0.6** 0.024	**0.3** 0.012	NUTR1542	NUTR1542DZ	**22.8** 5130	**29.4** 6610	**20.0** 4500	**21.2** 4770	**28.4** 6380	6100	**0.166** 0.366
47 1.8504	**47** 1.8504	**17** 0.6693	**21** 0.827	**20** 0.787	**27** 1.063	**1.0** 0.039	**0.3** 0.012	NUTR1747	NUTR1747DZ	**24.5** 5510	**33.3** 7490	**22.0** 4950	**28.1** 6320	**33.6** 7550	5300	**0.230** 0.507
	47 1.8504	**20** 0.7874	**25** 0.984	**24** 0.945	**32** 1.260	**1.0** 0.039	**0.3** 0.012	NUTR20	NUTR20DZ	**39.0** 8770	**53.2** 12000	**28.1** 6320	**20.5** 4610	**32.7** 7350	4500	**0.254** 0.560
52 2.0472	**52** 2.0472	**20** 0.7874	**25** 0.984	**24** 0.945	**32** 1.260	**1.0** 0.039	**0.3** 0.012	NUTR2052	NUTR2052DZ	**39.0** 8770	**53.2** 12000	**31.6** 7100	**31.0** 6970	**45.9** 10300	4500	**0.326** 0.719
	52 2.0472	**25** 0.9843	**25** 0.984	**24** 0.945	**37** 1.457	**1.0** 0.039	**0.3** 0.012	NUTR25	NUTR25DZ	**43.0** 9670	**63.1** 14200	**29.6** 6650	**22.2** 4990	**35.4** 7960	3700	**0.291** 0.642
62 2.4409	**62** 2.4409	**25** 0.9843	**25** 0.984	**24** 0.945	**37** 1.457	**1.0** 0.039	**0.3** 0.012	NUTR2562	NUTR2562DZ	**43.0** 9670	**63.1** 14200	**36.0** 8090	**43.9** 9870	**57.8** 13000	3700	**0.460** 1.014
	62 2.4409	**30** 1.1811	**29** 1.142	**28** 1.102	**44** 1.732	**1.0** 0.039	**0.3** 0.012	NUTR30	NUTR30DZ	**60.0** 13500	**83.1** 18700	**40.8** 9170	**29.0** 6520	**46.2** 10400	3200	**0.480** 1.058
72 2.8346	**72** 2.8346	**30** 1.1811	**29** 1.142	**28** 1.102	**44** 1.732	**1.0** 0.039	**0.3** 0.012	NUTR3072	NUTR3072DZ	**60.0** 13500	**83.1** 18700	**48.6** 10900	**53.2** 12000	**74.2** 16700	3200	**0.711** 1.567
	72 2.8346	**35** 1.3780	**29** 1.142	**28** 1.102	**50** 1.969	**1.1** 0.043	**0.6** 0.024	NUTR35	NUTR35DZ	**65.5** 14700	**97.8** 22000	**45.9** 10300	**38.7** 8700	**61.7** 13900	2600	**0.655** 1.444
80 3.1496	**80** 3.1496	**35** 1.3780	**29** 1.142	**28** 1.102	**50** 1.969	**1.1** 0.043	**0.6** 0.024	NUTR3580	NUTR3580DZ	**65.5** 14700	**97.8** 22000	**51.7** 11600	**58.7** 13200	**81.9** 18400	2600	**0.865** 1.907
	80 3.1496	**40** 1.5748	**32** 1.260	**30** 1.181	**55** 2.165	**1.1** 0.043	**0.6** 0.024	NUTR40	NUTR40DZ	**88.0** 19800	**132** 29700	**60.6** 13600	**48.0** 10800	**76.5** 17200	2500	**0.848** 1.870
85 3.3465	**85** 3.3465	**45** 1.7717	**32** 1.260	**30** 1.181	**60** 2.362	**1.1** 0.043	**0.6** 0.024	NUTR45	NUTR45DZ	**93.0** 20900	**146** 32800	**62.0** 13900	**50.2** 11300	**80.0** 18000	2200	**0.917** 2.022
90 3.5433	**90** 3.5433	**40** 1.5748	**32** 1.260	**30** 1.181	**55** 2.165	**1.1** 0.043	**0.6** 0.024	NUTR4090	NUTR4090DZ	**88.0** 19800	**132** 29700	**69.1** 15500	**75.4** 17000	**111** 25000	2500	**1.162** 2.562
	90 3.5433	**50** 1.9685	**32** 1.260	**30** 1.181	**65** 2.559	**1.1** 0.043	**0.6** 0.024	NUTR50	NUTR50DZ	**98.0** 22000	**160** 36000	**63.3** 14200	**52.9** 11900	**84.3** 19000	2000	**0.988** 2.178
100 3.9370	**100** 3.9370	**45** 1.7717	**32** 1.260	**30** 1.181	**60** 2.362	**1.1** 0.043	**0.6** 0.024	NUTR45100	NUTR45100DZ	**93.0** 20900	**146** 32800	**74.3** 16700	**92.2** 20700	**127** 28600	2200	**1.412** 3.113
110 4.3307	**110** 4.3307	**50** 1.9685	**32** 1.260	**30** 1.181	**65** 2.559	**1.1** 0.043	**0.6** 0.024	NUTR50110	NUTR50110DZ	**98.0** 22000	**160** 36000	**79.0** 17800	**110** 24700	**141** 31700	2000	**1.727** 3.807

STUD-TYPE AND YOKE-TYPE TRACK ROLLERS – FULL COMPLEMENT

INCH SERIES

Inch series track rollers listed in this catalog have been designed with the outer rings of large radial cross section to withstand heavy rolling or shock loads on track-type or cam-controlled equipment.

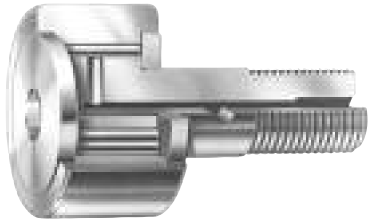


Fig. B5-14. CR with stud

REFERENCE STANDARD:

- **ANSI/ABMA Std. 18.2** – needle roller bearings – radial, inch design.

Before selecting specific inch series track rollers, the engineering section in this catalog should be reviewed.

Fig. B5-15. YCR for yoke mounting

IDENTIFICATION

The stud- and yoke-type, special construction features and size are designated by an identification code consisting of prefix letters followed by a dash and suffix numbers.

The initial prefix letters denote the type of track roller/cam follower. Additional prefix letters are used when it is necessary to denote special construction features. The suffix numbers following the prefix letters denote the size of the track roller. See Table B5-9.

The basic types are listed below:

CR – regular stud-type, full complement needle rollers, inch series
YCR – yoke-type, full complement needle rollers, inch series

Construction feature code letters – for inch series track rollers – are used as required, in the following order:

H – heavy stud
S – seals with internal thrust washers
B – hexagonal wrench socket in stud head (stud-type only)
C – crowned outer ring
E – eccentric stud (regular stud-type only)

Descriptions of typical examples, with complete letter codes, combining basic type of bearing and construction features follow. See Table B5-10.

Since the entire identification code might not appear on the bearing itself, the manufacturer's parts list or another reliable source should always be consulted when ordering bearings for field or service replacement to make certain the correct unit with the correct lubricant is specified.

Table B5-9. Identification code – inch series

Prefix letters		Suffix numbers	Complete
Type	Construction features	O.D.	Designation
CR	SBE	-16	CRSBE-16
CR		-16	CR-16

Table B5-10. Code description – inch series

Stud-types	
Description	Prefix code
With seals and internal thrust washers	CRS
With seals, internal thrust washers and heavy stud	CRHS
With seals, internal thrust washers and crowned outer ring	CRSC
With seals, internal thrust washers, hex socket and crowned outer ring	CRSBC
With seals, internal thrust washers, hex socket, crowned outer ring and eccentric stud	CRSBCE
Yoke-types	
With seals and internal thrust washers	YCRS
With seals, internal thrust washers and profiled outer ring	YCRSC

CONSTRUCTION

JTEKT products listed on the following pages have been designed with the outer ring of the large radial cross section to withstand heavy rolling and shock loads on track-type or cam-controlled equipment.

Regular stud-type (CR) are designed with integral studs for cantilever mounting. When a regular stud-type track roller is used within the permissible dynamic load ($F_{r\ perm}$) given in the bearing tables, the ductile core of the stud provides the necessary toughness for and resistance to shock loads. A screwdriver slot or a hexagonal wrench socket, in the head of the stud, facilitates mounting.

Yoke-type (YCR) are designed for straddle mounting. Each type is available with a full complement of needle rollers.

All inch series track rollers have a black-oxide finish on all external surfaces.

SEALED TRACK ROLLERS – INCH SERIES

Inch series sealed track rollers contain a lip-type seal and an internal thrust washer. On some sizes of track rollers, the thrust washer and seal have been incorporated into a single component. Regardless of configuration, the thrust washer fits between the shoulders of the outer ring. The inside faces the steel retaining washer and flange of the stud. These washers reduce sliding friction and serve to increase the life of the bearing – particularly when it is infrequently re-lubricated, or where misalignment occurs. In all cases, the external dimensions of the sealed bearings are the same as the unsealed bearings. The seals are thermally stable in a temperature range between -30° C and +110° C (-25° F and +225° F).

CROWNED TRACK ROLLERS

These units are available with cylindrical or crowned outer rings.

Track rollers are designed with a crowned outer ring to alleviate the uneven bearing loading – resulting from deflection, bending or misalignment in mounting.

To specify a crowned ring for any inch series track roller having a cylindrical outer ring, add the letter "C" at the end of the prefix code. For example:

prefix CR – regular stud-type, full complement of needle rollers and cylindrical outer ring
prefix CRC – same as above, but with crowned outer ring.

The O.D. tolerance of crowned track rollers is 0.000 – 0.050 mm (+0.0000 - 0.0020 in).

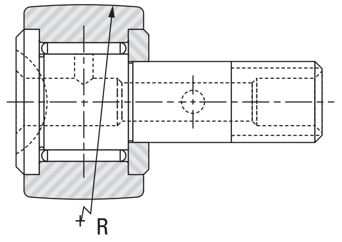


Fig. B5-16. CR with stud

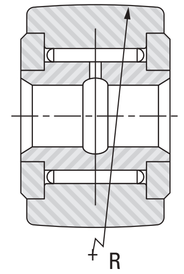


Fig. B5-17.YCR for yoke mounting

HEXAGONAL SOCKETS

Smaller sizes of regular inch series stud-type units have a screwdriver slot or a hexagonal socket in the flanged end of the stud to facilitate mounting. Larger sizes have a socket to accommodate a hexagonal wrench. Wrench sizes are listed in Table B5-11 on page B-5-30.

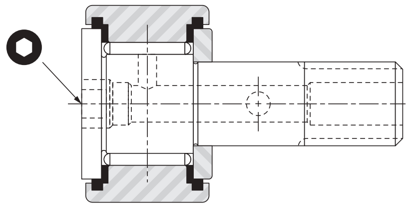


Fig. B5-18. Inch series stud-type unit with hexagonal socket

Table B5-11. Hexagonal wrench sizes – inch series

Size designation (suffix)	Wrench size	Size designation (suffix)	Wrench size
	mm in		mm in
-8	3.175 0.1250	-28	7.937 0.3125
-8-1	3.175 0.1250	-30	7.937 0.3125
-10	3.175 0.1250	-32	11.112 0.4375
-10-1	3.175 0.1250	-36	11.112 0.4375
-12	4.762 0.1875	-40	12.700 0.5000
-14	4.762 0.1875	-44	12.700 0.5000
-16	6.350 0.2500	-48	19.050 0.7500
-18	6.350 0.2500	-52	19.050 0.7500
-20	6..350 0.2500	-56	19.050 0.7500
-22	6.350 0.2500	-64	19.050 0.7500
-24	7.937 0.3125	-80	22.225 0.875
-26	7.937 0.3125	-96	25.40 1.000

ECCENTRIC STUDS

To provide radial adjustment of the outer ring toward the track or cam surface at the time of installation, the regular inch series stud-types are available with eccentric studs which are specified by adding the letter "E" to the construction feature code:

prefix CRSBE – regular stud-type track roller with full complement of needle rollers, two seals, with internal thrust washers, hexagonal wrench socket in stud head, and eccentric stud.

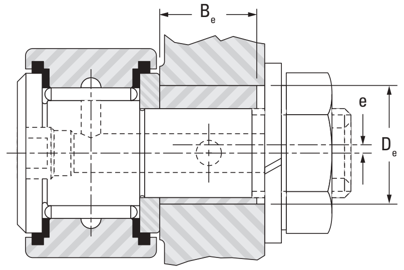


Fig. B5-19. Eccentric studs – inch series

Since a track roller with an eccentric stud is usually adjusted upon installation by turning the stud in the mounting hole, a close clearance fit between the outer diameter of the bushing and the mounting hole is necessary. For turning the stud, a hexagonal wrench is generally more convenient than a screwdriver. And an option for a hexagonal wrench socket, in the head of the stud, should be exercised.

Some applications may require more secure positioning than provided by the tightened stud nut. If so, it is suggested that the housing, and eccentric bushing, be drilled at the time of installation to accept a locating dowel pin.

LOAD RATINGS

DYNAMIC LOADING AS A TRACK ROLLER

When the outer ring of a stud-type or yoke-type track roller runs on a track, the contact under a radial load causes elastic (oval) deformation of the outer ring. As a result, a smaller zone of the raceway is loaded and the load is distributed on fewer needle rollers. This, in turn, affects the track roller's dynamic and static load ratings. Also, this deformation generates bending stress in the outer ring, which must not exceed the maximum permitted for the material of the outer ring. The maximum permissible dynamic ($F_{r\ perm}$) radial load condition is determined by this requirement.

The rating life of a stud-type or yoke-type track roller should be calculated using the dynamic load ratings, C_w, shown in the tables. The tables also show the maximum permissible radial load, $F_{r\ perm}$, that can be dynamically applied on the stud-type or yoke-type track rollers. However, to calculate the L_{10} life of a track roller, the applied radial load must not be greater than $C_w/4$ – based on ideal operating conditions of alignment, lubrication, temperature, speed and accelerations.

STATIC LOADING

In addition to the basic static load rating C_0, the tables also list the maximum permissible static radial load, $F_{0r\ perm}$, that may be applied to a stud-type or yoke-type track roller. The values of $F_{0r\ perm}$ result in a minimum static factor f_s of 0.7, for the worst condition of internal load distribution in inch series track roller operation. **The $F_{0r\ perm}$ values must not be exceeded.** Exceeding $F_{0r\ perm}$ may cause permanent damage to the track roller. A damaged track roller could cause the equipment in which the track roller is installed to malfunction. The static factor f_s can be calculated using the following formula:

$$f_s \geq 0.7 \left(\frac{F_{0r\ perm}}{P_{0r}} \right)$$

Where:

$F_{0r\ perm}$ = Maximum permissible static radial load
P_{0r} = Equivalent static load (F_{0r} for yoke-type track rollers)
F_{0r} = Static radial load
f_s = Static factor whose values should not be smaller than those suggested in Table B5-12.

Table B5-12. Suggested values for static factors f_s for inch series track rollers

Requirements for yoke – type track rollers and stud – type track rollers	Suggested f_s values	
	Max.	Min.
High shock-type loads – Quiet running	1.5	2.5
Normal loading – Normal quietness of running	1	1.5
Minor impact loads and rotary motion particularly quiet running not required	0.7	1

MOUNTING

The surface of the hole in the machine element, which supports the stud or the mounting shaft, must not deform under the expected load, and the support should be sufficiently rigid to resist bending loads.

Deformation and bending will cause uneven loading of the outer ring.

In mounting the stud-type track roller, the retaining washer must be firmly backed up by a flat shoulder which is square with the stud center line. The shoulder diameter must be no smaller than the minimum clamping diameter (d_a) listed in the bearing tables.

The maximum inherent strength of the stud is obtained when the unit is supported, as close as possible, to the retaining washer – which minimizes the bending moment. For this reason, the edge of the housing, which supports the stud shank, should be kept as sharp as possible, but free from burrs.

To minimize deflection in mounted stud-type track rollers, the stud shank should be housed with the fit (d_b) shown in the bearing tables. The clamping nut should not be tightened with a torque value higher than the maximum listed. A screwdriver slot, or hexagonal socket in the end of the stud, is provided for a tool to prevent the stud from turning when the nut is being tightened. Because the bottom of the screwdriver slot is not flat, it is helpful to put a radius on the tip of the screwdriver being used to hold the stud more securely.

When the stud shank is housed with an interference fit, installation force should be applied only to the center portion of the flanged end of the stud, preferably with an arbor press.

When the loads are high, the yoke-type track rollers should be mounted on a high strength bolt or shaft with the tight transition fit listed in the bearing tables. The bearing should be clamped between flat and parallel faces, at right angles, to the axis to prevent the retaining washers from coming off under load. If the bearing cannot be clamped, a close axial fit in the yoke is required.

When the applied loads are light to moderate, the inner ring of a yoke-type track roller may be mounted on an unhardened shaft, or a bolt with the loose transition fit listed in the bearing tables. Again, the retaining washers should be backed up axially to prevent their coming off under load.

LUBRICATION

All inch series stud-type track rollers with a screwdriver slot in the flanged end of the stud have provisions for lubrication, through the flanged end of the stud. The 12, and larger sizes of inch series stud-type track rollers with screwdriver slots, have provisions for re-lubrication through either end of the stud, and through a cross-drilled hole in the shank. The ends of the axial holes are counterbored to accept drive-type grease lubrication fittings. Hole diameters for these grease fittings are listed in the tables of dimensions.

Sizes 8 through 10-1 of the inch series stud-type track rollers, with a hexagonal socket in the flanged end of the stud, cannot be re-lubricated. Size 12 and up have re-lubrication provisions in the threaded end of the stud, and a cross-drilled hole in the shank. At the threaded end of the stud, the axial hole is counterbored to receive a drive type grease fitting. Sizes 12 through 22 and 48 through 64 of inch series stud-type track rollers, with hexagonal sockets, also have provisions for re-lubrication through the hex socket in the flanged end of the stud. Sizes 48 through 64 are supplied with lubrication fittings which may be installed in the axial hole in the bottom of the hexagonal slot in the head end of the stud – at a depth which allows the hexagonal wrench to be inserted in the wrench socket, without damaging the grease fitting.

Plugs are furnished with stud-type track rollers to close off unused holes. If the cross-drilled hole in the stud shank is not used, it will be covered when the track roller is installed properly.

Most inch series yoke-type track rollers are produced with lubrication holes and grooves in the inner ring bores, so they can be re-lubricated through axially and radially drilled holes in the supporting shaft or bolt.

Oil is the preferred lubricant for all types. Use continuous oil lubrication, or frequent grease lubrication for steady rotating conditions. Applications involving slow, intermittent oscillation are not as critical. And longer intervals between re-lubrication are permissible. Both stud- and yoke-type track rollers are normally supplied with medium temperature grease lubrication.

SPECIAL TRACK ROLLERS/ CAM FOLLOWERS

Track rollers can be obtained with dimensions different from those in the bearing tables, if the quantities permit economical production. For these and other modifications, please consult your representative.

FORKLIFT TRUCK

Yoke-type sealed units serve as high capacity and rugged guide rollers for lift trucks. Their design permits them to be mounted on studs welded to the structure. The seals exclude foreign matter and extend the time between re-lubrication periods.

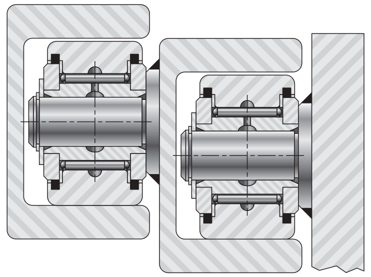


Fig. B5-20. Yoke-type sealed units

HAY BALER

Stud-types are important components on many different types of farm equipment because of their required long service life under severe loads and operating conditions. Needle roller bearings provide dependable and economical operation in the windrow pickup of hay balers.

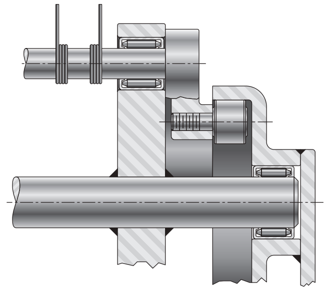


Fig. B5-21. Stud-type

MACHINE WAY

Heavily loaded machine tool tables must travel freely and accurately. Stud- and yoke-type sealed units, in combination, support and guide such tables under the most severe conditions. The high capacity and the very low wear rate permit heavy loads to be carried without impairing the accuracy of the table's travel. The seals exclude dirt and chips, and make the need for re-lubrication infrequent.

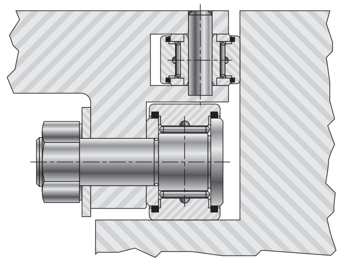


Fig. B5-22. Stud- and yoke-type sealed units

RECIPROCATING SLIDE

Stud-types find wide application in feeding and advancing mechanisms on metalworking presses. The rotary motion of an eccentric cam, rotating between two cam followers, mounted on a slide imparts reciprocating linear motion to the slide. Dwell periods, as well as accuracy in both rapid and slow linear actuation of the slide, are made possible.

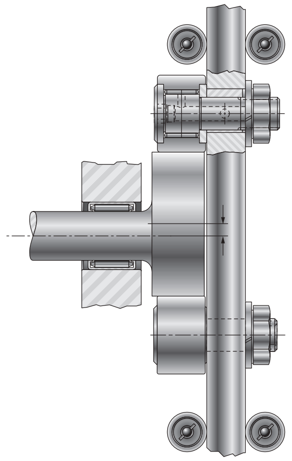
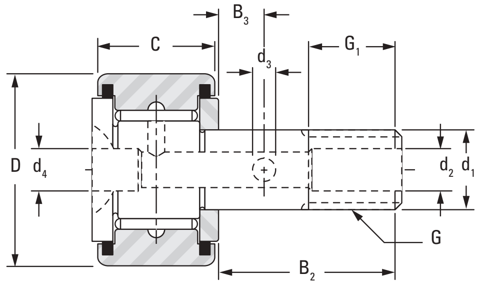


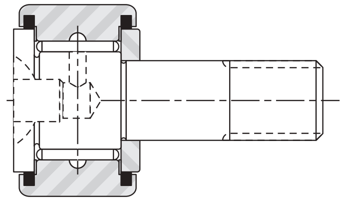
Fig. B5-23. Stud-type

STUD-TYPE TRACK ROLLERS
CR, CRS SERIES
INCH SERIES

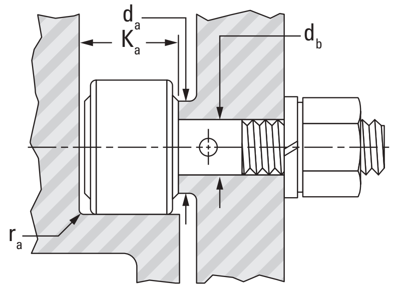
- Screwdriver slot in head facilitates mounting.
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers, and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.



CR and CRS -12 to -64



CR and CRS -8 to -10-1



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

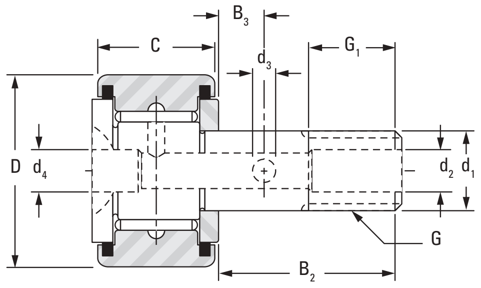
Outer Dia.	d_1	D	C	B_2	B_3	G_1	d_2 and d_4	d_3	G	Track Roller Designation		Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	(nom.)		Min.			UNF	Without Seals	With Seals and Internal Thrust Washers	As a Bearing		As a Track Roller				d_b	$r_{as\,max}$	K_a	d_a		
												Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.0005 **0** 0	Max.	Min.	Min.		
												C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$							
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in			**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
1/2	**4.826** 0.1900	**12.70** 0.500	**8.74** 0.344	**12.70** 0.500	-	**6.35** 0.250	**3.18**(1)(2) 0.125	-	10-32	CR-8	CRS-8	**4.44** 999	**4.94** 1110	**3.07** 690	**1.20** 269	**2.87** 645	7000	**4.826** 0.1900	**0.25** 0.010	**10.41** 0.410	**10.41** 0.410	**1.69** 15	**0.01** 0.02
1/2	**4.826** 0.1900	**12.70** 0.500	**9.53** 0.375	**15.88** 0.625	-	**6.35** 0.250	**3.18**(1)(2) 0.125	-	10-32	CR-8-1	CRS-8-1	**4.89** 1100	**5.60** 1260	**3.39** 762	**1.36** 305	**3.25** 731	7000	**4.826** 0.1900	**0.25** 0.010	**11.20** 0.441	**10.41** 0.410	**1.69** 15	**0.01** 0.02
5/8	**6.350** 0.2500	**15.88** 0.625	**10.31** 0.406	**15.90** 0.630	-	**7.90** 0.310	**3.18**(1)(2) 0.125	-	1/4-28	CR-10	CRS-10	**6.05** 1360	**7.87** 1770	**4.42** 994	**2.53** 569	**6.09** 1370	5500	**6.350** 0.2500	**0.38** 0.015	**11.99** 0.472	**11.73** 0.462	**3.95** 35	**0.02** 0.04
5/8	**6.350** 0.2500	**15.88** 0.625	**11.11** 0.438	**19.10** 0.750	-	**7.90** 0.310	**3.18**(1)(2) 0.125	-	1/4-28	CR-10-1	CRS-10-1	**6.54** 1470	**8.72** 1960	**4.76** 1070	**2.79** 628	**6.72** 1510	5500	**6.350** 0.2500	**0.38** 0.015	**12.80** 0.504	**11.73** 0.462	**3.95** 35	**0.02** 0.05
3/4	**9.530** 0.3750	**19.05** 0.750	**12.70** 0.500	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	**4.78** 0.188	**2.39** 0.094	3/8-24	CR-12	CRS-12	**10.14** 2280	**14.68** 3300	**6.27** 1410	**2.92** 656	**6.98** 1570	3800	**9.525** 0.3750	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**10.73** 95	**0.03** 0.08
7/8	**9.530** 0.3750	**22.23** 0.875	**12.70** 0.500	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	**4.78** 0.188	**2.39** 0.094	3/8-24	CR-14	CRS-14	**10.14** 2280	**14.68** 3300	**7.38** 1660	**4.94** 1110	**11.88** 2670	3800	**9.525** 0.3750	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**10.73** 95	**0.04** 0.10
1	**11.110** 0.4375	**25.40** 1.000	**15.88** 0.625	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	**4.78** 0.188	**2.39** 0.094	7/16-20	CR-16	CRS-16	**12.99** 2920	**21.93** 4930	**8.41** 1890	**5.60** 1260	**13.43** 3020	2800	**11.112** 0.4375	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**28.25** 250	**0.07** 0.16
1 1/8	**11.110** 0.4375	**28.58** 1.125	**15.88** 0.625	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	**4.78** 0.188	**2.39** 0.094	7/16-20	CR-18	CRS-18	**12.99** 2920	**21.93** 4930	**9.43** 2120	**8.18** 1840	**17.48** 3930	2800	**11.112** 0.4375	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**28.25** 250	**0.09** 0.20
1 1/4	**12.700** 0.5000	**31.75** 1.250	**19.05** 0.750	**31.75** 1.250	**7.92** 0.312	**15.90** 0.630	**4.78** 0.188	**2.39** 0.094	1/2-20	CR-20	CRS-20	**23.31** 5240	**30.29** 6810	**16.06** 3610	**7.38** 1660	**17.75** 3990	2700	**12.700** 0.5000	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**39.55** 350	**0.14** 0.30
1 3/8	**12.700** 0.5000	**34.93** 1.375	**19.05** 0.750	**31.80** 1.250	**7.92** 0.312	**15.90** 0.630	**4.78** 0.188	**2.39** 0.094	1/2-20	CR-22	CRS-22	**23.31** 5240	**30.29** 6810	**17.66** 3970	**10.45** 2350	**25.04** 5630	2700	**12.700** 0.5000	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**39.55** 350	**0.16** 0.35
1 1/2	**15.880** 0.6250	**38.10** 1.500	**22.23** 0.875	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	**4.78** 0.188	**2.39** 0.094	5/8-18	CR-24	CRS-24	**28.16** 6330	**40.26** 9050	**20.15** 4530	**11.97** 2690	**28.74** 6460	2700	**15.872** 0.6250	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**73.45** 650	**0.24** 0.53
1 5/8	**15.880** 0.6250	**41.28** 1.625	**22.23** 0.875	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	**4.78** 0.188	**2.39** 0.094	5/8-18	CR-26	CRS-26	**28.16** 6330	**40.26** 9050	**21.62** 4860	**15.66** 3520	**36.08** 8110	2300	**15.872** 0.6250	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**73.45** 650	**0.27** 0.61

Continued on next page.

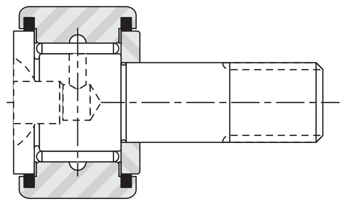
(1) No lubrication hole in threaded end.
(2) Oil hole (d_4) only.
(3) UNS instead of UNF threads.

STUD-TYPE TRACK ROLLERS
CR, CRS SERIES
INCH SERIES

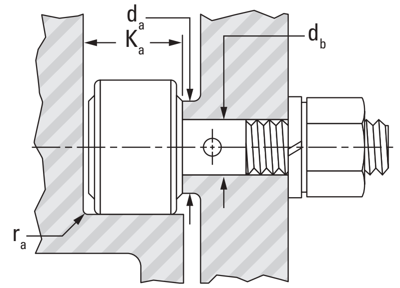
- Screwdriver slot in head facilitates mounting.
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers, and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.



CR and CRS -12 to -64



CR and CRS -8 to -10-1



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

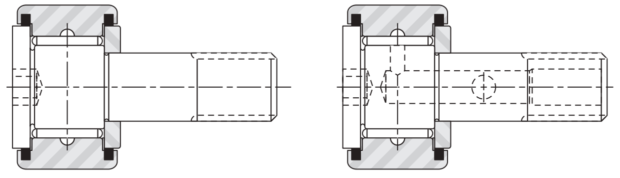
Outer Dia.	d1 +0.025 +0.001 / 0 0	D 0 0 / -0.025 -0.001	C 0 0 / -0.13 -0.005	B2 (nom.)	B3	G1 Min.	d2 and d4	d3	G UNF	Track Roller Designation Without Seals	Track Roller Designation With Seals and Internal Thrust Washers	Load Rating As a Bearing Dynamic C	Load Rating As a Bearing Static C0	Load Rating As a Track Roller Dynamic Cw	Load Rating As a Track Roller Dynamic Fr perm	Load Rating As a Track Roller Static F0r perm	Speed Rating Grease	Mounting Dimensions db Bore Dia. For Stud +0.013 +0.0005 / 0 0	Mounting Dimensions ras max Max.	Mounting Dimensions Ka Min.	Mounting Dimensions da Min.	Clamping Torque	Approx Wt.
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	in			kN lbf	kN lbf	kN lbf	kN lbf	kN lbf	min-1	mm in	mm in	mm in	mm in	N-m lb-in	kg lbs
1 3/4	19.050 0.7500	44.45 1.750	25.40 1.000	44.45 1.750	11.13 0.438	22.20 0.880	4.78 0.188	3.18 0.125	3/4-16	CR-28	CRS-28	35.50 7980	56.49 12700	25.93 5830	19.04 4280	45.82 10300	1900	19.050 0.7500	1.02 0.040	27.08 1.066	31.75 1.250	141.25 1250	0.38 0.85
1 7/8	19.050 0.7500	47.63 1.875	25.40 1.000	44.45 1.750	11.13 0.438	22.20 0.880	4.78 0.188	3.18 0.125	3/4-16	CR-30	CRS-30	35.50 7980	56.49 12700	27.40 6160	23.66 5320	51.15 11500	1900	19.050 0.7500	1.02 0.040	27.08 1.066	31.75 1.250	141.25 1250	0.43 0.95
2	22.230 0.8750	50.80 2.000	31.75 1.250	50.80 2.000	12.70 0.500	25.40 1.000	4.78 0.188	3.18 0.125	7/8-14	CR-32	CRS-32	43.19 9710	75.62 17000	31.89 7170	28.11 6320	62.72 14100	1700	22.225 0.8750	1.27 0.050	33.43 1.316	35.71 1.406	169.5 1500	0.62 1.37
2 1/4	22.230 0.8750	57.15 2.250	31.75 1.250	50.80 2.000	12.70 0.500	25.40 1.000	4.78 0.188	3.18 0.125	7/8-14	CR-36	CRS-36	43.19 9710	75.62 17000	34.70 7800	39.86 8960	73.40 16500	1700	22.225 0.8750	1.27 0.050	33.43 1.316	35.71 1.406	169.5 1500	0.76 1.67
2 1/2	25.400 1.0000	63.50 2.500	38.10 1.500	57.20 2.250	14.27 0.562	28.57 1.125	4.78 0.188	3.18 0.125	1-14(3)	CR-40	CRS-40	58.27 13100	117.43 26400	44.48 10000	54.71 12300	104.09 23400	1400	25.400 1.0000	2.29 0.090	39.78 1.566	42.88 1.688	254.25 2250	1.14 2.50
2 3/4	25.400 1.0000	69.85 2.750	38.10 1.500	57.20 2.250	14.27 0.562	28.57 1.125	4.78 0.188	3.18 0.125	1-14(3)	CR-44	CRS-44	58.27 13100	117.43 26400	47.15 10600	71.17 16000	116.54 26200	1400	25.400 1.0000	2.29 0.090	39.78 1.566	42.88 1.688	254.25 2250	1.33 2.93
3	31.750 1.2500	76.20 3.000	44.45 1.750	63.50 2.500	15.88 0.625	31.75 1.250	6.35 0.250	3.18 0.125	1 1/4-12	CR-48	CRS-48	74.29 16700	177.93 40000	51.60 11600	68.50 15400	131.22 29500	990	31.750 1.2500	2.29 0.090	46.13 1.816	53.98 2.125	389.85 3450	1.91 4.20
3 1/4	31.750 1.2500	82.55 3.250	44.45 1.750	63.50 2.500	15.88 0.625	31.75 1.250	6.35 0.250	3.18 0.125	1 1/4-12	CR-52	CRS-52	74.29 16700	177.93 40000	54.71 12300	85.85 19300	147.24 33100	990	31.750 1.2500	2.29 0.090	46.13 1.816	53.98 2.125	389.85 3450	2.18 4.81
3 1/2	34.930 1.3750	88.90 3.500	50.80 2.000	69.90 2.750	17.48 0.688	34.93 1.375	6.35 0.250	3.18 0.125	1 3/8-12	CR-56	CRS-56	109.87 24700	225.52 50700	82.29 18500	94.75 21300	191.27 43000	950	34.925 1.3750	2.29 0.090	52.48 2.066	61.93 2.438	474.6 4200	2.91 6.42
4	38.100 1.5000	101.60 4.000	57.15 2.250	88.90 3.500	19.05 0.750	38.10 1.500	6.35 0.250	3.18 0.125	1 1/2-12	CR-64	CRS-64	137.89 31000	319.38 71800	98.75 22200	125.88 28300	250.43 56300	780	38.100 1.5000	2.29 0.090	58.83 2.316	71.04 2.797	565 5000	4.29 9.46

(1) No lubrication hole in threaded end.
(2) Oil hole (d_4) only.
(3) UNS instead of UNF threads.

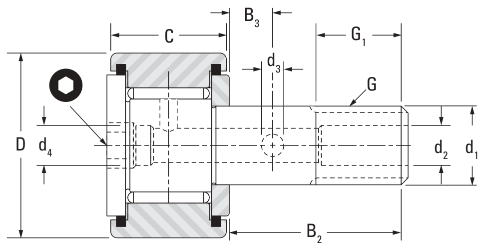
STUD-TYPE TRACK ROLLERS
CRSB SERIES
INCH SERIES

- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

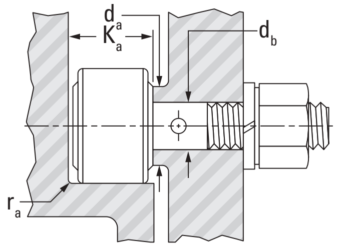
For hexagonal wrench sizes, see page B-5-30.



CRSB -8 to -10-1　**CRSB -24 to -44**



CRSB -12 to -22
CRSB -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d1	D	C	B2	B3	G1	d4	d2	d3	G	Bearing Designation
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	(nom.)		Min.				UNF	
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
1/2	**4.826** 0.1900	**12.70** 0.500	**8.74** 0.344	**12.70** 0.500	-	**6.35** 0.250	-	-	-	10-32	CRSB-8
1/2	**4.826** 0.1900	**12.70** 0.500	**9.53** 0.375	**15.88** 0.625	-	**6.35** 0.250	-	-	-	10-32	CRSB-8-1
5/8	**6.350** 0.2500	**15.88** 0.625	**10.31** 0.406	**15.90** 0.630	-	**7.90** 0.310	-	-	-	1/4-28	CRSB-10
5/8	**7.940** 0.3125	**15.88** 0.625	**11.11** 0.438	**19.10** 0.750	-	**7.90** 0.310	-	-	-	1/4-28	CRSB-10-1
3/4	**9.530** 0.3750	**19.05** 0.750	**12.70** 0.500	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	-	**4.78** 0.188	**2.39** 0.094	3/8-24	CRSB-12
7/8	**9.530** 0.3750	**22.23** 0.875	**12.70** 0.500	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	-	**4.78** 0.188	**2.39** 0.094	3/8-24	CRSB-14
1	**11.110** 0.4375	**25.40** 1.000	**15.88** 0.625	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	-	**4.78** 0.188	**2.39** 0.094	7/16-20	CRSB-16
1 1/8	**11.110** 0.4375	**28.58** 1.125	**15.88** 0.625	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	-	**4.78** 0.188	**2.39** 0.094	7/16-20	CRSB-18
1 1/4	**12.700** 0.5000	**31.75** 1.250	**19.05** 0.750	**31.75** 1.250	**7.92** 0.312	**15.90** 0.630	-	**4.78** 0.188	**2.39** 0.094	1/2-20	CRSB-20
1 3/8	**12.700** 0.5000	**34.93** 1.375	**19.05** 0.750	**31.80** 1.250	**7.92** 0.312	**15.90** 0.630	-	**4.78** 0.188	**2.39** 0.094	1/2-20	CRSB-22
1 1/2	**15.880** 0.6250	**38.10** 1.500	**22.23** 0.875	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	-	**4.78** 0.188	**2.39** 0.094	5/8-18	CRSB-24
1 5/8	**15.880** 0.6250	**41.28** 1.625	**22.23** 0.875	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	-	**4.78** 0.188	**2.39** 0.094	5/8-18	CRSB-26

Bearing Designation	Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
	As a Bearing		As a Track Roller				db	ras max	Ka	da		
	Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.0005 **0** 0	Max.	Min.	Min.		
	C	C0	Cw	Fr perm	F0r perm							
	kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min-1	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
CRSB-8	**4.44** 999	**4.94** 1110	**3.07** 690	**1.20** 269	**2.87** 645	7000	**4.826** 0.1900	**0.25** 0.010	**10.41** 0.410	**10.41** 0.410	**1.69** 15	**0.01** 0.02
CRSB-8-1	**4.89** 1100	**5.60** 1260	**3.39** 762	**1.36** 305	**3.25** 731	7000	**4.826** 0.1900	**0.25** 0.010	**11.20** 0.441	**10.41** 0.410	**1.69** 15	**0.01** 0.02
CRSB-10	**6.05** 1360	**7.87** 1770	**4.42** 994	**2.53** 569	**6.09** 1370	5500	**6.350** 0.2500	**0.38** 0.015	**11.99** 0.472	**11.73** 0.462	**3.95** 35	**0.02** 0.04
CRSB-10-1	**6.54** 1470	**8.72** 1960	**4.76** 1070	**2.79** 628	**6.72** 1510	5500	**6.350** 0.2500	**0.38** 0.015	**12.80** 0.504	**11.73** 0.462	**3.95** 35	**0.02** 0.05
CRSB-12	**10.14** 2280	**14.68** 3300	**6.27** 1410	**2.92** 656	**6.98** 1570	3800	**9.525** 0.3750	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**10.73** 95	**0.03** 0.08
CRSB-14	**10.14** 2280	**14.68** 3300	**7.38** 1660	**4.94** 1110	**11.88** 2670	3800	**9.525** 0.3750	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**10.73** 95	**0.04** 0.10
CRSB-16	**12.99** 2920	**21.93** 4930	**8.41** 1890	**5.60** 1260	**13.43** 3020	2800	**11.112** 0.4375	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**28.25** 250	**0.07** 0.16
CRSB-18	**12.99** 2920	**21.93** 4930	**9.43** 2120	**8.18** 1840	**17.48** 3930	2800	**11.112** 0.4375	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**28.25** 250	**0.09** 0.20
CRSB-20	**23.31** 5240	**30.29** 6810	**16.06** 3610	**7.38** 1660	**17.75** 3990	2700	**12.700** 0.5000	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**39.55** 350	**0.14** 0.30
CRSB-22	**23.31** 5240	**30.29** 6810	**17.66** 3970	**10.45** 2350	**25.04** 5630	2700	**12.700** 0.5000	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**39.55** 350	**0.16** 0.35
CRSB-24	**28.16** 6330	**40.26** 9050	**20.15** 4530	**11.97** 2690	**28.74** 6460	2700	**15.872** 0.6250	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**73.45** 650	**0.24** 0.53
CRSB-26	**28.16** 6330	**40.26** 9050	**21.62** 4860	**15.66** 3520	**36.08** 8110	2300	**15.872** 0.6250	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**73.45** 650	**0.27** 0.61

(1) UNS instead of UNF threads.

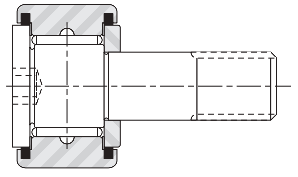
Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

Continued on next page.

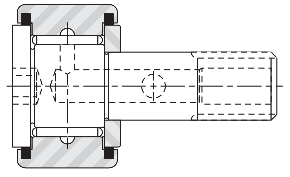
STUD-TYPE TRACK ROLLERS
CRSB SERIES
INCH SERIES

- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

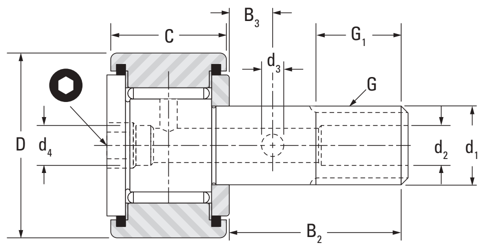
For hexagonal wrench sizes, see page B-5-30.



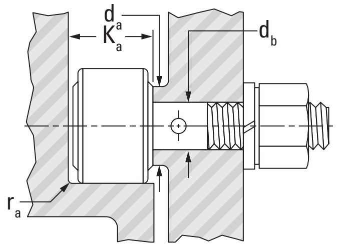
CRSB -8 to -10-1



CRSB -24 to -44



CRSB -12 to -22
CRSB -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d_1	D	C	B_2	B_3	G1	d_4	d_2	d_3	G	Bearing Designation
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	(nom.)		Min.				UNF	
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
1 3/4	**19.050** 0.7500	**44.45** 1.750	**25.40** 1.000	**44.45** 1.750	**11.13** 0.438	**22.20** 0.880	-	**4.78** 0.188	**3.18** 0.125	3/4-16	CRSB-28
1 7/8	**19.050** 0.7500	**47.63** 1.875	**25.40** 1.000	**44.45** 1.750	**11.13** 0.438	**22.20** 0.880	-	**4.78** 0.188	**3.18** 0.125	3/4-16	CRSB-30
2	**22.230** 0.8750	**50.80** 2.000	**31.75** 1.250	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	7/8-14	CRSB-32
2 1/4	**22.230** 0.8750	**57.15** 2.250	**31.75** 1.250	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	7/8-14	CRSB-36
2 1/2	**25.400** 1.0000	**63.50** 2.500	**38.10** 1.500	**57.20** 2.250	**14.27** 0.562	**28.57** 1.125	-	**4.78** 0.188	**3.18** 0.125	1-14(1)	CRSB-40
2 3/4	**25.400** 1.0000	**69.85** 2.750	**38.10** 1.500	**57.20** 2.250	**14.27** 0.562	**28.57** 1.125	-	**4.78** 0.188	**3.18** 0.125	1-14(1)	CRSB-44
3	**31.750** 1.2500	**76.20** 3.000	**44.45** 1.750	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/4-12	CRSB-48
3 1/4	**31.750** 1.2500	**82.55** 3.250	**44.45** 1.750	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/4-12	CRSB-52
3 1/2	**34.930** 1.3750	**88.90** 3.500	**50.80** 2.000	**69.90** 2.750	**17.48** 0.688	**34.93** 1.375	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 3/8-12	CRSB-56
4	**38.100** 1.5000	**101.60** 4.000	**57.15** 2.250	**88.90** 3.500	**19.05** 0.750	**38.10** 1.500	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/2-12	CRSB-64
5	**50.800** 2.0000	**127.00** 5.000	**69.85** 2.750	**128.57** 5.062	**22.23** 0.875	**65.10** 2.563	1/4 NPT	1/4 NPT	**4.78** 0.188	2-12	CRSB-80
6	**63.500** 2.5000	**152.40** 6.000	**82.55** 3.250	**152.40** 6.000	**25.40** 1.000	**76.20** 3.000	1/4 NPT	1/4 NPT	**4.78** 0.188	2 1/2-12	CRSB-96

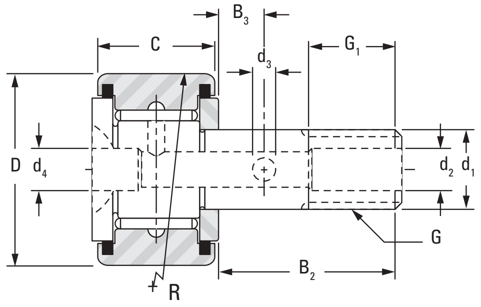
(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

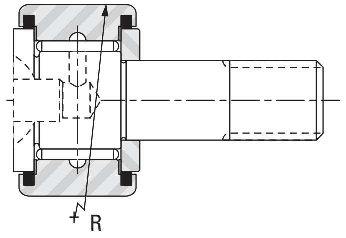
Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
As a Bearing		As a Track Roller				d_b	$r_{as\,max}$	K_a	d_a		
Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.0005 **0** 0	Max.	Min.	Min.		
C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$							
kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
35.50 7980	**56.49** 12700	**25.93** 5830	**19.04** 4280	**45.82** 10300	1900	**19.050** 0.7500	**1.02** 0.040	**27.08** 1.066	**31.75** 1.250	**141.25** 1250	**0.38** 0.85
35.50 7980	**56.49** 12700	**27.40** 6160	**23.66** 5320	**51.15** 11500	1900	**19.050** 0.7500	**1.02** 0.040	**27.08** 1.066	**31.75** 1.250	**141.25** 1250	**0.43** 0.95
43.19 9710	**75.62** 17000	**31.89** 7170	**28.11** 6320	**62.72** 14100	1700	**22.225** 0.8750	**1.27** 0.050	**33.43** 1.316	**35.71** 1.406	**169.5** 1500	**0.62** 1.37
43.19 9710	**75.62** 17000	**34.70** 7800	**39.86** 8960	**73.40** 16500	1700	**22.225** 0.8750	**1.27** 0.050	**33.43** 1.316	**35.71** 1.406	**169.5** 1500	**0.76** 1.67
58.27 13100	**117.43** 26400	**44.48** 10000	**54.71** 12300	**104.09** 23400	1400	**25.400** 1.0000	**2.29** 0.090	**39.78** 1.566	**42.88** 1.688	**254.25** 2250	**1.14** 2.50
58.27 13100	**117.43** 26400	**47.15** 10600	**71.17** 16000	**116.54** 26200	1400	**25.400** 1.0000	**2.29** 0.090	**39.78** 1.566	**42.88** 1.688	**254.25** 2250	**1.33** 2.93
74.29 16700	**177.93** 40000	**51.60** 11600	**68.50** 15400	**131.22** 29500	990	**31.750** 1.2500	**2.29** 0.090	**46.13** 1.816	**53.98** 2.125	**389.85** 3450	**1.91** 4.20
74.29 16700	**177.93** 40000	**54.71** 12300	**85.85** 19300	**147.24** 33100	990	**31.750** 1.2500	**2.29** 0.090	**46.13** 1.816	**53.98** 2.125	**389.85** 3450	**2.18** 4.81
109.87 24700	**225.52** 50700	**82.29** 18500	**94.75** 21300	**191.27** 43000	950	**34.925** 1.3750	**2.29** 0.090	**52.48** 2.066	**61.93** 2.438	**474.6** 4200	**2.91** 6.42
137.89 31000	**319.38** 71800	**98.75** 22200	**125.88** 28300	**250.43** 56300	780	**38.100** 1.5000	**2.29** 0.090	**58.83** 2.316	**71.04** 2.797	**565** 5000	**4.29** 9.46
210.40 47300	**484.86** 109000	**149.02** 33500	**171.70** 38600	**370.09** 83200	620	**50.800** 2.0000	**3.18** 0.125	**73.15** 2.880	**90.50** 3.563	**565** 5000	**8.90** 19.60
285.13 64100	**578.27** 130000	**201.06** 45200	**188.16** 42300	**436.37** 98100	520	**63.500** 2.5000	**3.18** 0.125	**85.85** 3.380	**113.51** 4.469	**565** 5000	**14.87** 32.76

STUD-TYPE TRACK ROLLERS
CRSC SERIES
INCH SERIES

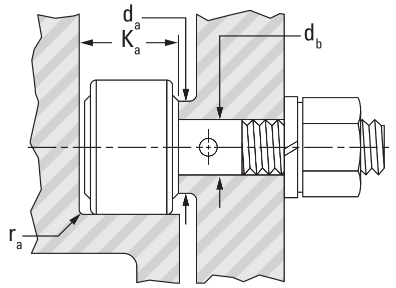
- Screwdriver slot in head facilitates mounting.
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers, and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Crowned outer ring to support uneven bearing load.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.



CRSC -12 to -64



CRSC -8 to -10-1



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

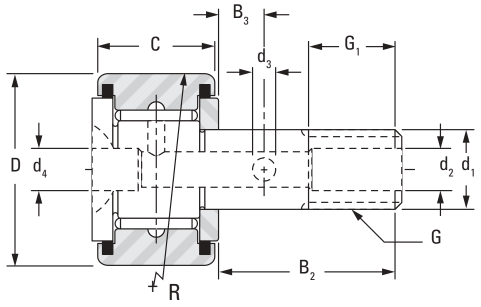
Outer Dia.	d_1	D	C	R	B_2	B_3	G_1	d_2 and d_4	d_3	G	Bearing Designation	Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
												As a Bearing		As a Track Roller				d_b	$r_{as\ max}$	K_a	d_a		
	+0.025 +0.001 0 0	0 0 **-0.025** -0.001	0 0 **-0.13** -0.005	Crown radius (approx.)	(nom.)		Min.			UNF		Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.0005 0 0	Max.	Min.	Min.		
												C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$							
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in		**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
1/2	**4.826** 0.1900	**12.70** 0.500	**8.74** 0.344	**152** 6	**12.70** 0.500	-	**6.35** 0.250	**3.18**(1)(2) 0.125	-	10-32	CRSC-8	**4.44** 999	**4.94** 1110	**3.07** 690	**1.20** 269	**2.87** 645	7000	**4.826** 0.1900	**0.25** 0.010	**10.41** 0.410	**10.41** 0.410	**1.69** 15	**0.01** 0.02
1/2	**4.826** 0.1900	**12.70** 0.500	**9.53** 0.375	**178** 7	**15.88** 0.625	-	**6.35** 0.250	**3.18**(1)(2) 0.125	-	10-32	CRSC-8-1	**4.89** 1100	**5.60** 1260	**3.39** 762	**1.36** 305	**3.25** 731	7000	**4.826** 0.1900	**0.25** 0.010	**11.20** 0.441	**10.41** 0.410	**1.69** 15	**0.01** 0.02
5/8	**6.350** 0.2500	**15.88** 0.625	**10.31** 0.406	**178** 7	**15.90** 0.630	-	**7.90** 0.310	**3.18**(1)(2) 0.125	-	1/4-28	CRSC-10	**6.05** 1360	**7.87** 1770	**4.42** 994	**2.53** 569	**6.09** 1370	5500	**6.350** 0.2500	**0.38** 0.015	**11.99** 0.472	**11.73** 0.462	**3.95** 35	**0.02** 0.04
5/8	**7.940** 0.3125	**15.88** 0.625	**11.11** 0.438	**203** 8	**19.10** 0.750	-	**7.90** 0.310	**3.18**(1)(2) 0.125	-	1/4-28	CRSC-10-1	**6.54** 1470	**8.72** 1960	**4.76** 1070	**2.79** 628	**6.72** 1510	5500	**6.350** 0.2500	**0.38** 0.015	**12.80** 0.504	**11.73** 0.462	**3.95** 35	**0.02** 0.05
3/4	**9.530** 0.3750	**19.05** 0.750	**12.70** 0.500	**254** 10	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	**4.78** 0.188	**2.39** 0.094	3/8-24	CRSC-12	**10.14** 2280	**14.68** 3300	**6.27** 1410	**2.92** 656	**6.98** 1570	3800	**9.525** 0.3750	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**10.73** 95	**0.03** 0.08
7/8	**9.530** 0.3750	**22.23** 0.875	**12.70** 0.500	**254** 10	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	**4.78** 0.188	**2.39** 0.094	3/8-24	CRSC-14	**10.14** 2280	**14.68** 3300	**7.38** 1660	**4.94** 1110	**11.88** 2670	3800	**9.525** 0.3750	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**10.73** 95	**0.04** 0.10
1	**11.110** 0.4375	**25.40** 1.000	**15.88** 0.625	**305** 12	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	**4.78** 0.188	**2.39** 0.094	7/16-20	CRSC-16	**12.99** 2920	**21.93** 4930	**8.41** 1890	**5.60** 1260	**13.43** 3020	2800	**11.112** 0.4375	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**28.25** 250	**0.07** 0.16
1 1/8	**11.110** 0.4375	**28.58** 1.125	**15.88** 0.625	**305** 12	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	**4.78** 0.188	**2.39** 0.094	7/16-20	CRSC-18	**12.99** 2920	**21.93** 4930	**9.43** 2120	**8.18** 1840	**17.48** 3930	2800	**11.112** 0.4375	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**28.25** 250	**0.09** 0.20
1 1/4	**12.700** 0.5000	**31.75** 1.250	**19.05** 0.750	**356** 14	**31.75** 1.250	**7.92** 0.312	**15.90** 0.630	**4.78** 0.188	**2.39** 0.094	1/2-20	CRSC-20	**23.31** 5240	**30.29** 6810	**16.06** 3610	**7.38** 1660	**17.75** 3990	2700	**12.700** 0.5000	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**39.55** 350	**0.14** 0.30
1 3/8	**12.700** 0.5000	**34.93** 1.375	**19.05** 0.750	**356** 14	**31.80** 1.250	**7.92** 0.312	**15.90** 0.630	**4.78** 0.188	**2.39** 0.094	1/2-20	CRSC-22	**23.31** 5240	**30.29** 6810	**17.66** 3970	**10.45** 2350	**25.04** 5630	2700	**12.700** 0.5000	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**39.55** 350	**0.16** 0.35
1 1/2	**15.880** 0.6250	**38.10** 1.500	**22.23** 0.875	**508** 20	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	**4.78** 0.188	**2.39** 0.094	5/8-18	CRSC-24	**28.16** 6330	**40.26** 9050	**20.15** 4530	**11.97** 2690	**28.74** 6460	2700	**15.872** 0.6250	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**73.45** 650	**0.24** 0.53
1 5/8	**15.880** 0.6250	**41.28** 1.625	**22.23** 0.875	**508** 20	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	**4.78** 0.188	**2.39** 0.094	5/8-18	CRSC-26	**28.16** 6330	**40.26** 9050	**21.62** 4860	**15.66** 3520	**36.08** 8110	2300	**15.872** 0.6250	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**73.45** 650	**0.27** 0.61

(1) No lubrication hole in threaded end.
(2) Oil hole (d_4) only.
(3) UNS instead of UNF threads.

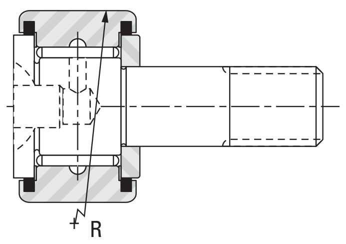
Continued on next page.

STUD-TYPE TRACK ROLLERS
CRSC SERIES
INCH SERIES

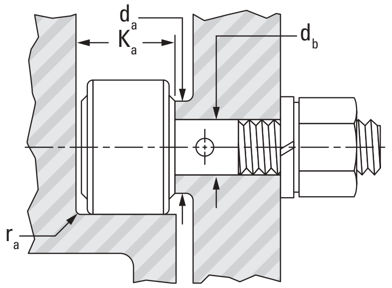
- Screwdriver slot in head facilitates mounting.
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers, and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Crowned outer ring to support uneven bearing load.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.



CRSC -12 to -64



CRSC -8 to -10-1



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d_1	D	C	R	B_2	B_3	G_1	d_2 and d_4	d_3	G	Bearing Designation
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	Crown radius (approx.)	(nom.)		Min.			UNF	
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
1 3/4	**19.050** 0.7500	**44.45** 1.750	**25.40** 1.000	**508** 20	**44.45** 1.750	**11.13** 0.438	**22.20** 0.880	**4.78** 0.188	**3.18** 0.125	3/4-16	CRSC-28
1 7/8	**19.050** 0.7500	**47.63** 1.875	**25.40** 1.000	**508** 20	**44.45** 1.750	**11.13** 0.438	**22.20** 0.880	**4.78** 0.188	**3.18** 0.125	3/4-16	CRSC-30
2	**22.230** 0.8750	**50.80** 2.000	**31.75** 1.250	**610** 24	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	**4.78** 0.188	**3.18** 0.125	7/8-14	CRSC-32
2 1/4	**22.230** 0.8750	**57.15** 2.250	**31.75** 1.250	**610** 24	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	**4.78** 0.188	**3.18** 0.125	7/8-14	CRSC-36
2 1/2	**25.400** 1.0000	**63.50** 2.500	**38.10** 1.500	**762** 30	**57.20** 2.250	**14.27** 0.562	**28.57** 1.125	**4.78** 0.188	**3.18** 0.125	1-14(3)	CRSC-40
2 3/4	**25.400** 1.0000	**69.85** 2.750	**38.10** 1.500	**762** 30	**57.20** 2.250	**14.27** 0.562	**28.57** 1.125	**4.78** 0.188	**3.18** 0.125	1-14(3)	CRSC-44
3	**31.750** 1.2500	**76.20** 3.000	**44.45** 1.750	**762** 30	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**3.18** 0.125	1 1/4-12	CRSC-48

Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
As a Bearing		As a Track Roller				d_b	$r_{as\ max}$	K_a	d_a		
Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.0005 **0** 0	Max.	Min.	Min.		
C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$							
kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
35.50 7980	**56.49** 12700	**25.93** 5830	**19.04** 4280	**45.82** 10300	1900	**19.050** 0.7500	**1.02** 0.040	**27.08** 1.066	**31.75** 1.250	**141.25** 1250	**0.38** 0.85
35.50 7980	**56.49** 12700	**27.40** 6160	**23.66** 5320	**51.15** 11500	1900	**19.050** 0.7500	**1.02** 0.040	**27.08** 1.066	**31.75** 1.250	**141.25** 1250	**0.43** 0.95
43.19 9710	**75.62** 17000	**31.89** 7170	**28.11** 6320	**62.72** 14100	1700	**22.225** 0.8750	**1.27** 0.050	**33.43** 1.316	**35.71** 1.406	**169.5** 1500	**0.62** 1.37
43.19 9710	**75.62** 17000	**34.70** 7800	**39.86** 8960	**73.40** 16500	1700	**22.225** 0.8750	**1.27** 0.050	**33.43** 1.316	**35.71** 1.406	**169.5** 1500	**0.76** 1.67
58.27 13100	**117.43** 26400	**44.48** 10000	**54.71** 12300	**104.09** 23400	1400	**25.400** 1.0000	**2.29** 0.090	**39.78** 1.566	**42.88** 1.688	**254.25** 2250	**1.14** 2.50
58.27 13100	**117.43** 26400	**47.15** 10600	**71.17** 16000	**116.54** 26200	1400	**25.400** 1.0000	**2.29** 0.090	**39.78** 1.566	**42.88** 1.688	**254.25** 2250	**1.33** 2.93
74.29 16700	**177.93** 40000	**51.60** 11600	**68.50** 15400	**131.22** 29500	990	**31.750** 1.2500	**2.29** 0.090	**46.13** 1.816	**53.98** 2.125	**389.85** 3450	**1.91** 4.20

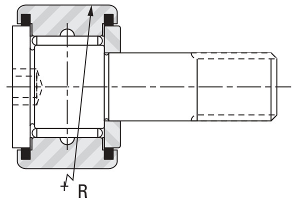
(1) No lubrication hole in threaded end.
(2) Oil hole (d_4) only.
(3) UNS instead of UNF threads.

STUD-TYPE TRACK ROLLERS
CRSBC SERIES

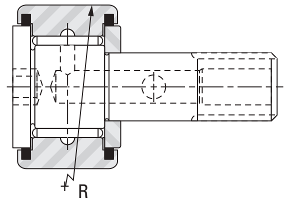
INCH SERIES

- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Crowned outer ring to support uneven bearing load.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

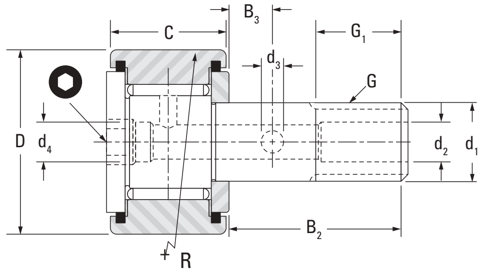
⬢ For hexagonal wrench sizes, see page B-5-30.



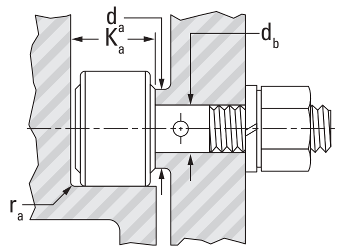
CRSBC -8 to -10-1



CRSBC -24 to -44



CRSBC -12 to -22
CRSBC -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d_1 +0.025 +0.001 0 0	D 0 0 -0.025 -0.001	C 0 0 -0.13 -0.005	R Crown radius (approx.)	B_2 (nom.)	B_3	G_1 Min.	d_4	d_2	d_3	G UNF	Bearing Designation	Load Rating – As a Bearing – Dynamic C	Load Rating – As a Bearing – Static C_0	Load Rating – As a Track Roller – Dynamic C_w	Load Rating – As a Track Roller – Dynamic $F_{r\,perm}$	Load Rating – As a Track Roller – Static $F_{0r\,perm}$	Speed Rating Grease	Mounting Dimensions – d_b Bore Dia. For Stud +0.013 +0.0005 0 0	Mounting Dimensions – $r_{as\,max}$ Max.	Mounting Dimensions – K_a Min.	Mounting Dimensions – d_a Min.	Clamping Torque	Approx Wt.
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	in		kN lbf	kN lbf	kN lbf	kN lbf	kN lbf	min^{-1}	mm in	mm in	mm in	mm in	N-m lb-in	kg lbs
1/2	4.826 0.1900	12.70 0.500	8.74 0.344	152 6	12.70 0.500	-	6.35 0.250	-	-	-	10-32	CRSBC-8	4.44 999	4.94 1110	3.07 690	1.20 269	2.87 645	7000	4.826 0.1900	0.25 0.010	10.41 0.410	10.41 0.410	1.69 15	0.01 0.02
1/2	4.826 0.1900	12.70 0.500	9.53 0.375	178 7	15.88 0.625	-	6.35 0.250	-	-	-	10-32	CRSBC-8-1	4.89 1100	5.60 1260	3.39 762	1.36 305	3.25 731	7000	4.826 0.1900	0.25 0.010	11.20 0.441	10.41 0.410	1.69 15	0.01 0.02
5/8	6.350 0.2500	15.88 0.625	10.31 0.406	178 7	15.90 0.630	-	7.90 0.310	-	-	-	1/4-28	CRSBC-10	6.05 1360	7.87 1770	4.42 994	2.53 569	6.09 1370	5500	6.350 0.2500	0.38 0.015	11.99 0.472	11.73 0.462	3.95 35	0.02 0.04
5/8	7.940 0.3125	15.88 0.625	11.11 0.438	203 8	19.10 0.750	-	7.90 0.310	-	-	-	1/4-28	CRSBC-10-1	6.54 1470	8.72 1960	4.76 1070	2.79 628	6.72 1510	5500	6.350 0.2500	0.38 0.015	12.80 0.504	11.73 0.462	3.95 35	0.02 0.05
3/4	9.530 0.3750	19.05 0.750	12.70 0.500	254 10	22.20 0.880	6.35 0.250	9.50 0.380	-	4.78 0.188	2.39 0.094	3/8-24	CRSBC-12	10.14 2280	14.68 3300	6.27 1410	2.92 656	6.98 1570	3800	9.525 0.3750	0.38 0.015	14.38 0.566	15.47 0.609	10.73 95	0.03 0.08
7/8	9.530 0.3750	22.23 0.875	12.70 0.500	254 10	22.20 0.880	6.35 0.250	9.50 0.380	-	4.78 0.188	2.39 0.094	3/8-24	CRSBC-14	10.14 2280	14.68 3300	7.38 1660	4.94 1110	11.88 2670	3800	9.525 0.3750	0.38 0.015	14.38 0.566	15.47 0.609	10.73 95	0.04 0.10
1	11.110 0.4375	25.40 1.000	15.88 0.625	305 12	25.40 1.000	6.35 0.250	12.70 0.500	-	4.78 0.188	2.39 0.094	7/16-20	CRSBC-16	12.99 2920	21.93 4930	8.41 1890	5.60 1260	13.43 3020	2800	11.112 0.4375	0.76 0.030	17.55 0.691	19.84 0.781	28.25 250	0.07 0.16
1 1/8	11.110 0.4375	28.58 1.125	15.88 0.625	305 12	25.40 1.000	6.35 0.250	12.70 0.500	-	4.78 0.188	2.39 0.094	7/16-20	CRSBC-18	12.99 2920	21.93 4930	9.43 2120	8.18 1840	17.48 3930	2800	11.112 0.4375	0.76 0.030	17.55 0.691	19.84 0.781	28.25 250	0.09 0.20
1 1/4	12.700 0.5000	31.75 1.250	19.05 0.750	356 14	31.75 1.250	7.92 0.312	15.90 0.630	-	4.78 0.188	2.39 0.094	1/2-20	CRSBC-20	23.31 5240	30.29 6810	16.06 3610	7.38 1660	17.75 3990	2700	12.700 0.5000	0.76 0.030	20.73 0.816	24.99 0.984	39.55 350	0.14 0.30
1 3/8	12.700 0.5000	34.93 1.375	19.05 0.750	356 14	31.80 1.250	7.92 0.312	15.90 0.630	-	4.78 0.188	2.39 0.094	1/2-20	CRSBC-22	23.31 5240	30.29 6810	17.66 3970	10.45 2350	25.04 5630	2700	12.700 0.5000	0.76 0.030	20.73 0.816	24.99 0.984	39.55 350	0.16 0.35
1 1/2	15.880 0.6250	38.10 1.500	22.23 0.875	508 20	38.10 1.500	9.53 0.375	19.10 0.750	-	4.78 0.188	2.39 0.094	5/8-18	CRSBC-24	28.16 6330	40.26 9050	20.15 4530	11.97 2690	28.74 6460	2700	15.872 0.6250	0.76 0.030	23.90 0.941	27.79 1.094	73.45 650	0.24 0.53
1 5/8	15.880 0.6250	41.28 1.625	22.23 0.875	508 20	38.10 1.500	9.53 0.375	19.10 0.750	-	4.78 0.188	2.39 0.094	5/8-18	CRSBC-26	28.16 6330	40.26 9050	21.62 4860	15.66 3520	36.08 8110	2300	15.872 0.6250	0.76 0.030	23.90 0.941	27.79 1.094	73.45 650	0.27 0.61
1 3/4	19.050 0.7500	44.45 1.750	25.40 1.000	508 20	44.45 1.750	11.13 0.438	22.20 0.880	-	4.78 0.188	3.18 0.125	3/4-16	CRSBC-28	35.50 7980	56.49 12700	25.93 5830	19.04 4280	45.82 10300	1900	19.050 0.7500	1.02 0.040	27.08 1.066	31.75 1.250	141.25 1250	0.38 0.85

[1] UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

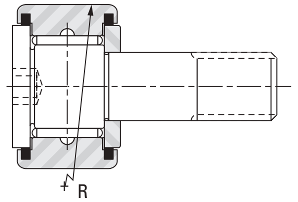
Continued on next page.

STUD-TYPE TRACK ROLLERS
CRSBC SERIES

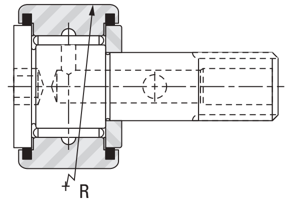
INCH SERIES

- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Crowned outer ring to support uneven bearing load.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

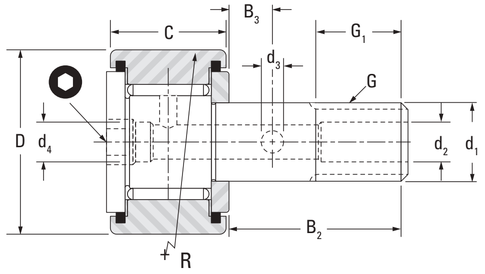
For hexagonal wrench sizes, see page B-5-30.



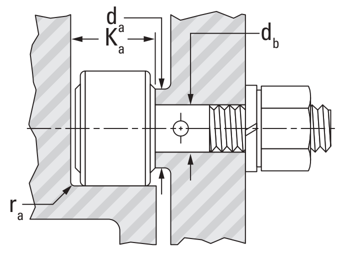
CRSBC -8 to -10-1



CRSBC -24 to -44



CRSBC -12 to -22
CRSBC -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d1	D	C	R	B2	B3	G1	d4	d2	d3	G	Bearing Designation	Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
													As a Bearing		As a Track Roller				d_b	$r_{as\ max}$	K_a	d_a		
													Dynamic	Static	Dynamic		Static		Bore Dia. For Stud +0.013 +0.0005 0 0	Max.	Min.	Min.		
	+0.025 +0.001 0 0	0 0 -0.025 -0.001	0 0 -0.13 -0.005	Crown radius (approx.)	(nom.)		Min.				UNF		C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$							
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	in		kN lbf	kN lbf	kN lbf	kN lbf	kN lbf	min^{-1}	mm in	mm in	mm in	mm in	N-m lb-in	kg lbs
1 7/8	19.050 0.7500	47.63 1.875	25.40 1.000	508 20	44.45 1.750	11.13 0.438	22.20 0.880	-	4.78 0.188	3.18 0.125	3/4-16	CRSBC-30	35.50 7980	56.49 12700	27.40 6160	23.66 5320	51.15 11500	1900	19.050 0.7500	1.02 0.040	27.08 1.066	31.75 1.250	141.25 1250	0.43 0.95
2	22.230 0.8750	50.80 2.000	31.75 1.250	610 24	50.80 2.000	12.70 0.500	25.40 1.000	-	4.78 0.188	3.18 0.125	7/8-14	CRSBC-32	43.19 9710	75.62 17000	31.89 7170	28.11 6320	62.72 14100	1700	22.225 0.8750	1.27 0.050	33.43 1.316	35.71 1.406	169.5 1500	0.62 1.37
2 1/4	22.230 0.8750	57.15 2.250	31.75 1.250	610 24	50.80 2.000	12.70 0.500	25.40 1.000	-	4.78 0.188	3.18 0.125	7/8-14	CRSBC-36	43.19 9710	75.62 17000	34.70 7800	39.86 8960	73.40 16500	1700	22.225 0.8750	1.27 0.050	33.43 1.316	35.71 1.406	169.5 1500	0.76 1.67
2 1/2	25.400 1.0000	63.50 2.500	38.10 1.500	762 30	57.20 2.250	14.27 0.562	28.57 1.125	-	4.78 0.188	3.18 0.125	1-14(1)	CRSBC-40	58.27 13100	117.43 26400	44.48 10000	54.71 12300	104.09 23400	1400	25.400 1.0000	2.29 0.090	39.78 1.566	42.88 1.688	254.25 2250	1.14 2.50
2 3/4	25.400 1.0000	69.85 2.750	38.10 1.500	762 30	57.20 2.250	14.27 0.562	28.57 1.125	-	4.78 0.188	3.18 0.125	1-14(1)	CRSBC-44	58.27 13100	117.43 26400	47.15 10600	71.17 16000	116.54 26200	1400	25.400 1.0000	2.29 0.090	39.78 1.566	42.88 1.688	254.25 2250	1.33 2.93
3	31.750 1.2500	76.20 3.000	44.45 1.750	762 30	63.50 2.500	15.88 0.625	31.75 1.250	6.35 0.250	6.35 0.250	3.18 0.125	1 1/4-12	CRSBC-48	74.29 16700	177.93 40000	51.60 11600	68.50 15400	131.22 29500	990	31.750 1.2500	2.29 0.090	46.13 1.816	53.98 2.125	389.85 3450	1.91 4.20
3 1/4	31.750 1.2500	82.55 3.250	44.45 1.750	762 30	63.50 2.500	15.88 0.625	31.75 1.250	6.35 0.250	6.35 0.250	3.18 0.125	1 1/4-12	CRSBC-52	74.29 16700	177.93 40000	54.71 12300	85.85 19300	147.24 33100	990	31.750 1.2500	2.29 0.090	46.13 1.816	53.98 2.125	389.85 3450	2.18 4.81
3 1/2	34.930 1.3750	88.90 3.500	50.80 2.000	762 30	69.90 2.750	17.48 0.688	34.93 1.375	6.35 0.250	6.35 0.250	3.18 0.125	1 3/8-12	CRSBC-56	109.87 24700	225.52 50700	82.29 18500	94.75 21300	191.27 43000	950	34.925 1.3750	2.29 0.090	52.48 2.066	61.93 2.438	474.6 4200	2.91 6.42
4	38.100 1.5000	101.60 4.000	57.15 2.250	762 30	88.90 3.500	19.05 0.750	38.10 1.500	6.35 0.250	6.35 0.250	3.18 0.125	1 1/2-12	CRSBC-64	137.89 31000	319.38 71800	98.75 22200	125.88 28300	250.43 56300	780	38.100 1.5000	2.29 0.090	58.83 2.316	71.04 2.797	565 5000	4.29 9.46

(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

STUD-TYPE TRACK ROLLERS
CRSBE SERIES
INCH SERIES

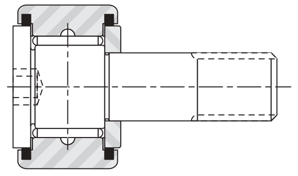
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Eccentric stud radial adjustment of outer ring.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

Outer Dia.	d_1	D	C	B_2	Eccentric Bushing			B_3	G_1	d_4	d_2	d_3	G	Bearing Designation
					De	Be	e							
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	(nom.)	Bushing OD	Bushing width	Eccentricity		Min.				UNF	
					±0.025 ±0.001	**±0.025** ±0.001	(nom.)							
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
1/2	**4.830** 0.1900	**12.70** 0.500	**8.74** 0.344	**12.70** 0.500	**6.35** 0.250	**6.35** 0.250	**0.25** 0.010	-	**6.40** 0.250	-	-	-	10-32	CRSBE-8
1/2	**4.830** 0.1900	**12.70** 0.500	**9.53** 0.375	**15.90** 0.630	**6.35** 0.250	**9.53** 0.375	**0.25** 0.010	-	**6.40** 0.250	-	-	-	10-32	CRSBE-8-1
5/8	**6.350** 0.2500	**15.88** 0.625	**11.11** 0.438	**19.10** 0.750	**9.53** 0.375	**11.10** 0.437	**0.38** 0.015	-	**7.90** 0.310	-	-	-	1/4-28	CRSBE-10-1
3/4	**9.530** 0.3750	**19.05** 0.750	**12.70** 0.500	**22.20** 0.880	**12.70** 0.500	**12.70** 0.500	**0.38** 0.015	**6.25** 0.250	**9.50** 0.380	-	**4.77** 0.188	**2.39** 0.094	3/8-24	CRSBE-12
7/8	**9.530** 0.3750	**22.23** 0.875	**12.70** 0.500	**22.20** 0.880	**12.70** 0.500	**12.70** 0.500	**0.38** 0.015	**6.25** 0.250	**9.50** 0.380	-	**4.77** 0.188	**2.39** 0.094	3/8-24	CRSBE-14
1	**11.110** 0.4375	**25.40** 1.000	**15.88** 0.625	**25.40** 1.000	**15.88** 0.625	**12.70** 0.500	**0.76** 0.030	**6.35** 0.250	**12.70** 0.500	-	**4.78** 0.188	**2.39** 0.094	7/16-20	CRSBE-16
1 1/8	**11.110** 0.4375	**28.58** 1.125	**15.88** 0.625	**25.40** 1.000	**15.88** 0.625	**12.70** 0.500	**0.76** 0.030	**6.35** 0.250	**12.70** 0.500	-	**4.78** 0.188	**2.39** 0.094	7/16-20	CRSBE-18
1 1/4	**12.700** 0.5000	**31.75** 1.250	**19.05** 0.750	**31.75** 1.250	**17.45** 0.687	**15.88** 0.625	**0.76** 0.030	**7.92** 0.312	**15.90** 0.630	-	**4.78** 0.188	**2.39** 0.094	1/2-20	CRSBE-20
1 3/8	**12.700** 0.5000	**34.93** 1.375	**19.05** 0.750	**31.80** 1.250	**17.45** 0.687	**15.88** 0.625	**0.76** 0.030	**7.92** 0.312	**15.90** 0.630	-	**4.78** 0.188	**2.39** 0.094	1/2-20	CRSBE-22
1 1/2	**15.880** 0.6250	**38.10** 1.500	**22.23** 0.875	**38.10** 1.500	**22.23** 0.875	**19.05** 0.750	**0.76** 0.030	**9.53** 0.375	**19.10** 0.750	-	**4.78** 0.188	**2.39** 0.094	5/8-18	CRSBE-24
1 5/8	**15.880** 0.6250	**41.28** 1.625	**22.23** 0.875	**38.10** 1.500	**22.23** 0.875	**19.05** 0.750	**0.76** 0.030	**9.53** 0.375	**19.10** 0.750	-	**4.78** 0.188	**2.39** 0.094	5/8-18	CRSBE-26
1 3/4	**19.050** 0.7500	**44.45** 1.750	**25.40** 1.000	**44.45** 1.750	**25.40** 1.000	**22.23** 0.875	**0.76** 0.030	**11.13** 0.438	**22.20** 0.880	-	**4.78** 0.188	**3.18** 0.125	3/4-16	CRSBE-28
1 7/8	**19.050** 0.7500	**47.63** 1.875	**25.40** 1.000	**44.45** 1.750	**25.40** 1.000	**22.23** 0.875	**0.76** 0.030	**11.13** 0.438	**22.20** 0.880	-	**4.78** 0.188	**3.18** 0.125	3/4-16	CRSBE-30

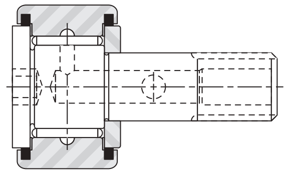
(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

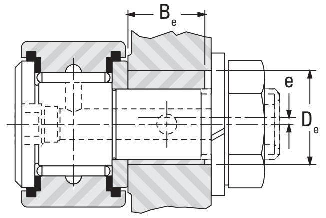
For hexagonal wrench sizes, see page B-5-30.



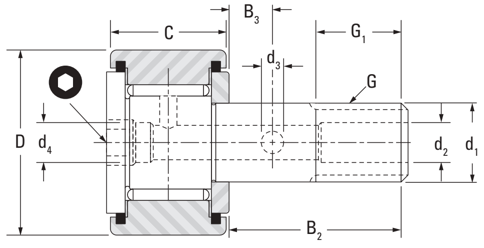
CRSBE -8 to -10-1



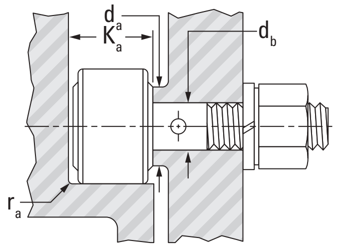
CRSBE -24 to -44



Eccentric studs



CRSBE -12 to -22
CRSBE -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
As a Bearing		As a Track Roller				d_b	$r_{as\ max}$	K_a	d_a		
Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.050** +0.002 **0** 0	Max.	Min.	Min.		
C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$							
kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
4.44 999	**4.94** 1110	**3.07** 690	**1.20** 269	**2.87** 645	7000	**6.400** 0.2520	**0.25** 0.010	**10.41** 0.410	**10.41** 0.410	**1.69** 15	**0.01** 0.02
4.89 1100	**5.60** 1260	**3.39** 762	**1.36** 305	**3.25** 731	7000	**6.400** 0.2520	**0.25** 0.010	**11.20** 0.441	**10.41** 0.410	**1.69** 15	**0.01** 0.02
6.05 1360	**7.87** 1770	**4.42** 994	**2.53** 569	**6.09** 1370	5500	**9.575** 0.3770	**0.38** 0.015	**12.80** 0.504	**11.73** 0.462	**3.95** 35	**0.02** 0.04
6.54 1470	**8.72** 1960	**4.76** 1070	**2.79** 628	**6.72** 1510	5500	**12.745** 0.5020	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**3.95** 35	**0.02** 0.05
10.14 2280	**14.68** 3300	**6.27** 1410	**2.92** 656	**6.98** 1570	3800	**12.745** 0.5020	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**10.73** 95	**0.03** 0.08
10.14 2280	**14.68** 3300	**7.38** 1660	**4.94** 1110	**11.88** 2670	3800	**15.700** 0.6270	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**10.73** 95	**0.04** 0.10
12.99 2920	**21.93** 4930	**8.41** 1890	**5.60** 1260	**13.43** 3020	2800	**15.700** 0.6270	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**28.25** 250	**0.07** 0.16
12.99 2920	**21.93** 4930	**9.43** 2120	**8.18** 1840	**17.48** 3930	2800	**17.495** 0.6890	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**28.25** 250	**0.09** 0.20
23.31 5240	**30.29** 6810	**16.06** 3610	**7.38** 1660	**17.75** 3990	2700	**17.495** 0.6890	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**39.55** 350	**0.14** 0.30
23.31 5240	**30.29** 6810	**17.66** 3970	**10.45** 2350	**25.04** 5630	2700	**22.275** 0.8770	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**39.55** 350	**0.16** 0.35
28.16 6330	**40.26** 9050	**20.15** 4530	**11.97** 2690	**28.74** 6460	2700	**22.275** 0.8770	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**73.45** 650	**0.24** 0.53
28.16 6330	**40.26** 9050	**21.62** 4860	**15.66** 3520	**36.08** 8110	2300	**25.445** 1.0020	**1.02** 0.040	**27.08** 1.066	**31.75** 1.250	**73.45** 650	**0.27** 0.61
35.50 7980	**56.49** 12700	**25.93** 5830	**19.04** 4280	**45.82** 10300	1900	**25.445** 1.0020	**1.02** 0.040	**27.08** 1.066	**31.75** 1.250	**141.25** 1250	**0.38** 0.85

Continued on next page.

STUD-TYPE TRACK ROLLERS
CRSBE SERIES
INCH SERIES

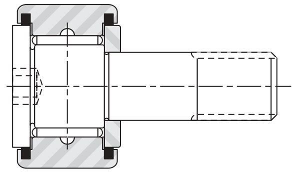
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Eccentric stud radial adjustment of outer ring.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

Outer Dia.	d1	D	C	B2	Eccentric Bushing			B3	G1	d4	d2	d3	G	Bearing Designation
					De	Be	e							
					Bushing OD	Bushing width	Eccentricity							
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	(nom.)	**±0.025** ±0.001	**±0.025** ±0.001	(nom.)		Min.				UNF	
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
2	**22.230** 0.8750	**50.80** 2.000	**31.75** 1.250	**50.80** 2.000	**30.15** 1.187	**25.40** 1.000	**0.76** 0.030	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	7/8-14	CRSBE-32
2 1/4	**22.230** 0.8750	**57.15** 2.250	**31.75** 1.250	**50.80** 2.000	**30.15** 1.187	**25.40** 1.000	**0.76** 0.030	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	7/8-14	CRSBE-36
2 1/2	**25.400** 1.0000	**63.50** 2.500	**38.10** 1.500	**57.20** 2.250	**34.93** 1.375	**28.58** 1.125	**0.76** 0.030	**14.27** 0.562	**28.57** 1.125	-	**4.78** 0.188	**3.18** 0.125	1-14(1)	CRSBE-40
2 3/4	**25.400** 1.0000	**69.85** 2.750	**38.10** 1.500	**57.20** 2.250	**34.93** 1.375	**28.58** 1.125	**0.76** 0.030	**14.27** 0.562	**28.57** 1.125	-	**4.78** 0.188	**3.18** 0.125	1-14(1)	CRSBE-44
3	**31.750** 1.2500	**76.20** 3.000	**44.45** 1.750	**63.50** 2.500	**44.45** 1.750	**31.75** 1.250	**0.52** 0.060	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/4-12	CRSBE-48
3 1/4	**31.750** 1.2500	**82.55** 3.250	**44.45** 1.750	**63.50** 2.500	**44.45** 1.750	**31.75** 1.250	**0.52** 0.060	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/4-12	CRSBE-52
3 1/2	**34.930** 1.3750	**88.90** 3.500	**50.80** 2.000	**69.90** 2.750	**46.02** 1.812	**34.93** 1.375	**0.52** 0.060	**17.48** 0.688	**34.93** 1.375	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 3/8-12	CRSBE-56
4	**38.100** 1.5000	**101.60** 4.000	**57.15** 2.250	**88.90** 3.500	**50.80** 2.000	**50.80** 2.000	**0.52** 0.060	**19.05** 0.750	**38.10** 1.500	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/2-12	CRSBE-64

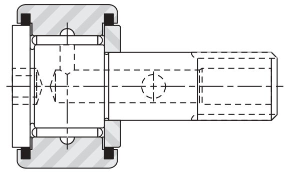
(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

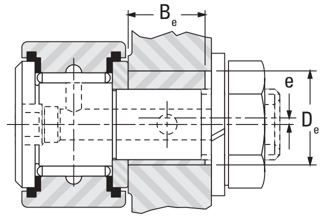
For hexagonal wrench sizes, see page B-5-30.



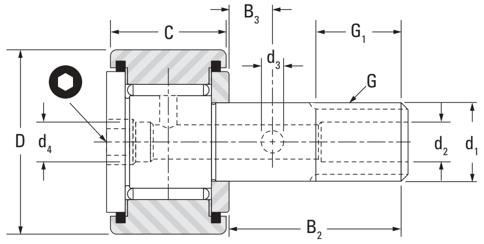
CRSBE -8 to -10-1



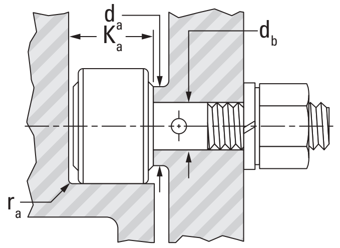
CRSBE -24 to -44



Eccentric studs



CRSBE -12 to -22
CRSBE -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Bearing Designation	Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
	As a Bearing		As a Track Roller				d_b	$r_{as\,max}$	K_a	d_a		
	Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.050** +0.002 **0** 0	Max.	Min.	Min.		
	C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$							
	kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
CRSBE-32	**35.50** 7980	**56.49** 12700	**27.40** 6160	**23.66** 5320	**51.15** 11500	1900	**30.195** 1.1890	**1.27** 0.050	**33.43** 1.316	**35.71** 1.406	**141.25** 1250	**0.43** 0.95
CRSBE-36	**43.19** 9710	**75.62** 17000	**31.89** 7170	**28.11** 6320	**62.72** 14100	1700	**30.195** 1.1890	**1.27** 0.050	**33.43** 1.316	**35.71** 1.406	**169.5** 1500	**0.62** 1.37
CRSBE-40	**43.19** 9710	**75.62** 17000	**34.70** 7800	**39.86** 8960	**73.40** 16500	1700	**34.975** 1.3770	**2.29** 0.090	**39.78** 1.566	**42.88** 1.688	**169.5** 1500	**0.76** 1.67
CRSBE-44	**58.27** 13100	**117.43** 26400	**44.48** 10000	**54.71** 12300	**104.09** 23400	1400	**34.975** 1.3770	**2.29** 0.090	**39.78** 1.566	**42.88** 1.688	**254.25** 2250	**1.14** 2.50
CRSBE-48	**58.27** 13100	**117.43** 26400	**47.15** 10600	**71.17** 16000	**116.54** 26200	1400	**44.495** 1.7520	**2.29** 0.090	**46.13** 1.816	**53.98** 2.125	**254.25** 2250	**1.33** 2.93
CRSBE-52	**74.29** 16700	**177.93** 40000	**51.60** 11600	**68.50** 15400	**131.22** 29500	990	**44.495** 1.7520	**2.29** 0.090	**46.13** 1.816	**53.98** 2.125	**389.85** 3450	**1.91** 4.20
CRSBE-56	**74.29** 16700	**177.93** 40000	**54.71** 12300	**85.85** 19300	**147.24** 33100	990	**46.075** 1.8140	**2.29** 0.090	**52.48** 2.066	**61.93** 2.438	**389.85** 3450	**2.18** 4.81
CRSBE-64	**109.87** 24700	**225.52** 50700	**82.29** 18500	**94.75** 21300	**191.27** 43000	950	**50.825** 2.0010	**2.29** 0.090	**58.83** 2.316	**71.04** 2.797	**474.6** 4200	**2.91** 6.42

STUD-TYPE TRACK ROLLERS
CRSBCE SERIES
INCH SERIES

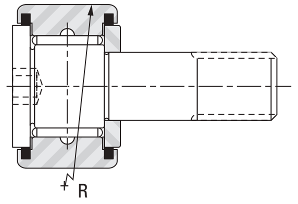
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Crowned outer ring to support uneven bearing load.
- Eccentric stud for radial adjustment of outer ring.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

Outer Dia.	d_1	D	C	R	B_2	Eccentric Bushing			B_3	G_1	d_4	d_2	d_3	G	Bearing Designation
						De	Be	e							
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	Crown radius (approx.)	(nom.)	Bushing OD	Bushing width	Eccentricity		Min.				UNF	
						±0.025 ±0.001	**±0.025** ±0.001	(nom.)							
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
1/2	**4.830** 0.1900	**12.70** 0.500	**8.74** 0.344	**152** 6	**12.70** 0.500	**6.35** 0.250	**6.35** 0.250	**0.25** 0.010	-	**6.40** 0.250	-	-	-	10-32	CRSBCE-8
1/2	**4.830** 0.1900	**12.70** 0.500	**9.53** 0.375	**178** 7	**15.90** 0.630	**6.35** 0.250	**9.53** 0.375	**0.25** 0.010	-	**6.40** 0.250	-	-	-	10-32	CRSBCE-8-1
5/8	**6.350** 0.2500	**15.88** 0.625	**11.11** 0.438	**203** 8	**19.10** 0.750	**9.53** 0.375	**11.10** 0.437	**0.38** 0.015	-	**7.90** 0.310	-	-	-	1/4-28	CRSBCE-10-1
3/4	**9.530** 0.3750	**19.05** 0.750	**12.70** 0.500	**254** 10	**22.20** 0.880	**12.70** 0.500	**12.70** 0.500	**0.38** 0.015	**6.25** 0.250	**9.50** 0.380	-	**4.77** 0.188	**2.39** 0.094	3/8-24	CRSBCE-12
7/8	**9.530** 0.3750	**22.23** 0.875	**12.70** 0.500	**254** 10	**22.20** 0.880	**12.70** 0.500	**12.70** 0.500	**0.38** 0.015	**6.25** 0.250	**9.50** 0.380	-	**4.77** 0.188	**2.39** 0.094	3/8-24	CRSBCE-14
1	**11.110** 0.4375	**25.40** 1.000	**15.88** 0.625	**305** 12	**25.40** 1.000	**15.88** 0.625	**12.70** 0.500	**0.76** 0.030	**6.35** 0.250	**12.70** 0.500	-	**4.78** 0.188	**2.39** 0.094	7/16-20	CRSBCE-16
1 1/8	**11.110** 0.4375	**28.58** 1.125	**15.88** 0.625	**305** 12	**25.40** 1.000	**15.88** 0.625	**12.70** 0.500	**0.76** 0.030	**6.35** 0.250	**12.70** 0.500	-	**4.78** 0.188	**2.39** 0.094	7/16-20	CRSBCE-18
1 1/4	**12.700** 0.5000	**31.75** 1.250	**19.05** 0.750	**356** 14	**31.75** 1.250	**17.45** 0.687	**15.88** 0.625	**0.76** 0.030	**7.92** 0.312	**15.90** 0.630	-	**4.78** 0.188	**2.39** 0.094	1/2-20	CRSBCE-20
1 3/8	**12.700** 0.5000	**34.93** 1.375	**19.05** 0.750	**356** 14	**31.80** 1.250	**17.45** 0.687	**15.88** 0.625	**0.76** 0.030	**7.92** 0.312	**15.90** 0.630	-	**4.78** 0.188	**2.39** 0.094	1/2-20	CRSBCE-22
1 1/2	**15.880** 0.6250	**38.10** 1.500	**22.23** 0.875	**508** 20	**38.10** 1.500	**22.23** 0.875	**19.05** 0.750	**0.76** 0.030	**9.53** 0.375	**19.10** 0.750	-	**4.78** 0.188	**2.39** 0.094	5/8-18	CRSBCE-24
1 5/8	**15.880** 0.6250	**41.28** 1.625	**22.23** 0.875	**508** 20	**38.10** 1.500	**22.23** 0.875	**19.05** 0.750	**0.76** 0.030	**9.53** 0.375	**19.10** 0.750	-	**4.78** 0.188	**2.39** 0.094	5/8-18	CRSBCE-26
1 3/4	**19.050** 0.7500	**44.45** 1.750	**25.40** 1.000	**508** 20	**44.45** 1.750	**25.40** 1.000	**22.23** 0.875	**0.76** 0.030	**11.13** 0.438	**22.20** 0.880	-	**4.78** 0.188	**3.18** 0.125	3/4-16	CRSBCE-28

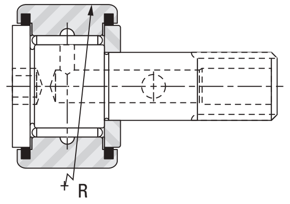
(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

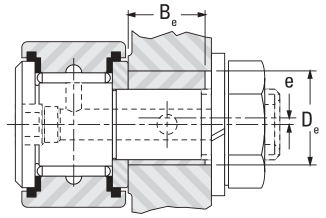
For hexagonal wrench sizes, see page B-5-30.



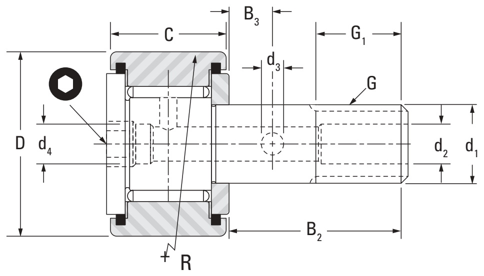
CRSBCE -8 to -10-1



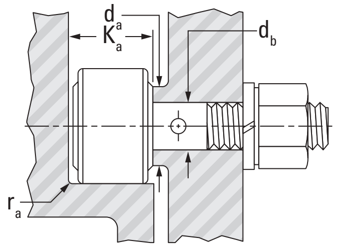
CRSBCE -24 to -44



Eccentric studs



CRSBCE -12 to -22
CRSBCE -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
As a Bearing		As a Track Roller				d_b	$r_{as\ max}$	K_a	d_a		
Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.050** +0.002 **0** 0	Max.	Min.	Min.		
C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$							
kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
4.44 999	**4.94** 1110	**3.07** 690	**1.20** 269	**2.87** 645	7000	**6.400** 0.2520	**0.25** 0.010	**10.41** 0.410	**10.41** 0.410	**1.69** 15	**0.01** 0.02
4.89 1100	**5.60** 1260	**3.39** 762	**1.36** 305	**3.25** 731	7000	**6.400** 0.2520	**0.25** 0.010	**11.20** 0.441	**10.41** 0.410	**1.69** 15	**0.01** 0.02
6.05 1360	**7.87** 1770	**4.42** 994	**2.53** 569	**6.09** 1370	5500	**9.575** 0.3770	**0.38** 0.015	**12.80** 0.504	**11.73** 0.462	**3.95** 35	**0.02** 0.04
6.54 1470	**8.72** 1960	**4.76** 1070	**2.79** 628	**6.72** 1510	5500	**12.745** 0.5020	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**3.95** 35	**0.02** 0.05
10.14 2280	**14.68** 3300	**6.27** 1410	**2.92** 656	**6.98** 1570	3800	**12.745** 0.5020	**0.38** 0.015	**14.38** 0.566	**15.47** 0.609	**10.73** 95	**0.03** 0.08
10.14 2280	**14.68** 3300	**7.38** 1660	**4.94** 1110	**11.88** 2670	3800	**15.700** 0.6270	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**10.73** 95	**0.04** 0.10
12.99 2920	**21.93** 4930	**8.41** 1890	**5.60** 1260	**13.43** 3020	2800	**15.700** 0.6270	**0.76** 0.030	**17.55** 0.691	**19.84** 0.781	**28.25** 250	**0.07** 0.16
12.99 2920	**21.93** 4930	**9.43** 2120	**8.18** 1840	**17.48** 3930	2800	**17.495** 0.6890	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**28.25** 250	**0.09** 0.20
23.31 5240	**30.29** 6810	**16.06** 3610	**7.38** 1660	**17.75** 3990	2700	**17.495** 0.6890	**0.76** 0.030	**20.73** 0.816	**24.99** 0.984	**39.55** 350	**0.14** 0.30
23.31 5240	**30.29** 6810	**17.66** 3970	**10.45** 2350	**25.04** 5630	2700	**22.275** 0.8770	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**39.55** 350	**0.16** 0.35
28.16 6330	**40.26** 9050	**20.15** 4530	**11.97** 2690	**28.74** 6460	2700	**22.275** 0.8770	**0.76** 0.030	**23.90** 0.941	**27.79** 1.094	**73.45** 650	**0.24** 0.53
28.16 6330	**40.26** 9050	**21.62** 4860	**15.66** 3520	**36.08** 8110	2300	**25.445** 1.0020	**1.02** 0.040	**27.08** 1.066	**31.75** 1.250	**73.45** 650	**0.27** 0.61

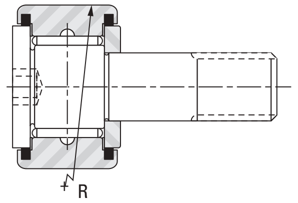
Continued on next page.

STUD-TYPE TRACK ROLLERS CRSBCE SERIES

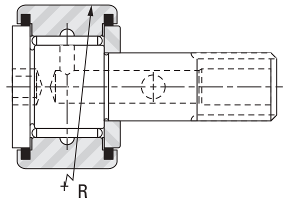
INCH SERIES

- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Crowned outer ring to support uneven bearing load.
- Eccentric stud for radial adjustment of outer ring.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

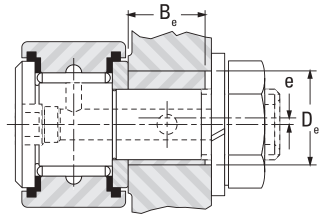
For hexagonal wrench sizes, see page B-5-30.



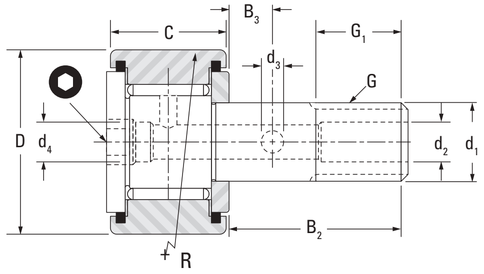
CRSBCE -8 to -10-1



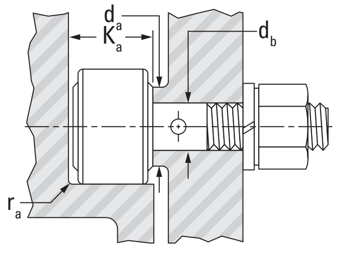
CRSBCE -24 to -44



Eccentric studs



CRSBCE -12 to -22
CRSBCE -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d_1	D	C	R	B_2	Eccentric Bushing			B_3	G_1	d_4	d_2	d_3	G	Bearing Designa-tion
						De	Be	e							
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	Crown radius (approx.)	(nom.)	Bushing OD	Bushing width	Eccentricity		Min.				UNF	
						±0.025 ±0.001	**±0.025** ±0.001	(nom.)							
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
1 7/8	**19.050** 0.7500	**47.63** 1.875	**25.40** 1.000	**508** 20	**44.45** 1.750	**25.40** 1.000	**22.23** 0.875	**0.76** 0.030	**11.13** 0.438	**22.20** 0.880	-	**4.78** 0.188	**3.18** 0.125	3/4-16	CRSBCE-30
2	**22.230** 0.8750	**50.80** 2.000	**31.75** 1.250	**610** 24	**50.80** 2.000	**30.15** 1.187	**25.40** 1.000	**0.76** 0.030	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	7/8-14	CRSBCE-32
2 1/4	**22.230** 0.8750	**57.15** 2.250	**31.75** 1.250	**610** 24	**50.80** 2.000	**30.15** 1.187	**25.40** 1.000	**0.76** 0.030	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	7/8-14	CRSBCE-36
2 1/2	**25.400** 1.0000	**63.50** 2.500	**38.10** 1.500	**762** 30	**57.20** 2.250	**34.93** 1.375	**28.58** 1.125	**0.76** 0.030	**14.27** 0.562	**28.57** 1.125	-	**4.78** 0.188	**3.18** 0.125	1-14⁽¹⁾	CRSBCE-40
2 3/4	**25.400** 1.0000	**69.85** 2.750	**38.10** 1.500	**762** 30	**57.20** 2.250	**34.93** 1.375	**28.58** 1.125	**0.76** 0.030	**14.27** 0.562	**28.57** 1.125	-	**4.78** 0.188	**3.18** 0.125	1-14⁽¹⁾	CRSBCE-44
3	**31.750** 1.2500	**76.20** 3.000	**44.45** 1.750	**762** 30	**63.50** 2.500	**44.45** 1.750	**31.75** 1.250	**0.52** 0.060	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/4-12	CRSBCE-48

Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
As a Bearing		As a Track Roller				d_b	$r_{as\,max}$	K_a	d_a		
Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.050** +0.002 **0** 0	Max.	Min.	Min.		
C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$							
kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
35.50 7980	**56.49** 12700	**25.93** 5830	**19.04** 4280	**45.82** 10300	1900	**25.445** 1.0020	**1.02** 0.040	**27.08** 1.066	**31.75** 1.250	**141.25** 1250	**0.38** 0.85
35.50 7980	**56.49** 12700	**27.40** 6160	**23.66** 5320	**51.15** 11500	1900	**30.195** 1.1890	**1.27** 0.050	**33.43** 1.316	**35.71** 1.406	**141.25** 1250	**0.43** 0.95
43.19 9710	**75.62** 17000	**31.89** 7170	**28.11** 6320	**62.72** 14100	1700	**30.195** 1.1890	**1.27** 0.050	**33.43** 1.316	**35.71** 1.406	**169.5** 1500	**0.62** 1.37
43.19 9710	**75.62** 17000	**34.70** 7800	**39.86** 8960	**73.40** 16500	1700	**34.975** 1.3770	**2.29** 0.090	**39.78** 1.566	**42.88** 1.688	**169.5** 1500	**0.76** 1.67
58.27 13100	**117.43** 26400	**44.48** 10000	**54.71** 12300	**104.09** 23400	1400	**34.975** 1.3770	**2.29** 0.090	**39.78** 1.566	**42.88** 1.688	**254.25** 2250	**1.14** 2.50
58.27 13100	**117.43** 26400	**47.15** 10600	**71.17** 16000	**116.54** 26200	1400	**44.495** 1.7520	**2.29** 0.090	**46.13** 1.816	**53.98** 2.125	**254.25** 2250	**1.33** 2.93

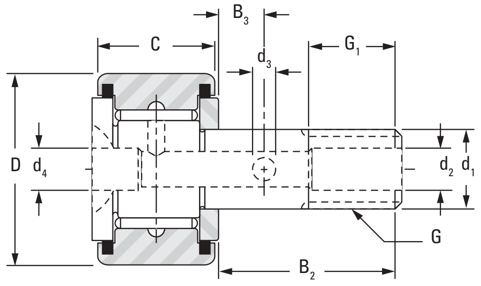
(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

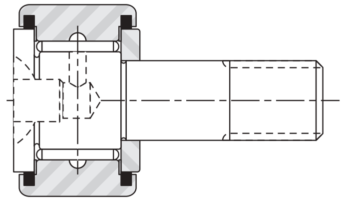
STUD-TYPE TRACK ROLLERS
CRH, CRHS SERIES

INCH SERIES

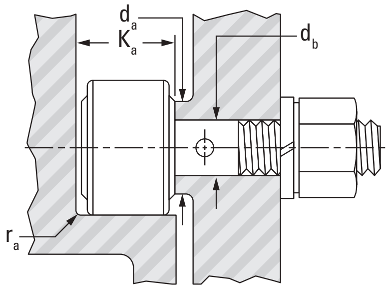
- Screwdriver slot in head facilitates mounting.
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers, and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Large diameter heavy-duty stud.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.



CRH and CRHS -12 to -64



CRH and CRHS -8-1 to -10-1



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d_1	D	C	B_2	B_3	G_1	d_2 and d_4	d_3	G	Track Roller Designation	
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	(nom.)		Min.			UNF	Without Seals	With Seals and Internal Thrust Washers
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in		
1/2	**6.350** 0.2500	**12.70** 0.500	**9.53** 0.375	**15.88** 0.625	-	**6.35** 0.250	**3.18**(1)(2) 0.125	-	1/4-28	CRH-8-1	CRHS-8-1
5/8	**7.940** 0.3125	**15.88** 0.625	**11.11** 0.438	**19.10** 0.750	-	**7.90** 0.310	**3.18**(1)(2) 0.125	-	5/16-24	CRH-10-1	CRHS-10-1
3/4	**11.110** 0.4375	**19.05** 0.750	**12.70** 0.500	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	**4.78** 0.188	**2.39** 0.094	7/16-20	CRH-12	CRHS-12
7/8	**11.110** 0.4375	**22.23** 0.875	**12.70** 0.500	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	**4.78** 0.188	**2.39** 0.094	7/16-20	CRH-14	CRHS-14
1	**15.880** 0.6250	**25.40** 1.000	**15.88** 0.625	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	**4.78** 0.188	**2.39** 0.094	5/8-18	CRH-16	CRHS-16
1 1/8	**15.880** 0.6250	**28.58** 1.125	**15.88** 0.625	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	**4.78** 0.188	**2.39** 0.094	5/8-18	CRH-18	CRHS-18
1 1/4	**19.050** 0.7500	**31.75** 1.250	**19.05** 0.750	**31.75** 1.250	**7.92** 0.312	**15.90** 0.630	**4.78** 0.188	**2.39** 0.094	3/4-16	CRH-20	CRHS-20
1 3/8	**19.050** 0.7500	**34.93** 1.375	**19.05** 0.750	**31.80** 1.250	**7.92** 0.312	**15.90** 0.630	**4.78** 0.188	**2.39** 0.094	3/4-16	CRH-22	CRHS-22
1 1/2	**22.230** 0.8750	**38.10** 1.500	**22.23** 0.875	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	**4.78** 0.188	**2.39** 0.094	7/8-14	CRH-24	CRHS-24
1 5/8	**22.230** 0.8750	**41.28** 1.625	**22.23** 0.875	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	**4.78** 0.188	**2.39** 0.094	7/8-14	CRH-26	CRHS-26
1 3/4	**25.400** 1.0000	**44.45** 1.750	**25.40** 1.000	**44.45** 1.750	**11.13** 0.438	**22.20** 0.880	**4.78** 0.188	**3.18** 0.125	1-14(3)	CRH-28	CRHS-28
1 7/8	**25.400** 1.0000	**47.63** 1.875	**25.40** 1.000	**44.45** 1.750	**11.13** 0.438	**22.20** 0.880	**4.78** 0.188	**3.18** 0.125	1-14(3)	CRH-30	CRHS-30
2	**28.580** 1.1250	**50.80** 2.000	**31.75** 1.250	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	**4.78** 0.188	**3.18** 0.125	1 1/8-12	CRH-32	CRHS-32

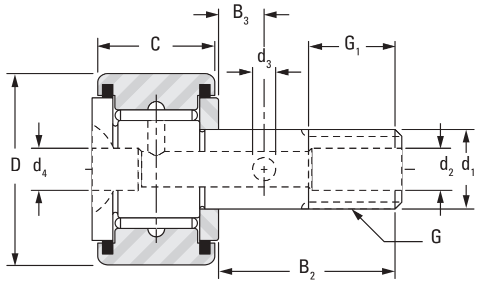
Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
As a Bearing		As a Track Roller				d_b	$r_{as\ max}$	K_a	d_a		
Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.005 **0** 0	Max.	Min.	Min.		
C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$							
kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
4.89 1100	**5.60** 1260	**3.39** 762	**1.36** 305	**3.25** 731	7000	**6.350** 0.2500	**0.25** 0.010	**11.20** 0.44	**10.41** 0.410	**3.96** 35	**0.02** 0.04
6.54 1470	**8.72** 1960	**4.76** 1070	**2.79** 628	**6.72** 1510	5500	**7.938** 0.3125	**0.38** 0.015	**12.80** 0.50	**11.73** 0.462	**10.17** 90	**0.02** 0.05
10.14 2280	**14.68** 3300	**6.27** 1410	**2.92** 656	**6.98** 1570	3800	**11.112** 0.4375	**0.38** 0.015	**14.38** 0.57	**15.47** 0.609	**28.25** 250	**0.04** 0.08
10.14 2280	**14.68** 3300	**7.38** 1660	**4.94** 1110	**11.88** 2670	3800	**11.112** 0.4375	**0.38** 0.015	**14.38** 0.57	**15.47** 0.609	**28.25** 250	**0.05** 0.11
12.99 2920	**21.93** 4930	**8.41** 1890	**5.60** 1260	**13.43** 3020	2800	**15.875** 0.6250	**0.76** 0.030	**17.55** 0.69	**19.84** 0.781	**73.45** 650	**0.09** 0.20
12.99 2920	**21.93** 4930	**9.43** 2120	**8.18** 1840	**17.48** 3930	2800	**15.875** 0.6250	**0.76** 0.030	**17.55** 0.69	**19.84** 0.781	**73.45** 650	**0.11** 0.24
21.04 4730	**33.27** 7480	**13.88** 3120	**8.27** 1860	**19.79** 4450	2400	**19.050** 0.7500	**0.76** 0.030	**20.73** 0.82	**24.99** 0.984	**141.25** 1250	**0.17** 0.38
21.04 4730	**33.27** 7480	**15.26** 3430	**11.39** 2560	**26.56** 5970	2400	**19.050** 0.7500	**0.76** 0.030	**20.73** 0.82	**24.99** 0.984	**141.25** 1250	**0.20** 0.44
24.64 5540	**42.61** 9580	**16.95** 3810	**13.12** 2950	**30.83** 6930	2000	**22.225** 0.8750	**0.76** 0.030	**23.90** 0.94	**27.79** 1.094	**169.5** 1500	**0.31** 0.69
24.64 5540	**42.61** 9580	**18.19** 4090	**16.95** 3810	**35.27** 7930	2000	**22.225** 0.8750	**0.76** 0.030	**23.90** 0.94	**27.79** 1.094	**169.5** 1500	**0.34** 0.75
30.87 6940	**59.16** 13300	**21.66** 4870	**20.73** 4660	**44.48** 10000	1700	**25.400** 1.0000	**1.02** 0.040	**27.08** 1.07	**31.75** 1.250	**254.25** 2250	**0.45** 1.00
30.87 6940	**59.16** 13300	**22.91** 5150	**25.58** 5750	**49.38** 11100	1700	**25.400** 1.0000	**1.02** 0.040	**27.08** 1.07	**31.75** 1.250	**254.25** 2250	**0.52** 1.15
38.25 8600	**81.40** 18300	**27.05** 6080	**30.87** 6940	**61.83** 13900	1500	**28.575** 1.1250	**1.27** 0.050	**33.43** 1.32	**35.71** 1.406	**316.4** 2800	**0.71** 1.56

(1) No lubrication hole in threaded end.
(2) Oil hole (d_4) only.
(3) UNS instead of UNF threads.

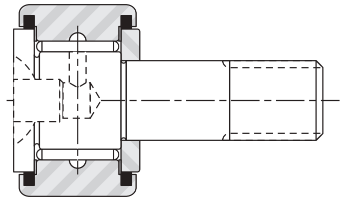
Continued on next page.

STUD-TYPE TRACK ROLLERS
CRH, CRHS SERIES
INCH SERIES

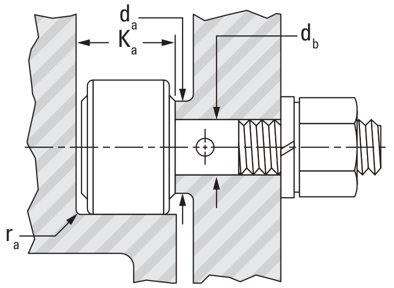
- Screwdriver slot in head facilitates mounting.
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers, and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Large diameter heavy-duty stud.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.



CRH and CRHS -12 to -64



CRH and CRHS -8-1 to -10-1



NOTE
Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d_1	D	C	B_2	B_3	G_1	d_2 and d_4	d_3	G	Track Roller Designation	
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	(nom.)		Min.			UNF	Without Seals	With Seals and Internal Thrust Washers
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in		
2 1/4	**28.580** 1.1250	**57.15** 2.250	**31.75** 1.250	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	**4.78** 0.188	**3.18** 0.125	1 1/8-12	CRH-36	CRHS-36
2 1/2	**31.750** 1.2500	**63.50** 2.500	**38.10** 1.500	**57.20** 2.250	**14.27** 0.562	**28.58** 1.125	**4.78** 0.188	**3.18** 0.125	1 1/4-12	CRH-40	CRHS-40
2 3/4	**31.750** 1.2500	**69.85** 2.750	**38.10** 1.500	**57.20** 2.250	**14.27** 0.562	**28.57** 1.125	**4.78** 0.188	**3.18** 0.125	1 1/4-12	CRH-44	CRHS-44
3	**38.100** 1.5000	**76.20** 3.000	**44.45** 1.750	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**3.18** 0.125	1 1/2-12	CRH-48	CRHS-48
3 1/4	**38.100** 1.5000	**82.55** 3.250	**44.45** 1.750	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**3.18** 0.125	1 1/2-12	CRH-52	CRHS-52
3 1/2	**44.450** 1.7500	**88.90** 3.500	**50.80** 2.000	**69.90** 2.750	**17.48** 0.688	**34.93** 1.375	**6.35** 0.250	**3.18** 0.125	1 3/4-12	CRH-56	CRHS-56
4	**50.800** 2.0000	**101.60** 4.000	**57.15** 2.250	**88.90** 3.500	**19.05** 0.750	**38.10** 1.500	**6.35** 0.250	**3.18** 0.125	2/12	CRH-64	CRHS-64

Outer Dia.	Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
	As a Bearing		As a Track Roller				d_b	$r_{as\ max}$	K_a	d_a		
	Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.005 **0** 0	Max.	Min.	Min.		
	C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$							
in	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
2 1/4	**38.25** 8600	**81.40** 18300	**29.40** 6610	**43.10** 9690	**72.51** 16300	1500	**28.575** 1.1250	**1.27** 0.050	**33.43** 1.32	**35.71** 1.406	**316.4** 2800	**0.85** 1.88
2 1/2	**58.27** 13100	**117.43** 26400	**44.48** 10000	**54.71** 12300	**104.09** 23400	1400	**31.750** 1.2500	**2.29** 0.090	**39.78** 1.57	**42.88** 1.688	**389.85** 3450	**1.25** 2.75
2 3/4	**58.27** 13100	**117.43** 26400	**47.15** 10600	**71.17** 16000	**116.54** 26200	1400	**31.750** 1.2500	**2.29** 0.090	**39.78** 1.57	**42.88** 1.688	**389.85** 3450	**1.45** 3.19
3	**74.29** 16700	**177.93** 40000	**51.60** 11600	**68.50** 15400	**131.22** 29500	990	**38.100** 1.5000	**2.29** 0.090	**46.13** 1.82	**53.98** 2.125	**565** 5000	**2.07** 4.56
3 1/4	**74.29** 16700	**177.93** 40000	**54.71** 12300	**85.85** 19300	**147.24** 33100	990	**38.100** 1.5000	**2.29** 0.090	**46.13** 1.82	**53.98** 2.125	**565** 5000	**2.36** 5.19
3 1/2	**109.87** 24700	**225.52** 50700	**82.29** 18500	**94.75** 21300	**191.27** 43000	950	**44.450** 1.7500	**2.29** 0.090	**52.48** 2.07	**61.93** 2.438	**565** 5000	**3.18** 7.01
4	**137.89** 31000	**319.38** 71800	**98.75** 22200	**125.88** 28300	**250.43** 56300	780	**50.800** 2.0000	**2.29** 0.090	**58.83** 2.32	**71.04** 2.797	**565** 5000	**2.23** 4.91

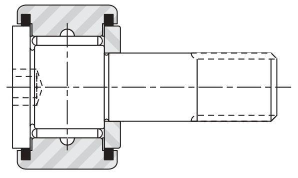
(1) No lubrication hole in threaded end.
(2) Oil hole (d_4) only.
(3) UNS instead of UNF threads.

STUD-TYPE TRACK ROLLERS CRHB,CRHSB SERIES

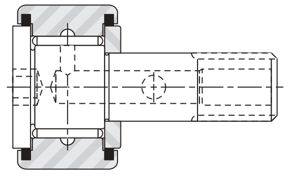
INCH SERIES

- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Large diameter heavy-duty stud.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

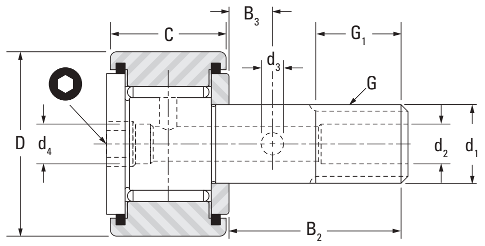
⬢ For hexagonal wrench sizes, see page B-5-30.



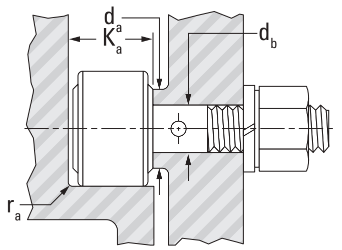
CRHB and CRHSB -8-1 to -10-1



CRHB and CRHSB -24 to -44



CRHB and CRHSB -12 to -22
CRHB and CRHSB -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d_1	D	C	B_2	B_3	G_1	d_4	d_2	d_3	G	Track Roller Designation	
	+0.025 +0.001 0 0	0 0 -0.025 -0.001	0 0 -0.13 -0.005	(nom.)		Min.				UNF	Without Seals	With Seals and Internal Thrust Washers
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	in		
1/2	6.350 0.2500	12.70 0.500	9.53 0.375	15.88 0.625	-	6.35 0.250	-	-	-	1/4-28	CRHB-8-1	CRHSB-8-1
5/8	7.940 0.3125	15.88 0.625	11.11 0.438	19.10 0.750	-	7.90 0.310	-	-	-	5/16-24	CRHB-10-1	CRHSB-10-1
3/4	11.110 0.4375	19.05 0.750	12.70 0.500	22.20 0.880	6.35 0.250	9.50 0.380	-	4.78 0.188	2.39 0.094	7/16-20	CRHB-12	CRHSB-12
7/8	11.110 0.4375	22.23 0.875	12.70 0.500	22.20 0.880	6.35 0.250	9.50 0.380	-	4.78 0.188	2.39 0.094	7/16-20	CRHB-14	CRHSB-14
1	15.880 0.6250	25.40 1.000	15.88 0.625	25.40 1.000	6.35 0.250	12.70 0.500	-	4.78 0.188	2.39 0.094	5/8-18	CRHB-16	CRHSB-16
1 1/8	15.880 0.6250	28.58 1.125	15.88 0.625	25.40 1.000	6.35 0.250	12.70 0.500	-	4.78 0.188	2.39 0.094	5/8-18	CRHB-18	CRHSB-18
1 1/4	19.050 0.7500	31.75 1.250	19.05 0.750	31.75 1.250	7.92 0.312	15.90 0.630	-	4.78 0.188	2.39 0.094	3/4-16	CRHB-20	CRHSB-20
1 3/8	19.050 0.7500	34.93 1.375	19.05 0.750	31.80 1.250	7.92 0.312	15.90 0.630	-	4.78 0.188	2.39 0.094	3/4-16	CRHB-22	CRHSB-22
1 1/2	22.230 0.8750	38.10 1.500	22.23 0.875	38.10 1.500	9.53 0.375	19.10 0.750	-	4.78 0.188	2.39 0.094	7/8-14	CRHB-24	CRHSB-24
1 5/8	22.230 0.8750	41.28 1.625	22.23 0.875	38.10 1.500	9.53 0.375	19.10 0.750	-	4.78 0.188	2.39 0.094	7/8-14	CRHB-26	CRHSB-26
1 3/4	25.400 1.0000	44.45 1.750	25.40 1.000	44.45 1.750	11.13 0.438	22.20 0.880	-	4.78 0.188	3.18 0.125	1-14(1)	CRHB-28	CRHSB-28
1 7/8	25.400 1.0000	47.63 1.875	25.40 1.000	44.45 1.750	11.13 0.438	22.20 0.880	-	4.78 0.188	3.18 0.125	1-14(1)	CRHB-30	CRHSB-30

Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
As a Bearing		As a Track Roller				d_b	$r_{as\ max}$	K_a	d_a		
Dynamic	Static	Dynamic		Static		Bore Dia. For Stud +0.013 +0.0005 0 0	Max.	Min.	Min.		
C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$							
kN lbf	kN lbf	kN lbf	kN lbf	kN lbf	min^{-1}	mm in	mm in	mm in	mm in	N-m lb-in	kg lbs
4.89 1100	5.60 1260	3.39 762	1.36 305	3.25 731	7000	6.350 0.2500	0.25 0.010	11.2 0.44	10.41 0.410	3.96 35	0.02 0.04
6.54 1470	8.72 1960	4.76 1070	2.79 628	6.72 1510	5500	7.938 0.3125	0.38 0.015	12.8 0.50	11.73 0.462	10.17 90	0.02 0.05
10.14 2280	14.68 3300	6.27 1410	2.92 656	6.98 1570	3800	11.112 0.4375	0.38 0.015	14.4 0.57	15.47 0.609	28.25 250	0.04 0.08
10.14 2280	14.68 3300	7.38 1660	4.94 1110	11.88 2670	3800	11.112 0.4375	0.38 0.015	14.4 0.57	15.47 0.609	28.25 250	0.05 0.11
12.99 2920	21.93 4930	8.41 1890	5.60 1260	13.43 3020	2800	15.875 0.6250	0.76 0.030	17.6 0.69	19.84 0.781	73.45 650	0.09 0.20
12.99 2920	21.93 4930	9.43 2120	8.18 1840	17.48 3930	2800	15.875 0.6250	0.76 0.030	17.6 0.69	19.84 0.781	73.45 650	0.11 0.24
21.04 4730	33.27 7480	13.88 3120	8.27 1860	19.79 4450	2400	19.050 0.7500	0.76 0.030	20.7 0.82	24.99 0.984	141.25 1250	0.17 0.38
21.04 4730	33.27 7480	15.26 3430	11.39 2560	26.56 5970	2400	19.050 0.7500	0.76 0.030	20.7 0.82	24.99 0.984	141.25 1250	0.20 0.44
24.64 5540	42.61 9580	16.95 3810	13.12 2950	30.83 6930	2000	22.225 0.8750	0.76 0.030	23.9 0.94	27.79 1.094	169.5 1500	0.31 0.69
24.64 5540	42.61 9580	18.19 4090	16.95 3810	35.27 7930	2000	22.225 0.8750	0.76 0.030	23.9 0.94	27.79 1.094	169.5 1500	0.34 0.75
30.87 6940	59.16 13300	21.66 4870	20.73 4660	44.48 10000	1700	25.400 1.0000	1.02 0.040	27.1 1.07	31.75 1.250	254.25 2250	0.45 1.00
30.87 6940	59.16 13300	22.91 5150	25.58 5750	49.38 11100	1700	25.400 1.0000	1.02 0.040	27.1 1.07	31.75 1.250	254.25 2250	0.52 1.15

(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

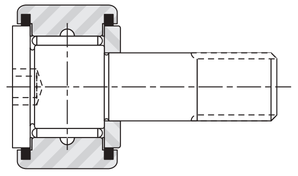
Continued on next page.

STUD-TYPE TRACK ROLLERS
CRHB,CRHSB SERIES

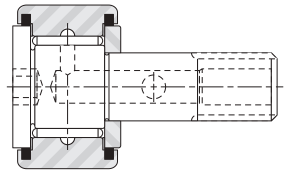
INCH SERIES

- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Large diameter heavy-duty stud.
- Tolerance limits for outer diameters of stud and outer ring refer to “single mean diameter.”
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

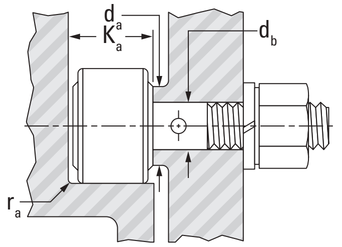
For hexagonal wrench sizes, see page B-5-30



CRHB and CRHSB -8-1 to -10-1

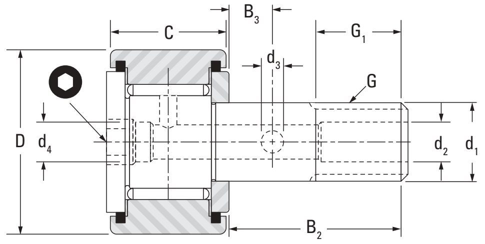


CRHB and CRHSB -24 to -44



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.



CRHB and CRHSB -12 to -22
CRHB and CRHSB -48 to -64

Outer Dia.	d_1	D	C	B_2	B_3	G_1	d_4	d_2	d_3	G	Track Roller Designation		Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
													As a Bearing		As a Track Roller				d_b	$r_{as\,max}$	K_a	d_a		
													Dynamic	Static	Dynamic		Static							
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	(nom.)		Min.				UNF	Without Seals	With Seals and Internal Thrust Washers	C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$		Bore Dia. For Stud **+0.013** +0.0005 **0** 0	Max.	Min.	Min.		
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in			**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
2	**28.580** 1.1250	**50.80** 2.000	**31.75** 1.250	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	1 1/8-12	CRHB-32	CRHSB-32	**38.25** 8600	**81.40** 18300	**27.05** 6080	**30.87** 6940	**61.83** 13900	1500	**28.575** 1.1250	**1.27** 0.050	**33.4** 1.32	**35.71** 1.406	**316.4** 2800	**0.71** 1.56
2 1/4	**28.580** 1.1250	**57.15** 2.250	**31.75** 1.250	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	1 1/8-12	CRHB-36	CRHSB-36	**38.25** 8600	**81.40** 18300	**29.40** 6610	**43.10** 9690	**72.51** 16300	1500	**28.575** 1.1250	**1.27** 0.050	**33.4** 1.32	**35.71** 1.406	**316.4** 2800	**0.85** 1.88
2 1/2	**31.750** 1.2500	**63.50** 2.500	**38.10** 1.500	**57.20** 2.250	**14.27** 0.562	**28.58** 1.125	-	**4.78** 0.188	**3.18** 0.125	1 1/4-12	CRHB-40	CRHSB-40	**58.27** 13100	**117.43** 26400	**44.48** 10000	**54.71** 12300	**104.09** 23400	1400	**31.750** 1.2500	**2.29** 0.090	**39.8** 1.57	**42.88** 1.688	**389.85** 3450	**1.25** 2.75
2 3/4	**31.750** 1.2500	**69.85** 2.750	**38.10** 1.500	**57.20** 2.250	**14.27** 0.562	**28.57** 1.125	-	**4.78** 0.188	**3.18** 0.125	1 1/4-12	CRHB-44	CRHSB-44	**58.27** 13100	**117.43** 26400	**47.15** 10600	**71.17** 16000	**116.54** 26200	1400	**31.750** 1.2500	**2.29** 0.090	**39.8** 1.57	**42.88** 1.688	**389.85** 3450	**1.45** 3.19
3	**38.100** 1.5000	**76.20** 3.000	**44.45** 1.750	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/2-12	CRHB-48	CRHSB-48	**74.29** 16700	**177.93** 40000	**51.60** 11600	**68.50** 15400	**131.22** 29500	990	**38.100** 1.5000	**2.29** 0.090	**46.1** 1.82	**53.98** 2.125	**565** 5000	**2.07** 4.56
3 1/4	**38.100** 1.5000	**82.55** 3.250	**44.45** 1.750	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/2-12	CRHB-52	CRHSB-52	**74.29** 16700	**177.93** 40000	**54.71** 12300	**85.85** 19300	**147.24** 33100	990	**38.100** 1.5000	**2.29** 0.090	**46.1** 1.82	**53.98** 2.125	**565** 5000	**2.36** 5.19
3 1/2	**44.450** 1.7500	**88.90** 3.500	**50.80** 2.000	**69.90** 2.750	**17.48** 0.688	**34.93** 1.375	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 3/4-12	CRHB-56	CRHSB-56	**109.87** 24700	**225.52** 50700	**82.29** 18500	**94.75** 21300	**191.27** 43000	950	**44.450** 1.7500	**2.29** 0.090	**52.5** 2.07	**61.93** 2.438	**565** 5000	**3.18** 7.01
4	**50.800** 2.0000	**101.60** 4.000	**57.15** 2.250	**88.90** 3.500	**19.05** 0.750	**38.10** 1.500	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	2/12	CRHB-64	CRHSB-64	**137.89** 31000	**319.38** 71800	**98.75** 22200	**125.88** 28300	**250.43** 56300	780	**50.800** 2.0000	**2.29** 0.090	**58.8** 2.32	**71.04** 2.797	**565** 5000	**2.23** 4.91

(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

STUD-TYPE TRACK ROLLERS
CRHSBC SERIES
INCH SERIES

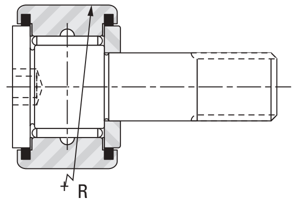
- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Crowned outer ring to support uneven bearing load.
- Large diameter heavy-duty stud.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

Outer Dia.	d_1	D	C	R	B_2	B_3	G_1	d_4	d_2	d_3	G	Bearing Designation
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	Crown radius (approx.)	(nom.).		Min.				UNF	
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
1/2	**6.350** 0.2500	**12.70** 0.500	**9.53** 0.375	**178** 7	**15.88** 0.625	-	**6.35** 0.250	-	-	-	1/4-28	CRHSBC-8-1
5/8	**7.940** 0.3125	**15.88** 0.625	**11.11** 0.438	**203** 8	**19.10** 0.750	-	**7.90** 0.310	-	-	-	5/16-24	CRHSBC-10-1
3/4	**11.110** 0.4375	**19.05** 0.750	**12.7** 0.500	**254** 10	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	-	**4.78** 0.188	**2.39** 0.094	7/16-20	CRHSBC-12
7/8	**11.110** 0.4375	**22.23** 0.875	**12.70** 0.500	**254** 10	**22.20** 0.880	**6.35** 0.250	**9.50** 0.380	-	**4.78** 0.188	**2.39** 0.094	7/16-20	CRHSBC-14
1	**15.880** 0.6250	**25.40** 1.000	**15.88** 0.625	**305** 12	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	-	**4.78** 0.188	**2.39** 0.094	5/8-18	CRHSBC-16
1 1/8	**15.880** 0.6250	**28.58** 1.125	**15.88** 0.625	**305** 12	**25.40** 1.000	**6.35** 0.250	**12.70** 0.500	-	**4.78** 0.188	**2.39** 0.094	5/8-18	CRHSBC-18
1 1/4	**19.050** 0.7500	**31.75** 1.250	**19.05** 0.750	**356** 14	**31.75** 1.250	**7.92** 0.312	**15.90** 0.630	-	**4.78** 0.188	**2.39** 0.094	3/4-16	CRHSBC-20
1 3/8	**19.050** 0.7500	**34.93** 1.375	**19.05** 0.750	**356** 14	**31.80** 1.250	**7.92** 0.312	**15.90** 0.630	-	**4.78** 0.188	**2.39** 0.094	3/4-16	CRHSBC-22
1 1/2	**22.230** 0.8750	**38.10** 1.500	**22.23** 0.875	**508** 20	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	-	**4.78** 0.188	**2.39** 0.094	7/8-14	CRHSBC-24
1 5/8	**22.230** 0.8750	**41.28** 1.625	**22.23** 0.875	**508** 20	**38.10** 1.500	**9.53** 0.375	**19.10** 0.750	-	**4.78** 0.188	**2.39** 0.094	7/8-14	CRHSBC-26
1 3/4	**25.400** 1.0000	**44.45** 1.750	**25.40** 1.000	**508** 20	**44.45** 1.750	**11.13** 0.438	**22.20** 0.880	-	**4.775** 0.188	**3.18** 0.125	1-14(1)	CRHSBC-28
1 7/8	**25.400** 1.0000	**47.63** 1.875	**25.40** 1.000	**508** 20	**44.45** 1.750	**11.13** 0.438	**22.20** 0.880	-	**4.78** 0.188	**3.18** 0.125	1-14(1)	CRHSBC-30

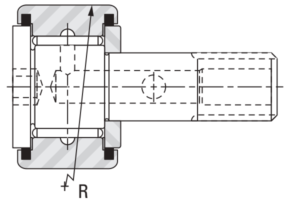
(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

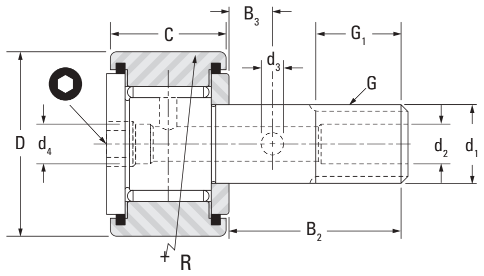
For hexagonal wrench sizes, see page B-5-30.



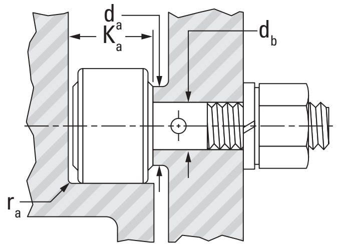
CRHSBC -8-1 to -10-1



CRHSBC -24 to -44



CRHSBC -12 to -22
CRHSBC -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Bearing Designation	Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
	As a Bearing		As a Track Roller				d_b	$r_{as\,max}$	K_a	d_a		
	Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.0005 **0** 0	Max.	Min.	Min.		
	C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$							
	kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
CRHSBC-8-1	**4.89** 1100	**5.60** 1260	**3.39** 762	**1.36** 305	**3.25** 731	7000	**6.350** 0.2500	**0.25** 0.010	**11.2** 0.44	**10.41** 0.410	**3.96** 35	**0.02** 0.04
CRHSBC-10-1	**6.54** 1470	**8.72** 1960	**4.76** 1070	**2.79** 628	**6.72** 1510	5500	**7.938** 0.3125	**0.38** 0.015	**12.8** 0.50	**11.73** 0.462	**10.17** 90	**0.02** 0.05
CRHSBC-12	**10.14** 2280	**14.68** 3300	**6.27** 1410	**2.92** 656	**6.98** 1570	3800	**11.112** 0.4375	**0.38** 0.015	**14.4** 0.57	**15.47** 0.609	**28.25** 250	**0.04** 0.08
CRHSBC-14	**10.14** 2280	**14.68** 3300	**7.38** 1660	**4.94** 1110	**11.88** 2670	3800	**11.112** 0.4375	**0.38** 0.015	**14.4** 0.57	**15.47** 0.609	**28.25** 250	**0.05** 0.11
CRHSBC-16	**12.99** 2920	**21.93** 4930	**8.41** 1890	**5.60** 1260	**13.43** 3020	2800	**15.875** 0.6250	**0.76** 0.030	**17.6** 0.69	**19.84** 0.781	**73.45** 650	**0.09** 0.20
CRHSBC-18	**12.99** 2920	**21.93** 4930	**9.43** 2120	**8.18** 1840	**17.48** 3930	2800	**15.875** 0.6250	**0.76** 0.030	**17.6** 0.69	**19.84** 0.781	**73.45** 650	**0.11** 0.24
CRHSBC-20	**21.04** 4730	**33.27** 7480	**13.88** 3120	**8.27** 1860	**19.79** 4450	2400	**19.050** 0.7500	**0.76** 0.030	**20.7** 0.82	**24.99** 0.984	**141.25** 1250	**0.17** 0.38
CRHSBC-22	**21.04** 4730	**33.27** 7480	**15.26** 3430	**11.39** 2560	**26.56** 5970	2400	**19.050** 0.7500	**0.76** 0.030	**20.7** 0.82	**24.99** 0.984	**141.25** 1250	**0.20** 0.44
CRHSBC-24	**24.64** 5540	**42.61** 9580	**16.95** 3810	**13.12** 2950	**30.83** 6930	2000	**22.225** 0.8750	**0.76** 0.030	**23.9** 0.94	**27.79** 1.094	**169.5** 1500	**0.31** 0.69
CRHSBC-26	**24.64** 5540	**42.61** 9580	**18.19** 4090	**16.95** 3810	**35.27** 7930	2000	**22.225** 0.8750	**0.76** 0.030	**23.9** 0.94	**27.79** 1.094	**169.5** 1500	**0.34** 0.75
CRHSBC-28	**30.87** 6940	**59.16** 13300	**21.66** 4870	**20.73** 4660	**44.48** 10000	1700	**25.400** 1.0000	**1.02** 0.040	**27.1** 1.07	**31.75** 1.250	**254.25** 2250	**0.45** 1.00
CRHSBC-30	**30.87** 6940	**59.16** 13300	**22.91** 5150	**25.58** 5750	**49.38** 11100	1700	**25.400** 1.0000	**1.02** 0.040	**27.1** 1.07	**31.75** 1.250	**254.25** 2250	**0.52** 1.15

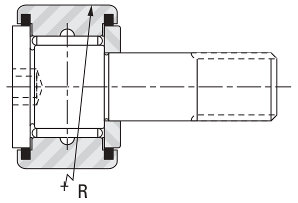
Continued on next page.

STUD-TYPE TRACK ROLLERS
CRHSBC SERIES

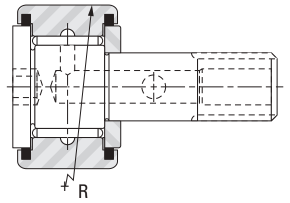
INCH SERIES

- Non-separable, sealed unit with outer ring, full complement of needle rollers, stud seals, self-lubricating resin internal thrust washers and stud-fastened retaining washer.
- Seals help retain lubricant and exclude foreign matter (CRS Series).
- Hexagonal wrench socket in stud head for mounting.
- Re-lubrication via axially drilled hole through stud with cross-drilled holes in stud raceway and shank.
- Recessed axial hole accepts standard nominal inch drive-type grease lubrication fitting.
- Lubrication fitting plugs furnished to close off unused holes.
- Crowned outer ring to support uneven bearing load.
- Large diameter heavy-duty stud.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- A close fit between stud and hole required for mounting.
- Bore dimensions given below result in varying fit (0.025 mm tight to 0.013 mm loose [0.0010 in. tight to 0.0005 in. loose]).
- Retaining washer should be firmly backed up by flat housing shoulder (perpendicular to the stud axis).
- Shoulder diameter should be at least same size as minimum clamping diameter listed.
- May be mounted with two thin lock nuts, or nut and lock washer.

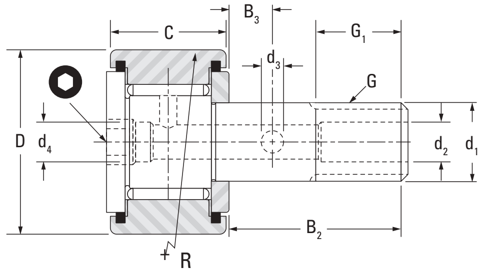
For hexagonal wrench sizes, see page B-5-30.



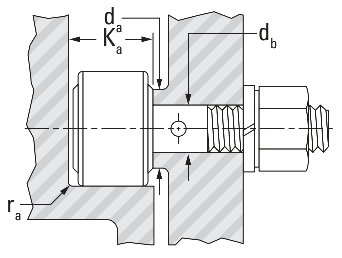
CRHSBC -8-1 to -10-1



CRHSBC -24 to -44



CRHSBC -12 to -22
CRHSBC -48 to -64



NOTE

Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.

Outer Dia.	d_1	D	C	R	B_2	B_3	G_1	d_4	d_2	d_3	G	Bearing Designation
	+0.025 +0.001 **0** 0	**0** 0 **-0.025** -0.001	**0** 0 **-0.13** -0.005	Crown radius (approx.)	(nom.).		Min.				UNF	
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in	
2	**28.580** 1.1250	**50.80** 2.000	**31.75** 1.250	**610** 24	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	1 1/8-12	CRHSBC-32
2 1/4	**28.580** 1.1250	**57.15** 2.250	**31.75** 1.250	**610** 24	**50.80** 2.000	**12.70** 0.500	**25.40** 1.000	-	**4.78** 0.188	**3.18** 0.125	1 1/8-12	CRHSBC-36
2 1/2	**31.750** 1.2500	**63.50** 2.500	**38.10** 1.500	**762** 30	**57.20** 2.250	**14.27** 0.562	**28.58** 1.125	-	**4.78** 0.188	**3.18** 0.125	1 1/4-12	CRHSBC-40
2 3/4	**31.750** 1.2500	**69.85** 2.750	**38.10** 1.500	**762** 30	**57.20** 2.250	**14.27** 0.562	**28.57** 1.125	-	**4.78** 0.188	**3.18** 0.125	1 1/4-12	CRHSBC-44
3	**38.100** 1.5000	**76.20** 3.000	**44.45** 1.750	**762** 30	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/2-12	CRHSBC-48
3 1/4	**38.100** 1.5000	**82.55** 3.250	**44.45** 1.750	**762** 30	**63.50** 2.500	**15.88** 0.625	**31.75** 1.250	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 1/2-12	CRHSBC-52
3 1/2	**44.450** 1.7500	**88.90** 3.500	**50.80** 2.000	**762** 30	**69.90** 2.750	**17.48** 0.688	**34.93** 1.375	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	1 3/4-12	CRHSBC-56
4	**50.800** 2.0000	**101.60** 4.000	**57.15** 2.250	**762** 30	**88.90** 3.500	**19.05** 0.750	**38.1** 1.500	**6.35** 0.250	**6.35** 0.250	**3.18** 0.125	2/12	CRHSBC-64

Bearing Designation	Load Rating					Speed Rating Grease	Mounting Dimensions				Clamping Torque	Approx Wt.
	As a Bearing		As a Track Roller				d_b	$r_{as\,max}$	K_a	d_a		
	Dynamic	Static	Dynamic		Static		Bore Dia. For Stud **+0.013** +0.0005 **0** 0	Max.	Min.	Min.		
	C	C_0	C_w	$F_{r\,perm}$	$F_{0r\,perm}$							
	kN lbf	**kN** lbf	**kN** lbf	**kN** lbf	**kN** lbf	min^{-1}	**mm** in	**mm** in	**mm** in	**mm** in	**N-m** lb-in	**kg** lbs
CRHSBC-32	**38.25** 8600	**81.40** 18300	**27.05** 6080	**30.87** 6940	**61.83** 13900	1500	**28.575** 1.1250	**1.27** 0.050	**33.4** 1.32	**35.71** 1.406	**316.4** 2800	**0.71** 1.56
CRHSBC-36	**38.25** 8600	**81.40** 18300	**29.40** 6610	**43.10** 9690	**72.51** 16300	1500	**28.575** 1.1250	**1.27** 0.050	**33.4** 1.32	**35.71** 1.406	**316.4** 2800	**0.85** 1.88
CRHSBC-40	**58.27** 13100	**117.43** 26400	**44.48** 10000	**54.71** 12300	**104.09** 23400	1400	**31.750** 1.2500	**2.29** 0.090	**39.8** 1.57	**42.88** 1.688	**389.85** 3450	**1.25** 2.75
CRHSBC-44	**58.27** 13100	**117.43** 26400	**47.15** 10600	**71.17** 16000	**116.54** 26200	1400	**31.750** 1.2500	**2.29** 0.090	**39.8** 1.57	**42.88** 1.688	**389.85** 3450	**1.45** 3.19
CRHSBC-48	**74.29** 16700	**177.93** 40000	**51.60** 11600	**68.50** 15400	**131.22** 29500	990	**38.100** 1.5000	**2.29** 0.090	**46.1** 1.82	**53.98** 2.125	**565** 5000	**2.07** 4.56
CRHSBC-52	**74.29** 16700	**177.93** 40000	**54.71** 12300	**85.85** 19300	**147.24** 33100	990	**38.100** 1.5000	**2.29** 0.090	**46.1** 1.82	**53.98** 2.125	**565** 5000	**2.36** 5.19
CRHSBC-56	**109.87** 24700	**225.52** 50700	**82.29** 18500	**94.75** 21300	**191.27** 43000	950	**44.450** 1.7500	**2.29** 0.090	**52.5** 2.07	**61.93** 2.438	**565** 5000	**3.18** 7.01
CRHSBC-64	**137.89** 31000	**319.38** 71800	**98.75** 22200	**125.88** 28300	**250.43** 56300	780	**50.800** 2.0000	**2.29** 0.090	**58.8** 2.32	**71.04** 2.797	**565** 5000	**2.23** 4.91

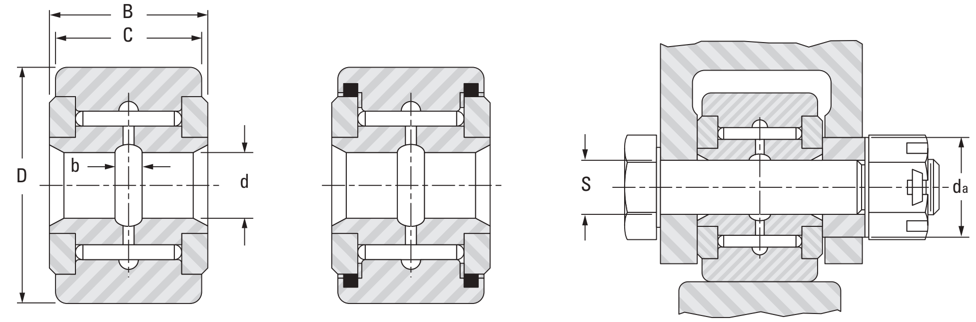
(1) UNS instead of UNF threads.

Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.

YOKE-TYPE TRACK ROLLERS
YCR, YCRS SERIES

INCH SERIES

- Non-separable unit with outer ring, a full complement of needle rollers, inner ring, self-lubricating resin internal thrust washers, and two retaining washers securely fastened to the inner ring.
- Seals in counterbores of outer ring seal against the retaining washers; retain lubricant and exclude foreign matter (YCRS Series).
- Dimensions shown are for unplated finished unit.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- The machine element with the holes in which the mounting bolt is supported must be sufficiently rigid to resist local crushing under the applied load and to resist bending which can cause uneven loading of the rollers.
- When the applied loads are high, the tight transition fit should be used in conjunction with a high strength shaft or bolt. When loads are moderate, the loose transition fit may be used with a high strength shaft or bolt. For light loads, the loose transition fit may be used with an unhardened shaft or bolt.
- The unit should be clamped endwise between parallel faces perpendicular to the axis to prevent the retaining washers from coming off under load. If the unit cannot be clamped, a close axial fit in the yoke is required.



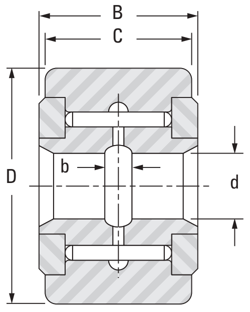
YCR YCRS

Outer Dia.	D	d		B	C	b	Track Roller Designation		Load Rating					Speed Rating Grease	Mounting Dimensions				da	Approx Wt.
									As a Bearing		As a Track Roller				Shaft Bolt Diameter (S)				Clamping Diameter Min.	
	0 0 -0.025 -0.001	Max.	Min.	+0.13 +0.005 -0.25 -0.01	0 0 -0.13 -0.005	(nom.)	Without Seals	With Seals and Internal Thrust Washers	Dynamic	Static	Dynamic		Static		Loose Fit (f7)		Tight Fit (h6)			
									C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$		Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf	kN lbf	kN lbf	kN lbf	kN lbf	min^{-1}	mm in	mm in	mm in	mm in	N-m lb-in	kg lbs
3/4	**19.05** 0.750	**6.355** 0.2502	**6.34** 0.2496	**14.280** 0.5625	**12.70** 0.500	**2.95** 0.116	YCR-12	YCRS-12	**10.14** 2280	**14.68** 3300	**6.27** 1410	**2.92** 656	**6.98** 1570	3800	**6.342** 0.2497	**6.332** 0.2493	**6.363** 0.2505	**6.353** 0.2501	**1.55** 0.610	**0.03** 0.06
7/8	**22.23** 0.875	**6.355** 0.2502	**6.34** 0.2496	**14.280** 0.5625	**12.70** 0.500	**2.95** 0.116	YCR-14	YCRS-14	**10.14** 2280	**14.68** 3300	**7.38** 1660	**4.94** 1110	**11.88** 2670	3800	**6.342** 0.2497	**6.332** 0.2493	**6.363** 0.2505	**6.353** 0.2501	**1.55** 0.610	**0.04** 0.08
1	**25.40** 1.000	**7.943** 0.3127	**7.927** 0.3121	**17.460** 0.6875	**15.88** 0.625	**3.18** 0.125	YCR-16	YCRS-16	**12.99** 2920	**21.93** 4930	**8.41** 1890	**5.60** 1260	**13.43** 3020	2800	**7.930** 0.3122	**7.920** 0.3118	**7.950** 0.3130	**7.940** 0.3126	**1.98** 0.780	**0.07** 0.15
1 1/8	**28.58** 1.125	**7.943** 0.3127	**7.927** 0.3121	**17.460** 0.6875	**15.88** 0.625	**3.18** 0.125	YCR-18	YCRS-18	**12.99** 2920	**21.93** 4930	**9.43** 2120	**8.18** 1840	**17.48** 3930	2800	**7.930** 0.3122	**7.920** 0.3118	**7.950** 0.3130	**7.940** 0.3126	**1.98** 0.780	**0.08** 0.17
1 1/4	**31.75** 1.250	**9.53** 0.3752	**9.515** 0.3746	**20.640** 0.8125	**19.05** 0.750	**3.20** 0.126	YCR-20	YCRS-20	**23.31** 5240	**30.29** 6810	**16.06** 3610	**7.38** 1660	**17.75** 3990	2700	**9.517** 0.3747	**9.507** 0.3743	**9.538** 0.3755	**9.528** 0.3751	**2.49** 0.980	**0.11** 0.24
1 3/8	**34.93** 1.375	**9.53** 0.3752	**9.515** 0.3746	**20.640** 0.8125	**19.05** 0.750	**3.20** 0.126	YCR-22	YCRS-22	**23.31** 5240	**30.29** 6810	**17.66** 3970	**10.45** 2350	**25.04** 5630	2700	**9.517** 0.3747	**9.507** 0.3743	**9.538** 0.3755	**9.528** 0.3751	**2.49** 0.980	**0.14** 0.3
1 1/2	**38.10** 1.500	**1.118** 0.4377	**11.102** 0.4371	**23.810** 0.9375	**22.23** 0.875	**3.18** 0.125	YCR-24	YCRS-24	**28.16** 6330	**40.26** 9050	**20.15** 4530	**11.97** 2690	**28.74** 6460	2700	**11.105** 0.4372	**11.095** 0.4368	**11.125** 0.4380	**11.115** 0.4376	**2.77** 1.090	**0.19** 0.41
1 5/8	**41.20** 1.625	**1.118** 0.4377	**11.102** 0.4371	**23.810** 0.9375	**22.23** 0.875	**3.18** 0.125	YCR-26	YCRS-26	**28.16** 6330	**40.26** 9050	**21.62** 4860	**15.66** 3520	**36.08** 8110	2300	**11.105** 0.4372	**11.095** 0.4368	**11.125** 0.4380	**11.115** 0.4376	**2.77** 1.090	**0.23** 0.5
1 3/4	**44.45** 1.750	**12.703** 0.5001	**12.687** 0.4995	**26.990** 1.0625	**25.40** 1.000	**3.20** 0.126	YCR-28	YCRS-28	**35.50** 7980	**56.49** 12700	**25.93** 5830	**19.04** 4280	**45.82** 10300	1900	**12.692** 0.4997	**12.682** 0.4993	**12.718** 0.5007	**12.708** 0.5003	**3.18** 1.250	**0.29** 0.64
1 7/8	**47.63** 1.875	**12.703** 0.5001	**12.687** 0.4995	**26.990** 1.0625	**25.40** 1.000	**3.20** 0.126	YCR-30	YCRS-30	**35.50** 7980	**56.49** 12700	**27.40** 6160	**23.66** 5320	**51.15** 11500	1900	**12.692** 0.4997	**12.682** 0.4993	**12.718** 0.5007	**12.708** 0.5003	**3.18** 1.250	**0.36** 0.8
2	**50.80** 2.000	**15.878** 0.6251	**15.862** 0.6245	**33.340** 1.3125	**31.75** 1.250	**3.20** 0.126	YCR-32	YCRS-32	**43.19** 9710	**75.62** 17000	**31.89** 7170	**28.11** 6320	**62.72** 14100	1700	**15.867** 0.6247	**15.857** 0.6243	**15.893** 0.6257	**15.883** 0.6253	**3.58** 1.410	**0.48** 1.05
2 1/4	**57.15** 2.250	**15.878** 0.6251	**15.862** 0.6245	**33.340** 1.3125	**31.75** 1.250	**3.20** 0.126	YCR-36	YCRS-36	**43.19** 9710	**75.62** 17000	**34.70** 7800	**39.86** 8960	**73.40** 16500	1700	**15.867** 0.6247	**15.857** 0.6243	**15.893** 0.6257	**15.883** 0.6253	**3.58** 1.410	**0.60** 1.32
2 1/2	**63.50** 2.500	**19.053** 0.7501	**19.037** 0.7495	**39.690** 1.5625	**38.10** 1.500	**3.68** 0.145	YCR-40	YCRS-40	**58.27** 13100	**117.43** 26400	**44.48** 10000	**54.71** 12300	**104.09** 23400	1400	**19.042** 0.7497	**19.032** 0.7493	**19.068** 0.7507	**19.058** 0.7503	**4.29** 1.690	**0.82** 1.8

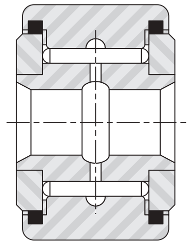
Continued on next page.

YOKE-TYPE TRACK ROLLERS
YCR, YCRS SERIES
INCH SERIES

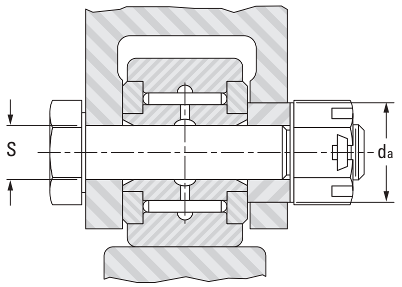
- Non-separable unit with outer ring, a full complement of needle rollers, inner ring, self-lubricating resin internal thrust washers, and two retaining washers securely fastened to the inner ring.
- Seals in counterbores of outer ring seal against the retaining washers; retain lubricant and exclude foreign matter (YCRS Series).
- Dimensions shown are for unplated finished unit.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- The machine element with the holes in which the mounting bolt is supported must be sufficiently rigid to resist local crushing under the applied load and to resist bending which can cause uneven loading of the rollers.
- When the applied loads are high, the tight transition fit should be used in conjunction with a high strength shaft or bolt. When loads are moderate, the loose transition fit may be used with a high strength shaft or bolt. For light loads, the loose transition fit may be used with an unhardened shaft or bolt.
- The unit should be clamped endwise between parallel faces perpendicular to the axis to prevent the retaining washers from coming off under load. If the unit cannot be clamped, a close axial fit in the yoke is required.



YCR



YCRS

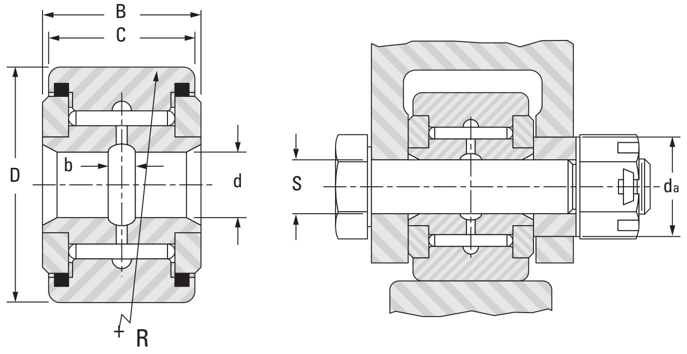


Outer Dia.	D	d		B	C	b	Track Roller Designation		Load Rating					Speed Rating Grease	Mounting Dimensions				da	Approx Wt.
									As a Bearing		As a Track Roller				Shaft Bolt Diameter (S)				Clamping Diameter Min.	
	$^{0}_{-0.025}$ $^{0}_{-0.001}$	Max.	Min.	$^{+0.13}_{-0.25}$ $^{+0.005}_{-0.01}$	$^{0}_{-0.13}$ $^{0}_{-0.005}$	(nom.)	Without Seals	With Seals and Internal Thrust Washers	Dynamic	Static	Dynamic		Static		Loose Fit (f7)		Tight Fit (h6)			
									C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$		Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in	mm in	mm in			kN lbf	kN lbf	kN lbf	kN lbf	kN lbf	min^{-1}	mm in	mm in	mm in	mm in	N-m lb-in	kg lbs
2 3/4	**69.85** 2.750	**19.053** 0.7501	**19.037** 0.7495	**39.690** 1.5625	**38.10** 1.500	**3.68** 0.145	YCR-44	YCRS-44	**58.27** 13100	**117.43** 26400	**47.15** 10600	**71.17** 16000	**116.54** 26200	1400	**19.042** 0.7497	**19.032** 0.7493	**19.068** 0.7507	**19.058** 0.7503	**4.29** 1.690	**1.02** 2.25
3	**76.20** 3.000	**25.403** 1.0001	**25.387** 0.9995	**46.040** 1.8125	**44.45** 1.750	**3.68** 0.145	YCR-48	YCRS-48	**74.29** 16700	**177.93** 40000	**51.60** 11600	**68.50** 15400	**131.22** 29500	990	**25.390** 0.9996	**25.377** 0.9991	**25.420** 1.0008	**25.408** 1.0003	**5.41** 2.130	**1.41** 3.1
3 1/4	**82.55** 3.250	**25.403** 1.0001	**25.387** 0.9995	**46.040** 1.8125	**44.45** 1.750	**3.68** 0.145	YCR-52	YCRS-52	**74.29** 16700	**177.93** 40000	**54.71** 12300	**85.85** 19300	**147.24** 33100	990	**25.390** 0.9996	**25.377** 0.9991	**25.420** 1.0008	**25.408** 1.0003	**5.41** 2.130	**1.64** 3.62
3 1/2	**88.90** 3.500	**28.578** 1.1251	**28.562** 1.1245	**52.390** 2.0625	**50.80** 2.000	**3.68** 0.145	YCR-56	YCRS-56	**109.87** 24700	**225.52** 50700	**82.29** 18500	**94.75** 21300	**191.27** 43000	950	**28.565** 1.1246	**28.552** 1.1241	**28.595** 1.1258	**28.583** 1.1253	**6.20** 2.440	**2.25** 4.95
4	**101.60** 4.000	**31.753** 1.2501	**57.137** 2.2495	**58.740** 2.3125	**57.15** 2.250	**3.68** 0.145	YCR-64	YCRS-64	**137.89** 31000	**319.38** 71800	**98.75** 22200	**125.88** 28300	**250.43** 56300	780	**31.740** 1.2496	**31.727** 1.2491	**31.770** 1.2508	**31.758** 1.2503	**7.11** 2.800	**3.20** 7.05
5	**127.00** 5.000	**44.453** 1.7501	**44.437** 1.7495	**73.030** 2.875	**69.85** 2.750	**8.66** 0.341	YCR-80	YCRS-80	**210.40** 47300	**484.86** 109000	**149.02** 33500	**171.70** 38600	**370.09** 83200	620	**44.440** 1.7496	**44.427** 1.7491	**44.470** 1.7508	**44.458** 1.7503	**9.04** 3.560	**6.51** 14.34
6	**152.40** 6.000	**57.153** 2.2501	**57.137** 2.2495	**85.725** 3.725	**82.55** 3.250	**8.48** 0.334	YCR-96	YCRS-96	**285.13** 64100	**578.27** 130000	**201.06** 45200	**188.16** 42300	**436.37** 98100	440	**57.140** 2.2496	**57.127** 2.2491	**57.170** 2.2508	**57.158** 2.2503	**11.35** 4.470	**9.15** 20.16

YOKE-TYPE TRACK ROLLERS
YCRSC SERIES

INCH SERIES

- Non-separable unit with outer ring, a full complement of needle rollers, inner ring, self-lubricating resin internal thrust washers, and two retaining washers securely fastened to the inner ring.
- Seals in counterbores of outer ring seal against the retaining washers; retain lubricant and exclude foreign matter (YCRS Series).
- Dimensions shown are for unplated finished unit.
- Crowned outer ring to support uneven bearing load.
- Tolerance limits for outer diameters of stud and outer ring refer to "single mean diameter."
- The machine element with the holes in which the mounting bolt is supported must be sufficiently rigid to resist local crushing under the applied load and to resist bending which can cause uneven loading of the rollers.
- When the applied loads are high, the tight transition fit should be used in conjunction with a high strength shaft or bolt. When loads are moderate, the loose transition fit may be used with a high strength shaft or bolt. For light loads, the loose transition fit may be used with an unhardened shaft or bolt.
- The unit should be clamped endwise between parallel faces perpendicular to the axis to prevent the retaining washers from coming off under load. If the unit cannot be clamped, a close axial fit in the yoke is required.



YCRSC

Outer Dia.	D	d		B	C	R	b	Bearing Designation	Load Rating					Speed Rating Grease	Mounting Dimensions				da	Approx Wt.
	0 0 -0.025 -0.001	Max.	Min.	+0.13 +0.005 -0.25 -0.01	0 0 -0.13 -0.005	Crown radius (approx.)	(nom.)		As a Bearing		As a Track Roller				Shaft Bolt Diameter (S)				Clamping Diameter Min.	
									Dynamic	Static	Dynamic		Static		Loose Fit (f7)		Tight Fit (h6)			
									C	C_0	C_w	$F_{r\ perm}$	$F_{0r\ perm}$		Max.	Min.	Max.	Min.		
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf	kN lbf	kN lbf	kN lbf	kN lbf	min^{-1}	mm in	mm in	mm in	mm in	N-m lb-in	kg lbs
3/4	19.05 0.750	6.355 0.2502	6.34 0.2496	14.280 0.5625	12.70 0.500	254 10	2.95 0.116	YCRSC-12	10.14 2280	14.68 3300	6.27 1410	2.92 656	6.98 1570	3800	6.342 0.2497	6.332 0.2493	6.363 0.2505	6.353 0.2501	1.55 0.610	0.03 0.06
7/8	22.23 0.875	6.355 0.2502	6.34 0.2496	14.280 0.5625	12.70 0.500	254 10	2.95 0.116	YCRSC-14	10.14 2280	14.68 3300	7.38 1660	4.94 1110	11.88 2670	3800	6.342 0.2497	6.332 0.2493	6.363 0.2505	6.353 0.2501	1.55 0.610	0.04 0.08
1	25.40 1.000	7.943 0.3127	7.927 0.3121	17.460 0.6875	15.88 0.625	304.8 12	3.18 0.125	YCRSC-16	12.99 2920	21.93 4930	8.41 1890	5.60 1260	13.43 3020	2800	7.930 0.3122	7.920 0.3118	7.950 0.3130	7.940 0.3126	1.98 0.780	0.07 0.15
1 1/8	28.58 1.125	7.943 0.3127	7.927 0.3121	17.460 0.6875	15.88 0.625	304.8 12	3.18 0.125	YCRSC-18	12.99 2920	21.93 4930	9.43 2120	8.18 1840	17.48 3930	2800	7.930 0.3122	7.920 0.3118	7.950 0.3130	7.940 0.3126	1.98 0.780	0.08 0.17
1 1/4	31.75 1.250	9.53 0.3752	9.515 0.3746	20.640 0.8125	19.05 0.750	355.6 14	3.20 0.126	YCRSC-20	23.31 5240	30.29 6810	16.06 3610	7.38 1660	17.75 3990	2700	9.517 0.3747	9.507 0.3743	9.538 0.3755	9.528 0.3751	2.49 0.980	0.11 0.24
1 3/8	34.93 1.375	9.53 0.3752	9.515 0.3746	20.640 0.8125	19.05 0.750	355.6 14	3.20 0.126	YCRSC-22	23.31 5240	30.29 6810	17.66 3970	10.45 2350	25.04 5630	2700	9.517 0.3747	9.507 0.3743	9.538 0.3755	9.528 0.3751	2.49 0.980	0.14 0.3
1 1/2	38.10 1.500	1.118 0.4377	11.102 0.4371	23.810 0.9375	22.23 0.875	508 20	3.18 0.125	YCRSC-24	28.16 6330	40.26 9050	20.15 4530	11.97 2690	28.74 6460	2700	11.105 0.4372	11.095 0.4368	11.125 0.4380	11.115 0.4376	2.77 1.090	0.19 0.41
1 5/8	41.20 1.625	1.118 0.4377	11.102 0.4371	23.810 0.9375	22.23 0.875	508 20	3.18 0.125	YCRSC-26	28.16 6330	40.26 9050	21.62 4860	15.66 3520	36.08 8110	2300	11.105 0.4372	11.095 0.4368	11.125 0.4380	11.115 0.4376	2.77 1.090	0.23 0.5
1 3/4	44.45 1.750	12.703 0.5001	12.687 0.4995	26.990 1.0625	25.40 1.000	508 20	3.20 0.126	YCRSC-28	35.50 7980	56.49 12700	25.93 5830	19.04 4280	45.82 10300	1900	12.692 0.4997	12.682 0.4993	12.718 0.5007	12.708 0.5003	3.18 1.250	0.29 0.64
1 7/8	47.63 1.875	12.703 0.5001	12.687 0.4995	26.990 1.0625	25.40 1.000	508 20	3.20 0.126	YCRSC-30	35.50 7980	56.49 12700	27.40 6160	23.66 5320	51.15 11500	1900	12.692 0.4997	12.682 0.4993	12.718 0.5007	12.708 0.5003	3.18 1.250	0.36 0.8
2	50.80 2.000	15.878 0.6251	15.862 0.6245	33.340 1.3125	31.75 1.250	609.6 24	3.20 0.126	YCRSC-32	43.19 9710	75.62 17000	31.89 7170	28.11 6320	62.72 14100	1700	15.867 0.6247	15.857 0.6243	15.893 0.6257	15.883 0.6253	3.58 1.410	0.48 1.05
2 1/4	57.15 2.250	15.878 0.6251	15.862 0.6245	33.340 1.3125	31.75 1.250	609.6 24	3.20 0.126	YCRSC-36	43.19 9710	75.62 17000	34.70 7800	39.86 8960	73.40 16500	1700	15.867 0.6247	15.857 0.6243	15.893 0.6257	15.883 0.6253	3.58 1.410	0.60 1.32
2 1/2	63.50 2.500	19.053 0.7501	19.037 0.7495	39.690 1.5625	38.10 1.500	762 30	3.68 0.145	YCRSC-40	58.27 13100	117.43 26400	44.48 10000	54.71 12300	104.09 23400	1400	19.042 0.7497	19.032 0.7493	19.068 0.7507	19.058 0.7503	4.29 1.690	0.82 1.8
2 3/4	69.85 2.750	19.053 0.7501	19.037 0.7495	39.690 1.5625	38.10 1.500	762 30	3.68 0.145	YCRSC-44	58.27 13100	117.43 26400	47.15 10600	71.17 16000	116.54 26200	1400	19.042 0.7497	19.032 0.7493	19.068 0.7507	19.058 0.7503	4.29 1.690	1.02 2.25
3	76.20 3.000	25.403 1.0001	25.387 0.9995	46.040 1.8125	44.45 1.750	762 30	3.68 0.145	YCRSC-48	74.29 16700	177.93 40000	51.60 11600	68.50 15400	131.22 29500	990	25.390 0.9996	25.377 0.9991	25.420 1.0008	25.408 1.0003	5.41 2.130	1.41 3.1
3 1/4	82.55 3.250	25.403 1.0001	25.387 0.9995	46.040 1.8125	44.45 1.750	762 30	3.68 0.145	YCRSC-52	74.29 16700	177.93 40000	54.71 12300	85.85 19300	147.24 33100	990	25.390 0.9996	25.377 0.9991	25.420 1.0008	25.408 1.0003	5.41 2.130	1.64 3.62
3 1/2	88.90 3.500	28.578 1.1251	28.562 1.1245	52.390 2.0625	50.80 2.000	762 30	3.68 0.145	YCRSC-56	109.87 24700	225.52 50700	82.29 18500	94.75 21300	191.27 43000	950	28.565 1.1246	28.552 1.1241	28.595 1.1258	28.583 1.1253	6.20 2.440	2.25 4.95
4	101.60 4.000	31.753 1.2501	57.137 2.2495	58.740 2.3125	57.15 2.250	762 30	3.68 0.145	YCRSC-64	137.89 31000	319.38 71800	98.75 22200	125.88 28300	250.43 56300	780	31.740 1.2496	31.727 1.2491	31.770 1.2508	31.758 1.2503	7.11 2.800	3.20 7.05

THRUST BEARINGS, ASSEMBLIES, WASHERS

Overview: Thrust needle roller and cage assemblies are complements of small diameter needle rollers, arranged in a spoke-like configuration. Needle rollers are equally spaced by means of a cage, its web section separates the rollers and provides guidance to keep them tracking in an orbital path. The purpose of these assemblies is to transmit a thrust load between two relatively rotating objects while greatly reducing friction.

Thrust needle roller and cage assemblies also can be unitized with lipped washers to serve as raceway surfaces for the needle rollers. Washers can be supplied separately or can be mechanically unitized to the thrust needle roller and cage assemblies for ease of handling.

- **Catalog range:** 6 mm – 160 mm (0.2362 in – 6.2992 in).
- **Markets:** Automotive automatic and manual transmissions, automotive accessories (compressors, steering gears, etc.) agricultural and construction equipment.
- **Features:** One-way fool-proof assembly features, anti-rotation locking features and lubrication flow enhancements.
- **Benefits:** High-speed performance and application flexibility.

Needle Roller Thrust Bearings – Metric Nominal Dimensions

Prefix
AXK, FNT thrust needle roller and cage assembly

Bore
60 = 60 mm

Outer Diameter
85 = 85 mm

AXK 60 85

Prefix
K.811 cylindrical roller thrust bearing
K.812 cylindrical roller thrust bearing

Bore Diameter
02 = 15 mm
03 = 17 mm
(for bore ≥ 20 mm): bore code x 5 = bore diameter
04 = 4 x 5 = 20 mm

K.811 04 TVP

Suffix
TVP molded, reinforced polymer window-type cage
LPB machined, light metal window-type cage

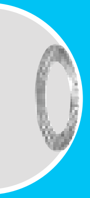
Bearing design symbol
TP thrust needle roller and cage assembly
TPK, TVK unitized thrust bearing assembly

Outer diameter
33 = 33 mm

TVK 17 33 JL

Bore diameter
17 = 17 mm

Thrust washer shape symbol
(only for unitized bearing assemblies)
JL with outer-diameter flange thrust washers and bore-diameter flange thrust washers
J with outer-diameter flange thrust washers
L with bore-diameter flange thrust washers



Thrust Washers – Metric Nominal Dimensions

Prefix
AS thin thrust washer
LS heavy thrust washer

Bore
40 = 40 mm

Outer Diameter
60 = 60 mm

LS 40 60

Prefix
GS.811, GS.812 housing washer
WS.812, WS.812 shaft washer

Bore Diameter

for WS.811, WS.812:
02 = 15 mm
03 = 17 mm
(for bore ≥ 20 mm):
bore code x 5 = bore diameter
04 = 4 x 5 = 20 mm

for GS.811:
02 = 16 mm
03 = 18 mm
04 = 21 mm
05 = 26 mm
(for bore ≥ 30 mm):
[bore code x 5]+2 = bore diameter
06 = [6 x 5] +2 = 32 mm

for GS.812:
02 = 16 mm
03 = 17mm
04 = 21 mm
05 = 26 mm
(for bore ≥ 30 mm):
[bore code x 5]+2 = bore diameter
06 = [6 x 5] +2 = 32 mm
(for bore > 85 mm):
[bore code x 5]+3 = bore diameter
17 = [17 x 5] +3 = 88 mm

GS.811 04

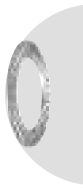
Prefix
W thin thrust washer
WS thick (heavy) thrust washer

Outer diameter
16 = 16 mm

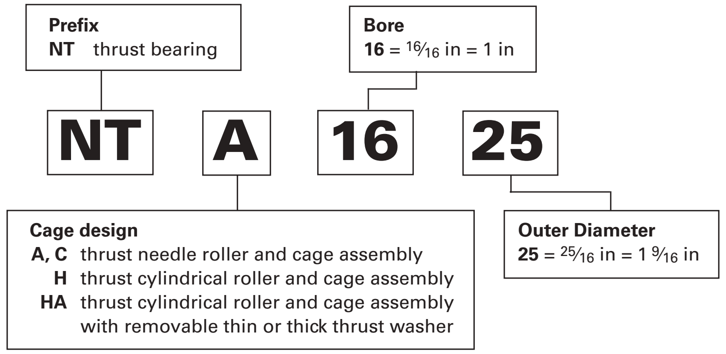
W 08 16 F

Bore diameter
08 = 8 mm

Thrust washer shape symbol
F flat thrust washer



Thrust Bearings – Inch Nominal Dimensions



Prefix
NT thrust bearing

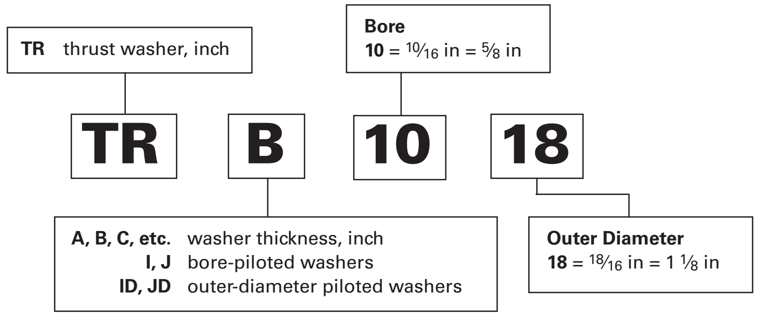
Bore
16 = 16/16 in = 1 in

NT A 16 25

Cage design
A, C thrust needle roller and cage assembly
H thrust cylindrical roller and cage assembly
HA thrust cylindrical roller and cage assembly with removable thin or thick thrust washer

Outer Diameter
25 = 25/16 in = 1 9/16 in

Thrust Washers – Inch Nominal Dimensions



TR thrust washer, inch

Bore
10 = 10/16 in = 5/8 in

TR B 10 18

A, B, C, etc. washer thickness, inch
I, J bore-piloted washers
ID, JD outer-diameter piloted washers

Outer Diameter
18 = 18/16 in = 1 1/8 in

Thrust Bearings, Assemblies, Washers

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES AND THRUST WASHERS – METRIC SERIES *Page*

CYLINDRICAL ROLLER THRUST BEARINGS AND THEIR COMPONENTS – METRIC SERIES

THRUST ASSEMBLIES AND THRUST BEARINGS – INCH SERIES

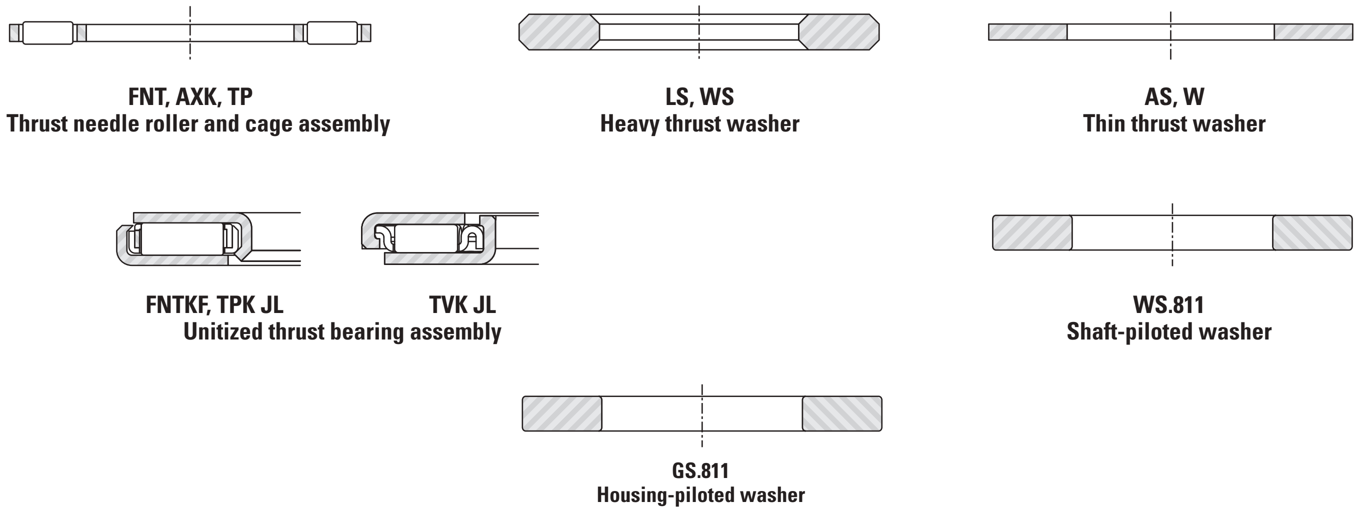
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES AND THRUST WASHERS

METRIC SERIES

Thrust needle roller and cage assemblies are available in a variety of sizes. They all have very small cross sections. This catalog includes the most popular, standardized designs.

REFERENCE STANDARDS ARE:

- **ISO 3031** – rolling bearings – thrust needle roller and cage assemblies, thrust washers – dimensions and tolerances.
- **DIN 5405 Part 2** – rolling bearings – needle roller bearings – thrust needle roller and cage assemblies.
- **DIN 5405 Part 3** – rolling bearings – needle roller bearings – thrust washers.
- **ANSI/ABMA Std. 21.1-1988** – thrust needle roller and cage assemblies and thrust washers – metric design.
- **JIS B 1536** – roller bearings – boundary dimensions and tolerances of needle roller bearings.


FNT, AXK, TP
Thrust needle roller and cage assembly

LS, WS
Heavy thrust washer

AS, W
Thin thrust washer

FNTKF, TPK JL
TVK JL
Unitized thrust bearing assembly

WS.811
Shaft-piloted washer

GS.811
Housing-piloted washer

Fig. B6-1. Types of metric series thrust needle roller and cage assemblies and thrust washers

CONSTRUCTION

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

The thrust needle roller and cage assembly (FNT and TP series) has a two-piece steel cage and through-hardened needle rollers that are precision finished to close tolerances for optimum load distribution. The cage is comprised of two mating pieces that are securely fastened together.

AXK series thrust needle roller and cage assembly, which can be used interchangeably with the FNT assembly, has a one-piece cage. The cage is similar in design to the successful profiled radial steel cages.

These cage assemblies have a very thin section and when they must run directly against the backup surface raceways, their section may be 2.000 to 5.000 mm (0.0787 to 0.1969 in) – equivalent to the diameter of the needle rollers used.

When the backup surfaces cannot be hardened and ground, hardened washers of different thicknesses are available.

UNITIZED THRUST BEARING ASSEMBLIES

Thrust bearing assemblies of the FNTK, FNTF, FNTKF, TPK and TVK series have been specially designed for use in applications where a unitized assembly allows for easy installation and eliminates the need for heat treatment and precision finishing of one or both thrust bearing backup surfaces.

Each FNTK, FNTF, FNTKF, TPK and TVK assembly consists of a FNT, TP or TV thrust needle roller and cage assembly – with one or two special-lipped washers that snap over the cage to produce a unitized thrust bearing assembly. The FNTK, FNTF, TPK J, TPK L, TVK J and TVK L assembly has one such washer. The FNTKF, TPK JL and TVK JL assembly has a washer on each side of the bearing.

The backup surfaces for these unitized thrust bearing assemblies should meet the limits of permissible out-of-squareness and coning or dishing, as shown in Fig. B6-2 on page B-6-10. Oil is the preferred lubricant for these assemblies. However they also are available pre-greased for applications that do not allow for oil lubrication.

THRUST WASHERS

Ideally, a thrust washer should be stationary with respect to, and piloted by, its supporting or backing member – whether or not this is an integral part of the shaft or housing. There should be no rubbing action between the thrust washer and any other machine member. Some thrust washers are designed for bore piloting and others may be piloted by their outer diameter.

THIN THRUST WASHERS (AS, W)

The metric series thin thrust washers are made of hardened spring steel. Thin washers are used when the supporting or backing members cannot be adequately prepared as raceways for the needle rollers. These washers are only 1.000 mm (0.0394 in) thick, and provide a very compact and cost-effective bearing arrangement. Although they are usually guided on the shaft, they may be housing-guided, when required by the application.

HEAVY THRUST WASHERS (LS, WS)

These metric series thrust washers are made of bearing quality steel, hardened and precision-ground on the flat raceway surfaces. Their bores and outer diameters are not ground, but provide satisfactory surfaces for shaft-piloting or housing-piloting arrangements.

SHAFT-PILOTED WASHERS (WS.811) AND HOUSING-PILOTED WASHERS (GS.811)

These shaft-piloted and housing-piloted metric series thrust washers are primarily for use with metric series cylindrical roller thrust bearings of series 811. They are made of bearing-quality steel with hardened and precision-ground, lapped-flat raceway surfaces. The bore and outer diameter tolerances for shaft-piloted washers and housing-piloted washers are shown in Table B6-8 and B6-9 on page B-6-28.

DIMENSIONAL ACCURACY

TOLERANCES FOR THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

Pages B-6-12 to B-6-19 list the nominal outer diameter, bore diameter and needle roller diameter for the FNT, AXK and TP series of thrust needle roller and cage assemblies and also the nominal outer diameter and bore diameter of the series AS, LS, WS.811, GS.811, W and WS thrust washers. Thickness tolerances for the AS and LS thrust washers also are included.

Tolerances for the outer and bore diameters of series FNT, AXK and TP thrust needle roller and cage assemblies are given in Table B6-1 on page B-6-7, Table B6-2 on page B-6-8 and Table B6-6 on page B-6-9.

Table B6-1. Tolerances for outer diameter (D_c) and bore diameter (D_{c1}) of series FNT and TP thrust needle roller and cage assemblies

D_c		Deviations of max. outside diameter (c12)		D_{c1}		Deviations of min. bore diameter (E11)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
18.000 0.7087	**30.000** 1.1811	**-0.110** -0.0043	**-0.320** -0.0126	**3.000** 0.1181	**6.000** 0.2362	**+0.095** +0.0037	**+0.020** +0.0008
30.000 1.1811	**40.000** 1.5748	**-0.120** -0.0047	**-0.370** -0.0146	**6.000** 0.2362	**10.000** 0.3937	**+0.115** +0.0045	**+0.025** +0.0010
40.000 1.5748	**50.000** 1.9685	**-0.130** -0.0051	**-0.380** -0.0150	**10.000** 0.3937	**18.000** 0.7087	**+0.142** +0.0056	**+0.032** +0.0013
50.000 1.9685	**65.000** 2.5591	**-0.140** -0.0055	**-0.440** -0.0173	**18.000** 0.7087	**30.000** 1.1811	**+0.170** +0.0067	**+0.040** +0.0016
65.000 2.5591	**80.000** 3.1496	**-0.150** -0.0059	**-0.450** -0.0177	**30.000** 1.1811	**50.000** 1.9685	**+0.210** +0.0083	**+0.050** +0.0020
80.000 3.1496	**100.000** 3.9370	**-0.170** -0.0067	**-0.520** -0.0205	**50.000** 1.9685	**80.000** 3.1496	**+0.250** +0.0098	**+0.060** +0.0024
100.000 3.9370	**120.000** 4.7244	**-0.180** -0.0071	**-0.530** -0.0209	**80.000** 3.1496	**120.000** 4.7244	**+0.292** +0.0115	**+0.072** +0.0028
120.000 4.7244	**140.000** 5.5118	**-0.200** -0.0079	**-0.600** -0.0236	**120.000** 4.7244	**180.000** 7.0866	**+0.335** +0.0132	**+0.085** +0.0033
140.000 5.5118	**160.000** 6.2992	**-0.210** -0.0083	**-0.610** -0.0240				
160.000 6.2992	**180.000** 7.0866	**-0.230** -0.0091	**-0.630** -0.0248				
180.000 7.0866	**200.000** 7.8740	**-0.240** -0.0094	**-0.700** -0.0276				

Table B6-2. Tolerances for outer diameter (D_c) and bore diameter (D_{c1}) of series AXK thrust needle roller and cage assemblies

D_c		Deviations of max. outside diameter (c13)		D_{c1}		Deviations of min. bore diameter (E12)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
18.000 0.7087	**30.000** 1.1811	**-0.110** -0.0043	**-0.440** -0.0173	**3.000** 0.1181	**6.000** 0.2362	**+0.140** +0.0055	**+0.020** +0.0008
30.000 1.1811	**40.000** 1.5748	**-0.120** -0.0047	**-0.510** -0.0201	**6.000** 0.2362	**10.000** 0.3937	**+0.175** +0.0069	**+0.025** +0.0010
40.000 1.5748	**50.000** 1.9685	**-0.130** -0.0051	**-0.520** -0.0205	**10.000** 0.3937	**18.000** 0.7087	**+0.212** +0.0083	**+0.032** +0.0013
50.000 1.9685	**65.000** 2.5591	**-0.140** -0.0055	**-0.600** -0.0236	**18.000** 0.7087	**30.000** 1.1811	**+0.250** +0.0098	**+0.040** +0.0016
65.000 2.5591	**80.000** 3.1496	**-0.150** -0.0059	**-0.610** -0.0240	**30.000** 1.1811	**50.000** 1.9685	**+0.300** +0.0118	**+0.050** +0.0020
80.000 3.1496	**100.000** 3.9370	**-0.170** -0.0067	**-0.710** -0.0280	**50.000** 1.9685	**80.000** 3.1496	**+0.360** +0.4220	**+0.060** +0.0024
100.000 3.9370	**120.000** 4.7244	**-0.180** -0.0071	**-0.720** -0.0283	**80.000** 3.1496	**120.000** 4.7244	**+0.422** +0.0166	**+0.072** +0.0028
120.000 4.7244	**140.000** 5.5118	**-0.200** -0.0079	**-0.830** -0.0327	**120.000** 4.7244	**180.000** 7.0866	**+0.485** +0.0191	**+0.085** +0.0033
140.000 5.5118	**160.000** 6.2992	**-0.210** -0.0083	**-0.840** -0.0331				
160.000 6.2992	**180.000** 7.0866	**-0.230** -0.0091	**-0.860** -0.0339				
180.000 7.0866	**200.000** 7.8740	**-0.240** -0.0094	**-0.960** -0.0378				

BORE INSPECTION PROCEDURE FOR ASSEMBLY

If an inspection of the bore diameter is desired, the bore diameter (D_{c1}) of the assembly should be checked with "go" and "no go" plug gages. The "go" plug gage size is the minimum bore diameter of the assembly. The "no go" plug gage size is the maximum bore diameter of the assembly.

The assembly, under its own weight, must fall freely from the "go" plug gage. The "no go" plug gage must not enter the bore. Where the "no go" plug gage can be forced through the bore, the assembly must not fall from the gage under its own weight.

TOLERANCES FOR THRUST WASHERS

Tolerances for the outer and bore diameters of series AS thrust washers are given in Table B6-3 on page B-6-9. Thickness tolerance for series AS thrust washers is ±0.050 mm (±0.0020 in).

Tolerances for the outer and bore diameters of series LS heavy thrust washers are given in Table B6-4 on page B-6-9.

Thickness tolerance for series LS heavy thrust washers is given in Table B6-5 on page B-6-9.

BORE INSPECTION PROCEDURE FOR SERIES AS AND LS THRUST WASHERS

If an inspection of the thrust washer bore diameter (d) is desired, it should be checked with "go" and "no go" plug gages. The "go" plug gage size is the minimum bore diameter of the thrust washer. The "no go" plug gage size is the maximum bore diameter of the thrust washer.

The thrust washer, under its own weight, must fall freely from the "go" plug gage. The "no go" plug gage must not enter the bore. Where the "no go" plug gage can be forced through the bore, the thrust washer must not fall from the gage under its own weight.

Table B6-3. Tolerances for outer diameter (d_1) and bore diameter (d) of series AS thrust washers

d_1		Deviations of max. outside diameter (e13)		d		Deviations of min. bore diameter (E13)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
18.000 0.7087	**30.000** 1.1811	**-0.040** -0.0016	**-0.370** -0.0146	**3.000** 0.1181	**6.000** 0.2362	**+0.200** +0.0079	**+0.020** +0.0008
30.000 1.1811	**50.000** 1.9685	**-0.050** -0.0020	**-0.440** -0.0173	**6.000** 0.2362	**10.000** 0.3937	**+0.245** +0.0096	**+0.025** +0.0010
50.000 1.9685	**80.000** 3.1496	**-0.060** -0.0024	**-0.520** -0.0205	**10.000** 0.3937	**18.000** 0.7087	**+0.302** +0.0119	**+0.032** +0.0013
80.000 3.1496	**120.000** 4.7244	**-0.072** -0.0028	**-0.612** -0.0241	**18.000** 0.7087	**30.000** 1.1811	**+0.370** +0.0146	**+0.040** +0.0016
120.000 4.7244	**180.000** 7.0866	**-0.085** -0.0034	**-0.715** -0.0282	**30.000** 1.1811	**50.000** 1.9685	**+0.440** +0.0173	**+0.050** +0.0020
180.000 7.0866	**250.000** 9.8425	**-0.100** -0.0039	**-0.820** -0.0323	**50.000** 1.9685	**80.000** 3.1496	**+0.520** +0.0205	**+0.060** +0.0024
				80.000 3.1496	**120.000** 4.7244	**+0.612** +0.0241	**+0.072** +0.0028
				120.000 4.7244	**180.000** 7.0866	**+0.715** +0.0281	**+0.085** +0.0034

Table B6-4. Tolerances for outer diameter (d_1) and bore diameter (d) of series LS heavy thrust washers

d_1		Deviations of max. outside diameter (a12)		d		Deviations of min. bore diameter (E12)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
18.000 0.7087	**30.000** 1.1811	**-0.300** -0.0118	**-0.510** -0.0201	**3.000** 0.1181	**6.000** 0.2362	**+0.140** +0.0055	**+0.020** +0.0008
30.000 1.1811	**40.000** 1.5748	**-0.310** -0.0122	**-0.560** -0.0221	**6.000** 0.2362	**10.000** 0.3937	**+0.175** +0.0069	**+0.025** +0.0010
40.000 1.5748	**50.000** 1.9685	**-0.320** -0.0126	**-0.570** -0.0224	**10.000** 0.3937	**18.000** 0.7087	**+0.212** +0.0084	**+0.032** +0.0013
50.000 1.9685	**65.000** 2.5591	**-0.340** -0.0134	**-0.640** -0.0252	**18.000** 0.7087	**30.000** 1.1811	**+0.250** +0.0098	**+0.040** +0.0016
65.000 2.5591	**80.000** 3.1496	**-0.360** -0.0142	**-0.660** -0.0260	**30.000** 1.1811	**50.000** 1.9685	**+0.300** +0.0118	**+0.050** +0.0020
80.000 3.1496	**100.000** 3.9370	**-0.380** -0.0150	**-0.730** -0.0290	**50.000** 1.9685	**80.000** 3.1496	**+0.360** +0.0142	**+0.060** +0.0024
100.000 3.9370	**120.000** 4.7244	**-0.410** -0.0161	**-0.760** -0.0299	**80.000** 3.1496	**120.000** 4.7244	**+0.422** +0.0166	**+0.072** +0.0028
120.000 4.7244	**140.000** 5.5118	**-0.460** -0.0181	**-0.860** -0.0339	**120.000** 4.7244	**180.000** 7.0866	**+0.485** +0.0191	**+0.085** +0.0034
140.000 5.5118	**160.000** 6.2992	**-0.520** -0.0205	**-0.920** -0.0362				
160.000 6.2992	**180.000** 7.0866	**-0.580** -0.0228	**-0.980** -0.0386				
180.000 7.0866	**200.000** 7.8740	**-0.660** -0.0260	**-1.120** -0.0441				

Table B6-5. Thickness tolerance for series LS heavy thrust washers

h		Tolerance	
>	≤	Max.	Min.
mm in		µm in	
0 0	**3** 0.1181	**0** 0	**-0.060** -0.0024
3 0.118	**6** 0.2362	**0** 0	**-0.075** -0.0030
6 0.236	**10** 0.3937	**0** 0	**-0.090** -0.0035

Table B6-6. W/WS series thrust washer tolerances and unitized thrust bearing assembly (TPK/TVK series) tolerances =JIS B 0401=

(1) Outer diameter

Nominal outer diameter d_1		Maximum actually measured outer diameter tolerance (e12)	
>	≤	Max.	Min.
mm		µm	
18	30	-40	-250
30	50	-50	-300
50	80	-60	-360
80	120	-72	-422
120	180	-85	-485

· These values correspond to the W and WS series thickness (h, h1) tolerances and to JIS B 0401-2 tolerance zone class js12.

(2) Bore diameter

Nominal bore diameter d		Minimum actually measured bore diameter tolerance (E12)	
>	≤	Max.	Min.
mm		µm	
6	10	+175	+25
10	18	+212	+32
18	30	+250	+40
30	50	+300	+50
50	80	+360	+60
80	120	+422	+72

· These values correspond to the W and WS series thickness (h, h1) tolerances and to JIS B 0401-2 tolerance zone class js12.

Table B6-7. Mounting tolerances for shafts and housings for metric series components

Bearing components	Shaft tolerance (shaft piloting)	Housing tolerance (housing piloting)
Needle roller and cage assembly. Types: AXK, FNT and TP	h8	H8
Thin thrust washer. Types: AS and W	h8	H8
Heavy thrust washer. Types: LS and WS	h8	H8
Shaft-piloted thrust washer. Type: WS.811	h6 (j6)	Clearance
Housing-piloted thrust washer. Type: GS.811	Clearance	H7 (K7)
Unitized thrust bearing assembly. Types: FNTKF (FNTK, FNTF) and TPK/TVK series	h8	H8

MOUNTING TOLERANCES

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES – METRIC SERIES

On FNT and AXK series thrust needle roller and cage assemblies, the cage bore has a closer tolerance than the outer diameter. Therefore bore piloting is preferred for these assemblies. To reduce wear, it is suggested that the piloting surface for the cage be hardened to an equivalent of at least 55 HRC. Where design requirements prevent bore piloting, the FNT or AXK series thrust needle roller and cage assemblies may be piloted on the outer diameters. For such cases, suitable O.D. piloting dimensions should be determined. Mounting tolerances are given in Table B6-7 on page B-6-10.

THRUST WASHERS

The mounting tolerances for series AS, W, LS, WS, WS.811 and GS.811 thrust washers for use with thrust needle roller and cage assemblies are given in Table B6-7 on page B-6-10.

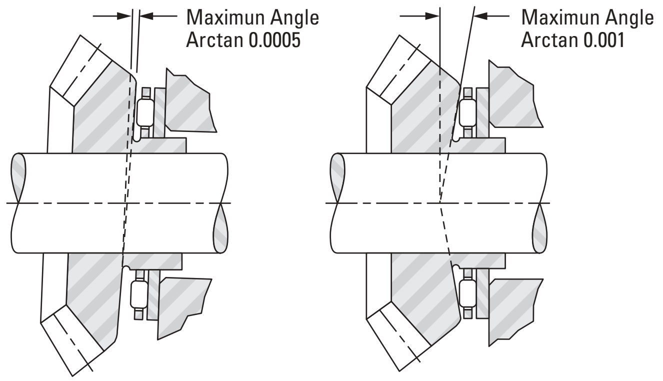
To reduce the wear in the FNT and AXK series thrust assemblies, the piloting surface for the thrust washers should also be hardened to an equivalent of at least 55 HRC.

BACKUP SURFACES

In some applications, it is desirable to use the backup surfaces as raceways for the needle rollers of the thrust needle roller and cage assemblies. In such designs, these surfaces should be parallel and must be hardened to at least 58 HRC. If this hardness cannot be achieved and thrust washers cannot be used, the load ratings must be reduced as explained in the engineering section of this catalog.

Thrust raceway surfaces must be ground to a surface finish of 0.2 µm Ra (8 µin Ra). When this requirement cannot be met, thrust washers must be used.

The raceways against which the needle rollers operate, or the surface against which the thrust washers bear, must be square with the axis of the shaft. Equally important, the raceway or surface backing of the thrust washer must not be dished or coned. The permissible limits of out-of-squareness and dishing or coning are shown in the figures below.



Out of square surface **Dished or coned surface**

Fig. B6-2. Permissible limits

For the thin series washers AS thrust washers, full backup should be provided across the whole area of circulation of the rolling elements.

Thick series needle thrust bearings and thick thrust washers can be supported on a more restricted or discontinuous shoulder – provided that the deflection of the washer under load does not impede the smooth operation of the thrust bearing or the required axial run-out.

When an application does not involve the use of a thrust washer, the surface forming the second raceway must:

- Posess a suitable surface finish 0.2 µm Ra (8 µin Ra) and sufficient hardness in relation to the load to be supported. A minimum hardness of 58 HRC, enables thrust bearings to carry their full load capacity. Lower hardness values reduce the capacities shown in the tables of dimensions (see tabulated sizes).

LOAD RATINGS

MINIMUM AXIAL LOAD

Slippage can occur if the applied axial load is too light and the operating speed of the thrust needle roller and cage assembly is high – particularly if accompanied by inadequate lubrication. For satisfactory operation, a certain minimum load must be applied to a thrust needle roller and cage assembly which can be calculated from:

$$F_{a\,min} = C_{0a}/2200 \text{ [kN]}$$

Where:

C_{0a} = static load rating [kN]
$F_{a\,min}$ = minimum axial load [kN]

LUBRICATION

Oil is the preferred lubricant for thrust needle roller and cage assemblies and an ample oil flow is absolutely necessary for high speeds or for moderate speeds when the load is relatively high.

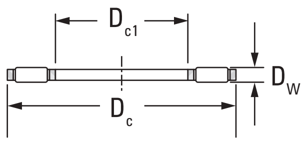
SPECIAL DESIGNS

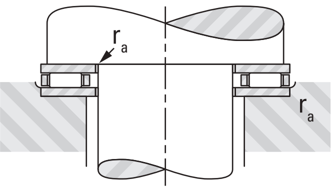
Thrust needle roller and cage assemblies and thrust washers are made to special dimensions and configurations, as well as from special materials – when quantities permit economical manufacture.

Thrust needle roller and cage assemblies are particularly adaptable to low-cost integral combination with special thrust washers. When the use of such special designs is considered, the following pages should be reviewed for evaluation of proposed arrangements.

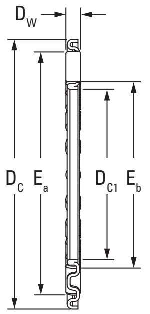
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

METRIC SERIES
AXK, FNT SERIES

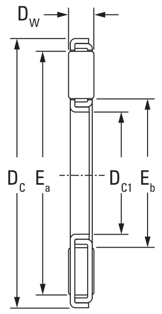




CAGE DESIGN

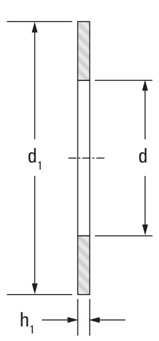


AXK



FNT

Shaft Dia.	D_{c1}	D_c	D_w	E_a	E_b	$r_{a\,max.}$	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.
								Dynamic C	Static C_o		Oil	
mm	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}	kg lbs
6	**6** 0.2362	**19** 0.7480	**2** 0.0787	**16.9** 0.665	**7.8** 0.307	**0.3** 0.012	AXK0619TN	**6.37** 1432	**14.3** 3215	1.40	23000	**0.001** 0.002
				18.0 0.709	**8.0** 0.315	**0.3** 0.012	FNT-619	**6.82** 1530	**15.6** 3510	1.50	21000	**0.002** 0.004
8	**8** 0.3150	**21** 0.8268	**2** 0.0787	**18.6** 0.732	**9.6** 0.378	**0.3** 0.012	AXK0821TN	**8.34** 1870	**21.1** 4740	2.00	20000	**0.001** 0.002
				20.0 0.787	**10.0** 0.394	**0.3** 0.012	FNT-821	**7.67** 1720	**19.1** 4290	1.85	20000	**0.002** 0.004
10	**10** 0.3937	**24** 0.9449	**2** 0.0787	**22.5** 0.886	**11.0** 0.433	**0.3** 0.012	AXK1024	**9.32** 2100	**25.9** 5820	2.90	17000	**0.003** 0.007
				23.0 0.906	**12.0** 0.472	**0.3** 0.012	FNT-1024	**9.14** 2060	**25.2** 5670	2.40	17000	**0.002** 0.004
12	**12** 0.4724	**26** 1.0236	**2** 0.0787	**24.5** 0.965	**13.0** 0.512	**0.3** 0.012	AXK1226	**10.8** 2430	**32.3** 7260	3.40	15000	**0.004** 0.009
				25.0 0.984	**14.0** 0.551	**0.3** 0.012	FNT-1226	**9.92** 2230	**29.0** 6520	2.75	15000	**0.004** 0.009
15	**15** 0.5906	**28** 1.1024	**2** 0.0787	**27.0** 1.063	**17.0** 0.669	**0.3** 0.012	AXK1528	**11.1** 2500	**35.2** 7910	3.35	15000	**0.004** 0.009
				27.0 1.063	**17.0** 0.669	**0.3** 0.012	FNT-1528	**10.2** 2290	**31.3** 7040	3.00	15000	**0.004** 0.009
17	**17** 0.6693	**30** 1.1811	**2** 0.0787	**28.7** 1.130	**18.3** 0.721	**0.3** 0.012	AXK1730TN	**11.7** 2630	**38.7** 8700	3.70	14000	**0.004** 0.009
				29.0 1.142	**19.0** 0.748	**0.3** 0.012	FNT-1730	**10.8** 2430	**34.8** 7820	3.35	14000	**0.004** 0.009
20	**20** 0.7874	**35** 1.3780	**2** 0.0787	**34.0** 1.339	**22.0** 0.866	**0.3** 0.012	AXK2035	**12.8** 2880	**45.4** 10200	4.40	12000	**0.006** 0.013
				34.0 1.339	**22.0** 0.866	**0.3** 0.012	FNTA-2035	**13.8** 3100	**50.7** 11400	4.80	12000	**0.005** 0.011
25	**25** 0.9843	**42** 1.6535	**2** 0.0787	**41.0** 1.614	**29.0** 1.142	**0.6** 0.024	AXK2542	**14.3** 3210	**56.8** 12800	5.50	10000	**0.007** 0.015
				41.0 1.614	**27.0** 1.063	**0.6** 0.024	FNT-2542	**18.0** 4050	**75.3** 16900	8.05	9700	**0.008** 0.018
30	**30** 1.1811	**47** 1.8504	**2** 0.0787	**46.0** 1.811	**35.0** 1.378	**0.6** 0.024	AXK3047	**16.0** 3600	**68.1** 15300	6.60	9000	**0.009** 0.020
				46.0 1.811	**32.0** 1.260	**0.6** 0.024	FNTA-3047	**18.6** 4180	**82.4** 18500	8.65	8900	**0.009** 0.020
35	**35** 1.3780	**52** 2.0472	**2** 0.0787	**51.0** 2.008	**40.0** 1.575	**0.6** 0.024	AXK3552	**17.4** 3910	**79.5** 17900	7.70	8100	**0.010** 0.022
				51.0 2.008	**37.0** 1.457	**0.6** 0.024	FNT-3552	**21.7** 4880	**104.0** 23400	11.1	7900	**0.010** 0.022



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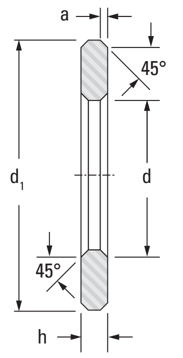

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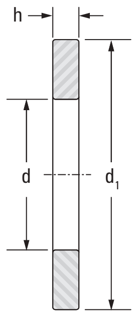

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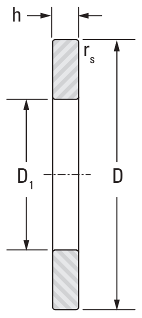

GS.811

Washer Dimensions			Thin			Heavy (LS)				Heavy				
d	D, d_1	D_1	h_1	Washer Designation	Approx. Wt.	h	a	Washer Designation	Approx. Wt.	h	$r_{s\,min.}$	Washer Designation Shaft Piloted	Washer Designation Housing Piloted	Approx. Wt.
mm in	mm in	mm in	mm in		kg lbs	mm in	mm in		kg lbs	mm in	mm in			kg lbs
6 0.2362	**19** 0.7480		**1.00** 0.0394	AS0619	**0.001** 0.002									
8 0.3150	**21** 0.8268		**1.00** 0.0394	AS0821	**0.002** 0.004	**2.75** 0.108	**0.30** 0.012	LS0821	**0.004** 0.009					
10 0.3937	**24** 0.9449		**1.00** 0.0394	AS1024	**0.003** 0.007	**2.75** 0.108	**0.50** 0.020	LS1024	**0.008** 0.018					
12 0.4724	**26** 1.0236		**1.00** 0.0394	AS1226	**0.003** 0.007	**2.75** 0.108	**0.50** 0.020	LS1226	**0.009** 0.020					
15 0.5906	**28** 1.1024	**16** 0.6299	**1.00** 0.0394	AS1528	**0.003** 0.007	**2.75** 0.108	**0.50** 0.020	LS1528	**0.010** 0.022	**2.75** 0.108	**0.30** 0.012	WS.81102	GS.81102	**0.0100** 0.0220
17 0.6693	**30** 1.1811	**18** 0.7087	**1.00** 0.0394	AS1730	**0.003** 0.007	**2.75** 0.108	**0.50** 0.020	LS1730	**0.011** 0.024	**2.75** 0.108	**0.30** 0.012	WS.81103	GS.81103	**0.011** 0.024
20 0.7874	**35** 1.3780	**21** 0.8268	**1.00** 0.0394	AS2035	**0.005** 0.011	**2.75** 0.108	**0.50** 0.020	LS2035	**0.014** 0.031	**2.75** 0.108	**0.30** 0.012	WS.81104	GS.81104	**0.014** 0.031
25 0.9843	**42** 1.6535	**26** 1.0236	**1.00** 0.0394	AS2542	**0.007** 0.015	**3.00** 0.118	**1.00** 0.039	LS2542	**0.021** 0.046	**3.00** 0.118	**0.60** 0.024	WS.81105	GS.81105	**0.021** 0.046
30 1.1811	**47** 1.8504	**32** 1.2598	**1.00** 0.0394	AS3047	**0.008** 0.018	**3.00** 0.118	**1.00** 0.039	LS3047	**0.023** 0.051	**3.00** 0.118	**0.60** 0.024	WS.81106	GS.81106	**0.023** 0.051
35 1.3780	**52** 2.0472	**37** 1.4567	**1.00** 0.0394	AS3552	**0.009** 0.020	**3.50** 0.138	**1.00** 0.039	LS3552	**0.030** 0.066	**3.50** 0.138	**0.60** 0.024	WS.81107	GS.81107	**0.032** 0.071

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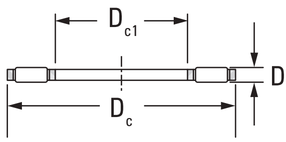
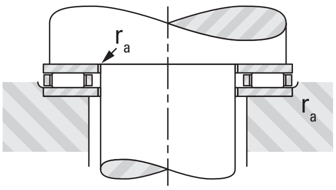
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

METRIC SERIES
AXK, FNT SERIES





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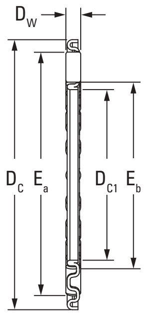

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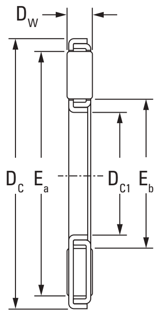
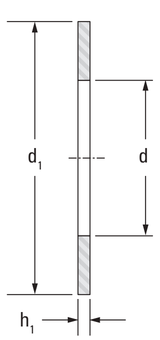


FNT

Shaft Dia.	D_{c1}	D_c	D_w	E_a	E_b	$r_{a\,max.}$	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.
								Dynamic	Static		Oil	
								C	C_o			
mm	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}	kg lbs
40	40 1.5748	60 2.3622	3 0.1181	58.0 2.283	45.0 1.772	0.6 0.024	AXK4060	27.1 6090	110.0 24700	11.9	7000	0.016 0.035
				57.0 2.244	43.0 1.693	0.6 0.024	FNT-4060	31.5 7080	132.0 29700	14.6	7100	0.020 0.044
45	45 1.7717	65 2.5591	3 0.1181	63.0 2.480	50.0 1.969	0.6 0.024	AXK4565	29.0 6520	124.0 27900	13.4	6500	0.020 0.044
				63.0 2.480	47.0 1.850	0.6 0.024	FNT-4565	37.6 8450	172.0 38700	18.5	6400	0.024 0.053
50	50 1.9685	70 2.7559	3 0.1181	68.0 2.677	55.0 2.165	0.6 0.024	AXK5070	30.8 6920	137.0 30800	14.9	6000	0.020 0.044
				68.0 2.677	52.0 2.047	0.6 0.024	FNT-5070	37.9 8520	179.0 40200	19.1	5900	0.026 0.057
55	55 2.1654	78 3.0709	3 0.1181	76.0 2.992	60.0 2.362	0.6 0.024	AXK5578	39.4 8860	195.0 43800	20.5	5300	0.026 0.057
				76.0 2.992	57.0 2.244	0.6 0.024	FNT-5578	48.5 10900	254.0 57100	26.3	5300	0.033 0.073
60	60 2.3622	85 3.3465	3 0.1181	83.0 3.268	65.0 2.559	0.6 0.024	AXK6085	44.5 10000	234.0 52600	24.7	4900	0.035 0.077
65	65 2.5591	90 3.5433	3 0.1181	88.0 3.465	70.0 2.756	0.6 0.024	AXK6590	46.7 10500	254 57100	26.8	4600	0.036 0.079
70	70 2.7559	95 3.7402	4 0.1575	93.0 3.661	74.0 2.913	0.6 0.024	AXK7095	53.8 12100	253 56900	28.0	4400	0.055 0.121
				93.0 3.661	73.0 2.874	0.6 0.024	FNTA-7095	66.6 15000	333 74900	35.3	4400	0.057 0.126
75	75 2.9528	100 3.9370	4 0.1575	98.0 3.858	79.0 3.110	0.6 0.024	AXK75100	55.1 12400	266 59800	29.4	4200	0.058 0.128
				98.0 3.858	78.0 3.071	0.6 0.024	FNT-75100	71.6 16100	374 84100	39.7	4100	0.064 0.141
80	80 3.1496	105 4.1339	4 0.1575	103.0 4.055	84.0 3.307	0.6 0.024	AXK80105	56.4 12700	279 62700	30.8	4000	0.092 0.203
				103.0 4.055	83.0 3.268	0.6 0.024	FNTA-80105	71.3 16100	379 85200	40.1	3900	0.062 0.137
85	85 3.3465	110 4.3307	4 0.1575	108.0 4.252	89.0 3.504	0.6 0.024	AXK85110	57.6 12900	291 65400	32.2	3800	0.063 0.139
90	90 3.5433	120 4.7244	4 0.1575	118.0 4.646	94.0 3.701	0.6 0.024	AXK90120	72.9 16400	405 91000	43.0	3500	0.081 0.179
100	100 3.9370	135 5.3150	4 0.1575	133.0 5.236	105.0 4.134	0.6 0.024	AXK100135	90.2 20300	552 124000	56.4	3100	0.106 0.234
110	110 4.3307	145 5.7087	4 0.1575	143.0 5.630	115.0 4.528	0.6 0.024	AXK110145	93.2 21000	591 133000	59.0	2800	0.117 0.258



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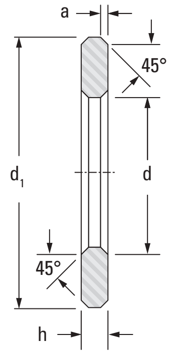

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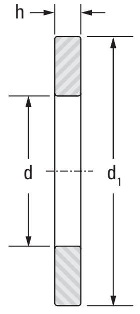

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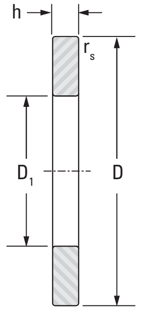

GS.811

Washer Dimensions			Thin			Heavy (LS)				Heavy				
d	D, d_1	D_1	h_1	Washer Designation	Approx. Wt.	h	a	Washer Designation	Approx. Wt.	h	$r_{s\,min.}$	Washer Designation		Approx. Wt.
												Shaft Piloted	Housing Piloted	
mm in	mm in	mm in	mm in		kg lbs	mm in	mm in		kg lbs	mm in	mm in			kg lbs
40 1.5748	60 2.3622	42 1.6535	1.00 0.0394	AS4060	0.012 0.026	3.50 0.138	1.00 0.039	LS4060	0.041 0.090	3.50 0.138	0.60 0.024	WS.81108	GS.81108	0.043 0.095
45 1.7717	65 2.5591	47 1.8504	1.00 0.0394	AS4565	0.013 0.029	4.00 0.157	1.00 0.039	LS4565	0.052 0.115	4.00 0.157	0.60 0.024	WS.81109	GS.81109	0.054 0.119
50 1.9685	70 2.7559	52 2.0472	1.00 0.0394	AS5070	0.014 0.031	4.00 0.157	1.00 0.039	LS5070	0.0560 0.1230	4.00 0.157	0.60 0.024	WS.81110	GS.81110	0.059 0.130
55 2.1654	78 3.0709	57 2.2441	1.00 0.0394	AS5578	0.018 0.040	5.00 0.197	1.00 0.039	LS5578	0.0910 0.2010	5.00 0.197	0.60 0.024	WS.81111	GS.81111	0.094 0.207
60 2.3622	85 3.3465	62 2.4409	1.00 0.0394	AS6085	0.022 0.049	4.75 0.187	1.50 0.059	LS6085	0.102 0.225	4.75 0.187	1.00 0.039	WS.81112	GS.81112	0.106 0.234
65 2.5591	90 3.5433	67 2.6378	1.00 0.0394	AS6590	0.023 0.051	5.25 0.207	1.50 0.059	LS6590	0.121 0.267	5.25 0.207	1.00 0.039	WS.81113	GS.81113	0.125 0.276
70 2.7559	95 3.7402	72 2.8346	1.00 0.0394	AS7095	0.025 0.055	5.25 0.207	1.50 0.059	LS7095	0.1280 0.2820	5.25 0.207	1.00 0.039	WS.81114	GS.81114	0.133 0.293
75 2.9528	100 3.9370	77 3.0315	1.00 0.0394	AS75100	0.027 0.060	5.75 0.226	1.50 0.059	LS75100	0.1500 0.3310	5.75 0.226	1.00 0.039	WS.81115	GS.81115	0.155 0.342
80 3.1496	105 4.1339	82 3.2283	1.00 0.0394	AS80105	0.028 0.062	5.75 0.226	1.50 0.059	LS80105	0.1580 0.3480	5.75 0.226	1.00 0.039	WS.81116	GS.81116	0.165 0.364
85 3.3465	110 4.3307	87 3.4252	1.00 0.0394	AS85110	0.028 0.062	5.75 0.226	1.50 0.059	LS85110	0.166 0.366	5.75 0.226	1.00 0.039	WS.81117	GS.81117	0.173 0.381
90 3.5433	120 4.7244	92 3.6220	1.00 0.0394	AS90120	0.038 0.084	6.50 0.256	1.50 0.059	LS90120	0.245 0.540	6.50 0.256	1.00 0.039	WS.81118	GS.81118	0.253 0.558
100 3.9370	135 5.3150		1.00 0.0394	AS100135	0.050 0.110									
110 4.3307	145 5.7087		1.00 0.0394	AS110145	0.055 0.121	7.00 0.276	1.50 0.059	LS110145	0.373 0.822	7.00 0.276				

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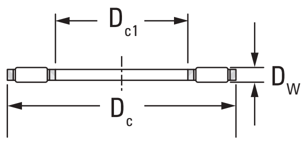
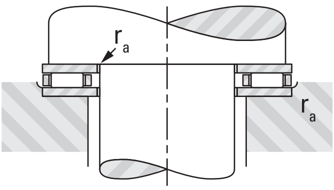
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

METRIC SERIES
AXK, FNT SERIES





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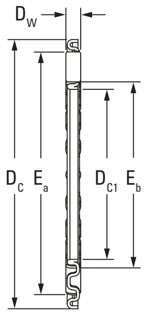

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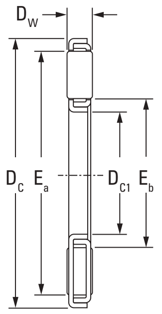
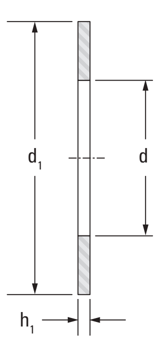


FNT

Shaft Dia.	D_{c1}	D_c	D_w	E_a	E_b	$r_{a\ max.}$	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Approx. Wt.
								Dynamic	Static		Oil	
								C	C_o			
mm	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}	kg lbs
120	**120** 4.7244	**155** 6.1024	**4** 0.1575	**153.0** 6.024	**125.0** 4.921	**0.6** 0.024	AXK120155	**98.5** 22100	**650** 146000	63.5	2700	**0.126** 0.278
130	**130** 5.1181	**170** 6.6929	**5** 0.1969	**167.0** 6.575	**136.0** 5.354	**0.6** 0.024	AXK130170	**132** 29700	**829** 186000	78.7	2400	**0.198** 0.437
140	**140** 5.5118	**180** 7.0866	**5** 0.1969	**177.0** 6.969	**146.0** 5.748	**0.6** 0.024	AXK140180	**136** 30600	**887** 199000	82.5	2300	**0.221** 0.487
150	**150** 5.9055	**190** 7.4803	**5** 0.1969	**187.0** 7.362	**156.0** 6.142	**0.6** 0.024	AXK150190	**141** 31700	**944** 212000	86.2	2200	**0.225** 0.496
160	**160** 6.2992	**200** 7.8740	**5** 0.1969	**197.0** 7.756	**166.0** 6.535	**0.6** 0.024	AXK160200	**146** 32800	**1000** 225000	89.9	2100	**0.249** 0.549



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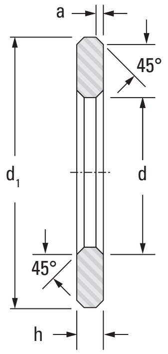

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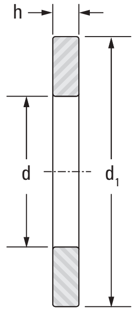

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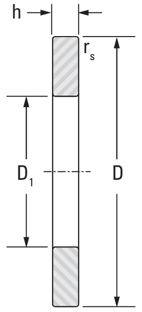
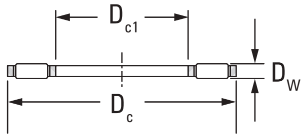


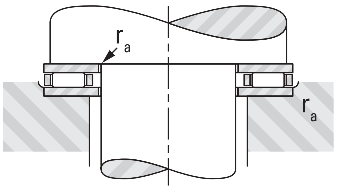
GS.811

Washer Dimensions			Thin			Heavy (LS)				Heavy				
d	D, d_1	D_1	h_1	Washer Designation	Approx. Wt.	h	a	Washer Designation	Approx. Wt.	h	$r_{s\ min.}$	Washer Designation		Approx. Wt.
												Shaft Piloted	Housing Piloted	
mm in	mm in	mm in	mm in		kg lbs	mm in	mm in		kg lbs	mm in	mm in			kg lbs
120 4.7244	**155** 6.1024		**1.00** 0.0394	AS120155	**0.059** 0.130									
130 5.1181	**170** 6.6929		**1.00** 0.0394	AS130170	**0.074** 0.163	**9.00** 0.354	**1.50** 0.059	LS130170	**0.649** 1.431					
140 5.5118	**180** 7.0866		**1.00** 0.0394	AS140180	**0.078** 0.172									
150 5.9055	**190** 7.4803		**1.00** 0.0394	AS150190	**0.083** 0.183									
160 6.2992	**200** 7.8740		**1.00** 0.0394	AS160200	**0.089** 0.196									

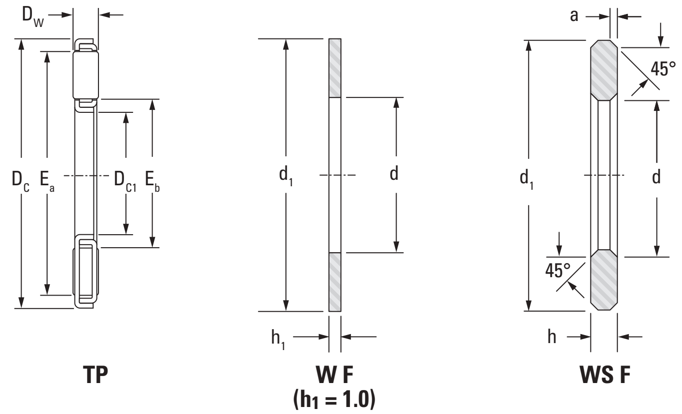
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

METRIC SERIES
TP SERIES





CAGE DESIGN

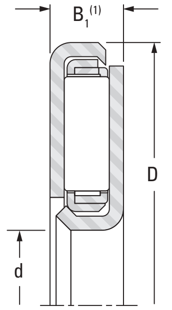


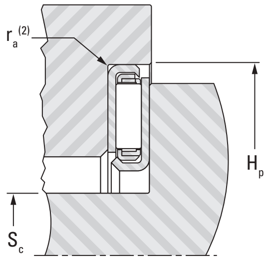
Shaft Dia.	D_{c1}	D_c	D_w	E_a	E_b	$r_{a\,max.}$	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_o	Fatigue Load Limit C_u	Speed Rating Oil	Approx. Wt.
mm	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}	kg lbs
15	15	32.3	2	31	22		TP1532-1	12.7	44.7	4.50	13000	0.006
18	18	31	2	29	20		TP1831	10.6	34.4	3.30	14000	0.005
20	20	34.72	2	32	22		TP2035	15.3	57.4	5.70	12000	0.006
20.9	20.9	32	2	30	23		TP2132D	9.20	29.7	2.85	13000	0.005
21.9	21.9	34	2	32	25		TP2234	8.85	28.6	2.75	13000	0.005
25	25	42	2	40	28		TP2542	16.2	66.2	6.90	10000	0.009
30	30	47	2	45	34		TP3047-1	17.9	78.6	8.20	9000	0.010
33.49	33.49	45.13	2	43	37		TP3445A	9.35	34.3	4.85	9000	0.007
39.6	39.6	58.24	3	56	43		TP4058-1	29.2	120	12.9	7000	0.022
41	41	68.05	9	64	45		TP4168	86.6	233	26.5	6000	0.104
42	42	62	3	57	47		TP4262	19.3	71.4	7.00	7000	0.023
45	45	56	2	54	47		TP4556	9.90	39.6	3.80	7000	0.008
46.4	46.4	68	3.5	65	49		TP4668-2	42.2	182	19.3	6000	0.035
50	50	70	3	66	54		TP5070	29.4	129	14.2	6000	0.028
70	70	95	4	91	74		TP7095	57.3	275	29.2	4000	0.070

Washer Dimensions d	Washer Dimensions D, d_1	Washer Dimensions D_1	Thin h_1	Thin Washer Designation	Thin Approx. Wt.	Heavy (WS) h	Heavy (WS) a	Heavy (WS) Washer Designation	Heavy (WS) Approx. Wt.	Heavy h	Heavy $r_{s\,min.}$	Heavy Washer Designation Shaft Piloted	Heavy Washer Designation Housing Piloted	Heavy Approx. Wt.
mm in	mm in	mm in	mm in		kg lbs	mm in	mm in		kg lbs	mm in	mm in			kg lbs
15	32		1.00	W1532F	0.005									
18	31		1.00	W1831F	0.004									
25	42		1.00	W2542F	0.007	3.00		WS2542KF	0.021					
70	95					3.00		WS7095F	0.075					

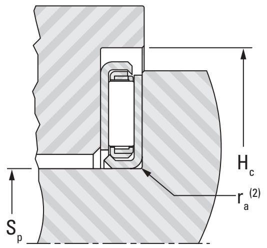
UNITIZED THRUST BEARING

METRIC SERIES
FNTKF SERIES



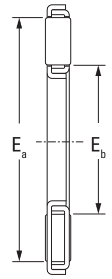


Housing Piloting



Shaft Piloting

CAGE DESIGN



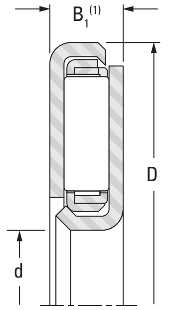
FNT

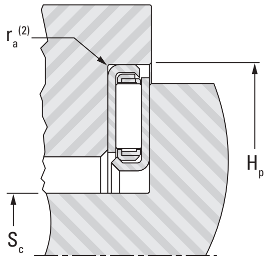
Shaft Dia.	d	D	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt
					Dynamic	Static			Housing Piloting		Shaft Piloting				
								Oil	H_p	S_c(3)	S_p	H_c(3)	E_a	E_b	
	(E13)	(e13)	(-0.2)		C	C_o			—	Max.	—	Min.			
mm	mm in	mm in	mm in		kN lbf		kN	min-1	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
10	**10** 0.3937	**28** 1.1024	**3.7**(1) 0.146	FNTKF-1028	**9.88** 2220	**29.0** 6520	2.75	16000	**28** 1.102	**8** 0.31496	**10** 0.394	**30** 1.181	**25** 0.984	**14** 0.551	**0.010**
13	**13** 0.5118	**30** 1.1811	**3.7**(1) 0.146	FNTKF-1330	**10.1** 2270	**31.3** 7040	3.00	15000	**30** 1.181	**11** 0.433	**13** 0.512	**32** 1.260	**27** 1.063	**17** 0.669	**0.011**
15	**15** 0.5906	**32** 1.2598	**3.7**(1) 0.146	FNTKF-1532	**10.8** 2430	**34.8** 7820	3.35	14000	**32** 1.260	**13** 0.512	**15** 0.591	**34** 1.339	**29** 1.142	**19** 0.748	**0.012**
18	**18** 0.7087	**37** 1.4567	**3.7**(1) 0.146	FNTKF-1837	**13.8** 3100	**50.3** 11300	4.80	12000	**37** 1.457	**16** 0.630	**18** 0.709	**39** 1.535	**34** 1.339	**22** 0.866	**0.017**
23	**23** 0.9055	**44** 1.7323	**3.7**(1) 0.146	FNTKF-2344	**18.0** 4050	**75.3** 16900	8.05	9700	**44** 1.732	**21** 0.827	**23** 0.906	**46** 1.811	**41** 1.614	**27** 1.063	**0.021**
28	**28** 1.1024	**49** 1.9291	**3.7**(1) 0.146	FNTKF-2849	**18.6** 4180	**82.4** 18500	8.65	8900	**49** 1.929	**26** 1.024	**28** 1.102	**51** 2.008	**46** 1.811	**32** 1.260	**0.024**
33	**33** 1.2992	**54** 2.126	**3.7**(1) 0.146	FNTKF-3354	**21.6** 4860	**104** 23400	11.1	7900	**54** 2.126	**31** 1.220	**33** 1.299	**56** 2.205	**51** 2.008	**37** 1.457	**0.029**
38	**38** 1.4961	**62** 2.4409	**4.7**(1) 0.185	FNTKF-3862	**31.4** 7060	**132** 29700	14.6	7100	**62** 2.441	**36** 1.417	**38** 1.496	**64** 2.520	**57** 2.244	**43** 1.693	**0.047**
43	**43** 1.6929	**67** 2.6378	**4.7**(1) 0.185	FNTKF-4367	**37.8** 8500	**173** 38900	18.5	6400	**67** 2.638	**41** 1.614	**43** 1.693	**69** 2.717	**63** 2.480	**47** 1.850	**0.051**
48	**48** 1.890	**72** 2.8346	**4.7**(1) 0.185	FNTKF-4872	**37.9** 8520	**179** 40200	19.1	5900	**72** 2.835	**46** 1.811	**48** 1.890	**74** 2.913	**68** 2.677	**52** 2.047	**0.056**
53	**53** 2.0866	**80** 3.150	**4.7**(1) 0.185	FNTKF-5380	**48.5** 10900	**254** 57100	26.3	5300	**80** 3.150	**51** 2.008	**53** 2.087	**82** 3.228	**76** 2.992	**57** 2.244	**0.070**

(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=d-2mm, H_c=D+2mm

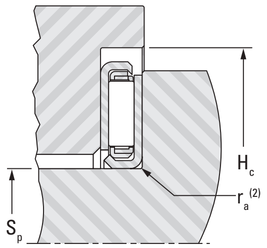
UNITIZED THRUST BEARING

METRIC SERIES
TPK JL,
TVK JL SERIES



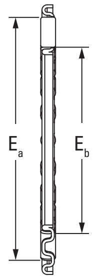


Housing Piloting

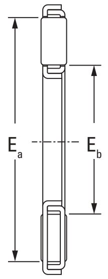


Shaft Piloting

CAGE DESIGN



TVK



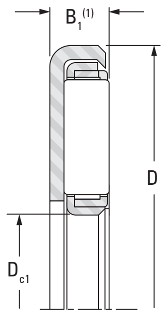
TPK

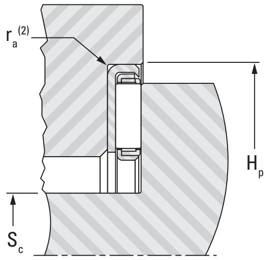
Shaft Dia.	d	D	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static			Housing Piloting		Shaft Piloting				
								Oil	H_p	S_c(3)	S_p	H_c(3)	E_a	E_b	
					C	C_o			—	Max.	—	Min.			
mm	mm in	mm in	mm in		kN lbf		kN	min-1	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
16.987	**16.987**	**33**	**3.4**	TVK1733JL	**8.95**	**27.7**	2.80	14000	**33**	**15**	**17**	**35**	**30**	**21**	**0.011**
22.6	**22.6**	**40**	**3.6**	TVK2340JL-3	**11.8**	**43.1**	4.35	11000	**40**	**20.6**	**22.6**	**42**	**36**	**28**	**0.016**
30.7	**30.7**	**47.15**	**4.184**	TPK3147JL-2	**14.4**	**59.6**	6.00	9000	**47.1**	**28.7**	**30.7**	**49.1**	**43**	**34**	**0.024**
34	**34**	**51.4**	**3.6**	TPK3451JL	**14.5**	**61.6**	6.20	9000	**51.4**	**32**	**34**	**53.4**	**47**	**38**	**0.023**
38	**38**	**53**	**3.6**	TPK3853JL	**13.5**	**57.9**	5.55	8000	**53**	**36**	**38**	**55**	**49**	**42**	**0.022**
	38	**58**	**4.8**	TPK3858JL	**24.7**	**95.8**	9.35	8000	**58**	**36**	**38**	**60**	**54**	**43**	**0.041**
54	**54**	**77**	**6**	TVK5477JL	**31.4**	**144**	15.7	6000	**77**	**52**	**54**	**79**	**72**	**60**	**0.076**
55.9	**55.9**	**76**	**3.584**	TVK5676JL	**18.5**	**96.6**	9.00	6000	**76**	**53.9**	**55.9**	**78**	**70**	**60**	**0.040**
60.4	**60.4**	**77.9**	**3.8**	TVK6078JL	**15.8**	**80.1**	8.05	5000	**78**	**58.4**	**60.4**	**80**	**74**	**65**	**0.037**
	60.4	**78.0**	**3.6**	TPK6078JL	**20.6**	**114**	11.5	5000	**77.9**	**58.4**	**60.4**	**79.9**	**74**	**65**	**0.038**
63.8	**63.8**	**83.6**	**4.6**	TPK6484JL	**29.9**	**141**	13.3	5000	**83.6**	**61.8**	**63.8**	**85.6**	**79**	**69**	**0.054**
67.6	**67.6**	**92**	**5.4**	TVK6892JL-1	**34.7**	**175**	19.0	5000	**92**	**65.6**	**67.6**	**94**	**86**	**74**	**0.086**
73.6	**73.6**	**89.6**	**3.6**	TPK7490JL	**11.7**	**56.7**	5.45	5000	**89.6**	**71.6**	**73.6**	**91.6**	**85**	**78**	**0.041**
110	**110**	**132.2**	**4.3**	TPK110132JL-1	**22.9**	**131**	11.6	3000	**132.2**	**108**	**110**	**134.2**	**126**	**116**	**0.091**

(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=d-2mm, H_c=D+2mm

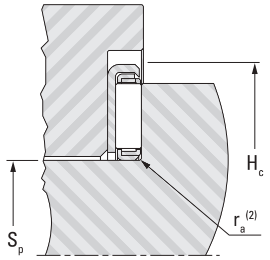
UNITIZED THRUST BEARING

METRIC SERIES
FNTK SERIES



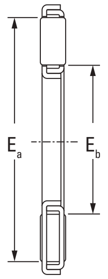


Housing Piloting



Shaft Piloting

CAGE DESIGN



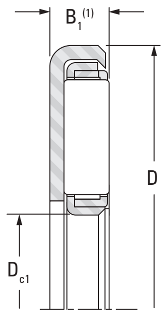
FNT

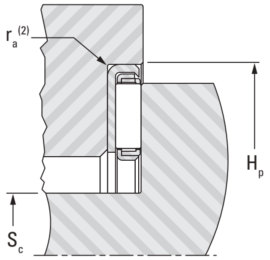
Shaft Dia.	D_{c1}	D	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static			Housing Piloting		Shaft Piloting				
								Oil	H_p	S_c(3)	S_p	H_c(3)			
	(E11)	(e13)	(-0.1)		C	C_o			—	Max.	—	Min.	E_a	E_b	
mm	mm in	mm in	mm in		kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
12	12 0.4724	28 1.1024	2.85(1) 0.1122	FNTK-1228	9.88 2220	29.0 6520	2.75	16000	28 1.102	10.5 0.413	12 0.4724	29.5 1.161	25 0.9843	14 0.5512	0.007
15	15 0.5906	30 1.1811	2.85(1) 0.1122	FNTK-1530	10.1 2270	31.3 7040	3.00	15000	30 1.181	13.5 0.531	15 0.5906	31.5 1.240	27 1.063	17 0.6693	0.008
17	17 0.6693	32 1.260	2.85(1) 0.1122	FNTK-1732	10.8 2430	34.8 7820	3.35	14000	32 1.260	15.5 0.610	17 0.6693	33.5 1.319	29 1.1417	19 0.748	0.008
20	20 0.7874	37 1.4567	2.85(1) 0.1122	FNTK-2037	13.8 3100	50.3 11300	4.80	12000	37 1.457	18.5 0.728	20 0.7874	38.5 1.516	34 1.3386	22 0.8661	0.012
25	25 0.9843	44 1.7323	2.85(1) 0.1122	FNTK-2544	18.0 4050	75.3 16900	8.05	9700	44 1.732	23.5 0.925	25 0.9843	45.5 1.791	41 1.6142	27 1.063	0.015
30	30 1.1811	49 1.9291	2.85(1) 0.1122	FNTK-3049	18.6 4180	82.4 18500	8.65	8900	49 1.929	28.5 1.122	30 1.1811	50.5 1.988	46 1.811	32 1.260	0.018
35	35 1.378	54 2.126	2.85(1) 0.1122	FNTK-3554	21.6 4860	104 23400	11.1	7900	54 2.126	33.5 1.319	35 1.378	55.5 2.185	51 2.0079	37 1.4567	0.021
40	40 1.5748	62 2.4409	3.85(1) 0.1516	FNTK-4062	31.4 7060	132 29700	14.6	7100	62 2.441	38.5 1.516	40 1.5748	63.5 2.500	57 2.2441	43 1.6929	0.035
45	45 1.7717	67 2.6378	3.85(1) 0.1516	FNTK-4567	37.8 8500	173 38900	18.5	6400	67 2.638	43.5 1.713	45 1.7717	68.5 2.697	63 2.480	47 1.850	0.039
50	50 1.9685	72 2.8346	3.85(1) 0.1516	FNTK-5072	37.9 8520	179 40200	19.1	5900	72 2.835	48.5 1.909	50 1.9685	73.5 2.894	68 2.6772	52 2.0472	0.042
55	55 2.1654	80 3.150	3.85(1) 0.1516	FNTK-5580	48.5 10900	254 57100	26.3	5300	80 3.150	53.5 2.106	55 2.1654	81.5 3.209	76 2.9921	57 2.2441	0.053

(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=D_{c1}-1.5mm, H_c=D+1.5mm

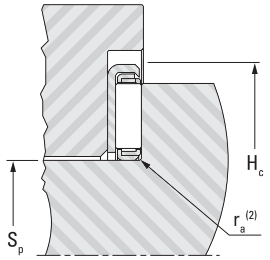
UNITIZED THRUST BEARING

METRIC SERIES
TPK J,
TVK J SERIES



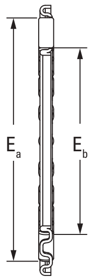


Housing Piloting

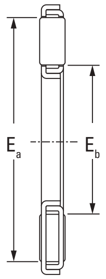


Shaft Piloting

CAGE DESIGN



TVK



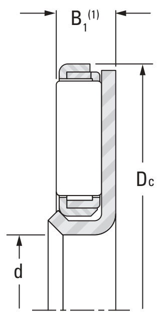
TPK

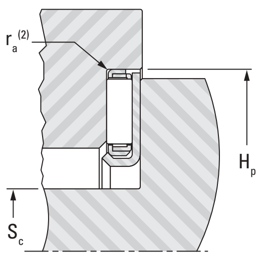
Shaft Dia.	D_{c1}	D	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static			Housing Piloting		Shaft Piloting				
								Oil	H_p	S_c(3)	S_p	H_c(3)			
					C	C_o			—	Max.	—	Min.	E_a	E_b	
mm	mm in	mm in	mm in		kN lbf		kN	min^{-1}	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
25	25	39.5	3.3	TVK2540J	16	54.1	5.10	11000	39.5	23.5			36	26	0.012
25.8	25.8	42	2.784	TVK2642J	14.6	57	5.65	11000	42	24.3			37	27	0.013
33.7	33.7	48.2	2.784	TVK3448J-1	15.6	66.2	6.15	9000	48.2	32.2			45	35	0.014
35	35	53	2.8	TVK3553J-1	13.8	57.2	5.95	5000	53	33.5			49	37	0.017
38	38	52	2.8	TVK3852J-1	13.9	58.5	5.90	8000	52	36.5			48	39	0.015

(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=D_{c1}-1.5mm, H_c=D+1.5mm

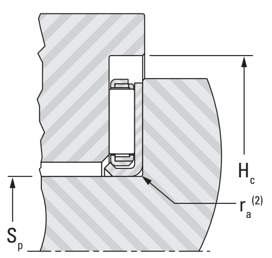
UNITIZED THRUST BEARING

METRIC SERIES
FNTF SERIES



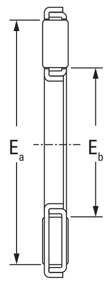


Housing Piloting



Shaft Piloting

CAGE DESIGN



FNT

Shaft Dia.	d	D_c	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static			Housing Piloting		Shaft Piloting				
								Oil	H_p	S_c(3)	S_p	H_c(3)	E_a	E_b	
	(E13)	(c12)	(-0.1)		C	C_o			—	Max.	—	Min.			
mm	mm in	mm in	mm in		kN lbf		kN	min-1	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
10	10 0.394	26 1.024	2.85(1) 0.112	FNTF-1026	9.88 2220	29.0 6520	2.75	16000	26 1.024	8.5 0.335	10 0.394	27.5 1.083	25 0.984	14 0.551	0.006
13	13 0.512	28 1.102	2.85(1) 0.112	FNTF-1328	10.1 2270	31.3 7040	3.00	15000	28 1.102	11.5 0.453	13 0.512	29.5 1.161	27 1.063	17 0.669	0.007
15	15 0.591	30 1.181	2.85(1) 0.112	FNTF-1530	10.8 2430	34.8 7820	3.35	14000	30 1.181	13.5 0.531	15 0.591	31.5 1.240	29 1.142	19 0.748	0.008
18	18 0.709	35 1.378	2.85(1) 0.112	FNTF-1835	13.8 3100	50.3 11300	4.80	12000	35 1.378	16.5 0.650	18 0.709	36.5 1.437	34 1.339	22 0.866	0.011
23	23 0.906	42 1.654	2.85(1) 0.112	FNTF-2342	18.0 4050	75.3 16900	8.05	9700	42 1.654	21.5 0.846	23 0.906	43.5 1.713	41 1.614	27 1.063	0.014
28	28 1.102	47 1.850	2.85(1) 0.112	FNTF-2847	18.6 4180	82.4 18500	8.65	8900	47 1.850	26.5 1.043	28 1.102	48.5 1.909	46 1.811	32 1.260	0.017
33	33 1.299	52 2.047	2.85(1) 0.112	FNTF-3352	21.6 4860	104 23400	11.1	7900	52 2.047	31.5 1.240	33 1.299	53.5 2.106	51 2.008	37 1.457	0.019
38	38 1.496	60 2.362	3.85(1) 0.152	FNTF-3860	31.4 7060	132 29700	14.6	7100	60 2.362	36.5 1.437	38 1.496	61.5 2.421	57 2.244	43 1.693	0.033
43	43 1.693	65 2.559	3.85(1) 0.152	FNTF-4365	37.8 8500	173 38900	18.5	6400	65 2.559	41.5 1.634	43 1.693	66.5 2.618	63 2.480	47 1.850	0.038
48	48 1.890	70 2.756	3.85(1) 0.152	FNTF-4870	37.9 8520	179 40200	19.1	5900	70 2.756	46.5 1.831	48 1.890	71.5 2.815	68 2.677	52 2.047	0.041
53	53 2.087	78 3.071	3.85(1) 0.152	FNTF-5378	48.5 10900	254 57100	26.3	5300	78 3.071	51.5 2.028	53 2.087	79.5 3.130	76 2.992	57 2.244	0.053

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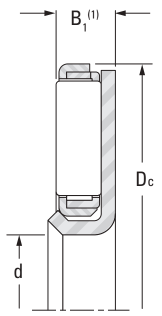
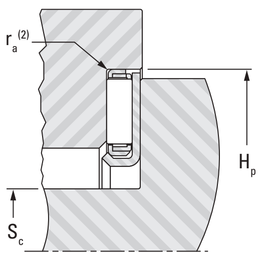
(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=d-1.5mm, H_c=D_c+1.5mm

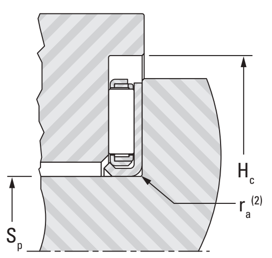
UNITIZED THRUST BEARING

METRIC SERIES
TPK L,
TVK L SERIES



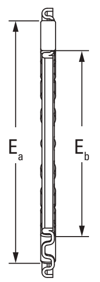


Housing Piloting

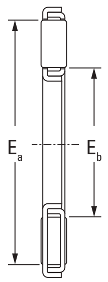


Shaft Piloting

CAGE DESIGN



TVK



TPK

Shaft Dia.	d	D_c	B_1	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating	Mounting Dimensions				Contact Dimensions Nominal		Approx. Wt.
					Dynamic	Static			Housing Piloting		Shaft Piloting				
								Oil	H_p	S_c(3)	S_p	H_c(3)	E_a	E_b	
					C	C_o			—	Max.	—	Min.			
mm	mm in	mm in	mm in		kN lbf		kN	min-1	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs
18.1	18.1	31.6	2.8	TPK1832L	8.70	27.1	2.60	14000			18.1	33.1	30	22	0.008
22	22	41	2.8	TPK2241L	15.0	59.4	5.90	10000			22	42.5	38	28	0.015
29	29	49	3.8	TVK2949L	24.7	90.8	9.80	8000			29	50.5	47	35	0.022
30.1	30.1	45.5	2.784	TPK3046L-3	13.7	55.9	5.20	9000			30.1	47	43	35	0.014
30.5	30.5	55.68	5.3	TPK3156L	40.7	135	15.4	8000			30.5	57.18	53	38	0.050
32.9	32.9	53.1	2.784	TVK3353L	20.8	101	10.5	8000			32.9	54.6	52	39	0.020
37.4	37.4	57.3	2.784	TVK3757L	21.9	110	11.5	7000			37.4	58.8	56	44	0.023
57	57	71	2.784	TVK5771L	16.8	85.6	8.60	6000			57	72.5	70	61	0.020
63	63	78	2.8	TVK6378L	15.7	80.1	8.05	5000			63	79.5	76	68	0.023

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(1) To be measured under a 2.0 kN (450 lbf) load.
(2) r_a = 0.500 mm max. (0.0197 in max.).
(3) S_c=d-1.5mm, H_c=D_c+1.5mm

CYLINDRICAL ROLLER THRUST BEARINGS AND THEIR COMPONENTS

METRIC SERIES

Cylindrical roller thrust bearings provide rolling bearing arrangements that accommodate high-dynamic axial loads. The simple geometry of the bearing components allows the use of many design arrangements. As an example, for less demanding applications, it is possible to combine metric series, thrust cylindrical roller and cage assemblies, including the metric series heavy thrust washers (LS) and even the metric series thin thrust washers (AS). These two thrust washer types are more commonly used with thrust needle roller and cage assemblies. Thrust cylindrical roller and cage assemblies also can be used without bearing thrust washers if the adjacent machine components can be prepared to serve as suitable raceways.

Cylindrical roller thrust bearings may be used where the load carrying capability of thrust needle roller and cage assemblies is insufficient. Also, the bearings can accommodate high-dynamic and static axial loads in one direction, but they are not suitable to transmit radial loads.

REFERENCE STANDARDS ARE:

- **ISO 104** – rolling bearings – thrust bearings – boundary dimensions, general plan.
- **ISO 199** – rolling bearings – thrust bearings – tolerances.
- **DIN 616** – rolling bearings – general plan for boundary dimensions.
- **DIN 722** – rolling bearing – thrust cylindrical roller bearings – single direction.

811, 812 Series
Cylindrical roller thrust bearings

K.811, K.812
Thrust cylindrical roller and cage assemblies

WS.811, WS.812
Shaft washers

GS.811, GS.812
Housing washers

Fig. B6-3. Types of metric series cylindrical roller thrust bearings and their components

Suffixes	
LPB	Machined light metal window-type cage.
TVP	Molded window-type cage of glass reinforced nylon.

CONSTRUCTION

BASIC DESIGNS

Cylindrical roller thrust bearings of dimension series 811 and 812 comprise a thrust cylindrical roller and cage assembly (K), a shaft washer (WS) and a housing washer (GS). Providing the backup surfaces can be hardened and ground, they can be used as raceways for the cylindrical rollers of the thrust cylindrical roller and cage assembly resulting in a compact bearing arrangement.

CAGE DESIGNS

Metric series 811 and 812 cylindrical roller thrust bearings use molded cages of glass-fiber reinforced-nylon (suffix TVP) or machined cages of light metal (suffix LPB). The cages are designed to be piloted on the shaft. The reinforced nylon cages can be used at temperatures up to 120° C (250° F) continuously for extended periods. When lubricating these bearings with oil, it should be ensured that the oil does not contain additives detrimental to the cage over extended life at operating temperatures higher than 100° C (212° F). Also, care should be exercised that oil change intervals are observed as old oil may reduce cage life at such temperatures.

BEARING THRUST WASHERS

SHAFT WASHERS AND HOUSING WASHERS

Shaft washers of types WS.811 and WS.812, as well as housing washers of types GS.811 and GS.812, are components of the metric series cylindrical roller thrust bearings of series 811 and 812. They are made of bearing-quality steel – with hardened, precision- ground and lapped-flat raceway surfaces. The tolerances of the thrust bearing bore and outer diameter shown in Table B6-9 and Table B6-10 (see next page) apply to shaft-piloted and housing-piloted metric series washers.

HEAVY THRUST WASHERS (LS), THIN THRUST WASHERS (AS)

These thrust washers are more frequently used with thrust needle roller and cage assemblies of metric series FNT or AXK. They also are suitable for use with the thrust cylindrical roller and cage assemblies K.811. The heavy thrust washer of series LS are made of bearing-quality steel – hardened and precision-ground on the flat raceway surfaces. The bore and outer diameters of the heavy thrust washers are not ground. Therefore, when used with K.811 type assemblies, they are only suggested where accurate centering is not required. The thin thrust washers of series AS may be used in applications where the loads are light. Both types of these washers are listed in the tabular part of the metric series thrust needle roller and cage assemblies section.

DIMENSIONAL ACCURACY

The tolerances for the metric series cylindrical roller thrust bearing bore and outer diameter shown in Table B6-8 and B6-9 apply to shaft-piloted washers of series WS.811 and WS.812, as well as housing-piloted washers of series GS.811 and GS.812. Tolerances for the bore diameter of series K.811 and K.812 thrust assemblies are given on page B-6-30.

The tolerances for the bore and outer diameter of series AS thrust washers are shown in Table B6-10 below. The tolerances for the bore and outer diameter of series LS thrust washers are given in Table B6-11 on page B-6-29. Bore inspection procedures for thin thrust washers (AS) and heavy thrust washers (LS) are given on page B-6-8.

Table B6-8. Tolerances of cylindrical roller thrust bearings - shaft piloted washer - metric series

Nominal bore diameter d		Tolerance class P0 (normal tolerance)				Tolerance class P6				Tolerance class P5			
		Deviations		Variation	Wall thickness variation	Deviations		Variation	Wall thickness variation	Deviations		Variation	Wall thickness variation
		Δdmp		Vdsp	Si(1)	Δdmp		Vdsp	Si(1)	Δdmp		Vdsp	Si(1)
>	≤	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
	18.000 0.7087	0.000 0.0000	-0.008 -0.0003	0.006 0.0002	0.010 0.0004	0.000 0.0000	-0.008 -0.0003	0.006 0.0002	0.005 0.0002	0.000 0.0000	-0.008 -0.0003	0.006 0.0002	0.003 0.0001
18.000 0.7087	30.000 1.1811	0.000 0.0000	-0.010 -0.0004	0.008 0.0003	0.010 0.0004	0.000 0.0000	-0.010 -0.0004	0.008 0.0003	0.005 0.0002	0.000 0.0000	-0.010 -0.0004	0.008 0.0003	0.003 0.0001
30.000 1.1811	50.000 1.9685	0.000 0.0000	-0.012 -0.0005	0.009 0.00035	0.010 0.0004	0.000 0.0000	-0.012 -0.0005	0.009 0.00035	0.006 0.0002	0.000 0.0000	-0.012 -0.0005	0.009 0.00035	0.003 0.0001
50.000 1.9685	80.000 3.1496	0.000 0.0000	-0.015 -0.0006	0.011 0.0004	0.010 0.0004	0.000 0.0000	-0.015 -0.0006	0.011 0.0004	0.007 0.0003	0.000 0.0000	-0.015 -0.0006	0.011 0.0004	0.004 0.0002
80.000 3.1496	120.000 4.7244	0.000 0.0000	-0.020 -0.0008	0.015 0.0006	0.015 0.0006	0.000 0.0000	-0.020 -0.0008	0.015 0.0006	0.008 0.0003	0.000 0.0000	-0.020 -0.0008	0.015 0.0006	0.004 0.0002
120.000 4.7244	180.000 7.0866	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.015 0.0006	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.009 0.00035	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.005 0.0002
180.000 7.0866	250.000 9.8425	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.020 0.0008	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.010 0.0004	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.005 0.0002
250.000 9.8425	315.000 12.4016	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.025 0.0010	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.013 0.0005	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.007 0.0003
315.000 12.4016	400.000 15.7480	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.030 0.0012	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.015 0.0006	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.007 0.0003
400.000 15.7480	500.000 19.6850	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.030 0.0012	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.018 0.0007	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.009 0.00035

*The values of the wall thickness variation Se, for the housing piloted washer are identical to Si for the shaft - piloted washers.

Table B6-9. Tolerances of cylindrical roller thrust bearings - housing piloted washer - metric series

Nominal outside diameter D		Tolerance class P0 (normal tolerance)			Tolerance class P6			Tolerance class P5		
		Deviations		Variation	Deviations		Variation	Deviations		Variation
		ΔDmp		VDsp	ΔDmp		VDsp	ΔDmp		VDsp
>	≤	Max.	Min.	Max.	Max.	Min.	Max.	Max.	Min.	Max.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
	30.000 1.1811	0.000 0.0000	-0.013 -0.0005	0.010 0.0004	0.000 0.0000	-0.013 -0.0005	0.010 0.0004	0.000 0.0000	-0.013 -0.0005	0.010 0.0004
30.000 1.1811	50.000 1.9685	0.000 0.0000	-0.016 -0.0006	0.012 0.0005	0.000 0.0000	-0.016 -0.0006	0.012 0.0005	0.000 0.0000	-0.016 -0.0006	0.012 0.0005
50.000 1.9685	80.000 3.1496	0.000 0.0000	-0.019 -0.00075	0.014 0.00055	0.000 0.0000	-0.019 -0.00075	0.014 0.00055	0.000 0.0000	-0.019 -0.00075	0.014 0.00055
80.000 3.1496	120.000 4.7244	0.000 0.0000	-0.022 -0.0009	0.017 0.0007	0.000 0.0000	-0.022 -0.0009	0.017 0.0007	0.000 0.0000	-0.022 -0.0009	0.017 0.0007
120.000 4.7244	180.000 7.0866	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.000 0.0000	-0.025 -0.0010	0.019 0.00075	0.000 0.0000	-0.025 -0.0010	0.019 0.00075
180.000 7.0866	250.000 9.8425	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.000 0.0000	-0.030 -0.0012	0.023 0.0009	0.000 0.0000	-0.030 -0.0012	0.023 0.0009
250.000 9.8425	315.000 12.4016	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.000 0.0000	-0.035 -0.0014	0.026 0.0010	0.000 0.0000	-0.035 -0.0014	0.026 0.0010
315.000 12.4016	400.000 15.7480	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.000 0.0000	-0.040 -0.0016	0.030 0.0012	0.000 0.0000	-0.040 -0.0016	0.030 0.0012
400.000 15.7480	500.000 19.6850	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.000 0.0000	-0.045 -0.0018	0.034 0.0013	0.000 0.0000	-0.045 -0.0018	0.034 0.0013

Table B6-10. Tolerances for outer diameter (d_1) and bore diameter (d) of series AS thrust washers

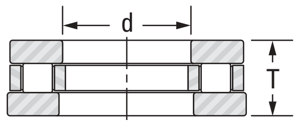
d_1		Deviations of max. O.D. (e13)		d		Deviations of min. bore diameter (E13)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
18.000 0.7087	30.000 1.1811	-0.040 -0.0016	-0.370 -0.0146	3.000 0.1181	6.000 0.2362	+0.200 +0.0079	+0.020 +0.0008
30.000 1.1811	50.000 1.9685	-0.050 -0.0020	-0.440 -0.0173	6.000 0.2362	10.000 0.3937	+0.245 +0.0096	+0.025 +0.0010
50.000 1.9685	80.000 3.1496	-0.060 -0.0024	-0.520 -0.0205	10.000 0.3937	18.000 0.7087	+0.302 +0.0119	+0.032 +0.0013
80.000 3.1496	120.000 4.7244	-0.072 -0.0028	-0.612 -0.0241	18.000 0.7087	30.000 1.1811	+0.370 +0.0146	+0.040 +0.0016
120.000 4.7244	180.000 7.0866	-0.085 -0.0034	-0.715 -0.0282	30.000 1.1811	50.000 1.9685	+0.440 +0.0173	+0.050 +0.0020
180.000 7.0866	250.000 9.8425	-0.100 -0.0039	-0.820 -0.0323	50.000 1.9685	80.000 3.1496	+0.520 +0.0205	+0.060 +0.0024
				80.000 3.1496	120.000 4.7244	+0.612 +0.0241	+0.072 +0.0028
				120.000 4.7244	180.000 7.0866	+0.715 +0.0281	+0.085 +0.0034

Table B6-11. Tolerances for outer diameter (d_1) and bore diameter (d) of series LS heavy thrust washers

d1		Deviations of max. O.D. (a12)		d		Deviations of min. bore diameter (E12)	
>	≤	Max.	Min.	>	≤	Max.	Min.
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
18.000 0.7087	30.000 1.1811	-0.300 -0.0118	-0.510 -0.0201	3.000 0.1181	6.000 0.2362	+0.140 +0.0055	+0.020 +0.0008
30.000 1.1811	40.000 1.5748	-0.310 -0.0122	-0.560 -0.0221	6.000 0.2362	10.000 0.3937	+0.175 +0.0069	+0.025 +0.0010
40.000 1.5748	50.000 1.9685	-0.320 -0.0126	-0.570 -0.0224	10.000 0.3937	18.000 0.7087	+0.212 +0.0084	+0.032 +0.0013
50.000 1.9685	65.000 2.5591	-0.340 -0.0134	-0.640 -0.0252	18.000 0.7087	30.000 1.1811	+0.250 +0.0098	+0.040 +0.0016
65.000 2.5591	80.000 3.1496	-0.360 -0.0142	-0.660 -0.0260	30.000 1.1811	50.000 1.9685	+0.300 +0.0118	+0.050 +0.0020
80.000 3.1496	100.000 3.9370	-0.380 -0.0150	-0.730 -0.0290	50.000 1.9685	80.000 3.1496	+0.360 +0.0142	+0.060 +0.0024
100.000 3.9370	120.000 4.7244	-0.410 -0.0161	-0.760 -0.0299	80.000 3.1496	120.000 4.7244	+0.422 +0.0166	+0.072 +0.0028
120.000 4.7244	140.000 5.5118	-0.460 -0.0181	-0.860 -0.0339	120.000 4.7244	180.000 7.0866	+0.485 +0.0191	+0.085 +0.0034
140.000 5.5118	160.000 6.2992	-0.520 -0.0205	-0.920 -0.0362				
160.000 6.2992	180.000 7.0866	-0.580 -0.0228	-0.980 -0.0386				
180.000 7.0866	200.000 7.8740	-0.660 -0.0260	-1.120 -0.0441				

Thickness tolerances for series LS heavy thrust washers are given in bearing tables.

Table B6-12. Tolerances of width T of thrust cylindrical roller bearings (811 and 812 series)



Nominal bore diameter of shaft piloted washer **d**		Deviations of width **T**	
>	≤	Max.	Min.
mm	mm	mm	mm
-	30	+0.02	-0.25
30	50	+0.02	-0.25
50	80	+0.02	-0.30
80	120	+0.02	-0.30

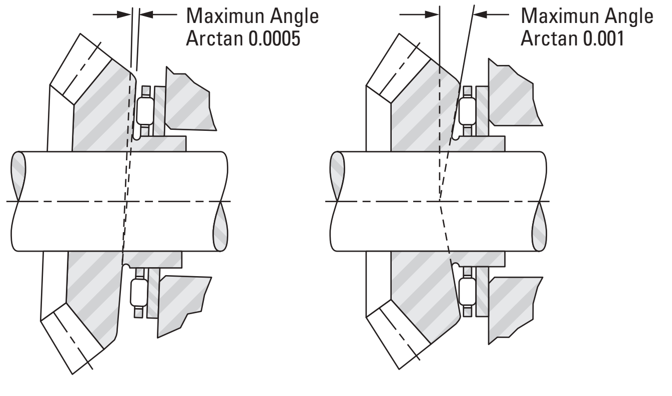
MOUNTING TOLERANCES

Shaft and housing tolerances for mounting metric series thrust cylindrical roller and cage assemblies are given in Table B6-13, shown below. If the cylindrical rollers of the thrust cylindrical roller and cage assemblies are to run directly on the adjacent support surfaces, they must be hardened to at least 58 HRC.

Table B6-13. Mounting tolerances for shafts and housings for metric series components

Bearing components	Shaft tolerance (shaft piloting)	Housing tolerance (housing piloting)	Piloting member
Thrust cylindrical roller and cage assembly. Types: K.811 and K.812	h8	H10	Shaft
Thin thrust washer. Type: AS	h10	H11	Shaft
Heavy thrust washer. Type: LS	h10	H11	Shaft
Shaft-piloted thrust washer. Type: WS.811, WS.812	h6 (j6)	Clearance	Shaft
Housing-piloted thrust washer. Type: GS.811, GS.812	Clearance	H7 (K7)	Housing

The backup surfaces for the shaft washers WS.811 and WS.812 as well as the housing washers GS.811 and GS.812 of cylindrical roller thrust bearings must be square with the axis of the shaft. Equally important, the raceway or the surface backing the thrust washer must not be dished or coned. The permissible limits of the squareness and dishing or coning are shown in figures below. When using the thin (AS) thrust washers the cylindrical rollers of the thrust cage assembly must be supported over their entire length.



Out-of-square surface Dished or coned surface

Fig. B6-4. Permissible limits

Bearing thrust washers should make close contact with the shaft or housing shoulder and must not touch the fillet radius. Therefore, the maximum fillet radius $r_{a\,max.}$ must be no greater than the minimum chamfer $r_{s\,min.}$ of the shaft washer (WS) and the housing washer (GS). See tabular pages B-6-31 and B-6-33.

Since roller thrust bearings generally run under considerable loads their incorporated washer (and thrust washer) should be supported on a shoulder covering the whole area of circulation of the rollers.

LOAD RATINGS

MINIMUM AXIAL LOAD

To prevent slippage, a cylindrical roller thrust bearing must always be axially loaded. For satisfactory operation, a certain minimum load must be applied between the cylindrical rollers and their raceways. This can be calculated from:

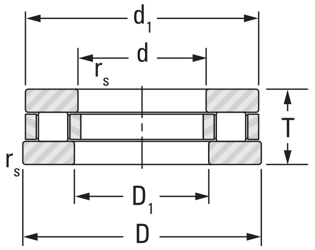
$$F_{a\,min.} = C_{0a}/2200\ [kN]$$

Where:

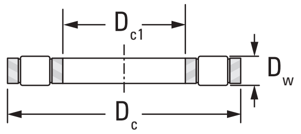
C_{0a} = static load rating [kN]
$F_{a\,min.}$ = minimum axial load [kN]

THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

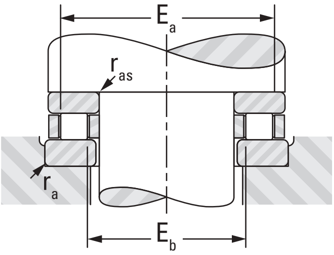
METRIC SERIES



811, 812

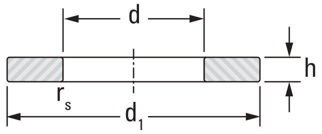


K.811, K.812

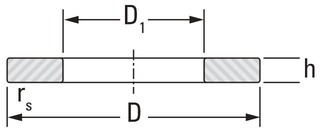


Shaft Dia.	Assembly Dimensions							Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil
	D_{c1} 1)	D_c	D_w	T	$E_{b\,max.}$	$E_{a\,min.}$	$r_{as\,max.}$ $r_{a\,max.}$		Dynamic	Static		
		(a13)							C	C_o		
mm	mm in	mm in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}
15	**15** 0.5906	**28** 1.1024	**3.5** 0.1378	**9** 0.354	**18** 0.709	**25** 0.984	**0.3** 0.012	K.81102LPB	**12.1** 2720	**26.3** 5910	3.70	12000
	15 0.5906	**28** 1.1024	**3.5** 0.1378	**9** 0.354	**18** 0.709	**25** 0.984	**0.3** 0.012	K.81102TVP	**12.8** 2880	**28.6** 6430	4.05	12000
17	**17** 0.6693	**30** 1.1811	**3.5** 0.1378	**–** –	**20** 0.787	**27** 1.063	**0.3** 0.012	K.81103LPB	**12.6** 2830	**28.6** 6430	4.05	11000
	17 0.6693	**30** 1.1811	**3.5** 0.1378	**9** 0.354	**20** 0.787	**27** 1.063	**0.3** 0.012	K.81103TVP	**14.2** 3190	**33.4** 7510	4.70	11000
20	**20** 0.7874	**35** 1.3780	**4.5** 0.1772	**10** 0.394	**23** 0.906	**32** 1.260	**0.3** 0.012	K.81104TVP	**23.6** 5310	**56.8** 12800	6.85	9500
25	**25** 0.9843	**42** 1.6535	**5.0** 0.1969	**11** 0.433	**28** 1.102	**39** 1.535	**0.6** 0.024	K.81105TVP	**31.2** 7010	**81.0** 18200	11.4	8000
30	**30** 1.1811	**47** 1.8504	**5.0** 0.1969	**–** –	**33** 1.299	**44** 1.732	**0.6** 0.024	K.81106LPB	**28.5** 6410	**69.5** 15600	10.7	6700
	30 1.1811	**47** 1.8504	**5.0** 0.1969	**11** 0.433	**33** 1.299	**44** 1.732	**0.6** 0.024	K.81106TVP	**33.0** 7420	**91.1** 20500	12.8	6700
	30 1.1811	**52** 2.0472	**7.5** 0.2953	**–** –	**33** 1.299	**49** 1.929	**0.6** 0.024	K.81206LPB	**53.4** 12000	**129** 29000	13.9	6300
	30 1.1811	**52** 2.0472	**7.5** 0.2953	**16** 0.630	**33** 1.299	**49** 1.929	**0.6** 0.024	K.81206TVP	**56.9** 12800	**141** 31700	15.2	6300
35	**35** 1.3780	**52** 2.0472	**5.0** 0.1969	**–** –	**38** 1.496	**49** 1.929	**0.6** 0.024	K.81107LPB	**30.8** 6920	**86.0** 19300	12.1	6000
	35 1.3780	**52** 2.0472	**5.0** 0.1969	**12** 0.472	**38** 1.496	**49** 1.929	**0.6** 0.024	K.81107TVP	**34.8** 7820	**101** 22700	14.2	6000
	35 1.3780	**62** 2.4409	**7.5** 0.2953	**–** –	**41** 1.614	**56** 2.205	**1.0** 0.039	K.81207LPB	**58.3** 13100	**152** 34200	16.5	5300
	35 1.3780	**62** 2.4409	**7.5** 0.2953	**18** 0.709	**41** 1.614	**56** 2.205	**1.0** 0.039	K.81207TVP	**61.6** 13800	**164** 36900	17.7	5300
40	**40** 1.5748	**60** 2.3622	**6.0** 0.2362	**–** –	**44** 1.732	**56** 2.205	**0.6** 0.024	K.81108LPB	**44.2** 9940	**126** 28300	12.0	5300
	40 1.5748	**60** 2.3622	**6.0** 0.2362	**13** 0.512	**44** 1.732	**56** 2.205	**0.6** 0.024	K.81108TVP	**49.8** 11200	**148** 33300	14.1	5300
	40 1.5748	**68** 2.6772	**9.0** 0.3543	**19** 0.748	**45** 1.772	**63** 2.480	**1.0** 0.039	K.81208TVP	**86.8** 19500	**233** 52400	26.9	4800
45	**45** 1.7717	**65** 2.5591	**6.0** 0.2362	**–** –	**49** 1.929	**61** 2.402	**0.6** 0.024	K.81109LPB	**47.0** 10600	**140** 31500	13.4	4800
	45 1.7717	**65** 2.5591	**6.0** 0.2362	**14** 0.551	**49** 1.929	**61** 2.402	**0.6** 0.024	K.81109TVP	**52.3** 11800	**163** 36600	15.5	4800
	45 1.7717	**73** 2.8740	**9.0** 0.3543	**–** –	**50** 1.969	**68** 2.677	**1.0** 0.039	K.81209TVP	**94.2** 21200	**266** 59800	30.8	4500

1) D_{c1} bore tolerance is applied E11 for *LPB. B13 for *TVP. (ISO tolerance see on page A-26.)



WS.811, WS.812



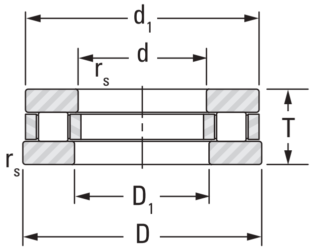
GS.811, GS.812

Approx. Wt.	Washer Dimensions			h		$r_{s\,min.}$	Washer Designation		Approx. Wt.	Shaft Dia.
	d	D_1	D, d_1	Max.	Min.					
kg lbs	mm in	mm in	mm in	mm in	mm in	mm in	Shaft Piloted	Housing Piloted	kg lbs	mm
0.006 0.013	**15** 0.591	**16** 0.630	**28** 1.102	**2.75** 0.108	**2.64** 0.104	**0.3** 0.012	WS.81102	GS.81102	**0.010** 0.022	**15**
0.006 0.013	**15** 0.591	**16** 0.630	**28** 1.102	**2.75** 0.108	**2.64** 0.104	**0.3** 0.012	WS.81102	GS.81102	**0.010** 0.022	
0.008 0.018	**17** 0.669	**18** 0.709	**30** 1.181	**2.75** 0.108	**2.64** 0.104	**0.3** 0.012	WS.81103	GS.81103	**0.011** 0.024	**17**
0.008 0.018	**17** 0.669	**18** 0.709	**30** 1.181	**2.75** 0.108	**2.64** 0.104	**0.3** 0.012	WS.81103	GS.81103	**0.011** 0.024	
0.009 0.020	**20** 0.787	**21** 0.827	**35** 1.378	**2.75** 0.108	**2.62** 0.103	**0.3** 0.012	WS.81104	GS.81104	**0.014** 0.031	**20**
0.014 0.031	**25** 0.984	**26** 1.024	**42** 1.654	**3.00** 0.118	**2.87** 0.113	**0.6** 0.024	WS.81105	GS.81105	**0.021** 0.046	**25**
0.026 0.057	**30** 1.181	**32** 1.260	**47** 1.850	**3.00** 0.118	**2.87** 0.113	**0.6** 0.024	WS.81106	GS.81106	**0.023** 0.051	**30**
0.016 0.035	**30** 1.181	**32** 1.260	**47** 1.850	**3.00** 0.118	**2.87** 0.113	**0.6** 0.024	WS.81106	GS.81106	**0.023** 0.051	
0.052 0.115	**30** 1.181	**32** 1.260	**52** 2.047	**4.25** 0.167	**4.12** 0.162	**0.6** 0.024	WS.81206	GS.81206	**0.047** 0.104	
0.034 0.075	**30** 1.181	**32** 1.260	**52** 2.047	**4.25** 0.167	**4.12** 0.162	**0.6** 0.024	WS.81206	GS.81206	**0.047** 0.104	
0.025 0.055	**35** 1.378	**37** 1.457	**52** 2.047	**3.50** 0.138	**3.34** 0.131	**0.6** 0.024	WS.81107	GS.81107	**0.032** 0.071	**35**
0.020 0.044	**35** 1.378	**37** 1.457	**52** 2.047	**3.50** 0.138	**3.34** 0.131	**0.6** 0.024	WS.81107	GS.81107	**0.032** 0.071	
0.073 0.161	**35** 1.378	**37** 1.457	**62** 2.441	**5.25** 0.207	**5.09** 0.200	**1.0** 0.039	WS.81207	GS.81207	**0.085** 0.187	
0.055 0.121	**35** 1.378	**37** 1.457	**62** 2.441	**5.25** 0.207	**5.09** 0.200	**1.0** 0.039	WS.81207	GS.81207	**0.085** 0.187	
0.044 0.097	**40** 1.575	**42** 1.654	**60** 2.362	**3.50** 0.138	**3.34** 0.131	**0.6** 0.024	WS.81108	GS.81108	**0.043** 0.095	**40**
0.031 0.068	**40** 1.575	**42** 1.654	**60** 2.362	**3.50** 0.138	**3.34** 0.131	**0.6** 0.024	WS.81108	GS.81108	**0.043** 0.095	
0.076 0.168	**40** 1.575	**42** 1.654	**68** 2.677	**5.00** 0.197	**4.84** 0.191	**1.0** 0.039	WS.81208	GS.81208	**0.093** 0.205	
0.035 0.077	**45** 1.772	**47** 1.850	**65** 2.559	**4.00** 0.157	**3.84** 0.151	**0.6** 0.024	WS.81109	GS.81109	**0.054** 0.119	**45**
0.035 0.077	**45** 1.772	**47** 1.850	**65** 2.559	**4.00** 0.157	**3.84** 0.151	**0.6** 0.024	WS.81109	GS.81109	**0.054** 0.119	
0.083 0.183	**45** 1.772	**47** 1.850	**73** 2.874	**5.50** 0.217	**5.34** 0.210	**1.0** 0.039	WS.81209	GS.81209	**0.112** 0.247	

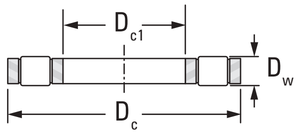
Continued on next page.

THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

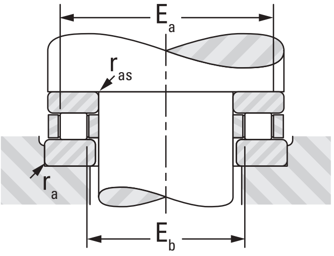
METRIC SERIES

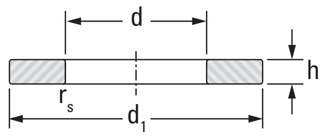


811, 812

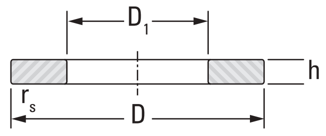


K.811, K.812





WS.811, WS.812



GS.811, GS.812

Shaft Dia.	Assembly Dimensions							Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil
	D_{c1} 1)	D_c	D_w	T	$E_{b\,max.}$	$E_{a\,min.}$	$r_{as\,max.}$ $r_{a\,max.}$		Dynamic	Static		
		(a13)							C	C_0		
mm	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}
50	**50** 1.9685	**70** 2.7559	**6.0** 0.2362	**14** 0.551	**54** 2.126	**66** 2.598	**0.6** 0.024	K.81110LPB	**49.7** 11200	**155** 34800	14.8	4300
	50 1.9685	**70** 2.7559	**6.0** 0.2362	**14** 0.551	**54** 2.126	**66** 2.598	**0.6** 0.024	K.81110TVP	**54.8** 12300	**177** 39800	17.0	4300
	50 1.9685	**78** 3.0709	**9.0** 0.3543	**22** 0.866	**55** 2.165	**73** 2.874	**1.0** 0.039	K.81210TVP	**101** 22700	**299** 67200	34.6	4000
55	**55** 2.1654	**78** 3.0709	**6.0** 0.2362	**16** 0.630	**60** 2.362	**73** 2.874	**0.6** 0.024	K.81111TVP	**60.3** 13600	**207** 46500	19.8	4000
	55 2.1654	**90** 3.5433	**11.0** 0.4331	**–** –	**61** 2.402	**84** 3.307	**1.0** 0.039	K.81211LPB	**127** 28600	**359** 80700	39.6	3600
	55 2.1654	**90** 3.5433	**11.0** 0.4331	**25** 0.984	**61** 2.402	**84** 3.307	**1.0** 0.039	K.81211TVP	**138** 31000	**403** 90600	45.2	3600
60	**60** 2.3622	**85** 3.3465	**7.5** 0.2953	**17** 0.669	**65** 2.559	**80** 3.150	**1.0** 0.039	K.81112TVP	**84.4** 19000	**281** 63200	30.4	3600
	60 2.3622	**95** 3.7402	**11.0** 0.4331	**26** 1.024	**66** 2.598	**89** 3.504	**1.0** 0.039	K.81212LPB	**129** 29000	**378** 85000	42.4	3400
65	**65** 2.5591	**90** 3.5433	**7.5** 0.2953	**18** 0.709	**70** 2.756	**85** 3.346	**1.0** 0.039	K.81113TVP	**88.3** 19900	**305** 68600	33.0	3400
	65 2.5591	**100** 3.9370	**11.0** 0.4331	**27** 1.063	**71** 2.795	**94** 3.701	**1.0** 0.039	K.81213LPB	**134** 30100	**403** 90600	45.2	3200
70	**70** 2.7559	**95** 3.7402	**7.5** 0.2953	**18** 0.709	**75** 2.953	**90** 3.543	**1.0** 0.039	K.81114TVP	**92.1** 20700	**328** 73700	35.5	3200
	70 2.7559	**105** 4.1339	**11.0** 0.4331	**27** 1.063	**76** 2.992	**99** 3.898	**1.0** 0.039	K.81214LPB	**138** 31000	**428** 96200	48.0	3000
75	**75** 2.9528	**100** 3.9370	**7.5** 0.2953	**19** 0.748	**80** 3.150	**95** 3.740	**1.0** 0.039	K.81115LPB	**86.1** 19400	**305** 68600	33.0	3000
	75 2.9528	**110** 4.3307	**11.0** 0.4331	**27** 1.063	**81** 3.189	**104** 4.094	**1.0** 0.039	K.81215LPB	**143** 32100	**453** 101800	50.9	2800
80	**80** 3.1496	**105** 4.1339	**7.5** 0.2953	**19** 0.748	**85** 3.346	**100** 3.937	**1.0** 0.039	K.81116LPB	**87.5** 19700	**316** 71000	34.2	2800
	80 3.1496	**115** 4.5276	**11.0** 0.4331	**28** 1.102	**86** 3.386	**109** 4.291	**1.0** 0.039	K.81216LPB	**147** 33000	**478** 107500	53.7	2600
85	**85** 3.3465	**110** 4.3307	**7.5** 0.2953	**19** 0.748	**90** 3.543	**105** 4.134	**1.0** 0.039	K.81117LPB	**88.9** 20000	**328** 73700	35.5	2600
	85 3.3465	**125** 4.9213	**12.0** 0.4724	**31** 1.220	**93** 3.661	**117** 4.606	**1.0** 0.039	K.81217LPB	**174** 39100	**572** 128600	65.5	2400
90	**90** 3.5433	**120** 4.7244	**9.0** 0.3543	**22** 0.866	**96** 3.780	**114** 4.488	**1.0** 0.039	K.81118LPB	**119** 26800	**432** 97100	49.3	2400
	90 3.5433	**135** 5.3150	**14.0** 0.5512	**35** 1.378	**98** 3.858	**127** 5.000	**1.0** 0.039	K.81218LPB	**215** 48300	**691** 155300	81.5	2400

1) Dc_1 bore tolerance is applied E11 for *LPB. B13 for *TVP. (ISO tolerance see on page A-26.)

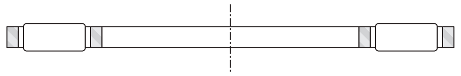
Approx. Wt.	Washer Dimensions			h		$r_{s\,min.}$	Washer Designation		Approx. Wt.	Shaft Dia.
	d	D_1	D, d_1	Max.	Min.					
kg lbs	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	Shaft Piloted	Housing Piloted	**kg** lbs	**mm**
0.052 0.115	**50** 1.969	**52** 2.047	**70** 2.756	**4.00** 0.157	**3.84** 0.151	**0.6** 0.024	WS.81110	GS.81110	**0.059** 0.130	**50**
0.042 0.093	**50** 1.969	**52** 2.047	**70** 2.756	**4.00** 0.157	**3.84** 0.151	**0.6** 0.024	WS.81110	GS.81110	**0.059** 0.130	
0.089 0.196	**50** 1.969	**52** 2.047	**78** 3.071	**6.5** 0.256	**6.34** 0.250	**1.0** 0.039	WS.81210	GS.81210	**0.144** 0.317	**55**
0.066 0.146	**55** 2.165	**57** 2.244	**78** 3.071	**5.00** 0.197	**4.81** 0.189	**0.6** 0.024	WS.81111	GS.81111	**0.094** 0.207	
0.156 0.344	**55** 2.165	**57** 2.244	**90** 3.543	**7.00** 0.276	**6.81** 0.268	**1.0** 0.039	WS.81211	GS.81211	**0.219** 0.483	
0.140 0.309	**55** 2.165	**57** 2.244	**90** 3.543	**7.00** 0.276	**6.81** 0.268	**1.0** 0.039	WS.81211	GS.81211	**0.219** 0.483	
0.103 0.227	**60** 2.362	**62** 2.441	**85** 3.346	**4.75** 0.187	**4.56** 0.180	**1.0** 0.039	WS.81112	GS.81112	**0.106** 0.234	**60**
0.166 0.366	**60** 2.362	**62** 2.441	**95** 3.740	**7.50** 0.295	**7.31** 0.288	**1.0** 0.039	WS.81212	GS.81212	**0.251** 0.553	
0.109 0.240	**65** 2.559	**67** 2.638	**90** 3.543	**5.25** 0.207	**5.06** 0.199	**1.0** 0.039	WS.81113	GS.81113	**0.125** 0.276	**65**
0.176 0.388	**65** 2.559	**67** 2.638	**100** 3.937	**8.00** 0.315	**7.81** 0.307	**1.0** 0.039	WS.81213	GS.81213	**0.285** 0.628	
0.056 0.123	**70** 2.756	**72** 2.835	**95** 3.740	**5.25** 0.207	**5.06** 0.199	**1.0** 0.039	WS.81114	GS.81114	**0.133** 0.293	**70**
0.186 0.410	**70** 2.756	**72** 2.835	**105** 4.134	**8.00** 0.315	**7.81** 0.307	**1.0** 0.039	WS.81214	GS.81214	**0.302** 0.666	
0.091 0.201	**75** 2.953	**77** 3.031	**100** 3.937	**5.75** 0.226	**5.56** 0.219	**1.0** 0.039	WS.81115	GS.81115	**0.155** 0.342	**75**
0.197 0.434	**75** 2.953	**77** 3.031	**110** 4.331	**8.00** 0.315	**7.81** 0.307	**1.0** 0.039	WS.81215	GS.81215	**0.319** 0.703	
0.103 0.227	**80** 3.150	**82** 3.228	**105** 4.134	**5.75** 0.226	**5.56** 0.219	**1.0** 0.039	WS.81116	GS.81116	**0.165** 0.364	**80**
0.208 0.459	**80** 3.150	**82** 3.228	**115** 4.528	**8.50** 0.335	**8.31** 0.327	**1.0** 0.039	WS.81216	GS.81216	**0.357** 0.787	
0.108 0.238	**85** 3.346	**87** 3.425	**110** 4.331	**5.75** 0.226	**5.53** 0.218	**1.0** 0.039	WS.81117	GS.81117	**0.173** 0.381	**85**
0.376 0.829	**85** 3.346	**88** 3.465	**125** 4.921	**9.50** 0.374	**9.28** 0.365	**1.0** 0.039	WS.81217	GS.81217	**0.492** 1.085	
0.156 0.344	**90** 3.543	**92** 3.622	**120** 4.724	**6.50** 0.256	**6.28** 0.247	**1.0** 0.039	WS.81118	GS.81118	**0.253** 0.558	**90**
0.540 1.190	**90** 3.543	**93** 3.661	**135** 5.315	**10.50** 0.413	**10.28** 0.405	**1.1** 0.043	WS.81218	GS.81218	**0.655** 1.444	

THRUST ASSEMBLIES AND THRUST BEARINGS – INCH SERIES

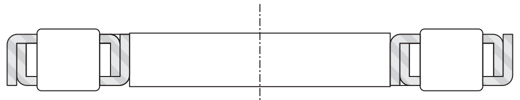
Thrust assemblies and thrust bearings of inch series are available in a variety of sizes. This catalog includes the most popular, standardized designs. If the backup surfaces cannot be used as raceways, hardened thrust washers are available.

REFERENCE STANDARDS ARE:

- **ANSI/ABMA Std. 21.2** – thrust needle roller and case assemblies and thrust washers – inch design.
- **ANSI/ABMA Std. 24.2** – thrust bearings of ball and cylindrical roller types – inch design.



NTA
Thrust needle roller and cage assembly



NTH
Thrust cylindrical roller and cage assembly

NTHA
Cylindrical roller thrust bearing

TRA…TRD
Thrust washers

Fig. B6-5. Types of inch series thrust assemblies, thrust bearings and thrust washers

IDENTIFICATION

NTA is the complete prefix code for a thrust needle roller and cage assembly with inch nominal dimensions using needle rollers of the smallest practical diameter.

Thrust cylindrical roller and cage assemblies with inch nominal dimensions are identified by the prefix letters NTH. They use large diameter cylindrical rollers, providing higher load ratings.

Thrust washers of inch nominal dimensions are identified by the prefix letters TR followed by another letter such as A, B or C etc. – indicating washer thickness. TRA is the complete prefix code for the thinnest thrust washer made to inch nominal dimensions.

Most thrust washers are intended to be piloted on their bores. Some washers, however, are designed to be piloted on their outer diameters. Such washers are identified by the letter D, following the thickness code letter. Thus TRJD is the complete prefix code for a thrust washer with inch nominal dimensions of J thickness and designed to be piloted by its outer diameter.

Cylindrical roller thrust bearings, with prefix code NTHA, are made up of one NTH assembly – one TRI or TRJ bore-piloted washer and one TRID or TRJD outer-diameter piloted washer.

Because the bearing designation for thrust assemblies does not appear on the bearing itself, the manufacturer's parts list or another reliable source should always be consulted when ordering bearings for service or field replacement – to make certain that the correct bearing with the correct lubricant is used.

CONSTRUCTION

Thrust needle roller and cage assemblies (NTA) and thrust cylindrical roller and cage assemblies (NTH) have hardened cages and through-hardened, precision-ground rollers. The cages are securely fastened assemblies of two mating pieces. This construction minimizes cage stress and assures that the roller retaining function of the cage is unaffected by normal wear. The needle rollers and the cylindrical rollers are precision ground and lapped to close tolerance for optimum load distribution.

Thrust washers for the thrust needle roller and cage assemblies are designed for bore piloting. The thinner thrust washers are tumble burnished and may be out-of-flat due to heat treatment – but will flatten under load. The raceway surfaces of thick thrust washers are ground and lapped.

Thrust washers for the thrust cylindrical roller and cage assemblies are available in both bore-piloted and outer-diameter piloted types. Their piloting surfaces are ground and raceway surfaces are ground and lapped.

DIMENSIONAL ACCURACY

TOLERANCES FOR THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

Pages B-6-38 to B-6-47, list the nominal outer diameter, bore diameter and the needle roller diameter for the inch thrust needle roller and cage assemblies and their corresponding thrust washers appear in the bearing tables.

Tolerances for the bore diameters and outer diameters of inch thrust assemblies are given in Table B6-14.

Table B6-14. Tolerances for bore (D_{c1}) and outer (D_c) diameters of nominal inch thrust needle (NTA) and cylindrical (NTH) roller and cage assemblies

NTA thrust needle roller and cage assemblies				
Needle roller diameter (nominal)	Deviations			
	Bore diameter		Outer diameter	
	D_{c1}		D_c	
D_w	Max.	Min.	Max.	Min.
mm **in**	mm **in**	mm **in**	mm **in**	mm **in**
1.984 **0.0781**	+0.178 **+0.007**	+0.051 **+0.002**	-0.254 **-0.010**	-0.508 **-0.020**
3.175 **0.1250**	+0.254 **+0.010**	+0.051 **+0.002**	-0.254 **-0.010**	-0.635 **-0.025**
NTH thrust cylindrical roller and cage assemblies				
All diameters	+0.381 **+0.015**	0.000 **0.000**	-0.127 **-0.005**	-0.508 **-0.020**

BORE INSPECTION PROCEDURE FOR ASSEMBLY

The bore diameter (D_{c1}) of the assembly should be checked with "go" and "no go" plug gages. The "go" plug gage size is the minimum bore diameter of the assembly. The "no go" plug gage size is the maximum bore diameter of the assembly.

The assembly must fall freely from the "go" plug gage under its own free weight. The "no go" plug gage must not enter the bore. Where the "no go" plug gage can be forced through the bore, the assembly must not fall from the gage under its own weight.

TOLERANCES FOR THRUST WASHERS

Tolerances for the outer diameters and bore diameters of nominal inch thrust washers are given in Tables B6-15 and B6-16.

Table B6-15. Tolerances for outer diameter (d_1) of nominal inch (TRA, TRB, etc.) thrust washers

d_1:Nominal outer diameter				Deviations			
>		≤		Max.		Min.	
mm	**in**	mm	**in**	mm	**in**	mm	**in**
6.000	**0.24**	133.400	**5.25**	-0.254	**-0.010**	-0.762	**-0.030**

Table B6-16. Tolerances for bore diameter (d) of nominal inch (TRA, TRB, etc.) thrust washers

d:Nominal bore diameter				Deviations			
>		≤		Max.		Min.	
mm	**in**	mm	**in**	mm	**in**	mm	**in**
6.000	**0.24**	57.200	**2.25**	+0.300	**+0.012**	+0.050	**+0.002**
57.200	**2.25**	133.400	**5.25**	+0.430	**+0.017**	+0.050	**+0.002**

BORE INSPECTION PROCEDURE FOR THRUST WASHER

The bore diameter (d) of the thrust washer should be checked with “go” and “no go” plug gages. The “go” plug gage size is the minimum bore diameter of the thrust washer. The “no go” plug gage size is the maximum bore diameter of the thrust washer.

The thrust washer, under its own weight, must fall freely from the “go” plug gage. The “no go” plug gage must not enter the bore. Where the “no go” plug gage can be forced through the bore, the thrust washer must not fall from the gage under its own weight.

TOLERANCES FOR CYLINDRICAL ROLLER THRUST BEARINGS

The tolerances for inch series cylindrical roller thrust bearings, cylindrical roller cage and thrust assemblies and their corresponding component thrust washers appear in the bearing tables.

MOUNTING TOLERANCES

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

On NTA inch type thrust needle roller and cage assemblies, the cage bore has a larger contact area and a closer tolerance than the outer diameter. Therefore, bore piloting is preferred for these assemblies. To reduce wear, it is suggested that the piloting surface for the cage be hardened to an equivalent of at least 55 HRC.

Where design requirements prevent bore piloting, the NTA thrust needle roller and cage assemblies may be piloted on the outer diameters. It should be noted that the “diameter to clear washer O.D.” given in the bearing tables is not suitable for outer diameter piloting. For such cases, suitable O.D. piloting dimensions should be determined in consultation with your representative.

THRUST WASHERS FOR USE WITH NTA THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES

Ideally, a thrust washer should be stationary with respect to and piloted by its supporting or backing member – whether or not this is an integral part of the shaft or housing. There should be no rubbing action between the thrust washer and any other machine member. The economics of design, however, often preclude these ideal conditions and thrust washers must be employed in another manner. In such cases, design details should be determined in consultation with your representative.

THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES

Type NTH assembly cage has a relatively large contact area on both the bore and the outer diameter. Thus, these assemblies can be piloted by either the shaft or the housing. In order to reduce wear, it is suggested that the piloting surface for the cage be hardened to an equivalent of at least 55 HRC.

When the shaft is used as the piloting surface the outer diameter of the cage must clear the housing under all conditions. Conversely, when the housing is the piloting surface, the shaft must clear the cage bore under all conditions. The mounting dimensions are given in the bearing tables for both shaft and housing piloting. Bore inspection procedure for the assembly given on page B-6-35 should be used for checking the bore of NTH assemblies.

THRUST WASHERS FOR USE WITH THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES

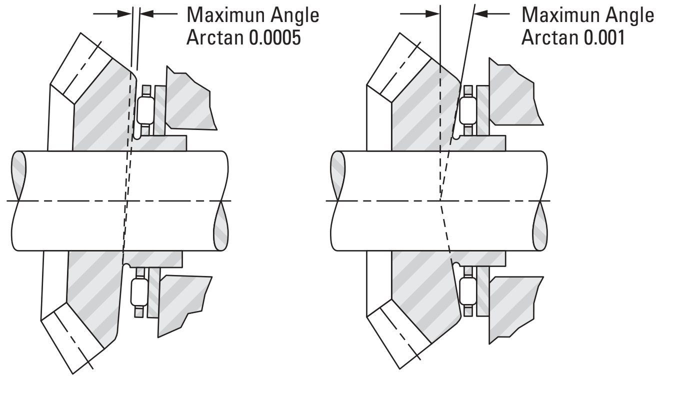
Types TRID and TRJD thrust washers for use with thrust cylindrical roller and cage assemblies are designed to pilot from the housing and to clear the shaft. Types TRI and TRJ thrust washers are designed to pilot from the shaft and clear the housing. The thrust washers should be stationary with respect to their piloting (or locating) machine members. There should be no rubbing action between the washer and any other machine member.

BACKUP SURFACES

In some applications, it is desirable to use the backup surfaces as raceways for the rollers of the thrust assemblies. When this is done, these surfaces must be hardened to an equivalent of at least 58 HRC. If this hardness cannot be achieved and thrust washers cannot be used, the load ratings must be reduced as explained in the engineering section of this catalog.

Thrust raceway surfaces must be ground to a surface of 8 µin Ra (0.20 µm Ra). When this requirement cannot be met, thrust washers must be used.

The raceways against which the rollers operate or the surfaces against which the thrust washers bear must be square with the axis of the shaft. Equally important, the raceway or surface backing the thrust washer must not be dished or coned. The permissible limits of out-of-squareness and dishing or coning are shown in the figures below.



Out-of-square surface

Dished or coned surface

Fig. B6-6. Permissible limits

TYPE NTHA CYLINDRICAL ROLLER THRUST BEARING

The NTHA cylindrical roller thrust bearing consists of the NTH thrust cylindrical roller and cage assembly and two thrust washers. This bearing is sold as a unit.

A typical mounting of the thrust bearing on a rotating shaft is shown in Fig. B6-7. The bore of the rotating shaft supported thrust washer is ground for an accurate fit on the shaft. The outer diameter of the stationary housing supported thrust washer is ground for a proper fit in the housing.

The NTHA cylindrical roller thrust bearing cage is normally shaft piloted. In the event it is necessary to pilot the cage by the housing – Fig. B6-8 illustrates a possible mounting arrangement. When other mounting arrangements are dictated by the application, they should be determined in consultation with your representative.

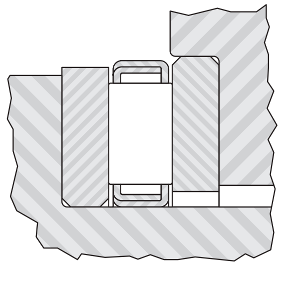


Fig. B6-7.
Typical mounting of a thrust bearing when the shaft rotates

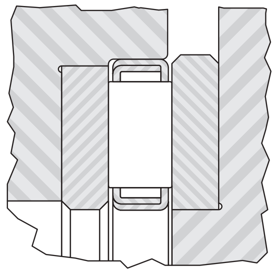


Fig. B6-8.
NTHA possible mounting arrangement

LOAD RATINGS

MINIMUM AXIAL LOAD

Slippage can occur if the applied axial load is too light and the operating speed of the thrust needle roller and cage assembly is high – particularly if accompanied by inadequate lubrication. For satisfactory operation, a certain minimum load must be applied to a thrust needle roller and cage assembly which can be calculated from:

$$F_{a\ min.} = C_{0a}/2200\ [kN]$$

Where:

C_{0a} = static load rating [kN]
$F_{a\ min.}$ = minimum axial load [kN]

LUBRICATION

Oil is the preferred lubricant for thrust needle or cylindrical roller and cage assemblies. An ample oil flow is absolutely necessary for high speeds or for moderate speeds when the load is relatively high.

SPECIAL DESIGNS

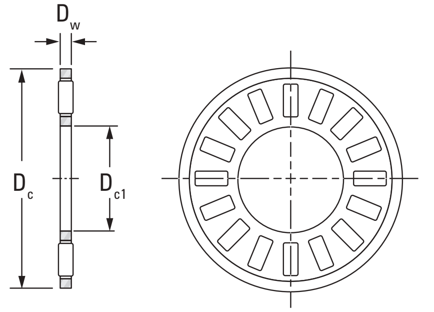
Thrust needle roller and cage assemblies and thrust washers are also made to special dimensions and configurations, as well as from special materials – when quantities permit economical manufacture.

Thrust needle roller and cage assemblies are particularly adaptable to low-cost integral combinations, with special thrust washers. When the use of such special designs are considered, the following pages should be reviewed for evaluation of proposed arrangements.

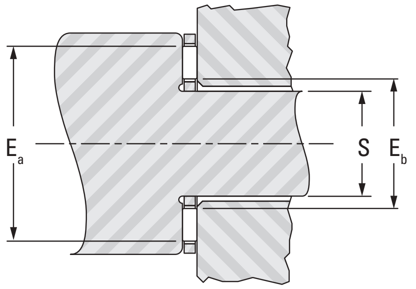
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-36 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.



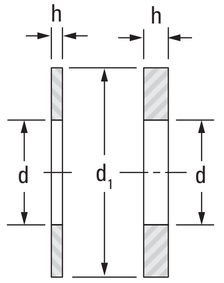
NTA

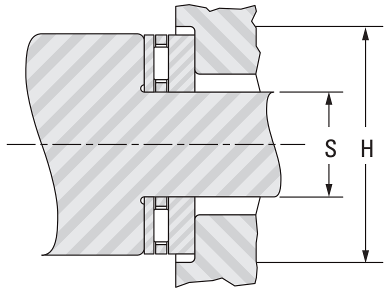


Raceway hardness to be 58 HRC or equivalent

Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating[1]
	D_{c1}	D_c	D_w	E_b	E_a		Dynamic C	Static C_o		
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}
1/4	**6.35** 0.250	**17.45** 0.687	**1.984** 0.0781	**8.636** 0.340	**14.732** 0.580	NTA-411	**5.12** 1150	**10.76** 2420	1.05	26000
5/16	**7.92** 0.312	**19.05** 0.75	**1.984** 0.0781	**10.16** 0.400	**16.256** 0.640	NTA-512	**5.83** 1310	**13.17** 2 960	1.30	24000
3/8	**9.53** 0.375	**20.625** 0.812	**1.984** 0.0781	**11.68** 0.460	**18.034** 0.710	NTA-613	**6.05** 1360	**14.32** 3220	1.40	22000
1/2	**12.70** 0.500	**23.80** 0.937	**1.984** 0.0781	**14.99** 0.590	**21.08** 0.830	NTA-815	**7.16** 1610	**19.13** 4300	1.85	19000
9/16	**14.275** 0.562	**25.40** 1.000	**1.984** 0.0781	**16.51** 0.650	**22.606** 0.890	NTA-916	**7.70** 1730	**21.53** 4840	2.10	18000
5/8	**15.88** 0.625	**28.575** 1.125	**1.984** 0.0781	**18.03** 0.710	**25.908** 1.020	NTA-1018	**9.79** 2200	**30.38** 6830	2.85	15000

[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-37 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.





Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H[2]		
kg lbs		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs	in
0.001 0.003	TRA-411	**6.35** 0.250	**17.45** 0.687	**0.81** 0.032	**0.76** 0.030	**6.35** 0.250	**6.27** 0.247	**18.26** 0.719	**0.001** 0.003	1/4
	TRB-411	**6.35** 0.250	**17.45** 0.687	**1.60** 0.063	**1.52** 0.060	**6.35** 0.250	**6.27** 0.247	**18.26** 0.719	**0.002** 0.005	
	TRC-411	**6.35** 0.250	**17.45** 0.687	**2.41** 0.095	**2.34** 0.092	**6.35** 0.250	**6.27** 0.247	**18.26** 0.719	**0.004** 0.008	
0.002 0.004	TRA-512	**7.92** 0.312	**19.05** 0.750	**0.81** 0.032	**0.76** 0.030	**7.92** 0.312	**7.85** 0.309	**19.84** 0.781	**0.001** 0.003	5/16
	TRB-512	**7.92** 0.312	**19.05** 0.750	**1.60** 0.063	**1.52** 0.060	**7.92** 0.312	**7.85** 0.309	**19.84** 0.781	**0.003** 0.006	
0.002 0.004	TRA-613	**9.53** 0.375	**20.62** 0.812	**0.81** 0.032	**0.76** 0.030	**9.53** 0.375	**9.45** 0.372	**21.44** 0.844	**0.001** 0.003	3/8
	TRB-613	**9.53** 0.375	**20.62** 0.812	**1.60** 0.063	**1.52** 0.060	**9.53** 0.375	**9.45** 0.372	**21.44** 0.844	**0.003** 0.006	
	TRC-613	**9.53** 0.375	**20.62** 0.812	**2.41** 0.095	**2.34** 0.092	**9.53** 0.375	**9.45** 0.372	**21.44** 0.844	**0.004** 0.009	
0.002 0.005	TRA-815	**12.70** 0.500	**23.80** 0.937	**0.81** 0.032	**0.76** 0.030	**12.70** 0.500	**12.62** 0.497	**24.61** 0.969	**0.002** 0.004	1/2
	TRB-815	**12.70** 0.500	**23.80** 0.937	**1.60** 0.063	**1.52** 0.060	**12.70** 0.500	**12.62** 0.497	**24.61** 0.969	**0.004** 0.008	
	TRC-815	**12.70** 0.500	**23.80** 0.937	**2.41** 0.095	**2.34** 0.092	**12.70** 0.500	**12.62** 0.497	**24.61** 0.969	**0.005** 0.012	
0.003 0.006	TRA-916	**14.27** 0.562	**25.40** 1.000	**0.81** 0.032	**0.76** 0.030	**14.27** 0.562	**14.20** 0.559	**26.19** 1.031	**0.002** 0.005	9/16
	TRB-916	**14.27** 0.562	**25.40** 1.000	**1.60** 0.063	**1.52** 0.060	**14.27** 0.562	**14.20** 0.559	**26.19** 1.031	**0.004** 0.008	
	TRC-916	**14.27** 0.562	**25.40** 1.000	**2.41** 0.095	**2.34** 0.092	**14.27** 0.562	**14.20** 0.559	**26.19** 1.031	**0.006** 0.013	
0.003 0.007	TRA-1018	**15.88** 0.625	**28.58** 1.125	**0.81** 0.032	**0.76** 0.030	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.003** 0.006	5/8
	TRB-1018	**15.88** 0.625	**28.58** 1.125	**1.60** 0.063	**1.52** 0.060	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.005** 0.012	
	TRC-1018	**15.88** 0.625	**28.58** 1.125	**2.41** 0.095	**2.34** 0.092	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.008** 0.018	
	TRD-1018	**15.88** 0.625	**28.58** 1.125	**3.20** 0.126	**3.12** 0.123	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.011** 0.024	
	TRE-1018	**15.88** 0.625	**28.58** 1.125	**3.99** 0.157	**3.91** 0.154	**15.88** 0.625	**15.80** 0.622	**29.36** 1.156	**0.013** 0.029	

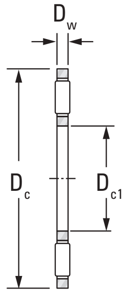
Continued on next page.

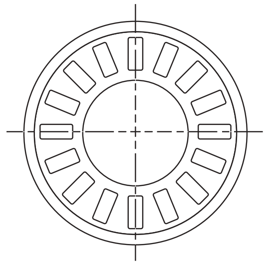
[2] If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

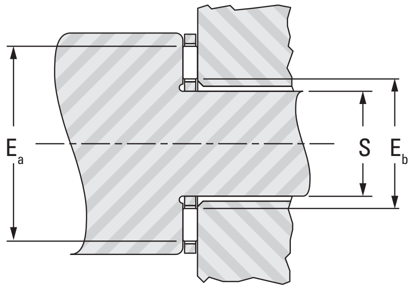
INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-36 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.



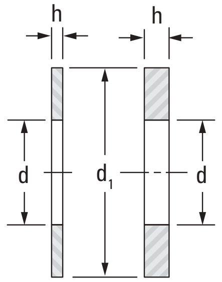


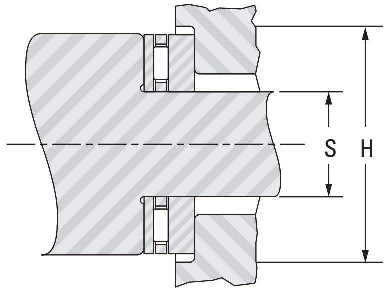
NTA



Raceway hardness to be 58 HRC or equivalent

Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating(1)
							Dynamic	Static		
	D_{c1}	D_c	D_w	E_b	E_a		C	C_o		
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min-1
3/4	**19.05** 0.750	**31.75** 1.250	**1.984** 0.0781	**21.34** 0.840	**28.956** 1.140	NTA-1220	**10.90** 2450	**36.48** 8200	3.40	14000
7/8	**22.23** 0.875	**36.50** 1.437	**1.984** 0.0781	**24.38** 0.960	**33.782** 1.330	NTA-1423	**13.43** 3020	**49.82** 11200	4.65	12000
7/8	**22.23** 0.875	**42.85** 1.687	**1.984** 0.0781	**25.91** 1.020	**39.878** 1.570	NTC-1427	**18.46** 4150	**78.29** 17600	8.05	9800
1	**25.40** 1.000	**39.675** 1.562	**1.984** 0.0781	**27.69** 1.090	**36.83** 1.450	NTA-1625	**13.83** 3110	**53.82** 12100	5.00	11000
1 1/8	**28.58** 1.125	**44.45** 1.75	**1.984** 0.0781	**30.73** 1.210	**41.656** 1.640	NTA-1828	**16.68** 3750	**71.17** 16000	7.30	9600





Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H (2)		
kg lbs		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs	in
0.004 0.009	TRA-1220	**19.05** 0.750	**31.75** 1.250	**0.81** 0.032	**0.76** 0.030	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.003** 0.007	3/4
	TRB-1220	**19.05** 0.750	**31.75** 1.250	**1.60** 0.063	**1.52** 0.060	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.006** 0.013	
	TRC-1220	**19.05** 0.750	**31.75** 1.250	**2.41** 0.095	**2.34** 0.092	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.010** 0.021	
	TRD-1220	**19.05** 0.750	**31.75** 1.250	**3.20** 0.126	**3.12** 0.123	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.012** 0.026	
	TRE-1220	**19.05** 0.750	**31.75** 1.250	**3.99** 0.157	**3.91** 0.154	**19.05** 0.750	**18.97** 0.747	**32.54** 1.281	**0.015** 0.033	
0.005 0.011	TRA-1423	**22.23** 0.875	**36.50** 1.437	**0.81** 0.032	**0.76** 0.030	**22.23** 0.875	**22.15** 0.872	**37.31** 1.469	**0.004** 0.009	7/8
	TRB-1423	**22.23** 0.875	**36.50** 1.437	**1.60** 0.063	**1.52** 0.060	**22.23** 0.875	**22.15** 0.872	**37.31** 1.469	**0.008** 0.017	
	TRC-1423	**22.23** 0.875	**36.50** 1.437	**2.41** 0.095	**2.34** 0.092	**22.23** 0.875	**22.15** 0.872	**37.31** 1.469	**0.012** 0.026	
	TRD-1423	**22.23** 0.875	**36.50** 1.437	**3.20** 0.126	**3.12** 0.123	**22.23** 0.875	**22.15** 0.872	**37.31** 1.469	**0.015** 0.034	
0.008 0.017	TRB-1427	**22.23** 0.875	**42.86** 1.688	**1.60** 0.063	**1.52** 0.060	**22.23** 0.875	**22.15** 0.872	**43.66** 1.719	**0.013** 0.029	
	TRC-1427	**22.23** 0.875	**42.86** 1.688	**2.41** 0.095	**2.34** 0.092	**22.23** 0.875	**22.15** 0.872	**43.66** 1.719	**0.020** 0.044	
	TRD-1427	**22.23** 0.875	**42.86** 1.688	**3.20** 0.126	**3.12** 0.123	**22.23** 0.875	**22.15** 0.872	**43.66** 1.719	**0.026** 0.057	
0.006 0.013	TRA-1625	**25.40** 1.000	**39.67** 1.562	**0.81** 0.032	**0.76** 0.030	**25.40** 1.000	**25.32** 0.997	**40.49** 1.594	**0.005** 0.010	1
	TRB-1625	**25.40** 1.000	**39.67** 1.562	**1.60** 0.063	**1.52** 0.060	**25.40** 1.000	**25.32** 0.997	**40.49** 1.594	**0.009** 0.019	
	TRD-1625	**25.40** 1.000	**39.67** 1.562	**3.20** 0.126	**3.12** 0.123	**25.40** 1.000	**25.32** 0.997	**40.49** 1.594	**0.017** 0.038	
	TRE-1625	**25.40** 1.000	**39.67** 1.562	**3.99** 0.157	**3.91** 0.154	**25.40** 1.000	**25.32** 0.997	**40.49** 1.594	**0.021** 0.047	
0.009 0.019	TRA-1828	**28.58** 1.125	**44.45** 1.750	**0.81** 0.032	**0.76** 0.030	**28.58** 1.125	**28.50** 1.122	**45.24** 1.781	**0.006** 0.013	1 1/8
	TRB-1828	**28.58** 1.125	**44.45** 1.750	**1.60** 0.063	**1.52** 0.060	**28.58** 1.125	**28.50** 1.122	**45.24** 1.781	**0.011** 0.024	
	TRC-1828	**28.58** 1.125	**44.45** 1.750	**2.41** 0.095	**2.34** 0.092	**28.58** 1.125	**28.50** 1.122	**45.24** 1.781	**0.017** 0.037	

Continued on next page.

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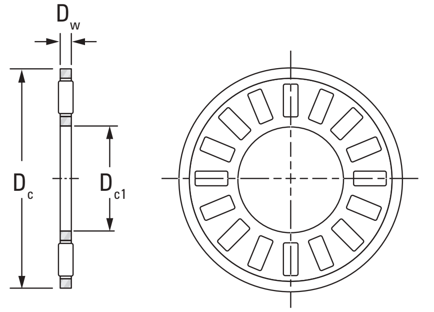
(1) Speed ratings listed are based on adequate oil lubrication. See page B-6-37 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.

(2) If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-36 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.



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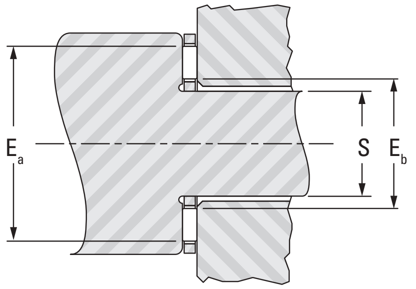
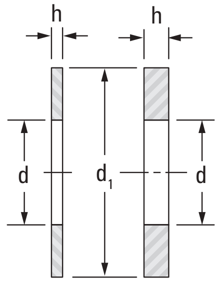
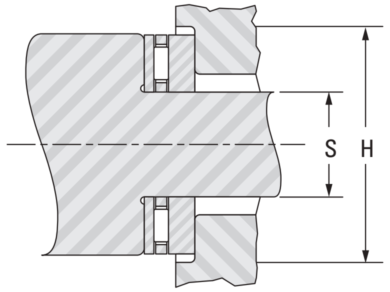


Raceway hardness to be 58 HRC or equivalent

Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating[1]
							Dynamic	Static		
	D_{c1}	D_c	D_w	E_b	E_a		C	C_o		
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min^{-1}
1 1/4	**31.75** 1.250	**49.20** 1.937	**1.984** 0.0781	**34.04** 1.340	**46.228** 1.820	NTA-2031	**20.15** 4530	**93.41** 21000	9.55	8600
1 3/8	**34.93** 1.375	**52.375** 2.062	**1.984** 0.0781	**37.08** 1.460	**49.53** 1.950	NTA-2233	**21.35** 4800	**103.20** 23200	10.5	8000
1 1/2	**38.10** 1.500	**55.55** 2.187	**1.984** 0.0781	**40.39** 1.590	**52.578** 2.070	NTA-2435	**23.22** 5220	**117.88** 26500	12.0	7600
1 3/4	**44.45** 1.750	**63.50** 2.500	**1.984** 0.0781	**46.74** 1.840	**58.928** 2.320	NTA-2840	**25.31** 5690	**137.45** 30900	14.0	6800

[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-37 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.





Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H [2]		
kg lbs		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs	in
	TRD-1828	**28.58** 1.125	**44.45** 1.750	**3.20** 0.126	**3.12** 0.123	**28.58** 1.125	**28.50** 1.122	**45.24** 1.781	**0.022** 0.048	
0.010 0.021	TRA-2031	**31.75** 1.250	**49.20** 1.937	**0.81** 0.032	**0.76** 0.030	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.007** 0.015	1 1/4
	TRB-2031	**31.75** 1.250	**49.20** 1.937	**1.60** 0.063	**1.52** 0.060	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.014** 0.030	
	TRC-2031	**31.75** 1.250	**49.20** 1.937	**2.41** 0.095	**2.34** 0.092	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.020** 0.044	
	TRD-2031	**31.75** 1.250	**49.20** 1.937	**3.20** 0.126	**3.12** 0.123	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.026** 0.058	
	TRF-2031	**31.75** 1.250	**49.20** 1.937	**4.78** 0.188	**4.70** 0.185	**31.75** 1.250	**31.67** 1.247	**50.01** 1.969	**0.041** 0.090	
0.010 0.023	TRA-2233	**34.93** 1.375	**52.37** 2.062	**0.81** 0.032	**0.76** 0.030	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.007** 0.016	1 3/8
	TRB-2233	**34.93** 1.375	**52.37** 2.062	**1.60** 0.063	**1.52** 0.060	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.015** 0.033	
	TRC-2233	**34.93** 1.375	**52.37** 2.062	**2.41** 0.095	**2.34** 0.092	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.018** 0.040	
	TRD-2233	**34.93** 1.375	**52.37** 2.062	**3.20** 0.126	**3.12** 0.123	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.029** 0.065	
	TRE-2233	**34.93** 1.375	**52.37** 2.062	**3.99** 0.157	**3.91** 0.154	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.037** 0.081	
	TRF-2233	**34.93** 1.375	**52.37** 2.062	**4.78** 0.188	**4.70** 0.185	**34.93** 1.375	**34.85** 1.372	**53.19** 2.094	**0.044** 0.097	
0.011 0.025	TRA-2435	**38.10** 1.500	**55.55** 2.187	**0.81** 0.032	**0.76** 0.030	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.008** 0.017	1 1/2
	TRB-2435	**38.10** 1.500	**55.55** 2.187	**1.60** 0.063	**1.52** 0.060	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.015** 0.034	
	TRC-2435	**38.10** 1.500	**55.55** 2.187	**2.41** 0.095	**2.34** 0.092	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.023** 0.050	
	TRD-2435	**38.10** 1.500	**55.55** 2.187	**3.20** 0.126	**3.12** 0.123	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.030** 0.067	
	TRF-2435	**38.10** 1.500	**55.55** 2.187	**4.78** 0.188	**4.70** 0.185	**38.10** 1.500	**38.02** 1.497	**56.36** 2.219	**0.045** 0.100	
0.014 0.031	TRA-2840	**44.45** 1.750	**63.50** 2.500	**0.81** 0.032	**0.76** 0.030	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.010** 0.021	1 3/4
	TRB-2840	**44.45** 1.750	**63.50** 2.500	**1.60** 0.063	**1.52** 0.060	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.020** 0.044	

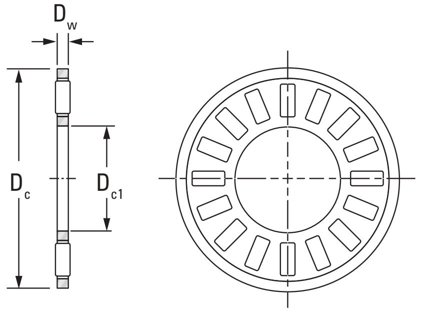
Continued on next page.

[2] If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-36 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.



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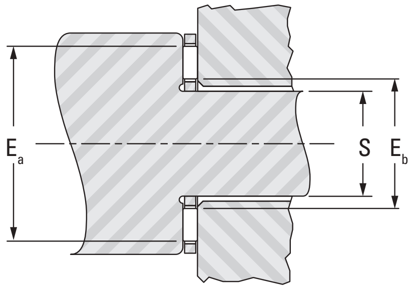
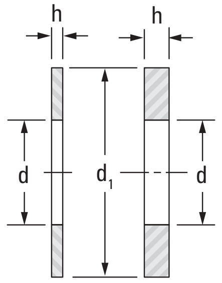
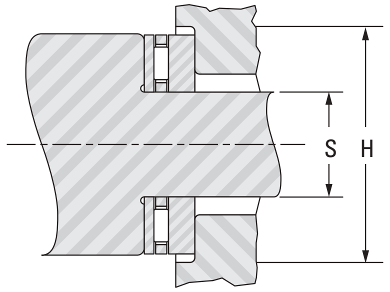


Raceway hardness to be 58 HRC or equivalent





Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating(1)	Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
							Dynamic	Static					d	d_1	h		S				
	D_{c1}	D_c	D_w	E_b	E_a		C	C_o							Max.	Min.	Max.	Min.	H (2)		
in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		**kN** lbf		kN	min⁻¹	**kg** lbs		**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**kg** lbs	in
												TRC-2840	**44.45** 1.750	**63.50** 2.500	**2.41** 0.095	**2.34** 0.092	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.029** 0.063	
												TRD-2840	**44.45** 1.750	**63.50** 2.500	**3.20** 0.126	**3.12** 0.123	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.038** 0.084	
												TRF-2840	**44.45** 1.750	**63.50** 2.500	**4.78** 0.188	**4.70** 0.185	**44.45** 1.750	**44.37** 1.747	**64.29** 2.531	**0.057** 0.126	
2	**50.80** 2.000	**69.85** 2.750	**1.984** 0.0781	**53.09** 2.090	**65.278** 2.570	NTA-3244	**24.02** 5400	**132.56** 29800	13.5	6100	**0.015** 0.033	TRA-3244	**50.80** 2.000	**69.85** 2.750	**0.81** 0.032	**0.76** 0.030	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.011** 0.024	2
												TRB-3244	**50.80** 2.000	**69.85** 2.750	**1.60** 0.063	**1.52** 0.060	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.022** 0.048	
												TRC-3244	**50.80** 2.000	**69.85** 2.750	**2.41** 0.095	**2.34** 0.092	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.033** 0.072	
												TRD-3244	**50.80** 2.000	**69.85** 2.750	**3.20** 0.126	**3.12** 0.123	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.044** 0.096	
												TRF-3244	**50.80** 2.000	**69.85** 2.750	**4.78** 0.188	**4.70** 0.185	**50.80** 2.000	**50.72** 1.997	**70.64** 2.781	**0.066** 0.145	
2 1/8	**53.98** 2.125	**73.025** 2.875	**1.984** 0.0781	**56.39** 2.220	**68.58** 2.700	NTA-3446	**24.42** 5490	**137.45** 30900	14.0	5800	**0.016** 0.036	TRA-3446	**53.98** 2.125	**73.03** 2.875	**0.81** 0.032	**0.76** 0.030	**53.98** 2.125	**53.90** 2.122	**73.81** 2.906	**0.012** 0.026	2 1/8
												TRB-3446	**53.98** 2.125	**73.03** 2.875	**1.60** 0.063	**1.52** 0.060	**53.98** 2.125	**53.90** 2.122	**73.81** 2.906	**0.024** 0.052	
												TRC-3446	**53.98** 2.125	**73.03** 2.875	**2.41** 0.095	**2.34** 0.092	**53.98** 2.125	**53.90** 2.122	**73.81** 2.906	**0.035** 0.078	
												TRD-3446	**53.98** 2.125	**73.03** 2.875	**3.20** 0.126	**3.12** 0.123	**53.98** 2.125	**53.90** 2.122	**73.81** 2.906	**0.047** 0.103	
2 1/4	**57.15** 2.250	**76.20** 3.000	**1.984** 0.0781	**59.44** 2.340	**71.628** 2.820	NTA-3648	**24.78** 5570	**142.34** 32000	14.6	5600	**0.017** 0.038	TRA-3648	**57.15** 2.250	**76.20** 3.000	**0.81** 0.032	**0.76** 0.030	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.012** 0.026	2 1/4
												TRB-3648	**57.15** 2.250	**76.20** 3.000	**1.60** 0.063	**1.52** 0.060	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.022** 0.048	
												TRC-3648	**57.15** 2.250	**76.20** 3.000	**2.41** 0.095	**2.34** 0.092	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.037** 0.081	
												TRD-3648	**57.15** 2.250	**76.20** 3.000	**3.20** 0.126	**3.12** 0.123	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.048** 0.105	
												TRF-3648	**57.15** 2.250	**76.20** 3.000	**4.78** 0.188	**4.70** 0.185	**57.15** 2.250	**57.07** 2.247	**76.99** 3.031	**0.071** 0.157	
2 1/4	**57.15** 2.250	**79.375** 3.125	**3.175** 0.1250	**59.94** 2.360	**75.184** 2.960	NTA-3650	**37.68** 8470	**177.04** 39800	18.6	5300	**0.029** 0.064	TRC-3650	**57.15** 2.250	**79.38** 3.125	**2.41** 0.095	**2.34** 0.092	**57.15** 2.250	**57.07** 2.247	**80.16** 3.156	**0.043** 0.095	2 1/4
2 1/2	**63.50** 2.500	**82.55** 3.250	**1.984** 0.0781	**65.79** 2.590	**77.978** 3.070	NTA-4052	**25.53** 5740	**152.13** 34200	15.6	5100	**0.019** 0.041	TRA-4052	**63.50** 2.500	**82.55** 3.250	**0.81** 0.032	**0.76** 0.030	**63.50** 2.500	**63.42** 2.497	**83.34** 3.281	**0.013** 0.029	2 1/2
												TRB-4052	**63.50** 2.500	**82.55** 3.250	**1.60** 0.063	**1.52** 0.060	**63.50** 2.500	**63.42** 2.497	**83.34** 3.281	**0.027** 0.059	

Continued on next page.

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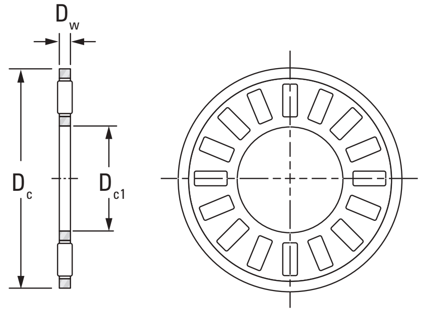
(1)Speed ratings listed are based on adequate oil lubrication. See page B-6-37 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.

(2)If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

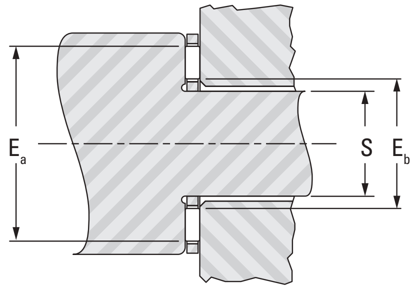
THRUST NEEDLE ROLLER AND CAGE ASSEMBLIES, THRUST WASHERS

INCH SERIES

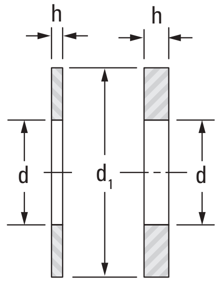
- Dimensions for bore and O.D. of thrust assemblies and washers are nominal.
- See page B-6-36 for details on piloting and backup surfaces.
- Thrust washers burnished at least one-quarter of bore area (remainder is rough breakaway finish).
- O.D. finish of washers will be as blanked.

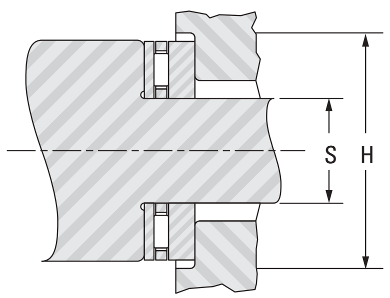


NTA



Raceway hardness to be 58 HRC or equivalent





Shaft Dia.	Assembly Dimensions					Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Speed Rating(1)
							Dynamic	Static		
	D_{c1}	D_c	D_w	E_b	E_a		C	C_o		
in	mm in	mm in	mm in	mm in	mm in		kN lbf		kN	min^{-1}
$2\frac{3}{4}$	**69.85** 2.750	**92.075** 3.625	**3.175** 0.1250	**72.64** 2.860	**87.884** 3.460	NTA-4458	**47.60** 10700	**255.8** 57500	26.8	4600
3	**76.20** 3.000	**95.25** 3.750	**1.984** 0.0781	**78.49** 3.090	**90.678** 3.570	NTA-4860	**26.96** 6060	**172.1** 38700	17.6	4400
$3\frac{1}{4}$	**82.55** 3.250	**104.78** 4.125	**3.175** 0.1250	**85.34** 3.360	**100.58** 3.960	NTA-5266	**51.60** 11600	**294.9** 66300	30.9	4000
$3\frac{3}{4}$	**95.25** 3.750	**117.48** 4.625	**3.175** 0.1250	**98.04** 3.860	**113.28** 4.460	NTA-6074	**56.05** 12600	**344.3** 77400	35.5	3500
$4\frac{1}{8}$	**104.78** 4.125	**128.57** 5.062	**3.175** 0.1250	**107.44** 4.230	**124.46** 4.900	NTA-6681	**63.61** 14300	**414.6** 93200	41.3	3200

Approx. Wt.	Thrust Washer Designation	Washer Dimensions				Piloting Dimensions		Dia. To Clear O.D.	Washer Wt.	Shaft Dia.
		d	d_1	h		S				
				Max.	Min.	Max.	Min.	H (2)		
kg lbs		mm in	mm in	mm in	mm in	mm in	mm in	mm in	kg lbs	in
	TRC-4052	**63.50** 2.500	**82.55** 3.250	**2.41** 0.095	**2.34** 0.092	**63.50** 2.500	**63.42** 2.497	**83.34** 3.281	**0.041** 0.09	
	TRD-4052	**63.50** 2.500	**82.55** 3.250	**3.20** 0.126	**3.12** 0.123	**63.50** 2.500	**63.42** 2.497	**83.34** 3.281	**0.054** 0.119	
0.037 0.082	TRA-4458	**69.85** 2.750	**92.08** 3.625	**0.81** 0.032	**0.76** 0.030	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.018** 0.039	$2\frac{3}{4}$
	TRB-4458	**69.85** 2.750	**92.08** 3.625	**1.60** 0.063	**1.52** 0.060	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.035** 0.077	
	TRC-4458	**69.85** 2.750	**92.08** 3.625	**2.41** 0.095	**2.34** 0.092	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.051** 0.113	
	TRD-4458	**69.85** 2.750	**92.08** 3.625	**3.20** 0.126	**3.12** 0.123	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.069** 0.152	
	TRF-4458	**69.85** 2.750	**92.08** 3.625	**4.78** 0.188	**4.70** 0.185	**69.85** 2.750	**69.77** 2.747	**92.86** 3.656	**0.104** 0.229	
0.022 0.048	TRA-4860	**76.20** 3.000	**95.25** 3.750	**0.81** 0.032	**0.76** 0.030	**76.20** 3.000	**76.12** 2.997	**96.04** 3.781	**0.015** 0.034	3
	TRB-4860	**76.20** 3.000	**95.25** 3.750	**1.60** 0.063	**1.52** 0.060	**76.20** 3.000	**76.12** 2.997	**96.04** 3.781	**0.032** 0.07	
	TRD-4860	**76.20** 3.000	**95.25** 3.750	**3.20** 0.126	**3.12** 0.123	**76.20** 3.000	**76.12** 2.997	**96.04** 3.781	**0.061** 0.135	
0.042 0.092	TRA-5266	**82.55** 3.250	**104.78** 4.125	**0.81** 0.032	**0.76** 0.030	**82.55** 3.250	**82.47** 3.247	**105.56** 4.156	**0.020** 0.044	$3\frac{1}{4}$
	TRD-5266	**82.55** 3.250	**104.78** 4.125	**3.20** 0.126	**3.12** 0.123	**82.55** 3.250	**82.47** 3.247	**105.56** 4.156	**0.080** 0.176	
0.050 0.11	TRA-6074	**95.25** 3.750	**117.48** 4.625	**0.81** 0.032	**0.76** 0.030	**95.25** 3.750	**95.17** 3.747	**118.26** 4.656	**0.023** 0.05	$3\frac{3}{4}$
	TRB-6074	**95.25** 3.750	**117.48** 4.625	**1.60** 0.063	**1.52** 0.060	**95.25** 3.750	**95.17** 3.747	**118.26** 4.656	**0.046** 0.101	
	TRC-6074	**95.25** 3.750	**117.48** 4.625	**2.41** 0.095	**2.34** 0.092	**95.25** 3.750	**95.17** 3.747	**118.26** 4.656	**0.069** 0.152	
	TRD-6074	**95.25** 3.750	**117.48** 4.625	**3.20** 0.126	**3.12** 0.123	**95.25** 3.750	**95.17** 3.747	**118.26** 4.656	**0.092** 0.202	
0.062 0.136	TRA-6681	**104.78** 4.125	**128.57** 5.062	**0.81** 0.032	**0.76** 0.030	**104.78** 4.125	**104.70** 4.122	**129.39** 5.094	**0.027** 0.059	$4\frac{1}{8}$
	TRC-6681	**104.78** 4.125	**128.57** 5.062	**2.41** 0.095	**2.34** 0.092	**104.78** 4.125	**104.70** 4.122	**129.39** 5.094	**0.081** 0.178	
	TRD-6681	**104.78** 4.125	**128.57** 5.062	**3.20** 0.126	**3.12** 0.123	**104.78** 4.125	**104.70** 4.122	**129.39** 5.094	**0.109** 0.24	
	TRF-6681	**104.78** 4.125	**128.57** 5.062	**4.78** 0.188	**4.70** 0.185	**104.78** 4.125	**104.70** 4.122	**129.39** 5.094	**0.161** 0.354	

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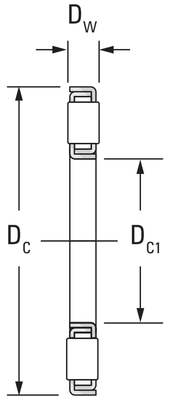
(1) Speed ratings listed are based on adequate oil lubrication. See page B-6-37 for lubrication information.
Suggestions for an application requiring O.D. piloting should be determined in consultation with your representative.

(2) If the shaft and the housing adjacent to the bearing O.D. are not concentric, the T.I.R. between the shaft and housing should be added to this dimension.

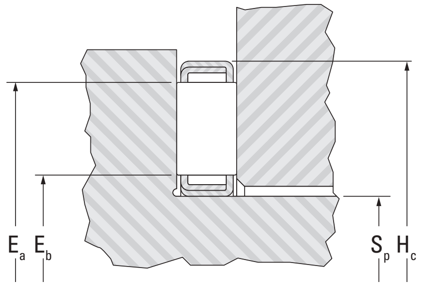
THRUST CYLINDRICAL ROLLER AND CAGE ASSEMBLIES

INCH SERIES

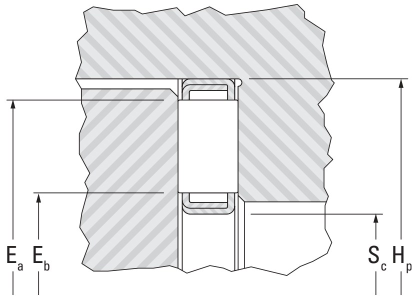
- Backup surfaces should be flat and square with the centerline of the shaft.
- See pages B-6-36 for details on piloting and backup surfaces.



NTH



Shaft Piloted



Housing Piloted

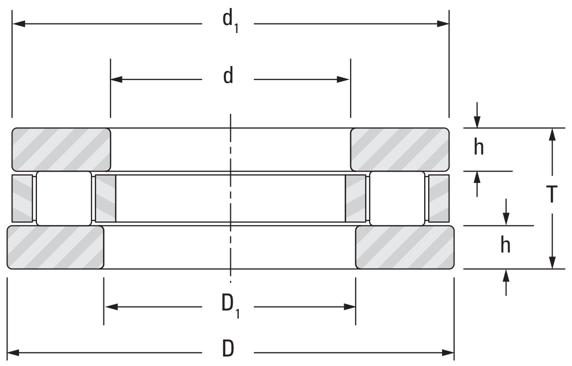
Shaft Dia.	D_{c1}	D_c	D_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_o	Fatigue Load Limit C_u	Speed Rating[1]
in	**mm** in	**mm** in	**mm** in		**kN** lbf	**kN** lbf	kN	min⁻¹
1 1/2	**38.15** 1.502	**75.44** 2.970	**6.350** 0.2500	NTH-2448	**81.8** 18400	**280** 62900	29.5	5700
2	**50.85** 2.002	**91.31** 3.595	**9.525** 0.3750	NTH-3258	**129** 29000	**407** 91600	45.7	4700
2 1/8	**54.03** 2.127	**94.49** 3.720	**9.525** 0.3750	NTH-3460	**133** 30000	**433** 97400	48.6	4500
2 1/4	**57.20** 2.252	**97.66** 3.845	**9.525** 0.3750	NTH-3662	**138** 31100	**458** 103000	51.4	4400
2 3/8	**60.38** 2.377	**100.84** 3.970	**9.525** 0.3750	NTH-3864	**143** 32100	**484.9** 109000	54.3	4200
2 1/2	**63.55** 2.502	**104.01** 4.095	**9.525** 0.3750	NTH-4066	**147** 33000	**511** 115000	57.1	4100
2 5/8	**66.73** 2.627	**109.60** 4.315	**9.525** 0.3750	NTH-4270	**156** 35100	**556** 125000	63.1	3900
2 3/4	**69.98** 2.755	**112.78** 4.440	**9.525** 0.3750	NTH-4472	**161** 36100	**587** 132000	66.3	3800
3	**76.33** 3.005	**119.13** 4.690	**9.525** 0.3750	NTH-4876	**169** 38000	**641** 144000	72.6	3600
3 1/4	**82.68** 3.255	**125.48** 4.940	**9.525** 0.3750	NTH-5280	**178** 39900	**698** 157000	78.0	3400
3 1/2	**89.03** 3.505	**132.26** 5.207	**9.525** 0.3750	NTH-5684	**180** 40500	**725** 163000	81.1	3200

Assembly Wt.	Piloting Dimensions						Shaft Dia.
	Shaft Piloting		Housing Piloting		Raceway Contact		
	S_p	H_c	S_c	H_p	E_b	E_a	
	+0, +0.000			**+0.13,** +0.005			
	-0.13, -0.005	Min.	Max.	**-0,** -0.000			
kg lbs	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	in
0.10 0.23	**38.10** 1.500	**76.96** 3.030	**36.63** 1.442	**75.57** 2.975	**44.70** 1.760	**68.83** 2.710	1 1/2
0.21 0.47	**50.80** 2.000	**92.84** 3.655	**49.33** 1.942	**91.44** 3.600	**57.40** 2.260	**84.33** 3.320	2
0.22 0.49	**53.98** 2.125	**96.01** 3.780	**52.5** 2.067	**94.62** 3.725	**60.71** 2.390	**87.38** 3.440	2 1/8
0.24 0.52	**57.15** 2.250	**99.19** 3.905	**55.68** 2.192	**97.79** 3.850	**63.75** 2.510	**90.68** 3.570	2 1/4
0.24 0.54	**60.33** 2.375	**102.36** 4.030	**58.85** 2.317	**100.97** 3.975	**67.06** 2.640	**93.73** 3.690	2 3/8
0.26 0.57	**63.50** 2.500	**105.54** 4.155	**62.03** 2.442	**104.14** 4.100	**70.10** 2.760	**97.03** 3.820	2 1/2
0.28 0.62	**66.68** 2.625	**111.13** 4.375	**65.2** 2.567	**109.73** 4.320	**73.41** 2.890	**102.36** 4.030	2 5/8
0.29 0.64	**69.85** 2.750	**114.30** 4.500	**68.45** 2.695	**112.90** 4.445	**76.45** 3.010	**105.66** 4.160	2 3/4
0.31 0.69	**76.20** 3.000	**120.65** 4.750	**74.8** 2.945	**119.25** 4.695	**82.80** 3.260	**112.01** 4.410	3
0.34 0.75	**82.55** 3.250	**127.00** 5.000	**81.15** 3.195	**125.60** 4.945	**89.15** 3.510	**118.36** 4.660	3 1/4
0.37 0.81	**88.90** 3.500	**133.78** 5.267	**87.5** 3.445	**132.38** 5.212	**95.76** 3.770	**125.73** 4.950	3 1/2

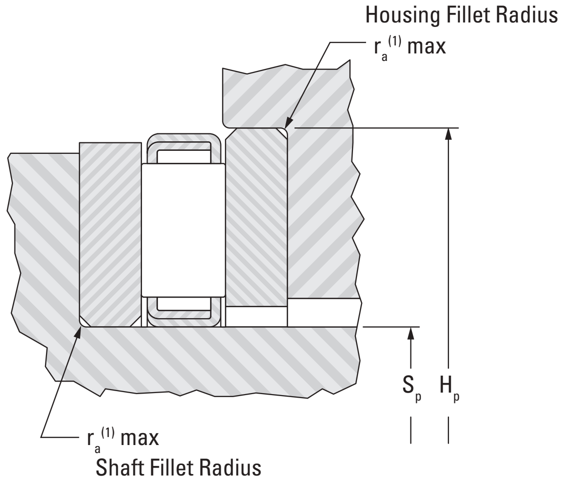
[1] Speed ratings listed are based on adequate oil lubrication. See page B-6-37 for lubrication information.

CYLINDRICAL ROLLER THRUST BEARINGS

- The NTHA thrust cylindrical roller bearing consists of an NTH roller and cage assembly, one bore piloted washer and one O.D. piloted washer. The NTHA bearing is identified and sold as a unit and is manufactured to inch-nominal dimensions only.
- Load ratings given are identical to the corresponding NTH thrust cylindrical roller and cage assembly.
- It is suggested that the roller and cage assembly be bore piloted when applying NTHA bearings. When different arrangements of piloting are required, please contact your representative.
- Backup surfaces should be flat and square with the center line of the shaft.
- To order individual thrust washers, see washer designation below.



NTHA



Shaft Dia.	Shaft-Piloted Washer			Housing-Piloted Washer			T +0.000 −0.006	Bearing Designation	Bearing Wt.
	d		d_1	D		D_1			
	Max.	Min.	Nom.	Max.	Min.	Nom.			
in	mm in	mm in	mm in	mm in	mm in	mm in	mm in		kg lbs
1 1/2	**38.100** 1.5000	**38.082** 1.4993	**74.613** 2 15/16	**76.218** 3.0007	**76.200** 3.0000	**39.688** 1 9/16	**20.62** 0.812	NTHA-2448	**0.47** 1.03
2	**50.800** 2.0000	**50.775** 1.9990	**90.488** 3 9/16	**92.098** 3.6259	**92.075** 3.6250	**52.388** 2 1/16	**25.40** 1.000	NTHA-3258	**0.76** 1.68
2 1/8	**53.975** 2.1250	**53.950** 2.1240	**93.663** 3 11/16	**95.278** 3.7511	**95.250** 3.7500	**55.563** 2 3/16	**25.40** 1.000	NTHA-3460	**0.80** 1.76
2 1/4	**57.150** 2.2500	**57.122** 2.2489	**96.838** 3 13/16	**98.453** 3.8761	**98.425** 3.8750	**58.738** 2 5/16	**25.40** 1.000	NTHA-3662	**0.83** 1.84
2 3/8	**60.325** 2.3750	**60.297** 2.3739	**100.013** 3 15/16	**101.628** 4.0011	**101.600** 4.0000	**61.913** 2 7/16	**25.40** 1.000	NTHA-3864	**0.87** 1.91
2 1/2	**63.500** 2.5000	**63.472** 2.4989	**103.188** 4 1/16	**104.808** 4.1263	**104.775** 4.1250	**65.088** 2 9/16	**25.40** 1.000	NTHA-4066	**0.90** 1.99
2 5/8	**66.675** 2.6250	**66.645** 2.6238	**108.744** 4 9/32	**110.345** 4.3443	**110.312** 4.3430	**68.263** 2 11/16	**25.40** 1.000	NTHA-4270	**1.01** 2.22
2 3/4	**69.850** 2.7500	**69.820** 2.7488	**111.919** 4 13/32	**113.520** 4.4693	**113.487** 4.4680	**71.438** 2 13/16	**25.40** 1.000	NTHA-4472	**1.04** 2.29
3	**76.200** 3.0000	**76.170** 2.9988	**118.269** 4 21/32	**119.875** 4.7195	**119.837** 4.7180	**77.788** 3 1/16	**25.40** 1.000	NTHA-4876	**1.12** 2.46
3 1/4	**82.550** 3.2500	**82.517** 3.2487	**124.619** 4 29/32	**126.225** 4.9695	**126.187** 4.9680	**84.138** 3 5/16	**25.40** 1.000	NTHA-5280	**1.19** 2.62
3 1/2	**88.900** 3.5000	**88.867** 3.4987	**130.969** 5 5/32	**132.575** 5.2195	**132.537** 5.2180	**90.488** 3 9/16	**25.40** 1.000	NTHA-5684	**1.27** 2.80

Load Ratings		Fatigue Load Limit C_u	Speed Rating Oil	Piloting Dimensions				Bore Piloted Washer	Washer Wt.	O.D. Piloted Washer	Washer Wt.	Shaft Dia.
Dynamic	Static			S_p	H_p	$r_{s\,min.}$	h					
				+0, +0.000	**+0.13,** +0.005		**+0,** +0.000					
C	C_o			**-0.13,** -0.005	**-0,** -0.000		**-0.076,** -0.0030					
kN lbf		kN	min⁻¹	mm in	mm in	mm in	mm in		kg lbs		kg lbs	in
81.8 18400	**280** 62900	29.5	5700	**38.082** 1.4993	**76.218** 3.0007	**0.81** 0.032	**7.137** 0.2810	TRI-2448	**0.18** 0.39	TRID-2448	**0.18** 0.39	1 1/2
129 29000	**408** 91600	45.7	4700	**50.775** 1.9990	**92.098** 3.6259	**1.57** 0.062	**7.938** 0.3125	TRJ-3258	**0.26** 0.57	TRJD-3258	**0.27** 0.59	2
133 30000	**433** 97400	48.6	4500	**53.950** 2.1240	**95.278** 3.7511	**1.57** 0.062	**7.938** 0.3125	TRJ-3460	**0.27** 0.60	TRJD-3460	**0.28** 0.61	2 1/8
138 31100	**458** 103000	51.4	4400	**57.122** 2.2489	**98.453** 3.8761	**1.57** 0.062	**7.938** 0.3125	TRJ-3662	**0.28** 0.62	TRJD-3662	**0.29** 0.64	2 1/4
143 32100	**485** 109000	54.3	4200	**60.297** 2.3739	**101.628** 4.0011	**1.57** 0.062	**7.938** 0.3125	TRJ-3864	**0.29** 0.65	TRJD-3864	**0.30** 0.66	2 3/8
147 33000	**512** 115000	57.1	4100	**63.472** 2.4989	**104.808** 4.1263	**1.57** 0.062	**7.938** 0.3125	TRJ-4066	**0.30** 0.67	TRJD-4066	**0.31** 0.69	2 1/2
156 35100	**556** 125000	63.1	3900	**66.645** 2.6238	**110.345** 4.3443	**1.57** 0.062	**7.938** 0.3125	TRJ-4270	**0.34** 0.75	TRJD-4270	**0.35** 0.77	2 5/8
161 36100	**587** 132000	66.3	3800	**69.820** 2.7488	**113.520** 4.4693	**1.57** 0.062	**7.938** 0.3125	TRJ-4472	**0.35** 0.78	TRJD-4472	**0.36** 0.80	2 3/4
169 38000	**641** 144000	72.6	3600	**76.170** 2.9988	**119.875** 4.7195	**1.57** 0.062	**7.938** 0.3125	TRJ-4876	**0.38** 0.83	TRJD-4876	**0.39** 0.85	3
177 39900	**698** 157000	78.0	3400	**82.517** 3.2487	**126.225** 4.9695	**1.57** 0.062	**7.938** 0.3125	TRJ-5280	**0.40** 0.89	TRJD-5280	**0.41** 0.91	3 1/4
180 40500	**725** 163000	81.1	3200	**88.867** 3.4987	**132.575** 5.2195	**1.57** 0.062	**7.938** 0.3125	TRJ-5684	**0.43** 0.94	TRJD-5284	**0.43** 0.96	3 1/2

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[1] $r_{a\,max}$ is equal to minimum washer chamfer $r_{s\,min}$.

NOTES

COMBINED NEEDLE ROLLER BEARINGS

Overview: Combined bearings incorporate a radial needle roller bearing and a thrust ball or roller bearing into a convenient unitized package.

- **Catalog range:** 10.000 mm – 70.000 mm (0.3940 in – 2.7560 in) bore.
- **Markets:** Industrial applications, machine tools, and automotive transmissions.
- **Features:** Available with ball, needle roller or cylindrical roller thrust component, machined and drawn outer rings are available, some sizes available with integral dust caps.
- **Benefits:** An effective alternative to separate radial and thrust bearings.

Combined Needle Roller Bearings – Metric Nominal Dimensions

Prefix

NAXR machined outer ring thrust cylindrical roller and radial needle roller bearing without inner ring

NAXK machined outer ring thrust ball and radial needle roller bearing without inner ring

NAXR 20 Z.TN

Bore Diameter
20 = 20 mm

Suffix
TN molded polymer retainer
Z thrust washer retaining dust cap

Inner Rings for Combined Needle Roller Bearings – Metric Nominal Dimensions

Prefix
JR inner ring for use with NAXR series bearings

JR 25 x 30 x 18

Bore Diameter
25 = 25 mm

Outer Diameter
14 = 14 mm

Width
18 = 18 mm

Combined Needle Roller Bearings

COMBINED BEARINGS

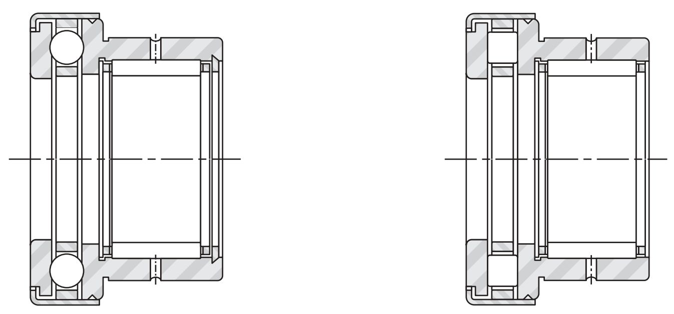
METRIC SERIES

Combined bearings consist of a radial bearing (needle roller bearing) and a thrust bearing (ball, roller or needle bearing). The thrust roller bearing is usually a cylindrical roller thrust bearing.

Combined bearings make an effective alternative in place of two separate bearings – in terms of cost, handling and packaging. Combined bearings can be used with or without matching inner rings and thrust washers – though these are listed opposite the bearing part numbers, where possible, on the following pages of tables for convenience.

REFERENCE STANDARDS ARE:

- **DIN 5429, Part 1** – needle roller – thrust cylindrical roller bearings, series NAXR, NAXR.Z.
- **DIN 5429, Part 1** – needle roller – thrust ball bearings, series NAXK, NAXK.Z.
- **ISO 1206** – needle roller bearings – light and medium series – dimensions and tolerances.



Needle roller-ball thrust bearing

Needle roller-cylindrical roller thrust bearings

NAXK.Z

NAXR.Z

Fig. B7-1. Types of metric series combined bearings

Suffixes

TN	molded cage of reinforced engineered polymer
Z	retained with a dust cap
Z.TN	retained with a dust cap, molded cage of reinforced engineered polymer

CONSTRUCTION

Needle roller-cylindrical roller thrust bearings of series NAXR is available with dust caps. They have the highest axial load-carrying capability of all combined bearings. The NAXR and NAXR.Z Series have the same dimensions as needle roller-ball thrust bearings (series NAXK and NAXK.Z).

The previous bearing types may be best used without inner rings because the radial internal clearances are smaller if the needle roller and cage assemblies operate directly on a hardened and ground shaft. Tolerance class F6 is the normal specification for the needle roller complement bore diameters of the unmounted bearings.

Quality requirements for shafts, when used as a bearing raceway, are given in the engineering section of this catalog. When it becomes impractical to meet the shaft raceway design requirements, standard inner rings may be used with these bearings.

DIMENSIONAL ACCURACY

TOLERANCES

Metric series combined bearings are manufactured to the normal tolerances which apply to the metric series radial bearings and standard thrust bearings, as shown in the engineering section. The only exceptions are the diameter tolerances of the shaft-piloted washer and the bearing width tolerances. The shaft-piloted washer bore tolerance is E7 for the NAXK, NAXR, NAXK.Z and NAXR.Z Series bearings. The thickness tolerance of the combined bearings thrust component (C_1) can be found in Table B7-2 The matching thrust washer thickness tolerance may be found in the metric unitized thrust bearing section of this catalog.

BEARING MOUNTING

MOUNTING DIMENSIONS

Simple, through-bored housings are adequate for combined bearings. The mounting tolerances for the mechanical-ring combined bearings are provided in Table B7-1.

The shaft-piloted washers of combined bearings must be supported, at least over half of their width. Other quality requirements for shafts and housings are given in the engineering section. Requirements for fillets, recesses and shoulder heights are the same as for needle roller bearings, as shown in the Mounting Dimensions paragraph on pages B-4-9 and B-4-10.

When mounting these bearings in their housings with a tight fit, relatively high press-in forces will be required which may brinell the raceways of the thrust bearing arrangements. Particular care should be exercised when installing needle roller-cylindrical roller thrust bearings with dust caps – and where the roller assembly of the thrust bearings cannot be removed. In order to avoid brinelling of the thrust bearing raceways, the bearings should be installed with uniform, continuous pressure against the installation tool, avoiding sudden impact forces. At times it may even be desirable to heat the housing before bearing mounting.

Table B7-1. Mounting tolerances

Rotation conditions	ISO tolerance zone for housing	Nominal shaft diameters d		With inner ring	Without inner ring
		>	≤	ISO tolerances zone for shaft	
		mm in	**mm** in		
Load stationary relative to housing	K6 (M6)[1]	**10.000** 0.3937	**40.000** 1.5748	k6	h6
		40.000 1.5748	**70.000** 2.7559	m6	h6
Load rotates relative to housing	M6 (N6)[1]	All diameters		g6	f6

[1] Tighter fit for more secure arrangement.

Table B7-2. Thrust component thickness (C_1) tolerances

Bearing series	Tolerances	
	Max.	Min.
	mm in	**mm** in
NAXK, NAXK.Z	**+0.000** +0.000	**-0.200** -0.0078
NAXR, NAXR.Z		

LUBRICATION

When the applied axial loads are relatively high and the application allows the use of oil as the desired method of lubrication, bearing types NAXR and NAXK should be given consideration. Combined bearings with a dust cap may use oil lubrication, although their design makes them better suited for use with grease lubrication.

Combined bearings are typically shipped protected with a corrosion-preventive compound that is not a lubricant. The bearings may be used in oil- or grease-lubricated applications, without removal of the corrosion-preventive compound. However, it may be advisable to remove the corrosion-preventive compound before packing the bearings (with a suitable grease) to obtain optimum grease performance and to minimize the possibility of confusing grease bearings with bearings containing corrosion preventive.

LOAD RATINGS

Minimum axial load for combined bearings:

The minimum axial load $F_{a\,min.} = C_{0a}/2200$ (kN)

Where:

C_{0a} = static load rating (kN)

DYNAMIC EQUIVALENT LOAD

Combined bearings can accommodate radial and axial loads.

Radial needle roller complement

$P = F_r$ (kN)

Cylindrical or needle roller thrust complement

$P_a = F_a$ (kN)

STATIC EQUIVALENT LOAD

For all combined bearings series:

Radial needle roller complement

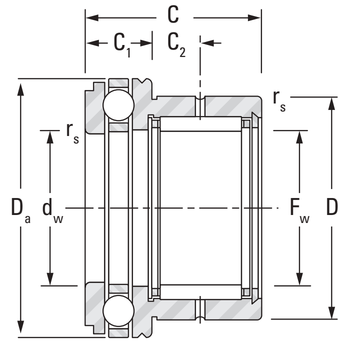
$P_0 = F_r$ (kN)

Cylindrical or needle roller thrust complement

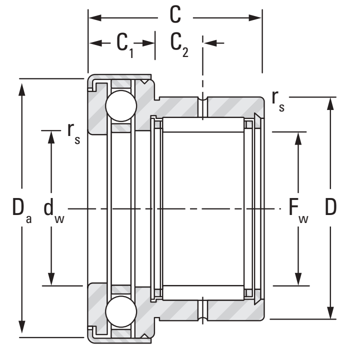
$P_{0a} = F_a$ (kN)

BALL THRUST SERIES

METRIC SERIES



NAXK



NAXK.Z

Shaft Diameter	F_w	D	C	d_w	D_a	C_1	C_2	$r_{s\,min.}$	Bearing Designation	Speed Rating Oil	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner ring Designation	Shaft Diameter
											Radial		Thrust						
											Dynamic	Static	Dynamic	Static					
				E7							C	C_0	C_a	C_{0a}	Radial	Thrust			
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in		min^{-1}	**kN** lbf		**kN** lbf		kN		kg		**mm** in
10 0.394	**10** 0.394	**19** 0.748	**23** 0.906	**10** 0.394	**24** 0.945	**9** 0.354	**6.5** 0.256	**0.3** 0.012	NAXK10	9500	**7.9** 1780	**8.7** 1960	**10.4** 2340	**14** 3150	1.35	0.630	0.04	JR7x10x16	**10** 0.394
	10 0.394	**19** 0.748	**23** 0.906	**10** 0.394	**25** 0.984	**9** 0.354	**6.5** 0.256	**0.3** 0.012	NAXK10Z	9500	**7.9** 1780	**8.7** 1960	**10.4** 2340	**14** 3150	1.35	0.630	0.04	JR7x10x16	
12 0.472	**12** 0.472	**21** 0.827	**23** 0.906	**12** 0.472	**26** 1.024	**9** 0.354	**6.5** 0.256	**0.3** 0.012	NAXK12	9000	**7.5** 1690	**8.5** 1910	**10.7** 2410	**15.4** 3460	1.30	0.70	0.046	JR9x12x16	**12** 0.472
	12 0.472	**21** 0.827	**23** 0.906	**12** 0.472	**27** 1.063	**9** 0.354	**6.5** 0.256	**0.3** 0.012	NAXK12Z	9000	**7.5** 1690	**8.5** 1910	**10.7** 2410	**15.4** 3460	1.30	0.70	0.047	JR9x12x16	
15 0.591	**15** 0.591	**24** 0.945	**23** 0.906	**15** 0.591	**28** 1.102	**9** 0.354	**6.5** 0.256	**0.3** 0.012	NAXK15	8500	**9.7** 2180	**12.6** 2830	**10.9** 2450	**16.8** 3780	1.90	0.760	0.047	JR12x15x16	**15** 0.591
	15 0.591	**24** 0.945	**23** 0.906	**15** 0.591	**29** 1.142	**9** 0.354	**6.5** 0.256	**0.3** 0.012	NAXK15Z	8500	**9.7** 2180	**12.6** 2830	**10.9** 2450	**16.8** 3780	1.90	0.760	0.05	JR12x15x16	
17 0.669	**17** 0.669	**26** 1.024	**25** 0.984	**17** 0.669	**30** 1.181	**9** 0.354	**8** 0.315	**0.3** 0.012	NAXK17	8500	**11.4** 2560	**16.1** 3620	**11.8** 2650	**19.6** 4410	2.50	0.880	0.06	JR14x17x17	**17** 0.669
	17 0.669	**26** 1.024	**25** 0.984	**17** 0.669	**31** 1.220	**9** 0.354	**8** 0.315	**0.3** 0.012	NAXK17Z	8500	**11.4** 2560	**16.1** 3620	**11.8** 2650	**19.6** 4410	2.50	0.880	0.064	JR14x17x17	
20 0.787	**20** 0.787	**30** 1.181	**30** 1.181	**20** 0.787	**35** 1.378	**10** 0.394	**10.5** 0.413	**0.3** 0.012	NAXK20	7000	**14.8** 3330	**23.7** 5330	**15.5** 3480	**26.6** 5980	3.65	1.20	0.089	JR17x20x20	**20** 0.787
	20 0.787	**30** 1.181	**30** 1.181	**20** 0.787	**36** 1.417	**10** 0.394	**10.5** 0.413	**0.3** 0.012	NAXK20Z	7000	**14.8** 3330	**23.7** 5330	**15.5** 3480	**26.6** 5980	3.65	1.20	0.094	JR17x20x20	
25 0.984	**25** 0.984	**37** 1.457	**30** 1.181	**25** 0.984	**42** 1.654	**11** 0.433	**9.5** 0.374	**0.6** 0.024	NAXK25	6300	**18.9** 4250	**29.8** 6700	**18.8** 4230	**35.5** 7980	4.60	1.60	0.134	JR20x25x20	**25** 0.984
	25 0.984	**37** 1.457	**30** 1.181	**25** 0.984	**43** 1.693	**11** 0.433	**9.5** 0.374	**0.6** 0.024	NAXK25Z	6300	**18.9** 4250	**29.8** 6700	**18.8** 4230	**35.5** 7980	4.60	1.60	0.141	JR20x25x20	
30 1.181	**30** 1.181	**42** 1.654	**30** 1.181	**30** 1.181	**47** 1.850	**11** 0.433	**9.5** 0.374	**0.6** 0.024	NAXK30	5600	**20.3** 4560	**34.6** 7780	**19.5** 4380	**40** 8990	5.35	2.15	0.146	JR25x30x20	**30** 1.181
	30 1.181	**42** 1.654	**30** 1.181	**30** 1.181	**48** 1.890	**11** 0.433	**9.5** 0.374	**0.6** 0.024	NAXK30Z	5600	**20.3** 4560	**34.6** 7780	**19.5** 4380	**40** 8990	5.35	2.15	0.154	JR25x30x20	
35 1.378	**35** 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**52** 2.047	**12** 0.472	**9** 0.354	**0.6** 0.024	NAXK35	5300	**22.1** 4970	**40.8** 9170	**20.8** 4680	**46.6** 10500	6.35	2.10	0.176	JR30x35x20	**35** 1.378
	35 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**53** 2.087	**12** 0.472	**9** 0.354	**0.6** 0.024	NAXK35Z	5300	**22.1** 4970	**40.8** 9170	**20.8** 4680	**46.6** 10500	6.35	2.10	0.184	JR30x35x20	
40 1.575	**40** 1.575	**52** 2.047	**32** 1.260	**40** 1.575	**60** 2.362	**13** 0.512	**10** 0.394	**0.6** 0.024	NAXK40	4500	**25** 5620	**51** 11500	**28** 6290	**63** 14200	7.30	2.85	0.224	JR35x40x20	**40** 1.575
	40 1.575	**52** 2.047	**32** 1.260	**40** 1.575	**61** 2.402	**13** 0.512	**10** 0.394	**0.6** 0.024	NAXK40Z	4500	**25** 5620	**51** 11500	**28** 6290	**63** 14200	7.30	2.85	0.233	JR35x40x20	
45 1.772	**45** 1.772	**58** 2.283	**32** 1.260	**45** 1.772	**65** 2.559	**14** 0.551	**9** 0.354	**0.6** 0.024	NAXK45	4500	**24.9** 5600	**51.8** 11600	**29** 6520	**69.2** 15600	8.05	3.10	0.262	JR40x45x20	**45** 1.772
	45 1.772	**58** 2.283	**32** 1.260	**45** 1.772	**66.5** 2.618	**14** 0.551	**9** 0.354	**0.6** 0.024	NAXK45Z	4500	**24.9** 5600	**51.8** 11600	**29** 6520	**69.2** 15600	8.05	3.10	0.275	JR40x45x20	

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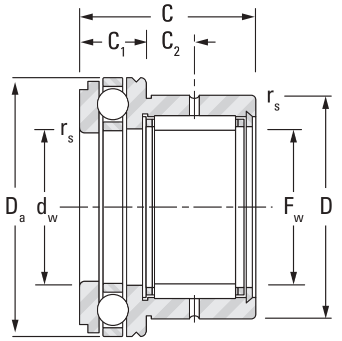
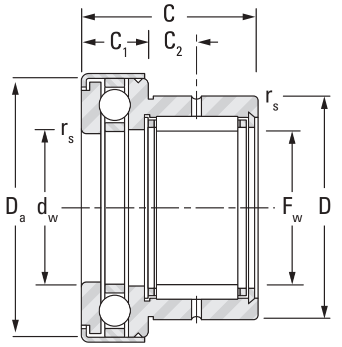
BALL THRUST SERIES

METRIC SERIES



NAXK



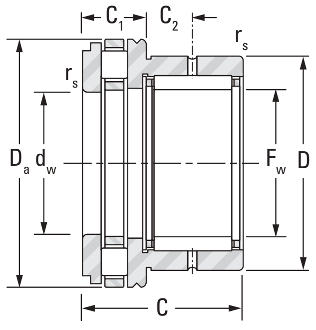
NAXK.Z

Shaft Diameter	F_w	D	C	d_w	D_a	C_1	C_2	$r_{s\ min.}$
				E7				
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
50 1.969	**50** 1.969	**62** 2.441	**35** 1.378	**50** 1.969	**70** 2.756	**14** 0.551	**10** 0.394	**0.6** 0.024
	50 1.969	**62** 2.441	**35** 1.378	**50** 1.969	**71.5** 2.815	**14** 0.551	**10** 0.394	**0.6** 0.024
60 2.362	**60** 2.362	**72** 2.835	**40** 1.575	**60** 2.362	**85** 3.346	**17** 0.669	**12** 0.472	**1** 0.039
70 2.756	**70** 2.756	**85** 3.346	**40** 1.575	**70** 2.756	**95** 3.740	**18** 0.709	**11** 0.433	**1** 0.039

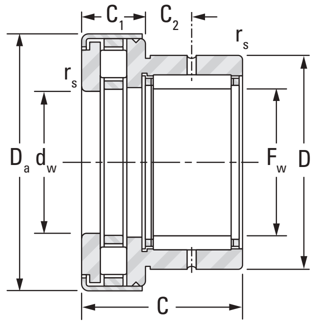
Bearing Designation	Speed Rating Oil	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner ring Designation	Shaft Diameter
		Radial		Thrust						
		Dynamic	Static	Dynamic	Static					
		C	C_0	C_a	C_{0a}	Radial	Thrust			
	min^{-1}	**kN** lbf		**kN** lbf		kN		kg		**mm** in
NAXK50	4300	**30.2** 6790	**68.5** 15400	**28.8** 6470	**75.4** 17000	10.7	3.40	0.316	JR45x50x25	**50** 1.969
NAXK50Z	4300	**30.2** 6790	**68.5** 15400	**28.8** 6470	**75.4** 17000	10.7	3.40	0.332	JR45x50x25	
NAXK60	3600	**31.9** 7170	**78.1** 17600	**41.4** 9310	**113** 25400	12.2	5.10	0.48	JR50x60x25	**60** 2.362
NAXK70	3400	**44.9** 10100	**87.1** 19600	**40.0** 8990	**110** 24700	13.9	4.95	0.659	JR60x70x25	**70** 2.756

CYLINDRICAL ROLLER THRUST SERIES

METRIC SERIES



NAXR



NAXR.Z

Shaft Diameter	F_w	D	C	d_w	D_a	C_1	C_2	$r_{s\,min.}$
				E7				
mm in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in	**mm** in
15 0.591	**15** 0.591	**24** 0.945	**23** 0.906	**15** 0.591	**28** 1.102	**9** 0.354	**6.5** 0.256	**0.3** 0.012
	15 0.591	**24** 0.945	**23** 0.906	**15** 0.591	**29** 1.142	**9** 0.354	**6.5** 0.256	**0.3** 0.012
17 0.669	**17** 0.669	**26** 1.024	**25** 0.984	**17** 0.669	**30** 1.181	**9** 0.354	**8.0** 0.315	**0.3** 0.012
	17 0.669	**26** 1.024	**25** 0.984	**17** 0.669	**31** 1.220	**9** 0.354	**8.0** 0.315	**0.3** 0.012
20 0.787	**20** 0.787	**30** 1.181	**30** 1.181	**20** 0.787	**35** 1.378	**10** 0.394	**10.5** 0.413	**0.3** 0.012
	20 0.787	**30** 1.181	**30** 1.181	**20** 0.787	**36** 1.417	**10** 0.394	**10.5** 0.413	**0.3** 0.012
25 0.984	**25** 0.984	**37** 1.457	**30** 1.181	**25** 0.984	**42** 1.654	**11** 0.433	**9.5** 0.374	**0.6** 0.024
	25 0.984	**37** 1.457	**30** 1.181	**25** 0.984	**43** 1.693	**11** 0.433	**9.5** 0.374	**0.6** 0.024
30 1.181	**30** 1.181	**42** 1.654	**30** 1.181	**30** 1.181	**47** 1.850	**11** 0.433	**9.5** 0.374	**0.6** 0.024
	30 1.181	**42** 1.654	**30** 1.181	**30** 1.181	**48** 1.890	**11** 0.433	**9.5** 0.374	**0.6** 0.024
35 1.378	**35** 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**52** 2.047	**12** 0.472	**9.0** 0.354	**0.6** 0.024
	35 1.378	**47** 1.850	**30** 1.181	**35** 1.378	**53** 2.087	**12** 0.472	**9.0** 0.354	**0.6** 0.024
40 1.575	**40** 1.575	**52** 2.047	**32** 1.260	**40** 1.575	**60** 2.362	**13** 0.512	**10.0** 0.394	**0.6** 0.024
	40 1.575	**52** 2.047	**32** 1.260	**40** 1.575	**61** 2.402	**13** 0.512	**10.0** 0.394	**0.6** 0.024
45 1.772	**45** 1.772	**58** 2.283	**32** 1.260	**45** 1.772	**65** 2.559	**14** 0.551	**9.0** 0.354	**0.6** 0.024
	45 1.772	**58** 2.283	**32** 1.260	**45** 1.772	**66** 2.598	**14** 0.551	**9.0** 0.354	**0.6** 0.024
50 1.969	**50** 1.969	**62** 2.441	**35** 1.378	**50** 1.969	**70** 2.756	**14** 0.551	**10.0** 0.394	**0.6** 0.024
	50 1.969	**62** 2.441	**35** 1.378	**50** 1.969	**71** 2.795	**14** 0.551	**10.0** 0.394	**0.6** 0.024

Bearing Designation		Speed Rating	Load Ratings				Fatigue Load Limits C_u		Approx. Wt.	Matching Inner Ring Designation	Shaft Diameter
			Radial		Thrust						
			Dynamic	Static	Dynamic	Static					
NAXR	NAXR.Z		C	C_0	C_a	C_{0a}	Radial	Thrust			
		min^{-1}	**kN** lbf		**kN** lbf		kN		**kg** lbs		**mm** in
NAXR15		12000	**12.4** 2790	**15.0** 3370	**12.0** 2700	**26.3** 5910	2.30	3.70	**0.032** 0.071	JR12x15x16	**15** 0.591
	NAXR15.Z	12000	**12.4** 2790	**15.0** 3370	**12.0** 2700	**26.3** 5910	2.30	3.70	**0.035** 0.077	JR12x15x16	
NAXR17		11000	**13.7** 3080	**17.5** 3930	**12.6** 2830	**28.6** 6430	2.70	4.05	**0.050** 0.110	JR14x17x17	**17** 0.669
	NAXR17.Z	11000	**13.7** 3080	**17.5** 3930	**12.6** 2830	**28.6** 6430	2.70	4.05	**0.053** 0.117	JR14x17x17	
NAXR20TN		9500	**17.5** 3930	**25.3** 5690	**23.5** 5280	**56.8** 12800	4.00	8.00	**0.090** 0.198	JR17x20x20	**20** 0.787
	NAXR20Z.TN	9500	**17.5** 3930	**25.3** 5690	**23.5** 5280	**56.8** 12800	4.00	8.00	**0.095** 0.209	JR17x20x20	
NAXR25TN		8000	**19.2** 4320	**30.4** 6830	**31.2** 7010	**81.0** 18200	4.80	11.4	**0.146** 0.322	JR20x25x20	**25** 0.984
	NAXR25Z.TN	8000	**19.2** 4320	**30.4** 6830	**31.2** 7010	**81.0** 18200	4.80	11.4	**0.152** 0.335	JR20x25x20	
NAXR30TN		6700	**24.2** 5440	**38.3** 8610	**33.0** 7420	**91.1** 20500	6.10	12.8	**0.162** 0.357	JR25x30x20	**30** 1.181
	NAXR30Z.TN	6700	**24.2** 5440	**38.3** 8610	**33.0** 7420	**91.1** 20500	6.10	12.8	**0.169** 0.373	JR25x30x20	
NAXR35		6000	**26.1** 5870	**44.4** 9980	**30.8** 6920	**86.0** 19300	7.05	12.1	**0.186** 0.410	JR30x35x20	**35** 1.378
	NAXR35.Z	6000	**26.1** 5870	**44.4** 9980	**30.8** 6920	**86.0** 19300	7.05	12.1	**0.195** 0.430	JR30x35x20	
NAXR40		5300	**27.9** 6270	**50.4** 11300	**44.1** 9910	**126.0** 28300	8.05	12.0	**0.288** 0.635	JR35x40x20	**40** 1.575
	NAXR40.Z	5300	**27.9** 6270	**50.4** 11300	**44.1** 9910	**126.0** 28300	8.05	12.0	**0.299** 0.659	JR35x40x20	
NAXR45TN		4800	**29.5** 6630	**56.4** 12700	**52.3** 11800	**163.0** 36600	9.00	15.5	**0.360** 0.794	JR40x45x20	**45** 1.772
	NAXR45Z.TN	4800	**29.5** 6630	**56.4** 12700	**52.3** 11800	**163.0** 36600	9.00	15.5	**0.370** 0.816	JR40x45x20	
NAXR50		4300	**40.8** 9170	**79.3** 17800	**49.6** 11200	**155.0** 34800	12.5	14.8	**0.432** 0.952	JR45x50x25	**50** 1.969
	NAXR50.Z	4300	**40.8** 9170	**79.3** 17800	**49.6** 11200	**155.0** 34800	12.5	14.8	**0.452** 0.996	JR45x50x25	

NOTES

NEEDLE ROLLERS, ACCESSORIES

NEEDLE/CYLINDRICAL ROLLERS

Overview: Loose needle and cylindrical rollers are mainly used as bearing rolling elements to reduce friction and torque in rotating and pivoting applications. However, these precision rollers have many other uses, such as shafts or locating pins.

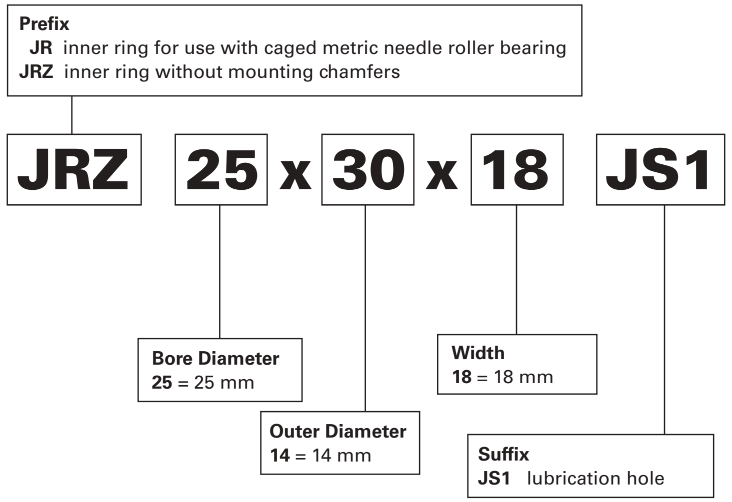
- **Catalog range:** Diameters from 1.5 mm (0.0591 in) to 14 mm (0.5512 in). Lengths from 5 mm (0.1969 in) to 63.5 mm (2.5 in).
- **Markets:** Vehicle and industrial transmissions, universal joints, and two-cycle engines.
- **Features:** Cylindrical and needle sizes are available. Needle rollers are available with flat and rounded-ends; metric series needle rollers available in Grade 2, 3 or 5.
- **Benefits:** Provide the maximum load-carrying capacity, within the smallest envelope, at a low cost.

METRIC INNER RINGS

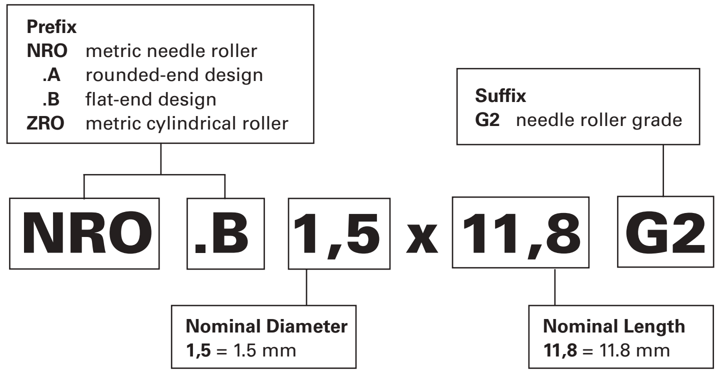
Overview: Inner rings are made from bearing-quality steel, and their O.D. and bore are precision-ground. They function as the inner raceway for a needle roller bearing by providing a surface that meets all shaft raceway design requirements (hardness, surface finish, roundness, etc.).

- **Catalog range:** 5 mm (0.1969 in) bore to 180 mm (7.0866 in) bore.
- **Markets:** Automotive, truck, power transmissions, and industrial applications.
- **Features:** Available with and without chamfers, some are available with a profiled outer diameter.
- **Benefits:** When it is not practical to manufacture the shaft to raceway quality, an inner ring allows a customer to obtain acceptable bearing performance.

Standard Inner Rings for Needle Roller Bearings – Metric Nominal Dimensions



Loose Rollers – Metric Nominal Dimensions



Needle Rollers, Accessories

Page

NEEDLE ROLLERS – METRIC SERIES

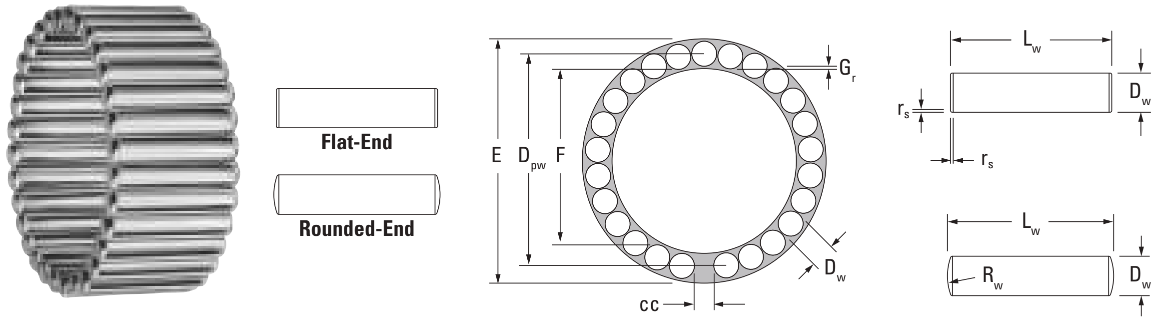


Fig. B8-1. Metric Series needle rollers

Needle rollers are made from rolling bearing-quality steel, hardened to 60-64 HRC or equivalent. Nominal metric needle rollers in various grades are standardized at national and international levels. The grades determine the dimensional and form tolerances of the needle rollers. Metric series needle rollers may differ by their end form: type A has rounded-end and type B has flat-ends. JTEKT prefers to supply needle roller in the most economical flat-end, or type B design, in G2 grade. Metric series needle rollers of type A also may be made available on request and in other G3 or G5 grades.

METRIC SERIES NEEDLE ROLLER DIMENSIONS

Nominally metric needle rollers, conforming to the International Standard ISO 3096, are shown in Table B8-2 on page B-8-6. The symbols used in Table B8-2 on page B-8-6, as well as in subsequent tables and figures, are summarized in Table B8-5 on page B-8-8. Needle rollers with flat-ends, which are the preferred design, are shown in Table B8-2 on page B-8-6. Chamfer dimension limits are also shown, the use of which results in the maximum possible effective contact length between roller and raceway. Yet, the relief at the needle roller ends help to reduce stress concentration – resulting in more uniform stress distribution, optimum load ratings, and longer life.

Every needle roller gage is separately packed, and packages are marked accordingly.

REFERENCE STANDARDS ARE:

- **ISO 3096** – rolling bearings – needle rollers – dimensions and tolerances.
- **DIN 5402** – rolling bearing components – needle rollers.

EXAMPLE OF METRIC SERIES NEEDLE ROLLER DESIGNATION AND PACKAGE MARKING:

NRO.B1,5x13,8G2
M2M4

NRO –	Needle roller
.B –	Flat-end needle rollers
1,5 –	Nominal diameter D_W = 1.500 mm
13,8 –	Nominal length L_W = 13.800 mm
G2 –	Needle roller grade
M2M4 –	Deviation of needle roller gage -2.000/-4.000 µm

The actual finished diameter is between 1.496 and 1.498 mm.

In the marking of the needle roller gage, P identifies zero (0) or plus (+), and M identifies minus (-). If a shipment of needle rollers of the same size comprises several boxes, each box contains needle rollers of the same grade. The gage may vary from box to box. Each individual box, however, contains needle rollers of the particular gage identified on the box.

METRIC SERIES NEEDLE ROLLER TOLERANCES

Table B8-1. Variation of Gage Lot Diameter, Preferred Gages and Circularity Deviation (values in µm)

<table>
<tr><th>Grade</th><th>Variation of Gage Lot Diameter V_{DwL} Max.</th><th colspan="19">Gages High/Low Deviation of Mean Diameters D_{wmp}</th><th>Circularity Deviation Max.</th></tr>
<tr><td>2</td><td>2</td><td>Max.
Min.</td><td colspan="2">0
-2</td><td colspan="2">-1
-3</td><td colspan="2">-2
-4</td><td colspan="2">-3
-5</td><td colspan="2">-4
-6</td><td colspan="2">-5
-7</td><td colspan="2">-6
-8</td><td colspan="2">-7
-9</td><td colspan="2">-8
-10</td><td>1</td></tr>
<tr><td>3</td><td>3</td><td>Max.
Min.</td><td colspan="3">0
-3</td><td colspan="3">-1.5
-4.5</td><td colspan="3">-3
-6</td><td colspan="3">-4.5
-7.5</td><td colspan="3">-6
-9</td><td colspan="3">-7
-10</td><td>1.5</td></tr>
<tr><td>5</td><td>5</td><td>Max.
Min.</td><td colspan="6">0
-5</td><td colspan="6">-3
-8</td><td colspan="6">-5
-10</td><td>2.5</td></tr>
</table>

Note 1 - Tolerance values apply only at the middle of the needle roller length.
Note 2 - Needle rollers of any nominal dimensions and any of the quoted grades will be supplied sub-divided into the gages listed in Table B8-1 at our option, if nothing to the contrary is agreed upon at the time of ordering.

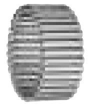


Table B8-2. Dimensions of metric series needle rollers

D_w Dia.	L_w Length	Needle Roller Designation	Wt. 1000 pcs Approx.	Chamfer Dimension Limits		
				$r_{s\ min.}$	Rad.	Axial
mm in	mm in		kg lbs	mm in	mm in	mm in
1.5 0.0591	**5.8** 0.228	NRO.B1,5x5,8G2	**0.080** 0.176	**0.1** 0.004	**0.6** 0.024	**0.8** 0.031
1.5 0.0591	**6.8** 0.268	NRO.B1.5x6,8G2	**0.094** 0.207	**0.1** 0.004	**0.6** 0.024	**0.8** 0.031
1.5 0.0591	**7.8** 0.307	NRO.B1.5x7,8G2	**0.108** 0.238	**0.1** 0.004	**0.6** 0.024	**0.8** 0.031
1.5 0.0591	**9.8** 0.386	NRO.B1,5x9,8G2	**0.136** 0.300	**0.1** 0.004	**0.6** 0.024	**0.8** 0.031
1.5 0.0591	**11.8** 0.465	NRO.B1,5x11,8G2	**0.164** 0.362	**0.1** 0.004	**0.6** 0.024	**0.8** 0.031
1.5 0.0591	**13.8** 0.543	NRO.B1,5x13,8G2	**0.191** 0.421	**0.1** 0.004	**0.6** 0.024	**0.8** 0.031
2 0.0787	**7.8** 0.307	NRO.B2x7,8G2	**0.190** 0.419	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2 0.0787	**9.8** 0.386	NRO.B2x9,8G2	**0.240** 0.529	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2 0.0787	**11.8** 0.465	NRO.B2x11,8G2	**0.290** 0.639	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2 0.0787	**13.8** 0.543	NRO.B2x13,8G2	**0.340** 0.750	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2 0.0787	**15.8** 0.622	NRO.B2x15,8G2	**0.390** 0.860	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2 0.0787	**17.8** 0.701	NRO.B2x17,8G2	**0.440** 0.970	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2 0.0787	**19.8** 0.780	NRO.B2x19,8G2	**0.490** 1.080	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2 0.0787	**21.8** 0.858	NRO.B2x21,8G2	**0.540** 1.190	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**7.8** 0.307	NRO.B2,5x7,8G2	**0.300** 0.661	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**9.8** 0.386	NRO.B2,5x9,8G2	**0.380** 0.838	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**11.8** 0.465	NRO.B2,5x11,8G2	**0.450** 0.992	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**13.8** 0.543	NRO.B2,5x13,8G2	**0.530** 1.168	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**15.8** 0.622	NRO.B2,5x15,8G2	**0.610** 1.345	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**17.8** 0.701	NRO.B2,5x17,8G2	**0.690** 1.521	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**19.8** 0.780	NRO.B2,5x19,8G2	**0.760** 1.676	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**21.8** 0.858	NRO.B2,5x21,8G2	**0.840** 1.852	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
2.5 0.0984	**23.8** 0.937	NRO.B2,5x23,8G2	**0.920** 2.028	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**9.8** 0.386	NRO.B3x9,8G2	**0.540** 1.190	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**11.8** 0.465	NRO.B3x11,8G2	**0.650** 1.433	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**13.8** 0.543	NRO.B3x13,8G2	**0.760** 1.676	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**15.8** 0.622	NRO.B3x15,8G2	**0.870** 1.918	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**17.8** 0.701	NRO.B3x17,8G2	**0.990** 2.183	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**19.8** 0.780	NRO.B3x19,8G2	**1.100** 2.425	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**21.8** 0.858	NRO.B3x21,8G2	**1.210** 2.668	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**23.8** 0.937	NRO.B3x23,8G2	**1.320** 2.910	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**25.8** 1.016	NRO.B3x25,8G2	**1.430** 3.153	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3 0.1181	**27.8** 1.094	NRO.B3x27,8G2	**1.540** 3.395	**0.2** 0.008	**0.6** 0.024	**0.8** 0.031
3.5 0.1378	**11.8** 0.465	NRO.B3,5x11,8G2	**0.910** 2.006	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
3.5 0.1378	**13.8** 0.543	NRO.B3,5x13,8G2	**1.040** 2.293	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
3.5 0.1378	**15.8** 0.622	NRO.B3,5x15,8G2	**1.190** 2.624	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
3.5 0.1378	**17.8** 0.701	NRO.B3,5x17,8G2	**1.340** 2.954	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
3.5 0.1378	**21.8** 0.858	NRO.B3,5x21,8G2	**1.640** 3.616	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
3.5 0.1378	**23.8** 0.937	NRO.B3,5x23,8G2	**1.850** 4.079	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
3.5 0.1378	**25.8** 1.016	NRO.B3,5x25,8G2	**1.950** 4.299	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
3.5 0.1378	**29.8** 1.173	NRO.B3,5x29,8G2	**2.250** 4.960	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
3.5 0.1378	**34.8** 1.370	NRO.B3,5x34,8G2	**2.650** 5.842	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**11.8** 0.465	NRO.B4x11,8G2	**1.600** 3.527	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**13.8** 0.543	NRO.B4x13,8G2	**1.360** 2.998	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**15.8** 0.622	NRO.B4x15,8G2	**1.550** 3.417	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**17.8** 0.701	NRO.B4x17,8G2	**1.750** 3.858	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**19.8** 0.780	NRO.B4x19,8G2	**1.950** 4.299	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**21.8** 0.858	NRO.B4x21,8G2	**2.150** 4.740	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**23.8** 0.937	NRO.B4x23,8G2	**2.350** 5.181	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**25.8** 1.016	NRO.B4x25,8G2	**2.550** 5.622	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**27.8** 1.094	NRO.B4x27,8G2	**2.740** 6.041	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**29.8** 1.173	NRO.B4x29,8G2	**2.950** 6.504	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**34.8** 1.370	NRO.B4x34,8G2	**3.400** 7.496	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
4 0.1575	**39.8** 1.567	NRO.B4x39,8G2	**3.900** 8.598	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**15.8** 0.622	NRO.B5x15,8G2	**2.430** 5.357	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**19.8** 0.780	NRO.B5x19,8G2	**3.050** 6.724	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**21.8** 0.858	NRO.B5x21,8G2	**3.360** 7.408	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**23.8** 0.937	NRO.B5x23,8G2	**3.670** 8.091	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**25.8** 1.016	NRO.B5x25,8G2	**3.980** 8.774	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**27.8** 1.094	NRO.B5x27,8G2	**4.290** 9.458	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**29.8** 1.173	NRO.B5x29,8G2	**4.600** 10.141	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**34.8** 1.370	NRO.B5x34,8G2	**5.400** 11.905	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**39.8** 1.567	NRO.B5x39,8G2	**6.150** 13.558	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
5 0.1969	**49.8** 1.961	NRO.B5x49,8G2	**7.500** 16.535	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039
6 0.2362	**17.8** 0.701	NRO.B6x17,8G2	**3.950** 8.708	**0.3** 0.012	**0.8** 0.031	**1.0** 0.039

END FORM TOLERANCES

Table B8-3 specifies the applicable end configuration for rounded end and flat end needle rollers of all grades.

Table B8-3. End configuration limits for metric needle rollers

Rounded End Needle Rollers End Radius R_w[1]		Nominal Diameters of Needle Roller D_w		Flat End Needle Rollers Chamfer Dimension Limits (Dimensions in millimeters)		
				$r_{s\ min.}$[1]	$r_{s\ max.}$	
Min.	Max.	>	≤		Radial	Axial
$\frac{D_w}{2}$	$\frac{L_w}{2}$	—	1	0.1	0.6	0.8
		1	1.5	0.1	0.6	0.8
		1.5	3	0.2	0.6	0.8
		3	6	0.3	0.8	1

[1] The chamfer of a needle roller shall clear a fillet radius equal to $r_{s\ min.}$, which should also be considered for designs using rounded end needle rollers.

NEEDLE ROLLER LENGTH TOLERANCE

Tolerances on the length L_w for needle rollers of all grades: h13, see Table B8-4.

Table B8-4. Tolerances for needle roller length, nominal metric needle rollers

Nominal Length, L_w mm		Tolerance Limits mm (ISO h13)	
>	≤	Max.	Min.
3	6	0	-0.18
6	10	0	-0.22
10	18	0	-0.27
18	30	0	-0.33
30	50	0	-0.39

DESIGN CALCULATIONS FOR NEEDLE ROLLER BEARING COMPLEMENTS

In the majority of full complement needle roller applications, needle roller complements of less than 35 needle rollers per row and a ratio of length to diameter between 4:1 and 8:1, is advantageous. Other combinations of quantity and length-to-diameter ratios of needle rollers have been used successfully. Specific design requirements usually dictate the appropriate selection.

In general, needle roller complements for rotating motion should employ a smaller number of large diameter needle rollers, while needle roller complements subjected to oscillating motion (especially under high loads) should employ a large number of smaller diameter needle rollers.

Oscillating applications with small angular travel encourage the development of fretting corrosion. The best performance under these conditions has been achieved by using the largest practical number of small diameter needle rollers.

CALCULATION OF RACEWAY DIAMETERS

The calculation of inner and outer raceway diameters may be carried out using either the formula given in Table B8-5 on page B-8-8 or the raceway calculation form in Table B8-6 on page B-8-8. To assist the designer in making these calculations, the values of K, required for calculation of needle roller complements of six through 60 needle rollers, are listed in Table B8-7 on page B-8-8. Values of K, for other numbers of needle rollers, can be calculated using the formulas given in Table B8-5 on page B-8-8.

Table B8-8 on page B-8-9 lists the suggested values for minimum radial internal clearance ($G_{r\ min.}$) and the minimum circumferential clearance divided by π ($cc_{\ min.}/\pi$), to be used for calculating needle roller complements for normal rotating applications – where the speeds, loads and shaft deflections are moderate.

Applications with poor lubrication, unusual motion, large misalignment, raceway distortions, load reversals, high speeds, etc., cannot be characterized as normal rotating applications. These miscellaneous applications require adjustment of the minimum clearances, listed in Table B8-8 on page B-8-10. The factors in Table B8-9 on page B-8-10 may be used for general guidance in the adjustment of minimal clearances. For any of the listed miscellaneous applications or any application where abnormal factors such as those listed above exist, and particularly when the inner raceway diameter will exceed 50.000 mm (1.9685 in), consult your representative for design assistance.

Table B8-5. Design factors for needle rollers

Z	Number of needle rollers per bearing path
K	Chordal factor, K = 1/sin (180°/Z)
cc	Total circumferential clearance. See Tables B8-8 and B8-9 on page B-8-9 for cc_{min}/π values.
G_r	Radial internal clearance. See Tables B8-8 and B8-9 on page B-8-9 for $G_{r\,min}$ values
D_{pw}	Pitch diameter: $D_{pw} = KD_{w\,max.} + (cc_{min.}/\pi) = E_{min.} - D_{w\,max.}$ $= F_{max.} + G_{r\,min.} + D_{w\,max.}$
E	Outer raceway bore diameter: $E_{min.} = D_{pw} + D_{w\,max.} = (K+1)D_{w\,max.} + (cc_{min.}/\pi)$ $= F_{max.} + G_{r\,min.} + 2D_{w\,max.}$
F	Inner raceway diameter: $F_{max.} = D_{pw} - D_{w\,max.} - G_{r\,min.}$ $= (K-1)D_{w\,max.} + (cc_{min.}/\pi) - G_{r\,min.}$ $= E_{min.} - 2D_{w\,max.} - G_{r\,min.}$
D_w	Nominal needle roller diameter
D_{we}	Needle roller diameter applicable in the calculation of load ratings: $D_{we} = D_{pw} - F_{max.} - G_{r\,min.} = \frac{D_{pw} - cc_{min.}/\pi}{K}$ $= \frac{F_{max.} + G_{r\,min.} - (cc_{min.}/\pi)}{(K-1)}$ $= E_{min.} - D_{pw} = \frac{E_{min.} - cc_{min.}/\pi}{(K+1)}$
L_w	Overall needle roller length
R_w	End radius, rounded-end needle roller
r_s	Corner rounding, flat-end needle roller
L_{we}	Needle roller length applicable in the calculation of load ratings, for rounded-end needle rollers: $L_{we} = L_{w\,max.} - (L_{w\,max.} - \sqrt{L_{w\,max.}^2 - D_{we}^2})$ For flat-end needle rollers: $L_{we} = L_{w\,max.} - (2r_{s\,min.})$

Note: If length of contact of the needle roller with the raceway is reduced because of undercuts, chamfers, etc. — L_{we} must be reduced correspondingly

RACEWAY DIAMETER TOLERANCES

Tables B8-10 and B8-11 on page B-8-9 lists the recommended tolerances that should be applied to the dimensions for the maximum inner raceway and minimum outer raceway diameter after they have been calculated using the information given in Table B8-5 or Table B8-6.

Table B8-6. Raceway calculation form

Step	Source	Design factor	**mm** (in)
1	Given	Dw, needle roller diameter	**3.000** max. (0.1181 max.)
2	Table B8-7	K, for 30 needle rollers	**9.56677**
3	(1)×(2)	KD_w	**28.700** (1.1299)
4	Table B8-8 on page B-8-11	cc_{min}/π = 0.127 mm (0.005 in)	**0.127** min. (0.005 min.)
5	(3) + (4)	Dpw pitch diameter	**28.827** (1.1349)
6	Given	Dw, needle roller diameter	**3.000** max. (0.1181 max.)
7	(5) - (6)		**25.827** (1.0168)
8	Table B8-8 on page B-8-11	Gr, radial clearance	**0.013** min. (0.0005 min.)
9	(7) - (8)	F, inner raceway diameter	**25.814** max. (1.0163 max.) **25.805** min.(1) (1.0159 min.)
10	(5) + (6)	E, outer raceway diameter	**31.827** min. (1.2530 min.) **31.843** max.(1) (1.2536 max.)

(1) Tolerance from Tables B8-10 and B8-11 on page B-8-9.

Table B8-7. K values

K values		K values		K values		K values		K values		K values	
Z	K	Z	K	Z	K	Z	K	Z	K	Z	K
6	2.00000	16	5.12583	26	8.29623	36	11.47371	46	14.65364	56	17.86471
7	2.30476	17	5.44219	27	8.61379	37	11.79163	47	14.97171	57	18.15285
8	2.61313	18	5.75877	28	8.93140	38	12.10957	48	15.28979	58	18.47100
9	2.92380	19	6.07553	29	9.24907	39	12.42752	49	15.60788	59	18.78916
10	3.23607	20	6.39245	30	9.56677	40	12.74549	50	15.92597	60	19.10732
11	3.54947	21	6.70951	31	9.88452	41	13.06348	51	16.24408		
12	3.86370	22	7.02667	32	10.20230	42	13.38149	52	16.56219		
13	4.17858	23	7.34394	33	10.52011	43	13.69951	53	16.88031		
14	4.49396	24	7.66130	34	10.83795	44	14.01754	54	17.19843		
15	4.80973	25	7.97873	35	11.15582	45	14.33559	55	17.51657		

CLEARANCES IN NEEDLE ROLLER COMPLEMENTS

Needle rollers, supplied in bulk, are generally used for full complement assemblies. Successful operation of a full complement of needle rollers not only requires careful selection of radial internal clearance, but more importantly, depends on proper circumferential clearance – or the total clearance between needle rollers.

Needle roller guidance, in a full complement assembly, depends largely on contact between needle rollers. Too little circumferential clearance causes overheating. Too much circumferential clearance in a heavily loaded full complement of needle rollers causes loss of needle roller guidance and results in needle roller skew and resultant end thrusting.

Control of radial clearance and circumferential clearance is influenced by the needle roller diameter tolerance, as well as the tolerances of the inner and outer raceway diameters.

Table B8-8. Minimum clearances, normal rotating applications

F Nominal Inner Raceway Diameter **mm** in		$CC_{min.}/\pi$	$G_{r\,min.}$
>	≤	**mm** in	**mm** in
- -	**3** 0.1181	**0.025** 0.0010	**0.006** 0.0002
3 0.1181	**6** 0.2362	**0.102** 0.0040	**0.008** 0.0003
6 0.2362	**10** 0.3937	**0.127** 0.0050	**0.009** 0.0004
10 0.3937	**18** 0.7087	**0.127** 0.0050	**0.011** 0.0004
18 0.7087	**30** 1.1811	**0.127** 0.0050	**0.013** 0.0005
30 1.1811	**50** 1.9685	**0.127** 0.0050	**0.016** 0.0006
50 1.9685	**80** 3.1496	**0.127** 0.0050	**0.019** 0.0007
80 3.1496	**120** 4.7244	**0.127** 0.0050	**0.022** 0.0009

Table B8-9. Minimum clearances, miscellaneous applications

Application	$cc_{min.}/\pi$	$G_{r\,min.}$
universal joint	1/3 • normal	1/2 • normal
transmission pilot	normal	3 • normal
constant mesh gear	0.2 • roller dia.	normal
transmission planet	normal	normal
crank pin for two cycle engine	5 • normal	7 • normal

END CLEARANCE

The total needle roller end clearance, or endplay, normally should be 0.20 mm (0.008 in) minimum per path of needle rollers.

Table B8-10. Recommended inner raceway diameter tolerances

F Nominal Inner Raceway Diameter **mm** in		Tolerance Limits (ISO h5) **mm** in	
>	≤	Max.	Min.
3 0.1181	**6** 0.2362	**0** 0	**-0.005** -0.0002
6 0.2362	**10** 0.3937	**0** 0	**-0.006** -0.0002
10 0.3937	**18** 0.7087	**0** 0	**-0.008** -0.0003
18 0.7087	**30** 1.1811	**0** 0	**-0.009** -0.0004
30 1.1811	**50** 1.9685	**0** 0	**-0.011** -0.0004
50 1.9685	**80** 3.1496	**0** 0	**-0.013** -0.0005
80 3.1496	**120** 4.7244	**0** 0	**-0.015** -0.0006

Table B8-11. Recommended outer raceway bore diameter tolerances

E Nominal Outer Raceway Bore Diameter **mm** in		Tolerance Limits (ISO H6) **mm** in	
>	≤	Max.	Min.
3 0.1181	**6** 0.2362	**0.008** 0.0003	**0** 0
6 0.2362	**10** 0.3937	**0.009** 0.0004	**0** 0
10 0.3937	**18** 0.7087	**0.011** 0.0004	**0** 0
18 0.7087	**30** 1.1811	**0.013** 0.0005	**0** 0
30 1.1811	**50** 1.9685	**0.016** 0.0006	**0** 0
50 1.9685	**80** 3.1496	**0.019** 0.0007	**0** 0
80 3.1496	**120** 4.7244	**0.022** 0.0009	**0** 0

LOAD RATING AND LIFE CALCULATIONS FOR FULL COMPLEMENTS OF NEEDLE ROLLERS

Before selecting the quantity and size of needle rollers to be used in a needle roller complement, it is usually necessary to calculate the load rating required using the applied load, speed and desired life. For a review of bearing size selection, see the engineering section of the this catalog.

Because it is not practical to tabulate the dynamic and static load ratings for the great number of needle roller complements that can be assembled by using different quantities, diameters and lengths of rollers, formulae are provided for the necessary calculations. See Tables B8-3 and B8-4 on page B-8-7 and Table B8-5 on page B-8-8 for calculation of Lwe.

For convenience, values of f_c and values of $Z^{3/4}$ have been combined into single factors ($f_c Z^{3/4}$). These factors, for a wide range of roller complements, are tabulated in Table B8-12.

Table B8-12. Values of fc $Z^{3/4}$ for metric units

Z	$f_c Z^{3/4}$ kN - units	
	mm	in
6	**0.267**	0.0105
7	**0.336**	0.0132
8	**0.400**	0.0158
9	**0.459**	0.0181
10	**0.514**	0.0202
11	**0.565**	0.0222
12	**0.613**	0.0241
13	**0.658**	0.0259
14	**0.701**	0.0276
15	**0.742**	0.0292
16	**0.781**	0.0308
17	**0.818**	0.0322
18	**0.853**	0.0336
19	**0.887**	0.0349
20	**0.919**	0.0362
21	**0.951**	0.0374
22	**0.981**	0.0386
23	**1.011**	0.0398
24	**1.039**	0.0409
25	**1.067**	0.0420
26	**1.094**	0.0430
27	**1.120**	0.0441
28	**1.145**	0.0451
29	**1.170**	0.0461
30	**1.195**	0.0471
31	**1.219**	0.0480
32	**1.242**	0.0489
33	**1.265**	0.0498
34	**1.288**	0.0507
35	**1.310**	0.0516
36	**1.331**	0.0524
37	**1.353**	0.0533
38	**1.374**	0.0541
39	**1.394**	0.0549
40	**1.415**	0.0557
41	**1.435**	0.0565
42	**1.454**	0.0572
43	**1.474**	0.0580
44	**1.493**	0.0588
45	**1.512**	0.0595
46	**1.531**	0.0603
47	**1.549**	0.0610
48	**1.568**	0.0617
49	**1.586**	0.0624
50	**1.604**	0.0632
51	**1.621**	0.0638
52	**1.639**	0.0645
53	**1.656**	0.0652
54	**1.673**	0.0659
55	**1.690**	0.0665
56	**1.707**	0.0672
57	**1.724**	0.0679
58	**1.740**	0.0685
59	**1.757**	0.0692
60	**1.773**	0.0698

BASIC DYNAMIC LOAD RATINGS

The basic dynamic load rating C, for any roller bearing, can be calculated from the formula:

$$C = f_c(iL_{we}\cos\alpha)^{7/9} Z^{3/4} D_{we}^{29/27}$$

Where:

f_c = a factor which depends on the geometry of the bearing components, the accuracy to which the various components are made, and the material. Maximum values are listed in such standards as ISO 281 and USA ANSI-ABMA Standard 11.

i = number of rows of rollers in any one bearing.

α = nominal angle of contact. Since $\alpha = 0$ for a radial roller bearing, $\cos\alpha = 1$.

Other symbols are explained in Table B8-5 on page B-8-8.

For single-path radial roller bearings, where $i = 1$ and $\cos\alpha = 1$, the basic dynamic load rating formula can be written as:

$$C = f_c Z^{3/4} L_{we}^{7/9} D_{we}^{29/27}$$

Example:

Calculate the basic dynamic load rating for a full complement of 28 flat-end rollers, 3.000 mm (0.1181 in) diameter and 17.800 mm (0.7008 in) length.

$$C = f_c Z^{3/4} L_{we}^{7/9} D_{we}^{29/27}$$

$f_c Z^{3/4}$ from Table B8-12 on page B-8-12 = 1.145

$$D_{we}^{29/27} = 3^{29/27} = 3.254$$

L_{we} = 17.8- 0.4 = 17.4 mm (see Table B8-5 on page B-8-8)

$$L_{we}^{7/9} = 17.4^{7/9} = 9.223$$

$$C = 1.145 \times 9.223 \times 3.254 = 34.4 \text{ kN}$$

When a couple load (overturning moment) is imposed on a single row of needle rollers, the resulting uneven distribution of load can seriously affect bearing life. In such cases, two rows of needle rollers are generally suggested.

Your representative should be consulted before a final selection of a needle roller complement is made.

BASIC STATIC LOAD RATING

The basic static load rating (C_0) for any roller bearing, including needle roller bearings, can be calculated from the following formula included in ISO 76, USA ANSI-ABMA Standard 11, and other Standards:

$$C_o = f_0\left(1 - \frac{D_{we}\cos\alpha}{D_{pw}}\right) iZL_{we}D_{we}\cos\alpha$$

Where:

f_0 = 0.044 when kilo-newton and millimeter units are used.

D_{pw} = pitch diameter of the needle roller complement (mm).

i = number of rows of rollers in any one bearing.

α = nominal angle of contact. Since $\alpha = 0$ for radial roller bearing, $\cos\alpha = 1$.

The other symbols are described in Table B8-5 on page B-8-8.

NEEDLE ROLLERS – INCH SERIES

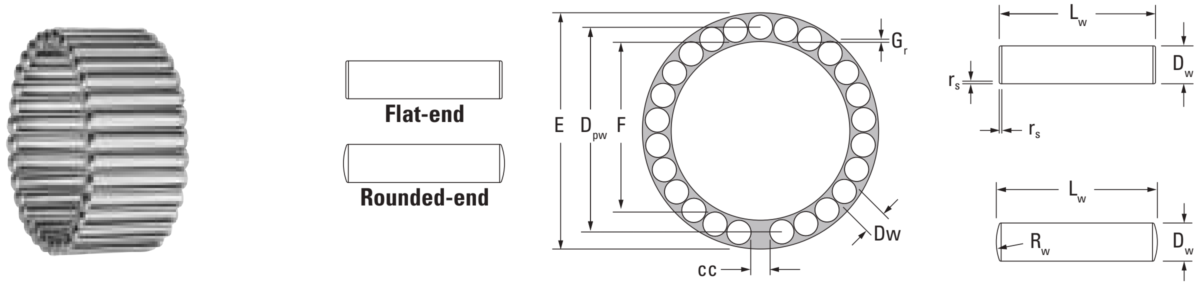


Fig. B8-2. Inch series needle rollers

INTRODUCTION

Before selecting a specific needle roller complement, the engineering section should be reviewed for detailed information concerning:

- Bearing type selection.
- Bearing life and reliability.
- Definition of load ratings.
- Life and load relationships.
- Effect of raceway hardness.
- Example of life calculation.
- Lubrication.
- Shaft design.
- Housing design.

In addition to these general considerations, material which follows should also be reviewed when selecting a needle roller complement.

Standard inch series needle rollers are furnished in two styles – rounded-end or the most economical design: flat-end. Materials, dimensions and tolerances for standard needle rollers are specified in this section.

When required, needle rollers having spherical ends, conical ends, trunnion ends or crank pin ends, as well as other end designs, can be furnished. Your representative should be consulted before final needle roller selection is made.

INCH SERIES – NEEDLE ROLLER DIMENSIONS

Needle rollers are made from rolling-bearing-quality steel hardened to 60-64 HRC or equivalent. Nominally inch needle rollers are given in Table B8-13. Your representative should be consulted for availability. The symbols used in Tables B8-13, as well as in subsequent tables and figures, are summarized in Table B8-14 on page B-8-14.

Needle rollers with rounded-ends permit the use of a more generous fillet between the raceway and the locating shoulder than is possible with flat-end rollers. Also, due to the length of the rounded-end, the possibility of the roller's cylindrical surface operating over the edge of the raceway is less – reducing the chance of occurrence of harmful stress concentrations. On the other hand, where design considerations permit their use, flat-end rollers achieve the maximum possible effective contact length between roller and raceway along with maximum load ratings and longer life.

Table B8-13. Preferred needle roller sizes

D_w	L_w																						
Nominal dia.	Nominal length																						
mm in	**3.048** 0.12	**4.064** 0.16	**4.826** 0.19	**5.588** 0.22	**6.350** 0.25	**7.112** 0.28	**7.874** 0.31	**9.652** 0.38	**11.176** 0.44	**12.700** 0.5	**14.224** 0.56	**15.748** 0.62	**19.050** 0.75	**22.352** 0.88	**25.400** 1	**28.448** 1.12	**31.750** 1.25	**35.052** 1.38	**38.100** 1.5	**44.450** 1.75	**50.800** 2	**57.150** 2.25	**63.500** 2.5
1.588 0.0625					•	•	•	•	•	•	•	•	•										
1.984 0.0781							•	•	•	•	•	•	•	•									
2.383 0.0938								•	•	•	•	•	•	•	•								
3.175 0.1250										•	•	•	•	•	•	•	•	•					
3.967 0.1562												•	•	•	•	•	•	•	•				
4.763 0.1875													•	•	•	•	•	•	•	•			
5.558 0.2188														•	•	•	•	•	•	•	•		
6.350 0.2500															•	•	•	•	•	•	•	•	•

• Indicates preferred needle roller sizes. Consult with your representative.

CLEARANCES IN NEEDLE ROLLER COMPLEMENTS

Needle rollers, supplied in bulk, are generally used to assemble full complement bearings. Successful operation of a full complement of rollers not only requires careful selection of radial clearance, but more importantly, depends on proper circumferential clearance – or the total clearance between rollers.

Circumferential guidance in a full complement of needle rollers depends largely on roller-to-roller contact. Too little circumferential clearance causes overheating. Too much circumferential clearance, in a heavily loaded full complement of needle rollers, causes loss of roller guidance and results in roller skew and heavy end thrust.

Control of radial clearance and circumferential clearance is influenced by the roller diameter tolerance, as well as the tolerances of the inner and outer raceway diameters.

END CLEARANCE

The total needle roller end clearance, or endplay, normally should be 0.20 mm (0.008 in) minimum per path of needle rollers.

NOMINAL-INCH NEEDLE ROLLER TOLERANCES

Unless otherwise specified, inch needle rollers are normally manufactured with a tolerance of +0.000 mm -0.005 mm (+0.0000 in -0.0002 in). This tolerance has proven acceptable and ensures satisfactory control of circumferential clearance. The needle roller length tolerance may vary with the end configuration. The normal roller length tolerance for rounded-end rollers is +0.000 mm -0.508 mm (+0.0000 in -0.0200 in) .

JTEKT also manufactures needle rollers with 0.0025 mm (0.0001 in) diameter tolerance. These offer enhanced load-carrying capability and improved control of circumferential clearance. For needle rollers of greater precision, please consult with your representative.

Nominal dimensions for typical inch series needle rollers are shown in Table B8-13 on page B-8-12. JTEKT can supply rollers with smaller and larger length-to-diameter ratios for special applications. Rollers with dimensions other than those shown in Table B8-13 on page B-8-12 can be obtained, provided the quantities permit economical production. For example, although the largest needle rollers shown in Table B8-13 on page B-8-12 are 6.35 mm (0.2500 in) [the usual limits for needle rollers], JTEKT can produce quantities of rollers as large as 15.900 mm (0.6250 in) diameter.

Your representative should be contacted with the following information about the required needle rollers:

- Nominal metric or inch.
- Diameter and tolerance (e.g., 3.175 mm, + 0.000 mm, -0.005 mm [0.1250 in, + 0.0000 in, -0.0002 in]).
- Length and tolerance (e.g., 14.224 mm, + 0.000 mm, -0.508 mm [0.5600 in, + 0.0000 in, -0.0200 in]).
- End form (e.g., rounded-end or flat-end).
- Material (e.g., high-carbon chrome steel).
- Special features required (e.g., controlled stress).
- Quantity required.

DESIGN CALCULATIONS FOR NEEDLE ROLLER BEARING COMPLEMENTS

In the majority of full complement needle roller applications, roller complements of less than 35 needle rollers per row and a ratio of roller length to roller diameter between 8:1 and 4:1 is advantageous. Other combinations of quantity and length-to-diameter ratios of needle rollers have been used successfully. Specific design requirements usually dictate the appropriate selection.

In general, roller complements for rotating motion should employ a smaller number of larger-diameter needle rollers, while roller complements subjected to oscillating motion (especially under high loads) should employ a larger number of smaller-diameter needle rollers.

Oscillating applications with small angular travel encourage the development of fretting corrosion. The best performance under these conditions has been achieved by using the largest practical number of small-diameter needle rollers.

CALCULATION OF RACEWAY DIAMETERS

It may be convenient to use the Bearing Calculation Form in Table B8-15 on page B-8-14 to calculate the maximum inner raceway and the minimum outer raceway diameters of a bearing. The formula given in Table B8-14 on page B-8-14 can also be used. To assist the designer in making these calculations, the values of K, required for calculation of needle roller complements of 6 through 60 needle rollers, are listed in Table B8-18 on page B-8-15. Values of K for other numbers of needle rollers will be furnished on request or can be calculated from the formula given in Table B8-14 on page B-8-14.

Table B8-16 on page B-8-14 lists the suggested values for minimum radial clearance and ($G_{r\ min.}$) minimum circumferential clearance divided by π ($cc_{min./\pi}$), to be used for calculating needle roller complements for normal rotating applications where the speeds, loads and shaft deflections are moderate.

Applications with poor lubrication, unusual motion, large misalignment, raceway distortions, load reversals, high speeds, etc., can not be characterized as normal rotating applications. These miscellaneous applications require adjustment of the minimum clearances listed in Table B8-16 on page B-8-14. The factors in Tables B8-17 on page B-8-14 may be used for general guidance in the adjustment of the minimal clearances. For any of the listed miscellaneous applications or any application where abnormal factors such as those listed above exist – and particularly when the inner raceway diameter will exceed 50.800 mm (2.0000 in) – your representative should be consulted for design assistance.

Table B8-14. Design factors for needle rollers

Z	Number of needle rollers per bearing path
K	Chordal factor, $K = 1/\sin(180°/Z)$
cc	Total circumferential clearance. See Tables B8-16 and B8-17 for $cc_{min.}/\pi$ values.
G_r	Radial internal clearance. See Tables B8-16 and B8-17 for $G_{r\,min.}$ values
D_{pw}	Pitch diameter: $D_{pw} = KD_{w\,max.} + (cc_{min.}/\pi) = E_{min.} - D_{w\,max.}$ $= F_{max.} + G_{r\,min.} + D_{w\,max.}$
E	Outer raceway bore diameter: $E_{min.} = D_{pw} + D_{w\,max.} = (K+1)D_{w\,max.} + (cc_{min.}/\pi)$ $= F_{max.} + G_{r\,min.} + 2D_{w\,max.}$
F	Inner raceway diameter: $F_{max.} = D_{pw} - D_{w\,max.} - G_{r\,min.}$ $= (K-1)\,D_{w\,max.} + (cc_{min.}/\pi) - G_{r\,min.}$ $= E_{min.} - 2D_{w\,max.} - G_{r\,min.}$
D_w	Nominal needle roller diameter
D_{we}	Needle roller diameter applicable in the calculation of load ratings: $D_{we} = D_{pw} - F_{max.} - G_{r\,min.} = \dfrac{D_{pw} - cc_{min.}/\pi}{K}$ $= \dfrac{F_{max.} + G_{r\,min.} - (cc_{min.}/\pi)}{(K-1)}$ $= E_{min.} - D_{pw} = \dfrac{E_{min.} - cc_{min.}/\pi}{(K+1)}$
L_w	Overall needle roller length
R_w	End radius, rounded-end needle roller
r_s	Corner rounding, flat-end needle roller
L_{we}	Needle roller length applicable in the calculation of load ratings, for rounded-end needle rollers: $L_{we} = L_{w\,max.} - (0.4D_{we})$ For flat-end needle rollers: $L_{we} = L_{w\,max.} - (2r_{s\,min.})$

Note: If length of contact of the needle roller with the raceway is reduced because of undercuts, chamfers, etc. – L_{we} must be reduced correspondingly.

RACEWAY DIAMETER TOLERANCE LIMITS

Tables B8-19 and B8-20 on page B-8-15 lists the recommended tolerances that should be applied to the dimensions for the maximum inner raceway and the minimum outer raceway diameter after they have been calculated using the Bearing Calculation Form, Table B8-15.

Table B8-15. Bearing calculation form

Step	Source	Design factor	mm (in)	
1	Given	D_w, roller diameter	**3.175** (0.1250) max.	Min.
2	Table B8-18	K, for 30 rollers	**9.56677**	
3	(1)×(2)	KD_w	**30.374** (1.1958)	
4	Table B8-16	cc_{min}/π = 0.127 mm (0.005 in)	**0.127** (0.005) min.	Max.
5	(3) + (4)	D_{pw}, pitch diameter	**30.501** (1.2008)	
6	Given	D_w, roller diameter	**3.175** (0.1250) max.	Min.
7	(5) - (6)		**27.326** (1.0758)	
8	Table B8-16	G_r, radial clearance	**0.013** (0.0005) min.	Max.
9	(7) - (8)	F, inner raceway diameter	**27.349** (1.0753) max.	**27.340** (1.0749) min.(1)
10	(5) + (6)	E, outer raceway diameter	**33.676** (1.3258) min.	**33.692** (1.3264) max.(1)

(1) From Tables B8-19 and B8-20 on page B-8-15.

Table B8-16. Minimum clearances, normal rotating applications

F Nominal Inner Raceway Diameter mm **in**		$CC_{min.}/\pi$	$G_{r\,min.}$
>	≤	mm **in**	mm **in**
- **-**	3 **0.1181**	0.025 **0.0010**	0.006 **0.0002**
3 **0.1181**	6 **0.2362**	0.102 **0.0040**	0.008 **0.0003**
6 **0.2362**	10 **0.3937**	0.127 **0.0050**	0.009 **0.0004**
10 **0.3937**	18 **0.7087**	0.127 **0.0050**	0.011 **0.0004**
18 **0.7087**	30 **1.1811**	0.127 **0.0050**	0.013 **0.0005**
30 **1.1811**	50 **1.9685**	0.127 **0.0050**	0.016 **0.0006**
50 **1.9685**	80 **3.1496**	0.127 **0.0050**	0.019 **0.0007**
80 **3.1496**	120 **4.7244**	0.127 **0.0050**	0.022 **0.0009**

Table B8-17. Minimum clearances, miscellaneous applications

Application	$cc_{min.}/\pi$	$G_{r\,min.}$
universal joint	1/3 • normal	1/2 • normal
transmission pilot	normal	3 • normal
constant mesh gear	0.2 • roller dia.	normal
transmission planet	normal	normal
crank pin for two cycle engine	5 • normal	7 • normal

Table B8-18. K values

Z	K	Z	K	Z	K	Z	K
6	2.00000	21	6.70951	36	11.47371	51	16.24408
7	2.30476	22	7.02667	37	11.79163	52	16.56219
8	2.61313	23	7.34394	38	12.10957	53	16.88031
9	2.92380	24	7.66130	39	12.42752	54	17.19843
10	3.23607	25	7.97873	40	12.74549	55	17.51657
11	3.54947	26	8.29623	41	13.06348	56	17.83471
12	3.86370	27	8.61379	42	13.38149	57	18.15285
13	4.17858	28	8.93140	43	13.69951	58	18.47100
14	4.49396	29	9.24907	44	14.01754	59	18.78916
15	4.80973	30	9.56677	45	14.33559	60	19.10732
16	5.12583	31	9.88452	46	14.65364		
17	5.44219	32	10.20230	47	14.97171		
18	5.75877	33	10.52011	48	15.28979		
19	6.07553	34	10.83795	49	15.60788		
20	6.39245	35	11.15582	50	15.92597		

Table B8-19. Recommended inner raceway diameter tolerances

F Nominal Inner Raceway Diameter mm **in**		Tolerance Limits (ISO h5) mm **in**	
>	≤	Max.	Min.
3 **0.1181**	6 **0.2362**	0 **0**	-0.005 **-0.0002**
6 **0.2362**	10 **0.3937**	0 **0**	-0.006 **-0.0002**
10 **0.3937**	18 **0.7087**	0 **0**	-0.008 **-0.0003**
18 **0.7087**	30 **1.1811**	0 **0**	-0.009 **-0.0004**
30 **1.1811**	50 **1.9685**	0 **0**	-0.011 **-0.0004**
50 **1.9685**	80 **3.1496**	0 **0**	-0.013 **-0.0005**
80 **3.1496**	120 **4.7244**	0 **0**	-0.015 **-0.0006**

Table B8-20. Recommended outer raceway bore diameter tolerances

E Nominal Outer Raceway Bore Diameter mm **in**		Tolerance Limits (ISO H6) mm **in**	
>	≤	Max.	Min.
3 **0.1181**	6 **0.2362**	0.008 **0.0003**	0 **0**
6 **0.2362**	10 **0.3937**	0.009 **0.0004**	0 **0**
10 **0.3937**	18 **0.7087**	0.011 **0.0004**	0 **0**
18 **0.7087**	30 **1.1811**	0.013 **0.0005**	0 **0**
30 **1.1811**	50 **1.9685**	0.016 **0.0006**	0 **0**
50 **1.9685**	80 **3.1496**	0.019 **0.0007**	0 **0**
80 **3.1496**	120 **4.7244**	0.022 **0.0009**	0 **0**

KEYSTONED ROLLER ASSEMBLIES

Retention of the rollers in the outer raceway by keystoning can be helpful in assembly operations. The following formula may be used to check the bearing design to be sure that a given number of rollers, Z, will keystone.

$$YD_{w\,min.} > E_{max.} = \text{keystone condition}$$

That is, the product of the keystone constant Y, given below, and the minimum roller diameter $D_{w\,min.}$, must be greater than the maximum outer race bore, $E_{max.}$.

Roller complements with 14 or more rollers usually will not keystone unless steps are taken to reduce the circumferential clearance. It is suggested that your representative be consulted when designing a keystoned roller complement with 14 or more rollers.

Table B8-21. Keystone constant

Z	Y	Z	Y
8	3.67633	14	5.51128
9	3.97094	15	5.82467
10	4.27277	16	6.13885
11	4.57895	17	6.45365
12	4.88797	18	6.76893
13	5.19892	19	7.08461

LOAD RATING AND LIFE CALCULATIONS FOR FULL COMPLEMENTS OF NEEDLE ROLLERS

Before selecting the quantity and size of needle rollers to be used in a needle roller complement, it is usually necessary to calculate the load rating required using the applied load, speed and desired life.

Since it is not practical to tabulate the dynamic and static load ratings for the great number of needle roller complements that can be assembled by using different quantities, diameters and lengths of rollers, formulae are provided for the necessary calculations.

For convenience, values of f_c and values of $Z^{3/4}$ have been combined into single factors ($f_c Z^{3/4}$). These factors for a wide range of needle roller complements are contained in Table B8-22.

Table B8-22. Values of $f_c Z^{3/4}$ for inch units

Z	$f_c Z^{3/4}$ lbf - units
	in
6	24000
7	30200
8	35900
9	41200
10	46100
11	50700
12	55100
13	59100
14	63000
15	66600
16	70100
17	73400
18	76600
19	79700
20	82600
21	85400
22	88100
23	90800
24	93300
25	95800
26	98200
27	100600
28	102900
29	105100
30	107300
31	109500
32	111600
33	113600
34	115600
35	117600
36	119600
37	121500
38	123400
39	125200
40	127100
41	128900
42	130600
43	132400
44	134100
45	135800
46	137500
47	139200
48	140800
49	142400
50	144000
51	145600
52	147200
53	148800
54	150300
55	151800
56	153300
57	154800
58	156300
59	157800
60	159200

BASIC DYNAMIC LOAD RATINGS

The basic dynamic load rating, C, for any roller bearing can be calculated from the formula:

$$C = f_c (i\, L_w \cos \alpha)^{7/9} Z^{3/4} D_w^{29/27}$$

Where:

f_c = a factor which depends on the geometry of the bearing components, the accuracy to which the various components are made, and the material. Maximum values are listed in such standards as ISO 281 and USA ANSI-ABMA Standard 11.

i = number of rows of needle rollers in any one bearing.

α = nominal angle of contact. Since $\alpha = 0$ for a radial needle roller bearing, $\cos \alpha = 1$.

Other symbols are explained in Table B8-14 on page B-8-14.

For single-path radial needle roller bearings, where i = 1 and cos α = 1, the basic dynamic load rating formula can be written as:

$$C_r = f_c Z^{3/4} L_{we}^{7/9} D_w^{29/27}$$

Example:

Calculate the basic dynamic load rating in lbf for a full complement of 28 rounded-end rollers, 0.1250 inch diameter and 0.750 inch length.

$$C = f_c Z^{3/4} L_{we}^{7/9} D_{we}^{29/27}$$

$f_c Z^{3/4}$ from Table B8-22 = 102900

Where:

$D_{we}^{29/27} = 0.1250^{29/27} = 0.1072$

$L_{we} = 0.750 - (0.4)\ 0.1250 = 0.700$ (see Table B8-14 on page B-8-14)

$L_{we}^{7/9} = 0.700^{7/9} = 0.758$

$C = 102900 \times 0.1072 \times 0.758 = 8360$ lbf

When a couple load (overturning moment) is imposed on a single row of needle rollers, the resulting uneven distribution of load can seriously affect bearing life. In such cases, two rows of needle rollers are generally suggested.

Your representative should be consulted before a final selection of a needle roller complement is made.

BASIC STATIC LOAD RATING

The basic static load rating (C_0) for any roller bearing, including needle roller bearings, can be calculated from the following formula included in ISO 76, USA ANSI-ABMA Standard 11 and other Standards:

$$C_o = f_0 \left(1 - \frac{D_{we} \cos \alpha}{D_{pw}}\right) i Z L_{we} D_{we} \cos \alpha$$

Where:

f_0 = 6430 when pound-force and inch units are used

D_{pw} = pitch diameter of the needle roller complement (inch).

i = number of rows of rollers in any one bearing.

α = nominal angle of contact. Since $\alpha = 0$ for radial roller bearing, $\cos \alpha = 1$.

The other symbols are described in Table B8-14 on page B-8-14.

CYLINDRICAL ROLLERS – METRIC SERIES

JTEKT cylindrical rollers are made from bearing-quality steel and hardened to 58-65 HRC or equivalent. Nominal metric cylindrical rollers are sorted into gages based on the mean deviation from nominal diameter and nominal length. The relieved ends of the cylindrical rollers, when used in bearing complements, help to reduce stress concentration at the ends of rollers, both under misalignment or ideal alignment. This results in a more uniform stress distribution along the roller-raceway contact length and optimum bearing performance.

METRIC SERIES CYLINDRICAL ROLLER DIMENSIONS

Nominally metric cylindrical rollers conforming to DIN 5402 sheet 1 are shown in Table B8-23. Chamfer dimension limits of these cylindrical rollers with flat-ends are also shown in Table B8-23. The use of these chamfer limits results in the maximum possible effective contact length between roller and raceway, along with the already mentioned relieved ends, producing the maximum possible load ratings and longer life.

Each cylindrical roller gage is packed separately, and the mean deviations of diameter and length gages are shown on the package (below the roller designation).

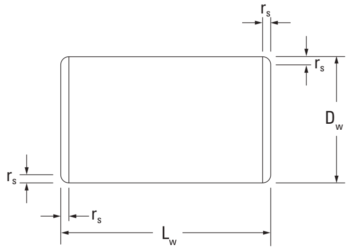


Fig. B8-3. Metric series cylindrical rollers

Table B8-23. Dimensions of metric series cylindrical rollers

D_w Nominal diameter	L_w Nominal length	$r_{s\,min.}$	$r_{s\,max.}$ (radial)	$r_{s\,max.}$ (axial)	Cylindrical roller designation	Wt. 100 pieces approx.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
3 0.1181	**5** 0.1969	**0.2** 0.0079	**0.4** 0.0158	**0.7** 0.0276	ZRO.3x5	**0.027** 0.060
3.5 0.1378	**5** 0.1969	**0.2** 0.0079	**0.4** 0.0158	**0.7** 0.0276	ZRO.3,5x5	**0.037** 0.082
4 0.1575	**4** 0.1575	**0.2** 0.0079	**0.4** 0.0158	**0.7** 0.0276	ZRO.4x4	**0.039** 0.086
4 0.1575	**6** 0.2362	**0.2** 0.0079	**0.4** 0.0158	**0.7** 0.0276	ZRO.4x6	**0.058** 0.128
4 0.1575	**8** 0.3150	**0.2** 0.0079	**0.4** 0.0158	**0.7** 0.0276	ZRO.4x8	**0.078** 0.172
5 0.1969	**5** 0.1969	**0.2** 0.0079	**0.6** 0.236	**0.7** 0.0276	ZRO.5x5	**0.075** 0.165
5 0.1969	**8** 0.3150	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.5x8	**0.121** 0.267
5.5 0.2165	**8** 0.3150	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.5,5x8	**0.146** 0.322
6 0.2362	**6** 0.2362	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.6x6	**0.13** 0.287
6 0.2362	**12** 0.4724	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.6x12	**0.261** 0.575
6.5 0.2559	**9** 0.3543	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.6,5x9	**0.23** 0.507
7 0.2756	**7** 0.2756	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.7x7	**0.206** 0.454
7 0.2756	**10** 0.3937	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.7x10	**0.296** 0.653
7 0.2756	**14** 0.5512	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.7x14	**0.417** 0.919
7.5 0.2953	**7.5** 0.2953	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.7,5x7.5	**0.254** 0.560
7.5 0.2953	**9** 0.3543	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.7,5x9	**0.312** 0.688
7.5 0.2953	**11** 0.4331	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.7,5x11	**0.374** 0.825
8 0.3150	**8** 0.3150	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.8x8	**0.308** 0.679
8 0.3150	**12** 0.4724	**0.2** 0.0079	**0.6** 0.0236	**0.7** 0.0276	ZRO.8x12	**0.465** 1.025
9 0.3543	**10** 0.3937	**0.3** 0.0118	**0.7** 0.0276	**1.0** 0.0394	ZRO.9x10	**0.5** 1.102
9 0.3543	**14** 0.5512	**0.3** 0.0118	**0.7** 0.0276	**1.0** 0.0394	ZRO.9x14	**0.68** 1.499
10 0.3937	**10** 0.3937	**0.3** 0.0118	**0.7** 0.0276	**1.0** 0.0394	ZRO.10x10	**0.6** 1.323
10 0.3937	**11** 0.4331	**0.3** 0.0118	**0.7** 0.0276	**1.0** 0.0394	ZRO.10x11	**0.68** 1.499
10 0.3937	**14** 0.5512	**0.3** 0.0118	**0.7** 0.0276	**1.0** 0.0394	ZRO.10x14	**0.85** 1.874
11 0.4331	**15** 0.5906	**0.3** 0.0118	**0.7** 0.0276	**1.0** 0.0394	ZRO.11x15	**1.1** 2.425
12 0.4724	**14** 0.5512	**0.3** 0.0118	**0.7** 0.0276	**1.0** 0.0394	ZRO.12x14	**1.23** 2.712
13 0.5118	**20** 0.7874	**0.4** 0.0158	**0.8** 0.0315	**1.2** 0.0472	ZRO.13x20	**2.04** 4.497
14 0.5512	**14** 0.5512	**0.4** 0.0158	**0.8** 0.0315	**1.2** 0.0472	ZRO.14x14	**1.66** 3.660
14 0.5512	**20** 0.7874	**0.4** 0.0158	**0.8** 0.0315	**1.2** 0.0472	ZRO.14x20	**2.38** 5.247

Note: Mass in accordance with DIN 5402.

EXAMPLE OF METRIC SERIES CYLINDRICAL ROLLER DESIGNATION AND PACKAGE MARKING:

ZRO.6 x 8
P0/M6
Nominal diameter: D_w = 6.000 mm
Nominal length: L_w = 8.000 mm
Mean deviation of the diameter +0.000 mm (see Table B8-24)
Mean deviation of the length -0.006 mm (see Table B8-25)
The actual finished diameter is between 5.999 and 6.001 mm
The actual finished length is between 7.991 and 7.997 mm

In the marking of the cylindrical roller gage, P identifies zero (0) or plus (+), M identifies minus (-). If a shipment of cylindrical rollers of the same size comprises several boxes, each box contains cylindrical rollers of the identical gage, although the gage may vary from box to box.

Table B8-24. Diameter and form accuracy of metric series cylindrical rollers

Nominal Diameter D_w		Total Diameter Deviation		Variation of Gage	Mean Deviation of Gage DIN/ISO 1101															Circularity Deviation
>	≤	Max.	Min.																	Max.
mm	mm	µm	µm	µm	µm															µm
—	20	+7	-9	2	+6	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6	-7	-8	0.8

Table B8-25. Length gages of metric series cylindrical rollers

Nominal Diameter L_w		Total Length Deviation		Variation of Gage	ean Deviation of Gage				Axial Runout DIN/ISO 1101
>	≤	Max.	Min.						
mm	mm	µm	µm	µm	µm				µm
—	48	+9	-15	6	+6	0	-6	-12	6

INNER RINGS – METRIC SERIES

When it is impractical to meet the shaft raceway design requirements (hardness, surface finish, case depth, etc.) outlined in the engineering section of this catalog, standard inner rings may be used.

Inner rings are made of rolling bearing steel and after hardening, their bores, raceways and end surfaces are ground. Metric series inner rings may be used to provide inner raceway surfaces for metric series radial needle roller and cage assemblies, metric series needle roller bearings and metric series drawn cup needle roller bearings. The extended inner rings are suitable for use with bearings containing lip contact seals and for applications in which axial movement may be present.

CONSTRUCTION

Metric series inner rings are available with combinations of three primary design features. The inner rings may be purchased: without chamfers at the end of the raceway surface to allow for maximum possible raceway contact area, with lubrication holes to allow for increased lubrication to the bearing area, or with a profiled outer diameter for use in applications having a greater degree of misalignment. Table B8-26 outlines the features offered in the different series.

Table B8-26. Outline of features

Series	Lube Hole	Chamfers	Raceway Profile
JR		X	
JR.JS1	X	X	
JRZ.JS1	X		

The lubrication holes are located nominally at the center of the inner ring width. The nominal diameters for the lubrication holes for inner rings listed in this section are shown in Table B8-27.

Table B8-27. Nominal diameters for the lubrication holes for inner ring

Series Designation	Inner Ring Bore Diameter		Nominal Lubrication Hole Diameter
	mm		mm
	>	≤	
		20	2.0
JR.JS1	20	40	2.5
JRZ.JS1	40	80	3.0
	80		3.5

DIMENSIONAL ACCURACY

The tolerances of size, form, and runout for metric series inner rings meet the requirements of ISO normal tolerance class for radial bearings (see the engineering section of this catalog). Most metric series inner rings are produced with outer diameter raceway tolerance in accordance with h5 which, in most cases, is suitable for combining the metric series needle roller bearings to give the normal clearance class and for use with metric caged drawn cup bearings. An exception is the inner rings for metric, full complement drawn cup needle roller bearings; these inner rings are produced with outside diameter raceway tolerance in accordance with g5. Other raceway tolerances may also be found on inner rings for combining with needle roller bearings to give one of the clearance classes, or other specially requested radial internal clearance requirement.

Table B8-28 lists the dimensional accuracy of inner rings.

Table B8-28. Dimensional accuracy of inner ring

Part Designation	OD Tolerance	Other Feature Tolerances
JR & JRZ	h5	ISO 492 Normal Tolerance Class

MOUNTING OF INNER RINGS

Inner rings may be mounted on the shaft with either a loose transition fit or an interference fit. These fits, used in conjunction with the proper fit of the bearing outer ring, will provide the correct operating clearances for most applications.

Regardless of the fit of the inner ring on the shaft, the inner ring should be axially located by shaft shoulders or other positive means. The shaft shoulder diameter adjacent to the inner ring must not exceed the inner ring outer diameter (per suggestions on page B-4-9 of the metric series needle roller bearing section).

When metric series inner rings are to be used with the metric series needle roller bearings, appropriate shaft tolerances should be selected from Table B4-3 on page B-4-9 in the heavy-duty needle roller bearing section. When metric series inner rings are to be used with drawn- cup bearings, the suggested shaft tolerances are given in the "inner rings" discussion on page B-2-8 of the metric series drawn cup needle roller bearings section of this catalog.

INCH SERIES INNER RINGS

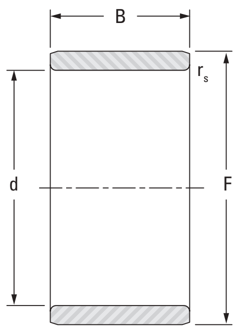
Inch series inner rings for use with inch series drawn cup bearings are tabulated on page B-2-68 of this catalog. See page B-4-48 for inch series inner rings for use with inch series heavy-duty needle roller bearings.

END WASHERS – METRIC SERIES

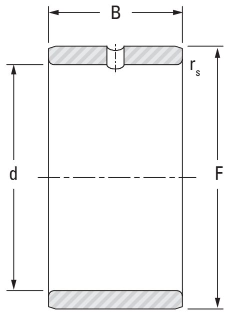
When the metric series radial needle roller and cage assembly used in series NAO and RNAO needle roller bearings without flanges cannot be axially located by suitable shoulders or side faces, end washers of series SNSH may be used. These end washers, which are made of spring steel, are designed to be guided in the housing bore. They are tabulated on page B-8-30.

INNER RINGS

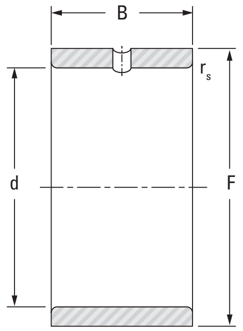
METRIC SERIES



JR



JR.JS1



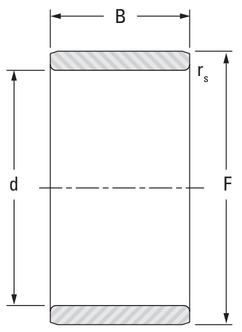
JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
5 0.1969	**5** 0.1969	**8** 0.3150	**8** 0.3150	**0.3** 0.01	JR5x8x8JS1	**0.002** 0.004
	5 0.1969	**8** 0.3150	**12** 0.4724	**0.3** 0.01	JR5x8x12	**0.003** 0.007
	5 0.1969	**8** 0.3150	**16** 0.630	**0.3** 0.01	JR5x8x16	**0.004** 0.009
6 0.2362	**6** 0.2362	**9** 0.3543	**8** 0.315	**0.3** 0.01	JR6x9x8JS1	**0.002** 0.004
	6 0.2362	**9** 0.3543	**12** 0.4724	**0.3** 0.01	JR6x9x12	**0.003** 0.007
	6 0.2362	**9** 0.3543	**16** 0.630	**0.3** 0.01	JR6x9x16	**0.004** 0.009
	6 0.2362	**10** 0.3937	**10** 0.394	**0.3** 0.01	JR6x10x10	**0.004** 0.009
	6 0.2362	**10** 0.3937	**10** 0.394	**0.3** 0.01	JR6x10x10JS1	**0.004** 0.009
	6 0.2362	**10** 0.3937	**12** 0.4724	**0.3** 0.01	JRZ6x10x12JS1	**0.005** 0.011
7 0.2756	**7** 0.2756	**10** 0.3937	**10.5** 0.413	**0.3** 0.01	JR7x10x10,5	**0.003** 0.007
	7 0.2756	**10** 0.3937	**12** 0.4724	**0.3** 0.01	JR7x10x12	**0.004** 0.009
	7 0.2756	**10** 0.3937	**16** 0.630	**0.3** 0.01	JR7x10x16	**0.005** 0.011
8 0.3150	**8** 0.3150	**12** 0.4724	**10** 0.394	**0.3** 0.01	JR8x12x10	**0.005** 0.011
	8 0.3150	**12** 0.4724	**10** 0.394	**0.3** 0.01	JR8x12x10JS1	**0.005** 0.011
	8 0.3150	**12** 0.4724	**10.5** 0.413	**0.3** 0.01	JR8x12x10,5	**0.005** 0.011
	8 0.3150	**12** 0.4724	**12** 0.472	**0.3** 0.01	JRZ8xl2x12JS1	**0.006** 0.013
	8 0.3150	**12** 0.4724	**12.5** 0.492	**0.3** 0.01	JR8x12x12,5	**0.006** 0.013
9 0.3543	**9** 0.3543	**12** 0.4724	**12** 0.4724	**0.3** 0.01	JR9x12x12	**0.005** 0.011
	9 0.3543	**12** 0.4724	**16** 0.630	**0.3** 0.01	JR9x12x16	**0.006** 0.013
10 0.3937	**10** 0.3937	**13** 0.5118	**12.5** 0.492	**0.3** 0.01	JR10x13x12,5	**0.005** 0.011
	10 0.3937	**14** 0.5512	**11** 0.433	**0.3** 0.01	JR10x14x11JS1	**0.007** 0.015
	10 0.3937	**14** 0.5512	**12** 0.4724	**0.3** 0.01	JR10x14x12	**0.007** 0.015
	10 0.3937	**14** 0.5512	**12** 0.4724	**0.3** 0.01	JR10x14x12JS1	**0.007** 0.015
	10 0.3937	**14** 0.5512	**13** 0.512	**0.3** 0.01	JR10x14x13	**0.007** 0.015

[1] See Table B8-28 on page B-8-19 for outside diameter tolerance.

INNER RINGS

METRIC SERIES



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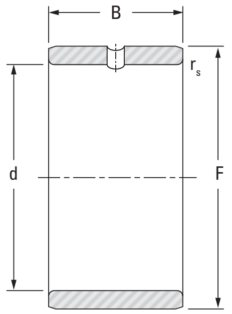
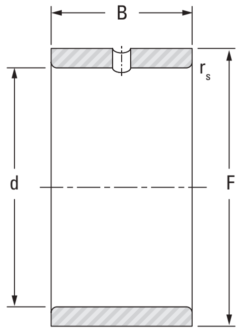


JR.JS1



JRZ.JS1

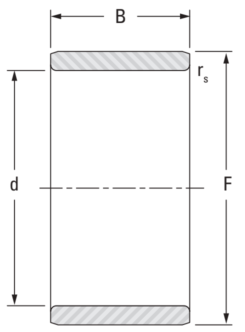
Shaft Dia.	d	F [1]	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
10 0.3937	**10** 0.3937	**14** 0.5512	**14** 0.551	**0.3** 0.01	JRZ10x14x14JS1	**0.008** 0.018
	10 0.3937	**14** 0.5512	**16** 0.630	**0.3** 0.01	JR10x14x16	**0.009** 0.020
	10 0.3937	**14** 0.5512	**20** 0.787	**0.3** 0.01	JR10x14x20	**0.012** 0.026
12 0.4724	**12** 0.4724	**15** 0.5906	**12.5** 0.492	**0.3** 0.01	JR12x15x12,5	**0.006** 0.013
	12 0.4724	**15** 0.5906	**16** 0.630	**0.3** 0.01	JR12x15x16	**0.008** 0.018
	12 0.4724	**15** 0.5906	**16.5** 0.650	**0.3** 0.01	JR12x15x16,5	**0.008** 0.018
	12 0.4724	**15** 0.5906	**18.5** 0.728	**0.3** 0.01	JR12x15x18,5	**0.009** 0.020
	12 0.4724	**15** 0.5906	**22.5** 0.886	**0.3** 0.01	JR12x15x22,5	**0.011** 0.024
	12 0.4724	**16** 0.6299	**12** 0.472	**0.3** 0.01	JR12x16x12	**0.008** 0.018
	12 0.4724	**16** 0.6299	**12** 0.472	**0.3** 0.01	JR12x16x12JS1	**0.008** 0.018
	12 0.4724	**16** 0.6299	**13** 0.512	**0.3** 0.01	JR12x16x13	**0.008** 0.018
	12 0.4724	**16** 0.6299	**14** 0.551	**0.3** 0.01	JRZ12x16x14JS1	**0.010** 0.022
	12 0.4724	**16** 0.6299	**16** 0.630	**0.3** 0.01	JR12x16x16	**0.011** 0.024
	12 0.4724	**16** 0.6299	**20** 0.787	**0.3** 0.01	JR12x16x20	**0.014** 0.031
	12 0.4724	**16** 0.6299	**22** 0.866	**0.3** 0.01	JR12x16x22	**0.015** 0.033
14 0.5512	**14** 0.5512	**17** 0.6693	**17** 0.669	**0.3** 0.01	JR14x17x17	**0.009** 0.020
15 0.5906	**15** 0.5906	**18** 0.7087	**16.5** 0.650	**0.3** 0.01	JR15x18x16,5	**0.010** 0.022
	15 0.5906	**19** 0.7480	**16** 0.630	**0.3** 0.01	JR15x19x16	**0.013** 0.029
	15 0.5906	**19** 0.7480	**20** 0.787	**0.3** 0.01	JR15x19x20	**0.017** 0.037
	15 0.5906	**20** 0.7874	**12** 0.472	**0.3** 0.01	JR15x20x12	**0.012** 0.026
	15 0.5906	**20** 0.7874	**12** 0.472	**0.3** 0.01	JR15x20x12JS1	**0.012** 0.026
	15 0.5906	**20** 0.7874	**13** 0.512	**0.3** 0.01	JR15x20x13	**0.014** 0.031
	15 0.5906	**20** 0.7874	**14** 0.551	**0.3** 0.01	JRZ15x20x14JS1	**0.015** 0.033
	15 0.5906	**20** 0.7874	**16** 0.630	**0.3** 0.01	JR15x20x16	**0.017** 0.037

[1] See Table B8-28 on page B-8-19 for outside diameter tolerance.

Continued on next page.

INNER RINGS

METRIC SERIES



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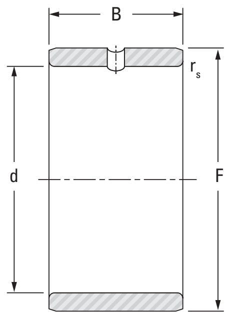
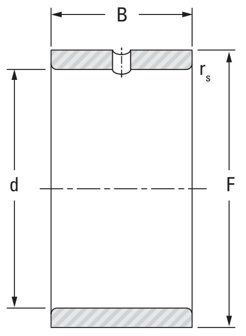


JR.JS1



JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
15 0.5906	**15** 0.5906	**20** 0.7874	**23** 0.906	**0.3** 0.01	JR15x20x23	**0.025** 0.055
	15 0.5906	**20** 0.7874	**26** 1.024	**0.3** 0.01	JR15x20x26	**0.028** 0.062
17 0.6693	**17** 0.6693	**20** 0.7874	**16.5** 0.650	**0.3** 0.01	JR17x20x16,5	**0.011** 0.024
	17 0.6693	**20** 0.7874	**20** 0.787	**0.3** 0.01	JR17x20x20	**0.014** 0.031
	17 0.6693	**20** 0.7874	**20.5** 0.807	**0.3** 0.01	JR17x20x20,5	**0.014** 0.031
	17 0.6693	**20** 0.7874	**30.5** 1.201	**0.3** 0.01	JR17x20x30,5	**0.021** 0.046
	17 0.6693	**21** 0.8268	**16** 0.630	**0.3** 0.01	JR17x21x16	**0.015** 0.033
	17 0.6693	**21** 0.8268	**20** 0.787	**0.3** 0.01	JR17x21x20	**0.019** 0.042
	17 0.6693	**22** 0.8661	**13** 0.512	**0.3** 0.01	JR17x22x13	**0.015** 0.033
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JR17x22x16	**0.019** 0.042
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JR17x22x16JS1	**0.019** 0.042
	17 0.6693	**22** 0.8661	**16** 0.630	**0.3** 0.01	JRZ17x22x16JS1	**0.019** 0.042
	17 0.6693	**22** 0.8661	**23** 0.906	**0.3** 0.01	JR17x22x23	**0.028** 0.062
	17 0.6693	**22** 0.8661	**26** 1.024	**0.3** 0.01	JR17x22x26	**0.031** 0.068
	17 0.6693	**22** 0.8661	**32** 1.260	**0.3** 0.01	JR17x22x32	**0.038** 0.084
20 0.7874	**20** 0.7874	**24** 0.9449	**16** 0.630	**0.3** 0.01	JR20x24x16	**0.018** 0.040
	20 0.7874	**24** 0.9449	**20** 0.787	**0.3** 0.01	JR20x24x20	**0.022** 0.049
	20 0.7874	**25** 0.9843	**16** 0.630	**0.3** 0.01	JR20x25x16	**0.022** 0.049
	20 0.7874	**25** 0.9843	**16** 0.630	**0.3** 0.01	JR20x25x16JS1	**0.022** 0.049
	20 0.7874	**25** 0.9843	**17** 0.669	**0.3** 0.01	JR20x25x17	**0.023** 0.051
	20 0.7874	**25** 0.9843	**18** 0.709	**0.3** 0.01	JRZ20x25x18JS1	**0.025** 0.055
	20 0.7874	**25** 0.9843	**20** 0.787	**0.3** 0.01	JR20x25x20	**0.028** 0.062
	20 0.7874	**25** 0.9843	**20.5** 0.807	**0.3** 0.01	JR20x25x20,5	**0.029** 0.064
	20 0.7874	**25** 0.9843	**26** 1.024	**0.3** 0.01	JR20x25x26	**0.036** 0.079

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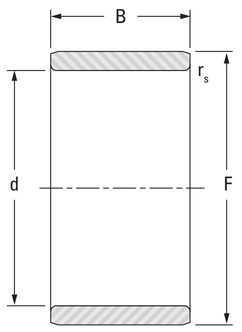
[1] See Table B8-28 on page B-8-19 for outside diameter tolerance.

INNER RINGS

METRIC SERIES



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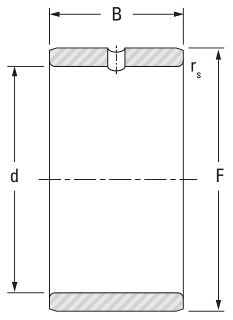
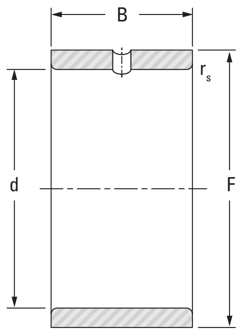


JR.JS1



JRZ.JS1

Shaft Dia.	d	F [1]	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
20 0.7874	**20** 0.7874	**25** 0.9843	**26.5** 1.043	**0.3** 0.01	JR20x25x26,5	**0.037** 0.082
	20 0.7874	**25** 0.9843	**30** 1.181	**0.3** 0.01	JR20x25x30	**0.042** 0.093
	20 0.7874	**25** 0.9843	**32** 1.260	**0.3** 0.01	JR20x25x32	**0.044** 0.097
	20 0.7874	**25** 0.9843	**38.5** 1.516	**0.3** 0.01	JR20x25x38,5	**0.054** 0.119
22 0.8661	**22** 0.8661	**26** 1.0236	**16** 0.630	**0.3** 0.01	JR22x26x16	**0.019** 0.042
	22 0.8661	**26** 1.0236	**20** 0.787	**0.3** 0.01	JR22x26x20	**0.023** 0.051
	22 0.8661	**28** 1.1024	**17** 0.669	**0.3** 0.01	JR22x28x17	**0.030** 0.066
	22 0.8661	**28** 1.1024	**20.5** 0.807	**0.3** 0.01	JR22x28x20,5	**0.038** 0.084
	22 0.8661	**28** 1.1024	**30** 1.181	**0.3** 0.01	JR22x28x30	**0.056** 0.123
25 0.9843	**25** 0.9843	**29** 1.1417	**20** 0.787	**0.3** 0.01	JR25x29x20	**0.027** 0.060
	25 0.9843	**29** 1.1417	**30** 1.181	**0.3** 0.01	JR25x29x30	**0.040** 0.088
	25 0.9843	**30** 1.1811	**16** 0.630	**0.3** 0.01	JR25x30x16	**0.027** 0.060
	25 0.9843	**30** 1.1811	**16** 0.630	**0.3** 0.01	JR25x30x16JS1	**0.027** 0.060
	25 0.9843	**30** 1.1811	**17** 0.669	**0.3** 0.01	JR25x30x17	**0.028** 0.062
	25 0.9843	**30** 1.1811	**18** 0.709	**0.3** 0.01	JRZ25x30x18JS1	**0.031** 0.068
	25 0.9843	**30** 1.1811	**20** 0.787	**0.3** 0.01	JR25x30x20	**0.034** 0.075
	25 0.9843	**30** 1.1811	**20.5** 0.807	**0.3** 0.01	JR25x30x20,5	**0.035** 0.077
	25 0.9843	**30** 1.1811	**26** 1.024	**0.3** 0.01	JR25x30x26	**0.044** 0.097
	25 0.9843	**30** 1.1811	**26.5** 1.043	**0.3** 0.01	JR25x30x26,5	**0.045** 0.099
	25 0.9843	**30** 1.1811	**30** 1.181	**0.3** 0.01	JR25x30x30	**0.051** 0.112
	25 0.9843	**30** 1.1811	**32** 1.260	**0.3** 0.01	JR25x30x32	**0.054** 0.119
	25 0.9843	**30** 1.1811	**38.5** 1.516	**0.3** 0.01	JR25x30x38,5	**0.066** 0.146
28 1.1024	**28** 1.1024	**32** 1.2598	**17** 0.669	**0.3** 0.01	JR28x32x17	**0.028** 0.062
	28 1.1024	**32** 1.2598	**20** 0.787	**0.3** 0.01	JR28x32x20	**0.030** 0.066

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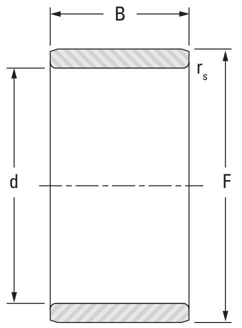
[1] See Table B8-28 on page B-8-19 for outside diameter tolerance.

Continued on next page.

INNER RINGS

METRIC SERIES



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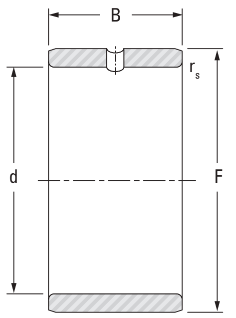
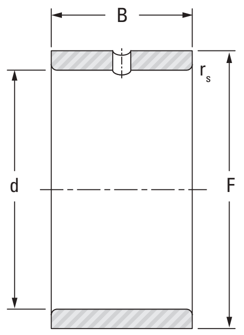


JR.JS1



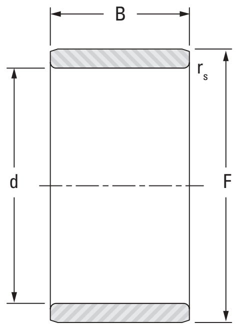
JRZ.JS1

Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
28 1.1024	**28** 1.1024	**32** 1.2598	**30** 1.181	**0.3** 0.01	JR28x32x30	**0.044** 0.097
30 1.1811	**30** 1.1811	**35** 1.3780	**16** 0.630	**0.3** 0.01	JR30x35x16	**0.031** 0.068
	30 1.1811	**35** 1.3780	**17** 0.669	**0.3** 0.01	JR30x35x17	**0.033** 0.073
	30 1.1811	**35** 1.3780	**18** 0.709	**0.3** 0.01	JRZ30x35x18JS1	**0.036** 0.079
	30 1.1811	**35** 1.3780	**20** 0.787	**0.3** 0.01	JR30x35x20	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20** 0.787	**0.3** 0.01	JRZ30x35x20JS1	**0.039** 0.086
	30 1.1811	**35** 1.3780	**20.5** 0.807	**0.3** 0.01	JR30x35x20,5	**0.040** 0.088
	30 1.1811	**35** 1.3780	**26** 1.024	**0.3** 0.01	JR30x35x26	**0.054** 0.119
	30 1.1811	**35** 1.3780	**30** 1.181	**0.3** 0.01	JR30x35x30	**0.057** 0.126
	30 1.1811	**35** 1.3780	**32** 1.260	**0.3** 0.01	JR30x35x32	**0.062** 0.137
	30 1.1811	**38** 1.4961	**20** 0.787	**0.6** 0.02	JR30x38x20JS1	**0.067** 0.148
32 1.2598	**32** 1.2598	**37** 1.4567	**20** 0.787	**0.3** 0.01	JR32x37x20	**0.043** 0.095
	32 1.2598	**37** 1.4567	**30** 1.181	**0.3** 0.01	JR32x37x30	**0.064** 0.141
	32 1.2598	**40** 1.5748	**20** 0.787	**0.6** 0.02	JR32x40x20	**0.069** 0.152
	32 1.2598	**40** 1.5748	**36** 1.417	**0.6** 0.02	JR32x40x36	**0.128** 0.282
35 1.3780	**35** 1.3780	**40** 1.5748	**17** 0.669	**0.3** 0.01	JR35x40x17	**0.040** 0.088
	35 1.3780	**40** 1.5748	**20** 0.787	**0.3** 0.01	JR35x40x20	**0.046** 0.101
	35 1.3780	**40** 1.5748	**20.5** 0.807	**0.3** 0.01	JR35x40x20,5	**0.049** 0.108
	35 1.3780	**40** 1.5748	**22** 0.866	**0.3** 0.01	JR35x40x22	**0.052** 0.115
	35 1.3780	**40** 1.5748	**30** 1.181	**0.3** 0.01	JR35x40x30	**0.071** 0.157
	35 1.3780	**40** 1.5748	**34** 1.339	**0.3** 0.01	JR35x40x34	**0.080** 0.176
	35 1.3780	**40** 1.5748	**40** 1.575	**0.3** 0.01	JR35x40x40	**0.094** 0.207
	35 1.3780	**42** 1.6535	**20** 0.787	**0.6** 0.02	JR35x42x20	**0.065** 0.143
	35 1.3780	**42** 1.6535	**20** 0.787	**0.6** 0.02	JR35x42x20JS1	**0.065** 0.143

(1) See Table B8-28 on page B-8-19 for outside diameter tolerance.

INNER RINGS

METRIC SERIES



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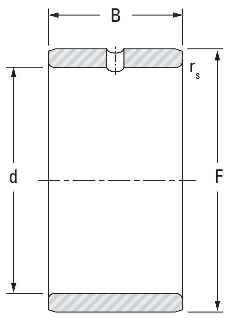
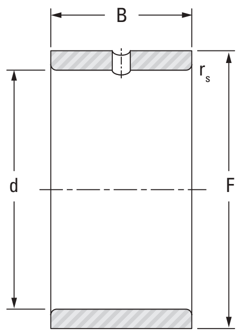


JR.JS1



JRZ.JS1

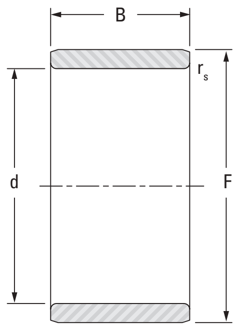
Shaft Dia.	d	F (1)	B	$r_{s\ min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
35 1.3780	**35** 1.3780	**42** 1.6535	**23** 0.906	**0.6** 0.02	JRZ35x42x23JS1	**0.074** 0.163
	35 1.3780	**42** 1.6535	**36** 1.417	**0.6** 0.02	JR35x42x36	**0.122** 0.269
	35 1.3780	**44** 1.7323	**22** 0.866	**0.6** 0.02	JR35x44x22	**0.097** 0.214
38 1.4961	**38** 1.4961	**43** 1.6929	**20** 0.787	**0.3** 0.01	JR38x43x20	**0.050** 0.110
	38 1.4961	**43** 1.6929	**30** 1.181	**0.3** 0.01	JR38x43x30	**0.075** 0.165
40 1.5748	**40** 1.5748	**45** 1.7717	**17** 0.669	**0.3** 0.01	JR40x45x17	**0.044** 0.097
	40 1.5748	**45** 1.7717	**20** 0.787	**0.3** 0.01	JR40x45x20	**0.052** 0.115
	40 1.5748	**45** 1.7717	**20.5** 0.807	**0.3** 0.01	JR40x45x20,5	**0.054** 0.119
	40 1.5748	**45** 1.7717	**30** 1.181	**0.3** 0.01	JR40x45x30	**0.078** 0.172
	40 1.5748	**45** 1.7717	**34** 1.339	**0.3** 0.01	JR40x45x34	**0.089** 0.196
	40 1.5748	**45** 1.7717	**40** 1.575	**0.3** 0.01	JR40x45x40	**0.115** 0.254
	40 1.5748	**48** 1.8898	**22** 0.866	**0.6** 0.02	JR40x48x22	**0.094** 0.207
	40 1.5748	**48** 1.8898	**23** 0.906	**0.6** 0.02	JRZ40x48x23JS1	**0.100** 0.220
	40 1.5748	**48** 1.8898	**40** 1.575	**0.6** 0.02	JR40x48x40	**0.173** 0.381
	40 1.5748	**50** 1.9685	**20** 0.787	**1** 0.04	JR40x50x20	**0.110** 0.243
42 1.6535	**42** 1.6535	**47** 1.8504	**20** 0.787	**0.3** 0.01	JR42x47x20	**0.055** 0.121
	42 1.6535	**47** 1.8504	**30** 1.181	**0.3** 0.01	JR42x47x30	**0.083** 0.183
45 1.7717	**45** 1.7717	**50** 1.9685	**20** 0.787	**0.3** 0.01	JR45x50x20	**0.058** 0.128
	45 1.7717	**50** 1.9685	**25** 0.984	**0.6** 0.02	JR45x50x25	**0.073** 0.161
	45 1.7717	**50** 1.9685	**25.5** 1.004	**0.3** 0.01	JR45x50x25,5	**0.075** 0.165
	45 1.7717	**50** 1.9685	**35** 1.378	**0.6** 0.02	JR45x50x35	**0.103** 0.227
	45 1.7717	**50** 1.9685	**40** 1.575	**0.3** 0.01	JR45x50x40	**0.117** 0.258
	45 1.7717	**52** 2.0472	**22** 0.866	**0.6** 0.02	JR45x52x22	**0.090** 0.198
	45 1.7717	**52** 2.0472	**23** 0.906	**0.6** 0.02	JR45x52x23	**0.096** 0.212

(1) See Table B8-28 on page B-8-19 for outside diameter tolerance.

Continued on next page.

INNER RINGS

METRIC SERIES



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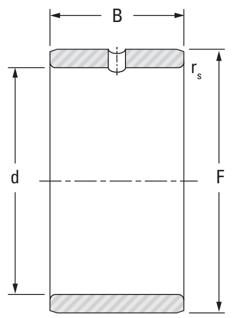
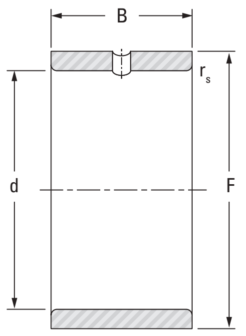


JR.JS1



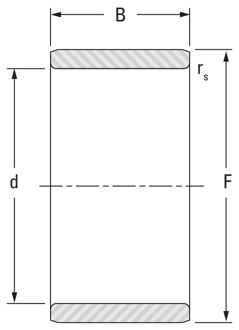
JRZ.JS1

Shaft Dia.	d	F (1)	B	r$_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
45 1.7717	**45** 1.7717	**52** 2.0472	**23** 0.906	**0.6** 0.02	JRZ45x52x23JS1	**0.096** 0.212
	45 1.7717	**52** 2.0472	**40** 1.575	**0.6** 0.02	JR45x52x40	**0.167** 0.368
	45 1.7717	**55** 2.1654	**20** 0.787	**1** 0.04	JR45x55x20	**0.133** 0.293
	45 1.7717	**55** 2.1654	**20** 0.787	**1** 0.04	JR45x55x20JS1	**0.133** 0.293
	45 1.7717	**55** 2.1654	**22** 0.866	**1** 0.04	JR45x55x22	**0.135** 0.298
	45 1.7717	**55** 2.1654	**40** 1.575	**1** 0.04	JR45x55x40	**0.247** 0.545
50 1.9685	**50** 1.9685	**55** 2.1654	**20** 0.787	**0.3** 0.01	JR50x55x20	**0.065** 0.143
	50 1.9685	**55** 2.1654	**25** 0.984	**0.6** 0.02	JR50x55x25	**0.081** 0.179
	50 1.9685	**55** 2.1654	**35** 1.378	**0.6** 0.02	JR50x55x35	**0.113** 0.249
	50 1.9685	**55** 2.1654	**40** 1.575	**0.3** 0.01	JR50x55x40	**0.130** 0.287
	50 1.9685	**58** 2.2835	**22** 0.866	**0.6** 0.02	JR50x58x22	**0.117** 0.258
	50 1.9685	**58** 2.2835	**23** 0.906	**0.6** 0.02	JRZ50x58x23JS1	**0.122** 0.269
	50 1.9685	**58** 2.2835	**40** 1.575	**0.6** 0.02	JR50x58x40	**0.213** 0.470
	50 1.9685	**60** 2.3622	**20** 0.787	**1** 0.04	JR50x60x20	**0.155** 0.342
	50 1.9685	**60** 2.3622	**20** 0.787	**1** 0.04	JR50x60x20JS1	**0.155** 0.342
	50 1.9685	**60** 2.3622	**25** 0.984	**1** 0.04	JR50x60x25	**0.170** 0.375
	50 1.9685	**60** 2.3622	**40** 1.575	**1** 0.04	JR50x60x40	**0.310** 0.683
55 2.1654	**55** 2.1654	**60** 2.3622	**25** 0.984	**0.6** 0.02	JR55x60x25	**0.088** 0.194
	55 2.1654	**60** 2.3622	**35** 1.378	**0.6** 0.02	JR55x60x35	**0.124** 0.273
	55 2.1654	**63** 2.4803	**25** 0.984	**1** 0.04	JR55x63x25	**0.141** 0.311
	55 2.1654	**63** 2.4803	**45** 1.772	**1** 0.04	JR55x63x45	**0.286** 0.631
	55 2.1654	**65** 2.5591	**30** 1.181	**1** 0.04	JR55x65x30	**0.222** 0.489
	55 2.1654	**65** 2.5591	**60** 2.362	**1** 0.04	JR55x65x60	**0.444** 0.979
60 2.3622	**60** 2.3622	**68** 2.6772	**25** 0.984	**0.6** 0.02	JR60x68x25	**0.153** 0.337

(1) See Table B8-28 on page B-8-19 for outside diameter tolerance.

INNER RINGS

METRIC SERIES



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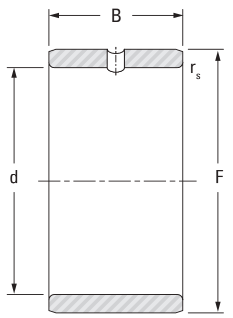
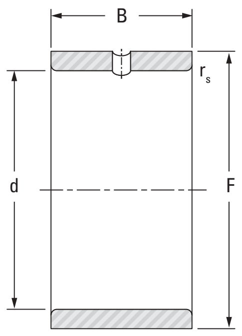


JR.JS1



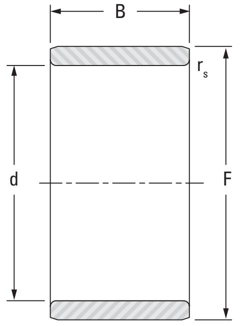
JRZ.JS1

Shaft Dia.	d	F (1)	B	r$_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
60 2.3622	**60** 2.3622	**68** 2.6772	**35** 1.378	**0.6** 0.02	JR60x68x35	**0.220** 0.485
	60 2.3622	**68** 2.6772	**45** 1.772	**1** 0.04	JR60x68x45	**0.284** 0.626
	60 2.3622	**70** 2.7559	**25** 0.984	**1** 0.04	JR60x70x25	**0.200** 0.441
	60 2.3622	**70** 2.7559	**30** 1.181	**1** 0.04	JR60x70x30	**0.240** 0.529
	60 2.3622	**70** 2.7559	**60** 2.362	**1** 0.04	JR60x70x60	**0.480** 1.058
65 2.5591	**65** 2.5591	**72** 2.8346	**25** 0.984	**1** 0.04	JR65x72x25	**0.143** 0.315
	65 2.5591	**72** 2.8346	**45** 1.772	**1** 0.04	JR65x72x45	**0.266** 0.586
	65 2.5591	**73** 2.8740	**25** 0.984	**0.6** 0.02	JR65x73x25	**0.170** 0.375
	65 2.5591	**73** 2.8740	**35** 1.378	**0.6** 0.02	JR65x73x35	**0.240** 0.529
	65 2.5591	**75** 2.9528	**28** 1.102	**1** 0.04	JR65x75x28	**0.240** 0.529
	65 2.5591	**75** 2.9528	**30** 1.181	**1** 0.04	JR65x75x30	**0.260** 0.573
	65 2.5591	**75** 2.9528	**60** 2.362	**1** 0.04	JR65x75x60	**0.520** 1.146
70 2.7559	**70** 2.7559	**80** 3.1496	**25** 0.984	**1** 0.04	JR70x80x25	**0.230** 0.507
	70 2.7559	**80** 3.1496	**30** 1.181	**1** 0.04	JR70x80x30	**0.270** 0.595
	70 2.7559	**80** 3.1496	**35** 1.378	**1** 0.04	JR70x80x35	**0.320** 0.705
	70 2.7559	**80** 3.1496	**54** 2.126	**1** 0.04	JR70x80x54	**0.500** 1.102
	70 2.7559	**80** 3.1496	**60** 2.362	**1** 0.04	JR70x80x60	**0.556** 1.226
75 2.9528	**75** 2.9528	**85** 3.3465	**25** 0.984	**1** 0.04	JR75x85x25	**0.240** 0.529
	75 2.9528	**85** 3.3465	**30** 1.181	**1** 0.04	JR75x85x30	**0.289** 0.637
	75 2.9528	**85** 3.3465	**35** 1.378	**1** 0.04	JR75x85x35	**0.338** 0.745
	75 2.9528	**85** 3.3465	**54** 2.126	**1** 0.04	JR75x85x54	**0.530** 1.168
80 3.1496	**80** 3.1496	**90** 3.5433	**25** 0.984	**1** 0.04	JR80x90x25	**0.260** 0.573
	80 3.1496	**90** 3.5433	**30** 1.181	**1** 0.04	JR80x90x30	**0.306** 0.675
	80 3.1496	**90** 3.5433	**35** 1.378	**1** 0.04	JR80x90x35	**0.355** 0.783

(1) See Table B8-28 on page B-8-19 for outside diameter tolerance.

Continued on next page.

INNER RINGS
METRIC SERIES



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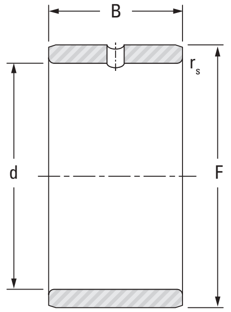
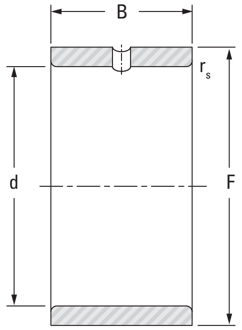


JR.JS1



JRZ.JS1

Shaft Dia.	d	$F^{(1)}$	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
80 3.1496	**80** 3.1496	**90** 3.5433	**54** 2.126	**1** 0.04	JR80x90x54	**0.565** 1.246
85 3.3465	**85** 3.3465	**95** 3.7402	**26** 1.024	**1** 0.04	JR85x95x26	**0.290** 0.639
	85 3.3465	**95** 3.7402	**30** 1.181	**1** 0.04	JR85x95x30	**0.334** 0.736
	85 3.3465	**95** 3.7402	**36** 1.417	**1** 0.04	JR85x95x36	**0.397** 0.875
	85 3.3465	**100** 3.9370	**35** 1.378	**1.1** 0.04	JR85x100x35	**0.595** 1.312
	85 3.3465	**100** 3.9370	**63** 2.480	**1.1** 0.04	JR85x100x63	**1.080** 2.381
90 3.5433	**90** 3.5433	**100** 3.9370	**26** 1.024	**1** 0.04	JR90x100x26	**0.300** 0.661
	90 3.5433	**100** 3.9370	**30** 1.181	**1** 0.04	JR90x100x30	**0.350** 0.772
	90 3.5433	**100** 3.9370	**36** 1.417	**1** 0.04	JR90x100x36	**0.422** 0.930
	90 3.5433	**105** 4.1339	**32** 1.260	**1.1** 0.04	JR90x105x32	**0.580** 1.279
	90 3.5433	**105** 4.1339	**35** 1.378	**1.1** 0.04	JR90x105x35	**0.624** 1.376
	90 3.5433	**105** 4.1339	**63** 2.480	**1.1** 0.04	JR90x105x63	**1.140** 2.513
95 3.7402	**95** 3.7402	**105** 4.1339	**26** 1.024	**1** 0.04	JR95x105x26	**0.310** 0.683
	95 3.7402	**105** 4.1339	**36** 1.417	**1** 0.04	JR95x105x36	**0.430** 0.948
	95 3.7402	**110** 4.3307	**35** 1.378	**1.1** 0.04	JR95x110x35	**0.653** 1.440
	95 3.7402	**110** 4.3307	**63** 2.480	**1.1** 0.04	JR95x110x63	**1.200** 2.646
100 3.9370	**100** 3.9370	**110** 4.3307	**30** 1.181	**1.1** 0.04	JR100x110x30	**0.384** 0.847
	100 3.9370	**110** 4.3307	**40** 1.575	**1.1** 0.04	JR100x110x40	**0.510** 1.124
	100 3.9370	**115** 4.5276	**40** 1.575	**1.1** 0.04	JR100x115x40	**0.790** 1.742
110 4.3307	**110** 4.3307	**120** 4.7244	**30** 1.181	**1** 0.04	JR110x120x30	**0.425** 0.937
	110 4.3307	**125** 4.9213	**40** 1.575	**1.1** 0.04	JR110x125x40	**0.870** 1.918
120 4.7244	**120** 4.7244	**130** 5.1181	**30** 1.181	**1** 0.04	JR120x130x30	**0.460** 1.014
	120 4.7244	**135** 5.3150	**45** 1.772	**1.1** 0.04	JR120x135x45	**1.060** 2.337
130 5.1181	**130** 5.1181	**145** 5.7087	**35** 1.378	**1.1** 0.04	JR130x145x35	**0.890** 1.962

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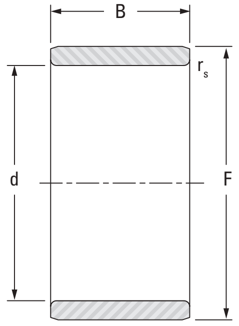
(1) See Table B8-28 on page B-8-19 for outside diameter tolerance.

INNER RINGS
METRIC SERIES



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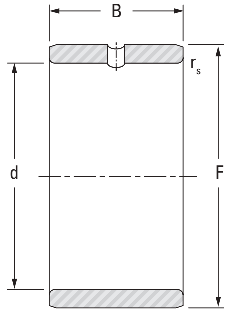
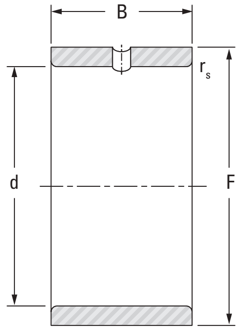


JR.JS1



JRZ.JS1

Shaft Dia.	d	$F^{(1)}$	B	$r_{s\,min.}$	Inner Ring Designation	Approx. Wt.
mm in	**mm** in	**mm** in	**mm** in	**mm** in		**kg** lbs
130 5.1181	**130** 5.1181	**150** 5.9055	**50** 1.969	**1.5** 0.06	JR130x150x50	**1.730** 3.814
140 5.5118	**140** 5.5118	**155** 6.1024	**35** 1.378	**1.1** 0.04	JR140x155x35	**0.955** 2.105
	140 5.5118	**160** 6.2992	**50** 1.969	**1.5** 0.06	JR140x160x50	**1.860** 4.101
150 5.9055	**150** 5.9055	**165** 6.4961	**40** 1.575	**1.1** 0.04	JR150x165x40	**1.170** 2.579
160 6.2992	**160** 6.2992	**175** 6.8898	**40** 1.575	**1.1** 0.04	JR160x175x40	**1.240** 2.734
170 6.6929	**170** 6.6929	**185** 7.2835	**45** 1.772	**1.1** 0.04	JR170x185x45	**1.480** 3.263
180 7.0866	**180** 7.0866	**195** 7.6772	**45** 1.772	**1.1** 0.04	JR180x195x45	**1.560** 3.439

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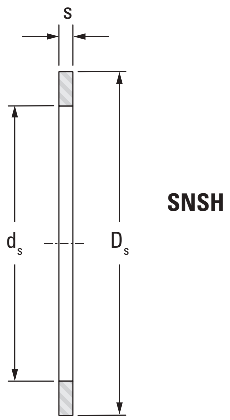
(1) See Table B8-28 on page B-8-19 for outside diameter tolerance.

END WASHERS

METRIC SERIES



d_s	D_s	S	End Washer Designation	Approx. Wt.
mm in	**mm** in	**mm** in		**kg** lbs
8.0 0.315	**18** 0.709	**2.0** 0.079	SNSH8X18X2	**0.003** 0.007
8.5 0.335	**15** 0.591	**0.5** 0.020	SNSH8,5X15X0,5	**0.0005** 0.001
10.5 0.413	**17** 0.669	**0.5** 0.020	SNSH10,5X17X0,5	**0.0006** 0.001
10.5 0.413	**20** 0.787	**0.5** 0.020	SNSH10,5X20X0,5	**0.0009** 0.002
12.5 0.492	**19** 0.748	**0.5** 0.020	SNSH12,5X19X0,5	**0.0006** 0.001
12.5 0.492	**22** 0.866	**0.5** 0.020	SNSH12,5X22X0,5	**0.0010** 0.002
14.5 0.571	**22** 0.866	**0.5** 0.020	SNSH14,5X22X0,5	**0.0008** 0.002
14.5 0.571	**26** 1.024	**0.5** 0.020	SNSH14,5X26X0,5	**0.0014** 0.003
15.5 0.610	**23** 0.906	**0.5** 0.020	SNSH15,5X23X0,5	**0.0009** 0.002
16.5 0.650	**24** 0.945	**0.5** 0.020	SNSH16,5X24X0,5	**0.0009** 0.002
16.5 0.650	**28** 1.102	**0.5** 0.020	SNSH16,5X28X0,5	**0.0016** 0.004
17.5 0.689	**25** 0.984	**0.5** 0.020	SNSH17,5X25X0,5	**0.001** 0.002
18.5 0.728	**26** 1.024	**0.5** 0.020	SNSH18,5X26X0,5	**0.001** 0.002
18.5 0.728	**30** 1.181	**0.5** 0.020	SNSH18,5X30X0,5	**0.002** 0.004
20.5 0.807	**28** 1.102	**0.5** 0.020	SNSH20,5X28X0,5	**0.001** 0.002
20.5 0.807	**32** 1.260	**0.5** 0.020	SNSH20,5X32X0,5	**0.002** 0.004
22.5 0.886	**30** 1.181	**0.5** 0.020	SNSH22,5X30X0,5	**0.001** 0.003
22.5 0.886	**35** 1.378	**0.5** 0.020	SNSH22,5X35X0,5	**0.002** 0.005
25.5 1.004	**35** 1.378	**0.5** 0.020	SNSH25,5X35X0,5	**0.002** 0.004
25.5 1.004	**37** 1.457	**0.5** 0.020	SNSH25,5X37X0,5	**0.002** 0.005
28.5 1.122	**40** 1.575	**0.5** 0.020	SNSH28,5X40X0,5	**0.002** 0.005
30.5 1.201	**40** 1.575	**0.5** 0.020	SNSH30,5X40X0,5	**0.002** 0.005
35.5 1.398	**47** 1.850	**0.5** 0.020	SNSH35,5X47X0,5	**0.003** 0.006
40.5 1.594	**50** 1.969	**0.5** 0.020	SNSH40,5X50X0,5	**0.003** 0.006
41.0 1.614	**55** 2.165	**1.0** 0.039	SNSH41X55X1	**0.008** 0.018
45.5 1.791	**55** 2.165	**0.5** 0.020	SNSH45,5X55X0,5	**0.003** 0.007
46.0 1.811	**62** 2.441	**1.0** 0.039	SNSH46X62X1	**0.011** 0.024
51.0 2.008	**65** 2.559	**1.0** 0.039	SNSH51X65X1	**0.010** 0.022
56.0 2.205	**72** 2.835	**1.0** 0.039	SNSH56X72X1	**0.013** 0.029
61.0 2.402	**78** 3.071	**1.0** 0.039	SNSH61X78X1	**0.015** 0.033
66.0 2.598	**85** 3.346	**1.0** 0.039	SNSH66X85X1	**0.018** 0.040

SUPPLEMENTARY TABLES

C

C SUPPLEMENTARY TABLES, INDEX

Supplementary table 1 (1) SI units and conversion factors

Mass	SI units	Other Units[1]	Conversion into SI units	Conversion from SI units
Angle	rad	° [degree(s)] *	1° = π / 180 rad	1 rad = 57.295 78°
	[radian(s)]	′ [minute(s)] *	1′ = π / 10 800 rad	
		″ [second(s)] *	1″ = π / 648 000 rad	
Length	m	Å [Angstrom unit]	1 Å = 10^{-10} m = 0.1 nm = 100 pm	1 m = 10^{10} Å
	[meter(s)]	µ [micron(s)]	1 µ = 1 µm	
		in [inch(es)]	1 in = 25.4 mm	1 m = 39.37 in
		ft [foot(feet)]	1 ft = 12 in = 0.304 8 m	1 m = 3.280 8 ft
		yd [yard(s)]	1 yd = 3 ft = 0.914 4 m	1 m = 1.093 6 yd
		mile [mile(s)]	1 mile = 5 280 ft = 1 609.344 m	1 km = 0.621 4 mile
Area	m^2	a [are(s)]	1 a = 100 m^2	
		ha [hectare(s)]	1 ha = 10^4 m^2	
		acre [acre(s)]	1 acre = 4 840 yd^2 = 4 046.86 m^2	1 km^2 = 247.1 acre
Volume	m^3	ℓ, L [liter(s)] *	1ℓ = 1 dm^3 = 10^{-3} m^3	1 m^3 = 10^3ℓ
		cc [cubic centimeters]	1 cc = 1 cm^3 = 10^{-6} m^3	1 m^3 = 10^6 cc
		gal (US) [gallon(s)]	1 gal (US) = 231 in^3 = 3.785 41 dm^3	1 m^3 = 264.17 gal
		fl oz (US) [fluid ounce(s)]	1 fl oz (US) = 29.573 5 cm^3	1 m^3 = 33 814 fl oz
		barrel (US) [barrels (US)]	1 barrel (US) = 158.987 dm^3	1 m^3 = 6.289 8 barrel
Time	s	min [minute(s)] *		
	[second(s)]	h [hour(s)] *		
		d [day(s)] *		
Angular velocity	rad / s			
Velocity	m / s	kn [knot(s)]	1 kn = 1 852 m / h	1 km / h = 0.539 96 kn
		m / h *		
Acceleration	m / s^2	G	1 G = 9.806 65 m / s^2	1 m / s^2 = 0.101 97 G
Frequency	Hz	c / s [cycle(s) / second]	1 c / s = 1 s^{-1} = 1 Hz	
	[hertz]			
Rotational frequency	s^{-1}	rpm [revolutions per minute]	1 rpm = 1 / 60 s^{-1}	1 s^{-1} = 60 rpm
		min^{-1} *		
		r / min		
Mass	kg	t [ton(s)] *	1 t = 10^3 kg	
	[kilogram(s)]	lb [pound(s)]	1 lb = 0.453 592 37 kg	1 kg = 2.204 6 lb
		gr [grain(s)]	1 gr = 64.798 91 mg	1 g = 15.432 4 gr
		oz [ounce(s)]	1 oz = 1 / 16 lb = 28.349 5 g	1 kg = 35.274 0 oz
		ton (UK) [ton(s) (UK)]	1 ton (UK) = 1 016.05 kg	1 t = 0.984 2 ton (UK)
		ton (US) [ton(s) (US)]	1 ton (US) = 907.185 kg	1 t = 1.102 3 ton (US)
		car [carat(s)]	1 car = 200 mg	1 g = 5 car

[Note] 1) * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 1 (2) SI units and conversion factors

Mass	SI units	Other Units1)	Conversion into SI units	Conversion from SI units
Density	kg / m^3			
Linear density	kg / m			
Momentum	kg·m / s			
Moment of momentum, Angular momentum	kg·m^2 / s			
Moment of inertia	kg·m^2			
Force	N	dyn [dyne(s)]	1 dyn = 10^{-5} N	1 N = 10^5 dyn
	[newton(s)]	kgf [kilogram-force]	1 kgf = 9.806 65 N	1 N = 0.101 97 kgf
		gf [gram-force]	1 gf = 9.806 65 × 10^{-3} N	
		tf [ton-force]	1 tf = 9.806 65 × 10^3 N	
		lbf [pound-force]	1 lbf = 4.448 22 N	1 N = 0.224 809 lbf
Moment of force	N·m	gf·cm	1 gf·cm = 9.806 65 × 10^{-5} N·m	
	[newton meter(s)]	kgf·cm	1 kgf·cm = 9.806 65 × 10^{-2} N·m	
		kgf·m	1 kgf·m = 9.806 65 N·m	1 N·m = 0.101 97 kgf·m
		tf·m	1 tf·m = 9.806 65 × 10^3 N·m	
		lbf·ft	1 lbf·ft = 1.355 82 N·m	1 N·m = 0.737 56 lbf·ft
Pressure,	Pa	gf / cm^2	1 gf / cm^2 = 9.806 65 × 10 Pa	
	[pascal(s)]	kgf / mm^2	1 kgf / mm^2 = 9.806 65 × 10^6 Pa	1 MPa = 0.101 97 kgf / mm^2
		kgf / m^2	1 kgf / m^2 = 9.806 65 Pa	1 Pa = 0.101 97 kgf / m^2
Normal stress	or N / m^2	lbf / in^2	1 lbf / in^2 = 6 894.76 Pa	1 Pa = 0.145 × 10^{-3} lbf / in^2
	{1 Pa = 1 N / m^2}	bar [bar(s)]	1 bar = 10^5 Pa	1 Pa = 10^{-2} mbar
		at [engineering air pressure]	1 at = 1 kgf / cm^2 = 9.806 65 × 10^4 Pa	
		mH$_2$O, mAq [meter water column]	1 mH$_2$O = 9.806 65 × 10^3 Pa	
		atm [atmosphere]	1 atm = 101 325 Pa	
		mHg [meter mercury column]	1 mHg = $\frac{101\ 325}{0.76}$ Pa	
		Torr [torr]	1 Torr = 1 mmHg = 133.322 Pa	1 Pa = 7.500 6 × 10^{-3} Torr
Viscosity	Pa·s	P [poise]	10^{-2} P = 1 cP = 1 mPa·s	
	[pascal second]	kgf·s / m^2	1 kgf·s / m^2 = 9.806 65 Pa·s	1 Pa·s = 0.101 97 kgf·s / m^2
Kinematic viscosity	m^2 / s	St [stokes]	10^{-2} St = 1 cSt = 1 mm^2 / s	
Surface tension	N / m			

Supplementary table 1 (3) SI units and conversion factors

Mass	SI units	Other Units1)	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J = 1 N·m}	eV [electron volt(s)] * erg [erg(s)] kgf·m lbf·ft	1 eV = (1.602 189 2 ± 0.000 004 6) × 10^{-19} J 1 erg = 10^{-7} J 1 kgf·m = 9.806 65 J 1 lbf·ft = 1.355 82 J	1 J = 10^{7} erg 1 J = 0.101 97 kgf·m 1 J = 0.737 56 lbf·ft
Power	W [watt(s)]	erg / s [ergs per second] kgf·m / s PS [French horse-power] HP [horse-power (British)] lbf·ft / s	1 erg / s = 10^{-7} W 1 kgf·m / s = 9.806 65 W 1 PS = 75 kgf·m / s = 735.5 W 1 HP = 550 lbf·ft / s = 745.7 W 1 lbf·ft / s = 1.355 82 W	1 W = 0.101 97 kgf·m / s 1 W = 0.001 36 PS 1 W = 0.001 34 HP
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	°C [celsius(s)] {t °C = (t + 273.15) K}	°F [degree(s) Fahrenheit]	$t\ °\mathrm{F} = \frac{5}{9}(t - 32)\ °\mathrm{C}$	$t\ °\mathrm{C} = (\frac{9}{5}t + 32)\ °\mathrm{F}$
Linear expansion coefficient	K^{-1}	$°C^{-1}$ [per degree]		
Heat	J [joule(s)] {1 J = 1 N·m}	erg [erg(s)] kgf·m cal_{IT} [I. T. calories]	1 erg = 10^{-7} J 1 cal_{IT} = 4.186 8 J 1 Mcal_{IT} = 1.163 kW·h	1 J = 10^{7} erg 1 J = 0.238 85 cal_{IT} 1 kW·h = 0.86 × 10^{6} cal_{IT}
Thermal conductivity	W / (m·K)	W / (m·°C) cal / (s·m·°C)	1 W / (m·°C) = 1 W / (m·K) 1 cal / (s·m·°C) = 4.186 05 W / (m·K)	
Coefficient of heat transfer	W / (m^2·K)	W / (m^2·°C) cal / (s·m^2·°C)	1 W / (m^2·°C) = 1 W / (m^2·K) 1 cal / (s·m^2·°C) = 4.186 05 W / (m^2·K)	
Heat capacity	J / K	J / °C	1 J / °C = 1 J / K	
Massic heat capacity	J / (kg·K)	J / (kg·°C)		

[Note] 1) * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 1 (4) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge, quantity of electricity	C [coulomb(s)] {1 C = 1 A·s}	A·h *	1 A·h = 3.6 kC	
Tension, electric potential	V [volt(s)] {1 V = 1 W / A}			
Capacitance	F [farad(s)] {1 F = 1 C / V}			
Magnetic field strength	A / m	Oe [oersted(s)]	1 Oe = $\frac{10^3}{4\pi}$ A / m	1 A / m = $4\pi \times 10^{-3}$ Oe
Magnetic flux density	T [tesla(s)] {1 T = 1 N / (A·m) = 1 Wb / m^2 = 1 V·s / m^2}	Gs [gauss(es)] γ [gamma(s)]	1 Gs = 10^{-4} T 1 γ = 10^{-9} T	1 T = 10^4 Gs 1 T = 10^9 γ
Magnetic flux	Wb [weber(s)] {1 Wb = 1 V·s}	Mx [maxwell(s)]	1 Mx = 10^{-8} Wb	1 Wb = 10^8 Mx
Self inductance	H [henry(-ries)] {1 H = 1 Wb / A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω = 1 V / A}			
Conductance (to direct current)	S [siemens] {1 S = 1 A / V}			
Active power	{W 1 W = 1 J / s = 1 A·V}			

Supplementary table 2 Steel hardness numbers (1)

		Brinell Hardness Number 10 mm Ball 3000 kg Load			Rockwell Hardness Number			Rockwell Superficial Hardness Number Superficial Brale Penetrator						
Rockwell C-Scale Hardness Number	Diamond Pyramid Hardness Number Vickers	Standard Ball	Hultgren Ball	Tungsten Carbide Ball	A-Scale 60 kg Load Brale Penetrator	B-Scale 15 kg Load 1/16 in (1.59 mm) Dia.	D-Scale 100 kg Brale Penetrator	15-N Scale 15 kg Load	30-N Scale 30 kg Load	45-N Scale 45 kg Load	Shore Scleroscope Hardness Number	Tensil Strength (approx.) MPa	Tensil Strength (approx.) 1000 psi	Rockwell C-Scale Hardness Number
68	940	—	—	—	85.6	—	76.9	93.2	84.4	75.4	97	—	—	68
67	900	—	—	—	85	—	76.1	92.9	83.6	74.2	95	—	—	67
66	865	—	—	—	84.5	—	75.4	92.5	82.8	73.3	92	—	—	66
65	832	—	—	739	83.9	—	74.5	92.2	81.9	72	91	—	—	65
64	800	—	—	722	83.4	—	73.8	91.8	81.1	71	88	—	—	64
63	772	—	—	705	82.8	—	73	91.4	80.1	69.9	87	—	—	63
62	746	—	—	688	82.3	—	72.2	91.1	79.3	68.8	85	—	—	62
61	720	—	—	670	81.8	—	71.5	90.7	78.4	67.7	83	—	—	61
60	697	—	613	654	81.2	—	70.7	90.2	77.5	66.6	81	—	—	60
59	674	—	599	634	80.7	—	69.9	89.8	76.6	65.5	80	2250	326	59
58	653	—	587	615	80.1	—	69.2	89.3	75.7	64.3	78	2170	315	58
57	633	—	575	595	79.6	—	68.5	88.9	74.8	63.2	76	2100	305	57
56	613	—	561	577	79	—	67.7	88.3	73.9	62	75	2030	295	56
55	595	—	546	560	78.5	—	66.9	87.9	73	60.9	74	1980	287	55
54	577	—	534	543	78	—	66.1	87.4	72	59.8	72	1920	278	54
53	560	—	519	525	77.4	—	65.4	86.9	71.2	58.6	71	1850	269	53
52	544	500	508	512	76.8	—	64.6	86.4	70.2	57.4	69	1810	262	52
51	528	487	494	496	76.3	—	63.8	85.9	69.4	56.1	68	1740	253	51
50	513	475	481	481	75.9	—	63.1	85.5	68.5	55	67	1690	245	50
49	498	464	469	469	75.2	—	62.1	85	67.6	53.8	66	1650	239	49
48	484	451	455	455	74.7	—	61.4	84.5	66.7	52.5	64	1600	232	48
47	471	442	443	443	74.1	—	60.8	83.9	65.8	51.4	63	1550	225	47
45	446	421	421	421	73.1	—	59.2	83	64	49	60	1460	212	45
44	434	409	409	409	72.5	—	58.5	82.5	63.1	47.8	58	1420	206	44
43	423	400	400	400	72	—	57.7	82	62.2	46.7	57	1390	201	43
42	412	390	390	390	71.5	—	56.9	81.5	61.3	45.5	56	1350	196	42
41	402	381	381	381	70.9	—	56.2	80.9	60.4	44.3	55	1320	191	41
40	392	371	371	371	70.4	—	55.4	80.4	59.5	43.1	54	1280	186	40
39	382	362	362	362	69.9	—	54.6	79.9	58.6	41.9	52	1250	181	39
38	372	353	353	353	69.4	—	53.8	79.4	57.7	40.8	51	1210	176	38
37	363	344	344	344	68.9	—	53.1	78.8	56.8	39.6	50	1190	172	37
36	354	336	336	336	68.4	(109)	52.3	78.3	55.9	38.4	49	1160	168	36
35	345	327	327	327	67.9	(108.5)	51.5	77.7	55	37.2	48	1120	163	35
34	336	319	319	319	67.4	(108)	50.8	77.2	54.2	36.1	47	1100	159	34
33	327	311	311	311	66.8	(107.5)	50	76.6	53.3	34.9	46	1060	154	33
32	318	301	301	301	66.3	(107)	49.2	76.1	52.1	33.7	44	1030	150	32
31	310	294	294	294	65.8	(106)	48.4	75.6	51.3	32.5	43	1010	146	31
30	302	286	286	286	65.3	(105.5)	47.7	75	50.4	31.3	42	980	142	30
29	294	279	279	279	64.7	(104.5)	47	74.5	49.5	30.1	41	950	138	29
28	286	271	271	271	64.3	(104)	46.1	73.9	48.6	28.9	41	920	134	28
27	279	264	264	264	63.8	(103)	45.2	73.3	47.7	27.8	40	900	131	27
26	272	258	258	258	63.3	(102.5)	44.6	72.8	46.8	26.7	38	880	127	26
25	266	253	253	253	62.8	(101.5)	43.8	72.2	45.9	25.5	38	850	124	25
24	260	247	247	247	62.4	(101)	43.1	71.6	45	24.3	37	830	121	24
23	254	243	243	243	62	100	42.1	71	44	23.1	36	810	118	23
22	248	237	237	237	61.5	99	41.6	70.5	43.2	22	35	790	115	22
21	243	231	231	231	61	98.5	40.9	69.9	42.3	20.7	35	780	113	21
20	238	226	226	226	60.5	97.8	40.1	69.4	41.5	19.6	34	760	110	20

(1) Source ASTM

Supplementary table 3 Inch/millimeter conversion

Inch		Inches										
		0	1	2	3	4	5	6	7	8	9	10
		mm										
0	0	**0**	**25.4000**	**50.8000**	**76.2000**	**101.6000**	**127.0000**	**152.4000**	**177.8000**	**203.2000**	**228.6000**	**254.0000**
1/64	0.015625	0.3969	25.7969	51.1969	76.5969	101.9969	127.3969	152.7969	178.1969	203.5969	228.9969	254.3969
1/32	0.03125	0.7938	26.1938	51.5938	76.9938	102.3938	127.7938	153.1938	178.5938	203.9938	229.3938	254.7938
3/64	0.046875	1.1906	26.5906	51.9906	77.3906	102.7906	128.1906	153.5906	178.9906	204.3906	229.7906	255.1906
1/16	0.0625	1.5875	26.9875	52.3875	77.7875	103.1875	128.5875	153.9875	179.3875	204.7875	230.1875	255.5875
5/64	0.078125	1.9844	27.3844	52.7844	78.1844	103.5844	128.9844	154.3844	179.7844	205.1844	230.5844	255.9844
3/32	0.09375	2.3812	27.7812	53.1812	78.5812	103.9812	129.3812	154.7812	180.1812	205.5812	230.9812	256.3812
7/64	0.109375	2.7781	28.1781	53.5781	78.9781	104.3781	129.7781	155.1781	180.5781	205.9781	231.3781	256.7781
1/8	0.125	**3.1750**	**28.5750**	**53.9750**	**79.3750**	**104.7750**	**130.1750**	**155.5750**	**180.9750**	**206.3750**	**231.7750**	**257.1750**
9/64	0.140625	3.5719	28.9719	54.3719	79.7719	105.1719	130.5719	155.9719	181.3719	206.7719	232.1719	257.5719
5/32	0.15625	3.9688	29.3688	54.7688	80.1688	105.5688	130.9688	156.3688	181.7688	207.1688	232.5688	257.9688
11/64	0.171875	4.3656	29.7656	55.1656	80.5656	105.9656	131.3656	156.7656	182.1656	207.5656	232.9656	258.3656
3/16	0.1875	4.7625	30.1625	55.5625	80.9625	106.3625	131.7625	157.1625	182.5625	207.9625	233.3625	258.7625
13/64	0.203125	5.1594	30.5594	55.9594	81.3594	106.7594	132.1594	157.5594	182.9594	208.3594	233.7594	259.1594
7/32	0.21875	5.5562	30.9562	56.3562	81.7562	107.1562	132.5562	157.9562	183.3562	208.7562	234.1562	259.5562
15/64	0.234375	5.9531	31.3531	56.7531	82.1531	107.5531	132.9531	158.3531	183.7531	209.1531	234.5531	259.9531
1/4	0.25	**6.3500**	**31.7500**	**57.1500**	**82.5500**	**107.9500**	**133.3500**	**158.7500**	**184.1500**	**209.5500**	**234.9500**	**260.3500**
17/64	0.265625	6.7469	32.1469	57.5469	82.9469	108.3469	133.7469	159.1469	184.5469	209.9469	235.3469	260.7469
9/32	0.28125	7.1438	32.5438	57.9438	83.3438	108.7438	134.1438	159.5438	184.9438	210.3438	235.7438	261.1438
19/64	0.296875	7.5406	32.9406	58.3406	83.7406	109.1406	134.5406	159.9406	185.3406	210.7406	236.1406	261.5406
5/16	0.3125	7.9375	33.3375	58.7375	84.1375	109.5375	134.9375	160.3375	185.7375	211.1375	236.5375	261.9375
21/64	0.328125	8.3344	33.7344	59.1344	84.5344	109.9344	135.3344	160.7344	186.1344	211.5344	236.9344	262.3344
11/32	0.34375	8.7312	34.1312	59.5312	84.9312	110.3312	135.7312	161.1312	186.5312	211.9312	237.3312	262.7312
23/64	0.359375	9.1281	34.5281	59.9281	85.3281	110.7281	136.1281	161.5281	186.9281	212.3281	237.7281	263.1281
3/8	0.375	**9.5250**	**34.9250**	**60.3250**	**85.7250**	**111.1250**	**136.5250**	**161.9250**	**187.3250**	**212.7250**	**238.1250**	**263.5250**
25/64	0.390625	9.9219	35.3219	60.7219	86.1219	111.5219	136.9219	162.3219	187.7219	213.1219	238.5219	263.9219
13/32	0.40625	10.3188	35.7188	61.1188	86.5188	111.9188	137.3188	162.7188	188.1188	213.5188	238.9188	264.3188
27/64	0.421875	10.7156	36.1156	61.5156	86.9156	112.3156	137.7156	163.1156	188.5156	213.9156	239.3156	264.7156
7/16	0.4375	11.1125	36.5125	61.9125	87.3125	112.7125	138.1125	163.5125	188.9125	214.3125	239.7125	265.1125
29/64	0.453125	11.5094	36.9094	62.3094	87.7094	113.1094	138.5094	163.9094	189.3094	214.7094	240.1094	265.5094
15/32	0.46875	11.9062	37.3062	62.7062	88.1062	113.5062	138.9062	164.3062	189.7062	215.1062	240.5062	265.9062
31/64	0.484375	12.3031	37.7031	63.1031	88.5031	113.9031	139.3031	164.7031	190.1031	215.5031	240.9031	266.3031
1/2	0.5	**12.7000**	**38.1000**	**63.5000**	**88.9000**	**114.3000**	**139.7000**	**165.1000**	**190.5000**	**215.9000**	**241.3000**	**266.7000**
33/64	0.515625	13.0969	38.4969	63.8969	89.2969	114.6969	140.0969	165.4969	190.8969	216.2969	241.6969	267.0969
17/32	0.53125	13.4938	38.8938	64.2938	89.6938	115.0938	140.4938	165.8938	191.2938	216.6938	242.0938	267.4938
35/64	0.546875	13.8906	39.2906	64.6906	90.0906	115.4906	140.8906	166.2906	191.6906	217.0906	242.4906	267.8906
9/16	0.5625	14.2875	39.6875	65.0875	90.4875	115.8875	141.2875	166.6875	192.0875	217.4875	242.8875	268.2875
37/64	0.578125	14.6844	40.0844	65.4844	90.8844	116.2844	141.6844	167.0844	192.4844	217.8844	243.2844	268.6844
19/32	0.59375	15.0812	40.4812	65.8812	91.2812	116.6812	142.0812	167.4812	192.8812	218.2812	243.6812	269.0812
39/64	0.609375	15.4781	40.8781	66.2781	91.6781	117.0781	142.4781	167.8781	193.2781	218.6781	244.0781	269.4781
5/8	0.625	**15.8750**	**41.2750**	**66.6750**	**92.0750**	**117.4750**	**142.8750**	**168.2750**	**193.6750**	**219.0750**	**244.4750**	**269.8750**
41/64	0.640625	16.2719	41.6719	67.0719	92.4719	117.8719	143.2719	168.6719	194.0719	219.4719	244.8719	270.2719
21/32	0.65625	16.6688	42.0688	67.4688	92.8688	118.2688	143.6688	169.0688	194.4688	219.8688	245.2688	270.6688
43/64	0.671875	17.0656	42.4656	67.8656	93.2656	118.6656	144.0656	169.4656	194.8656	220.2656	245.6656	271.0656
11/16	0.6875	17.4625	42.8625	68.2625	93.6625	119.0625	144.4625	169.8625	195.2625	220.6625	246.0625	271.4625
45/64	0.703125	17.8594	43.2594	68.6594	94.0594	119.4594	144.8594	170.2594	195.6594	221.0594	246.4594	271.8594
23/32	0.71875	18.2562	43.6562	69.0562	94.4562	119.8562	145.2562	170.6562	196.0562	221.4562	246.8562	272.2562
47/64	0.734375	18.6531	44.0531	69.4531	94.8531	120.2531	145.6531	171.0531	196.4531	221.8531	247.2531	272.6531
3/4	0.75	**19.0500**	**44.4500**	**69.8500**	**95.2500**	**120.6500**	**146.0500**	**171.4500**	**196.8500**	**222.2500**	**247.6500**	**273.0500**
49/64	0.765625	19.4469	44.8469	70.2469	95.6469	121.0469	146.4469	171.8469	197.2469	222.6469	248.0469	273.4469
25/32	0.78125	19.8438	45.2438	70.6438	96.0438	121.4438	146.8438	172.2438	197.6438	223.0438	248.4438	273.8438
51/64	0.796875	20.2406	45.6406	71.0406	96.4406	121.8406	147.2406	172.6406	198.0406	223.4406	248.8406	274.2406
13/16	0.8125	20.6375	46.0375	71.4375	96.8375	122.2375	147.6375	173.0375	198.4375	223.8375	249.2375	274.6375
53/64	0.828125	21.0344	46.4344	71.8344	97.2344	122.6344	148.0344	173.4344	198.8344	224.2344	249.6344	275.0344
27/32	0.84375	21.4312	46.8312	72.2312	97.6312	123.0312	148.4312	173.8312	199.2312	224.6312	250.0312	275.4312
55/64	0.859375	21.8281	47.2281	72.6281	98.0281	123.4281	148.8281	174.2281	199.6281	225.0281	250.4281	275.8281
7/8	0.875	**22.2250**	**47.6250**	**73.0250**	**98.4250**	**123.8250**	**149.2250**	**174.6250**	**200.0250**	**225.4250**	**250.8250**	**276.2250**
57/64	0.890625	22.6219	48.0219	73.4219	98.8219	124.2219	149.6219	175.0219	200.4219	225.8219	251.2219	276.6219
29/32	0.90625	23.0188	48.4188	73.8188	99.2188	124.6188	150.0188	175.4188	200.8188	226.2188	251.6188	277.0188
59/64	0.921875	23.4156	48.8156	74.2156	99.6156	125.0156	150.4156	175.8156	201.2156	226.6156	252.0156	277.4156
15/16	0.9375	23.8125	49.2125	74.6125	100.0125	125.4125	150.8125	176.2125	201.6125	227.0125	252.4125	277.8125
61/64	0.953125	24.2094	49.6094	75.0094	100.4094	125.8094	151.2094	176.6094	202.0094	227.4094	252.8094	278.2094
31/32	0.96875	24.6062	50.0062	75.4062	100.8062	126.2062	151.6062	177.0062	202.4062	227.8062	253.2062	278.6062
63/64	0.984375	25.0031	50.4031	75.8031	101.2031	126.6031	152.0031	177.4031	202.8031	228.2031	253.6031	279.0031

Supplementary table 4 °C / °F conversion

°C		°F	°C		°F	°C		°F	°C		°F
−73	**−100**	−148	− 1.6	**29**	84.2	17.7	**64**	147.2	37.1	**99**	210.2
−62	**− 80**	−112	− 1.1	**30**	86.0	18.2	**65**	149.0	37.7	**100**	212
−51	**− 60**	− 76	− 0.6	**31**	87.8	18.8	**66**	150.8	40.6	**105**	221
−40	**− 40**	− 40	0	**32**	89.6	19.3	**67**	152.6	43	**110**	230
−29	**− 20**	− 4	0.5	**33**	91.4	19.9	**68**	154.4	49	**120**	248
−23.3	**− 10**	14	1.1	**34**	93.2	20.4	**69**	156.2	54	**130**	266
−17.7	**0**	32	1.6	**35**	95.0	21.0	**70**	158.0	60	**140**	284
−17.2	**1**	33.8	2.2	**36**	96.8	21.5	**71**	159.8	65	**150**	302
−16.6	**2**	35.6	2.7	**37**	98.6	22.2	**72**	161.6	71	**160**	320
−16.1	**3**	37.4	3.3	**38**	100.4	22.7	**73**	163.4	76	**170**	338
−15.5	**4**	39.2	3.8	**39**	102.2	23.3	**74**	165.2	83	**180**	356
−15.0	**5**	41.0	4.4	**40**	104.0	23.8	**75**	167.0	88	**190**	374
−14.4	**6**	42.8	4.9	**41**	105.8	24.4	**76**	168.8	93	**200**	392
−13.9	**7**	44.6	5.4	**42**	107.6	25.0	**77**	170.6	121	**250**	482
−13.3	**8**	46.4	6.0	**43**	109.4	25.5	**78**	172.4	149	**300**	572
−12.7	**9**	48.2	6.6	**44**	111.2	26.2	**79**	174.2	177	**350**	662
−12.2	**10**	50.0	7.1	**45**	113.0	26.8	**80**	176.0	204	**400**	752
−11.6	**11**	51.8	7.7	**46**	114.8	27.3	**81**	177.8	232	**450**	842
−11.1	**12**	53.6	8.2	**47**	116.6	27.7	**82**	179.6	260	**500**	932
−10.5	**13**	55.4	8.8	**48**	118.4	28.2	**83**	181.4	288	**550**	1 022
−10.0	**14**	57.2	9.3	**49**	120.2	28.8	**84**	183.2	315	**600**	1 112
− 9.4	**15**	59.0	9.9	**50**	122.0	29.3	**85**	185.0	343	**650**	1 202
− 8.8	**16**	61.8	10.4	**51**	123.8	29.9	**86**	186.8	371	**700**	1 292
− 8.3	**17**	63.6	11.1	**52**	125.6	30.4	**87**	188.6	399	**750**	1 382
− 7.7	**18**	65.4	11.5	**53**	127.4	31.0	**88**	190.4	426	**800**	1 472
− 7.2	**19**	67.2	12.1	**54**	129.2	31.5	**89**	192.2	454	**850**	1 562
− 6.6	**20**	68.0	12.6	**55**	131.0	32.1	**90**	194.0	482	**900**	1 652
− 6.1	**21**	69.8	13.2	**56**	132.8	32.6	**91**	195.8	510	**950**	1 742
− 5.5	**22**	71.6	13.7	**57**	134.6	33.3	**92**	197.6	538	**1 000**	1 832
− 5.0	**23**	73.4	14.3	**58**	136.4	33.8	**93**	199.4	593	**1 100**	2 012
− 4.4	**24**	75.2	14.8	**59**	138.2	34.4	**94**	201.2	648	**1 200**	2 192
− 3.9	**25**	77.0	15.6	**60**	140.0	34.9	**95**	203.0	704	**1 300**	2 372
− 3.3	**26**	78.8	16.1	**61**	141.8	35.5	**96**	204.8	760	**1 400**	2 552
− 2.8	**27**	80.6	16.6	**62**	143.6	36.1	**97**	206.6	815	**1 500**	2 732
− 2.2	**28**	82.4	17.1	**63**	145.4	36.6	**98**	208.4	871	**1 600**	2 937

[Example] The center columns of numbers is the temperature in either degrees Centigrade (°C) or Fahrenheit (°F) whichever is desired to convert into the other. If degrees Fahrenheit is given, read degrees Centigrade to the left. If degrees Centigrade is given, read degrees Fahrenheit to the right.

$$^\circ\mathrm{C} = \frac{5}{9}(^\circ\mathrm{F} - 32)$$

$$^\circ\mathrm{F} = \frac{9}{5}\,^\circ\mathrm{C} + 32$$

Supplementary table 5 Viscosity conversion

Kinematic viscosity mm²/s	Saybolt SUS (second)		Redwood R (second)		Engler E (degree)
	100 °F	210 °F	50 °C	100 °C	
2	32.6	32.8	30.8	31.2	1.14
3	36.0	36.3	33.3	33.7	1.22
4	39.1	39.4	35.9	36.5	1.31
5	42.3	42.6	38.5	39.1	1.40
6	45.5	45.8	41.1	41.7	1.48
7	48.7	49.0	43.7	44.3	1.56
8	52.0	52.4	46.3	47.0	1.65
9	55.4	55.8	49.1	50.0	1.75
10	58.8	59.2	52.1	52.9	1.84
11	62.3	62.7	55.1	56.0	1.93
12	65.9	66.4	58.2	59.1	2.02
13	69.6	70.1	61.4	62.3	2.12
14	73.4	73.9	64.7	65.6	2.22
15	77.2	77.7	68.0	69.1	2.32
16	81.1	81.7	71.5	72.6	2.43
17	85.1	85.7	75.0	76.1	2.54
18	89.2	89.8	78.6	79.7	2.64
19	93.3	94.0	82.1	83.6	2.76
20	97.5	98.2	85.8	87.4	2.87
21	102	102	89.5	91.3	2.98
22	106	107	93.3	95.1	3.10
23	110	111	97.1	98.9	3.22
24	115	115	101	103	3.34
25	119	120	105	107	3.46
26	123	124	109	111	3.58
27	128	129	112	115	3.70
28	132	133	116	119	3.82
29	137	138	120	123	3.95
30	141	142	124	127	4.07
31	145	146	128	131	4.20
32	150	150	132	135	4.32
33	154	155	136	139	4.45
34	159	160	140	143	4.57
35	163	164	144	147	4.70
36	168	170	148	151	4.83
37	172	173	153	155	4.96
38	177	178	156	159	5.08
39	181	183	160	164	5.21
40	186	187	164	168	5.34
41	190	192	168	172	5.47
42	195	196	172	176	5.59
43	199	201	176	180	5.72
44	204	205	180	185	5.85
45	208	210	184	189	5.98
46	213	215	188	193	6.11
47	218	219	193	197	6.24
48	222	224	197	202	6.37
49	227	228	201	206	6.50
50	231	233	205	210	6.63
55	254	256	225	231	7.24
60	277	279	245	252	7.90
65	300	302	266	273	8.55
70	323	326	286	294	9.21
75	346	349	306	315	9.89
80	371	373	326	336	10.5
85	394	397	347	357	11.2
90	417	420	367	378	11.8
95	440	443	387	399	12.5
100	464	467	408	420	13.2
120	556	560	490	504	15.8
140	649	653	571	588	18.4
160	742	747	653	672	21.1
180	834	840	734	757	23.7
200	927	933	816	841	26.3
250	1 159	1 167	1 020	1 051	32.9
300	1 391	1 400	1 224	1 241	39.5

[Remark] 1 mm²/s = 1 cSt (centi stokes)

INDEX

CODE	DESCRIPTION	PAGE
EWC	Drawn cup roller clutch with synthetic resin housings, outer ring outside diameter surface protrusion, metric series	B-3-20
FC	Drawn cup roller clutch, regular series, multi-roller per stainless steel spring, metric series	B-3-10~B-3-11
FC -K	Drawn cup roller clutch, regular series, single roller per stainless steel spring, metric series	B-3-10~B-3-11
FCB	Drawn cup roller clutch and bearing assembly, regular series, multi-roller per stainless steel spring, metric series	B-3-12~B-3-13
FCBL -K	Drawn cup roller clutch and bearing assembly, light series, single roller per stainless steel spring, metric series	B-3-12~B-3-13
FCBN -K	Drawn cup roller clutch and bearing assembly, light series, single roller per stainless steel spring, metric series	B-3-12~B-3-13
FCL -K	Drawn cup roller clutch, light series, single roller per stainless steel spring, metric series	B-3-10~B-3-11
FCS	Drawn cup roller clutch, regular series, single roller per stainless steel spring, metric series	B-3-10~B-3-11
FNT, FNTA	Thrust needle roller and cage assembly (without washers), two-piece cage, metric series	B-6-12~B-6-15
FNTF	Unitized needle roller thrust bearing, non-separable design, with one I.D. lipped thrust washer, metric series	B-6-24
FNTK	Unitized needle roller thrust bearing, non-separable design, with one O.D. lipped thrust washer, metric series	B-6-22
FNTKF	Unitized needle roller thrust bearing, with non-separable washers, one I.D. lipped washer and one O.D. lipped washer, metric series	B-6-20
GB	Extra-precision drawn cup needle roller bearing, full complement, inch series	B-2-59
GBH	Extra-precision drawn cup needle roller bearing, full complement, heavy series, inch series	B-2-59
GS	Radial needle roller and cage assembly for crank pin applications, metric series	B-1-50
GS.811, GS.812	Thrust washer, housing piloted, metric series	B-6-13~B-6-15 & B-6-31~B-6-33
HJ	Needle roller bearing with integral flanges, lubricating groove and a lubricating hole in the outer ring, without inner ring, inch series	B-4-42~B-4-45

CODE	DESCRIPTION	PAGE
HJ RS	Needle roller bearing with integral flanges, lubricating groove and a lubricating hole in the outer ring, without inner ring, with one seal, inch series	B-4-46~B-4-47
HJ .2RS	Needle roller bearing with integral flanges, lubricating groove and a lubricating hole in the outer ring, with two seals, without inner ring, inch series	B-4-46~B-4-47
HK	Drawn cup needle roller bearing, open ends, caged, metric series	B-2-14~B-2-19
HK RS	Drawn cup needle roller bearing, open ends, caged, with one seal, metric series	B-2-24~B-2-25
HK .2RS	Drawn cup needle roller bearing, open ends, caged, with two seals, metric series	B-2-24~B-2-25
IR (≤4 digit)	Inner ring for drawn cup needle roller bearing, inch-series	B-2-68~B-2-70
IR (6 digit)	Inner ring for heavy-duty needle roller bearing, inch series	B-4-48~B-4-50
IRA	Inner ring for drawn cup needle roller bearing, extra wide, inch-series	B-2-68~B-2-70
J	Drawn cup needle roller bearing, caged, open ends, inch series	B-2-60~B-2-63
JH	Drawn cup needle roller bearing, caged, open ends, heavy series, inch series	B-2-60~B-2-63
JP-F	Drawn cup needle roller bearing, plastic finger cage, inch series	B-2-60
JR	Inner ring for needle roller bearing, no lubrication hole, metric series	B-2-28~B-2-37 & B-8-20~B-8-29
JR. JS1	Inner ring for needle roller bearing, with lubrication hole, metric series	B-2-28~B-2-34 & B-8-20~B-8-26
JRZ. JS1	Inner ring for needle roller bearing, with lubrication hole, without raceway chamfer, metric series	B-2-28~B-2-34 & B-8-20~B-8-26
JT	Drawn cup needle roller bearing, with one seal, open ends, caged, inch series	B-2-66~B-2-67
JTT	Drawn cup needle roller bearing, with two seals, open ends, caged, inch series	B-2-66~B-2-67
K	Radial needle roller and cage assembly, single-row, metric series	B-1-8~B-1-28
K BE	Radial needle roller and cage assembly for crank pin applications, metric series	B-1-47~B-1-48
K F	Radial needle roller and cage assembly, machined cage, single-row, metric series	B-1-9~B-1-28

CODE	DESCRIPTION	PAGE
NAXR .Z	Combined needle roller bearings, combination machined race needle roller and thrust cylindrical roller bearing, caged, single directional axial load capability, with dust cap, without inner ring, metric series	B-7-10~B-7-11
NK	Heavy-duty needle roller bearing, caged, with flanges (inserted or integral), without inner ring, metric series	B-4-20~B-4-26
NKJ	Heavy-duty needle roller bearing, caged, with flanges (inserted or integral), with inner ring, metric series	B-4-13~B-4-18
NKJS	Heavy-duty needle roller bearing, with integral flanges, lubricating groove and one lubricating hole in the outer ring, with inner ring, metric series	B-4-15~B-4-17
NKS	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, metric series	B-4-21~B-4-25
NQ	Heavy-duty needle roller bearing, caged, with integral flanges, without inner ring, metric series	B-4-27~B-4-28
NQI	Heavy-duty needle roller bearing, caged, with integral flanges, with inner ring, metric series	B-4-19
NRO.B	Needle roller, flat end, metric series	B-8-6
NTA	Thrust needle roller and cage assembly (without washers), two-piece cage, inch series	B-6-38~B-6-47
NTH	Thrust cylindrical roller and cage assembly (without washers), inch series	B-6-48~B-6-49
NTHA	Cylindrical roller thrust bearing, with separable washers, one shaft-piloted washer and one housing-piloted washer, inch series	B-6-50~B-6-51
NUKR	Cylindrical roller bearing, track roller, stud-type, full complement, with shields, crowned outer ring outer diameter, metric series	B-5-20~B-5-21
NUTR	Cylindrical roller bearing, track roller, yoke-type, full complement, crowned outer ring outer diameter, with end washers, non-separable design, with inner ring, metric series	B-5-27
NUTR.DZ	Cylindrical roller bearing, track roller, yoke-type, full complement, cylindrical outer ring outer diameter, with end washers, non-separable design, with inner ring, metric series	B-5-27
R	Radial needle roller and cage assembly, steel cage, metric series	B-1-30~B-1-41
R P	Radial needle roller and cage assembly for wrist pin applications, metric series	B-1-53~B-1-54
RC	Drawn cup roller clutch, single roller per integral spring, inch series	B-3-14~B-3-15
RC -FS	Drawn cup roller clutch, single roller per stainless steel spring, inch series	B-3-14~B-3-15
RCB	Drawn cup roller clutch and bearing assembly, single roller per integral spring, inch series	B-3-16~B-3-17
RCB -FS	Drawn cup roller clutch and bearing assembly, single roller per stainless steel spring, inch series	B-3-16~B-3-17
RE	Radial needle roller and cage assembly for wrist pin applications, metric series	B-1-53~B-1-54
RF	Radial needle roller and cage assembly, molded polymer cage, metric series	B-1-30~B-1-40
RFN	Radial needle roller and cage assembly, molded polymer cage, metric series	B-1-40
RFU	Radial needle roller and cage assembly, half-caged, molded polymer cage, metric series	B-1-32~B-1-40
RNA22 .2RS	Needle roller bearing, track roller, yoke type, caged, sealed, with integral flanges, crowned outer ring outer diameter, without inner ring, metric series	B-5-24
RNA22 .2RS.DZ	Needle roller bearing, track roller, yoke type, caged, sealed, with integral flanges, cylindrical outer ring outer diameter, without inner ring, metric series	B-5-24
RNA48	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, metric series	B-4-26
RNA49	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, metric series	B-4-20~B-4-26, B-4-28~B-4-29
RNA49 RS	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, with one seal, metric series	B-4-31
RNA49 .2RS	Heavy-duty needle roller bearing, caged, with integral flanges, lubricating groove and one lubricating hole in the outer ring, without inner ring, with two seals, metric series	B-4-31

CODE	DESCRIPTION	PAGE
RNA69	Heavy-duty needle roller bearing, caged, with flanges (inserted or integral), lubricating groove and one lubricating hole in the outer ring, without inner ring (sizes with 40 mm and larger bores have two needle roller and cage assemblies), metric series	B-4-21~B-4-26, B-4-28
RNAO	Heavy-duty needle roller bearing without flanges, without inner ring, metric series	B-4-35~B-4-37
RP	Radial needle roller and cage assembly, steel cage, metric series	B-1-31~B-1-40
RPU	Radial needle roller and cage assembly, half-caged, steel cage, metric series	B-1-33~B-1-40
RS	Radial needle roller and cage assembly, steel cage, metric series	B-1-30~B-1-39
RSTO	Needle roller bearing, track roller, yoke type, caged, crowned outer ring outer diameter, separable design, without inner ring, without end washers, metric series	B-5-22
RSTO. DZ	Needle roller bearing, track roller, yoke type, caged, cylindrical outer ring outer diameter, separable design, without inner ring, without end washers, metric series	B-5-22
RSU	Radial needle roller and cage assembly, half-caged, steel cage, metric series	B-1-37
RV	Radial needle roller and cage assembly, steel cage, metric series	B-1-30~B-1-41
RVU	Radial needle roller and cage assembly, half-caged, steel cage, metric series	B-1-35
SNSH	End washers, for use with NAO and RNAO needle roller bearings, metric series	B-4-32~B-4-37 & B-8-30
STO	Needle roller bearing, track roller, yoke type, caged, crowned outer ring outer diameter, separable design, with inner ring, metric series	B-5-23
STO. DZ	Needle roller bearing, track roller, yoke type, caged, cylindrical outer ring outer diameter, separable design, with inner ring, metric series	B-5-23
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TPK L	Unitized needle roller thrust bearing, non-separable design, with one I.D. lipped thrust washer, metric series	B-6-25
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TVK JL	Unitized needle roller thrust bearing, with non-separable washers, one I.D. lipped washer and one O.D. lipped washer, metric series	B-6-21
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CODE	DESCRIPTION	PAGE
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NOTES

NOTES

NOTES

GLOBAL NETWORK

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VEGETABLE OIL INK

CAT.NO.BS007EN-0DS
Printed in Japan '19.11('13.1)

List of products that are listed in CAT.NO.B2020E-1 but not in CAT.NO.BS007EN-0DS

・Metric series drawn cup needle roller bearing (full complement type) : DL, DLF

・Metric series inner ring : IM...P, IM, IM...P6, IMC, BICG, BIG, BIK, BIP

・Metric series heavy-duty needle roller bearing (full complement type) : NA, RNA

・Metric series stud-type track rollers (full complement type) : GC16-90/GCL16-90, GCR, GCRL, GC10-15/GCL10-15, GCU, GCUL, GCUR, GCURL

・Metric series yoke-type track rollers (full complement type, sealed) : FP, FPL, FG, FGL, RNA...B6, RNAB, RNAL

・Metric series yoke-type track rollers (full complement type, with metal seals) : FGU, FGUL

・Metris series unitized thrust bearings : AX, CP, AXZ, ARZ, AR

・Metric series combined needle roller bearings : RAXZ500, RAX500, RAX400, RAX700, RAXF700

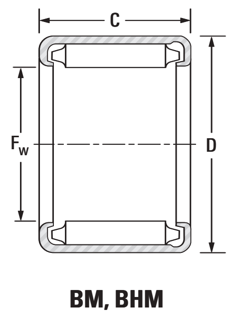
CAT.NO.BS007EN-0DS (B-2-38,39) 7

’NEEDLE ROLLER BEARINGS ”

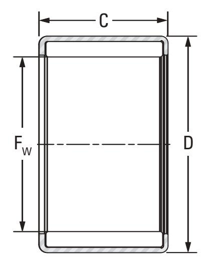
The basic dynamic load rating *C* on these two pages will be corrected as shown in the red frame.

DRAWN CUP NEEDLE ROLLER BEARINGS
FULL COMPLEMENT
OPEN ENDS

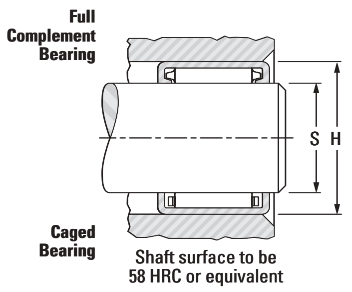
METRIC SERIES
BM, BHM, YM SERIES



BM, BHM



YM



Shaft Dia.	F_w	D	C	$C_{3\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions				Inspection gage
			+0 +0.000 -0.3 -0.012			Dynamic	Static			Shaft (h5)		Housing (H6)		
					Open Ends	C	C_0			Max.	Min.	Max.	Min.	
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in	
3.5 0.1378	3.5	8	11	—	YM040811A	4.10 920	4.20 940	0.62	0.003	3.500	3.495	8.009	8.000	Table B2-3
6.13 0.2413	6.13	11	9.7	—	6YM1110BM	4.70 1060	5.80 1300	0.88	0.004	6.130	6.124	11.011	11.000	Table B2-3
8 0.3150	8	12	10	—	YM081210	6.10 1370	8.80 1980	1.35	0.004	8.000	7.994	12.011	12.000	Table B2-3
	8	13	10	—	YM081310AM	5.65 1270	7.70 1730	1.15	0.006	8.000	7.994	13.011	13.000	Table B2-3
10 0.3937	10	14	10	—	10BM1410	6.55 1470	9.50 2140	1.45	0.004	10.000	9.994	14.011	14.000	Table B2-3
12 0.4724	12	18	12	—	12BM1812	9.70 2180	12.8 2880	1.90	0.010	12.000	11.992	18.011	18.000	Table B2-3
14 0.5512	14	20	12	—	14BM2012	10.5 2360	14.8 3330	2.25	0.011	14.000	13.992	20.013	20.000	Table B2-3
15 0.5906	15	21	10	—	15BM2110	8.85 1990	12.0 2700	1.85	0.009	15.000	14.992	21.013	21.000	Table B2-3
	15	21	12	—	15BM2112	11.2 2520	16.1 3620	2.45	0.012	15.000	14.992	21.013	21.000	Table B2-3
	15	21	16	—	15BM2116	15.4 3460	24.4 5490	3.70	0.016	15.000	14.992	21.013	21.000	Table B2-3
16 0.6299	16	22	12	—	16BM2212	11.7 2630	17.3 3890	2.65	0.012	16.000	15.992	22.013	22.000	Table B2-3
17 0.6693	17	23	12	—	17BM2312	11.9 2680	18.2 4090	2.70	0.013	17.000	16.992	23.013	23.000	Table B2-3
	17	24	12	—	YM172412-1	14.9 3350	21.5 4830	3.25	0.016	17.000	16.992	24.013	24.000	Table B2-3
	17	24	17	—	BM172417-1	18.3 4110	28.2 6340	4.30	0.023	17.000	16.992	24.013	24.000	Table B2-3
	17	24	20	—	BHM1720A	21.7 4880	35.1 7890	5.55	0.026	17.000	16.992	24.013	24.000	Table B2-3
	17	24	25	—	BHM1725	27.2 6110	46.9 10540	7.30	0.034	17.000	16.992	24.013	24.000	Table B2-3
18 0.7087	18	24	16	—	18BM2416	17.2 3870	29.4 6610	4.45	0.018	18.000	17.992	24.013	24.000	Table B2-3
20 0.7874	20	26	14	—	YM202614	17.2 3870	31.4 7060	4.75	0.019	20.000	19.991	26.013	26.000	Table B2-3
	20	26	16	—	20BM2616	17.0 3820	31.7 7130	4.85	0.021	20.000	19.991	26.013	26.000	Table B2-3

Note) · For information on the speed ratings, contact JTEKT.

Shaft Dia.	F_w	D	C	$C_{3\,min.}$	Bearing Designation	Load Ratings		Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions				Inspection gage
			+0 +0.000 -0.3 -0.012			Dynamic	Static			Shaft (h5)		Housing (H6)		
					Open Ends	C	C_0			Max.	Min.	Max.	Min.	
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in	
20 0.7874	20	26	20	—	20BM2620	21.5 4830	42.7 9600	6.70	0.026	20.000	19.991	26.013	26.000	Table B2-3
	20	27	15	—	BM2015	17.8 4000	28.0 6290	4.25	0.022	20.000	19.991	27.013	27.000	Table B2-3
	20	27	26	—	BM2026	31.5 7080	58.3 13110	9.10	0.040	20.000	19.991	27.013	27.000	Table B2-3
21 0.8268	21	27	20	—	21YM2720J	23.3 5240	47.6 10700	7.45	0.029	21.000	20.991	27.013	27.000	Table B2-3
22 0.8661	22	29	25	—	BM222925	30.5 6860	60.1 13510	9.40	0.043	22.000	21.991	29.013	29.000	Table B2-3
25 0.9843	25	32	16	—	BM2516	21.5 4830	38.3 8610	5.85	0.028	25.000	24.991	32.016	32.000	Table B2-3
	25	32	20	—	BM2520	27.3 6140	52.0 11690	8.15	0.036	25.000	24.991	32.016	32.000	Table B2-3
	25	32	26	—	BM2526	35.4 7960	72.7 16340	11.4	0.048	25.000	24.991	32.016	32.000	Table B2-3
	25	33	25	—	BHM2525	35.8 8050	66.6 14970	10.4	0.053	25.000	24.991	33.016	33.000	Table B2-3
28 1.1024	28	34	17	—	BM2817	23.6 5310	50.0 11240	7.80	0.029	28.000	27.991	34.016	34.000	Table B2-3
	28	34	24	—	BM2824	33.0 7420	77.1 17330	12.1	0.042	28.000	27.991	34.016	34.000	Table B2-3
	28	37	30	—	28BHM3730	49.8 11200	95.1 21380	14.9	0.080	28.000	27.991	37.016	37.000	Table B2-3
	28	39	30	—	BM283930A	50.7 11400	86.3 19400	13.5	0.101	28.000	27.991	39.016	39.000	Table B2-3
30 1.1811	30	37	20	—	30BM3720	30.6 6880	62.9 14140	10.0	0.042	30.000	29.991	37.016	37.000	Table B2-3
	30	37	26	—	30BM3726	39.6 8900	87.7 19710	13.7	0.056	30.000	29.991	37.016	37.000	Table B2-3
34 1.3386	34	42	25	—	34YM4225L	42.1 9460	94.1 21150	14.7	0.075	34.000	33.989	42.016	42.000	Table B2-3
38 1.4961	38	48	20	—	YM3820PL	43.7 9820	83.3 18730	13.3	0.082	38.000	37.989	48.016	48.000	Table B2-3
40 1.5748	40	53	20	—	YM405320JM	54.2 12180	89.9 20210	14.4	0.116	40.000	39.989	53.019	53.000	Table B2-3

Koyo®

OIL SEALS & O-RINGS

JTEKT | JTEKT CORPORATION

KOYO SEALING TECHNO CO., LTD.

JTEKT
Koyo | TOYODA

CAT. NO.R2001E-4

Koyo®

OIL SEALS & O-RINGS

Koyo®

OIL SEALS & O-RINGS

JTEKT | JTEKT CORPORATION

KOYO SEALING TECHNO CO., LTD.

Preface

This catalog lists Koyo oil seals and O-rings, including all items of the dimension series specified in ISO, JIS and JASO (Japanese Automobile Standards Organization) standards. This catalog is also based on knowledge gained from our supply record, experience, expertise, technologies, and research developments that JTEKT and KOYO SEALING TECHNO have acquired in cooperation with customers since its foundation in 1964.

A specialty of this new catalog is the comprehensive information, it offers regarding the selection and handling of oil seals and O-rings.

Energy-saving, efforts to protect global environment are in great demand, and we make efforts to continue further research and development in response to these.

We look forward to receiving your further loyal patronage of Koyo products.

If you have any questions or requests in selecting oil seals, please fill out the Request Forms for Oil Seal Design and Production provided at the end of this catalog and send them by fax to your nearest JTEKT operation.

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Contents

1. Oil Seals

2. O-Rings

3. Application Examples of Oil Seals and O-Rings

4. References

Koyo Oil Seals: Features

1. Lightweight, compact, and energy-saving

Koyo oil seals offer high sealing performance, while being compact with reduced seal width. They help reduction of machine weight, size, and resource consumption

2. High sealing performance by optimum lip design

Koyo oil seals employ a linear-contact lip, which provides proper radial lip load. The lip design ensures excellent sealing performance, low torque, proper flexibility and high allowability for eccentricity.

3. Low heat generation and long service life by highly self-lubricating rubber materials

Based on extensive research and experimentation, JTEKT has succeeded in developing seal rubber materials with high self-lubrication performance. These rubber materials show limited chemical changes such as hardening, softening and/or aging.

These materials, having excellent durability, can offer long service life with less heat generated even under high-peripheral speed.

4. High sealing performance and long service life by hydrodynamic ribs (Perfect Seal, Helix Seal, Super Helix Seal)

The sealing lip has special spiral threads (hydrodynamic ribs) in one or two directions, which drastically improved sealing performance and service life.

Various oil seals

Large-size oil seals

Koyo O-Rings: Features

1. High sealing performance and reliability

High sealing performance against water, oil, air, various gases and chemicals.

2. Available in a full lineup of designs and sizes

3. Easy handling

Various O-rings

Koyo Functional Products: Features

JTEKT produces various functional products based on advanced sealing technologies and sophisticated manufacturing expertise acquired through extensive research and development.

Koyo functional products are very helpful in improving machine performance, reducing weight, size, noise and vibration.

Consult JTEKT if there is no product in this catalog that exactly matches your requirements--JTEKT can custom-design products.

1. Functional products for automobiles and industrial machinery

Various functional products

- Center bearing unit
- Bearings molded with vibration isolating rubber
- Spark-plug tube gasket
- Plastic gear shafts
- Dust covers

Bonded piston seals for automatic transmissions and CVT

Friction dampers for manual transmissions and engine balance shafts

2. Functional products for motorcycles

■ **Various functional products**

- Air cleaner joint
- Carburetor joint
- Muffler joints
- Plastic gear shafts
- Oil strainer
- Mesh gasket
- Ball-component clutch releases
- Vertical gaskets
- Chain tensioner
- Chain guide

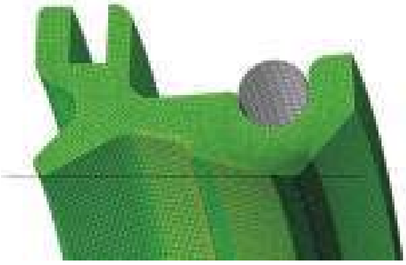
FEM (Finite Element Method) Analysis

JTEKT uses the non-linear finite element method to analyze non-linear materials such as rubber, for which accurate analysis was difficult before. The company has been studying sealing-mechanism theories by this method in order to develop new products.

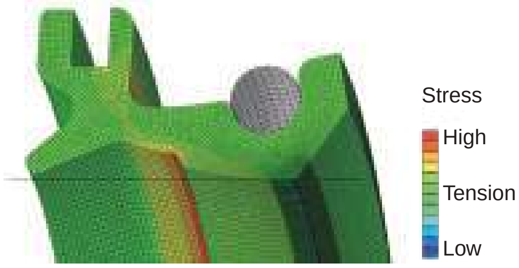
The findings so far have been very useful for basic research as well as for rubber-component design.

The FEM is our common design tool today, enabling highly reliable analysis and evaluation, speeding up research and product development.

Pressure deflection, stress analysis



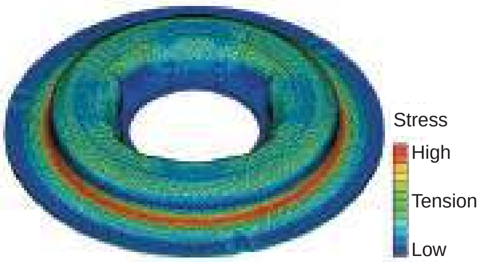
Under no load



Under load (stress distribution diagram)

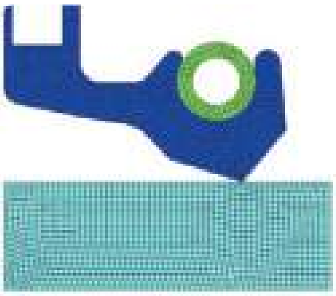
Metal ring three-dimensional stress analysis

Under no load

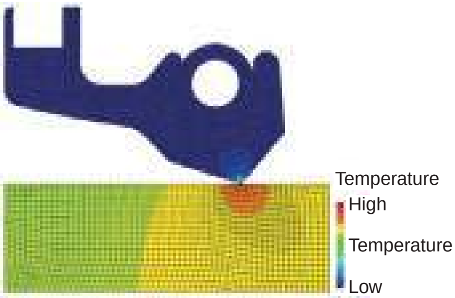


Under load (stress distribution diagram)

Heat transfer analysis (temperature distribution)



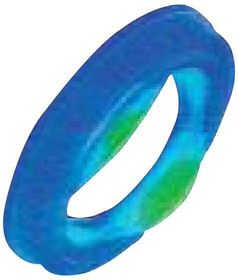
When the shaft is standstill



After the shaft is rotated (heat temperature distribution chart)

Three-dimensional seal lip vibration analysis

Under no load



At resonance

1

Oil Seals

1.1 Nomenclature and functions of seal components

(1) Nomenclature of components

Oil seals work to prevent leakage of sealed objects such as lubricants from inside and also to prevent the entry of dust and contaminants from outside.

Oil seals are designed in a variety of shapes according to the applications and substances to be sealed.

Fig. 1.1.1 shows a typical shape of seal and its component nomenclature.

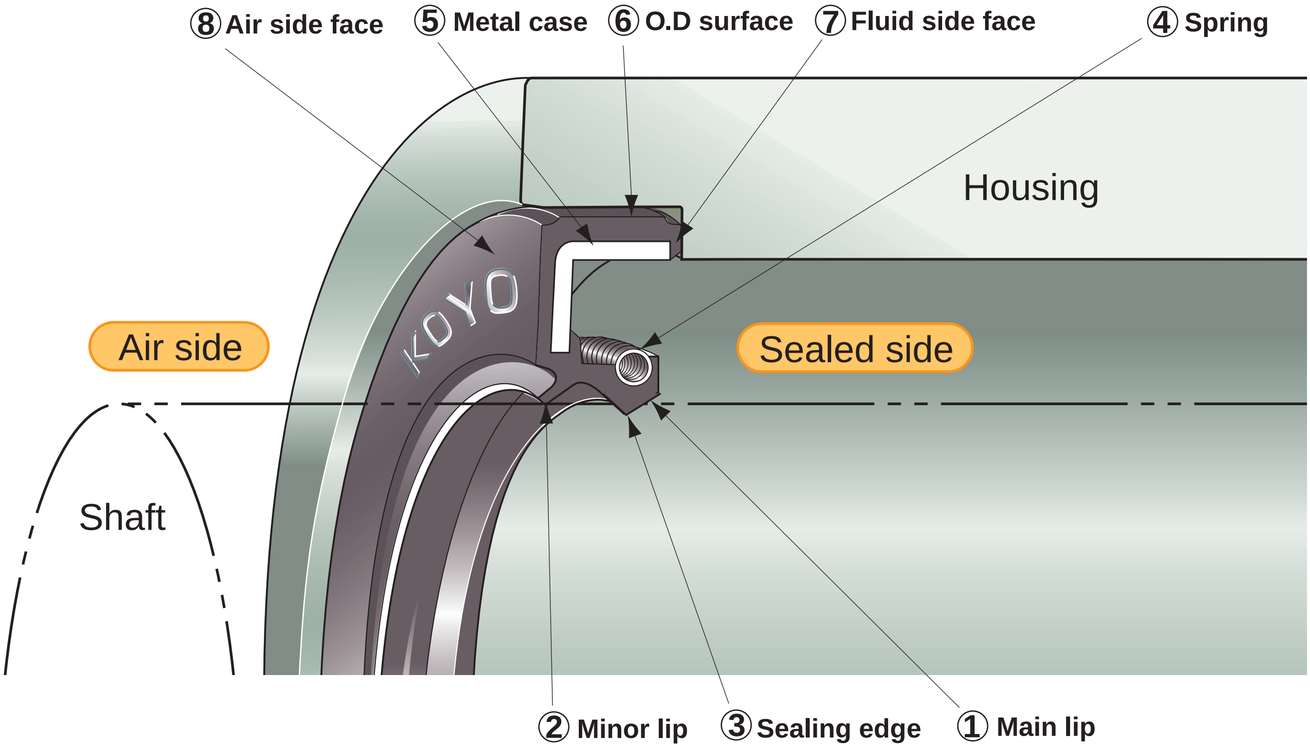


Fig. 1.1.1 Typically shaped oil seal and component nomenclature

(2) Component functions

① Main lip

The main lip is the most critical component of seals.

Its sealing edge contacts around the shaft surface in order to provide excellent sealing performance.

During service, seals are placed under various stresses, such as machine vibration, shaft runout, and changes in the temperature and pressure of substances to be sealed.

The main lip is designed so as to generate force (radial lip load) and to keep the sealing edge consistently in contact with the shaft under such stresses.

For such stresses, seal rubber material is made from synthetic rubber, which is highly elastic and abrasion-resistant.

② Minor lip

The minor lip prevents the entry of dust and contaminants from outside. As a lubricant, grease can be retained in the space between main lip and minor lip.

③ Sealing edge

Section of the sealing edge is wedge-shaped to be pressed against the shaft surface and linearly contacts with the shaft to ensure sufficient sealing performance and suitability for operation at high peripheral speed.

④ Spring

The spring supplements the tension at the sealing edge to ensure tight contact between the shaft and the sealing edge and enhanced sealing performance. The spring also prevents the deterioration of main lip sealing performance caused by high heat or others.

Because this spring is a closely wound type coil, the initial tension can be obtained high level, and then changes in load characteristics can be gradual with respect to spring elongation. Tension at the sealing edge can thus be kept stable at an appropriate level.

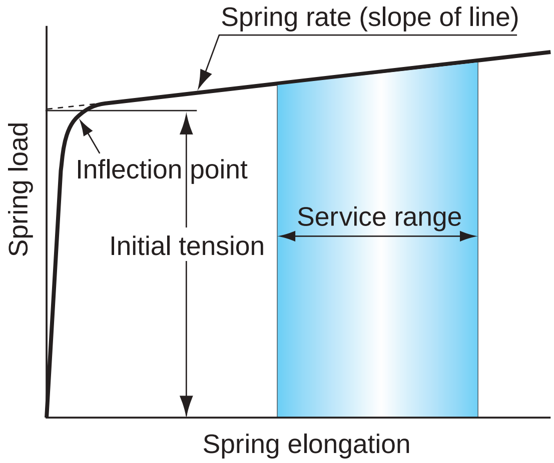


Fig. 1.1.2 Spring properties for seal

⑤ Metal case

The metal case provides rigidity on seal, helping it settle on the housing securely. It also ensures easy seal handling and mounting.

⑥ O.D surface

Seals are fitted tightly into the housing bore generally.

O.D surface prevents the oil leakage through fitting area, while excluding contaminants. This surface may be made of either metal or rubber and selected depending on the application.

⑦ Fluid side face

The front end face of the seal is called the nose. Seals are usually mounted for the nose to face the substances to be sealed. The nose is made of rubber and forms a gasket seal when compressed on housing shoulder.

⑧ Air side face

The oil seal surface vertical to the center line of the shaft on the side that does not come in contact with substances to be sealed is generally called the back face. Either metal or rubber peripheral surface is available, depending on the application.

1.2 Seal numbering system

Table 1.2.1 Seal numbering system

Example

MH S A 45 70 8 J

Special shape code .... J: Additional code is added here as an identifier when two or more seals have exactly the same type codes and dimensional numbers.

Dimensional numbers
- Shaft number .... 45: The seal suits the shaft diameter of ϕ45 mm.
- Housing bore number ... 70: The seal suits the housing bore diameter of ϕ70 mm.
- Width number .... 8: The seal width is 8 mm.

Lip type code .... No code: without minor lip
A: with minor lip

Spring code .... No code: without spring
S: with spring

Seal type code ....
- MH: O.D wall is rubber material
- HM: O.D wall is metal case
- HM(S)H: O.D wall is metal with a reinforcing inner metal case. (A spring is always provided for this type.)

Remark) For the type codes of special type seals, refer to Section 1.3.

Koyo oil seals: Features

Rubber O.D wall prevents leakage efficiently under pressure

Light metal case with sufficient rigidity

Nose gasket prevents leakage through the seal O.D

Lip design with excellent followability

Linear contact type sealing edge with high durability under high peripheral speed

Minor lip preventing entry of contaminants

Rubber materials with high self lubricating property

1.3 Seal types

(1) Common seal types and their features

Seals are classified by O.D wall material, lip type and whether with spring or without spring. Major oil seals are specified in ISO 6194 and JIS B 2402. Table 1.3.1 shows common seal types.

Table 1.3.2 lists the seal type codes used at JTEKT, along with the corresponding codes used in the ISO, JIS, and JASO standards.

Table 1.3.1 Oil seals of common types

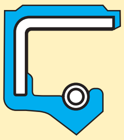
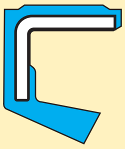
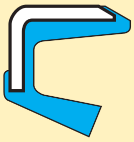
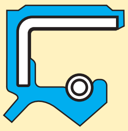
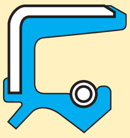
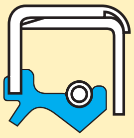
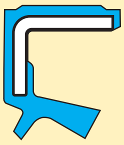
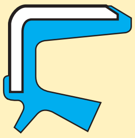
	With spring [1]			Without spring	
	Rubber O.D wall [2]	Metal O.D wall [3]	Metal O.D wall (with a reinforcing inner metal case) [3] [4]	Rubber O.D wall [2]	Metal O.D wall [3]
Without minor lip Type code	 MHS	 HMS	 HMSH	 MH	 HM
With minor lip [5] Type code	 MHSA	 HMSA	 HMSAH	 MHA	 HMA
Features of each type	1) With spring type secures stable sealing performance 2) Rubber O.D wall type provides stable sealing performance around the seal O.D surface 3) Metal O.D wall type ensures improved fitting retention between the seal O.D and the housing bore 4) Reinforcing inner metal case in the metal O.D wall type protects the main lip 5) With minor lip type is used for applications where there are contaminants, such as dust and foreign matter, on the air side face of the oil seal.				

Table 1.3.2 Koyo oil seal type codes corresponding to the codes used in Industrial standards

KOYO	ISO [1] · JIS [2]	Old JIS
MHS	Type 1	S
HMS	Type 2	SM
HMSH	Type 3	SA
MH	–	G
HM	–	GM
MHSA	Type 4	D
HMSA	Type 5	DM
HMSAH	Type 6	DA
MHA	–	–
HMA	–	–

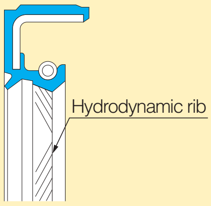
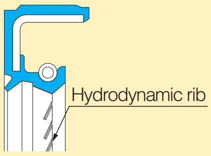
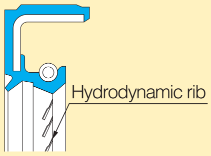
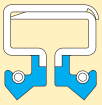
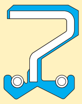
Notes 1) ISO : International Organization Standardization
2) JIS : Japanese Industrial Standard

(2) Special seal types and their features

JTEKT and Koyo sealing techno Co.,Ltd. provide special seals to meet a wide variety of machines and applications:

Table 1.3.3 Oil seals of special types (1)

◎: For bi-directional rotation ○: For uni-directional rotation

Seal type	Type code and shape	Motion	Features	Applications
Perfect Seals	 MHSA...XBT	◎	The hydrodynamic ribs provided in two directions on the air side face of the lip ensure improved pumping effect and higher sealing performance in both rotational directions of the shaft.	Reduction gears input shafts Differential gear sides
Helix Seals	 MHSA...XRT MHSA...XLT	○	The hydrodynamic ribs provided in one direction on the air side face of the lip ensure improved pumping effect and higher sealing performance.	Engine crankshafts Oil pumps Differential gear sides Reduction gears input shafts
Super Helix Seals	 MHSA...XRT MHSA...XLT	○	The hydrodynamic ribs (a combination of fixed-width ribs and wedge-shaped ribs) provided in one direction on the air side face of the lip ensure improved pumping effect and enhanced durability.	Engine crankshafts Oil pumps Differential gear sides Reduction gears input shafts
Double Lip Seals	 HMSD  MHSD	◎	These seals can separate and seal two kinds of oil or fluid on one shaft	Engaged positions of transfer system

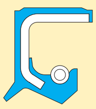
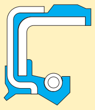
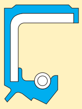
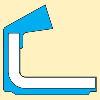
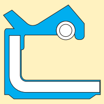
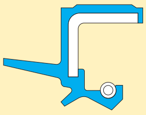
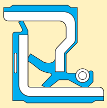
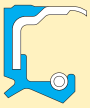
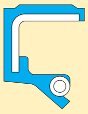
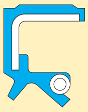
Perfect Seal

Helix Seal

Super Helix Seal

Table 1.3.3 Oil seals of special types (2)

◎: For bi-directional rotation –: For reciprocation

Seal type	Type code and shape	Motion	Features	Applications
Pressure-resistant Seals	 MHSA...P  GMHSA...P	◎	These seals are designed to reduce lip deformation caused by oil pressure. Sealing performance does not being deteriorated under high pressure	Hydraulic motors Motorcycle engine crankshafts Power steering input shafts
Reciprocating Seals	 MHSAF...R	◎	These seals are designed to accommodate shaft strokes and to lessen lip deformation caused by shaft reciprocating motion	CVT shafts of motorcycles
External Lip Seals	 XMH  XMHSA	◎	This type of seal has the lip on its outside, sealing the contact with housing	Front hubs Rear hubs
Seals with Side Lip	 MHSA...S	◎	A large side lip ensures prevention of entry of dust/water	Differential gear sides Differential pinion gear
Mud-resistant Seals with Integrated Sleeve	 D	◎	These seals are designed to enhance prevention of entry of mud	Wheel hubs
HR Seals	 HRSA	◎	HR seals ensures sealing performance around seal O.D and retain fitting with housing	Engine crankshafts Wheel hubs
SIM Seals	 MHR  MHRA	◎	The seals are spring-in mold type, which protect the spring from dust / water and enhance durability	Plug tubes Wheel hubs

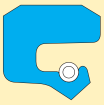
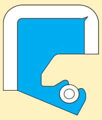
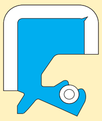
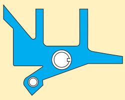
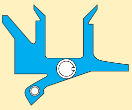
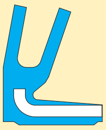
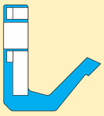
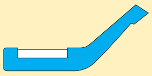
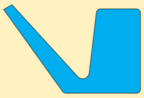
■ **Seal with Side Lip**

■ **HR Seal**

■ **SIM Seal**

Table 1.3.3 Oil seals of special types (3)

◎: For bi-directional rotation

Seal type	Type code and shape	Motion	Features	Applications
Full Rubber Seals	 MS	◎	Mounting is easy because of full rubber construction. Split type seals are available which can be mounted directly, not necessarily mounting from the shaft end	Long shafts, complex shaped shaft
YS Type Seal	 YS  YSA	◎	Wide range sizes for medium and large shafts are available	Rolling mills Various medium and large size machines
MORGOIL Seals	 MS...J  MS...NJ	◎	MORGOIL seals are used exclusively on MORGOIL bearings	MORGOIL bearings
Water Seals	 XMHE	◎	The double lips ensure improved water-proof performance	Rolling mill roll necks
Scale Seals	 WR  WR...BJ	◎	These seals prevent the ingress of scales in rolling oil	Rolling mill roll necks
V-Rings	 MV...A	◎	With these rings, shafts can be sealed at the end. The V-rings can be mounted easily in limited spaces	Rolling mill roll necks

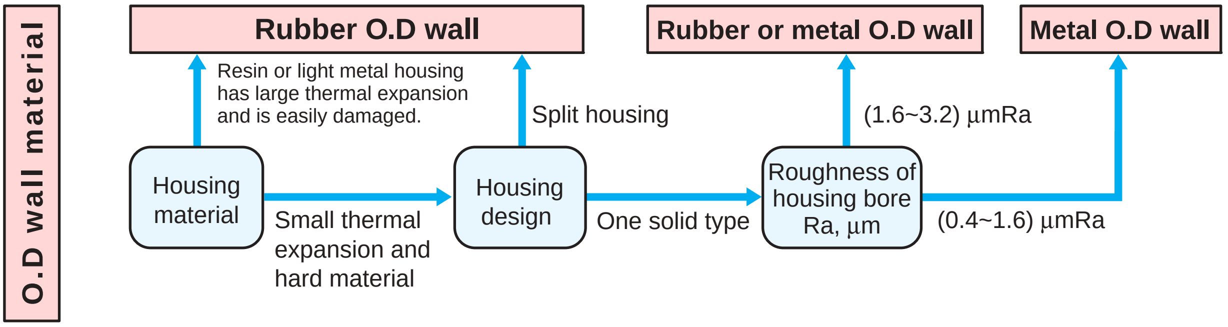
1.4 Selection of seal

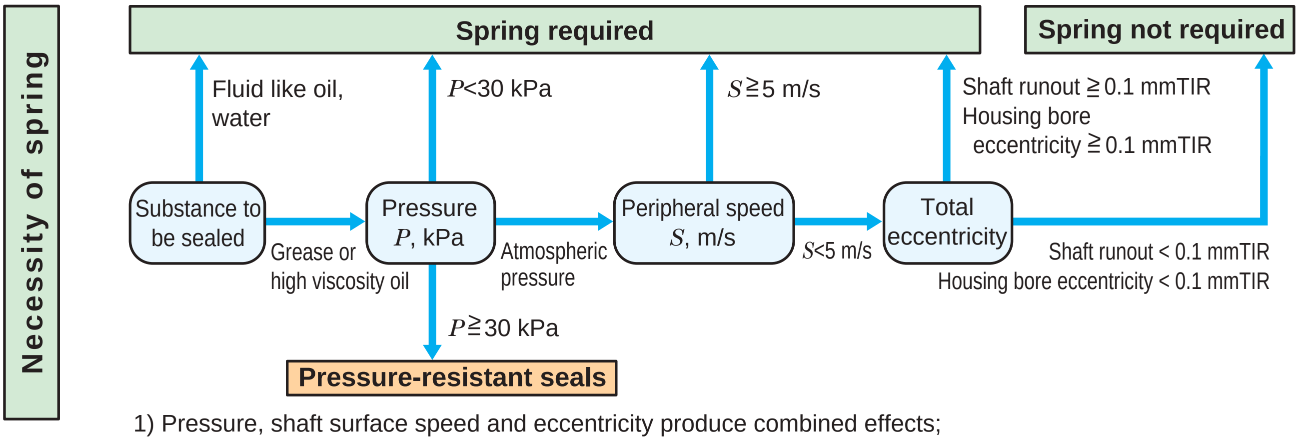
(1) Selection of seal type

To select a seal type, seal O.D wall material, lip type, and whether a spring should be provided or not should be decided based on operational conditions as shown in flowcharts below.

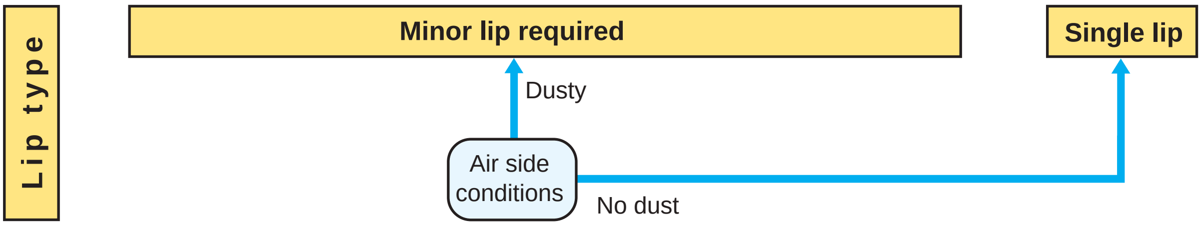
If you need oil seals used under special conditions not covered in the flowcharts, refer to Section 1.3 Paragraph (2), "Special seal types and their features."

Table 1.4.1 Flowcharts for oil seal selection





1) Pressure, shaft surface speed and eccentricity produce combined effects; use the above selective values only for reference purposes
2) TIR is shown "Total Indicator Reading"



★Seal selection example

- Housing: Made of steel, one solid design, housing bore surface roughness 1.8 μmRa
- Substance to be sealed: Grease
- Pressure: Atmospheric
- Shaft surface speed: 6 m/s
- Air side condition: Dusty

According to the above flowcharts, a seal with a rubber or metal O.D wall, spring, and minor lip is the most suitable for these conditions.
The MHSA or HMSA seal is recommended in this case.

(2) Selection of rubber material

Rubber materials should be selected according to temperature conditions and substances to be sealed.

Table 1.4.2 lists rubber materials along with their operational temperature ranges and their stability to fluids.

◎: The rubber has excellent resistance to the substance to be sealed
○: The rubber has good resistance to the substance except under extreme conditions
△: The rubber is not resistant to the substance except under specific favorable conditions
×: The rubber is not resistant to the substance

Table 1.4.2 Rubber materials, operational temperature ranges and their stability to fluids4)

Rubber material (ASTM3) code)	Grade	Features	Operational temperature range 1) 2)	
			Lower limit	Upper limit
Nitrile rubber (NBR)	Standard type	Well-balanced rubber in resistance to high-, low- temperature, and to abrasion	–30	100
	Low-temperature resistant type	High resistant to both high- and low-temperatures and to abrasion	–40	100
	High- and low-temperature resistant type	Very strong and low strain. Superior in resistance to high- and low-temperature	–40	110
	Heat resistant type	Enhanced heat and abrasion resistance. Highly compatible with synthetic oil	–20	120
	For food processing machines	Nitrile rubber passed tests specified in the Food Sanitation Law	–30	100
Hydrogenated nitrile rubber (HNBR)	Standard type	Compared with nitrile rubber, superior in resistance to heat and to abrasion	–30	140
Acrylic rubber (ACM)	Standard type	High resistant to oil and to abrasion	–20	150
	High- and low-temperature resistant type	Improved low-temperature resistance. Low strain and same level heat resistance as standard type	–30	150
Silicone rubber (VMQ)	Standard type	Wide operational temperature range and good abrasion resistance	–50	170
Fluoro rubber (FKM)	Standard type	Most superior in heat resistance and good abrasion resistance	–20	180

–50 0 50 100 150 200 °C

Normal operation range

Rubber material	Grade	Fuel oil			Lubrication oil and hydraulic fluid										Grease					Chemicals and water							
		Gasoline (regular)	Gasoline (premium)	Kerosene, light oil	Gear oil	Turbine oil	Engine oil	Automatic-transmission fluid	Mineral oil	Water + glycol	Phosphoric ester	Brake oil	Cutting oil	Machine oil	Lithium base	Urea base	Ester base	Silicone base	Fluorine base	Alcohol	Ether	Ketone	Water	Concentrate inorganic acid solution	Dilute inorganic acid solution	Concentrate alkaline solution	Dilute alkaline solution
Nitrile rubber (NBR)	Standard type	○	○	◎	◎	◎	◎	◎	◎	○	×	×	○	○	◎	◎	△	◎	◎	○	△	×	◎	△	○	○	○
	Low-temperature resistant type	△	△	○			○	△									△							×	△		
	High- and low-temperature resistant type	△	△	○			◎	◎									△										
	Heat resistant type	○	○	◎			◎	○									○										
	For food processing machines	△	△	○			○	△									△										
Hydrogenated nitrile rubber (HNBR)	Standard type	◎	◎	◎	◎	◎	◎	◎	◎	○	×	×	◎	◎	◎	◎	△	◎	◎	○	△	×	◎	×	△	○	○
Acrylic rubber (ACM)	Standard type	△	△	◎	◎	◎	◎	◎	◎	×	×	×	△	◎	◎	◎	×	◎	◎	×	×	×	○	×	△	×	×
	High- and low-temperature resistant type																						△				
Silicone rubber (VMQ)	Standard type	×	×	○	×	○	○	△	◎	△	○	△	△	×	○	○	○	×	△	○	×	○	○	△	○	◎	◎
Fluoro rubber (FKM)	Standard type	◎	◎	◎	◎	◎	◎	◎	◎	△	×	△	◎	◎	◎	△	◎	◎	◎	○	×	×	△	○	◎	×	△

* The information provided in the above chart is for reference only. For specific details, consult JTEKT.

Notes 1) Operational temperature means the lip (Sliding part) temperature. It should be determined based on ambient temperature, heat generated by the machine, lip friction heat, heat generation by the agitation of the substance to be sealed and heat transfered from other components etc.
2) The highest normal-operation temperature may be lower than indicated in this table, depending on the kind and properties of the substance to be sealed (Refer to Table 1.4.3.)
3) ASTM : American Socienty for Testing and Materials.
4) Properties above may be affected by the components of rust preventing oil and cleaning fluid. Consult JTEKT.

Table 1.4.3 Upper limits guideline of normal operation temperature of rubber materials used with different oils (˚C)

Rubber material	Gear oil	Turbine oil	Engine oil	ATF
Nitrile rubber	(100)	100	120	(120)
Hydrogenated nitrile rubber	140	←	←	←
Acrylic rubber	150	←	←	←
Silicone rubber	Incompatible	150	170	(150)
Fluoro rubber	180	←	←	←

Remark)
The ( ) indicates oil with extreme pressure additives. Extreme pressure additives are compounds of phosphor, sulfur or chlorine base, added to prevent wear or seizure on sliding or rotating surfaces. These compounds are activated by heat and chemically react against rubber, which deteriorates rubber properties.

Small talk 1

A new salesman's resolution

When the new salesman asked the chief engineer how the elastic rubber is made, he got the reply: "After adding cross-linking chemicals to rubber polymers made from naphtha, high pressure is applied under high temperature. This creates a long-lasting elasticity. High stress conditions do wonders to things, even to humans."

Hearing this, the new salesman resolved to live like rubber, resilient and bouncing back into shape.

(3) Selection of metal case and spring materials

The materials of metal case and spring can be selected according to the substance to be sealed.

Table 1.4.4 Compatibility of metal-case and spring materials with substance to be sealed

Material / Substance to be sealed	Metal case		Spring	
	Cold rolled carbon steel sheet (JIS SPCC)	Stainless steel sheet (JIS SUS304)	High carbon steel wire (JIS SWB)	Stainless steel wire (JIS SUS304)
Oil	○	–	○	–
Grease	○	–	○	–
Water	×	○	×	○
Seawater	×	○	×	○
Water vapor	×	○	×	○
Chemicals	×	○	×	○
Organic solvent	○	○	○	○

○ : Compatible × : Incompatible – : Not applicable

Small talk 2

A service engineer's finding

One customer called, "Some seals show oil leakage and some are OK. Please come and see immediately." A JTEKT service engineer visited the customer.

He checked shaft diameter and any damage, also visually checked the seals , but no possible cause of oil leakage was found.

He asked how the shaft surface was finished. It was paper lapped to get the desired level of surface roughness. He then checked the shaft surface and found that the leaking shaft had lead marks (spiral traces of lapping) running in the leaking direction. When he rotated the shaft in the reversing direction, no leakage occurred.

Showing a catalog, he advised the customer to finish shafts by plange cut grinding. Satisfied, he went back and felt it was a good day.

1.5 Shaft and housing design

(1) Shaft design

Oil seals can show good sealing performance when mounted on properly designed shafts. To design shafts properly, follow the specifications below.

1) Material

Shafts should be made from carbon steels for machine structural use, low-alloy steel, or stainless steel. Brass, bronze, aluminum, zinc, magnesium alloy and other soft materials are not suitable, except for special applications such as for low-speed or in a clean-environment.

2) Hardness

Shaft hardness should be at least 30 HRC. In a clean environment, shaft hardness does not influence seal performance. However, in an environment where dust, contaminated oil, etc. exists, a shaft hardness of 50 to 60 HRC is recommended in consideration of factors such as shaft wear.

Hard shaft is advantageous regarding seal damage prevention.

3) Dimensional accuracy

The shaft diameter tolerance should be h8. Seals are designed to suit shafts with the tolerance of h8.

When mounted on other tolerance shafts, seals may be unable to provide sufficient sealing performance.

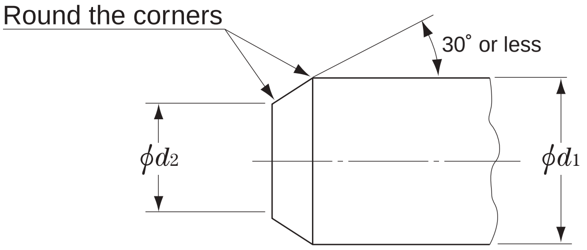
For use of shaft diameter tolerances larger than h8, consult JTEKT.

Table 1.5.1 h8 Shaft tolerance

Nominal shaft diameter d, mm		Tolerance μm	
		h8	
Over	Up to	Upper	Lower
3	6	0	–18
6	10	0	–22
10	18	0	–27
18	30	0	–33
30	50	0	–39
50	80	0	–46
80	120	0	–54
120	180	0	–63
180	250	0	–72
250	315	0	–81
315	400	0	–89
400	500	0	–97
500	630	0	–110
630	800	0	–125
800	1 000	0	–140

4) Shaft end chamfer

To protect seals from damage at mounting onto shafts, recommended chamfer on the shaft end is shown below.



Nominal shaft diameter d_1, mm		d_1–d_2 mm	Nominal shaft diameter d_1, mm		d_1–d_2 mm
Over	Up to		Over	Up to	
–	10	1.5 min.	50	70	4.0 min.
10	20	2.0 min.	70	95	4.5 min.
20	30	2.5 min.	95	130	5.5 min.
30	40	3.0 min.	130	240	7.0 min.
40	50	3.5 min.	240	500	11.0 min.

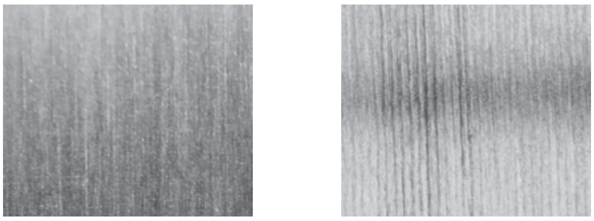
[Remark] When round chamfer is applied, take the above specified d_1-d_2 dimensional chamfer or more.

Fig. 1.5.1 Shaft end chamfer

5) Surface roughness and finishing method

To ensure the sealing performance of seals, the shaft surface to be in contact with the lip should be finished to 0.1-0.32 µmRa and 0.8-2.5 µmRz in roughness.

Note that lead marks on the shaft surface may carry the substance to be sealed in the axial direction during shaft rotation, which interferes with the function of the seal. Finish shaft surface such that the lead angle will be no greater than 0.05˚. To achieve this, plange cut grinding is most suitable. To avoid undulation on the shaft surface, the ratio of shaft rotational speed vs grinding-wheel rotational speed should not be an integer.



■ **Good finished surface**

■ **Undesirable finished surface**

The surface shows visible lead marks

Fig. 1.5.2 Shaft surface with and without lead marks

(2) Housing design

1) Material

Steel or cast iron is generally used as the material of housings. When aluminum or plastic housing is used, the following consideration and study are required, as seal seating in housing bore may become loose fitting under high temperature because the housing material and seal material have different linear expansion coefficients. This may cause problems such as leakage through the seal O.D, or seal dislocation.

2) Dimensional accuracy

The housing bore tolerance should be H7 or H8 when bore is 400 mm or less. For larger housing bores, recommended tolerance is H7.

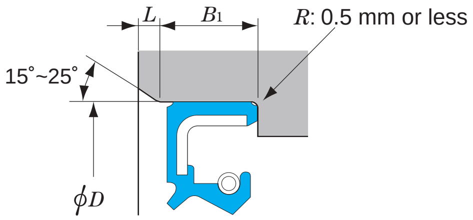
Table 1.5.2 Housing bore tolerance

Nominal bore diameter D, mm		Tolerance µm			
		H7		H8	
Over	Up to	Upper	Lower	Upper	Lower
3	6	+12	0	+18	0
6	10	+15	0	+22	0
10	18	+18	0	+27	0
18	30	+21	0	+33	0
30	50	+25	0	+39	0
50	80	+30	0	+46	0
80	120	+35	0	+54	0
120	180	+40	0	+63	0
180	250	+46	0	+72	0
250	315	+52	0	+81	0
315	400	+57	0	+89	0
400	500	+63	0	–	–
500	630	+70	0	–	–
630	800	+80	0	–	–
800	1 000	+90	0	–	–
1 000	1 250	+105	0	–	–
1 250	1 600	+125	0	–	–

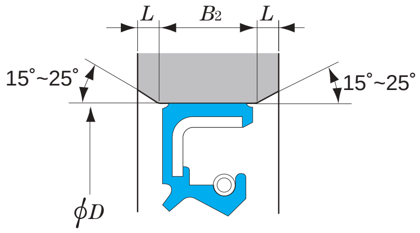
3) Chamfer

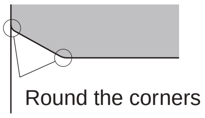
Provide the chamfer at the housing bore inlet as shown below so that a seal can be mounted easily and avoided from damages.

Shouldered bore



Straight bore





Unit : mm

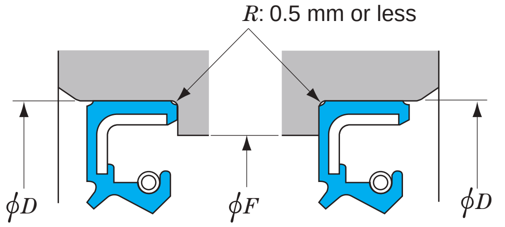
Nominal seal width, b		B_1 min.	B_2 min.	L
Over	Up to			
–	10	b + 0.5	b + 1.0	1.0
10	18			1.5
18	50	b + 0.8	b + 1.6	

[Remark] b indicates the width of a seal.

Fig. 1.5.3 Recommended housing bore chamfers

4) Housing shoulder diameter

In case the housing bore has a shoulder, satisfy the following dimensional requirements.



Unit : mm

Nominal seal O.D, D		F
Over	Up to	
–	50	D - 4
50	150	D - 6
150	400	D - 8

[Remark] D indicates the outer diameter of a seal.

Fig. 1.5.4 Recommended housing shoulder diameters

5) Surface roughness

To ensure seal sitting and to prevent leakage through seal O.D, finish bore surface to the roughness specified below.

Table 1.5.3 Housing bore surface roughness

Seal type	Housing bore surface roughness
For metal O.D wall type seal	(0.4~1.6) μmRa (1.6~6.3) μmRz
For rubber O.D wall type seal	(1.6~3.2) μmRa (6.3~12.5) μmRz

Seals with coated metal O.D wall are available in case metal O.D wall type seals with extremely high sealing performance are required.

Consult JTEKT for these oil seals.

(3) Total eccentricity

When the total eccentricity is excessive, the sealing edge of the seal lip cannot accommodate shaft motions and leakage may occur.

Total eccentricity is the sum of shaft runout and the housing-bore eccentricity. It is normally expressed in TIR (Total Indicator Reading).

Shaft runout is defined as being twice the eccentricity between the shaft center and center of shaft-center rotation trajectory.

This is also normally expressed in TIR.

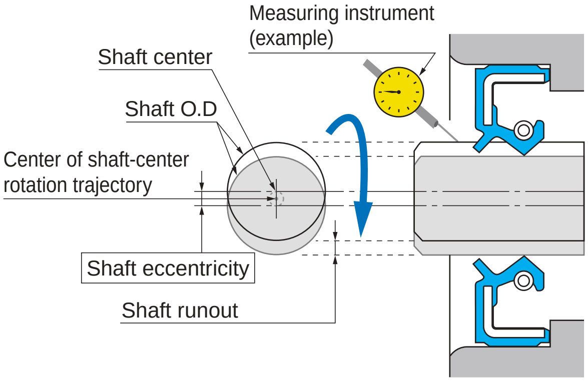


Fig. 1.5.5 Shaft runout

Housing bore eccentricity is defined as being the double of eccentricity between the housing-bore center and shaft rotation center. It is generally expressed in TIR (Total Indicator Reading).

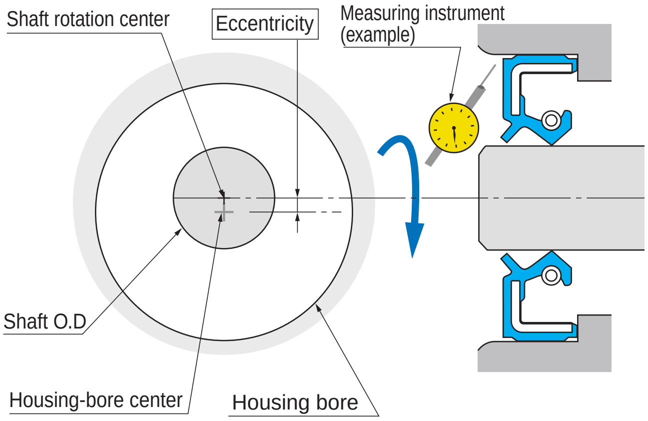


Fig. 1.5.6 Housing bore eccentricity

(4) Allowable total eccentricity

The allowable total eccentricity is the maximum total eccentricity at which the sealing edge can accommodate shaft rotation and retain adequate sealing performance. The allowable total eccentricity of seals is dependent not only on seal characteristics, such as seal type, seal size, and rubber material, but also on other conditions, including shaft diameter tolerance, temperature and rotational speed.

It is therefore difficult to determine the allowable total eccentricity of individual seals. The typical allowable total eccentricity values of seals are shown in Fig. 1.5.7.

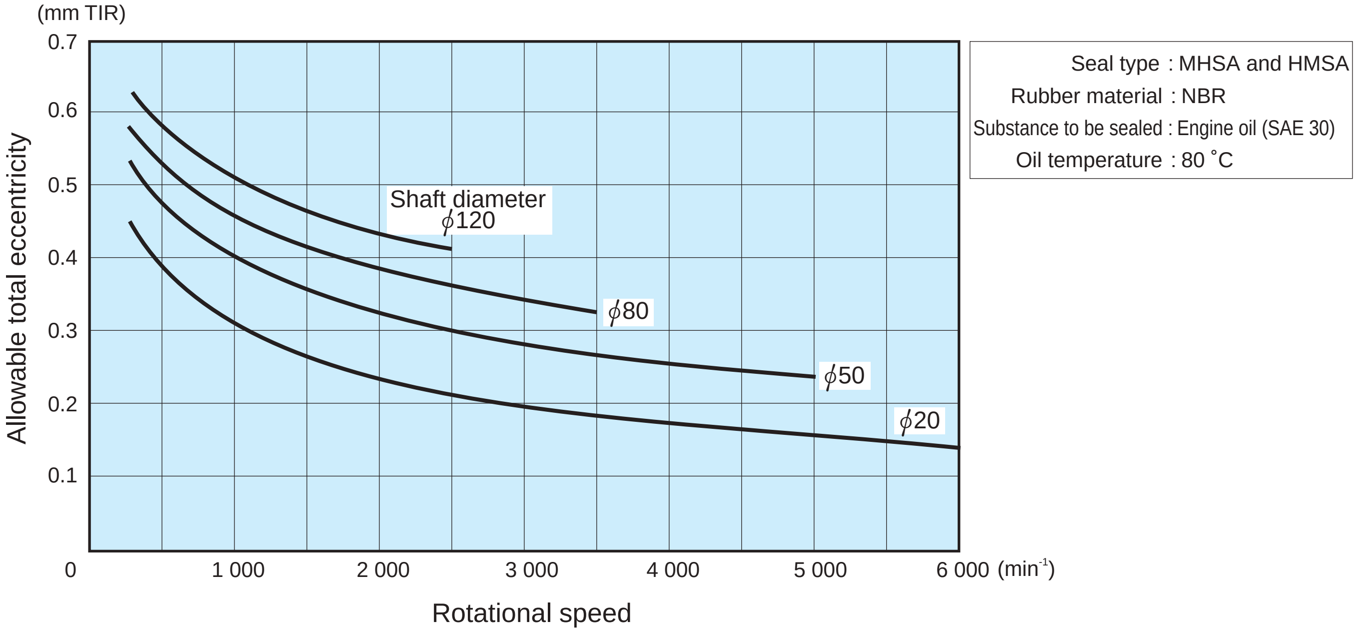


Fig. 1.5.7 Allowable total eccentricity for oil seal (reference)

1.6 Seal characteristics

(1) Sealing property

Oil seals are used to prevent lubricants or other fluids from leaking outside of the equipment or machine.

As shown in Fig. 1.6.1, the main lip shape and the contact with the rotating shaft surface produce a pumping effect that returns the fluid, thus ensuring the fluid is contained inside.

The pumping effect is measured and expressed by pumped fluid volume per time unit. The greater the pumped volume, the higher the sealing performance will be.

The pumped volume depends on multiple factors, such as rotational speed and fluid viscosity.

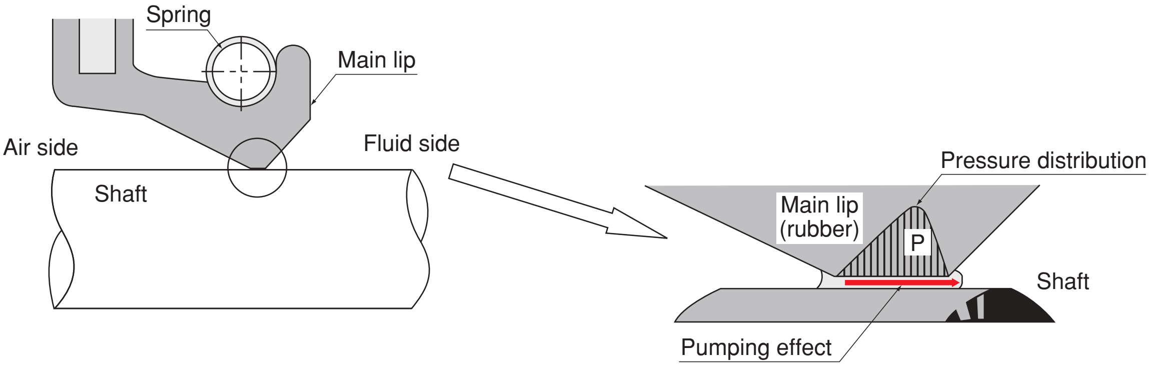


Fig. 1.6.1 Sealing property

As it can be observed in Fig. 1.6.2, which shows the relation between rotational speed and pumped volume, the pumped volume increases with the rotational speed.

Using the hydrodynamic ribs can further increase pumped volume.

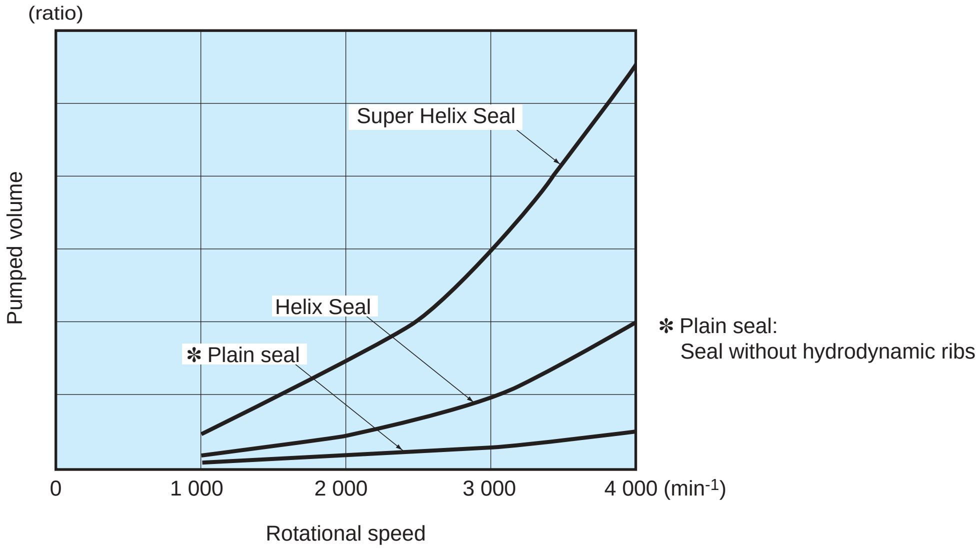


Fig. 1.6.2 Rotational speed and pumped volume (reference)

(2) Seal service life

The seal service life is defined as the time it takes to reach insufficient seal performance, which can be the result of wear on the lip rubber, chemical deterioration due to the use of oil or grease, or hardening.

It is not so easy to determine actual seal service life, because it is dependent on many factors, such as condition of operational temperature, eccentricity, rotational speed, substance to be sealed, and lubrication.

The diagram below (Fig. 1.6.3) shows the curves of estimated seal service life, obtained using major life-determining conditions as parameters, such as rubber material, lubricant, and lip temperature.

The service life shown in Fig. 1.6.3 is approximate, and the actual service life may be shorter depending on the operating conditions.

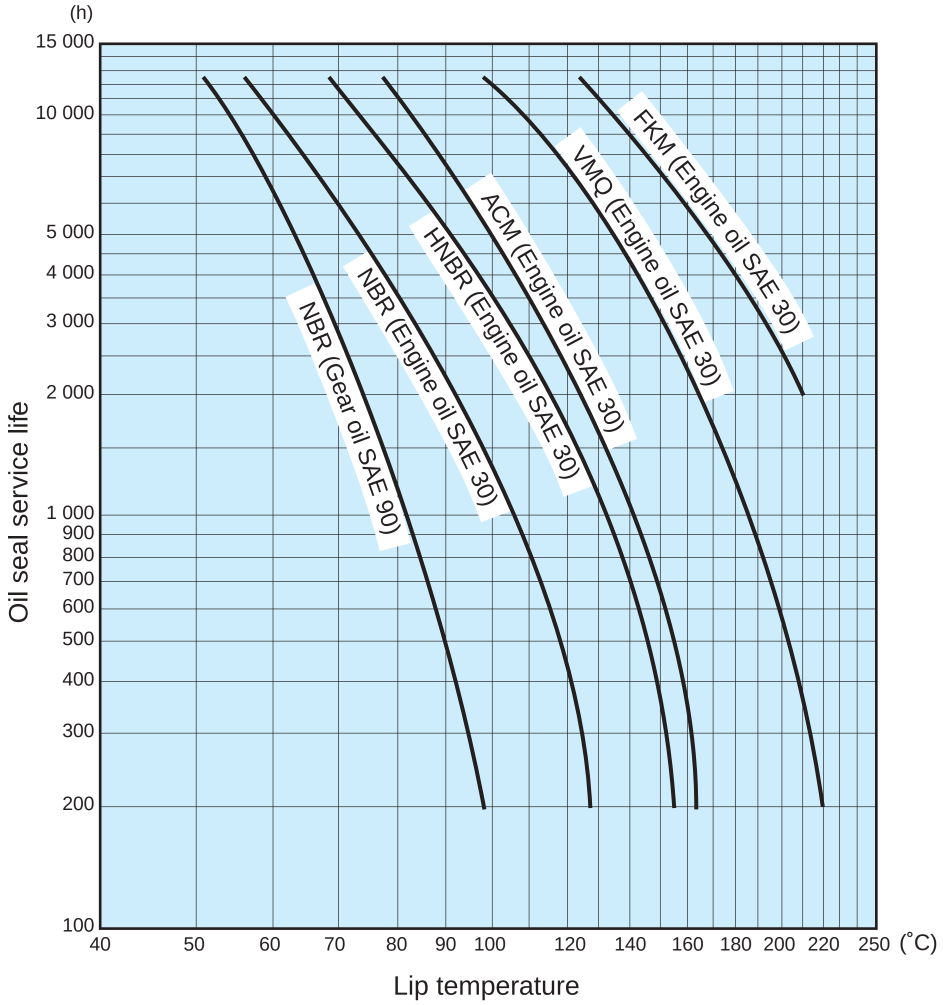


Fig. 1.6.3 Oil seal service life estimation curves

(3) Lip temperature

To determine the seal service life based on the above diagram, it is critical to estimate lip temperature precisely.

As the shaft rotates, the seal lip is heated due to friction. Lip temperature is dependent on the balance between the energy supplied by frictional heat and the radiated energy, which varies according to temperature difference and the construction surrounding the seal.

Many factors influence lip temperature, so it is difficult to determine this precisely.

The following is the procedure for estimation of lip temperature.

● Lip temperature estimation method

① Calculate the peripheral speed at the sealing edge using the following equation

$$v = \frac{\pi d n}{(60 \times 1\,000)}$$

where,

v: peripheral speed at the sealing edge, m/s
π: Ratio of circle circumference to diameter (3.14)
d: Shaft diameter, mm
n: Rotational speed, min^{-1}

② Determine the supposed ambient temperature
③ Find the point at which the ambient temperature curve meets the calculated shaft surface speed in Fig. 1.6.4
④ Read the ordinate value of the point
⑤ Obtain the estimated lip temperature by the sum of the ordinate value and ambient temperature

Example
Shaft diameter: ϕ50 mm
Rotational speed: 4 000 min^{-1}
Ambient temperature: 80 °C
Peripheral speed at the sealing edge can be obtained as follows;

$$v = \frac{\pi \times 50 \times 4\,000}{60 \times 1\,000} = 10.5 \text{ m/s}$$

In Fig. 1.6.4, the cross of the curve for ambient temperature 80 °C and peripheral speed 10.5 m/s indicates that the lip temperature rise will be 20 °C.

Therefore, lip temperature is estimated 100 °C (80 + 20 = 100 °C).

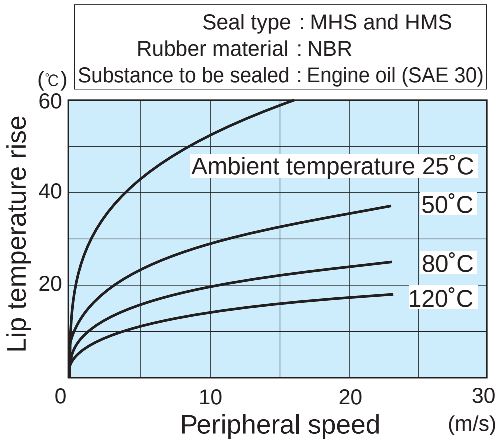


Fig. 1.6.4 Estimated lip temperature rise curves (reference)

(4) Allowable peripheral speed

The sealing edge of the seal should provide constant sealing performance, maintaining contact with the shaft while accommodating runout of the shaft (sum of shaft runout and mounting eccentricity).

When shaft rotation is extremely fast, the sealing edge eventually becomes unable to accommodate runout of the shaft (sum of shaft runout and housing-bore eccentricity), thus deteriorating sealing performance. The speed just before the sealing performance is deteriorated, is called the allowable peripheral speed for seals.

The allowable peripheral speed for seal is mostly influenced by shaft runout. When total eccentricity is small, the allowable peripheral speed is a constant value, depending on the rubber material and seal type.

The diagrams below show the typical allowable peripheral speed for seals mounted on the shaft and housing that are finished to a given level of accuracy.

Figs.1.6.5 and 1.6.6 show the examples of allowable peripheral speed actually measured with the oil seals attached to the shaft finished with a certain accuracy and housing.

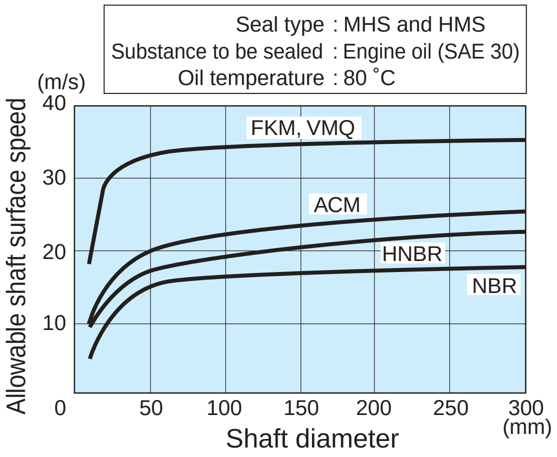


Fig. 1.6.5 Relation between rubber materials and allowable peripheral speed for seal

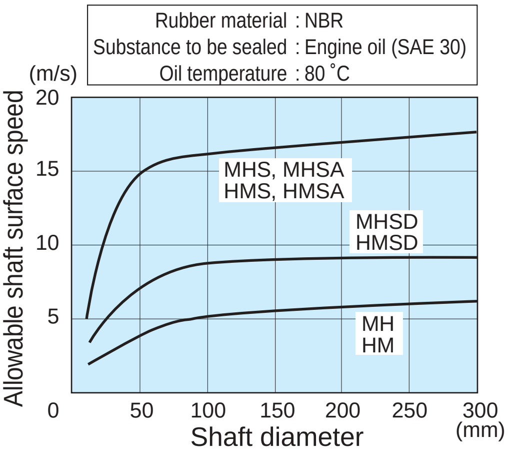


Fig. 1.6.6 Relation between seal types and allowable peripheral speed for seal

(5) Allowable internal pressure

Another factor that may deteriorate seal performance is internal pressure. The allowable internal pressure is also significantly dependent on runout of the shaft (sum of shaft runout and housing-bore eccentricity).

Fig.1.6.7 shows the example of allowable internal pressure actually measured with the oil seals attached to the shaft finished with the accuracy recommended in this catalogue and housing.

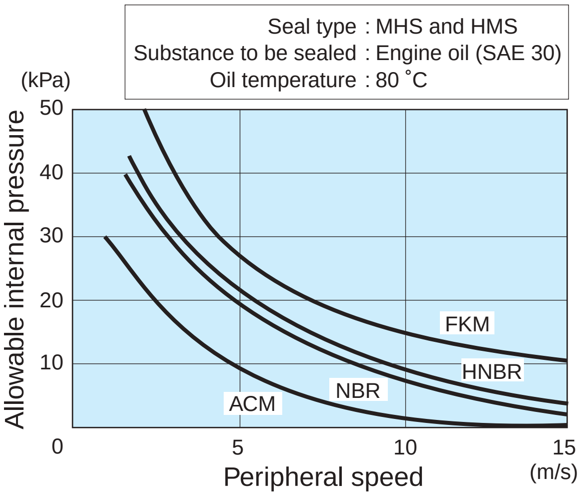


Fig. 1.6.7 Allowable internal pressure for seal

Small talk 3

A precious experience for a new salesman

"The oil seal melts down and oil leaks!"

Receiving an urgent phone call from a customer, a new salesman at JTEKT left the office immediately, believing that something critical had happened.

At the customer's site, the lip was abraded significantly and the rubber did look molten. The customer suspected that the material was the cause of the problem.

Browsing the catalog confusedly, he questioned the customer, remembering the sales-training lectures he had attended before. "How did you lubricate the seal before its initial use?"

Suspecting that insufficient initial lubrication might be the cause, he instructed the customer to coat grease around the lip and run the machine.

Two hours passed, and the seal still showed no leakage. An overhaul proved that the seal was in good condition, with negligible lip abrasion.

"I now thoroughly understand the importance of pre-lubrication," said the customer. It was a precious experience for the salesman as well.

(6) Seal torque

The seal torque is determined by lip radial load, coefficient of friction, and shaft diameter, and can be calculated by the following equation:

$$T = \frac{1}{2 \times 1\,000} \mu d R_L$$

where,

T : Seal torque, N · m

μ : Coefficient of friction at sealing edge (including oil viscosity)

d : Shaft diameter, mm

R_L: Lip radial load, N

Lip radial load is determined by three factors: a component of stress caused by circumferential lip elongation that occurs when the seal is mounted on a shaft, a component stress caused by deflection at the lip base, and a component of spring load (Fig. 1.6.8).

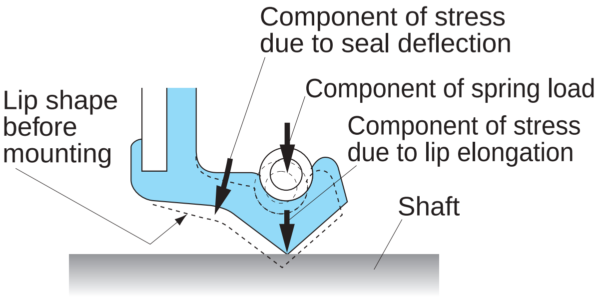


Fig. 1.6.8 Factors of lip radial load

The coefficient of friction at the sealing edge varies significantly depending on type of lubricants used and peripheral speed. To find rotational torques of oil seals, various operating conditions must be taken into consideration. For details, consult JTEKT.

1) Initial seal torque

Seal torque may be very high just after the seal mounting on a machine. However, it will become stable low torque within one or two hours (Fig. 1.6.9).

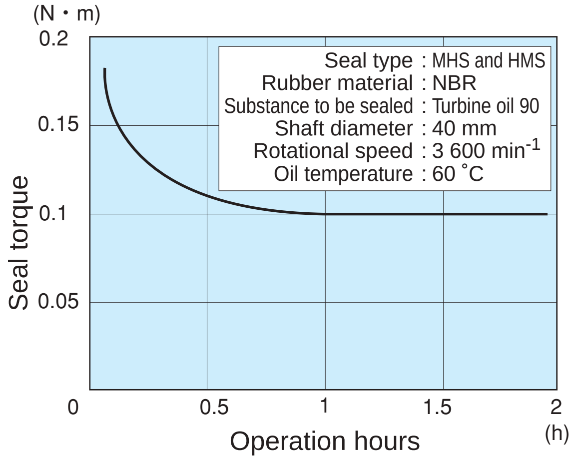


Fig. 1.6.9 Seal torque change with passing time (reference)

Initial high torque occurs because the coefficient of shaft-lip friction is unstable. As operation continues, the shaft and lip become running in each other, it stabilizes the friction coefficient and seal torque.

2) Factors for seal torque

Fig. 1.6.10 shows how rotational speed and lubricant influence seal torque. As this diagram shows, generally seal torque increases in proportion to shaft rotational speed increase. High viscosity lubricating oil also increases seal torque.

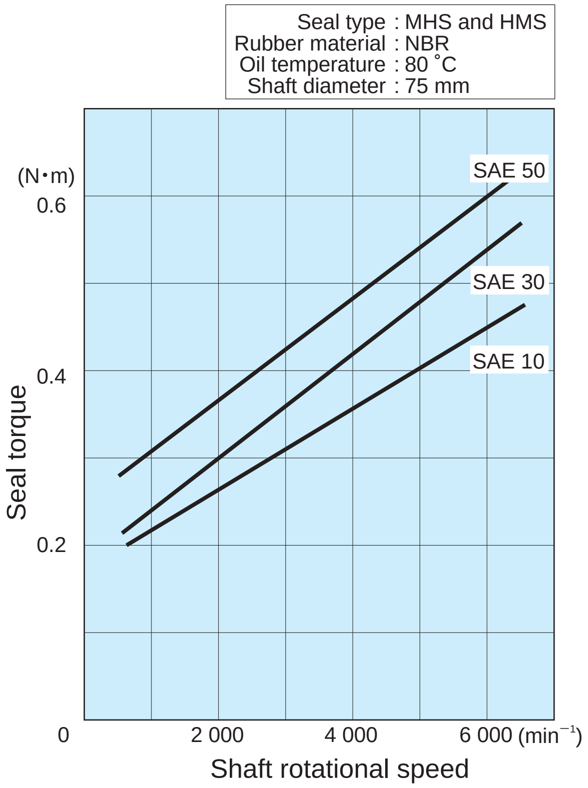


Fig. 1.6.10 Relation between rotational speed and seal torque

Fig. 1.6.11 shows how shaft diameter influences seal torque. The larger shaft diameter, the higher the seal torque correspondingly.

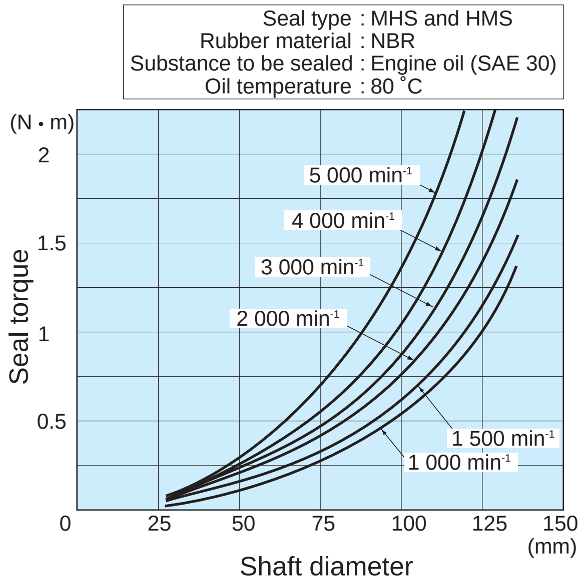


Fig. 1.6.11 Relation between shaft diameter and seal torque

Small talk 4

A discovery on a cold day

A second-year JTEKT sales rep received a harsh complaint from a customer. "Oil seals cannot be easily mounted today! When we press-fit them, the rubber tears."

He checked the seal at the customer's site, but could not find the reason. Then he consulted his manager by phone for advice.

"The seal is having a 'cold'," his manager responded. "Like humans, seals do not enjoy a cold environment. Tell them to warm up the room and try again." Following this advice, a stove was carried into the assembly shop and the seal was tried to remount after being slightly heated. To the surprise of the customer as well as the sales rep, the seal could be mounted smoothly without any problem.

The customer was very grateful to him. "Thank you for dealing with the problem. We also can now work in a warm environment." The sales rep returned to the office, feeling very proud of himself.

Back in the office, he heard another good piece of news from a material engineer: "Recent Koyo oil seals are made of improved material and can operate well in cold environments."

1.7 Handling of seal

Carelessness in seal handling may cause oil leakage. Correct action should be taken for good inwards, storage, transportation, handling and mounting.

(1) Storage

Follow the instructions below in the storing.

- Keep air-conditioned: Room temperature Max. 30 ˚C and humidity 40% to 70% on average. (See Fig. 1.7.1)
- Keep rule: Use older oil seals stored, first.
- Avoid: Direct/reflected of sunlight, ozone
- When storing oil seals in a worksite, keep them in sealed containers to protect them from dusts, sands, and other contaminations, as well as mechanical damages caused by various equipment or subjects dropped.
- Avoid storing oil seals in a stack or hung as such storage condition can lead to deformation of seal edges due to their own weight.
- When an oil seal is stored for a long time, a white, powdery substance (blooming) may appear on the surface of the rubber, but this does not affect performance.

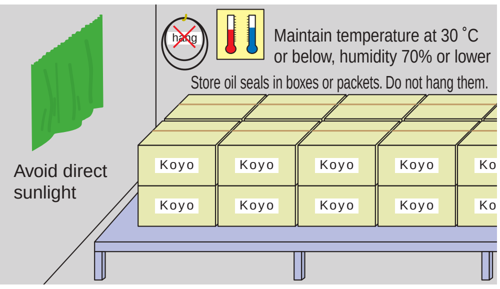


Fig. 1.7.1

(2) Handling

- When carrying oil seals, avoid excessive impact in order to prevent deformation and spring loss.
- Do not damage seals by knife or screw driver when opening wrap.
- Do not place seals for long time on table without sheet cover, due to chance of dust or sand adhesion.
- Do not hang by wire, string, or nail, which deforms or damages seal lip.
- Do not use cleaners, solvents, corrosive fluids, or chemical liquid. Use kerosene when washing seals.

(3) Mounting

1) Before mounting, confirm that there is no damage, no dirt or foreign particles on the seals.

2) Apply suitable, clean lubricant to the seal lip for initial lubrication. For oil seals with a minor lip, pack clean grease between main lip and minor lip (Fig. 1.7.2).

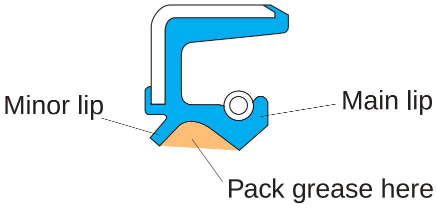


Fig. 1.7.2 Prelubrication for seals with minor lip

3) Recommended grease
- Small penetration (soft grease)
- Small penetration change by temperature
- Wide serviceable temperature range
- Lithium base type (avoid silicone base grease for silicon rubber seal, urea base grease for fluoric rubber seal which may harden or deteriorate seal rubber)

4) When seal is mounted at cold area, warm seal up to have seal flexibility and then mount it.

5) To avoid damage on seal lip and shaft surface when seal is mounted onto shaft. Shaft edge should be chamfered or 0.2 mm smaller guide as illustrated bellow (Fig.1.7.3).

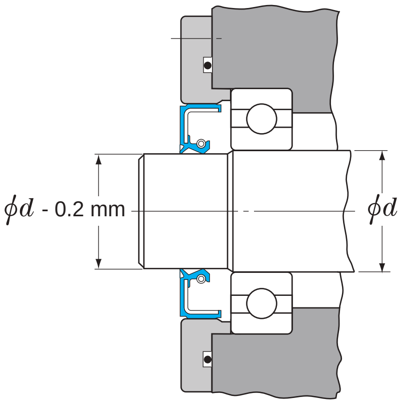
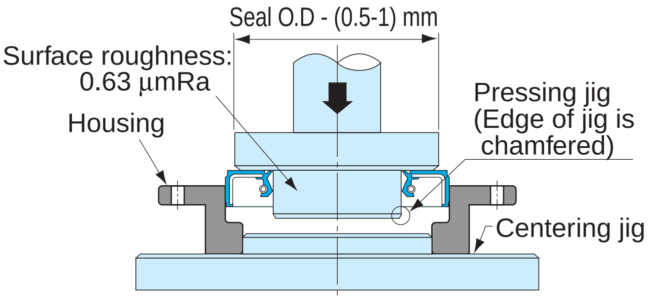


Fig. 1.7.3 Recommended shaft profile and machine construction to avoid damaging shaft surface

6) When seal is pressed into housing bore, use pressing jig as shown in Fig. 1.7.4. When press-fitting an oil seal into the housing bore in the opposite direction, use the pressing jig as shown in Figs.1.7.5 and 1.7.6.

Jig for shouldered housing bore



Jig for straight housing bore

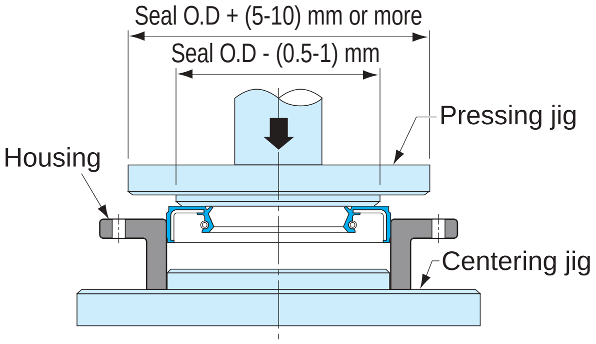


Fig. 1.7.4 Recommended seal press-fitting jigs

Seal press fit at a slant may cause the fit surface to have tear or scuffing and leakage. To ensure good sealing performance, seals need to be mounted at right angles to shafts. For right angled mounting , press the seal down thoroughly to reach the housing shoulder (Fig. 1.7.5).

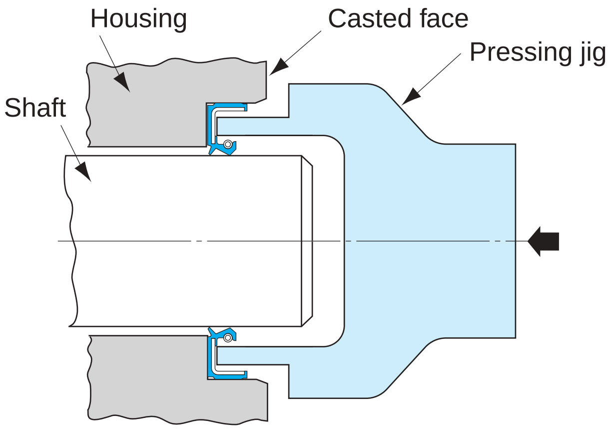


Fig. 1.7.5 Seal press-fitting jig for shouldered housing bore in the opposite direction

To mount seal into a straight housing bore, the jig should be contacted with the machine-finished surface to mount the seal at right angles to the housing bore (Fig. 1.7.6).

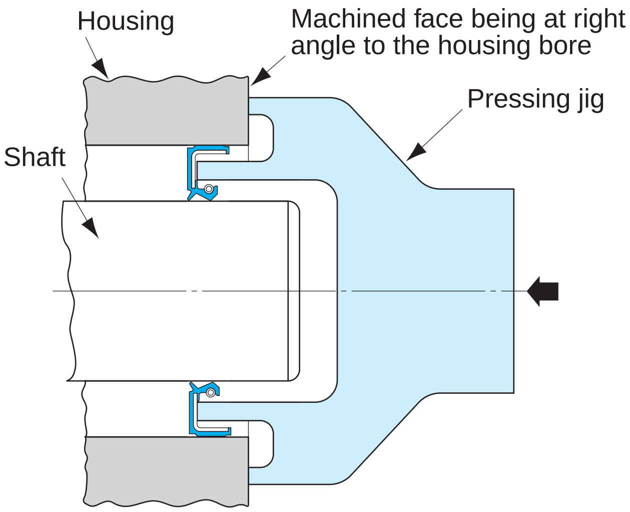
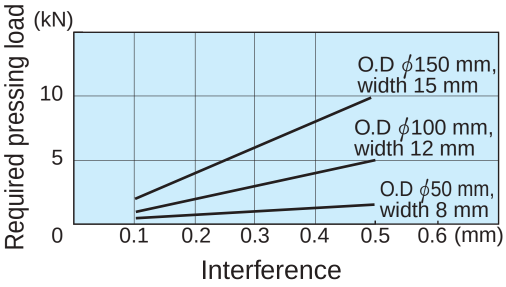


Fig. 1.7.6 Seal press-fitting jig for straight housing bore in the opposite direction

In the case of O.D wall being rubber, press the seal into housing by constant pressure 2-3 times at a constant speed to prevent spring back.
Fig. 1.7.7 shows typical seal pressing load required to press-fit an oil seal into the housing. Refer to the shown data when press-fitting oil seals.
Based on these diagrams, decide a slightly higher pressing load.

Measuring conditions
No lubricant
Surface roughness of housing bore: 1.6 µmRa

O.D wall: Rubber (Rubber material: NBR)



O.D wall: Metal

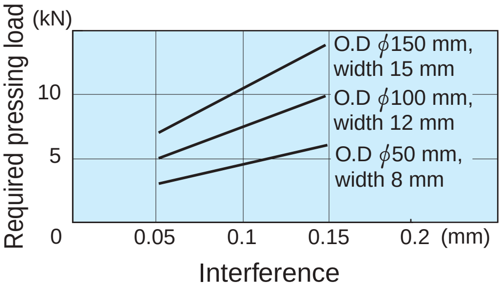


Fig. 1.7.7 Relation between required seal pressing load and seal interference

7) In case of shaft has spline, keyway, or holes, use seal protecting jig to prevent lip damage as illustrated bellow (Fig. 1.7.8).
If difficult to use jig, remove sharp corners, round the edges and coat enough grease.

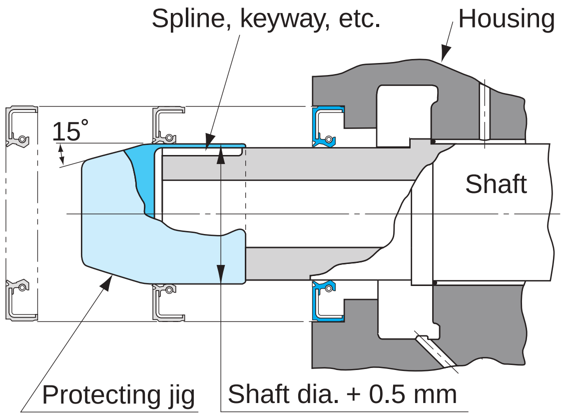


Fig. 1.7.8 Seal protecting jig for spline, keyway, holes on shaft

All the corners of the jig should be chamfered.
Do not use a jig made from soft material such as aluminum; such a jig is prone to damages and a damaged jig may scratch the seal lip. Use a protecting jig made from steel or stainless steel.

8) When heavy housing with seal is assembled with shaft, or when long or heavy shaft is inserted into seal, seal damage should be avoided. Use the following guide jig to get centering (Figs. 1.7.9 and 1.7.10).

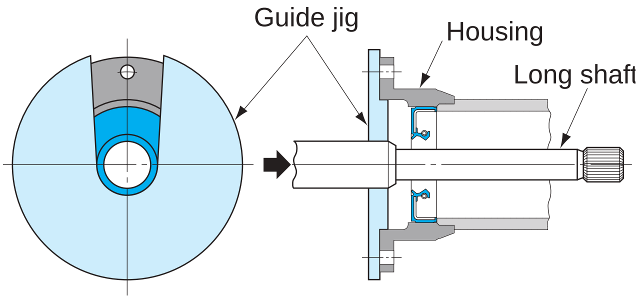


Fig. 1.7.9 Guide jig for inserting of long shaft into seal bore

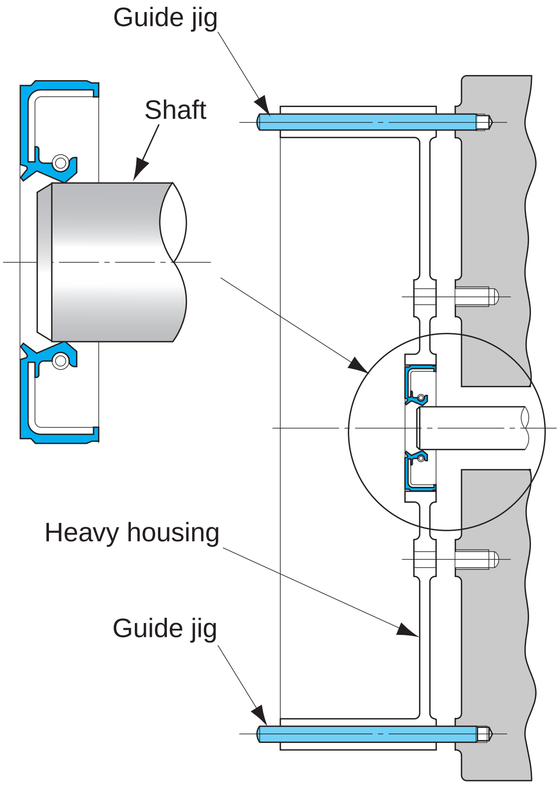


Fig. 1.7.10 Guide jig for mounting of heavy housing with seal onto shaft

If these methods cannot be applied (Fig. 1.7.10), assemble shaft and housing first, then mount seal.

9) When oil seal is removed, use a new oil seal instead of the seal used.
Contact position of new seal lip on the shaft should be displaced to 0.5 mm (1~2 mm for large-size seals) from the old seal lip contact position by applying spacer as illustrated bellow (Fig. 1.7.11).

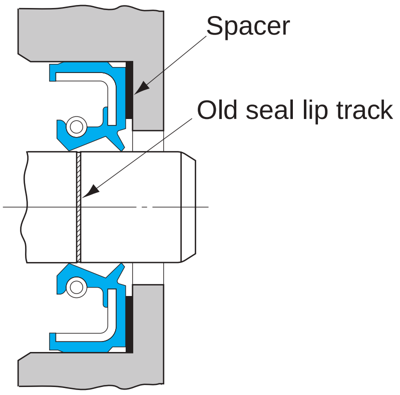


Fig. 1.7.11 Avoid old seal lip track

(4) Mounting of split MS-type seals

MS-type seal has one split in order to have easy mounting on to long shaft or complicated shaped shaft (Fig. 1.7.12).

Fig. 1.7.12 MS-type seal with one split

When fitting the oil seal of this type, do not bond the cut portion of it with adhesive agent. If bonding is absolutely necessary, pay close attention to avoid any step around the seal lip.

Mount a split MS-type seal on to the shaft as following procedure:

① Mount the spring first and connect spring by the hook (Fig. 1.7.13).

② Mount the seal and position split area to upwards on the shaft.

③ Place the spring on the seal spring groove, position spring joint area to 45˚ apart from seal split area.

④ Fix the seal by seal fixing ring. If seal fixing ring is split type, avoid position of ring split area from seal split area.

Fig. 1.7.13 Spring hook connection

(5) Cautions after mounting

1) If the area near the oil seal is painted, make sure to keep the seal lip and the shaft area in contact with the lip free from paint.

2) Avoid cleaning on the mounted seal area as much as possible. If cleaning is inevitable, perform it quickly and wipe off the detergent immediately when completed.

Small talk 5

A murmur of a female staff member

One day, a female staff member over-heard a conversation:

Third-year sales rep: "The rubber of oil seals is petroleum-based (naphtha-base), isn't it?"

Engineering leader: "Nitrile rubber and acrylic rubber are synthetically produced based on naphtha, but silicone rubber is made from silicon, which can be found naturally. Fluoro rubber is produced synthetically from fluorine compounds extracted from fluorite, which is known for its fluorescent light emission."

"Oh, how knowledgeable our engineering leader is!" murmured the female staff member, impressed.

1.8 Causes of seal failures and countermeasures

(1) Causes of seal failures

To identify the causes of seal failure and take proper measures, it is critical to observe the seal lip closely and evaluate the failure in all respects, such as shaft surface roughness, contaminants and lubrication. Causes of major seal failure are listed below (Table 1.8.1).

Table 1.8.1 Causes of seal failures

Factor				
1st	2nd	3rd	4th	5th
Leakage from seal	From lip	Damages on lip	Burrs on shaft chamfer	
			Spline, keyway on shaft	
			Entry of foreign materials	
			Wrong handling	
		Lip turned backward	Small shaft chamfer	
			Center off set at mount	
			Excessive inside pressure	
		Missing spring	Small shaft chamfer	
			Center off set at mount	
			Caused by Stick slip*	
		Lip hardened	High oil temperature	
			Poor lubrication	
			Excessive inside pressure	
		Lip softened	Improper rubber	
			Long time dip in cleaner, solvent	
		Heavy wear on shaft	Entry of foreign materials	
			Chemical wear	Depends on oil components
			Poor lubrication	
			Caused by Stick slip*	
		Heavy wear on lip	Poor lubrication	
			Excessive internal pressure	
			Rough shaft surface finish	
			Entry of foreign materials	
		Uneven wear on lip	Excessive eccentricity at mount	
			Inclined seal mounting	
		Rough face, Steaks on lip	Entry of foreign materials	
			Poor lubrication	
		Tear at seal heel bottom	Wrong handling	
			Reaction by impact pressure	
			Excessive inside pressure	
		Lip deformation (small interference)	High oil temperature	
		Lip face contact	Excessive inside pressure	
			Minus pressure between lips	
			Big shaft runout	
			Larger shaft diameter	
		Lip tear	Caused by Stick slip*	Poor lubrication Improper rubber
			Reaction by impact pressure	
		Blisters on lip	Deterioration of lubrication (directly under lip)	
			Mirror finish on shaft surface	
			Higher peripheral speed	
			Higher radial lip load	
		No abnormality on seal	Smaller shaft diameter	Small interference
			Improper shaft roughness	
			Damages on shaft	
			Lead machining on shaft	
			Poor lip followability	Big shaft runout Big eccentricity Small interference Lip high rigidity Poor low temperature resistance
			Wrong direction of seal mounting	
			Adhesion of foreign particles at mounting	
	From fitting area	Peeling, Scuffing, Damages, Deformation, Inclined mounting on seal	Smaller housing bore diameter	Large interference
			Small housing bore chamfer	
			Rough housing bore surface finish	
			Improper mounting tool	
		Oil seal fall-out	Larger housing bore	
			Smaller oil seal O.D	
			Improper oil seal press-fit position	
		No abnormality on seal	Larger housing bore	Small interference
			Smaller seal O.D	Small interference
			Rough housing bore surface finish	
			Damages or blowholes on housing bore	
			Wrong direction of seal mounting	

✻ Stick slip:
A friction related phenomena in which the sealing element tends to adhere and rotate with the shaft surface momentarily until the elastic characteristics of the sealing element overcome the adhesive force,causing the seal lip to lose contact with the rotating shaft long enough to allow leakage.

This cycle repeats itself continuously and is normally associated with non-lubricated and boundary-lubricated conditions.

(2) Causes of seal failures and countermeasures

Table 1.8.2 below lists the possible causes of seal failures and countermeasures.

Table 1.8.2 Causes of seal failures and countermeasures (1)

Oil leakage from lip (1)

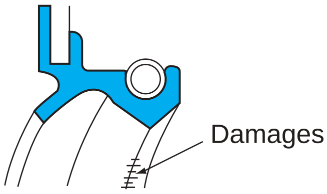
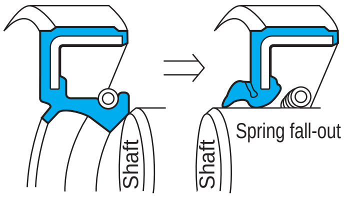
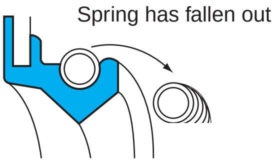
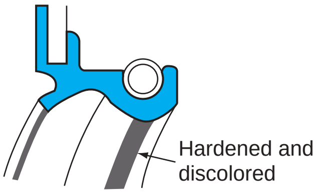
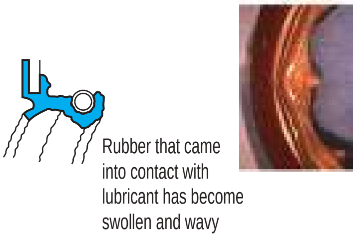
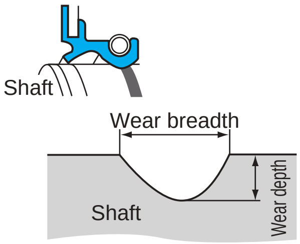
Symptom	Phenomenon	Causes	Countermeasures
Damages on sealing edge	Visible damage on lip edge 	1) Sharp edge or burrs on shaft chamfer 2) Shaft spline or keyway 3) Entry of foreign materials 4) Poor handling	• Remove burrs and polish • Use shaft protecting jig (See Fig. 1.7.8 on page 29.) • Clean work shop • Improve handling manner (Consult JTEKT.)
Lip turned backward		1) Too small chamfer on shaft end 2) Center offset between shaft and housing 3) Excessive inside pressure happened	• Correct shaft chamfer (See Fig. 1.5.1 on page 19.) • Improve center offset (Consult JTEKT.) • Apply high pressure proof seal or breather (vent)
Missing spring		1) Inadequate shaft end chamfer 2) Center offset between shaft and housing 3) Caused by Stick slip	• Improve shaft end chamfers (See Fig. 1.5.1 on page 19.) • Improve center offset (Consult JTEKT.) • Improve lubrication including pre-lubricating on seal
Lip hardened		1) Temperature exceeded seal service temperature range 2) Poor lubrication 3) Excessive inside pressure happened	• Change rubber material to high temperature proof rubber (See Table 1.4.2 on page 16.) • Improve lubricating method and lubricant supply volume • Apply high pressure proof seal or breather (vent)
Lip softening		1) Mis-selection of rubber material 2) Long time dip in cleaning oil or organic solvent	• Change rubber to material not swelling in lubricant (See Table 1.4.2 on page 16.) • To clean the seal, apply the oil used for lubrication as cleaning oil. In an application where grease is used for lubrication, use kerosene as cleaning oil
Heavy wear on shaft		1) Entry of foreign materials 2) Chemical wear due to high temperature or excessive pressure additive 3) Poor lubrication 4) Caused by Stick slip	• Attach prevention device for entry of foreign materials • Take countermeasure to prevent high temperature and change lubricants (Consult JTEKT.) • Improve lubrication on lip including pre-lubricating (Improve quantity of lubricant or lubricating method)

Table 1.8.2 Causes of seal failures and countermeasures (2)

Oil leakage from lip (2)

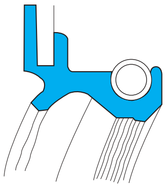
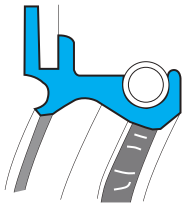
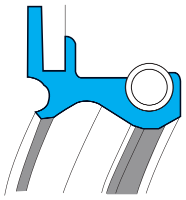
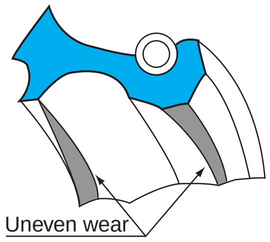
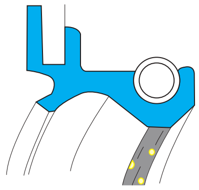
Symptom	Phenomenon	Causes	Countermeasures
Heavy wear on lip	Rough face, Streaks 	1) Poor lubrication 2) Rough shaft surface finish 3) Entry of foreign materials	• Take pre-lubrication on lip • Improve lubrication • Improve shaft surface finish (See page 19.) • Attach prevention device for foreign materials
	Hardening, Cracks 	Excess heat generation due to 1) Poor lubrication 2) Running under conditions beyond specifications a) Excess peripheral speed b) Excessive inside pressure	• Improve lubrication • Examine cause of heat source • Change rubber to heat proof rubber (See Table 1.4.2 on page 16.) • Apply high pressure proof seal or breather (vent)
	Double-faced wear 	• Excessive inside pressure	• Apply high pressure proof seal or breather (vent)
Lip uneven wear	Wear track width is uneven. Max. wear positions of main lip and minor lip are same.  	1) Center offset between shaft and housing 2) Inclination of shaft	• Examine misalignment for shaft to housing (Take countermeasure to reduce offset)
	Wear track width is uneven. Max. and Min. wear areas are located 180° apart. (Main and minor lips show opposite pattern.)  	Inclined seal was mounted into housing 1) Improper housing bore diameter 2) Improper housing bore chamfer 3) Improper housing bore corner radius 4) Improper mounting tool	• Correct housing bore diameter (See Table 1.5.2 on page 19.) • Correct housing bore chamfer (See Fig. 1.5.3 on page 20.) • Correct housing bore corner radius (See Fig. 1.5.4 on page 20.) • Improve mounting tool (Consult JTEKT.)
Rough face and streaks on lip	Rough face and streaks on sealing edge 	1) Entry of foreign materials 2) Poor lubrication	• Attach prevention device for entry of foreign materials • Improve lubrication

Table 1.8.2 Causes of seal failures and countermeasures (3)

Oil leakage from lip (3)

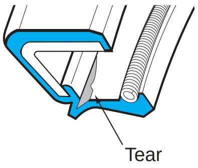
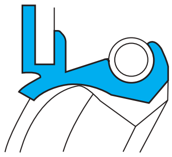
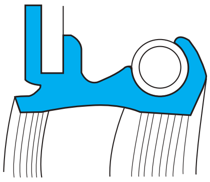
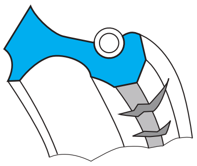
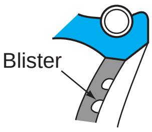
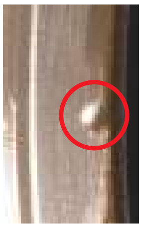
Symptom	Phenomenon	Causes	Countermeasures
Tear at seal heel bottom		1) Improper handling 2) Excessive inside pressure 3) Reaction by impact pressure	• Improve handling manner (Consult JTEKT.) • Apply high pressure proof seal or breather (vent) • Prevention of impact pressure by design change of machine structure
Lip deformation	Reduction of tightening interference due to rubber hardened 	• Oil temperature rose up during operation	• Change rubber to high temperature proof rubber (See Table 1.4.2 on page 16.) • Examination of and countermeasure against the cause of temperature increase are required.
Lip face contact	Whole lip face shows sliding contact pattern 	1) Excessive inside pressure happened 2) Minus pressure happened between lips 3) Big shaft runout 4) Larger shaft diameter	• Prevent excess pressure (change of machine structure) • Give clearance for minor lip • Improve shaft accuracy • Correct shaft diameter
Lip tear		1) Caused by Stick slip a) No or poor lubrication b) Mirror surface finish on shaft c) Excessive shaft surface speed 2) Impact pressure	• Improve lubrication including pre-lubricating on seal • Correct shaft surface finish to (0.1-0.32) µmRa and (0.8-2.5) µmRz • Review machine structure to reduce impact pressure
Blister	 	• Increased agglomeration of high-temperature oil that entered the sliding surface a) Deterioration of lubrication (directly under lip) b) Mirror finish on shaft surface c) Higher peripheral speed d) Higher radial lip load	• Improve lip lubrication • Correct shaft surface finish to (0.1-0.32) µmRa and (0.8-2.5) µmRz • Reduce radial lip load of oil seal
–	No abnormality on seal but oil leakage is observed	1) Smaller shaft diameter 2) Improper shaft roughness 3) Damages on shaft 4) Lead machining on shaft 5) Poor lip followability a) Big shaft runout b) Big housing-bore eccentricity c) Small interference d) Lip high rigidity e) Poor low temperature resistance 6) Wrong direction of seal mounting 7) Adhesion of foreign particles at mounting	• Improve and correct shaft accuracy • Improve shaft surface finish (0.1-0.32) µmRa and (0.8-2.5) µmRz • Remove sharp corners and burrs, or replace shaft • Change the grinding method (avoid axial feed) • Reduce center offset (Consult JTEKT.) • Improve and correct shaft accuracy • Use low torque seal • Change rubber material to low temperature proof one (See Table 1.4.2 on page 16) • Correct seal direction • Improve handling manner

Table 1.8.2 Causes of seal failures and countermeasures (4)

Oil leakage from seal fitting area (1)

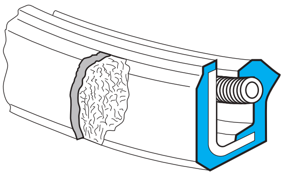
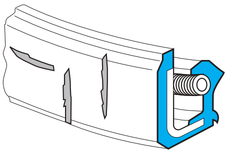
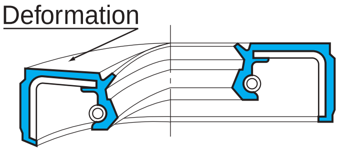
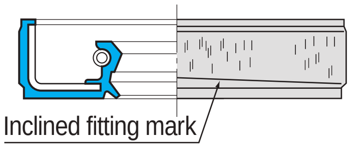
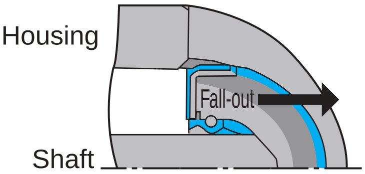
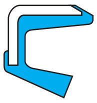
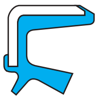
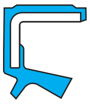
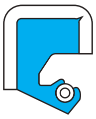
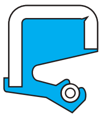
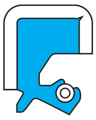
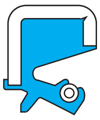
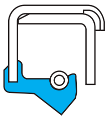
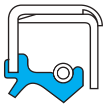
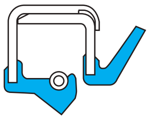
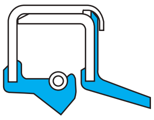
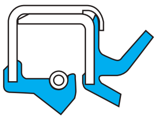
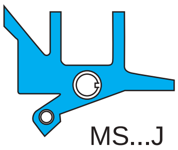
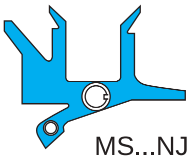
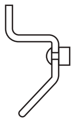
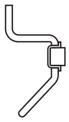
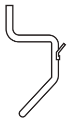
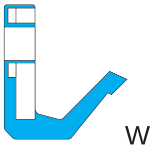
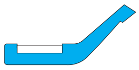
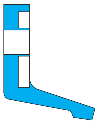
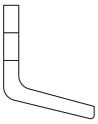
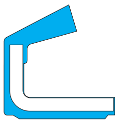
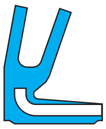
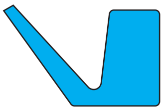
Symptom	Phenomenon	Causes	Countermeasures
Peeling, scuffing on O.D wall		1) Smaller housing bore 2) In adequate housing bore chamfer 3) Rough housing bore surface finish 4) Centering offset between housing and seal mounting	• Correct housing bore diameter (See Table 1.5.2 on page 19.) • Correct housing bore chamfer (See Fig. 1.5.3 on page 20.) • Optimize the housing bore roughness • Improve mounting tool and handling manner (See Figs. 1.7.3 to 1.7.5 on page 27 to 28.)
Damages on O.D wall		1) Burrs on housing bore 2) Damages, or blowholes on housing bore	• Remove burrs, chips • Repair housing bore to eliminate damage, blowhole
Deformation		1) Smaller housing bore 2) Small housing bore chamfer 3) Improper seal mounting tool	• Correct housing bore diameter (See Table 1.5.2 on page 19.) • Correct housing bore chamfer (See Fig. 1.5.3 on page 20.) • Improve mounting tool (Consult JTEKT.)
Seal inclined mounting	Uneven fitting marks on seal O.D face 	1) Smaller housing bore 2) Small housing bore chamfer 3) Poor parallel accuracy between mounting tool and housing	• Correct housing bore diameter (See Table 1.5.2 on page 19.) • Correct housing bore chamfer (See Fig. 1.5.3 on page 20.) • Improve mounting tool (Consult JTEKT.)
Oil seal fall-out		1) Larger housing bore 2) Smaller oil seal O.D 3) Improper oil seal press-fit position 4) Deformation of housing	• Use appropriate housing bore diameter (See Table 1.5.2 on page 19.) • Optimize the oil seal outer dimensions • Improve the outer circumference design (metal O.D wall, HR seal) • Correct the oil seal press-fit position (Consult JTEKT.) • Improve the rigidity of housing

Table 1.8.2 Causes of seal failures and countermeasures (5)

Oil leakage from seal fitting area (2)

Symptom	Phenomenon	Causes	Countermeasures
–	No abnormality on seal but oil leakage is observed	1) Larger housing bore 2) Smaller seal O.D 3) Rough housing bore surface finish 4) Damages or blowholes on housing bore 5) Wrong direction of seal mounting	• Correct housing bore diameter (See Table 1.5.2 on page 19.) • Replace seal • Improve housing bore surface finish (See Table 1.5.3 on page 20.) (In urgent cases, apply liquid gasket to housing bore.) • Remove damages and blowholes • Correct seal direction

1.9 Seal dimensional tables (Contents)

		Type					Page
Standard type seals	Metal O.D wall seals d_1 7~540	 HM	 HMA	 HMS	 HMSA		38
	Rubber O.D wall seals d_1 6~300	 MH	 MHA	 MHS	 MHSA		
Special seals	YS type seals d_1 220~1 640	 YS	 YSN	 YSA	 YSAN		56
	Assembled seals d_1 41~440	 HMSH	 HMSAH	 HMSH...J	 HMSH...J	 HMSH...J	72
	Full rubber seals d1 10~3 530	 MS					78
	MORGOIL seals Seal inner rings d_1 167~1 593	 MS...J	 MS...NJ	 H...J	 H...JM	 H...PJ	84
	Scale seals Scale covers d 195~1 595	 WR	 WR...BJ	 WR...RJ, MH...J	 H...J		86
	Water seals d_1 219.2~1 460	 XMH	 XM, XMHE				90
	V-rings d 38~875	 MV...A					92

The cross-sectional view indicates a representative oil seal shape.

Oil seals

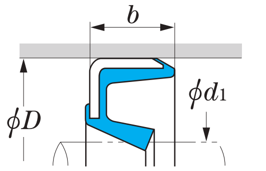
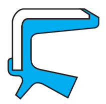
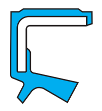
Standard types

d_1 6~(16)

HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

d_1 6~(13)

			Metal O.D wall																Rubber O.D wall															
																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
d_1	D	b	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
6	14	4																					●											
7	20	7									●																●				●			
8	14	4																	●															
	18	4																	●															
	18	7																									●							
	18	9									●																							
	22	5																	●												●			
	22	7																									●				●			
9	22	7																									●				●			
10	17	6																	●															
	18	5																									●							
	20	4	●																●			●												
	20	5													●																			
	20	7									●				●										●		●				●			
	21	8																									●							
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	25	5	●																															
	25	7									●																●				●			
	25	8									●																							
	28	8									●																●							
	30	7																					●				●							
11	22	7																									●	●			●			●
	25	7									●																							
12	16	3					●																											
	18	5																	●															
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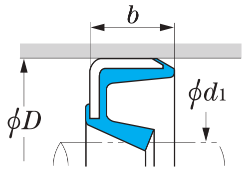
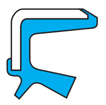
	32	7																									●							
13	20	5					●																		●									
	25	4	●																															

d_1 (13)~(16)

			Metal O.D wall																Rubber O.D wall															
																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
d_1	D	b	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
13	25	7																													●			
	28	5	●																															
	28	7																									●				●	●		
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	30	9									●																							
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	24	6																	●		●						●	●	●		●			
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15	20	5					●																											
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	28	6																													●			
	28	7									●		●	●													●							
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	30	7									●				●												●			●	●		●	●
	30	9																									●							
	30	12																													●			
	32	6																	●															
	32	7									●																●							
	32	9													●												●							
	35	5																													●			
	35	6	●																●															
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16	22	3.5																						●										
	24	4	●																●				●											
	26	7									●				●								●				●					●		●
	28	4	●																●															
	28	7									●				●																●			●
	30	5																													●			
	30	6																									●	●						

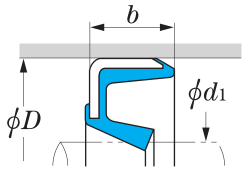
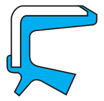
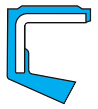
Standard types

*d*1 (16)~20

HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

*d*1 (16)~(19)

			Metal O.D wall																Rubber O.D wall															
																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
16	30	7									●				●			●									●				●			
	30	8									●																							
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17	23	3					●																											
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	28	7									●																●				●			
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	30	8									●		●		●												●			●	●			
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	38	10									●																							
19	27	4					●																											
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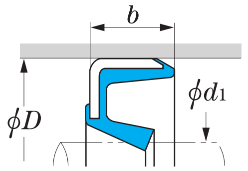
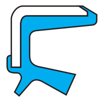
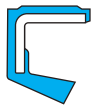
*d*1 (19)~20

			Metal O.D wall																Rubber O.D wall															
																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
19	32	8																													●			
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	42	8																													●	●		
	45	12																									●							
	47	5																													●			
	47	6	●																●												●			
	47	7																													●			
	52	8																													●			

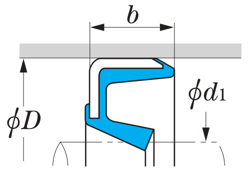
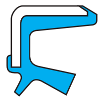
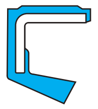
Standard types

*d*1 21~(28)

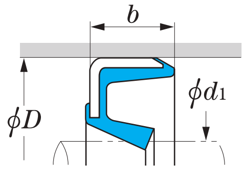
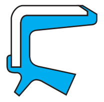
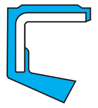
HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

*d*1 21~(25)

			Metal O.D wall																Rubber O.D wall															
																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
21	40	7																													●			
22	28	4	●																				●											
	29	4																					●											
	30	4	●				●																●											
	32	7																									●				●			
	34	5																	●															
	35	5	●		●														●															
	35	7									●		●		●												●	●	●		●			
	35	8									●				●																●		●	
	36	10									●																							
	38	8									●																●				●			
	40	11																													●			
	42	5																	●															
	42	7									●																				●			
	42	10									●				●																●			
	42	11									●																●				●			
23	35	6																					●											
24	35	6									●																							
	35	7													●																			
	35	8									●																				●			
	38	5	●																●															
	38	8									●				●																●			
	38	10									●																							
	40	6	●																															
	40	8									●																●				●			
25	32	4																	●															
	32	8									●																							
	33	4					●																											
	35	5	●		●														●															
	35	6																													●			
	35	7									●																				●			
	35	8									●																							
	38	5	●		●	●													●															
	38	7									●		●	●	●												●				●			●
	38	8									●				●																●	●		
	40	5	●		●														●															
	40	6	●																															
	40	7													●																●			

*d*1 (25)~(28)

			Metal O.D wall																Rubber O.D wall															
																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
25	40	8									●			●	●												●	●	●	●	●	●		●
	40	10																									●				●			
	42	5																					●											
	42	8									●																				●			
	44	7									●		●																					
	45	5	●																●															
	45	7									●				●																●			
	45	8									●				●												●	●			●	●		
	45	10									●				●												●				●			
	45	11																									●			●	●			●
	47	5	●																●			●												
	47	6	●								●		●						●								●							
	47	7																									●				●			
	47	8													●																●			
	48	8									●																●							
	50	9																									●							
	50	12									●				●												●				●			
	52	7																													●			
	52	10									●																							
	52	12									●																				●			
	62	11																													●	●		
26	36	8											●																					
	38	8									●		●		●												●				●			
	40	7													●																			
	40	8																													●			
	42	8									●				●												●	●	●		●			
	45	7																									●							
	48	11									●				●																			
27	40	8									●		●																					
	47	11									●																●							
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	37	6	●																															
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	44	8													●																●			
	44	11									●		●																					
	45	6	●																●															
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	47	8																													●			

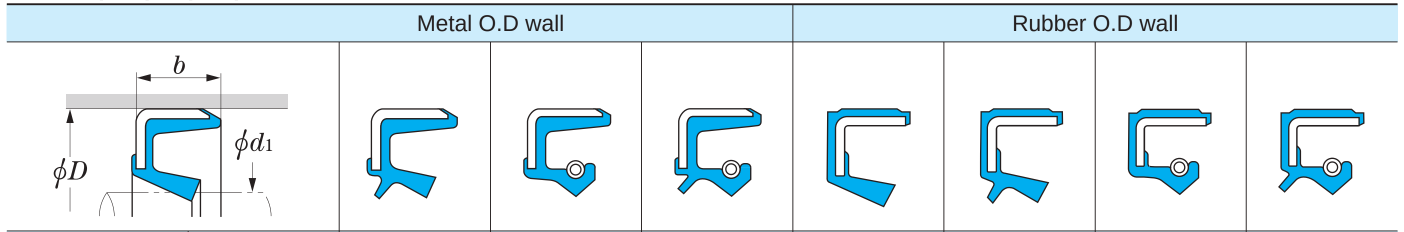
Standard types

*d*1 (28)~(35)

HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

*d*1 (28)~(30)



			Metal O.D wall																Rubber O.D wall															
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
28	48	5	●																															
	48	7																													●			
	48	8																													●			
	48	11													●		●										●				●			
	50	6	●																															
30	37	3.2																	●															
	39	7									●		●																					
	40	5	●																●															
	40	7									●																●				●			
	42	5	●		●	●													●															
	42	7																													●			
	42	8									●				●	●											●		●		●	●		
	44	7													●																			
	44	9									●				●												●							
	45	6	●		●														●															
	45	7													●																●			
	45	8									●	●		●	●			●									●				●	●		●
	45	12									●																●							
	46	5																	●															
	46	7																													●	●		
	47	8																									●		●		●			
	47	12									●																							
	48	7																													●			
	48	8									●																							
	50	5																	●															
	50	7									●																				●			
	50	8									●			●	●			●									●	●		●	●	●		
	50	10									●																							
	50	11									●		●	●	●			●									●			●	●			●
	50	12									●																							
	52	8																													●			
	52	10																									●							
	52	12									●																●							
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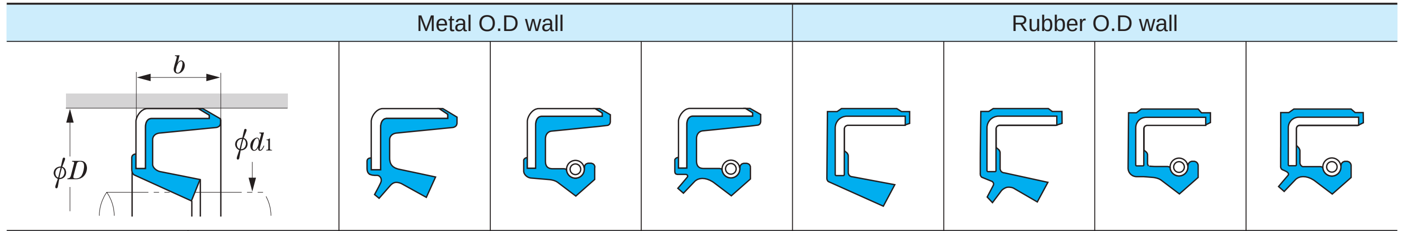
	55	12									●																●				●			
	56	5	●																●															
	62	7																													●			
	62	8																									●				●			

*d*1 (30)~(35)



			Metal O.D wall																Rubber O.D wall															
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
30	62	10																													●			
32	43	7																													●			
	43	10									●																							
	44	9									●																							
	45	5	●																●															
	45	7																													●			
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	46	8									●																●							
	47	8									●																							
	48	8									●				●			●													●			
	52	5																	●															
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	52	11									●				●																●			●
	54	10																													●			
33	50	7									●																							
34	42	5																					●											
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	48	5																	●															
	48	7																													●		●	
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	50	8									●				●			●									●				●	●		●
	50	11																									●				●		●	
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	55	5	●		●														●															
	55	7													●																●			
	55	8									●				●												●	●			●			
	55	9									●																							
	55	11													●			●									●		●	●	●		●	●

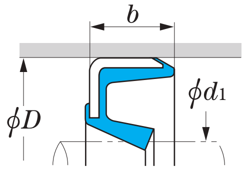
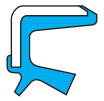
Standard types

d_1 (35)~(50)

HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
   Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

d_1 (35)~(40)

			Metal O.D wall																Rubber O.D wall															
 																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
d_1	D	b	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
35	55	12																														●			
	60	12									●				●																●			
	62	10									●		●																					
36	50	7									●																●			●	●	●		
	50	10									●																							
38	45	8					●																											
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	50	8									●																●				●		●	
	52	6					●																				●							
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	55	9									●				●																●			
	58	5																	●															
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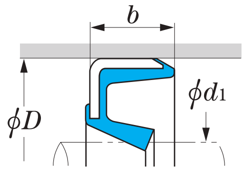
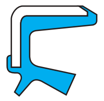
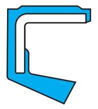
	58	8													●												●				●			
	58	11									●				●												●				●		●	
40	50	6																					●											
	52	5	●		●	●													●															
	52	7													●																●			
	52	8									●				●												●			●	●			●
	55	7													●																●			
	55	8									●				●	●	●										●				●			
	55	9									●																●				●			
	58	6																	●															
	58	7																													●			
	58	8									●			●	●			●									●				●			
	58	10																													●			
	60	8									●																●							
	60	12									●																●				●			
	62	5	●																●		●													
	62	7													●																●			
	62	8									●																●			●	●		●	
	62	10																					●											
	62	11									●		●	●	●			●									●				●			
	62	12									●		●		●			●									●	●			●	●		
	65	5	●																															
	65	12																									●							

d_1 (40)~(50)

			Metal O.D wall																Rubber O.D wall															
 																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
d_1	D	b	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
40	65	14									●																●				●			
	75	12																													●			
41	65	9									●																							
42	55	6	●				●																											
	55	7													●													●			●			
	55	9									●			●																	●			
	58	10																									●							
	60	7	●																															
	60	9									●	●			●												●				●			
	65	7													●																			
	65	9									●																●							
	65	12									●	●		●	●												●				●		●	
44	60	9																													●			
45	55	4	●																															
	60	6	●		●														●															
	60	7									●				●																			
	60	9									●		●	●	●												●				●	●		
	61	9									●	●		●																				
	62	6					●																											
	62	7	●		●														●												●			
	62	9									●		●	●	●												●	●	●		●		●	●
	62	10									●																							
	65	5	●	●															●															
	68	6	●																															
	68	7																													●			
	68	9									●																●			●	●			
	68	12									●				●												●	●			●			
	70	12																									●			●	●			
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	71	6.5	●																															
	72	12													●																●			
47	62	11																					●											
48	62	6	●																●															
	62	9									●																				●			
	65	9									●			●	●												●				●			
	70	7													●																●			
	70	9									●				●												●				●			
	70	12									●	●		●	●			●									●				●			
50	64	10									●																				●			
	65	6	●		●	●													●															
	65	7													●																			
	65	9									●				●			●													●		●	
	68	7																	●															

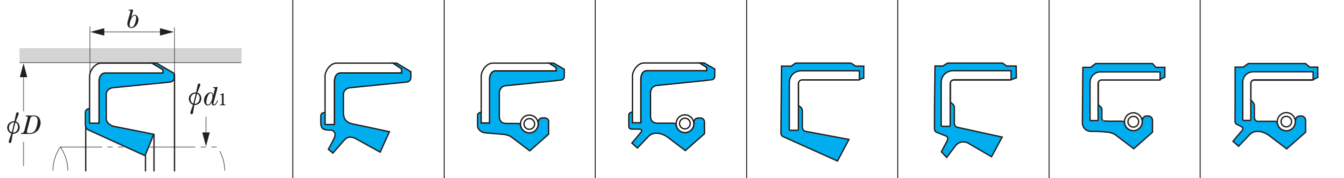
Standard types

*d*₁ (50)~(70)

HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

d_1 (50)~(58)



			Metal O.D wall																Rubber O.D wall															
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
d_1	D	b	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
50	68	9									●			●	●												●			●	●			●
	70	10									●				●												●				●		●	
	70	12									●																●				●			
	72	5																	●															
	72	6	●																															
	72	7													●																●			
	72	9									●				●												●				●			
	72	10													●																			
	72	12									●	●	●	●	●		●										●		●	●	●			●
	72	14																													●			
	75	12									●																							
	80	7	●																															
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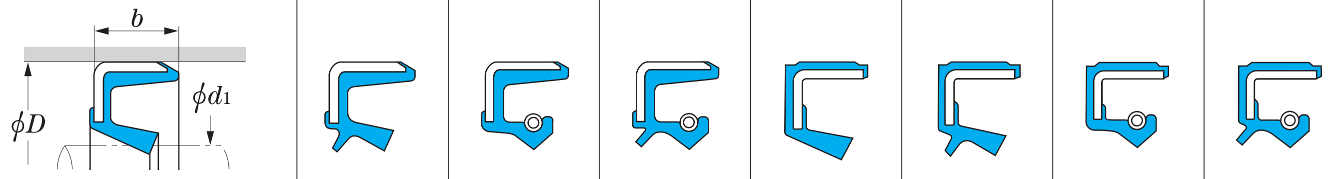
51	63	6					●																											
52	65	6																	●															
	70	9									●				●												●				●			
	75	9													●																			
	75	12									●			●	●												●							
53	78	12																									●			●				
55	70	6	●		●	●													●															
	70	7													●																			
	70	9									●			●																	●			
	72	7	●		●										●				●												●			
	72	9									●				●	●		●									●	●			●			
	74	6	●																															
	75	12									●																							
	78	6																	●															
	78	7													●																●			
	78	9									●		●		●												●			●	●			
	78	12									●	●	●	●	●	●		●									●		●	●	●	●		●
	80	12									●	●			●												●				●			
	85	7	●			●																												
	85	14									●			●	●												●	●	●		●			
56	70	6	●																															
	78	9																													●			
	78	12									●				●																●			
58	72	6	●																●															
	72	9									●																			●				

d_1 (58)~(70)



			Metal O.D wall																Rubber O.D wall															
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
d_1	D	b	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
58	75	9									●				●																●			
	80	9									●																				●			
	80	12									●				●			●									●				●			
60	75	6	●			●													●															
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	75	9									●																							
	80	9									●				●																●			
	85	12									●			●	●												●		●		●			
63	80	9													●																●			
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	85	12									●				●												●				●			
65	80	6																	●															
	82	8													●																			
	82	10									●			●													●				●			
	85	10									●				●																			
	85	12									●																							
	88	6	●			●																												
	88	8																													●			
	88	12									●		●		●			●									●	●	●	●	●		●	●
	90	8													●																			
	90	10																					●											
	90	12																									●							
	90	13									●				●		●										●			●	●			
	95	14									●					●																●		
	95	16													●																			
68	90	12									●				●	●											●				●			
	95	13									●				●												●							
70	82	12													●																			

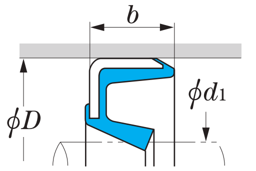
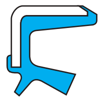
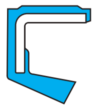
Standard types

d_1 (70)~(130)

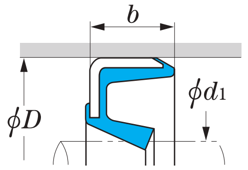
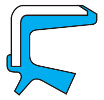
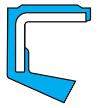
HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

d_1 (70)~88

			Metal O.D wall																Rubber O.D wall															
																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
d_1	D	b	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
70	85	6	●																●															
	88	12									●				●												●				●		●	●
	90	10	●																															
	90	12									●																●				●			
	92	7	●		●														●															
	92	8													●																●			
	92	12									●			●	●			●									●		●	●	●	●		●
	95	8													●																●			
	95	13									●				●			●									●		●	●	●	●	●	
	100	14									●		●		●												●				●			
71	95	13									●																				●			
72	100	12									●		●	●																				
73	95	14									●				●																			
75	90	6	●																															
	100	7	●																●															
	100	8													●																●			
	100	13									●				●		●	●									●			●	●			●
	105	15									●				●												●				●			
77	93	10													●																			
80	100	7	●																●															
	100	8									●		●		●																●			
	100	10									●	●			●												●	●	●	●	●		●	
	100	12																												●	●		●	
	105	8	●												●																●			
	105	13									●	●			●	●	●	●									●		●	●	●	●		●
	105	15													●																			
	110	15													●																			
	115	15									●				●												●				●			
85	100	6	●																															
	100	13									●		●																					
	105	13									●		●		●												●							
	105	15									●			●																				
	110	7																	●															
	110	8	●																															
	110	9													●																●			
	110	13									●				●			●									●	●	●	●	●	●		●
	120	15									●		●		●																			
88	115	13									●			●																				

d_1 90~(130)

			Metal O.D wall																Rubber O.D wall															
																																		
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
d_1	D	b	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
90	100	7																	●			●												
	105	6	●																															
	115	5																	●															
	115	8	●																															
	115	9																													●			
	115	13									●	●	●	●	●			●									●			●	●			●
	115	15									●																							
	120	13									●		●																					
	125	15									●		●		●												●							
95	115	13									●																				●			
	115	16									●																							
	120	8	●																															
	120	9																													●			
	120	13									●	●		●	●			●									●			●	●	●	●	●
	130	13									●																							
	130	15									●		●	●	●												●				●			●
	135	13																	●															
100	120	12									●																							
	125	8	●																															
	125	13									●			●	●			●									●		●	●	●		●	●
	125	15													●																			
	135	15									●				●												●				●			●
105	130	13									●	●	●														●							
	135	9																													●			
	135	14									●		●	●	●			●									●			●	●		●	●
	140	15									●																●							
110	140	8	●																															
	140	14									●			●	●			●									●			●	●		●	
	145	15									●		●		●												●					●		
112	145	14																													●			
115	145	14									●	●	●		●			●									●			●	●			
	150	16									●																							
120	135	7	●																															
	150	9																													●			
	150	14									●			●	●		●	●									●	●	●	●	●		●	
	155	16									●				●												●				●	●	●	●
125	155	14									●	●	●		●												●				●	●	●	
	155	16													●																			
	160	16									●																●							
130	150	11																													●			
	160	9													●																●			
	160	14									●		●	●	●		●										●			●	●			●
	160	16											●		●																			

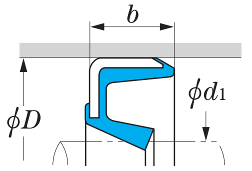
Standard types

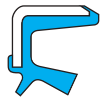
*d*1 (130)~(280)

HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

*d*1 (130)~(190)



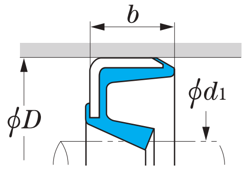


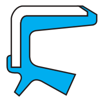


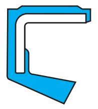


			Metal O.D wall																Rubber O.D wall															
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
130	170	16									●		●														●							
135	165	14									●			●	●			●									●		●	●	●			
	175	16									●																							
140	160	14													●																●			
	170	14									●			●	●												●			●	●	●		●
	185	16									●		●														●				●		●	●
145	175	12																													●			
	175	14									●				●	●	●	●									●				●			
	190	16																											●					
150	180	12													●																●			
	180	14									●	●		●	●	●	●	●									●				●		●	●
	180	16													●																●			
155	180	15									●																				●			
	185	15									●																							
	200	20									●		●		●		●																	
160	190	12													●																●			
	190	14									●		●	●	●	●	●										●							
	190	16									●	●	●		●	●											●		●	●	●		●	●
165	195	14																									●				●			●
	220	20									●																							
170	200	12																													●			
	200	16									●				●			●									●			●	●			●
	205	12													●																			
	205	16									●	●																						
	205	18													●																			
	210	15																									●		●					
	225	16													●																			
	225	20									●				●																			
175	230	20									●																							
180	210	12																													●			
	210	15									●																							
	210	16									●			●	●		●	●									●				●			●
	215	16									●	●	●	●																				
	215	18													●																●			
	220	15									●																							
	225	20									●																							
	235	20									●																							
190	220	14									●		●																					

*d*1 (190)~(280)






			Metal O.D wall																Rubber O.D wall															
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
190	220	15																									●							
	225	16									●			●	●	●		●																
	245	22											●																					
200	230	15									●																●							
	235	16									●																							
	235	18													●																			
	240	20									●			●	●		●														●			●
	255	22									●																							
205	260	23									●																							
210	240	15									●																●							
	250	16									●		●	●	●																			
	250	18									●																							
	250	20									●		●		●		●	●																
	265	23									●				●																			
220	250	15									●	●		●													●							
	250	16																													●		●	
	255	16									●				●												●	●						
	255	18									●				●			●															●	●
	260	20															●										●	●						
	260	22									●				●		●	●																
	275	23									●																							
230	255	15									●																							
	260	15									●				●												●							
	260	20									●				●			●																
	270	16																													●			●
	270	20																													●	●	●	●
	285	23									●																							
240	270	15									●			●													●							
	270	20																													●			
	275	16									●			●	●												●				●		●	
	275	18													●																			
	280	19									●		●	●	●																			
250	280	15									●																●							
	285	18													●												●				●		●	●
	310	25									●		●		●																			
260	300	20																									●				●			
	320	25									●			●	●			●																
270	330	25												●	●		●	●																
	345	15																	●															
280	310	16																									●							
	320	18									●			●																				
	320	22													●			●													●			
	330	24																									●							

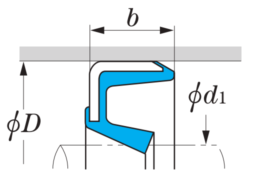
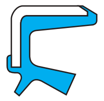
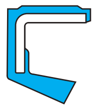
Standard types

*d*1 (280)~670

HM HMA HMS HMSA
MH MHA MHS MHSA

Remarks
1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: HMSA55729(55×72×9 mm).
4) Rubber code N represents nitrile rubber, A: acrylic rubber, S: silicone rubber, and F: fluoro rubber.
5) Consult JTEKT separately for information on inventory, delivery, and production lots.

*d*1 (280)~670

			Metal O.D wall																Rubber O.D wall															
																														
Boundary dimensions, mm			HM				HMA				HMS				HMSA				MH				MHA				MHS				MHSA			
*d*1	*D*	*b*	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F	N	A	S	F
280	340	28									●				●			●																
290	330	15																									●							
	330	18									●																							
	350	25									●			●	●		●	●																
300	340	22																													●			
	345	22									●																							
	360	25									●				●		●																	
310	370	28													●																			
320	360	20													●			●																
	360	25									●																							
	380	25									●																							
	380	28													●		●														●			
340	380	20									●																				●			
	400	25									●																							
	400	28													●																			
350	390	20																													●			
360	400	17																									●							
	420	25									●		●	●																				
370	415	20									●																							
380	440	25									●																							
	440	28																													●			
395	430	18									●																							
420	480	25									●			●																				
	480	28																													●			
460	500	20																													●			
540	600	25																●																
670	710	20																													●			

YS type

d_1 220~335

YS YSN YSA YSAN

Remarks

1) For seals marked ●, JTEKT owns molding dies for production.

2) The cross-sectional view indicates a representative oil seal shape.

3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: YS32036018 (320×360×18 mm).

4) Seal number marked ●❈ have suffix -1.

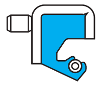
5) Seals with spacer are available. Seal number with spacer is refered on right side page.

6) Rubber code N represents nitrile rubber,
F: fluoro rubber, and
K: hydrogenated nitrile rubber.

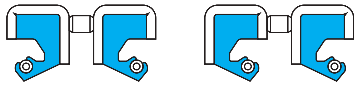
Example of seal number with spacer

(Various width spacers are available as like 10 mm.)

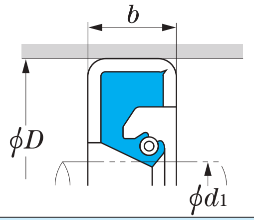
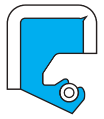
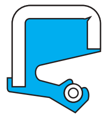
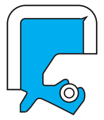
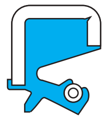
Example 1 **YS 320 360 18 D5** Spacer width: 5 mm



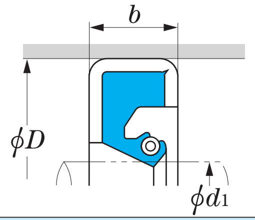
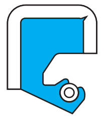
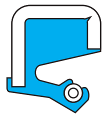
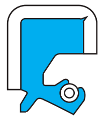
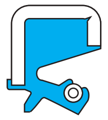
Example 2 **YS 320 360 18 2D5** Spacer width: 5 mm



d_1 220~(310)

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
220	255	16				●						
230	264	16				●						
240	275	16				●						
250	285	16				●						
255	315	25	●									
265	305	18	●			●						
270	330	25	●									
280	320	18	●			●						
	330	20	●❈									
	340	25	●			●						
290	330	18	●									
	340	20	●									
	350	25	●									
	350	28							●			
300	340	18	●	●		●	●					
	340	20	●									
	340	25	●									
	345	20	●									
	345	22	●									
	350	20	●❈									
	350	25	●									
	350	29							●			
	360	25	●			●						
	360	28							●			
304	342.1	17.5	●❈									
304.8	342.9	17.5	●❈									
	355.6	20.6	●									
	355.6	25.4	●									
305	355	23	●									
	355	25	●									
310	350	18	●									

d_1 (310)~335

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
310	350	19	●									
	350	20	●			●						
	360	20	●									
	360	25	●						●			
	370	25	●	●		●			●❈			
	370	28							●			
315	355	20	●									
	360	20	●									
	365	20	●									
	375	25	●									
	375	28							●			
320	360	18	●			●						
	360	20	●									
	360	25	●		●	●						
	370	20	●									
	370	25	●									
	380	25	●			●			●			
	380	28							●	●		
320.68	371.48	25.4	●									
325	365	20	●									
	375	25	●									
330	370	18	●									
	370	20	●									
	370	25	●									
	380	25	●									
	390	25	●			●						
	390	28							●			
330.2	368.3	17.5	●❈									
335	375	20	●									
	385	25							●			
	395	28							●			

YS type

d_1 336.6~(400)

YS　YSN　YSA　YSAN

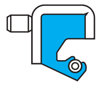
Remarks

1) For seals marked ●, JTEKT owns molding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: YS32036018 (320×360×18 mm).
4) Seal number marked ●✻ have suffix -1.
5) Seals with spacer are available. Seal number with spacer is refered on right side page.
6) Rubber code N represents nitrile rubber,
F: fluoro rubber, and
K: hydrogenated nitrile rubber.

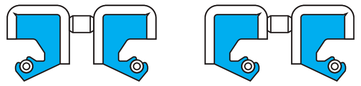
Example of seal number with spacer

(Various width spacers are available as like 10 mm.)

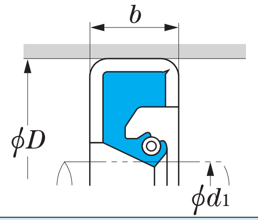
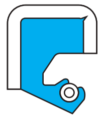
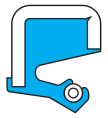
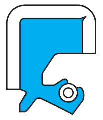
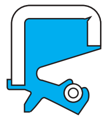
Example 1　**YS 320 360 18 D5** — Spacer width: 5 mm



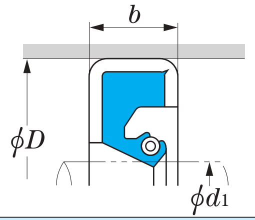
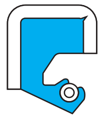
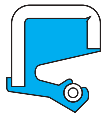
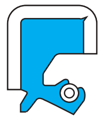
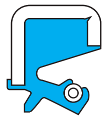
Example 2　**YS 320 360 18 2D5** — Spacer width: 5 mm



d_1 336.6~365

			Seal type										
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
336.6	374.65	17.5	●✻									
340	380	18	●			●						
	380	20	●	●			●					
	380	25	●									
	384	20	●									
	390	20	●									
	390	25							●			
	400	25	●	●		●			●			
	400	28							●			
342.9	381	17.5	●									
	393.7	20.6	●									
	393.7	25.4	●									
350	390	16				●						
	390	18	●									
	390	20	●									
	400	17	●									
	400	25	●						●			
	410	25	●									
	410	28							●	●		
355	405	25	●						●			
	415	28							●			
355.6	406.4	20.6	●✻									
	406.4	25.4	●									
360	400	17	●			●						
	400	18	●			●						
	400	20	●									
	400	25	●									
	410	25	●						●			
	420	25	●						●			
	420	28							●	●		
365	405	18	●									

d_1 370~(400)

			Seal type										
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
370	410	18	●	●								
	410	20	●									
	410	25	●									
	415	20	●	●								
	420	20	●									
	420	25	●						●			
	430	25	●									
	430	28							●			
374.65	419.1	22.2	●									
375	420	18	●									
	420	20	●									
	435	28							●			
380	420	18	●									
	420	20	●									
	420	25	●									
	430	25	●									
	440	25	●									
	440	28							●			
381	419.1	17.5	●									
	431.8	20.6	●✻									
	431.8	25.4	●									
385	425	18	●									
387.4	425.15	17.5	●✻									
390	430	18	●									
	430	20	●									
	440	20	●									
	440	25	●						●			
	450	25	●						●			
	450	28							●			
393.7	431.8	19	●									
400	440	18	●									

YS type
*d*1 (400)~460

YS YSN YSA YSAN

Remarks

1) For seals marked ●, JTEKT owns molding dies for production.

2) The cross-sectional view indicates a representative oil seal shape.

3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: YS32036018 (320×360×18 mm).

4) Seal number marked ●❈ have suffix -1.

5) Seals with spacer are available. Seal number with spacer is refered on right side page.

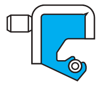
6) Rubber code N represents nitrile rubber,
F: fluoro rubber, and
K: hydrogenated nitrile rubber.

Example of seal number with spacer

(Various width spacers are available as like 10 mm.)

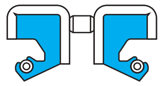
Example 1 **YS 320 360 18 D5**

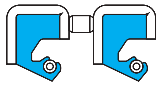
Spacer width: 5 mm



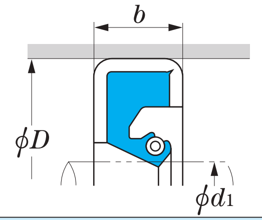
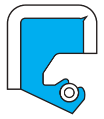
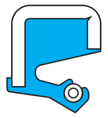
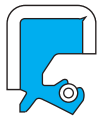
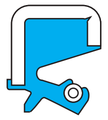
Example 2 **YS 320 360 18 2D5**

Spacer width: 5 mm

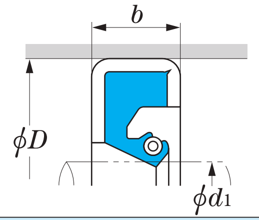
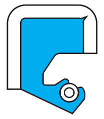
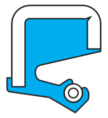
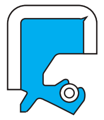
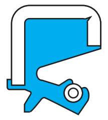




*d*1 (400)~(425)

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
*d*1	*D*	*b*	N	F	K	N	F	K	N	F	N	F
400	440	20	●									
	444	20	●									
	450	20	●									
	450	25	●						●			
	460	25	●						●			
	460	28							●			
400.05	438.15	15				●						
	438.15	17.5	●			●						
405	455	25	●									
406.4	444.5	19	●									
	450.85	22.2	●						●❈			
	457.2	20.6	●			●						
	457.2	23	●			●						
	457.2	23.8	●❈									
410	450	20	●									
	460	25	●						●			
	470	25	●		●							
	470	28							●			
	480	25	●									
415	475	23	●									
419.1	457.2	19.1	●									
420	460	18	●									
	460	19	●									
	460	20	●			●						
	460	25	●									
	470	20	●									
	470	22	●❈									
	470	25	●	●					●			
	480	25	●						●			
	480	28							●			
425	465	20	●									

*d*1 (425)~460

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
*d*1	*D*	*b*	N	F	K	N	F	K	N	F	N	F
425	485	28							●			
430	470	20	●			●						
	480	20	●									
	480	25	●						●			
	490	25	●			●						
	490	28							●			
431.8	469.9	19	●									
432	476	20	●									
438.2	476.25	19	●									
440	480	20	●			●						
	490	17	●									
	490	20	●									
	490	22	●❈									
	490	25	●									
	500	25	●									
	500	28							●			
444.5	495.3	25.4	●									
450	490	19	●									
	490	20	●									
	500	20	●									
	500	25	●						●			
	510	25	●	●		●						
	510	28							●			
452.6	501.65	19.1	●❈									
454	504.82	19	●									
457.2	508	19.1	●									
460	500	20	●			●						
	510	20	●									
	510	25	●									
	520	25	●	●		●			●			
	520	28							●			

YS type

d_1 463.6~550

YS YSN YSA YSAN

Remarks

1) For seals marked ●, JTEKT owns molding dies for production.

2) The cross-sectional view indicates a representative oil seal shape.

3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: YS32036018 (320×360×18 mm).

4) Seal number marked ●❈ have suffix -1.

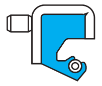
5) Seals with spacer are available. Seal number with spacer is refered on right side page.

6) Rubber code N represents nitrile rubber,
F: fluoro rubber, and
K: hydrogenated nitrile rubber.

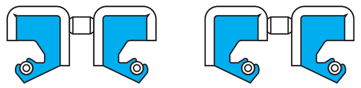
Example of seal number with spacer

(Various width spacers are available as like 10 mm.)

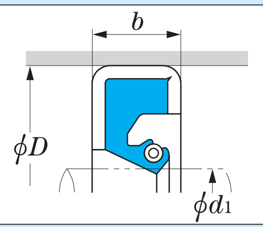
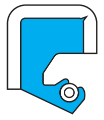
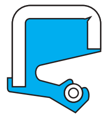
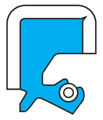
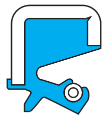
Example 1 **YS 320 360 18 D5** Spacer width: 5 mm



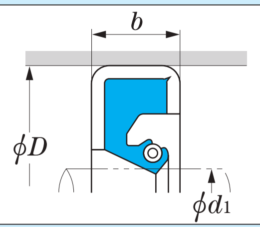
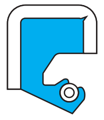
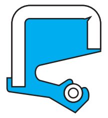
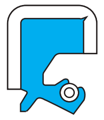
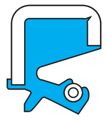
Example 2 **YS 320 360 18 2D5** Spacer width: 5 mm



d_1 463.6~510

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
463.6	501.65	19.1	●									
465	510	20	●									
	515	25							●			
467	510	20	●									
469.9	520.7	23	●									
	520.7	23.4	●									
470	510	20	●									
	520	18	●❈									
	520	20	●			●	●					
	520	25							●			
	530	25	●						●			
	530	28							●			
480	520	20	●			●						
	530	20	●									
	530	22	●									
	530	25	●									
	540	25	●	●					●			
	540	28							●			
482.6	520.7	19	●	●								
490	530	20	●									
	540	25	●						●			
	550	25	●									
495.3	546.1	23.8	●									
500	540	20	●									
	550	20	●									
	550	25	●									
	560	25	●						●			
	560	28							●			
510	550	20	●									
	560	25	●	●		●						
	570	28							●			

d_1 514~550

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
514	565	25	●									
514.4	565.15	22.2	●									
520	560	20	●				●					
	570	20	●									
	580	20				●						
	580	25	●						●			
	580	28							●			
520.7	558.8	19.1	●❈									
	571.5	22.2	●									
530	570	20	●									
	580	20	●									
	580	22	●									
	590	28							●			
	600	25	●									
539.8	590.55	22	●❈									
540	580	20	●									
	580	25	●									
	590	20	●									
	590	25	●									
	600	25	●						●			
	600	28							●			
	610	25	●									
546.1	596.9	20.6	●									
	596.9	22.2	●									
550	590	20	●									
	600	20	●									
	600	25	●	●								
	610	23	●									
	610	25	●									
	610	28							●			
	620	25	●	●								

YS type

d_1 558~647.7

YS YSN YSA YSAN

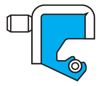
Remarks

1) For seals marked ●, JTEKT owns molding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: YS32036018 (320×360×18 mm).
4) Seal number marked ●❈ have suffix -1.
5) Seals with spacer are available. Seal number with spacer is refered on right side page.
6) Rubber code N represents nitrile rubber,
F: fluoro rubber, and
K: hydrogenated nitrile rubber.

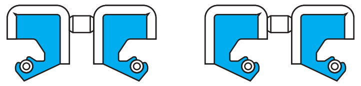
Example of seal number with spacer

(Various width spacers are available as like 10 mm.)

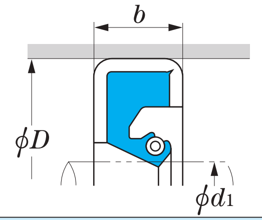
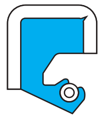
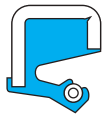
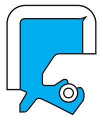
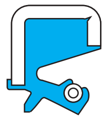
Example 1 **YS 320 360 18 D5** Spacer width: 5 mm



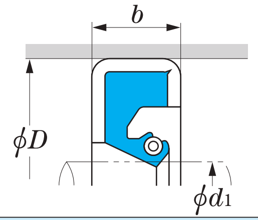
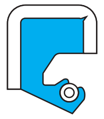
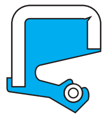
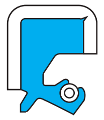
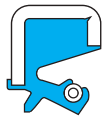
Example 2 **YS 320 360 18 2D5** Spacer width: 5 mm



d_1 558~(600)

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
558	618	25	●									
558.8	596.9	19.1	●❈									
	609.6	22.2	●									
	622.3	22.2	●									
560	600	20	●									
	610	20	●			●						
	610	22	●									
	610	23	●									
	620	25	●									
	620	28							●			
	620	30							●			
	630	25	●	●								
570	610	20	●									
	620	22	●									
	630	25	●									
579.2	630	25.4	●									
580	620	20	●			●						
	630	20	●									
	630	25	●									
	640	25	●									
	640	28							●			
	640	30							●			
	650	25		●								
584.2	622.3	19	●		●							
	635	25.4	●									
587	637	20	●									
590	630	20	●									
	640	20	●									
	640	25	●									
	650	28							●			
600	640	19	●									

d_1 (600)~647.7

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
600	640	20	●									
	650	25							●			
	660	25	●									
	660	28							●			
609.6	660.4	22.2	●									
610	660	25	●									
	670	23	●									
	670	25	●									
	670	28							●			
	670	30							●			
620	660	20	●									
	670	20	●									
	670	25	●									
	680	25	●									
	680	28							●			
	690	25	●									
622.3	673.1	22.2	●									
630	670	20	●									
	670	25	●									
	680	25	●									
	690	25	●									
	690	30	●									
	700	30							●			
635	673.1	19.1	●									
	685	25	●									
	695	25	●									
640	680	20	●									
	690	25	●									
	700	25	●									
	700	28							●			
647.7	698.5	22.2	●									

YS type

*d*1 650~(810)

YS YSN YSA YSAN

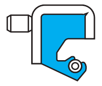
Remarks

1) For seals marked ●, JTEKT owns molding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
   Example: YS32036018 (320×360×18 mm).
4) Seal number marked ●❊ have suffix -1.
5) Seals with spacer are available. Seal number with spacer is refered on right side page.
6) Rubber code N represents nitrile rubber,
   F: fluoro rubber, and
   K: hydrogenated nitrile rubber.

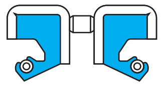
Example of seal number with spacer

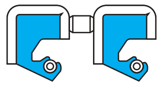
(Various width spacers are available as like 10 mm.)

Example 1 **YS 320 360 18 D5** Spacer width: 5 mm

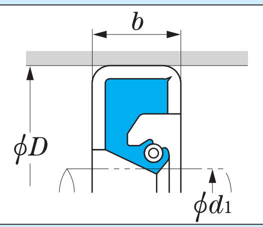
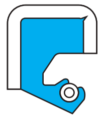
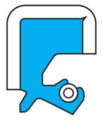
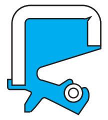


Example 2 **YS 320 360 18 2D5** Spacer width: 5 mm

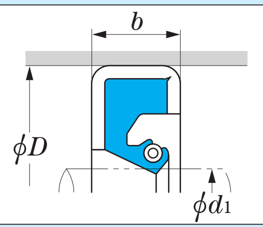
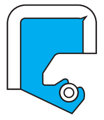
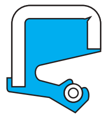
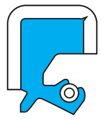
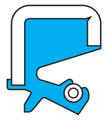




*d*1 650~723.9

Boundary dimensions, mm			Seal type									
												
			YS			YSN			YSA		YSAN	
*d*1	*D*	*b*	N	F	K	N	F	K	N	F	N	F
650	700	25	●									
	710	25	●		●							
	710	28							●			
	710	30		●								
	720	25	●									
660	710	25	●									
	720	25	●									
660.4	711.2	22.2	●									
670	710	20	●									
	720	20	●									
	720	25	●									
673.1	711.2	19	●									
680	720	20	●									
	730	25	●									
685	745	25	●									
685.8	736.6	20.2	●									
	736.6	22.2	●❊									
690	730	20	●									
	750	25	●									
698.5	749.3	22.2	●									
700	750	20	●									
	750	25	●									
	760	25	●									
710	750	20	●									
	760	25	●		●							
	770	25	●	●	●							
711.2	762	22.2	●									
720	770	25	●									
	780	28							●			
	780	30		●								
723.9	774.7	22.2	●❊									

*d*1 730~(810)

Boundary dimensions, mm			Seal type									
												
			YS			YSN			YSA		YSAN	
*d*1	*D*	*b*	N	F	K	N	F	K	N	F	N	F
730	780	25	●									
	790	25	●									
730.3	781.05	22.2	●									
735	795	25	●									
736.6	774.7	19	●		●							
	787.4	22.2	●❊									
	812.8	41.3							●			
740	790	25	●									
	800	25	●									
750	800	25	●									
	810	25	●									
	810	28							●			
760	810	25	●									
	813	22				●		●				
	820	25	●									
	830	30					●					
762	825.5	22.4	●									
774.7	825.5	22.2	●									
	850.9	25.4	●									
780	830	25	●		●							
790	835	20				●						
	840	25	●									
	850	25	●❊									
793.5	844.55	19	●									
800	850	22	●									
	850	25	●		●							
	860	25	●									
	870	25	●									
810	860	25	●									
	870	25	●									
	870	28							●			

YS type

d_1 (810)~(1 000)

YS YSN YSA YSAN

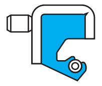
Remarks

1) For seals marked ●, JTEKT owns molding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
   Example: YS32036018 (320×360×18 mm).
4) Seal number marked ●❈ have suffix -1.
5) Seals with spacer are available. Seal number with spacer is refered on right side page.
6) Rubber code N represents nitrile rubber,
   F: fluoro rubber, and
   K: hydrogenated nitrile rubber.

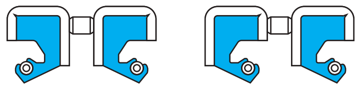
Example of seal number with spacer

(Various width spacers are available as like 10 mm.)

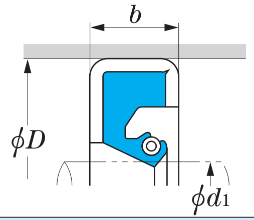
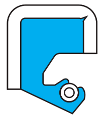
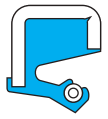
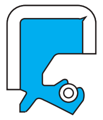
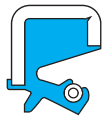
Example 1 **YS 320 360 18 D5** — Spacer width: 5 mm



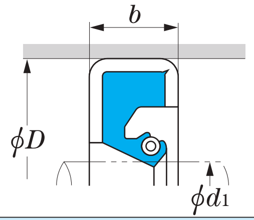
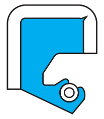
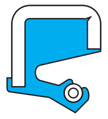
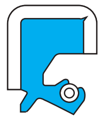
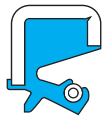
Example 2 **YS 320 360 18 2D5** — Spacer width: 5 mm



d_1 (810)~(889)

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
810	874	22	●									
820	870	25	●									
	880	25	●									
	880	28							●			
	884	25		●								
825.5	876.3	22.2	●									
830	880	25	●									
	900	25	●									
838.2	879.5	19				●						
	889	22.2	●									
840	890	22	●									
	890	25	●		●							
	910	25	●									
849	900	25									●	
850	900	25	●	●								
	910	25	●									
850.9	914.4	22.2	●									
860	910	25	●									
	920	23	●									
	920	25	●									
864	928	22	●									
870	920	25	●			●		●				
876.3	927.1	22.2	●									
880	930	25	●									
	930	30							●			
	940	25	●									
	940	28							●			
882.7	933.45	22.2	●									
889	939.8	20.6	●									
	952.5	22.2	●									
	952.5	25.4	●									

d_1 (889)~(1 000)

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
889	965.2	25.4	●									
890	940	25	●									
	950	25	●									
900	950	25	●				●	●				
	960	25	●									
914.4	977.9	25.4	●									
920	970	20	●									
	970	25	●									
927.1	977.9	22.2	●									
940	990	25	●									
	1 000	23	●									
	1 000	25	●									
950	1 000	23	●									
	1 000	25	●									
	1 000	30							●			
	1 010	25	●									
952.5	990.6	22.2				●						
	1 002.9	22.2	●									
	1 003.3	22.2	●									
960	1 020	25	●									
970	1 020	25	●									
	1 030	25	●❈									
971.5	1 035.05	19.05	●									
971.6	1 035.05	25	●									
977.9	1 041.4	25	●❈									
990	1 040	25	●❈									
990.6	1 041.4	22.2	●									
1 000	1 050	22	●									
	1 050	23	●		●							
	1 050	25	●									
	1 050	30							●			

Remarks

1) For seals marked ●, JTEKT owns molding dies for production.

2) The cross-sectional view indicates a representative oil seal shape.

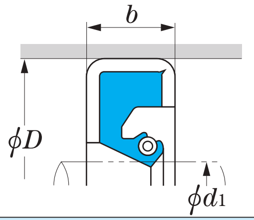
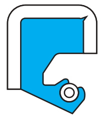
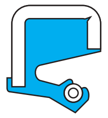
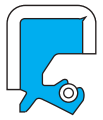
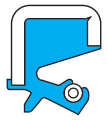
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: YS32036018 (320×360×18 mm).

4) Seal number marked ●❈ have suffix -1.

5) Seals with spacer are available. Seal number with spacer is refered on right side page.

6) Rubber code N represents nitrile rubber,
F: fluoro rubber, and
K: hydrogenated nitrile rubber.

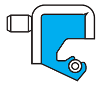
d_1 (1 000)~1 500

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
1 000	1 060	25	●									
	1 100	20				●						
1 010	1 060	25			●							
1 016	1 066.8	22.2	●									
1 020	1 070	25	●									
1 030	1 070	25	●									
1 050	1 110	25	●									
1 070	1 120	25	●									
	1 130	25	●									
1 079.5	1 143	22.2	●									
1 080	1 130	25	●❈									
1 090	1 140	25	●									
	1 150	25	●									
1 092.2	1 155.7	25.4	●									
1 104.9	1 155.7	22.2	●									
1 105	1 155	15				●						
1 110	1 160	25	●									
1 117.6	1 181.1	22.2	●									
1 130	1 180	25	●									
1 136	1 186	25	●									
1 140	1 200	25	●									
1 200	1 264	25	●									
1 210	1 270	25	●									
1 320	1 380	30							●	●		
1 340	1 390	25	●									
1 360	1 410	25	●									
1 400	1 460	25	●									
1 460	1 510	25	●									
1 480	1 530.8	22.2	●									
1 498.6	1 549.4	22.2	●						●			
1 500	1 550	25	●									

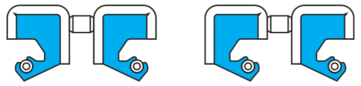
Example of seal number with spacer

(Various width spacers are available as like 10 mm.)

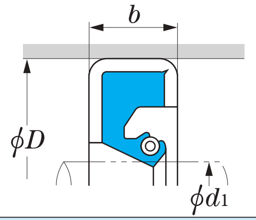
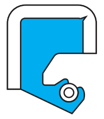
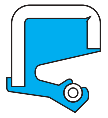
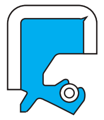
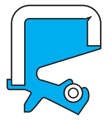
Example 1 **YS 320 360 18 D5** Spacer width: 5 mm



Example 2 **YS 320 360 18 2D5** Spacer width: 5 mm

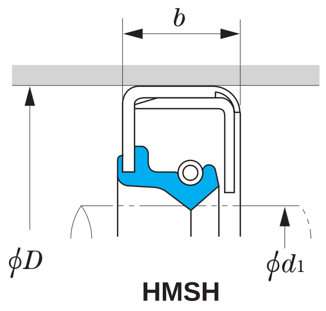


d_1 1 640

			Seal type									
												
Boundary dimensions, mm			YS			YSN			YSA		YSAN	
d_1	D	b	N	F	K	N	F	K	N	F	N	F
1 640	1 690	25	●❈									

HMSH

Seals with reinforcing inner metal ring



HMSH

Remarks 1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.

*d*1 41~(195)

Boundary dimensions, mm			Seal No.
*d*1	*D*	*b*	
41	53	7	HMSH 41 53 7
80	100	10	HMSH 80 100 10
95	120	13	HMSH 95 120 13
115	145	14	HMSH 115 145 14
125	155	14	HMSH 125 155 14
130	150	10	HMSH 130 150 10
	160	14	HMSH 130 160 14
	170	16	HMSH 130 170 16
135	165	14	HMSH 135 165 14
140	170	14	HMSH 140 170 14
150	180	14	HMSH 150 180 14
155	190	14	HMSH 155 190 14
160	190	14	HMSH 160 190 14
	190	16	HMSH 160 190 16
165	195	14	HMSH 165 195 14
	200	15	HMSH 165 200 15
170	200	16	HMSH 170 200 16
	205	16	HMSH 170 205 16
	225	20	HMSH 170 225 20
175	220	15	HMSH 175 220 15
	230	20	HMSH 175 230 20
180	210	14	HMSH 180 210 14
	210	16	HMSH 180 210 16
	215	16	HMSH 180 215 16
	215	18	HMSH 180 215 18
	220	15	HMSH 180 220 15
	220	18	HMSH 180 220 18
	225	18	HMSH 180 225 18
	235	20	HMSH 180 235 20
190	220	12	HMSH 190 220 12
	220	14	HMSH 190 220 14
	220	15	HMSH 190 220 15
	225	14	HMSH 190 225 14
	225	16	HMSH 190 225 16
	225	18	HMSH 190 225 18
	245	20	HMSH 190 245 20
	245	22	HMSH 190 245 22
	245	25	HMSH 190 245 25
195	230	16	HMSH 195 230 16

*d*1 (195)~(240)

Boundary dimensions, mm			Seal No.
*d*1	*D*	*b*	
195	250	20	HMSH 195 250 20
198	255	22	HMSH 198 255 22
200	230	15	HMSH 200 230 15
	235	16	HMSH 200 235 16
	240	14	HMSH 200 240 14
	240	20	HMSH 200 240 20
205	230	16	HMSH 205 230 16
	235	15	HMSH 205 235 15
	235	16	HMSH 205 235 16
	260	23	HMSH 205 260 23
210	240	12	HMSH 210 240 12
	240	15	HMSH 210 240 15
	250	16	HMSH 210 250 16
	250	18	HMSH 210 250 18
	265	23	HMSH 210 265 23
212	245	16	HMSH 212 245 16
215	240	12	HMSH 215 240 12
	245	14	HMSH 215 245 14
	245	15	HMSH 215 245 15
	250	16	HMSH 215 250 16
	270	23	HMSH 215 270 23
220	245	14	HMSH 220 245 14
	250	15	HMSH 220 250 15
	255	16	HMSH 220 255 16
	260	15	HMSH 220 260 15
	260	16	HMSH 220 260 16
	275	23	HMSH 220 275 23
224	260	18	HMSH 224 260 18
225	255	13	HMSH 225 255 13
	280	23	HMSH 225 280 23
230	255	15	HMSH 230 255 15
	255	16	HMSH 230 255 16
	260	15	HMSH 230 260 15
	260	20	HMSH 230 260 20
	285	23	HMSH 230 285 23
235	290	23	HMSH 235 290 23
236	270	16	HMSH 236 270 16
240	270	15	HMSH 240 270 15
	270	16	HMSH 240 270 16

*d*1 (240)~(330)

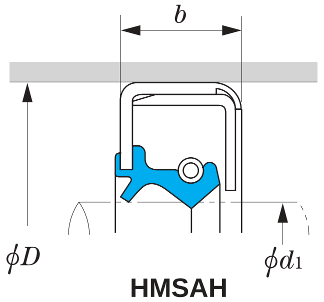
Boundary dimensions, mm			Seal No.
*d*1	*D*	*b*	
240	273	16	HMSH 240 273 16
	275	18	HMSH 240 275 18
	280	16	HMSH 240 280 16
	280	19	HMSH 240 280 19
	300	25	HMSH 240 300 25
245	275	13	HMSH 245 275 13
	305	25	HMSH 245 305 25
	305	28	HMSH 245 305 28
250	280	15	HMSH 250 280 15
	280	18	HMSH 250 280 18
	285	16	HMSH 250 285 16
	290	16	HMSH 250 290 16
	310	25	HMSH 250 310 25
260	280	16	HMSH 260 280 16
	290	16	HMSH 260 290 16
	300	18	HMSH 260 300 18
	300	20	HMSH 260 300 20
	300	22	HMSH 260 300 22
	320	25	HMSH 260 320 25
265	290	16	HMSH 265 290 16
	305	18	HMSH 265 305 18
	325	25	HMSH 265 325 25
270	300	15	HMSH 270 300 15
	310	18	HMSH 270 310 18
	313	20	HMSH 270 313 20
	330	25	HMSH 270 330 25
275	310	16	HMSH 275 310 16
280	305	12	HMSH 280 305 12
	310	16	HMSH 280 310 16
	320	18	HMSH 280 320 18
	320	20	HMSH 280 320 20
290	320	25	HMSH 290 320 25
298	337	20	HMSH 298 337 20
300	330	15	HMSH 300 330 15
	332	16	HMSH 300 332 16
	335	18	HMSH 300 335 18
	340	16	HMSH 300 340 16
	340	18	HMSH 300 340 18
	340	22	HMSH 300 340 22
	345	22	HMSH 300 345 22
	360	25	HMSH 300 360 25
	372	16	HMSH 300 372 16
310	340	15	HMSH 310 340 15
	340	22	HMSH 310 340 22
	350	18	HMSH 310 350 18
320	360	18	HMSH 320 360 18
	380	25	HMSH 320 380 25
330	360	18	HMSH 330 360 18
	370	18	HMSH 330 370 18
	380	18	HMSH 330 380 18

*d*1 (330)~440

Boundary dimensions, mm			Seal No.
*d*1	*D*	*b*	
330	390	25	HMSH 330 390 25
	390	28	HMSH 330 390 28
340	372	16	HMSH 340 372 16
	380	18	HMSH 340 380 18
350	390	18	HMSH 350 390 18
355	390	15	HMSH 355 390 15
370	410	15	HMSH 370 410 15
	410	18	HMSH 370 410 18
380	440	25	HMSH 380 440 25
440	490	16.5	HMSH 440 490 16.5

HMSAH

Seals with reinforcing inner metal ring



HMSAH

Remarks 1) The cross-sectional view indicates a representative oil seal shape.

2) All seals use nitrile rubber.

d_1 68~340

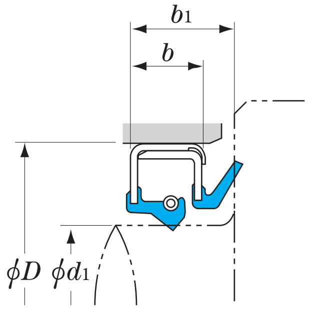
Boundary dimensions, mm			Seal No.
d_1	D	b	
68	88	10	HMSAH 68 88 10
	90	10	HMSAH 68 90 10
70	90	10	HMSAH 70 90 10
90	118	12	HMSAH 90 118 12
	135	15	HMSAH 90 135 15
140	170	14	HMSAH 140 170 14
160	190	16	HMSAH 160 190 16
164	194	16	HMSAH 164 194 16
180	215	18	HMSAH 180 215 18
190	225	18	HMSAH 190 225 18
200	235	18	HMSAH 200 235 18
205	260	23	HMSAH 205 260 23
210	265	23	HMSAH 210 265 23
220	255	18	HMSAH 220 255 18
240	270	16	HMSAH 240 270 16
	275	18	HMSAH 240 275 18
	300	28	HMSAH 240 300 28
250	285	15	HMSAH 250 285 15
	310	28	HMSAH 250 310 28
260	290	16	HMSAH 260 290 16
	290	18	HMSAH 260 290 18
	300	22	HMSAH 260 300 22
270	330	25	HMSAH 270 330 25
	330	28	HMSAH 270 330 28
280	320	18	HMSAH 280 320 18
	320	22	HMSAH 280 320 22
	340	28	HMSAH 280 340 28
300	340	22	HMSAH 300 340 22
310	340	20	HMSAH 310 340 20
	350	18	HMSAH 310 350 18
340	400	25	HMSAH 340 400 25

Assembled seals

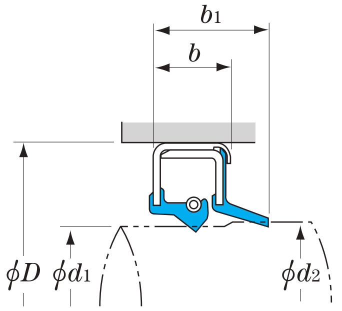
*d*1 117~405

HMSH...J

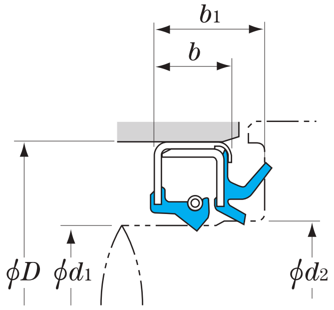
Seals with reinforcing inner metal ring



Design 1



Design 2



Design 3

Remarks 1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.
3) Consult JTEKT for drain-provided seals.

*d*1 117~270

Boundary dimensions, mm					Seal No.	Design
*d*1	*d*2	*D*	*b*	*b*1		
117	–	140	10	14	HMSH 117 140 10 – 14 J	1
130	132	150	10	14	HMSH 130 150 10 – 14 J	3
134	–	160	11	17	HMSH 134 160 11 – 17 J	1
137	139	160	11	14	HMSH 137 160 11 – 14 J	3
145	–	165	10	15	HMSH 145 165 10 – 15 J	1
155	158	180	13	17	HMSH 155 180 13 – 17 J	3
159	–	183	12	18	HMSH 159 183 12 – 18 J	1
166	–	190	12	18	HMSH 166 190 12 – 18 J	1
170	–	200	16	25	HMSH 170 200 16 – 25 J	1
174	177	200	14	19	HMSH 174 200 14 – 19 J	3
175	–	200	10	15.5	HMSH 175 200 10 – 15.5 J	1
180	–	220	16	25	HMSH 180 220 16 – 25 J	1
190	–	220	12	18	HMSH 190 220 12 – 18 J	1
	193	220	14	20	HMSH 190 220 14 – 20 J	3
200	203	230	14	20	HMSH 200 230 14 – 20 J	3
	–	235	16	23	HMSH 200 235 16 – 23 J	1
205	–	235	15	22	HMSH 205 235 15 – 22 J	1
210	–	240	12	21	HMSH 210 240 12 – 21 J	1
215	–	240	12	18	HMSH 215 240 12 – 18 J	1
	218	245	14	22	HMSH 215 245 14 – 22 J	3
220	–	245	13	21	HMSH 220 245 13 – 21 J	1
	–	260	16	23	HMSH 220 260 16 – 23 J	1
225	–	255	13	21	HMSH 225 255 13 – 21 J	1
	228	260	14	20	HMSH 225 260 14 – 20 J	3
230	–	260	15	23	HMSH 230 260 15 – 23 J	1
240	240	270	16	22	HMSH 240 270 16 – 22 J	2
	243	275	16	24	HMSH 240 275 16 – 24 J	3
245	–	275	13	21	HMSH 245 275 13 – 21 J	1
250	–	280	16	23	HMSH 250 280 16 – 23 J	1
	–	280	16	25	HMSH 250 280 16 – 25 J	1
254	–	285	11.5	18.4	HMSH 254 285 11.5 – 18.4 J	1
260	263	290	14	20	HMSH 260 290 14 – 20 J	3
270	–	300	16	25	HMSH 270 300 16 – 25 J	1

*d*1 280~405

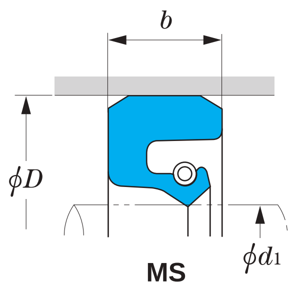
Boundary dimensions, mm					Seal No.	Design
*d*1	*d*2	*D*	*b*	*b*1		
280	–	316	18	25	HMSH 280 316 18 – 25 J	1
	384	320	20	28	HMSH 280 320 20 – 28 J	3
300	300	340	20	29	HMSH 300 340 20 – 29 J	3
310	–	350	18	28	HMSH 310 350 18 – 28 J	1
	313	350	20	28	HMSH 310 350 20 – 28 J	3
320	–	360	18	25	HMSH 320 360 18 – 25 J	1
330	–	380	18	25	HMSH 330 380 18 – 25 J	1
340	–	380	18	24	HMSH 340 380 18 – 24 J	1
	–	380	16	21.5	HMSH 340 380 16 – 21.5 J	1
	343	380	18	26	HMSH 340 380 18 – 26 J	3
350	–	390	18	25	HMSH 350 390 18 – 25 J	1
370	–	410	18	25	HMSH 370 410 18 – 25 J	1
375	378	420	20	28	HMSH 375 420 20 – 28 J	3
405	–	435	14.5	19.2	HMSH 405 435 14.5 – 19.2 J	1

Full rubber seals

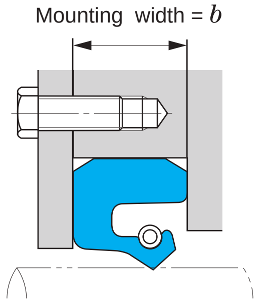
*d*1 10~340

MS

Koyo



■ Mounting example



Remarks
1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.
3) Mounting width deviation should be as specified in the table below:

Mounting width deviation (Unit : mm)

Mounting width = *b*	Deviation
— Up to 6	– 0.1 ~ – 0.2
Over 6 up to 10	– 0.1 ~ – 0.3
Over 10 up to 18	– 0.1 ~ – 0.4
Over 18 up to 30	– 0.1 ~ – 0.5

*d*1 10~100

Boundary dimensions, mm			Seal No.
*d*1	*D*	*b*	
10	26	6	MS 10 26 6
35	59	12	MS 35 59 12
	60	12	MS 35 60 12
40	65	12	MS 40 65 12
	67	14	MS 40 67 14
45	72	14	MS 45 72 14
50	72	12	MS 50 72 12
	77	14	MS 50 77 14
	80	14	MS 50 80 14
55	78	12	MS 55 78 12
	82	14	MS 55 82 14
	85	14	MS 55 85 14
60	82	12	MS 60 82 12
	84	13	MS 60 84 13
65	92	14	MS 65 92 14
	95	14	MS 65 95 14
	95	15	MS 65 95 15
	95	16	MS 65 95 16
70	100	16	MS 70 100 16
75	100	13	MS 75 100 13
	100	16	MS 75 100 16
	105	16	MS 75 105 16
80	105	13	MS 80 105 13
	110	16	MS 80 110 16
85	110	13	MS 85 110 13
	115	16	MS 85 115 16
90	115	13	MS 90 115 13
	120	16	MS 90 120 16
95	120	10	MS 95 120 10
	125	16	MS 95 125 16
100	120	13	MS 100 120 13
	130	16	MS 100 130 16
	130	18	MS 100 130 18
	133	18	MS 100 133 18
	135	15	MS 100 135 15

*d*1 105~160

Boundary dimensions, mm			Seal No.
*d*1	*D*	*b*	
105	140	13	MS 105 140 13
	140	18	MS 105 140 18
108	134	16	MS 108 134 16
110	135	8	MS 110 135 8
	140	12	MS 110 140 12
	140	14	MS 110 140 14
	143	18	MS 110 143 18
	145	18	MS 110 145 18
115	145	18	MS 115 145 18
	148	18	MS 115 148 18
	150	18	MS 115 150 18
120	150	14	MS 120 150 14
	150	15	MS 120 150 15
	150	18	MS 120 150 18
	155	18	MS 120 155 18
125	155	14	MS 125 155 14
	158	18	MS 125 158 18
	160	18	MS 125 160 18
130	160	14	MS 130 160 14
	163	18	MS 130 163 18
135	168	18	MS 135 168 18
	170	18	MS 135 170 18
140	170	14	MS 140 170 14
	173	18	MS 140 173 18
	175	18	MS 140 175 18
145	175	14	MS 145 175 14
	178	18	MS 145 178 18
	180	18	MS 145 180 18
150	180	14	MS 150 180 14
	185	18	MS 150 185 18
	186	20	MS 150 186 20
155	191	20	MS 155 191 20
	200	20	MS 155 200 20
160	195	18	MS 160 195 18
	196	20	MS 160 196 20

*d*1 165~235

Boundary dimensions, mm			Seal No.
*d*1	*D*	*b*	
165	201	20	MS 165 201 20
170	203	13	MS 170 203 13
	205	16	MS 170 205 16
	210	20	MS 170 210 20
175	211	20	MS 175 211 20
180	215	16	MS 180 215 16
	216	20	MS 180 216 20
	220	20	MS 180 220 20
185	221	20	MS 185 221 20
188	230	20	MS 188 230 20
190	220	12	MS 190 220 12
	226	20	MS 190 226 20
	230	20	MS 190 230 20
195	230	19	MS 195 230 19
	231	20	MS 195 231 20
200	230	16	MS 200 230 16
	239	22	MS 200 239 22
	240	20	MS 200 240 20
205	250	20	MS 205 250 20
208	248	16	MS 208 248 16
	250	20	MS 208 250 20
215	254	22	MS 215 254 22
220	260	20	MS 220 260 20
	260	22	MS 220 260 22
224	260	16	MS 224 260 16
225	260	18	MS 225 260 18
	265	20	MS 225 265 20
230	260	20	MS 230 260 20
	261	10	MS 230 261 10
	269	22	MS 230 269 22
	270	20	MS 230 270 20
	285	23	MS 230 285 23
231	270	20	MS 231 270 20
235	275	20	MS 235 275 20
	275	22	MS 235 275 22

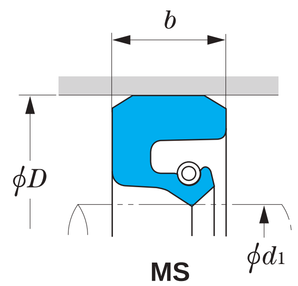
*d*1 238~340

Boundary dimensions, mm			Seal No.
*d*1	*D*	*b*	
238	275	20	MS 238 275 20
240	275	16	MS 240 275 16
250	290	20	MS 250 290 20
	295	24	MS 250 295 24
255	300	24	MS 255 300 24
260	305	22	MS 260 305 22
	315	24	MS 260 315 24
265	310	22	MS 265 310 22
270	320	24	MS 270 320 24
275	320	24	MS 275 320 24
280	315	20	MS 280 315 20
	325	22	MS 280 325 22
	325	24	MS 280 325 24
	340	25	MS 280 340 25
290	335	24	MS 290 335 24
	350	25	MS 290 350 25
300	340	20	MS 300 340 20
	344	20	MS 300 344 20
	345	22	MS 300 345 22
	350	25	MS 300 350 25
310	350	20	MS 310 350 20
	355	24	MS 310 355 24
	360	25	MS 310 360 25
315	360	20	MS 315 360 20
	360	25	MS 315 360 25
320	370	20	MS 320 370 20
	370	25	MS 320 370 25
	380	25	MS 320 380 25
	380	27	MS 320 380 27
325	375	25	MS 325 375 25
330	380	24	MS 330 380 24
	380	25	MS 330 380 25
340	384	20	MS 340 384 20
	390	25	MS 340 390 25
	400	25	MS 340 400 25

Full rubber seals

d_1 350~1 760

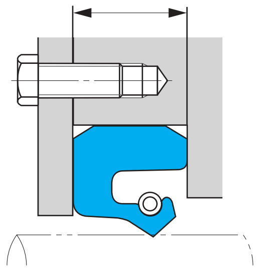
MS



MS

■ Mounting example

Mounting width = *b*



Remarks
1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.
3) Mounting width deviation should be as specified in the table below:

Mounting width deviation (Unit : mm)

Mounting width = *b*	Deviation
— Up to 6	− 0.1 ~ − 0.2
Over 6 up to 10	− 0.1 ~ − 0.3
Over 10 up to 18	− 0.1 ~ − 0.4
Over 18 up to 30	− 0.1 ~ − 0.5

d_1 350~480

Boundary dimensions, mm			Seal No.
d_1	D	b	
350	390	25	MS 350 390 25
	400	20	MS 350 400 20
	400	21	MS 350 400 21
	400	25	MS 350 400 25
355	405	25	MS 355 405 25
360	404	20	MS 360 404 20
	405	25	MS 360 405 25
370	420	24	MS 370 420 24
	420	25	MS 370 420 25
	430	25	MS 370 430 25
380	420	20	MS 380 420 20
	428	20	MS 380 428 20
	430	25	MS 380 430 25
	440	25	MS 380 440 25
384	428	20	MS 384 428 20
390	435	25	MS 390 435 25
	450	25	MS 390 450 25
400	450	25	MS 400 450 25
410	460	25	MS 410 460 25
	470	25	MS 410 470 25
420	470	25	MS 420 470 25
	470	30	MS 420 470 30
	480	25	MS 420 480 25
430	480	25	MS 430 480 25
432	476	20	MS 432 476 20
440	490	25	MS 440 490 25
450	500	25	MS 450 500 25
457	508	21	MS 457 508 21
460	510	25	MS 460 510 25
	515	28	MS 460 515 28
	520	25	MS 460 520 25
465	515	25	MS 465 515 25
475	525	25	MS 475 525 25
480	530	30	MS 480 530 30
	540	25	MS 480 540 25

d_1 490~610

Boundary dimensions, mm			Seal No.
d_1	D	b	
490	540	25	MS 490 540 25
495	545	25	MS 495 545 25
500	550	20	MS 500 550 20
	550	25	MS 500 550 25
	560	25	MS 500 560 25
	560	30	MS 500 560 30
510	560	25	MS 510 560 25
515	565	25	MS 515 565 25
520	570	24	MS 520 570 24
	570	25	MS 520 570 25
	570	30	MS 520 570 30
	580	25	MS 520 580 25
525	575	22	MS 525 575 22
	575	25	MS 525 575 25
540	590	25	MS 540 590 25
	590	30	MS 540 590 30
550	600	25	MS 550 600 25
	600	30	MS 550 600 30
	610	25	MS 550 610 25
560	610	20	MS 560 610 20
	610	30	MS 560 610 30
	620	25	MS 560 620 25
	620	30	MS 560 620 30
570	620	25	MS 570 620 25
	630	30	MS 570 630 30
580	630	25	MS 580 630 25
	630	30	MS 580 630 30
585	635	22	MS 585 635 22
600	647	25	MS 600 647 25
	650	30	MS 600 650 30
	660	25	MS 600 660 25
	670	30	MS 600 670 30
610	660	25	MS 610 660 25
	660	30	MS 610 660 30
	670	30	MS 610 670 30

d_1 630~920

Boundary dimensions, mm			Seal No.
d_1	D	b	
630	680	25	MS 630 680 25
	680	30	MS 630 680 30
	700	30	MS 630 700 30
635	705	30	MS 635 705 30
650	700	30	MS 650 700 30
	705	19	MS 650 705 19
	710	30	MS 650 710 30
	720	30	MS 650 720 30
670	720	25	MS 670 720 25
675	725	30	MS 675 725 30
680	730	30	MS 680 730 30
	740	30	MS 680 740 30
690	750	30	MS 690 750 30
695	765	30	MS 695 765 30
700	770	30	MS 700 770 30
710	760	25	MS 710 760 25
	770	30	MS 710 770 30
730	800	30	MS 730 800 30
750	800	30	MS 750 800 30
	820	30	MS 750 820 30
760	820	25	MS 760 820 25
770	817	25	MS 770 817 25
	830	30	MS 770 830 30
780	840	30	MS 780 840 30
790	850	30	MS 790 850 30
800	860	30	MS 800 860 30
	870	30	MS 800 870 30
810	857	25	MS 810 857 25
820	890	30	MS 820 890 30
826	876	30	MS 826 876 30
830	900	30	MS 830 900 30
870	940	30	MS 870 940 30
900	950	25	MS 900 950 25
	960	30	MS 900 960 30
920	990	30	MS 920 990 30

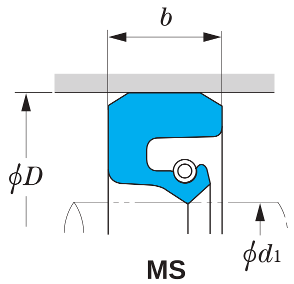
d_1 930~1 760

Boundary dimensions, mm			Seal No.
d_1	D	b	
930	1 000	30	MS 930 1000 30
950	1 010	30	MS 950 1010 30
960	1 020	25	MS 960 1020 25
1 000	1 050	30	MS 1000 1050 30
1 005	1 052	25	MS 1005 1052 25
1 030	1 080	30	MS 1030 1080 30
1 040	1 087	25	MS 1040 1087 25
	1 110	30	MS 1040 1110 30
1 045	1 095	25	MS 1045 1095 25
1 090	1 137	25	MS 1090 1137 25
1 100	1 150	30	MS 1100 1150 30
	1 157	25	MS 1100 1157 25
	1 170	30	MS 1100 1170 30
1 110	1 157	25	MS 1110 1157 25
1 170	1 217	25	MS 1170 1217 25
1 200	1 250	24	MS 1200 1250 24
	1 250	30	MS 1200 1250 30
	1 270	30	MS 1200 1270 30
1 210	1 267	25	MS 1210 1267 25
1 220	1 267	25	MS 1220 1267 25
1 230	1 290	30	MS 1230 1290 30
1 310	1 357	25	MS 1310 1357 25
1 390	1 450	30	MS 1390 1450 30
1 400	1 456	25	MS 1400 1456 25
	1 460	30	MS 1400 1460 30
1 450	1 497	25	MS 1450 1497 25
1 470	1 517	25	MS 1470 1517 25
1 500	1 550	25	MS 1500 1550 25
1 526	1 582	25	MS 1526 1582 25
1 530	1 590	30	MS 1530 1590 30
1 550	1 606	25	MS 1550 1606 25
1 580	1 640	30	MS 1580 1640 30
1 650	1 700	30	MS 1650 1700 30
1 734	1 790	25	MS 1734 1790 25
1 760	1 820	30	MS 1760 1820 30

Full rubber seals

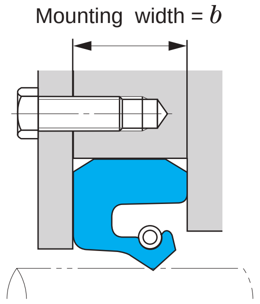
***d*₁** 1 880~3 530

MS



MS

■ Mounting example



Remarks
1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.
3) Mounting width deviation should be as specified in the table below:

Mounting width deviation (Unit : mm)

Mounting width = *b*	Deviation
— Up to 6	– 0.1 ~ – 0.2
Over 6 up to 10	– 0.1 ~ – 0.3
Over 10 up to 18	– 0.1 ~ – 0.4
Over 18 up to 30	– 0.1 ~ – 0.5

d_1 1 880~3 530

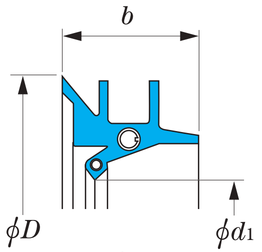
Boundary dimensions, mm			Seal No.
d_1	D	b	
1 880	1 940	30	MS 1880 1940 30
1 940	1 996	25	MS 1940 1996 25
2 000	2 060	30	MS 2000 2060 30
2 150	2 206	25	MS 2150 2206 25
2 380	2 436	25	MS 2380 2436 25
2 420	2 476	25	MS 2420 2476 25
2 538	2 594	25	MS 2538 2594 25
2 915	2 970	25	MS 2915 2970 25
3 530	3 585	25	MS 3530 3585 25

MORGOIL seals

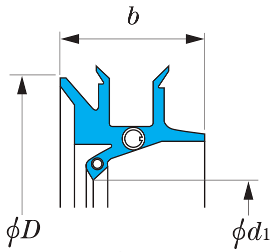
d_1 167~1 593

MS..J MS..NJ H..J H..JM H..PJ

■ MORGOIL seals

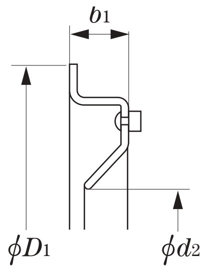


MS..J

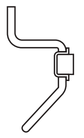


MS..NJ

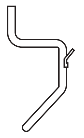
■ Seal inner rings



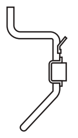
Design 1



Design 2

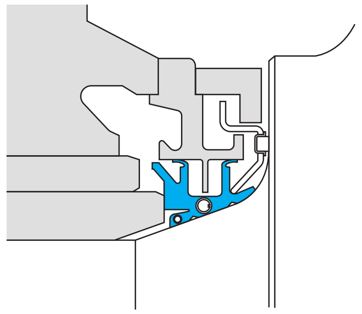


Design 3



Design 4

■ Mounting example



Remarks 1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.

Note 1) Special type code B represents "with a steel band" and W represents "with a wire."

d_1 167~936

MORGOIL seals				Seal inner rings				
Boundary dimensions, mm			Seal No.[1]	Boundary dimensions, mm			Seal inner ring No.	Design
d_1	D	b		d_2	D_1	b_1		
167	219	41	MS 10 J	194	238	16	H 10 J	1
236	295	49	MS 14 J	270	327	17.5	H 14 J	1
275	346	51	MS 16 J	308	372	21.5	H 16 J	1
323	402	54	MS 18 J	349	421	18	H 18 J	1
369	459	60	MS 21 J	406	490	19	H 21 J	1
			MS 21 JBW					
423	531	72	MS 24 J	475	567	27	H 24 J	1
677	798	84	MS 38 J	737	883	32	H 38 J	1
			MS 38 JB					
			MS 38 NJBW					
713	834	84	MS 40 J	772	940	36.5	H 40 J	1
754	907	95	MS 42 J	822	988	38	H 42 J	1
							H 42 JM	2
786	939	95	MS 44 J	854	1 029	38	H 44 J	1
			MS 44 JB				H 44 JM	2
			MS 44 NJBW				H 44 PJ	3
825	977	95	MS 46 J	892	1 061	38	H 46 J	1
							H 46 JM	2
			MS 46 NJBW	892	1 061	45	H 46 NJM	2
866	1 018	95	MS 48 J	933	1 124	44.5	H 48 J	1
			MS 48 JB				H 48 JM	2
			MS 48 JW					
			MS 48 NJBW					
901	1 054	95	MS 50 J	968	1 162	44.5	H 50 J	1
			MS 50 JB	968	1 162	44.5	H 50 J	1
							H 50 JM	2
							H 50 PJ	3
			MS 50 NJ	968	1 150	43	HM 50 NJP	3
			MS 50 NJB, NJBW					
936	1 089	95	MS 52 J	1 003	1 200	48	H 52 JM	2

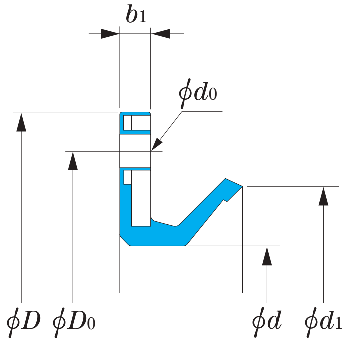
d_1 962~1 593

MORGOIL seals				Seal inner rings				
Boundary dimensions, mm			Seal No.[1]	Boundary dimensions, mm			Seal inner ring No.	Design
d_1	D	b		d_2	D_1	b_1		
962	1 109	92	MS 54 NJBW	1 038	1 225	44.5	H 54 NJP	3
972	1 124	95	MS 54 J	1 038	1 238	44.5	H 54 J	2
			MS 54 JB				H 54 JM	2
							H 54 PJ	3
				1 052	1 252	72	H 54 SNJP	3
1 029	1 181	95	MS 56 SJ	1 098	1 289	38	H 56 J	1
			MS 56 SJB				H 56 JM	2
							H 56 PJ	3
			MS 56 NJ	1 098	1 287	44	H 56 NJP	3
			MS 56 NJBW	1 098	1 287	44	H 56 NJM	2
							H 56 NJP	3
1 099	1 245	92	MS 60 NJBW	1 175	1 340	45	H 60 NJP	3
1 253	1 438	108	MS 68 J					
1 542	1 712	108	MS 80 J	1 630	1 885	55	H 80 JMP	4
1 593	1 782	108	MS 82 J	1 680	1 955	82	H 82 JMP	4

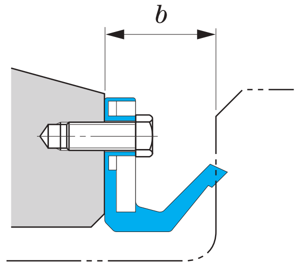
Scale seals

d 195~1 595

WR



WR



Remarks

1) The cross-sectional view indicates a representative oil seal shape.

2) All seals use nitrile rubber.

3) Consult JTEKT for drain-provided seals.

d 195~740

Boundary dimensions, mm					Scale seal No.	Fixing holes		
d	D	b	b_1	d_1		D_0 mm	d_0 mm	Hole Q'ty (equally spaced)
195	250	26	5	222	WR 195 250 26	234	9.5	6
200	250	26	5	229	WR 200 250 26	234	9.5	6
210	265	19	4	231	WR 210 265 19	245	9.5	8
240	300	26	5	269	WR 240 300 26	280	9.5	6
255	315	23	5	280	WR 255 315 23	295	9.5	8
275	335	30	5	311	WR 275 335 30	315	9.5	8
280	340	25	5	304	WR 280 340 25	320	9.5	6
290	348	23	5	320	WR 290 348 23	330	9.5	8
	349	35	5	325	WR 290 N1	330	9.5	8
310	455	42.5	11	354	WR 310 455 42.5	400	17.5	Special
318	380	30	8	350	WR 318 380 30	355	9.5	6
325	385	30	8	358	WR 325 385 30 J	360	9.5	6
330	400	35	5	370	WR 330 400 35	380	9.5	Special
335	390	22	4.5	364	WR 335 N1	370	9.5	6
340	410	26	5	369	WR 340 410 26	390	9.5	6
	435	30	5	400	WR 340 435 30 J	415	9	8
350	414	35	5	386	WR 350 414 35	395	10	8
	450	25	5	396	WR 350 450 25	426	11	6
365	425	27.5	5	400	WR 365 425 27.5	405	9.5	12
380	455	35	8	421	WR 380 455 35	430	12	Special
383	450	24	5	409	WR 383 450 24	430	9.5	12
420	480	26	5.5	444	WR 420 N1	462	10	8
424	482	22.5	5	453	WR 424 482 22.5 J	465	9.5	12
430	490	26	8	456	WR 430 490 26	472	10	12
435	489	25.4	7	460	WR 435 489 25.4	470	10	8
440	514	35	5	464	WR 440 514 35	490	12	8
	530	50	7	495	WR 440 530 50	500	14	8
448	510	28.4	6	485	WR 448 510 28.4	490	12	Special
458	540	26	6	485	WR 458 N2	458	11.5	12
490	560	26	6	523	WR 490 N1	535	9.5	8
550	610	22	6	578	WR 550 610 22	590	9.5	8
580	650	51	8	632	WR 580 650 51	626	12	12
645	719	30	4.5	684	WR 645 N1	690	12	12
734	830	21.1	4	770	WR 734 830 21.1	800	12	8
740	840	55	9	786	WR 740 840 55	800	12	12

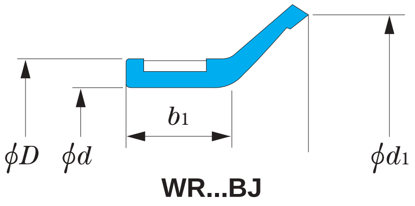
d 760~1 595

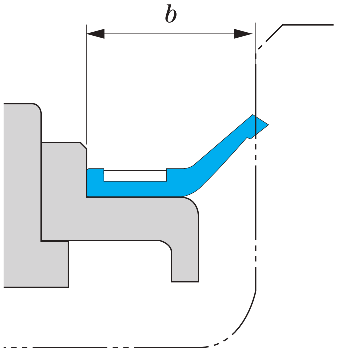
Boundary dimensions, mm					Scale seal No.	Fixing holes		
d	D	b	b_1	d_1		D_0 mm	d_0 mm	Hole Q'ty (equally spaced)
760	835	33	6	802	WR 760 N2	810	11	8
840	915	35	8	876	WR 840 915 35	890	12	8
870	980	40	8	912	WR 870 980 40	940	14	12
890	1 000	50	8	948	WR 890 1000 50	950	18	12
992	1 064	26	6	1 020	WR 992 1064 26	1 040	12	Special
1 000	1 108	38	8	1 040	WR 1000 1108 38	1 065	14	12
1 105	1 180	40	6	1 145	WR 1105 1180 40	1 156	14	16
1 200	1 270	38	8	1 242	WR 1200 1270 38	1 242	12	16
1 595	1 750	48	7.6	1 663	WR 1595 1750 48 J	1 700	14	20

Scale seals

d 280~1 193.8

WR...BJ





Remarks
1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.
3) Consult JTEKT for drain-provided seals.

d 280~1 193.8

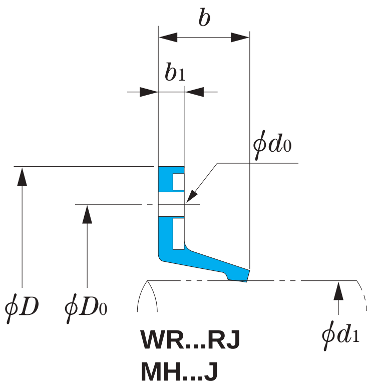
Boundary dimensions, mm					Scale seal No.
d	*d*1	*b*	*b*1	*D*	
280	292	27	22.5	288	WR 280 288 27 BJ
326	342.5	38	23	336	WR 326 336 38 BJ
390	400	35	25	400	WR 390 400 35 BJ
395	405	38	25	405	WR 395 405 38 BJ
420	452	35	25	435	WR 420 435 35 BJ
445	461	35	25	461	WR 445 461 35 BJ
	478	35	25	470	WR 445 470 35 BJ
500	516	56.5	35	516	WR 500 516 56.5 BJ – 1
533	546	31.5	22	543	WR 533 543 31.5 BJ – 1
595.3	611.3	29	22	611	WR 595.3 611.3 29 BJ
600	616	45	28	616	WR 600 616 45 BJ
750	792	45	25	766	WR 750 766 45 BJ
760	776	56.5	35	776	WR 760 776 56.5 BJ
800	854	56.5	35	816	WR 800 816 56.5 BJ
824	840	45	25	840	WR 824 840 45 BJ
995	1 044	50	32	1 011	WR 995 1011 50 BJ
1 130	1 146	45	25	1 146	WR 1130 1146 45 BJ
1 193.8	1 231	40	20.5	1 209.8	WR 1193.8 1209.8 40 BJ

Scale seals

d_1 210~1 203

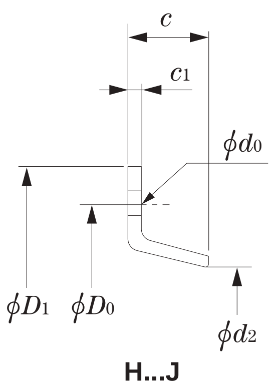
WR...RJ MH...J H...J

■ Scale seal



WR...RJ
MH...J

■ Scale cover



H...J

Remarks

1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.
3) Consult JTEKT for drain-provided seals.

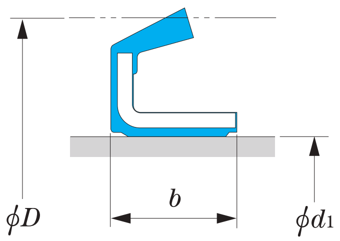
d_1 210~1 203

Boundary dimensions, mm				Scale seal No.	Scale cover					Fixing holes		
					Boundary dimensions, mm				Scale cover No.	D_0 mm	d_0 mm	Hole Q'ty (equally spaced)
d_1	D	b	b_1		d_2	D_1	c	c_1				
210	300	16	4	MH 210 300 4J	218	300	18	2	H 210 300 18 J	275	10	Special
235	340	25	5	WR 235 340 25 RJ	—	—	—	—	—	300	11.5	5
300	380	26	6	MH 300 380 6 J	—	—	—	—	—	350	10	6
395	475	35	6	MH 395 475 6 J	409	475	33	5	H 395 475 33 J	455	10	Special
425	490	16.8	5	MH 425 490 5 J	—	—	—	—	—	470	9.5	8
510	580	25	5	WR 510 580 25 RJ	524	580	30	3.2	H 510 580 30 J	562	9.5	8
550	624	35	8	MH 550 624 8 J	556	624	40	5	H 550 624 40 J	605	10	Special
580	654	34	8	WR 580 654 34 RJ	589	654	40	5	H 580 654 40 J	635	10	12
584	685	25	5	WR 584 685 25 RJ	—	—	—	—	—	635	9	8
623	705	32	8	MH 623 705 8 J	635	705	30	5	H 623 705 30 J	685	12	Special
690	770	35	8	MH 690 770 8 J	700	770	40	5	H 690 770 40 J	745	10	Special
					695	770	55	5	H 690 770 55 J	745	10	Special
696	780	32	8	MH 696 780 8 J	705	780	30	5	H 696 780 30 J	750	14	8
	780	37	8	WR 696 780 32 RJ	—	—	—	—	—	750	10	Special
760	845	35	8	MH 760 845 8 J	—	—	—	—	—	820	10	12
805	885	35	8	MH 805 885 8 J	815	885	37	5	H 805 885 37 J	860	10	12
815	880	35	10	MH 815 880 8 J	828	880	27	5	H 815 880 27 J	865	9	12
820	925	35	8	MH 820 925 8 J	834	925	35	5	H 820 925 35 J	890	14	Special
850	925	30	8	MH 850 925 8 J	857	925	30	5	H 850 925 30 J	900	10	Special
920	995	35	8	WR 920 995 35 RJ	—	—	—	—	—	970	10	12
970	1 070	35	8	WR 970 1070 35 RJ	—	—	—	—	—	1 040	12	12
990	1 090	40	8	WR 990 1090 40 RJ	—	—	—	—	—	1 060	14	12
1 010	1 110	35	6	WR 1010 1110 35 RJ	—	—	—	—	—	1 080	14	12
1 030	1 120	40	8	WR 1030 1120 40 RJ	—	—	—	—	—	1 090	15	12
1 117	1 230	41.5	10	WR 1117 1230 40 RJ	1 137	1 230	45	5	H 1117 1230 45 J	1 200	14	18
1 120	1 220	35	10	MH 1120 1220 10 J	1 132	1 220	33	5	H 1120 1220 33 J	1 190	14	12
1 193	1 290	35	10	MH 1193 1290 10 J	1 206	1 290	33	5	H 1193 1290 33 J	1 260	13	12
1 203	1 300	35	10	MH 1203 1300 10 J	1 215	1 300	33	5	H 1203 1300 33 J	1 270	13	Special

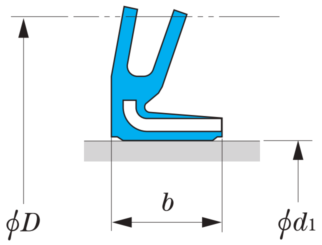
Water seals

d_1 219.2~1 460

XMH XM XMHE



XMH



XM
XMHE

Remarks

1) For seals marked ●, JTEKT owns moulding dies for production.
2) The cross-sectional view indicates a representative oil seal shape.
3) Seal number is constructed by combination of type code and dimensional numbers (bore diameter, outside diameter and width).
Example: XMHE77081029 (770×810×29 mm)
4) All seals use nitrile rubber.

d_1 219.2~940

Boundary dimensions, mm			Seal type		
d_1	D	b	XMH	XM	XMHE
219.2	240	6		●	
230	260	15	●		
265	295	15	●		
274	304	13	●		
296	324	15	●		
345	375	15			●
360	390	20	●		
	400	20			●
365	405	12	●		
400	440	20			●
420	470	20		●	
440	480	20		●	
465	505	25		●	
485	525	25		●	
490	530	20			●
520	560	20			●
560	600	25		●	
580	624	25		●	
610	660	25		●	
620	660	25			●
680	720	25			●
720	770	25			●
740	810	45			●
750	800	25			●
760	820	38			●
834	884	25			●
850	900	30			●
880	930	25			●
905	955	25			●
940	990	25			●

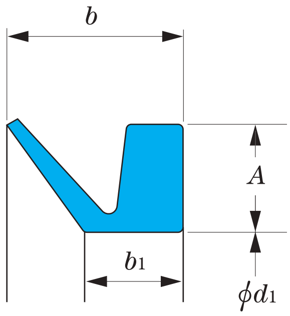
d_1 980~1 460

Boundary dimensions, mm			Seal type		
d_1	D	b	XMH	XM	XMHE
980	1 030	25			●
1 040	1 090	25			●
1 080	1 130	25		●	
1 090	1 150	25		●	
1 110	1 160	25		●	
1 460	1 510	25			●

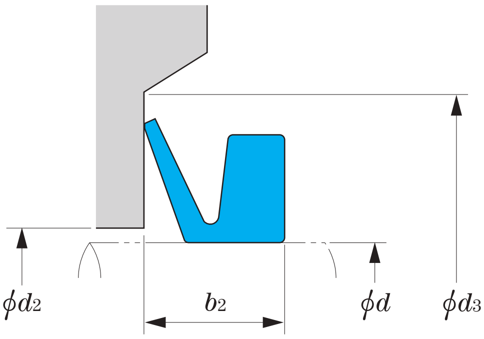
V-rings

d 38~875

MV...A



MV...A



Remarks 1) The cross-sectional view indicates a representative oil seal shape.
2) All seals use nitrile rubber.

d 38~875

V-ring No.	Shaft diameter	Boundary dimensions, mm				Mounted dimensions, mm		
	d, mm (from~to)	d_1	A	b	b_1	d_2 (max.)	d_3 (min.)	b_2
MV 40 A	38 ~ 43	36	5	9	5.5	d + 3	d + 15	7.0 ± 1.0
MV 60 A	58 ~ 63	54						
MV 90 A	88 ~ 93	81	6	11	6.8	d + 4	d + 18	9.0 ± 1.2
MV 100 A	98 ~ 105	90						
MV 120 A	115 ~ 125	108	7	12.8	7.9		d + 21	10.5 ± 1.5
MV 140 A	135 ~ 145	126						
MV 150 A	145 ~ 155	135						
MV 170 A	165 ~ 175	153	8	14.5	9	d + 5	d + 24	12.0 ± 1.8
MV 199 A	195 ~ 210	180						
MV 250 A	235 ~ 265	225	15	25	14.3	d + 10	d + 45	20.0 ± 4.0
MV 275 A	265 ~ 290	247						
MV 325 A	310 ~ 335	292						
MV 350 A	335 ~ 365	315						
MV 375 A	365 ~ 390	337						
MV 400 A	390 ~ 430	360						
MV 450 A	430 ~ 480	405						
MV 500 A	480 ~ 530	450						
MV 550 A	530 ~ 580	495						
MV 650 A	630 ~ 665	600						
MV 750 A	745 ~ 785	705						
MV 800 A	785 ~ 830	745						
MV 850 A	830 ~ 875	785						

2

O-Rings

2.1 Classification of O-ring and backup ring

(1) O-ring classification and application guide

O-rings are used in a various machines as a compact sealing component. O-rings can generally be classified into dynamic applications ("packing") and static applications ("gaskets").

Other classification is according to their properties, such as oil resistance. O-rings are specified in the industrial standards listed in Table 2.1.1.

Table 2.1.1 O-ring classification and application guide

Application	**General industrial machines**				**Automobiles**		**Aircraft**
Standard	JIS B 2401			Old ISO 3601	JASO F 404		AS 568 AS 28775A
Classification	JIS code	Remarks (hardness measured by type A durometer)	Old JIS identification code	Remarks	Material class	Remarks	Remarks
Material	NBR-70-1	Mineral oil resistance (A70)	Class 1-A	For mineral-based fluids Class: JIS NBR-70-1	Class 1-A	General mineral oil resistance	For mineral-based fluids Class: JIS NBR-70-1 NBR-90 FKM-70
	NBR-90	Mineral oil resistance (A90)	Class 1-B		Class 2	Gasoline resistance	
	NBR-70-2	Gasoline resistance (A70)	Class 2		Class 3	Animal oil, vegetable oil, and brake fluid resistance	
	EPDM-70	Animal oil, vegetable oil, and brake fluid resistance (A70)	Class 3				
	EPDM-90	Animal oil, vegetable oil, and brake fluid resistance (A90)	–				
	VMQ-70	High-temperature application resistance (A70)	Class 4-C		Class 4-C	High-temperature application resistance	
	FKM-70	High-temperature application resistance (A70)	Class 4-D				
	FKM-90	High-temperature application resistance (A90)	–		Class 4-D	High-temperature application resistance	
	HNBR-70	Mineral oil and high-temperature application resistance (A70)	–				
	HNBR-90	Mineral oil and high-temperature application resistance (A90)	–		Class 4-E	High-temperature application resistance	
	ACM-70	High-temperature application and mineral oil resistance (A70)	–				
	SBR-70*	Animal oil and vegetable oil resistance (A70)	Class 3		Class 5	Coolant resistance	
Application	P: For dynamic use and static sealing V: For vacuum flanges G: For static sealing S: For slim static sealing (not standardized in the JIS)			For general industrial use	For dynamic use and static sealing		For static sealing

∗: Not standardized in the JIS

(2) Backup ring types and material

Backup rings are used with O-rings to prevent O-ring protrusion from the groove.

Backup rings are used for dynamic sealing and for static sealing of cylindrical surface.

Table 2.1.2 shows backup ring types and material.

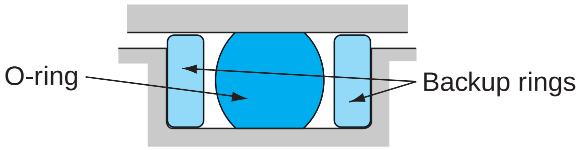
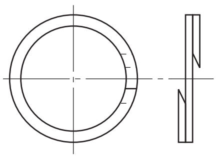
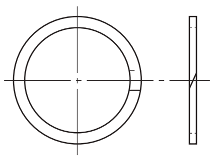
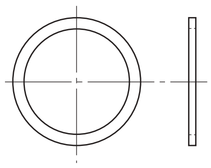


Fig. 2.1.1 O-ring installation with backup rings

Table 2.1.2 Backup ring types and material

Applicable standard	JIS B 2407		
Type	**T1: Spiral ring**	**T2: Bias-cut ring**	**T3: Endless ring**
Shape			
Material	Tetrafluoroethylene resin		
Applications	For dynamic sealing / static sealing of cylindrical surface		

2.2 Numbering systems of O-ring and backup ring

(1) O-ring designation numbers

O-ring designation number consists of material code, application code, and dimensional code.

Table 2.2.1 O-ring numbering system

Example

Material code	Application code	Dimensional code	
	P	**26**	JIS product 1)
1B	**G**	**80**	JIS product 1)
2	**JASO**	**1013**	JASO product 2)
	AS	**325**	AS product 3)
	B	**0212G**	ISO product 4)

Notes 1) JIS: Japanese Industrial Standards
2) JASO: Japanese Automobile Standard Organization
3) AS: Aeronautical Standard
4) ISO: International Organization for Standardization

1) Material codes

Code	Standard (JIS B 2401)	Standard（JASO F 404）
None	NBR-70-1	Class1-A
1B	NBR-90	–
2	NBR-70-2	Class2
3	SBR-70*	Class3
4C	VMQ-70	Class4-C
4D	FKM-70	Class4-D
4E	ACM-70	Class4-E
4F	FKM-90	–
5	–	Class5
5A	EPDM-70	–
5B	EPDM-90	–
6A	HNBR-70	–
6B	HNBR-90	–

＊: Not standardized in the JIS

2) Application codes

Code	Standard	Remarks
P	JIS B 2401-1	For dynamic use and static sealing
G		For static sealing
V		For vacuum flanges
S	Slim series	For static sealing
JASO	JASO F 404	For dynamic use and static sealing
AS	AS 568	For static sealing
	AS 28775A	For dynamic use and static sealing
A **B** **C** **D** **E**	Old ISO 3601	For general industrial use

(2) Backup ring designation numbers

Backup ring designation number consists of type code and the O-ring number for which the backup ring is applied.

Table 2.2.2 Backup ring numbering system

Example

Type code	O-ring number
T1	**P5**

■ Type codes

Code	Backup ring shape
T1	Spiral
T2	Bias-cut
T3	Endless

Remark) Backup ring types and shapes are listed in Table 2.1.2.

2.3 Selection of O-ring

(1) O-ring materials

Materials conforming to JIS B 2401 or JASO F 404 standards are mainly used. Major rubber materials and their physical properties are listed in Table 2.3.1.

Consult JTEKT for special materials to suit a wide variety of applications.

Table 2.3.1 O-ring rubber materials and their physical properties

Applicable standards		Class												
JIS B 2401		NBR-70-1	NBR-90	NBR-70-2	HNBR-70	HNBR-90	SBR-70[3]	VMQ-70	FKM-70	FKM-90	ACM-70	EPDM-70	–	EPDM-90
JASO F 404		Class 1-A	–	Class 2	–	–	Class 3	Class 4-C	Class 4-D	–	Class 4-E	–	Class 5	–
Rubber materials, Applications		Nitrile rubber (NBR)	Nitrile rubber (NBR)	Nitrile rubber (NBR)	Hydrogenated nitrile rubber (HNBR)	Hydrogenated nitrile rubber (HNBR)	Styrene-butadiene rubber (SBR)	Silicone rubber (VMQ)	Fluoro rubber (FKM)	Fluoro rubber (FKM)	Acrylic rubber (ACM)	Ethylene-propylene rubber (EPDM)	Ethylene-propylene rubber (EPDM)	Ethylene-propylene rubber (EPDM)
Test items		Mineral oil resistance		Gasoline resistance	Mineral oil and high-temperature application resistance		Animal oil and vegetable oil resistance	High-temperature application resistance				Animal oil, vegetable oil, and brake fluid resistance	Coolant resistance	Animal oil, vegetable oil, and brake fluid resistance
Normal properties	Hardness by durometer type A[1]	A70 ± 5	A90 ± 5	A70 ± 5	A70 ± 5	A90 ± 5	A70 ± 5	A70 ± 5	A70 ± 5	A90 ± 5	A70 ± 5	A70 ± 5	A70 ± 5	A90 ± 5
	Tensile strength (MPa), min.	10.0	14.0	10.0	16.0	16.0	9.8	3.5	10.0	10.0	6.0	10.0	9.8	10.0
	Elongation (%), min.	250	100	200	180	100	150	60	170	80	100	150	150	80
	Tensile stress (MPa), min. (at 100 % elongation)	2.5	–	2.5	2.5	–	2.7	–	2.0	–	–	–	2.7	–
Aging tests	Temperature and duration	120 °C, 72h		100 °C, 72h	150 °C, 72h		100 °C, 70h	230 °C, 72h		230 °C, 72h	150 °C, 72h	100 °C, 72h	120 °C, 70h	100 °C, 72h
	Change in hardness, max.	+ 10	+ 10	+ 10	+ 15	+ 15	+ 10	+ 10	+ 5	+ 5	+ 10	+ 10	+ 10	+ 10
	Change in tensile strength (%), max.	– 15	– 25	– 15	– 30	– 30	– 15	– 10	– 10	– 10	– 30	– 15	– 20	– 15
	Change in elongation (%), max.	– 45	– 55	– 40	– 40	– 40	– 45	– 25	– 25	– 25	– 40	– 45	– 40	– 45
Compression set test	Temperature and duration	120 °C, 72h		100 °C, 72h	150 °C, 72h		100 °C, 70h	175 °C, 72h	200 °C, 72h	200 °C, 72h	150 °C, 72h	100 °C, 72h	120 °C, 70h	100 °C, 72h
	Compression set (%), max.	40	40	25	40	40	25	30	40	40	60	25	40	30
Immersion test	Temperature, duration, and testing oil	120 °C, 72h IRM901[2]		23 °C, 72h fuel oil No.1[2]	150 °C, 72h IRM901[2]		100 °C, 70h brake fluid[2]	175 °C, 72h IRM901[2]		175 °C, 72h IRM901[2]	150 °C, 72h IRM901[2]	100 °C, 72h brake fluid[2]	100 °C, 70h coolant	100 °C, 72h brake fluid[2]
	Change in hardness	– 5 ~ + 8	– 5 ~ + 8	– 8 ~ 0	– 5 ~ + 10	– 5 ~ + 10	– 15 ~ 0	– 10 ~ + 5	– 10 ~ + 5	– 10 ~ + 5	– 7 ~ + 10	– 15 ~ 0	– 5 ~ + 5	– 15 ~ 0
	Change in tensile strength (%), max.	– 15	– 20	– 15	– 20	– 20	– 40	– 20	– 20	– 20	– 30	– 40	– 40	– 40
	Change in elongation (%), max.	– 40	– 40	– 25	– 40	– 40	– 40	– 20	– 20	– 20	– 40	– 40	– 40	– 40
	Change in volume (%)	– 8 ~ + 5	– 8 ~ + 5	– 3 ~ + 5	– 10 ~ + 5	– 10 ~ + 5	0 ~ + 12	0 ~ + 10	– 5 ~ + 5	– 5 ~ + 5	– 5 ~ + 5	0 ~ + 12	– 5 ~ + 5	0 ~ + 12
	Temperature, duration, and testing oil	120 °C, 72h IRM903[2]		23 °C, 72h fuel oil No.2[2]	150 °C, 72h IRM903[2]		–	–	175 °C, 72h IRM903[2]	175 °C, 72h IRM903[2]	150 °C, 72h IRM903[2]	–	–	–
	Change in hardness	– 15 ~ 0	– 10 ~ + 5	– 20 ~ 0	– 15 ~ + 5	– 15 ~ + 5			– 10 ~ + 5	– 10 ~ + 5	– 20 ~ 0			
	Change in tensile strength (%), max.	– 25	– 35	– 45	– 30	– 35			– 20	– 20	– 40			
	Change in elongation (%), max.	– 35	– 35	– 45	– 40	– 40			– 20	– 20	– 40			
	Change in volume (%)	0 ~ + 20	0 ~ + 20	0 ~ + 30	0 ~ + 30	0 ~ + 25			– 5 ~ + 5	– 5 ~ + 5	0 ~ + 30			
Low-temperature brittleness test	Brittleness limit temperature (°C), max.	– 13	–	– 10	–	–	– 40	– 50	– 15	–	– 1	–	– 40	–
Low-temperature elastic recovery test	TR10 value (°C), max.	– 15	– 15	– 10	– 15	– 15	–	– 30	– 10	– 10	– 10	– 30	–	– 25
Corrosion test	Temperature and duration	70 ± 1 °C, 24h												
	Appearance	The rubber shall not corrode the metal with which it is in contact nor shall the rubber become sticky. However, changes in metal surface color shall not be judged as corrosion.												

Notes 1) Instantaneous values have been used.

2) For details, see the appendix of JIS B 2401-1.

3) Not standardized in the JIS.

(2) Selection of O-ring material

O-rings have contact with substances to be sealed. Therefore, material should be chemically stable to such substances.

Table 2.3.2 below lists the substances with which each rubber material can remain stable. Consult JTEKT for further details.

◎ : Resistant to the substance
○ : Resistant to the substance except under extreme conditions
△ : Not resistant to the substance except under specific favorable conditions
× : Not resistant to the substance

Table 2.3.2 O-ring rubber materials and their stability to fluids

Applicable standard		Class													
JIS B 2401		NBR-70-1	NBR-90	NBR-70-2	HNBR-70	HNBR-90	SBR-70*	VMQ-70	FKM-70		FKM-90	ACM-70	EPDM-70	–	EPDM-90
JASO F 404		Class 1-A	–	Class 2	–	–	Class 3	Class 4-C	Class 4-D		–	Class 4-E	–	Class 5	–
Rubber materials		Nitrile rubber (NBR)	Nitrile rubber (NBR)	Nitrile rubber (NBR)	Hydrogenated nitrile rubber (HNBR)	Hydrogenated nitrile rubber (HNBR)	Styrene-butadiene rubber (SBR)	Silicone rubber (VMQ)	Fluoro rubber (FKM)		Fluoro rubber (FKM)	Acrylic rubber (ACM)	Ethylene-propylene rubber (EPDM)		Ethylene-propylene rubber (EPDM)
Operating temperature range (˚C) (Guidance)		– 30 ~ 100	– 25 ~ 100	– 25 ~ 80	– 30 ~ 140	– 25 ~ 140	– 50 ~ 80	– 50 ~ 200	– 15 ~ 200		– 10 ~ 200	– 15 ~ 130	– 45 ~ 130		– 40 ~ 130
Weatherability	Ozone resistance	△		△	○		△	◎	◎		◎	◎	◎		
	Flame resistance	×		×	×		×	○	◎		◎	×	×		
	Radiation resistance	△		△	△		○	△	△		△	×	○		
	Coal gas	○		◎	○		△	△	◎		◎	○	△		
	Liquefied petroleum gas	○		◎	○		×	×	◎		◎	△	×		
Resistance to lubrication oils	Gear oil	◎		○	◎		×	×	◎		◎	◎	×		
	Engine oil	◎		○	◎		×	△	◎		◎	◎	×		
	Machine oil	◎		◎	◎		×	○	◎		◎	◎	×		
	Spindle oil	○		◎	◎		×	△	◎		◎	○	×		
	Lithium grease	◎		◎	◎		×	◎	◎		◎	◎	×		
	Silicone grease	◎		◎	◎		○	×	◎		◎	◎	◎		
	Cup grease	◎		◎	◎		×	△	◎		◎	○	×		
	Refrigeration oil (mineral oil)	○		◎	○		×	△	◎		◎	○	×		
Resistance to hydraulic fluids	Turbine oil	◎		◎	◎		×	○	◎		◎	◎	×		
	Torque-converter oil	△		◎	△		×	△	◎		◎	◎	×		
	Brake fluid	△		△	△		◎	○	△		△	×	◎		
	Silicone oil	◎		◎	◎		○	×	◎		◎	◎	◎		
	Phosphoric ester	×		×	×		×	○	△		△	×	◎		
	Water + glycol	○		○	○		○	△	○		○	×	◎		
	Oil + water emulsion	◎		◎	◎		△	△	○		○	×	△		
Resistance to fuel oils and water	Gasoline	△		○	○		×	×	◎		◎	△	×		
	Light oil and kerosene	○		◎	◎		×	△	◎		◎	△	×		
	Heavy oil	△		○	△		×	×	◎		◎	×	×		
	Cold water and warm water	○		○	○		○	○	○		○	×	◎		
	Steam and hot water	○		○	○		○	△	△		△	×	◎		
	Water including antifreeze fluid	○		○	○		△	△	○		○	×	◎		
	Water-based cutting oil	○		○	○		△	△	○		○	×	△		
Chemical resistance	Trichloroethylene	×		×	×		×	×	△		△	×	×		
	Alcohol	○		○	○		◎	○	○		○	×	◎		
	Benzene	×		×	×		×	×	△		△	×	×		
	Ethylene glycol	◎		◎	◎		◎	◎	◎		◎	△	◎		
	Acetone	×		×	×		△	△	×		×	×	○		
	Hydrochloric acid 20 %	△		△	△		○	△	◎		◎	△	◎		
	Sulfuric-acid 30 %	○		○	○		○	○	◎		◎	△	◎		
	Nitric-acid 10 %	×		×	×		×	×	◎		◎	×	○		
	Caustic soda 30 %	○		○	○		◎	△	×		×	×	◎		
Features		• The most common material • High resistance to oil, abrasion and heat • Hardness: A70	• Harder and higher pressureresistance than NBR-70-1 (Class 1-A rubber) • Same properties as NBR-70-1 (Class 1-A rubber) in other respects • Hardness: A90	• High resistance to fuel oils, such as gasoline, light oil and kerosene	• Superior to the NBR-70-1 in terms of ozone resistance, oil resistance, and heat resistance • Hardness: A70	• Superior to the HNBR-70 in terms of hardness and resistance to pressure • Same properties as the HNBR-70 in other respects • Hardness: A90	• Highest resistance to animal oil and vegetable oil, such as brake fluid	• High resistance to high and low temperature • Excellent self-restoration after compression, under a wide temperature range	• Highest resistance to oils, chemicals, and heat • Useful over a wide temperature range • Hardness: A70		• Harder and higher pressureresistance than FKM-70 (Class 4-D rubber) • Same properties as FKM-70 (Class 4-D rubber) in other respects • Hardness: A90	• Superior to nitrile rubber in terms of heat resistance and oil resistance • Especially resistant to high-temperature oil	• Superior in ozone resistance, heat resistance and electrical insulation resistance • Hardness: A70		• Harder and higher pressureresistance than EPDM-70 (Class 5 rubber) • Same properties as EPDM-70 (Class 5 rubber) in other respects • Hardness: A90

＊Not standardized in the JIS.

(3) Selection of cross section diameter

When sealing fluid with O-ring, design the O-ring so that the depth of groove for fitting it is smaller than the thickness of the O-ring to compress (squeeze) it (provide compression amount). Determine this compression carefully, because O-rings may become permanently deformed if squeezed excessively, thus deteriorating sealing performance.

Generally, the compression rate of an O-ring should be between 8 % and 30 % in ring cross section diameter (the lower limit of 8 % for sufficient sealing performance and the upper limit of 30 % for limited compression set.).

Fig. 2.3.1 shows the relation between O-ring cross section diameter and compression set.

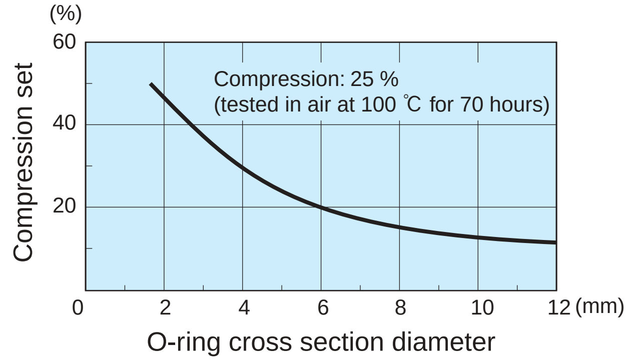


Fig. 2.3.1 Relation between O-ring cross section diameter and compression set

Larger cross section diameter offers more stable sealing performance. As shown in Fig. 2.3.1, when the O-ring compression rate is constant (25 % in the figure), the larger cross section diameter shows the smaller the compression set. Larger cross section diameter is advantageous in that it can accommodate errors in installation dimensions as well.

In dynamic-sealing applications, larger cross section diameter is less likely to twist during service or during installation. The largest cross section diameter possible should be selected providing it can fit in the available space.

2.4 O-ring technical principles

(1) Sealing mechanism

Fig. 2.4.1 shows how O-ring can be deformed under pressure.

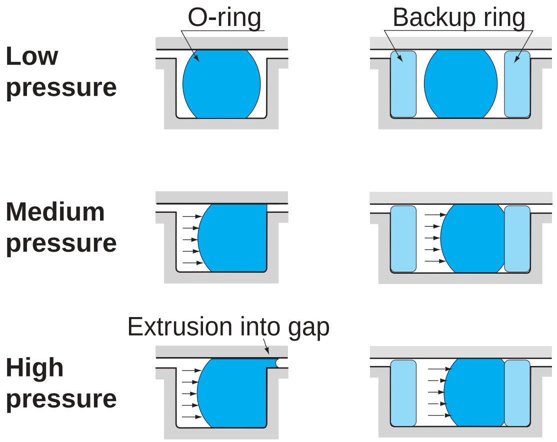


Fig. 2.4.1 O-ring deformation under pressure

O-ring installed in a groove with compression (compression rate) of 8 % to 30 % provides a self-seal by its elasticity when the pressure is low.

When operation pressure is higher, the O-ring is pressed against one side of the groove, providing better sealing. However, under extremely high pressure, the O-ring partially is pressed out from groove into the gap and may be damaged, and deteriorated sealing performance.

For such high-pressure applications, one or two backup rings should be applied to prevent extrusion into gap.

(2) Backup ring

Backup rings are used for dynamic sealing and for static sealing of cylindrical surface.

Two backup rings should be installed on both sides of O-ring when high pressure is put on the O-ring in two directions. One backup ring is installed on low pressure side of O-ring when high pressure is applied in one direction.

Even when extrusion into gap does not occur under low pressure, backup rings are recommended because they can extend O-ring service life by preventing O-ring tearing or damage, which are the most common causes of O-ring failures.

One each backup ring is installed on both sides of O-ring normally (total is two backup rings). However, if space does not allow this, one backup ring should be installed on the lower-pressure side.

The O-ring extrusion varies depending on applied pressure, O-ring hardness and gap amount on the cylindrical surface. Refer to Fig. 2.5.2, "O-ring extrusion limit values," when using backup rings.

Backup rings of endless design (T3) are the most advantageous in the prevention of extrusion into the gap. However, those of spiral design (T1) and bias-cut design (T2) can be more easily installed.

Backup rings of spiral design are most commonly used.

Use backup rings of spiral design with a pressure between 10 MPa and 20 MPa. If the operating temperature exceeds 100˚C, use backup rings of spiral design with a pressure of less than 10 MPa.

Backup rings of bias-cut design excel at protecting O-rings at pressures ranging from 15 MPa to 20 MPa and above.

Backup rings of endless design are suited to use with pressures exceeding 25 MPa and temperatures exceeding 135˚C.

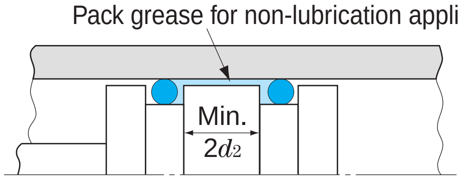
All Koyo backup rings are made from tetrafluoroethylene (PTFE) resin, which is chemically stable to all media under a wide range of temperatures and is resistant to corrosion.

(3) O-rings for dynamic sealing (Reciprocal movement)

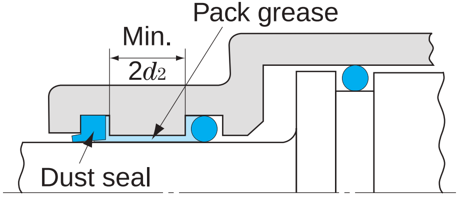
When fitting groove is provided on the piston, use two O-rings to ensure improved service life and sealing performance (Fig. 2.4.2). Pack grease between the two O-rings in a non-lubrication application. Recommended grease is lithium soap base with NLGI No. 2.

When fitting groove is provided on the cylinder, use a dust seal as well and pack grease between the O-ring and dust seal.

Groove on piston



Groove on cylinder



d_2: O-ring cross section diameter

Fig. 2.4.2 Typical installation of O-ring for dynamic sealing

For the installation of O-rings on cast cylinders or for low-friction dynamic-sealing applications, consult JTEKT.

(4) O-rings for static sealing of cylindrical surface

When O-ring is used under low pressure with the compression rate close to the minimal of 8 %, the fitting groove accuracy affects sealing performance so much, so that the groove accuracy should be controlled at the same level as the fitting groove of dynamic sealing.

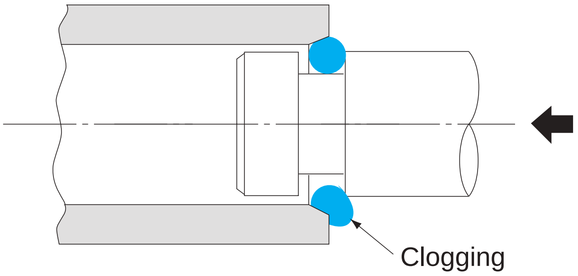


Fig. 2.4.3 O-ring slack and clogging

Even when an O-ring is selected in accordance with the dimensional table values and groove dimensions, the O-ring may become slack due to dimensional deviation and installation method, which may be caused by the reason why the O-ring is unduly caught between the groove and housing (Fig. 2.4.3).

Especially large size O-rings must be installed with care to avoid ring slack.

To prevent ring slack for the ring size of 150 mm or more, a slightly smaller size O-ring may be used rather than one that exactly fits the groove dimensions after determining the O-ring compression amount carefully.

Consult JTEKT for this method.

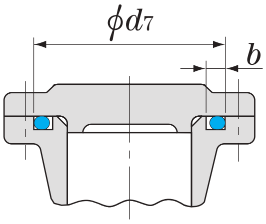
(5) O-rings for static sealing of flat surface

Determine the O-ring compression amount to be slightly larger than in other applications.

If the O-ring is exposed to internal pressure, the O-ring outside diameter should be determined, according to groove diameter ϕd_7. When the O-ring is exposed to external pressure, O-ring bore diameter should be determined according to groove diameter ϕd_8 (see Fig. 2.4.4 (a) and (b)).

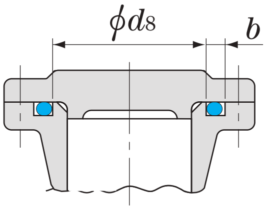
(a) For internal pressure

d_7: Groove O.D
b: Groove width



(b) For external pressure

d_8: Groove I.D
b: Groove width



(c) For internal pressure

B: Seat width

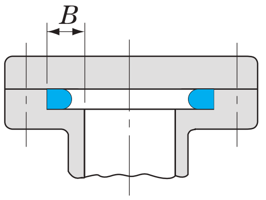


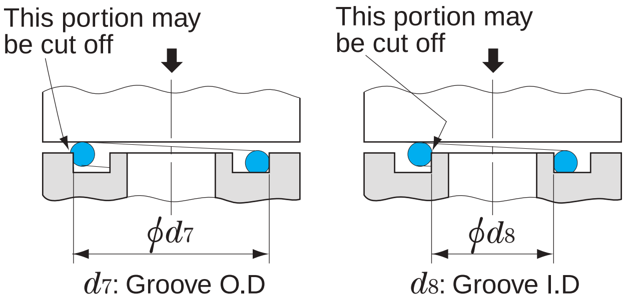
Fig. 2.4.4 Fitting groove for static sealing of flat surface

If the O-ring is exposed to pressure in one direction, the groove side face on the high-pressure side can be eliminated for easy machining (Fig. 2.4.4 (c)).

In this case, dimension B should be greater than the minimum of the groove width b (Fig. 2.4.4(a)) used in flat surface static-sealing application.

In the case of internal-pressure applications and O-ring size is small (30 mm or less), groove outside diameter ϕd_7 should be 0.2 to 0.3 mm larger to ensure correct O-ring installation.

In the case of thin O-ring (cross section diameter 3 mm or less) of large size (150 mm or more), it may be installed on the groove incorrectly and partially protruding from the groove, which results in cutting off of O-ring. Such a situation must be avoided. Use thicker O-ring to prevent such a protrusion (Fig. 2.4.5).



For internal pressure **For external pressure**

Fig. 2.4.5 O-ring protrusion

(6) O-rings for vacuum flanges

In vacuum applications, O-rings are used to seal in gases. Therefore, fitting groove surfaces should be carefully machined and finished.

To select a suitable rubber material to meet vacuum grade, consult JTEKT.

(7) Installation in triangular groove

When O-ring is installed on the interior angle on a shaft or flange, the A dimension of the triangular groove should be 1.3 to 1.4 times of the O-ring cross section diameter (Fig. 2.4.6).

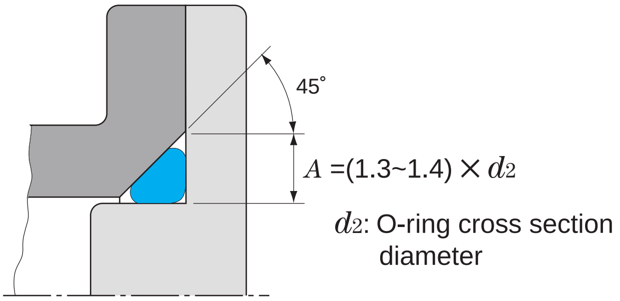


Fig. 2.4.6 Triangular-groove dimensions

2.5 Fitting groove design for O-ring

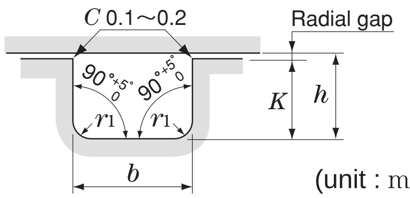
(1) Compression amount and compression rate

Table 2.5.1 lists the JIS-standard of O-ring Compression amount and compression rate.

See dimension table for each groove dimensions corresponding to O-ring number.

Compression amounts of standards other than JIS are shown in respective dimensional tables.

Fig.2.5.1 shows the details of relation between the shape of groove and the compression amount and compression rate.



(unit : mm)

1) Groove depth K

Determine dimension h to obtain O-ring compression rate between 8 % and 30%.

Determine the radial gap by the consideration that the double radial gap (gap in diameter) should be less than the value shown in Fig. 2.5.2.

Compression amount = $d_2 - h$

Compression rate = $\frac{d_2 - h}{d_2}$ x 100 (%)

d_2 : O-ring cross section diameter

2) Groove width b

Determine groove width by the consideration that O-ring should not occupy more than 90 % of the groove space.

Occupancy percentage = $\frac{\pi \times (d_2 / 2)^2}{b \times h}$ x 100 (%)

Fig. 2.5.1 Relation between shape of groove and compression amount (rate)

Table 2.5.1 O-ring compression amount and compression rate

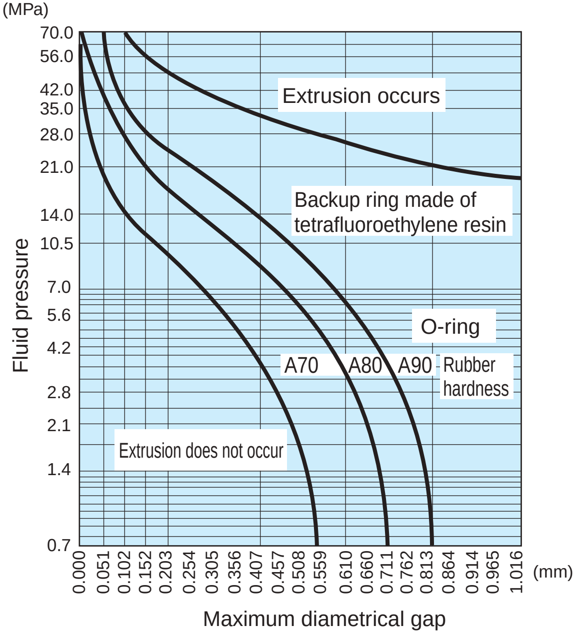
O-ring number	O-ring dimensions, mm			Compression amount and compression rate							
				For dynamic sealing /static sealing of cylindrical surface				For static sealing of flat surface			
				mm		%		mm		%	
	Cross section diameter d_2	Bore diameter d_1		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
P3 ~ P10	1.9 ±0.08	2.8 ~ 9.8	Tolerances of O-ring bore diameter d_1 are given in the dimensional table of the O-rings.	0.48	0.27	24.2	14.8	0.63	0.37	31.8	20.3
P10A ~ P18	2.4 ±0.09	9.8 ~ 17.8		0.49	0.25	19.7	10.8	0.74	0.46	29.7	19.9
P20 ~ P22		19.8 ~ 21.8									
P22A ~ P40	3.5 ±0.1	21.7 ~ 39.7		0.60	0.32	16.7	9.4	0.95	0.65	26.4	19.1
P41 ~ P50		40.7 ~ 49.7									
P48A ~ P70	5.7 ±0.13	47.6 ~ 69.6		0.83	0.47	14.2	8.4	1.28	0.92	22.0	16.5
P71 ~ P125		70.6 ~ 124.6									
P130 ~ P150		129.6 ~ 149.6									
P150A~ P180	8.4 ±0.15	149.5 ~ 179.5		1.05	0.65	12.3	7.9	1.70	1.30	19.9	15.8
P185 ~ P300		184.5 ~ 299.5									
P315 ~ P400		314.5 ~ 399.5									
G25 ~ G40	3.1 ±0.1	24.4 ~ 39.4		0.70	0.40	21.85	13.3	0.85	0.55	26.6	18.3
G45 ~ G70		44.4 ~ 69.4									
G75 ~ G125		74.4 ~ 124.4									
G130 ~ G145		129.4 ~ 144.4									
G150 ~ G180	5.7 ±0.13	149.3 ~ 179.3		0.83	0.47	14.2	8.4	1.28	0.92	22.0	16.5
G185 ~ G300		184.3 ~ 299.3									

(2) Extrusion into gap from fitting groove

The O-ring and backup ring extrusion into the gap from the fitting groove on cylindrical surfaces is mainly related to the gap amount of the cylindrical surface.

Pressure of fluid to be sealed or O-ring hardness also influence.

Fig. 2.5.2 shows the relation between these factors.



<O-ring test conditions>
1. Without backup ring
2. Expansion of cylinder inner diameter due to internal pressure of cylinder is not included.
3. These results were obtained after 100 thousand cycles at 2.5 Hz between zero pressure to the pressure specified in the diagram.

Fig. 2.5.2 O-ring and backup ring extrusion limit values

Expansion of cylinder inner diameter due to internal pressure of cylinder is not taken into consideration for the gap in the diagram above. If any expansion of the cylinder inner diameter may occur, the gap should be 75% of the values shown in the diagram, taking expansion of the gap into consideration.

Also, if an O-ring exceeds the values of the gaps in the figure above, use a backup ring.

(3) Fitting groove surface roughness

Fitting groove surface should be finished as specified in Table 2.5.2 below for the O-ring to have sufficient sealing performance and long service life, and to minimize frictional resistance.

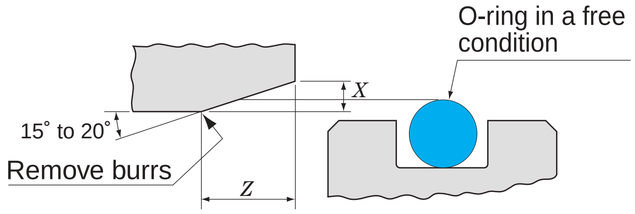
Table 2.5.2 O-ring fitting groove surface roughness

Location	Purpose	Type of pressure		Surface roughness	
				µm Ra	µm Rz
Groove side and bottom	Static sealing	Constant	Flat surface	3.2	12.5
			Cylindrical surface	1.6	6.3
		Pulsating			
	Dynamic sealing	With backup rings			
		Without backup ring		0.8	3.2
O-ring sealed contact surface	Static sealing	Constant		1.6	6.3
		Pulsating		0.8	3.2
	Dynamic sealing	–		0.4	1.6
Chamfer area				3.2	12.5

(4) Chamfer of installation location

Provide chamfers on all edges of the cylinder and piston rod to prevent O-ring damage during installation, as shown in Table 2.5.3.

Table 2.5.3 Chamfer of O-ring installed area



unit : mm

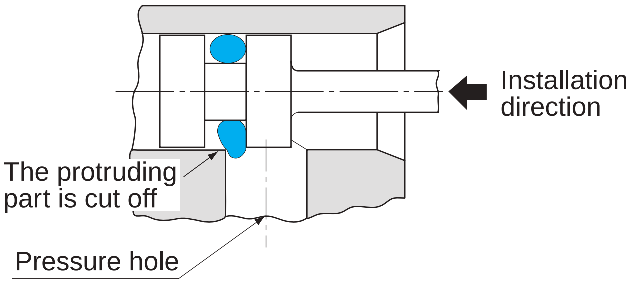
O-ring cross section diameter		X (min.)	Z [1]	
Over	Up to		At 15°	At 20°
—	2.4	0.9	3.4	2.5
2.4	3.5	1.1	4.1	3
3.5	5.7	1.3	4.9	3.6
5.7	8.4	1.5	5.6	4.1

Note 1) Dimension Z is shown when dimension X is minimum.

When O-ring is used on piston seal, do not provide a pressure hole on the area on which the O-ring slides.

If the pressure hole must be installed in the area the O-ring is slid, chamfer the pressure hole (Fig.2.5.3). For the chamfering amount, see the Table 2.5.3.

When the pressure hole is not chamfered:



When the pressure hole is chamfered:

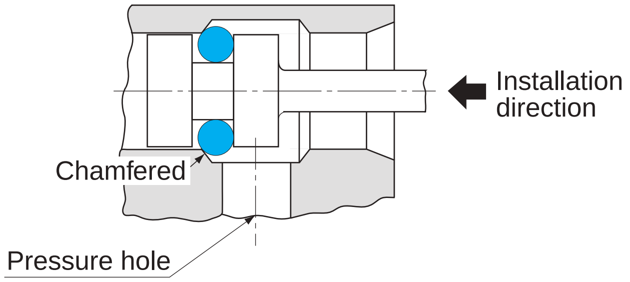


Fig. 2.5.3 Chamfer of pressure-hole edges

(5) Material and surface finishing of fitting groove parts

Cylinder material for dynamic-sealing application should be steel. The most suitable piston rod material is hardened steel.

Soft materials such as aluminum, brass, bronze, Monel metal and soft stainless steel are not suitable as a sliding surface material because of inferior in abrasion resistance.

For static-sealing applications, materials should have sufficient strength to normal operation pressure and should also be resistant to pulsating pressure.

Surface finishing methods to minimize friction are honing, varnishing (roller varnishing), and polishing after hard nickel plating.

Hard-nickel plating is preferable for the application which requires heat resistance, abrasion resistance and low-friction.

Table 2.5.4 shows materials for fitting groove parts and their compatibility

Table 2.5.4 Groove materials and compatibility

Metal	Corrosion resistance	Abrasion resistance	Contamination resistance	Metal protection	O-ring	
					Static sealing	Dynamic sealing
Cadmium	×	×	×	◎	○	○
Chrome	◎	◎	◎	×	○	○
Copper	○	△	×	○	×	×
Gold	◎	△	◎	△	○	×
Iron	×	○	×	○	○	○
Lead	○	×	×	△	○	×
Nickel	○	○	△	○	○	○
Rhodium	◎	◎	◎	△	○	○
Silver	○	△	△	△	○	×
Tin	○	×	○	△	○	×
Zinc	×	×	×	◎	○	×
Remarks	◎ : Excellent △ : Acceptable ○ : Good × : No good				○ : Compatible × : Not compatible	

2.6 Handling of O-ring

(1) Storage

The following practices are advisable to keep O-ring quality for a long time.

- Do not store where exposed to direct sunlight.
- Store enclosed indoors where temperature is less than 30 ˚C and humidity is less than 65 %.
- Keep O-rings away from heat or ozone sources.
- O-rings should be sealed completely in packages when stored.
- Do not hang or suspend O-rings on hooks, wires, or strings.

(2) Handling

For good performance of O-ring, pay attention to the points shown below.

- Avoid reuse of used O-rings.
- When installing an O-ring, apply sealing medium (lubricant) to the O-ring and contact surface.
- Install an O-ring in the groove without twisting it.
- Do not clean O-ring equipped machine with cleaning oil or gasoline and protect O-ring from cleaning oil. Otherwise, it may be swollen, causing poor sealing performance.
- If an O-ring passes along the threaded surface or sharp edges on it during installation, provide any mechanism to prevent the O-ring from being damaged.
  When fitting an O-ring, insert the cap onto the threaded surface as shown in Fig.2.6.1.

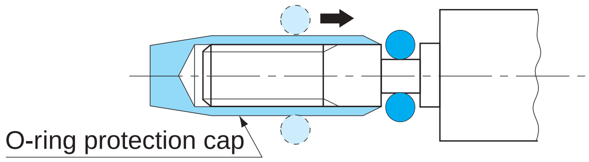


Fig. 2.6.1 O-ring installation jig

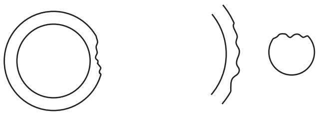
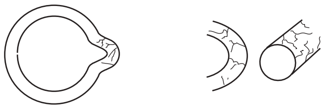
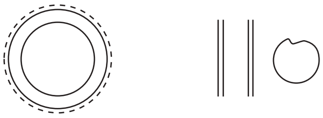
2.7 Typical O-ring failures, causes and countermeasures

When leakage is observed, investigate the causes and implement proper countermeasures.

To identify the causes, it is critical to observe the O-ring closely and evaluate the failure in all respects, such as cylinder, piston, and medium to be sealed.

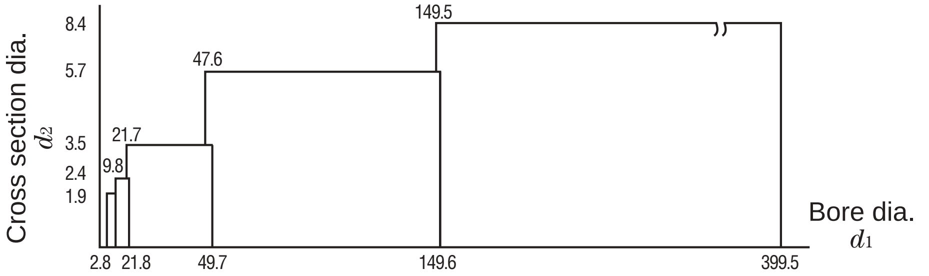
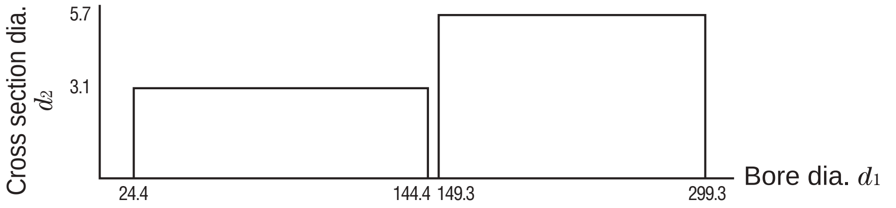
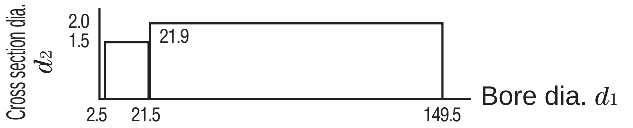
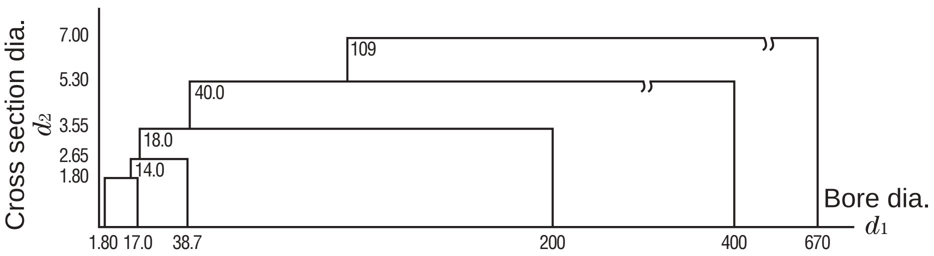
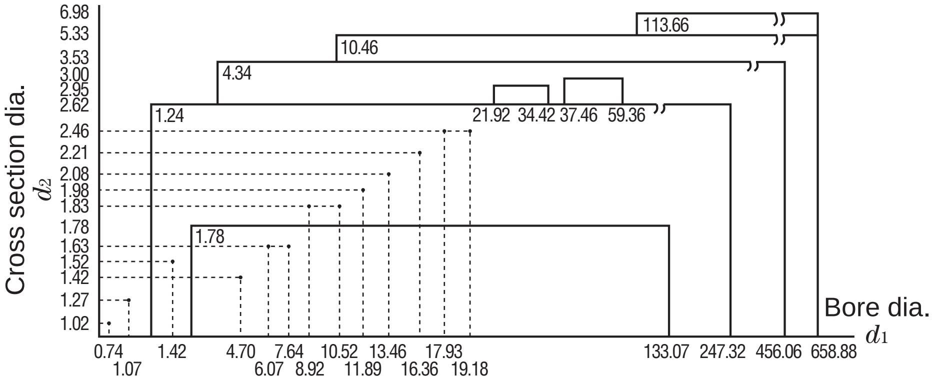
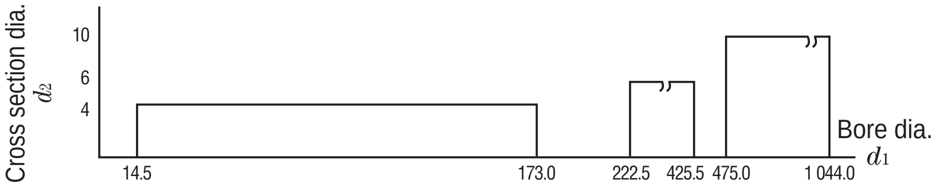
Table 2.7.1 O-ring failures, causes and countermeasures

Ⓓ: Dynamic sealing Ⓢ: Static sealing

Appearance			Major causes	Countermeasures
Phenomenon	Condition			
Ⓓ **Twist**	Twisted and deformed		1) Excessive speed 2) Eccentric movements 3) Poor surface finish on sliding face 4) Twisted installation	• Replace with V-packing • Improve accuracy of equipment • Improve sliding surface finish • Install with care(Coat grease.)
Ⓓ **Chipping**	Partially chipped		• Chipped by the bore edge, threads, or sharp corner at installation	• Round all sharp edges • Use an installation jig
Ⓓ and Ⓢ **Permanent set**	Deformed into the groove's shape		1) Exposure to repeated drastic temperature changes 2) Improper adjustment of temperature, compression, and fluid	• Study alternative rubber materials • Study groove dimensions
Ⓓ **Abrasion around the circumference**	Worn all round the circumference		1) Poor sliding surface finish 2) Poor lubrication 3) Entry of dust or other foreign materials	• Improve sliding surface finish • Supply sufficient lubrication • Clean thoroughly and use filter etc
Ⓓ and Ⓢ **Partial abrasion**	Sliding surface is partially worn		• There are damages on sliding surface	• Remove damages on sliding surface and improve surface finish
Ⓢ **Hardening**	Hardened and cracked when bent		• Operating temperature is higher than the rubber's heat resistance limit	• Study alternative rubber materials
Ⓢ **Swelling**	Softened and swollen		1) Improper rubber material 2) Cleaned with fuel oil or other incompatible cleanser	• Study alternative rubber materials • Clean with kerosene
Ⓢ **Scratch**	Scratch marks are observed		• Scratched by a thread or sharp edge at installation	• Use an installation jig
Ⓢ **Protrusion**	The outside or inside of the ring is cut off partially or around the entire circumference		1) Inappropriate determination of pressure, gap and hardness 2) Due to swelling	• Restudy pressure, gap and hardness • Apply backup rings • Study alternative rubber materials
Ⓢ **Tearing**	The squeezed portion is cut off or chipped		1) Poor chamfer 2) Groove depth is not sufficient	• Improve chamfer • Restudy groove depth
Ⓢ **Crack by ozone**	Cracks are observed on all over the ring		• Left in the air in a stretched condition	• Do not stretch the ring • Coat grease or oil to the O-ring to avoid contact with air • Study alternative rubber materials

Remark) Dotted line shows original O-ring shape or size.

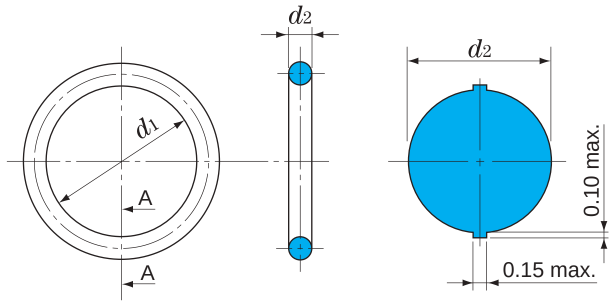
2.8 O-ring dimensional tables (Contents)

Code	O-ring dimensions (Unit mm)	Application	Page
JIS P		**General industrial machines** Dynamic/static sealing	108
JIS G		**General industrial machines** Static sealing	116
S		**General industrial machines** Static sealing	118
Old ISO A, B C, D E		**General industrial machines**	120
JASO		**Automobiles** Dynamic/static sealing	124
AS		**Aircraft** Static sealing and Dynamic/static sealing	130
BACKUP RING	—	For dynamic / static sealing of cylindrical surface	138
JIS V		**General industrial machines** For Vacuum flanges	142

JIS B 2401 P (for Dynamic and Static Sealing)

Material : JIS NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90, VMQ-70, FKM-70, FKM-90, HNBR-70, HNBR-90, ACM-70 and SBR-70 (Not standardized in the JIS)

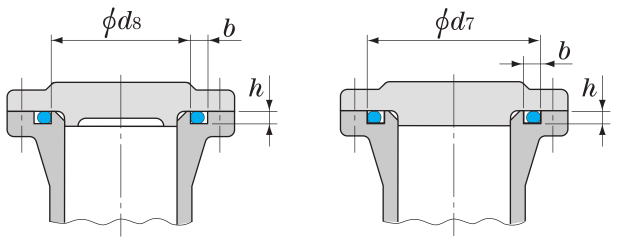
■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions

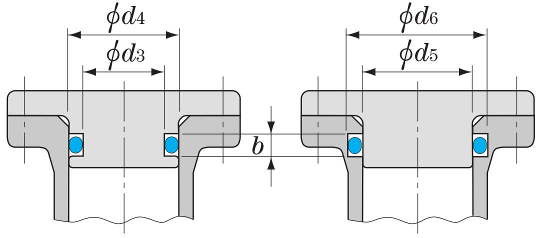
Static sealing on flat surface



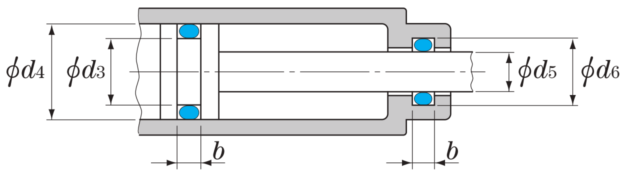
For external pressure

For internal pressure

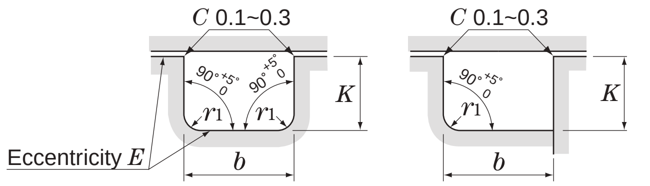
For static sealing on cylindrical surface



For dynamic sealing



■ Fitting groove design (unit : mm)

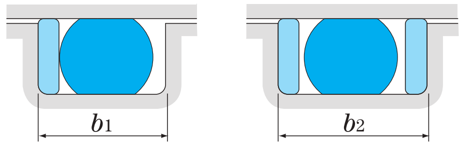


A single component

Matching two components

■ Backup rings

(For dynamic sealing and static sealing on cylindrical surface)



One backup ring

Two backup rings

P 3~35

unit : mm

O-ring dimensions			O-ring No.	Groove dimensions for static sealing on flat surface				
Bore dia. d_1 1)		Cross section dia. d_2		d_8 2) (for external pressure)	d_7 2) (for internal pressure)	b $^{+0.25}_{0}$	h ± 0.05	r_1 max.
2.8	± 0.14	1.9 ± 0.08	**P 3**	3	6.2	2.5	1.4	0.4
3.8	± 0.14		**P 4**	4	7.2			
4.8	± 0.15		**P 5**	5	8.2			
5.8	± 0.15		**P 6**	6	9.2			
6.8	± 0.16		**P 7**	7	10.2			
7.8	± 0.16		**P 8**	8	11.2			
8.8	± 0.17		**P 9**	9	12.2			
9.8	± 0.17		**P 10**	10	13.2			
9.8	± 0.17	2.4 ± 0.09	**P 10A**	10	14	3.2	1.8	0.4
10.8	± 0.18		**P 11**	11	15			
11.0	± 0.18		**P 11.2**	11.2	15.2			
11.8	± 0.19		**P 12**	12	16			
12.3	± 0.19		**P 12.5**	12.5	16.5			
13.8	± 0.19		**P 14**	14	18			
14.8	± 0.20		**P 15**	15	19			
15.8	± 0.20		**P 16**	16	20			
17.8	± 0.21		**P 18**	18	22			
19.8	± 0.22		**P 20**	20	24			
20.8	± 0.23		**P 21**	21	25			
21.8	± 0.24		**P 22**	22	26			
21.7	± 0.24	3.5 ± 0.10	**P 22A**	22	28	4.7	2.7	0.8
22.1	± 0.24		**P 22.4**	22.4	28.4			
23.7	± 0.24		**P 24**	24	30			
24.7	± 0.25		**P 25**	25	31			
25.2	± 0.25		**P 25.5**	25.5	31.5			
25.7	± 0.26		**P 26**	26	32			
27.7	± 0.28		**P 28**	28	34			
28.7	± 0.29		**P 29**	29	35			
29.2	± 0.29		**P 29.5**	29.5	35.5			
29.7	± 0.29		**P 30**	30	36			
30.7	± 0.30		**P 31**	31	37			
31.2	± 0.31		**P 31.5**	31.5	37.5			
31.7	± 0.31		**P 32**	32	38			
33.7	± 0.33		**P 34**	34	40			
34.7	± 0.34		**P 35**	35	41			

O-ring No.	Groove dimensions for dynamic sealing and static sealing on cylindrical surface												
	d_3, d_5		Reference fitting codes corresponding to d_3 and d_5 tolerances			d_4, d_6		3) Fitting code	b $^{+0.25}_{0}$ Without backup ring	b_1 $^{+0.25}_{0}$ With one backup ring	b_2 $^{+0.25}_{0}$ With two backup rings	E 4) max.	r_1 max.
P 3	3	$^{0}_{-0.05}$	h9	f8	e9	6	$^{+0.05}_{0}$	H10	2.5	3.9	5.4	0.05	0.4
P 4	4					7		H9					
P 5	5					8							
P 6	6					9							
P 7	7				e8	10							
P 8	8					11							
P 9	9					12							
P 10	10					13							
P 10A	10	$^{0}_{-0.06}$				14	$^{+0.06}_{0}$		3.2	4.4	6.0	0.05	0.4
P 11	11					15							
P 11.2	11.2					15.2							
P 12	12					16							
P 12.5	12.5					16.5							
P 14	14					18							
P 15	15					19							
P 16	16					20							
P 18	18					22							
P 20	20				e7	24							
P 21	21					25							
P 22	22					26							
P 22A	22	$^{0}_{-0.08}$			e8	28	$^{+0.08}_{0}$		4.7	6.0	7.8	0.08	0.8
P 22.4	22.4					28.4							
P 24	24					30							
P 25	25					31							
P 25.5	25.5					31.5							
P 26	26					32							
P 28	28					34							
P 29	29					35							
P 29.5	29.5					35.5							
P 30	30					36							
P 31	31				e7	37							
P 31.5	31.5					37.5							
P 32	32					38							
P 34	34					40							
P 35	35					41							

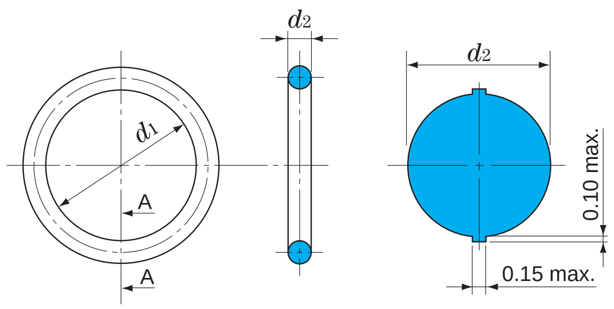
Notes
1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90 and SBR-70 (Not standardized in the JIS) products.
For VMQ-70 and ACM-70 products, the tolerance is 1.5 times these values, and for FKM-70, FKM-90, HNBR-70 and HNBR-90 products, 1.2 times.
2) For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.
3) The fitting code is corresponding to the d_4 and d_6 tolerances.
4) Eccentricity E means the difference between the maximum value and minimum value of dimension K.
The eccentricity can also be defined as double the coaxiality measurement.

P 35.5~105

JIS B 2401 P (for Dynamic and Static Sealing)

Material : JIS NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90, VMQ-70, FKM-70, FKM-90, HNBR-70, HNBR-90, ACM-70 and SBR-70 (Not standardized in the JIS)

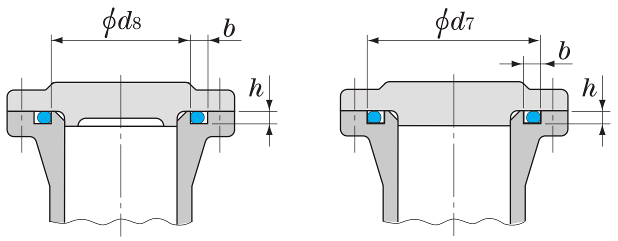
■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions

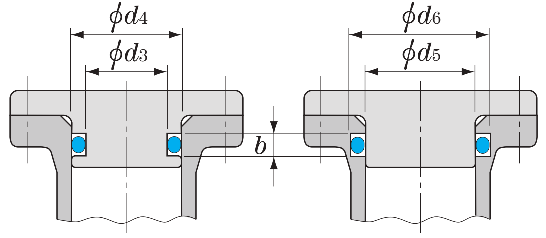
Static sealing on flat surface



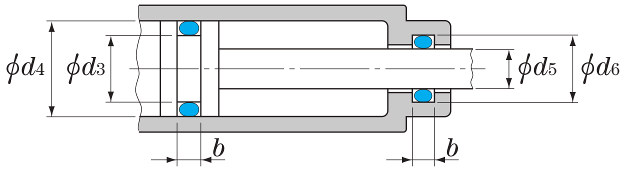
For external pressure

For internal pressure

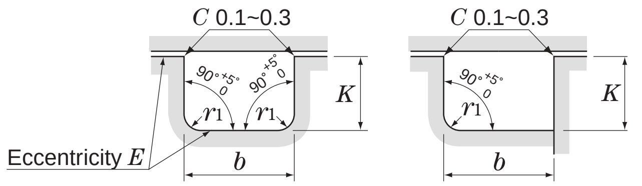
For static sealing on cylindrical surface



For dynamic sealing



■ Fitting groove design (unit : mm)

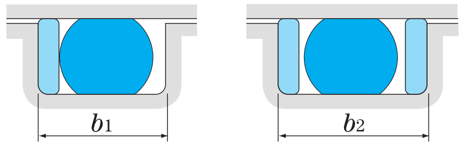


A single component

Matching two components

■ Backup rings

(For dynamic sealing and static sealing on cylindrical surface)



One backup ring

Two backup rings

P 35.5~105

unit : mm

O-ring dimensions			O-ring No.	Groove dimensions for static sealing on flat surface				
Bore dia. d_1 1)		Cross section dia. d_2		d_8 2) (for external pressure)	d_7 2) (for internal pressure)	b $^{+0.25}_{0}$	h ± 0.05	r_1 max.
35.2	± 0.34	3.5 ± 0.1	**P 35.5**	35.5	41.5	4.7	2.7	0.8
35.7	± 0.34		**P 36**	36	42			
37.7	± 0.37		**P 38**	38	44			
38.7	± 0.37		**P 39**	39	45			
39.7	± 0.37		**P 40**	40	46			
40.7	± 0.38		**P 41**	41	47			
41.7	± 0.39		**P 42**	42	48			
43.7	± 0.41		**P 44**	44	50			
44.7	± 0.41		**P 45**	45	51			
45.7	± 0.42		**P 46**	46	52			
47.7	± 0.44		**P 48**	48	54			
48.7	± 0.45		**P 49**	49	55			
49.7	± 0.45		**P 50**	50	56			
47.6	± 0.44	5.7 ± 0.13	**P 48A**	48	58	7.5	4.6	0.8
49.6	± 0.45		**P 50A**	50	60			
51.6	± 0.47		**P 52**	52	62			
52.6	± 0.48		**P 53**	53	63			
54.6	± 0.49		**P 55**	55	65			
55.6	± 0.50		**P 56**	56	66			
57.6	± 0.52		**P 58**	58	68			
59.6	± 0.53		**P 60**	60	70			
61.6	± 0.55		**P 62**	62	72			
62.6	± 0.56		**P 63**	63	73			
64.6	± 0.57		**P 65**	65	75			
66.6	± 0.59		**P 67**	67	77			
69.6	± 0.61		**P 70**	70	80			
70.6	± 0.62		**P 71**	71	81			
74.6	± 0.65		**P 75**	75	85			
79.6	± 0.69		**P 80**	80	90			
84.6	± 0.73		**P 85**	85	95			
89.6	± 0.77		**P 90**	90	100			
94.6	± 0.81		**P 95**	95	105			
99.6	± 0.84		**P 100**	100	110			
101.6	± 0.85		**P 102**	102	112			
104.6	± 0.87		**P 105**	105	115			

O-ring No.	Groove dimensions for dynamic sealing and static sealing on cylindrical surface												
	d_3, d_5		Reference fitting codes corresponding to d_3 and d_5 tolerances			d_4, d_6		3) Fitting code	b $^{+0.25}_{0}$ Without backup ring	b_1 $^{+0.25}_{0}$ With one backup ring	b_2 $^{+0.25}_{0}$ With two backup rings	E 4) max.	r_1 max.
P 35.5	35.5	0 − 0.08	h9	f8	e7	41.5	+ 0.08 0	H9	4.7	6.0	7.8	0.08	0.8
P 36	36					42							
P 38	38					44							
P 39	39					45							
P 40	40					46							
P 41	41					47							
P 42	42					48							
P 44	44					50							
P 45	45					51							
P 46	46					52							
P 48	48					54							
P 49	49					55							
P 50	50					56							
P 48A	48	0 − 0.10			e8	58	+ 0.10 0		7.5	9.0	11.5	0.10	0.8
P 50A	50					60							
P 52	52				e7	62							
P 53	53					63							
P 55	55					65							
P 56	56					66							
P 58	58					68							
P 60	60					70							
P 62	62					72							
P 63	63					73							
P 65	65					75							
P 67	67					77							
P 70	70					80							
P 71	71					81							
P 75	75					85							
P 80	80					90							
P 85	85					95							
P 90	90					100							
P 95	95				e6	105							
P 100	100					110							
P 102	102					112							
P 105	105					115							

Notes 1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90 and SBR-70 (Not standardized in the JIS) products.
For VMQ-70 and ACM-70 products, the tolerance is 1.5 times these values, and for FKM-70, FKM-90, HNBR-70 and HNBR-90 products, 1.2 times.

2) For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.

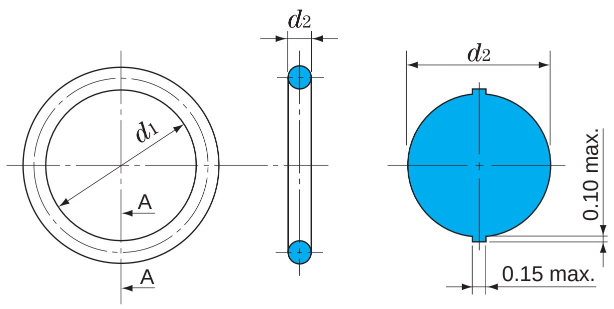
3) The fitting code is corresponding to the d_4 and d_6 tolerances.

4) Eccentricity E means the difference between the maximum value and minimum value of dimension K.
The eccentricity can also be defined as double the coaxiality measurement.

JIS B 2401 P (for Dynamic and Static Sealing)

Material : JIS NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90, VMQ-70, FKM-70, FKM-90, HNBR-70, HNBR-90, ACM-70 and SBR-70 (Not standardized in the JIS)

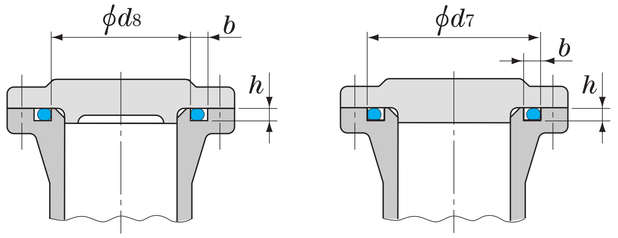
■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions

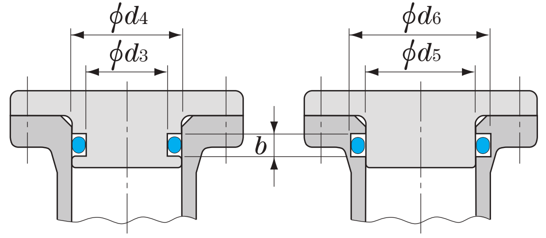
Static sealing on flat surface



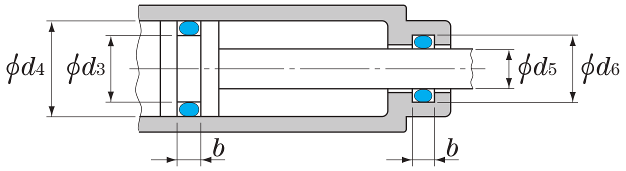
For external pressure

For internal pressure

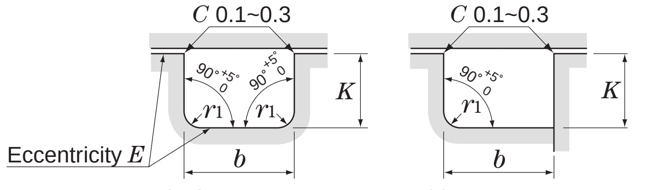
For static sealing on cylindrical surface



For dynamic sealing



■ Fitting groove design (unit : mm)

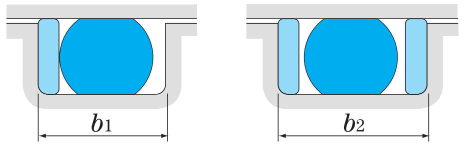


A single component

Matching two components

■ Backup rings

(For dynamic sealing and static sealing on cylindrical surface)



One backup ring

Two backup rings

P 110~260

unit : mm

O-ring dimensions			Groove dimensions for static sealing on flat surface					
Bore dia. d_1 [1]		Cross section dia. d_2	O-ring No.	d_8 [2] (for external pressure)	d_7 [2] (for internal pressure)	b $^{+0.25}_{0}$	h ± 0.05	r_1 max.
109.6	± 0.91	5.7 ± 0.13	**P 110**	110	120	7.5	4.6	0.8
111.6	± 0.92		**P 112**	112	122			
114.6	± 0.94		**P 115**	115	125			
119.6	± 0.98		**P 120**	120	130			
124.6	± 1.01		**P 125**	125	135			
129.6	± 1.05		**P 130**	130	140			
131.6	± 1.06		**P 132**	132	142			
134.6	± 1.09		**P 135**	135	145			
139.6	± 1.12		**P 140**	140	150			
144.6	± 1.16		**P 145**	145	155			
149.6	± 1.19		**P 150**	150	160			
149.5	± 1.19	8.4 ± 0.15	**P 150A**	150	165	11.0	6.9	1.2
154.5	± 1.23		**P 155**	155	170			
159.5	± 1.26		**P 160**	160	175			
164.5	± 1.30		**P 165**	165	180			
169.5	± 1.33		**P 170**	170	185			
174.5	± 1.37		**P 175**	175	190			
179.5	± 1.40		**P 180**	180	195			
184.5	± 1.44		**P 185**	185	200			
189.5	± 1.48		**P 190**	190	205			
194.5	± 1.51		**P 195**	195	210			
199.5	± 1.55		**P 200**	200	215			
204.5	± 1.58		**P 205**	205	220			
208.5	± 1.61		**P 209**	209	224			
209.5	± 1.62		**P 210**	210	225			
214.5	± 1.65		**P 215**	215	230			
219.5	± 1.68		**P 220**	220	235			
224.5	± 1.71		**P 225**	225	240			
229.5	± 1.75		**P 230**	230	245			
234.5	± 1.78		**P 235**	235	250			
239.5	± 1.81		**P 240**	240	255			
244.5	± 1.84		**P 245**	245	260			
249.5	± 1.88		**P 250**	250	265			
254.5	± 1.91		**P 255**	255	270			
259.5	± 1.94		**P 260**	260	275			

O-ring No.	Groove dimensions for dynamic sealing and static sealing on cylindrical surface												
	d_3, d_5		Reference fitting codes corresponding to d_3 and d_5 tolerances			d_4, d_6		Fitting code [3]	b $^{+0.25}_{0}$ Without backup ring	b_1 $^{+0.25}_{0}$ With one backup ring	b_2 $^{+0.25}_{0}$ With two backup rings	E [4] max.	r_1 max.
P 110	110	0 − 0.10	h9	f8	e6	120	+ 0.10 0	H9	7.5	9.0	11.5	0.10	0.8
P 112	112					122							
P 115	115					125							
P 120	120					130							
P 125	125			f7		135							
P 130	130					140							
P 132	132					142							
P 135	135					145							
P 140	140					150							
P 145	145					155							
P 150	150					160							
P 150A	150					165			11.0	13.0	17.0	0.12	1.2
P 155	155					170							
P 160	160					175							
P 165	165					180							
P 170	170					185		H8					
P 175	175					190							
P 180	180					195							
P 185	185		h8			200							
P 190	190					205							
P 195	195					210							
P 200	200					215							
P 205	205					220							
P 209	209					224							
P 210	210					225							
P 215	215					230							
P 220	220					235							
P 225	225					240							
P 230	230					245							
P 235	235					250							
P 240	240					255							
P 245	245					260							
P 250	250					265							
P 255	255			f6		270							
P 260	260					275							

Notes

[1] The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90 and SBR-70 (Not standardized in the JIS) products.
For VMQ-70 and ACM-70 products, the tolerance is 1.5 times these values, and for FKM-70, FKM-90, HNBR-70 and HNBR-90 products, 1.2 times.

[2] For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.

[3] The fitting code is corresponding to the d_4 and d_6 tolerances.

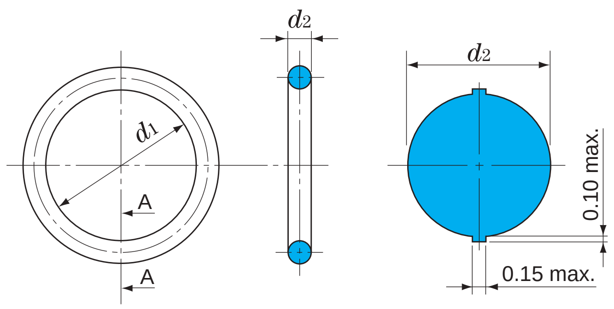
[4] Eccentricity E means the difference between the maximum value and minimum value of dimension K.
The eccentricity can also be defined as double the coaxiality measurement.

P 265~400

JIS B 2401 P (for Dynamic and Static Sealing)

Material : JIS NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90, VMQ-70, FKM-70, FKM-90, HNBR-70, HNBR-90, ACM-70 and SBR-70 (Not standardized in the JIS)

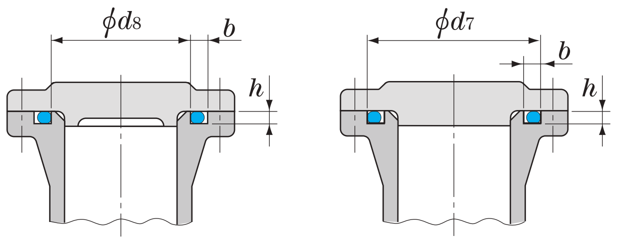
■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions

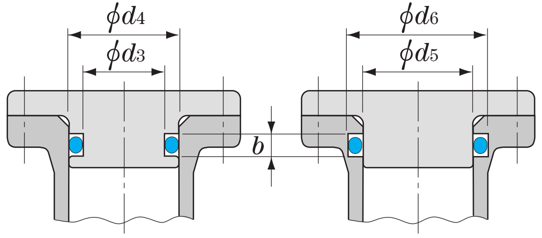
Static sealing on flat surface



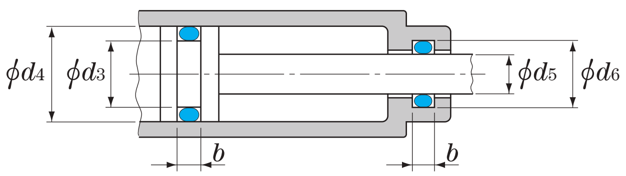
For external pressure

For internal pressure

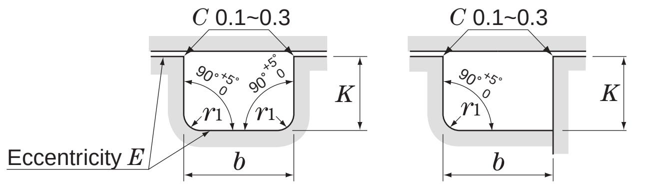
For static sealing on cylindrical surface



For dynamic sealing



■ Fitting groove design (unit : mm)

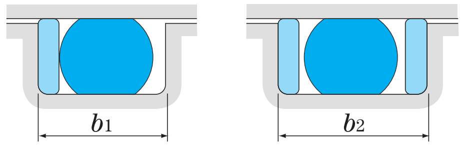


A single component

Matching two components

■ Backup rings

(For dynamic sealing and static sealing on cylindrical surface)



One backup ring

Two backup rings

P 265~400

unit : mm

O-ring dimensions: Bore dia. d_1 [1)		O-ring dimensions: Cross section dia. d_2	O-ring No.	Groove dimensions for static sealing on flat surface: d_8 [2) (for external pressure)	d_7 [2) (for internal pressure)	b $^{+0.25}_{0}$	h ± 0.05	r_1 max.
264.5	± 1.97	8.4 ± 0.15	**P 265**	265	280	11.0	6.9	1.2
269.5	± 2.01		**P 270**	270	285			
274.5	± 2.04		**P 275**	275	290			
279.5	± 2.07		**P 280**	280	295			
284.5	± 2.10		**P 285**	285	300			
289.5	± 2.14		**P 290**	290	305			
294.5	± 2.17		**P 295**	295	310			
299.5	± 2.20		**P 300**	300	315			
314.5	± 2.30		**P 315**	315	330			
319.5	± 2.33		**P 320**	320	335			
334.5	± 2.42		**P 335**	335	350			
339.5	± 2.45		**P 340**	340	355			
354.5	± 2.54		**P 355**	355	370			
359.5	± 2.57		**P 360**	360	375			
374.5	± 2.67		**P 375**	375	390			
384.5	± 2.73		**P 385**	385	400			
399.5	± 2.82		**P 400**	400	415			

O-ring No.	Groove dimensions for dynamic sealing and static sealing on cylindrical surface: d_3, d_5		Reference fitting codes corresponding to d_3 and d_5 tolerances			d_4, d_6		[3) Fitting code	b $^{+0.25}_{0}$ Without backup ring	b_1 $^{+0.25}_{0}$ With one backup ring	b_2 $^{+0.25}_{0}$ With two backup rings	E [4) max.	r_1 max.
P 265	265	$^{0}_{-0.10}$	h8	f6		280	$^{+0.10}_{0}$	H8	11.0	13.0	17.0	0.12	1.2
P 270	270					285							
P 275	275					290							
P 280	280					295							
P 285	285					300							
P 290	290					305							
P 295	295					310							
P 300	300					315							
P 315	315					330							
P 320	320					335							
P 335	335					350							
P 340	340					355							
P 355	355					370							
P 360	360					375							
P 375	375					390							
P 385	385					400							
P 400	400					415							

Notes 1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90 and SBR-70 (Not standardized in the JIS) products.
For VMQ-70 and ACM-70 products, the tolerance is 1.5 times these values, and for FKM-70, FKM-90, HNBR-70 and HNBR-90 products, 1.2 times.

2) For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.

3) The fitting code is corresponding to the d_4 and d_6 tolerances.

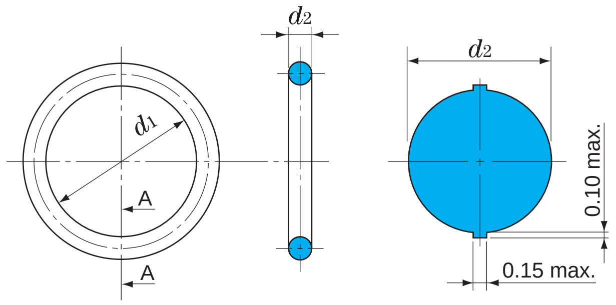
4) Eccentricity E means the difference between the maximum value and minimum value of dimension K.
The eccentricity can also be defined as double the coaxiality measurement.

G 25~300

JIS B 2401 G (for Static Sealing)

Material : JIS NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90, VMQ-70, FKM-70, FKM-90, HMBR-70, HMBR-90, ACM-70 and SBR-70 (Not standardized in the JIS)

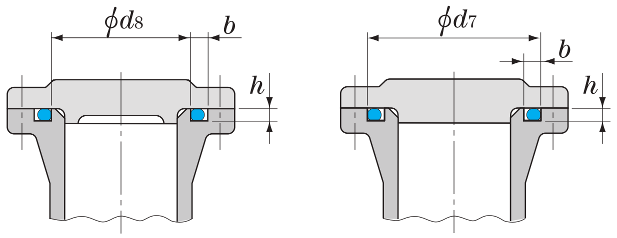
O-ring shape and dimensions (unit : mm)



Cross section A-A

Fitting groove dimensions

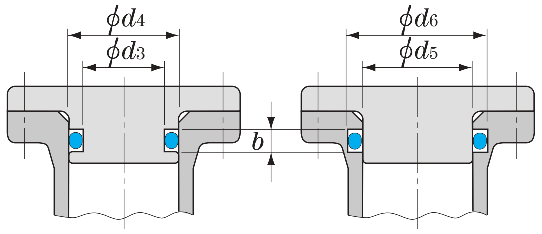
Static sealing on flat surface



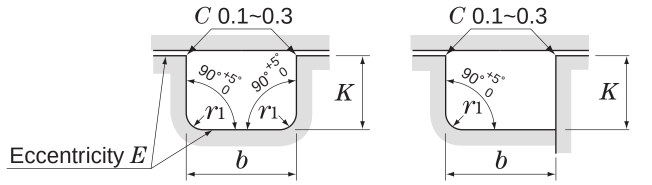
For external pressure

For internal pressure

For static sealing on cylindrical surface



Fitting groove design (unit : mm)

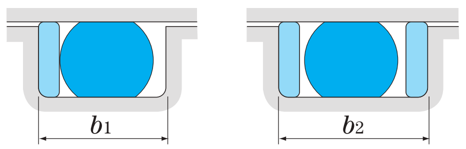


A single component

Matching two components

Backup rings

(For static sealing on cylindrical surface)



One backup ring

Two backup rings

G 25~300

unit : mm

O-ring dimensions			O-ring No.	Groove dimensions for static sealing on flat surface				
Bore dia. d_1 1)		Cross section dia. d_2		d_8 2) for external pressure	d_7 2) for internal pressure	b $^{+0.25}_{0}$	h ± 0.05	r_1 max.
24.4	± 0.25	3.1 ± 0.10	**G 25**	25	30	4.1	2.4	0.7
29.4	± 0.29		**G 30**	30	35			
34.4	± 0.33		**G 35**	35	40			
39.4	± 0.37		**G 40**	40	45			
44.4	± 0.41		**G 45**	45	50			
49.4	± 0.45		**G 50**	50	55			
54.4	± 0.49		**G 55**	55	60			
59.4	± 0.53		**G 60**	60	65			
64.4	± 0.57		**G 65**	65	70			
69.4	± 0.61		**G 70**	70	75			
74.4	± 0.65		**G 75**	75	80			
79.4	± 0.69		**G 80**	80	85			
84.4	± 0.73		**G 85**	85	90			
89.4	± 0.77		**G 90**	90	95			
94.4	± 0.81		**G 95**	95	100			
99.4	± 0.85		**G 100**	100	105			
104.4	± 0.87		**G 105**	105	110			
109.4	± 0.91		**G 110**	110	115			
114.4	± 0.94		**G 115**	115	120			
119.4	± 0.98		**G 120**	120	125			
124.4	± 1.01		**G 125**	125	130			
129.4	± 1.05		**G 130**	130	135			
134.4	± 1.08		**G 135**	135	140			
139.4	± 1.12		**G 140**	140	145			
144.4	± 1.16		**G 145**	145	150			
149.3	± 1.19	5.7 ± 0.13	**G 150**	150	160	7.5	4.6	0.8
154.3	± 1.23		**G 155**	155	165			
159.3	± 1.26		**G 160**	160	170			
164.3	± 1.30		**G 165**	165	175			
169.3	± 1.33		**G 170**	170	180			
174.3	± 1.37		**G 175**	175	185			
179.3	± 1.40		**G 180**	180	190			
184.3	± 1.44		**G 185**	185	195			
189.3	± 1.47		**G 190**	190	200			
194.3	± 1.51		**G 195**	195	205			
199.3	± 1.55		**G 200**	200	210			
209.3	± 1.61		**G 210**	210	220			
219.3	± 1.68		**G 220**	220	230			
229.3	± 1.73		**G 230**	230	240			
239.3	± 1.81		**G 240**	240	250			
249.3	± 1.88		**G 250**	250	260			
259.3	± 1.94		**G 260**	260	270			
269.3	± 2.01		**G 270**	270	280			
279.3	± 2.07		**G 280**	280	290			
289.3	± 2.14		**G 290**	290	300			
299.3	± 2.20		**G 300**	300	310			

O-ring No.	Groove dimensions for static sealing on cylindrical surface												
	d_3, d_5		Reference fitting codes corresponding to d_3 and d_5 tolerances			d_4, d_6		3) Fitting code	b $^{+0.25}_{0}$ Without backup ring	b_1 $^{+0.25}_{0}$ With one backup ring	b_2 $^{+0.25}_{0}$ With two backup rings	E 4) max.	r_1 max.
G 25	25	0 − 0.10	h9	f8	e9	30	+ 0.10 0	H10	4.1	5.6	7.3	0.08	0.7
G 30	30					35							
G 35	35				e8	40							
G 40	40					45							
G 45	45					50							
G 50	50					55		H9					
G 55	55				e7	60							
G 60	60					65							
G 65	65					70							
G 70	70					75							
G 75	75					80							
G 80	80					85							
G 85	85				e6	90							
G 90	90					95							
G 95	95					100							
G 100	100					105							
G 105	105					110							
G 110	110					115							
G 115	115					120							
G 120	120					125							
G 125	125			f7		130							
G 130	130					135							
G 135	135					140							
G 140	140					145							
G 145	145					150							
G 150	150					160			7.5	9.0	11.5	0.10	0.8
G 155	155					165							
G 160	160					170							
G 165	165					175							
G 170	170					180							
G 175	175					185		H8					
G 180	180					190							
G 185	185		h8			195							
G 190	190					200							
G 195	195					205							
G 200	200					210							
G 210	210					220							
G 220	220					230							
G 230	230					240							
G 240	240					250							
G 250	250					260							
G 260	260			f6		270							
G 270	270					280							
G 280	280					290							
G 290	290					300							
G 300	300					310							

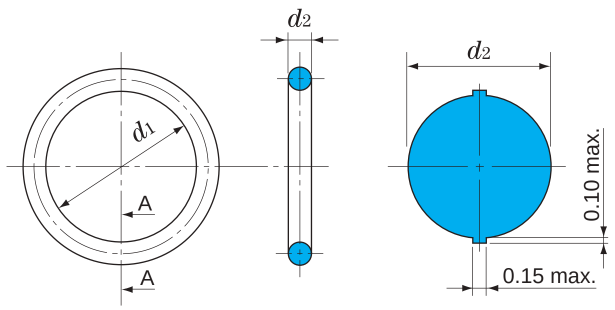
Notes
1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90 and SBR-70 (Not standardized in the JIS) products.
For VMQ-70 and ACM-70 products, the tolerance is 1.5 times these values, and for FKM-70, FKM-90, HNBR-70 and HNBR-90 products, 1.2 times.
2) For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.
3) The fitting code is corresponding to the d_4 and d_6 tolerances.
4) Eccentricity E means the difference between the maximum value and minimum value of dimension K. The eccentricity can also be defined as double the coaxiality measurement.

S 3~150

Slim Series (for Static Sealing)

Material : JIS NBR-70-1 and FKM-70

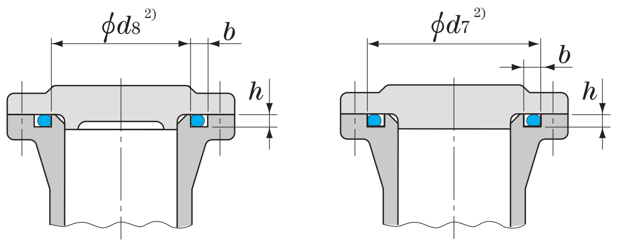
■ O-ring shape and dimensions (unit : mm)



Cross section A-A.

■ Fitting groove dimensions

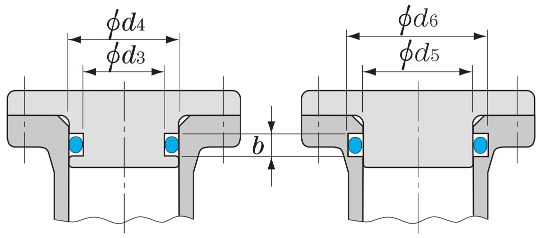
Static sealing on flat surface



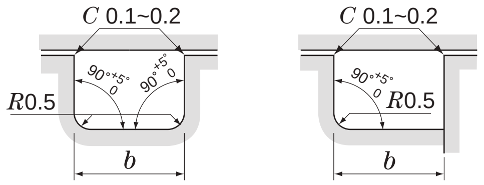
For external pressure

For internal pressure

For static sealing on cylindrical surface



■ Fitting groove design (unit : mm)



A single component

Matching two components

S 3~40

unit : mm

O-ring dimensions			O-ring No.	Groove dimensions				
Bore dia. d_1 1)		Cross section dia. d_2		d_3, d_5, d_8 2) $^{0}_{-0.05}$	d_4, d_6 $^{+0.05}_{0}$	d_7 2)	b $^{+0.25}_{0}$	h $^{0}_{-0.1}$
2.5	± 0.15	1.5 ± 0.1	**S 3**	3	5	5.3	2.5	1.0
3.5			**S 4**	4	6	6.3		
4.5			**S 5**	5	7	7.3		
5.5			**S 6**	6	8	8.3		
6.5			**S 7**	7	9	9.3		
7.5			**S 8**	8	10	10.3		
8.5			**S 9**	9	11	11.3		
9.5			**S 10**	10	12	12.3		
10.7			**S 11.2**	11.2	13.2	13.5		
11.5			**S 12**	12	14	14.3		
12.0			**S 12.5**	12.5	14.5	14.8		
13.5			**S 14**	14	16	16.3		
14.5			**S 15**	15	17	17.3		
15.5			**S 16**	16	18	18.3		
17.5			**S 18**	18	20	20.3		
19.5			**S 20**	20	22	22.3		
21.5			**S 22**	22	24	24.3		
21.9		2.0 ± 0.1	**S 22.4**	22.4	25.4	25.9	2.7	1.5
23.5			**S 24**	24	27	27.5		
24.5			**S 25**	25	28	28.5		
25.5			**S 26**	26	29	29.5		
27.5			**S 28**	28	31	31.5		
28.5			**S 29**	29	32	32.5		
29.5			**S 30**	30	33	33.5		
31.0			**S 31.5**	31.5	34.5	35		
31.5			**S 32**	32	35	35.5		
33.5			**S 34**	34	37	37.5		
34.5			**S 35**	35	38	38.5		
35.0			**S 35.5**	35.5	38.5	39		
35.5			**S 36**	36	39	39.5		
37.5			**S 38**	38	41	41.5		
38.5			**S 39**	39	42	42.5		
39.5			**S 40**	40	43	43.5		

Notes 1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1, products. For FKM-70 products, the tolerance is 2 times these values.

2) For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.

S 42~150

unit : mm

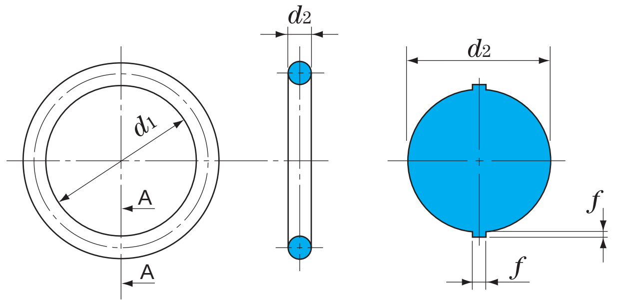
O-ring dimensions			O-ring No.	Groove dimensions				
Bore dia. d_1 1)		Cross section dia. d_2		d_3, d_5, d_8 2) $^{0}_{-0.05}$	d_4, d_6 $^{+0.05}_{0}$	d_7 2)	b $^{+0.25}_{0}$	h $^{0}_{-0.1}$
41.5	± 0.25	2.0 ± 0.1	**S 42**	42	45	45.5	2.7	1.5
43.5			**S 44**	44	47	47.5		
44.5			**S 45**	45	48	48.5		
45.5			**S 46**	46	49	49.5		
47.5			**S 48**	48	51	51		
49.5			**S 50**	50	53	53		
52.5			**S 53**	53	56	56		
54.5			**S 55**	55	58	58		
55.5			**S 56**	56	59	59		
59.5			**S 60**	60	63	63		
62.5			**S 63**	63	66	66		
64.5			**S 65**	65	68	68		
66.5			**S 67**	67	70	70		
69.5			**S 70**	70	73	73		
70.5	± 0.40		**S 71**	71	74	74		
74.5			**S 75**	75	78	78		
79.5			**S 80**	80	83	83		
84.5			**S 85**	85	88	88		
89.5			**S 90**	90	93	93		
94.5			**S 95**	95	98	98		
99.5			**S 100**	100	103	103		
104.5			**S 105**	105	108	108		
109.5			**S 110**	110	113	113		
111.5			**S 112**	112	115	115		
114.5			**S 115**	115	118	118		
119.5			**S 120**	120	123	123		
124.5			**S 125**	125	128	128		
129.5	± 0.60		**S 130**	130	133	133		
131.5			**S 132**	132	135	135		
134.5			**S 135**	135	138	138		
139.5			**S 140**	140	143	143		
144.5			**S 145**	145	148	148		
149.5			**S 150**	150	153	153		

Old ISO A,B,C,D d_1 1.8~75

Old ISO 3601 (for General Industrial Applications)

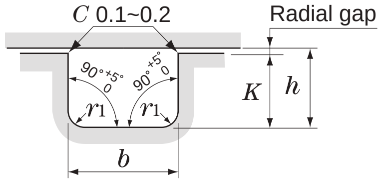
Material : JIS NBR-70-1

■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions (unit : mm)



Cross section dia. d_2	Corner radius r_1
1.80 2.65	0.3 ± 0.1
3.55 5.30	0.6 ± 0.2
7.00	1.0 ± 0.2

1) Groove depth K

Determine dimension h to obtain O-ring compression rate between 8 % and 30 %.

Compression rate = $\frac{d_2 - h}{d_2}$ × 100 (%) = 8 % ~ 30 %

Determine the radial gap by the consideration that the double radial gap (gap in diameter) should be less than the value shown in Fig. 2.5.2.

Therefore: $K = h$ – gap in radial

d_2: O-ring cross section diameter

2) Groove width b

Determine groove width by the consideration that O-ring should not occupy more than 90 % of the groove space.

Occupancy percentage = $\frac{\pi \times (d_2/2)^2}{b \times h}$ ×100 (%) < 90 %

d_1 1.8~20

unit : mm

Cross section dia. d_2		1.80 ± 0.08	2.65 ± 0.09	3.55 ± 0.10	5.30 ± 0.13	7.00 ± 0.15
Dike width and height f		Up to 0.1	Up to 0.12	Up to 0.14	Up to 0.16	Up to 0.18
Bore dia. d_1	Tolerance	O-ring No.				
1.80	± 0.13	A0018G				
2.00		A0020G				
2.24		A0022G				
2.50		A0025G				
2.80	± 0.14	A0028G				
3.15		A0031G				
3.55		A0035G				
3.75		A0037G				
4.00		A0040G				
4.50		A0045G				
4.87	± 0.15	A0048G				
5.00		A0050G				
5.15		A0051G				
5.30		A0053G				
5.60		A0056G				
6.00		A0060G				
6.30		A0063G				
6.70	± 0.16	A0067G				
6.90		A0069G				
7.10		A0071G				
7.50		A0075G				
8.00		A0080G				
8.50		A0085G				
8.75	± 0.17	A0087G				
9.00		A0090G				
9.50		A0095G				
10.0		A0100G				
10.6	± 0.18	A0106G				
11.2		A0112G				
11.8	± 0.19	A0118G				
12.5		A0125G				
13.2		A0132G				
14.0		A0140G	B0140G			
15.0	± 0.20	A0150G	B0150G			
16.0		A0160G	B0160G			
17.0	± 0.21	A0170G	B0170G			
18.0			B0180G	C0180G		
19.0	± 0.22		B0190G	C0190G		
20.0			B0200G	C0200G		

＊ Old ISO: Applies to the ISO series of the old JIS standard

d_1 21.2~75

unit : mm

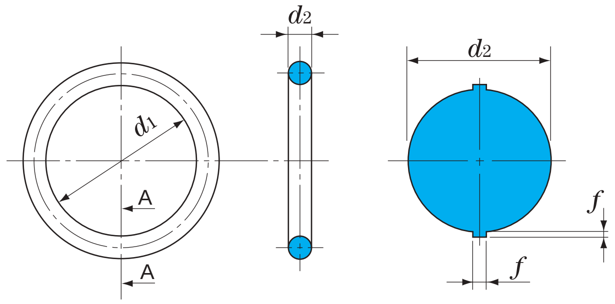
Cross section dia. d_2		1.80 ± 0.08	2.65 ± 0.09	3.55 ± 0.10	5.30 ± 0.13	7.00 ± 0.15
Dike width and height f		Up to 0.1	Up to 0.12	Up to 0.14	Up to 0.16	Up to 0.18
Bore dia. d_1	Tolerance	O-ring No.				
21.2	± 0.23		B0212G	C0212G		
22.4	± 0.24		B0224G	C0224G		
23.6			B0236G	C0236G		
25.0	± 0.25		B0250G	C0250G		
25.8	± 0.26		B0258G	C0258G		
26.5			B0265G	C0265G		
28.0	± 0.28		B0280G	C0280G		
30.0	± 0.29		B0300G	C0300G		
31.5	± 0.31		B0315G	C0315G		
32.5	± 0.32		B0325G	C0325G		
33.5	± 0.32		B0335G	C0335G		
34.5	± 0.33		B0345G	C0345G		
35.5	± 0.34		B0355G	C0355G		
36.5	± 0.35		B0365G	C0365G		
37.5	± 0.36		B0375G	C0375G		
38.7	± 0.37		B0387G	C0387G		
40.0	± 0.38			C0400G	D0400G	
41.2	± 0.39			C0412G	D0412G	
42.5	± 0.40			C0425G	D0425G	
43.7	± 0.41			C0437G	D0437G	
45.0	± 0.42			C0450G	D0450G	
46.2	± 0.43			C0462G	D0462G	
47.5	± 0.44			C0475G	D0475G	
48.7	± 0.45			C0487G	D0487G	
50.0	± 0.46			C0500G	D0500G	
51.5	± 0.47			C0515G	D0515G	
53.0	± 0.48			C0530G	D0530G	
54.5	± 0.50			C0545G	D0545G	
56.0	± 0.51			C0560G	D0560G	
58.0	± 0.52			C0580G	D0580G	
60.0	± 0.54			C0600G	D0600G	
61.5	± 0.55			C0615G	D0615G	
63.0	± 0.56			C0630G	D0630G	
65.0	± 0.58			C0650G	D0650G	
67.0	± 0.59			C0670G	D0670G	
69.0	± 0.61			C0690G	D0690G	
71.0	± 0.63			C0710G	D0710G	
73.0	± 0.64			C0730G	D0730G	
75.0	± 0.66			C0750G	D0750G	

Old ISO C,D,E d_1 77.5~670

Old ISO 3601 (for General Industrial Applications)

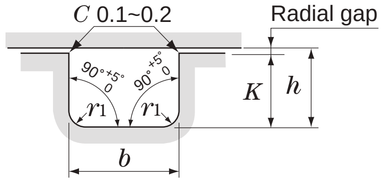
Material : JIS NBR-70-1

O-ring shape and dimensions (unit : mm)



Cross section A-A

Fitting groove dimensions (unit : mm)



Cross section dia. d_2	**Corner radius** r_1
1.80 2.65	0.3 ± 0.1
3.55 5.30	0.6 ± 0.2
7.00	1.0 ± 0.2

1) Groove depth K

Determine dimension h to obtain O-ring compression rate between 8 % and 30 %.

$$\text{Compression rate} = \frac{d_2 - h}{d_2} \times 100\ (\%) = 8\ \% \sim 30\ \%$$

Determine the radial gap by the consideration that the double radial gap (gap in diameter) should be less than the value shown in Fig. 2.5.2.

Therefore: $K = h -$ gap in radial

d_2: O-ring cross section diameter

2) Groove width b

Determine groove width by the consideration that O-ring should not occupy more than 90 % of the groove space.

$$\text{Occupancy percentage} = \frac{\pi \times (d_2/2)^2}{b \times h} \times 100\ (\%) < 90\ \%$$

d_1 77.5~230

unit : mm

Cross section dia. d_2		1.80 ± 0.08	2.65 ± 0.09	3.55 ± 0.10	5.30 ± 0.13	7.00 ± 0.15
Dike width and height f		Up to 0.1	Up to 0.12	Up to 0.14	Up to 0.16	Up to 0.18
Bore dia. d_1	Tolerance	**O-ring No.**				
77.5	± 0.67			C0775G	D0775G	
80.0	± 0.69			C0800G	D0800G	
82.5	± 0.71			C0825G	D0825G	
85.0	± 0.73			C0850G	D0850G	
87.5	± 0.75			C0875G	D0875G	
90.0	± 0.77			C0900G	D0900G	
92.5	± 0.79			C0925G	D0925G	
95.0	± 0.81			C0950G	D0950G	
97.5	± 0.83			C0975G	D0975G	
100	± 0.84			C1000G	D1000G	
103	± 0.87			C1030G	D1030G	
106	± 0.89			C1060G	D1060G	
109	± 0.91			C1090G	D1090G	E1090G
112	± 0.93			C1120G	D1120G	E1120G
115	± 0.95			C1150G	D1150G	E1150G
118	± 0.97			C1180G	D1180G	E1180G
122	± 1.00			C1220G	D1220G	E1220G
125	± 1.03			C1250G	D1250G	E1250G
128	± 1.05			C1280G	D1280G	E1280G
132	± 1.08			C1320G	D1320G	E1320G
136	± 1.10			C1360G	D1360G	E1360G
140	± 1.13			C1400G	D1400G	E1400G
145	± 1.17			C1450G	D1450G	E1450G
150	± 1.20			C1500G	D1500G	E1500G
155	± 1.24			C1550G	D1550G	E1550G
160	± 1.27			C1600G	D1600G	E1600G
165	± 1.31			C1650G	D1650G	E1650G
170	± 1.34			C1700G	D1700G	E1700G
175	± 1.38			C1750G	D1750G	E1750G
180	± 1.41			C1800G	D1800G	E1800G
185	± 1.44			C1850G	D1850G	E1850G
190	± 1.48			C1900G	D1900G	E1900G
195	± 1.51			C1950G	D1950G	E1950G
200	± 1.55			C2000G	D2000G	E2000G
206	± 1.59				D2060G	E2060G
212	± 1.63				D2120G	E2120G
218	± 1.67				D2180G	E2180G
224	± 1.71				D2240G	E2240G
230	± 1.75				D2300G	E2300G

＊ Old ISO: Applies to the ISO series of the old JIS standard

d_1 236~670

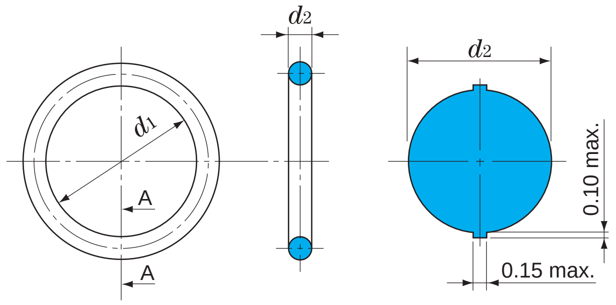
unit : mm

Cross section dia. d_2		1.80 ± 0.08	2.65 ± 0.09	3.55 ± 0.10	5.30 ± 0.13	7.00 ± 0.15
Dike width and height f		Up to 0.1	Up to 0.12	Up to 0.14	Up to 0.16	Up to 0.18
Bore dia. d_1	Tolerance	**O-ring No.**				
236	± 1.79				D2360G	E2360G
243	± 1.83				D2430G	E2430G
250	± 1.88				D2500G	E2500G
258	± 1.93				D2580G	E2580G
265	± 1.98				D2650G	E2650G
272	± 2.02				D2720G	E2720G
280	± 2.08				D2800G	E2800G
290	± 2.14				D2900G	E2900G
300	± 2.21				D3000G	E3000G
307	± 2.25				D3070G	E3070G
315	± 2.30				D3150G	E3150G
325	± 2.37				D3250G	E3250G
335	± 2.43				D3350G	E3350G
345	± 2.49				D3450G	E3450G
355	± 2.56				D3550G	E3550G
365	± 2.62				D3650G	E3650G
375	± 2.68				D3750G	E3750G
387	± 2.76				D3870G	E3870G
400	± 2.84				D4000G	E4000G
412	± 2.91					E4120G
425	± 2.99					E4250G
437	± 3.07					E4370G
450	± 3.15					E4500G
462	± 3.22					E4620G
475	± 3.30					E4750G
487	± 3.37					E4870G
500	± 3.45					E5000G
515	± 3.54					E5150G
530	± 3.63					E5300G
545	± 3.72					E5450G
560	± 3.81					E5600G
580	± 3.93					E5800G
600	± 4.05					E6000G
615	± 4.13					E6150G
630	± 4.22					E6300G
650	± 4.34					E6500G
670	± 4.46					E6700G

JASO F 404 (for Dynamic and Static Sealing)

Material : JASO classes 1-A, 2, 3, 4-C, 4-D, 4-E and 5

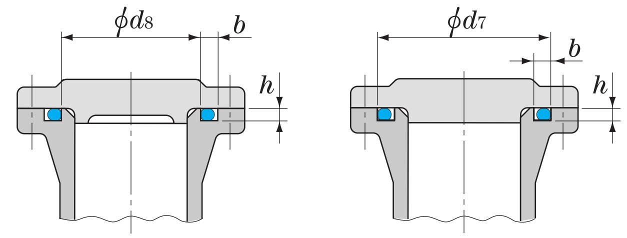
■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions

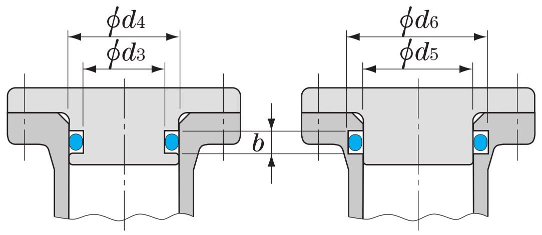
Static sealing on flat surface



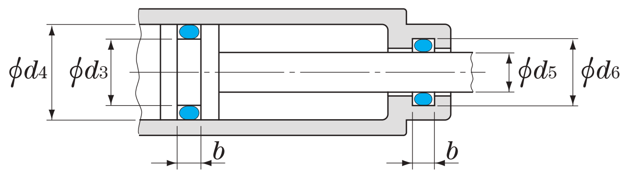
For external pressure

For internal pressure

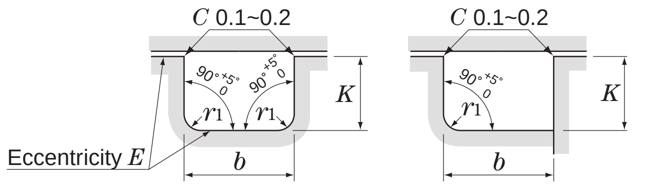
For static sealing on cylindrical surface



For dynamic sealing



■ Fitting groove design (unit : mm)

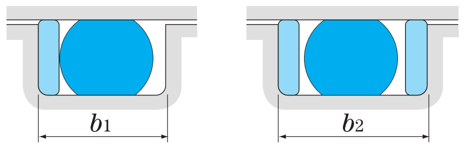


A single component

Matching two components

■ Backup rings

(For dynamic sealing and static sealing on cylindrical surface)



One backup ring

Two backup rings

d_2 1.9

unit : mm

O-ring dimensions			O-ring No.	Groove dimensions for static sealing on flat surface					O-ring No.	Groove dimensions for dynamic sealing and static sealing on cylindrical surface										
Bore dia. d_1		Cross section dia. d_2		d_8 [1] (for external pressure)	d_7 [1] (for internal pressure)	b $^{+0.25}_{0}$	h ± 0.05	r_1 max.		d_3	d_5	Tolerances of d_3 and d_5	d_4	d_6	Tolerances of d_4 and d_6	b $^{+0.25}_{0}$ Without backup ring	b_1 $^{+0.25}_{0}$ With one backup ring	b_2 $^{+0.25}_{0}$ With two backup rings	E [2] max.	r_1 max.
2.8	Classes 1-A and 2 ± 0.12 Classes 3 and 4-D ± 0.24 Classes 4-C, 4-E and 5 ± 0.36	1.9 ± 0.07	**JASO 1003**	3	6.3	2.5	1.4	0.4	**JASO 1003**	3.1	3	0 − 0.05	6	5.9	+ 0.05 0	2.5	3.9	5.4	0.05	0.4
3.8			**JASO 1004**	4	7.3				**JASO 1004**	4.1	4		7	6.9						
4.8			**JASO 1005**	5	8.3				**JASO 1005**	5.1	5		8	7.9						
5.8			**JASO 1006**	6	9.3				**JASO 1006**	6.1	6		9	8.9						
6.8			**JASO 1007**	7	10.3				**JASO 1007**	7.1	7		10	9.9						
7.8			**JASO 1008**	8	11.3				**JASO 1008**	8.1	8		11	10.9						
8.8			**JASO 1009**	9	12.3				**JASO 1009**	9.1	9		12	11.9						
9.8			**JASO 1010**	10	13.3				**JASO 1010**	10.1	10		13	12.9						
11.0			**JASO 1011**	11.2	14.4				**JASO 1011**	11.3	11.2	0 − 0.06	14.2	14.1	+ 0.06 0					
12.3			**JASO 1012**	12.5	15.7				**JASO 1012**	12.6	12.5		15.5	15.4						
13.0			**JASO 1013**	13.2	16.4				**JASO 1013**	13.3	13.2		16.2	16.1						
13.8			**JASO 1014**	14	17.2				**JASO 1014**	14.1	14		17	16.9						
14.8			**JASO 1015**	15	18.2				**JASO 1015**	15.1	15		18	17.9						
15.8			**JASO 1016**	16	19.2				**JASO 1016**	16.1	16		19	18.9						
16.8			**JASO 1017**	17	20.2				**JASO 1017**	17.1	17		20	19.2						
17.8			**JASO 1018**	18	21.2				**JASO 1018**	18.1	18		21	20.9						
18.8	Classes 1-A and 2 ± 0.15 Classes 3 and 4-D ± 0.3 Classes 4-C, 4-E and 5 ± 0.45		**JASO 1019**	19	22.2				**JASO 1019**	19.1	19		22	21.9						
19.8			**JASO 1020**	20	23.2				**JASO 1020**	20.1	20		23	22.9						
21.0			**JASO 1021**	21.2	24.4				**JASO 1021**	21.3	21.2		24.2	24.1						
22.1			**JASO 1022**	22.4	25.5				**JASO 1022**	22.5	22.4	0 − 0.08	25.4	25.3	+ 0.08 0					
23.3			**JASO 1023**	23.6	26.7				**JASO 1023**	23.7	23.6		26.6	26.5						
24.7			**JASO 1025**	25	28.1				**JASO 1025**	25.1	25		28	27.9						
26.2			**JASO 1026**	26.5	29.6				**JASO 1026**	26.6	26.5		29.5	29.4						
27.7			**JASO 1028**	28	31.1				**JASO 1028**	28.1	28		31	30.9						
29.7			**JASO 1030**	30	33.1				**JASO 1030**	30.1	30		33	32.9						
31.2			**JASO 1031**	31.5	34.6				**JASO 1031**	31.6	31.5		34.5	34.4						
33.2			**JASO 1033**	33.5	36.6				**JASO 1033**	33.6	33.5		36.5	36.4						
35.2			**JASO 1035**	35.5	38.6				**JASO 1035**	35.6	35.5		38.5	38.4						

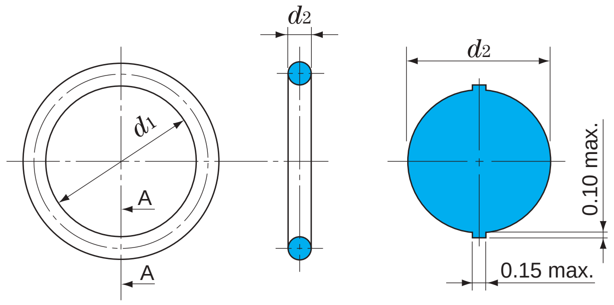
Notes 1) For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.

2) Eccentricity E means the difference between the maximum value and minimum value of dimension K. The eccentricity can also be defined as double the coaxiality measurement.

JASO F 404 (for Dynamic and Static Sealing)

Material : JASO classes 1-A, 2, 3, 4-C, 4-D, 4-E and 5

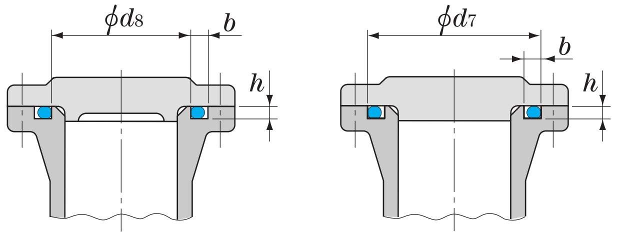
■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions

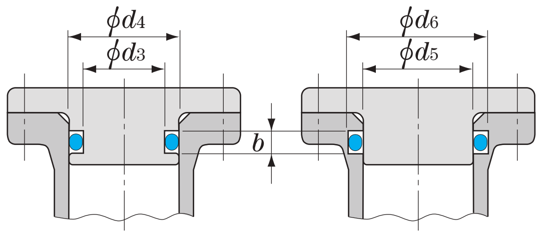
Static sealing on flat surface



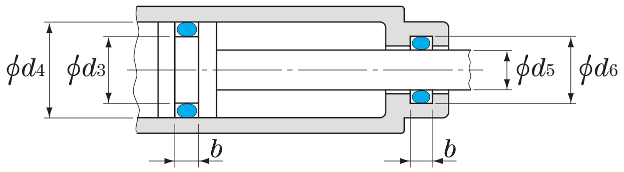
For external pressure

For internal pressure

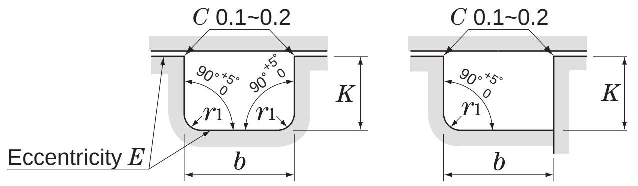
For static sealing on cylindrical surface



For dynamic sealing



■ Fitting groove design (unit : mm)

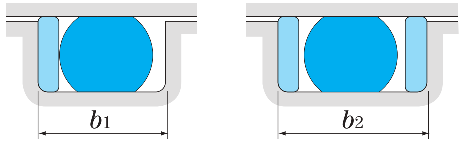


A single component

Matching two components

■ Backup rings

(For dynamic sealing and static sealing on cylindrical surface)



One backup ring

Two backup rings

d_2 2.4

unit : mm

O-ring dimensions: Bore dia. d_1		Cross section dia. d_2	O-ring No.	Groove dimensions for static sealing on flat surface: d_8 [1] (for external pressure)	d_7 [1] (for internal pressure)	$b^{+0.25}_{0}$	h ± 0.05	r_1 max.
9.8	Classes 1-A and 2 ± 0.12 Classes 3 and 4-D ± 0.24 Classes 4-C, 4-E and 5 ± 0.36	2.4 ± 0.07	**JASO 2010**	10	14.1	3.2	1.8	0.4
11.0			**JASO 2011**	11.2	15.3			
12.3			**JASO 2012**	12.5	16.6			
13.0			**JASO 2013**	13.2	17.3			
13.8			**JASO 2014**	14	18.1			
14.8			**JASO 2015**	15	19.1			
15.8			**JASO 2016**	16	20.1			
16.8			**JASO 2017**	17	21.1			
17.8			**JASO 2018**	18	22.1			
18.8	Classes 1-A and 2 ± 0.15 Classes 3 and 4-D ± 0.30 Classes 4-C, 4-E and 5 ± 0.45		**JASO 2019**	19	23.1			
19.8			**JASO 2020**	20	24.1			
20.8			**JASO 2021**	21	25.1			
22.1			**JASO 2022**	22.4	26.4			
23.3			**JASO 2023**	23.6	27.6			
24.7			**JASO 2025**	25	29			
26.2			**JASO 2026**	26.5	30.5			
27.7			**JASO 2028**	28	32			
29.7			**JASO 2030**	30	34			
31.2			**JASO 2031**	31.5	35.5			
33.2			**JASO 2033**	33.5	37.5			
35.2			**JASO 2035**	35.5	39.5			
37.2			**JASO 2037**	37.5	41.5			
39.7			**JASO 2040**	40	44			
42.2	Classes 1-A and 2 ± 0.25 Classes 3 and 4-D ± 0.50 Classes 4-C, 4-E and 5 ± 0.75		**JASO 2042**	42.5	46.5			
44.7			**JASO 2045**	45	49			
47.2			**JASO 2047**	47.5	51.5			
49.7			**JASO 2050**	50	54			
52.6			**JASO 2053**	53	57			
55.6			**JASO 2056**	56	60			
59.6			**JASO 2060**	60	64			
62.6			**JASO 2063**	63	67			
66.6			**JASO 2067**	67	71			
70.6	Classes 1-A and 2 ± 0.40 Classes 3 and 4-D ± 0.80 Classes 4-C, 4-E and 5 ± 1.20		**JASO 2071**	71	75			

O-ring No.	Groove dimensions for dynamic sealing and static sealing on cylindrical surface: d_3	d_5	Tolerances of d_3 and d_5	d_4	d_6	Tolerances of d_4 and d_6	$b^{+0.25}_{0}$ Without backup ring	$b_1{}^{+0.25}_{0}$ With one backup ring	$b_2{}^{+0.25}_{0}$ With two backup rings	E [2] max.	r_1 max.
JASO 2010	10.2	10	$^{0}_{-0.06}$	14	13.8	$^{+0.06}_{0}$	3.2	4.4	6.0	0.05	0.4
JASO 2011	11.4	11.2		15.2	15						
JASO 2012	12.7	12.5		16.5	16.3						
JASO 2013	13.4	13.2		17.2	17						
JASO 2014	14.2	14		18	17.8						
JASO 2015	15.2	15		19	18.8						
JASO 2016	16.2	16		20	19.8						
JASO 2017	17.2	17		21	20.8						
JASO 2018	18.2	18		22	21.8						
JASO 2019	19.2	19		23	22.8						
JASO 2020	20.2	20		24	23.8						
JASO 2021	21.2	21		25	24.8						
JASO 2022	22.6	22.4	$^{0}_{-0.08}$	26.4	26.2	$^{+0.08}_{0}$					
JASO 2023	23.8	23.6		27.6	27.4						
JASO 2025	25.2	25		29	28.8						
JASO 2026	26.7	26.5		30.5	30.3						
JASO 2028	28.2	28		32	31.8						
JASO 2030	30.2	30		34	33.8						
JASO 2031	31.7	31.5		35.5	35.3						
JASO 2033	33.7	33.5		37.5	37.3						
JASO 2035	35.7	35.5		39.5	39.3						
JASO 2037	37.7	37.5		41.5	41.3						
JASO 2040	40.2	40		44	43.8						
JASO 2042	42.7	42.5		46.5	46.3						
JASO 2045	45.2	45		49	48.8						
JASO 2047	47.7	47.5		51.5	51.3						
JASO 2050	50.2	50	$^{0}_{-0.10}$	54	53.8	$^{+0.10}_{0}$					
JASO 2053	53.2	53		57	56.8						
JASO 2056	56.2	56		60	59.8						
JASO 2060	60.2	60		64	63.8						
JASO 2063	63.2	63		67	66.8						
JASO 2067	67.2	67		71	70.8						
JASO 2071	71.2	71		75	74.8						

Notes

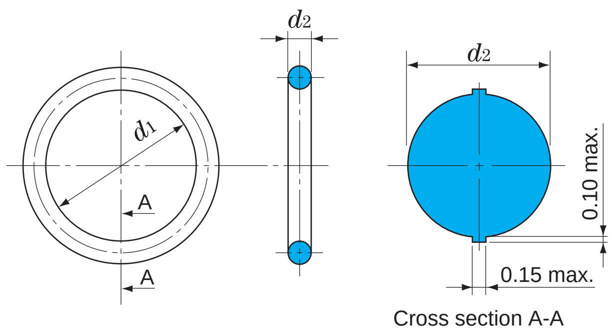
[1] For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.

[2] Eccentricity E means the difference between the maximum value and minimum value of dimension K. The eccentricity can also be defined as double the coaxiality measurement.

JASO F 404 (for Dynamic and Static Sealing)

Material : JASO classes 1-A, 2, 3, 4-C, 4-D, 4-E and 5

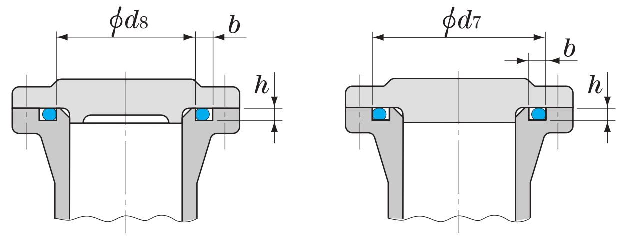
■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions

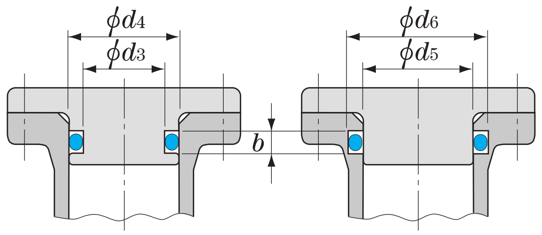
Static sealing on flat surface



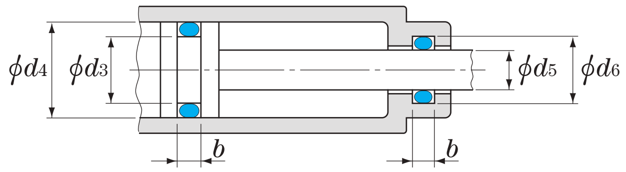
For external pressure

For internal pressure

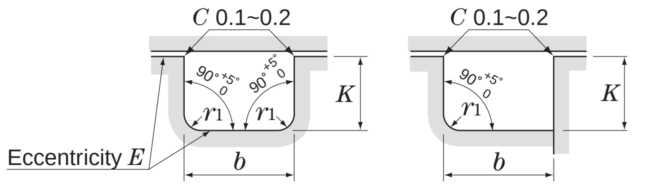
For static sealing on cylindrical surface



For dynamic sealing



■ Fitting groove design (unit : mm)

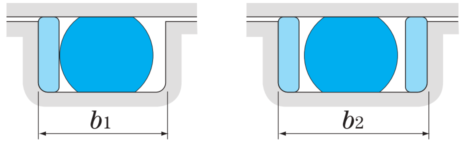


A single component

Matching two components

■ Backup rings

(For dynamic sealing and static sealing on cylindrical surface)



One backup ring

Two backup rings

d_2 3.5

unit : mm

O-ring dimensions				Groove dimensions for static sealing on flat surface				
Bore dia. d_1		Cross section dia. d_2	O-ring No.	d_8 [1] (for external pressure)	d_7 [1] (for internal pressure)	b $^{+0.25}_{0}$	h ± 0.05	r_1 max.
22.1	Classes 1-A and 2 ± 0.15 Classes 3 and 4-D ± 0.30 Classes 4-C, 4-E and 5 ± 0.45	3.5 ± 0.10	JASO 3022	22.4	28.4	4.7	2.7	0.7
23.7			JASO 3024	24	30			
24.7			JASO 3025	25	31			
25.7			JASO 3026	26	32			
27.7			JASO 3028	28	34			
29.7			JASO 3030	30	36			
31.2			JASO 3031	31.5	37.5			
33.7			JASO 3034	34	40			
35.2			JASO 3035	35.5	41.5			
37.7			JASO 3038	38	44			
38.7			JASO 3039	39	45			
39.7			JASO 3040	40	46			
41.7	Classes 1-A and 2 ± 0.25 Classes 3 and 4-D ± 0.50 Classes 4-C, 4-E and 5 ± 0.75		JASO 3042	42	48			
43.7			JASO 3044	44	50			
44.7			JASO 3045	45	51			
47.7			JASO 3048	48	54			
49.7			JASO 3050	50	56			
52.6			JASO 3053	53	59			
55.6			JASO 3056	56	62			
59.6			JASO 3060	60	66			
62.6			JASO 3063	63	69			
66.6			JASO 3067	67	73			
70.6	Classes 1-A and 2 ± 0.40 Classes 3 and 4-D ± 0.80 Classes 4-C, 4-E and 5 ± 1.20		JASO 3071	71	77			
74.6			JASO 3075	75	81			
79.6			JASO 3080	80	86			
84.6			JASO 3085	85	91			
89.6			JASO 3090	90	96			
94.6			JASO 3095	95	101			
99.6			JASO 3100	100	106			
105.6			JASO 3106	106	112			
111.6			JASO 3112	112	118			
117.6			JASO 3118	118	124			
124.6			JASO 3125	125	131			
131.6	Classes 1-A and 2 ± 0.60 Classes 3 and 4-D ± 1.20 Classes 4-C, 4-E and 5 ± 1.80		JASO 3132	132	138			
139.6			JASO 3140	140	146			
149.6			JASO 3150	150	156			

O-ring No.	Groove dimensions for dynamic sealing and static sealing on cylindrical surface										
	d_3	d_5	Tolerances of d_3 and d_5	d_4	d_6	Tolerances of d_4 and d_6	b $^{+0.25}_{0}$ Without backup ring	b_1 $^{+0.25}_{0}$ With one backup ring	b_2 $^{+0.25}_{0}$ With two backup rings	E [2] max.	r_1 max.
JASO 3022	22.7	22.4	0 − 0.08	28.4	28.1	+ 0.08 0	4.7	6.0	7.8	0.08	0.7
JASO 3024	24.3	24		30	29.7						
JASO 3025	25.3	25		31	30.7						
JASO 3026	26.3	26		32	31.7						
JASO 3028	28.3	28		34	33.7						
JASO 3030	30.3	30		36	35.7						
JASO 3031	31.8	31.5		37.5	37.2						
JASO 3034	34.3	34		40	39.7						
JASO 3035	35.8	35.5		41.5	41.2						
JASO 3038	38.3	38		44	43.7						
JASO 3039	39.3	39		45	44.7						
JASO 3040	40.3	40		46	45.7						
JASO 3042	42.3	42		48	47.7						
JASO 3044	44.3	44		50	49.7						
JASO 3045	45.3	45		51	50.7						
JASO 3048	48.3	48		54	53.7						
JASO 3050	50.3	50		56	55.7						
JASO 3053	53.3	53	0 − 0.10	59	58.7	+ 0.10 0					
JASO 3056	56.3	56		62	61.7						
JASO 3060	60.3	60		66	65.7						
JASO 3063	63.3	63		69	68.7						
JASO 3067	67.3	67		73	72.7						
JASO 3071	71.3	71		77	76.7						
JASO 3075	75.3	75		81	80.7						
JASO 3080	80.3	80		86	85.7						
JASO 3085	85.3	85		91	90.7						
JASO 3090	90.3	90		96	95.7						
JASO 3095	95.3	95		101	100.7						
JASO 3100	100.3	100		106	105.7						
JASO 3106	106.3	106		112	111.7						
JASO 3112	112.3	112		118	117.7						
JASO 3118	118.3	118		124	123.7						
JASO 3125	125.3	125		131	130.7						
JASO 3132	132.3	132		138	137.7						
JASO 3140	140.3	140		146	145.7						
JASO 3150	150.3	150		156	155.7						

Notes

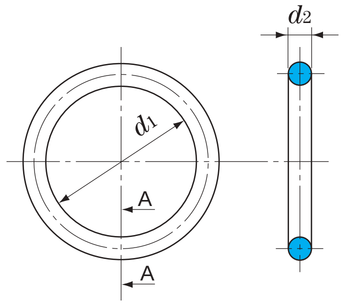
[1] For a static sealing application on a flat surface, design the groove according to dimension d_8 for use under external pressure, or according to dimension d_7 for use under internal pressure. An O-ring for use under external pressure can thus have its bore surface in close contact with the inner wall of the groove during use. Likewise an O-ring for use under internal pressure can thus have its circumferential surface in close contact with the outer wall of the groove.

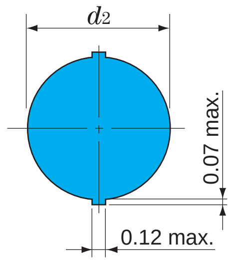
[2] Eccentricity E means the difference between the maximum value and minimum value of dimension K. The eccentricity can also be defined as double the coaxiality measurement.

AS 568 for Aircraft Hydraulic Applications (Dynamic Sealing and Static Sealing)

Material : JIS NBR-70-1, NBR-90 and FKM-70

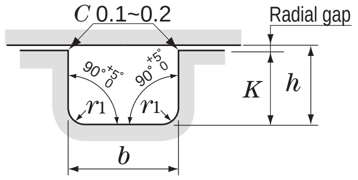
O-ring shape and dimensions (unit : mm)





Cross section A-A

Fitting groove dimensions (unit : mm)



Cross section dia. d_2		Corner radius r_1 max
Over	Up to	
–	3.00	0.4
3.00	6.98	0.8

1) Groove depth K

Determine dimension h to obtain O-ring compression rate between 8 % and 30 %.

$$\text{Compression rate} = \frac{d_2 - h}{d_2} \times 100\ (\%) = 8\ \% \sim 30\ \%$$

Determine the radial gap by the consideration that the double radial gap (gap in diameter) should be less than the value shown in Fig. 2.5.2.

Therefore: $K = h$ – gap in radial

d_2: O-ring cross section diameter

2) Groove width b

Determine groove width by the consideration that O-ring should not occupy more than 90 % of the groove space.

$$\text{Occupancy percentage} = \frac{\pi \times (d_2/2)^2}{b \times h} \times 100\ (\%) < 90\ \%$$

d_2 1.02~(1.78)

unit : mm

O-ring dimensions			O-ring No.	Reference No.
Cross section dia. d_2	Bore dia. d_1[1)]			AS 28775A
1.02 ± 0.07	0.74	± 0.10	**AS 001**	
1.27 ± 0.07	1.07		**AS 002**	
1.42 ± 0.07	4.70	± 0.12	**AS 901**	
1.52 ± 0.07	1.42	± 0.10	**AS 003**	
1.63 ± 0.07	6.07	± 0.12	**AS 902**	
	7.64		**AS 903**	
1.78 ± 0.07	1.78	± 0.12	**AS 004**	
	2.57		**AS 005**	
	2.90		**AS 006**	
	3.68		**AS 007**	
	4.47		**AS 008**	
	5.28		**AS 009**	
	6.07		**AS 010**	
	7.65		**AS 011**	
	9.25		**AS 012**	
	10.82		**AS 013**	
	12.42		**AS 014**	
	14.00		**AS 015**	
	15.60		**AS 016**	
	17.17		**AS 017**	
	18.77		**AS 018**	
	20.35	± 0.15	**AS 019**	
	21.95		**AS 020**	
	23.52		**AS 021**	
	25.12		**AS 022**	
	26.70		**AS 023**	
	28.30		**AS 024**	
	29.87		**AS 025**	
	31.47		**AS 026**	
	33.05		**AS 027**	
	34.65		**AS 028**	
	37.82	± 0.25	**AS 029**	
	41.00		**AS 030**	
	44.17		**AS 031**	
	47.35		**AS 032**	
	50.52		**AS 033**	
	53.70		**AS 034**	
	56.87		**AS 035**	
	60.05		**AS 036**	
	63.22		**AS 037**	

Note 1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1 and NBR-90 products. For FKM-70 products, consult JTEKT.

d_2 (1.78)~(2.62)

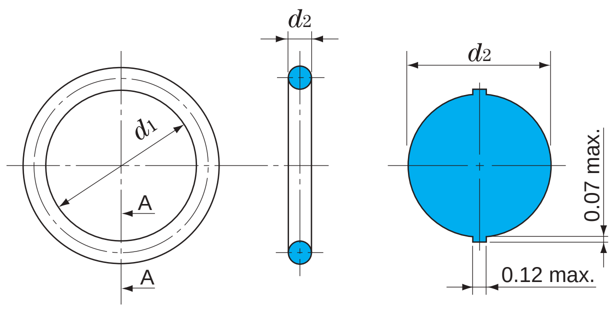
unit : mm

O-ring dimensions			O-ring No.	Reference No.
Cross section dia. d_2	Bore dia. d_1[1)]			AS 28775A
1.78 ± 0.07	66.40	± 0.25	**AS 038**	
	69.57	± 0.38	**AS 039**	
	72.75		**AS 040**	
	75.92		**AS 041**	
	82.27		**AS 042**	
	88.62		**AS 043**	
	94.97		**AS 044**	
	101.32		**AS 045**	
	107.67		**AS 046**	
	114.02		**AS 047**	
	120.37		**AS 048**	
	126.72	± 0.58	**AS 049**	
	133.07		**AS 050**	
1.83 ± 0.07	8.92	± 0.12	**AS 904**	
	10.52		**AS 905**	
1.98 ± 0.07	11.89		**AS 906**	
2.08 ± 0.07	13.46		**AS 907**	
2.21 ± 0.07	16.36		**AS 908**	
2.46 ± 0.07	17.93		**AS 909**	
	19.18		**AS 910**	
2.62 ± 0.07	1.24	± 0.12	**AS 102**	
	2.06		**AS 103**	
	2.84		**AS 104**	
	3.63		**AS 105**	
	4.42		**AS 106**	
	5.23		**AS 107**	
	6.02		**AS 108**	
	7.59		**AS 109**	
	9.19		**AS 110**	
	10.77		**AS 111**	
	12.37		**AS 112**	
	13.94		**AS 113**	
	15.54		**AS 114**	
	17.12		**AS 115**	
	18.72		**AS 116**	
	20.29	± 0.15	**AS 117**	
	21.89		**AS 118**	
	23.47		**AS 119**	
	25.07		**AS 120**	
	26.64		**AS 121**	
	28.24		**AS 122**	
	29.82		**AS 123**	
	31.42		**AS 124**	
	32.99		**AS 125**	
	34.59		**AS 126**	
	36.17		**AS 127**	
	37.77		**AS 128**	
	39.34	± 0.25	**AS 129**	
	40.94		**AS 130**	
	42.52		**AS 131**	
	44.12		**AS 132**	
	45.69		**AS 133**	
	47.29		**AS 134**	
	48.90		**AS 135**	
	50.47		**AS 136**	
	52.07		**AS 137**	
	53.64		**AS 138**	

AS 568 for Aircraft Hydraulic Applications (Dynamic Sealing and Static Sealing)

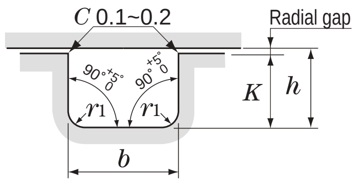
Material : JIS NBR-70-1, NBR-90 and FKM-70

■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions (unit : mm)



Cross section dia. d_2		Corner radius r_1 max
Over	Up to	
–	3.00	0.4
3.00	6.98	0.8

1) Groove depth K

Determine dimension h to obtain O-ring compression rate between 8 % and 30 %.

$$\text{Compression rate} = \frac{d_2 - h}{d_2} \times 100\ (\%) = 8\ \% \sim 30\ \%$$

Determine the radial gap by the consideration that the double radial gap (gap in diameter) should be less than the value shown in Fig. 2.5.2.

Therefore: $K = h$ – gap in radial

d_2: O-ring cross section diameter

2) Groove width b

Determine groove width by the consideration that O-ring should not occupy more than 90 % of the groove space.

$$\text{Occupancy percentage} = \frac{\pi \times (d_2/2)^2}{b \times h} \times 100\ (\%) < 90\ \%$$

d_2 (2.62)

unit : mm

O-ring dimensions			O-ring No.	Reference No.
Cross section dia. d_2	Bore dia. d_1[1)]			AS 28775A
2.62 ± 0.07	55.24	± 0.25	**AS 139**	
	56.82		**AS 140**	
	58.42		**AS 141**	
	59.99		**AS 142**	
	61.60		**AS 143**	
	63.17		**AS 144**	
	64.77		**AS 145**	
	66.34		**AS 146**	
	67.94	± 0.38	**AS 147**	
	69.52		**AS 148**	
	71.12		**AS 149**	
	72.69		**AS 150**	
	75.87		**AS 151**	
	82.22		**AS 152**	
	88.57		**AS 153**	
	94.92		**AS 154**	
	101.27		**AS 155**	
	107.62		**AS 156**	
	113.97		**AS 157**	
	120.32		**AS 158**	
	126.67		**AS 159**	
	133.02	± 0.58	**AS 160**	
	139.37		**AS 161**	
	145.72		**AS 162**	
	152.07		**AS 163**	
	158.42		**AS 164**	
	164.77		**AS 165**	
	171.12		**AS 166**	
	177.47		**AS 167**	
	183.82	± 0.76	**AS 168**	
	190.17		**AS 169**	
	196.52		**AS 170**	
	202.87		**AS 171**	
	209.22		**AS 172**	
	215.57		**AS 173**	
	221.92		**AS 174**	
	228.27		**AS 175**	
	234.62		**AS 176**	
	240.97		**AS 177**	
	247.32		**AS 178**	

Note 1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1 and NBR-90 products.
For FKM-70 products, consult JTEKT.

d_2 2.95~(3.53)

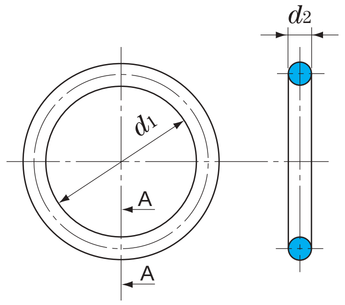
unit : mm

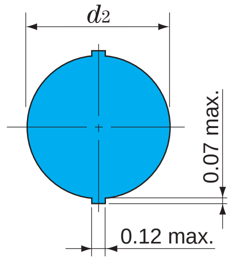
O-ring dimensions			O-ring No.	Reference No.
Cross section dia. d_2	Bore dia. d_1[1)]			AS 28775A
2.95 ± 0.10	21.92	± 0.12	**AS 911**	
	23.47	± 0.15	**AS 912**	
	25.04		**AS 913**	
	26.59		**AS 914**	
	29.74		**AS 916**	
	34.42		**AS 918**	
3.00 ± 0.10	37.46	± 0.25	**AS 920**	
	43.69		**AS 924**	
	53.09		**AS 928**	
	59.36		**AS 932**	
3.53 ± 0.10	4.34	± 0.12	**AS 201**	
	5.94		**AS 202**	
	7.52		**AS 203**	
	9.12		**AS 204**	
	10.69		**AS 205**	
	12.29		**AS 206**	
	13.87		**AS 207**	
	15.47		**AS 208**	
	17.04		**AS 209**	
	18.64	± 0.15	**AS 210**	
	20.22		**AS 211**	
	21.82		**AS 212**	
	23.39		**AS 213**	
	24.99		**AS 214**	
	26.57		**AS 215**	
	28.17		**AS 216**	
	29.74		**AS 217**	
	31.34		**AS 218**	
	32.92		**AS 219**	
	34.52		**AS 220**	
	36.09		**AS 221**	
	37.69		**AS 222**	
	40.87	± 0.25	**AS 223**	223
	44.04		**AS 224**	224
	47.22		**AS 225**	225
	50.39		**AS 226**	226
	53.57		**AS 227**	227
	56.74		**AS 228**	228
	59.92		**AS 229**	229
	63.09		**AS 230**	230
	66.27		**AS 231**	231
	69.44	± 0.38	**AS 232**	232
	72.62		**AS 233**	233
	75.79		**AS 234**	234
	78.97		**AS 235**	235
	82.14		**AS 236**	236
	85.32		**AS 237**	237
	88.49		**AS 238**	238
	91.67		**AS 239**	239
	94.84		**AS 240**	240
	98.02		**AS 241**	241
	101.19		**AS 242**	242
	104.37		**AS 243**	243
	107.54		**AS 244**	244
	110.72		**AS 245**	245
	113.89		**AS 246**	246
	117.07		**AS 247**	247

AS 568 for Aircraft Hydraulic Applications (Dynamic Sealing and Static Sealing)

Material : JIS NBR-70-1, NBR-90 and FKM-70

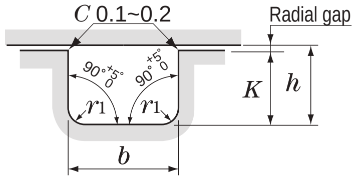
■ O-ring shape and dimensions (unit : mm)





Cross section A-A

■ Fitting groove dimensions (unit : mm)



Cross section dia. d_2		Corner radius r_1 max
Over	Up to	
–	3.00	0.4
3.00	6.98	0.8

1) Groove depth K

Determine dimension h to obtain O-ring compression rate between 8 % and 30 %.

$$\text{Compression rate} = \frac{d_2 - h}{d_2} \times 100\ (\%) = 8\ \% \sim 30\ \%$$

Determine the radial gap by the consideration that the double radial gap (gap in diameter) should be less than the value shown in Fig. 2.5.2.

Therefore: $K = h$ – gap in radial

d_2: O-ring cross section diameter

2) Groove width b

Determine groove width by the consideration that O-ring should not occupy more than 90 % of the groove space.

$$\text{Occupancy percentage} = \frac{\pi \times (d_2/2)^2}{b \times h} \times 100\ (\%) < 90\ \%$$

d_2 (3.53)~(5.33)

unit : mm

O-ring dimensions			O-ring No.	Reference No.
Cross section dia. d_2	Bore dia. d_1[1]			AS 28775A
3.53 ± 0.10	120.24	± 0.38	**AS 248**	248
	123.42		**AS 249**	249
	126.59		**AS 250**	250
	129.77	± 0.58	**AS 251**	251
	132.94		**AS 252**	252
	136.12		**AS 253**	253
	139.29		**AS 254**	254
	142.47		**AS 255**	255
	145.64		**AS 256**	256
	148.82		**AS 257**	257
	151.99		**AS 258**	258
	158.34		**AS 259**	259
	164.69		**AS 260**	260
	171.04		**AS 261**	261
	177.39		**AS 262**	262
	183.74	± 0.76	**AS 263**	263
	190.09		**AS 264**	264
	196.44		**AS 265**	265
	202.79		**AS 266**	266
	209.14		**AS 267**	267
	215.49		**AS 268**	268
	221.84		**AS 269**	269
	228.19		**AS 270**	270
	234.54		**AS 271**	271
	240.89		**AS 272**	272
	247.24		**AS 273**	273
	253.59		**AS 274**	274
	266.29		**AS 275**	
	278.99		**AS 276**	
	291.69		**AS 277**	
	304.39		**AS 278**	
	329.79		**AS 279**	
	355.19		**AS 280**	
	380.59		**AS 281**	
	405.26	± 1.14	**AS 282**	
	430.66		**AS 283**	
	456.06		**AS 284**	
5.33 ± 0.12	10.46	± 0.12	**AS 309**	
	12.06		**AS 310**	
	13.64		**AS 311**	

Note [1] The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1 and NBR-90 products. For FKM-70 products, consult JTEKT.

d_2 (5.33)

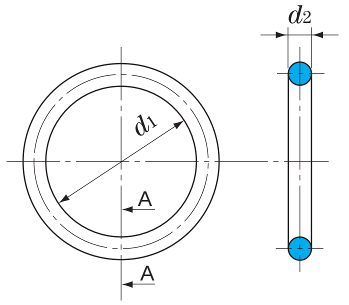
unit : mm

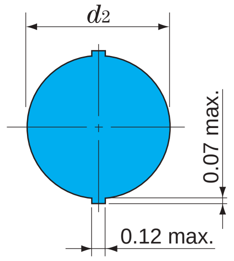
O-ring dimensions			O-ring No.	Reference No.
Cross section dia. d_2	Bore dia. d_1[1]			AS 28775A
5.33 ± 0.12	15.24	± 0.12	**AS 312**	
	16.81		**AS 313**	
	18.42	± 0.15	**AS 314**	
	19.99		**AS 315**	
	21.59		**AS 316**	
	23.16		**AS 317**	
	24.76		**AS 318**	
	26.34		**AS 319**	
	27.94		**AS 320**	
	29.51		**AS 321**	
	31.12		**AS 322**	
	32.69		**AS 323**	
	34.29		**AS 324**	
	37.46	± 0.25	**AS 325**	
	40.64		**AS 326**	
	43.82		**AS 327**	
	46.99		**AS 328**	
	50.16		**AS 329**	
	53.34		**AS 330**	
	56.52		**AS 331**	
	59.69		**AS 332**	
	62.86		**AS 333**	
	66.04		**AS 334**	
	69.22	± 0.38	**AS 335**	
	72.39		**AS 336**	
	75.56		**AS 337**	
	78.74		**AS 338**	
	81.92		**AS 339**	
	85.09		**AS 340**	
	88.26		**AS 341**	
	91.44		**AS 342**	
	94.62		**AS 343**	
	97.79		**AS 344**	
	100.96		**AS 345**	
	104.14		**AS 346**	
	107.32		**AS 347**	
	110.49		**AS 348**	
	113.66		**AS 349**	
	116.84		**AS 350**	
	120.02		**AS 351**	
	123.19		**AS 352**	
	126.36		**AS 353**	
	129.54	± 0.58	**AS 354**	
	132.72		**AS 355**	
	135.89		**AS 356**	
	139.07		**AS 357**	
	142.24		**AS 358**	
	145.42		**AS 359**	
	148.59		**AS 360**	
	151.77		**AS 361**	
	158.12		**AS 362**	
	164.47		**AS 363**	
	170.82		**AS 364**	
	177.17		**AS 365**	
	183.52	± 0.76	**AS 366**	
	189.87		**AS 367**	
	196.22		**AS 368**	

AS 568 for Aircraft Hydraulic Applications (Dynamic Sealing and Static Sealing)

Material : JIS NBR-70-1, NBR-90 and FKM-70

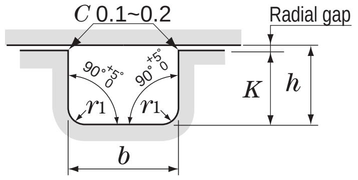
■ O-ring shape and dimensions (unit : mm)





Cross section A-A

■ Fitting groove dimensions (unit : mm)



Cross section dia. d_2		Corner radius r_1 max
Over	Up to	
–	3.00	0.4
3.00	6.98	0.8

1) Groove depth K

Determine dimension h to obtain O-ring compression rate between 8 % and 30 %.

$$\text{Compression rate} = \frac{d_2 - h}{d_2} \times 100\ (\%) = 8\ \% \sim 30\ \%$$

Determine the radial gap by the consideration that the double radial gap (gap in diameter) should be less than the value shown in Fig. 2.5.2.

Therefore: $K = h$ – gap in radial

d_2: O-ring cross section diameter

2) Groove width b

Determine groove width by the consideration that O-ring should not occupy more than 90 % of the groove space.

$$\text{Occupancy percentage} = \frac{\pi \times (d_2/2)^2}{b \times h} \times 100\ (\%) < 90\ \%$$

d_2 (5.33)~(6.98)

unit : mm

O-ring dimensions			O-ring No.	Reference No.
Cross section dia. d_2	Bore dia. d_1[1)]			AS 28775A
5.33 ± 0.12	202.57	± 0.76	**AS 369**	
	208.92		**AS 370**	
	215.26		**AS 371**	
	221.62		**AS 372**	
	227.96		**AS 373**	
	234.32		**AS 374**	
	240.67		**AS 375**	
	247.02		**AS 376**	
	253.37		**AS 377**	
	266.07		**AS 378**	
	278.77		**AS 379**	
	291.47		**AS 380**	
	304.17		**AS 381**	
	329.57		**AS 382**	
	354.97		**AS 383**	
	380.37		**AS 384**	
	405.26	± 1.14	**AS 385**	
	430.66		**AS 386**	
	456.06		**AS 387**	
	481.46		**AS 388**	
	506.86		**AS 389**	
	532.26		**AS 390**	
	557.66		**AS 391**	
	582.68	± 1.52	**AS 392**	
	608.08		**AS 393**	
	633.48		**AS 394**	
	658.88		**AS 395**	
6.98 ± 0.15	113.66	± 0.38	**AS 425**	
	116.84		**AS 426**	
	120.02		**AS 427**	
	123.19		**AS 428**	
	126.36		**AS 429**	
	129.54	± 0.58	**AS 430**	
	132.72		**AS 431**	
	135.89		**AS 432**	
	139.06		**AS 433**	
	142.24		**AS 434**	
	145.42		**AS 435**	
	148.59		**AS 436**	
	151.76		**AS 437**	

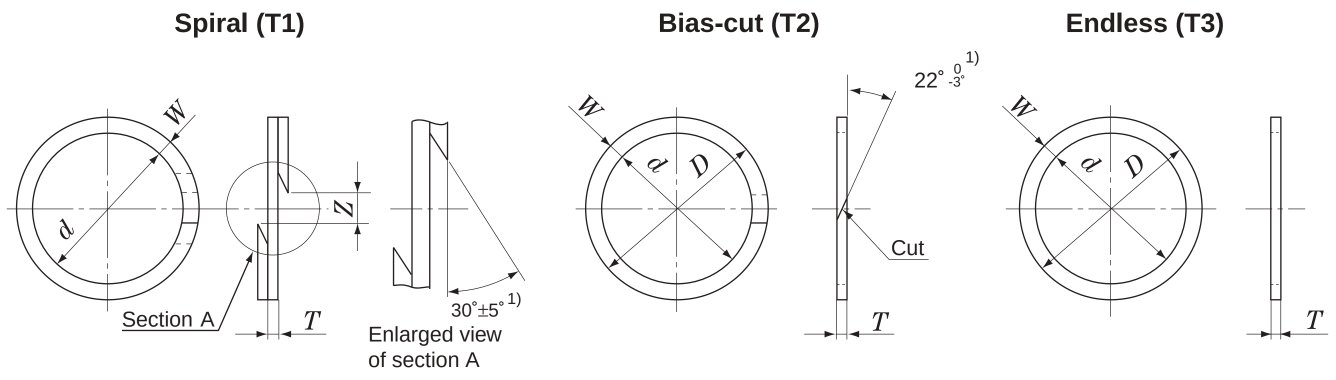
Note 1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1 and NBR-90 products.
For FKM-70 products, consult JTEKT.

d_2 (6.98)

unit : mm

O-ring dimensions			O-ring No.	Reference No.
Cross section dia. d_2	Bore dia. d_1[1)]			AS 28775A
6.98 ± 0.15	158.12	± 0.58	**AS 438**	
	164.46		**AS 439**	
	170.82		**AS 440**	
	177.16		**AS 441**	
	183.52	± 0.76	**AS 442**	
	189.86		**AS 443**	
	196.22		**AS 444**	
	202.56		**AS 445**	
	215.26		**AS 446**	
	227.96		**AS 447**	
	240.66		**AS 448**	
	253.36		**AS 449**	
	266.06		**AS 450**	
	278.76		**AS 451**	
	291.46		**AS 452**	
	304.16		**AS 453**	
	316.86		**AS 454**	
	329.56		**AS 455**	
	342.26		**AS 456**	
	354.96		**AS 457**	
	367.66		**AS 458**	
	380.36		**AS 459**	
	393.06		**AS 460**	
	405.26	± 1.14	**AS 461**	
	417.96		**AS 462**	
	430.66		**AS 463**	
	443.36		**AS 464**	
	456.06		**AS 465**	
	468.76		**AS 466**	
	481.46		**AS 467**	
	494.16		**AS 468**	
	506.86		**AS 469**	
	532.46		**AS 470**	
	557.66		**AS 471**	
	582.68	± 1.52	**AS 472**	
	608.08		**AS 473**	
	633.48		**AS 474**	
	658.88		**AS 475**	

■ Backup ring shape and dimensions



Remark) All rings material is tetrafluoroethylene resin.

P 3~34

unit : mm

Applied O-ring No.	Spiral ring					Bias-cut and Endless ring [2)]						
	Backup ring No.	Dimensions				Backup ring No.		Dimensions				
		d	*W* [3)]	*T*	*Z* [4)]	Bias-cut	Endless	*d*		*D*		*T*
P 3	T1 P 3	3	1.5 $^{+0.03}_{-0.06}$	0.7 ± 0.05	1.2 ± 0.4	T2 P 3	T3 P 3	3	$^{+0.15}_{0}$	6	$^{0}_{-0.15}$	1.25 ± 0.1
P 4	T1 P 4	4				T2 P 4	T3 P 4	4		7		
P 5	T1 P 5	5				T2 P 5	T3 P 5	5		8		
P 6	T1 P 6	6				T2 P 6	T3 P 6	6		9		
P 7	T1 P 7	7				T2 P 7	T3 P 7	7		10		
P 8	T1 P 8	8				T2 P 8	T3 P 8	8		11		
P 9	T1 P 9	9				T2 P 9	T3 P 9	9		12		
P 10	T1 P 10	10				T2 P 10	T3 P 10	10		13		
P 10A	T1 P 10A	10	2.0 $^{+0.03}_{-0.06}$	0.7 ± 0.05	1.4 ± 0.8	T2 P 10A	T3 P 10A	10		14		
P 11	T1 P 11	11				T2 P 11	T3 P 11	11		15		
P 11.2	T1 P 11.2	11.2				T2 P 11.2	T3 P 11.2	11.2		15.2		
P 12	T1 P 12	12				T2 P 12	T3 P 12	12		16		
P 12.5	T1 P 12.5	12.5				T2 P 12.5	T3 P 12.5	12.5		16.5		
P 14	T1 P 14	14				T2 P 14	T3 P 14	14		18		
P 15	T1 P 15	15				T2 P 15	T3 P 15	15		19		
P 16	T1 P 16	16				T2 P 16	T3 P 16	16		20		
P 18	T1 P 18	18				T2 P 18	T3 P 18	18		22		
P 20	T1 P 20	20				T2 P 20	T3 P 20	20		24		
P 21	T1 P 21	21				T2 P 21	T3 P 21	21		25		
P 22	T1 P 22	22				T2 P 22	T3 P 22	22		26		
P 22A	T1 P 22A	22	3.0 $^{+0.03}_{-0.06}$	0.7 ± 0.05	2.5 ± 1.5	T2 P 22A	T3 P 22A	22	$^{+0.20}_{0}$	28	$^{0}_{-0.20}$	1.25 ± 0.1
P 22.4	T1 P 22.4	22.4				T2 P 22.4	T3 P 22.4	22.4		28.4		
P 24	T1 P 24	24				T2 P 24	T3 P 24	24		30		
P 25	T1 P 25	25				T2 P 25	T3 P 25	25		31		
P 25.5	T1 P 25.5	25.5				T2 P 25.5	T3 P 25.5	25.5		31.5		
P 26	T1 P 26	26				T2 P 26	T3 P 26	26		32		
P 28	T1 P 28	28				T2 P 28	T3 P 28	28		34		
P 29	T1 P 29	29				T2 P 29	T3 P 29	29		35		
P 29.5	T1 P 29.5	29.5				T2 P 29.5	T3 P 29.5	29.5		35.5		
P 30	T1 P 30	30				T2 P 30	T3 P 30	30		36		
P 31	T1 P 31	31				T2 P 31	T3 P 31	31		37		
P 31.5	T1 P 31.5	31.5				T2 P 31.5	T3 P 31.5	31.5		37.5		
P 32	T1 P 32	32				T2 P 32	T3 P 32	32		38		
P 34	T1 P 34	34				T2 P 34	T3 P 34	34		40		

Notes
1) The cut angle for P3 to P10 is 35°~ 40°.
2) The dimensions shown in the "Bias-cut and Endless ring" column are the dimensions of endless rings. Bias-cut rings are produced by cutting endless rings.
3) In the case of bias-cut and endless ring, the deviation of ring thickness *W* (within one piece) shall be 0.05 mm max.
4) The clearance *Z* is shown when the backup ring is installed on a shaft toleranced to 0 mm / – 0.05 mm.

P 35~165

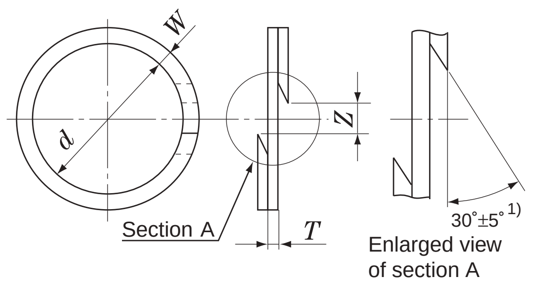
unit : mm

Applied O-ring No.	Spiral ring					Bias-cut and Endless ring [2)]						
	Backup ring No.	Dimensions				Backup ring No.		Dimensions				
		d	*W* [3)]	*T*	*Z* [4)]	Bias-cut	Endless	*d*		*D*		*T*
P 35	T1 P 35	35	3.0 $^{+0.03}_{-0.06}$	0.7 ± 0.05	2.5 ± 1.5	T2 P 35	T3 P 35	35	$^{+0.20}_{0}$	41	$^{0}_{-0.20}$	1.25 ± 0.1
P 35.5	T1 P 35.5	35.5				T2 P 35.5	T3 P 35.5	35.5		41.5		
P 36	T1 P 36	36				T2 P 36	T3 P 36	36		42		
P 38	T1 P 38	38				T2 P 38	T3 P 38	38		44		
P 39	T1 P 39	39				T2 P 39	T3 P 39	39		45		
P 40	T1 P 40	40				T2 P 40	T3 P 40	40		46		
P 41	T1 P 41	41				T2 P 41	T3 P 41	41		47		
P 42	T1 P 42	42				T2 P 42	T3 P 42	42		48		
P 44	T1 P 44	44				T2 P 44	T3 P 44	44		50		
P 45	T1 P 45	45				T2 P 45	T3 P 45	45		51		
P 46	T1 P 46	46				T2 P 46	T3 P 46	46		52		
P 48	T1 P 48	48				T2 P 48	T3 P 48	48		54		
P 49	T1 P 49	49				T2 P 49	T3 P 49	49		55		
P 50	T1 P 50	50				T2 P 50	T3 P 50	50		56		
P 48A	T1 P 48A	48	5.0 $^{+0.03}_{-0.06}$	0.9 ± 0.06	4.5 ± 1.5	T2 P 48A	T3 P 48A	48	$^{+0.25}_{0}$	58	$^{0}_{-0.25}$	1.9 ± 0.13
P 50A	T1 P 50A	50				T2 P 50A	T3 P 50A	50		60		
P 52	T1 P 52	52				T2 P 52	T3 P 52	52		62		
P 53	T1 P 53	53				T2 P 53	T3 P 53	53		63		
P 55	T1 P 55	55				T2 P 55	T3 P 55	55		65		
P 56	T1 P 56	56				T2 P 56	T3 P 56	56		66		
P 58	T1 P 58	58				T2 P 58	T3 P 58	58		68		
P 60	T1 P 60	60				T2 P 60	T3 P 60	60		70		
P 62	T1 P 62	62				T2 P 62	T3 P 62	62		72		
P 63	T1 P 63	63				T2 P 63	T3 P 63	63		73		
P 65	T1 P 65	65				T2 P 65	T3 P 65	65		75		
P 67	T1 P 67	67				T2 P 67	T3 P 67	67		77		
P 70	T1 P 70	70				T2 P 70	T3 P 70	70		80		
P 71	T1 P 71	71				T2 P 71	T3 P 71	71		81		
P 75	T1 P 75	75				T2 P 75	T3 P 75	75		85		
P 80	T1 P 80	80				T2 P 80	T3 P 80	80		90		
P 85	T1 P 85	85				T2 P 85	T3 P 85	85		95		
P 90	T1 P 90	90				T2 P 90	T3 P 90	90		100		
P 95	T1 P 95	95				T2 P 95	T3 P 95	95		105		
P 100	T1 P 100	100				T2 P 100	T3 P 100	100		110		
P 102	T1 P 102	102				T2 P 102	T3 P 102	102		112		
P 105	T1 P 105	105				T2 P 105	T3 P 105	105		115		
P 110	T1 P 110	110				T2 P 110	T3 P 110	110		120		
P 112	T1 P 112	112				T2 P 112	T3 P 112	112		122		
P 115	T1 P 115	115				T2 P 115	T3 P 115	115		125		
P 120	T1 P 120	120				T2 P 120	T3 P 120	120		130		
P 125	T1 P 125	125				T2 P 125	T3 P 125	125		135		
P 130	T1 P 130	130				T2 P 130	T3 P 130	130		140		
P 132	T1 P 132	132				T2 P 132	T3 P 132	132		142		
P 135	T1 P 135	135				T2 P 135	T3 P 135	135		145		
P 140	T1 P 140	140				T2 P 140	T3 P 140	140		150		
P 145	T1 P 145	145				T2 P 145	T3 P 145	145		155		
P 150	T1 P 150	150				T2 P 150	T3 P 150	150		160		
P 150A	T1 P 150A	150	7.5 $^{+0.03}_{-0.06}$	1.4 ± 0.08	6.0 ± 2.0	T2 P 150A	T3 P 150A	150	$^{+0.30}_{0}$	165	$^{0}_{-0.30}$	2.75 ± 0.15
P 155	T1 P 155	155				T2 P 155	T3 P 155	155		170		
P 160	T1 P 160	160				T2 P 160	T3 P 160	160		175		
P 165	T1 P 165	165				T2 P 165	T3 P 165	165		180		

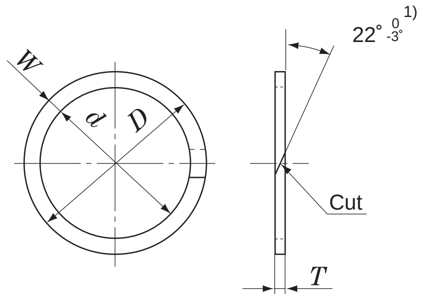
Backup Rings
P 170~**G** 300

■ Backup ring shape and dimensions

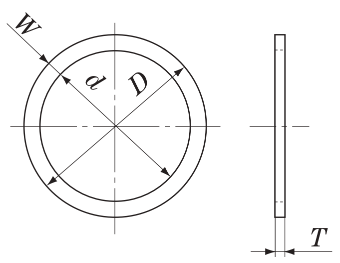
Spiral (T1)



Bias-cut (T2)



Endless (T3)



Remark) All rings material is tetrafluoroethylene resin.

P 170~360

unit : mm

Applied O-ring No.	Spiral ring					Bias-cut and Endless ring [2]						
	Backup ring No.	Dimensions				Backup ring No.		Dimensions				
		d	W [3]	T	Z [4]	Bias-cut	Endless	d		D		T
P 170	T1 P170	170	$7.5^{+0.03}_{-0.06}$	1.4 ± 0.08	6.0 ± 2.0	T2 P 170	T3 P 170	170	$^{+0.30}_{0}$	185	$^{0}_{-0.30}$	2.75 ± 0.15
P 175	T1 P175	175				T2 P 175	T3 P 175	175		190		
P 180	T1 P180	180				T2 P 180	T3 P 180	180		195		
P 185	T1 P185	185				T2 P 185	T3 P 185	185		200		
P 190	T1 P190	190				T2 P 190	T3 P 190	190		205		
P 195	T1 P195	195				T2 P 195	T3 P 195	195		210		
P 200	T1 P200	200				T2 P 200	T3 P 200	200		215		
P 205	T1 P205	205				T2 P 205	T3 P 205	205		220		
P 209	T1 P209	209				T2 P 209	T3 P 209	209		224		
P 210	T1 P210	210				T2 P 210	T3 P 210	210		225		
P 215	T1 P215	215				T2 P 215	T3 P 215	215		230		
P 220	T1 P220	220				T2 P 220	T3 P 220	220		235		
P 225	T1 P225	225				T2 P 225	T3 P 225	225		240		
P 230	T1 P230	230				T2 P 230	T3 P 230	230		245		
P 235	T1 P235	235				T2 P 235	T3 P 235	235		250		
P 240	T1 P240	240				T2 P 240	T3 P 240	240		255		
P 245	T1 P245	245				T2 P 245	T3 P 245	245		260		
P 250	T1 P250	250				T2 P 250	T3 P 250	250		265		
P 255	T1 P255	255				T2 P 255	T3 P 255	255		270		
P 260	T1 P260	260				T2 P 260	T3 P 260	260		275		
P 265	T1 P265	265				T2 P 265	T3 P 265	265		280		
P 270	T1 P270	270				T2 P 270	T3 P 270	270		285		
P 275	T1 P275	275				T2 P 275	T3 P 275	275		290		
P 280	T1 P280	280				T2 P 280	T3 P 280	280		295		
P 285	T1 P285	285				T2 P 285	T3 P 285	285		300		
P 290	T1 P290	290				T2 P 290	T3 P 290	290		305		
P 295	T1 P295	295				T2 P 295	T3 P 295	295		310		
P 300	T1 P300	300				T2 P 300	T3 P 300	300		315		
P 315	T1 P315	315				T2 P 315	T3 P 315	315		330		
P 320	T1 P320	320				T2 P 320	T3 P 320	320		335		
P 335	T1 P335	335				T2 P 335	T3 P 335	335		350		
P 340	T1 P340	340				T2 P 340	T3 P 340	340		355		
P 355	T1 P355	355				T2 P 355	T3 P 355	355		370		
P 360	T1 P360	360				T2 P 360	T3 P 360	360		375		

Notes
1) The cut angle for P3 to P10 is 35°~ 40°.
2) The dimensions shown in the "Bias-cut and Endless ring" column are the dimensions of endless rings.
Bias-cut rings are produced by cutting endless rings.
3) In the case of bias-cut and endless ring, the deviation of ring thickness W (within one piece) shall be 0.05 mm max.
4) The clearance Z is shown when the backup ring is installed on a shaft toleranced to 0 mm / – 0.05 mm.

P 375~400
G 25~300

unit : mm

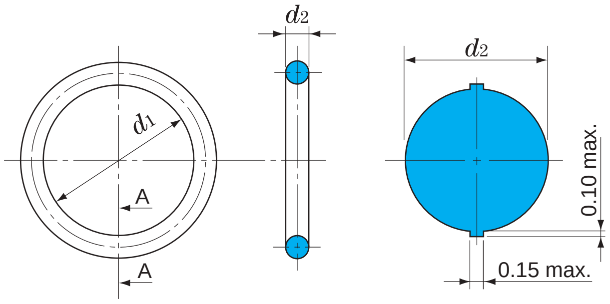
Applied O-ring No.	Spiral ring					Bias-cut and Endless ring [2]						
	Backup ring No.	Dimensions				Backup ring No.		Dimensions				
		d	W [3]	T	Z [4]	Bias-cut	Endless	d		D		T
P 375	T1 P 375	375	$7.5^{+0.03}_{-0.06}$	1.4 ± 0.08	6.0 ± 2.0	T2 P 375	T3 P 375	375	$^{+0.30}_{0}$	390	$^{0}_{-0.30}$	2.75 ± 0.15
P 385	T1 P 385	385				T2 P 385	T3 P 385	385		400		
P 400	T1 P 400	400				T2 P 400	T3 P 400	400		415		
G 25	T1 G 25	25	$2.5^{+0.03}_{-0.06}$	0.7 ± 0.05	4.5 ± 1.5	T2 G 25	T3 G 25	25	$^{+0.20}_{0}$	30	$^{0}_{-0.20}$	1.25 ± 0.1
G 30	T1 G 30	30				T2 G 30	T3 G 30	30		35		
G 35	T1 G 35	35				T2 G 35	T3 G 35	35		40		
G 40	T1 G 40	40				T2 G 40	T3 G 40	40		45		
G 45	T1 G 45	45				T2 G 45	T3 G 45	45		50		
G 50	T1 G 50	50				T2 G 50	T3 G 50	50		55		
G 55	T1 G 55	55				T2 G 55	T3 G 55	55	$^{+0.25}_{0}$	60	$^{0}_{-0.25}$	1.25 ± 0.1
G 60	T1 G 60	60				T2 G 60	T3 G 60	60		65		
G 65	T1 G 65	65				T2 G 65	T3 G 65	65		70		
G 70	T1 G 70	70				T2 G 70	T3 G 70	70		75		
G 75	T1 G 75	75				T2 G 75	T3 G 75	75		80		
G 80	T1 G 80	80				T2 G 80	T3 G 80	80		85		
G 85	T1 G 85	85				T2 G 85	T3 G 85	85		90		
G 90	T1 G 90	90				T2 G 90	T3 G 90	90		95		
G 95	T1 G 95	95				T2 G 95	T3 G 95	95		100		
G 100	T1 G 100	100				T2 G 100	T3 G 100	100		105		
G 105	T1 G 105	105				T2 G 105	T3 G 105	105		110		
G 110	T1 G 110	110				T2 G 110	T3 G 110	110		115		
G 115	T1 G 115	115				T2 G 115	T3 G 115	115		120		
G 120	T1 G 120	120				T2 G 120	T3 G 120	120		125		
G 125	T1 G 125	125				T2 G 125	T3 G 125	125		130		
G 130	T1 G 130	130				T2 G 130	T3 G 130	130		135		
G 135	T1 G 135	135				T2 G 135	T3 G 135	135		140		
G 140	T1 G 140	140				T2 G 140	T3 G 140	140		145		
G 145	T1 G 145	145				T2 G 145	T3 G 145	145		150		
G 150	T1 G 150	150	$5.0^{+0.03}_{-0.06}$	0.9 ± 0.06	6.0 ± 2.0	T2 G 150	T3 G 150	150	$^{+0.30}_{0}$	160	$^{0}_{-0.30}$	1.9 ± 0.13
G 155	T1 G 155	155				T2 G 155	T3 G 155	155		165		
G 160	T1 G 160	160				T2 G 160	T3 G 160	160		170		
G 165	T1 G 165	165				T2 G 165	T3 G 165	165		175		
G 170	T1 G 170	170				T2 G 170	T3 G 170	170		180		
G 175	T1 G 175	175				T2 G 175	T3 G 175	175		185		
G 180	T1 G 180	180				T2 G 180	T3 G 180	180		190		
G 185	T1 G 185	185				T2 G 185	T3 G 185	185		195		
G 190	T1 G 190	190				T2 G 190	T3 G 190	190		200		
G 195	T1 G 195	195				T2 G 195	T3 G 195	195		205		
G 200	T1 G 200	200				T2 G 200	T3 G 200	200		210		
G 210	T1 G 210	210				T2 G 210	T3 G 210	210		220		
G 220	T1 G 220	220				T2 G 220	T3 G 220	220		230		
G 230	T1 G 230	230				T2 G 230	T3 G 230	230		240		
G 240	T1 G 240	240				T2 G 240	T3 G 240	240		250		
G 250	T1 G 250	250				T2 G 250	T3 G 250	250		260		
G 260	T1 G 260	260				T2 G 260	T3 G 260	260		270		
G 270	T1 G 270	270				T2 G 270	T3 G 270	270		280		
G 280	T1 G 280	280				T2 G 280	T3 G 280	280		290		
G 290	T1 G 290	290				T2 G 290	T3 G 290	290		300		
G 300	T1 G 300	300				T2 G 300	T3 G 300	300		310		

V 15~1 055

JIS B 2401 V (for Vacuum Flanges)

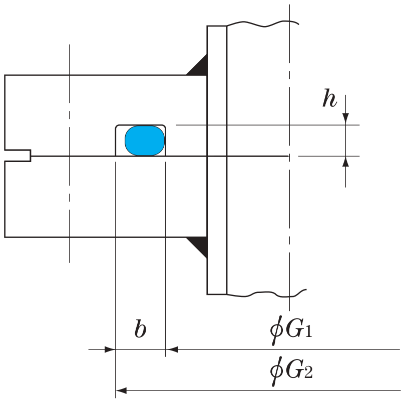
Material : JIS NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90, VMQ-70, FKM-70, FKM-90, HNBR-70, HNBR-90, ACM-70 and SBR-70 (Not standardized in the JIS)

■ O-ring shape and dimensions (unit : mm)



Cross section A-A

■ Fitting groove dimensions



V 15~1 055

unit : mm

O-ring dimensions			O-ring No.	Groove dimensions				
Bore dia. d_1 [1]		Cross section dia. d_2		G_1		G_2	b $^{+0.1}_{0}$	h $^{0}_{-0.2}$
14.5	± 0.20	4 ± 0.10	**V 15**	15	+ 1.0 0	25	5.0	3.0
23.5	± 0.24		**V 24**	24		34		
33.5	± 0.33		**V 34**	34		44		
39.5	± 0.37		**V 40**	40		50		
54.5	± 0.49		**V 55**	55		65		
69.0	± 0.61		**V 70**	70		80		
84.0	± 0.72		**V 85**	85		95		
99.0	± 0.83		**V 100**	100		110		
119.0	± 0.97		**V 120**	120		130		
148.5	± 1.18		**V 150**	150		160		
173.0	± 1.36		**V 175**	175		185		
222.5	± 1.70	6 ± 0.15	**V 225**	225		241	8.0	4.5
272.0	± 2.02		**V 275**	275		291		
321.5	± 2.34		**V 325**	325		341		
376.0	± 2.68		**V 380**	380	+ 1.5 0	396		
425.5	± 2.99		**V 430**	430		446		
475.0	± 3.30	10 ± 0.30	**V 480**	480		504	12.0	7.0
524.5	± 3.60		**V 530**	530		554		
579.0	± 3.92		**V 585**	585		609		
633.5	± 4.24		**V 640**	640		664		
683.0	± 4.54		**V 690**	690	+ 2.0 0	714		
732.5	± 4.83		**V 740**	740		764		
782.0	± 5.12		**V 790**	790		814		
836.5	± 5.44		**V 845**	845		869		
940.5	± 6.06		**V 950**	950		974		
1 044.0	± 6.67		**V 1 055**	1 055		1 079		

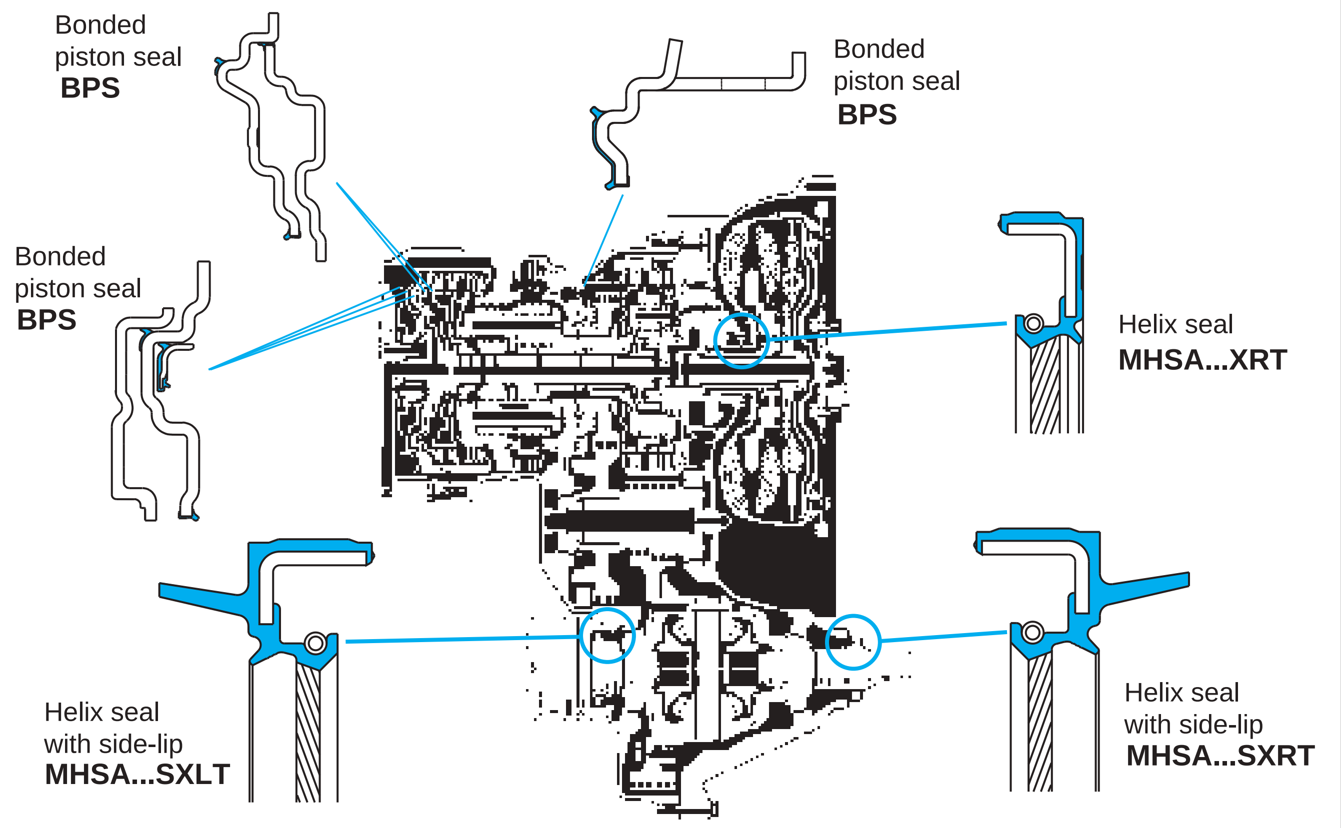
Note 1) The tolerance of bore diameter d_1 shows the specified values in JIS B 2401 for NBR-70-1, NBR-90, NBR-70-2, EPDM-70, EPDM-90 and SBR-70 (Not standardized in the JIS) products.
For VMQ-70 and ACM-70 products, the tolerance is 1.5 times these values, and for FKM-70, FKM-90, HNBR-70 and HNBR-90 products, 1.2 times.

3

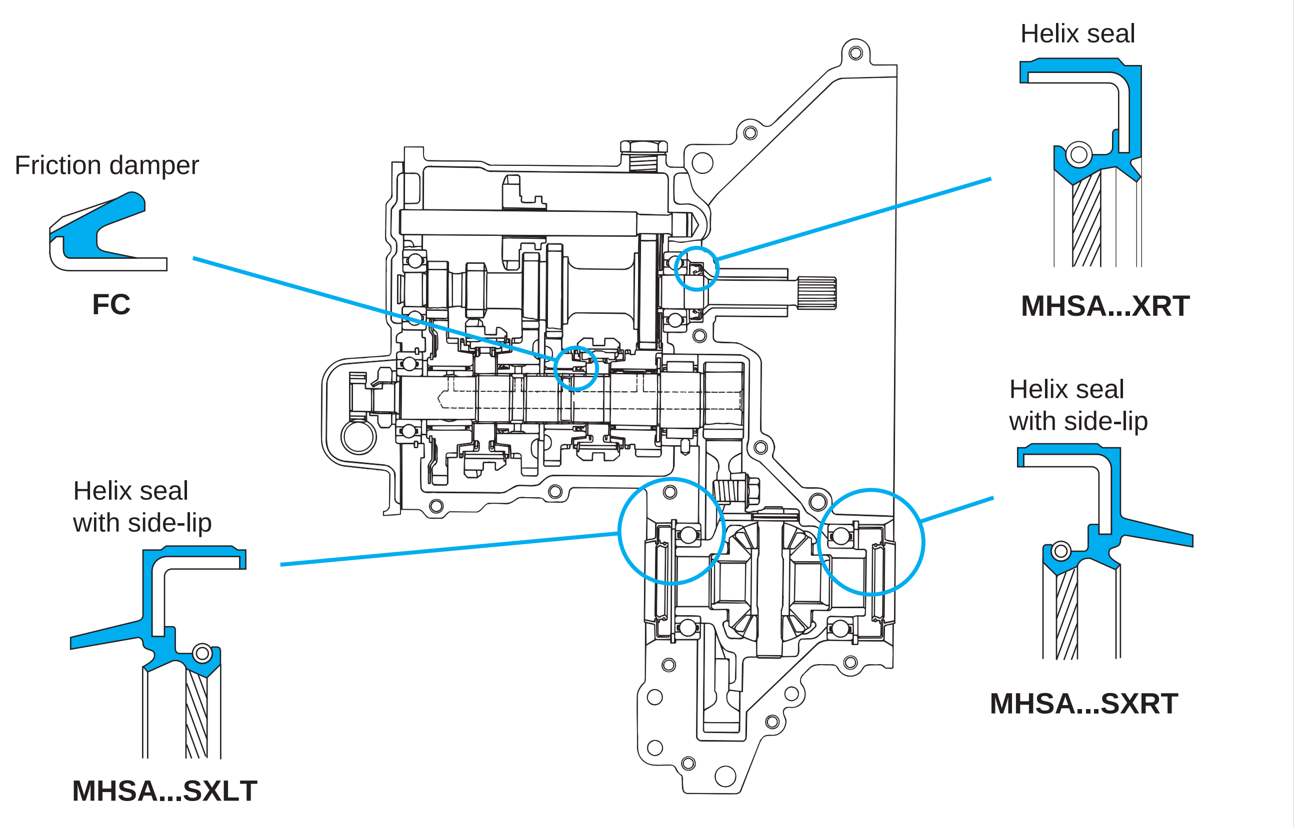
Application Examples of Oil Seals and O-Rings

3.1 Automobile

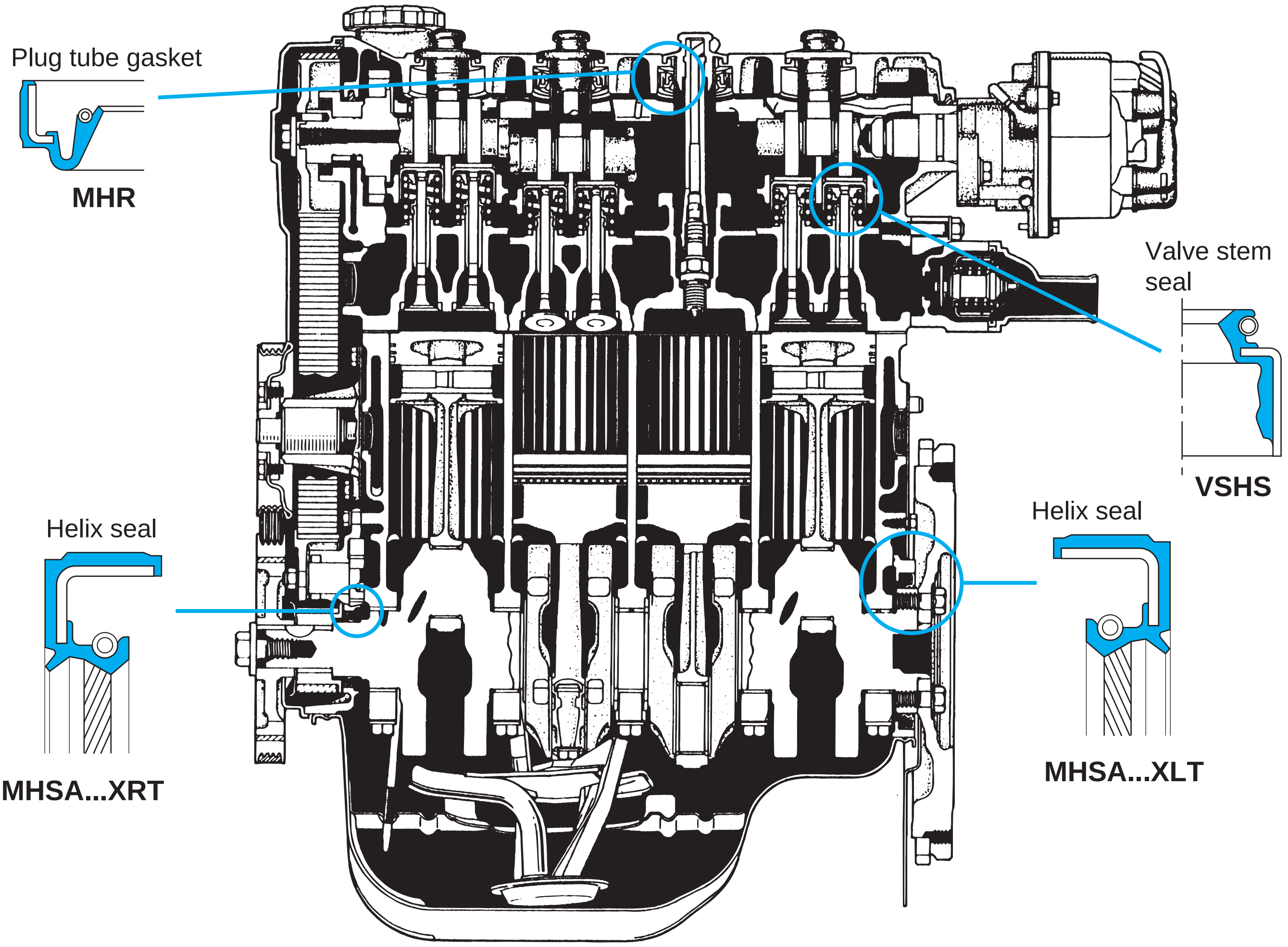
Automatic transaxle



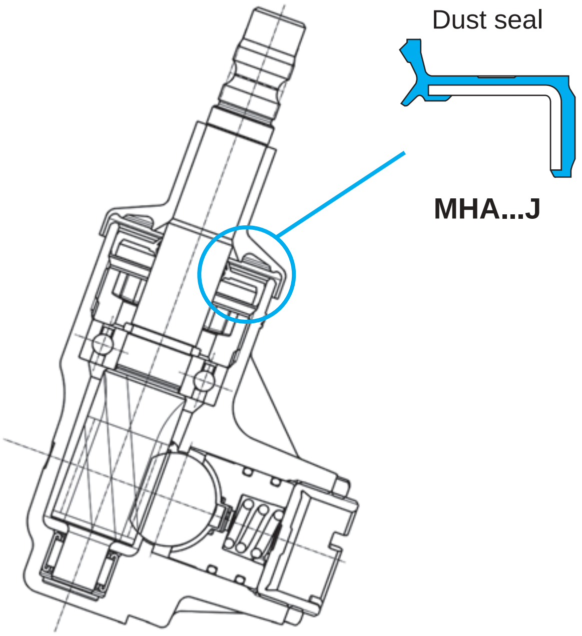
Manual transaxle



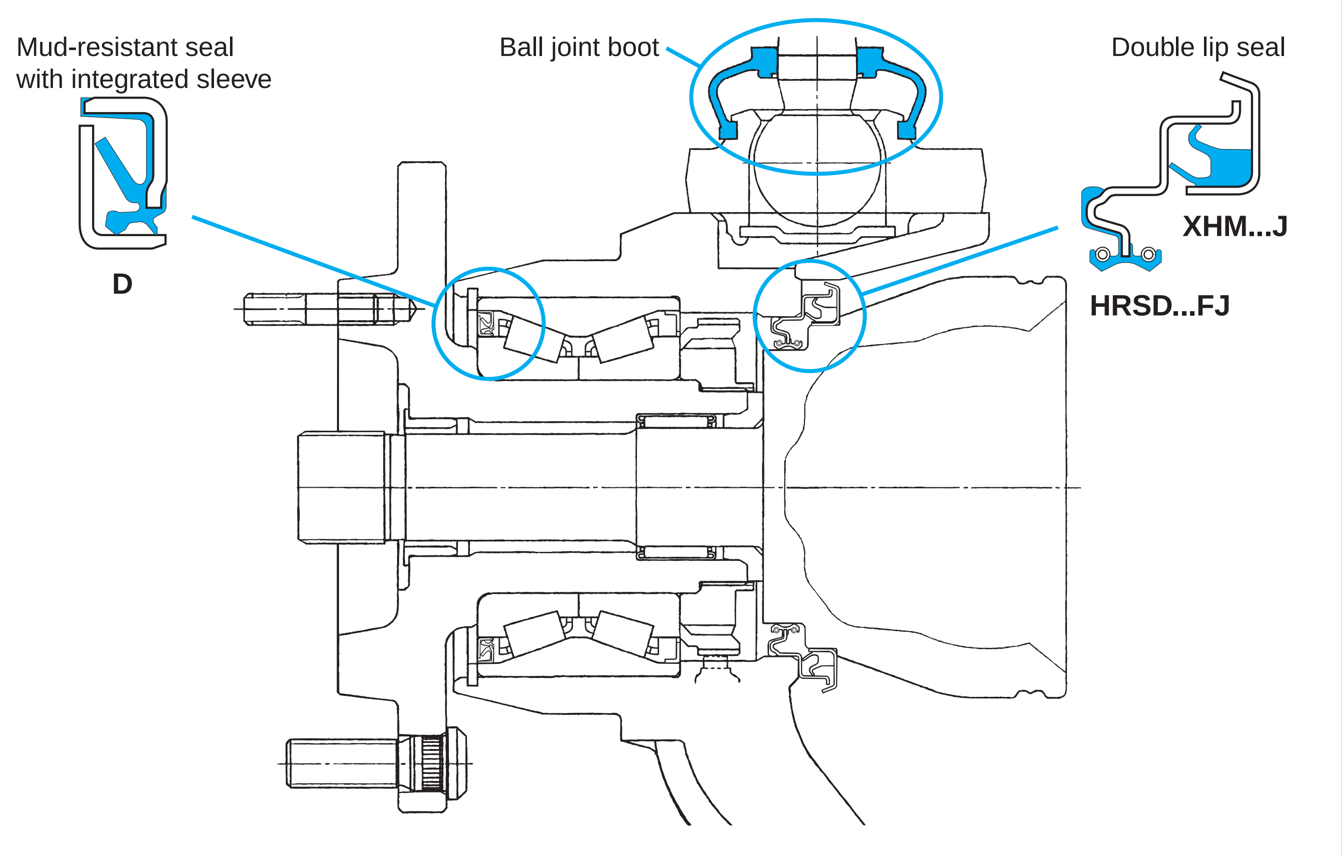
Engine



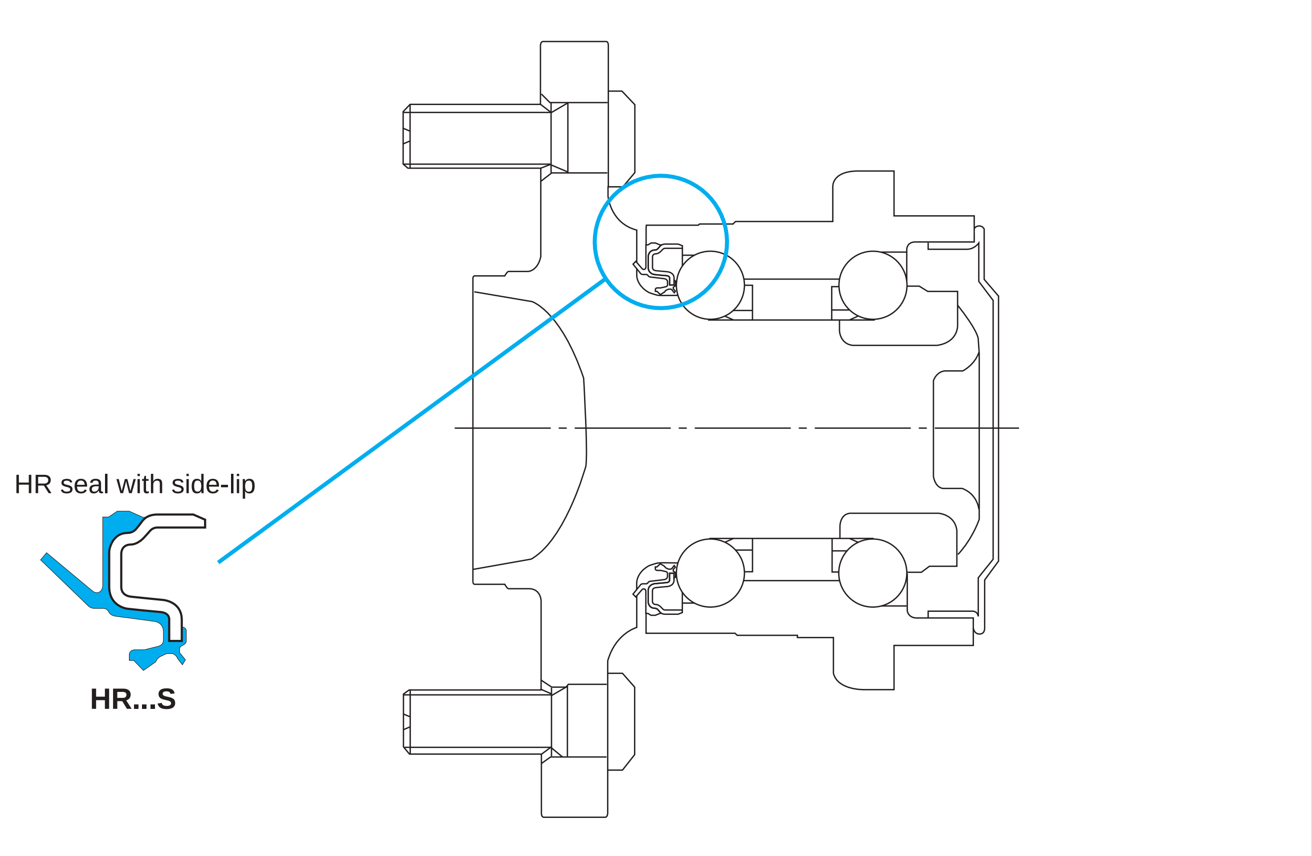
Electric power steering



Driving wheel

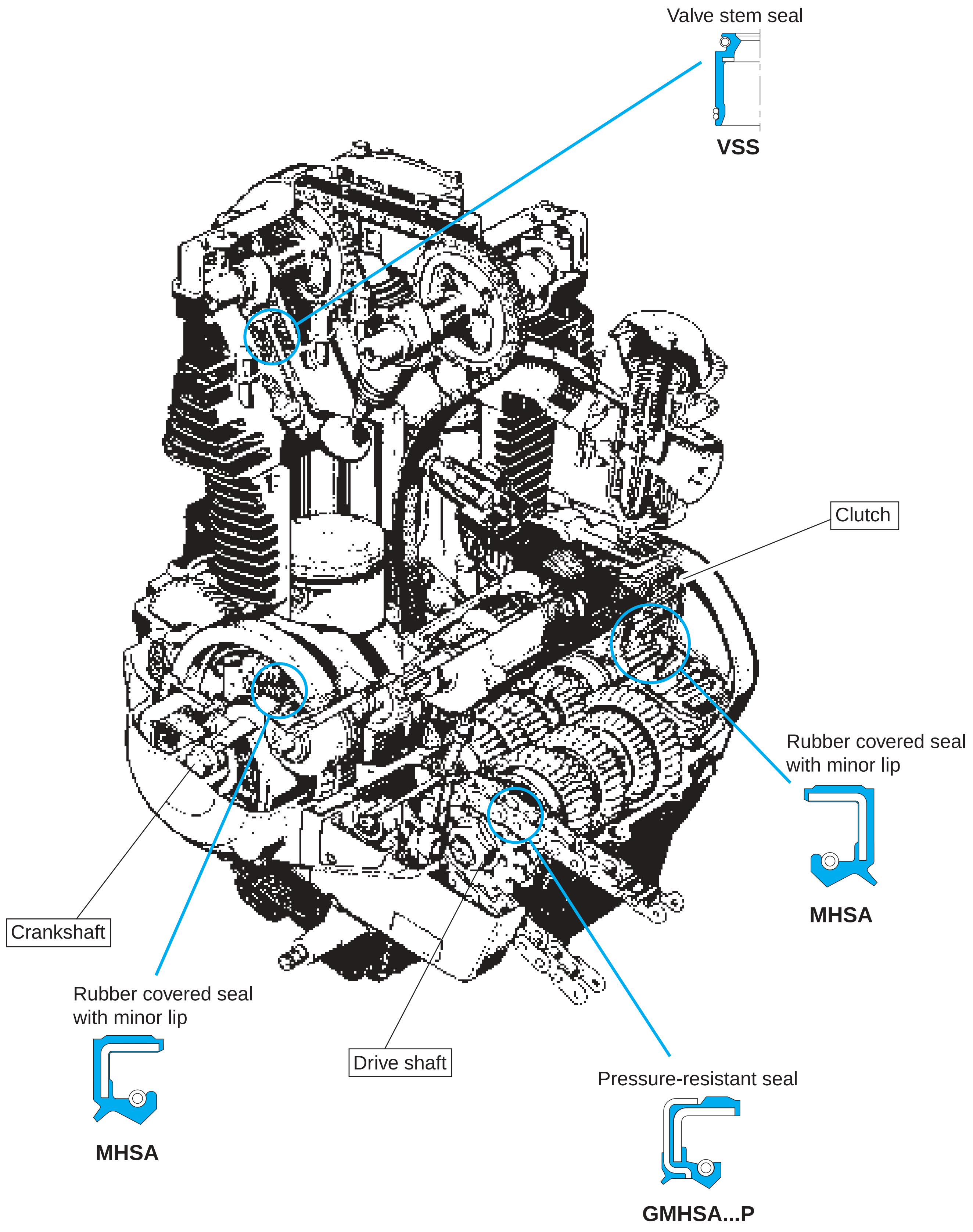


Driven wheel



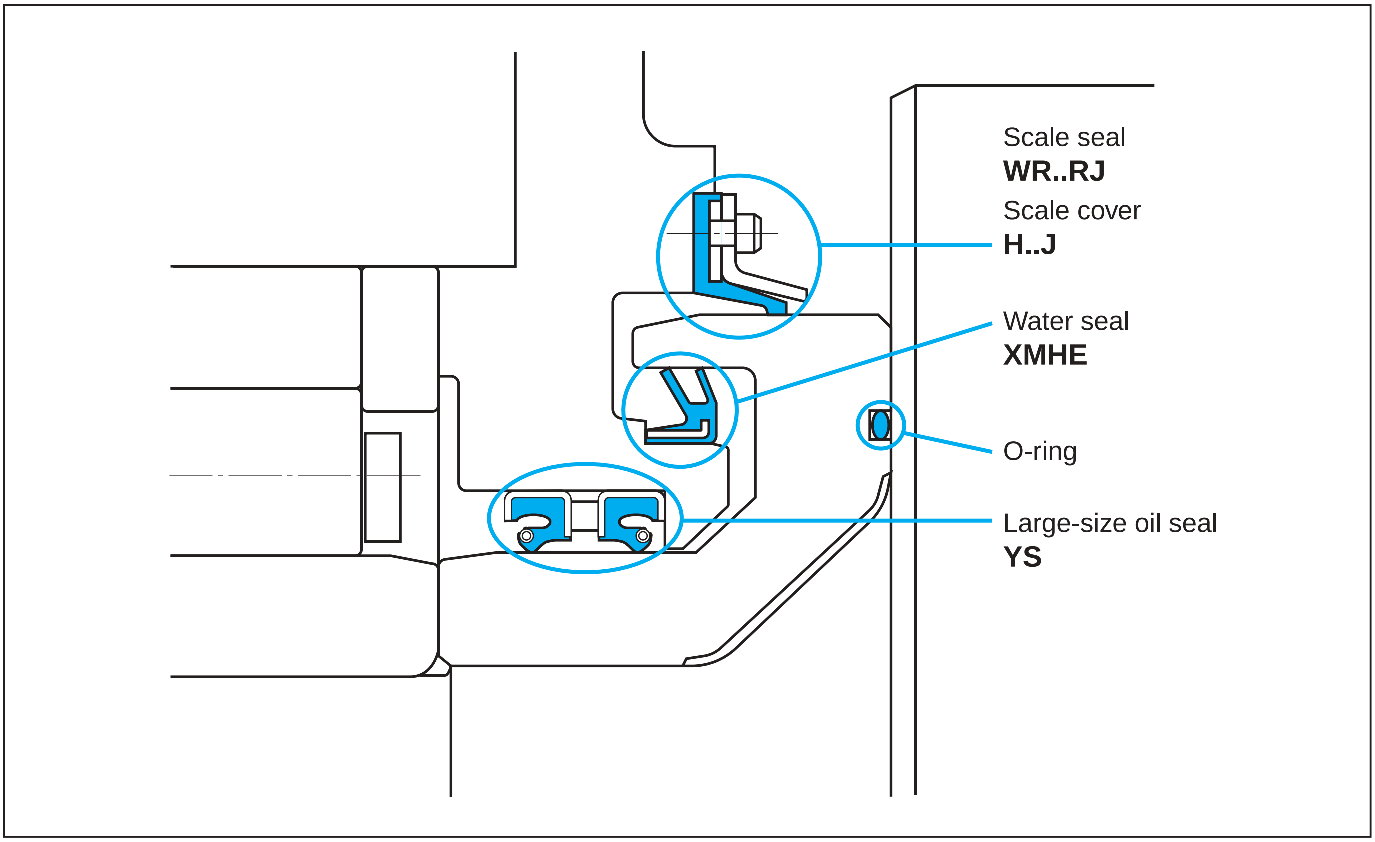
3.2 Motorcycle

■ Engine

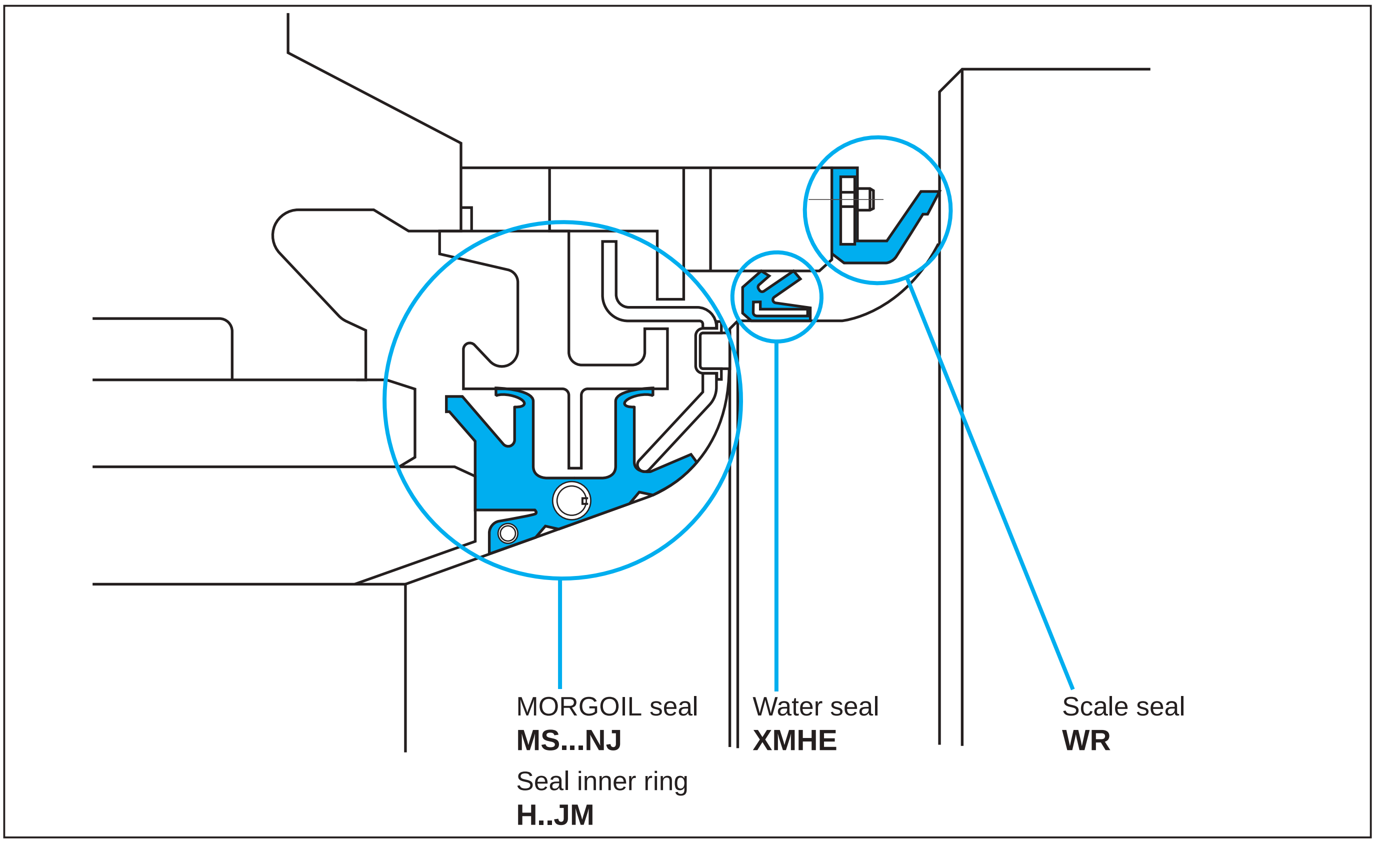


3.3 Rolling mill roll necks

Rolling bearing

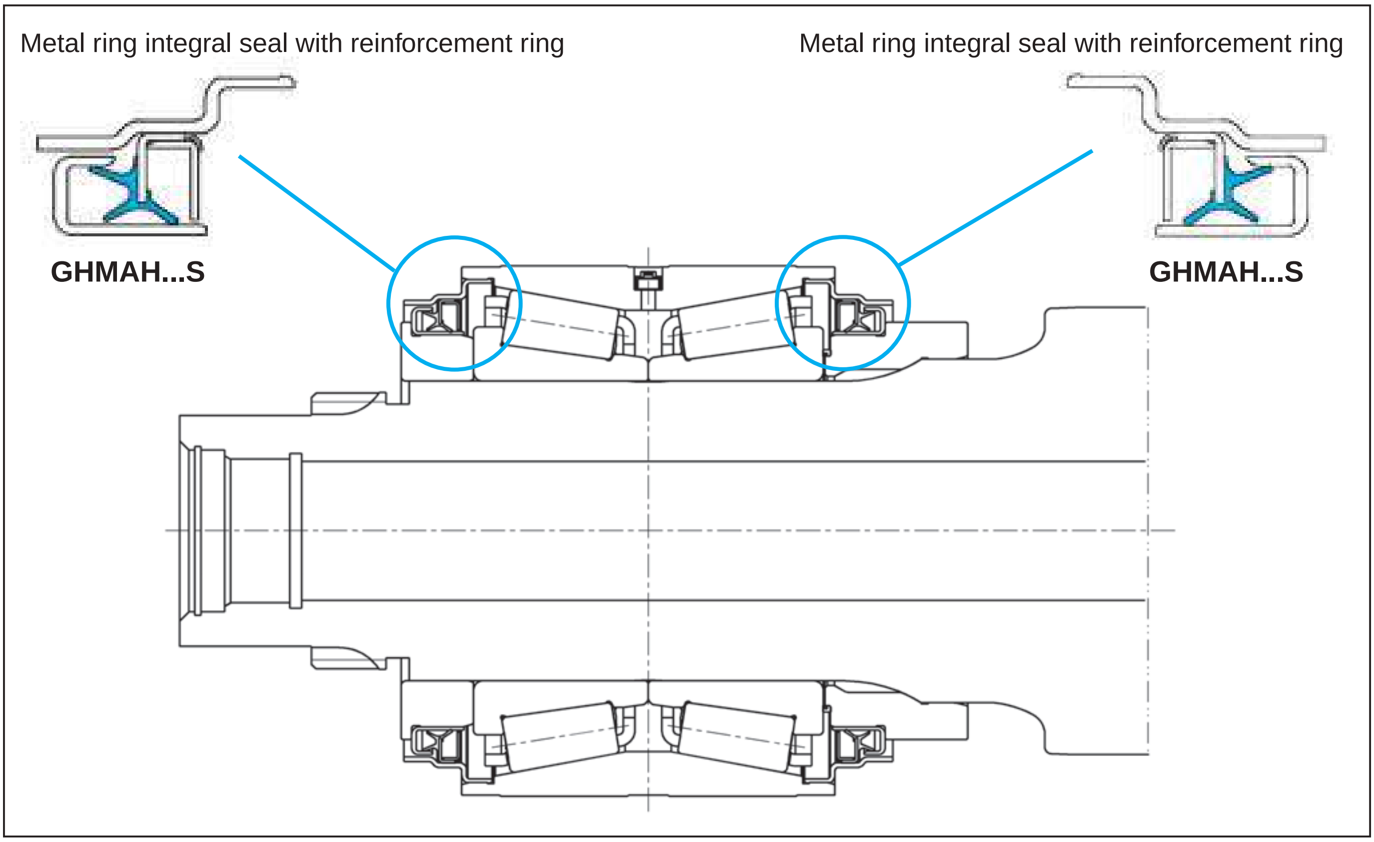


Oil-film bearing

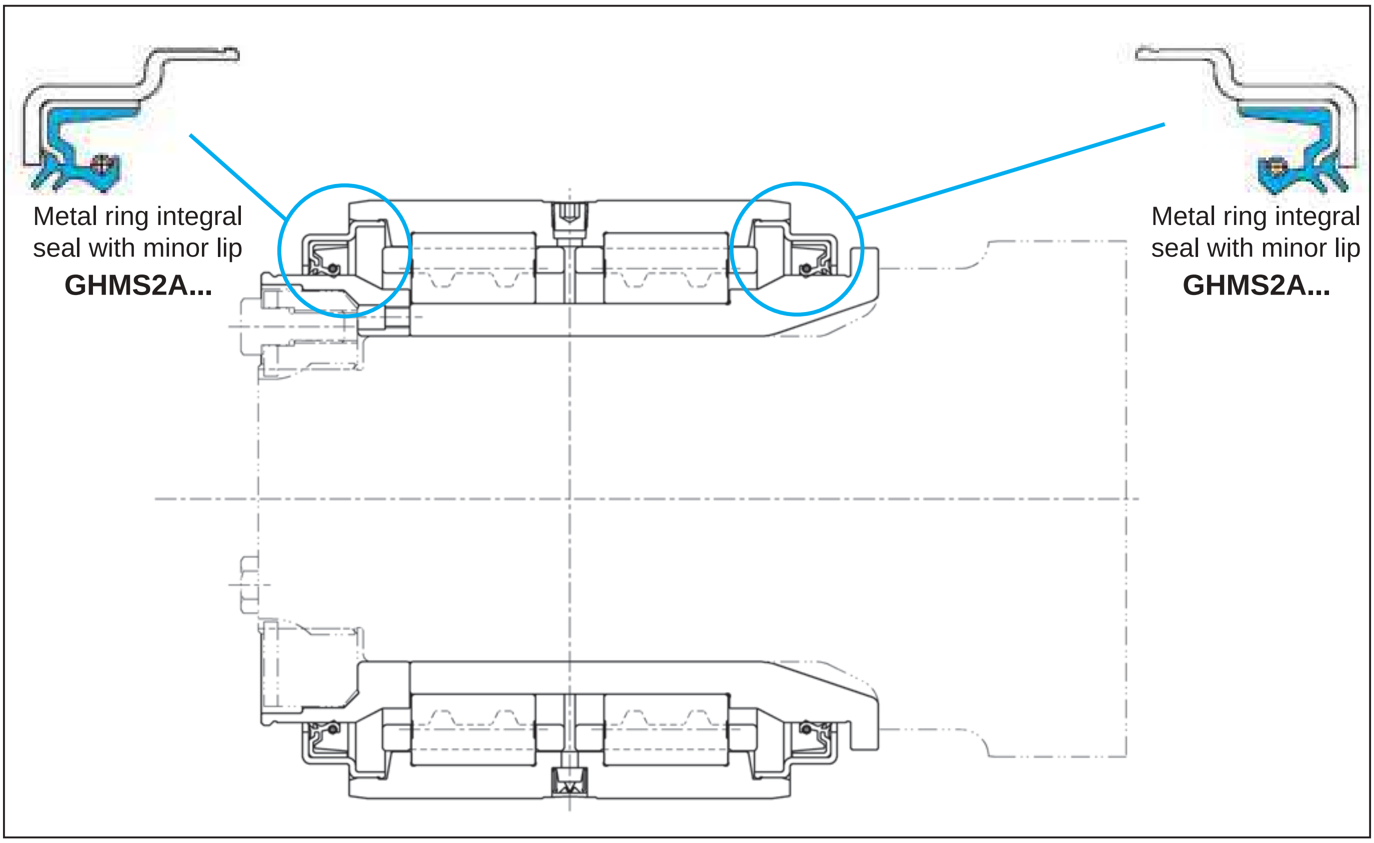


3.4 Rolling stock axles

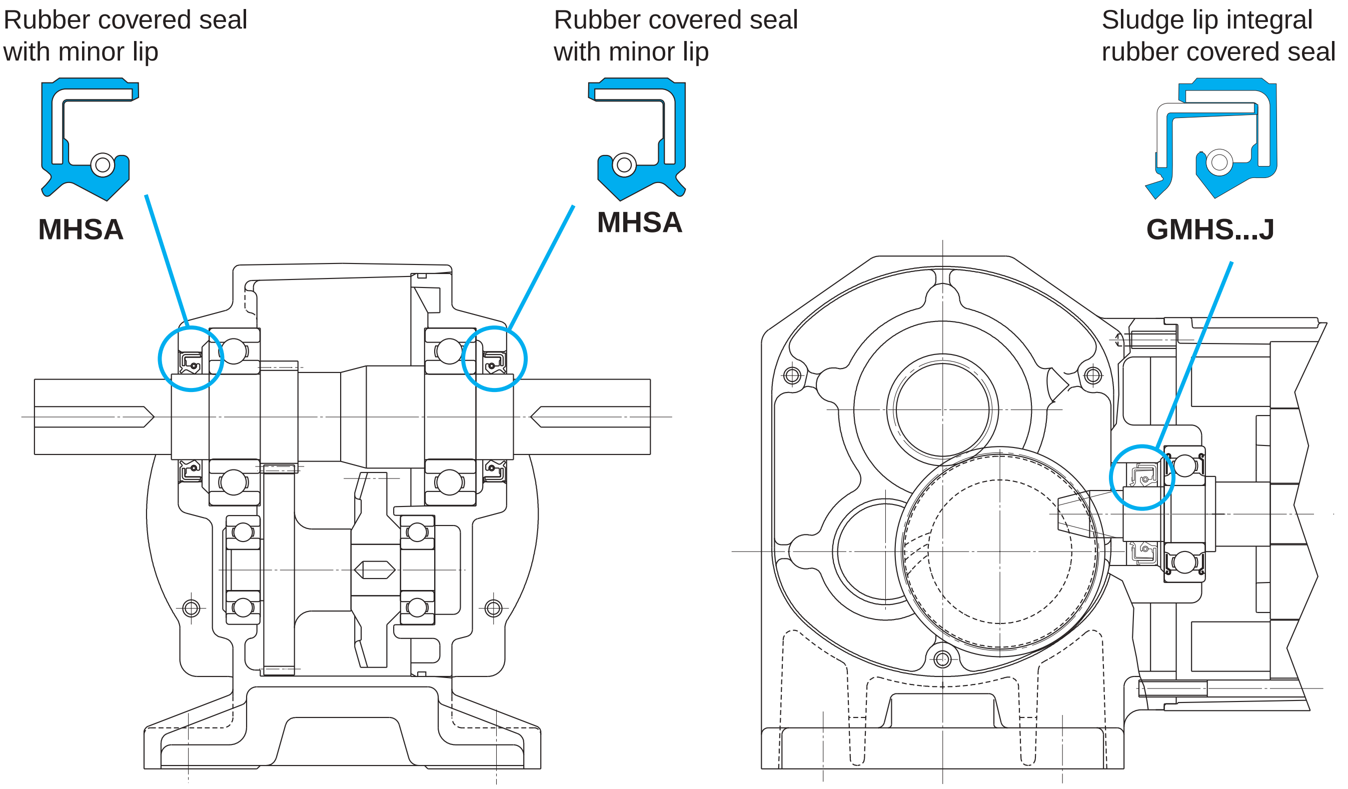
■ Double row tapered roller bearing



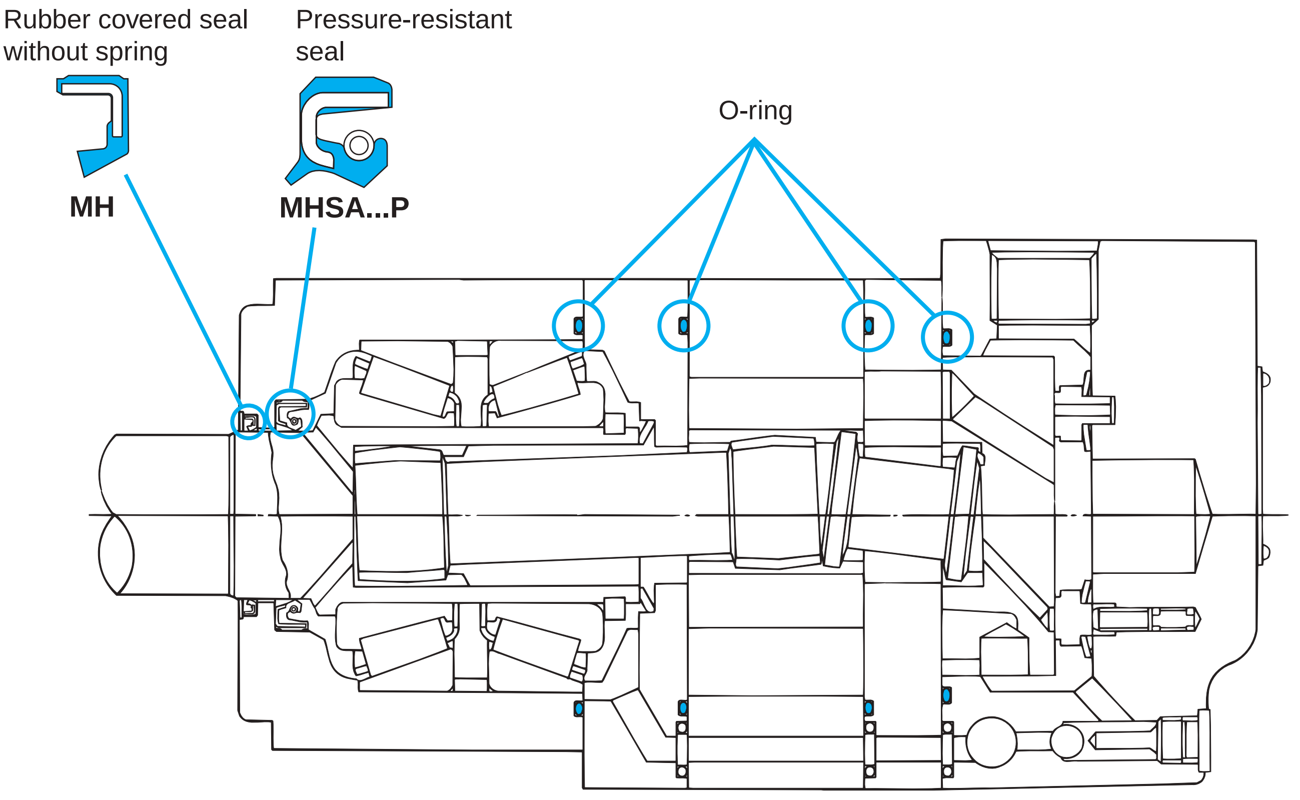
■ Double row cylindrical roller bearing



3.5 Geared motor



3.6 Hydraulic motor



4

References

4.1 Rubber-material varieties and properties

This table compares the properties of all available rubber materials, including those that are not suitable for oil seals and O-rings.

◎ : Resistant to the substance.
○ : Resistant to the substance except under extreme conditions.
△ : Not resistant to the substance except under specific favorable conditions.
× : Not resistant to the substance.

Kind of rubber (ASTM code)		Nitrile rubber (NBR)	Hydrogenated nitrile rubber (HNBR)	Acrylic rubber (ACM and ANM)	Silicone rubber (VMQ)	Fluoro rubber (FKM)	Chloroprene rubber (CR)	Ethylene-propylene rubber (EPM and EPDM)	Styrene-butadiene rubber (SBR)	Urethane rubber (U)	Natural rubber and isoprene rubber (NR and IR)	Butadiene rubber (BR)	Butyl rubber (IIR)	Chlorosulfonated polyethylene rubber (CSM)
Chemical structure		Acrylonitrile-butadiene copolymer	Hydrogenated acrylonitrile-butadiene copolymer	Acrylic-ester copolymer	Organopolysiloxane	Hexafluoropropylene-vinylidene-fluoride copolymer	Polychloroprene	Ethylene-propylene copolymer	Styrene-butadiene copolymer	Polyurethane	Polyisoprene	Polybutadiene	Isobutylene-isoprene copolymer	Chlorosulfonated polyethylene
Raw-rubber properties	Specific gravity	0.96 ~ 1.02	0.98 ~ 1.00	1.09 ~ 1.10	0.95 ~ 0.98	1.80 ~ 1.82	1.15 ~ 1.25	0.86 ~ 0.87	0.92 ~ 0.97	1.00 ~ 1.30	0.92	0.91 ~ 0.94	0.91 ~ 0.93	1.11 ~ 1.18
	Mooney viscosity ML_{1+4} (100 ˚C)	30 ~ 130	65 ~ 85	45 ~ 60	Liquid	35 ~ 160	45 ~ 120	40 ~ 100	30 ~ 70	25 ~ 60 (or liquid)	45 ~ 150	35 ~ 55	45 ~ 80	30 ~ 115
Compounded-rubber physical and resistance properties	Applicable JIS hardness range 1)	20 ~ 100	40 ~ 100	40 ~ 90	30 ~ 90	50 ~ 90	10 ~ 90	30 ~ 90	30 ~ 100	60 ~ 100	10 ~ 100	30 ~ 100	20 ~ 90	50 ~ 90
	Tensile strength (MPa)	5 ~ 25	5 ~ 30	7 ~ 12	3 ~ 12	7 ~ 20	5 ~ 25	5 ~ 20	2 ~ 30	20 ~ 45	3 ~ 35	2 ~ 20	5 ~ 20	7 ~ 20
	Elongation (%)	800 ~ 100	800 ~ 100	600 ~ 100	500 ~ 50	500 ~ 100	1 000 ~ 100	800 ~ 100	800 ~ 100	800 ~ 300	1 000 ~ 100	800 ~ 100	800 ~ 100	500 ~ 100
	Impact resilience	○	○	△	◎	△	◎	○	○	◎	◎	◎	△	○
	Tear strength	○	○	△	× ~ △	○	○	△	△	◎	◎	○	○	○
	Abrasion resistance	◎	◎	○	× ~ △	◎	○ ~ ◎	○	◎	◎	◎	◎	○	◎
	Flex crack resistance	○	○	○	× ~ ○	○	○	○	○	◎	◎	△	◎	○
	Servisable temperature range (˚C)	– 50 ~ 120	– 40 ~ 160	– 30 ~ 180	– 80 ~ 250	– 30 ~ 250	–60 ~ 120	–60 ~ 150	–60 ~ 70	–60 ~ 80	–75 ~ 90	–100 ~ 100	–60 ~ 150	–60 ~ 150
	Aging resistance	◎	◎	◎	◎	◎	◎	◎	○	○	○	○	◎	◎
	Resistance to weather	○	◎	◎	◎	◎	◎	◎	○	◎	○	○	◎	◎
	Ozone resistance	×	○	◎	◎	◎	◎	◎	×	◎	×	×	◎	◎
	Flame resistance	× ~ △	× ~ △	× ~ △	× ~ ○	◎	○	×	×	× ~ △	×	×	×	○
	Electrical insulation (Ω・cm) (volume resistivity)	10^{2} ~ 10^{11}	–	10^{8} ~ 10^{10}	10^{11} ~ 10^{16}	10^{10} ~ 10^{14}	10^{10} ~ 10^{12}	10^{12} ~ 10^{16}	10^{10} ~ 10^{15}	10^{9} ~ 10^{12}	10^{10} ~ 10^{15}	10^{14} ~ 10^{15}	10^{16} ~ 10^{18}	10^{12} ~ 10^{14}
	Gas permeability (10^{-16} m^4/N・s)	0.03 ~ 0.35	–	1	40	0.1	0.3	1.5	1.2	0.2	1.8	1.3 ~ 5	0.09 ~ 0.1	0.3
	Radiation resistance	△ ~ ○	△ ~ ○	× ~ ○	△ ~ ◎	△ ~ ○	△ ~ ○	×	○	○	△ ~ ○	×	×	△ ~ ○
Compound-rubber chemical resistance	Gasoline and light oil	◎	◎	◎	× ~ △	◎	○	×	×	◎	×	×	×	△
	Benzene and toluene	× ~ △	× ~ △	×	× ~ △	◎	×	△	×	× ~ △	×	×	△ ~ ○	× ~ △
	Alcohol	◎	◎	×	◎	◎	◎	◎	◎	△	◎	◎	◎	◎
	Ether	× ~ △	× ~ △	×	× ~ △	× ~ △	× ~ △	○	×	×	×	×	△ ~ ○	×
	Ketone (MEK)	×	×	×	○	×	△ ~ ○	◎	△ ~ ○	×	△ ~ ○	△ ~ ○	◎	△ ~ ○
	Ethyl acetate	× ~ △	× ~ △	×	△ ~ ◎	×	×	◎	× ~ △	△	× ~ △	× ~ △	◎	×
	Water	◎	◎	△	○	◎	◎	◎	◎	△	◎	◎	◎	◎
	Organic acid	× ~ △	× ~ △	×	○	×	× ~ △	×	×	×	×	×	△ ~ ○	△
	Concentrate inorganic acid solution	○	○	△	△	◎	○	○	△	×	△	△	◎	◎
	Dilute inorganic acid solution	○	○	○	○	◎	◎	◎	○	△	○	○	◎	◎
	Concentrate inorganic alkaline solution	○	○	△	◎	×	◎	◎	○	×	○	○	◎	◎
	Dilute inorganic alkaline solution	○	○	○	◎	△	◎	◎	○	×	○	○	◎	◎
Typical properties and major applications		The most common oil-resistant rubber material. Good resistance to abrasion. Widely used for oil seals and O-rings.	Excellent heat resistance and mechanical strength, in addition to having properties of nitrile rubber. An optimal material for oil seals for high-temperature or hydraulic applications.	Compared with nitrile rubber, superior in aging resistance. Suitable for sealing hydraulic fluids. Commonly used in automotive applications such as transmission, crankshaft, and valve stem.	Siloxane-based, excellent heat resistance and low-temperature resistance. Suitable for extreme-temperature environments and food processing applications.	Most excellent in resistance against various severe conditions. Optimal for use in proximity to engines.	Well-balanced in resistance to weather, oil and heat. Commonly used to isolate vibration and to coat wires. Some cases used for oil seals and O-rings.	Excellent weatherproof and waterproof. It is used for clad automobiles and wires.	Compared with natural rubber, superior in resistance to abrasion and aging. Used as the material of tires and belts.	Superior mechanical strength and oil resistance, however relatively low heat resistance and waterproofness. Used in applications where heat resistance is not essential.	Excellent resilience and superior abrasion resistance. Oil resistance is relatively low. Used for tires and shoes.	Excellent in resilience and mechanical strength. But inferior in resistance to oil and to pressure. Used for produce tires and sport goods.	Low gas permeability and inferior in resilience. Commonly used for tubes and vibration isolators.	Superior aging resistance and chemical resistance. Used for hoses and cladding.

Note 1) Hardness measured by durometer.

References : Japanese Standards Association. Shinban Gomu Zairyo Sentaku no Pointo ("Rubber Material Selection Guidelines, Rev.").
Society of Rubber Industry, Japan. Gomu Kogyo Binran ("Rubber Industry Handbook"), 4th ed.

4.2 SI units and conversion factors

SI units and conversion factors (1)

Mass	SI units	Other Units[1]	Conversion into SI units	Conversion from SI units
Angle	rad [radian(s)]	° [degree(s)] ✻ ' [minute(s)] ✻ " [second(s)] ✻	$1^\circ = \pi / 180$ rad $1' = \pi / 10\ 800$ rad $1'' = \pi / 648\ 000$ rad	1 rad = $57.295\ 78^\circ$
Length	m [meter(s)]	Å [Angstrom unit] μ [micron(s)] in [inch(es)] ft [foot(feet)] yd [yard(s)] mile [mile(s)]	1Å = 10^{-10} m = 0.1 nm = 100 pm 1μ = 1μm 1 in = 25.4 mm 1 ft = 12 in = 0.304 8 m 1 yd = 3 ft = 0.914 4 m 1 mile = 5 280 ft = 1 609.344 m	1 m = 10^{10} Å 1 m = 39.37 in 1 m = 3.280 8 ft 1 m = 1.093 6 yd 1 km = 0.621 4 mile
Area	m^2	a [are(s)] ha [hectare(s)] acre [acre(s)]	1 a = 100 m^2 1 ha = 10^4 m^2 1 acre = 4 840 yd^2 = 4 046.86 m^2	 1 km^2 = 247.1 acre
Volume	m^3	ℓ , L [liter(s)] ✻ cc [cubic centimeters] gal (US) [gallon(s)] floz (US) [fluid ounce(s)] barrel (US) [barrels(US)]	1 ℓ = 1 dm^3 = 10^{-3} m^3 1 cc = 1 cm^3 = 10^{-6} m^3 1 gal (US) = 231 in^3 = 3.785 41 dm^3 1 floz (US) = 29.573 5 cm^3 1 barrel (US) = 158.987 dm^3	1 m^3 = 10^3 ℓ 1 m^3 = 10^6 cc 1 m^3 = 264.17 gal 1 m^3 = 33 814 floz 1 m^3 = 6.289 8 barrel
Time	s [second(s)]	min [minute(s)] ✻ h [hour(s)] ✻ d [day(s)] ✻		
Angular velocity	rad/s			
Velocity	m/s	kn [knot(s)] m/h ✻	1 kn = 1 852 m/h	1 km/h = 0.539 96 kn
Acceleration	m/s^2	G	1 G = 9.806 65 m/s^2	1 m/s^2 = 0.101 97 G
Frequency	Hz [hertz]	c/s [cycle(s)/second]	1 c/s = 1 s^{-1} = 1 Hz	
Rotational frequency	s^{-1}	rpm [revolutions per minute] min^{-1} ✻ r/min	1 rpm = 1/60 s^{-1}	1 s^{-1} = 60 rpm
Mass	kg [kilogram(s)]	t [ton(s)] ✻ lb [pound(s)] gr [grain(s)] oz [ounce(s)] ton (UK) [ton(s) (UK)] ton (US) [ton(s) (US)] car [carat(s)]	1 t = 10^3 kg 1 lb = 0.453 592 37 kg 1 gr = 64.798 91 mg 1 oz = 1/16 lb = 28.349 5 g 1 ton (UK) = 1 016.05 kg 1 ton (US) = 907.185 kg 1 car = 200 mg	 1 kg = 2.204 6 lb 1 g = 15.432 4 gr 1 kg = 35.274 0 oz 1 t = 0.984 2 ton (UK) 1 t = 1.102 3 ton (US) 1 g = 5 car

Note 1) ✻ : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

SI units and conversion factors (2)

Mass	SI units	Other Units[1]	Conversion into SI units	Conversion from SI units
Density	kg/m^3			
Linear density	kg/m			
Momentum	kg • m/s			
Moment of momentum, Angular momentum	kg • m^2/s			
Moment of inertia	kg • m^2			
Force	N [newton(s)]	dyn [dyne(s)]	1 dyn = 10^{-5} N	1 N = 10^5 dyn
		kgf [kilogram-force]	1 kgf = 9.806 65 N	1 N = 0.101 97 kgf
		gf [gram-force]	1 gf = 9.806 65 × 10^{-3} N	
		tf [ton-force]	1 tf = 9.806 65 × 10^3 N	
		lbf [pound-force]	1 lbf = 4.448 22 N	1 N = 0.224 809 lbf
Moment of force	N • m [newton meter(s)]	gf • cm	1 gf • cm = 9.806 65 × 10^{-5} N • m	
		kgf • cm	1 kgf • cm = 9.806 65 × 10^{-2} N • m	
		kgf • m	1 kgf • m = 9.806 65 N • m	1 N • m = 0.101 97 kgf • m
		tf • m	1 tf • m = 9.806 65 × 10^3 N • m	
		lbf • ft	1 lbf • ft = 1.355 82 N • m	1 N • m = 0.737 56 lbf • ft
Pressure, Normal stress	Pa [pascal(s)] or N/m^2 {1 Pa = 1 N/m^2}	gf/ cm^2	1 gf/ cm^2 = 9.806 65 × 10 Pa	
		kgf/mm^2	1 kgf/mm^2 = 9.806 65 × 10^6 Pa	1 MPa = 0.101 97 kgf/mm^2
		kgf/m^2	1 kgf/m^2 = 9.806 65 Pa	1 Pa = 0.101 97 kgf/m^2
		lbf/in^2	1 lbf/in^2 = 6 894.76 Pa	1 Pa = 0.145 × 10^{-3} lbf/in^2
		bar [bar(s)]	1 bar = 10^5 Pa	1 Pa = 10^{-2} mbar
		at [engineering air pressure]	1 at = 1kgf/cm^2 = 9.806 65 × 10^4 Pa	
		mH_2O, mAq [meter water column]	1 mH_2O = 9.806 65 × 10^3 Pa	
		atm [atmosphere]	1 atm = 101 325 Pa	
		mHg [meter mercury column]	1 mHg = $\frac{101\ 325}{0.76}$ Pa	
		Torr [torr]	1 Torr = 1mmHg = 133.322 Pa	1 Pa = 7.500 6 × 10^{-3} Torr
Viscosity	Pa • s [pascal second]	P [poise]	10^{-2} P = 1 cP = 1 mPa • s	
		kgf • s/m^2	1 kgf • s/m^2 = 9.806 65 Pa • s	1 Pa • s = 0.101 97 kgf • s/m^2
Kinematic viscosity	m^2/s	St [stokes]	10^{-2} St = 1 cSt = 1 mm^2/s	
Surface tension	N/m			

SI units and conversion factors (3)

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J = 1 N • m}	eV [electron volt(s)] ❇ erg [erg(s)] kgf • m lbf • ft	1 eV = (1.602 189 2±0.000 004 6)×10^{-19} J 1 erg = 10^{-7} J 1 kgf • m = 9.806 65 J 1 lbf • ft = 1.355 82 J	1 J = 10^{7} erg 1 J = 0.101 97 kgf • m 1 J = 0.737 56 lbf • ft
Power	W [watt(s)]	erg/s [ergs per second] kgf • m/s PS [French horse-power] HP [horse-power (British)] lbf • ft/s	1 erg/s = 10^{-7} W 1 kgf • m/s = 9.806 65 W 1 PS = 75 kgf • m/s = 735.5 W 1 HP = 550 lbf • ft/s = 745.7 W 1 lbf • ft/s = 1.355 82 W	1 W = 0.101 97 kgf • m/s 1 W = 0.001 36 PS 1 W = 0.001 34 HP
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	˚C [celsius(s)] {t˚C = (t+273.15) K}	˚F [degree(s) Fahrenheit]	$t^\circ\text{F} = \frac{5}{9}(t-32)^\circ\text{C}$	$t^\circ\text{C} = (\frac{9}{5}t+32)^\circ\text{F}$
Linear expansion coefficient	K^{-1}	$^\circ\text{C}^{-1}$ [per degree]		
Heat	J [joule(s)] {1 J = 1 N • m}	erg [erg(s)] kgf • m cal$_{\text{IT}}$ [I. T. calories]	1 erg = 10^{-7} J 1 cal$_{\text{IT}}$ = 4.186 8 J 1 Mcal$_{\text{IT}}$ = 1.163 kW • h	1 J = 10^{7} erg 1 J = 0.238 85 cal$_{\text{IT}}$ 1 kW • h = 0.86 × 10^{6} cal$_{\text{IT}}$
Thermal conductivity	W/ (m • K)	W/ (m • ˚C) cal/ (s • m • ˚C)	1 W/ (m • ˚C) = 1 W/ (m • K) 1 cal/ (s • m • ˚C) = 4.186 05 W/ (m • K)	
Coeffcient of heat transfer	W/ (m^2 • K)	W/ (m^2 • ˚C) cal/ (s • m^2 • ˚C)	1 W/ (m^2 • ˚C) = 1 W/ (m^2 • K) 1 cal/ (s • m^2 • ˚C) = 4.186 05 W/ (m^2 • K)	
Heat capacity	J/K	J/˚C	1 J/˚C = 1 J/K	
Massic heat capacity	J/ (kg • K)	J/ (kg • ˚C)		

Note 1) ❇ : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

SI units and conversion factors (4)

Mass	SI units	Other Units1)	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge, **quantity of electricity**	C [coulomb(s)] {1 C = 1 A • s}	A • h ✻	1 A • h = 3.6 kC	
Tension, **electric potential**	V [volt(s)] {1 V = 1 W/A}			
Capacitance	F [farad(s)] {1 F = 1 C/V}			
Magnetic field strength	A/m	Oe [oersted(s)]	$1\ \mathrm{Oe} = \frac{10^3}{4\pi}\ \mathrm{A/m}$	$1\ \mathrm{A/m} = 4\pi \times 10^{-3}\ \mathrm{Oe}$
Magnetic flux density	T [tesla(s)] {1 T = 1 N/(A • m) = 1 Wb/m^2 = 1 V • s/m^2}	Gs [gauss(es)] γ [gamma(s)]	$1\ \mathrm{Gs} = 10^{-4}\ \mathrm{T}$ $1\ \gamma = 10^{-9}\ \mathrm{T}$	$1\ \mathrm{T} = 10^{4}\ \mathrm{Gs}$ $1\ \mathrm{T} = 10^{9}\ \gamma$
Magnetic flux	Wb [weber(s)] {1 Wb = 1 V • s}	Mx [maxwell(s)]	$1\ \mathrm{Mx} = 10^{-8}\ \mathrm{Wb}$	$1\ \mathrm{Wb} = 10^{8}\ \mathrm{Mx}$
Self inductance	H [henry (– ries)] {1 H = 1 Wb/A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω = 1 V/A}			
Conductance (to direct current)	S [siemens] {1 S = 1 A/V}			
Active power	W {1 W = 1 J/s = 1 A • V}			

4.3 Shaft tolerance

unit μm

Nominal shaft diameter mm		Deviation classes of shaft diameter															
over	up to	d6	e6	e7	e8	e9	f6	f7	f8	g5	g6	h5	h6	h7	h8	h9	h10
–	3	−20 −26	−14 −20	−14 −24	−14 −28	−14 −39	−6 −12	−6 −16	−6 −20	−2 −6	−2 −8	0 −4	0 −6	0 −10	0 −14	0 −25	0 −40
3	6	−30 −38	−20 −28	−20 −32	−20 −38	−20 −50	−10 −18	−10 −22	−10 −28	−4 −9	−4 −12	0 −5	0 −8	0 −12	0 −18	0 −30	0 −48
6	10	−40 −49	−25 −34	−25 −40	−25 −47	−25 −61	−13 −22	−13 −28	−13 −35	−5 −11	−5 −14	0 −6	0 −9	0 −15	0 −22	0 −36	0 −58
10	18	−50 −61	−32 −43	−32 −50	−32 −59	−32 −75	−16 −27	−16 −34	−16 −43	−6 −14	−6 −17	0 −8	0 −11	0 −18	0 −27	0 −43	0 −70
18	30	−65 −78	−40 −53	−40 −61	−40 −73	−40 −92	−20 −33	−20 −41	−20 −53	−7 −16	−7 −20	0 −9	0 −13	0 −21	0 −33	0 −52	0 −84
30	50	−80 −96	−50 −66	−50 −75	−50 −89	−50 −112	−25 −41	−25 −50	−25 −64	−9 −20	−9 −25	0 −11	0 −16	0 −25	0 −39	0 −62	0 −100
50	80	−100 −119	−60 −79	−60 −90	−60 −106	−60 −134	−30 −49	−30 −60	−30 −76	−10 −23	−10 −29	0 −13	0 −19	0 −30	0 −46	0 −74	0 −120
80	120	−120 −142	−72 −94	−72 −107	−72 −126	−72 −159	−36 −58	−36 −71	−36 −90	−12 −27	−12 −34	0 −15	0 −22	0 −35	0 −54	0 −87	0 −140
120	180	−145 −170	−85 −110	−85 −125	−85 −148	−85 −185	−43 −68	−43 −83	−43 −106	−14 −32	−14 −39	0 −18	0 −25	0 −40	0 −63	0 −100	0 −160
180	250	−170 −199	−100 −129	−100 −146	−100 −172	−100 −215	−50 −79	−50 −96	−50 −122	−15 −35	−15 −44	0 −20	0 −29	0 −46	0 −72	0 −115	0 −185
250	315	−190 −222	−110 −142	−110 −162	−110 −191	−110 −240	−56 −88	−56 −108	−56 −137	−17 −40	−17 −49	0 −23	0 −32	0 −52	0 −81	0 −130	0 −210
315	400	−210 −246	−125 −161	−125 −182	−125 −214	−125 −265	−62 −98	−62 −119	−62 −151	−18 −43	−18 −54	0 −25	0 −36	0 −57	0 −89	0 −140	0 −230
400	500	−230 −270	−135 −175	−135 −198	−135 −232	−135 −290	−68 −108	−68 −131	−68 −165	−20 −47	−20 −60	0 −27	0 −40	0 −63	0 −97	0 −155	0 −250
500	630	−260 −304	−145 −189	−145 −215	−145 −255	−145 −320	−76 −120	−76 −146	−76 −186	−22 −54	−22 −66	0 −32	0 −44	0 −70	0 −110	0 −175	0 −280
630	800	−290 −340	−160 −210	−160 −240	−160 −285	−160 −360	−80 −130	−80 −160	−80 −205	−24 −60	−24 −74	0 −36	0 −50	0 −80	0 −125	0 −200	0 −320
800	1 000	−320 −376	−170 −226	−170 −260	−170 −310	−170 −400	−86 −142	−86 −176	−86 −226	−26 −66	−26 −82	0 −40	0 −56	0 −90	0 −140	0 −230	0 −360

																Nominal shaft diameter mm	
js5	js6	js7	j5	j6	k5	k6	k7	m5	m6	m7	n5	n6	p6	r6	r7	over	up to
±2	±3	±5	±2	+4 −2	+4 0	+6 0	+10 0	+6 +2	+8 +2	+12 +2	+8 +4	+10 +4	+10 +6	+16 +10	+20 +10	–	3
±2.5	±4	±6	+3 −2	+6 −2	+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+16 +4	+13 +8	+16 +8	+20 +12	+23 +15	+27 +15	3	6
±3	±4.5	±7.5	+4 −2	+7 −2	+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+21 +6	+16 +10	+19 +10	+24 +15	+28 +19	+34 +19	6	10
±4	±5.5	±9	+5 −3	+8 −3	+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+25 +7	+20 +12	+23 +12	+29 +18	+34 +23	+41 +23	10	18
±4.5	±6.5	±10.5	+5 −4	+9 −4	+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+29 +8	+24 +15	+28 +15	+35 +22	+41 +28	+49 +28	18	30
±5.5	±8	±12.5	+6 −5	+11 −5	+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+34 +9	+28 +17	+33 +17	+42 +26	+50 +34	+59 +34	30	50
±6.5	±9.5	±15	+6 −7	+12 −7	+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+41 +11	+33 +20	+39 +20	+51 +32	+60 +41	+71 +41	50	65
														+62 +43	+73 +43	65	80
±7.5	±11	±17.5	+6 −9	+13 −9	+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+48 +13	+38 +23	+45 +23	+59 +37	+73 +51	+86 +51	80	100
														+76 +54	+89 +54	100	120
±9	±12.5	±20	+7 −11	+14 −11	+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+55 +15	+45 +27	+52 +27	+68 +43	+88 +63	+103 +63	120	140
														+90 +65	+105 +65	140	160
														+93 +68	+108 +68	160	180
±10	±14.5	±23	+7 −13	+16 −13	+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+63 +17	+51 +31	+60 +31	+79 +50	+106 +77	+123 +77	180	200
														+109 +80	+126 +80	200	225
														+113 +84	+130 +84	225	250
±11.5	±16	±26	+7 −16	±16	+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+72 +20	+57 +34	+66 +34	+88 +56	+126 +94	+146 +94	250	280
														+130 +98	+150 +98	280	315
±12.5	±18	±28.5	+7 −18	±18	+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+78 +21	+62 +37	+73 +37	+98 +62	+144 +108	+165 +108	315	355
														+150 +114	+171 +114	355	400
±13.5	±20	±31.5	+7 −20	±20	+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+86 +23	+67 +40	+80 +40	+108 +68	+166 +126	+189 +126	400	450
														+172 +132	+195 +132	450	500
±16	±22	±35	–	–	+32 0	+44 0	+70 0	+58 +26	+70 +26	+96 +26	+76 +44	+88 +44	+122 +78	+194 +150	+220 +150	500	560
														+199 +155	+225 +155	560	630
±18	±25	±40	–	–	+36 0	+50 0	+80 0	+66 +30	+80 +30	+110 +30	+86 +50	+100 +50	+138 +88	+225 +175	+255 +175	630	710
														+235 +185	+265 +185	710	800
±20	±28	±45	–	–	+40 0	+56 0	+90 0	+74 +34	+90 +34	+124 +34	+96 +56	+112 +56	+156 +100	+266 +210	+300 +210	800	900
														+276 +220	+310 +220	900	1 000

4.4 Housing bore tolerance

unit µm

Nominal bore diameter mm		Deviation classes of housing bore diameter																											Nominal bore diameter mm	
over	up to	E6	F6	F7	G6	G7	H6	H7	H8	H9	H10	JS5	JS6	JS7	J6	J7	K5	K6	K7	M5	M6	M7	N5	N6	N7	P6	P7	R7	over	up to
3	6	+28 +20	+18 +10	+22 +10	+12 +4	+16 +4	+8 0	+12 0	+18 0	+30 0	+48 0	±2.5	±4	±6	+5 −3	±6	0 −5	+2 −6	+3 −9	−3 −8	−1 −9	0 −12	−7 −12	−5 −13	−4 −16	−9 −17	−8 −20	−11 −23	3	6
6	10	+34 +25	+22 +13	+28 +13	+14 +5	+20 +5	+9 0	+15 0	+22 0	+36 0	+58 0	±3	±4.5	±7.5	+5 −4	+8 −7	+1 −5	+2 −7	+5 −10	−4 −10	−3 −12	0 −15	−8 −14	−7 −16	−4 −19	−12 −21	−9 −24	−13 −28	6	10
10	18	+43 +32	+27 +16	+34 +16	+17 +6	+24 +6	+11 0	+18 0	+27 0	+43 0	+70 0	±4	±5.5	±9	+6 −5	+10 −8	+2 −6	+2 −9	+6 −12	−4 −12	−4 −15	0 −18	−9 −17	−9 −20	−5 −23	−15 −26	−11 −29	−16 −34	10	18
18	30	+53 +40	+33 +20	+41 +20	+20 +7	+28 +7	+13 0	+21 0	+33 0	+52 0	+84 0	±4.5	±6.5	±10.5	+8 −5	+12 −9	+1 −8	+2 −11	+6 −15	−5 −14	−4 −17	0 −21	−12 −21	−11 −24	−7 −28	−18 −31	−14 −35	−20 −41	18	30
30	50	+66 +50	+41 +25	+50 +25	+25 +9	+34 +9	+16 0	+25 0	+39 0	+62 0	+100 0	±5.5	±8	±12.5	+10 −6	+14 −11	+2 −9	+3 −13	+7 −18	−5 −16	−4 −20	0 −25	−13 −24	−12 −28	−8 −33	−21 −37	−17 −42	−25 −50	30	50
50	80	+79 +60	+49 +30	+60 +30	+29 +10	+40 +10	+19 0	+30 0	+46 0	+74 0	+120 0	±6.5	±9.5	±15	+13 −6	+18 −12	+3 −10	+4 −15	+9 −21	−6 −19	−5 −24	0 −30	−15 −28	−14 −33	−9 −39	−26 −45	−21 −51	−30 −60	50	65
																												−32 −62	65	80
80	120	+94 +72	+58 +36	+71 +36	+34 +12	+47 +12	+22 0	+35 0	+54 0	+87 0	+140 0	±7.5	±11	±17.5	+16 −6	+22 −13	+2 −13	+4 −18	+10 −25	−8 −23	−6 −28	0 −35	−18 −33	−16 −38	−10 −45	−30 −52	−24 −59	−38 −73	80	100
																												−41 −76	100	120
120	180	+110 +85	+68 +43	+83 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+100 0	+160 0	±9	±12.5	±20	+18 −7	+26 −14	+3 −15	+4 −21	+12 −28	−9 −27	−8 −33	0 −40	−21 −39	−20 −45	−12 −52	−36 −61	−28 −68	−48 −88	120	140
																												−50 −90	140	160
																												−53 −93	160	180
180	250	+129 +100	+79 +50	+96 +50	+44 +15	+61 +15	+29 0	+46 0	+72 0	+115 0	+185 0	±10	±14.5	±23	+22 −7	+30 −16	+2 −18	+5 −24	+13 −33	−11 −31	−8 −37	0 −46	−25 −45	−22 −51	−14 −60	−41 −70	−33 −79	−60 −106	180	200
																												−63 −109	200	225
																												−67 −113	225	250
250	315	+142 +110	+88 +56	+108 +56	+49 +17	+69 +17	+32 0	+52 0	+81 0	+130 0	+210 0	±11.5	±16	±26	+25 −7	+36 −16	+3 −20	+5 −27	+16 −36	−13 −36	−9 −41	0 −52	−27 −50	−25 −57	−14 −66	−47 −79	−36 −88	−74 −126	250	280
																												−78 −130	280	315
315	400	+161 +125	+98 +62	+119 +62	+54 +18	+75 +18	+36 0	+57 0	+89 0	+140 0	+230 0	±12.5	±18	±28.5	+29 −7	+39 −18	+3 −22	+7 −29	+17 −40	−14 −39	−10 −46	0 −57	−30 −55	−26 −62	−16 −73	−51 −87	−41 −98	−87 −144	315	355
																												−93 −150	355	400
400	500	+175 +135	+108 +68	+131 +68	+60 +20	+83 +20	+40 0	+63 0	+97 0	+155 0	+250 0	±13.5	±20	±31.5	+33 −7	+43 −20	+2 −25	+8 −32	+18 −45	−16 −43	−10 −50	0 −63	−33 −60	−27 −67	−17 −80	−55 −95	−45 −108	−103 −166	400	450
																												−109 −172	450	500
500	630	+189 +145	+120 +76	+146 +76	+66 +22	+92 +22	+44 0	+70 0	+110 0	+175 0	+280 0	±16	±22	±35	–	–	0 −32	0 −44	0 −70	−26 −58	−26 −70	−26 −96	−44 −76	−44 −88	−44 −114	−78 −122	−78 −148	−150 −220	500	560
																												−155 −225	560	630
630	800	+210 +160	+130 +80	+160 +80	+74 +24	+104 +24	+50 0	+80 0	+125 0	+200 0	+320 0	±18	±25	±40	–	–	0 −36	0 −50	0 −80	−30 −66	−30 −80	−30 −110	−50 −86	−50 −100	−50 −130	−88 −138	−88 −168	−175 −255	630	710
																												−185 −265	710	800
800	1 000	+226 +170	+142 +86	+176 +86	+82 +26	+116 +26	+56 0	+90 0	+140 0	+230 0	+360 0	±20	±28	±45	–	–	0 −40	0 −56	0 −90	−34 −74	−34 −90	−34 −124	−56 −96	−56 −112	−56 −146	−100 −156	−100 −190	−210 −300	800	900
																												−220 −310	900	1 000
1 000	1 250	+261 +195	+164 +98	+203 +98	+94 +28	+133 +28	+66 0	+105 0	+165 0	+260 0	+420 0	±23.5	±33	±52.5	–	–	0 −47	0 −66	0 −105	−40 −87	−40 −106	−40 −145	−66 −113	−66 −132	−66 −171	−120 −186	−120 −225	−250 −355	1 000	1 120
																												−260 −365	1 120	1 250

4.5 ˚C -˚F temperature conversion table

˚C		˚F	˚C		˚F	˚C		˚F	˚C		˚F
– 73	**– 100**	– 148	– 1.6	**29**	84.2	17.7	**64**	147.2	37.1	**99**	210.2
– 62	**– 80**	– 112	– 1.1	**30**	86.0	18.2	**65**	149.0	37.7	**100**	212
– 51	**– 60**	– 76	– 0.6	**31**	87.8	18.8	**66**	150.8	40.6	**105**	221
– 40	**– 40**	– 40	0	**32**	89.6	19.3	**67**	152.6	43	**110**	230
– 29	**– 20**	– 4	0.5	**33**	91.4	19.9	**68**	154.4	49	**120**	248
– 23.3	**– 10**	14	1.1	**34**	93.2	20.4	**69**	156.2	54	**130**	266
– 17.7	**0**	32	1.6	**35**	95.0	21.0	**70**	158.0	60	**140**	284
– 17.2	**1**	33.8	2.2	**36**	96.8	21.5	**71**	159.8	65	**150**	302
– 16.6	**2**	35.6	2.7	**37**	98.6	22.2	**72**	161.6	71	**160**	320
– 16.1	**3**	37.4	3.3	**38**	100.4	22.7	**73**	163.4	76	**170**	338
– 15.5	**4**	39.2	3.8	**39**	102.2	23.3	**74**	165.2	83	**180**	356
– 15.0	**5**	41.0	4.4	**40**	104.0	23.8	**75**	167.0	88	**190**	374
– 14.4	**6**	42.8	4.9	**41**	105.8	24.4	**76**	168.8	93	**200**	392
– 13.9	**7**	44.6	5.4	**42**	107.6	25.0	**77**	170.6	121	**250**	482
– 13.3	**8**	46.4	6.0	**43**	109.4	25.5	**78**	172.4	149	**300**	572
– 12.7	**9**	48.2	6.6	**44**	111.2	26.2	**79**	174.2	177	**350**	662
– 12.2	**10**	50.0	7.1	**45**	113.0	26.8	**80**	176.0	204	**400**	752
– 11.6	**11**	51.8	7.7	**46**	114.8	27.3	**81**	177.8	232	**450**	842
– 11.1	**12**	53.6	8.2	**47**	116.6	27.7	**82**	179.6	260	**500**	932
– 10.5	**13**	55.4	8.8	**48**	118.4	28.2	**83**	181.4	288	**550**	1 022
– 10.0	**14**	57.2	9.3	**49**	120.2	28.8	**84**	183.2	315	**600**	1 112
– 9.4	**15**	59.0	9.9	**50**	122.0	29.3	**85**	185.0	343	**650**	1 202
– 8.8	**16**	61.8	10.4	**51**	123.8	29.9	**86**	186.8	371	**700**	1 292
– 8.3	**17**	63.6	11.1	**52**	125.6	30.4	**87**	188.6	399	**750**	1 382
– 7.7	**18**	65.4	11.5	**53**	127.4	31.0	**88**	190.4	426	**800**	1 472
– 7.2	**19**	67.2	12.1	**54**	129.2	31.5	**89**	192.2	454	**850**	1 562
– 6.6	**20**	68.0	12.6	**55**	131.0	32.1	**90**	194.0	482	**900**	1 652
– 6.1	**21**	69.8	13.2	**56**	132.8	32.6	**91**	195.8	510	**950**	1 742
– 5.5	**22**	71.6	13.7	**57**	134.6	33.3	**92**	197.6	538	**1 000**	1 832
– 5.0	**23**	73.4	14.3	**58**	136.4	33.8	**93**	199.4	593	**1 100**	2 012
– 4.4	**24**	75.2	14.8	**59**	138.2	34.4	**94**	201.2	648	**1 200**	2 192
– 3.9	**25**	77.0	15.6	**60**	140.0	34.9	**95**	203.0	704	**1 300**	2 372
– 3.3	**26**	78.8	16.1	**61**	141.8	35.5	**96**	204.8	760	**1 400**	2 552
– 2.8	**27**	80.6	16.6	**62**	143.6	36.1	**97**	206.6	815	**1 500**	2 732
– 2.2	**28**	82.4	17.1	**63**	145.4	36.6	**98**	208.4	871	**1 600**	2 937

Example

The center columns of numbers is the temperature in either degrees Centigrade (˚C) or Fahrenheit (˚F) whichever is desired to convert into the other.
If degrees Fahrenheit is given, read degrees Centigrade to the left.It degrees Centigrade is given, read degrees Fahrenheit to the right.

$C=\frac{5}{9}(F-32)$

$F=\frac{9}{5}C+32$

4.6 Steel hardness conversion table

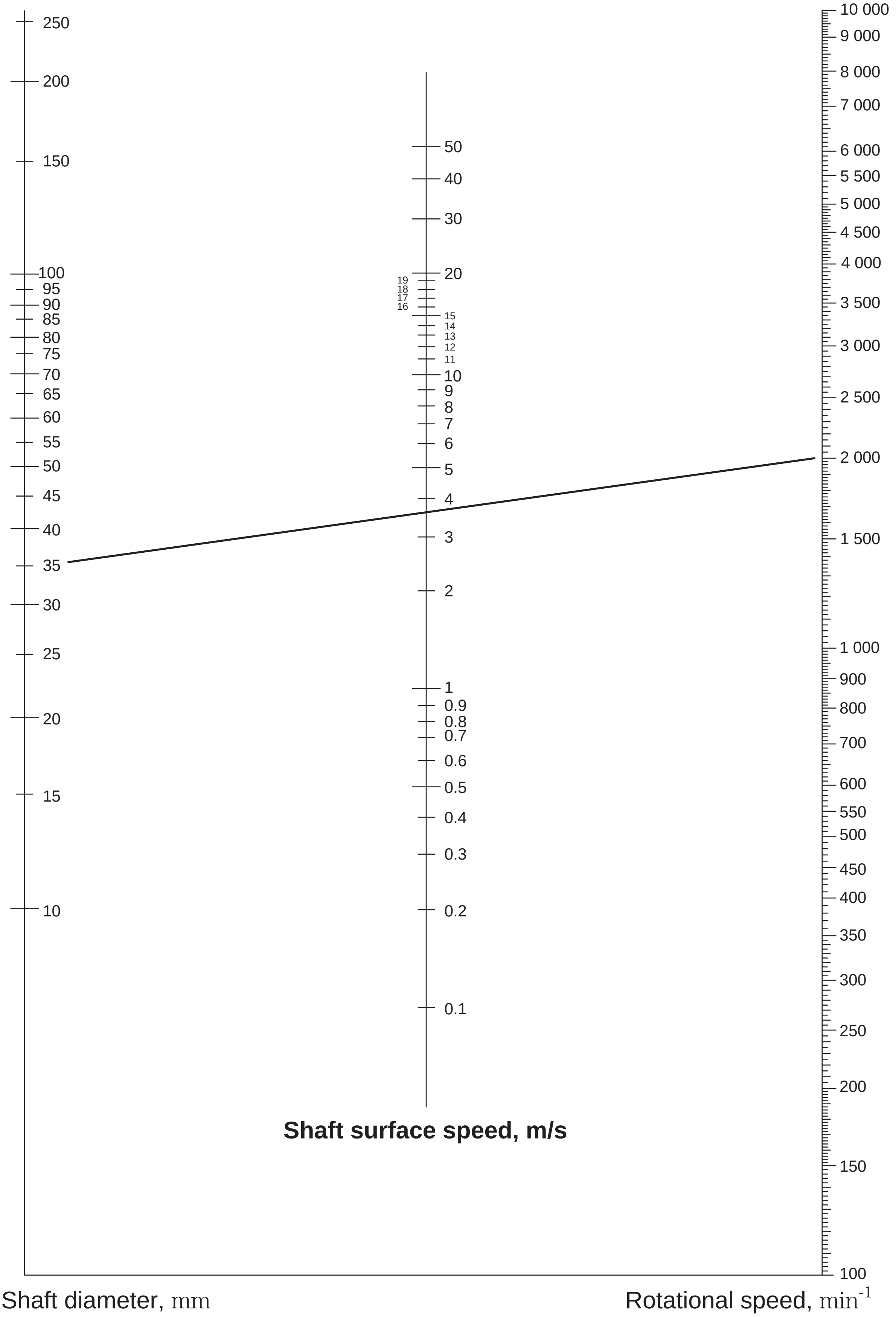
Rockwell	Vicker's	Brinell		Rockwell		Shore
C-scale 1471.0 N {150 kgf}		Standard ball	Tungsten carbide ball	A-scale 588.4 N {60 kgf}	B-scale 980.7 N {100 kgf}	
68	940			85.6		97
67	900			85.0		95
66	865			84.5		92
65	832		739	83.9		91
64	800		722	83.4		88
63	772		705	82.8		87
62	746		688	82.3		85
61	720		670	81.8		83
60	697		654	81.2		81
59	674		634	80.7		80
58	653		615	80.1		78
57	633		595	79.6		76
56	613		577	79.0		75
55	595	–	560	78.5		74
54	577	–	543	78.0		72
53	560	–	525	77.4		71
52	544	500	512	76.8		69
51	528	487	496	76.3		68
50	513	475	481	75.9		67
49	498	464	469	75.2		66
48	484	451	455	74.7		64
47	471	442	443	74.1		63
46	458	432	432	73.6		62
45	446	421		73.1		60
44	434	409		72.5		58
43	423	400		72.0		57
42	412	390		71.5		56
41	402	381		70.9		55
40	392	371		70.4	–	54
39	382	362		69.9	–	52
38	372	353		69.4	–	51
37	363	344		68.9	–	50
36	354	336		68.4	(109.0)	49
35	345	327		67.9	(108.5)	48
34	336	319		67.4	(108.0)	47
33	327	311		66.8	(107.5)	46
32	318	301		66.3	(107.0)	44
31	310	294		65.8	(106.0)	43
30	302	286		65.3	(105.5)	42
29	294	279		64.7	(104.5)	41
28	286	271		64.3	(104.0)	41
27	279	264		63.8	(103.0)	40
26	272	258		63.3	(102.5)	38
25	266	253		62.8	(101.5)	38
24	260	247		62.4	(101.0)	37
23	254	243		62.0	100.0	36
22	248	237		61.5	99.0	35
21	243	231		61.0	98.5	35
20	238	226		60.5	97.8	34
(18)	230	219		–	96.7	33
(16)	222	212		–	95.5	32
(14)	213	203		–	93.9	31
(12)	204	194		–	92.3	29
(10)	196	187			90.7	28
(8)	188	179			89.5	27
(6)	180	171			87.1	26
(4)	173	165			85.5	25
(2)	166	158			83.5	24
(0)	160	152			81.7	24

4.7 Viscosity conversion table

Kinematic viscosity mm^2/s	Saybolt SUS (second)		Redwood R (second)		Engler E (degree)
	100 °F	210 °F	50 °C	100 °C	
2	32.6	32.8	30.8	31.2	1.14
3	36.0	36.3	33.3	33.7	1.22
4	39.1	39.4	35.9	36.5	1.31
5	42.3	42.6	38.5	39.1	1.40
6	45.5	45.8	41.1	41.7	1.48
7	48.7	49.0	43.7	44.3	1.56
8	52.0	52.4	46.3	47.0	1.65
9	55.4	55.8	49.1	50.0	1.75
10	58.8	59.2	52.1	52.9	1.84
11	62.3	62.7	55.1	56.0	1.93
12	65.9	66.4	58.2	59.1	2.02
13	69.6	70.1	61.4	62.3	2.12
14	73.4	73.9	64.7	65.6	2.22
15	77.2	77.7	68.0	69.1	2.32
16	81.1	81.7	71.5	72.6	2.43
17	85.1	85.7	75.0	76.1	2.54
18	89.2	89.8	78.6	79.7	2.64
19	93.3	94.0	82.1	83.6	2.76
20	97.5	98.2	85.8	87.4	2.87
21	102	102	89.5	91.3	2.98
22	106	107	93.3	95.1	3.10
23	110	111	97.1	98.9	3.22
24	115	115	101	103	3.34
25	119	120	105	107	3.46
26	123	124	109	111	3.58
27	128	129	112	115	3.70
28	132	133	116	119	3.82
29	137	138	120	123	3.95
30	141	142	124	127	4.07
31	145	146	128	131	4.20
32	150	150	132	135	4.32
33	154	155	136	139	4.45
34	159	160	140	143	4.57
35	163	164	144	147	4.70
36	168	170	148	151	4.83
37	172	173	153	155	4.96
38	177	178	156	159	5.08
39	181	183	160	164	5.21
40	186	187	164	168	5.34
41	190	192	168	172	5.47
42	195	196	172	176	5.59
43	199	201	176	180	5.72
44	204	205	180	185	5.85
45	208	210	184	189	5.98
46	213	215	188	193	6.11
47	218	219	193	197	6.24
48	222	224	197	202	6.37
49	227	228	201	206	6.50
50	231	233	205	210	6.63
55	254	256	225	231	7.24
60	277	279	245	252	7.90
65	300	302	266	273	8.55
70	323	326	286	294	9.21
75	346	349	306	315	9.89
80	371	373	326	336	10.5
85	394	397	347	357	11.2
90	417	420	367	378	11.8
95	440	443	387	399	12.5
100	464	467	408	420	13.2
120	556	560	490	504	15.8
140	649	653	571	588	18.4
160	742	747	653	672	21.1
180	834	840	734	757	23.7
200	927	933	816	841	26.3
250	1 159	1 167	1 020	1 051	32.9
300	1 391	1 400	1 224	1 241	39.5

Remark) 1 mm^2/s=1 cSt (centi stokes)

4.8 Shaft surface speed – Quick reference diagram –



5. Request Forms for Oil Seal Design and Production

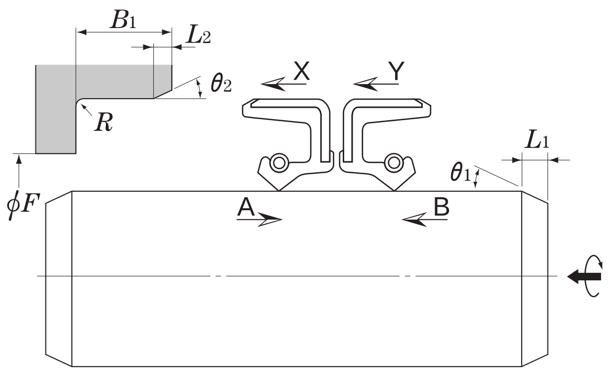
Fill in the Request Forms for Oil Seal Design and Production (1) and (2) and send them by fax to your nearest JTEKT office when you need oil seal selection or when you have any requests or questions.

Request Form for Oil Seal Design and Production (1)

Your name		TEL	
Company / Dept.		FAX	
Address			
E-mail			

Applied position			Machine name		
Shaft	Outside diameter and tolerance		Housing	Bore diameter and tolerance	
	Chamfer	L_1 θ_1		Width and tolerance	
	Motion type	Rotary / Reciprocating / Oscillatory		Chamfer	L_2 θ_2
	Direction of motion	Horizontal / Vertical		Material and surface roughness	
		Other ( )		Housing bore eccentricity	mm TIR
	Motion frequency	Continuous	Sealed medium	Substance to be sealed	Inside
		Intermittent			Outside
		Other (rapid acceleration / deceleration)		Level	
	Rotational speed	Normal: Max.: min^{-1}		Temperature	Normal ℃ Max. ℃
	Sliding frequency	Hz mm		Pressure Internal	Normal kPa Max. kPa
	Oscillation frequency	Hz °		Pressure External	Normal kPa Max. kPa
	Shaft runout	mm TIR	Bearing	Bearing Number	
	Material and hardness			Lubricant oil name	
	Surface finishing method			Lubrication method	Oil bath / Circulation / Splash / Drip / Other ( )
	Surface roughness				

Mounting specification



- Housing shoulder diameter F:
- Housing bore depth B_1:
- Housing bore radius R:
- Seal mounting direction into housing: X/Y
- Seal mounting direction onto shaft: A/B
- Shaft rotational direction: Right/Left/Bi-direction

Right: Clockwise when viewed from the air side face of the oil seal
Left: Counterclockwise when viewed from the air side face of the oil seal

✩ Please specify as many items as possible to enable correct product design and selection.

Request Form for Oil Seal Design and Production (2)

Shaft diameter	Changeable	Yes/No	To ϕ____ mm (max. min.)	Oil seal type	Your requested type	Yes ( ) / No
Housing bore diameter	Changeable	Yes/No	To ϕ____ mm (max. min.)	Rubber material	Your requested type	Yes ( ) / No
Width	Changeable	Yes/No	To ____ mm (max. min.)	Other		
Requested oil seal life						

Mounting location details (Attach drawing of the oil seal location, if possible).

Requests/Questions

✰ Please specify as many items as possible to enable correct product design and selection.

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INSERT BEARING UNITS

CAT.NO.BS006EN-0DS

Insert Bearing Units (contents)

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Supplementary table

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Square-flanged type
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Insert bearings for units
Parts and accessories — Parts and accessories
Example of application — Example of application
Supplementary table — Supple-mentary table

INSERT BEARING UNITS

Publication of
New Koyo Insert Bearing Units Catalog

In recent years, needs in industrial world for machineries and equipment highly developed in all aspects have been increased more than ever. Therefore, high technology covering from superior technical advantages including longer service life and maintenance free to higher reliability even under extraordinary conditions such as high and low temperatures and rotation at a high speed is required for insert bearing units.

This catalog completely includes results of technical examinations and abundant research and development.

In the first half of this catalog, technical descriptions referring from the selection to the handling of Koyo Insert Bearing Units are mentioned, while a lot of dimensional tables with types and dimensions are included in the last half. Varied technical information is provided at the last of this catalog. We trust this catalog will help you to select and use Koyo Insert Bearing Units appropriately.

JTEKT keeps trying to get ideas from the market, step up persistent efforts of technical research and development, and provide the best technologies, quality, and services.
JTEKT is grateful for your patronage and look forward to continuing to serve you in the future.

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14 Handling

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4 Round-flanged type with spigot joint

5 Pressed steel housing type

6 Take-up type

7 Other units

Parts and accessories

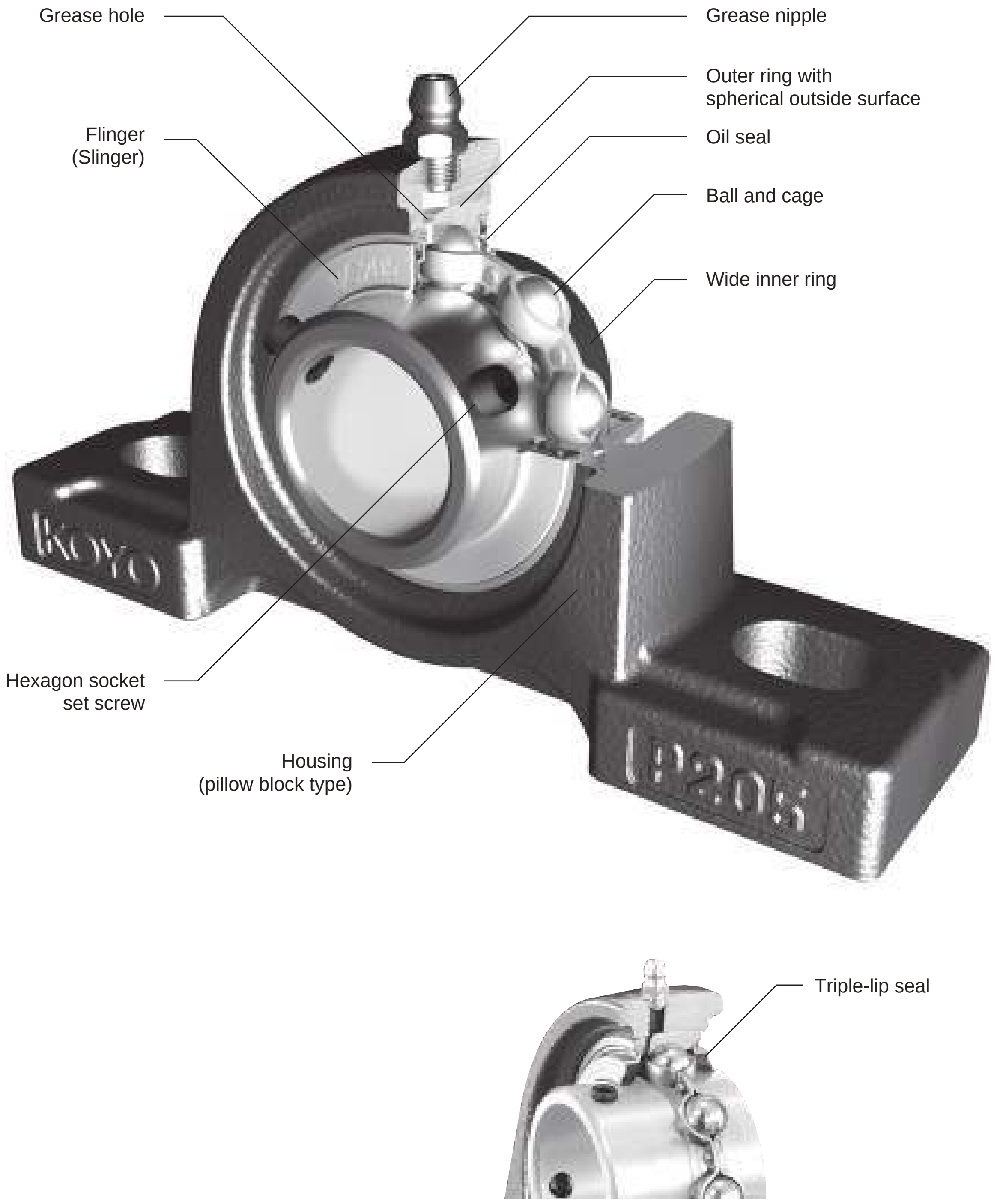
16 Parts and accessories

1 Structure and features

Koyo Insert Bearing Units are highly precise bearing units comprising grease sealed deep groove ball bearings and housings in various forms. The insert bearing units allow easy handling and installation by followings: direct installation to machines and equipment with some bolts, self-aligning, and greasing.

1.1 Structure

Koyo Insert Bearing Unit comprises the insert bearing for unit with spherical outside surface and the housing with spherical bearing seat (**Fig. 1.1**).



Triple-lip seal unit

Fig. 1.1 Structure of insert bearing units (representative example)

1.2 Features

Koyo Insert Bearing Units, having many features, are available in various types. Select the bearing unit optimal for your purpose among the types with unique features.

1 Supreme load capacity and accuracy

Koyo Insert Bearings for unit, featuring the internal structure identical to single row deep groove ball bearings, bear axial load in both directions, as well as great radial load. The tolerance is equal to that of an standard bearing. They feature high rotation accuracy and high speed rotation.

2 Rational self aligning mechanism and optimal fit

Koyo Insert Bearing Units have self aligning mechanism by the spherical outside surface bearing and the housing with and spherical bearing seat. Because of this mechanism, deviation of the shaft center caused by warp of the shaft flexion of axis (shaft) or offset is automatically adjusted to eliminate abnormal load onto the bearing, leading to guarantee of original service life of the bearing.

Since the spherical outside surface of the bearing is ground and the spherical bearing seat of the housing is machined by a boring machine with high accuracy, optimal fitting of the bearing and the housing can be obtained, as well as superior aligning performance.

The allowable aligning angle of standard insert bearing unit is 3º, while that of insert bearing unit with cover is 1º.

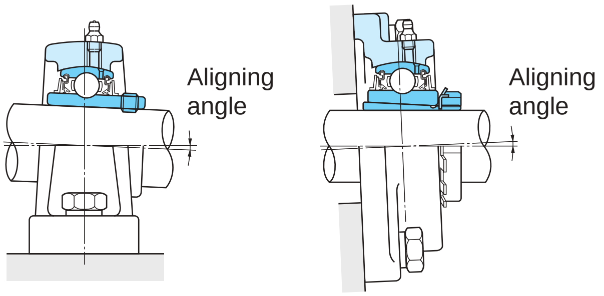


Fig. 1.2 Allowable aligning angle of insert bearing unit

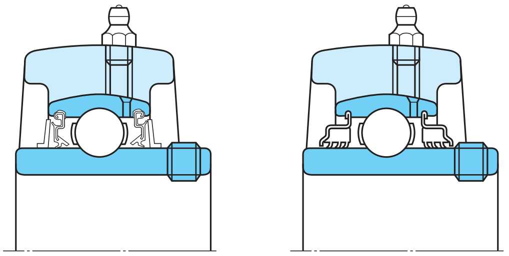
3 Superior sealing performance

Koyo Insert Bearing Units can prevent leak of grease in the bearing to the outside, as well as ingress of dusts and water from the outside into the inside of the bearing by the synergetic effect of the oil seal installed to the outer ring of the bearing and the flinger (slinger) installed to the inner ring of the bearing.

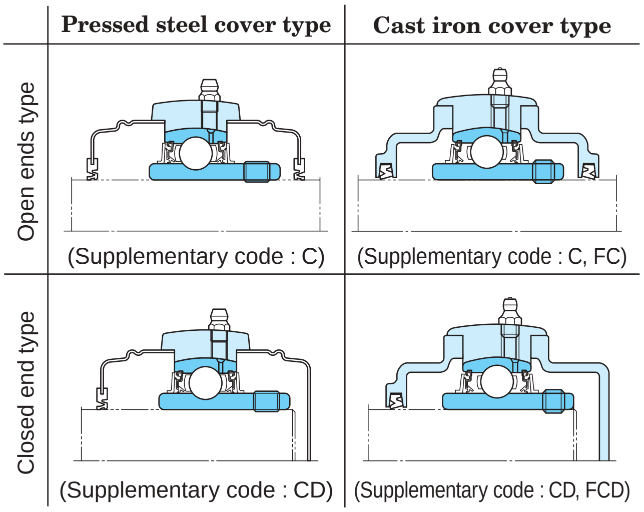
The oil seal is made of synthetic rubber featuring supreme oil proof. Its lip contacts with the inner ring of the bearing with optimal tension (radial load of lip).

When using in environments with many dusts or high humidity, the triple-lip seal unit (supplementary code : L3) or the unit with cover (supplementary code : C, CD, FC, FD) is optimal.

The triple-lip seal unit or unit with cover strongly prevents ingress of water and dusts from the outside, and guarantees a longer service life of the bearing.



Standard type **Triple-lip seal type**
(Supplementary code : L3)



Unit with cover

Fig. 1.3 Sealing mechanism of insert bearing unit

4 Simple greasing

Because of the grease nipple on the housing of Koyo Insert Bearing Unit, fresh grease can be easily supplied to the bearing being operated. If the bearing is used in severe environments that are exposed to many dusts or high humidity or that is high temperture, supply fresh grease at a regular interval. Then, the lubrication status of the bearing is kept to the best, and the service life of the bearing can be extended.

When greasing to the bearing unit with the centralized lubricating system, use the socket for lubricating installed to the grease nipple tapped hole on the housing.

5 Highly rigid and strong housing

Koyo Insert Bearing Unit housing is designed so that it is optimal for reduction of deformation due to centralization of stress and load. After the selection of good material, it is produced by highly advanced casting technique or press working technique.

Since any abnormal load onto the bearing is eliminated by the highly rigid and strong housing, the service life of the bearing can be extended. Baking finish on the surface of the housing keeps good surface status for a long time.

Koyo original solid base pillow block housings seat better and produce a more stable mounting configuration that significantly reduces vibration.

The support ribs have been eliminated to make more room for mounting bolts and washers, yet these housings are more than 30% stronger than before while also reducing housing weight. The new housing downward destruction strength means that the inserts break before the housings.

6 Simple installation and handling

Koyo Insert Bearing Units of many types can be installed to any of machine or equipment with some bolts, and can be used in the status as it is. Clearance fit is used for the inner ring of bearing and the shaft, as a rule.

Therefore, Koyo Insert Bearing Unit does not need any work such as filling of lubricant or installation of sealing unit required for standard bearings. As a result, the total of manpower can be drastically reduced.

As for the fixing method of bearing to shaft, three methods, (1) set screw mounted to the cylindrical bore wide inner ring, (2) adapter installed to the tapered bore inner ring, and (3) eccentric locking collar installed to the cylindrical bore wide inner ring are available.

Fixing of bearing to shaft can be executed easily and securely by adopting any of these method.

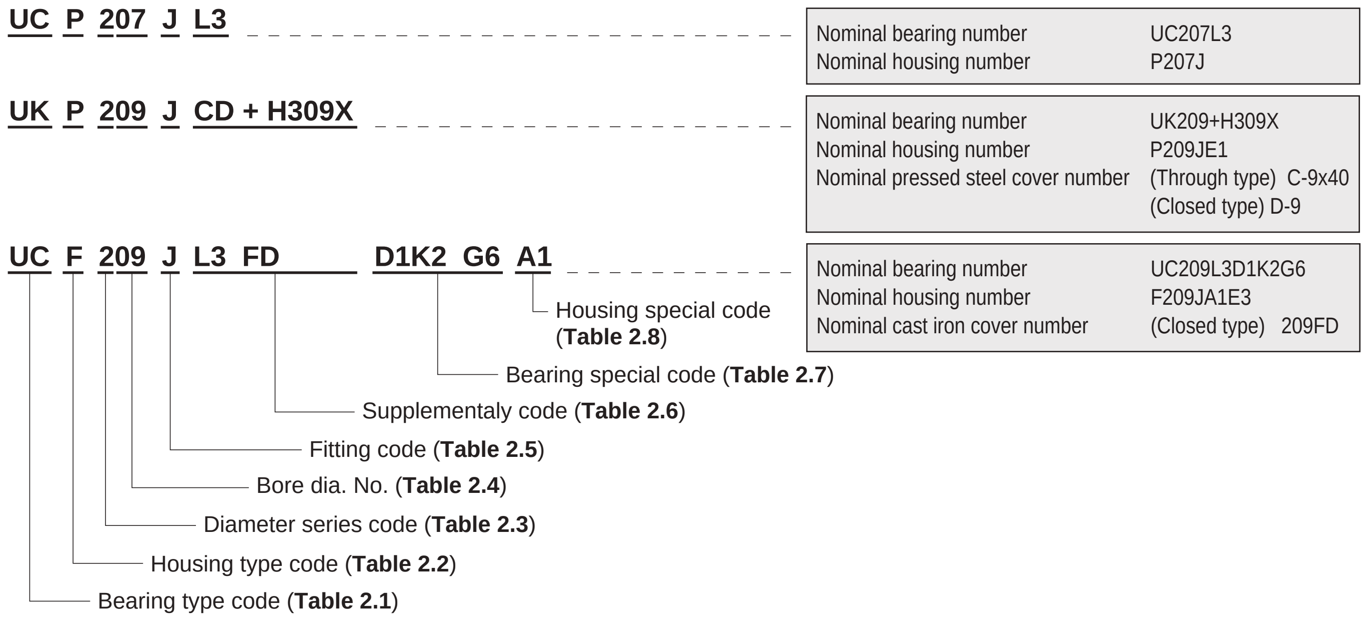
7 Various types

Koyo Insert Bearing Units are available in various types.

Reliability of machine or equipment used together with the units can be improved by selecting and using bearing units optimal for the purpose and operating conditions.

2 Unit number

Nominal number of Koyo Insert Bearing Unit conform to JIS B1557, and comprise the bearing unit type number (comprising bearing type code and housing type code), diameter series code, bore dia. number, supplementary code, and special code.



UC P 207 J L3

Nominal bearing number	UC207L3
Nominal housing number	P207J

UK P 209 J CD + H309X

Nominal bearing number	UK209+H309X
Nominal housing number	P209JE1
Nominal pressed steel cover number	(Through type) C-9x40 (Closed type) D-9

UC F 209 J L3 FD D1K2 G6 A1

Nominal bearing number	UC209L3D1K2G6
Nominal housing number	F209JA1E3
Nominal cast iron cover number	(Closed type) 209FD

[Remark] The above number shows an example of nominal number structure. It may depend on the bearing unit type.

Table 2.1 Bearing type code

Bearing type code	Details
UC	Cylindrical bore, with set screws
UC-S6	Cylindrical bore, with set screws (stainless-series)
UK	Tapered bore (for adapter)
NA	Cylindrical bore, with eccentric locking collar
SB	Cylindrical bore, with set screws (light duty type)
SU	Cylindrical bore, with set screws (“compact” series)
SA	Cylindrical bore, with eccentric locking collar (light duty type)
SU-S6	Cylindrical bore, with set screws (stainless-series)
ER	Cylindrical bore, with set screws, cylindrical outer diameter, Lubricating mechanism
RB	Cylindrical bore, with set screws, cylindrical outer diameter

Table 2.2 Housing type code

Housing type code	Details
P	Pillow block type
IP	Thick section pillow block type
PA	Tapped-base pillow block type
PH	Higher centerheight pillow block type
LP	Light duty pillow block type
P	Pillow block type (“compact” series)
SP	Pillow block type (stainless-series)
SPA	Tapped-base pillow (stainless-series)
SP	Pillow block type (stainless-series)
PP	Cast steel pillow block type
F	Square-flanged type
FL	Rhombic-flanged type
FA	Adjustable rhombic-flanged type
FB	Three-bolt flange type
FC	Round-flanged type with spigot joint
FS	Square-flanged type
FL	Rhombic-flanged type (“compact” series)
SF	Square-flanged type (stainless-series)
SFC	Round-flanged type with spigot joint (stainless-series)
SFL	Rhombic-flanged type (stainless-series)
PF	Pressed steel round-flanged type
PFL	Pressed steel rhombic-flanged type
PFT	Pressed steel triangle-flanged type
T	Take-up type
ST	Take-up type (stainless-series)
TH	Section steel frame take-up type
TL	Light channel steel frame take-up type
TU	Channel steel frame take-up type
PTH	Pressed steel frame take-up type
NPTH	Pressed steel frame take-up type
C	Cartridge type
HA	Hanger type
RU-M	Rubber clamping ring type

Table 2.3 Diameter series code

Diameter series code	Details
0	For light duty
2	For medium duty
X	For medium duty
3	For heavy duty

Table 2.4 Bore dia. number

Bore dia. No.	Details
8	Nominal bearing bore dia. 8 mm
00	Nominal bearing bore dia. 10 mm
01	Nominal bearing bore dia. 12 mm
02	Nominal bearing bore dia. 15 mm
03	Nominal bearing bore dia. 17 mm
04 or more	(Bore dia. No.) × 5 = Nominal bearing bore dia. (mm)
01–8	– (bore dia. No.) /16 = nominal bearing bore dia. (inch) (in this case, 8/16 = 1/2 inch = 12.7 mm)

Table 2.5 Fitting code

Fitting code	Details
J	Tolerance class of spherical bore of the housing is J7 (not shown on the bearing that the spherical bore diameter exceeds 120 mm)
H	Tolerance class of spherical bore of the housing is H7 With integrated lock pin
K	Tolerance class of spherical bore of the housing is K7

Table 2.6 Supplementary code

Supplementary code	Details
C	Cover, open type
D	Cover, closed type
FC	Cast iron cover, open type
FD	Cast iron cover, closed type
L2[1)]	Double-lip seal type
L3[1)]	Triple-lip seal type

Note 1) Standard specifications of codes L2 and L3 are as shown below.

Bearing No.	Applicable seal type
UC201 to UC205, UK205 NA201 to NA205	L2 (Double-lip seal)
UC206 to UC218, UK206 to UK218 NA206 to NA215	L3 (Triple-lip seal)
UCX05 to UCX17, UKX05 to UKX17	
UC307 to UC328, UK307 to UK328	

However, UC 206 - 18 to UC 206 - 20 are L2 [double-lip seal type]

[Remark] Please refer to **“16 Parts and accessories”** for cover details.

Table 2.7 Bearing special code

Item	Bearing special code	Details
Grease	**None**	Alvania No.2 or equivalents
	D1	SH44M
	D2	SH33M
	D9	Demnum L-200
Set Screw	**None**	Bullet Point
	G4	Pointed tip
	G6	With full dog point
Oil seal	**None**	Nitrile rubber
	K2	Silicone rubber
	K3	Non-contact type
Sealing Device	**None**	With oil seal and flinger (slinger) (UC, UK, NA, ER and RB types) With oil seal (SB, SA and SU types)
	P3	Without oil seal, flinger (slinger)
	P4	Without oil seal
Others	**P11**[1)]	With integrated lock pin
	S3	Air handling fit,100% noise check, the anti-rotation pin
	S5	For blower (oil seal : K3, inner clearance and bearing accuracy are specially controlled)
	S6	Stainless steel bearing
	S7	Plated bearing (for corrosion-resistance)

Note 1) Code P11 is unnecessary in the following cases.

Bearing Type	Bearing No.	Fitting code	Code
UC	313 or more	**J**	Not indication
UC200S6, SU000S6	All		
All	All	**H**	

Table 2.8 Housing special code

Item	Housing special code	Details
Grease Nipple Thread Bore dia.	**None**	As shown in dimensional table
	A1	PT1/8 tube thread
	A2	PF1/8 tube thread
	A3	PT1/4 tube thread
	A4	PF1/4 tube thread
Grease Nipple Thread Bore Position	**None**	As shown in dimensional table
	B1	Right
	B2	Left
	B3	45º
	B5	30º
	B7	Both right and left
Machining	**None**	Standard type
	E1	Pressed steel cover mounting groove
	E3	Cast iron cover mounting groove (diameter series 2, X, 3)
	E4	Non-lubricating type
Material	**None**	Gray iron casting (FC200) or cold-reduced carbon steel sheets and strips (SPCC) Compact type is made of zinc alloy die-cast (ZDC2) Small stainless series is made of stainless cast steel type (SCS13)
	H4	Ductile iron (FCD450-10)
	H5	Rolled steel for general purpose (SS400)
Grease Nipple	**None**	A type
	N1	B type (67.5º)
	N2	C type (90º)

3 Types

3.1 Type list

Koyo Insert Bearing Units are available in various types.

Table 3.1 and **Table 3.2** show the types of Koyo Insert Bearing Units and insert bearing for unit.

Table 3.1 Koyo Insert Bearing Units types

Type		Bearing bore dia. Surface (fixing to shaft)	Type code	Shaft dia.		Dimension table
				(inch)	(mm)	
1 Pillow block type	(1) Standard	Cylindrical bore (with set screws)	**UCP**	$^{1}/_{2}$ – 4	12 – 140	P.78
		Cylindrical bore (with eccentric locking collar)	**NAP**	$^{1}/_{2}$ – 2 $^{15}/_{16}$	12 – 75	P.84
			NAPK	$^{1}/_{2}$ – 2 $^{15}/_{16}$	12 – 75	P.86
		Tapered bore (with adapter)	**UKP**	$^{3}/_{4}$ – 4 $^{1}/_{2}$	20 – 125	P.88
	(2) Thick section type	Cylindrical bore (with set screws)	**UCIP**	1 $^{1}/_{2}$ – 4	40 – 140	P.94
		Tapered bore (with adapter)	**UKIP**	1 $^{1}/_{4}$ – 4 $^{1}/_{2}$	35 – 125	P.96
	(3) Tapped-base type	Cylindrical bore (with set screws)	**UCPA**	$^{1}/_{2}$ – 2	12 – 50	P.98
	(4) Higher centerheight type	Cylindrical bore (with set screws)	**UCPH**	$^{1}/_{2}$ – 2	12 – 50	P.100
	(5) Light duty type	Cylindrical bore (with set screws)	**BLP**	$^{1}/_{2}$ – 1 $^{9}/_{16}$	12 – 40	P.102
		Cylindrical bore (with eccentric locking collar)	**ALP**			
	(6) “Compact” series	Cylindrical bore (with set screws)	**UP**	N/A	10 – 30	P.104
	(7) Stainless-series	Cylindrical bore (with set screws)	**UCSP-S6**	N/A	12 – 65	P.106
			UCSPA-S6	N/A	12 – 50	P.108
			USP-S6	N/A	10 – 30	P.110
2 Square-flanged type	(1) Standard	Cylindrical bore (with set screws)	**UCF**	$^{1}/_{2}$ – 4	12 – 140	P.112
			UCF-E	$^{1}/_{2}$ – 3 $^{7}/_{16}$	12 – 85	P.118
		Cylindrical bore (with eccentric locking collar)	**NANF**	$^{1}/_{2}$ – 2 $^{7}/_{16}$	12 – 60	P.122
		Tapered bore (with adapter)	**UKF**	$^{3}/_{4}$ – 4 $^{1}/_{2}$	20 – 125	P.124
	(2) With spigot joint	Cylindrical bore (with set screws)	**UCFS**	1 – 4	25 – 140	P.130
		Tapered bore (with adapter)	**UKFS**	$^{3}/_{4}$ – 4 $^{1}/_{2}$	20 – 125	P.132
	(3) Stainless-series	Cylindrical bore (with set screws)	**UCSF-S6**	N/A	20 – 65	P.134
3 Rhombic-flanged type	(1) Standard	Cylindrical bore (with set screws)	**UCFL**	$^{1}/_{2}$ – 4	12 – 120	P.136
			UCFL-E	$^{1}/_{2}$ – 3 $^{1}/_{4}$	12 – 85	P.142
		Cylindrical bore (with eccentric locking collar)	**NANFL**	$^{1}/_{2}$ – 2 $^{3}/_{16}$	12 – 55	P.146
		Tapered bore (with adapter)	**UKFL**	$^{3}/_{4}$ – 4	20 – 110	P.148
	(2) Adjustable type	Cylindrical bore (with set screws)	**UCFA**	$^{1}/_{2}$ – 2 $^{3}/_{16}$	12 – 55	P.152
	(3) Three-bolt type	Cylindrical bore (with set screws)	**UCFB**	$^{1}/_{2}$ – 2	12 – 50	P.154
	(4) Light duty type	Cylindrical bore (with set screws)	**BLF**	$^{1}/_{2}$ – 1 $^{7}/_{16}$	12 – 35	P.156
		Cylindrical bore (with eccentric locking collar)	**ALF**			
	(5) “Compact” series	Cylindrical bore (with set screws)	**UFL**	N/A	8 – 30	P.158
	(6) Stainless-series	Cylindrical bore (with set screws)	**UCSFL-S6**	N/A	12 – 50	P.160
			USFL-S6	N/A	10 – 30	P.162
4 Round-flanged type with spigot joint	(1) Standard	Cylindrical bore (with set screws)	**UCFC**	$^{1}/_{2}$ – 4	12 – 100	P.164
			UCFCX-E	1 – 4	25 – 100	P.168
		Tapered bore (with adapter)	**UKFC**	$^{3}/_{4}$ – 3 $^{1}/_{2}$	20 – 90	P.170
	(2) Stainless-series	Cylindrical bore (with set screws)	**UCSFC-S6**	N/A	20 – 40	P.174
5 Pressed steel housing type	(1) Pillow block type	Cylindrical bore (with set screws)	**SBPP**	$^{1}/_{2}$ – 1 $^{1}/_{4}$	12 – 30	P.176
		Cylindrical bore (with eccentric locking collar)	**SAPP**			
	(2) Round-flanged type	Cylindrical bore (with set screws)	**SBPF**	$^{1}/_{2}$ – 1 $^{7}/_{16}$	12 – 35	P.178
		Cylindrical bore (with eccentric locking collar)	**SAPF**			
	(3) Rhombic-flanged type	Cylindrical bore (with set screws)	**SBPFL**	$^{1}/_{2}$ – 1 $^{7}/_{16}$	12 – 35	P.180
		Cylindrical bore (with eccentric locking collar)	**SAPFL**			
	(4) Triangle-flanged type	Cylindrical bore (with set screws)	**SBPFT**	N/A	12 – 35	P.182

Table 3.1 Koyo Insert Bearing Units types (continued)

Type		Bearing bore dia. Surface (fixing to shaft)	Type code	Shaft dia.		Dimension table
				(inch)	(mm)	
6 Take-up type	(1) Standard	Cylindrical bore (with set screws)	**UCT**	$^{1}/_{2}$ – 4	12 – 140	P.184
			UCT-E	$^{1}/_{2}$ – 3 $^{7}/_{16}$	12 – 85	P.190
		Tapered bore (with adapter)	**UKT**	$^{3}/_{4}$ – 4 $^{1}/_{2}$	20 – 125	P.194
	(2) Stainless-series	Cylindrical bore (with set screws)	**UCST-S6**	N/A	20 – 50	P.198
	(3) Section steel frame type	Cylindrical bore (with set screws)	**UCTH**	$^{1}/_{2}$ – 2 $^{1}/_{2}$	12 – 65	P.200
	(4) Channel steel frame type	Cylindrical bore (with set screws)	**UCTL**	N/A	20 – 45	P.202
			UCTU	N/A	40 – 90	P.204
	(5) Pressed steel frame type	Cylindrical bore (with set screws)	**SBPTH**	N/A	12 – 25	P.208
			SBNPTH	N/A	12 – 25	P.210
7 Cartridge type		Cylindrical bore (with set screws)	**UCC**	$^{1}/_{2}$ – 4	12 – 140	P.212
		Tapered bore (with adapter)	**UKC**	$^{3}/_{4}$ – 4 $^{1}/_{2}$	20 – 125	P.216
8 Hanger type		Cylindrical bore (with set screws)	**UCHA**	$^{1}/_{2}$ – 3	12 – 75	P.218
9 Rubber clamping ring type		Cylindrical bore (with set screws)	**RU-M**	N/A	20 – 30	P.220

Table 3.2 Types of insert bearing for Koyo Insert Bearing Unit

Type		Bearing bore dia. Surface (fixing to shaft)	Type code	Shaft dia.		Dimension table
				(inch)	(mm)	
Insert bearing for units	(1) Standard	Cylindrical bore (with set screws)	**UC**	$^{1}/_{2}$ – 4	12 – 140	P.222
	(2) Standard	Tapered bore (with adapter)	**UK**	$^{3}/_{4}$ – 4 $^{1}/_{2}$	20 – 125	P.234
	(3) Standard	Cylindrical bore (with eccentric locking collar)	**NA**	$^{1}/_{2}$ – 3	12 – 75	P.230
	(4) Light duty	Cylindrical bore (with set screws)	**SB**	$^{1}/_{2}$ – 1 $^{1}/_{2}$	12 – 40	P.222
	(5) Light duty	Cylindrical bore (with eccentric locking collar)	**SA**	$^{1}/_{2}$ – 1 $^{9}/_{16}$	12 – 40	P.230
			SA-F	$^{1}/_{2}$ – 2 $^{3}/_{16}$	12 – 55	
	(6) “Compact”	Cylindrical bore (with set screws)	**SU**	N/A	8 – 30	P.222
	(7) Stainless steel	Cylindrical bore (with set screws)	**UC-S6**	N/A	12 – 65	P.228
			SU-S6	N/A	10 – 30	
	(8) Cylindrical outside surface (with lubricating mechanism and snap ring)	Cylindrical bore (with set screws)	**ER**	$^{1}/_{2}$ – 2 $^{7}/_{16}$	12 – 60	P.240
	(9) Cylindrical outside surface	Cylindrical bore (with set screws)	**RB**	$^{1}/_{2}$ – 1 $^{9}/_{16}$	12 – 40	P.240
	(10) Adapter assembly		**H2300X**	$^{3}/_{4}$ – 5	20 – 125	P.242

3.2 Types and features

Koyo Insert Bearing Units are available in various types by combinations of bearings and housings.

Types and features of the Insert Bearing Units are shown below.

Remark) Descriptions of codes for unit with cover are shown in the table below. (common to all the types)

Diameter series	Code	Descriptions
2	C, CD	Pressed steel cover type
	FC, FCD	Cast iron cover type
X	C, CD	From **X05** to **X17** : pressed steel cover type **X18** and **X20** : cast iron cover type
3	C, CD	Cast iron cover type

1 Pillow block type units

1 Pillow block type units


UCP


UKP

NAP

NAPK

Cylindrical bore (with set screws)…Bearing **UC2 (X, 3)** series are used.

UCP2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, CD (FC, FCD) : Pressed steel cover type or cast iron cover type

Cylindrical bore (with eccentric locking collar) …Bearing **NA2** series are used.

NAP2, NAPK2 : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

Tapered bore (with adapter)…Bearing **UK2 (X, 3)** series are used.

UKP2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, CD (FC, FCD) : Pressed steel cover type or cast iron cover type

This is the most typical type insert bearing unit. The rib at the bottom of the housing mounting section allows the highly strong structure which withstands against loads applied from all the directions.

The housing can be installed to a machine with two bolts. As for the tapered bore (UKP) type, nominal number of adapter assembly which follows the nominal number of unit should be added.

Applications : Transmission devices, general industrial equipment

2 Thick section pillow block type units


UCIP


UKIP

Cylindrical bore (with set screws)…Bearing **UC2 (3)** series are used.

UCIP2 (3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, CD (FC, FCD) : Pressed steel cover type or cast iron cover type

Tapered bore (with adapter)…Bearing **UK2 (3)** series are used.

UKIP2 (3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

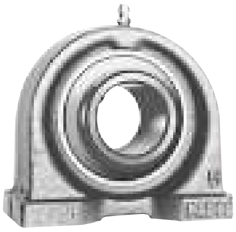
C, CD (FC, FCD) : Pressed steel cover type or cast iron cover type

This pillow block type unit is applicable for use with a great load. The thick and highly rigid housing is suitable to environment exposed to a great load, vibration, and impact. The mounting bolt holes are drilled, and the housing can be installed to the exact location with two bolts.

Applications : Crane, heavy object conveyor, quarrying plant, ships

(1 Pillow block type units)

3 Tapped-base pillow block type unit



UCPA

Cylindrical bore (with set screws)…Bearing **UC2** series are used.

UCPA2 : Standard type, **L3 (L2)** : Triple-lip seal type or
Double-lip seal type

This pillow block type unit is designed so that the mounting space is reduced. It is installed to machines with the two tapped holes on the housing mounting bottom.

Applications : Roller conveyor, purpose with small mounting space

4 Higher centerheight pillow block type unit

UCPH

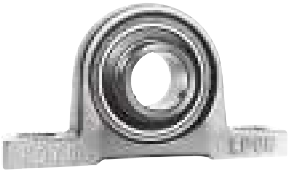
Cylindrical bore (with set screws)…Bearing **UC2** series are used.

UCPH2 : Standard type, **L3 (L2)** : Triple-lip seal type or
Double-lip seal type

This unit, designed as the higher centerheight pillow block type unit, has high strength against impact load. It is suitable for the machine that the distance from the mounting bottom to the shaft center is long. The housing can be installed to machines with two bolts.

Applications : Printing machine, spinneret

5 Light duty pillow block type unit



BLP

ALP

Cylindrical bore (with set screws)…Bearing **SB2** series are used.

BLP2

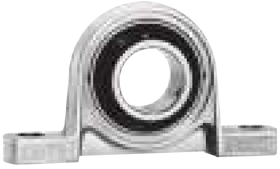
Cylindrical bore (with eccentric locking collar)
…Bearing **SA2** series are used.

ALP2

This pillow block type unit is designed for the aim of lightweight. The housing can be installed to machines with two bolts.

Applications : Machinery for general purposes aiming at lightweight

6 "Compact" series pillow block type unit



UP

Cylindrical bore (with set screws)…Bearing **SU0** series are used.

UP0

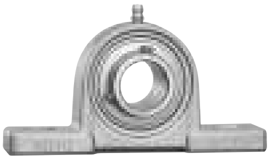
C, CD : Rubber coating cover type

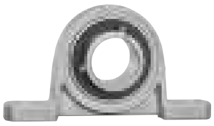
The small and lightweight pillow block type unit, comprising the insert bearing for unit for light load and the special lightweight alloy housing, needs not to be lubricated additionally.

The housing can be installed to machines with two bolts.

Applications : Machineries for light load

7 Stainless-series pillow block type units


UCSP-S6


USP-S6

UCSPA-S6

Cylindrical bore (with set screws)

Standard…Bearing **UC2-S6** series are used.

UCSP2-S6

C, CD : Pressed stainless steel cover type

Tapped base…Bearing **UC2-S6** series are used.

UCSPA-S6

C, CD : Pressed stainless steel cover type

Compact…Bearing **SU0-S6** series are used.

USP0-S6

C, CD : Pressed stainless steel cover type

This superior anticorrosion pillow block type unit comprises the bearing and housing made of stainless steel. The unit is thinner than standard UCP series units, leading to downsizing of machinery. The housing can be installed to machines with two bolts.

Applications : Food machinery, agricultural machinery

2 Square-flanged type units

1 Square-flanged type units


UCF, UCF-E


UKF

NANF

Cylindrical bore (with set screws)…Bearing **UC2 (X, 3)** series are used.

UCF2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, D (FC, FD) : Pressed steel cover type or cast iron cover type

UCF2 (X) -E : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

Cylindrical bore (with eccentric locking collar)

…Bearing **NA2** series are used.

NANF2 : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

Tapered bore (with adapter)…Bearing **UK2 (X, 3)** series are used.

UKF2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, D (FC, FD) : Pressed steel cover type or cast iron cover type

This bearing unit comprises the insert bearing for unit and the housing with square flange. It is suitable to use on a vertical surface, such as the side of machinery.

The housing can be installed to machines with four bolts.

(2 Square-flanged type units)

2 Square-flanged types with spigot joint

UCFS

UKFS

Cylindrical bore (with set screws)…Bearing **UC3** series are used.

UCFS3 : Standard type, **L3 (L2)** : Triple-lip seal type or
Double-lip seal type

C, D : Cast iron cover type

Tapered bore (with adapter)…Bearing **UK3** series are used.

UKFS3 : Standard type, **L3 (L2)** : Triple-lip seal type or
Double-lip seal type

C, D : Cast iron cover type

This bearing unit comprises the insert bearing for unit, square flange, and the housing with spigot joint on the mounting surface. The housing can be installed to a machine by fitting the spigot joint into the mounting hole of it, and using four bolts.

The housing can be installed to the exact location by fitting the spigot joint into the mounting hole.

Applications : Rotating drum, rotating roller, purposes excellent mounting accuracy is required

3 Stainless-series square-flanged type unit

UCSF-S6

Cylindrical bore (with set screws)…Bearing **UC2-S6** series are used.

UCSF2-S6

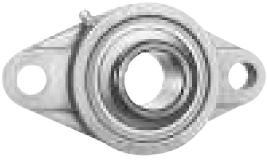
C, D : Pressed stainless steel cover type

In this superior waterproof and anticorrosion square-flanged type unit, bearing and housing are made of stainless steel. The unit is thinner than standard UCF series units, leading to downsizing of machinery. The housing can be installed to machines with four bolts.

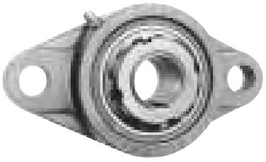
Applications : Food machinery, agricultural machinery

3 Rhombic-flanged type units

1 Rhombic-flanged type units



UCFL, UCFL-E



UKFL

NANFL

Cylindrical bore (with set screws)…Bearing **UC2 (X, 3)** series are used.

UCFL2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, D (FC, FD) : Pressed steel cover type or cast iron cover type

UCFL2 (X) -E : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

Cylindrical bore (with eccentric locking collar)

…Bearing **NA2** series are used.

NANFL2 : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

Tapered bore (with adapter)…Bearing **UK2 (X, 3)** series are used.

UKFL2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, D (FC, FD) : Pressed steel cover type or cast iron cover type

This bearing unit comprises the insert bearing for unit and the housing with rhombic flange. It is suitable to use on a vertical surface, such as the side of machinery. Compared to the square-flanged type unit, it requires less mounting space, and the unit weight is also reduced.

Since the pitches of the center of two mounting bolt holes on the rhombic-flanged type housing are the same as those of the center of bolt holes located opposite each other on the square-flanged housing, they are compatible.

The housing can be installed to machines with two bolts.

Applications : Roller conveyor, environment the mounting dimensions are small

2 Adjustable rhombic-flanged type unit

UCFA

Cylindrical bore (with set screws)…Bearing **UC2** series are used.

UCFA2 : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

This rhombic-flanged type unit allows angle adjustment with a supporting point as the shaft center. Therefore, when the bearing unit is installed, fine adjustment of supporting location for the shaft center is enabled.

Since the pitches of the center of mounting bolt holes on the housing are the same as those of the square-flanged type unit and rhombic-flanged type unit, they are compatible.

The housing can be installed to machines with two bolts.

(3 Rhombic-flanged type units)

3 Three-bolt flange type unit

UCFB

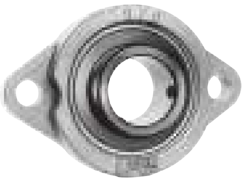
Cylindrical bore (with set screws)…Bearing **UC2** series are used.

UCFB2 : Standard type, **L3 (L2)** : Triple-lip seal type or
Double-lip seal type

The housing of this unit has the one-side rhombic flange, and the unit is suitable to use on a vertical surface and in a limited space, such as the side of machinery.

The housing can be installed to machines with three bolts.

4 Light duty rhombic-flanged type units



BLF

ALF

Cylindrical bore (with set screws)…Bearing **SB2** series are used.

BLF2

Cylindrical bore (with eccentric locking collar)
…Bearing **SA2** series are used.

ALF2

This rhombic-flanged type unit is designed for the aim of lightweight. The housing can be installed to machines with two bolts.

5 "Compact" series rhombic-flanged type unit

UFL

Cylindrical bore (with set screws)…Bearing **SU0** series are used.

UFL0

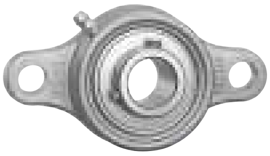
C, D : Rubber coating cover type

The small and lightweight rhombic-flanged type unit, comprising the insert bearing for unit for light load and the special lightweight alloy housing, needs not to be lubricated additionally.

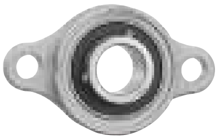
The housing can be installed to machines with two bolts.

Applications : Machineries for light load

6 Stainless-series rhombic-flanged type units



UCSFL-S6



USFL-S6

Cylindrical bore (with set screws)

Standard…Bearing **UC2X (2) -S6** series are used.

UCSFL2X (2) -S6

C, D : Pressed stainless steel cover type

Compact…Bearing **SU0-S6** series are used.

USFL0-S6

C, D : Rubber coating cover type

This superior anticorrosion rhombic-flanged type unit comprises the bearing and housing made of stainless steel. The unit is thinner than standard UCFL series units, leading to downsizing of machinery.

The housing can be installed to machines with two bolts.

Applications : Food machinery, agricultural machinery

4 Round-flanged types with spigot joint

1 Round-flanged types with spigot joint

UCFC, UCFC-E

UKFC

Cylindrical bore (with set screws)…Bearing **UC2 (X)** series are used.

UCFC2 (X) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, D (FC, FD) : Pressed steel cover or cast iron cover type

UCFCX-E : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

Tapered bore (with adapter)…Bearing **UK2 (X)** series are used.

UKFC2(X) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, D (FC, FD) : Pressed steel cover or cast iron cover type

This bearing unit comprises the insert bearing for unit, round flange, and the housing with spigot joint on the mounting surface. The housing can be installed to machines by fitting the spigot joint into the mounting hole of machinery, and using four bolts.

The housing can be installed to the exact location by fitting the spigot joint into the mounting hole.

Applications : Rotating drum, rotating roller, purposes excellent mounting accuracy is required.

2 Stainless-series round-flanged types with spigot joint

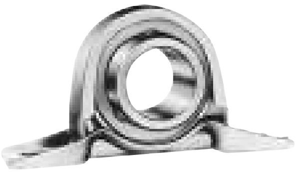
UCSFC is a four-Bolt Flange Cartridge Units that is made entirely out of stainless steel components for the highest level of corrosion resistance for a mounted bearing unit. It is also prefilled with food grade grease for food processing applications.

Duty: Standard

UCSFC-S6

5 Pressed steel housing type units

1 Pressed steel pillow block type unit



SBPP

SAPP

Cylindrical bore (with set screws)…Bearing **SB2** series are used.

SBPP2

Cylindrical bore (with eccentric locking collar)

…Bearing **SA2** series are used.

SAPP2

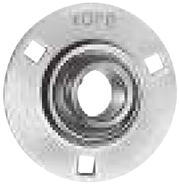
This lightweight pillow block type unit for light load comprises the insert bearing for lightweight unit and the pressed steel plate housing.

The housing can be installed to machines with two bolts.

Applications : Light duty conveyor, environment exposed to light load and low speed rotation

(5 Pressed steel housing type units)

2 Pressed steel round-flanged type units



SBPF

SAPF

Cylindrical bore (with set screws)…Bearing **SB2** series are used.

SBPF2

Cylindrical bore (with eccentric locking collar)
…Bearing **SA2** series are used.

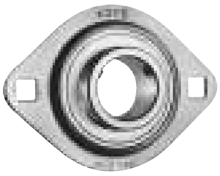
SAPF2

This lightweight round-flanged type unit for light load comprises the insert bearing for lightweight unit and the pressed steel plate housing.

The housing can be installed to machines with three bolts.

Applications : Light duty conveyor, environment exposed to light load and low speed rotation

3 Pressed steel rhombic-flanged type units



SBPFL

SAPFL

Cylindrical bore (with set screws)…Bearing **SB2** series are used.

SBPFL2

Cylindrical bore (with eccentric locking collar)
…Bearing **SA2** series are used.

SAPFL2

This lightweight rhombic-flanged type unit for light load comprises the insert bearing for lightweight unit and the pressed steel plate housing. Compared to the pressed steel round-flanged type unit, less mounting space is required.

The housing can be installed to machines with two bolts.

Applications : Light duty conveyor, environment exposed to light load and low speed rotation

4 Pressed steel triangle-flanged type units

SBPFT

Cylindrical bore (with set screws)…Bearing **SB2** series are used.

SBPFT2

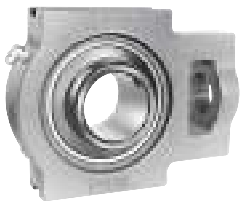
This lightweight triangle-flanged type unit for light load comprises the insert bearing for lightweight unit and the pressed steel plate housing.

The housing can be installed to machines with three bolts.

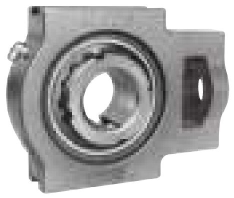
Applications : Light duty conveyor, environment exposed to light load and low speed rotation

6 Take-up type units

1 Take-up type units



UCT, UCT-E



UKT

Cylindrical bore (with set screws)…Bearing **UC2 (X, 3)** series are used.

UCT2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type
C, CD (FC, FCD) : Pressed steel cover or cast iron cover type
UCT2 (X) -E : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

Tapered bore (with adapter)…Bearing **UK2 (X, 3)** series are used.

UKT2(X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type
C, CD (FC, FCD) : Pressed steel cover or cast iron cover type

The bearing unit comprises the insert bearing for unit and the housing with slide groove. This unit allows angle adjustment with a supporting point of the shaft center by moving the housing in radial direction along the slide groove.

Applications : Belt conveyor, use the supporting point of the shaft center must be adjusted

2 Stainless-series take-up type unit

UCST-S6

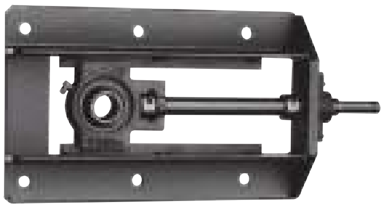
Cylindrical bore (with set screws)…bearing **UC2-S6** series are used.

UCT2-S6
C, CD : Pressed stainless steel cover type

This superior anticorrosion take-up type unit comprises the bearing and the housing made of stainless steel. The unit is thinner than standard UCT series units, leading to downsizing of machinery.

Applications : Conveyor of food machinery, agricultural machinery

3 Section steel frame take-up type unit



UCTH

Cylindrical bore (with set screws)…Bearing **UC2** series are used.

UCTH2 : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type
C, CD (FC, FCD) : Pressed steel or cast iron cover type

This unit comprises the take-up type unit, the section steel frame, adjuster bolt, and so on.

This unit allows adjustment of the supporting point of the shaft center by moving the housing in radial direction with the adjuster bolt on the unit.

The housing can be installed to machines with six bolts.

Applications : Belt conveyor, use the supporting point of the shaft center must be adjusted

(6 Take-up type units)

4 Channel steel frame take-up type unit

UCTL

Cylindrical bore (with set screws)…Bearing **UC2 (3)** series are used.

UCTL2 : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, CD (FC, FCD) : Pressed steel cover or cast iron cover type

UCTU2 (3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

C, CD (FC, FCD) : Pressed steel cover or cast iron cover type

This unit comprises the take-up type unit, the channel steel frame, adjuster bolt, and so on. This unit allows adjustment of the supporting point of the shaft center by moving the housing in radial direction with the adjuster bolt in the frame.

Since this unit is installed with the frame stood, the mounting space is reduced.

The TL lightweight type unit is made of light channel steel, and the TU highly rigid type unit is made of channel steel. The housing can be installed to machines with two or four bolts.

Tapered bore (with adapter) unit is also available (examples of nominal number : UKTL 207J-100, UKTU208J-500).

Applications : Belt conveyor, use the supporting point of the shaft center must be adjusted

5 Pressed steel frame take-up type unit

SBPTH

Cylindrical bore (with set screws)…Bearing **SB2** series are used.

SBPTH2

SBNPTH2

This unit comprises the pressed steel take-up type unit, the pressed steel frame, adjuster bolt, and so on. This unit allows adjustment of the supporting point of the shaft center by moving the housing in radial direction with the adjuster bolt in the frame.

Since the housing and the frame are made of pressed steel, the unit is compact and lightweight. The housing can be installed to machines with four or six bolts.

Applications : Small belt conveyor for lightload, use the supporting point of the shaft center must be adjusted

7 Other units

1 Cartridge type units

UCC

UKC

Cylindrical bore (with set screws)…Bearing **UC2 (X, 3)** series are used.

UCC2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

Tapered bore (with adapter)…Bearing **UK2 (X, 3)** series are used.

UKC2 (X, 3) : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

This unit comprises the insert bearing for unit and the housing with the cylindrical outside surface. The housing, having the grounded cylindrical outer surface, can be fit to the cylindrical bore of a machine.

The cartridge type unit, moving in axial direction, is used as the bearing for free side when a shaft is expanded or contracted.

The cylindrical outside surface and the automatic aligning mechanism allow handling similar to standard automatic aligning type bearing.

2 Hanger type unit

UCHA

Cylindrical bore (with set screws)…Bearing **UC2** series are used.

UCHA2 : Standard type, **L3 (L2)** : Triple-lip seal type or Double-lip seal type

The bearing unit comprises the insert bearing for unit and the housing with parallel thread for pipe on one side. The compact housing is installed to machinery with suspended with steel pipe.

Applications : Intermediate bearing of screw conveyor

8 Insert bearings for units

1 UC type bearing

UC

Cylindrical bore (with set screws)

UC2 (X, 3)…Standard type

UC2 (X, 3) L3 (L2)…Triple-lip seal type or Double-lip seal type

UC2-S6…Stainless steel series

This grease sealed type deep groove insert bearing incorporates the outer ring with the spherical outside surface and lubricating mechanism and wide inner ring with cylindrical bore set screw. Two types, standard type (oil seal and flinger are included) and triple-lip seal type (supplementary code : L3), are available, depending on the type of sealing device.

It can be fixed to shaft with two set screws on the inner ring. It is the most typical type in insert bearings for unit.

The UC2-S6 series are superior waterproof and anticorrosive insert bearings for unit. The bearing is made of stainless steel, and the series are used for stainless-series units.

As for the types and features of set screw for UC type bearing, see **"14 Handling"**.

(8 Insert bearings for units)

2 UK type bearing

UK

Tapered bore (with adapter)

UK2 (X, 3)…Standard type

UK2 (3) L3 (L2)…Triple-lip seal type or Double-lip seal type

This grease sealed type deep groove ball bearing incorporates the outer ring with the spherical outside surface and lubricating mechanism and wide inner ring with tapered bore. Two types, standard type (oil seal and flinger are included) and triple-lip seal type (supplementary code : L3), are available, depending on the type of sealing device.

It can be fixed to shaft with the adapter. The UK type bearing (with adapter) is optimal for use of long shaft.

As for the UK type bearing, applicable adapter assembly number should be added to the bearing number.

3 NA type insert bearing

NA

Cylindrical bore (with eccentric locking collar)

NA2

This type is based on the UC type bearing having set screw, but equipped with the eccentric locking collar. The grease sealed type deep groove ball bearing incorporates the spherical outside surface outer ring with lubricating mechanism and the cylindrical bore, wide inner ring, and eccentric locking collar with eccentric section on one side. The sealing device is equipped with the oil seal and flinger.

When fixing the bearing to shaft, fit the eccentric recessed section of the eccentric locking collar to the eccentric section of the inner ring, turn the eccentric locking collar to fix it to shaft, and tighten the set screw of the eccentric locking collar to shaft.

4 SB type bearing

SB

Cylindrical bore (with set screws)

SB2

This is the lightweight UC type bearing. The non-lubricating type grease sealed deep groove ball bearing incorporates the spherical outside surface outer ring and the wide inner ring with cylindrical bore set screw. When fixing it to shaft, use the two set screws on the inner ring.

It is used for lightweight unit or pressed steel unit.

5 SA type bearing

SA

SA-F

Cylindrical bore (with eccentric locking collar)

SA2, SA2-F

This type is based on the SB type bearing having set screw, but equipped with the eccentric locking collar. The non-lubricating type grease sealed type deep groove ball bearing incorporates the spherical outside surface outer ring and the cylindrical bore, wide inner ring, and eccentric locking collar with eccentric section on one side.

When fixing the bearing to shaft, fit the eccentric recessed section of the eccentric locking collar to the eccentric section of the inner ring, turn the eccentric locking collar to fix it to shaft, and tighten the set screw of the eccentric locking collar to shaft.

(SA-F type bearing has lubricating mechanism on outer ring.)

It is used for lightweight unit or pressed steel unit.

6 SU type bearing (“compact” series)

SU

Cylindrical bore (with set screws)

SU0…Standard type

SU0-S6…Stainless steel

The bearing series intended for light load is suitable for downsizing and weight saving.

The non-lubricating type grease sealed deep groove ball bearing incorporates the spherical outside surface outer ring and the wide inner ring with cylindrical bore set screw. When fixing it to shaft, use the two set screws on the inner ring.

The SU0-S6 type bearing for unit, made of stainless steel, is superior in corrosion resistance, and used for stainless-series units.

7 ER type bearing

ER

Cylindrical bore (with set screws), cylindrical outside surface, lubricating mechanism, locating snap ring and snap ring groove

ER2

The grease sealed type deep groove ball bearing incorporates the spherical outside surface with lubricating mechanism and set screw, the wide inner ring with cylindrical bore set screw. When fixing it to shaft, use the two set screws on the inner ring.

It features lubricating mechanism, set screw (easy to locate bearing), clearance fit of inner ring and shaft (easy to install). Therefore, it can be used for various purposes in a similar way to standard bearings.

8 RB type bearing

RB

Cylindrical bore (with set screws), cylindrical outside surface

RB2

This bearing is based on the ER type bearing, but without the lubricating mechanism and locating snap ring and snap ring groove. The grease sealed deep groove ball bearing incorporates the spherical outside surface outer ring and the wide inner ring with cylindrical bore set screw. When fixing it to shaft, use the two set screws on the inner ring.

Since clearance fit may be used for installation of the inner ring to shaft (easy to install), it can be used for various purposes in a similar way to standard bearings.

3.3 Unit for special use

To meet with requests for varied and special purposes, JTEKT supplies insert bearing series for special use with various features, as well as standard types. If you use insert bearing units under special environment or conditions, select optimal type among insert bearing units for special use.

JTEKT produces bearing units in various forms and specifications, other than units for special use. Contact JTEKT, if you need them.

1 Triple-lip seal unit (Double-lip seal unit) (supplementary code : L3 (L2))

Triple-lip seal has the structure in which the triple-lip oil seal is glued to the pressed steel shield plate with vulcanized adhesive. The triple-lip eliminates ingress of dusts and mud water into bearing to ensure long service life of the bearing even under severe environmental conditions.

Since the triple-lip seal is fit to the outer ring of the bearing, the triple-lip seal bearing unit can be handled in the same manner as the standard types. The triple-lip seal unit does not lead to uneven contact of the shaft with seal while the bearing is aligned unlike the unit with cover, and maintains stable sealing performance for a long time.

The triple-lip seal unit is the outstanding product that defects of conventional dust and water preventive unit are improved to realize energy-saving and low cost. The triple-lip seal is applicable to the UC type bearing and the UK type bearing.

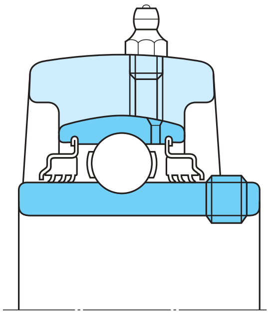


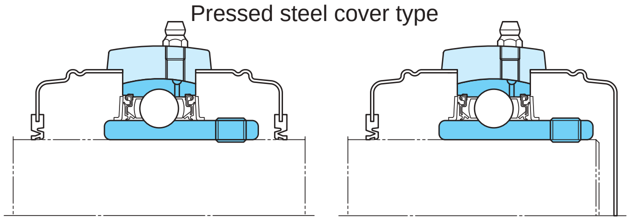
Fig. 3.1 Structure of triple-lip seal unit

2 Unit with cover (supplementary code : C, D, FC, FD)

The unit with cover is equipped with the standard type housing and the pressed steel cover or cast iron cover, and features the double sealing structure of bearing and housing. The unit ensures a long service life of bearing even under severe environmental conditions such as dusts and mud water.

The unit with cover is available in two types : open ends type C type, FC type, closed end type D type, and FD type (for pillow block type unit, CD type or FCD type).

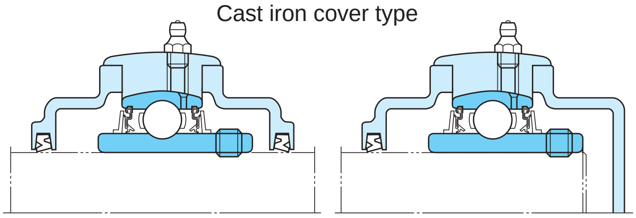
Pressed steel cover type



Open ends type

Closed end type

Cast iron cover type



Open ends type

Closed end type

Fig. 3.2 Type and structure of unit with cover

3 Heat resistant unit (special code : D1K2) and Cold resistant unit (special code : D2K2)

The operating temperature range of a insert bearing unit depends on the performance of grease and oil seal (rubber) used for the bearing. The operating temperature range of Koyo Insert Bearing Unit (standard type) ranges from –20 ℃ to 100 ℃.

If you use bearing units in the higher or lower temperature range beyond the operating temperature range of standard type, select the heat resistant (special code : D1K2) or the cold resistant unit (special code : D2K2).

Specifications of the heat resistant unit and the cold resistant unit are shown in **Table 3.3**.

Table 3.3 Specifications of heat resistant unit and cold resistant unit

Category	Special code	Operating temperature range (℃)	Grease	Oil seal rubber material	Bearing internal clearance	
					UC type	UK type
Standard	(no code)	–20 to 100	Alvania No. 2 or equivalence (lithium soap)	Nitrile	CN	C3
Heat resistant	D1K2	–40 to 180	SH44M (lithium soap)	Silicone	C4	C5
Cold resistant	D2K2	–50 to 120	SH33M (lithium soap)	Silicone	CN	C3

4 High speed unit (special code : K3)

The high speed unit (special code : K3) is the product that has been developed for intention of high speed and less heat. For the high speed unit bearing, the non-contact type oil seal optimal for high speed rotation and low torque is used.

This unit is intended for the purposes high speed rotation, low torque, and less heat are required, such as textile machinery and printing machinery.

5 Unit for blower (special code : S5)

The insert bearing unit for blower must meet requests for high speed rotation, less heat, less vibration, and low noise.

To meet with these requests for performance, JTEKT supplies the series of unit for blower (special code : S5) that the non-contact type oil seal is used, as well as improves the machining accuracy.

This unit is intended for the purposes high speed rotation, less heat, less vibration, low noise are required, such as a blower.

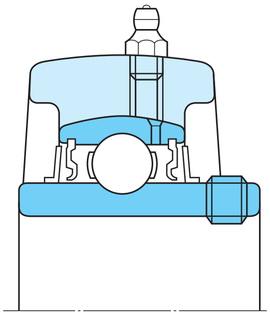


Fig. 3.3 Structure of bearing unit for blower

6 "Compact" series unit

For downsizing of machinery in facilities, the set screw method facilitating installation of the shaft is adopted for this unit.

The unit comprises the compact bearing and the special alloy housing.

Since the cover surface is coated with rubber, it contacts close with the housing well, and features superior dustproof and waterproof performance.

Operating temperature range : Standard temperature

7 Stainless-series unit (special code : S6)

The insert bearing units used for food machinery need waterproof performance.

For this purpose, JTEKT has released a series of Insert Bearing units of which bearings and housings are made of stainless steel in order to satisfy the required performance.

We can also provide bearing units packing grease applicable to use related to food certified by USDA (US Agriculture Department) H1.

Operating temperature range : From –20 ℃ to +100 ℃

* If you use this unit for machines splashed with water or in the environment that the operating temperature exceeds 50 ℃, it is recommended you use UC-S6 to be able to be lubricated for SU-S6.

4 Selection of unit

4.1 Outline of selection

Koyo Insert Bearing Units are available in various types and series. Therefore, to select the bearing unit optimal for design of machinery, various factors including the structure of machinery, operating conditions, performance required for bearing unit, specifications relative to the unit, marketability, and economic efficiency, must be comprehensively taken into consideration. Service life of the bearing greatly depends on the quality of selection.

Procedures of selection of standard insert bearing units are shown in **Table 4.1**.

Table 4.1 Procedures of selection of standard insert bearing units

Procedures of selection	Items to be examined	Operating conditions to be considered	Reference
1 Selection of type	· Pillow block type · Flange type · Take-up type · Cartridge type · Hanger type	Structure of machinery, mounting space, mounting dimensions	3 Types (P.13)
2 Selection of shaft dia. and dia. series	· Bearing bore dia. : From 10 to 140 mm · Dia. series : 0, 2, X, 3	Rating life of bearings required, load applied to bearings, rotational speed	5 Life of bearing (P.33) 6 Bearing load (P.38) 7 Allowable rotational speed (P.45)
3 Selection against atmosphere	· L3 (L2) type · Cover type · Stainless steel series · For high speed use · For blower	Environment (dusts, mud water, high humidity, chemicals), rotational speed	3 Types (P.13) (P.28) 7 Allowable rotational speed (P.45)
4 Selection against temperature	· Heat resistant type · Cold resistant type · Measures against expansion and contraction of shaft · Grease supply	Bearing temperature	3 Types (P.13) (P.28) 8 Operating temperature and bearing specifications (P.46) 10 Design of shaft and base (P.52) 14 Handling (P.66)
5 Selection of installing to shaft	· Set screw · Adapter · Eccentric locking collar	Rotational speed, load conditions, handling	3 Types (P.13) 14 Handling (P.66)
6 Selection of shafts	· Dimensional tolerance · Adoption of shouldered shaft · Provision of set screw for shaft · Measures against expansion and contraction of shaft	Rotational speed, load conditions, bearing temperature	3 Types (P.13) (P.28) 7 Allowable rotational speed (P.45) 10 Design of shaft and base (P.52) 14 Handling (P.66)
7 Selection of strength of housings	· Cast iron · Cast steel · Pressed steel	Load conditions, load directions, presence of impact	9 Strength of housing (P.47)
8 Selection of lubrication	· Lubricating type · Non-lubricating type · Centralized lubricating type · Greasing interval	Environment, importance of machine, bearing temperature, grease life	14 Handling (P.66)
9 Selection of maintenance and check	· Periodic inspection · Grease supply	Environment, importance of machine, bearing temperature, grease life	14 Handling (P.66)

4.2 Selection of type and specifications

Koyo Insert Bearing Units series are available in various types and specifications applicable to your purposes. Therefore, when selecting types and specifications of bearing unit, structure of machine, operating conditions, and environment must be fully taken into consideration for comprehensive examination.

Outline of selection of insert bearing unit types and specifications are shown in **Table 4.2**.

Table 4.2 (1) Outline of selection of insert bearing unit types and specifications

○ : Acceptable or Yes, × : Unacceptable or No

Category	Performance required		Bearing specifications			Applicable housing
	Operating conditions	Fixing to shaft	Sealing structure	Type code	Lubrication	
Bearing	Standard	Set screw Adapter	Oil seal and flinger	UC UK	○	C, F, FA, FB, FC, FL, FS, HA, IP, P, PA, PH, T, TH, TL, TU
		Eccentric locking collar		NA	○	C, FC, NF, NFL, P, T
	Dustproof and waterproof	Set screw Adapter	Triple-lip seal	UC-L3 UK-L3	○	C, F, FA, FB, FC, FL, FS, HA, IP, P, PA, PH, T, TH, TL, TU
	Lightweight	Set screw	Oil seal	SA, SB	×	LF, LP, PF, PFL, PP, PTH, NPTH
	“Compact”	Set screw		SU		FL0, P0
	Anticorrosion	Set screw	Oil seal and flinger	UC-S6	○	SFL, SP
	Anticorrosion and compact		Oil seal	SU-S6	×	SFL0, SP0
	Heat resistant Cold resistant For high speed For blower	Set screw Adapter	Oil seal and flinger	UC UK	○	C, F, FA, FB, FC, FL, FS, HA, IP, P, PA, PH, T

Table 4.2 (2) Outline of selection of insert bearing unit types and specifications

Category	Performance required		Housing specifications				Applicable bearing
	Type	Operating conditions	Type code	Material	Presence of cover	Lubrication	
Housing	Pillow block type	Standard	P	Cast iron	○	○	UC (-L3 or -L2), UK (-L3 or -L2)
		Thick section (highly strong)	IP	Cast iron			
		Tapped-base	PA	Cast iron	×	○	UC (-L3 or -L2)
		Higher centerheight	PH			○	UC (-L3 or -L2)
		Light duty	LP			×	SB
		“Compact”	P0	Special light alloy	○	×	SU
		Anticorrosion	SP	Stainless steel		○	UC-S6
		Anticorrosion and compact	SP0	Stainless steel		×	SU-S6
		Pressed steel	PP	Pressed steel	×	×	SB
	Flange type	Square	F	Cast iron	○	○	UC (-L3 or -L2), UK (-L3 or -L2)
		With spigot joint (square)	FS				
		(round)	FC				
		Rhombic	FL	Cast iron	×	○	UC (-L3 or -L2)
		Shaft alignment (adjustable rhombic)	FA				
		Cantilever (deformed)	FB				
		Light duty (rhombic)	LF	Cast iron	×	×	SB
		“Compact” (rhombic)	FL0	Special light alloy	○	×	SU
		Anticorrosion (rhombic)	SFL	Stainless steel	○	○	UC-S6
		(round)	SFC	Stainless steel	○	○	UC-S6
		Anticorrosion and compact (rhombic)	SFL0	Stainless steel	○	×	SU-S6

Table 4.2 (2) Outline of selection of insert bearing unit types and specifications

Category	Performance required		Housing specifications				Applicable bearing
	Type	Operating conditions	Type code	Material	Presence of cover	Lubrication	
Housing	Flange type	Pressed steel (round) (rhombic) (triangle)	PF PFL PFT	Pressed steel	×	×	SB
	Take-up type	Standard	T	Cast iron	○	○	UC (-L3 or -L2), UK (-L3 or -L2)
		Section steel frame type	TH	Cast iron	○	○	UC (-L3 or -L2)
		Channel steel frame type	TL TU	Cast iron	○	○	UC (-L3 or -L2), UK (-L3 or -L2)
		Pressed steel frame type	PTH NPTH	Pressed steel	×	×	SB
	Cartridge type	Standard	C	Cast iron	×	○	UC (-L3 or -L2), UK (-L3 or -L2)
	Hanger type	Standard	HA	Cast iron	×	○	UC (-L3 or -L2)

4.3 Selection from a maintenance standpoint

Koyo Insert Bearing Units need not to be maintained or checked for standard purposes during operation, because of their structures. However, they must be periodically maintained or checked if they are used for important machines or under special environment.

Thus, it is important that intervals of periodic maintenance or check during operation are extended or insert bearing units optimal for purposes or operating conditions are selected in order to reduce the manpower required for maintenance and check.

For your purposes, various factors must be fully examined. In the environment exposed to vibration or impact, increase in safety factor of service life of the bearing, and strength of the housing must be fully examined. In the environment exposed to great axial load, use of shouldered shaft, in the environment exposed to dusts or mud water, use of the triple-lip seal type or covered type, in the environment exposed to high or low temperature, material of oil seal and grease type must be fully taken into consideration.

5 Life of bearing

If a insert bearing unit is installed to a machine or device and operated, vibration or noise from the unit may be increased or seizure may occur, after a certain period has passed, even under appropriate conditions. The period of bearing operation until the unit cannot be used due to these causes is called the life of insert bearing unit.

Life of a insert bearing unit is caused by two reasons, fatigue of bearing material (fatigue service life) and degradation of grease leading to faulty lubrication, and inability of continuous use. Each of them can be found as the rating life of bearing and grease life.

The life of insert bearing unit depends on the shorter one, between the rating life of bearing and grease life. Since the lubricating system is adopted for the Koyo Insert Bearing Unit, the grease life can be extended to the rating life of bearing by appropriate lubrication. If the bearing unit is used without lubrication, the shorter period, the rating life of bearing or grease life, is the life of the bearing unit.

However, a insert bearing unit is actually installed to a machine or device and operated, the unit cannot be used due to causes other than the rating life of bearing or grease service life (wear, dent, crack, seizure, etc.). They can be prevented by full examination of the selection, handling, installation, and lubrication of the insert bearing unit.

5.1 Basic rating life and basic rating load

5.1.1 Basic rating life

While a bearing is rotated under load, the raceways surfaces of the inner and outer rings of bearing and the rolling surfaces of rolling element are exposed to load continuously. Thus, damages like scales appear on the raceway surfaces or rolling surfaces due to fatigue of material (flaking or peel-off). The total number of revolution until the damages appear is called as "(Fatigue) service life" of bearing. Fatigue service life of bearing may be greatly varied even if the bearings having the same structure, dimensions, materials, and machining methods, are operated under the same operating conditions.

To solve this problem, if a group of the same bearings are operated under the same conditions, the total number of revolution of 90% of the bearings without damage due to rotating fatigue (life of 90% reliability) is called as the **"Basic rating life of bearing"**.

5.1.2 Basic rating load

Basic rating load indicates the withstanding strength against rolling fatigue of a bearing, that is to say, loading capacity. It is the pure radial load of a certain level and direction (for radial bearing) or central axial load (for thrust bearing) that a million times of rotations can be obtained as the basic rating life if the inner ring of bearing is rotated while the outer ring is stopped (or the outer ring is rotated while the inner ring is stopped).

They are called as the **basic dynamic radial load rating** (C_r) for radial bearing or the **basic dynamic axial load rating** (C_a) for axial bearings.

In the insert bearing for insert bearing unit, it is indicated as the basic dynamic radial load rating (C_r), and the value is shown in the dimensional table.

5.2 Calculation of rating life

Relation between the basic rating life, basic dynamic load rating, and the dynamic equivalent load of the insert bearing for insert bearing unit can be indicated as the **Equation (5.1)**. If the insert bearing unit is used at a fixed rotational speed, it is convenient that the life is indicated as time, as shown in the **Equation (5.2)**.

(Total revolution) $$L_{10} = \left(\frac{C_r}{P_r}\right)^3 \quad \cdots\cdots (5.1)$$

(Time) $$L_{10h} = \frac{10^6}{60n}\left(\frac{C_r}{P_r}\right)^3 \quad \cdots\cdots (5.2)$$

Whereas,

L_{10}	: Basic rating life	10^6 rotations
L_{10h}	: Basic rating life	h
C_r	: Basic dynamic load rating	N
P_r	: Dynamic equivalent load (see **"6 Bearing load"**)	N
n	: Rotational speed	min^{-1}

Calculation of the basic rating life with using the life factor (f_h) and the speed factor (f_n) in the **Equation (5.2)** are shown below.

$$L_{10h} = 500\ f_h^3 \quad \cdots\cdots (5.3)$$

Life factor $$f_h = f_n \cdot \frac{C_r}{P_r} \quad \cdots\cdots (5.4)$$

Speed factor $$f_n = \left(\frac{10^6}{500 \times 60n}\right)^{1/3} = (0.03n)^{-1/3} \quad \cdots\cdots (5.5)$$

Values of f_n, f_h and L_{10h} can be easily found by the nomogram of **Fig. 5.1**.

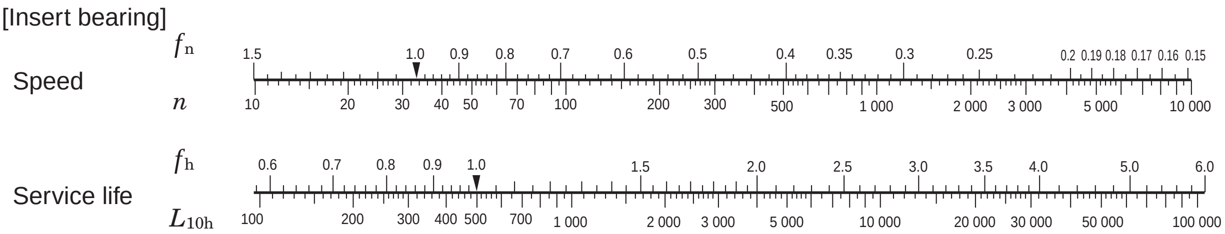


Fig. 5.1 Rotational speed (n) and its coefficients (f_n), and service life coefficient (f_h) and basic rating life (L_{10h})

5.2.1 Correction of basic rating load for high temperature use

If a insert bearing unit is used at a high temperature, structure of bearing material is changed, leading to decreased hardness, and the basic dynamic load rating is reduced than that of the use at standard temperature. Once the structure of bearing material is changed, it will not be restored even if the temperature returns to standard level.

Therefore, when using a insert bearing unit at 150 ℃ or more, the basic rating load must be corrected by multiplying the basic dynamic load rating shown in dimensional table by the temperature factor shown in **Table 5.1**.

If the insert bearing unit has been used for a long period at 120 ℃ or more, fluctuations in dimensions of the bearing may be increased. If you use it under such conditions, contact JTEKT.

Table 5.1 Temperature factor

Bearing temperature, ℃	**125**	**150**	**175**	**200**	**250**
Temperature factor	1	1	0.95	0.90	0.75

5.2.2 Modified rating life L_{nm}

The life of rolling bearings was standardized as a basic rating life in the 1960s, but in actual applications, sometimes the actual life and the basic rating life have been quite different due to the lubrication status and the influence of the usage environment. To make the calculated life closer to the actual life, a corrected rating life has been considered since the 1980s. In this corrected rating life, bearing characteristic factor a_2 (a correction factor for the case in which the characteristics related to the life are changed due to the bearing materials, manufacturing process, and design) and usage condition factor a_3 (a correction factor that takes into account usage conditions that have a direct influence on the bearing life, such as the lubrication) or factor a_{23} formed from the interdependence of these two factors, are considered with the basic rating life. These factors were handled differently by each bearing manufacturer, but they have been standardized as a modified rating life in **ISO 281** in 2007. In 2013, **JIS B 1518** (dynamic load ratings and rating life) was amended to conform to the **ISO**.

The basic rating life (L_{10}) shown in **Equation (5.1)** is the (fatigue) life with a dependability of 90 % under normal usage conditions for rolling bearings that have standard factors such as internal design, materials, and manufacturing quality. **JIS B 1518**:2013 specifies a calculation method based on **ISO 281**:2007. To calculate accurate bearing life under a variety of operating conditions, it is necessary to consider elements such as the effect of changes in factors that can be anticipated when using different reliabilities and system approaches, and interactions between factors. Therefore, the specified calculation method considers additional stress due to the lubrication status, lubricant contamination, and fatigue load limit C_u (refer to P.36) on the inside of the bearing. The life that uses this life modification factor a_{ISO}, which considers the above factors, is called modified rating life L_{nm} and is calculated with the following **Equation (5.6)**.

$$L_{nm} = a_1 a_{ISO} L_{10} \quad \cdots\cdots (5.6)$$

In this equation,

L_{nm} : Modified rating life 10^6 rotations

(This rating life has been modified for one of or a combination of the following: reliability of 90 % or higher, fatigue load limit, special bearing characteristics, lubrication contamination, and special operating conditions.)

L_{10} : Basic rating life 10^6 rotations
(reliability: 90 %)

a_1 : Life modification factor for reliability
.... refer to section (1)

a_{ISO} : Life modification factor
.... refer to section (2)

[Remark] When bearing dimensions are to be selected given L_{nm} greater than 90 % in reliability, the strength of shaft and housing must be considered.

(1) Life modification factor for reliability a_1

The term “reliability” is defined as “for a group of apparently identical rolling bearings, operating under the same conditions, the percentage of the group that is expected to attain or exceed a specified life” in **ISO 281**:2007. Values of a_1 used to calculate a modified rating life with a reliability of 90 % or higher (a failure probability of 10 % or less) are shown in **Table 5.2**.

Table 5.2 Life modification factor for reliability a_1

Reliability, %	L_{nm}	a_1
90	L_{10m}	1
95	L_{5m}	0.64
96	L_{4m}	0.55
97	L_{3m}	0.47
98	L_{2m}	0.37
99	L_{1m}	0.25
99.2	$L_{0.8m}$	0.22
99.4	$L_{0.6m}$	0.19
99.6	$L_{0.4m}$	0.16
99.8	$L_{0.2m}$	0.12
99.9	$L_{0.1m}$	0.093
99.92	$L_{0.08m}$	0.087
99.94	$L_{0.06m}$	0.080
99.95	$L_{0.05m}$	0.077

(Citation from **JIS B 1518**:2013)

(2) Life modification factor $a_{\rm ISO}$

a) System approach

The various influences on bearing life are dependent on each other. The system approach of calculating the modified life has been evaluated as a practical method for determining life modification factor $a_{\rm ISO}$ (ref. **Fig. 5.2**). Life modification factor $a_{\rm ISO}$ is calculated with the following equation. A diagram is available for each bearing type (radial ball bearings, radial roller bearings, thrust ball bearings, and thrust roller bearings). (Each diagram (**Figs. 5.3** to **5.6**) is a citation from **JIS B 1518**:2013.)

Note that in practical use, this is set so that life modification factor $a_{\rm ISO}$ ≧ 50.

$$a_{\rm ISO} = f\left(\frac{e_{\rm c}C_{\rm u}}{P}, \kappa\right) \quad \cdots\cdots\cdots\cdots\cdots\cdots \quad (5.7)$$

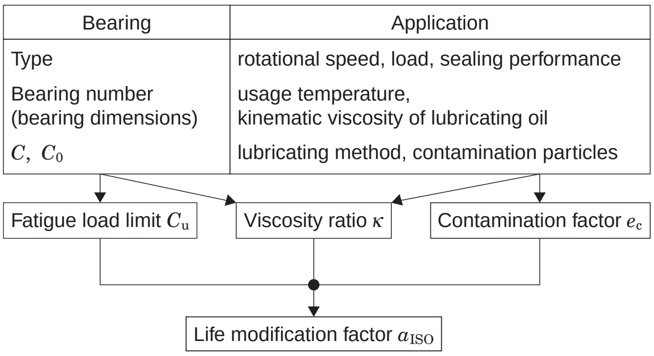


Fig. 5.2 System approach

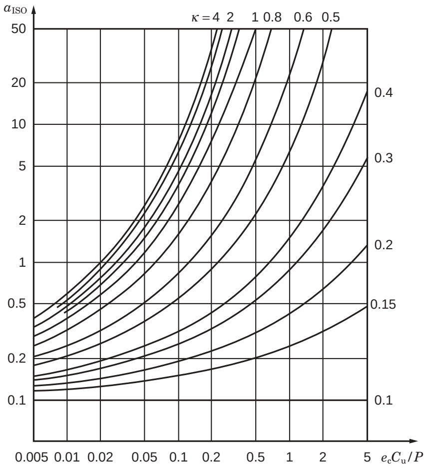


Fig. 5.3 Life modification factor $a_{\rm ISO}$ (Radial ball bearings)

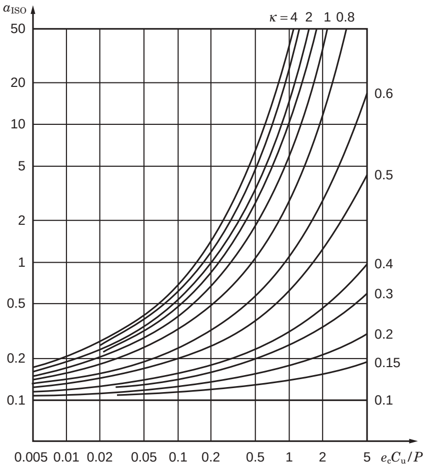


Fig. 5.4 Life modification factor $a_{\rm ISO}$ (Radial roller bearings)

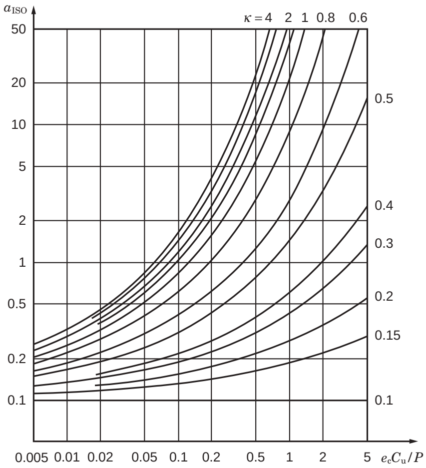


Fig. 5.5 Life modification factor $a_{\rm ISO}$ (Thrust ball bearings)

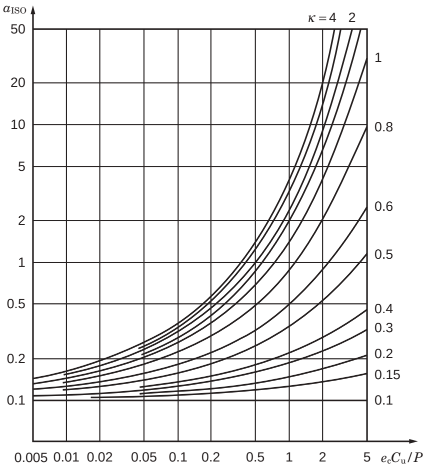


Fig. 5.6 Life modification factor $a_{\rm ISO}$ (Thrust roller bearings)

(**Figs. 5.3** to **5.6** Citation from **JIS B 1518**:2013)

b) Fatigue load limit C_u

For regulated steel materials or alloy steel that has equivalent quality, the fatigue life is unlimited so long as the load condition does not exceed a certain value and so long as the lubrication conditions, lubrication cleanliness class, and other operating conditions are favorable. For general high-quality materials and bearings with high manufacturing quality, the fatigue stress limit is reached at a contact stress of approximately 1.5 GPa between the raceway and rolling elements. If one or both of the material quality and manufacturing quality are low, the fatigue stress limit will also be low.

The term "fatigue load limit" C_u is defined as "bearing load under which the fatigue stress limit is just reached in the most heavily loaded raceway contact" in **ISO 281**: 2007. and is affected by factors such as the bearing type, size, and material.

For details on the fatigue load limits of special bearings and other bearings not listed in this catalog, contact JTEKT.

c) Contamination factor e_c

If solid particles in the contaminated lubricant are caught between the raceway and the rolling elements, indentations may form on one or both of the raceway and the rolling elements. These indentations will lead to localized increases in stress, which will decrease the life. This decrease in life attributable to the contamination of the lubricant can be calculated from the contamination level as contamination factor e_c.

D_{pw} shown in this table is the pitch diameter of ball/roller set, which is expressed simply as $D_{pw} = (D + d)/2$. (D: Outside diameter, d: Bore diameter)

For information such as details on special lubricating conditions or detailed investigations, contact JTEKT.

d) Viscosity ratio κ

The lubricant forms an oil film on the roller contact surface, which separates the raceway and the rolling elements. The status of the lubricant oil film is expressed by viscosity ratio κ, the actual kinematic viscosity at the operating temperature ν divided by the reference kinematic viscosity ν_1 as shown in the following equation.

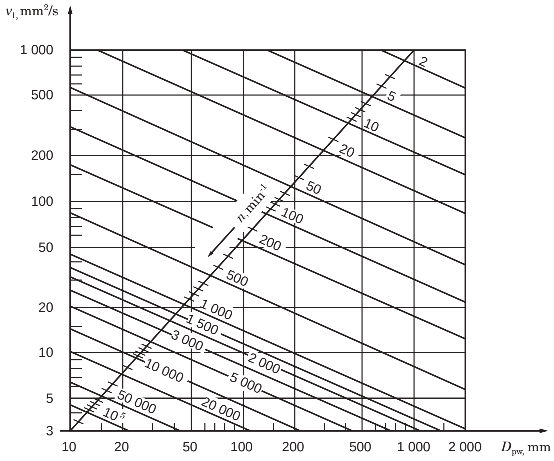
A κ greater than 4, equal to 4, or less than 0.1 is not applicable.

For details on lubricants such as grease and lubricants with extreme pressure additives, contact JTEKT.

$$\kappa = \frac{\nu}{\nu_1} \quad \cdots\cdots \quad (5.8)$$

ν : Actual kinematic viscosity at the operating temperature; the viscosity of the lubricant at the operating temperature

ν_1 : Reference kinematic viscosity; determined according to the speed and pitch diameter of ball/roller set D_{pw} of the bearing (ref. **Fig. 5.7**)



(**Fig. 5.7** Citation from **JIS B 1518**:2013)

Fig. 5.7 Reference kinematic viscosity ν_1

5.2.3 Service life of bearing system comprising two or more bearings

Even for systems which comprise two or more bearings, if one bearing is damaged, the entire system malfunctions.

Where all bearings used in an application are regarded as one system, the service life of the bearing system can be calculated using the following equation,

Table 5.3 Values of contamination factor e_c

Contamination level	e_c	
	D_{pw} < 100 mm	D_{pw} ≧ 100 mm
Extremely high cleanliness: The size of the particles is approximately equal to the thickness of the lubricant oil film, this is found in laboratory-level environments.	1	1
High cleanliness: The oil has been filtered by an extremely fine filter, this is found with standard grease-packed bearings and sealed bearings.	0.8 to 0.6	0.9 to 0.8
Standard cleanliness: The oil has been filtered by a fine filter, this is found with standard grease-packed bearings and shielded bearings.	0.6 to 0.5	0.8 to 0.6
Minimal contamination: The lubricant is slightly contaminated.	0.5 to 0.3	0.6 to 0.4
Normal contamination: This is found when no seal is used and a coarse filter is used in an environment in which wear debris and particles from the surrounding area penetrate into the lubricant.	0.3 to 0.1	0.4 to 0.2
High contamination: This is found when the surrounding environment is considerably contaminated and the bearing sealing is insufficient.	0.1 to 0	0.1 to 0
Extremely high contamination	0	0

(**Table 5.3** Citation from **JIS B 1518**:2013)

$$\frac{1}{L^e} = \frac{1}{L_1{}^e} + \frac{1}{L_2{}^e} + \frac{1}{L_3{}^e} + \cdots\cdots\cdots\cdots \quad (5.9)$$

where :

L : rating life of system

L_1, L_2, L_3 ······ : rating life of each bearing

e : constant

e = 10/9······ball bearing
e = 9/8······roller bearing
The mean value is for a system using both ball and roller bearings.

[Example]

When a shaft is supported by two roller bearings whose service lives are 50 000 hours and 30 000 hours respectively, the rating life of the bearing system supporting this shaft is calculated as follows, using **Equation (5.9)** :

$$\frac{1}{L^{9/8}} = \frac{1}{50\,000^{9/8}} + \frac{1}{30\,000^{9/8}}$$

$$L \fallingdotseq 20\,000 \text{ h}$$

The equation suggests that the rating life of these bearings as a system becomes shorter than that of the bearing with the shorter life.

This fact is very important in estimating bearing service life for applications using two or more bearings.

5.2.4 Recommended service life of bearing

Excessively long life of insert bearing unit does not lead to economic operation. Setup of the recommended service life of bearing unit depending on the type of machine the insert bearing unit is used together and operating conditions is required.

Recommended service life of insert bearing unit empirically adopted is shown in **Table 5.4**.

Table 5.4 Recommended service life of insert bearing unit (reference)

Operating conditions	Application	Recommended service life, h
Operated in short period or intermittently	Home electric appliances, electric tool, agricultural machinery, hoist, etc.	4 000 – 8 000
Discontinuously but for a long period	Factory motor, general gear, etc.	12 000 – 20 000
Always operated for 8 hours or longer a day or operated continuously for a long period	General machinery, blower, etc.	20 000 – 30 000
Operated continuously for 24 hours, no fault is allowed	Electric power plant facility, mine drainage facility, etc.	100 000 –200 000

5.3 Grease life

Grease life of a insert bearing for insert bearing unit is influenced by the level of load, rotational speed of bearing, and operating temperature.

Grease life of a insert bearing for unit used under appropriate operating conditions can be found by the equation shown below.

$$\log L = 6.10 - 4.40 \times 10^{-6}\, d_{\mathrm{m}} n - 2.50 \left(\frac{P_{\mathrm{r}}}{C_{\mathrm{r}}} - 0.05 \right)$$

$$- (0.021 - 1.80 \times 10^{-8}\, d_{\mathrm{m}} n)\, T \;\cdots\cdots\cdots\cdots \quad (5.10)$$

Whereas,

L : Grease life h

d_{m} : Pitch dia. of ball set mm

$$d_{\mathrm{m}} = \frac{(D+d)}{2}$$

D : Nominal bearing outer dia.,
d : Nominal bearing bore dia.

n : Rotational speed of bearing min^{-1}

P_{r} : Dynamic equivalent radial load N
(see **"6 Bearing load"**)

C_{r} : Basic dynamic radial load rating of bearing N

T : Operating temperature of bearing °C

Applicable conditions for the **Equation (5.10)** are shown below.

1) Operating temperature of bearing : T °C

To be applied if the following condition is satisfied : $T \leqq 100$

If T is smaller than 50 ($T < 50$), following condition should be applied : $T = 50$.

If T is larger than 100 ($T > 100$), contact JTEKT.

2) Rotationl speed of bearing : $d_{\mathrm{m}} n$

To be applied if the following condition is satisfied : $d_{\mathrm{m}} n \leqq 30 \times 10^4$

If $d_{\mathrm{m}} n$ is smaller than 12.5×10^4 ($d_{\mathrm{m}} n < 12.5 \times 10^4$), following condition should be applied : $d_{\mathrm{m}} n = 12.5 \times 10^4$

If $d_{\mathrm{m}} n$ is larger than 30×10^4 ($d_{\mathrm{m}} n > 30 \times 10^4$), contact JTEKT.

3) Load condition of bearing : $\frac{P_{\mathrm{r}}}{C_{\mathrm{r}}}$

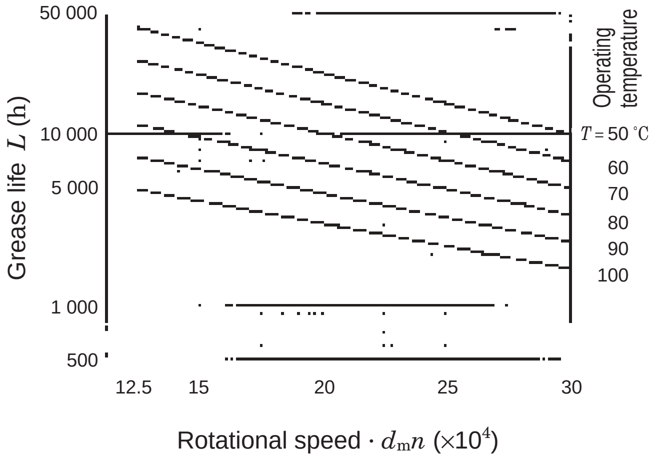
To be applied if the following condition is satisfied : $\frac{P_{\mathrm{r}}}{C_{\mathrm{r}}} \leqq 0.2$

If $\frac{P_{\mathrm{r}}}{C_{\mathrm{r}}}$ is smaller than 0.05 ($\frac{P_{\mathrm{r}}}{C_{\mathrm{r}}} < 0.05$), following condition should be applied : $\frac{P_{\mathrm{r}}}{C_{\mathrm{r}}} = 0.05$

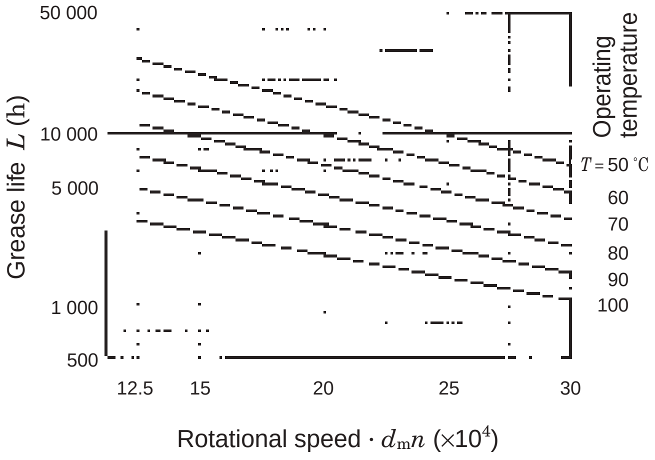
If $\frac{P_{\mathrm{r}}}{C_{\mathrm{r}}}$ is larger than 0.2 ($\frac{P_{\mathrm{r}}}{C_{\mathrm{r}}} > 0.2$), contact JTEKT.

Reference figure of grease life obtained by the **Equation (5.10)** is shown in **Fig. 5.8**.

(1) Bearing load · $\frac{P_r}{C_r} = 0.05$



(2) Bearing load · $\frac{P_r}{C_r} = 0.125$



(3) Bearing load · $\frac{P_r}{C_r} = 0.2$

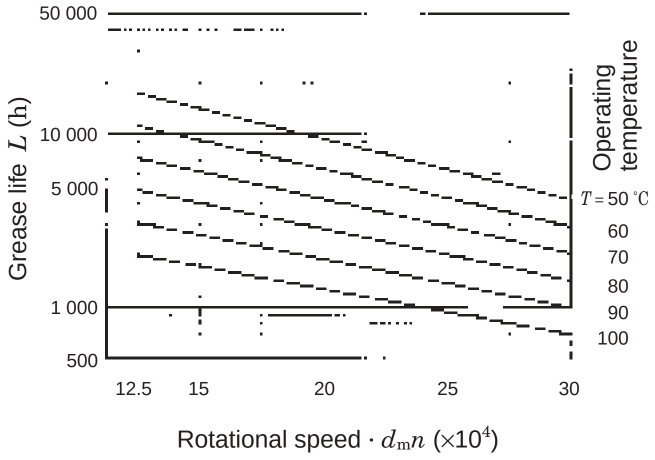


Fig. 5.8 Relation of grease life to bearing load, rotational speed, and operating temperature (reference)

6 Bearing load

As for the loads applied to a bearing, load caused by weight of object supported by the bearing, transmitting force of gears and belts, load generated in the machine operated are included. In many cases, these loads cannot be found out by simple calculation.

Because the loads are not fixed but fluctuated, and it is difficult to fix the level and direction of the fluctuations.

Therefore, in general, to find the loads applied to a bearing, the following steps are adopted : multiply the load to be able to be found theoretically by various factors obtained empirically.

6.1 Loads applied to bearing

6.1.1 Load factor

Even if radial load and axial load to be applied to a bearing can be found by standard dynamical calculation, loads actually applied to the bearing are greater than the calculated values because of vibration and impact generated while machine is being operated.

To find the loads actually applied to a bearing, multiply the theoretically found values by load factor.

$$F = f_w \cdot F_c \quad \cdots\cdots (6.1)$$

Whereas,

F : Load actually applied to bearing N
F_c : Theoretically calculated load N
f_w : Load factor (see **Table 6.1**)

Table 6.1 Load factor f_w

Operating conditions	Applications	f_w
Virtually no vibration or impact	Electric machines and instruments	1 – 1.2
Standard operation (weak impact)	Agricultural machines and blower	1.2 – 2
Great vibration and impact	Constructive machines and grinder	2 – 3

6.1.2 Loads in case of belt or chain transmission

As for belt transmission, theoretical load applied to the pulley shaft can be found by effective transmission force of belt. Actually, the effective transmission force must be multiplied by load factor (f_w) obtained with taking vibration and impact generated while machine is being operated into consideration and belt factor (f_b) with taking belt tension into consideration.

As for chain transmission, factor equivalent to the belt factor for belt transmission must be multiplied.

$$F_b = \frac{2M}{D_p} \cdot f_w \cdot f_b$$

$$= \frac{19.1 \times 10^6\,W}{D_p \cdot n} \cdot f_w \cdot f_b \quad \cdots\cdots\cdots (6.2)$$

Whereas,

F_b : Load actually applied to pulley shaft or sprocket shaft N
M : Torque applied to pulley or sprocket mN · m
W : Transmitted power kW
D_p : Pitch circle dia. of pulley or sprocket mm
n : Rotational speed min^{-1}
f_w : Load factor (see **Table 6.1**)
f_b : Belt factor (see **Table 6.2**)

Table 6.2 Belt factor f_b

Belt type	f_b
Toothed belt	1.3 – 2
V belt	2 – 2.5
Flat belt (with tension pulley)	2.5 – 3
Flat belt	4 – 5
Chain	1.2 – 1.5

6.1.3 Load in case of gear transmission

As for gear transmission, load in tangential direction (K_t), load in radial direction (K_r), and axial load (K_a) are included as the theoretical loads applied to a gear. They can be dynamically found by transmission force and gear type.

The followings show the example of standard flat gear (as for flat gear, no axial load applied is expected.).

(1) Load applied to gear in tangential direction (tangential line force)

$$K_t = \frac{2\,M}{D_p} = \frac{19.1 \times 10^6\,W}{D_p n} \quad \cdots\cdots\cdots (6.3)$$

(2) Load applied to gear in radial direction (separating force)

$$K_r = K_t \tan\alpha \quad \cdots\cdots\cdots (6.4)$$

(3) Synthetic load applied to gear

$$K_g = \sqrt{K_t^2 + K_r^2} = K_t \sec\alpha \quad \cdots\cdots\cdots (6.5)$$

Whereas,

K_t : Load applied to gear in tangential direction (tangential line force) N
K_r : Load applied to gear in radial direction (separating force) N
K_g : Synthetic load applied to gear N
M : Torque applied to gear mN · m
D_p : Pitch circle dia. of gear mm
W : Transmission power kW
n : Rotational speed min^{-1}
α : Pressure angle of gear deg

Note that the actual gear load must be found by multiplying the theoretical load by load factor (f_w) obtained with taking vibration and impact generated while machine is being operated into consideration and gear factor (f_g) with taking accuracy and finish of gear into consideration.

$$F_g = f_w \cdot f_g \cdot K_g \quad \cdots\cdots\cdots (6.6)$$

Whereas,

F_g : Load actually applied to gear N
K_g : Theoretically synthetic load applied to gear N
f_w : Load factor (see **Table 6.1**)
f_g : Gear factor (see **Table 6.3**)

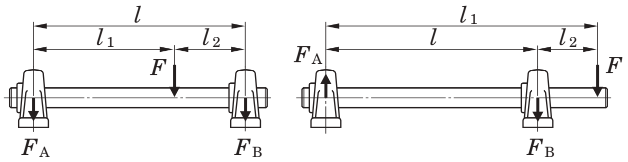
Table 6.3 Gear factor f_g

Gear type	f_g
Precision gear (both pitch error and tooth profile error should be 0.02 mm or less)	1 – 1.1
Standard gear (both pitch error and tooth profile error should be 0.1 mm or less)	1.1 – 1.3

6.2 Distribution of load to bearing

To distribute the load applied to the shaft system into the bearing which supports the shaft, find the radial component force of each load, and calculate the vector sum in accordance with the direction of load. **Fig. 6.1** shows the example of distribution of radial load.

In many cases, a bearing bears radial load as well as axial load, leading to synthetic loads. In such a case, convert it into dynamic equivalent load, and consider it as the bearing load.



$$F_A = \frac{l_2}{l} \cdot F \quad \cdots\cdots (6.7)$$

$$F_B = \frac{l_1}{l} \cdot F \quad \cdots\cdots (6.8)$$

Fig. 6.1 Distribution of load to bearing

6.3 Dynamic equivalent load

In many cases, a bearing is exposed to the synthetic load of radial load and axial load, and it is used under various conditions, including fluctuated load thus, the load actually applied to the bearing cannot be directly compared to the basic dynamic load rating.

In such a case, find the load running the bearing center in a fixed level and direction that allows the same bearing life as the actual bearing load and rotational speed. Then, compare it with the basic dynamic load rating.

The converted virtual load is called dynamic equivalent load (P).

6.3.1 Calculation of dynamic equivalent load

The dynamic equivalent radial load (P_r) of a radial bearing (insert bearing for unit is included) that bears the synthetic load in a fixed level and direction can be found by the equation shown below.

$$P_r = XF_r + YF_a \quad \cdots\cdots (6.9)$$

Whereas,

P_r : Dynamic equivalent radial load N
F_r : Radial load N
F_a : Axial load N
X : Radial load factor (see **Table 6.4**)
Y : Axial load factor (see **Table 6.4**)

Table 6.4 Radial load factor (X) and axial load factor (Y)

$\frac{f_0 F_a}{C_{0r}}$	e	$F_a / F_r \leqq e$		$F_a / F_r > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

[Remarks] 1. C_{0r} (basic static radial load rating) and f_0 (factor) are shown in the dimensional tables.
2. If $f_0 F_a / C_{0r}$ does not conform to the table above, find by interpolation.

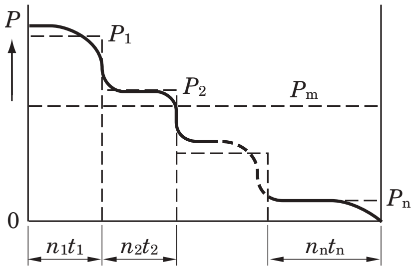
6.3.2 Mean dynamic equivalent load in case of fluctuated load

If level or direction of the load applied to a bearing is fluctuated, it is necessary to find the mean dynamic equivalent load to allow the same bearing life as that under actual fluctuated conditions.

Table 6.5 shows the method of finding the mean dynamic equivalent load under various fluctuated conditions.

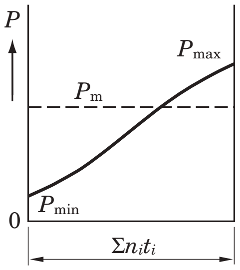
Table 6.5 Calculation of mean dynamic equivalent load in case of fluctuated load

(1) Staged fluctuation



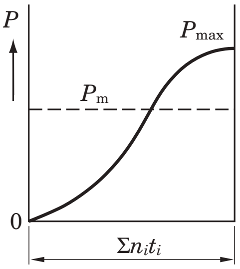
$$P_m = \sqrt[p]{\frac{P_1{}^p\, n_1t_1 + P_2{}^p\, n_2t_2 + \cdots\cdots + P_n{}^p\, n_nt_n}{n_1t_1 + n_2t_2 + \cdots\cdots + n_nt_n}}$$ ……………… (6.10)

(2) Stageless fluctuation



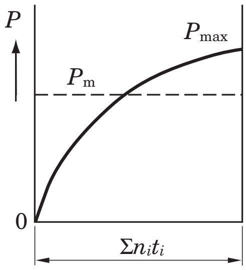
$$P_m = \frac{P_{min} + 2\,P_{max}}{3}$$ ………………………………………… (6.11)

(3) Sine curve fluctuation



$P_m = 0.68\ P_{max}$ ………………………………………………… (6.12)

(4) Sine curve fluctuation (upper half of sine curve)



$P_m = 0.75\ P_{max}$ ………………………………………………… (6.13)

Whereas,

P_m : Mean dynamic equivalent load N

P_1 : Dynamic equivalent load actuating for t_1 hours at rotational speed of n_1 N

P_2 : Dynamic equivalent load actuating for t_2 hours at rotational speed of n_2 N

·
·
·

P_n : Dynamic equivalent load actuating for t_n hours at rotational speed of n_n N

P_{min} : Minimum dynamic equivalent load N

P_{max} : Maximum dynamic equivalent load N

$\Sigma n_i t_i$: Total rotating frequency for t_1 to t_i hours

6.4 Basic static load rating and static equivalent load

6.4.1 Basic static load rating

If a bearing is exposed to excessive static load or impact load even under extra low rotational speed, partial permanent deformation occurs to the contact surface of the raceway of bearing with the rolling element. The permanent deformation increases with the increase of load, and when it exceeds a fixed level, smooth rotation of the bearing is interfered.

Basic static load rating of a bearing is the static load to generate the calculated contact stress shown below at the center of contact surface of the raceway the maximum load is applied and the rolling element.

(1) Self-aligning ball bearing .... 4 600 MPa
(2) Other ball bearings
 (insert bearing for unit is included) .... 4 200 MPa
(3) Roller bearing .... 4 000 MPa

The total permanent deformation of bearing raceway and rolling element to be generated under these contact stresses are 0.000 1 times of the diameter of rolling element.

In the insert bearing for unit, it is indicated as the **basic static radial load rating** (C_{0r}), and the values are shown in the dimensional tables.

6.4.2 Static equivalent load

Static equivalent load is the virtual load converted into the level that allows the generation of the same contact stress at the contact face of the raceway of bearing and rolling element that are exposed to the maximum stress as the contact stress under the actual load conditions, when a bearing is stopped or rotated at extra low speed.

Static equivalent radial load (P_{or}) of the insert bearing for unit can be calculated by the equation below (use greater value).

$$P_{0r} = 0.6F_r + 0.5F_a \quad \cdots\cdots (6.14)$$

$$P_{0r} = F_r \quad \cdots\cdots (6.15)$$

Whereas,

P_{0r}	: Static equivalent radial load	N
F_r	: Radial load	N
F_a	: Axial load	N

6.4.3 Safety factor

The static equivalent load allowed by a bearing depends on the basic static load rating of the bearing, and the limitation of use of bearing by the permanent deformation (partial dent) of the bearing depends on the performance required for the bearing or operating conditions.

Therefore, in order to examine the safety of the basic static load rating of the bearing, safety factor is defined taking conventional experiences into consideration.

$$f_s = \frac{C_{0r}}{P_{0r}} \quad \cdots\cdots (6.16)$$

Whereas,

f_s	: Safety factor (see **Table 6.6**)	
C_{0r}	: Basic static radial load rating	N
P_{0r}	: Static equivalent radial load	N

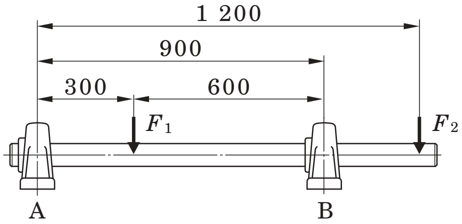
Table 6.6 Safety factor f_s (recommended)

Operating conditions		f_s (Min.)
Being rotated	High rotating accuracy is required	2
	Standard operating conditions	1
	Impact	1.5
Not always being rotated (sometimes oscillated)	Standard operating conditions	0.5
	Impact, unevenly distributed load	1

6.5 Example of applied calculation

Example 1 Distributing load

Find the load applied to the bearing A and bearing B, if the radial load F_1 ($F_1 = 1.5$ kN) and F_2 ($F_2 = 4.5$ kN) are applied.



(1) Find the radial load F_{1A} applied to the bearing A by F_1, with **Equations (6.7)** and **(6.8)**.

$$F_{1A} = \frac{600}{900} \times 1.5 = 1.0 \text{ (kN)}$$

In a similar manner, find the radial load F_{2A} applied to the bearing A by F_2.

$$F_{2A} = -\frac{1\,200 - 900}{900} \times 4.5 = -1.5 \text{ (kN)}$$

[Remark] Negative load is the upward load.

Radial load F_A applied to the bearing A :

$$F_A = F_{1A} + F_{2A} = 1.0 + (-1.5) = -0.5 \text{ (kN)}$$

(2) In a similar manner to (1), find the radial load F_B applied to the bearing B.

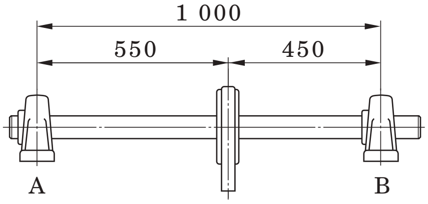
$$F_{1B} = \frac{300}{900} \times 1.5 = 0.5 \text{ (kN)}$$

$$F_{2B} = \frac{1\,200}{900} \times 4.5 = 6.0 \text{ (kN)}$$

$$F_B = F_{1B} + F_{2B} = 0.5 + 6.0 = 6.5 \text{ (kN)}$$

Example 2 Calculating load by V-belt transmission

Find the load applied to the bearing A and bearing B when the shaft is driven by the V-belt, transmission power W is 7.5 kW ($W = 7.5$ kW), rotational speed n is 300 min^{-1} ($n = 300$ min^{-1}), effective diameter of pulley D_p is 300 mm ($D_\mathrm{p} = 300$ mm).



(1) Find the load actually applied to the pulley shaft F_b with **Equation (6.2)**.

From **Table 6.1**, load factor f_w is 1.2 ($f_\mathrm{w} = 1.2$), and the belt factor f_b is 2.5 ($f_\mathrm{b} = 2.5$), from **Table 6.2**.

$$F_\mathrm{b} = \frac{19.1 \times 10^6\, W}{D_\mathrm{p} \cdot n} \cdot f_\mathrm{w} \cdot f_\mathrm{b}$$

$$= \frac{19.1 \times 10^6 \times 7.5}{300 \times 300} \times 1.2 \times 2.5 = 4.78 \text{ (kN)}$$

(2) Find the load actually applied to the bearing A and bearing B (F_A and F_B) with **Equations (6.7)** and **(6.8)**.

$$F_\mathrm{A} = \frac{450}{1\,000} \times 4.78 = 2.15 \text{ (kN)}$$

$$F_\mathrm{B} = \frac{550}{1\,000} \times 4.78 = 2.63 \text{ (kN)}$$

Example 3 Calculating dynamic equivalent radial load

Find the dynamic equivalent radial load P_r when the radial load F_r, 1.5 kN ($F_\mathrm{r} = 1.5$ kN), and the axial load F_a, 0.85 kN, ($F_\mathrm{a} = 0.85$ kN) are applied to the pillow block type unit UCP306J (bearing UC306).

(1) Find the radial load factor (X) and the axial load factor (Y) with using the static radial load rating $C_{0\mathrm{r}}$ of UCP306J (bearing UC306), 15.0 kN ($C_{0\mathrm{r}} = 15.0$ kN), and **Table 6.4**.

$$\frac{f_0\, F_\mathrm{a}}{C_{0\mathrm{r}}} = \frac{13.3 \times 0.85}{15.0} = 0.754,\ e = 0.264$$

$$\frac{F_\mathrm{a}}{F_\mathrm{r}} = \frac{0.85}{1.5} = 0.567 > e\ (0.264)$$

Therefore, $X = 0.56$, $Y = 1.68$

(2) Find the dynamic equivalent radial load P_r with **Equation (6.9).**

$$P_\mathrm{r} = XF_\mathrm{r} + YF_\mathrm{a} = 0.56 \times 1.5 + 1.68 \times 0.85$$

$$= 2.27 \text{ (kN)}$$

Example 4 Calculating bearing life

Under the conditions shown in the **Example 3**, find the bearing life $L_{10\mathrm{h}}$ when a bearing is used for a blower of the rotational speed n, 1 000 min^{-1}.

(1) Select the load factor f_w is 1.2 ($f_\mathrm{w} = 1.2$) from **Table 6.1**, and find the bearing load P_r.

$$P_\mathrm{r} = f_\mathrm{w} \cdot F = 1.2 \times 2.27 = 2.72 \text{ (kN)}$$

(2) The dynamic radial load rating of UCP306J (bearing UC306), C_r, is 26.7 kN ($C_\mathrm{r} = 26.7$ kN), and calculate the bearing life $L_{10\mathrm{h}}$ with the **Equation (5.2)**.

$$L_{10\mathrm{h}} = \frac{10^6}{60n} \cdot \left(\frac{C_\mathrm{r}}{P_\mathrm{r}}\right)^3 = \frac{10^6}{60 \times 1\,000} \times \left(\frac{26.7}{2.72}\right)^3$$

$$\fallingdotseq 15\,800 \text{ (h)}$$

(3) Calculate bearing life $L_{10\mathrm{h}}$ with the nomogram shown in **Fig. 5.1**.

When the rotational speed n is 1 000 min^{-1} ($n = 1\,000$ min^{-1}), rotational factor f_n is 0.32 ($f_\mathrm{n} = 0.32$). next, find the life factor f_h by speed factor f_n, dynamic radial load rating of bearing C_r, and the bearing load P_r.

$$\text{Life factor } f_\mathrm{h} = f_\mathrm{n} \cdot \frac{C_\mathrm{r}}{P_\mathrm{r}} = 0.32 \times \frac{26.7}{2.72}$$

$$= 3.14$$

From life factor f_h, bearing life $L_{10\mathrm{h}} \fallingdotseq 16\,000$ hours.

Example 5 Selecting insert bearing unit

If a bearing is operated under the following conditions, select the flange type unit (UCF) with at least two years (5 000 hours) or longer service life : rotational speed of shaft n is 1 500 min^{-1} ($n = 1\,500$ min^{-1}), and radial load F_r is 5 kN ($F_\mathrm{r} = 5$ kN). The radial load F_r includes the load factor and gear factor.

(1) From the nomogram shown in **Fig. 5.1**, when life time L_h is 5 000 h ($L_\mathrm{h} = 5\,000$ h), life factor f_h can be found as 2.16 ($f_\mathrm{h} \fallingdotseq 2.16$), and speed factor f_n can be found as 0.28 ($f_\mathrm{n} \fallingdotseq 0.28$) when the rotational speed n is 1 500 min^{-1} ($n = 1\,500$ min^{-1}).

$$\text{Dynamic radial load rating } C_\mathrm{r} = F_\mathrm{r} \cdot \frac{f_\mathrm{h}}{f_\mathrm{n}} = 5 \times \frac{2.16}{0.28}$$

$$\fallingdotseq 38.6 \text{ (kN)}$$

(2) Find the flange type unit that meets the following condition : dynamic radial load rating C_r is 38.6 kN ($C_\mathrm{r} = 38.6$ kN). As for the diameter series 2, UCF211J (dynamic radial load rating C_r is 43.4 kN ($C_\mathrm{r} = 43.4$ kN)) can be selected.

Example 6 Selecting pillow block type unit for low speed

If a bearing is used for a dolly under the following conditions, select the pillow block type unit (UCP) with 10 000 hours service life : radial load F_r is 12 kN ($F_r = 12$ kN), and rotational speed is 8 min^{-1}.

(1) Find the required dynamic radial load rating C_r with using **Equations (5.4)** and **(5.5)**.

Speed factor $f_n = (0.03n)^{-1/p} = (0.03 \times 8)^{-1/3} \fallingdotseq 1.61$

Life factor $f_h = \left(\dfrac{L_{10h}}{500}\right)^{1/p} = \left(\dfrac{10\,000}{500}\right)^{1/3} \fallingdotseq 2.71$

$$\text{Dynamic radial load rating } C_r = P_r \cdot \frac{f_h}{f_n} = 12 \times \frac{2.71}{1.61}$$

$$\fallingdotseq 20.2 \text{ (kN)}$$

(2) From **Table 6.6**, define safe factor f_s as 2 ($f_s = 2$), and find the static radial load rating of bearing required C_{0r}.

$$C_{0r} = f_s \cdot P_r = 2 \times 12 = 24 \text{ (kN)}$$

(3) The unit is used for a dolly, and vibration or impact may occur. Thus, select UCP308J ($C_r = 40.7$ kN, $C_{0r} = 24.0$ kN).

Example 7 Calculating bearing life in case of use at high temperature

Find the bearing life if the heat resistant pillow block type unit (UCP215JD1K2) is operated under the following conditions : operating temperature is 175 ºC, radial load F_r is 4 kN ($F_r = 4$ kN), and the rotational speed n is 800 min^{-1} ($n = 800\ \mathrm{min}^{-1}$). Note that the radial load F_r includes load factor and gear factor.

(1) From **Table 5.1**, find the dynamic load rating C_r with in the case that a bearing is used at 175 ºC.

$$C_r = 67.4 \times 0.95 = 64.0 \text{ (kN)}$$

Find the bearing life L_{10h} with using **Equation (5.2)**.

$$L_{10h} = \frac{10^6}{60n} \cdot \left(\frac{C_r}{P_r}\right)^3 = \frac{10^6}{60 \times 800} \times \left(\frac{64.0}{4}\right)^3$$

$$\fallingdotseq 85\,000 \text{ (h)}$$

(2) If a bearing unit is operated at 175 ºC, grease is degraded faster, and it cannot be used without lubrication. Supply grease at intervals specified in **Table 14.4**.

(3) If the shaft is extended excessively, install a bearing unit on the identical shaft on the fixed side (positioning of shaft), and install another bearing unit on the free side (see **"10 Design of shaft and base"**).

Example 8 Calculating grease life

Find the grease life in the case that pillow block type unit UCP204J (bearing UC204) under the following conditions : radial load F_r is 1 kN ($F_r = 1$ kN), and rotational speed n is 800 min^{-1} ($n = 800\ \mathrm{min}^{-1}$). Note that the radial load F_r includes load factor and belt factor. Operating temperature of the bearing should be 40 ºC.

Find the grease life L with using **Equation (5.10)**.

$$\log L = 6.10 - 4.40 \times 10^{-6}\, d_m n - 2.50 \left(\frac{P_r}{C_r} - 0.05\right)$$

$$- (0.021 - 1.80 \times 10^{-8}\, d_m n)\, T$$

$$= 6.10 - 4.40 \times 10^{-6} \times 12.5 \times 10^4$$

$$- 2.50 \left(\frac{1}{12.8} - 0.05\right)$$

$$- (0.021 - 1.80 \times 10^{-8} \times 12.5 \times 10^4) \times 50$$

$$= 4.542$$

$$L \fallingdotseq 34\,800 \text{ (h)}$$

Example 9 Calculating life of bearing unit in case of non-lubrication

Find the life of a bearing unit in the case that it is operated under the conditions shown in **Example 8**, but without lubrication.

(1) Find the rating life of bearing L_{10h} with using **Equation (5.2)**.

$$L_{10h} = \frac{10^6}{60n} \cdot \left(\frac{C_r}{P_r}\right)^3 = \frac{10^6}{60 \times 800} \times \left(\frac{12.8}{1}\right)^3$$

$$\fallingdotseq 43\,700 \text{ (h)}$$

(2) Compare the grease life L shown in **Example 8** to the rating life of bearings L_h. Then, grease life L is shorter than the bearing rating life. Therefore, life of a bearing unit should be the same as the grease life L, 34 800 hours ($L = 34\,800$ hours).

7 Allowable rotational speed

7.1 Allowable rotational speed

The rotational speed of a bearing is normally affected by friction heat generated in the bearing. If the heat exceeds a certain amount, seizure or other failures occur, thus causing rotation to be discontinued.

The allowable rotational speed is the highest speed at which a bearing can continuously operate without generating such critical heat.

Allowable rotational speed of a insert bearing unit depends on the dimensions of the bearing, type of oil seal, and fitting conditions of bearing inner ring and shaft.

Table 7.1 shows the standard allowable rotational speeds of insert bearing units.

Table 7.1 Allowable rotational speed of insert bearing units (standard value)

Unit : min^{-1}

Bore diameter No.	UC type bearing, UC-S6 type bearing, UK type bearing, NA type bearing, ER, RB type bearing										SA type bearing SB type bearing	SU type bearing SU-S6 type bearing
	Standard type, cold resistant type (D2K2)			Triple-lip sealed (L3)			Heat resistant type (D1K2)	Heat resistant type (K3), for blower (S5)				
	Diameter series			Diameter series			Diameter series	Diameter series				
	2	X	3	2	X	3	2, X, 3	2	X	3		
8												10 000
00	–			–			–	–			–	10 000
01	5 800			2 300			3 800	8 700			6 800	8 000
02	5 800			2 300			3 800	8 700			6 800	6 600
03	5 800			2 300			3 800	8 700			6 800	5 800
04	5 800	–	–	2 300	–		3 800	8 700	–	–	5 800	5 000
05	5 100	4 300	4 600	2 100	960		3 000	7 700	6 400	6 700	5 100	4 000
06	4 300	3 700	3 900	960	830	–	2 500	6 400	5 500	5 800	4 300	3 300
07	3 700	3 300	3 400	830	750	770	2 100	5 500	5 000	5 100	3 700	–
08	3 300	3 100	3 100	750	690	690	1 900	5 000	4 600	4 600	3 300	
09	3 100	2 800	2 700	690	640	620	1 700	4 600	4 300	4 100	3 100	
10	2 800	2 500	2 400	640	570	550	1 500	4 300	3 800	3 700	2 800	
11	2 500	2 300	2 300	570	520	510	1 400	3 800	3 500	3 400		
12	2 300	2 200	2 100	520	490	470	1 300	3 500	3 200	3 100		
13	2 200	2 100	1 900	490	460	440	1 200	3 200	3 100	2 900		
14	2 100	2 000	1 800	460	440	410	1 100	3 100	2 900	2 700		
15	2 000	1 800	1 700	440	410	380	1 000	2 900	2 700	2 600		
16	1 800	1 700	1 600	410	380	360	940	2 700	2 600	2 400		
17	1 700	1 600	1 500	380	360	340	880	2 600	2 400	2 300		
18	1 600	1 500	1 400	360	340	320	830	2 400	2 300	2 100		
19	–	–	1 400	–	–	310	790	–	–	2 000		
20		1 300	1 300		300	280	750		2 000	1 900		
21		–	1 200		–	–	710		–	1 800		
22			1 100			250	680			1 700		
24			1 100			240	630			1 600		
26			1 000			220	580			1 500		
28			910			200	540			1 400		

[Remarks] 1. Allowable rotational speed of the units with covers is 80% of the value shown in the table above.

2. If a bearing unit is used with excessively loose fitting, allowable rotational speed must be corrected by multiplying it by the fitting factor f_c shown in **Table 7.2**.

7.2 Correction of allowable rotational speed by fitting

For easier installation of a insert bearing unit to a shaft, clearance fit is used for a bearing inner ring and shaft, in general. Size of fitting clearance between the bearing inner ring and the shaft is related to the allowable rotational speed of the bearing unit. As the rotational speed is increased, the fitting clearance between the bearing inner ring and the shaft should be decreased.

Table 7.2 shows the fitting factors to correct the allowable rotational speed depending on the types of fitting of the bearing inner ring to the shaft.

As for the bearings with set screws, allowable rotational speed must be corrected by multiplying the allowable rotational speed (standard value) by fitting factor, depending on the tolerance class of the shaft used. For the bearings with adapter, shafts of h8 or h9 tolerance class are recommended, while shafts of h5 or j5 tolerance class are recommended for the bearings with eccentric locking collar.

Table 7.2 Fitting factor of insert bearing unit f_c (recommended)

Type of insert bearing unit	Fitting factor f_c					
	Shaft tolerance class					
	h5, j5	j6	h6	h7	h8	h9
With set screw						
Standard type	–	1.0	1.0	0.8	0.5	0.2
Triple-lip seal type (Supplementary code L3)	–	–	–	1.0	1.0	0.9
Heat resistant type (Special code D1K2)	–	–	–	1.0	1.0	0.7
Cold resistant type (Special code D2K2)	–	–	–	1.0	1.0	0.7
For high speed (Special code K3)	–	1.0	0.8	0.6	–	–
For blower (Special code S5)	1.0	–	0.8	0.6	–	–
With adapter	–	–	–	–	1.0	1.0
With eccentric locking collar	1.0	–	–	–	–	–

8 Operating temperature and bearing specifications

8.1 Operating temperature range

Operating temperature range of a insert bearing unit depends on the type of grease used for the bearing, oil seal rubber material, and the internal clearance of the bearing.

Koyo Insert Bearing Units are available in heat resistant unit (special code : D1K2) and cold resistant unit (special code : D2K2) series, as well as standard types, to allow selection optimal for the operating temperature (see **Table 3.3**).

Even though the bearing unit suitable for temperature is used, grease must be fed in accordance with the specified standards, since grease life greatly depends on temperature.

8.2 Operating temperature and internal clearance of bearing

If the temperature of transmission heat to the shaft is high or hot steam enters the hollow bore of the shaft, difference between the temperatures of the bearing inner and outer rings is increased and the internal clearance of the bearing is decreased, leading to breakage at early stages of the bearing sevice life.

Decrease in the internal clearance of the bearing depending on the difference in the temperatures of the bearing inner ring and the bearing outer ring can be found by **Equation (8.1)**.

Under these conditions, decrease in the internal clearance must be calculated, and the internal clearance of bearing needs to be selected properly.

$$S_{t1} = \alpha \cdot D_e \cdot \varDelta_t \quad \cdots\cdots (8.1)$$

Whereas,

S_{t1} : Decrease in the internal clearance of bearing depending on the difference in the temperatures of the bearing inner ring and the bearing outer ring mm

α : Line expansion factor of bearing steel 12.5×10^{-6}

D_e : Raceway dia. of bearing outer ring mm

Diameter series 2, X ····· $D_e \fallingdotseq 0.92\,D$

Diameter series 3 ·········· $D_e \fallingdotseq 0.9\,D$

D : Nominal bearing outer dia. mm

$\varDelta_t$: Difference in temperatures of bearing inner ring and outer ring ℃

If a insert bearing unit is used at a high temperature, abnormal axial load may be applied to the bearing due to axial extension of the shaft caused by high temperature, leading to breakage at early stages of the bearing service life. This fact must be taken into consideration, as well as the internal clearance of the bearing for use of the bearing at a high temperature.

The shaft of free side unit or the unit needs to be able to be moved axially, as the countermeasure against this problem.

(See **“10 Design of shaft and base”**)

9 Strength of housing

The housing for Koyo Insert Bearing Unit reliably withstands use under standard operating conditions, because of selection of good material and the highly tough design suitable to the load capacity of the bearing. However, if a great or impact loads occurs at a low rotational speed, strength of the bearing must be examined in advance, for the purpose safety is especially required.

Although the form of the housing is designed so that it is applicable to various purposes, destruction strength varies depending on the direction of load. Therefore, mounting direction of the bearing unit must be fully examined, as well as the strength of the housing.

At this time, setting of fixing device to support the housing is required depending on the direction or level of load.

Rigidity of the base and flatness of the mounting surface give influence on the strength of the housing. Note that the load applied to the insert bearing unit is recommended to be basically examined by the calculation result of bearing life even if the strength of the housing is satisfied.

9.1 Strength of cast iron housing

Though gray cast iron has many superior features as machine parts material, it is fragile against impact load. Therefore, prior to use of it, level, direction, and property of load applied to it must be fully examined.

Allowable load of gray cast iron housing can be found by using static destruction strength of the housing, taking safety factor into consideration.

Table 9.1 shows the safety factor of gray cast iron products against load, and **Fig. 9.1** to **Fig. 9.7** show the outline values of static destruction strength of pillow block type, flange type and take-up type housings.

Table 9.1 Safety factor of gray cast iron products (recommended)

Property of load	Safety factor of gray cast iron
Static load	4
With vibration	10
With impact	15

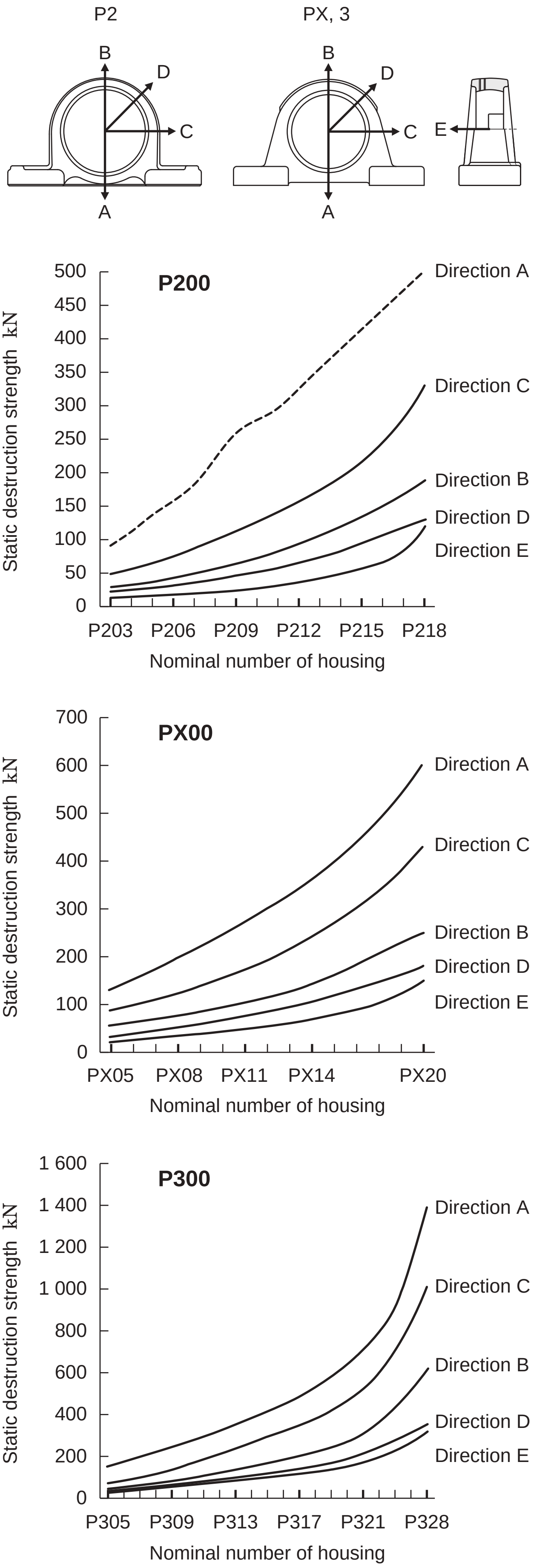


Fig. 9.1 Static destruction strength of pillow block type housing (P)

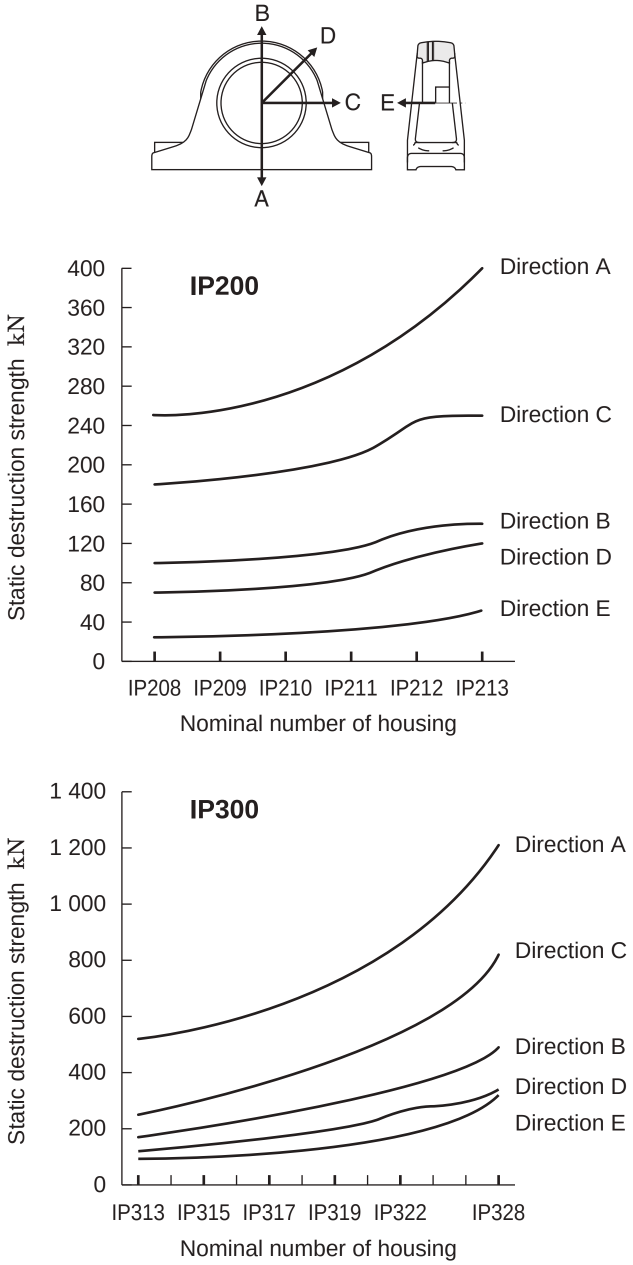


Fig. 9.2 Static destruction strength of thick section pillow block type housing (IP)

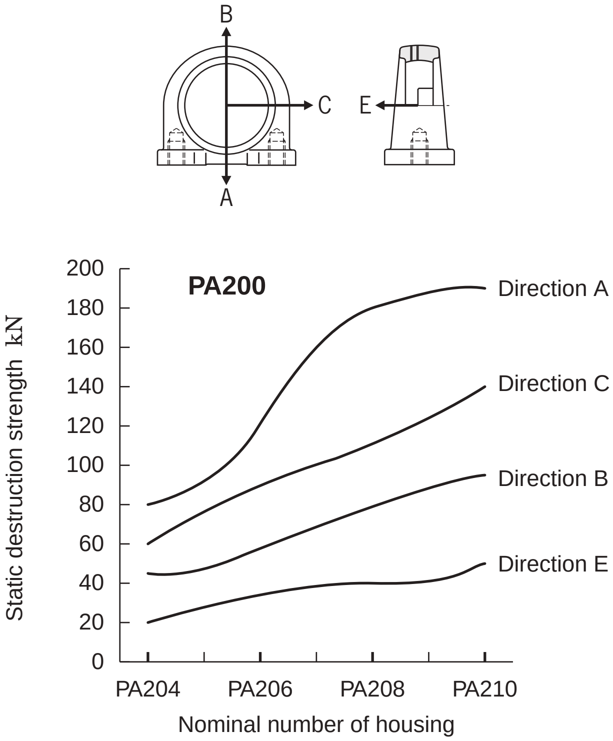


Fig. 9.3 Static destruction strength of tapped-base pillow block type housing (PA)

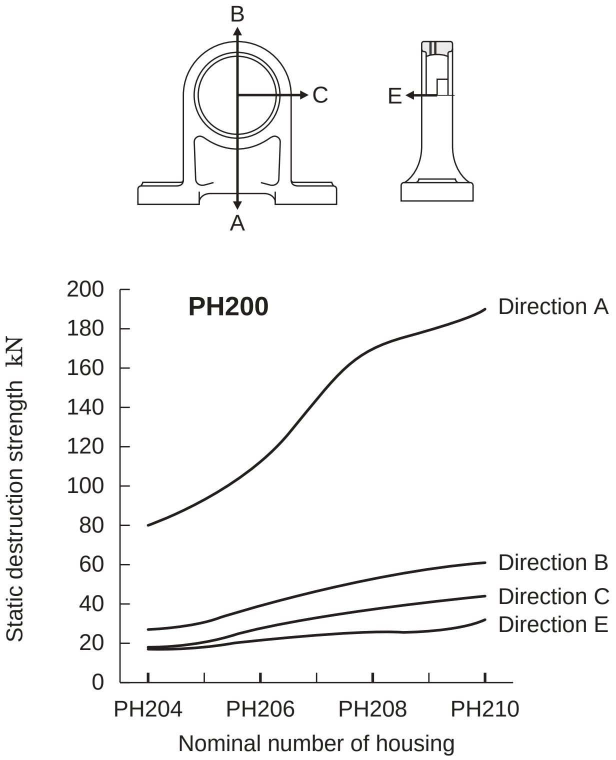


Fig. 9.4 Static destruction strength of higher centerheight pillow block type housing (PH)

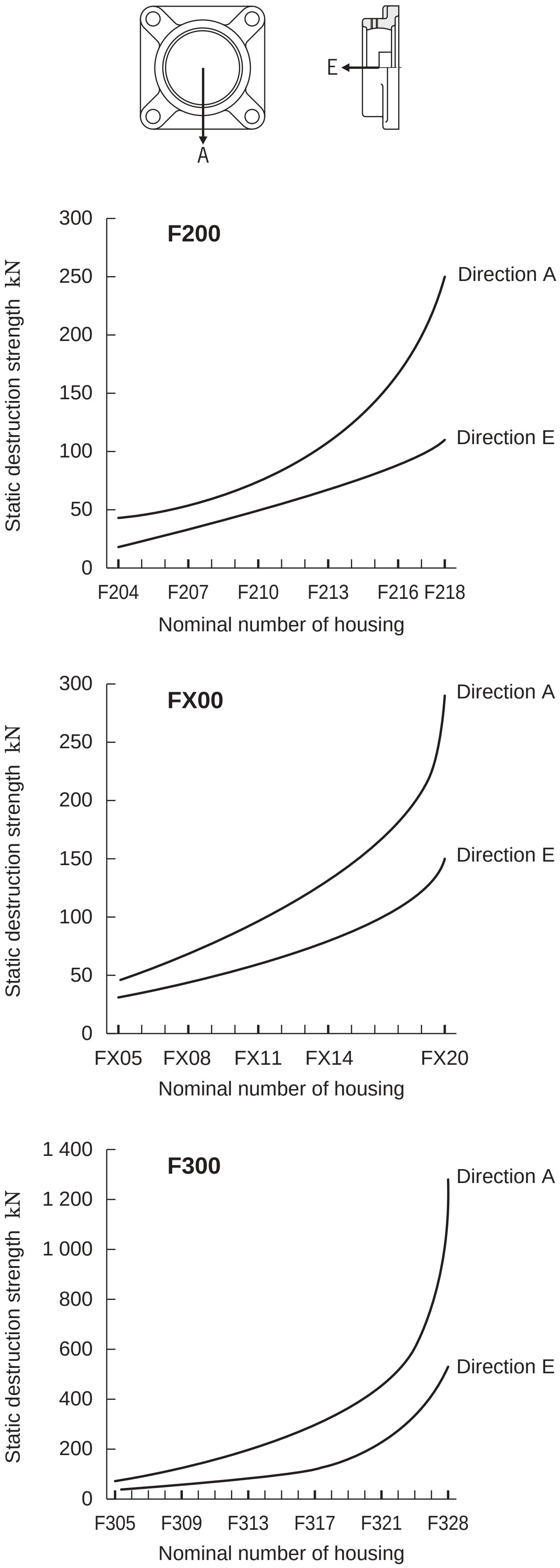


Fig. 9.5 Static destruction strength of square-flanged type housing (F)

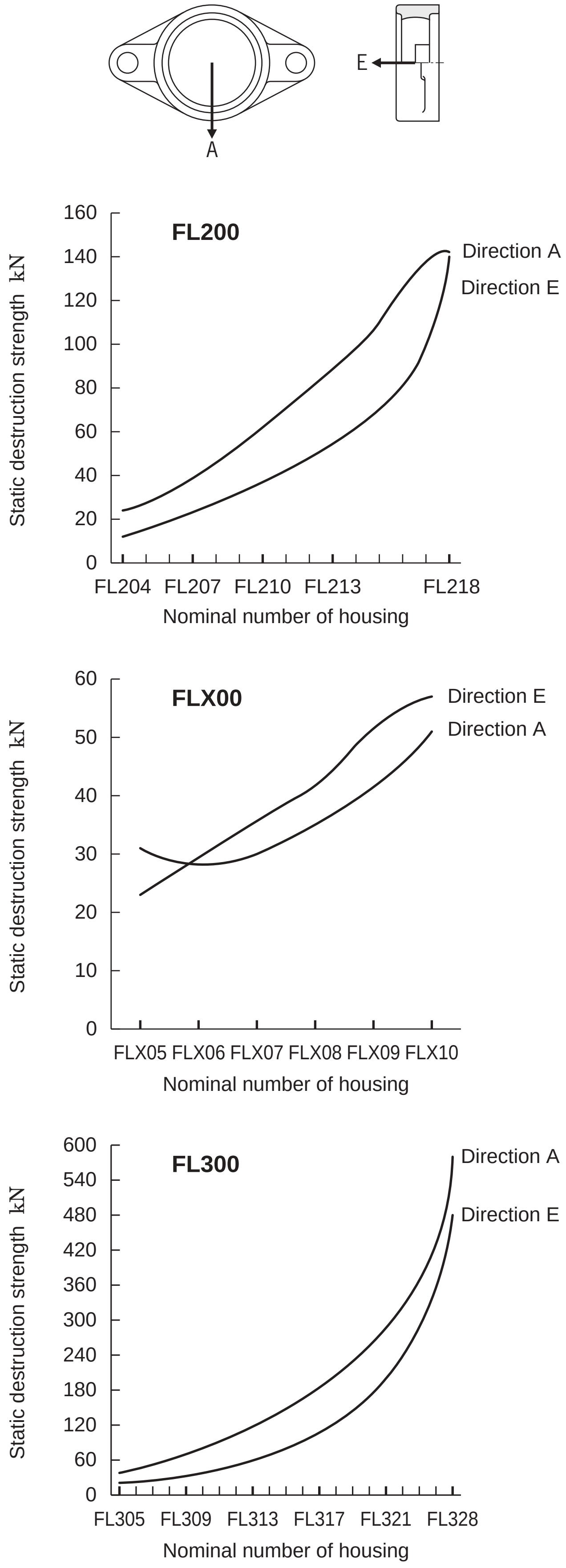


Fig. 9.6 Static destruction strength of rhombic-flanged type housing (FL)

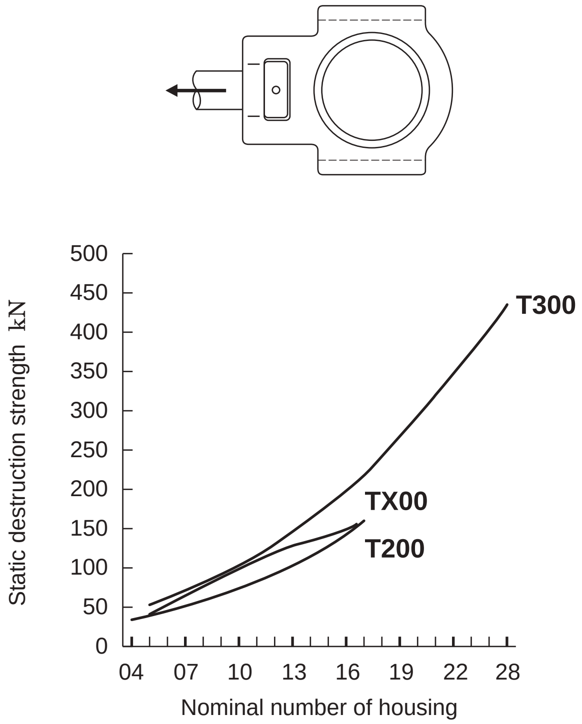


Fig. 9.7 Static destruction strength of take-up type housing (T)

9.2 Strength of steel housing

The precisely pressed steel housing is highly rigid, but great deformation occurs when load is applied until it is broken. Thus, allowable load of the pressed steel housing must be the value deformation of the housing caused by load does not influence on actual use.

Table 9.2 shows the allowable load of the pressed steel housing.

Table 9.2 Allowable load of pressed steel housing (recommended)

Load direction	Allowable load of pressed steel housing
Radial	Approx. 1/6 of basic dynamic radial load rating of bearing (C_r)
Axial	Approx. 1/18 of basic dynamic radial load rating of bearing (C_r)

9.3 Strength of stainless steel housing

To find the allowable load of a stainless steel housing, use the static destruction strength of a housing, taking safety factor into consideration.

Table 9.3 shows the safety factors for stainless steel products. As for the basic values of the static destruction strength of SP200, SPA200, SF200, SFL200, ST200 type housings, apply P200 of **Fig. 9.1**, PA200 of **Fig. 9.3**, F200 of **Fig. 9.5**, FL200 of **Fig. 9.6** and T200 of **Fig. 9.7**. For the basic values of the static destruction strength of the SP000 and SFL000 type housings, see P000 of **Fig. 9.8** and FL000 of **Fig. 9.9** and multiply them by 1.5 respectively.

Table 9.3 Safety factor of stainless steel products

Property of load	Safety factor of stainless steel products
Static load	3
With vibration	5
With impact	10

9.4 Strength of "compact" series housing

The "compact" series housing is made of zinc alloy die-cast, but great deformation occurs when load is applied until it is broken.

Table 9.4 shows safety factor for zinc alloy die-cast, and **Fig. 9.8** and **9.9** show the outline values of the static destruction strength of the zinc alloy die-cast housing.

Table 9.4 Safety factor of zinc alloy die-cast products

Property of load	Safety factor of die-cast products
Static load	8
With vibration	15
With impact	20

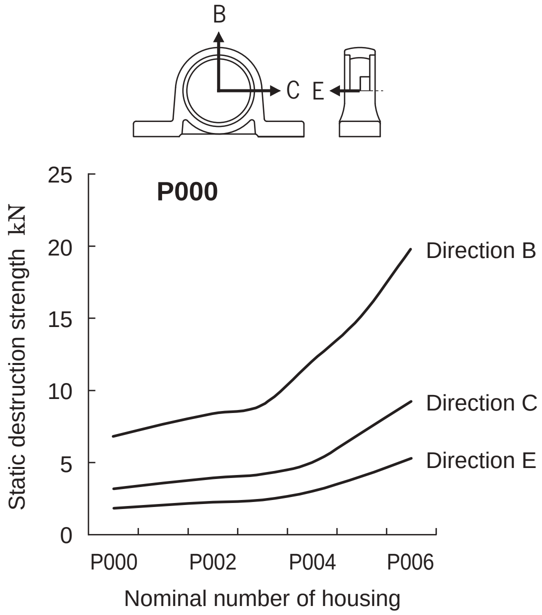


Fig. 9.8 Static destruction strength of "compact" housing (P)

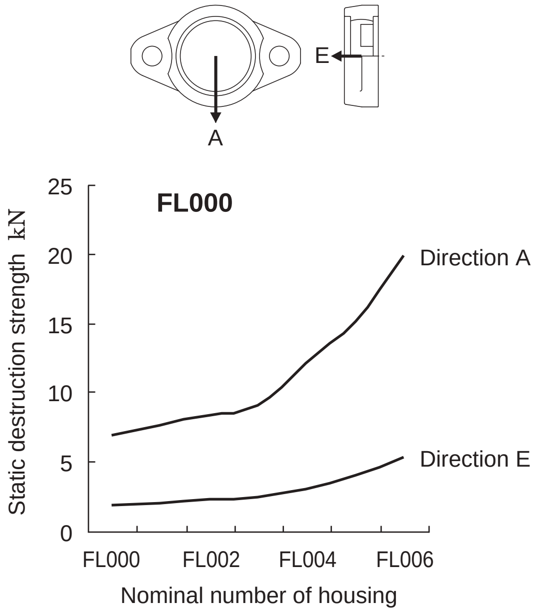


Fig. 9.9 Static destruction strength of "compact" housing (FL)

10 Design of shaft and base

10.1 Design of shaft

For intrinsic performance of a insert bearing unit and maintenance of it for a long time, selection of the shaft optimal for operating conditions is important. Use the shaft with enough rigidity but free from bend, scratch, or burr.

10.1.1 Tolerance of shaft

(1) Tolerance of shaft used for cylindrical bore bearing with set screws

For the cylindrical bore bearing with set screws, use the shaft of the tolerance class leading to relatively loose fitting to simplify the mounting procedures. The fitting clearance between the bearing inner ring and the shaft should be decreased as the rotational speed of the shaft is increased.

Table 10.1 shows the guideline for the tolerance class of the rotational speed of the cylindrical bore bearing with set screws and the shaft used.

If the cylindrical bore bearing with set screws is exposed to heavy load ($P_r / C_r > 0.12$), vibration, or impact, use shaft of the tolerance class leading to relatively tight fitting to prevent creep or fretting to be occurred to the fitting surface of the bearing inner ring and the shaft.

To use tight fitting of the cylindrical bore bearing with set screws, see **Table 10.2** showing the guideline for the tolerance class of the shaft used.

Table 10.3 shows the recommended deviation from circular and cylindrical forms of the shaft used.

Table 10.1 Tolerance of shaft used for cylindrical bore bearing with set screws (recommended) (clearance fitting or transition fitting)

Unit : μm

Shaft diameter (mm)		Tolerance of shaft							
		j6		h6		h7		h8	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower
6	**10**	+ 7	− 2	0	− 9	0	−15	0	−22
10	**18**	+ 8	− 3	0	−11	0	−18	0	−27
18	**30**	+ 9	− 4	0	−13	0	−21	0	−33
30	**50**	+11	− 5	0	−16	0	−25	0	−39
50	**80**	+12	− 7	0	−19	0	−30	0	−46
80	**120**	+13	− 9	0	−22	0	−35	0	−54
120	**180**	+14	−11	0	−25	0	−40	0	−63
Applicable rotational speed dn[1]		Over 120 000		Over 100 000, up to 120 000		Over 60 000, up to 100 000		up to 60 000	

Note 1) $dn = d$ (bearing bore, mm) $\times\, n$ (rotational speed, min^{-1})

Table 10.2 Tolerance of shaft used for cylindrical bore bearing with set screws (recommended) (transition fitting or interference fitting)

Unit : μm

Shaft diameter (mm)		Tolerance of shaft					
		k6		k7		m6	
over	up to	upper	lower	upper	lower	upper	lower
6	**10**	+10	+1	+16	+1	+15	+ 6
10	**18**	+12	+1	+19	+1	+18	+ 7
18	**30**	+15	+2	+23	+2	+21	+ 8
30	**50**	+18	+2	+27	+2	+25	+ 9
50	**80**	+21	+2	+32	+2	+30	+11
80	**120**	+25	+3	+38	+3	+35	+13
120	**180**	+28	+3	+43	+3	+40	+15

Table 10.3 Tolerance of shaft used for insert bearing units (recommended)

Unit : μm

Shaft diameter (mm)		Deviation from circular and cylindrical forms
over	up to	
6	**10**	6
10	**18**	8
18	**30**	9
30	**50**	11
50	**80**	13
80	**120**	15
120	**180**	18

(2) Tolerance of shaft used for bearing for blower (cylindrical bore with set screws)

In the bearing for blower (special code S5), smaller internal clearance of bearing (C2) and once-class-higher bearing tolerance reduce vibration and noise during high-speed rotation.

Therefore, use of the shaft in the tolerance class shown in **Table 10.4** as the bearing for blower (cylindrical bore with set screws) used is recommended.

Table 10.4 Tolerance of shaft used for bearing for blower (cylindrical bore with set screws) (recommended)

Unit : µm

Shaft diameter (mm)		Tolerance of shaft			
		h5		j5	
over	up to	upper	lower	upper	lower
10	**18**	0	– 8	+5	– 3
18	**30**	0	– 9	+5	– 4
30	**50**	0	–11	+6	– 5
50	**80**	0	–13	+6	– 7
80	**120**	0	–15	+6	– 9
120	**180**	0	–18	+7	–11

(3) Tolerance of shaft used for tapered bore bearing (with adapter)

Since the tapered bore bearing is fixed to a shaft with the adapter, the shaft in the tolerance class allowing relatively loose fitting should be selected, for easier mounting.

Table 10.5 shows the tolerance of shaft used for the tapered bore bearing (with adapter).

Table 10.5 Tolerance of shaft used for tapered bore bearing (with adapter) (recommended)

Unit : µm

Shaft diameter (mm)		Tolerance of shaft			
		h8		h9	
over	up to	upper	lower	upper	lower
18	**30**	0	–33	0	– 52
30	**50**	0	–39	0	– 62
50	**80**	0	–46	0	– 74
80	**120**	0	–54	0	– 87
120	**180**	0	–63	0	–100

(4) Tolerance of shaft used for cylindrical bore bearing with eccentric locking collar

As for the cylindrical bore bearing with eccentric locking collar, if the fitting clearance between the bearing inner ring and the shaft is great, the shaft may be installed with being tilted because of its structure.

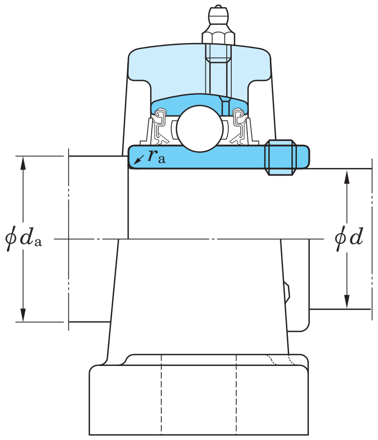
Therefore, for cylindrical bore bearing with eccentric locking collar, use of the shaft in the same tolerance class (h5 or j5) as that used with the bearing for blower (special code S5) is recommended (see **Table 10.4**).

10.1.2 Dimensions of shouldered shaft

When using the cylindrical bore bearing in the environment exposed to a great axial load, excessive vibration, or impact, adopt the shouldered shaft, and tighten the bearing inner ring with the nut.

Table 10.6 shows the shoulder diameter and the fillet radius of the shouldered shaft.

Table 10.6 Shoulder diameter and fillet radius of shouldered shaft (recommended)



Unit : mm

Bore dia. No.	Nominal bearing bore dia. d	UC200, UCX00		UC300	
		Shoulder dia. d_a	Fillet radius r_a (max.)	Shoulder dia. d_a	Fillet radius r_a (max.)
01	**12**	17	0.6		
02	**15**	20	0.6		
03	**17**	22	0.6		
04	**20**	30	1	–	–
05	**25**	35	1	35	1
06	**30**	40	1	40	1
07	**35**	45	1	45	1.5
08	**40**	50	1	50	1.5
09	**45**	55	1	55	1.5
10	**50**	60	1	60	2
11	**55**	65	1.5	65	2
12	**60**	70	1.5	75	2
13	**65**	75	1.5	80	2
14	**70**	80	1.5	85	2
15	**75**	85	1.5	90	2
16	**80**	90	2	95	2
17	**85**	95	2	100	2.5
18	**90**	100	2	105	2.5
19	**95**	–	–	110	2.5
20	**100**	115	2	115	2.5
21	**105**	–	–	120	2.5
22	**110**			125	2.5
24	**120**			135	2.5
26	**130**			150	3
28	**140**			160	3

10.1.3 Countermeasures against heat

In general, two or more insert bearing units are used for a shaft. If installation distance for the insert bearings is small or expansion and contraction of the shaft due to temperature are a little, install each of the bearing unit to the fixed side.

However, if installation distance is great and the shaft is exposed to heat, the shaft to be installed should be positioned with a bearing unit to be on the fixed side, and another bearing unit should be installed with it to be on the free side.

Because, if the shaft is exposed to heat, it is expanded in the axial direction, leading to a great axial load to the bearing, and it causes premature breakage of the bearing. Therefore, expansion of the shaft is absorbed by the bearing unit on the free side.

Equation (10.1) shows the relation of temperature increase to expansion of the shaft.

$$\Delta_\ell = \alpha \cdot \Delta_t \cdot l \quad \cdots\cdots\cdots (10.1)$$

Whereas,

Δ_ℓ : Expansion of shaft mm

α : Linear expansion coefficient of shaft

in the case of standard steel $11 \sim 12 \times 10^{-6}$

Δ_t : Temperature increase ℃

l : Installation distance of unit mm

Countermeasures against great expansion of shaft as a result of exposure to heat are shown below.

(1) Installation with full dog point set screw on the free side

If the shaft is exposed to heat and expanded in axial direction, the bearing unit must be installed so that it or the shaft can freely move in axial direction.

If the rotational speed is relatively slow, provide the shaft with key groove, attach the full dog point set screw (special code G6) to the bearing, and use it as the free side unit. Fit the tip on the dog point of the set screw to the key groove on the shaft to guide the move of the shaft in axial direction.

Fig. 10.1 shows the structure example of bearing unit with key groove on shaft and full dog point set screw and use as free side unit. **Table 10.7** shows the dimensions of key groove for the full dog point set screw.

If a bearing unit is used as the free side bearing unit by adopting this method, h7 is recommended as the tolerance class of the shaft to be used.

If temperature of the shaft is higher than that in the bearing, the shaft in the tolerance class allowing a greater fitting clearance must be used.

If a bearing unit is used as the free side unit by adopting the above method, fretting corrosion may occur to the fitting surface between the bearing inner ring and the shaft. In order to prevent fretting corrosion, application of grease onto the bore surface of the bearing when the bearing unit is installed.

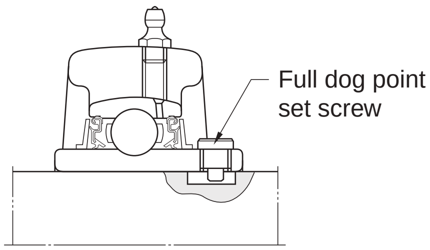


Fig. 10.1 Use on free side with full dog point set screw

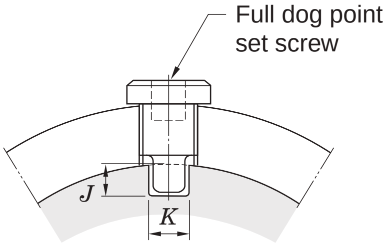


Table 10.7 Dimensions of key groove for full dog point set screw (use on free side)

Nominal size of set screw	Dimensions of key groove (mm)		Applicable nominal bearing number		
	J	K (Min.)	UC200	UCX00	UC300
M6 × 0.75	5	4	201–206	X05	305, 306
M8 × 1	6	6	207–209	X06–X08	307
M10 × 1.25	6.5	7	210–212	X09–X11	308, 309
M12 × 1.5	7	9	213–218	X12–X17	310–314
M14 × 1.5	7	10		X18	315, 316
M16 × 1.5	8	12		X20	317–319
M18 × 1.5	8	13			320–324
M20 × 1.5	8	15			326, 328

Allowable tolerance of key groove dimension “K” (Recommended value : 0~+0.2)

(2) Use of cartridge type unit on free side

In the environment the rotational speed is relatively high or the bearing unit is exposed to vibration, use of the cartridge type unit as the free side unit and move of the bearing unit between the mounting bore on a machine and the outside surface of the housing in axial direction are recommended.

Fig. 10.2 shows the example of structure of the cartridge type unit as the free side unit.

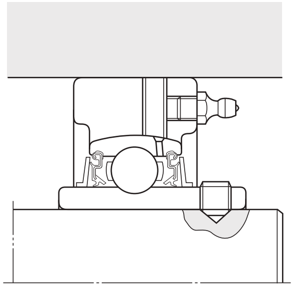


Fig. 10.2 Use of cartridge type unit on free side

If a insert bearing unit is exposed to heat, countermeasures against expansion of the shaft in axial direction as well as calculation of decrease in the internal clearance of the bearing to select the internal clearance of the bearing appropriately (see **"8 Operating temperature and bearing specifications"**).

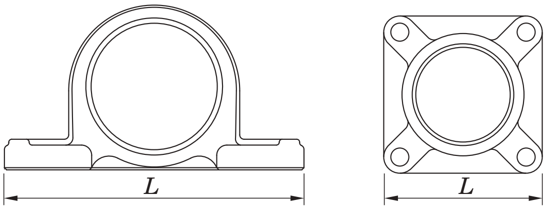
10.2 Design of base

10.2.1 Rigidity of base and flatness of mounting surface

If rigidity of the base that a insert bearing unit is to be installed is low or the flatness of the mounting surface is poor, vibration or abnormal noise may occur to the bearing unit during operation, leading to premature breakage or lower strength of the housing.

Therefore, the base that the insert bearing unit is to be installed must have enough rigidity, and the mounting surface must be finished with accuracy allowing elimination of deformation on the bearing or housing.

Fig. 10.3 shows the recommended values for flatness of the mounting surface of the base that the insert bearing unit is to be installed.



Max. : L / 1 000 mm

Fig. 10.3 Flatness of mounting surface of base (recommended)

10.2.2 Mounting bore of cartridge type unit

The cartridge type unit is directly fit to the cylindrical bore of the base.

Under the standard operating conditions, select H7 as the tolerance class of cylindrical hole on the base that the cartridge type unit is to be installed. For such purposes that the shaft and the bearing inner ring are hot, select G7 as the tolerance class of cylindrical bore on the base.

In the environment the bearing unit is exposed to vibration or impact, selection of the tolerance class allowing smaller fitting clearance between the cylindrical bore of the base and the bearing unit is recommended.

Table 10.8 shows the tolerance of cylindrical bore of the base that the cartridge type unit is to be installed.

Table 10.8 Tolerance of cylindrical bore for mounting cartridge type unit (recommended)

Unit : μm

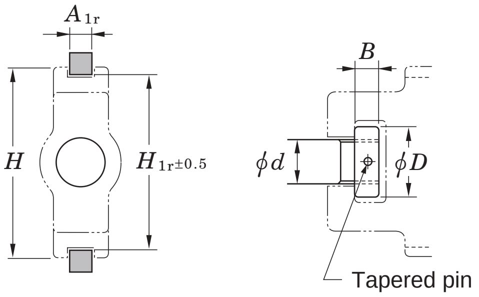
Nominal bore dia. of cylindrical bore (mm)		Tolerance of cylindrical bore			
		H7		G7	
over	up to	upper	lower	upper	lower
50	**80**	+30	0	+40	+10
80	**120**	+35	0	+47	+12
120	**180**	+40	0	+54	+14
180	**250**	+46	0	+61	+15
250	**315**	+52	0	+69	+17
315	**400**	+57	0	+75	+18

10.2.3 Dimensions relative to installation of take-up type unit

The take-up type unit is incorporated between the two guide rails on the base side, and enables adjustment of the support position with the shaft center by the adjuster bolt.

Table 10.9 shows the dimensions of the guide rail, adjuster bolt, and round nut to install the take-up type unit to the base.

Table 10.9 Dimensions relative to installation of take-up type unit (recommended)



Unit : mm

Nominal housing No.	Dimensions of guide rail			Dimensions of adjuster bolt and round nut		
	A_{1r}	H_{1r}	H (Reference)	d	D	B
T204 T205	11	77	89	16	28	14
T206 T207	11	90	102	18	32	14
T208	15	103	114	24	42	16
T209 T210	15	103	117	24	42	16
T211 T212	20	131	146	30	55	20 27
T213 T214 T215	24	152	167	36	60	27
T216	24	166	184	36	60	27
T217	28	174	198	42	60	30
TX05 TX06	11	90	102	18	32	14
TX07	15	103	114	24	42	16
TX08 TX09	15	103	117	24	42	16
TX10 TX11	20	131	146	30	55	20 27
TX12 TX13 TX14	24	152	167	36	60	27
TX15	26	166	184	36	60	27
TX16 TX17	26	174	198	42	60	30

Unit : mm

Nominal housing No.	Dimensions of guide rail			Dimensions of adjuster bolt and round nut		
	A_{1r}	H_{1r}	H (Reference)	d	D	B
T305	11	81	89	22	32	12
T306 T307	15	91 101	100 111	24 26	36 40	14
T308 T309	16	113 126	124 138	28 30	45 50	16 18
T310	18	141	151	32	55	20
T311 T312	20	151 161	163 178	34 36	60 65	22 24
T313 T314 T315	24	171 181 193	190 202 216	38 40 40	65 80 80	26 28 28
T316	28	205	230	46	90	34
T317 T318	30	216 230	240 255	46 50	90 95	34 38
T319	32	242	270	50	95	38
T320 T321	32	262	290	52	100	40
T322	36	287	320	55	110	44
T324	42	322	355	60	120	50
T326 T328	47	352 382	385 415	65 70	130 140	55 60

10.3 Machining dimensions of holes for housing dowel pins

The pillow block type, square-flanged type, and rhombic-flanged type housing have the dowel pin seat. If accurate positioning of the housing is required, install it with the dowel pin.

As for the position of the pin for fixing the housing and pin diameter, see the **Supplementary 5** at the end of this catalogue.

11 Tolerances and internal clearance

Tolerances of a insert bearing unit is specified in JIS B 1558 (Rolling bearings - Insert bearings and eccentric locking collars) and JIS B 1559 (Rolling bearings - Cast and pressed housings for insert bearings). JTEKT produces products conforming to these standards.

11.1 Tolerances of bearing

Table 11.1 to **Table 11.4** show the tolerance of a insert bearing for insert bearing unit.

Insert bearings for blower unit (special code S5) are produced with higher accuracy than standard types (see **Table 11.3**).

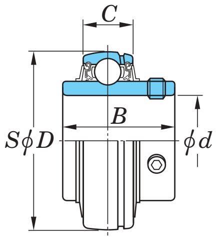
Table 11.5 shows the permissible values for chamfer dimensions of cylindrical bore bearing inner ring.

Table 11.2 Tolerances and permissible values of outer ring of insert bearing for insert bearing unit

Unit : μm

Nominal bearing outer dia. D (mm)		Mean outside diameter deviation Δ_{Dm}		Radial runout of assembled bearing outer ring K_{ea}
over	up to	upper	lower	max.
18	**30**	*0*	*– 9*	*15*
30	**50**	0	–11	20
50	**80**	0	–13	25
80	**120**	0	–15	35
120	**150**	0	–18	40
150	**180**	0	–25	45
180	**250**	0	–30	50
250	**315**	0	–35	60

[Remark] Values in Italics are prescribed in JTEKT standards.



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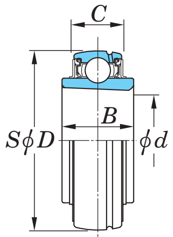

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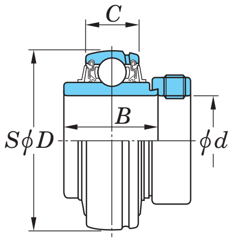

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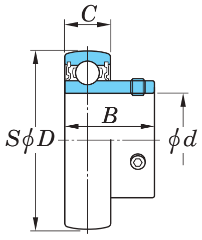

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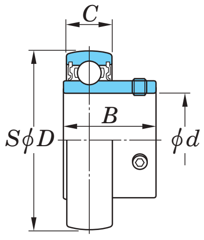

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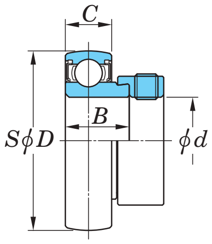

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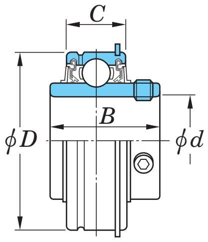

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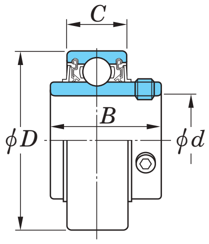


RB

Table 11.1 Tolerances and permissible values of inner rings of insert bearings for insert bearing units

Unit : μm

Nominal bearing bore dia. d (mm)		Single plane mean bore diameter deviation Δ_{dmp}		Single plane bore diameter variation V_{dsp}	Eccentricity deviation of eccentric surface of inner ring and eccentric locking collar Δ_{Hs}		Single inner (outer) ring width deviation Δ_{Bs} (Δ_{Cs})		Radial runout of assembled bearing inner ring K_{ia}
over	up to	upper	lower	max.	upper	lower	upper	lower	max.
–	**10**	*+15*	*0*	*10*	*+100*	*–100*	*0*	*–120*	*10*
10	**18**	+15	0	10	+100	–100	0	–120	15
18	**31.75**	+18	0	12	+100	–100	0	–120	18
31.75	**50.8**	+21	0	14	+100	–100	0	–120	20
50.8	**80**	+24	0	16	+100	–100	0	–150	25
80	**120**	+28	0	19	+100	–100	0	–200	30
120	**180**	+33	0	22	+100	–100	0	–250	35

[Remark] Values in Italics are prescribed in JTEKT standards.

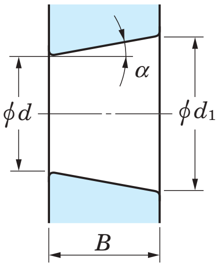
Table 11.3 Tolerances and permissible values of inner ring of insert bearing for blower unit (S5)

Unit : μm

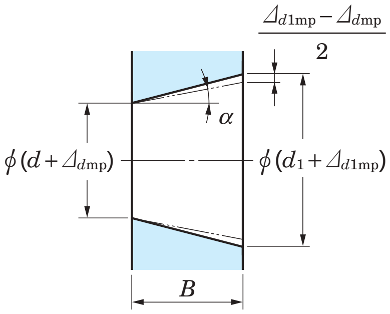
Nominal bearing bore dia. d (mm)		Single plane mean bore diameter deviation Δ_{dmp}		Single plane bore diameter variation V_{dsp}	Radial runout of assembled bearing inner ring K_{ia}
over	up to	upper	lower	max.	max.
10[1]	**18**	+13	0	6	7
18	**31.75**	+13	0	6	8
31.75	**50.8**	+13	0	10	10
50.8	**80**	+15	0	10	10
80	**120**	+18	0	14	13
120	**180**	+23	0	14	18

Note 1) 10 mm should be included in this category.

Table 11.4 Tolerances and permissible values for tapered bore of bearing



Theoretical tapered bore



Tapered bore with single plane mean bore diameter deviation

Unit : μm

Nominal bearing bore dia. d, mm		Δ_{dmp}		$\Delta_{d1mp}-\Delta_{dmp}$		V_{dsp}[1]
over	up to	upper	lower	upper	lower	max.
18	**30**	+33	0	+21	0	13
30	**50**	+39	0	+25	0	16
50	**80**	+46	0	+30	0	19
80	**120**	+54	0	+35	0	22
120	**180**	+63	0	+40	0	40

Note 1) To be applied to all the radial planes of tapered bore

[Remarks] 1. Applicable range
Applicable to tapered bore of inner ring of tapered bore radial bearing that standard value of taper ratio is 1/12

2. Amount code

d_1 : Standard diameter at theoretical large end of tapered bore $d_1 = d + \frac{1}{12}B$

Δ_{dmp} : Single plane mean bore diameter deviation at theoretical small end of tapered bore

Δ_{d1mp} : Single plane mean bore diameter deviation at theoretical large end of tapered bore

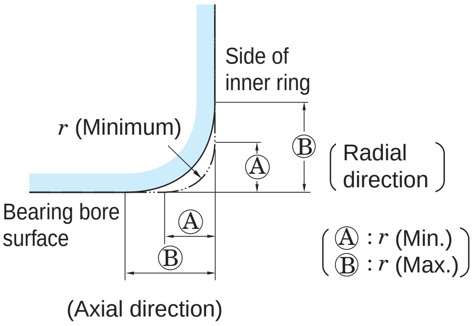
V_{dsp} : Single plane bore diameter variation (a tolerance for the diameter variation given by a maximum value applying in any radial plane of the bore)

B : Nominal inner ring width

α : 1/2 of nominal tapered angle of tapered bore

α = 2º 23' 9.4"
= 2.385 94º
= 0.041 643 rad

Table 11.5 Permissible values for chamfer dimensions of inner ring of bearing with cylindrical bore



Unit : mm

r (Min.)	*r* (Max.)	
	Radial direction	**Axial direction**
0.6	1	2
1	1.5	3
1.1	2	3.5
1.5	2.3	4
2	3	4.5
2.1	4	6.5
2.5	3.8	6
3	5	8
4	6.5	9

[Remark] There shall be no specification for the accuracy of the shape of the chamfer surface, but its outline in the axial plane shall not be situated outside of the imaginary circle arc with a radius of $r_{\min}$ or $r_{1\min}$ which contacts the inner ring side face and bore, or the outer ring side face and outside surface.

11.2 Tolerances of housing

As the tolerance of the housing for a insert bearing unit, tolerance of the diameter of spherical bearing seat fit to the bearing, and tolerance and permissible value of dimensions relative to installation of the housing are specified.

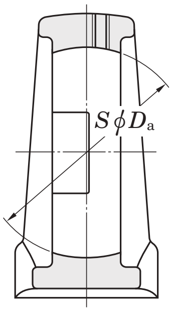
Table 11.6 shows the tolerance of diameter of the spherical bearing seat of housing. Usually, select tolerance class J7 that allows transition fitting of the housing and the bearing.

If priority should be given to operability in installation to a machine, select tolerance class H7 allowing clearance fitting. The unit conforming JIS of tolerance class H7 is equipped with the detent to the outer ring to prevent turning of the outer ring.

If rotating outer ring load occurs or the bearing is rotated while the shaft is stopped, select the tolerance K7 allowing interference fit.

Fig. 11.1 shows the representative example of dimensions relative to installation of the housing with tolerance and permissible value. Respective dimensional tables show the tolerance and permissible values of dimensions relative to installation of the housing.

Table 11.6 Tolerances of spherical bearing seat diameter of housing



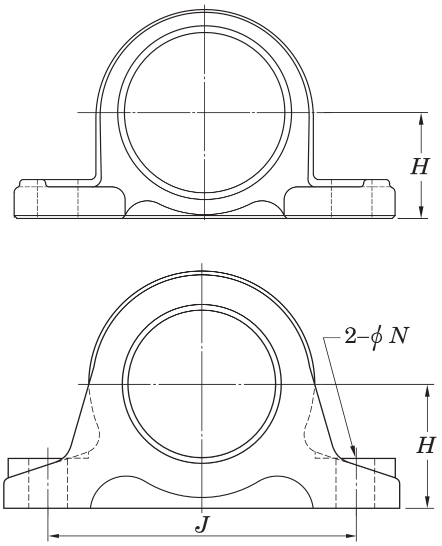
Unit : μm

Nominal dia. of spherical bearing seat D_a (mm)		Tolerance class H7		Tolerance class J7		Tolerance class K7	
		Deviation of spherical bearing seat dia. Δ_{Dam}		Deviation of spherical bearing seat dia. Δ_{Dam}		Deviation of spherical bearing seat dia. Δ_{Dam}	
over	up to	upper	lower	upper	lower	upper	lower
18	**30**	+21	0	+12	–9	+6	–15
30	**50**	+25	0	+14	–11	+7	–18
50	**80**	+30	0	+18	–12	+9	–21
80	**120**	+35	0	+22	–13	+10	–25
120	**180**	+40	0	+26	–14	+12	–28
180	**250**	+46	0	+30	–16	+13	–33
250	**315**	+52	0	+36	–16	+16	–36

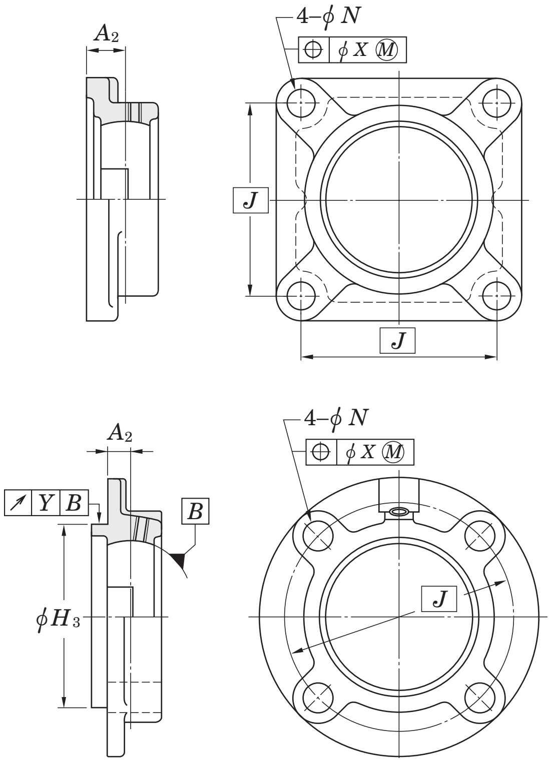
[Remark] JTEKT generally applies class J to housing designs.
Class H and class K can also be applied depeding on the application.

Fig. 11.1 Dimensions relative to installation of housing with tolerance and permissible value (representative example)

Pillow block type housing

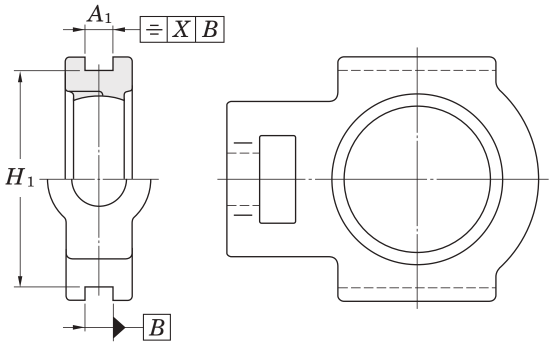


Flange type housing

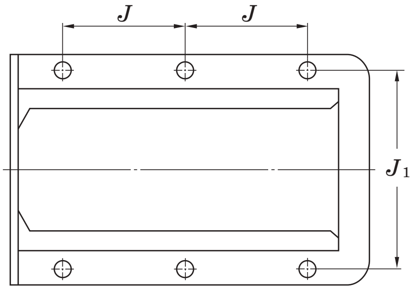


[Remark] Respective tolerances and permissible values for housing are shown in dimensional tables.

Take-up type housing



Frame for take-up type unit



Cartridge type housing

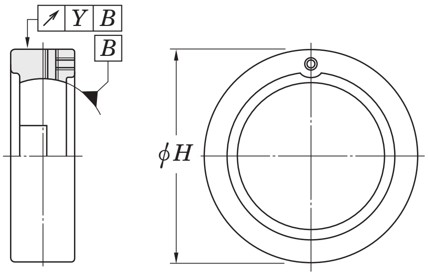


Table 11.7 shows standard tolerance of cut or cast portions not specified in this catalogue.

Table 11.7 Standard tolerance not specified respectively

Item	Standard No.	Class
Cutting	JIS B 0405	Medium
Casting of cast iron	JIS B 0403	Standard
Casting of cast steel	JIS B 0403	Standard

11.3 Bearing internal clearance

Insert bearing internal clearance for insert bearing unit is specified by the move at the time the inner ring or outer ring is moved in the radial direction (radial internal clearance). Value of internal clearance during operation (to be called operation clearance) gives a great influence on rolling fatigue life of the bearing, heat, noise, and vibration.

If the bearing inner ring is installed to the shaft with interference, the internal clearance of bearing must be fixed taking expansion of the bearing inner ring into consideration. If transmission heat to the shaft is high or hot steam runs through the hollow of the shaft, calculate the decrease of internal clearance, and appropriately select the internal clearance of bearing (see **"8 Operating temperature and bearing specifications"**).

Table 11.8 shows the internal clearance applicable to specifications of insert bearing for Koyo Insert Bearing Unit, and **Table 11.9** shows the standard values of bearing internal clearance.

Table 11.8 Internal clearance applicable to types of insert bearing for insert bearing unit

Type	Applicable internal clearance	
	Bearing with cylindrical bore	Bearing with tapered bore
Standard type	CN	C3
Stainless steel type	C3	–
Heat resistant type (special code : D1K2)	C4	C5
Cold resistant type (special code : D2K2)	CN	C3
High speed type (special code : K3)	CN	C3
For blower (special code : S5)	C2	C3

[Remark] For the bearings that the internal clearance in this table is applied, no clearance code is indicated.

Table 11.9 Standard values for internal clearance of insert bearing for insert bearing unit

Unit : μm

Nominal bearing bore dia. *d* (mm)		Internal clearance											
		C2		CN		GN		C3		C4		C5	
over	up to	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper
6	**10**	0	7	2	13	–	–	8	23	14	29	20	37
10	**18**	0	9	3	18	10	25	11	25	18	33	25	45
18	**24**	0	10	5	20	12	28	13	28	20	36	28	48
24	**30**	1	11	5	20	12	28	13	28	23	41	30	53
30	**40**	1	11	6	20	13	33	15	33	28	46	40	64
40	**50**	1	11	6	23	14	36	18	36	30	51	45	73
50	**65**	1	15	8	28	18	43	23	43	38	61	55	90
65	**80**	1	15	10	30	20	51	25	51	46	71	65	105
80	**100**	1	18	12	36	24	58	30	58	53	84	75	120
100	**120**	2	20	15	41	28	66	36	66	61	97	90	140
120	**140**	2	23	18	48	33	81	41	81	71	114	105	160

[Remarks] 1. Radial internal clearance in this table conforms to JIS B 1558 (Rolling bearings - Insert bearings and eccentric locking collars).

2. Increase in radial internal clearance generated by measured load conforms to the table below. Smaller correction of C2 clearance is applicable to the lower clearance, while larger correction is applicable to the upper clearance.

Unit : μm

Nominal bearing bore dia. *d* (mm)		Measured load	Correction of clearance				
over	up to	N	C2	CN	GN, C3	C4	C5
2.5	**18**	24.5	3 – 4	4	4		
18	**50**	49	4 – 5	5	6		
50	**280**	147	6 – 8	8	9		

12 Materials

12.1 Materials of bearing

Insert bearings for insert bearing unit are made of the following materials : bearing rings (outer and inner rings) and rolling elements (balls) are made of steel, and cages are made of pressed steel.

These bearing materials need the features shown below.

(1) Higher elastic limit is required, since high contact stress occurs partially.
(2) Higher rolling fatigue strength is required, since great contact load occurs repeatedly.
(3) Superior hardness
(4) Superior wear resistance
(5) Superior toughness against impact load
(6) Superior stability of dimensions

As the material of bearing rings (outer and inner rings) and rolling elements (balls) of the insert bearing for Koyo Insert Bearing Unit, high carbon chromium bearing steel specified in JIS is used.

For more reliability of bearing, vacuum degassing is executed against high carbon chromium bearing steel to reduce non-metallic inclusion and included oxygen. After the materials of bearing are made into the specified form, quench-and-temper is executed until its hardness is 60HRC.

Table 12.1 shows the chemical components of high carbon chromium bearing steel. As the material of bearing rings and rolling elements of the insert bearings for stainless-series unit (special code : S6), stainless steel with superior corrosion resistance is used. Cages are made of cold-reduced carbon steel sheets and strips specified in JIS.

Table 12.2 shows the chemical compositions of cold-reduced carbon steel sheets and strips specified in JIS.

12.2 Materials of housing

A housing for insert bearing unit is mainly made of gray iron casting products, carbon steel casting products, structural steel, cold-reduced carbon steel sheets and strips.

Gray iron casting is the most popular as the material of housing for insert bearing unit, featuring absorption of vibration, damping superior to other materials, easy and varied forming by casting, appropriate strength, and excellent heat property.

Table 12.3 shows the mechanical properties of gray iron casting.

If superior strength is required for the housing for insert bearing unit, select carbon steel casting products with higher rupture strength, carbon steel casting, or general structural rolled steel with higher strength against impact.

For the material of housings of the “compact” series unit, zinc alloy die-cast is used, and corrosion-resistant cast steel products are used for housings of the stainless series unit. Cold-reduced carbon steel sheets and strips are used as the material of housings for the pressed steel unit.

Table 12.4 to **12.8** show the mechanical properties of these housing materials.

Spheroidal graphite iron casting (FCD450-10 of JIS G 5502) may be used, as well as these materials.

Table 12.1 Chemical compositions of high carbon chromium bearing steel (JIS G 4805)

Code	Chemical components (%)						
	C	Si	Mn	P	S	Cr	Mo
SUJ 2	0.95–1.10	0.15–0.35	0.50 or less	0.025 or less	0.025 or less	1.30–1.60	0.08 or less
SUJ 3	0.95–1.10	0.40–0.70	0.90–1.15	0.025 or less	0.025 or less	0.90–1.20	0.08 or less

Table 12.2 Chemical compositions of cold-reduced carbon steel sheets and strips (SPCC) (JIS G 3141)

Code	Chemical components (%)						
	C	Si	Mn	P	S	Ni	Cr
SPCC	0.15 or less	–	0.60 or less	0.100 or less	0.035 or less	–	–
SPCD	0.10 or less	–	0.50 or less	0.040 or less	0.035 or less	–	–

Table 12.3 Mechanical properties of gray iron casting (FC200) (JIS G 5501)

Type code	Tensile strength N/mm^2	Hardness HB
FC200	200 or more	223 or less

Table 12.4 Mechanical properties of general structural rolled steel (SS400) (JIS G 3101)

Type code	Yielding point or bearing force N/mm^2			Tensile strength MPa	Thickness of steel mm	Tensile test piece	Elongation %	Bendability		
	Thickness of steel mm							Bending angle	Inside dia.	Test piece
	incl. 16	Over 16 incl. 40	Over 40							
SS400	245 or more	235 or more	215 or more	400–510	Over 5, 16 max.	No.1A	17 or more	180º	1.5 times of thickness	No.1
					Over 16, 40 max.	No.1A	21 or more			
					Over 40	No.4	23 or more			

Table 12.5 Mechanical properties of zinc alloy die-cast (ZDC02) (JIS H 5301) (Reference)

Code	Tensile strength MPa	Elongation %	Impact MJ/m^2	Hardness HB
ZDC2	285	10	1.4	82

Table 12.6 Mechanical properties of corrosion-resistant cast steel (SCS14) (JIS G 5121)

Type code	Bearing force MPa	Tensile strength MPa	Elongation %	Hardness HB
SCS14	185 or more	440 or more	28 or more	183 or less

Table 12.7 Mechanical properties of cold-reduced carbon steel sheets and strips (SPCC) (JIS G 3141)

Type code	Tensile strength MPa	Elongation %
SPCC	270 or more	34 or more
SPCD	270 or more	36 or more

Table 12.8 Mechanical properties of ductile cast iron (FCD450-10) (JIS G 5502)

Type code	Tensile strength N/mm^2	Elongation %
FCD	450 or more	10 or more

12.3 Materials of parts and accessories

Table 12.9 shows materials of parts and accessories of a insert bearing unit.

Table 12.9 Materials of parts and accessories of insert bearing units

Designations	Materials	Code	Standard code
Oil seal (standard type)	Nitrile rubber	NBR	–
Oil seal (heat resistant, cold resistant)	Silicone rubber	VMQ	–
Flinger (slinger)	Cold-reduced carbon steel sheets and strips	SPCC	JIS G 3141
Stainless steel Flinger (slinger)	Cold rolled stainless steel plate and steel strip	SUS304-CP, SUS304-CS	JIS G 4305
Pressed steel cover	Cold-reduced carbon steel sheets and strips	SPCD	JIS G 3141
Pressed stainless steel cover	Cold rolled stainless steel plate and steel strip	SUS304-CP, SUS304-CS	JIS G 4305
Cast iron cover	Gray casting iron products	FC200	JIS G 5501
Hexagon socket set screw	Chrome molybdenum steel	SCM435	JIS G 4053
Stainless steel hexagon socket set screw	Stainless bar steel	SUS304	JIS G 4303
Adapter sleeve for bearing	Mechanical structural carbon steel	S17C	JIS G 4051
Lock nut for bearing	Mechanical structural carbon steel	S17C	JIS G 4051
Washer for bearing	Cold-reduced carbon steel sheets and strips	SPCC	JIS G 3141
Eccentric locking collar	Mechanical structural carbon steel	S17C	JIS G 4051
Grease nipple	Free-cutting steel	SUM24L	JIS G 4804

13 Performance

13.1 Friction torque of bearing

Friction torque of a insert bearing for insert bearing unit is the synthesis of rolling friction between the rolling elements (balls) and the bearing rings (outer and inner rings), sliding friction between the rolling elements and the cages, agitating resistance of lubricants, and friction resistance of oil seal.

Greatness of friction torque is influenced by the type, dimensions, load, and rotational speed of bearing, and lubricating conditions.

For the insert bearing unit, oil seals with especially superior dustproof performance are adopted to improve sealing performance of the bearing. Thus, friction resistance of the oil seal greatly depends on the friction torque of the bearing.

Friction torque of the insert bearing for insert bearing unit can be found by the Equations below.

$$M = M_{\mathrm{p}} + M_{\mathrm{k}} \quad \cdots\cdots \quad (13.1)$$

$$M_{\mathrm{p}} = \mu \cdot P \cdot \frac{d}{2} \quad \cdots\cdots \quad (13.2)$$

Whereas,

M : Friction torque of bearing mN · m

M_{p} : Friction torque of sections changed by load mN · m

M_{k} : Friction torque of sections changed by rotational speed mN · m

μ : Friction coefficient (0.001 5 to 0.002)

P : Load applied to bearing N

d : Nominal bearing bore dia. mm

Note that the agitating resistance of lubricants and the friction resistance of oil seal are difficult to be calculated, since they are fluctuated by rotational speed.

Fig. 13.1 shows the result of measurement of friction torque of the typical insert bearing unit.

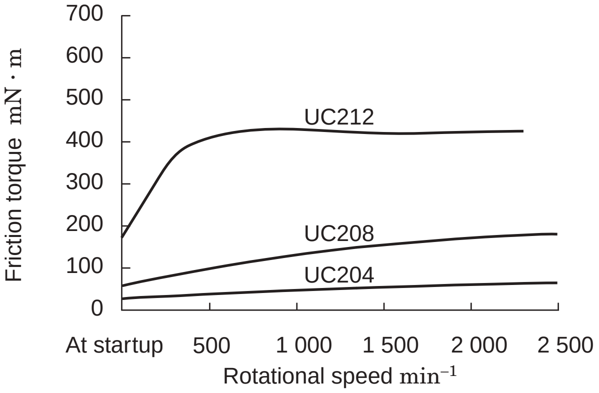


Fig. 13.1 Example of measurement result of insert bearing unit

13.2 Increase in temperature of bearing

Increase in temperature of the insert bearing for insert bearing unit is indicated as heat energy converted from the friction torque in the bearing during operation. Temperature of the bearing during operation increases in proportion to the greatness of friction torque and rotational speed (friction torque increases in proportion to the greatness of load).

Increase in temperature of the insert bearing for insert bearing unit depends on the heating value generated by friction in the bearing and that discharged outside from the surface of the bearing and housing. Therefore, increase in temperature of the insert bearing for insert bearing unit is influenced by the environmental conditions of the location that the insert bearing unit is installed (quality of heat radiation environment).

Temperature of the insert bearing unit is increased gradually after the startup of operation, and reaches the maximum level after one or two hours, if no abnormality occurs. Then, it is decreased a little, and enters the steady-state (see **Fig. 13.2**).

In this manner, if the operating conditions are not changed, bearing temperature is virtually constant, and therefore, measurement of temperature and assumption of the status of bearing are enabled.

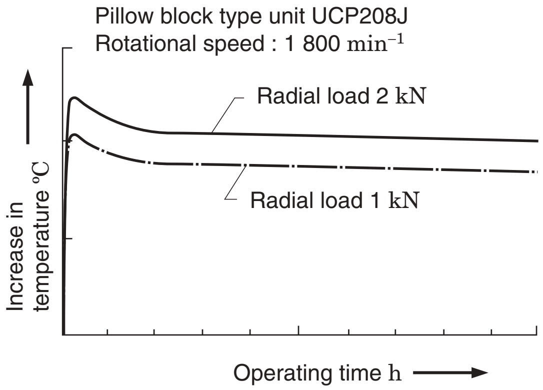


Fig. 13.2 Example of temperature measurement during operation of pillow block type unit

Increase in temperature during operation of the insert bearing unit depends on the type of oil seal used for the bearing as well as friction torque.

Increase in temperature of the triple-lip seal type (supplementary code L3) is greater than the standard type, and that of the non-contact seal type (special code K3, S5) is smaller than the standard type.

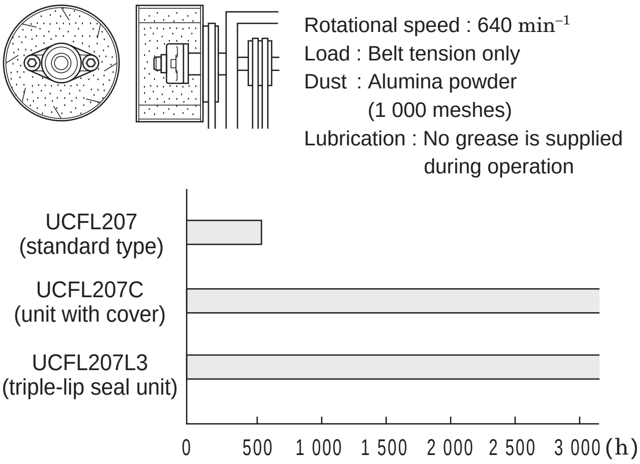
The bearing units for high speed and blower are equipped with the non-contact type oil seals for high speed use and reduction of heat, vibration, and noise.

13.3 Dustproof and waterproof performance

JTEKT executes various tests to check dustproof and waterproof performance of the insert bearing unit. Representative test results are shown below.

13.3.1 Dust sprinkle rotating test (dust preventive performance)

Use the drum type dust sprinkle rotating test machine for this test. Directly sprinkle dusts onto the insert bearing unit while it is being operated, and then, judge the dust preventive performance of the product.



Rotational speed : 640 min^{-1}
Load : Belt tension only
Dust : Alumina powder
(1 000 meshes)
Lubrication : No grease is supplied during operation

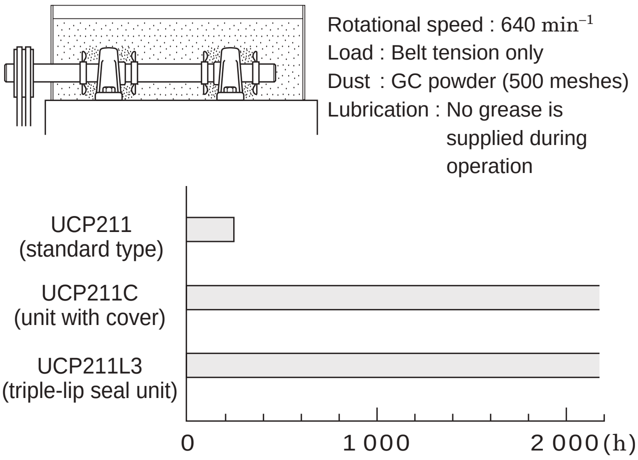
Fig. 13.3 Example of result of dust sprinkle rotating test (dust preventive performance)

In the case of the standard type, abnormal noise occurred about 500 hours after operation was started, and ingress of dusts was recognized.

On the other hand, no abnormality was found in the triple-lip seal type (supplementary code L3) and the covered type (supplementary code C) even after about 3 000 hours after operation was started, and superior dust proof performance was recognized.

13.3.2 Dust bury rotating test (dust preventive performance)

Bury the insert bearing unit into dusts, and run it with the impeller installed to the shaft while stirring dusts, and judge the dust preventive performance of the product. This test is executed under the severest conditions among the operating conditions of the insert bearing unit.



Rotational speed : 640 min^{-1}
Load : Belt tension only
Dust : GC powder (500 meshes)
Lubrication : No grease is supplied during operation

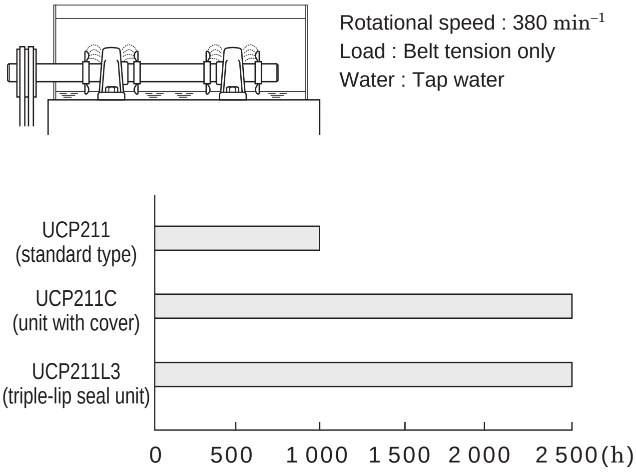
Fig. 13.4 Example of result of dust bury rotating test (dust preventive performance)

In the case of the standard type, abnormal noise occurred about 200 hours after operation was started, and ingress of dusts was recognized.

On the other hand, no abnormality was found in the triple-lip seal type (supplementary code L3) and the covered type (supplementary code C) even after about 2 000 hours after operation was started, and superior dust preventive performance was recognized.

13.3.3 Waterproof performance test

In this test, water is splashed directly impellers installed on the shaft.



Rotational speed : 380 min^{-1}
Load : Belt tension only
Water : Tap water

Fig. 13.5 Example result of waterproof performance test

In the case of the standard type, rust was found on the balls and raceway surface (outer and inner rings) about 1 000 hours after operation was started.

On the other hand, rust of equal level to the standard type was found in the triple-lip seal type (supplementary code L3) and the covered type (supplementary code C) after about 2 500 hours after operation was started.

14 Handling

The most significant feature of the insert bearing unit is simplicity of handling and installation. However, if handling or installation is wrong, premature breakage may occur to the insert bearing unit.

Therefore, handle and install it appropriately for genuine performance of the insert bearing unit.

14.1 Installation

14.1.1 Installation of unit with set screws

When installing the unit to the shaft with the set screws, it is enough to tighten the two set screws of the bearing inner ring with the specified torque.

However, if the environment is exposed to impact or vibration, the shaft is rotated in normal and reverse directions, or the machine is started and stopped frequently and repeatedly, grind the surface of the shaft where the set screw contacts with a file so that the flat seat (**Fig. 14.1**) or drilled seat (**Fig. 14.2**) is provided. It improves the tightening effect of the set screw substantially.

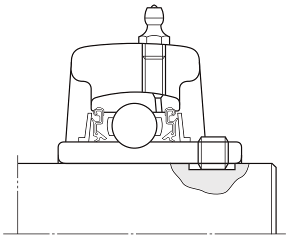


Fig. 14.1 Flat seat provided for shaft
(for improvement in set screw tightening effect)

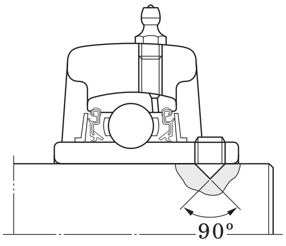


Fig. 14.2 Drilled seat provided for shaft
(for improvement in set screw tightening effect)

If the environment is exposed to a great axial load or excessive vibration, use the shouldered shaft, and tighten the bearing inner ring with the nut (**Fig. 14.3**).

As for the dimensions of the shouldered shaft, see **"10 Design of shaft and base"**.

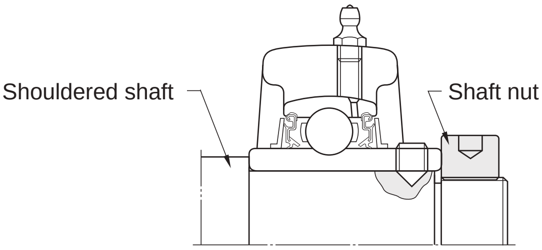


Fig. 14.3 Example of installation with using shouldered shaft and nut

The standard Koyo Insert Bearing Unit is equipped with the Bullet Point set screw featuring secure tightening to shaft. Other set screws are also available depending on your purposes and operating conditions (see **Table 14.1**).

Table 14.1 Set screw of insert bearing for unit

Designations (code)	Details
Bullet Point (no indication) 	The tip of the Bullet Point set screw has a ball shape, and it is designed to firmly grip the shaft by expanding its threads outward against the threads of the inner ring of the bearing as it is tightened. When shock or vibration are problems, the Bullet Point set screw can remain affixed to the shaft longer than other set screws styles including double point, ball point, or others.
Pointed (**G4**) 	The cone point set screw has a 90º angle and fits a drilled cone seat in the shaft. It allows correct positioning on the shaft and prevents shaft movement in an axial direction.
Full dog point cap (**G6**) 	The full dog point set screw fits into the key groove in the shaft and allows for expansion and contraction of the shaft.

Procedures for installation of the insert bearing unit with set screw are shown below.

(1) Inspect the unit to ensure that the rigidity of the base, flatness of the mounting surface, variation of tolerance of the shaft meet the standards. Check for bend, flaw, or birr on the shaft.

(2) Make sure that the tip of the set screw does not exceed the bearing bore diameter surface.

(3) Fit the bearing unit to the shaft, and place it to the specified position. To fit it to the shaft with tight fitting, press-fit the bearing unit to the shaft with a press, cold-fit by cooling the shaft, or shrink-fit the bearing unit by warming it with air bath (100 ℃ or less).

Avoid hitting the side of the bearing inner ring with a hammer to press-fit the bearing to the shaft.

(4) Place the bearing unit to the specified position on the base, and fix it with bolts (**Fig. 14.4**).

Tighten the mounting bolt of the housing with the specified torque by a torque wrench. As for the tightening torque of the mounting bolt, see the **Supplementary table 2** at the end of this catalogue.

Fig. 14.4 Fixing insert bearing unit to base

(5) Tighten the set screws (two) of a bearing inner ring with the specified tightening torque evenly (**Fig. 14.5**).
As for the tightening torque of the set screw, see the **Supplementary table 3** at the end of this catalogue.

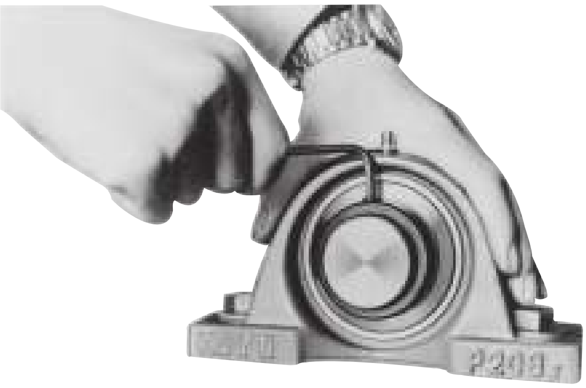


Fig. 14.5 Tightening of set screw

(6) Turn the shaft with your hands, and tighten the set screws (two) of another bearing inner ring with the specified torque.
(7) At last, turn the shaft with your hands, and check for abnormality in turning status of the bearing.

14.1.2 Installation of unit with adapter

To install the bearing with tapered bore to the shaft, set the adapter assembly (sleeve, locknut and washer) between the bearing bore diameter and the shaft. The bearing can be securely fixed even in the environment exposed to excessive vibration or impact.

If tightening of the locknut is loose, fitting to the shaft may be loosened during operation, and slippage occurs to the fitting surface, leading to wear on the shaft or parts. On the contrary, if tightening of the locknut is excessive, the bearing inner ring is expanded, and internal clearance of the bearing is too small, causing abnormal heat or premature breakage. Therefore, pay close attention to installation of the bearing with adapter.

Procedures for installation of the insert bearing unit with adapter assembly are shown below.

(1) Inspect the unit to ensure that the rigidity of the base, flatness of the installing surface, and variation of tolerance of the shaft meet the standards. Check for bend, flaw, or birr on the shaft.
(2) Fit the adapter sleeve to the shaft, and move the adapter sleeve to the installing position of the bearing unit.
If the fitting is too tight to insert the adapter sleeve, put a screwdriver into the cutout of the adapter sleeve, and expand the cutout for easier fitting.
(3) Fit the bearing unit to the shaft.
Then, place the cylindrical backing plate to the whole side of the bearing inner ring that the locknut is to be attached, and tap all around the large diameter side end face to fit the bore diameter surface of the bearing inner ring to the tapered surface of the adapter sleeve closely (**Fig. 14.6**).

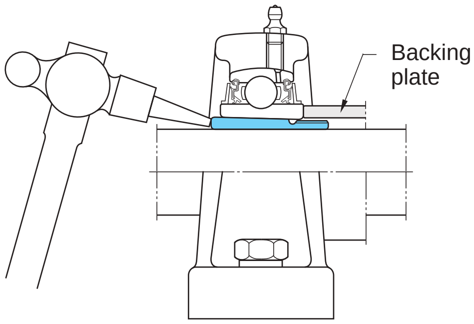


Fig. 14.6 Fitting adapter sleeve to bearing with tapered bore

(4) Fit the washer and locknut to the adapter sleeve, and tighten the locknut with your hands.
(5) Place the bearing unit to the specified position of the base, and fix it with the bolts.
Tighten the mounting bolt of the housing with the specified torque by a torque wrench.
As for the tightening torque of the set screw, see the **Supplementary table 2** at the end of this catalogue.
(6) Tighten the locknut of the adapter.
When tightening the locknut, tighten it with a wrench for tightening, or place a jig onto the cutout of the locknut outer surface, and tap the jig with a hammer and turn the locknut by 1/4 to 1/3 turn (**Fig. 14.7**).
As for the tightening torque of the locknut, see the **Supplementary table 4** at the end of this catalogue.

Fig. 14.7 Tightening locknut

(7A) For the pillow block type unit, loosen the mounting bolts on a housing, adjust the position of the bearing unit in the axial direction while turning the shaft by your hands, and then, tighten the mounting bolt on the housing with the specified torque again.

(7B) For the flange type unit, positions of the bearing and housing in the axial direction must be fit completely. Therefore, pay close attention and tighten the locknut to prevent any error of the position of bearing inner ring.

(8) Bend the outer tab on a washer that fits to the position of cutout on the outer surface of the locknut, and lock the locknut (**Fig. 14.8**).

Fig. 14.8 Bending outer tab of washer (Locking locknut)

(9) At last, turn the shaft with your hands, and check for abnormality in the rotating status of the bearing.

14.1.3 Installing unit with eccentric locking collar

When installing the bearing to the shaft with the eccentric ring, fit the eccentric section of the end outside surface of the bearing inner ring to the eccentric recessed section provided on the eccentric locking collar, turn the eccentric locking collar, and tighten the set screw of the eccentric locking collar to fix the bearing to the shaft.

Since the rotating force of the shaft increases the tightening force of the eccentric ring to the shaft, the unit with eccentric locking collar allows secure fixing of the bearing (**Fig. 14.9**).

Fig. 14.9 Insert bearing unit with eccentric locking collar

Procedures for installation of the insert bearing unit with eccentric locking collar are shown below.

(1) Inspect the unit to ensure that the rigidity of the base, flatness of the mounting surface, and variation of tolerance of the shaft meet the standards. Check for bend, flaw, or birr on the shaft.

(2) Fit the bearing unit to the shaft, and place it on the specified position.

(3) Install the bearing unit to the specified position of the base, and fix it with the bolts.

Tighten the mounting bolts for the housing with the specified torque with a torque wrench.

For the tightening torque of the mounting bolt, see the **Supplementary table 2** at the end of this catalogue.

(4) Fit the eccentric section of the bearing inner ring to the eccentric recessed section provided on the eccentric locking collar, turn the eccentric locking collar in the shaft turning direction, and tighten the set screw of the eccentric locking collar with the specified torque (**Fig. 14.10**).

For the tightening torque of the set screw, see the **Supplementary table 3** at the end of this catalogue.

Fig. 14.10 Installing eccentric locking collar

(5) Turn the shaft with your hands. Then, fix the eccentric locking collar of another bearing unit to the bearing inner ring, and tighten the set screw of the eccentric locking collar with the specified torque.
(6) At last, turn the shaft with your hands, and check for abnormality in the rotating status of the bearing.

14.1.4 Installing unit with cover

Covers for insert bearing unit are available in four types, pressed steel, cast iron, stainless and rubber coated. Install both the covers at last after installation of the bearing and housing is complete.

Procedures for installation of the insert bearing unit with cover are shown below.

(1) Apply grease all around the seal lip of the cover, and pack the internal space of the cover with grease (approximately 1/3 to 1/2 of the space capacity) (**Fig. 14.11**).

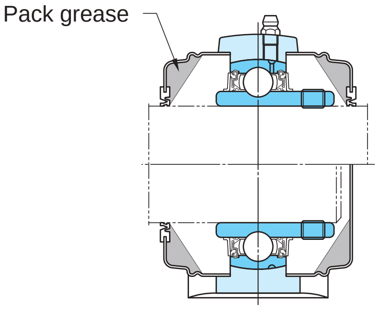


Fig. 14.11 Packing grease in internal space and seal lip of cover

(2) Put a cover through the shaft, and then, fit the bearing unit to the shaft.
(3) Fit the cover through the shaft to the cover groove on the housing, and fix it.
(4A) For the pressed steel cover, tap all around the cover evenly with a synthetic resin hammer to prevent deformation, and install it to the housing (**Fig. 14.12**).
To remove the pressed steel cover, put a screwdriver into the groove on the periphery of the cover, and slightly pry it.

Fig. 14.12 Installing steel plate cover

(4B) When installing the cast iron cover, fit the cover to the cover groove of the housing, and fix it with the bolt.
For the tightening torque of the cast iron cover mounting bolt, see the **Supplementary table 2** at the end of this catalogue.
(5) Install another cover to the housing in a similar manner.
(6) Check for abnormality of the installed cover.
(7) At last, turn the shaft with your hands, and check for abnormality in the rotating status of the bearing.

14.2 Test run inspection

After installation of the insert bearing unit is complete, execute the test run inspection to ensure that it is done appropriately.

The test run inspection should be executed by following the procedures below. Check for abnormality in the bearing unit.

(1) Turn the shaft with your hands, and make sure that the bearing is rotated smoothly.
If any jam, vibration, great rotation torque (heavy), or uneven rotation is found, the bearing is judged to be faulty.
(2) Execute power run with no load and at a low speed, and check for abnormal noise and vibration.
(3) Carry out power run under the specified conditions, and check for abnormal noise, vibration, and temperature increase.

Table 14.2 shows the main faults that may occur during the test run inspection of the insert bearing unit and causes.

Table 14.2 Main faults occurred during test run inspection and their causes

Faults	Causes
Excessively great torque, uneven rotating torque	(1) Faulty installation, leading to preload onto bearing in axial direction (2) Inappropriate handling or installation, leading to interference of oil seal with flinger (slinger) (3) Excessive tightening of locknut (adapter), leading to too small internal clearance of bearing
Abnormal noise, abnormal vibration	(1) Insufficient tightening of set screw of bearing inner ring or mounting bolt of housing (2) Excessively large internal clearance of bearing (3) Bend on shaft, deviation of shaft center of shouldered shaft (4) Faulty accuracy of shaft (5) Insufficient rigidity or faulty flatness of base
Abnormal temperature increase	(1) Excessively small internal clearance of bearing (2) Inappropriate installation, leading to preload onto bearing in axial direction (3) Great load applied (4) Allowable rotational speed is exceeded (5) Faulty flatness of base (6) Inappropriate handling or installation, leading to interference of oil seal with flinger (slinger)

14.3 Periodic inspection

Koyo Insert Bearing Units do not need to be inspected, as well as standard sealed bearings. However, for especially important purposes, periodic inspection must be executed with appropriate intervals for safe operation of the bearing unit.

Since a insert bearing unit cannot be disassembled for inspection of internal status, check the appearance and operating status as shown below, and ensure that the bearing unit is free from fault or not.

(1) Appearance
(2) Looseness of set screw of bearing inner ring or mounting bolt of housing
(3) Vibration, noise
(4) Temperature
(5) Grease supply interval, check of supplied amount

Table 14.3 shows the main faults found during the periodic inspection of insert bearing unit and their causes.

If any fault is found in the insert bearing unit during the periodic inspection, immediately provide countermeasures against them, and carry out them. If the unit is judged to be difficult to be used, replace the bearing unit. It is important to replace the bearing unit to prevent expanding damage to other parts.

Table 14.3 Main faults found during periodic inspection and their causes

Faults	Causes
Excessively great torque (heavy)	(1) Degraded grease (2) Interference of oil seal with flinger (slinger) due to excessive supply of grease (3) Deformation of flinger (slinger), leading to interference with oil seal (4) Abnormal load due to expansion of shaft
Abnormal noise, abnormal vibration	(1) Insufficient tightening of set screw of bearing inner ring or mounting bolt of housing (2) Wear on fitting surface of shaft and bearing inner ring due to creep or fretting (3) Ingress of foreign matters into bearing (4) Damage to raceway surface or rolling contact surface of rolling element by rolling fatigue (5) Dent on raceway surface or rolling contact surface of rolling element by excessive load (6) Excessive warp or bend of shaft
Abnormal temperature increase	(1) Degraded grease (2) Interference of oil seal with flinger (slinger) due to excessive supply of grease (3) Deformation of flinger (slinger), leading to interference with oil seal (4) Looseness of set screw or locknut (adapter) of bearing inner ring (5) Abnormal load due to expansion of shaft (6) Damage to raceway surface or rolling contact surface of rolling element by rolling fatigue

14.4 Supply of grease

In Koyo Insert Bearing Unit, grease of good quality is packed with high quality oil seal. Therefore, grease life is long under standard operating conditions, and use without lubrication is enabled.

If the operating temperature is high or the unit is used in the environment exposed to dusts or high humidity, grease may be degraded faster, leading to faulty lubrication in a short period.

Since Koyo Insert Bearing Units are lubricated type bearings, fresh grease must be periodically supplied to the bearings, if they are used for such purposes that premature degradation of grease is expected.

The insert bearing units can maintain normal lubricated status and longer service life by supplying fresh grease.

14.4.1 Grease life and supply intervals

Grease life of a packed grease insert bearing, like a insert bearing unit, can be found by **Equation (5.10)** in page 37. It is recommended to supply grease with the intervals of 1/4 to 1/3 of grease life found by the calculation shown above to insert bearing units, taking peculiarity of lubricating method and safety of bearing unit into consideration.

If the bearing unit is used under severe environmental conditions, including much dust and high humidity, the greasing intervals must be further shortened, taking these influences into consideration.

If operating conditions of the insert bearing unit are not clear or the unit is operated under standard conditions, consider the greasing intervals shown in **Table 14.4** as the guideline.

14.4.2 Greasing amount

Initial greasing amount of Koyo Insert Bearing Unit is approximately 30 to 35% of the internal space capacity of the bearing. If amount of grease supplied in the bearing is excessive, agitating resistance of grease increases, leading to abnormal heat or grease leak. DO NOT exceed the initial greasing amount.

Table 14.5 shows the recommended values of greasing amount of Koyo Insert Bearing Unit.

If the unit is used at a low speed, supply grease of double amount of that shown in **Table 14.5** is recommended to increase dust preventive performance.

[Remarks] 1. For greasing amount of the UK type bearing, use this table, too.
2. For greasing amount of the triple-lip seal type, 1.5 times of the values shown in this table are recommended.
3. Values shown in this table are applicable to standard grease (specific gravity : 0.9 g/ml). If you use greases of other specific gravity, adopt values converted with the same volume.

Table 14.5 Greasing amount of insert bearing unit (recommended)

Bore dia. code	Greasing amount, g		
	Diameter Series$^{1)}$		
	UC200	UCX00	UC300
01	0.7		
02	0.7		
03	0.7		
04	0.7		
05	0.8	1.3	1.8
06	1.3	1.8	2.5
07	1.8	2.3	3.4
08	2.3	2.8	4.6
09	2.8	3.2	6.3
10	3.2	4.3	8.1
11	4.3	5.5	11
12	5.5	6.8	14
13	6.8	7.7	17
14	7.7	9	21
15	9	11	25
16	11	14	29
17	14	17	34
18	17	21	40
19	–	–	47
20	–	29	61
21	–	–	69
22	–	–	84
24	–	–	98
26	–	–	126
28	–	–	151

Table 14.4 Greasing intervals of insert bearing unit (recommended)

Operating temperature, ºC		Grease Intervals			Bearing used	Grease supplied
over	up to	Substantially clean	Much dust	Much dust and muddy water		
	50	(3 months) not necessary	(2 months) 1 year	(1 month) 4 months	(Low temperature D2K2)$^{1)}$ Standard bearing	(Lithium) Lithium
50	**70**	1 year	4 months	1 month		
70	**100**	6 months	2 months	2 weeks		
100	**120**	2 months	2 weeks	5 days	High temperature D1K2	Lithium
120	**150**	2 weeks	5 days	2 days		
150	**180**	1 week	2 days	1 day		

Note 1) Greasing intervals in parentheses are applicable to the cold resistant type (D2K2).

[Remark] Greasing intervals shown in this table are applicable to the unit to be operated for 8 to 10 hours a day. If operating hour is out of this range, find the greasing interval proportionally by this table.

14.4.3 Types of grease supplied

Though various types of greases used for insert bearing units are available, if dissimilar grease, especially grease of which soap base is different, is mixed, lubricating performance may be significantly degraded.

Therefore, the same grease to be supplied as the initially packed grease must be used, and avoid use of dissimilar grease.

It is recommended to supply the same grease to Koyo Insert Bearing Unit as the initially packed grease (see **Table 3.3**). If you have no choice but to use other greases, you have to use grease of the same type (thickener) as the initially packed grease, if not the worst.

14.4.4 Supplying grease

When supplying grease to a insert bearing unit, use the grease nipple and grease gun installed to the housing (**Fig. 14.13**).

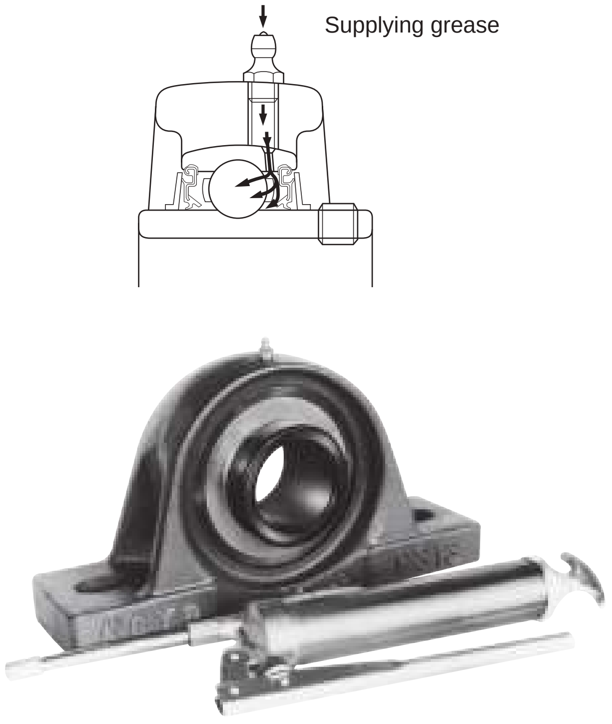


Fig. 14.13 Supplying grease to insert bearing unit

(1) Clean the grease nipple and area around it to prevent ingress of foreign matters.
(2) Clean the grease gun, and pack clean grease.
(3) Supply grease.

When supplying grease to the insert bearing unit, turning of the shaft with your hands or turning of the bearing unit at a low speed is recommended.

It allows appropriate discharge of old grease and even supply of fresh grease into the bearing.

If the grease supply with the grease nipple of the standard type (type A) is difficult because of the structure of the machine, grease nipples of the type B or type C are also available. Contact JTEKT.

Fig. 14.14 shows the types of grease nipples.

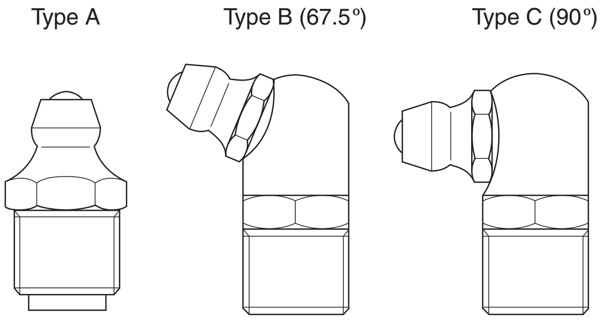


Fig. 14.14 Types of grease nipple for insert bearing unit

When supplying many insert bearing units with the centralized lubricating device, use soft grease with consistency from about 300 to 380, and provide piping appropriately so that grease of the specified amount is supplied.

Piping to the insert bearing unit should be provided with the tapped hole of the grease nipple of the housing. However, if size of the tapped hole on the housing differs from that of thread of the piping, use the reducing socket.

Fig. 14.15 shows the structure of the reducing socket for centralized lubricating.

When executing centralized lubricating, it is effective for the lubricating surface of the bearing to supply grease of the amount shown in **Table 14.5** by dividing into several times.

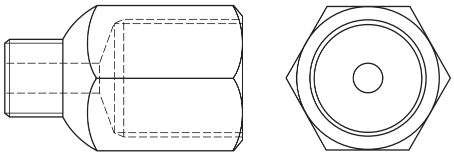


Fig. 14.15 Reducing socket for centralized lubricating

For details of grease nipples and reducing sockets, see **“16 Parts and accessories”**.

14.5 Replacing bearing

Since the bearings and the housings of Koyo Insert Bearing Units are compatible, if a bearing is faulty, it can be replaced and used continuously.

Replacing procedures of the bearing of the insert bearing unit are shown below.

(1) Remove the bearing unit from the shaft and the base.

(2) Screw in the set screw so that the head of the set screw does not project out from the outside diameter surface of the inner ring of the bearing.
Head of the set screw may be hooked on the housing when the bearing is tilted.

(3) Turn the bearing by 90º with a handle of a hammer until the bearing is horizontal.

(4) Take out the bearing from the bearing groove of the housing.

To fit a new bearing to the housing, reverse the removing procedures.

15 Specification tables of insert bearing units

1 Pillow block type

Pillow block type

Thick section pillow block type

Tapped-base pillow block type

Higher centerheight pillow block type

Light duty pillow block type

“Compact” series pillow block type

Stainless-series pillow block type

2 Square-flanged type

Square-flanged type

Square-flanged type with spigot joint

Stainless-series square-flanged type

3 Rhombic flanged type

Rhombic-flanged type

Adjustable rhombic-flanged type

Three-bolt flange type

Light duty rhombic-flanged type

“Compact” series rhombic-flanged type

Stainless-series rhombic-flanged type

4 Round-flanged type with spigot joint

Round-flanged type with spigot joint

Stainless-series round-flanged type with spigot joint

5 Pressed steel housing type

Pressed steel pillow block type

Pressed steel round-flanged type

Pressed steel rhombic-flanged type

Pressed steel triangle-flanged type

6 Take-up type

Take-up type

Stainless-series take-up type

Section steel frame take-up type

Channel steel frame take-up type

Pressed steel frame take-up type

7 Other units

Cartridge type

Hanger type

Rubber clamping ring/ anti vibration ring type

8 Insert bearings for units

Cylindrical bore (with set screws)

(Stainless-series) Cylindrical bore (with set screws)

Cylindrical bore (with eccentric locking collar)

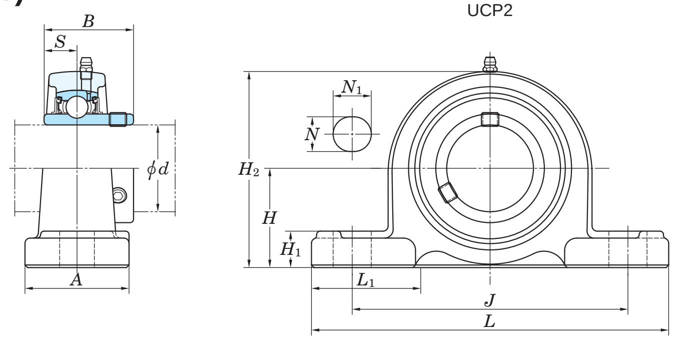
Tapered bore (with adapter)

Cylindrical bore (with set screws) Cylindrical outside surface

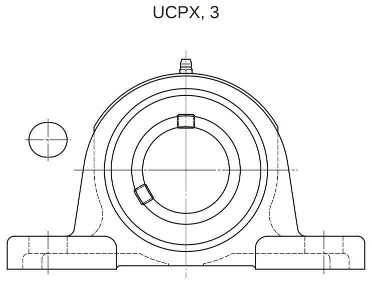
9 Adapter assemblies

UCP
Cylindrical bore (with set screws)
d 12 ~ (45) mm

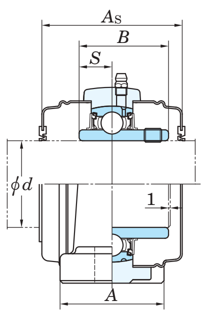
UCP2



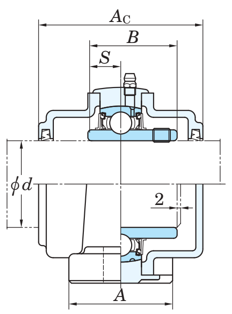
UCPX, 3



With Pressed Steel Covers (E1)



With Cast Iron Covers (E3)

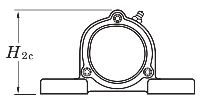


Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs})

Unit: mm

Housing No.			Δ_{Hs}
P203~P210	PX05~PX10	P305~P310	±0.15
P211~P218	PX11~PX18	P311~P318	±0.2
	PX20	P319~P328	±0.3

Forms and dimensions of H_{2c} of P204JE3 and P205JE3 (housing with cast iron covers) are shown below.



P204JE3 $H_{2c} = 70$ mm
P205JE3 $H_{2c} = 77$ mm

Position of grease nipple is different from standard only for P204JE3 and P205JE3.

Shaft Dia.		Dimensions inch mm											Bolt Size inch mm	Standard			Mass	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm d	inch d	H	L	A	J	N	N_1	H_1	H_2	L_1	B	S		Unit No.	Housing No.	Bearing No.	kg	C_r	C_{0r}	C_u	f_0	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension A_s mm	A_s inch	Mass kg	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension A_c mm	A_c inch	Mass kg
12		1 3/16 30.2	5 127	1 1/2 38	3 3/4 95	1/2 13	23/32 18	5/8 16	2 3/8 60	1 13/32 36	1.220 31	0.500 12.7	3/8 M10	UCP201	P203	UC201	0.63	12.8	6.65	0.302	13.2	UCP201C	UCP201CD	45	1 25/32	0.63	–	–	–	–	–
	1/2													UCP201-8		UC201-8	0.63					–	–	–	–	–	–	–	–	–	–
15														UCP202		UC202	0.61					UCP202C	UCP202CD	45	1 25/32	0.61	–	–	–	–	–
	5/8													UCP202-10		UC202-10	0.61					–	–	–	–	–	–	–	–	–	–
17														UCP203		UC203	0.60					UCP203C	UCP203CD	45	1 25/32	0.60	–	–	–	–	–
20	3/4	1 5/16 33.3	5 127	1 1/2 38	3 3/4 95	1/2 13	23/32 18	5/8 16	2 9/16 65	1 13/32 36	1.220 31	0.500 12.7	3/8 M10	UCP204-12	P204	UC204-12	0.66	12.8	6.65	0.302	13.2	–	–	–	–	–	–	–	–	–	–
														UCP204		UC204	0.66					UCP204C	UCP204CD	45	1 25/32	0.66	UCP204FC	UCP204FCD	62	2 7/16	0.96
25	7/8	1 7/16 36.5	5 1/2 140	1 1/2 38	4 1/8 105	1/2 13	23/32 18	5/8 16	2 3/4 70	1 1/2 38	1.343 34.1	0.563 14.3	3/8 M10	UCP205-14	P205	UC205-14	0.80	14.0	7.85	0.357	13.9	–	–	–	–	–	–	–	–	–	–
	15/16													UCP205-15		UC205-15	0.80					–	–	–	–	–	–	–	–	–	–
														UCP205		UC205	0.80					UCP205C	UCP205CD	49	1 15/16	0.80	UCP205FC	UCP205FCD	66	2 19/32	1.2
	1													UCP205-16		UC205-16	0.80					–	–	–	–	–	–	–	–	–	–
		1 3/4 44.4	6 1/4 159	2 51	4 11/16 119	21/32 17	31/32 25	5/8 16	3 3/8 86	1 27/32 47	1.500 38.1	0.626 15.9	1/2 M14	UCPX05	PX05	UCX05	1.5	19.5	11.3	0.514	13.9	UCPX05C	UCPX05CD	53	2 3/32	1.5	–	–	–	–	–
	1													UCPX05-16		UCX05-16	1.5					–	–	–	–	–	–	–	–	–	–
		1 49/64 45	6 7/8 175	1 3/4 45	5 3/16 132	21/32 17	25/32 20	5/8 16	3 11/32 85	2 5/32 55	1.496 38	0.591 15	1/2 M14	UCP305	P305	UC305	1.7	21.2	10.9	0.495	12.6	–	–	–	–	–	UCP305C	UCP305CD	76	3	2.3
	1													UCP305-16		UC305-16	1.7					–	–	–	–	–	–	–	–	–	–
30	1 1/8	1 11/16 42.9	6 1/2 165	1 7/8 48	4 3/4 121	21/32 17	13/16 21	21/32 17	3 5/16 84	1 7/8 48	1.500 38.1	0.626 15.9	1/2 M14	UCP206-18	P206	UC206-18	1.3	19.5	11.3	0.514	13.9	–	–	–	–	–	–	–	–	–	–
														UCP206		UC206	1.3					UCP206C	UCP206CD	53	2 3/32	1.3	UCP206FC	UCP206FCD	70	2 3/4	1.8
	1 3/16													UCP206-19		UC206-19	1.3					–	–	–	–	–	–	–	–	–	–
	1 1/4													UCP206-20		UC206-20	1.3					–	–	–	–	–	–	–	–	–	–
		1 7/8 47.6	6 7/8 175	2 1/4 57	5 127	21/32 17	31/32 25	21/32 17	3 21/32 93	2 5/32 55	1.689 42.9	0.689 17.5	1/2 M14	UCPX06	PX06	UCX06	2.1	25.7	15.4	0.700	13.9	UCPX06C	UCPX06CD	60	2 3/8	2.1	–	–	–	–	–
	1 3/16													UCPX06-19		UCX06-19	2.1					–	–	–	–	–	–	–	–	–	–
	1 1/4													UCPX06-20		UCX06-20	2.1					–	–	–	–	–	–	–	–	–	–
	–	1 31/32 50	7 3/32 180	1 31/32 50	5 1/2 140	21/32 17	25/32 20	21/32 17	3 3/4 95	2 3/32 53	1.693 43	0.669 17	1/2 M14	UCP306	P306	UC306	2.2	26.7	15.0	0.682	13.3	–	–	–	–	–	UCP306C	UCP306CD	82	3 7/32	2.8
35	1 1/4	1 7/8 47.6	6 9/16 167	1 7/8 48	5 127	21/32 17	13/16 21	23/32 18	3 3/4 95	1 27/32 47	1.689 42.9	0.689 17.5	1/2 M14	UCP207-20	P207	UC207-20	1.6	25.7	15.4	0.700	13.9	–	–	–	–	–	–	–	–	–	–
	1 5/16													UCP207-21		UC207-21	1.6					–	–	–	–	–	–	–	–	–	–
	1 3/8													UCP207-22		UC207-22	1.6					–	–	–	–	–	–	–	–	–	–
														UCP207		UC207	1.6					UCP207C	UCP207CD	60	2 3/8	1.6	UCP207FC	UCP207FCD	78	3 1/16	2.3
	1 7/16													UCP207-23		UC207-23	1.6					–	–	–	–	–	–	–	–	–	–
	1 3/8	2 1/8 54	8 203	2 1/4 57	5 21/32 144	21/32 17	1 3/16 30	3/4 19	4 1/8 105	2 17/32 64	1.937 49.2	0.748 19	1/2 M14	UCPX07-22	PX07	UCX07-22	2.7	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
														UCPX07		UCX07	2.7					UCPX07C	UCPX07CD	69	2 23/32	2.7	–	–	–	–	–
	1 7/16													UCPX07-23		UCX07-23	2.7					–	–	–	–	–	–	–	–	–	–
	–	2 13/64 56	8 9/32 210	2 7/32 56	6 5/16 160	21/32 17	31/32 25	3/4 19	4 7/32 107	2 9/16 65	1.890 48	0.748 19	1/2 M14	UCP307	P307	UC307	3.0	33.4	19.3	0.877	13.2	–	–	–	–	–	UCP307C	UCP307CD	88	3 15/32	3.8
40	1 1/2	1 15/16 49.2	7 1/4 184	2 1/8 54	5 13/32 137	21/32 17	13/16 21	23/32 18	3 27/32 98	2 3/32 53	1.937 49.2	0.748 19	1/2 M14	UCP208-24	P208	UC208-24	2.0	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
	1 9/16													UCP208-25		UC208-25	2.0					–	–	–	–	–	–	–	–	–	–
														UCP208		UC208	2.0					UCP208C	UCP208CD	69	2 23/32	2.0	UCP208FC	UCP208FCD	86	3 3/8	2.8
	1 1/2	2 5/16 58.7	8 3/4 222	2 5/8 67	6 5/32 156	25/32 20	1 1/4 32	13/16 21	4 1/2 114	2 25/32 71	1.937 49.2	0.748 19	5/8 M16	UCPX08-24	PX08	UCX08-24	3.5	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
														UCPX08		UCX08	3.5					UCPX08C	UCPX08CD	69	2 23/32	3.5	–	–	–	–	–
	1 1/2	2 23/64 60	8 21/32 220	2 3/8 60	6 11/16 170	21/32 17	1 1/16 27	3/4 19	4 21/32 118	2 9/16 65	2.047 52	0.748 19	1/2 M14	UCP308-24	P308	UC308-24	3.8	40.7	24.0	1.09	13.2	–	–	–	–	–	–	–	–	–	–
														UCP308		UC308	3.8					–	–	–	–	–	UCP308C	UCP308CD	96	3 25/32	4.8
45	1 5/8	2 1/8 54	7 15/32 190	2 1/8 54	5 3/4 146	21/32 17	13/16 21	25/32 20	4 3/16 106	2 5/32 55	1.937 49.2	0.748 19	1/2 M14	UCP209-26	P209	UC209-26	2.2	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
	1 11/16													UCP209-27		UC209-27	2.2					–	–	–	–	–	–	–	–	–	–
	1 3/4													UCP209-28		UC209-28	2.2					–	–	–	–	–	–	–	–	–	–
														UCP209		UC209	2.2					UCP209C	UCP209CD	69	2 23/32	2.2	UCP209FC	UCP209FCD	88	3 15/32	3.0
	1 3/4	2 5/16 58.7	8 3/4 222	2 5/8 67	6 5/32 156	25/32 20	1 5/16 33	13/16 21	4 9/16 116	2 25/32 71	2.031 51.6	0.748 19	5/8 M16	UCPX09-28	PX09	UCX09-28	3.7	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
														UCPX09		UCX09	3.7					UCPX09C	UCPX09CD	74	2 29/32	3.7	–	–	–	–	–

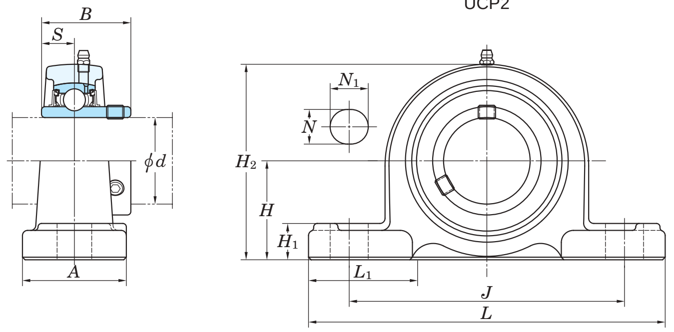
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210, X05~X09, 305~308
A-R1/8.................. 211~218, X10~X20, 309~328
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCP206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Representative examples of the forms of housing are indicated.
6. Housings of spheroidal graphite iron casting are also available.

UCP

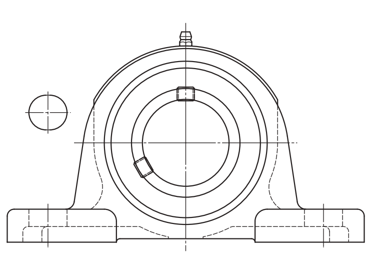
Cylindrical bore (with set screws)

d (45) ~ (75) mm

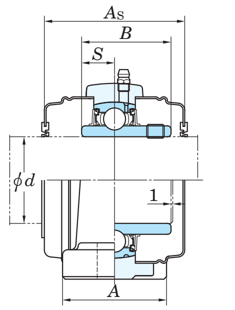
UCP2



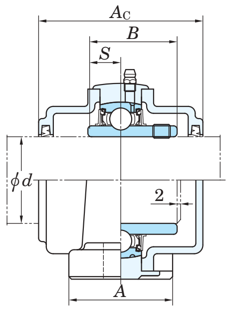
UCPX, 3



With Pressed Steel Covers (E1)



With Cast Iron Covers (E3)



Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs})

Unit: mm

Housing No.			Δ_{Hs}
P203~P210	PX05~PX10	P305~P310	±0.15
P211~P218	PX11~PX18	P311~P318	±0.2
	PX20	P319~P328	±0.3

Shaft Dia.		Dimensions inch mm											Bolt Size	Standard				Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm d	inch d	H	L	A	J	N	N_1	H_1	H_2	L_1	B	S	inch mm	Unit No.	Housing No.	Bearing No.	Mass kg	C_r kN	C_{0r} kN	C_u kN	f_0	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension A_s mm	Dimension A_s inch	Mass kg	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension A_c mm	Dimension A_c inch	Mass kg
45	1 3/4	2 41/64 67	9 21/32 245	2 5/8 67	7 15/32 190	25/32 20	1 3/16 30	13/16 21	5 3/16 132	2 15/16 75	2.244 57	0.866 22	5/8 M16	**UCP309-28**	P309	UC309-28	4.9	48.9	29.5	1.34	13.3	–	–	–	–	–	–	–	–	–	–
														UCP309		UC309	4.9					–	–	–	–	–	UCP309C	UCP309CD	102	4 1/32	6.2
50	1 7/8	2 1/4 57.2	8 1/8 206	2 3/8 60	6 1/4 159	25/32 20	7/8 22	13/16 21	4 7/16 113	2 3/8 60	2.031 51.6	0.748 19	5/8 M16	**UCP210-30**	P210	UC210-30	2.9	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
	1 15/16													**UCP210-31**		UC210-31	2.9					–	–	–	–	–	–	–	–	–	–
														UCP210		UC210	2.9					UCP210C	UCP210CD	74	2 29/32	2.9	UCP210FC	UCP210FCD	97	3 13/16	3.9
	2													**UCP210-32**		UC210-32	2.9					–	–	–	–	–	–	–	–	–	–
	1 15/16	2 1/2 63.5	9 1/2 241	2 7/8 73	6 23/32 171	25/32 20	1 13/32 36	7/8 22	4 31/32 126	3 76	2.189 55.6	0.874 22.2	5/8 M16	**UCPX10-31**	PX10	UCX10-31	4.6	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
														UCPX10		UCX10	4.6					UCPX10C	UCPX10CD	76	3	4.6	–	–	–	–	–
	2													**UCPX10-32**		UCX10-32	4.6					–	–	–	–	–	–	–	–	–	–
	–	2 61/64 75	10 13/16 275	2 15/16 75	8 11/32 212	25/32 20	1 3/8 35	15/16 24	5 13/16 148	3 15/32 88	2.402 61	0.866 22	5/8 M16	**UCP310**	P310	UC310	6.6	62.0	38.3	1.74	13.2	–	–	–	–	–	UCP310C	UCP310CD	110	4 11/32	8.2
55	2	2 1/2 63.5	8 5/8 219	2 3/8 60	6 23/32 171	25/32 20	7/8 22	29/32 23	4 29/32 125	2 9/16 65	2.189 55.6	0.874 22.2	5/8 M16	**UCP211-32**	P211	UC211-32	3.6	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
	2 1/8													**UCP211-34**		UC211-34	3.6					–	–	–	–	–	–	–	–	–	–
														UCP211		UC211	3.6					UCP211C	UCP211CD	76	3	3.6	UCP211FC	UCP211FCD	99	3 29/32	4.8
	2 3/16													**UCP211-35**		UC211-35	3.6					–	–	–	–	–	–	–	–	–	–
		2 3/4 69.8	10 1/4 260	3 1/8 79	7 1/4 184	31/32 25	1 13/32 36	1 3/32 28	5 15/32 139	3 9/32 83	2.563 65.1	1.000 25.4	3/4 M20	**UCPX11**	PX11	UCX11	6.5	52.4	36.2	1.65	14.4	UCPX11C	UCPX11CD	89	3 1/2	6.5	–	–	–	–	–
	2 3/16													**UCPX11-35**		UCX11-35	6.5					–	–	–	–	–	–	–	–	–	–
	2 1/4													**UCPX11-36**		UCX11-36	6.5					–	–	–	–	–	–	–	–	–	–
	2	3 5/32 80	12 7/32 310	3 5/32 80	9 9/32 236	25/32 20	1 1/2 38	1 1/16 27	6 7/32 158	3 17/32 90	2.598 66	0.984 25	5/8 M16	**UCP311-32**	P311	UC311-32	7.9	71.6	45.0	2.05	13.2	–	–	–	–	–	–	–	–	–	–
														UCP311		UC311	7.9					–	–	–	–	–	UCP311C	UCP311CD	114	4 1/2	9.7
60	2 1/4	2 3/4 69.8	9 1/2 241	2 3/4 70	7 1/4 184	25/32 20	31/32 25	31/32 25	5 7/16 138	2 7/8 73	2.563 65.1	1.000 25.4	5/8 M16	**UCP212-36**	P212	UC212-36	4.9	52.4	36.2	1.65	14.4	–	–	–	–	–	–	–	–	–	–
														UCP212		UC212	4.9					UCP212C	UCP212CD	89	3 1/2	4.9	UCP212FC	UCP212FCD	114	4 1/2	6.4
	2 3/8													**UCP212-38**		UC212-38	4.9					–	–	–	–	–	–	–	–	–	–
	2 7/16													**UCP212-39**		UC212-39	4.9					–	–	–	–	–	–	–	–	–	–
		3 76.2	11 1/4 286	3 1/4 83	8 203	31/32 25	1 9/16 40	1 3/32 28	5 31/32 152	3 15/32 88	2.563 65.1	1.000 25.4	3/4 M20	**UCPX12**	PX12	UCX12	7.7	57.2	40.1	1.82	14.4	UCPX12C	UCPX12CD	89	3 1/2	7.7	–	–	–	–	–
	2 7/16													**UCPX12-39**		UCX12-39	7.7					–	–	–	–	–	–	–	–	–	–
	–	3 11/32 85	13 330	3 11/32 85	9 27/32 250	31/32 25	1 1/2 38	1 5/32 29	6 9/16 167	4 1/16 103	2.795 71	1.024 26	3/4 M20	**UCP312**	P312	UC312	9.5	81.9	52.2	2.37	13.2	–	–	–	–	–	UCP312C	UCP312CD	124	4 7/8	11.8
65	2 1/2	3 76.2	10 7/16 265	2 3/4 70	8 203	31/32 25	1 3/16 30	1 1/16 27	5 29/32 150	3 1/16 78	2.563 65.1	1.000 25.4	3/4 M20	**UCP213-40**	P213	UC213-40	5.9	57.2	40.1	1.82	14.4	–	–	–	–	–	–	–	–	–	–
														UCP213		UC213	5.9					UCP213C	UCP213CD	89	3 1/2	5.9	UCP213FC	UCP213FCD	114	4 1/2	7.6
	2 1/2	3 76.2	11 1/4 286	3 1/4 83	8 203	31/32 25	1 9/16 40	1 3/32 28	6 3/32 155	3 15/32 88	2.937 74.6	1.189 30.2	3/4 M20	**UCPX13-40**	PX13	UCX13-40	8.1	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
														UCPX13		UCX13	8.1					UCPX13C	UCPX13CD	99	3 29/32	8.1	–	–	–	–	–
	2 1/2	3 35/64 90	13 3/8 340	3 17/32 90	10 1/4 260	31/32 25	1 1/2 38	1 1/4 32	6 15/16 176	4 11/32 110	2.953 75	1.181 30	3/4 M20	**UCP313-40**	P313	UC313-40	10.7	92.7	59.9	2.68	13.2	–	–	–	–	–	–	–	–	–	–
														UCP313		UC313	10.7					–	–	–	–	–	UCP313C	UCP313CD	122	4 13/16	12.8
70	2 3/4	3 1/8 79.4	10 15/32 266	2 27/32 72	8 9/32 210	31/32 25	1 3/16 30	1 1/16 27	6 3/16 157	2 15/16 75	2.937 74.6	1.189 30.2	3/4 M20	**UCP214-44**	P214	UC214-44	6.8	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
														UCP214		UC214	6.8					UCP214C	UCP214CD	99	3 29/32	6.8	UCP214FC	UCP214FCD	124	4 7/8	8.7
	2 3/4	3 1/2 88.9	13 330	3 1/2 89	9 229	1 1/16 27	1 31/32 50	1 1/4 32	6 23/32 171	3 27/32 98	3.063 77.8	1.331 33.3	7/8 M22	**UCPX14-44**	PX14	UCX14-44	10.2	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
														UCPX14		UCX14	10.2					UCPX14C	UCPX14CD	99	3 29/32	10.2	–	–	–	–	–
	2 3/4	3 47/64 95	14 3/16 360	3 17/32 90	11 1/32 280	1 1/16 27	1 9/16 40	1 3/8 35	7 5/16 186	4 11/32 110	3.071 78	1.299 33	7/8 M22	**UCP314-44**	P314	UC314-44	12.4	104	68.2	2.96	13.2	–	–	–	–	–	–	–	–	–	–
														UCP314		UC314	12.4					–	–	–	–	–	UCP314C	UCP314CD	124	4 7/8	14.7
75	2 15/16	3 1/4 82.6	10 13/16 275	2 29/32 74	8 17/32 217	31/32 25	1 3/16 30	1 3/32 28	6 3/8 162	3 1/16 78	3.063 77.8	1.311 33.3	3/4 M20	**UCP215-47**	P215	UC215-47	7.4	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
														UCP215		UC215	7.4					UCP215C	UCP215CD	99	3 29/32	7.4	UCP215FC	UCP215FCD	124	4 7/8	9.3
	3													**UCP215-48**		UC215-48	7.4					–	–	–	–	–	–	–	–	–	–
	2 15/16	3 1/2 88.9	13 330	3 1/2 89	9 229	1 1/16 27	1 31/32 50	1 1/4 32	6 7/8 175	3 29/32 99	3.252 82.6	1.311 33.3	7/8 M22	**UCPX15-47**	PX15	UCX15-47	10.8	72.7	53.0	2.30	14.6	–	–	–	–	–	–	–	–	–	–
														UCPX15		UCX15	10.8					UCPX15C	UCPX15CD	109	4 9/32	10.8	–	–	–	–	–
	3													**UCPX15-48**		UCX15-48	10.8					–	–	–	–	–	–	–	–	–	–

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210, X05~X09, 305~308
A-R1/8................. 211~218, X10~X20, 309~328

3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCP206JL3, UC206L3)

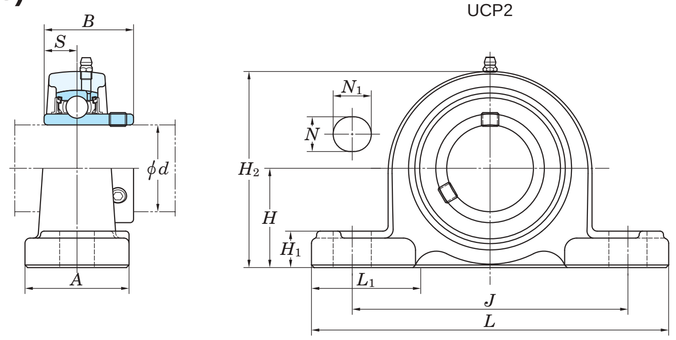
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

5. Representative examples of the forms of housing are indicated.

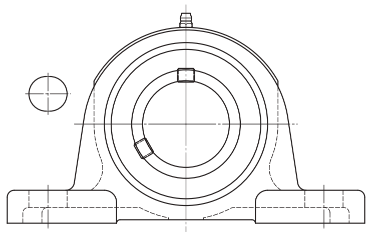
6. Housings of spheroidal graphite iron casting are also available.

UCP
Cylindrical bore (with set screws)
d (75) ~ 140 mm

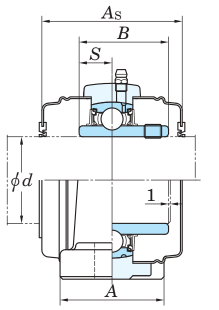
UCP2



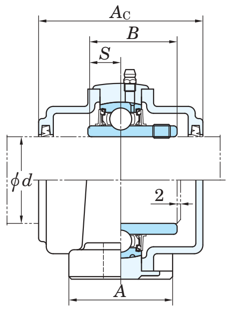
UCPX, 3



With Pressed Steel Covers
(E1)



With Cast Iron Covers
(E3)



Variations of tolerance of distance from mounting bottom to center of spherical bore ($\varDelta_{Hs}$)

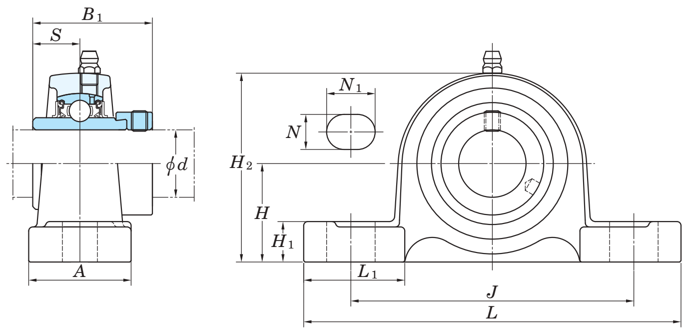
Unit: mm

Housing No.			$\varDelta_{Hs}$
P203~P210	PX05~PX10	P305~P310	±0.15
P211~P218	PX11~PX18	P311~P318	±0.2
	PX20	P319~P328	±0.3

Shaft Dia.		Dimensions											Bolt Size	Standard				Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm	inch	inch mm											inch mm	Unit No.	Housing No.	Bearing No.	Mass	kN		kN		Unit No.		Dimension		Mass	Unit No.		Dimension		Mass
d		H	L	A	J	N	N_1	H_1	H_2	L_1	B	S					kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	mm A_s	inch A_s	kg	Open Ends Type	Closed End Type	mm A_c	inch A_c	kg
75	2 15/16 3	3 15/16 100	14 31/32 380	3 15/16 100	11 13/32 290	1 1/16 27	1 9/16 40	1 3/8 35	7 25/32 198	4 7/32 107	3.228 82	1.260 32	7/8 M22	**UCP315-47** **UCP315** **UCP315-48**	P315	UC315-47 UC315 UC315-48	14.8 14.8 14.8	113	77.2	3.24	13.2	– – –	– – –	– – –	– – –	– – –	– UCP315C –	– UCP315CD –	– 134 –	– 5 9/32 –	– 17.3 –
80	3 1/8	3 1/2 88.9	11 1/2 292	3 1/16 78	9 1/8 232	31/32 25	1 3/8 35	1 3/16 30	6 27/32 174	3 9/32 83	3.252 82.6	1.311 33.3	3/4 M20	**UCP216-50** **UCP216**	P216	UC216-50 UC216	9.0 9.0	72.7	53.0	2.30	14.6	– UCP216C	– UCP216CD	– 109	– 4 9/32	– 9.0	– UCP216FC	– UCP216FCD	– 138	– 5 7/16	– 11.4
	–	4 101.6	15 381	4 102	11 1/8 283	1 1/16 27	2 9/32 58	1 11/32 34	7 11/16 195	4 9/16 116	3.374 85.7	1.343 34.1	7/8 M22	**UCPX16**	PX16	UCX16	15.3	84.0	61.9	2.60	14.5	UCPX16C	UCPX16CD	113	4 7/16	15.3	–	–	–	–	–
	–	4 11/64 106	15 3/4 400	4 11/32 110	11 13/16 300	1 1/16 27	1 9/16 40	1 3/8 35	8 7/32 209	4 23/32 120	3.386 86	1.339 34	7/8 M22	**UCP316**	P316	UC316	18.5	123	86.7	3.53	13.3	–	–	–	–	–	UCP316C	UCP316CD	138	5 7/16	21.4
85	3 1/4	3 3/4 95.2	12 7/32 310	3 9/32 83	9 23/32 247	31/32 25	1 3/8 35	1 1/4 32	7 9/32 185	3 7/16 87	3.374 85.7	1.343 34.1	3/4 M20	**UCP217-52** **UCP217**	P217	UC217-52 UC217	10.8 10.8	84.0	61.9	2.60	14.5	– UCP217C	– UCP217CD	– 113	– 4 7/16	– 10.8	– UCP217FC	– UCP217FCD	– 142	– 5 19/32	– 13.5
	3 7/16	4 101.6	15 381	4 102	11 1/8 283	1 1/16 27	2 3/8 60	1 11/32 34	7 7/8 200	4 9/16 116	3.780 96	1.563 39.7	7/8 M22	**UCPX17** **UCPX17-55**	PX17	UCX17 UCX17-55	16.1 16.1	96.1	71.5	2.91	14.5	UCPX17C –	UCPX17CD –	123 –	4 27/32 –	16.1 –	– –	– –	– –	– –	– –
	–	4 13/32 112	16 17/32 420	4 11/32 110	12 19/32 320	1 5/16 33	1 25/32 45	1 9/16 40	8 21/32 220	4 23/32 120	3.780 96	1.575 40	1 M27	**UCP317**	P317	UC317	20.3	133	96.8	3.82	13.3	–	–	–	–	–	UCP317C	UCP317CD	146	5 3/4	23.6
90	3 1/2	4 101.6	12 7/8 327	3 15/32 88	10 5/16 262	1 1/16 27	1 9/16 40	1 5/16 33	7 25/32 198	3 11/16 94	3.780 96	1.563 39.7	7/8 M22	**UCP218-56** **UCP218**	P218	UC218-56 UC218	13.9 13.9	96.1	71.5	2.91	14.5	– UCP218C	– UCP218CD	– 123	– 4 27/32	– 13.9	– UCP218FC	– UCP218FCD	– 152	– 6	– 17.0
	–	4 101.6	15 381	4 3/8 111	11 1/8 283	1 1/16 27	2 3/8 60	1 1/2 38	8 1/32 204	4 9/16 116	4.094 104	1.689 42.9	7/8 M22	**UCPX18**	PX18	UCX18	19.1	109	81.9	3.23	14.4	–	–	–	–	–	UCPX18C	UCPX18CD	158	6 7/32	22.5
	3 1/2	4 41/64 118	16 15/16 430	4 11/32 110	13 330	1 5/16 33	1 25/32 45	1 9/16 40	9 7/32 234	4 23/32 120	3.780 96	1.575 40	1 M27	**UCP318-56** **UCP318**	P318	UC318-56 UC318	22.8 22.8	143	107	4.11	13.3	– –	– –	– –	– –	– –	– UCP318C	– UCP318CD	– 150	– 5 29/32	– 26.6
95	–	4 59/64 125	18 1/2 470	4 23/32 120	14 3/16 360	1 13/32 36	1 31/32 50	1 13/16 46	9 3/4 248	4 29/32 125	4.055 103	1.614 41	1 1/8 M30	**UCP319**	P319	UC319	29.0	153	119	4.45	13.3	–	–	–	–	–	UCP319C	UCP319CD	162	6 3/8	33.3
100	3 15/16 4	5 127	17 432	4 3/4 121	13 1/4 337	1 5/16 33	2 9/16 65	1 25/32 45	9 21/32 245	4 31/32 126	4.626 117.5	1.937 49.2	1 M27	**UCPX20** **UCPX20-63** **UCPX20-64**	PX20	UCX20 UCX20-63 UCX20-64	30.4 30.4 30.4	133	105	3.91	14.4	– – –	– – –	– – –	– – –	– – –	UCPX20C – –	UCPX20CD – –	186 – –	7 5/16 – –	34.9 – –
	3 15/16 4	5 33/64 140	19 9/32 490	4 23/32 120	14 31/32 380	1 13/32 36	1 31/32 50	1 13/16 46	10 3/4 273	5 1/2 140	4.252 108	1.654 42	1 1/8 M30	**UCP320** **UCP320-63** **UCP320-64**	P320	UC320 UC320-63 UC320-64	35.1 35.1 35.1	173	141	5.08	13.2	– – –	– – –	– – –	– – –	– – –	UCP320C – –	UCP320CD – –	174 – –	6 27/32 – –	40.7 – –
105	–	5 33/64 140	19 9/32 490	4 23/32 120	14 31/32 380	1 13/32 36	1 31/32 50	1 13/16 46	10 15/16 278	5 1/2 140	4.409 112	1.732 44	1 1/8 M30	**UCP321**	P321	UC321	37.6	184	153	5.41	13.2	–	–	–	–	–	UCP321C	UCP321CD	178	7	43.6
110	–	5 29/32 150	20 15/32 520	5 1/2 140	15 3/4 400	1 9/16 40	2 5/32 55	1 31/32 50	11 21/32 296	5 29/32 150	4.606 117	1.811 46	1 1/4 M33	**UCP322**	P322	UC322	44.0	205	180	6.15	13.2	–	–	–	–	–	UCP322C	UCP322CD	188	7 13/32	50.8
120	–	6 19/64 160	22 7/16 570	5 1/2 140	17 23/32 450	1 9/16 40	2 5/32 55	1 31/32 50	12 7/16 316	6 5/16 160	4.961 126	2.008 51	1 1/4 M33	**UCP324**	P324	UC324	55.4	207	185	6.10	13.5	–	–	–	–	–	UCP324C	UCP324CD	196	7 23/32	64.9
130	–	7 3/32 180	23 5/8 600	5 1/2 140	18 29/32 480	1 9/16 40	2 5/32 55	1 31/32 50	13 21/32 355	7 11/16 195	5.315 135	2.126 54	1 1/4 M33	**UCP326**	P326	UC326	72.1	229	214	6.79	13.6	–	–	–	–	–	UCP326C	UCP326CD	214	8 7/16	84.2
140	–	7 7/8 200	24 13/32 620	5 1/2 140	19 11/16 500	1 9/16 40	2 5/32 55	2 3/8 60	15 15/32 393	7 9/32 185	5.709 145	2.323 59	1 1/4 M33	**UCP328**	P328	UC328	92.5	253	246	7.54	13.6	–	–	–	–	–	UCP328C	UCP328CD	222	8 3/4	108

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10~X20, 309~328
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCP206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Representative examples of the forms of housing are indicated.
6. Housings of spheroidal graphite iron casting are also available.

NAP
Cylindrical bore
(with eccentric locking collar)
d 12 ~ 75 mm



Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs})

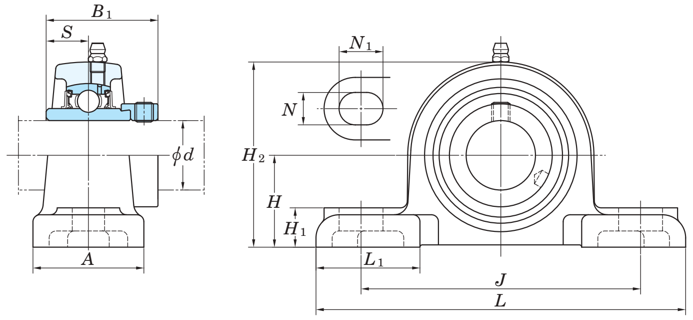
Unit: mm

Housing No.	Δ_{Hs}
P203~P210	±0.15
P211~P215	±0.2

Shaft Dia.		Dimensions											Bolt Size	Unit No.	Housing No.	Bearing No.	Basic Load Ratings		Fatigue Load Limit	Factor	Mass
mm	inch	inch mm											inch mm				kN		kN		
d		*H*	*L*	*A*	*J*	*N*	N_1	H_1	H_2	L_1	B_1	*S*					C_r	C_{0r}	C_u	f_0	kg
12		1 3/16 30.2	5 127	1 1/2 38	3 3/4 95	1/2 13	23/32 18	5/8 16	2 3/8 60	1 13/32 36	1.720 43.7	0.673 17.1	3/8 M10	**NAP201**	P203	NA201	12.8	6.65	0.302	13.2	0.71
	1/2													**NAP201-8**		NA201-8					
15														**NAP202**		NA202					0.69
	5/8													**NAP202-10**		NA202-10					
17														**NAP203**		NA203					0.66
	3/4	1 5/16 33.3	5 127	1 1/2 38	3 3/4 95	1/2 13	23/32 18	5/8 16	2 9/16 65	1 13/32 36	1.720 43.7	0.673 17.1	3/8 M10	**NAP204-12**	P204	NA204-12	12.8	6.65	0.302	13.2	0.73
20														**NAP204**		NA204					
	7/8	1 7/16 36.5	5 1/2 140	1 1/2 38	4 1/8 105	1/2 13	23/32 18	5/8 16	2 3/4 70	1 1/2 38	1.748 44.4	0.689 17.5	3/8 M10	**NAP205-14**	P205	NA205-14	14.0	7.85	0.357	13.9	0.87
	15/16													**NAP205-15**		NA205-15					
25														**NAP205**		NA205					
	1													**NAP205-16**		NA205-16					
	1 1/8	1 11/16 42.9	6 1/2 165	1 7/8 48	4 3/4 121	21/32 17	13/16 21	21/32 17	3 5/16 84	1 7/8 48	1.906 48.4	0.720 18.3	1/2 M14	**NAP206-18**	P206	NA206-18	19.5	11.3	0.514	13.9	1.4
30														**NAP206**		NA206					
	1 3/16													**NAP206-19**		NA206-19					
	1 1/4													**NAP206-20**		NA206-20					
	1 1/4	1 7/8 47.6	6 9/16 167	1 7/8 48	5 127	21/32 17	13/16 21	23/32 18	3 3/4 95	1 27/32 47	2.012 51.1	0.740 18.8	1/2 M14	**NAP207-20**	P207	NA207-20	25.7	15.4	0.700	13.9	1.8
	1 5/16													**NAP207-21**		NA207-21					
	1 3/8													**NAP207-22**		NA207-22					
35														**NAP207**		NA207					
	1 7/16													**NAP207-23**		NA207-23					
	1 1/2	1 15/16 49.2	7 1/4 184	2 1/8 54	5 13/32 137	21/32 17	13/16 21	23/32 18	3 27/32 98	2 3/32 53	2.217 56.3	0.843 21.4	1/2 M14	**NAP208-24**	P208	NA208-24	29.1	17.8	0.809	14.0	2.1
	1 9/16													**NAP208-25**		NA208-25					
40														**NAP208**		NA208					
	1 5/8	2 1/8 54	7 15/32 190	2 1/8 54	5 3/4 146	21/32 17	13/16 21	25/32 20	4 3/16 106	2 5/32 55	2.217 56.3	0.843 21.4	1/2 M14	**NAP209-26**	P209	NA209-26	34.1	21.3	0.968	14.0	2.4
	1 11/16													**NAP209-27**		NA209-27					
	1 3/4													**NAP209-28**		NA209-28					
45														**NAP209**		NA209					
	1 7/8	2 1/4 57.2	8 1/8 206	2 3/8 60	6 1/4 159	25/32 20	7/8 22	13/16 21	4 7/16 113	2 3/8 60	2.469 62.7	0.969 24.6	5/8 M16	**NAP210-30**	P210	NA210-30	35.1	23.3	1.06	14.4	3.1
	1 15/16													**NAP210-31**		NA210-31					
50														**NAP210**		NA210					
	2													**NAP210-32**		NA210-32					
	2	2 1/2 63.5	8 5/8 219	2 3/8 60	6 23/32 171	25/32 20	7/8 22	29/32 23	4 29/32 125	2 9/16 65	2.811 71.4	1.094 27.8	5/8 M16	**NAP211-32**	P211	NA211-32	43.4	29.4	1.34	14.4	3.9
	2 1/8													**NAP211-34**		NA211-34					
55														**NAP211**		NA211					
	2 3/16													**NAP211-35**		NA211-35					
	2 1/4	2 3/4 69.8	9 1/2 241	2 3/4 70	7 1/4 184	25/32 20	31/32 25	31/32 25	5 7/16 138	2 7/8 73	3.063 77.8	1.220 31	5/8 M16	**NAP212-36**	P212	NA212-36	52.4	36.2	1.65	14.4	5.2
60														**NAP212**		NA212					
	2 3/8													**NAP212-38**		NA212-38					
	2 7/16													**NAP212-39**		NA212-39					
	2 1/2	3 76.2	10 7/16 265	2 3/4 70	8 203	31/32 25	1 3/16 30	1 1/16 27	5 29/32 150	3 1/16 78	3.374 85.7	1.343 34.1	3/4 M20	**NAP213-40**	P213	NA213-40	57.2	40.1	1.82	14.4	6.5
65														**NAP213**		NA213					
	2 3/4	3 1/8 79.4	10 15/32 266	2 27/32 72	8 9/32 210	31/32 25	1 3/16 30	1 1/16 27	6 3/16 157	2 15/16 75	3.374 85.7	1.343 34.1	3/4 M20	**NAP214-44**	P214	NA214-44	62.2	44.1	2.01	14.5	7.7
70														**NAP214**		NA214					
	2 15/16	3 1/4 82.6	10 13/16 275	2 29/32 74	8 17/32 217	31/32 25	1 3/16 30	1 3/32 28	6 3/8 162	3 1/16 78	3.626 92.1	1.469 37.3	3/4 M20	**NAP215-47**	P215	NA215-47	67.4	48.3	2.17	14.5	7.9
75														**NAP215**		NA215					

Remarks 1. In Part No. of unit, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210
A-R1/8 .... 211~215
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : NAP206JL3, NA206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Representative examples of the forms of housing are indicated.
6. Housings of spheroidal graphite iron casting are also available.

NAPK
Cylindrical bore
(with eccentric locking collar)
d 12 ~ 75 mm



Variations of tolerance of distance from mounting bottom to center of spherical bore ($\varDelta_{Hs}$)

Unit: mm

Housing No.	$\varDelta_{Hs}$
PK204~PK210	±0.15
PK211~PK215	±0.2

Shaft Dia mm	inch	Dimensions inch mm											Bolt Size inch	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		H	L	A	J	N	N_1	H_1	H_2	L_1	B_1	S					C_r	C_{0r}	C_u	f_0	kg
12		1 1/4 31.8	5 1/4 133	1 5/8 41	3 27/32 98	7/16 11	9/16 14	9/16 14	2 15/32 63	1 25/32 45	1.72 43.7	0.673 17.1	3/8	**NAPK201**	PK204	NA201	12.8	6.65	0.302	13.2	0.82
	1/2													**NAPK201-8**		NA201-8					
15														**NAPK202**		NA202					
	5/8													**NAPK202-10**		NA202-10					
17														**NAPK203**		NA203					
	3/4													**NAPK204-12**		NA204-12					
20														**NAPK204**		NA204					
	7/8	1 5/16 33.3	5 1/2 140	1 23/32 44	4 1/8 105	7/16 11	9/16 14	5/8 16	2 11/16 68	1 25/32 45	1.748 44.4	0.689 17.5	3/8	**NAPK205-14**	PK205	NA205-14	14.0	7.85	0.357	13.9	1
	15/16													**NAPK205-15**		NA205-15					
25														**NAPK205**		NA205					
	1													**NAPK205-16**		NA205-16					
	1 1/8	1 9/16 39.7	6 5/16 160	1 7/8 48	4 3/4 121	9/16 14	3/4 19	21/32 17	3 5/32 80	1 25/32 45	1.906 48.4	0.72 18.3	1/2	**NAPK206-18**	PK206	NA206-18	19.5	11.3	0.514	13.9	1.4
30														**NAPK206**		NA206					
	1 3/16													**NAPK206-19**		NA206-19					
	1 1/4													**NAPK206-20**		NA206-20					
	1 1/4	1 13/16 46	6 9/16 167	1 7/8 48	5 127	9/16 14	3/4 19	3/4 19	3 5/8 92	1 25/32 45	2.012 51.1	0.74 18.8	1/2	**NAPK207-20**	PK207	NA207-20	25.7	15.4	0.700	13.9	2
	1 5/16													**NAPK207-21**		NA207-21					
	1 3/8													**NAPK207-22**		NA207-22					
35														**NAPK207**		NA207					
	1 7/16													**NAPK207-23**		NA207-23					
	1 1/2	1 15/16 49.2	7 1/8 181	2 1/8 54	5 3/8 136.5	9/16 14	1 1/32 26.3	3/4 19	3 15/16 100	1 31/32 50	2.217 56.3	0.843 21.4	1/2	**NAPK208-24**	PK208	NA208-24	29.1	17.8	0.809	14.0	2.5
	1 9/16													**NAPK208-25**		NA208-25					
40														**NAPK208**		NA208					
	1 5/8	2 1/16 52.4	7 15/32 190	2 1/8 54	5 7/8 149.2	9/16 14	1 1/8 28.6	25/32 20	4 3/16 106	2 1/16 52	2.217 56.3	0.843 21.4	1/2	**NAPK209-26**	PK209	NA209-26	34.1	21.3	0.968	14.0	2.7
	1 11/16													**NAPK209-27**		NA209-27					
	1 3/4													**NAPK209-28**		NA209-28					
45														**NAPK209**		NA209					
	1 7/8	2 3/16 55.6	8 203	2 1/4 57	6 1/4 159	9/16 14	3/4 19	7/8 22	4 13/32 112	25/32 55	2.469 62.7	0.969 24.6	1/2	**NAPK210-30**	PK210	NA210-30	35.1	23.3	1.06	14.4	3.2
	1 15/16													**NAPK210-31**		NA210-31					
50														**NAPK210**		NA210					
	2													**NAPK210-32**		NA210-32					
	2	2 7/16 61.9	9 1/8 232	2 3/8 60	7 1/8 181	23/32 18	15/16 24	31/32 25	4 7/8 124	2 19/32 66	2.811 71.4	1.094 27.8	5/8	**NAPK211-32**	PK211	NA211-32	43.4	29.4	1.34	14.4	4.6
	2 1/8													**NAPK211-34**		NA211-34					
55														**NAPK211**		NA211					
	2 3/16													**NAPK211-35**		NA211-35					
	2 1/4	2 11/16 68.3	9 1/2 241	2 17/32 64	7 17/32 191	23/32 18	15/16 24	13/32 28	5 11/32 136	2 9/16 65	3.063 77.8	1.22 31	5/8	**NAPK212-36**	PK212	NA212-36	52.4	36.2	1.65	14.4	5.2
60														**NAPK212**		NA212					
	2 3/8													**NAPK212-38**		NA212-38					
	2 7/16													**NAPK212-39**		NA212-39					
	2 15/16	3 5/16 84.1	11 31/32 304	3 7/32 82	9 1/2 241	7/8 22	1/4 32	1 1/2 38	6 1/2 165	3 7/16 87	3.626 92.1	1.469 37.3	3/4	**NAPK215-47**	PK215	NA215-47	67.4	48.3	2.17	14.5	9.6
75														**NAPK215**		NA215					

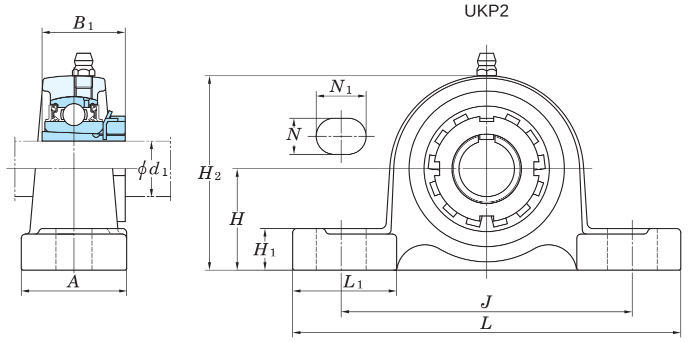
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210
A-R1/8 .... 211~215
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
4. Representative examples of the forms of housing are indicated.
5. Housings of spheroidal graphite iron casting are also available.

UKP

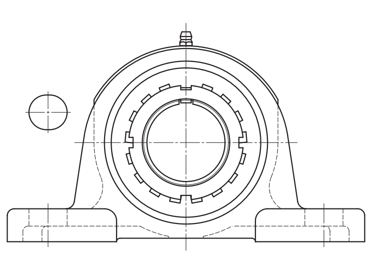
Tapered bore (with adapter)

d_1 20 ~ (50) mm

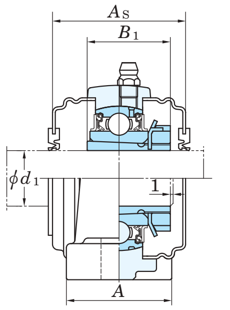
UKP2



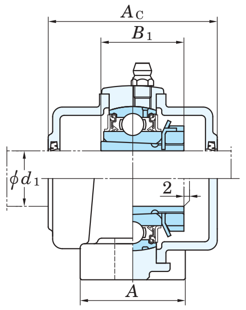
UKPX, 3



With Pressed Steel Covers (E1)



With Cast Iron Covers (E3)

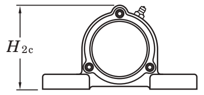


Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs})

Unit: mm

Housing No.			Δ_{Hs}
P205~P210	PX05~PX10	P305~P310	±0.15
P211~P218	PX11~PX18	P311~P318	±0.2
	PX20	P319~P328	±0.3

Forms and dimensions of H_{2c} of P205JE3 (housing with cast iron covers) are shown below.



P205JE3 $H_{2c} = 77$ mm

Position of grease nipple is different from standard only for P205JE3.

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm										Bolt Size inch mm	Standard Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers Unit No. Open Ends Type	 Closed End Type	Dimension mm	 inch	Mass kg	With Cast Iron Covers Unit No. Open Ends Type	 Closed End Type	Dimension mm	 inch	Mass kg
d_1		H	L	A	J	N	N_1	H_1	H_2	L_1	B_1							C_r	C_{0r}	C_u	f_0			A_s					A_c		
20	3/4	1 7/16 36.5	5 1/2 140	1 1/2 38	4 1/8 105	1/2 13	23/32 18	5/8 16	2 3/4 70	1 1/2 38	1 3/8 35	3/8 M10	UKP205	P205	UK205	HE2305X H2305X	0.84 0.84	14.0	7.85	0.357	13.9	– UKP205C	– UKP205CD	– 49	– 1 15/16	– 0.84	– UKP205FC	– UKP205FCD	– 66	– 2 19/32	– 1.3
	3/4	1 3/4 44.4	6 1/4 159	2 51	4 11/16 119	21/32 17	31/32 25	5/8 16	3 3/8 86	1 27/32 47	1 3/8 35	1/2 M14	UKPX05	PX05	UKX05	HE2305X H2305X	1.5 1.5	19.5	11.3	0.514	13.9	– UKPX05C	– UKPX05CD	– 53	– 2 3/32	– 1.5	– –	– –	– –	– –	– –
	3/4	1 49/64 45	6 7/8 175	1 3/4 45	5 3/16 132	21/32 17	25/32 20	5/8 16	3 11/32 85	2 5/32 55	1 3/8 35	1/2 M14	UKP305	P305	UK305	HE2305X H2305X	1.7 1.7	21.2	10.9	0.495	12.6	– –	– –	– –	– –	– –	– UKP305C	– UKP305CD	– 76	– 3	– 2.3
25	1	1 11/16 42.9	6 1/2 165	1 7/8 48	4 3/4 121	21/32 17	13/16 21	21/32 17	3 5/16 84	1 7/8 48	1 1/2 38	1/2 M14	UKP206	P206	UK206	H2306X HE2306X	1.4 1.4	19.5	11.3	0.514	13.9	UKP206C –	UKP206CD –	53 –	2 3/32 –	1.4 –	UKP206FC –	UKP206FCD –	70 –	2 3/4 –	1.9 –
	1	1 7/8 47.6	6 7/8 175	2 1/4 57	5 127	21/32 17	31/32 25	21/32 17	3 21/32 93	2 5/32 55	1 1/2 38	1/2 M14	UKPX06	PX06	UKX06	H2306X HE2306X	2.1 2.1	25.7	15.4	0.700	13.9	UKPX06C –	UKPX06CD –	60 –	2 3/8 –	2.1 –	– –	– –	– –	– –	– –
	1	1 31/32 50	7 3/32 180	1 31/32 50	5 1/2 140	21/32 17	25/32 20	21/32 17	3 3/4 95	2 3/32 53	1 1/2 38	1/2 M14	UKP306	P306	UK306	H2306X HE2306X	2.3 2.3	26.7	15.0	0.682	13.3	– –	– –	– –	– –	– –	UKP306C –	UKP306CD –	82 –	3 7/32 –	2.9 –
30	1 1/8	1 7/8 47.6	6 9/16 167	1 7/8 48	5 127	21/32 17	13/16 21	23/32 18	3 3/4 95	1 27/32 47	1 11/16 43	1/2 M14	UKP207	P207	UK207	HS2307X H2307X	1.7 1.7	25.7	15.4	0.700	13.9	– UKP207C	– UKP207CD	– 60	– 2 3/8	– 1.7	– UKP207FC	– UKP207FCD	– 78	– 3 1/16	– 2.5
	1 1/8	2 1/8 54	8 203	2 1/4 57	5 21/32 144	21/32 17	1 3/16 30	3/4 19	4 1/8 105	2 17/32 64	1 11/16 43	1/2 M14	UKPX07	PX07	UKX07	HS2307X H2307X	2.7 2.7	29.1	17.8	0.809	14.0	– UKPX07C	– UKPX07CD	– 69	– 2 23/32	– 2.7	– –	– –	– –	– –	– –
	1 1/8	2 13/64 56	8 9/32 210	2 7/32 56	6 5/16 160	21/32 17	31/32 25	3/4 19	4 7/32 107	2 9/16 65	1 11/16 43	1/2 M14	UKP307	P307	UK307	HS2307X H2307X	3.0 3.0	33.4	19.3	0.877	13.2	– –	– –	– –	– –	– –	– UKP307C	– UKP307CD	– 88	– 3 15/32	– 3.9
35	1 1/4 1 3/8	1 15/16 49.2	7 1/4 184	2 1/8 54	5 13/32 137	21/32 17	13/16 21	23/32 18	3 27/32 98	2 3/32 53	1 13/16 46	1/2 M14	UKP208	P208	UK208	HE2308X HS2308X H2308X	2.0 2.0 2.0	29.1	17.8	0.809	14.0	– – UKP208C	– – UKP208CD	– – 69	– – 2 23/32	– – 2.0	– – UKP208FC	– – UKP208FCD	– – 86	– – 3 3/8	– – 2.9
	1 1/4 1 3/8	2 5/16 58.7	8 3/4 222	2 5/8 67	6 5/32 156	25/32 20	1 1/4 32	13/16 21	4 1/2 114	2 25/32 71	1 13/16 46	5/8 M16	UKPX08	PX08	UKX08	HE2308X HS2308X H2308X	3.5 3.5 3.5	34.1	21.3	0.968	14.0	– – UKPX08C	– – UKPX08CD	– – 69	– – 2 23/32	– – 3.5	– – –	– – –	– – –	– – –	– – –
	1 1/4 1 3/8	2 23/64 60	8 21/32 220	2 3/8 60	6 11/16 170	21/32 17	1 1/16 27	3/4 19	4 21/32 118	2 9/16 65	1 13/16 46	1/2 M14	UKP308	P308	UK308	HE2308X HS2308X H2308X	3.8 3.8 3.8	40.7	24.0	1.09	13.2	– – –	– – –	– – –	– – –	– – –	– – UKP308C	– – UKP308CD	– – 96	– – 3 25/32	– – 5.2
40	1 1/2	2 1/8 54	7 15/32 190	2 1/8 54	5 3/4 146	21/32 17	13/16 21	25/32 20	4 3/16 106	2 5/32 55	1 31/32 50	1/2 M14	UKP209	P209	UK209	HE2309X H2309X	2.3 2.3	34.1	21.3	0.968	14.0	– UKP209C	– UKP209CD	– 69	– 2 23/32	– 2.3	– UKP209FC	– UKP209FCD	– 88	– 3 15/32	– 3.2
	1 1/2	2 5/16 58.7	8 3/4 222	2 5/8 67	6 5/32 156	25/32 20	1 5/16 33	13/16 21	4 9/16 116	2 25/32 71	1 31/32 50	5/8 M16	UKPX09	PX09	UKX09	HE2309X H2309X	3.7 3.7	35.1	23.3	1.06	14.4	– UKPX09C	– UKPX09CD	– 74	– 2 29/32	– 3.7	– –	– –	– –	– –	– –
	1 1/2	2 41/64 67	9 21/32 245	2 5/8 67	7 15/32 190	25/32 20	1 3/16 30	13/16 21	5 3/16 132	2 15/16 75	1 31/32 50	5/8 M16	UKP309	P309	UK309	HE2309X H2309X	5.0 5.0	48.9	29.5	1.34	13.3	– –	– –	– –	– –	– –	– UKP309C	– UKP309CD	– 102	– 4 1/32	– 6.3
45	1 3/4	2 1/4 57.2	8 1/8 206	2 3/8 60	6 1/4 159	25/32 20	7/8 22	13/16 21	4 7/16 113	2 3/8 60	2 5/32 55	5/8 M16	UKP210	P210	UK210	HE2310X H2310X	3.0 3.0	35.1	23.3	1.06	14.4	– UKP210C	– UKP210CD	– 74	– 2 29/32	– 3.0	– UKP210FC	– UKP210FCD	– 97	– 3 13/16	– 4.1
	1 3/4	2 1/2 63.5	9 1/2 241	2 7/8 73	6 23/32 171	25/32 20	1 13/32 36	7/8 22	4 31/32 126	3 76	2 5/32 55	5/8 M16	UKPX10	PX10	UKX10	HE2310X H2310X	4.6 4.6	43.4	29.4	1.34	14.4	– UKPX10C	– UKPX10CD	– 76	– 3	– 4.6	– –	– –	– –	– –	– –
	1 3/4	2 61/64 75	10 13/16 275	2 15/16 75	8 11/32 212	25/32 20	1 3/8 35	15/16 24	5 13/16 148	3 15/32 88	2 5/32 55	5/8 M16	UKP310	P310	UK310	HE2310X H2310X	6.7 6.7	62.0	38.3	1.74	13.2	– –	– –	– –	– –	– –	– UKP310C	– UKP310CD	– 110	– 4 11/32	– 8.4
50	1 7/8 2	2 1/2 63.5	8 5/8 219	2 3/8 60	6 23/32 171	25/32 20	7/8 22	29/32 23	4 29/32 125	2 9/16 65	2 5/16 59	5/8 M16	UKP211	P211	UK211	HS2311X H2311X HE2311X	3.7 3.7 3.7	43.4	29.4	1.34	14.4	– UKP211C –	– UKP211CD –	– 76 –	– 3 –	– 3.7 –	– UKP211FC –	– UKP211FCD –	– 99 –	– 3 29/32 –	– 5.0 –
	1 7/8 2	2 3/4 69.8	10 1/4 260	3 1/8 79	7 1/4 184	31/32 25	1 13/32 36	1 3/32 28	5 15/32 139	3 9/32 83	2 5/16 59	3/4 M20	UKPX11	PX11	UKX11	HS2311X H2311X HE2311X	6.2 6.2 6.2	52.4	36.2	1.65	14.4	– UKPX11C –	– UKPX11CD –	– 89 –	– 3 1/2 –	– 6.2 –	– – –	– – –	– – –	– – –	– – –

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.

A-1/4-28UNF .... 205~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10~X20, 309~328

3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables. (Example of Part No. : UKP206J + H2306X, UK206 + H2306X)

4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing.

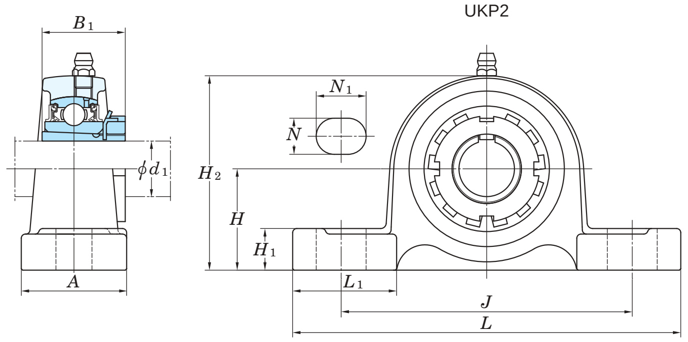
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.

6. Representative examples of the forms of housing are indicated.

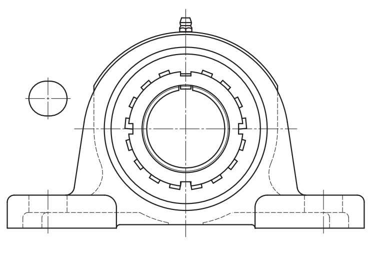
7. Housings of spheroidal graphite iron casting are also available.

UKP
Tapered bore (with adapter)
d_1 (50) ~ (90) mm

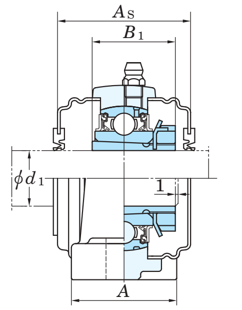
UKP2



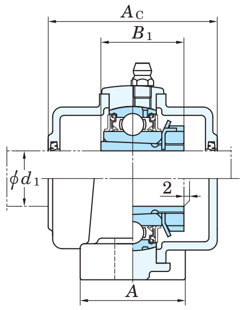
UKPX, 3



With Pressed Steel Covers (E1)



With Cast Iron Covers (E3)



Variations of tolerance of distance from mounting bottom to center of spherical bore ($\varDelta_{Hs}$)

Unit: mm

Housing No.			$\varDelta_{Hs}$
P205~P210	PX05~PX10	P305~P310	±0.15
P211~P218	PX11~PX18	P311~P318	±0.2
	PX20	P319~P328	±0.3

Shaft Dia.		Dimensions										Bolt Size	Standard					Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm	inch	inch mm										inch mm	Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass	kN		kN		Unit No.		Dimension mm	inch	Mass	Unit No.		Dimension mm	inch	Mass
d_1		H	L	A	J	N	N_1	H_1	H_2	L_1	B_1						kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	A_s		kg	Open Ends Type	Closed End Type	A_c		kg
50	1 7/8 2	3 5/32 80	12 7/32 310	3 5/32 80	9 9/32 236	25/32 20	1 1/2 38	1 1/16 27	6 7/32 158	3 17/32 90	2 5/16 59	5/8 M16	UKP311	P311	UK311	HS2311X H2311X HE2311X	8.1 8.1 8.1	71.6	45.0	2.05	13.2	– – –	– – –	– – –	– – –	– – –	– UKP311C –	– UKP311CD –	– 114 –	– 4 1/2 –	– 10.0 –
55	2 1/8	2 3/4 69.8	9 1/2 241	2 3/4 70	7 1/4 184	25/32 20	31/32 25	31/32 25	5 7/16 138	2 7/8 73	2 7/16 62	5/8 M16	UKP212	P212	UK212	HS2312X H2312X	4.8 4.8	52.4	36.2	1.65	14.4	– UKP212C	– UKP212CD	– 89	– 3 1/2	– 4.8	– UKP212FC	– UKP212FCD	– 114	– 4 1/2	– 6.3
	2 1/8	3 76.2	11 1/4 286	3 1/4 83	8 203	31/32 25	1 9/16 40	1 3/32 28	5 31/32 152	3 15/32 88	2 7/16 62	3/4 M20	UKPX12	PX12	UKX12	HS2312X H2312X	7.5 7.5	57.2	40.1	1.82	14.4	– UKPX12C	– UKPX12CD	– 89	– 3 1/2	– 7.5	– –	– –	– –	– –	– –
	2 1/8	3 11/32 85	13 330	3 11/32 85	9 27/32 250	31/32 25	1 1/2 38	1 5/32 29	6 9/16 167	4 1/16 103	2 7/16 62	3/4 M20	UKP312	P312	UK312	HS2312X H2312X	9.4 9.4	81.9	52.2	2.37	13.2	– –	– –	– –	– –	– –	– UKP312C	– UKP312CD	– 124	– 4 7/8	– 11.8
60	2 1/4 2 3/8	3 76.2	10 7/16 265	2 3/4 70	8 203	31/32 25	1 3/16 30	1 1/16 27	5 29/32 150	3 1/16 78	2 9/16 65	3/4 M20	UKP213	P213	UK213	HE2313X H2313X HS2313X	5.8 5.8 5.8	57.2	40.1	1.82	14.4	– UKP213C –	– UKP213CD –	– 89 –	– 3 1/2 –	– 5.8 –	– UKP213FC –	– UKP213FCD –	– 114 –	– 4 1/2 –	– 7.5 –
	2 1/4 2 3/8	3 76.2	11 1/4 286	3 1/4 83	8 203	31/32 25	1 9/16 40	1 3/32 28	6 3/32 155	3 15/32 88	2 9/16 65	3/4 M20	UKPX13	PX13	UKX13	HE2313X H2313X HS2313X	7.8 7.8 7.8	62.2	44.1	2.01	14.5	– UKPX13C –	– UKPX13CD –	– 99 –	– 3 29/32 –	– 7.8 –	– – –	– – –	– – –	– – –	– – –
	2 1/4 2 3/8	3 35/64 90	13 3/8 340	3 17/32 90	10 1/4 260	31/32 25	1 1/2 38	1 1/4 32	6 15/16 176	4 11/32 110	2 9/16 65	3/4 M20	UKP313	P313	UK313	HE2313X H2313X HS2313X	10.8 10.8 10.8	92.7	59.9	2.68	13.2	– – –	– – –	– – –	– – –	– – –	– UKP313C –	– UKP313CD –	– 122 –	– 4 13/16 –	– 13.2 –
65	2 1/2	3 1/4 82.6	10 13/16 275	2 29/32 74	8 17/32 217	31/32 25	1 3/16 30	1 3/32 28	6 3/8 162	3 1/16 78	2 7/8 73	3/4 M20	UKP215	P215	UK215	HE2315X H2315X	7.5 7.5	67.4	48.3	2.17	14.5	– UKP215C	– UKP215CD	– 99	– 3 29/32	– 7.5	– UKP215FC	– UKP215FCD	– 124	– 4 7/8	– 9.5
	2 1/2	3 1/2 88.9	13 330	3 1/2 89	9 229	1 1/16 27	1 31/32 50	1 1/4 32	6 7/8 175	3 29/32 99	2 7/8 73	7/8 M22	UKPX15	PX15	UKX15	HE2315X H2315X	10.5 10.5	72.7	53.0	2.30	14.6	– UKPX15C	– UKPX15CD	– 109	– 4 9/32	– 10.5	– –	– –	– –	– –	– –
	2 1/2	3 15/16 100	14 31/32 380	3 15/16 100	11 13/32 290	1 1/16 27	1 9/16 40	1 3/8 35	7 25/32 198	4 7/32 107	2 7/8 73	7/8 M22	UKP315	P315	UK315	HE2315X H2315X	14.9 14.9	113	77.2	3.24	13.2	– –	– –	– –	– –	– –	– UKP315C	– UKP315CD	– 134	– 5 9/32	– 17.7
70	2 3/4	3 1/2 88.9	11 1/2 292	3 1/16 78	9 1/8 232	31/32 25	1 3/8 35	1 3/16 30	6 27/32 174	3 9/32 83	3 1/16 78	3/4 M20	UKP216	P216	UK216	HE2316X H2316X	9.2 9.2	72.7	53.0	2.30	14.6	– UKP216C	– UKP216CD	– 109	– 4 9/32	– 9.2	– UKP216FC	– UKP216FCD	– 138	– 5 7/16	– 11.7
	2 3/4	4 101.6	15 381	4 102	11 1/8 283	1 1/16 27	2 9/32 58	1 11/32 34	7 11/16 195	4 9/16 116	3 1/16 78	7/8 M22	UKPX16	PX16	UKX16	HE2316X H2316X	15.4 15.4	84.0	61.9	2.60	14.5	– UKPX16C	– UKPX16CD	– 113	– 4 7/16	– 15.4	– –	– –	– –	– –	– –
	2 3/4	4 11/64 106	15 3/4 400	4 11/32 110	11 13/16 300	1 1/16 27	1 9/16 40	1 3/8 35	8 7/32 209	4 23/32 120	3 1/16 78	7/8 M22	UKP316	P316	UK316	HE2316X H2316X	18.6 18.6	123	86.7	3.53	13.3	– –	– –	– –	– –	– –	– UKP316C	– UKP316CD	– 138	– 5 7/16	– 21.7
75	3	3 3/4 95.2	12 7/32 310	3 9/32 83	9 23/32 247	31/32 25	1 3/8 35	1 1/4 32	7 9/32 185	3 7/16 87	3 7/32 82	3/4 M20	UKP217	P217	UK217	H2317X HE2317X	11.0 11.0	84.0	61.9	2.60	14.5	UKP217C –	UKP217CD –	113 –	4 7/16 –	11.0 –	UKP217FC –	UKP217FCD –	142 –	5 19/32 –	13.8 –
	3	4 101.6	15 381	4 102	11 1/8 283	1 1/16 27	2 3/8 60	1 11/32 34	7 7/8 200	4 9/16 116	3 7/32 82	7/8 M22	UKPX17	PX17	UKX17	H2317X HE2317X	15.8 15.8	96.1	71.5	2.91	14.5	UKPX17C –	UKPX17CD –	123 –	4 27/32 –	15.8 –	– –	– –	– –	– –	– –
	3	4 13/32 112	16 17/32 420	4 11/32 110	12 19/32 320	1 5/16 33	1 25/32 45	1 9/16 40	8 21/32 220	4 23/32 120	3 7/32 82	1 M27	UKP317	P317	UK317	H2317X HE2317X	20.2 20.2	133	96.8	3.82	13.3	– –	– –	– –	– –	– –	UKP317C –	UKP317CD –	146 –	5 3/4 –	23.7 –
80	–	4 101.6	12 7/8 327	3 15/32 88	10 5/16 262	1 1/16 27	1 9/16 40	1 5/16 33	7 25/32 198	3 11/16 94	3 3/8 86	7/8 M22	UKP218	P218	UK218	H2318X	13.8	96.1	71.5	2.91	14.5	UKP218C	UKP218CD	123	4 27/32	13.8	UKP218FC	UKP218FCD	152	6	18.8
	–	4 101.6	15 381	4 3/8 111	11 1/8 283	1 1/16 27	2 3/8 60	1 1/2 38	8 1/32 204	4 9/16 116	3 3/8 86	7/8 M22	UKPX18	PX18	UKX18	H2318X	18.6	109	81.9	3.23	14.4	–	–	–	–	–	UKPX18C	UKPX18CD	158	6 7/32	22.4
	–	4 41/64 118	16 15/16 430	4 11/32 110	13 330	1 5/16 33	1 25/32 45	1 9/16 40	9 7/32 234	4 23/32 120	3 3/8 86	1 M27	UKP318	P318	UK318	H2318X	22.8	143	107	4.11	13.3	–	–	–	–	–	UKP318C	UKP318CD	150	5 29/32	27.0
85	3 1/4	4 59/64 125	18 1/2 470	4 23/32 120	14 3/16 360	1 13/32 36	1 31/32 50	1 13/16 46	9 3/4 248	4 29/32 125	3 17/32 90	1 1/8 M30	UKP319	P319	UK319	HE2319X H2319X	29.3 29.3	153	119	4.45	13.3	– –	– –	– –	– –	– –	– UKP319C	– UKP319CD	– 162	– 6 3/8	– 34.0
90	3 1/2	5 127	17 432	4 3/4 121	13 1/4 337	1 5/16 33	2 9/16 65	1 25/32 45	9 21/32 245	4 31/32 126	3 13/16 97	1 M27	UKPX20	PX20	UKX20	HE2320X H2320X	29.3 29.3	133	105	3.91	14.4	– –	– –	– –	– –	– –	– UKPX20C	– UKPX20CD	– 186	– 7 5/16	– 34.3

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 205~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10~X20, 309~328

3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
(Example of Part No. : UKP206J + H2306X, UK206 + H2306X)

4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing.

5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.

6. Representative examples of the forms of housing are indicated.

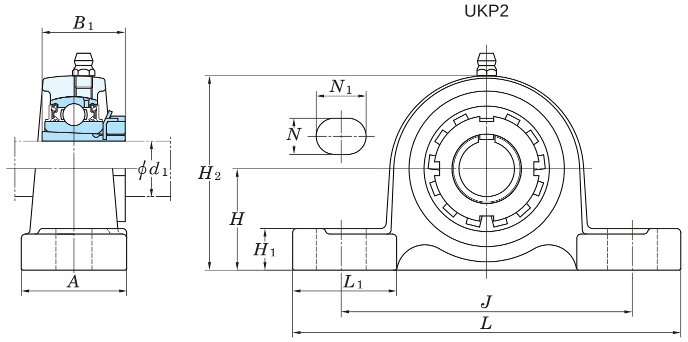
7. Housings of spheroidal graphite iron casting are also available.

UKP

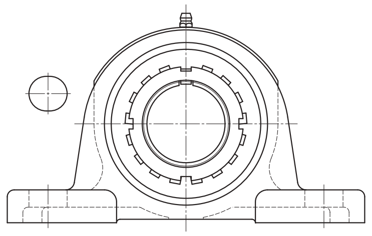
Tapered bore (with adapter)

d_1 (90) ~ 125 mm

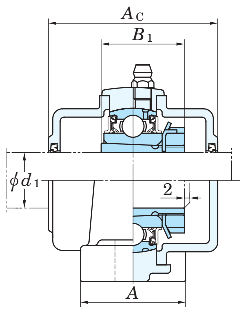
UKP2



UKPX, 3



With Cast Iron Covers
(E3)



Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs})

Unit: mm

Housing No.			Δ_{Hs}
P205~P210	PX05~PX10	P305~P310	±0.15
P211~P218	PX11~PX18	P311~P318	±0.2
	PX20	P319~P328	±0.3

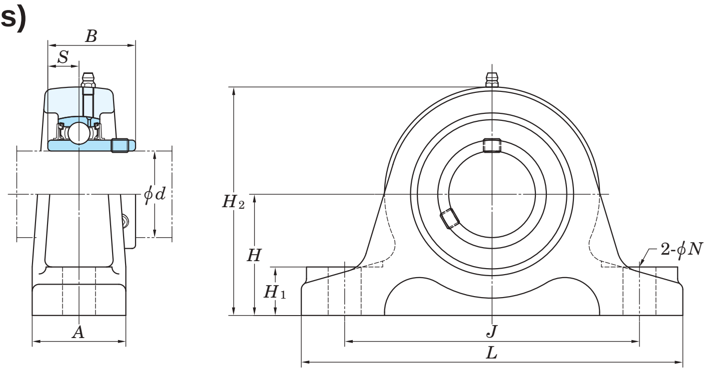
Shaft Dia.		Dimensions inch mm										Bolt Size inch mm	Standard					Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm d_1	inch d_1	H	L	A	J	N	N_1	H_1	H_2	L_1	B_1		Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	C_r	C_{0r}	C_u	f_0	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension mm A_s	Dimension inch A_s	Mass kg	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension mm A_c	Dimension inch A_c	Mass kg
90	3 1/2	5 33/64	19 9/32	4 23/32	14 31/32	1 13/32	1 31/32	1 13/16	10 3/4	5 1/2	3 13/16	1 1/8	**UKP320**	P320	UK320	HE2320X	34.8	173	141	5.08	13.2	–	–	–	–	–	–	–	–	–	–
		140	490	120	380	36	50	46	273	140	97	M30				H2320X	34.8					–	–	–	–	–	UKP320C	UKP320CD	174	6 27/32	41.0
100		5 29/32	20 15/32	5 1/2	15 3/4	1 9/16	2 5/32	1 31/32	11 21/32	5 29/32	4 1/8	1 1/4	**UKP322**	P322	UK322	H2322X	43.9	205	180	6.15	13.2	–	–	–	–	–	UKP322C	UKP322CD	188	7 13/32	50.8
	4	150	520	140	400	40	55	50	296	150	105	M33				HE2322X	43.9					–	–	–	–	–	–	–	–	–	–
110	–	6 19/64	22 7/16	5 1/2	17 23/32	1 9/16	2 5/32	1 31/32	12 7/16	6 5/16	4 13/32	1 1/4	**UKP324**	P324	UK324	H2324	55.7	207	185	6.10	13.5	–	–	–	–	–	UKP324C	UKP324CD	196	7 23/32	66.0
		160	570	140	450	40	55	50	316	160	112	M33																			
115	4 1/2	7 3/32	23 5/8	5 1/2	18 29/32	1 9/16	2 5/32	1 31/32	13 21/32	7 11/16	4 3/4	1 1/4	**UKP326**	P326	UK326	HE2326	71.9	229	214	6.79	13.6	–	–	–	–	–	–	–	–	–	–
		180	600	140	480	40	55	50	355	195	121	M33				H2326	71.9					–	–	–	–	–	UKP326C	UKP326CD	214	8 7/16	85.2
125	–	7 7/8	24 13/32	5 1/2	19 11/16	1 9/16	2 5/32	2 3/8	15 15/32	7 9/32	5 5/32	1 1/4	**UKP328**	P328	UK328	H2328	92.5	253	246	7.54	13.6	–	–	–	–	–	UKP328C	UKP328CD	222	8 3/4	109
		200	620	140	500	40	55	60	393	185	131	M33																			

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 205~210, X05~X09, 305~308
A-R1/8.................. 211~218, X10~X20, 309~328
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables. (Example of Part No. : UKP206J + H2306X, UK206 + H2306X)
4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing.
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Representative examples of the forms of housing are indicated.
7. Housings of spheroidal graphite iron casting are also available.

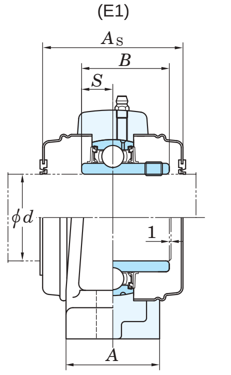
UCIP

Cylindrical bore (with set screws)

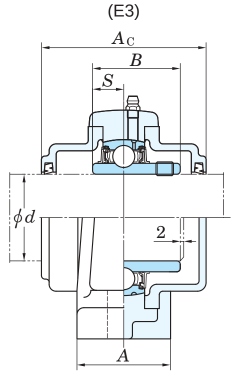
d 40 ~ 140 mm



With Pressed Steel Covers (E1)



With Cast Iron Covers (E3)



Variations of tolerance of distance from mounting bottom to center of spherical bore ($\varDelta_{Hs}$), variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$) and variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.		$\varDelta_{Hs}$	$\varDelta_{Js}$	$\varDelta_{Ns}$
IP208~IP210		±0.15	±0.5	±0.2
IP211~IP213	IP313~IP318	±0.2	±0.7	
	IP319~IP328	±0.3		±0.3

Shaft Dia.		Dimensions									Bolt Size	Standard			Mass	Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm	inch	inch mm									inch mm	Unit No.	Housing No.	Bearing No.	kg	kN		kN		Unit No.		Dimension		Mass	Unit No.		Dimension		Mass
d		H	L	A	J	N	H_1	H_2	B	S						C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	A_s mm	A_s inch	kg	Open Ends Type	Closed End Type	A_c mm	A_c inch	kg
40	1 1/2	2 23/64 60	7 7/8 200	2 3/8 60	5 29/32 150	3/4 19	31/32 25	4 17/32 115	1.937 49.2	0.748 19	5/8 M16	**UCIP208-24**	IP208	UC208-24	3.4	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
	1 9/16											**UCIP208-25**		UC208-25	3.4					–	–	–	–	–	–	–	–	–	–
												UCIP208		UC208	3.4					UCIP208C	UCIP208CD	69	2 23/32	3.4	UCIP208FC	UCIP208FCD	86	3 3/8	4.2
45	1 5/8	2 3/4 70	8 9/32 210	2 3/8 60	6 19/64 160	3/4 19	31/32 25	5 1/32 128	1.937 49.2	0.748 19	5/8 M16	**UCIP209-26**	IP209	UC209-26	3.9	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
	1 11/16											**UCIP209-27**		UC209-27	3.9					–	–	–	–	–	–	–	–	–	–
	1 3/4											**UCIP209-28**		UC209-28	3.9					–	–	–	–	–	–	–	–	–	–
												UCIP209		UC209	3.9					UCIP209C	UCIP209CD	69	2 23/32	3.9	UCIP209FC	UCIP209FCD	88	3 15/32	4.7
50	1 7/8	2 3/4 70	8 21/32 220	2 3/8 60	6 11/16 170	3/4 19	1 3/32 28	5 3/16 132	2.031 51.6	0.748 19	5/8 M16	**UCIP210-30**	IP210	UC210-30	4.8	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
	1 15/16											**UCIP210-31**		UC210-31	4.8					–	–	–	–	–	–	–	–	–	–
												UCIP210		UC210	4.8					UCIP210C	UCIP210CD	74	2 29/32	4.8	UCIP210FC	UCIP210FCD	97	3 13/16	5.8
	2											**UCIP210-32**		UC210-32	4.8					–	–	–	–	–	–	–	–	–	–
55	2	3 5/32 80	9 1/16 230	2 3/8 60	7 3/32 180	3/4 19	1 3/32 28	5 13/16 148	2.189 55.6	0.874 22.2	5/8 M16	**UCIP211-32**	IP211	UC211-32	5.3	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
	2 1/8											**UCIP211-34**		UC211-34	5.3					–	–	–	–	–	–	–	–	–	–
												UCIP211		UC211	5.3					UCIP211C	UCIP211CD	76	3	5.3	UCIP211FC	UCIP211FCD	99	3 29/32	6.3
	2 3/16											**UCIP211-35**		UC211-35	5.3					–	–	–	–	–	–	–	–	–	–
60	2 1/4	3 5/32 80	10 1/4 260	2 3/4 70	7 7/8 200	7/8 22	1 3/16 30	6 3/32 155	2.563 65.1	1.000 25.4	3/4 M20	**UCIP212-36**	IP212	UC212-36	7.2	52.4	36.2	1.65	14.4	–	–	–	–	–	–	–	–	–	–
												UCIP212		UC212	7.2					UCIP212C	UCIP212CD	89	3 1/2	7.2	UCIP212FC	UCIP212FCD	114	4 1/2	8.7
	2 3/8											**UCIP212-38**		UC212-38	7.2					–	–	–	–	–	–	–	–	–	–
	2 7/16											**UCIP212-39**		UC212-39	7.2					–	–	–	–	–	–	–	–	–	–
65	2 1/2	3 35/64 90	11 1/32 280	2 3/4 70	8 21/32 220	7/8 22	1 3/16 30	6 25/32 172	2.563 65.1	1.000 25.4	3/4 M20	**UCIP213-40**	IP213	UC213-40	8.8	57.2	40.1	1.82	14.4	–	–	–	–	–	–	–	–	–	–
												UCIP213		UC213	8.8					UCIP213C	UCIP213CD	89	3 1/2	8.8	UCIP213FC	UCIP213FCD	114	4 1/2	10.5
	2 1/2	4 21/64 110	12 7/32 310	2 3/4 70	9 27/32 250	7/8 22	1 3/16 30	8 3/16 208	2.953 75	1.181 30	3/4 M20	**UCIP313-40**	IP313	UC313-40	13.4	92.7	59.9	2.68	13.2	–	–	–	–	–	–	–	–	–	–
												UCIP313		UC313	13.4					–	–	–	–	–	UCIP313C	UCIP313CD	122	4 13/16	15.5
70	2 3/4	4 21/64 110	13 330	2 15/16 75	10 5/8 270	31/32 25	1 3/8 35	8 15/32 215	3.071 78	1.299 33	7/8 M22	**UCIP314-44**	IP314	UC314-44	15.3	104	68.2	2.96	13.2	–	–	–	–	–	–	–	–	–	–
												UCIP314		UC314	15.3					–	–	–	–	–	UCIP314C	UCIP314CD	124	4 7/8	17.6
75	2 15/16	4 23/32 120	13 3/8 340	2 15/16 75	11 1/32 280	31/32 25	1 3/8 35	9 1/16 230	3.228 82	1.260 32	7/8 M22	**UCIP315-47**	IP315	UC315-47	17.6	113	77.2	3.24	13.2	–	–	–	–	–	–	–	–	–	–
												UCIP315		UC315	17.6					–	–	–	–	–	UCIP315C	UCIP315CD	134	5 9/32	20.1
	3											**UCIP315-48**		UC315-48	17.6					–	–	–	–	–	–	–	–	–	–
80	–	4 23/32 120	13 25/32 350	3 11/32 85	11 27/64 290	31/32 25	1 9/16 40	9 1/4 235	3.386 86	1.339 34	7/8 M22	**UCIP316**	IP316	UC316	20.3	123	86.7	3.53	13.3	–	–	–	–	–	UCIP316C	UCIP316CD	138	5 7/16	23.2
85	–	5 1/8 130	14 9/16 370	3 11/32 85	12 13/64 310	31/32 25	1 9/16 40	10 1/32 255	3.780 96	1.575 40	7/8 M22	**UCIP317**	IP317	UC317	25.9	133	96.8	3.82	13.3	–	–	–	–	–	UCIP317C	UCIP317CD	146	5 3/4	29.2
90	3 1/2	5 1/8 130	15 3/4 400	3 11/32 85	13 330	1 5/32 29	1 25/32 45	10 1/4 260	3.780 96	1.575 40	1 M27	**UCIP318-56**	IP318	UC318-56	28.6	143	107	4.11	13.3	–	–	–	–	–	–	–	–	–	–
												UCIP318		UC318	28.6					–	–	–	–	–	UCIP318C	UCIP318CD	150	5 29/32	32.4
95	–	5 29/32 150	16 5/32 410	3 11/32 85	13 25/64 340	1 5/32 29	1 25/32 45	11 7/32 285	4.055 103	1.614 41	1 M27	**UCIP319**	IP319	UC319	31.7	153	119	4.45	13.3	–	–	–	–	–	UCIP319C	UCIP319CD	162	6 3/8	36.0
100		5 29/32 150	16 15/16 430	3 11/32 85	14 11/64 360	1 5/32 29	1 25/32 45	11 5/8 295	4.252 108	1.654 42	1 M27	**UCIP320**	IP320	UC320	36.9	173	141	5.08	13.2	–	–	–	–	–	UCIP320C	UCIP320CD	174	6 27/32	42.5
	3 15/16											**UCIP320-63**		UC320-63	36.9					–	–	–	–	–	–	–	–	–	–
	4											**UCIP320-64**		UC320-64	36.9					–	–	–	–	–	–	–	–	–	–
110	–	6 11/16 170	19 9/32 490	3 15/16 100	16 9/64 410	1 1/4 32	1 31/32 50	13 3/16 335	4.606 117	1.811 46	1 1/8 M30	**UCIP322**	IP322	UC322	52.4	205	180	6.15	13.2	–	–	–	–	–	UCIP322C	UCIP322CD	188	7 13/32	59.2
120	–	6 11/16 170	20 3/32 510	3 15/16 100	16 59/64 430	1 1/4 32	1 31/32 50	13 19/32 345	4.961 126	2.008 51	1 1/8 M30	**UCIP324**	IP324	UC324	58.7	207	185	6.10	13.5	–	–	–	–	–	UCIP324C	UCIP324CD	196	7 23/32	68.2
130	–	7 7/8 200	21 21/32 550	4 11/32 110	18 1/2 470	1 1/4 32	1 31/32 50	15 11/32 390	5.315 135	2.126 54	1 1/8 M30	**UCIP326**	IP326	UC326	76.2	229	214	6.79	13.6	–	–	–	–	–	UCIP326C	UCIP326CD	214	8 7/16	88.3
140	–	7 7/8 200	23 7/32 590	4 11/32 110	19 11/16 500	1 3/8 35	2 5/32 55	15 3/4 400	5.709 145	2.323 59	1 1/4 M33	**UCIP328**	IP328	UC328	87.0	253	246	7.54	13.6	–	–	–	–	–	UCIP328C	UCIP328CD	222	8 3/4	102

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.

A-1/4-28UNF .... 208~210
A-R1/8 .... 211~213, 313~328

3. As for the triple-lip seal type product, supplementary code L3 follows the Part No. of unit or bearing. (Example of Part No. : UCIP208JL3, UC208L3)

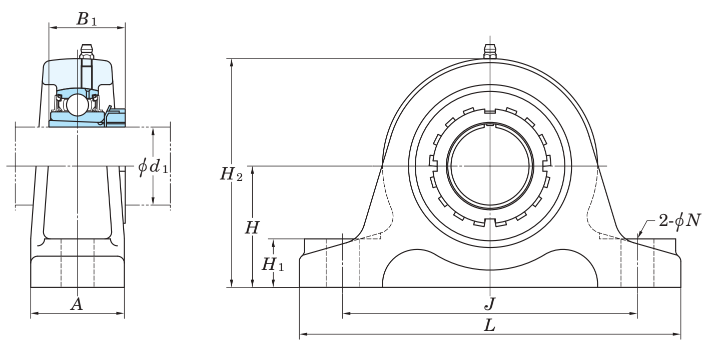
4. As for the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

5. Housings of spheroidal graphite iron casting are also available.

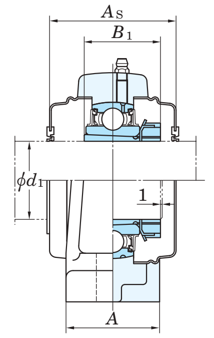
UKIP

Tapered bore (with adapter)

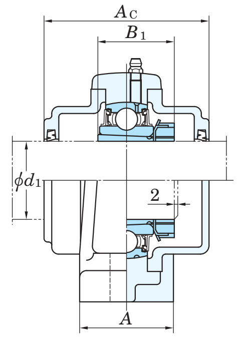
d_1 35 ~ 125 mm



With Pressed Steel Covers (E1)



With Cast Iron Covers (E3)



Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs}), variations of tolerance of distance between centers of bolt holes (Δ_{Js}) and variations of tolerance of bolt hole diameter (Δ_{Ns})

Unit: mm

Housing No.		Δ_{Hs}	Δ_{Js}	Δ_{Ns}
IP208~IP210		±0.15	±0.5	±0.2
IP211~IP213	IP313~IP318	±0.2	±0.7	
	IP319~IP328	±0.3		±0.3

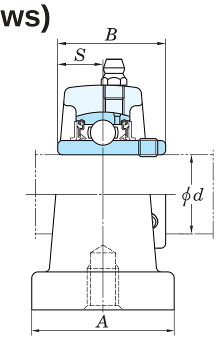
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm								Bolt Size inch / mm	Standard					Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers					With Cast Iron Covers				
d_1		H	L	A	J	N	H_1	H_2	B_1		Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	C_r	C_{0r}	C_u	f_0	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension A_s mm	Dimension A_s inch	Mass kg	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension A_c mm	Dimension A_c inch	Mass kg
35	1 1/4 1 3/8	2 23/64 60	7 7/8 200	2 3/8 60	5 29/32 150	3/4 19	31/32 25	4 17/32 115	1 13/16 46	5/8 M16	**UKIP208**	IP208	UK208	HE2308X HS2308X H2308X	3.5 3.5 3.5	29.1	17.8	0.809	14.0	– – UKIP208C	– – UKIP208CD	– – 69	– – 2 23/32	– – 3.5	– – UKIP208FC	– – UKIP208FCD	– – 86	– – 3 3/8	– – 4.4
40	1 1/2	2 3/4 70	8 9/32 210	2 3/8 60	6 19/64 160	3/4 19	31/32 25	5 1/32 128	1 31/32 50	5/8 M16	**UKIP209**	IP209	UK209	HE2309X H2309X	4.0 4.0	34.1	21.3	0.968	14.0	– UKIP209C	– UKIP209CD	– 69	– 2 23/32	– 4.0	– UKIP209FC	– UKIP209FCD	– 88	– 3 15/32	– 4.9
45	1 3/4	2 3/4 70	8 21/32 220	2 3/8 60	6 11/16 170	3/4 19	1 3/32 28	5 3/16 132	2 5/32 55	5/8 M16	**UKIP210**	IP210	UK210	HE2310X H2310X	4.8 4.8	35.1	23.3	1.06	14.4	– UKIP210C	– UKIP210CD	– 74	– 2 29/32	– 4.8	– UKIP210FC	– UKIP210FCD	– 97	– 3 13/16	– 5.8
50	1 7/8 2	3 5/32 80	9 1/16 230	2 3/8 60	7 3/32 180	3/4 19	1 3/32 28	5 13/16 148	2 5/16 59	5/8 M16	**UKIP211**	IP211	UK211	HS2311X H2311X HE2311X	5.3 5.3 5.3	43.4	29.4	1.34	14.4	– UKIP211C –	– UKIP211CD –	– 76 –	– 3 –	– 5.3 –	– UKIP211FC –	– UKIP211FCD –	– 99 –	– 3 29/32 –	– 5.9 –
55	2 1/8	3 5/32 80	10 1/4 260	2 3/4 70	7 7/8 200	7/8 22	1 3/16 30	6 3/32 155	2 7/16 62	3/4 M20	**UKIP212**	IP212	UK212	HS2312X H2312X	7.1 7.1	52.4	36.2	1.65	14.4	– UKIP212C	– UKIP212CD	– 89	– 3 1/2	– 7.1	– UKIP212FC	– UKIP212FCD	– 114	– 4 1/2	– 8.6
60	2 1/4 2 3/8	3 35/64 90	11 1/32 280	2 3/4 70	8 21/32 220	7/8 22	1 3/16 30	6 25/32 172	2 9/16 65	3/4 M20	**UKIP213**	IP213	UK213	HE2313X H2313X HS2313X	8.7 8.7 8.7	57.2	40.1	1.82	14.4	– UKIP213C –	– UKIP213CD –	– 89 –	– 3 1/2 –	– 8.7 –	– UKIP213FC –	– UKIP213FCD –	– 114 –	– 4 1/2 –	– 10.4 –
	2 1/4 2 3/8	4 21/64 110	12 7/32 310	2 3/4 70	9 27/32 250	7/8 22	1 3/16 30	8 3/16 208	2 9/16 65	3/4 M20	**UKIP313**	IP313	UK313	HE2313X H2313X HS2313X	13.5 13.5 13.5	92.7	59.9	2.68	13.2	– – –	– – –	– – –	– – –	– – –	– UKIP313C –	– UKIP313CD –	– 122 –	– 4 13/16 –	– 15.7 –
65	2 1/2	4 23/32 120	13 3/8 340	2 15/16 75	11 1/32 280	31/32 25	1 3/8 35	9 1/16 230	2 7/8 73	7/8 M22	**UKIP315**	IP315	UK315	HE2315X H2315X	17.7 17.7	113	77.2	3.24	13.2	– –	– –	– –	– –	– –	– UKIP315C	– UKIP315CD	– 134	– 5 9/32	– 20.5
70	2 3/4	4 23/32 120	13 25/32 350	3 11/32 85	11 27/64 290	31/32 25	1 9/16 40	9 1/4 235	3 1/16 78	7/8 M22	**UKIP316**	IP316	UK316	HE2316X H2316X	20.4 20.4	123	86.7	3.53	13.3	– –	– –	– –	– –	– –	– UKIP316C	– UKIP316CD	– 138	– 5 7/16	– 23.5
75	3	5 1/8 130	14 9/16 370	3 11/32 85	12 13/64 310	31/32 25	1 9/16 40	10 1/32 255	3 7/32 82	7/8 M22	**UKIP317**	IP317	UK317	H2317X HE2317X	25.7 25.7	133	96.8	3.82	13.3	– –	– –	– –	– –	– –	UKIP317C –	UKIP317CD –	146 –	5 3/4 –	29.2 –
80	–	5 1/8 130	15 3/4 400	3 11/32 85	13 330	1 5/32 29	1 25/32 45	10 1/4 260	3 3/8 86	1 M27	**UKIP318**	IP318	UK318	H2318X	28.7	143	107	4.11	13.3	–	–	–	–	–	UKIP318C	UKIP318CD	150	5 29/32	32.9
85	3 1/4	5 29/32 150	16 5/32 410	3 11/32 85	13 25/64 340	1 5/32 29	1 25/32 45	11 7/32 285	3 17/32 90	1 M27	**UKIP319**	IP319	UK319	HE2319X H2319X	32.0 32.0	153	119	4.45	13.3	– –	– –	– –	– –	– –	– UKIP319C	– UKIP319CD	– 162	– 6 3/8	– 36.7
90	3 1/2	5 29/32 150	16 15/16 430	3 11/32 85	14 11/64 360	1 5/32 29	1 25/32 45	11 5/8 295	3 13/16 97	1 M27	**UKIP320**	IP320	UK320	HE2320X H2320X	36.6 36.6	173	141	5.08	13.2	– –	– –	– –	– –	– –	– UKIP320C	– UKIP320CD	– 174	– 6 27/32	– 42.8
100	4	6 11/16 170	19 9/32 490	3 15/16 100	16 9/64 410	1 1/4 32	1 31/32 50	13 3/16 335	4 1/8 105	1 1/8 M30	**UKIP322**	IP322	UK322	H2322X HE2322X	52.2 52.2	205	180	6.15	13.2	– –	– –	– –	– –	– –	UKIP322C –	UKIP322CD –	188 –	7 13/32 –	59.1 –
110	–	6 11/16 170	20 3/32 510	3 15/16 100	16 59/64 430	1 1/4 32	1 31/32 50	13 19/32 345	4 13/32 112	1 1/8 M30	**UKIP324**	IP324	UK324	H2324	59.0	207	185	6.10	13.5	–	–	–	–	–	UKIP324C	UKIP324CD	196	7 23/32	69.3
115	4 1/2	7 7/8 200	21 21/32 550	4 11/32 110	18 1/2 470	1 1/4 32	1 31/32 50	15 11/32 390	4 3/4 121	1 1/8 M30	**UKIP326**	IP326	UK326	HE2326 H2326	76.0 76.0	229	214	6.79	13.6	– –	– –	– –	– –	– –	– UKIP326C	– UKIP326CD	– 214	– 8 7/16	– 89.3
125	–	7 7/8 200	23 7/32 590	4 11/32 110	19 11/16 500	1 3/8 35	2 5/32 55	15 3/4 400	4 5/32 131	1 1/4 M33	**UKIP328**	IP328	UK328	H2328	87.0	253	246	7.54	13.6	–	–	–	–	–	UKIP328C	UKIP328CD	222	8 3/4	104

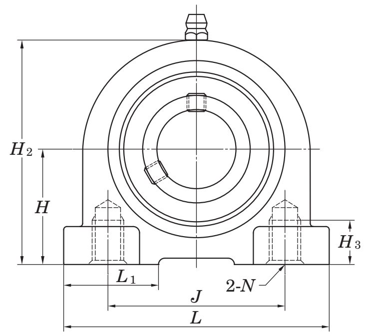
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 208~210
A-R1/8.................. 211~213, 313~328
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
(Example of Part No. : UKIP208J + H2308X, UK208 + H2308X)
4. As for the triple-lip seal type product, supplementary code L3 follows the Part No. of unit or bearing.
(Example of Part No. : UKIP208JL3 + H2308X, UK208L3 + H2308X)
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Housings of spheroidal graphite iron casting are also available.

UCPA

Cylindrical bore (with set screws)

d 12 ~ 50 mm





Variations of tolerance of distance from mounting bottom to center of spherical bore ($\varDelta_{Hs}$) and variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$)

Unit: mm

Housing No.	$\varDelta_{Hs}$	$\varDelta_{Js}$
PA204~PA210	±0.15	±0.5

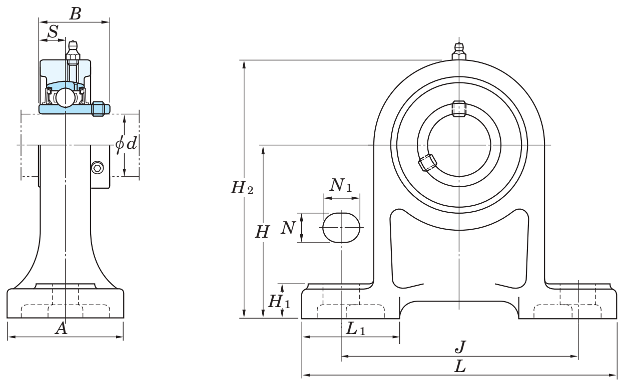
Shaft Dia. mm d	Shaft Dia. inch d	Dimensions inch / mm H	L	A	J	N	H_2	H_3	L_1	B	S	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Mass kg
12		1 3/16 30.2	3 76	1 9/16 40	2 3/64 52	M10×1.5	2 3/8 60	1/2 13	1 1/16 27	1.220 31	0.500 12.7	**UCPA201**	PA204	UC201	12.8	6.65	0.302	13.2	0.64
	1/2											**UCPA201-8**		UC201-8					
15												**UCPA202**		UC202					0.62
	5/8											**UCPA202-10**		UC202-10					
17												**UCPA203**		UC203					0.61
	3/4											**UCPA204-12**		UC204-12					
20												**UCPA204**		UC204					0.59
	7/8	1 7/16 36.5	3 5/16 84	1 25/32 45	2 13/64 56	M10×1.5	2 25/32 71	1/2 13	1 3/16 30	1.343 34.1	0.563 14.3	**UCPA205-14**	PA205	UC205-14	14.0	7.85	0.357	13.9	0.83
	15/16											**UCPA205-15**		UC205-15					
25												**UCPA205**		UC205					
	1											**UCPA205-16**		UC205-16					
	1 1/8	1 11/16 42.9	3 11/16 94	1 31/32 50	2 19/32 66	M14×2	3 5/16 84	23/32 18	1 13/32 36	1.500 38.1	0.626 15.9	**UCPA206-18**	PA206	UC206-18	19.5	11.3	0.514	13.9	1.2
30												**UCPA206**		UC206					
	1 3/16											**UCPA206-19**		UC206-19					
	1 1/4											**UCPA206-20**		UC206-20					
	1 1/4	1 7/8 47.6	4 11/32 110	2 5/32 55	3 5/32 80	M14×2	3 21/32 93	25/32 20	1 5/8 41	1.689 42.9	0.689 17.5	**UCPA207-20**	PA207	UC207-20	25.7	15.4	0.700	13.9	1.7
	1 5/16											**UCPA207-21**		UC207-21					
	1 3/8											**UCPA207-22**		UC207-22					
35												**UCPA207**		UC207					
	1 7/16											**UCPA207-23**		UC207-23					
	1 1/2	1 15/16 49.2	4 9/16 116	2 9/32 58	3 5/16 84	M14×2	3 27/32 98	25/32 20	1 5/8 41	1.937 49.2	0.748 19	**UCPA208-24**	PA208	UC208-24	29.1	17.8	0.809	14.0	2.0
	1 9/16											**UCPA208-25**		UC208-25					
40												**UCPA208**		UC208					
	1 5/8	2 9/64 54.2	4 23/32 120	2 3/8 60	3 35/64 90	M14×2	4 3/16 106	31/32 25	1 21/32 42	1.937 49.2	0.748 19	**UCPA209-26**	PA209	UC209-26	34.1	21.3	0.968	14.0	2.2
	1 11/16											**UCPA209-27**		UC209-27					
	1 3/4											**UCPA209-28**		UC209-28					
45												**UCPA209**		UC209					
	1 7/8	2 1/4 57.2	5 1/8 130	2 17/32 64	3 45/64 94	M16×2	4 7/16 113	31/32 25	1 27/32 47	2.031 51.6	0.748 19	**UCPA210-30**	PA210	UC210-30	35.1	23.3	1.06	14.4	2.8
	1 15/16											**UCPA210-31**		UC210-31					
50												**UCPA210**		UC210					
	2											**UCPA210-32**		UC210-32					

Remarks 1. In Part No. of unit, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of the applicable grease nipple is A-1/4-28UNF.
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows Part No. of unit or bearing. (Example of Part No. : UCPA206JL3, UC206L3)
4. As for the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Tapered bore (with adapter) type products are also available. (Example of Part No. : UKPA205J + H2305X, UK205 + H2305X)
6. Housings of spheroidal graphite iron casting are also available.

UCPH

Cylindrical bore (with set screws)

d 12 ~ 50 mm



Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs})

Unit: mm

Housing No.	Δ_{Hs}
PH204~PH210	±0.15

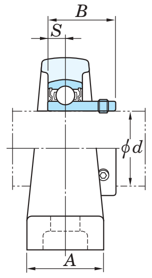
Shaft Dia. mm	inch	Dimensions inch mm H	L	A	J	N	N_1	H_1	H_2	L_1	B	S	Bolt Size inch mm	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Mass kg
12		2 3/4 70	5 127	1 9/16 40	3 3/4 95	1/2 13	3/4 19	19/32 15	3 31/32 101	1 13/16 46	1.220 31	0.500 12.7	3/8 M10	**UCPH201**	PH204	UC201	12.8	6.65	0.302	13.2	0.96
	1/2													**UCPH201-8**		UC201-8					
15														**UCPH202**		UC202					0.94
	5/8													**UCPH202-10**		UC202-10					
17														**UCPH203**		UC203					0.93
	3/4													**UCPH204-12**		UC204-12					
20														**UCPH204**		UC204					0.91
	7/8	3 5/32 80	5 1/2 140	1 31/32 50	4 1/8 105	1/2 13	3/4 19	5/8 16	4 1/2 114	1 15/16 49	1.343 34.1	0.563 14.3	3/8 M10	**UCPH205-14**	PH205	UC205-14	14.0	7.85	0.357	13.9	1.2
	15/16													**UCPH205-15**		UC205-15					
25														**UCPH205**		UC205					
	1													**UCPH205-16**		UC205-16					
	1 1/8	3 35/64 90	6 1/2 165	1 31/32 50	4 3/4 121	21/32 17	13/16 21	23/32 18	5 1/8 130	2 7/32 56	1.500 38.1	0.626 15.9	1/2 M14	**UCPH206-18**	PH206	UC206-18	19.5	11.3	0.514	13.9	1.6
30														**UCPH206**		UC206					
	1 3/16													**UCPH206-19**		UC206-19					
	1 1/4													**UCPH206-20**		UC206-20					
	1 1/4	3 47/64 95	6 9/16 167	2 3/8 60	5 127	21/32 17	13/16 21	23/32 18	5 1/2 140	2 1/8 54	1.689 42.9	0.689 17.5	1/2 M14	**UCPH207-20**	PH207	UC207-20	25.7	15.4	0.700	13.9	2.0
	1 5/16													**UCPH207-21**		UC207-21					
	1 3/8													**UCPH207-22**		UC207-22					
35														**UCPH207**		UC207					
	1 7/16													**UCPH207-23**		UC207-23					
	1 1/2	3 15/16 100	7 1/4 184	2 3/4 70	5 13/32 137	21/32 17	13/16 21	25/32 20	5 29/32 150	2 1/4 57	1.937 49.2	0.748 19	1/2 M14	**UCPH208-24**	PH208	UC208-24	29.1	17.8	0.809	14.0	2.7
	1 9/16													**UCPH208-25**		UC208-25					
40														**UCPH208**		UC208					
	1 5/8	4 9/64 105	7 15/32 190	2 3/4 70	5 3/4 146	21/32 17	13/16 21	25/32 20	6 7/32 158	2 9/32 58	1.937 49.2	0.748 19	1/2 M14	**UCPH209-26**	PH209	UC209-26	34.1	21.3	0.968	14.0	3.0
	1 11/16													**UCPH209-27**		UC209-27					
	1 3/4													**UCPH209-28**		UC209-28					
45														**UCPH209**		UC209					
	1 7/8	4 21/64 110	8 1/8 206	2 3/4 70	6 1/4 159	25/32 20	7/8 22	7/8 22	6 1/2 165	2 9/16 65	2.031 51.6	0.748 19	5/8 M16	**UCPH210-30**	PH210	UC210-30	35.1	23.3	1.06	14.4	3.5
	1 15/16													**UCPH210-31**		UC210-31					
50														**UCPH210**		UC210					
	2													**UCPH210-32**		UC210-32					

Remarks 1. In Part No. of unit, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of the applicable grease nipple is A-1/4-28UNF.
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows Part No. of unit or bearing. (Example of Part No. : UCPH206JL3, UC206L3)
4. As for the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Tapered bore (with adapter) type products are also available. (Example of Part No. : UKPH205J + H2305X, UK205 + H2305X)

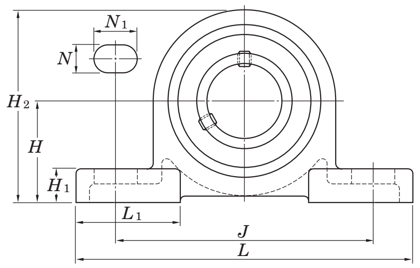
BLP
Cylindrical bore
(with set screws)

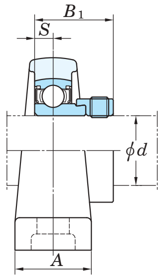
ALP
Cylindrical bore
(with eccentric locking collar)

d 12 ~ 40 mm



BLP





ALP

Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs})

Unit: mm

Housing No.	Δ_{Hs}
LP203~LP208	±0.15

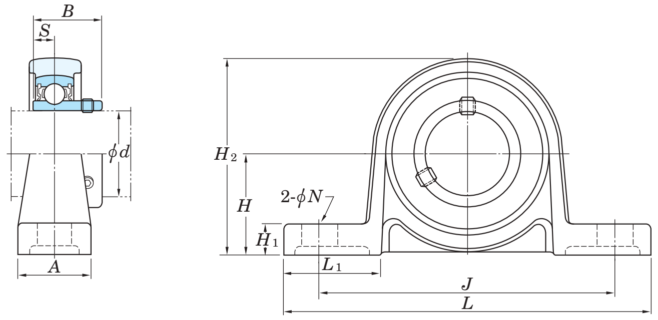
Shaft Dia. mm d	Shaft Dia. inch d	Dimensions inch / mm H	L	A	J	N	N_1	H_1	H_2	L_1	S	BLP B	ALP B_1	Bolt Size inch / mm	Unit No.	Bearing No.	Unit No.	Bearing No.	Housing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Mass kg BLP	ALP
12		1 3/16 30.2	4 1/2 114	31/32 25	3 7/16 87	7/16 11	5/8 16	15/32 12	2 1/4 57	1 3/8 35	0.236 6	0.866 22	1.122 28.5	3/8 M10	**BLP201**	SB201	**ALP201**	SA201	LP203	9.55	4.80	0.218	13.2	0.36	0.39
	1/2														**BLP201-8**	SB201-8	**ALP201-8**	SA201-8							
15															**BLP202**	SB202	**ALP202**	SA202							
	5/8														**BLP202-10**	SB202-10	**ALP202-10**	SA202-10							
17															**BLP203**	SB203	**ALP203**	SA203							
	3/4	1 5/16 33.3	4 29/32 125	1 1/16 27	3 13/16 97	7/16 11	5/8 16	1/2 13	2 9/16 65	1 1/2 38	0.276 7	0.984 25	1.161 29.5	3/8 M10	**BLP204-12**	SB204-12	**ALP204-12**	SA204-12	LP204	12.8	6.65	0.302	13.2	0.51	0.51
20															**BLP204**	SB204	**ALP204**	SA204							
	7/8	1 7/16 36.5	5 1/8 130	1 5/32 29	3 15/16 100	7/16 11	5/8 16	1/2 13	2 25/32 71	1 17/32 39	0.295 7.5	1.063 27	1.201 30.5	3/8 M10	**BLP205-14**	SB205-14	**ALP205-14**	SA205-14	LP205	14.0	7.85	0.357	13.9	0.57	0.61
	15/16														**BLP205-15**	SB205-15	**ALP205-15**	SA205-15							
25															**BLP205**	SB205	**ALP205**	SA205							
	1														**BLP205-16**	SB205-16	**ALP205-16**	SA205-16							
	1 1/8	1 11/16 42.9	6 5/32 156	1 5/16 33	4 23/32 120	9/16 14	13/16 21	9/16 14	3 9/32 83	1 27/32 47	0.315 8	1.181 30	1.335 33.9	1/2 M12	**BLP206-18**	SB206-18	**ALP206-18**	SA206-18	LP206	19.5	11.3	0.514	13.9	0.69	0.72
30															**BLP206**	SB206	**ALP206**	SA206							
	1 3/16														**BLP206-19**	SB206-19	**ALP206-19**	SA206-19							
	1 1/4														**BLP206-20**	SB206-20	**ALP206-20**	SA206-20							
	1 1/4	1 7/8 47.6	6 1/2 165	1 3/8 35	5 127	9/16 14	13/16 21	5/8 16	3 21/32 93	1 31/32 50	0.335 8.5	1.260 32	1.437 36.5	1/2 M12	**BLP207-20**	SB207-20	**ALP207-20**	SA207-20	LP207	25.7	15.4	0.700	13.9	0.94	1.0
	1 5/16																**ALP207-21**	SA207-21							
	1 3/8														**BLP207-22**	SB207-22	**ALP207-22**	SA207-22							
35															**BLP207**	SB207	**ALP207**	SA207							
	1 7/16														**BLP207-23**	SB207-23	**ALP207-23**	SA207-23							
	1 1/2	2 50.8	7 1/4 184	1 15/32 37	5 1/2 140	9/16 14	7/8 22	23/32 18	4 1/32 102	2 5/32 55	0.354 9	1.339 34	1.595 40.5	1/2 M12	**BLP208-24**	SB208-24	**ALP208-24**	SA208-24	LP208	29.1	17.8	0.809	14.0	1.8	1.9
	1 9/16																**ALP208-25**	SA208-25							
40															**BLP208**	SB208	**ALP208**	SA208							

Remarks 1. In Part No. of unit, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Allowable load to housing in radial direction is approximately half of basic load rating of bearing, C_r (when safety factor is 4).
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

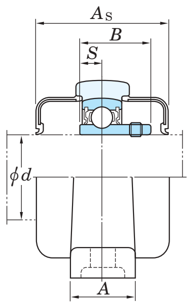
UP

Cylindrical bore (with set screws)

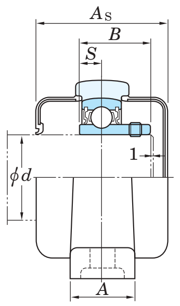
d 10 ~ 30 mm



Open Ends Type



Closed End Type



Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs}) and variations of tolerance of distance between centers of bolt holes (Δ_{Js})

Unit: mm

Housing No.	Δ_{Hs}	Δ_{Js}
P000~P006	±0.15	±0.3

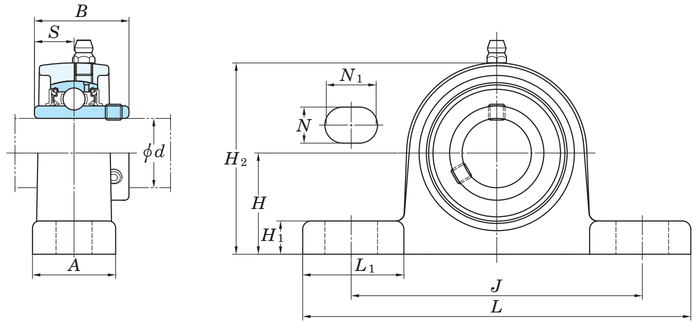
Shaft Dia. mm	Dimensions inch mm										Bolt Size inch mm	Standard			Mass	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Rubber Coated Covers				
												Unit No.	Housing No.	Bearing No.						Unit No.		Dimension		Mass
d	H	L	A	J	N	H_1	H_2	L_1	B	S					kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	A_s mm	A_s inch	kg
10	45/64 18	2 5/8 67	5/8 16	2 3/32 53	9/32 7	1/4 6	1 3/8 35	23/32 18	0.591 15	0.197 5	1/4 M6	**UP000**	P000	SU000	0.070	4.55	1.95	0.089	12.3	UP000C	UP000CD	29	1 5/32	0.07
12	3/4 19	2 25/32 71	5/8 16	2 13/64 56	9/32 7	1/4 6	1 1/2 38	3/4 19	0.591 15	0.197 5	1/4 M6	**UP001**	P001	SU001	0.090	5.10	2.40	0.109	13.2	UP001C	UP001CD	29	1 5/32	0.09
15	55/64 22	3 5/32 80	5/8 16	2 31/64 63	9/32 7	9/32 7	1 11/16 43	13/16 21	0.650 16.5	0.217 5.5	1/4 M6	**UP002**	P002	SU002	0.11	5.60	2.85	0.130	13.9	UP002C	UP002CD	31	1 7/32	0.11
17	15/16 24	3 11/32 85	23/32 18	2 41/64 67	9/32 7	9/32 7	1 27/32 47	13/16 21	0.689 17.5	0.236 6	1/4 M6	**UP003**	P003	SU003	0.15	6.00	3.25	0.148	14.4	UP003C	UP003CD	33	1 5/16	0.15
20	1 7/64 28	3 15/16 100	25/32 20	3 5/32 80	13/32 10	11/32 9	2 5/32 55	31/32 25	0.827 21	0.276 7	5/16 M8	**UP004**	P004	SU004	0.23	9.40	5.05	0.230	13.9	UP004C	UP004CD	38	1 1/2	0.23
25	1 17/64 32	4 13/32 112	25/32 20	3 35/64 90	13/32 10	13/32 10	2 7/16 62	1 3/32 28	0.866 22	0.276 7	5/16 M8	**UP005**	P005	SU005	0.28	10.1	5.85	0.266	14.5	UP005C	UP005CD	40	1 9/16	0.28
30	1 27/64 36	5 3/16 132	1 1/32 26	4 11/64 106	1/2 13	7/16 11	2 3/4 70	1 11/32 34	0.965 24.5	0.295 7.5	3/8 M10	**UP006**	P006	SU006	0.42	13.2	8.25	0.375	14.7	UP006C	UP006CD	44	1 23/32	0.42

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
3. Housing is made from special light alloy.

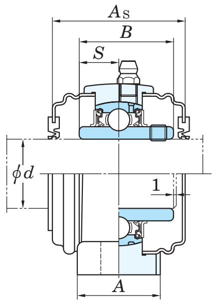
UCSP-S6

Cylindrical bore (with set screws)

d 12 ∼ 65 mm



With Pressed Stainless Steel Covers
(E1)



Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs})

Unit: mm

Housing No.	Δ_{Hs}
SP203~SP210	±0.15
SP211~SP212	±0.2

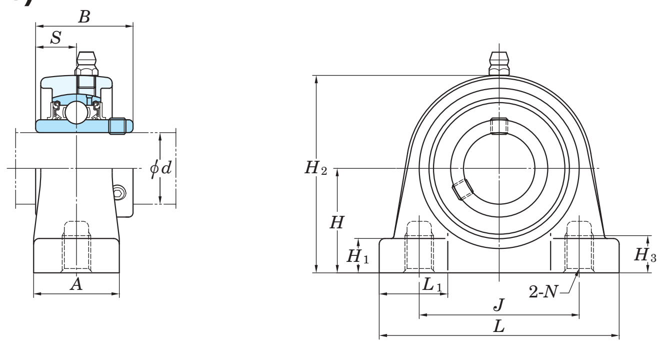
Shaft Dia. mm	Dimensions mm											Bolt Size mm	Standard				Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Stainless Steel Covers			
													Unit No.	Housing No.	Bearing No.	Mass					Unit No.		Dimension mm	Mass
d	H	L	A	J	N	N_1	H_1	H_2	L_1	B	S					kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	A_s	kg
12	30.2	127	30	95	13	18	11	56	37.5	27.4	11.5	M10	**UCSP201XS6**	SP203	UC201XS6	0.47	8.15	3.85	0.175	13.2	–	–	–	0.47
15	30.2	127	30	95	13	18	11	56	37.5	27.4	11.5	M10	**UCSP202XS6**	SP203	UC202XS6	0.47	8.15	3.85	0.175	13.2	–	–	–	0.47
17	30.2	127	30	95	13	18	11	56	37.5	27.4	11.5	M10	**UCSP203XS6**	SP203	UC203XS6	0.47	8.15	3.85	0.175	13.2	–	–	–	0.47
20	33.3	127	30	95	13	18	11	63	33	31	12.7	M10	**UCSP204S6**	SP204	UC204S6	0.6	10.9	5.35	0.243	13.2	UCSP204CS6	UCSP204CDS6	45	0.6
25	36.5	140	30	105	13	19	12	69	36.5	34.1	14.3	M10	**UCSP205S6**	SP205	UC205S6	0.7	11.9	6.30	0.286	13.9	UCSP205CS6	UCSP205CDS6	49	0.7
30	42.9	165	36	121	17	21	13	81	43.5	38.1	15.9	M14	**UCSP206S6**	SP206	UC206S6	1.1	16.5	9.05	0.411	13.9	UCSP206CS6	UCSP206CDS6	53	1.1
35	47.6	167	38	127	17	21	14	91	39	42.9	17.5	M14	**UCSP207S6**	SP207	UC207S6	1.4	21.8	12.3	0.559	13.9	UCSP207CS6	UCSP207CDS6	60	1.4
40	49.2	184	40	137	17	21	14	97	43	49.2	19	M14	**UCSP208S6**	SP208	UC208S6	1.7	24.8	14.3	0.650	14.0	UCSP208CS6	UCSP208CDS6	69	1.7
45	54	190	40	146	17	21	15	104	44	49.2	19	M14	**UCSP209S6**	SP209	UC209S6	2	27.8	16.2	0.736	14.0	UCSP209CS6	UCSP209CDS6	69	2.0
50	57.2	206	45	159	20	22	16	111	48	51.6	19	M16	**UCSP210S6**	SP210	UC210S6	2.5	29.8	18.6	0.845	14.4	UCSP210CS6	UCSP210CDS6	74	2.5
55	63.5	219	48	171	20	22	16	125	47.5	55.6	22.2	M16	**UCSP211S6**	SP211	UC211S6	3.4	36.8	23.5	1.07	14.4	UCSP211CS6	UCSP211CDS6	75	3.4
60	69.8	241	55	184	20	25	17	138	51.5	65.1	25.4	M16	**UCSP212S6**	SP212	UC212S6	4.5	44.5	29.0	1.32	14.4	UCSP212CS6	UCSP212CDS6	88	4.5
65	76.2	265	57	203	25	29	21	150	58	65.1	25.4	M16	**UCSP213S6**	SP213	UC213S6	5.6	48.2	32.1	1.46	14.4	UCSP213CS6	UCSP213CDS6	89	5.6

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of the applicable grease nipple is A-1/4-28UNFN12.
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

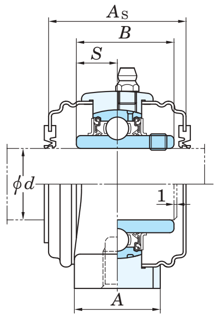
UCSPA-S6

Cylindrical bore (with set screws)

d 12 ～ 50 mm



With Pressed Stainless Steel Covers
(E1)



Variations of tolerance of distance from mounting bottom to center of spherical bore ($\varDelta_{Hs}$) and variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$)

Unit: mm

Housing No.	$\varDelta_{Hs}$	$\varDelta_{Js}$
SPA203~SPA208	±0.15	±0.5

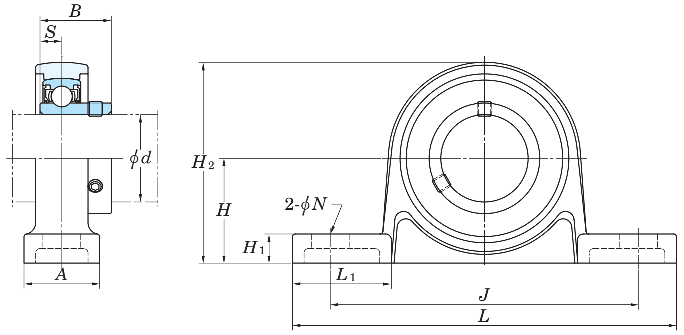
Shaft Dia. mm	Dimensions mm											Standard Unit No.	Housing No.	Bearing No.		Mass	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Stainless Steel Covers Unit No. Open Ends Type	Closed End Type	Dimension mm	Mass
d	H	L	A	J	N	H_1	H_2	H_3	L_1	B	S					kg	C_r	C_{0r}	C_u	f_0			A_s	kg
12	30.2	76	30	52	M10×1.5	10	57	13	22	27.4	11.5	**UCSPA201XS6**	SPA203	UC201XS6		0.43	8.15	3.85	0.175	13.2	–	–	–	0.43
15	30.2	76	30	52	M10×1.5	10	57	13	22	27.4	11.5	**UCSPA202XS6**	SPA203	UC202XS6		0.43	8.15	3.85	0.175	13.2	–	–	–	0.43
17	30.2	76	30	52	M10×1.5	10	57	13	22	27.4	11.5	**UCSPA203XS6**	SPA203	UC203XS6		0.43	8.15	3.85	0.175	13.2	–	–	–	0.43
20	30.2	76	30	52	M10×1.5	10	60	13	22	31	12.7	**UCSPA204S6**	SPA204	UC204S6		0.47	10.9	5.35	0.243	13.2	UCSPA204CS6	UCSPA204CDS6	45	0.47
25	36.5	84	30	56	M10×1.5	12	69	13	24	34.1	14.3	**UCSPA205S6**	SPA205	UC205S6		0.63	11.9	6.30	0.286	13.9	UCSPA205CS6	UCSPA205CDS6	49	0.63
30	42.9	94	36	66	M14×2	12	81	18	28	38.1	15.9	**UCSPA206S6**	SPA206	UC206S6		0.91	16.5	9.05	0.411	13.9	UCSPA206CS6	UCSPA206CDS6	53	0.91
35	47.6	110	38	80	M14×2	13	91	20	30	42.9	17.5	**UCSPA207S6**	SPA207	UC207S6		1.3	21.8	12.3	0.559	13.9	UCSPA207CS6	UCSPA207CDS6	60	1.3
40	49.2	116	40	84	M14×2	13	97	20	32	49.2	19	**UCSPA208S6**	SPA208	UC208S6		1.5	24.8	14.3	0.650	14.0	UCSPA208CS6	UCSPA208CDS6	69	1.5
45	54.2	120	40	90	M14×2	13	104	25	32	49.2	19	**UCSPA209S6**	SPA209	UC209S6		1.82	27.8	16.2	0.736	14.0	UCSPA209CS6	UCSPA209CDS6	69	1.82
50	57.2	130	45	94	M16×2	14	111	25	36	51.6	19	**UCSPA210S6**	SPA210	UC210S6		2.26	29.8	18.6	0.845	14.4	UCSPA210CS6	UCSPA210CDS6	74	2.26

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of the applicable grease nipple is A-1/4-28UNFN12.
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

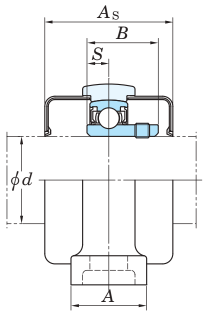
USP-S6

Cylindrical bore (with set screws)

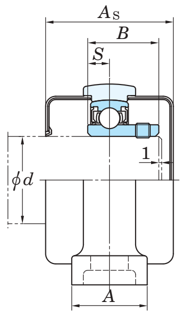
d 10 ～ 30 mm



Open Ends Type



Closed End Type



Variations of tolerance of distance from mounting bottom to center of spherical bore ($\varDelta_{Hs}$) and variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$)

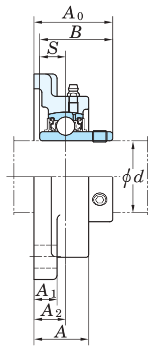
Unit: mm

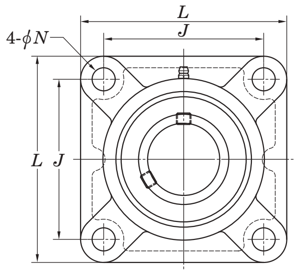
Housing No.	$\varDelta_{Hs}$	$\varDelta_{Js}$
SP000~SP006	±0.15	±0.3

Shaft Dia. mm d	Dimensions inch mm H	L	A	J	N	H_1	H_2	L_1	B	S	Bolt Size inch mm	Standard Unit No.	Housing No.	Bearing No.	Mass kg	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	With Rubber Coated Covers Unit No. Open Ends Type	Closed End Type	Dimension mm A_s	inch A_s	Mass kg
10	45/64 18	2 5/8 67	5/8 16	2 3/32 53	9/32 7	3/16 5	1 3/8 35	23/32 18	0.591 15	0.197 5	1/4 M6	**USP000S6**	SP000	SU000S6	0.076	3.9	1.55	0.070	12.3	USP000CS6	USP000CDS6	29	1 5/32	0.08
12	3/4 19	2 25/32 71	5/8 16	2 7/32 56	9/32 7	3/16 5	1 15/32 37	23/32 18.5	0.591 15	0.197 5	1/4 M6	**USP001S6**	SP001	SU001S6	0.08	4.3	1.9	0.086	13.2	USP001CS6	USP001CDS6	29	1 5/32	0.08
15	55/64 22	3 5/32 80	5/8 16	2 15/32 63	9/32 7	1/4 6	1 11/16 42.5	13/16 20.5	0.650 16.5	0.217 5.5	1/4 M6	**USP002S6**	SP002	SU002S6	0.11	4.7	2.25	0.102	13.9	USP002CS6	USP002CDS6	31	1 7/32	0.11
17	15/16 24	3 11/32 85	23/32 18	2 5/8 67	9/32 7	1/4 6	1 13/16 46	13/16 21	0.689 17.5	0.236 6	1/4 M6	**USP003S6**	SP003	SU003S6	0.14	5.1	2.6	0.118	14.4	USP003CS6	USP003CDS6	33	1 5/16	0.14
20	1 7/64 28	3 15/16 100	25/32 20	3 5/32 80	13/32 10	5/16 8	2 5/32 54.5	31/32 25	0.827 21	0.276 7	5/16 M8	**USP004S6**	SP004	SU004S6	0.23	7.9	4	0.182	13.9	USP004CS6	USP004CDS6	38	1 1/2	0.23
25	1 17/64 32	4 13/32 112	25/32 20	3 17/32 90	13/32 10	11/32 9	2 13/32 61	1 3/32 27.5	0.866 22	0.276 7	5/16 M8	**USP005S6**	SP005	SU005S6	0.28	8.5	4.65	0.211	14.5	USP005CS6	USP005CDS6	40	1 9/16	0.28
30	1 27/64 36	5 3/16 132	1 1/32 26	4 3/16 106	1/2 13	13/32 10	2 23/32 69	1 11/32 34	0.965 24.5	0.295 7.5	3/8 M10	**USP006S6**	SP006	SU006S6	0.43	11.2	6.6	0.300	14.7	USP006CS6	USP006CDS6	44	1 23/32	0.43

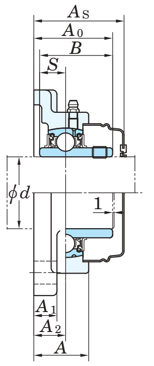
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

UCF
Cylindrical bore (with set screws)
d 12 ~ (45) mm

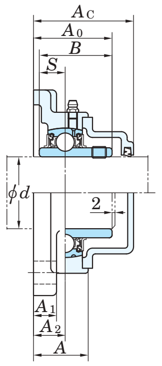


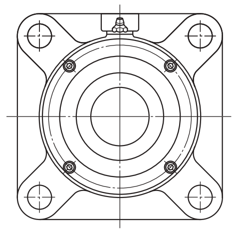


With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			$\varDelta_{A2s}$	X
F204~F210	FX05~FX10	F305~F310	±0.5	0.7
F211~F218	FX11~FX20	F311~F328	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.			$\varDelta_{Ns}$
F204~F218	FX05~FX18	F305~F315	±0.2
	FX20	F316~F328	±0.3

Shaft Dia.		Dimensions									Bolt Size	Standard			Mass	Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Cover					With Cast Iron Cover				
mm	inch	inch mm									inch mm	Unit No.	Housing No.	Bearing No.		kN		kN		Unit No.		Dimension		Mass	Unit No.		Dimension		Mass
d		L	A	J	N	A_1	A_2	A_0	B	S					kg	C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	mm A_s	inch	kg	Open End Type	Closed End Type	mm A_c	inch	kg
12		3 3/8 86	1 25.5	2 33/64 64	15/32 12	7/16 11	19/32 15	1 5/16 33.3	1.220 31	0.500 12.7	3/8 M10	**UCF201**	F204	UC201	0.64	12.8	6.65	0.302	13.2	UCF201C	UCF201D	37.5	1 15/32	0.64	–	–	–	–	–
	1/2											**UCF201-8**		UC201-8	0.64					–	–	–	–	–	–	–	–	–	–
15												**UCF202**		UC202	0.62					UCF202C	UCF202D	37.5	1 15/32	0.62	–	–	–	–	–
	5/8											**UCF202-10**		UC202-10	0.62					–	–	–	–	–	–	–	–	–	–
17												**UCF203**		UC203	0.61					UCF203C	UCF203D	37.5	1 15/32	0.61	–	–	–	–	–
	3/4											**UCF204-12**		UC204-12	0.61					–	–	–	–	–	–	–	–	–	–
20												**UCF204**		UC204	0.59					UCF204C	UCF204D	37.5	1 15/32	0.59	UCF204FC	UCF204FD	46	1 13/16	0.74
25	7/8	3 3/4 95	1 1/16 27	2 3/4 70	15/32 12	1/2 13	5/8 16	1 13/32 35.8	1.343 34.1	0.563 14.3	3/8 M10	**UCF205-14**	F205	UC205-14	0.83	14.0	7.85	0.357	13.9	–	–	–	–	–	–	–	–	–	–
	15/16											**UCF205-15**		UC205-15	0.83					–	–	–	–	–	–	–	–	–	–
												UCF205		UC205	0.83					UCF205C	UCF205D	40.5	1 19/32	0.83	UCF205FC	UCF205FD	49	1 15/16	1.0
	1											**UCF205-16**		UC205-16	0.83					–	–	–	–	–	–	–	–	–	–
		4 1/4 108	1 3/16 30	3 17/64 83	15/32 12	1/2 13	45/64 18	1 19/32 40.2	1.500 38.1	0.626 15.9	3/8 M10	**UCFX05**	FX05	UCX05	1.2	19.5	11.3	0.514	13.9	UCFX05C	UCFX05D	44.5	1 3/4	1.2	–	–	–	–	–
	1											**UCFX05-16**		UCX05-16	1.2					–	–	–	–	–	–	–	–	–	–
		4 11/32 110	1 5/32 29	3 5/32 80	5/8 16	1/2 13	5/8 16	1 17/32 39	1.496 38	0.591 15	1/2 M14	**UCF305**	F305	UC305	1.3	21.2	10.9	0.495	12.6	–	–	–	–	–	UCF305C	UCF305D	54	2 1/8	1.6
	1											**UCF305-16**		UC305-16	1.3					–	–	–	–	–	–	–	–	–	–
30	1 1/8	4 1/4 108	1 7/32 31	3 17/64 83	15/32 12	1/2 13	45/64 18	1 19/32 40.2	1.500 38.1	0.626 15.9	3/8 M10	**UCF206-18**	F206	UC206-18	1.1	19.5	11.3	0.514	13.9	–	–	–	–	–	–	–	–	–	–
												UCF206		UC206	1.1					UCF206C	UCF206D	44.5	1 3/4	1.1	UCF206FC	UCF206FD	53	2 3/32	1.4
	1 3/16											**UCF206-19**		UC206-19	1.1					–	–	–	–	–	–	–	–	–	–
	1 1/4											**UCF206-20**		UC206-20	1.1					–	–	–	–	–	–	–	–	–	–
		4 19/32 117	1 11/32 34	3 5/8 92	5/8 16	9/16 14	3/4 19	1 3/4 44.4	1.689 42.9	0.689 17.5	1/2 M14	**UCFX06**	FX06	UCX06	1.6	25.7	15.4	0.700	13.9	UCFX06C	UCFX06D	49	1 15/16	1.6	–	–	–	–	–
	1 3/16											**UCFX06-19**		UCX06-19	1.6					–	–	–	–	–	–	–	–	–	–
	1 1/4											**UCFX06-20**		UCX06-20	1.6					–	–	–	–	–	–	–	–	–	–
	–	4 29/32 125	1 1/4 32	3 47/64 95	5/8 16	19/32 15	45/64 18	1 23/32 44	1.693 43	0.669 17	1/2 M14	**UCF306**	F306	UC306	1.9	26.7	15.0	0.682	13.3	–	–	–	–	–	UCF306C	UCF306D	59	2 5/16	2.2
35	1 1/4	4 19/32 117	1 11/32 34	3 5/8 92	35/64 14	19/32 15	3/4 19	1 3/4 44.4	1.689 42.9	0.689 17.5	7/16 M12	**UCF207-20**	F207	UC207-20	1.5	25.7	15.4	0.700	13.9	–	–	–	–	–	–	–	–	–	–
	1 5/16											**UCF207-21**		UC207-21	1.5					–	–	–	–	–	–	–	–	–	–
	1 3/8											**UCF207-22**		UC207-22	1.5					–	–	–	–	–	–	–	–	–	–
												UCF207		UC207	1.5					UCF207C	UCF207D	49	1 15/16	1.5	UCF207FC	UCF207FD	58	2 9/32	1.9
	1 7/16											**UCF207-23**		UC207-23	1.5					–	–	–	–	–	–	–	–	–	–
	1 3/8	5 1/8 130	1 1/2 38	4 1/64 102	5/8 16	9/16 14	53/64 21	2 1/32 51.2	1.937 49.2	0.748 19	1/2 M14	**UCFX07-22**	FX07	UCX07-22	2.0	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
												UCFX07		UCX07	2.0					UCFX07C	UCFX07D	55.5	2 3/16	2.0	–	–	–	–	–
	1 7/16											**UCFX07-23**		UCX07-23	2.0					–	–	–	–	–	–	–	–	–	–
	–	5 5/16 135	1 13/32 36	3 15/16 100	3/4 19	5/8 16	25/32 20	1 15/16 49	1.890 48	0.748 19	5/8 M16	**UCF307**	F307	UC307	2.3	33.4	19.3	0.877	13.2	–	–	–	–	–	UCF307C	UCF307D	64	2 17/32	2.7
40	1 1/2	5 1/8 130	1 13/32 36	4 1/64 102	5/8 16	19/32 15	53/64 21	2 1/32 51.2	1.937 49.2	0.748 19	1/2 M14	**UCF208-24**	F208	UC208-24	1.9	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
	1 9/16											**UCF208-25**		UC208-25	1.9					–	–	–	–	–	–	–	–	–	–
												UCF208		UC208	1.9					UCF208C	UCF208D	55.5	2 3/16	1.9	UCF208FC	UCF208FD	64	2 17/32	2.3
	1 1/2	5 13/32 137	1 9/16 40	4 9/64 105	3/4 19	9/16 14	55/64 22	2 1/16 52.2	1.937 49.2	0.748 19	5/8 M16	**UCFX08-24**	FX08	UCX08-24	2.4	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
												UCFX08		UCX08	2.4					UCFX08C	UCFX08D	56.5	2 7/32	2.4	–	–	–	–	–
	1 1/2	5 29/32 150	1 9/16 40	4 13/32 112	3/4 19	21/32 17	29/32 23	2 7/32 56	2.047 52	0.748 19	5/8 M16	**UCF308-24**	F308	UC308-24	3.1	40.7	24.0	1.09	13.2	–	–	–	–	–	–	–	–	–	–
												UCF308		UC308	3.1					–	–	–	–	–	UCF308C	UCF308D	71	2 25/32	3.6
45	1 5/8	5 13/32 137	1 1/2 38	4 9/64 105	5/8 16	5/8 16	55/64 22	2 1/16 52.2	1.937 49.2	0.748 19	1/2 M14	**UCF209-26**	F209	UC209-26	2.2	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
	1 11/16											**UCF209-27**		UC209-27	2.2					–	–	–	–	–	–	–	–	–	–
	1 3/4											**UCF209-28**		UC209-28	2.2					–	–	–	–	–	–	–	–	–	–
												UCF209		UC209	2.2					UCF209C	UCF209D	56.5	2 7/32	2.2	UCF209FC	UCF209FD	66	2 19/32	2.6
	1 3/4	5 5/8 143	1 9/16 40	4 3/8 111	3/4 19	9/16 14	29/32 23	2 3/16 55.6	2.031 51.6	0.748 19	5/8 M16	**UCFX09-28**	FX09	UCX09-28	2.7	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
												UCFX09		UCX09	2.7					UCFX09C	UCFX09D	60	2 3/8	2.7	–	–	–	–	–

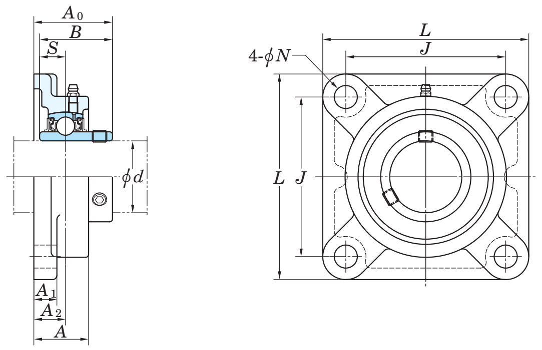
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210, X05~X09, 305~308
A-R1/8.................. 211~218, X10~X20, 309~328

3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCF206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

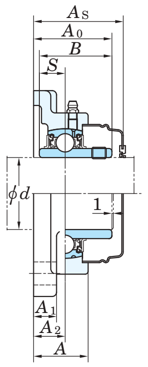
UCF

Cylindrical bore (with set screws)

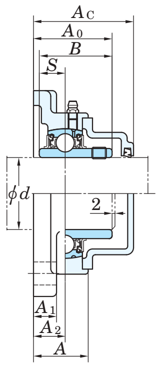
d (45) ~ (75) mm

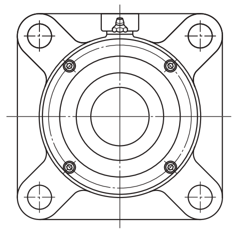


With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			$\varDelta_{A2s}$	X
F204~F210	FX05~FX10	F305~F310	±0.5	0.7
F211~F218	FX11~FX20	F311~F328	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.			$\varDelta_{Ns}$
F204~F218	FX05~FX18	F305~F315	±0.2
	FX20	F316~F328	±0.3

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm									Bolt Size inch mm	Standard Unit No.	Housing No.	Bearing No.	Mass	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Cover Unit No.		Dimension mm inch		Mass	With Cast Iron Cover Unit No.		Dimension mm inch		Mass
d		L	A	J	N	A_1	A_2	A_0	B	S					kg	C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	A_s mm	A_s inch	kg	Open End Type	Closed End Type	A_c mm	A_c inch	kg
45	1 3/4	6 5/16 160	1 23/32 44	4 59/64 125	3/4 19	23/32 18	63/64 25	2 3/8 60	2.244 57	0.866 22	5/8 M16	**UCF309-28**	F309	UC309-28	4.0	48.9	29.5	1.34	13.3	–	–	–	–	–	–	–	–	–	–
												UCF309		UC309	4.0					–	–	–	–	–	UCF309C	UCF309D	76	3	4.6
50	1 7/8	5 5/8 143	1 9/16 40	4 3/8 111	5/8 16	5/8 16	55/64 22	2 5/32 54.6	2.031 51.6	0.748 19	1/2 M14	**UCF210-30**	F210	UC210-30	2.5	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
	1 15/16											**UCF210-31**		UC210-31	2.5					–	–	–	–	–	–	–	–	–	–
												UCF210		UC210	2.5					UCF210C	UCF210D	59	2 5/16	2.5	UCF210FC	UCF210FD	70.5	2 25/32	3.0
	2											**UCF210-32**		UC210-32	2.5					–	–	–	–	–	–	–	–	–	–
	1 15/16	6 3/8 162	1 23/32 44	5 1/8 130	3/4 19	25/32 20	1 1/32 26	2 11/32 59.4	2.189 55.6	0.874 22.2	5/8 M16	**UCFX10-31**	FX10	UCX10-31	3.7	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
												UCFX10		UCX10	3.7					UCFX10C	UCFX10D	64	2 17/32	3.7	–	–	–	–	–
	2											**UCFX10-32**		UCX10-32	3.7					–	–	–	–	–	–	–	–	–	–
	–	6 7/8 175	1 7/8 48	5 13/64 132	29/32 23	3/4 19	1 7/64 28	2 5/8 67	2.402 61	0.866 22	3/4 M20	**UCF310**	F310	UC310	5.1	62.0	38.3	1.74	13.2	–	–	–	–	–	UCF310C	UCF310D	83	3 9/32	5.9
55	2	6 3/8 162	1 11/16 43	5 1/8 130	3/4 19	23/32 18	63/64 25	2 5/16 58.4	2.189 55.6	0.874 22.2	5/8 M16	**UCF211-32**	F211	UC211-32	3.4	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
	2 1/8											**UCF211-34**		UC211-34	3.4					–	–	–	–	–	–	–	–	–	–
												UCF211		UC211	3.4					UCF211C	UCF211D	63	2 15/32	3.4	UCF211FC	UCF211FD	74.5	2 15/16	4.0
	2 3/16											**UCF211-35**		UC211-35	3.4					–	–	–	–	–	–	–	–	–	–
		6 7/8 175	1 15/16 49	5 5/8 143	3/4 19	25/32 20	1 9/64 29	2 23/32 68.7	2.563 65.1	1.000 25.4	5/8 M16	**UCFX11**	FX11	UCX11	4.9	52.4	36.2	1.65	14.4	UCFX11C	UCFX11D	73.5	2 29/32	4.9	–	–	–	–	–
	2 3/16											**UCFX11-35**		UCX11-35	4.9					–	–	–	–	–	–	–	–	–	–
	2 1/4											**UCFX11-36**		UCX11-36	4.9					–	–	–	–	–	–	–	–	–	–
	2	7 9/32 185	2 1/16 52	5 33/64 140	29/32 23	25/32 20	1 3/16 30	2 25/32 71	2.598 66	0.984 25	3/4 M20	**UCF311-32**	F311	UC311-32	5.6	71.6	45.0	2.05	13.2	–	–	–	–	–	–	–	–	–	–
												UCF311		UC311	5.6					–	–	–	–	–	UCF311C	UCF311D	87	3 7/16	6.5
60	2 1/4	6 7/8 175	1 7/8 48	5 5/8 143	3/4 19	23/32 18	1 9/64 29	2 23/32 68.7	2.563 65.1	1.000 25.4	5/8 M16	**UCF212-36**	F212	UC212-36	4.2	52.4	36.2	1.65	14.4	–	–	–	–	–	–	–	–	–	–
												UCF212		UC212	4.2					UCF212C	UCF212D	73.5	2 29/32	4.2	UCF212FC	UCF212FD	86	3 3/8	5.0
	2 3/8											**UCF212-38**		UC212-38	4.2					–	–	–	–	–	–	–	–	–	–
	2 7/16											**UCF212-39**		UC212-39	4.2					–	–	–	–	–	–	–	–	–	–
		7 3/8 187	2 5/16 59	5 55/64 149	3/4 19	13/16 21	1 11/32 34	2 29/32 73.7	2.563 65.1	1.000 25.4	5/8 M16	**UCFX12**	FX12	UCX12	5.7	57.2	40.1	1.82	14.4	UCFX12C	UCFX12D	78.5	3 3/32	5.7	–	–	–	–	–
	2 7/16											**UCFX12-39**		UCX12-39	5.7					–	–	–	–	–	–	–	–	–	–
	–	7 11/16 195	2 7/32 56	5 29/32 150	29/32 23	7/8 22	1 19/64 33	3 1/16 78	2.795 71	1.024 26	3/4 M20	**UCF312**	F312	UC312	6.9	81.9	52.2	2.37	13.2	–	–	–	–	–	UCF312C	UCF312D	95	3 3/4	8.1
65	2 1/2	7 3/8 187	1 31/32 50	5 55/64 149	3/4 19	7/8 22	1 3/16 30	2 3/4 69.7	2.563 65.1	1.000 25.4	5/8 M16	**UCF213-40**	F213	UC213-40	5.2	57.2	40.1	1.82	14.4	–	–	–	–	–	–	–	–	–	–
												UCF213		UC213	5.2					UCF213C	UCF213D	74.5	2 15/16	5.2	UCF213FC	UCF213FD	87	3 7/16	6.0
	2 1/2	7 3/8 187	2 5/16 59	5 55/64 149	3/4 19	13/16 21	1 11/32 34	3 3/32 78.4	2.937 74.6	1.189 30.2	5/8 M16	**UCFX13-40**	FX13	UCX13-40	6.3	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
												UCFX13		UCX13	6.3					UCFX13C	UCFX13D	83.5	3 9/32	6.3	–	–	–	–	–
	2 1/2	8 3/16 208	2 9/32 58	6 17/32 166	29/32 23	7/8 22	1 19/64 33	3 1/16 78	2.953 75	1.181 30	3/4 M20	**UCF313-40**	F313	UC313-40	7.8	92.7	59.9	2.68	13.2	–	–	–	–	–	–	–	–	–	–
												UCF313		UC313	7.8					–	–	–	–	–	UCF313C	UCF313D	94	3 11/16	8.9
70	2 3/4	7 19/32 193	2 1/8 54	5 63/64 152	3/4 19	7/8 22	1 7/32 31	2 31/32 75.4	2.937 74.6	1.189 30.2	5/8 M16	**UCF214-44**	F214	UC214-44	5.9	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
												UCF214		UC214	5.9					UCF214C	UCF214D	80.5	3 5/32	5.9	UCF214FC	UCF214FD	93	3 21/32	6.8
	2 3/4	7 3/4 197	2 3/8 60	5 63/64 152	29/32 23	7/8 22	1 29/64 37	3 7/32 81.5	3.063 77.8	1.331 33.3	3/4 M20	**UCFX14-44**	FX14	UCX14-44	7.0	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
												UCFX14		UCX14	7.0					UCFX14C	UCFX14D	86.5	3 13/32	7.0	–	–	–	–	–
	2 3/4	8 29/32 226	2 13/32 61	7 1/64 178	63/64 25	31/32 25	1 27/64 36	3 3/16 81	3.071 78	1.299 33	7/8 M22	**UCF314-44**	F314	UC314-44	10.1	104	68.2	2.96	13.2	–	–	–	–	–	–	–	–	–	–
												UCF314		UC314	10.1					–	–	–	–	–	UCF314C	UCF314D	98	3 27/32	11.2
75	2 15/16	7 7/8 200	2 7/32 56	6 17/64 159	3/4 19	7/8 22	1 11/32 34	3 3/32 78.5	3.063 77.8	1.311 33.3	5/8 M16	**UCF215-47**	F215	UC215-47	6.4	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
												UCF215		UC215	6.4					UCF215C	UCF215D	83.5	3 9/32	6.4	UCF215FC	UCF215FD	96	3 25/32	7.4
	3											**UCF215-48**		UC215-48	6.4					–	–	–	–	–	–	–	–	–	–
	2 15/16	7 3/4 197	2 11/16 68	5 63/64 152	29/32 23	15/16 24	1 9/16 40	3 17/32 89.3	3.252 82.6	1.311 33.3	3/4 M20	**UCFX15-47**	FX15	UCX15-47	8.4	72.7	53.0	2.30	14.6	–	–	–	–	–	–	–	–	–	–
												UCFX15		UCX15	8.4					UCFX15C	UCFX15D	94.5	3 23/32	8.4	–	–	–	–	–
	3											**UCFX15-48**		UCX15-48	8.4					–	–	–	–	–	–	–	–	–	–

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10~X20, 309~328

3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCF206JL3, UC206L3)

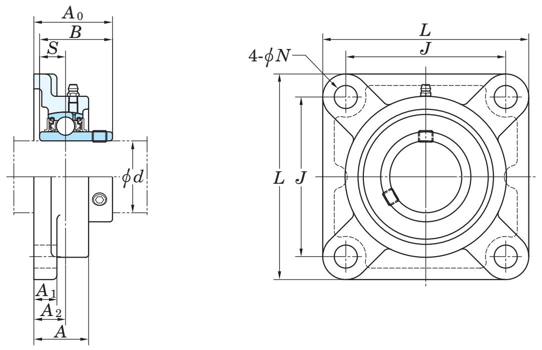
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

5. Housings of spheroidal graphite iron casting are also available.

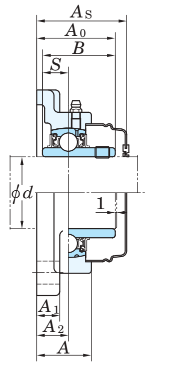
UCF

Cylindrical bore (with set screws)

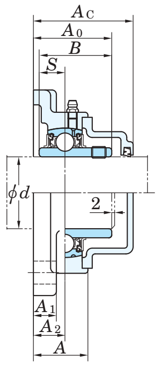
d (75) ~ 140 mm

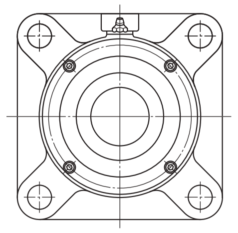


With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			Δ_{A2s}	X
F204~F210	FX05~FX10	F305~F310	±0.5	0.7
F211~F218	FX11~FX20	F311~F328	±0.8	1

Variations of tolerance of bolt hole diameter (Δ_{Ns})

Unit: mm

Housing No.			Δ_{Ns}
F204~F218	FX05~FX18	F305~F315	±0.2
	FX20	F316~F328	±0.3

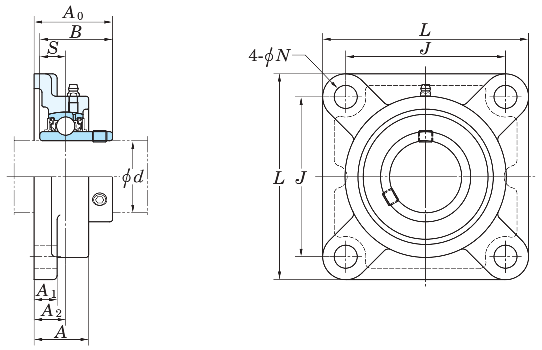
Shaft Dia.		Dimensions									Bolt Size	Standard			Mass	Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Cover					With Cast Iron Cover				
mm	inch	inch mm									inch mm	Unit No.	Housing No.	Bearing No.	kg	kN		kN		Unit No.		Dimension		Mass	Unit No.		Dimension		Mass
d		L	A	J	N	A_1	A_2	A_0	B	S						C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	A_s mm	A_s inch	kg	Open End Type	Closed End Type	A_c mm	A_c inch	kg
75	2 15/16 3	9 9/32 236	2 19/32 66	7 1/4 184	63/64 25	31/32 25	1 17/32 39	3 1/2 89	3.228 82	1.260 32	7/8 M22	**UCF315-47** **UCF315** **UCF315-48**	F315	UC315-47 UC315 UC315-48	11.6 11.6 11.6	113	77.2	3.24	13.2	– – –	– – –	– – –	– – –	– – –	– UCF315C –	– UCF315D –	– 106 –	– 4 3/16 –	– 12.9 –
80	3 1/8	8 3/16 208	2 9/32 58	6 1/2 165	29/32 23	7/8 22	1 11/32 34	3 9/32 83.3	3.252 82.6	1.311 33.3	3/4 M20	**UCF216-50** **UCF216**	F216	UC216-50 UC216	7.3 7.3	72.7	53.0	2.30	14.6	– UCF216C	– UCF216D	– 88.5	– 3 15/32	– 7.3	– UCF216FC	– UCF216FD	– 103	– 4 1/16	– 8.5
	–	8 7/16 214	2 3/4 70	6 47/64 171	29/32 23	15/16 24	1 9/16 40	3 19/32 91.6	3.374 85.7	1.343 34.1	3/4 M20	**UCFX16**	FX16	UCX16	9.4	84.0	61.9	2.60	14.5	UCFX16C	UCFX16D	96.5	3 13/16	9.4	–	–	–	–	–
	–	9 27/32 250	2 11/16 68	7 23/32 196	1 7/32 31	1 1/16 27	1 1/2 38	3 17/32 90	3.386 86	1.339 34	1 M27	**UCF316**	F316	UC316	12.8	123	86.7	3.53	13.3	–	–	–	–	–	UCF316C	UCF316D	107	4 7/32	14.2
85	3 1/4	8 21/32 220	2 15/32 63	6 57/64 175	29/32 23	15/16 24	1 13/32 36	3 7/16 87.6	3.374 85.7	1.343 34.1	3/4 M20	**UCF217-52** **UCF217**	F217	UC217-52 UC217	8.9 8.9	84.0	61.9	2.60	14.5	– UCF217C	– UCF217D	– 92.5	– 3 21/32	– 8.9	– UCF217FC	– UCF217FD	– 107	– 4 7/32	– 10.3
	3 7/16	8 7/16 214	2 3/4 70	6 47/64 171	29/32 23	15/16 24	1 9/16 40	3 25/32 96.3	3.780 96	1.563 39.7	3/4 M20	**UCFX17** **UCFX17-55**	FX17	UCX17 UCX17-55	10.8 10.8	96.1	71.5	2.91	14.5	UCFX17C –	UCFX17D –	101.5 –	4 –	10.8 –	– –	– –	– –	– –	– –
	–	10 1/4 260	2 29/32 74	8 1/32 204	1 7/32 31	1 1/16 27	1 47/64 44	3 15/16 100	3.780 96	1.575 40	1 M27	**UCF317**	F317	UC317	15.3	133	96.8	3.82	13.3	–	–	–	–	–	UCF317C	UCF317D	117	4 19/32	16.9
90	3 1/2	9 1/4 235	2 11/16 68	7 23/64 187	29/32 23	31/32 25	1 9/16 40	3 25/32 96.3	3.780 96	1.563 39.7	3/4 M20	**UCF218-56** **UCF218**	F218	UC218-56 UC218	11.4 11.4	96.1	71.5	2.91	14.5	– UCF218C	– UCF218D	– 101.5	– 4	– 11.4	– UCF218FC	– UCF218FD	– 116	– 4 9/16	– 12.9
	–	8 7/16 214	3 76	6 47/64 171	29/32 23	15/16 24	1 49/64 45	4 3/16 106.1	4.094 104	1.689 42.9	3/4 M20	**UCFX18**	FX18	UCX18	11.9	109	81.9	3.23	14.4	–	–	–	–	–	UCFX18C	UCFX18D	124	4 7/8	13.6
	3 1/2	11 1/32 280	3 76	8 1/2 216	1 3/8 35	1 3/16 30	1 47/64 44	3 15/16 100	3.780 96	1.575 40	1 1/8 M30	**UCF318-56** **UCF318**	F318	UC318-56 UC318	18.9 18.9	143	107	4.11	13.3	– –	– –	– –	– –	– –	– UCF318C	– UCF318D	– 119	– 4 11/16	– 20.8
95	–	11 13/32 290	3 11/16 94	8 31/32 228	1 3/8 35	1 3/16 30	2 21/64 59	4 3/4 121	4.055 103	1.614 41	1 1/8 M30	**UCF319**	F319	UC319	21.6	153	119	4.45	13.3	–	–	–	–	–	UCF319C	UCF319D	140	5 1/2	23.8
100	3 15/16 4	10 9/16 268	3 13/16 97	8 5/16 211	1 7/32 31	1 3/32 28	2 21/64 59	5 127.3	4.626 117.5	1.937 49.2	1 M27	**UCFX20** **UCFX20-63** **UCFX20-64**	FX20	UCX20 UCX20-63 UCX20-64	19.4 19.4 19.4	133	105	3.91	14.4	– – –	– – –	– – –	– – –	– – –	UCFX20C – –	UCFX20D – –	152 – –	5 31/32 – –	21.6 – –
	3 15/16 4	12 7/32 310	3 11/16 94	9 17/32 242	1 1/2 38	1 1/4 32	2 21/64 59	4 29/32 125	4.252 108	1.654 42	1 1/4 M33	**UCF320** **UCF320-63** **UCF320-64**	F320	UC320 UC320-63 UC320-64	25.8 25.8 25.8	173	141	5.08	13.2	– – –	– – –	– – –	– – –	– – –	UCF320C – –	UCF320D – –	146 – –	5 3/4 – –	28.6 – –
105	–	12 7/32 310	3 11/16 94	9 17/32 242	1 1/2 38	1 1/4 32	2 21/64 59	5 127	4.409 112	1.732 44	1 1/4 M33	**UCF321**	F321	UC321	30.2	184	153	5.41	13.2	–	–	–	–	–	UCF321C	UCF321D	148	5 13/16	33.2
110	–	13 3/8 340	3 25/32 96	10 15/32 266	1 39/64 41	1 3/8 35	2 23/64 60	5 5/32 131	4.606 117	1.811 46	1 3/8 M36	**UCF322**	F322	UC322	35.3	205	180	6.15	13.2	–	–	–	–	–	UCF322C	UCF322D	154	6 1/16	41.7
120	–	14 9/16 370	4 11/32 110	11 27/64 290	1 39/64 41	1 9/16 40	2 9/16 65	5 1/2 140	4.961 126	2.008 51	1 3/8 M36	**UCF324**	F324	UC324	47.3	207	185	6.10	13.5	–	–	–	–	–	UCF324C	UCF324D	163	6 13/32	52.1
130	–	16 5/32 410	4 17/32 115	12 19/32 320	1 39/64 41	1 25/32 45	2 9/16 65	5 3/4 146	5.315 135	2.126 54	1 3/8 M36	**UCF326**	F326	UC326	65.5	229	214	6.79	13.6	–	–	–	–	–	UCF326C	UCF326D	172	6 25/32	71.6
140	–	17 23/32 450	4 29/32 125	13 25/32 350	1 39/64 41	2 5/32 55	2 61/64 75	6 11/32 161	5.709 145	2.323 59	1 3/8 M36	**UCF328**	F328	UC328	80.4	253	246	7.54	13.6	–	–	–	–	–	UCF328C	UCF328D	186	7 5/16	89

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10~X20, 309~328
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCF206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

UCF-E

Cylindrical bore (with set screws)

d 12 ~ 55 mm



Variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.		Δ_{A2s}	X
F204E~F210E	FX05E~FX10E	±0.5	0.7
F211E~F217E	FX11E~FX17E	±0.8	1

Variations of tolerance of bolt hole diameter (Δ_{Ns})

Unit: mm

Housing No.		Δ_{Ns}
F204E~F217E	FX05E~FX17E	±0.2

Shaft Dia.		Dimensions									Bolt Size	Unit No.	Housing No.	Bearing No.	Basic Load Ratings		Fatigue Load Limit	Factor	Mass
mm	inch	inch mm									inch				kN		kN		
d		L	A	J	N	A_1	A_2	A_0	B	S					C_r	C_{0r}	C_u	f_0	kg
12		3 3/8 86	1 25.5	2 33/64 64	7/16 11	7/16 11	19/32 15	1 5/16 33.3	1.220 31	0.500 12.7	3/8	UCF201E	F204E	UC201	12.8	6.65	0.302	13.2	0.64
	1/2											UCF201-8E		UC201-8					
15												UCF202E		UC202					0.62
	5/8											UCF202-10E		UC202-10					
17												UCF203E		UC203					0.61
	3/4											UCF204-12E		UC204-12					
20												UCF204E		UC204					0.59
25	7/8	3 3/4 95	1 1/16 27	2 3/4 70	15/32 12	1/2 13	5/8 16	1 13/32 35.8	1.343 34.1	0.563 14.3	3/8	UCF205-14E	F205E	UC205-14	14.0	7.85	0.357	13.9	0.83
	15/16											UCF205-15E		UC205-15					
												UCF205E		UC205					
	1											UCF205-16E		UC205-16					
		4 1/4 108	1 3/16 30	3 17/64 83	15/32 12	1/2 13	45/64 18	1 19/32 40.2	1.500 38.1	0.626 15.9	3/8	UCFX05E	FX05E	UCX05	19.5	11.3	0.514	13.9	1.2
	1											UCFX05-16E		UCX05-16					
30	1 1/8	4 1/4 108	1 7/32 31	3 17/64 83	33/64 13	1/2 13	45/64 18	1 19/32 40.2	1.500 38.1	0.626 15.9	7/16	UCF206-18E	F206E	UC206-18	19.5	11.3	0.514	13.9	1.1
												UCF206E		UC206					
	1 3/16											UCF206-19E		UC206-19					
	1 1/4											UCF206-20E		UC206-20					
		4 19/32 117	1 11/32 34	3 5/8 92	33/64 13	9/16 14	3/4 19	1 3/4 44.4	1.689 42.9	0.689 17.5	7/16	UCFX06E	FX06E	UCX06	25.7	15.4	0.700	13.9	1.6
	1 3/16											UCFX06-19E		UCX06-19					
	1 1/4											UCFX06-20E		UCX06-20					
35	1 1/4	4 19/32 117	1 11/32 34	3 5/8 92	33/64 13	19/32 15	3/4 19	1 3/4 44.4	1.689 42.9	0.689 17.5	7/16	UCF207-20E	F207E	UC207-20	25.7	15.4	0.700	13.9	1.5
	1 5/16											UCF207-21E		UC207-21					
	1 3/8											UCF207-22E		UC207-22					
												UCF207E		UC207					
	1 7/16											UCF207-23E		UC207-23					
	1 3/8	5 1/8 130	1 1/2 38	4 1/64 102	33/64 13	9/16 14	53/64 21	2 1/32 51.2	1.937 49.2	0.748 19	7/16	UCFX07-22E	FX07E	UCX07-22	29.1	17.8	0.809	14.0	2.0
												UCFX07E		UCX07					
	1 7/16											UCFX07-23E		UCX07-23					
40	1 1/2	5 1/8 130	1 13/32 36	4 1/64 102	35/64 14	19/32 15	53/64 21	2 1/32 51.2	1.937 49.2	0.748 19	1/2	UCF208-24E	F208E	UC208-24	29.1	17.8	0.809	14.0	1.9
	1 9/16											UCF208-25E		UC208-25					
												UCF208E		UC208					
	1 1/2	5 13/32 137	1 9/16 40	4 9/64 105	19/32 15	9/16 14	55/64 22	2 1/16 52.2	1.937 49.2	0.748 19	1/2	UCFX08-24E	FX08E	UCX08-24	34.1	21.3	0.968	14.0	2.4
												UCFX08E		UCX08					
45	1 3/4	5 5/8 143	1 9/16 40	4 3/8 111	19/32 15	9/16 14	29/32 23	2 3/16 55.6	2.031 51.6	0.748 19	1/2	UCFX09-28E	FX09E	UCX09-28	35.1	23.3	1.06	14.4	2.7
												UCFX09E		UCX09					
50	1 15/16	6 3/8 162	1 23/32 44	5 1/8 130	21/32 16.5	25/32 20	1 1/32 26	2 11/32 59.4	2.189 55.6	0.874 22.2	9/16	UCFX10-31E	FX10E	UCX10-31	43.4	29.4	1.34	14.4	3.7
												UCFX10E		UCX10					
	2											UCFX10-32E		UCX10-32					
55	2	6 3/8 162	1 11/16 43	5 1/8 130	43/64 17	23/32 18	63/64 25	2 5/16 58.4	2.189 55.6	0.874 22.2	5/8	UCF211-32E	F211E	UC211-32	43.4	29.4	1.34	14.4	3.4
	2 1/8											UCF211-34E		UC211-34					
												UCF211E		UC211					
	2 3/16											UCF211-35E		UC211-35					
		6 7/8 175	1 15/16 49	5 5/8 143	21/32 16.5	25/32 20	1 9/64 29	2 23/32 68.7	2.563 65.1	1.000 25.4	9/16	UCFX11E	FX11E	UCX11	52.4	36.2	1.65	14.4	4.9
	2 3/16											UCFX11-35E		UCX11-35					
	2 1/4											UCFX11-36E		UCX11-36					

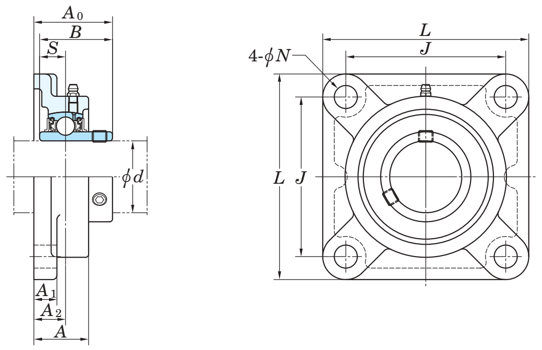
Remarks 1. In Part No. of unit, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210, X05~X09
A-R1/8.................. 211~217, X10~X17

3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCF206EJL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

UCF-E

Cylindrical bore (with set screws)

d 60 ~ 85 mm



Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.		$\varDelta_{A2s}$	X
F204E~F210E	FX05E~FX10E	±0.5	0.7
F211E~F217E	FX11E~FX17E	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

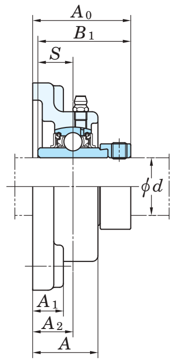
Unit: mm

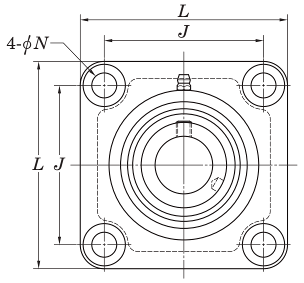
Housing No.		$\varDelta_{Ns}$
F204E~F217E	FX05E~FX17E	±0.2

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm									Bolt Size inch	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		L	A	J	N	A_1	A_2	A_0	B	S					C_r	C_{0r}	C_u	f_0	kg
60	2 1/4 2 3/8 2 7/16	6 7/8 175	1 7/8 48	5 5/8 143	43/64 17	23/32 18	1 9/64 29	2 23/32 68.7	2.563 65.1	1.000 25.4	5/8	UCF212-36E UCF212E UCF212-38E UCF212-39E	F212E	UC212-36 UC212 UC212-38 UC212-39	52.4	36.2	1.65	14.4	4.2
	2 7/16	7 3/8 187	2 5/16 59	5 55/64 149	21/32 16.5	13/16 21	1 11/32 34	2 29/32 73.7	2.563 65.1	1.000 25.4	9/16	UCFX12E UCFX12-39E	FX12E	UCX12 UCX12-39	57.2	40.1	1.82	14.4	5.7
65	2 1/2	7 3/8 187	1 31/32 50	5 55/64 149	43/64 17	7/8 22	1 3/16 30	2 3/4 69.7	2.563 65.1	1.000 25.4	5/8	UCF213-40E UCF213E	F213E	UC213-40 UC213	57.2	40.1	1.82	14.4	5.2
	2 1/2	7 3/8 187	1 31/32 59	5 55/64 149	21/32 16.5	13/16 21	1 11/32 34	3 3/32 78.4	2.937 74.6	1.189 30.2	9/16	UCFX13-40E UCFX13E	FX13E	UCX13-40 UCX13	62.2	44.1	2.01	14.5	6.3
70	2 3/4	7 3/4 197	2 3/8 60	5 63/64 152	25/32 20	7/8 22	1 29/64 37	3 7/32 81.5	3.063 77.8	1.331 33.3	11/16	UCFX14-44E UCFX14E	FX14E	UCX14-44 UCX14	67.4	48.3	2.17	14.5	7.0
75	2 15/16 3	7 3/4 197	2 11/16 68	5 63/64 152	25/32 20	15/16 24	1 9/16 40	3 17/32 89.3	3.252 82.6	1.311 33.3	11/16	UCFX15-47E UCFX15E UCFX15-48E	FX15E	UCX15-47 UCX15 UCX15-48	72.7	53.0	2.30	14.6	8.4
80	3 1/8	8 3/16 208	2 9/32 58	6 1/2 165	3/4 19	7/8 22	1 11/32 34	3 9/32 83.3	3.252 82.6	1.311 33.3	11/16	UCF216-50E UCF216E	F216E	UC216-50 UC216	72.7	53.0	2.30	14.6	7.3
	–	8 7/16 214	2 3/4 70	6 47/64 171	25/32 20	15/16 24	1 9/16 40	3 19/32 91.6	3.374 85.7	1.343 34.1	11/16	UCFX16E	FX16E	UCX16	84.0	61.9	2.60	14.5	9.4
85	3 1/4	8 21/32 220	2 15/32 63	6 57/64 175	3/4 19	15/16 24	1 13/32 36	3 7/16 87.6	3.374 85.7	1.343 34.1	11/16	UCF217-52E UCF217E	F217E	UC217-52 UC217	84.0	61.9	2.60	14.5	8.9
	3 7/16	8 7/16 214	2 3/4 70	6 47/64 171	25/32 20	15/16 24	1 9/16 40	3 25/32 96.3	3.780 96	1.563 39.7	11/16	UCFX17E UCFX17-55E	FX17E	UCX17 UCX17-55	96.1	71.5	2.91	14.5	10.8

Remarks 1. In Part No. of unit, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210, X05~X09
A-R1/8.................. 211~217, X10~X17
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCF206EJL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

NANF
Cylindrical bore
(with eccentric locking collar)
d 12 ~ 60 mm





Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.	$\varDelta_{A2s}$	X
NF204~NF210	±0.5	0.7
NF211~NF212	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
NF204~NF212	±0.2

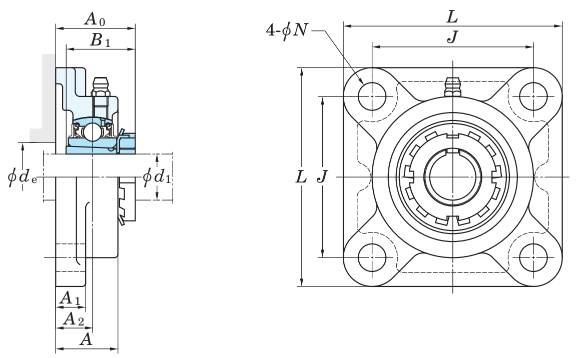
Shaft Dia mm	inch	Dimensions inch mm									Bolt Size inch	Unit No.	Housing No.	Bearing No.		Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		L	A	J	N	A_1	A_2	A_0	B_1	S						C_r	C_{0r}	C_u	f_0	kg
12		3 3/8 86	1 5/32 29.5	2 33/64 64	7/16 11	19/32 15	3/4 19	1 25/32 45.6	1.720 43.7	0.673 17.1	3/8	**NANF201**	NF204	NA201		12.8	6.65	0.302	13.2	0.73
	1/2											**NANF201-8**		NA201-8						
15												**NANF202**		NA202						
	5/8											**NANF202-10**		NA202-10						
17												**NANF203**		NA203						
	3/4											**NANF204-12**		NA204-12						
20												**NANF204**		NA204						
25	7/8	3 3/4 95	1 7/32 31	2 3/4 70	15/32 12	19/32 15	25/32 20	1 27/32 46.9	1.748 44.4	0.689 17.5	7/16	**NANF205-14**	NF205	NA205-14		14.0	7.85	0.357	13.9	0.95
	15/16											**NANF205-15**		NA205-15						
												NANF205		NA205						
	1											**NANF205-16**		NA205-16						
30	1 1/8	4 1/4 108	1 11/32 34	3 17/64 83	33/64 13	5/8 16	53/64 21	2 51.1	1.906 48.4	0.720 18.3	7/16	**NANF206-18**	NF206	NA206-18		19.5	11.3	0.514	13.9	1.4
												NANF206		NA206						
	1 3/16											**NANF206-19**		NA206-19						
	1 1/4											**NANF206-20**		NA206-20						
35	1 1/4	4 19/32 117	1 7/16 36.5	3 5/8 92	33/64 13	21/32 17	27/32 21.5	2 1/8 53.8	2.012 51.1	0.740 18.8	7/16	**NANF207-20**	NF207	NA207-20		25.7	15.4	0.700	13.9	1.8
	1 5/16											**NANF207-21**		NA207-21						
	1 3/8											**NANF207-22**		NA207-22						
												NANF207		NA207						
	1 7/16											**NANF207-23**		NA207-23						
40	1 1/2	5 1/8 130	1 17/32 39	4 1/64 102	35/64 14	21/32 17	15/16 24	2 5/16 58.9	2.217 56.3	0.843 21.4	1/2	**NANF208-24**	NF208	NA208-24		29.1	17.8	0.809	14.0	2.2
	1 9/16											**NANF208-25**		NA208-25						
												NANF208		NA208						
45	1 5/8	5 13/32 137	1 9/16 40	4 9/64 105	5/8 16	23/32 18	15/16 24	2 5/16 58.9	2.217 56.3	0.843 21.4	9/16	**NANF209-26**	NF209	NA209-26		34.1	21.3	0.968	14.0	2.6
	1 11/16											**NANF209-27**		NA209-27						
	1 3/4											**NANF209-28**		NA209-28						
												NANF209		NA209						
50	1 7/8	5 5/8 143	1 27/32 46.5	4 3/8 111	43/64 17	25/32 20	1 1/8 28.5	2 5/8 66.6	2.469 62.7	0.969 24.6	9/16	**NANF210-30**	NF210	NA210-30		35.1	23.3	1.06	14.4	3.0
	1 15/16											**NANF210-31**		NA210-31						
												NANF210		NA210						
	2											**NANF210-32**		NA210-32						
55	2	6 3/8 162	1 31/32 50	5 1/8 130	43/64 17	13/16 21	1 17/64 32	2 31/32 75.6	2.811 71.4	1.094 27.8	5/8	**NANF211-32**	NF211	NA211-32		43.4	29.4	1.34	14.4	4.1
	2 1/8											**NANF211-34**		NA211-34						
												NANF211		NA211						
	2 3/16											**NANF211-35**		NA211-35						
60	2 1/4	6 7/8 175	2 5/32 55	5 5/8 143	43/64 17	13/16 21	1 27/64 36	3 1/4 82.8	3.063 77.8	1.220 31	5/8	**NANF212-36**	NF212	NA212-36		52.4	36.2	1.65	14.4	4.9
												NANF212		NA212						
	2 3/8											**NANF212-38**		NA212-38						
	2 7/16											**NANF212-39**		NA212-39						

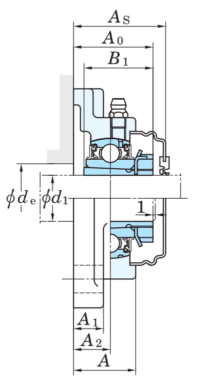
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210
A-R1/8 .... 211~212
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
4. Housings of spheroidal graphite iron casting are also available.

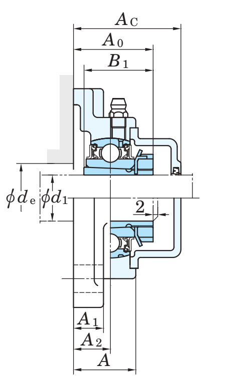
UKF

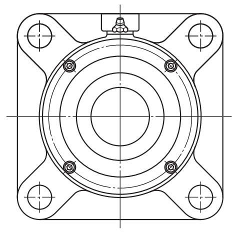
Tapered bore (with adapter)

d_1 20 ~ (50) mm




With Pressed Steel Cover (E1)


With Cast Iron Cover (E3)


Cast iron cover fixing screw position (standard)

Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			$\varDelta_{A2s}$	X
F205~F210	FX05~FX10	F305~F310	±0.5	0.7
F211~F218	FX11~FX20	F311~F328	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.			$\varDelta_{Ns}$
F205~F218	FX05~FX18	F305~F315	±0.2
	FX20	F316~F328	±0.3

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm									Bolt Size inch / mm	Standard					Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Cover					With Cast Iron Cover				
												Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass					Unit No.		Dimension		Mass	Unit No.		Dimension		Mass
d_1		L	A	J	N	A_1	A_2	A_0	B_1	d_e (min.)						kg	C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	A_s mm	A_s inch	kg	Open End Type	Closed End Type	A_c mm	A_c inch	kg
20	3/4	3 3/4 95	1 1/16 27	2 3/4 70	15/32 12	1/2 13	5/8 16	1 13/32 36	1 3/8 35	1 3/16 30	3/8 M10	UKF205	F205	UK205	HE2305X H2305X	0.87 0.87	14.0	7.85	0.357	13.9	– UKF205C	– UKF205D	– 40.5	– 1 19/32	– 0.87	– UKF205FC	– UKF205FD	– 49	– 1 15/16	– 1.1
	3/4	4 1/4 108	1 3/16 30	3 17/64 83	15/32 12	1/2 13	45/64 18	1 9/16 39.5	1 3/8 35	1 3/16 30	3/8 M10	UKFX05	FX05	UKX05	HE2305X H2305X	1.2 1.2	19.5	11.3	0.514	13.9	– UKFX05C	– UKFX05D	– 44.5	– 1 3/4	– 1.2	– –	– –	– –	– –	– –
	3/4	4 11/32 110	1 5/32 29	3 5/32 80	5/8 16	1/2 13	5/8 16	1 15/32 37.5	1 3/8 35	– –	1/2 M14	UKF305	F305	UK305	HE2305X H2305X	1.4 1.4	21.2	10.9	0.495	12.6	– –	– –	– –	– –	– –	– UKF305C	– UKF305D	– 54	– 2 1/8	– 1.7
25	1	4 1/4 108	1 7/32 31	3 17/64 83	15/32 12	1/2 13	45/64 18	1 9/16 39.5	1 1/2 38	1 13/32 36	3/8 M10	UKF206	F206	UK206	H2306X HE2306X	1.3 1.3	19.5	11.3	0.514	13.9	UKF206C –	UKF206D –	44.5 –	1 3/4 –	1.3 –	UKF206FC –	UKF206FD –	53 –	2 3/32 –	1.6 –
	1	4 19/32 117	1 11/32 34	3 5/8 92	5/8 16	9/16 14	3/4 19	1 21/32 42	1 1/2 38	1 13/32 36	1/2 M14	UKFX06	FX06	UKX06	H2306X HE2306X	1.6 1.6	25.7	15.4	0.700	13.9	UKFX06C –	UKFX06D –	49 –	1 15/16 –	1.6 –	– –	– –	– –	– –	– –
	1	4 29/32 125	1 1/4 32	3 47/64 95	5/8 16	19/32 15	45/64 18	1 5/8 41	1 1/2 38	– –	1/2 M14	UKF306	F306	UK306	H2306X HE2306X	1.9 1.9	26.7	15.0	0.682	13.3	– –	– –	– –	– –	– –	UKF306C –	UKF306D –	59 –	2 5/16 –	2.2 –
30	1 1/8	4 19/32 117	1 11/32 34	3 5/8 92	35/64 14	19/32 15	3/4 19	1 11/16 43	1 11/16 43	1 5/8 41	7/16 M12	UKF207	F207	UK207	HS2307X H2307X	1.6 1.6	25.7	15.4	0.700	13.9	– UKF207C	– UKF207D	– 49	– 1 15/16	– 1.6	– UKF207FC	– UKF207FD	– 58	– 2 9/32	– 2.0
	1 1/8	5 1/8 130	1 1/2 38	4 1/64 102	5/8 16	9/16 14	53/64 21	1 27/32 47	1 11/16 43	1 5/8 41	1/2 M14	UKFX07	FX07	UKX07	HS2307X H2307X	2.0 2.0	29.1	17.8	0.809	14.0	– UKFX07C	– UKFX07D	– 55.5	– 2 3/16	– 2.0	– –	– –	– –	– –	– –
	1 1/8	5 5/16 135	1 13/32 36	3 15/16 100	3/4 19	5/8 16	25/32 20	1 25/32 45.5	1 11/16 43	– –	5/8 M16	UKF307	F307	UK307	HS2307X H2307X	2.3 2.3	33.4	19.3	0.877	13.2	– –	– –	– –	– –	– –	– UKF307C	– UKF307D	– 64	– 2 17/32	– 2.8
35	1 1/4 1 3/8	5 1/8 130	1 13/32 36	4 1/64 102	5/8 16	19/32 15	53/64 21	1 7/8 48	1 13/16 46	1 13/16 46	1/2 M14	UKF208	F208	UK208	HE2308X HS2308X H2308X	1.9 1.9 1.9	29.1	17.8	0.809	14.0	– – UKF208C	– – UKF208D	– – 55.5	– – 2 3/16	– – 1.9	– – UKF208FC	– – UKF208FD	– – 64	– – 2 17/32	– – 2.3
	1 1/4 1 3/8	5 13/32 137	1 9/16 40	4 9/64 105	3/4 19	9/16 14	55/64 22	1 31/32 50	1 13/16 46	1 13/16 46	5/8 M16	UKFX08	FX08	UKX08	HE2308X HS2308X H2308X	2.3 2.3 2.3	34.1	21.3	0.968	14.0	– – UKFX08C	– – UKFX08D	– – 56.5	– – 2 7/32	– – 2.3	– – –	– – –	– – –	– – –	– – –
	1 1/4 1 3/8	5 29/32 150	1 9/16 40	4 13/32 112	3/4 19	21/32 17	29/32 23	2 50.5	1 13/16 46	– –	5/8 M16	UKF308	F308	UK308	HE2308X HS2308X H2308X	3.1 3.1 3.1	40.7	24.0	1.09	13.2	– – –	– – –	– – –	– – –	– – –	– – UKF308C	– – UKF308D	– – 71	– – 2 25/32	– – 3.6
40	1 1/2	5 13/32 137	1 1/2 38	4 9/64 105	5/8 16	5/8 16	55/64 22	2 51	1 31/32 50	2 1/16 52	1/2 M14	UKF209	F209	UK209	HE2309X H2309X	2.3 2.3	34.1	21.3	0.968	14.0	– UKF209C	– UKF209D	– 56.5	– 2 7/32	– 2.3	– UKF209FC	– UKF209FD	– 66	– 2 19/32	– 2.8
	1 1/2	5 5/8 143	1 9/16 40	4 3/8 111	3/4 19	9/16 14	29/32 23	2 1/16 52	1 31/32 50	2 1/16 52	5/8 M16	UKFX09	FX09	UKX09	HE2309X H2309X	2.7 2.7	35.1	23.3	1.06	14.4	– UKFX09C	– UKFX09D	– 60	– 2 3/8	– 2.7	– –	– –	– –	– –	– –
	1 1/2	6 5/16 160	1 23/32 44	4 59/64 125	3/4 19	23/32 18	63/64 25	2 5/32 55	1 31/32 50	– –	5/8 M16	UKF309	F309	UK309	HE2309X H2309X	4.1 4.1	48.9	29.5	1.34	13.3	– –	– –	– –	– –	– –	– UKF309C	– UKF309D	– 76	– 3	– 4.7
45	1 3/4	5 5/8 143	1 9/16 40	4 3/8 111	5/8 16	5/8 16	55/64 22	2 1/16 52	2 5/32 55	2 9/32 58	1/2 M14	UKF210	F210	UK210	HE2310X H2310X	2.6 2.6	35.1	23.3	1.06	14.4	– UKF210C	– UKF210D	– 59	– 2 5/16	– 2.6	– UKF210FC	– UKF210FD	– 70.5	– 2 25/32	– 3.1
	1 3/4	6 3/8 162	1 23/32 44	5 1/8 130	3/4 19	25/32 20	1 1/32 26	2 9/32 58	2 5/32 55	2 9/32 58	5/8 M16	UKFX10	FX10	UKX10	HE2310X H2310X	3.6 3.6	43.4	29.4	1.34	14.4	– UKFX10C	– UKFX10D	– 64	– 2 17/32	– 3.6	– –	– –	– –	– –	– –
	1 3/4	6 7/8 175	1 7/8 48	5 13/64 132	29/32 23	3/4 19	1 7/64 28	2 3/8 60	2 5/32 55	– –	3/4 M20	UKF310	F310	UK310	HE2310X H2310X	5.1 5.1	62.0	38.3	1.74	13.2	– –	– –	– –	– –	– –	– UKF310C	– UKF310D	– 83	– 3 9/32	– 5.9
50	1 7/8 2	6 3/8 162	1 11/16 43	5 1/8 130	3/4 19	23/32 18	63/64 25	2 1/4 57.5	2 5/16 59	2 17/32 64	5/8 M16	UKF211	F211	UK211	HS2311X H2311X HE2311X	3.5 3.5 3.5	43.4	29.4	1.34	14.4	– UKF211C –	– UKF211D –	– 63 –	– 2 15/32 –	– 3.5 –	– UKF211FC –	– UKF211FD –	– 74.5 –	– 2 15/16 –	– 4.1 –
	1 7/8 2	6 7/8 175	1 15/16 49	5 5/8 143	3/4 19	25/32 20	1 9/64 29	2 17/32 64.5	2 5/16 59	2 17/32 64	5/8 M16	UKFX11	FX11	UKX11	HS2311X H2311X HE2311X	4.6 4.6 4.6	52.4	36.2	1.65	14.4	– UKFX11C –	– UKFX11D –	– 73.5 –	– 2 29/32 –	– 4.6 –	– – –	– – –	– – –	– – –	– – –

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 205~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10~X20, 309~328

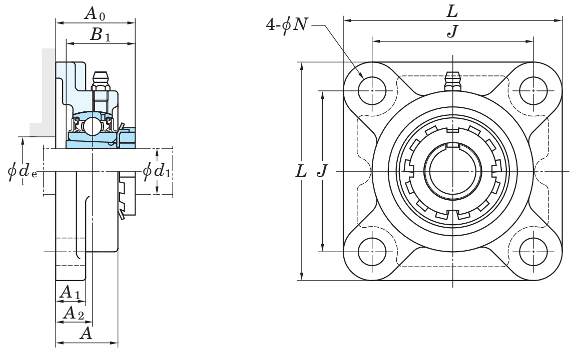
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables. (Example of Part No. : UKF206J + H2306X, UK206 + H2306X)

4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UKF206JL3 + H2306X, UK206L3 + H2306X)

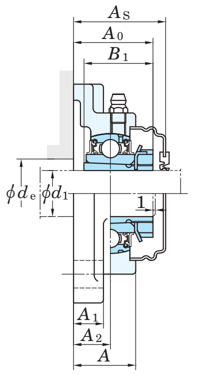
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.

6. Housings of spheroidal graphite iron casting are also available.

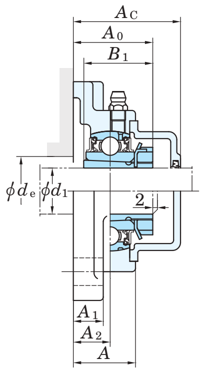
UKF
Tapered bore (with adapter)
d_1 (50) ~ (90) mm

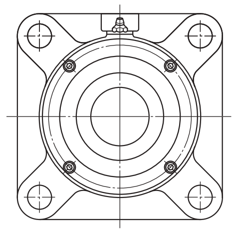


With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			$\varDelta_{A2s}$	X
F205~F210	FX05~FX10	F305~F310	±0.5	0.7
F211~F218	FX11~FX20	F311~F328	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.			$\varDelta_{Ns}$
F205~F218	FX05~FX18	F305~F315	±0.2
	FX20	F316~F328	±0.3

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm									Bolt Size inch mm	Standard					Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Cover					With Cast Iron Cover				
d_1		L	A	J	N	A_1	A_2	A_0	B_1	d_e (min.)		Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	C_r	C_{0r}	C_u	f_0	Unit No. Open End Type	Unit No. Closed End Type	Dimension mm A_s	Dimension inch A_s	Mass kg	Unit No. Open End Type	Unit No. Closed End Type	Dimension mm A_c	Dimension inch A_c	Mass kg
50	1 7/8 2	7 9/32 185	2 1/16 52	5 33/64 140	29/32 23	25/32 20	1 3/16 30	2 17/32 64	2 5/16 59	– –	3/4 M20	**UKF311**	F311	UK311	HS2311X H2311X HE2311X	5.9 5.9 5.9	71.6	45.0	2.05	13.2	– – –	– – –	– – –	– – –	– – –	– UKF311C –	– UKF311D –	– 87 –	– 3 7/16 –	– 6.8 –
55	2 1/8	6 7/8 175	1 7/8 48	5 5/8 143	3/4 19	23/32 18	1 9/64 29	2 19/32 65.5	2 7/16 62	2 23/32 69	5/8 M16	**UKF212**	F212	UK212	HS2312X H2312X	4.1 4.1	52.4	36.2	1.65	14.4	– UKF212C	– UKF212D	– 73.5	– 2 29/32	– 4.1	– UKF212FC	– UKF212FD	– 86	– 3 3/8	– 4.9
	2 1/8	7 3/8 187	2 5/16 59	5 55/64 149	3/4 19	13/16 21	1 11/32 34	2 9/16 65	2 7/16 62	2 23/32 69	5/8 M16	**UKFX12**	FX12	UKX12	HS2312X H2312X	5.5 5.5	57.2	40.1	1.82	14.4	– UKFX12C	– UKFX12D	– 78.5	– 3 3/32	– 5.5	– –	– –	– –	– –	– –
	2 1/8	7 11/16 195	2 7/32 56	5 29/32 150	29/32 23	7/8 22	1 19/64 33	2 3/4 69.5	2 7/16 62	– –	3/4 M20	**UKF312**	F312	UK312	HS2312X H2312X	6.8 6.8	81.9	52.2	2.37	13.2	– –	– –	– –	– –	– –	– UKF312C	– UKF312D	– 95	– 3 3/4	– 8.0
60	2 1/4 2 3/8	7 3/8 187	1 31/32 50	5 55/64 149	3/4 19	7/8 22	1 3/16 30	2 21/32 67.5	2 9/16 65	2 29/32 74	5/8 M16	**UKF213**	F213	UK213	HE2313X H2313X HS2313X	5.1 5.1 5.1	57.2	40.1	1.82	14.4	– UKF213C –	– UKF213D –	– 74.5 –	– 2 15/16 –	– 5.1 –	– UKF213FC –	– UKF213FD –	– 87 –	– 3 7/16 –	– 6.0 –
	2 1/4 2 3/8	7 3/8 187	2 5/16 59	5 55/64 149	3/4 19	13/16 21	1 11/32 34	2 11/16 68	2 9/16 65	2 29/32 74	5/8 M16	**UKFX13**	FX13	UKX13	HE2313X H2313X HS2313X	6.0 6.0 6.0	62.2	44.1	2.01	14.5	– UKFX13C –	– UKFX13D –	– 83.5 –	– 3 9/32 –	– 6.0 –	– – –	– – –	– – –	– – –	– – –
	2 1/4 2 3/8	8 3/16 208	2 9/32 58	6 17/32 166	29/32 23	7/8 22	1 19/64 33	2 13/16 71.5	2 9/16 65	– –	3/4 M20	**UKF313**	F313	UK313	HE2313X H2313X HS2313X	7.9 7.9 7.9	92.7	59.9	2.68	13.2	– – –	– – –	– – –	– – –	– – –	– UKF313C –	– UKF313D –	– 94 –	– 3 11/16 –	– 9.0 –
65	2 1/2	7 7/8 200	2 7/32 56	6 17/64 159	3/4 19	7/8 22	1 11/32 34	2 15/16 74.5	2 7/8 73	3 11/32 85	5/8 M16	**UKF215**	F215	UK215	HE2315X H2315X	6.5 6.5	67.4	48.3	2.17	14.5	– UKF215C	– UKF215D	– 83.5	– 3 9/32	– 6.5	– UKF215FC	– UKF215FD	– 96	– 3 25/32	– 7.5
	2 1/2	7 3/4 197	2 11/16 68	5 63/64 152	29/32 23	15/16 24	1 9/16 40	3 76	2 7/8 73	3 11/32 85	3/4 M20	**UKFX15**	FX15	UKX15	HE2315X H2315X	8.1 8.1	72.7	53.0	2.30	14.6	– UKFX15C	– UKFX15D	– 94.5	– 3 23/32	– 8.1	– –	– –	– –	– –	– –
	2 1/2	9 9/32 236	2 19/32 66	7 1/4 184	63/64 25	31/32 25	1 17/32 39	3 7/32 81.5	2 7/8 73	– –	7/8 M22	**UKF315**	F315	UK315	HE2315X H2315X	11.7 11.7	113	77.2	3.24	13.2	– –	– –	– –	– –	– –	– UKF315C	– UKF315D	– 106	– 4 3/16	– 13.1
70	2 3/4	8 3/16 208	2 9/32 58	6 1/2 165	29/32 23	7/8 22	1 11/32 34	3 3/32 78.5	3 1/16 78	3 17/32 90	3/4 M20	**UKF216**	F216	UK216	HE2316X H2316X	7.6 7.6	72.7	53.0	2.30	14.6	– UKF216C	– UKF216D	– 88.5	– 3 15/32	– 7.6	– UKF216FC	– UKF216FD	– 103	– 4 1/16	– 8.9
	2 3/4	8 7/16 214	2 3/4 70	6 47/64 171	29/32 23	15/16 24	1 9/16 40	3 1/8 79	3 1/16 78	3 17/32 90	3/4 M20	**UKFX16**	FX16	UKX16	HE2316X H2316X	9.5 9.5	84.0	61.9	2.60	14.5	– UKFX16C	– UKFX16D	– 96.5	– 3 25/32	– 9.5	– –	– –	– –	– –	– –
	2 3/4	9 27/32 250	2 11/16 68	7 23/32 196	1 7/32 31	1 1/16 27	1 1/2 38	3 1/4 82.5	3 1/16 78	– –	1 M27	**UKF316**	F316	UK316	HE2316X H2316X	12.9 12.9	123	86.7	3.53	13.3	– –	– –	– –	– –	– –	– UKF316C	– UKF316D	– 107	– 4 7/32	– 14.5
75	3	8 21/32 220	2 15/32 63	6 57/64 175	29/32 23	15/16 24	1 13/32 36	3 1/4 82.5	3 7/32 82	3 25/32 96	3/4 M20	**UKF217**	F217	UK217	H2317X HE2317X	9.0 9.0	84.0	61.9	2.60	14.5	UKF217C –	UKF217D –	92.5 –	3 21/32 –	9.0 –	UKF217FC –	UKF217FD –	107 –	4 7/32 –	10.4 –
	3	8 7/16 214	2 3/4 70	6 47/64 171	29/32 23	15/16 24	1 9/16 40	3 7/32 82	3 7/32 82	3 25/32 96	3/4 M20	**UKFX17**	FX17	UKX17	H2317X HE2317X	10.4 10.4	96.1	71.5	2.91	14.5	UKFX17C –	UKFX17D –	101.5 –	4 –	10.4 –	– –	– –	– –	– –	– –
	3	10 1/4 260	2 29/32 74	8 1/32 204	1 7/32 31	1 1/16 27	1 47/64 44	3 5/8 92	3 7/32 82	– –	1 M27	**UKF317**	F317	UK317	H2317X HE2317X	15.2 15.2	133	96.8	3.82	13.3	– –	– –	– –	– –	– –	UKF317C –	UKF317D –	117 –	4 19/32 –	17.0 –
80	–	9 1/4 235	2 11/16 68	7 23/64 187	29/32 23	31/32 25	1 9/16 40	3 17/32 89.5	3 3/8 86	4 1/32 102	3/4 M20	**UKF218**	F218	UK218	H2318X	11.4	96.1	71.5	2.91	14.5	UKF218C	UKF218D	101.5	4	11.4	UKF218FC	UKF218FD	116	4 9/16	13.0
	–	8 7/16 214	3 76	6 47/64 171	29/32 23	15/16 24	1 49/64 45	3 15/32 88	3 3/8 86	4 1/32 102	3/4 M20	**UKFX18**	FX18	UKX18	H2318X	11.4	109	81.9	3.23	14.4	–	–	–	–	–	UKFX18C	UKFX18D	124	4 7/8	13.3
	–	11 1/32 280	3 76	8 1/2 216	1 3/8 35	1 3/16 30	1 47/64 44	3 5/8 92	3 3/8 86	– –	1 1/8 M30	**UKF318**	F318	UK318	H2318X	19.0	143	107	4.11	13.3	–	–	–	–	–	UKF318C	UKF318D	119	4 11/16	21.1
85	3 1/4	11 13/32 290	3 11/16 94	8 31/32 228	1 3/8 35	1 3/16 30	2 21/64 59	4 3/8 111	3 17/32 90	– –	1 1/8 M30	**UKF319**	F319	UK319	HE2319X H2319X	21.9 21.9	153	119	4.45	13.3	– –	– –	– –	– –	– –	– UKF319C	– UKF319D	– 140	– 5 1/2	– 24.3
90	3 1/2	10 9/16 268	3 13/16 97	8 5/16 211	1 7/32 31	1 3/32 28	2 21/64 59	4 3/16 106	3 13/16 97	4 13/32 112	1 M27	**UKFX20**	FX20	UKX20	HE2320X H2320X	18.4 18.4	133	105	3.91	14.4	– –	– –	– –	– –	– –	– UKFX20C	– UKFX20D	– 152	– 5 31/32	– 20.9

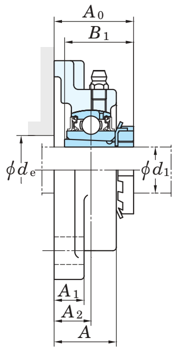
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 205~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10~X20, 309~328

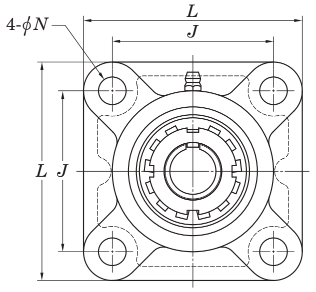
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
(Example of Part No. : UKF206J + H2306X, UK206 + H2306X)
4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (L2) follows the Part No. of unit or bearing.
(Example of Part No. : UKF206JL3 + H2306X, UK206L3 + H2306X)
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Housings of spheroidal graphite iron casting are also available.

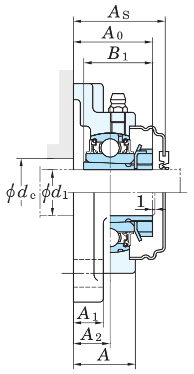
UKF

Tapered bore (with adapter)

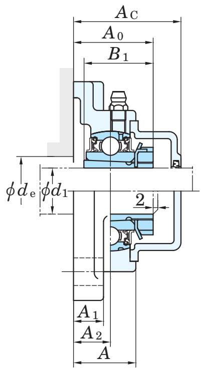
d_1 (90) ~ 125 mm



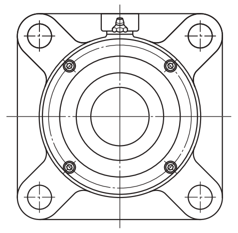




With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)



Cast iron cover fixing screw position
(standard)

Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			$\varDelta_{A2s}$	X
F205~F210	FX05~FX10	F305~F310	±0.5	0.7
F211~F218	FX11~FX20	F311~F328	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.			$\varDelta_{Ns}$
F205~F218	FX05~FX18	F305~F315	±0.2
	FX20	F316~F328	±0.3

Shaft Dia. d_1 mm	Shaft Dia. d_1 inch	Dimensions inch / mm L	A	J	N	A_1	A_2	A_0	B_1	d_e (min.)	Bolt Size inch / mm	Standard Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	With Pressed Steel Cover Unit No. Open End Type	Closed End Type	Dimension A_s mm	Dimension A_s inch	Mass kg	With Cast Iron Cover Unit No. Open End Type	Closed End Type	Dimension A_c mm	Dimension A_c inch	Mass kg
90	3 1/2	12 7/32	3 11/16	9 17/32	1 1/2	1 1/4	2 21/64	4 7/16	3 13/16	–	1 1/4	**UKF320**	F320	UK320	HE2320X	25.4	173	141	5.08	13.2	–	–	–	–	–	–	–	–	–	–
		310	94	242	38	32	59	113	97	–	M33				H2320X	25.4					–	–	–	–	–	UKF320C	UKF320D	146	5 3/4	28.5
100		13 3/8	3 25/32	10 15/32	1 39/64	1 3/8	2 23/64	4 23/32	4 1/8	–	1 3/8	**UKF322**	F322	UK322	H2322X	35.2	205	180	6.15	13.2	–	–	–	–	–	UKF322C	UKF322D	154	6 1/16	38.7
	4	340	96	266	41	35	60	120	105	–	M36				HE2322X	35.2					–	–	–	–	–	–	–	–	–	–
110	–	14 9/16	4 11/32	11 27/64	1 39/64	1 9/16	2 9/16	5 1/8	4 13/32	–	1 3/8	**UKF324**	F324	UK324	H2324	47.6	207	185	6.10	13.5	–	–	–	–	–	UKF324C	UKF324D	163	6 13/32	52.7
		370	110	290	41	40	65	130.5	112	–	M36																			
115	4 1/2	16 5/32	4 17/32	12 19/32	1 39/64	1 25/32	2 9/16	5 3/16	4 3/4	–	1 3/8	**UKF326**	F326	UK326	HE2326	65.3	229	214	6.79	13.6	–	–	–	–	–	–	–	–	–	–
		410	115	320	41	45	65	131.5	121	–	M36				H2326	65.3					–	–	–	–	–	UKF326C	UKF326D	172	6 25/32	71.9
125	–	17 23/32	4 29/32	13 25/32	1 39/64	2 5/32	2 61/64	5 13/16	5 5/32	–	1 3/8	**UKF328**	F328	UK328	H2328	74.9	253	246	7.54	13.6	–	–	–	–	–	UKF328C	UKF328D	186	7 5/16	83.5
		450	125	350	41	55	75	147.5	131	–	M36																			

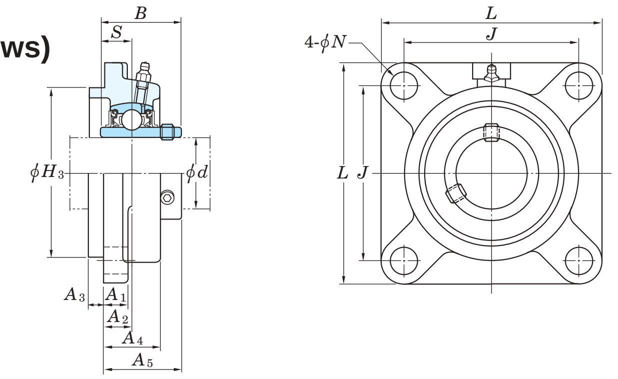
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 205~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10~X20, 309~328

3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
(Example of Part No. : UKF206J + H2306X, UK206 + H2306X)
4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (L2) follows the Part No. of unit or bearing.
(Example of Part No. : UKF206JL3 + H2306X, UK206L3 + H2306X)
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Housings of spheroidal graphite iron casting are also available.

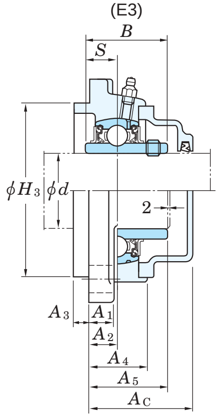
UCFS

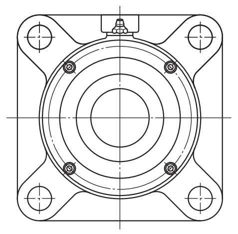
Cylindrical bore (with set screws)

d 25 ~ 140 mm



With Cast Iron Cover
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of spigot joint outside diameter ($\varDelta_{H3s}$), variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$), tolerance of position of bolt hole (X), and tolerance of circumferential runout of spigot joint (Y)

Unit: mm

Housing No.	$\varDelta_{H3s}$	$\varDelta_{A2s}$	X	Y
FS305	0 –0.046	±0.5	0.7	0.2
FS306~FS308	0 –0.054			
FS309~FS310	0 –0.063			
FS311~FS313		±0.8	1	0.3 ~FS318
FS314~FS319	0 –0.072			FS319~ 0.4
FS320~FS322	0 –0.081			
FS324~FS328	0 –0.089			

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
FS305~FS315	±0.2
FS316~FS328	±0.3

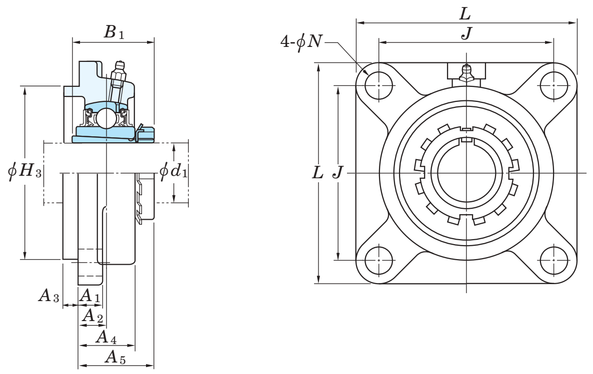
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm											Bolt Size inch / mm	Standard				Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Cast Iron Cover				
d		L	H_3	J	N	A_1	A_2	A_3	A_4	A_5	B	S		Unit No.	Housing No.	Bearing No.	Mass kg	C_r	C_{0r}	C_u	f_0	Unit No. Open End Type	Unit No. Closed End Type	Dimension A_c mm	Dimension A_c inch	Mass kg
25	1	4 11/32 110	3.1496 80	3 5/32 80	5/8 16	1/2 13	23/64 9	9/32 7	7/8 22	1 1/4 32	1.496 38	0.591 15	1/2 M14	UCFS305 UCFS305-16	FS305	UC305 UC305-16	1.4 1.4	21.2	10.9	0.495	12.6	UCFS305C –	UCFS305D –	47 –	1 27/32 –	1.7 –
30	–	4 29/32 125	3.5433 90	3 47/64 95	5/8 16	19/32 15	25/64 10	5/16 8	15/16 24	1 13/32 36	1.693 43	0.669 17	1/2 M14	UCFS306	FS306	UC306	1.9	26.7	15.0	0.682	13.3	UCFS306C	UCFS306D	51	2	2.2
35	–	5 5/16 135	3.9370 100	3 15/16 100	3/4 19	5/8 16	7/16 11	23/64 9	1 1/16 27	1 9/16 40	1.890 48	0.748 19	5/8 M16	UCFS307	FS307	UC307	2.3	33.4	19.3	0.877	13.2	UCFS307C	UCFS307D	55	2 5/32	2.7
40	1 1/2	5 29/32 150	4.5276 115	4 13/32 112	3/4 19	21/32 17	33/64 13	25/64 10	1 3/16 30	1 13/16 46	2.047 52	0.748 19	5/8 M16	UCFS308-24 UCFS308	FS308	UC308-24 UC308	3.4 3.4	40.7	24.0	1.09	13.2	– UCFS308C	– UCFS308D	– 61	– 2 13/32	– 3.9
45	1 3/4	6 5/16 160	4.9213 125	4 59/64 125	3/4 19	23/32 18	35/64 14	7/16 11	1 5/16 33	1 15/16 49	2.244 57	0.866 22	5/8 M16	UCFS309-28 UCFS309	FS309	UC309-28 UC309	4.4 4.4	48.9	29.5	1.34	13.3	– UCFS309C	– UCFS309D	– 65	– 2 9/16	– 5.0
50	–	6 7/8 175	5.5118 140	5 13/64 132	29/32 23	3/4 19	5/8 16	15/32 12	1 13/32 36	2 5/32 55	2.402 61	0.866 22	3/4 M20	UCFS310	FS310	UC310	5.3	62.0	38.3	1.74	13.2	UCFS310C	UCFS310D	71	2 25/32	6.1
55	2	7 9/32 185	5.9055 150	5 33/64 140	29/32 23	25/32 20	43/64 17	33/64 13	1 17/32 39	2 9/32 58	2.598 66	0.984 25	3/4 M20	UCFS311-32 UCFS311	FS311	UC311-32 UC311	6.1 6.1	71.6	45.0	2.05	13.2	– UCFS311C	– UCFS311D	– 74	– 2 29/32	– 7.0
60	–	7 11/16 195	6.2992 160	5 29/32 150	29/32 23	7/8 22	3/4 19	35/64 14	1 21/32 42	2 17/32 64	2.795 71	1.024 26	3/4 M20	UCFS312	FS312	UC312	7.4	81.9	52.2	2.37	13.2	UCFS312C	UCFS312D	81	3 3/16	8.6
65	2 1/2	8 3/16 208	6.8898 175	6 17/32 166	29/32 23	7/8 22	19/32 15	45/64 18	1 9/16 40	2 3/8 60	2.953 75	1.181 30	3/4 M20	UCFS313-40 UCFS313	FS313	UC313-40 UC313	8.8 8.8	92.7	59.9	2.68	13.2	– UCFS313C	– UCFS313D	– 76	– 3	– 9.9
70	2 3/4	8 29/32 226	7.2835 185	7 1/64 178	63/64 25	31/32 25	45/64 18	45/64 18	1 11/16 43	2 15/32 63	3.071 78	1.299 33	7/8 M22	UCFS314-44 UCFS314	FS314	UC314-44 UC314	11.2 11.2	104	68.2	2.96	13.2	– UCFS314C	– UCFS314D	– 80	– 3 5/32	– 12.3
75	2 15/16 3	9 9/32 236	7.8740 200	7 1/4 184	63/64 25	31/32 25	53/64 21	45/64 18	1 7/8 48	2 25/32 71	3.228 82	1.260 32	7/8 M22	UCFS315-47 UCFS315 UCFS315-48	FS315	UC315-47 UC315 UC315-48	13.7 13.7 13.7	113	77.2	3.24	13.2	– UCFS315C –	– UCFS315D –	– 88 –	– 3 15/32 –	– 15.0 –
80	–	9 27/32 250	8.2677 210	7 23/32 196	1 7/32 31	1 1/16 27	45/64 18	25/32 20	1 7/8 48	2 3/4 70	3.386 86	1.339 34	1 M27	UCFS316	FS316	UC316	15.1	123	86.7	3.53	13.3	UCFS316C	UCFS316D	87	3 7/16	16.5
85	–	10 1/4 260	8.6614 220	8 1/32 204	1 7/32 31	1 1/16 27	15/16 24	25/32 20	2 1/8 54	3 5/32 80	3.780 96	1.575 40	1 M27	UCFS317	FS317	UC317	17.3	133	96.8	3.82	13.3	UCFS317C	UCFS317D	97	3 13/16	18.9
90	3 1/2	11 1/32 280	9.4488 240	8 1/2 216	1 3/8 35	1 3/16 30	15/16 24	25/32 20	2 7/32 56	3 5/32 80	3.780 96	1.575 40	1 1/8 M30	UCFS318-56 UCFS318	FS318	UC318-56 UC318	21.3 21.3	143	107	4.11	13.3	– UCFS318C	– UCFS318D	– 99	– 3 29/32	– 23.2
95	–	11 13/32 290	9.8425 250	8 31/32 228	1 3/8 35	1 3/16 30	1 17/32 39	25/32 20	2 29/32 74	3 31/32 101	4.055 103	1.614 41	1 1/8 M30	UCFS319	FS319	UC319	24.5	153	119	4.45	13.3	UCFS319C	UCFS319D	120	4 23/32	26.7
100	3 15/16 4	12 7/32 310	10.2362 260	9 17/32 242	1 1/2 38	1 1/4 32	1 17/32 39	25/32 20	2 29/32 74	4 1/8 105	4.252 108	1.654 42	1 1/4 M33	UCFS320 UCFS320-63 UCFS320-64	FS320	UC320 UC320-63 UC320-64	29.5 29.5 29.5	173	141	5.08	13.2	UCFS320C – –	UCFS320D – –	126 – –	4 31/32 – –	32.3 – –
105	–	12 7/32 310	10.2362 260	9 17/32 242	1 1/2 38	1 1/4 32	1 17/32 39	25/32 20	2 29/32 74	4 7/32 107	4.409 112	1.732 44	1 1/4 M33	UCFS321	FS321	UC321	32.7	184	153	5.41	13.2	UCFS321C	UCFS321D	128	5 1/32	35.7
110	–	13 3/8 340	11.8110 300	10 15/32 266	1 39/64 41	1 3/8 35	1 3/8 35	63/64 25	2 25/32 71	4 3/16 106	4.606 117	1.811 46	1 3/8 M36	UCFS322	FS322	UC322	39.0	205	180	6.15	13.2	UCFS322C	UCFS322D	129	5 3/32	42.4
120	–	14 9/16 370	12.9921 330	11 27/64 290	1 39/64 41	1 9/16 40	1 3/8 35	1 3/16 30	3 5/32 80	4 11/32 110	4.961 126	2.008 51	1 3/8 M36	UCFS324	FS324	UC324	50.6	207	185	6.10	13.5	UCFS324C	UCFS324D	133	5 1/4	55.4
130	–	16 5/32 410	14.1732 360	12 19/32 320	1 39/64 41	1 25/32 45	1 3/8 35	1 3/16 30	3 11/32 85	4 9/16 116	5.315 135	2.126 54	1 3/8 M36	UCFS326	FS326	UC326	67.7	229	214	6.79	13.6	UCFS326C	UCFS326D	142	5 29/32	73.8
140	–	17 23/32 450	15.7480 400	13 25/32 350	1 39/64 41	2 5/32 55	1 49/64 45	1 3/16 30	3 3/4 95	5 5/32 131	5.709 145	2.323 59	1 3/8 M36	UCFS328	FS328	UC328	94.0	253	246	7.54	13.6	UCFS328C	UCFS328D	156	6 5/32	102

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 305~308
A-R1/8 .... 309~328
3. As for the triple-lip seal type product, supplementary code L3 follows the Part No. of unit or bearing.
(Example of Part No. : UCFS307JL3, UC307L3)
4. The dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

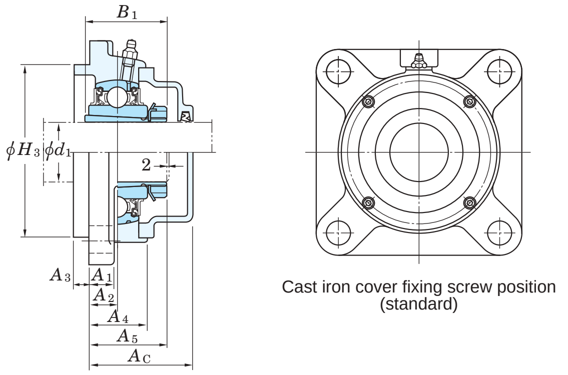
UKFS

Tapered bore (with adapter)

d_1 20 ~ 125 mm



With Cast Iron Cover
(E3)



Cast iron cover fixing screw position
(standard)

Variations of tolerance of spigot joint outside diameter ($\varDelta_{H3s}$), variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$), tolerance of position of bolt hole (X), and tolerance of circumferential runout of spigot joint (Y)

Unit: mm

Housing No.	$\varDelta_{H3s}$	$\varDelta_{A2s}$	X	Y
FS305	0 –0.046	±0.5	0.7	0.2
FS306~FS308	0 –0.054			
FS309~FS310	0 –0.063			
FS311~FS313		±0.8	1	0.3
FS315~FS319	0 –0.072			~FS318 FS319~
FS320~FS322	0 –0.081			0.4
FS324~FS328	0 –0.089			

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
FS305~FS315	±0.2
FS316~FS328	±0.3

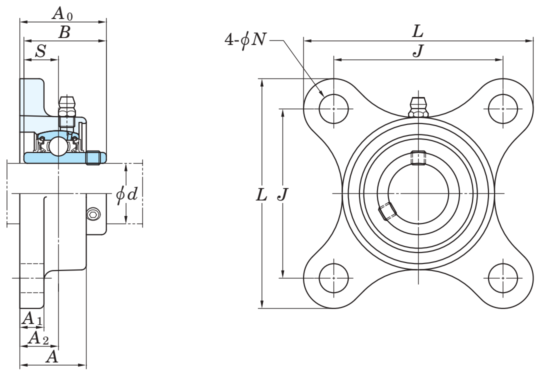
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm										Bolt Size inch / mm	Standard Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Cast Iron Cover Unit No.		Dimension		Mass kg
d_1		L	H_3	J	N	A_1	A_2	A_3	A_4	A_5	B_1							C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	A_c mm	A_c inch	
20	3/4	4 11/32 110	3.1496 80	3 5/32 80	5/8 16	1/2 13	23/64 9	9/32 7	7/8 22	1 3/16 30.5	1 3/8 35	1/2 M14	**UKFS305**	FS305	UK305	HE2305X H2305X	1.4 1.4	21.2	10.9	0.495	12.6	– UKFS305C	– UKFS305D	– 47	– 1 27/32	– 1.7
25	1	4 29/32 125	3.5433 90	3 47/64 95	5/8 16	19/32 15	25/64 10	5/16 8	15/16 24	1 5/16 33	1 1/2 38	1/2 M14	**UKFS306**	FS306	UK306	H2306X HE2306X	1.9 1.9	26.7	15.0	0.682	13.3	UKFS306C –	UKFS306D –	51 –	2 –	2.2 –
30	1 1/8	5 5/16 135	3.9370 100	3 15/16 100	3/4 19	5/8 16	7/16 11	23/64 9	1 1/16 27	1 7/16 36.5	1 11/16 43	5/8 M16	**UKFS307**	FS307	UK307	HS2307X H2307X	2.4 2.4	33.4	19.3	0.877	13.2	– UKFS307C	– UKFS307D	– 55	– 2 5/32	– 2.9
35	1 1/4 1 3/8	5 29/32 150	4.5276 115	4 13/32 112	3/4 19	21/32 17	33/64 13	25/64 10	1 3/16 30	1 19/32 40.5	1 13/16 46	5/8 M16	**UKFS308**	FS308	UK308	HE2308X HS2308X H2308X	3.4 3.4 3.4	40.7	24.0	1.09	13.2	– – UKFS308C	– – UKFS308D	– – 61	– – 2 13/32	– – 3.9
40	1 1/2	6 5/16 160	4.9213 125	4 59/64 125	3/4 19	23/32 18	35/64 14	7/16 11	1 5/16 33	1 23/32 44	1 31/32 50	5/8 M16	**UKFS309**	FS309	UK309	HE2309X H2309X	4.4 4.4	48.9	29.5	1.34	13.3	– UKFS309C	– UKFS309D	– 65	– 2 9/16	– 5.0
45	1 3/4	6 7/8 175	5.5118 140	5 13/64 132	29/32 23	3/4 19	5/8 16	15/32 12	1 13/32 36	1 7/8 48	2 5/32 55	3/4 M20	**UKFS310**	FS310	UK310	HE2310X H2310X	5.3 5.3	62.0	38.3	1.74	13.2	– UKFS310C	– UKFS310D	– 71	– 2 25/32	– 6.1
50	1 7/8 2	7 9/32 185	5.9055 150	5 33/64 140	29/32 23	25/32 20	43/64 17	33/64 13	1 17/32 39	2 51	2 5/16 59	3/4 M20	**UKFS311**	FS311	UK311	HS2311X H2311X HE2311X	6.3 6.3 6.3	71.6	45.0	2.05	13.2	– UKFS311C –	– UKFS311D –	– 74 –	– 2 29/32 –	– 7.2 –
55	2 1/8	7 11/16 195	6.2992 160	5 29/32 150	29/32 23	7/8 22	3/4 19	35/64 14	1 21/32 42	2 3/16 55.5	2 7/16 62	3/4 M20	**UKFS312**	FS312	UK312	HS2312X H2312X	7.3 7.3	81.9	52.2	2.37	13.2	– UKFS312C	– UKFS312D	– 81	– 3 3/16	– 8.5
60	2 1/4 2 3/8	8 3/16 208	6.8898 175	6 17/32 166	29/32 23	7/8 22	19/32 15	45/64 18	1 9/16 40	2 3/32 53.5	2 9/16 65	3/4 M20	**UKFS313**	FS313	UK313	HE2313X H2313X HS2313X	8.9 8.9 8.9	92.7	59.9	2.68	13.2	– UKFS313C –	– UKFS313D –	– 76 –	– 3 –	– 10.0 –
65	2 1/2	9 9/32 236	7.8740 200	7 1/4 184	63/64 25	31/32 25	53/64 21	45/64 18	1 7/8 48	2 1/2 63.5	2 7/8 73	7/8 M22	**UKFS315**	FS315	UK315	HE2315X H2315X	13.4 13.4	113	77.2	3.24	13.2	– UKFS315C	– UKFS315D	– 88	– 3 15/32	– 14.8
70	2 3/4	9 27/32 250	8.2677 210	7 23/32 196	1 7/32 31	1 1/16 27	45/64 18	25/32 20	1 7/8 48	2 15/32 62.5	3 1/16 78	1 M27	**UKFS316**	FS316	UK316	HE2316X H2316X	15.1 15.1	123	86.7	3.53	13.3	– UKFS316C	– UKFS316D	– 87	– 3 7/16	– 16.7
75	3	10 1/4 260	8.6614 220	8 1/32 204	1 7/32 31	1 1/16 27	15/16 24	25/32 20	2 1/8 54	2 27/32 72	3 7/32 82	1 M27	**UKFS317**	FS317	UK317	H2317X HE2317X	17.1 17.1	133	96.8	3.82	13.3	UKFS317C –	UKFS317D –	97 –	3 13/16 –	18.9 –
80	–	11 1/32 280	9.4488 240	8 1/2 216	1 3/8 35	1 3/16 30	15/16 24	25/32 20	2 7/32 56	2 27/32 72	3 3/8 86	1 1/8 M30	**UKFS318**	FS318	UK318	H2318X	21.4	143	107	4.11	13.3	UKFS318C	UKFS318D	99	3 29/32	23.5
85	3 1/4	11 13/32 290	9.8425 250	8 31/32 228	1 3/8 35	1 3/16 30	1 17/32 39	25/32 20	2 29/32 74	2 19/32 91	3 17/32 90	1 1/8 M30	**UKFS319**	FS319	UK319	HE2319X H2319X	24.8 24.8	153	119	4.45	13.3	– UKFS319C	– UKFS319D	– 120	– 4 23/32	– 26.2
90	3 1/2	12 7/32 310	10.2362 260	9 17/32 242	1 1/2 38	1 1/4 32	1 17/32 39	25/32 20	2 29/32 74	2 21/32 93	3 13/16 97	1 1/4 M33	**UKFS320**	FS320	UK320	HE2320X H2320X	29.1 29.1	173	141	5.08	13.2	– UKFS320C	– UKFS320D	– 126	– 4 31/32	– 32.2
100	4	13 3/8 340	11.8110 300	10 15/32 266	1 39/64 41	1 3/8 35	1 3/8 35	63/64 25	2 25/32 71	2 3/4 95	4 1/8 105	1 3/8 M36	**UKFS322**	FS322	UK322	H2322X HE2322X	38.6 38.6	205	180	6.15	13.2	UKFS322C –	UKFS322D –	129 –	5 3/32 –	42.1 –
110	–	14 9/16 370	12.9921 330	11 27/64 290	1 39/64 41	1 9/16 40	1 3/8 35	1 3/16 30	3 5/32 80	3 21/32 100.5	4 13/32 112	1 3/8 M36	**UKFS324**	FS324	UK324	H2324	50.9	207	185	6.10	13.5	UKFS324C	UKFS324D	133	5 1/4	56.0
115	4 1/2	16 5/32 410	14.1732 360	12 19/32 320	1 39/64 41	1 25/32 45	1 3/8 35	1 3/16 30	3 11/32 85	4 101.5	4 3/4 121	1 3/8 M36	**UKFS326**	FS326	UK326	HE2326 H2326	67.5 67.5	229	214	6.79	13.6	– UKFS326C	– UKFS326D	– 142	– 5 29/32	– 74.1
125	–	17 23/32 450	15.7480 400	13 25/32 350	1 39/64 41	2 5/32 55	1 49/64 45	1 3/16 30	3 3/4 95	4 5/8 117.5	5 5/32 131	1 3/8 M36	**UKFS328**	FS328	UK328	H2328	94.0	253	246	7.54	13.6	UKFS328C	UKFS328D	156	6 5/32	102

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 305~308
A-R1/8 .... 309~328
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
(Example of Part No. : UKFS307J + H2307X, UK307 + H2307X)
4. As for the triple-lip seal type product, supplementary code L3 follows the Part No. of unit or bearing.
(Example of Part No. : UKFS307JL3 + H2307X, UK307L3 + H2307X)
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Housings of spheroidal graphite iron casting are also available.

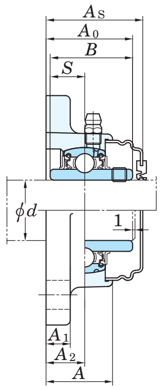
UCSF-S6

Cylindrical bore (with set screws)

d 20 ~ 65 mm



With Pressed Stainless Steel Cover
(E1)



Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.	$\varDelta_{A2s}$	X
SF204~SF210	±0.5	0.7

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
SF204~SF210	±0.2

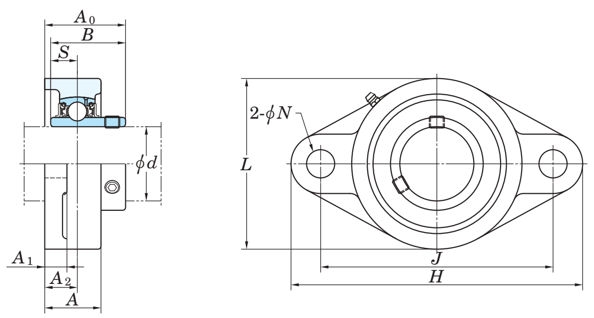
Shaft Dia.	Dimensions									Bolt Size	Standard					Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Stainless Steel Cover			
mm	mm									mm	Unit No.	Housing No.	Bearing No.		Mass	kN		kN		Unit No.		Dimension mm	Mass
d	L	A	J	N	A_1	A_2	A_0	B	S						kg	C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	A_s	kg
20	86	26	64	12	10	15	33.3	31	12.7	M10	**UCSF204S6**	SF204	UC204S6		0.53	10.9	5.35	0.243	13.2	UCSF204CS6	UCSF204DS6	38	0.53
25	95	27.5	70	12	10	16	35.8	34.1	14.3	M10	**UCSF205S6**	SF205	UC205S6		0.68	11.9	6.3	0.286	13.9	UCSF205CS6	UCSF205DS6	40	0.68
30	108	31	83	12	10	18	40.2	38.1	15.9	M10	**UCSF206S6**	SF206	UC206S6		1.02	16.5	9.05	0.411	13.9	UCSF206CS6	UCSF206DS6	45	1.02
35	117	34	92	14	11	19	44.4	42.9	17.5	M12	**UCSF207S6**	SF207	UC207S6		1.30	21.8	12.3	0.559	13.9	UCSF207CS6	UCSF207DS6	49	1.30
40	130	36	102	16	12	21	51.2	49.2	19	M14	**UCSF208S6**	SF208	UC208S6		1.63	24.8	14.3	0.650	14.0	UCSF208CS6	UCSF208DS6	56	1.63
45	137	38	105	16	13	22	52.2	49.2	19	M14	**UCSF209S6**	SF209	UC209S6		1.92	27.8	16.2	0.736	14.0	UCSF209CS6	UCSF209DS6	57	1.92
50	143	40	111	16	13	22	54.6	51.6	19	M14	**UCSF210S6**	SF210	UC210S6		2.18	29.8	18.6	0.845	14.4	UCSF210CS6	UCSF210DS6	59	2.18
55	162	43	130	19	15	25	58.4	55.6	22.2	M16	**UCSF211S6**	SF211	UC211S6		3.01	36.8	23.5	1.07	14.4	UCSF211CS6	UCSF211DS6	63	3.01
60	175	48	143	19	15	29	68.7	65.1	25.4	M16	**UCSF212S6**	SF212	UC212S6		3.82	44.5	29.0	1.32	14.4	UCSF212CS6	UCSF212DS6	73	3.82
65	187	50	149	19	18	30	69.7	65.1	25.4	M16	**UCSF213S6**	SF213	UC213S6		5.02	48.2	32.1	1.46	14.4	UCSF213CS6	UCSF213DS6	75	5.02

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of the applicable grease nipple is A-1/4-28UNFN12.
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

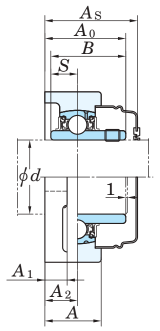
UCFL

Cylindrical bore (with set screws)

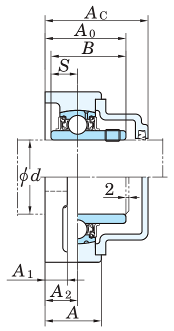
d 12 ~ (45) mm

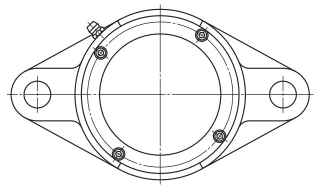


With Pressed Steel Cover (E1)



With Cast Iron Cover (E3)





Cast iron cover fixing screw position (standard)

Variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}) and tolerance of position of bolt hole (X)

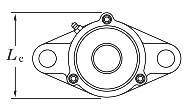
Unit: mm

Housing No.			Δ_{A2s}	X
FL204~FL210	FLX05~FLX10	FL305~FL310	±0.5	0.7
FL211~FL218		FL311~FL324	±0.8	1

Variations of tolerance of bolt hole diameter (Δ_{Ns}) Unit: mm

Housing No.			Δ_{Ns}
FL204~FL218	FLX05~FLX10	FL305~FL311	±0.2
		FL312~FL324	±0.3

Forms and dimensions of L_c of FL204JE3 and FL205JE3 (housing with cast iron cover) are shown below.



FL204JE3 $L_c = 65$ mm
FL205JE3 $L_c = 73$ mm

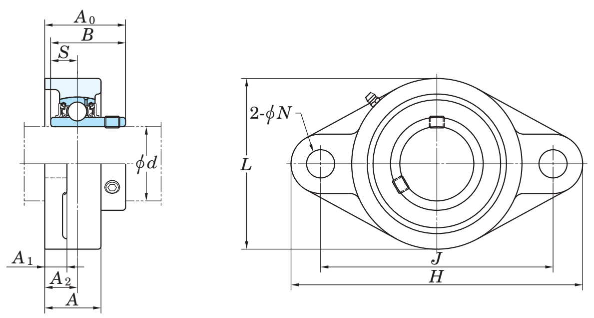
Shaft Dia. d mm	Shaft Dia. d inch	Dimensions inch / mm H	L	A	J	N	A_1	A_2	A_0	B	S	Bolt Size inch / mm	Standard Unit No.	Standard Housing No.	Standard Bearing No.	Mass kg	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	With Pressed Steel Cover Unit No. Open End Type	Closed End Type	Dimension A_s mm	A_s inch	Mass kg	With Cast Iron Cover Unit No. Open End Type	Closed End Type	Dimension A_c mm	A_c inch	Mass kg
12		4 7/16 113	2 3/8 60	1 25.5	3 35/64 90	15/32 12	7/16 11	19/32 15	1 5/16 33.3	1.220 31	0.500 12.7	3/8 M10	**UCFL201**	FL204	UC201	0.50	12.8	6.65	0.302	13.2	UCFL201C	UCFL201D	37.5	1 15/32	0.50	–	–	–	–	–
	1/2												**UCFL201-8**		UC201-8	0.50					–	–	–	–	–	–	–	–	–	–
15													**UCFL202**		UC202	0.48					UCFL202C	UCFL202D	37.5	1 15/32	0.48	–	–	–	–	–
	5/8												**UCFL202-10**		UC202-10	0.48					–	–	–	–	–	–	–	–	–	–
17													**UCFL203**		UC203	0.47					UCFL203C	UCFL203D	37.5	1 15/32	0.47	–	–	–	–	–
	3/4												**UCFL204-12**		UC204-12	0.47					–	–	–	–	–	–	–	–	–	–
20													**UCFL204**		UC204	0.45					UCFL204C	UCFL204D	37.5	1 15/32	0.45	UCFL204FC	UCFL204FD	46	1 13/16	0.6
25	7/8	5 1/8 130	2 11/16 68	1 1/16 27	3 57/64 99	5/8 16	1/2 13	5/8 16	1 13/32 35.8	1.343 34.1	0.563 14.3	1/2 M14	**UCFL205-14**	FL205	UC205-14	0.64	14.0	7.85	0.357	13.9	–	–	–	–	–	–	–	–	–	–
	15/16												**UCFL205-15**		UC205-15	0.64					–	–	–	–	–	–	–	–	–	–
													UCFL205		UC205	0.64					UCFL205C	UCFL205D	40.5	1 19/32	0.64	UCFL205FC	UCFL205FD	49	1 15/16	0.83
	1												**UCFL205-16**		UC205-16	0.64					–	–	–	–	–	–	–	–	–	–
		5 9/16 141	3 9/32 83	1 3/16 30	4 39/64 117	15/32 12	1/2 13	45/64 18	1 19/32 40.2	1.500 38.1	0.626 15.9	3/8 M10	**UCFLX05**	FLX05	UCX05	1.1	19.5	11.3	0.514	13.9	UCFLX05C	UCFLX05D	44.5	1 3/4	1.1	–	–	–	–	–
	1												**UCFLX05-16**		UCX05-16	1.1					–	–	–	–	–	–	–	–	–	–
		5 29/32 150	3 5/32 80	1 5/32 29	4 29/64 113	3/4 19	1/2 13	5/8 16	1 17/32 39	1.496 38	0.591 15	5/8 M16	**UCFL305**	FL305	UC305	1.1	21.2	10.9	0.495	12.6	–	–	–	–	–	UCFL305C	UCFL305D	54	2 1/8	1.4
	1												**UCFL305-16**		UC305-16	1.1					–	–	–	–	–	–	–	–	–	–
30	1 1/8	5 13/16 148	3 5/32 80	1 7/32 31	4 39/64 117	5/8 16	1/2 13	45/64 18	1 19/32 40.2	1.500 38.1	0.626 15.9	1/2 M14	**UCFL206-18**	FL206	UC206-18	0.93	19.5	11.3	0.514	13.9	–	–	–	–	–	–	–	–	–	–
													UCFL206		UC206	0.93					UCFL206C	UCFL206D	44.5	1 3/4	0.93	UCFL206FC	UCFL206FD	53	2 3/32	1.2
	1 3/16												**UCFL206-19**		UC206-19	0.93					–	–	–	–	–	–	–	–	–	–
	1 1/4												**UCFL206-20**		UC206-20	0.93					–	–	–	–	–	–	–	–	–	–
		6 5/32 156	3 3/4 95	1 11/32 34	5 1/8 130	5/8 16	9/16 14	3/4 19	1 3/4 44.4	1.689 42.9	0.689 17.5	1/2 M14	**UCFLX06**	FLX06	UCX06	1.5	25.7	15.4	0.700	13.9	UCFLX06C	UCFLX06D	49	1 15/16	1.5	–	–	–	–	–
	1 3/16												**UCFLX06-19**		UCX06-19	1.5					–	–	–	–	–	–	–	–	–	–
	1 1/4												**UCFLX06-20**		UCX06-20	1.5					–	–	–	–	–	–	–	–	–	–
	–	7 3/32 180	3 17/32 90	1 1/4 32	5 9/32 134	29/32 23	19/32 15	45/64 18	1 23/32 44	1.693 43	0.669 17	3/4 M20	**UCFL306**	FL306	UC306	1.5	26.7	15.0	0.682	13.3	–	–	–	–	–	UCFL306C	UCFL306D	59	2 5/16	1.8
35	1 1/4	6 11/32 161	3 17/32 90	1 11/32 34	5 1/8 130	5/8 16	9/16 14	3/4 19	1 3/4 44.4	1.689 42.9	0.689 17.5	1/2 M14	**UCFL207-20**	FL207	UC207-20	1.2	25.7	15.4	0.700	13.9	–	–	–	–	–	–	–	–	–	–
	1 5/16												**UCFL207-21**		UC207-21	1.2					–	–	–	–	–	–	–	–	–	–
	1 3/8												**UCFL207-22**		UC207-22	1.2					–	–	–	–	–	–	–	–	–	–
													UCFL207		UC207	1.2					UCFL207C	UCFL207D	49	1 15/16	1.2	UCFL207FC	UCFL207FD	58	2 9/32	1.6
	1 7/16												**UCFL207-23**		UC207-23	1.2					–	–	–	–	–	–	–	–	–	–
	1 3/8	6 23/32 171	4 1/8 105	1 1/2 38	5 43/64 144	5/8 16	9/16 14	53/64 21	2 1/32 51.2	1.937 49.2	0.748 19	1/2 M14	**UCFLX07-22**	FLX07	UCX07-22	1.9	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
													UCFLX07		UCX07	1.9					UCFLX07C	UCFLX07D	55.5	2 3/16	1.9	–	–	–	–	–
	1 7/16												**UCFLX07-23**		UCX07-23	1.9					–	–	–	–	–	–	–	–	–	–
	–	7 9/32 185	3 15/16 100	1 13/32 36	5 35/64 141	29/32 23	5/8 16	25/32 20	1 15/16 49	1.890 48	0.748 19	3/4 M20	**UCFL307**	FL307	UC307	1.8	33.4	19.3	0.877	13.2	–	–	–	–	–	UCFL307C	UCFL307D	64	2 17/32	2.2
40	1 1/2	6 7/8 175	3 15/16 100	1 13/32 36	5 43/64 144	5/8 16	9/16 14	53/64 21	2 1/32 51.2	1.937 49.2	0.748 19	1/2 M14	**UCFL208-24**	FL208	UC208-24	1.6	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
	1 9/16												**UCFL208-25**		UC208-25	1.6					–	–	–	–	–	–	–	–	–	–
													UCFL208		UC208	1.6					UCFL208C	UCFL208D	55.5	2 3/16	1.6	UCFL208FC	UCFL208FD	64	2 17/32	2.0
	1 1/2	7 1/16 179	4 3/8 111	1 9/16 40	5 53/64 148	5/8 16	9/16 14	55/64 22	2 1/16 52.2	1.937 49.2	0.748 19	1/2 M14	**UCFLX08-24**	FLX08	UCX08-24	2.1	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
													UCFLX08		UCX08	2.1					UCFLX08C	UCFLX08D	56.5	2 7/32	2.1	–	–	–	–	–
	1 1/2	7 7/8 200	4 13/32 112	1 9/16 40	6 7/32 158	29/32 23	21/32 17	29/32 23	2 7/32 56	2.047 52	0.748 19	3/4 M20	**UCFL308-24**	FL308	UC308-24	2.5	40.7	24.0	1.09	13.2	–	–	–	–	–	–	–	–	–	–
													UCFL308		UC308	2.5					–	–	–	–	–	UCFL308C	UCFL308D	71	2 25/32	3.0
45	1 5/8	7 13/32 188	4 1/4 108	1 1/2 38	5 53/64 148	3/4 19	19/32 15	55/64 22	2 1/16 52.2	1.937 49.2	0.748 19	5/8 M16	**UCFL209-26**	FL209	UC209-26	1.9	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
	1 11/16												**UCFL209-27**		UC209-27	1.9					–	–	–	–	–	–	–	–	–	–
	1 3/4												**UCFL209-28**		UC209-28	1.9					–	–	–	–	–	–	–	–	–	–
													UCFL209		UC209	1.9					UCFL209C	UCFL209D	56.5	2 7/32	1.9	UCFL209FC	UCFL209FD	66	2 19/32	2.3
	1 3/4	7 7/16 189	4 9/16 116	1 9/16 40	6 3/16 157	5/8 16	9/16 14	29/32 23	2 3/16 55.6	2.031 51.6	0.748 19	1/2 M14	**UCFLX09-28**	FLX09	UCX09-28	2.4	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
													UCFLX09		UCX09	2.4					UCFLX09C	UCFLX09D	60	2 3/8	2.4	–	–	–	–	–

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210, X05~X09, 305~308
A-R1/8.................. 211~218, X10, 309~324
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCFL206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

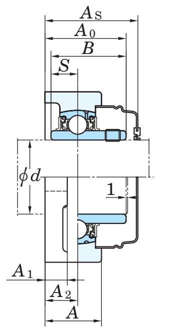
UCFL

Cylindrical bore (with set screws)

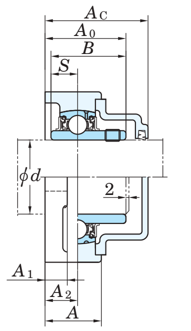
d (45) ~ (90) mm

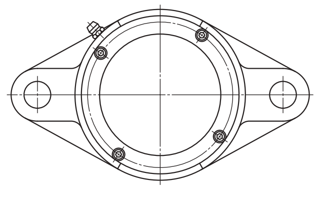


With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			$\varDelta_{A2s}$	X
FL204~FL210	FLX05~FLX10	FL305~FL310	±0.5	0.7
FL211~FL218		FL311~FL324	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$) Unit: mm

Housing No.			$\varDelta_{Ns}$
FL204~FL218	FLX05~FLX10	FL305~FL311	±0.2
		FL312~FL324	±0.3

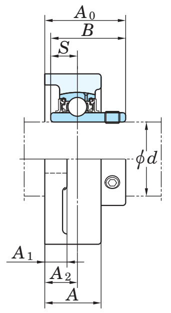
Shaft Dia.		Dimensions inch mm										Bolt Size	Standard				Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Cover					With Cast Iron Cover				
mm d	inch	H	L	A	J	N	A_1	A_2	A_0	B	S	inch mm	Unit No.	Housing No.	Bearing No.	Mass kg	C_r	C_{0r}	C_u	f_0	Unit No. Open End Type	Unit No. Closed End Type	Dimension mm A_s	Dimension inch A_s	Mass kg	Unit No. Open End Type	Unit No. Closed End Type	Dimension mm A_c	Dimension inch A_c	Mass kg
45	1 3/4	9 1/16 230	4 29/32 125	1 23/32 44	6 31/32 177	63/64 25	23/32 18	63/64 25	2 3/8 60	2.244 57	0.866 22	7/8 M22	UCFL309-28	FL309	UC309-28	3.5	48.9	29.5	1.34	13.3	–	–	–	–	–	–	–	–	–	–
													UCFL309		UC309	3.5					–	–	–	–	–	UCFL309C	UCFL309D	76	3	4.1
50	1 7/8	7 3/4 197	4 17/32 115	1 9/16 40	6 3/16 157	3/4 19	19/32 15	55/64 22	2 5/32 54.6	2.031 51.6	0.748 19	5/8 M16	UCFL210-30	FL210	UC210-30	2.2	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
	1 15/16												UCFL210-31		UC210-31	2.2					–	–	–	–	–	–	–	–	–	–
													UCFL210		UC210	2.2					UCFL210C	UCFL210D	59	2 5/16	2.2	UCFL210FC	UCFL210FD	70.5	2 25/32	2.7
	2												UCFL210-32		UC210-32	2.2					–	–	–	–	–	–	–	–	–	–
	1 15/16	8 1/2 216	5 1/4 133	1 23/32 44	7 1/4 184	3/4 19	25/32 20	1 1/32 26	2 11/32 59.4	2.189 55.6	0.874 22.2	5/8 M16	UCFLX10-31	FLX10	UCX10-31	3.8	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
													UCFLX10		UCX10	3.8					UCFLX10C	UCFLX10D	64	2 17/32	3.8	–	–	–	–	–
	2												UCFLX10-32		UCX10-32	3.8					–	–	–	–	–	–	–	–	–	–
	–	9 7/16 240	5 1/2 140	1 7/8 48	7 23/64 187	63/64 25	3/4 19	1 7/64 28	2 5/8 67	2.402 61	0.866 22	7/8 M22	UCFL310	FL310	UC310	4.4	62.0	38.3	1.74	13.2	–	–	–	–	–	UCFL310C	UCFL310D	83	3 9/32	5.2
55	2	8 13/16 224	5 1/8 130	1 11/16 43	7 1/4 184	3/4 19	23/32 18	63/64 25	2 5/16 58.4	2.189 55.6	0.874 22.2	5/8 M16	UCFL211-32	FL211	UC211-32	3.3	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
	2 1/8												UCFL211-34		UC211-34	3.3					–	–	–	–	–	–	–	–	–	–
													UCFL211		UC211	3.3					UCFL211C	UCFL211D	63	2 15/32	3.3	UCFL211FC	UCFL211FD	74.5	2 15/16	3.9
	2 3/16												UCFL211-35		UC211-35	3.3					–	–	–	–	–	–	–	–	–	–
	2	9 27/32 250	5 29/32 150	2 1/16 52	7 51/64 198	63/64 25	25/32 20	1 3/16 30	2 25/32 71	2.598 66	0.984 25	7/8 M22	UCFL311-32	FL311	UC311-32	5.3	71.6	45.0	2.05	13.2	–	–	–	–	–	–	–	–	–	–
													UCFL311		UC311	5.3					–	–	–	–	–	UCFL311C	UCFL311D	87	3 7/16	6.2
60	2 1/4	9 27/32 250	5 1/2 140	1 7/8 48	7 61/64 202	29/32 23	23/32 18	1 9/64 29	2 23/32 68.7	2.563 65.1	1.000 25.4	3/4 M20	UCFL212-36	FL212	UC212-36	4.2	52.4	36.2	1.65	14.4	–	–	–	–	–	–	–	–	–	–
													UCFL212		UC212	4.2					UCFL212C	UCFL212D	73.5	2 29/32	4.2	UCFL212FC	UCFL212FD	86	3 3/8	5.0
	2 3/8												UCFL212-38		UC212-38	4.2					–	–	–	–	–	–	–	–	–	–
	2 7/16												UCFL212-39		UC212-39	4.2					–	–	–	–	–	–	–	–	–	–
	–	10 5/8 270	6 5/16 160	2 7/32 56	8 11/32 212	1 7/32 31	7/8 22	1 19/64 33	3 1/16 78	2.795 71	1.024 26	1 M27	UCFL312	FL312	UC312	6.5	81.9	52.2	2.37	13.2	–	–	–	–	–	UCFL312C	UCFL312D	95	3 3/4	7.7
65	2 1/2	10 5/32 258	6 3/32 155	1 31/32 50	8 17/64 210	29/32 23	25/32 20	1 3/16 30	2 3/4 69.7	2.563 65.1	1.000 25.4	3/4 M20	UCFL213-40	FL213	UC213-40	5.1	57.2	40.1	1.82	14.4	–	–	–	–	–	–	–	–	–	–
													UCFL213		UC213	5.1					UCFL213C	UCFL213D	74.5	2 15/16	5.1	UCFL213FC	UCFL213FD	87	3 7/16	5.9
	2 1/2	11 5/8 295	6 7/8 175	2 9/32 58	9 29/64 240	1 7/32 31	31/32 25	1 19/64 33	3 1/16 78	2.953 75	1.181 30	1 M27	UCFL313-40	FL313	UC313-40	8.5	92.7	59.9	2.68	13.2	–	–	–	–	–	–	–	–	–	–
													UCFL313		UC313	8.5					–	–	–	–	–	UCFL313C	UCFL313D	94	3 11/16	9.6
70	2 3/4	10 7/16 265	6 5/16 160	2 1/8 54	8 1/2 216	29/32 23	25/32 20	1 7/32 31	2 31/32 75.4	2.937 74.6	1.189 30.2	3/4 M20	UCFL214-44	FL214	UC214-44	5.7	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
													UCFL214		UC214	5.7					UCFL214C	UCFL214D	80.5	3 5/32	5.7	UCFL214FC	UCFL214FD	93	3 21/32	6.6
	2 3/4	12 13/32 315	7 9/32 185	2 13/32 61	9 27/32 250	1 3/8 35	1 3/32 28	1 27/64 36	3 3/16 81	3.071 78	1.299 33	1 1/8 M30	UCFL314-44	FL314	UC314-44	9.7	104	68.2	2.96	13.2	–	–	–	–	–	–	–	–	–	–
													UCFL314		UC314	9.7					–	–	–	–	–	UCFL314C	UCFL314D	98	3 27/32	10.8
75	2 15/16	10 13/16 275	6 1/2 165	2 7/32 56	8 55/64 225	29/32 23	25/32 20	1 11/32 34	3 3/32 78.5	3.063 77.8	1.311 33.3	3/4 M20	UCFL215-47	FL215	UC215-47	6.4	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
													UCFL215		UC215	6.4					UCFL215C	UCFL215D	83.5	3 9/32	6.4	UCFL215FC	UCFL215FD	96	3 25/32	7.4
	3												UCFL215-48		UC215-48	6.4					–	–	–	–	–	–	–	–	–	–
	2 15/16	12 19/32 320	7 11/16 195	2 19/32 66	10 15/64 260	1 3/8 35	1 3/16 30	1 17/32 39	3 1/2 89	3.228 82	1.260 32	1 1/8 M30	UCFL315-47	FL315	UC315-47	11.3	113	77.2	3.24	13.2	–	–	–	–	–	–	–	–	–	–
													UCFL315		UC315	11.3					–	–	–	–	–	UCFL315C	UCFL315D	106	4 3/16	12.6
	3												UCFL315-48		UC315-48	11.3					–	–	–	–	–	–	–	–	–	–
80	3 1/8	11 13/32 290	7 3/32 180	2 9/32 58	9 11/64 233	63/64 25	25/32 20	1 11/32 34	3 9/32 83.3	3.252 82.6	1.311 33.3	7/8 M22	UCFL216-50	FL216	UC216-50	7.8	72.7	53.0	2.30	14.6	–	–	–	–	–	–	–	–	–	–
													UCFL216		UC216	7.8					UCFL216C	UCFL216D	88.5	3 15/32	7.8	UCFL216FC	UCFL216FD	103	4 1/16	9.0
	–	13 31/32 355	8 9/32 210	2 11/16 68	11 7/32 285	1 1/2 38	1 1/4 32	1 1/2 38	3 17/32 90	3.386 86	1.339 34	1 1/4 M33	UCFL316	FL316	UC316	14.4	123	86.7	3.53	13.3	–	–	–	–	–	UCFL316C	UCFL316D	107	4 7/32	15.8
85	3 1/4	12 305	7 15/32 190	2 15/32 63	9 49/64 248	63/64 25	7/8 22	1 27/64 36	3 7/16 87.6	3.374 85.7	1.343 34.1	7/8 M22	UCFL217-52	FL217	UC217-52	9.8	84.0	61.9	2.60	14.5	–	–	–	–	–	–	–	–	–	–
													UCFL217		UC217	9.8					UCFL217C	UCFL217D	92.5	3 21/32	9.8	UCFL217FC	UCFL217FD	107	4 7/32	11.2
	–	14 9/16 370	8 21/32 220	2 29/32 74	11 13/16 300	1 1/2 38	1 1/4 32	1 47/64 44	3 15/16 100	3.780 96	1.575 40	1 1/4 M33	UCFL317	FL317	UC317	16.0	133	96.8	3.82	13.3	–	–	–	–	–	UCFL317C	UCFL317D	117	4 19/32	17.6
90	3 1/2	12 19/32 320	8 1/16 205	2 11/16 68	10 7/16 265	63/64 25	29/32 23	1 37/64 40	3 25/32 96.3	3.780 96	1.563 39.7	7/8 M22	UCFL218-56	FL218	UC218-56	12.3	96.1	71.5	2.91	14.5	–	–	–	–	–	–	–	–	–	–
													UCFL218		UC218	12.3					UCFL218C	UCFL218D	101.5	4	12.3	UCFL218FC	UCFL218FD	116	4 9/16	13.8

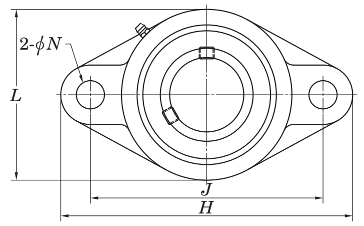
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10, 309~324
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCFL206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

UCFL

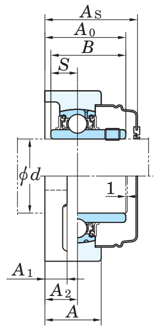
Cylindrical bore (with set screws)

d (90) ~ 120 mm

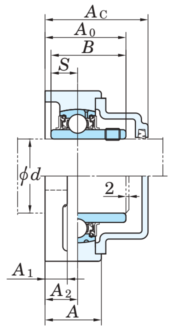


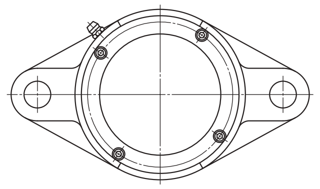


With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			Δ_{A2s}	X
FL204~FL210	FLX05~FLX10	FL305~FL310	±0.5	0.7
FL211~FL218		FL311~FL324	±0.8	1

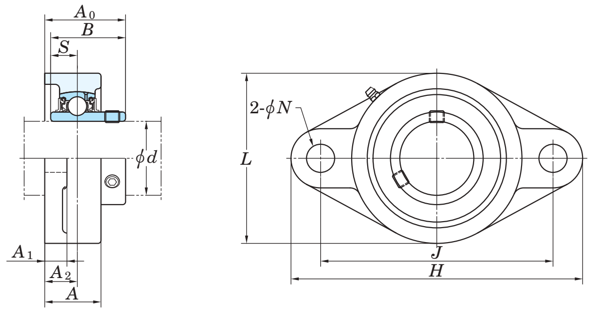
Variations of tolerance of bolt hole diameter (Δ_{Ns}) Unit: mm

Housing No.			Δ_{Ns}
FL204~FL218	FLX05~FLX10	FL305~FL311	±0.2
		FL312~FL324	±0.3

Shaft Dia.		Dimensions										Bolt Size	Standard				Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Cover					With Cast Iron Cover				
mm	inch	inch mm										inch mm	Unit No.	Housing No.	Bearing No.	Mass	kN		kN		Unit No. Open End Type	Unit No. Closed End Type	Dimension mm	Dimension inch	Mass	Unit No. Open End Type	Unit No. Closed End Type	Dimension mm	Dimension inch	Mass
d		H	L	A	J	N	A_1	A_2	A_0	B	S					kg	C_r	C_{0r}	C_u	f_0			A_s		kg			A_c		kg
90	3 1/2	15 5/32 385	9 1/4 235	3 76	12 13/32 315	1 1/2 38	1 13/32 36	1 47/64 44	3 15/16 100	3.780 96	1.575 40	1 1/4 M33	**UCFL318-56** **UCFL318**	FL318	UC318-56 UC318	19.0 19.0	143	107	4.11	13.3	– –	– –	– –	– –	– –	– UCFL318C	– UCFL318D	– 119	– 4 11/16	– 20.9
95	–	15 15/16 405	9 27/32 250	3 11/16 94	13 330	1 39/64 41	1 9/16 40	2 21/64 59	4 3/4 121	4.055 103	1.614 41	1 3/8 M36	**UCFL319**	FL319	UC319	24.6	153	119	4.45	13.3	–	–	–	–	–	UCFL319C	UCFL319D	140	5 1/2	26.8
100	3 15/16 4	17 5/16 440	10 5/8 270	3 11/16 94	14 11/64 360	1 47/64 44	1 9/16 40	2 21/64 59	4 29/32 125	4.252 108	1.654 42	1 1/2 M39	**UCFL320** **UCFL320-63** **UCFL320-64**	FL320	UC320 UC320-63 UC320-64	29.4 29.4 29.4	173	141	5.08	13.2	– – –	– – –	– – –	– – –	– – –	UCFL320C – –	UCFL320D – –	146 – –	5 3/4 – –	32.2 – –
110	–	18 1/2 470	11 13/16 300	3 25/32 96	15 23/64 390	1 47/64 44	1 21/32 42	2 23/64 60	5 5/32 131	4.606 117	1.811 46	1 1/2 M39	**UCFL322**	FL322	UC322	36.2	205	180	6.15	13.2	–	–	–	–	–	UCFL322C	UCFL322D	154	6 1/16	39.6
120	–	20 15/32 520	13 330	4 11/32 110	16 59/64 430	1 27/32 47	1 7/8 48	2 9/16 65	5 1/2 140	4.961 126	2.008 51	1 5/8 M42	**UCFL324**	FL324	UC324	51.6	207	185	6.10	13.5	–	–	–	–	–	UCFL324C	UCFL324D	163	6 13/32	56.4

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10, 309~324
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCFL206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

UCFL-E
Cylindrical bore (with set screws)
d 12 ～ 75 mm



Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.	$\varDelta_{A2s}$	X
FL203E~FL210E	±0.5	0.7
FL211E~FL217E	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
FL203E~FL217E	±0.2

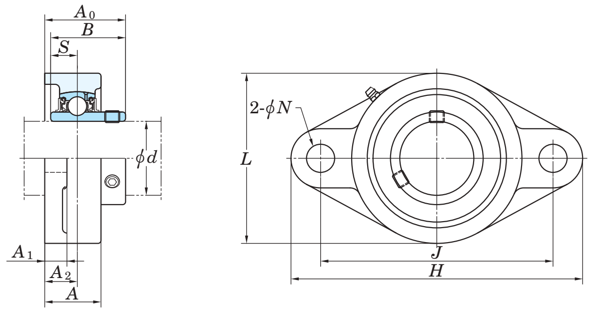
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm										Bolt Size inch	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		H	L	A	J	N	A_1	A_2	A_0	B	S					C_r	C_{0r}	C_u	f_0	kg
12		3 27/32 98	2 7/32 56	1 25.5	3 76.2	25/64 10	7/16 11	19/32 15	1 5/16 33.3	1.220 31	0.500 12.7	5/16	UCFL201E	FL203E	UC201	12.8	6.65	0.302	13.2	0.42
	1/2												UCFL201-8E		UC201-8					
15													UCFL202E		UC202					0.4
	5/8												UCFL202-10E		UC202-10					
17													UCFL203E		UC203					0.39
20	3/4	4 7/16 113	2 3/8 60	1 25.5	3 17/32 89.7	25/64 10	7/16 11	19/32 15	1 5/16 33.3	1.220 31	0.500 12.7	5/16	UCFL204-12E	FL204E	UC204-12	12.8	6.65	0.302	13.2	0.48
													UCFL204E		UC204					
25	7/8	5 1/8 130	2 11/16 68	1 1/16 27	3 57/64 98.8	15/32 12	1/2 13	5/8 16	1 13/32 35.8	1.343 34.1	0.563 14.3	3/8	UCFL205-14E	FL205E	UC205-14	14.0	7.85	0.357	13.9	0.64
	15/16												UCFL205-15E		UC205-15					
													UCFL205E		UC205					
	1												UCFL205-16E		UC205-16					
30	1 1/8	5 13/16 148	3 5/32 80	1 7/32 31	4 19/32 116.7	15/32 12	1/2 13	45/64 18	1 19/32 40.2	1.500 38.1	0.626 15.9	3/8	UCFL206-18E	FL206E	UC206-18	19.5	11.3	0.514	13.9	0.93
													UCFL206E		UC206					
	1 3/16												UCFL206-19E		UC206-19					
	1 1/4												UCFL206-20E		UC206-20					
35	1 1/4	6 11/32 161	3 17/32 90	1 11/32 34	5 1/8 130.2	33/64 13	9/16 14	3/4 19	1 3/4 44.4	1.689 42.9	0.689 17.5	7/16	UCFL207-20E	FL207E	UC207-20	25.7	15.4	0.700	13.9	1.2
	1 5/16												UCFL207-21E		UC207-21					
	1 3/8												UCFL207-22E		UC207-22					
													UCFL207E		UC207					
	1 7/16												UCFL207-23E		UC207-23					
40	1 1/2	6 7/8 175	3 15/16 100	1 13/32 36	5 21/32 143.7	33/64 13	9/16 14	53/64 21	2 1/32 51.2	1.937 49.2	0.748 19	7/16	UCFL208-24E	FL208E	UC208-24	29.1	17.8	0.809	14.0	1.6
	1 9/16												UCFL208-25E		UC208-25					
													UCFL208E		UC208					
45	1 5/8	7 13/32 188	4 1/4 108	1 1/2 38	5 27/32 148.4	19/32 15	19/32 15	55/64 22	2 1/16 52.2	1.937 49.2	0.748 19	1/2	UCFL209-26E	FL209E	UC209-26	34.1	21.3	0.968	14.0	1.9
	1 11/16												UCFL209-27E		UC209-27					
	1 3/4												UCFL209-28E		UC209-28					
													UCFL209E		UC209					
50	1 7/8	7 3/4 197	4 17/32 115	1 9/16 40	6 3/16 157	19/32 15	19/32 15	55/64 22	2 5/32 54.6	2.031 51.6	0.748 19	1/2	UCFL210-30E	FL210E	UC210-30	35.1	23.3	1.06	14.4	2.2
	1 15/16												UCFL210-31E		UC210-31					
													UCFL210E		UC210					
	2												UCFL210-32E		UC210-32					
55	2	8 13/16 224	5 1/8 130	1 11/16 43	7 1/4 184	21/32 16.5	23/32 18	63/64 25	2 5/16 58.4	2.189 55.6	0.874 22.2	9/16	UCFL211-32E	FL211E	UC211-32	43.4	29.4	1.34	14.4	3.3
	2 1/8												UCFL211-34E		UC211-34					
													UCFL211E		UC211					
	2 3/16												UCFL211-35E		UC211-35					
60	2 1/4	9 27/32 250	5 1/2 140	1 7/8 48	7 61/64 202	21/32 16.5	23/32 18	1 9/64 29	2 23/32 68.7	2.563 65.1	1.000 25.4	9/16	UCFL212-36E	FL212E	UC212-36	52.4	36.2	1.65	14.4	4.2
													UCFL212E		UC212					
	2 3/8												UCFL212-38E		UC212-38					
	2 7/16												UCFL212-39E		UC212-39					
65	2 1/2	10 5/32 258	6 3/32 155	1 31/32 50	8 17/64 210	21/32 16.5	25/32 20	1 3/16 30	2 3/4 69.7	2.563 65.1	1.000 25.4	9/16	UCFL213-40E	FL213E	UC213-40	57.2	40.1	1.82	14.4	5.2
													UCFL213E		UC213					
70	2 3/4	10 7/16 265	6 5/16 160	2 1/8 54	8 1/2 216	21/32 16.5	25/32 20	1 7/32 31	2 31/32 75.4	2.937 74.6	1.189 30.2	9/16	UCFL214-44E	FL214E	UC214-44	62.2	44.1	2.01	14.5	5.7
													UCFL214E		UC214					
75	2 15/16	10 13/16 275	6 1/2 165	2 7/32 56	8 55/64 225	3/4 19	25/32 20	1 11/32 34	3 3/32 78.5	3.063 77.8	1.311 33.3	11/16	UCFL215-47E	FL215E	UC215-47	67.4	48.3	2.17	14.5	6.4
													UCFL215E		UC215					
	3												UCFL215-48E		UC215-48					

Remarks 1. In Part No. of unit, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210
A-R1/8 .... 211~217
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCFL206EJL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

UCFL-E

Cylindrical bore (with set screws)

d 80 ~ 85 mm



Variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.	Δ_{A2s}	X
FL203E~FL210E	±0.5	0.7
FL211E~FL217E	±0.8	1

Variations of tolerance of bolt hole diameter (Δ_{Ns})

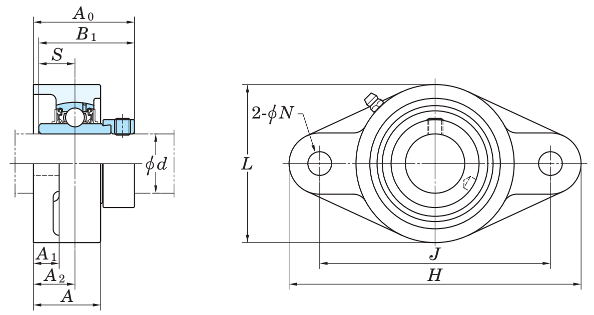
Unit: mm

Housing No.	Δ_{Ns}
FL203E~FL217E	±0.2

Shaft Dia. mm d	Shaft Dia. inch	Dimensions inch / mm H	L	A	J	N	A_1	A_2	A_0	B	S	Bolt Size inch	Unit No.	Housing No.	Bearing No.		Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Mass kg
80	3 1/8	11 13/32 290	7 3/32 180	2 9/32 58	9 11/64 233	3/4 19	25/32 20	1 11/32 34	3 9/32 83.3	3.252 82.6	1.311 33.3	11/16	**UCFL216-50E** **UCFL216E**	FL216E	UC216-50 UC216		72.7	53.0	2.30	14.6	7.8
85	3 1/4	12 305	7 15/32 190	2 15/32 63	9 49/64 248	3/4 19	7/8 22	1 27/64 36	3 7/16 87.6	3.374 85.7	1.343 34.1	11/16	**UCFL217-52E** **UCFL217E**	FL217E	UC217-52 UC217		84.0	61.9	2.60	14.5	9.8

Remarks 1. In Part No. of unit, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210
A-R1/8 .... 211~217
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCFL206EJL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

NANFL
Cylindrical bore
(with eccentric locking collar)
d 12 ~ 55 mm



Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.	$\varDelta_{A2s}$	X
NFL204~NFL210	±0.5	0.7
NFL211	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
NFL204~NFL211	±0.2

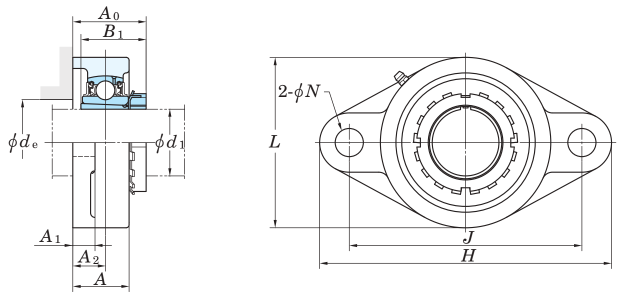
Shaft Dia mm	inch	Dimensions inch mm H	L	A	J	N	A_1	A_2	A_0	B_1	S	Bolt Size inch	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Mass kg
12		4 7/16 113	2 3/8 60	1 5/32 29.5	3 17/32 89.7	25/64 10	7/16 11	3/4 19	1 25/32 45.6	1.720 43.7	0.673 17.1	5/16	**NANFL201**	NFL204	NA201	12.8	6.65	0.302	13.2	0.59
	1/2												**NANFL201-8**		NA201-8					
15													**NANFL202**		NA202					
	5/8												**NANFL202-10**		NA202-10					
17													**NANFL203**		NA203					
	3/4												**NANFL204-12**		NA204-12					
20													**NANFL204**		NA204					
	7/8	5 1/8 130	2 11/16 68	1 7/32 31	3 57/64 98.8	15/32 12	1/2 13	25/32 20	1 27/32 46.9	1.748 44.4	0.689 17.5	3/8	**NANFL205-14**	NFL205	NA205-14	14.0	7.85	0.357	13.9	0.9
	15/16												**NANFL205-15**		NA205-15					
25													**NANFL205**		NA205					
	1												**NANFL205-16**		NA205-16					
	1 1/8	5 13/16 148	3 5/32 80	1 11/32 34	4 19/32 116.7	15/32 12	1/2 13	53/64 21	2 51.1	1.906 48.4	0.720 18.3	3/8	**NANFL206-18**	NFL206	NA206-18	19.5	11.3	0.514	13.9	1.1
30													**NANFL206**		NA206					
	1 3/16												**NANFL206-19**		NA206-19					
	1 1/4												**NANFL206-20**		NA206-20					
	1 1/4	6 11/32 161	3 17/32 90	1 7/16 36.5	5 1/8 130.2	33/64 13	9/16 14	27/32 21.5	2 1/8 53.8	2.012 51.1	0.740 18.8	7/16	**NANFL207-20**	NFL207	NA207-20	25.7	15.4	0.700	13.9	1.6
	1 5/16												**NANFL207-21**		NA207-21					
	1 3/8												**NANFL207-22**		NA207-22					
35													**NANFL207**		NA207					
	1 7/16												**NANFL207-23**		NA207-23					
	1 1/2	6 7/8 175	3 15/16 100	1 17/32 39	5 21/32 143.7	33/64 13	9/16 14	15/16 24	2 5/16 58.9	2.217 56.3	0.843 21.4	7/16	**NANFL208-24**	NFL208	NA208-24	29.1	17.8	0.809	14.0	2.0
	1 9/16												**NANFL208-25**		NA208-25					
40													**NANFL208**		NA208					
	1 5/8	7 13/32 188	4 1/4 108	1 9/16 40	5 27/32 148.4	19/32 15	9/16 14	15/16 24	2 5/16 58.9	2.217 56.3	0.843 21.4	1/2	**NANFL209-26**	NFL209	NA209-26	34.1	21.3	0.968	14.0	2.3
	1 11/16												**NANFL209-27**		NA209-27					
	1 3/4												**NANFL209-28**		NA209-28					
45													**NANFL209**		NA209					
	1 7/8	7 3/4 197	4 17/32 115	1 27/32 46.5	6 3/16 157	19/32 15	9/16 14	1 1/8 28.5	2 5/8 66.6	2.469 62.7	0.969 24.6	1/2	**NANFL210-30**	NFL210	NA210-30	35.1	23.3	1.06	14.4	2.7
	1 15/16												**NANFL210-31**		NA210-31					
50													**NANFL210**		NA210					
	2												**NANFL210-32**		NA210-32					
	2	8 13/16 224	5 1/8 130	1 31/32 50	7 1/4 184	21/32 16.5	25/32 20	1 17/64 32	2 31/32 75.6	2.811 71.4	1.094 27.8	9/16	**NANFL211-32**	NFL211	NA211-32	43.4	29.4	1.34	14.4	4.1
	2 1/8												**NANFL211-34**		NA211-34					
55													**NANFL211**		NA211					
	2 3/16												**NANFL211-35**		NA211-35					

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210
A-R1/8 211
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
4. Housings of spheroidal graphite iron casting are also available.

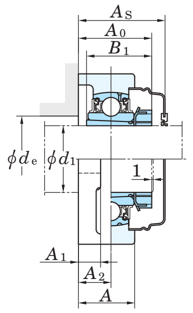
UKFL

Tapered bore (with adapter)

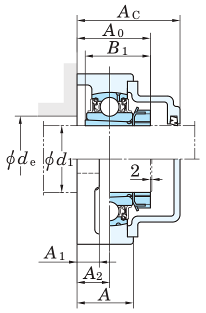
d_1 20 ~ 50 mm

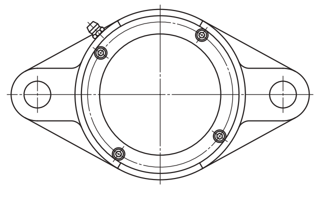


With Pressed Steel Cover (E1)



With Cast Iron Cover (E3)





Cast iron cover fixing screw position (standard)

Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and tolerance of position of bolt hole (X)

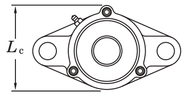
Unit: mm

Housing No.			$\varDelta_{A2s}$	X
FL205~FL210	FLX05~FLX10	FL305~FL310	±0.5	0.7
FL211~FL218		FL311~FL324	±0.8	1

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$) Unit: mm

Housing No.			$\varDelta_{Ns}$
FL205~FL218	FLX05~FLX10	FL305~FL311	±0.2
		FL312~FL324	±0.3

Forms and dimensions of L_c of FL205JE3 (housing with cast iron cover) are shown below.



FL205JE3 $L_c = 73$ mm

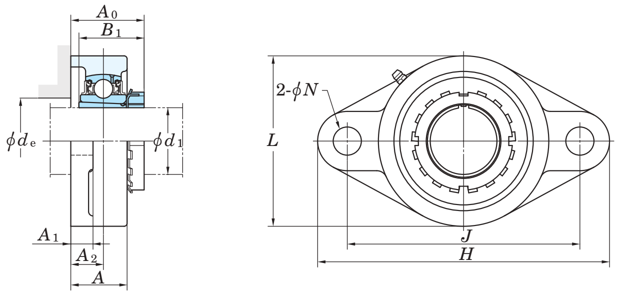
Shaft Dia. mm d_1	Shaft Dia. inch d_1	Dimensions inch / mm H	L	A	J	N	A_1	A_2	A_0	B_1	d_e (min.)	Bolt Size inch / mm	Standard Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	With Pressed Steel Cover Unit No. Open End Type	Closed End Type	Dimension mm A_s	Dimension inch A_s	Mass kg	With Cast Iron Cover Unit No. Open End Type	Closed End Type	Dimension mm A_c	Dimension inch A_c	Mass kg
20	3/4	5 1/8 130	2 11/16 68	1 1/16 27	3 57/64 99	5/8 16	1/2 13	5/8 16	1 13/32 36	1 3/8 35	1 3/16 30	1/2 M14	**UKFL205**	FL205	UK205	HE2305X H2305X	0.68 0.68	14.0	7.85	0.357	13.9	– UKFL205C	– UKFL205D	– 40.5	– 1 19/32	– 0.68	– UKFL205FC	– UKFL205FD	– 49	– 1 15/16	– 0.89
	3/4	5 9/16 141	3 9/32 83	1 3/16 30	4 39/64 117	15/32 12	1/2 13	45/64 18	1 9/16 39.5	1 3/8 35	1 3/16 30	3/8 M10	**UKFLX05**	FLX05	UKX05	HE2305X H2305X	1.0 1.0	19.5	11.3	0.514	13.9	– UKFLX05C	– UKFLX05D	– 44.5	– 1 3/4	– 1.0	– –	– –	– –	– –	– –
	3/4	5 29/32 150	3 5/32 80	1 5/32 29	4 29/64 113	3/4 19	1/2 13	5/8 16	1 15/32 37.5	1 3/8 35	– –	5/8 M16	**UKFL305**	FL305	UK305	HE2305X H2305X	1.1 1.1	21.2	10.9	0.495	12.6	– –	– –	– –	– –	– –	– UKFL305C	– UKFL305D	– 54	– 2 1/8	– 1.4
25	1	5 13/16 148	3 5/32 80	1 7/32 31	4 39/64 117	5/8 16	1/2 13	45/64 18	1 9/16 39.5	1 1/2 38	1 13/32 36	3/8 M14	**UKFL206**	FL206	UK206	H2306X HE2306X	0.97 0.97	19.5	11.3	0.514	13.9	UKFL206C –	UKFL206D –	44.5 –	1 3/4 –	0.97 –	UKFL206FC –	UKFL206FD –	53 –	2 3/32 –	1.2 –
	1	6 5/32 156	3 3/4 95	1 11/32 34	5 1/8 130	5/8 16	9/16 14	3/4 19	1 21/32 42	1 1/2 38	1 13/32 36	3/8 M14	**UKFLX06**	FLX06	UKX06	H2306X HE2306X	1.5 1.5	25.7	15.4	0.700	13.9	UKFLX06C –	UKFLX06D –	49 –	1 15/16 –	1.5 –	– –	– –	– –	– –	– –
	1	7 3/32 180	3 17/32 90	1 1/4 32	5 9/32 134	29/32 23	19/32 15	45/64 18	1 5/8 41	1 1/2 38	– –	3/4 M20	**UKFL306**	FL306	UK306	H2306X HE2306X	1.5 1.5	26.7	15.0	0.682	13.3	– –	– –	– –	– –	– –	UKFL306C –	UKFL306D –	59 –	2 5/16 –	1.8 –
30	1 1/8	6 11/32 161	3 17/32 90	1 11/32 34	5 1/8 130	5/8 16	9/16 14	3/4 19	1 11/16 43	1 11/16 43	1 5/8 41	3/8 M14	**UKFL207**	FL207	UK207	HS2307X H2307X	1.3 1.3	25.7	15.4	0.700	13.9	– UKFL207C	– UKFL207D	– 49	– 1 15/16	– 1.3	– UKFL207FC	– UKFL207FD	– 58	– 2 9/32	– 1.7
	1 1/8	6 23/32 171	4 1/8 105	1 1/2 38	5 43/64 144	5/8 16	9/16 14	53/64 21	1 27/32 47	1 11/16 43	1 5/8 41	3/8 M14	**UKFLX07**	FLX07	UKX07	HS2307X H2307X	1.8 1.8	29.1	17.8	0.809	14.0	– UKFLX07C	– UKFLX07D	– 55.5	– 2 3/16	– 1.8	– –	– –	– –	– –	– –
	1 1/8	7 9/32 185	3 15/16 100	1 13/32 36	5 35/64 141	29/32 23	5/8 16	25/32 20	1 25/32 45.5	1 11/16 43	– –	3/4 M20	**UKFL307**	FL307	UK307	HS2307X H2307X	1.9 1.9	33.4	19.3	0.877	13.2	– –	– –	– –	– –	– –	– UKFL307C	– UKFL307D	– 64	– 2 17/32	– 2.4
35	1 1/4 1 3/8	6 7/8 175	3 15/16 100	1 13/32 36	5 43/64 144	5/8 16	9/16 14	53/64 21	1 7/8 48	1 13/16 46	1 13/16 46	3/8 M14	**UKFL208**	FL208	UK208	HE2308X HS2308X H2308X	1.6 1.6 1.6	29.1	17.8	0.809	14.0	– – UKFL208C	– – UKFL208D	– – 55.5	– – 2 3/16	– – 1.6	– – UKFL208FC	– – UKFL208FD	– – 64	– – 2 17/32	– – 2.0
	1 1/4 1 3/8	7 1/16 179	4 3/8 111	1 9/16 40	5 53/64 148	5/8 16	9/16 14	55/64 22	1 31/32 50	1 13/16 46	1 13/16 46	3/8 M14	**UKFLX08**	FLX08	UKX08	HE2308X HS2308X H2308X	2.1 2.1 2.1	34.1	21.3	0.968	14.0	– – UKFLX08C	– – UKFLX08D	– – 56.5	– – 2 7/32	– – 2.1	– – –	– – –	– – –	– – –	– – –
	1 1/4 1 3/8	7 7/8 200	4 13/32 112	1 9/16 40	6 7/32 158	29/32 23	21/32 17	29/32 23	2 50.5	1 13/16 46	– –	3/4 M20	**UKFL308**	FL308	UK308	HE2308X HS2308X H2308X	2.5 2.5 2.5	40.7	24.0	1.09	13.2	– – –	– – –	– – –	– – –	– – –	– – UKFL308C	– – UKFL308D	– – 71	– – 2 25/32	– – 3.0
40	1 1/2	7 13/32 188	4 1/4 108	1 1/2 38	5 53/64 148	3/4 19	19/32 15	55/64 22	2 51	1 31/32 50	2 1/16 52	5/8 M16	**UKFL209**	FL209	UK209	HE2309X H2309X	2.0 2.0	34.1	21.3	0.968	14.0	– UKFL209C	– UKFL209D	– 56.5	– 2 7/32	– 2.0	– UKFL209FC	– UKFL209FD	– 66	– 2 19/32	– 2.5
	1 1/2	7 7/16 189	4 9/16 116	1 9/16 40	6 3/16 157	5/8 16	9/16 14	29/32 23	2 1/16 52	1 31/32 50	2 1/16 52	3/8 M14	**UKFLX09**	FLX09	UKX09	HE2309X H2309X	2.5 2.5	35.1	23.3	1.06	14.4	– UKFLX09C	– UKFLX09D	– 60	– 2 3/8	– 2.5	– –	– –	– –	– –	– –
	1 1/2	9 1/16 230	4 29/32 125	1 23/32 44	6 31/32 177	63/64 25	23/32 18	63/64 25	2 5/32 55	1 31/32 50	– –	7/8 M22	**UKFL309**	FL309	UK309	HE2309X H2309X	3.6 3.6	48.9	29.5	1.34	13.3	– –	– –	– –	– –	– –	– UKFL309C	– UKFL309D	– 76	– 3	– 4.2
45	1 3/4	7 3/4 197	4 17/32 115	1 9/16 40	6 3/16 157	3/4 19	19/32 15	55/64 22	2 1/16 52	2 5/32 55	2 9/32 58	5/8 M16	**UKFL210**	FL210	UK210	HE2310X H2310X	2.3 2.3	35.1	23.3	1.06	14.4	– UKFL210C	– UKFL210D	– 59	– 2 5/16	– 2.3	– UKFL210FC	– UKFL210FD	– 70.5	– 2 25/32	– 2.8
	1 3/4	8 1/2 216	5 1/4 133	1 23/32 44	7 1/4 184	3/4 19	25/32 20	1 1/32 26	2 9/32 58	2 5/32 55	2 9/32 58	5/8 M16	**UKFLX10**	FLX10	UKX10	HE2310X H2310X	3.7 3.7	43.4	29.4	1.34	14.4	– UKFLX10C	– UKFLX10D	– 64	– 2 17/32	– 3.7	– –	– –	– –	– –	– –
	1 3/4	9 7/16 240	5 1/2 140	1 7/8 48	7 23/64 187	63/64 25	3/4 19	1 7/64 28	2 3/8 60	2 5/32 55	– –	7/8 M22	**UKFL310**	FL310	UK310	HE2310X H2310X	4.4 4.4	62.0	38.3	1.74	13.2	– –	– –	– –	– –	– –	– UKFL310C	– UKFL310D	– 83	– 3 9/32	– 5.2
50	1 7/8 2	8 13/16 224	5 1/8 130	1 11/16 43	7 1/4 184	3/4 19	23/32 18	63/64 25	2 1/4 57.5	2 5/16 59	2 17/32 64	5/8 M16	**UKFL211**	FL211	UK211	HS2311X H2311X HE2311X	3.3 3.3 3.3	43.4	29.4	1.34	14.4	– UKFL211C –	– UKFL211D –	– 63 –	– 2 15/32 –	– 3.3 –	– UKFL211FC –	– UKFL211FD –	– 74.5 –	– 2 15/16 –	– 3.9 –
	1 7/8 2	9 27/32 250	5 29/32 150	2 1/16 52	7 51/64 198	63/64 25	25/32 20	1 3/16 30	2 17/32 64	2 5/16 59	– –	7/8 M22	**UKFL311**	FL311	UK311	HS2311X H2311X HE2311X	5.6 5.6 5.6	71.6	45.0	2.05	13.2	– – –	– – –	– – –	– – –	– – –	– UKFL311C –	– UKFL311D –	– 87 –	– 3 7/16 –	– 6.5 –

Remarks
1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
   A-1/4-28UNF .... 205~210, X05~X09, 305~308
   A-R1/8 .... 211~218, X10, 309~324
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
   (Example of Part No. : UKFL206J + H2306X, UK206 + H2306X)
4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing.
   (Example of Part No. : UKFL206JL3 + H2306X, UK206L3 + H2306X)
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Housings of spheroidal graphite iron casting are also available.

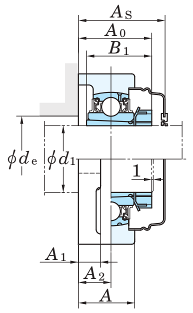
UKFL

Tapered bore (with adapter)

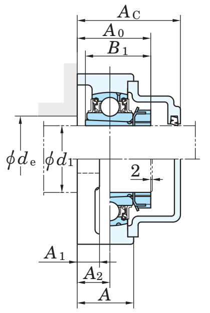
d_1 55 ~ 110 mm

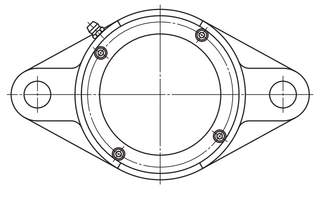


With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}) and tolerance of position of bolt hole (X)

Unit: mm

Housing No.			Δ_{A2s}	X
FL205~FL210	FLX05~FLX10	FL305~FL310	±0.5	0.7
FL211~FL218		FL311~FL324	±0.8	1

Variations of tolerance of bolt hole diameter (Δ_{Ns}) Unit: mm

Housing No.			Δ_{Ns}
FL205~FL218	FLX05~FLX10	FL305~FL311	±0.2
		FL312~FL324	±0.3

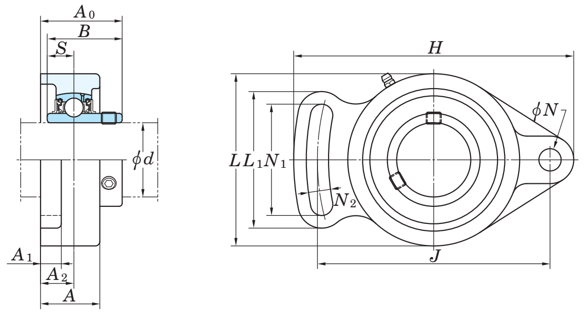
Shaft Dia. d_1 mm	Shaft Dia. d_1 inch	Dimensions inch / mm H	L	A	J	N	A_1	A_2	A_0	B_1	d_e (min.)	Bolt Size inch / mm	Standard Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	With Pressed Steel Cover Unit No. Open End Type	Closed End Type	Dimension A_s mm	Dimension A_s inch	Mass kg	With Cast Iron Cover Unit No. Open End Type	Closed End Type	Dimension A_c mm	Dimension A_c inch	Mass kg
55	2 1/8	9 27/32 250	5 1/2 140	1 7/8 48	7 61/64 202	29/32 23	23/32 18	1 9/64 29	2 19/32 65.5	2 7/16 62	2 23/32 69	3/4 M20	**UKFL212**	FL212	UK212	HS2312X H2312X	4.1 4.1	52.4	36.2	1.65	14.4	– UKFL212C	– UKFL212D	– 73.5	– 2 29/32	– 4.1	– UKFL212FC	– UKFL212FD	– 86	– 3 3/8	– 4.9
	2 1/8	10 5/8 270	6 5/16 160	2 7/32 56	8 11/32 212	1 7/32 31	7/8 22	1 19/64 33	2 3/4 69.5	2 7/16 62	– –	1 M27	**UKFL312**	FL312	UK312	HS2312X H2312X	6.9 6.9	81.9	52.2	2.37	13.2	– –	– –	– –	– –	– –	– UKFL312C	– UKFL312D	– 95	– 3 3/8	– 8.1
60	2 1/4 2 3/8	10 5/32 258	6 3/32 155	1 31/32 50	8 17/64 210	29/32 23	25/32 20	1 3/16 30	2 21/32 67.5	2 9/16 65	2 29/32 74	3/4 M20	**UKFL213**	FL213	UK213	HE2313X H2313X HS2313X	5.0 5.0 5.0	57.2	40.1	1.82	14.4	– UKFL213C –	– UKFL213D –	– 74.5 –	– 2 15/16 –	– 5.0 –	– UKFL213FC –	– UKFL213FD –	– 87 –	– 3 7/16 –	– 5.9 –
	2 1/4 2 3/8	11 5/8 295	6 7/8 175	2 9/32 58	9 29/64 240	1 7/32 31	31/32 25	1 19/64 33	2 13/16 71.5	2 9/16 65	– –	1 M27	**UKFL313**	FL313	UK313	HE2313X H2313X HS2313X	8.6 8.6 8.6	92.7	59.9	2.68	13.2	– – –	– – –	– – –	– – –	– – –	– UKFL313C –	– UKFL313D –	– 94 –	– 3 11/16 –	– 9.7 –
65	2 1/2	10 13/16 275	6 1/2 165	2 7/32 56	8 55/64 225	29/32 23	25/32 20	1 11/32 34	2 15/16 74.5	2 7/8 73	3 11/32 85	3/4 M20	**UKFL215**	FL215	UK215	HE2315X H2315X	6.6 6.6	67.4	48.3	2.17	14.5	– UKFL215C	– UKFL215D	– 83.5	– 3 9/32	– 6.6	– UKFL215FC	– UKFL215FD	– 96	– 3 25/32	– 7.6
	2 1/2	12 19/32 320	7 11/16 195	2 19/32 66	10 15/64 260	1 3/8 35	1 3/16 30	1 17/32 39	2 7/32 81.5	2 7/8 73	– –	1 1/8 M30	**UKFL315**	FL315	UK315	HE2315X H2315X	11.4 11.4	113	77.2	3.24	13.2	– –	– –	– –	– –	– –	– UKFL315C	– UKFL315D	– 106	– 4 3/16	– 12.8
70	2 3/4	11 13/32 290	7 3/32 180	2 9/32 58	9 11/64 233	63/64 25	25/32 20	1 11/32 34	3 3/32 78.5	3 1/16 78	3 17/32 90	7/8 M22	**UKFL216**	FL216	UK216	HE2316X H2316X	8.1 8.1	72.7	53.0	2.30	14.6	– UKFL216C	– UKFL216D	– 88.5	– 3 15/32	– 8.1	– UKFL216FC	– UKFL216FD	– 103	– 4 1/16	– 9.4
	2 3/4	13 31/32 355	8 9/32 210	2 11/16 68	11 7/32 285	1 1/2 38	1 1/4 32	1 1/2 38	3 1/4 82.5	3 1/16 78	– –	1 1/4 M33	**UKFL316**	FL316	UK316	HE2316X H2316X	13.9 13.9	123	86.7	3.53	13.3	– –	– –	– –	– –	– –	– UKFL316C	– UKFL316D	– 107	– 4 7/32	– 15.5
75	3	12 305	7 15/32 190	2 15/32 63	9 49/64 248	63/64 25	7/8 22	1 27/64 36	3 1/4 82.5	3 7/32 82	3 25/32 96	7/8 M22	**UKFL217**	FL217	UK217	H2317X HE2317X	9.9 9.9	84.0	61.9	2.60	14.5	UKFL217C –	UKFL217D –	92.5 –	3 21/32 –	9.9 –	UKFL217FC –	UKFL217FD –	107 –	4 7/32 –	11.3 –
	3	14 9/16 370	8 21/32 220	2 29/32 74	11 13/16 300	1 1/2 38	1 1/4 32	1 47/64 44	3 5/8 92	3 7/32 82	– –	1 1/4 M33	**UKFL317**	FL317	UK317	H2317X HE2317X	15.8 15.8	133	96.8	3.82	13.3	– –	– –	– –	– –	– –	UKFL317C –	UKFL317D –	117 –	4 19/32 –	17.6 –
80	–	12 19/32 320	8 1/16 205	2 11/16 68	10 7/16 265	63/64 25	29/32 23	1 37/64 40	3 17/32 89.5	3 3/8 86	4 1/32 102	7/8 M22	**UKFL218**	FL218	UK218	H2318X	12.2	96.1	71.5	2.91	14.5	UKFL218C	UKFL218D	101.5	4	12.2	UKFL218FC	UKFL218FD	116	4 9/16	13.8
	–	15 5/32 385	9 1/4 235	3 76	12 13/32 315	1 1/2 38	1 13/32 36	1 47/64 44	3 5/8 92	3 3/8 86	– –	1 1/4 M33	**UKFL318**	FL318	UK318	H2318X	19.1	143	107	4.11	13.3	–	–	–	–	–	UKFL318C	UKFL318D	119	4 11/16	21.2
85	3 1/4	15 15/16 405	9 27/32 250	3 11/16 94	13 330	1 39/64 41	1 9/16 40	2 21/64 59	4 3/8 111	3 17/32 90	– –	1 3/8 M36	**UKFL319**	FL319	UK319	HE2319X H2319X	24.9 24.9	153	119	4.45	13.3	– –	– –	– –	– –	– –	– UKFL319C	– UKFL319D	– 140	– 5 1/2	– 27.3
90	3 1/2	17 5/16 440	10 5/8 270	3 11/16 94	14 11/64 360	1 47/64 44	1 9/16 40	2 21/64 59	4 7/16 113	3 13/16 97	– –	1 1/2 M39	**UKFL320**	FL320	UK320	HE2320X H2320X	29.0 29.0	173	141	5.08	13.2	– –	– –	– –	– –	– –	– UKFL320C	– UKFL320D	– 146	– 5 3/4	– 32.1
100	4	18 1/2 470	11 13/16 300	3 25/32 96	15 23/64 390	1 47/64 44	1 21/32 42	2 23/64 60	4 23/32 120	4 1/8 105	– –	1 1/2 M39	**UKFL322**	FL322	UK322	H2322X HE2322X	36.1 36.1	205	180	6.15	13.2	– –	– –	– –	– –	– –	UKFL322C –	UKFL322D –	154 –	6 1/16 –	39.6 –
110	–	20 15/32 520	13 330	4 11/32 110	16 59/64 430	1 27/32 47	1 7/8 48	2 9/16 65	5 1/8 130.5	4 13/32 112	– –	1 5/8 M42	**UKFL324**	FL324	UK324	H2324	51.9	207	185	6.10	13.5	–	–	–	–	–	UKFL324C	UKFL324D	163	6 13/32	57.0

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 205~210, X05~X09, 305~308
A-R1/8 .... 211~218, X10, 309~324
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
(Example of Part No. : UKFL206J + H2306X, UK206 + H2306X)
4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing.
(Example of Part No. : UKFL206JL3 + H2306X, UK206L3 + H2306X)
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Housings of spheroidal graphite iron casting are also available.

UCFA

Cylindrical bore (with set screws)

d 12 ~ 55 mm



Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$)

Unit: mm

Housing No.	$\varDelta_{A2s}$
FA204~FA210	±0.5
FA211	±0.8

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
FA204~FA211	±0.2

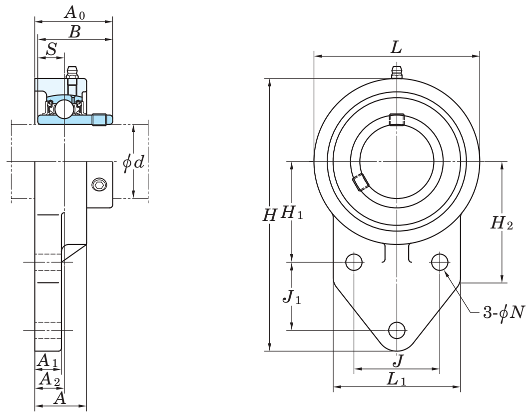
Shaft Dia. *d* mm	Shaft Dia. *d* inch	Dimensions inch / mm *H*	*L*	*A*	*J*	*N*	N_1	N_2	L_1	A_1	A_2	A_0	*B*	*S*	Bolt Size inch / mm	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Mass kg
12		3 27/32 98	2 5/16 59	15/16 24	3 5/64 78	25/64 10	1 9/16 40	13/32 10	1 31/32 50	7/16 11	35/64 13.8	1 1/4 32.1	1.220 31	0.500 12.7	5/16 M8	**UCFA201**	FA204	UC201	12.8	6.65	0.302	13.2	0.47
	1/2															**UCFA201-8**		UC201-8					
15																**UCFA202**		UC202					0.45
	5/8															**UCFA202-10**		UC202-10					
17																**UCFA203**		UC203					0.44
	3/4															**UCFA204-12**		UC204-12					
20																**UCFA204**		UC204					0.42
	7/8	4 7/8 124	2 3/4 70	1 1/16 27	3 55/64 98	7/16 11	1 15/16 49	7/16 11	2 17/32 64	1/2 13	5/8 16	1 13/32 35.8	1.343 34.1	0.563 14.3	3/8 M10	**UCFA205-14**	FA205	UC205-14	14.0	7.85	0.357	13.9	0.68
	15/16															**UCFA205-15**		UC205-15					
25																**UCFA205**		UC205					
	1															**UCFA205-16**		UC205-16					
	1 1/8	5 9/16 141	3 9/32 83	1 3/16 30	4 39/64 117	7/16 11	2 7/32 56	15/32 12	2 11/16 68	1/2 13	45/64 17.8	1 9/16 40	1.500 38.1	0.626 15.9	3/8 M10	**UCFA206-18**	FA206	UC206-18	19.5	11.3	0.514	13.9	1.0
30																**UCFA206**		UC206					
	1 3/16															**UCFA206-19**		UC206-19					
	1 1/4															**UCFA206-20**		UC206-20					
	1 1/4	6 3/32 155	3 25/32 96	1 11/32 34	5 1/8 130	33/64 13	2 15/32 63	1/2 13	2 15/16 75	9/16 14	47/64 18.6	1 23/32 44	1.689 42.9	0.689 17.5	7/16 M12	**UCFA207-20**	FA207	UC207-20	25.7	15.4	0.700	13.9	1.5
	1 5/16															**UCFA207-21**		UC207-21					
	1 3/8															**UCFA207-22**		UC207-22					
35																**UCFA207**		UC207					
	1 7/16															**UCFA207-23**		UC207-23					
	1 1/2	6 23/32 171	4 1/8 105	1 1/2 38	5 43/64 144	33/64 13	2 3/4 70	1/2 13	3 5/16 84	9/16 14	13/16 20.8	2 51	1.937 49.2	0.748 19	7/16 M12	**UCFA208-24**	FA208	UC208-24	29.1	17.8	0.809	14	1.9
	1 9/16															**UCFA208-25**		UC208-25					
40																**UCFA208**		UC208					
	1 5/8	7 1/16 179	4 3/8 111	1 9/16 40	5 53/64 148	19/32 15	2 27/32 72	19/32 15	3 15/32 88	9/16 14	55/64 21.8	2 1/16 52	1.937 49.2	0.748 19	1/2 M14	**UCFA209-26**	FA209	UC209-26	34.1	21.3	0.968	14	1.7
	1 11/16															**UCFA209-27**		UC209-27					
	1 3/4															**UCFA209-28**		UC209-28					
45																**UCFA209**		UC209					
	1 7/8	7 7/16 189	4 9/16 116	1 9/16 40	6 3/16 157	19/32 15	2 15/16 75	19/32 15	3 5/8 92	9/16 14	57/64 22.5	2 5/32 55.1	2.031 51.6	0.748 19	1/2 M14	**UCFA210-30**	FA210	UC210-30	35.1	23.3	1.06	14.4	2.0
	1 15/16															**UCFA210-31**		UC210-31					
50																**UCFA210**		UC210					
	2															**UCFA210-32**		UC210-32					
	2	8 1/2 216	5 1/4 133	1 23/32 44	7 1/4 184	5/8 16	3 3/8 86	5/8 16	4 1/32 102	25/32 20	1 1/64 25.7	2 5/16 59.1	2.189 55.6	0.874 22.2	1/2 M14	**UCFA211-32**	FA211	UC211-32	43.4	29.4	1.34	14.4	3.6
	2 1/8															**UCFA211-34**		UC211-34					
55																**UCFA211**		UC211					
	2 3/16															**UCFA211-35**		UC211-35					

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~210
A-R1/8 211
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows Part No. of unit or bearing. (Example of Part No. : UCFA206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Tapered bore (with adapter) type products are also available. (Example of Part No. : UKFA205J + H2305X, UK205 + H2305X)

UCFB

Cylindrical bore (with set screws)

d 12 ~ 50 mm



Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$), variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$, $\varDelta_{J1s}$), variations of tolerance of distance between both grooves ($\varDelta_{H1s}$)

Unit: mm

Housing No.	$\varDelta_{A2s}$	$\varDelta_{Js}$	$\varDelta_{J1s}$	$\varDelta_{H1s}$
FB204~FB210	±0.5			

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
FB204~FB210	±0.2

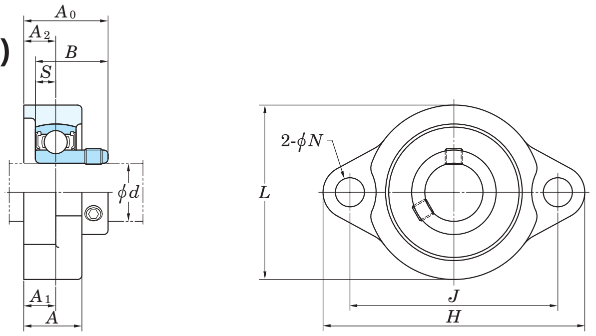
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm														Bolt Size inch mm	Unit No.	Housing No.		Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		*H*	*L*	*A*	*J*	J_1	*N*	H_1	H_2	L_1	A_1	A_2	A_0	*B*	*S*						C_r	C_{0r}	C_u	f_0	kg
12		4 11/32 110	2 7/16 62	15/16 24.5	1 17/64 32	1 1/16 27	3/8 9.5	1 21/32 42	2 1/16 52	2 1/16 52	1/2 13	17/32 13.5	1 1/4 31.8	1.220 31	0.500 12.7	5/16 M8	**UCFB201**	FB204		UC201	12.8	6.65	0.302	13.2	0.64
	1/2																**UCFB201-8**			UC201-8					
15																	**UCFB202**			UC202					0.62
	5/8																**UCFB202-10**			UC202-10					
17																	**UCFB203**			UC203					0.61
	3/4																**UCFB204-12**			UC204-12					
20																	**UCFB204**			UC204					0.59
	7/8	4 9/16 116	2 11/16 68	1 1/16 27	1 11/32 34	1 1/16 27	3/8 9.5	1 49/64 45	2 1/16 52	2 7/32 56	1/2 13	19/32 15	1 3/8 34.8	1.343 34.1	0.563 14.3	5/16 M8	**UCFB205-14**	FB205		UC205-14	14.0	7.85	0.357	13.9	0.68
	15/16																**UCFB205-15**			UC205-15					
25																	**UCFB205**			UC205					
	1																**UCFB205-16**			UC205-16					
	1 1/8	5 1/8 130	3 1/16 78	1 3/16 30	1 37/64 40	1 9/64 29	3/8 9.5	1 31/32 50	2 5/32 55	2 9/16 65	1/2 13	43/64 17	1 17/32 39.2	1.500 38.1	0.626 15.9	5/16 M8	**UCFB206-18**	FB206		UC206-18	19.5	11.3	0.514	13.9	0.92
30																	**UCFB206**			UC206					
	1 3/16																**UCFB206-19**			UC206-19					
	1 1/4																**UCFB206-20**			UC206-20					
	1 1/4	5 21/32 144	3 17/32 90	1 5/16 33.5	1 13/16 46	1 17/64 32	3/8 9.5	2 11/64 55	2 7/16 62	2 3/4 70	19/32 15	3/4 19	1 3/4 44.4	1.689 42.9	0.689 17.5	5/16 M8	**UCFB207-20**	FB207		UC207-20	25.7	15.4	0.700	13.9	1.3
	1 5/16																**UCFB207-21**			UC207-21					
	1 3/8																**UCFB207-22**			UC207-22					
35																	**UCFB207**			UC207					
	1 7/16																**UCFB207-23**			UC207-23					
	1 1/2	6 15/32 164	3 15/16 100	1 3/8 35	1 31/32 50	1 39/64 41	7/16 11	2 23/64 60	2 27/32 72	3 1/16 78	5/8 16	25/32 20	1 31/32 50.2	1.937 49.2	0.748 19	3/8 M10	**UCFB208-24**	FB208		UC208-24	29.1	17.8	0.809	14.0	1.8
	1 9/16																**UCFB208-25**			UC208-25					
40																	**UCFB208**			UC208					
	1 5/8	6 27/32 174	4 3/16 106	1 3/8 35.5	2 1/8 54	1 11/16 43	7/16 11	2 9/16 65	3 76	3 5/32 80	23/32 18	25/32 20	1 31/32 50.2	1.937 49.2	0.748 19	3/8 M10	**UCFB209-26**	FB209		UC209-26	34.1	21.3	0.968	14.0	2.0
	1 11/16																**UCFB209-27**			UC209-27					
	1 3/4																**UCFB209-28**			UC209-28					
45																	**UCFB209**			UC209					
	1 7/8	7 1/4 184	4 13/32 112	1 7/16 36	2 9/32 58	1 13/16 46	7/16 11	2 43/64 68	3 7/32 82	3 3/8 86	23/32 18	25/32 20	2 1/16 52.6	2.031 51.6	0.748 19	3/8 M10	**UCFB210-30**	FB210		UC210-30	35.1	23.3	1.06	14.4	2.3
	1 15/16																**UCFB210-31**			UC210-31					
50																	**UCFB210**			UC210					
	2																**UCFB210-32**			UC210-32					

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipple is A-1/4-28UNF.
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows Part No. of unit or bearing. (Example of Part No. : UCFB206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Tapered bore (with adapter) type products are also available. (Example of Part No. : UKFB205J + H2305X, UK205 + H2305X)

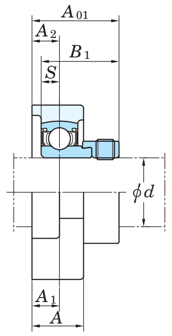
BLF
Cylindrical bore
(with set screws)

ALF
Cylindrical bore
(with eccentric locking collar)

d 12 ~ 35 mm



BLF



ALF

Variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}) and variations of tolerance of distance between centers of bolt holes (Δ_{Js})

Unit: mm

Housing No.	Δ_{A2s}	Δ_{Js}
LF203~LF207	±0.5	±0.7

Variations of tolerance of bolt hole diameter (Δ_{Ns})

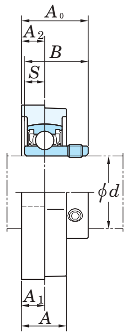
Unit: mm

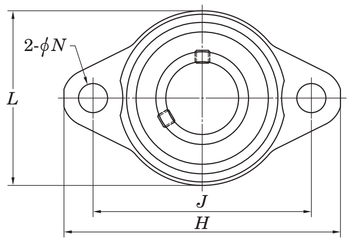
Housing No.	Δ_{Ns}
LF203~LF207	±0.2

Shaft Dia.		Dimensions inch mm												Bolt Size inch mm	Unit No.	Bearing No.	Unit No.	Bearing No.	Housing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass kg	
mm	inch									BLF		ALF													
d		H	L	A	J	N	A_1	A_2	S	A_0	B	A_{01}	B_1							C_r	C_{0r}	C_u	f_0	BLF	ALF
12		3 3/16 81	2 1/16 52	23/32 18	2 1/2 63.5	5/16 8	3/8 9.5	3/8 9.5	0.236 6	1 25.5	0.866 22	1 1/4 32	1.122 28.5	1/4 M6	**BLF201**	SB201	**ALF201**	SA201	LF203	9.55	4.80	0.218	13.2	0.25	0.28
	1/2														**BLF201-8**	SB201-8	**ALF201-8**	SA201-8							
15															**BLF202**	SB202	**ALF202**	SA202							
	5/8														**BLF202-10**	SB202-10	**ALF202-10**	SA202-10							
17															**BLF203**	SB203	**ALF203**	SA203							
20	3/4	3 17/32 90	2 3/8 60	25/32 20	2 13/16 71.5	25/64 10	7/16 11	7/16 11	0.276 7	1 5/32 29	0.984 25	1 5/16 33.5	1.161 29.5	5/16 M8	**BLF204-12**	SB204-12	**ALF204-12**	SA204-12	LF204	12.8	6.65	0.302	13.2	0.33	0.33
															BLF204	SB204	**ALF204**	SA204							
25	7/8	3 3/4 95	2 17/32 64	25/32 20	2 63/64 76	25/64 10	7/16 11	7/16 11	0.295 7.5	1 3/16 30.5	1.063 27	1 11/32 34	1.201 30.5	5/16 M8	**BLF205-14**	SB205-14	**ALF205-14**	SA205-14	LF205	14.0	7.85	0.357	13.9	0.38	0.42
	15/16														**BLF205-15**	SB205-15	**ALF205-15**	SA205-15							
															BLF205	SB205	**ALF205**	SA205							
	1														**BLF205-16**	SB205-16	**ALF205-16**	SA205-16							
30	1 1/8	4 7/16 113	3 76	7/8 22.5	3 9/16 90.5	15/32 12	15/32 12	15/32 12	0.315 8	1 11/32 34	1.181 30	1 1/2 37.9	1.335 33.9	3/8 M10	**BLF206-18**	SB206-18	**ALF206-18**	SA206-18	LF206	19.5	11.3	0.514	13.9	0.57	0.60
															BLF206	SB206	**ALF206**	SA206							
	1 3/16														**BLF206-19**	SB206-19	**ALF206-19**	SA206-19							
	1 1/4														**BLF206-20**	SB206-20	**ALF206-20**	SA206-20							
35	1 1/4	4 13/16 122	3 1/2 89	15/16 24	3 15/16 100	15/32 12	1/2 13	33/64 13	0.335 8.5	1 7/16 36.5	1.260 32	1 5/8 41	1.437 36.5	3/8 M10	**BLF207-20**	SB207-20	**ALF207-20**	SA207-20	LF207	25.7	15.4	0.700	13.9	0.77	0.85
	1 5/16																**ALF207-21**	SA207-21							
	1 3/8														**BLF207-22**	SB207-22	**ALF207-22**	SA207-22							
															BLF207	SB207	**ALF207**	SA207							
	1 7/16														**BLF207-23**	SB207-23	**ALF207-23**	SA207-23							

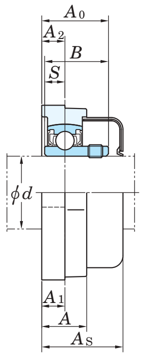
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Allowable load to housing in radial direction is approximately half of basic load rating of bearing, C_r (when safety factor is 4).
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

UFL
Cylindrical bore (with set screws)
d 8 ~ 30 mm

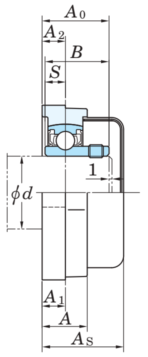




Open End Type



Closed End Type



Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$)

Unit: mm

Housing No.	$\varDelta_{A2s}$	$\varDelta_{Js}$
FL08	±0.5	±0.3
FL000~FL006		

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
FL08	±0.2
FL000~FL006	

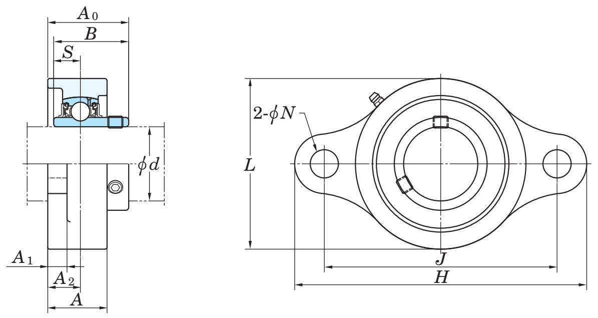
Shaft Dia. mm	Dimensions inch mm										Bolt Size inch mm	Standard			Mass	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Rubber Coated Cover				
												Unit No.	Housing No.	Bearing No.						Unit No.		Dimension mm inch		Mass
d	H	L	A	J	N	A_1	A_2	A_0	B	S					kg	C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	A_s		kg
8	1 7/8 48	1 1/16 27	11/32 8.5	1 29/64 37	3/16 4.8	5/32 4	5/32 4	1/2 12.5	0.472 12	0.1378 3.5	No.8 M4	**UFL08**	FL08	SU08	0.030	3.27	1.37	0.062	12.4	–	–	–	–	–
10	2 3/8 60	1 13/32 36	15/32 12	1 49/64 45	9/32 7	1/4 6	15/64 6	5/8 16	0.591 15	0.197 5	1/4 M6	**UFL000**	FL000	SU000	0.050	4.55	1.95	0.089	12.3	UFL000C	UFL000D	20.5	13/16	0.05
12	2 15/32 63	1 1/2 38	15/32 12	1 57/64 48	9/32 7	1/4 6	15/64 6	5/8 16	0.591 15	0.197 5	1/4 M6	**UFL001**	FL001	SU001	0.065	5.10	2.40	0.109	13.2	UFL001C	UFL001D	20.5	13/16	0.07
15	2 5/8 67	1 21/32 42	1/2 13	2 3/32 53	9/32 7	1/4 6.5	1/4 6.5	11/16 17.5	0.650 16.5	0.217 5.5	1/4 M6	**UFL002**	FL002	SU002	0.085	5.60	2.85	0.130	13.9	UFL002C	UFL002D	22	7/8	0.09
17	2 25/32 71	1 13/16 46	9/16 14	2 13/64 56	9/32 7	9/32 7	9/32 7	23/32 18.5	0.689 17.5	0.236 6	1/4 M6	**UFL003**	FL003	SU003	0.11	6.00	3.25	0.148	14.4	UFL003C	UFL003D	23.5	15/16	0.11
20	3 17/32 90	2 5/32 55	5/8 16	2 51/64 71	13/32 10	5/16 8	5/16 8	7/8 22	0.827 21	0.276 7	5/16 M8	**UFL004**	FL004	SU004	0.18	9.40	5.05	0.230	13.9	UFL004C	UFL004D	27	1 1/16	0.18
25	3 3/4 95	2 3/8 60	5/8 16	2 61/64 75	13/32 10	5/16 8	5/16 8	29/32 23	0.866 22	0.276 7	5/16 M8	**UFL005**	FL005	SU005	0.23	10.1	5.85	0.266	14.5	UFL005C	UFL005D	28	1 3/32	0.23
30	4 13/32 112	2 3/4 70	23/32 18	3 11/32 85	1/2 13	11/32 9	23/64 9	1 1/32 26	0.965 24.5	0.295 7.5	3/8 M10	**UFL006**	FL006	SU006	0.31	13.2	8.25	0.375	14.7	UFL006C	UFL006D	31	1 7/32	0.31

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Housing is made from special light alloy.
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

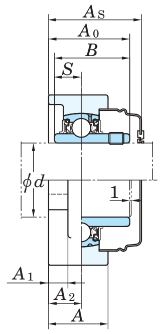
UCSFL-S6

Cylindrical bore (with set screws)

d 12 ~ 50 mm



With Pressed Stainless Steel Cover
(E1)



Variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$) and variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$)

Unit: mm

Housing No.	$\varDelta_{A2s}$	$\varDelta_{Js}$
SFL203~SFL210	±0.5	±0.5

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
SFL203~SFL210	±0.2

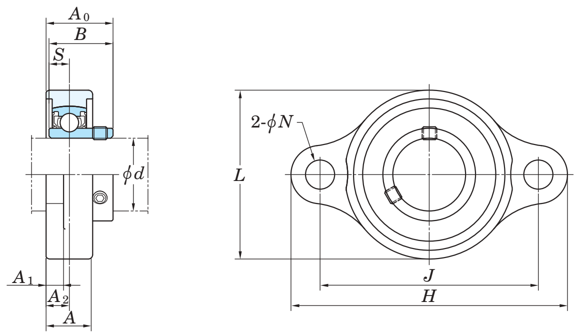
Shaft Dia.	Dimensions										Bolt Size	Standard					Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Stainless Steel Cover			
mm	mm										mm	Unit No.	Housing No.		Bearing No.	Mass	kN		kN		Unit No.		Dimension mm	Mass
d	H	L	A	J	N	A_1	A_2	A_0	B	S						kg	C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	A_s	kg
12	98	52	24	76.5	12	10	14	29.9	27.4	11.5	M10	**UCSFL201XS6**	SFL203		UC201XS6	0.33	8.15	3.85	0.175	13.2	–	–	–	0.33
15	98	52	24	76.5	12	10	14	29.9	27.4	11.5	M10	**UCSFL202XS6**	SFL203		UC202XS6	0.33	8.15	3.85	0.175	13.2	–	–	–	0.33
17	98	52	24	76.5	12	10	14	29.9	27.4	11.5	M10	**UCSFL203XS6**	SFL203		UC203XS6	0.33	8.15	3.85	0.175	13.2	–	–	–	0.33
20	113	60	26	90	12	10	15	33.3	31	12.7	M10	**UCSFL204S6**	SFL204		UC204S6	0.47	10.9	5.35	0.243	13.2	UCSFL204CS6	UCSFL204DS6	38	0.47
25	130	68	27.5	99	16	10	16	35.8	34.1	14.3	M14	**UCSFL205S6**	SFL205		UC205S6	0.61	11.9	6.30	0.286	13.9	UCSFL205CS6	UCSFL205DS6	40	0.61
30	148	80	31	117	16	10	18	40.2	38.1	15.9	M14	**UCSFL206S6**	SFL206		UC206S6	0.9	16.5	9.05	0.411	13.9	UCSFL206CS6	UCSFL206DS6	45	0.9
35	161	85	34	130	16	11	19	44.4	42.9	17.5	M14	**UCSFL207S6**	SFL207		UC207S6	1.1	21.8	12.3	0.559	13.9	UCSFL207CS6	UCSFL207DS6	49	1.1
40	175	94	36	144	16	12	21	51.2	49.2	19	M14	**UCSFL208S6**	SFL208		UC208S6	1.4	24.8	14.3	0.650	14.0	UCSFL208CS6	UCSFL208DS6	56	1.4
45	188	100	38	148	19	13	22	52.2	49.2	19	M16	**UCSFL209S6**	SFL209		UC209S6	1.6	27.8	16.2	0.736	14.0	UCSFL209CS6	UCSFL209DS6	57	1.6
50	197	106	40	157	19	13	22	54.6	51.6	19	M16	**UCSFL210S6**	SFL210		UC210S6	1.9	29.8	18.6	0.845	14.4	UCSFL210CS6	UCSFL210DS6	59	1.9

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipple is A-1/4-28UNFN12.
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

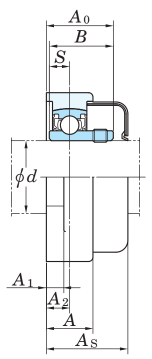
USFL-S6

Cylindrical bore (with set screws)

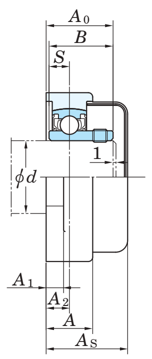
d 10 ～ 30 mm



Open End Type



Closed End Type



Variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}) and variations of tolerance of distance between centers of bolt holes (Δ_{Js})

Unit: mm

Housing No.	Δ_{A2s}	Δ_{Js}
SFL000~SFL006	±0.5	±0.3

Variations of tolerance of bolt hole diameter (Δ_{Ns})

Unit: mm

Housing No.	Δ_{Ns}
SFL000~SFL006	±0.2

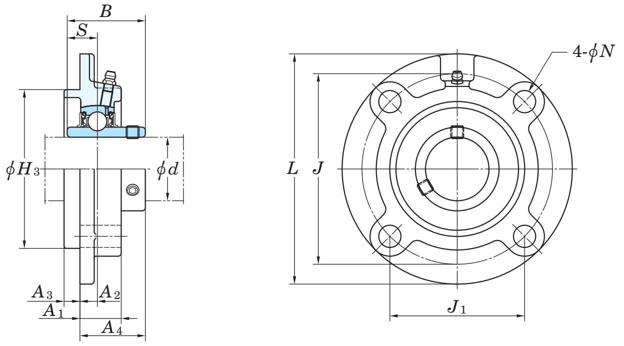
Shaft Dia. mm	Dimensions inch mm										Bolt Size inch mm	Standard			Mass	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Rubber Coated Cover				
												Unit No.	Housing No.	Bearing No.						Unit No.		Dimension		Mass
d	H	L	A	J	N	A_1	A_2	A_0	B	S					kg	C_r	C_{0r}	C_u	f_0	Open End Type	Closed End Type	mm A_s	inch	kg
10	2 3/8 60	1 11/32 34	15/32 12	1 49/64 45	9/32 7	3/16 5	15/64 6	5/8 16	0.591 15	0.197 5	1/4 M6	**USFL000S6**	SFL000	SU000S6	0.076	3.9	1.55	0.070	12.3	USFL000CS6	USFL000DS6	20.5	13/16	0.08
12	2 15/32 63	1 13/32 36	15/32 12	1 57/64 48	9/32 7	3/16 5	15/64 6	5/8 16	0.591 15	0.197 5	1/4 M6	**USFL001S6**	SFL001	SU001S6	0.080	4.3	1.9	0.086	13.2	USFL001CS6	USFL001DS6	20.5	13/16	0.08
15	2 5/8 67	1 5/8 41	1/2 13	2 3/32 53	9/32 7	1/4 6	1/4 6.5	11/16 17.5	0.650 16.5	0.217 5.5	1/4 M6	**USFL002S6**	SFL002	SU002S6	0.1	4.7	2.25	0.102	13.9	USFL002CS6	USFL002DS6	22	7/8	0.1
17	2 25/32 71	1 23/32 44	9/16 14	2 13/64 56	9/32 7	1/4 6	9/32 7	23/32 18.5	0.689 17.5	0.236 6	1/4 M6	**USFL003S6**	SFL003	SU003S6	0.13	5.1	2.6	0.118	14.4	USFL003CS6	USFL003DS6	23.5	15/16	0.13
20	3 19/32 91	2 3/32 53	5/8 16	2 51/64 71	13/32 10	1/4 6	5/16 8	7/8 22	0.827 21	0.276 7	5/16 M8	**USFL004S6**	SFL004	SU004S6	0.21	7.9	4	0.182	13.9	USFL004CS6	USFL004DS6	27	1 1/16	0.21
25	3 3/4 95	2 9/32 58	5/8 16	2 61/64 75	13/32 10	1/4 6	5/16 8	29/32 23	0.866 22	0.276 7	5/16 M8	**USFL005S6**	SFL005	SU005S6	0.23	8.5	4.65	0.211	14.5	USFL005CS6	USFL005DS6	28	1 3/32	0.23
30	4 11/32 110	2 19/32 66	23/32 18	3 11/32 85	1/2 13	9/32 7	23/64 9	1 1/32 26	0.965 24.5	0.295 7.5	3/8 M10	**USFL006S6**	SFL006	SU006S6	0.33	11.2	6.6	0.300	14.7	USFL006CS6	USFL006DS6	31	1 7/32	0.33

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

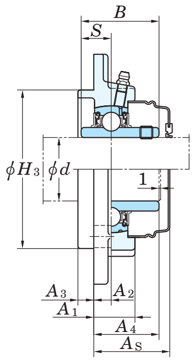
UCFC

Cylindrical bore (with set screws)

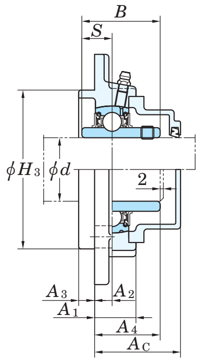
d 12 ~ 50 mm



With Pressed Steel Cover (E1)



With Cast Iron Cover (E3)



Variations of tolerance of spigot joint outside diameter ($\varDelta_{H3s}$), variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$), tolerance of position of bolt hole (X), and tolerance of circumferential runout of spigot joint (Y)

Unit: mm

Housing No.		$\varDelta_{H3s}$	$\varDelta_{A2s}$	X	Y
FC204~FC206	FCX05	0 –0.046	±0.5	0.7	0.2
FC207~FC210	FCX06~FCX10	0 –0.054			
FC211~FC217	FCX11~FCX15	0 –0.063	±0.8	1	0.3
FC218	FCX16~FCX18	0 –0.072			
	FCX20				0.4

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.		$\varDelta_{Ns}$
FC204~FC218	FCX05~FCX20	±0.2

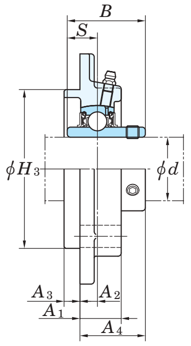
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm											Bolt Size inch / mm	Standard Unit No.	Standard Housing No.	Standard Bearing No.	Mass kg	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Cover Unit No. Open End Type	With Pressed Steel Cover Unit No. Closed End Type	Dimension mm	Dimension inch	Mass kg	With Cast Iron Cover Unit No. Open End Type	With Cast Iron Cover Unit No. Closed End Type	Dimension mm	Dimension inch	Mass kg
d		L	H_3	J	J_1	N	A_1	A_2	A_3	A_4	B	S						C_r	C_{0r}	C_u	f_0			A_s					A_c		
12		3 15/16 100	2.4409 62	3 5/64 78	2 11/64 55.1	15/32 12	13/16 20.5	25/64 10	13/64 5	1 1/8 28.3	1.220 31	0.500 12.7	3/8 M10	**UCFC201**	FC204	UC201	0.78	12.8	6.65	0.302	13.2	UCFC201C	UCFC201D	32.5	1 9/32	0.78	–	–	–	–	–
	1/2													**UCFC201-8**		UC201-8	0.78					–	–	–	–	–	–	–	–	–	–
15														**UCFC202**		UC202	0.76					UCFC202C	UCFC202D	32.5	1 9/32	0.76	–	–	–	–	–
	5/8													**UCFC202-10**		UC202-10	0.76					–	–	–	–	–	–	–	–	–	–
17														**UCFC203**		UC203	0.75					UCFC203C	UCFC203D	32.5	1 9/32	0.75	–	–	–	–	–
	3/4													**UCFC204-12**		UC204-12	0.75					–	–	–	–	–	–	–	–	–	–
20														**UCFC204**		UC204	0.73					UCFC204C	UCFC204D	32.5	1 9/32	0.73	UCFC204FC	UCFC204FD	41	1 17/32	0.84
25	7/8	4 17/32 115	2.7559 70	3 35/64 90	2 1/2 63.6	15/32 12	13/16 21	25/64 10	15/64 6	1 3/16 29.8	1.343 34.1	0.563 14.3	3/8 M10	**UCFC205-14**	FC205	UC205-14	0.95	14.0	7.85	0.357	13.9	–	–	–	–	–	–	–	–	–	–
	15/16													**UCFC205-15**		UC205-15	0.95					–	–	–	–	–	–	–	–	–	–
														UCFC205		UC205	0.95					UCFC205C	UCFC205D	34.5	1 11/32	0.95	UCFC205FC	UCFC205FD	43	1 21/32	1.1
	1													**UCFC205-16**		UC205-16	0.95					–	–	–	–	–	–	–	–	–	–
		4 3/8 111	2.9921 76	3 5/8 92	2 9/16 65	3/8 9.5	15/16 24	25/64 10	15/64 6	1 9/32 32.2	1.500 38.1	0.626 15.9	5/16 M8	**UCFCX05**	FCX05	UCX05	1.2	19.5	11.3	0.514	13.9	UCFCX05C	UCFCX05D	36.5	1 7/16	1.2	–	–	–	–	–
	1													**UCFCX05-16**		UCX05-16	1.2					–	–	–	–	–	–	–	–	–	–
30	1 1/8	4 29/32 125	3.1496 80	3 15/16 100	2 25/32 70.7	15/32 12	29/32 23	25/64 10	5/16 8	1 9/32 32.2	1.500 38.1	0.626 15.9	3/8 M10	**UCFC206-18**	FC206	UC206-18	1.3	19.5	11.3	0.514	13.9	–	–	–	–	–	–	–	–	–	–
														UCFC206		UC206	1.3					UCFC206C	UCFC206D	36.5	1 7/16	1.3	UCFC206FC	UCFC206FD	45	1 25/32	1.6
	1 3/16													**UCFC206-19**		UC206-19	1.3					–	–	–	–	–	–	–	–	–	–
	1 1/4													**UCFC206-20**		UC206-20	1.3					–	–	–	–	–	–	–	–	–	–
		5 127	3.3465 85	4 9/64 105	2 59/64 74.2	15/32 12	7/8 22.5	5/16 8	3/8 9.5	1 5/16 33.4	1.689 42.9	0.689 17.5	3/8 M10	**UCFCX06**	FCX06	UCX06	1.5	25.7	15.4	0.700	13.9	UCFCX06C	UCFCX06D	38	1 1/2	1.5	–	–	–	–	–
	1 3/16													**UCFCX06-19**		UCX06-19	1.5					–	–	–	–	–	–	–	–	–	–
	1 1/4													**UCFCX06-20**		UCX06-20	1.5					–	–	–	–	–	–	–	–	–	–
35	1 1/4	5 5/16 135	3.5433 90	4 21/64 110	3 1/16 77.8	35/64 14	1 1/32 26	7/16 11	5/16 8	1 7/16 36.4	1.689 42.9	0.689 17.5	7/16 M12	**UCFC207-20**	FC207	UC207-20	1.7	25.7	15.4	0.700	13.9	–	–	–	–	–	–	–	–	–	–
	1 5/16													**UCFC207-21**		UC207-21	1.7					–	–	–	–	–	–	–	–	–	–
	1 3/8													**UCFC207-22**		UC207-22	1.7					–	–	–	–	–	–	–	–	–	–
														UCFC207		UC207	1.7					UCFC207C	UCFC207D	41	1 5/8	1.7	UCFC207FC	UCFC207FD	50	1 31/32	2.1
	1 7/16													**UCFC207-23**		UC207-23	1.7					–	–	–	–	–	–	–	–	–	–
	1 3/8	5 1/4 133	3.6220 92	4 3/8 111	3 3/32 78.5	15/32 12	1 1/32 26	23/64 9	7/16 11	1 17/32 39.2	1.937 49.2	0.748 19	3/8 M10	**UCFCX07-22**	FCX07	UCX07-22	1.9	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
														UCFCX07		UCX07	1.9					UCFCX07C	UCFCX07D	43.5	1 23/32	1.9	–	–	–	–	–
	1 7/16													**UCFCX07-23**		UCX07-23	1.9					–	–	–	–	–	–	–	–	–	–
40	1 1/2	5 23/32 145	3.9370 100	4 23/32 120	3 11/32 84.8	35/64 14	1 1/32 26	7/16 11	25/64 10	1 5/8 41.2	1.937 49.2	0.748 19	7/16 M12	**UCFC208-24**	FC208	UC208-24	2.0	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
	1 9/16													**UCFC208-25**		UC208-25	2.0					–	–	–	–	–	–	–	–	–	–
														UCFC208		UC208	2.0					UCFC208C	UCFC208D	45.5	1 25/32	2.0	UCFC208FC	UCFC208FD	54	2 1/8	2.4
	1 1/2	5 1/4 133	3.6220 92	4 3/8 111	3 3/32 78.5	15/32 12	1 1/32 26	23/64 9	7/16 11	1 17/32 39.2	1.937 49.2	0.748 19	3/8 M10	**UCFCX08-24**	FCX08	UCX08-24	2.0	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
														UCFCX08		UCX08	2.0					UCFCX08C	UCFCX08D	43.5	1 23/32	2.0	–	–	–	–	–
45	1 5/8	6 5/16 160	4.1339 105	5 13/64 132	3 43/64 93.3	5/8 16	1 1/32 26	25/64 10	15/32 12	1 19/32 40.2	1.937 49.2	0.748 19	1/2 M14	**UCFC209-26**	FC209	UC209-26	2.6	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
	1 11/16													**UCFC209-27**		UC209-27	2.6					–	–	–	–	–	–	–	–	–	–
	1 3/4													**UCFC209-28**		UC209-28	2.6					–	–	–	–	–	–	–	–	–	–
														UCFC209		UC209	2.6					UCFC209C	UCFC209D	44.5	1 3/4	2.6	UCFC209FC	UCFC209FD	54	2 1/8	3.0
	1 3/4	6 3/32 155	4.2520 108	5 1/8 130	3 5/8 91.9	35/64 14	31/32 25	5/16 8	15/32 12	1 19/32 40.6	2.031 51.6	0.748 19	7/16 M12	**UCFCX09-28**	FCX09	UCX09-28	2.6	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
														UCFCX09		UCX09	2.6					UCFCX09C	UCFCX09D	45	1 25/32	2.6	–	–	–	–	–
50	1 7/8	6 1/2 165	4.3307 110	5 7/16 138	3 27/32 97.6	5/8 16	1 3/32 28	25/64 10	15/32 12	1 11/16 42.6	2.031 51.6	0.748 19	1/2 M14	**UCFC210-30**	FC210	UC210-30	2.9	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
	1 15/16													**UCFC210-31**		UC210-31	2.9					–	–	–	–	–	–	–	–	–	–
														UCFC210		UC210	2.9					UCFC210C	UCFC210D	47	1 27/32	2.9	UCFC210FC	UCFC210FD	58.5	2 5/16	3.4
	2													**UCFC210-32**		UC210-32	2.9					–	–	–	–	–	–	–	–	–	–
	1 15/16	6 3/8 162	4.6457 118	5 23/64 136	3 25/32 96.2	35/64 14	31/32 25	9/32 7	5/8 16	1 19/32 40.4	2.189 55.6	0.874 22.2	7/16 M12	**UCFCX10-31**	FCX10	UCX10-31	3.2	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
														UCFCX10		UCX10	3.2					UCFCX10C	UCFCX10D	45	1 25/32	3.2	–	–	–	–	–
	2													**UCFCX10-32**		UCX10-32	3.2					–	–	–	–	–	–	–	–	–	–

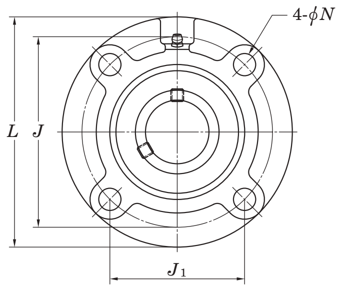
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210, X05~X09
A-R1/8.................. 211~218, X10~X20
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCFC206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

UCFC

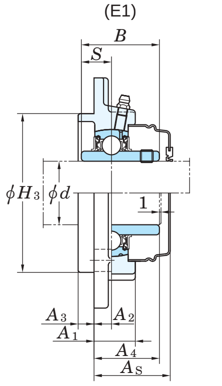
Cylindrical bore (with set screws)

d 55 ~ 100 mm

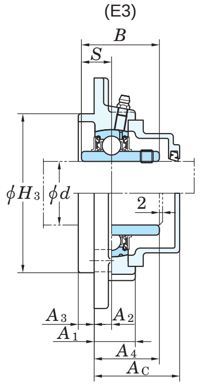




With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)



Variations of tolerance of spigot joint outside diameter (Δ_{H3s}), variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}), tolerance of position of bolt hole (X), and tolerance of circumferential runout of spigot joint (Y)

Unit: mm

Housing No.		Δ_{H3s}	Δ_{A2s}	X	Y
FC204~FC206	FCX05	0 –0.046	±0.5	0.7	0.2
FC207~FC210	FCX06~FCX10	0 –0.054			
FC211~FC217	FCX11~FCX15	0 –0.063	±0.8	1	0.3
FC218	FCX16~FCX18	0 –0.072			
	FCX20				0.4

Variations of tolerance of bolt hole diameter (Δ_{Ns})

Unit: mm

Housing No.		Δ_{Ns}
FC204~FC218	FCX05~FCX20	±0.2

Shaft Dia.		Dimensions inch mm											Bolt Size	Standard			Mass	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Cover					With Cast Iron Cover				
mm	inch												inch mm	Unit No.	Housing No.	Bearing No.						Unit No. Open End Type	Unit No. Closed End Type	Dimension mm	Dimension inch	Mass	Unit No. Open End Type	Unit No. Closed End Type	Dimension mm	Dimension inch	Mass
d		*L*	H_3	*J*	J_1	*N*	A_1	A_2	A_3	A_4	*B*	*S*					kg	C_r	C_{0r}	C_u	f_0			A_s		kg			A_c		kg
55	2	7 9/32 185	4.9213 125	5 29/32 150	4 11/64 106.1	3/4 19	1 7/32 31	33/64 13	15/32 12	1 13/16 46.4	2.189 55.6	0.874 22.2	5/8 M16	**UCFC211-32**	FC211	UC211-32	4.2	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
	2 1/8													**UCFC211-34**		UC211-34	4.2					–	–	–	–	–	–	–	–	–	–
														UCFC211		UC211	4.2					UCFC211C	UCFC211D	51	2	4.2	UCFC211FC	UCFC211FD	62.5	2 15/32	4.8
	2 3/16													**UCFC211-35**		UC211-35	4.2					–	–	–	–	–	–	–	–	–	–
		7 3/32 180	5 127	5 63/64 152	4 15/64 107.5	5/8 16	1 1/32 26	5/32 4	55/64 22	1 23/32 43.7	2.563 65.1	1.000 25.4	1/2 M14	**UCFCX11**	FCX11	UCX11	4.3	52.4	36.2	1.65	14.4	UCFCX11C	UCFCX11D	48.5	1 29/32	4.3	–	–	–	–	–
	2 3/16													**UCFCX11-35**		UCX11-35	4.3					–	–	–	–	–	–	–	–	–	–
	2 1/4													**UCFCX11-36**		UCX11-36	4.3					–	–	–	–	–	–	–	–	–	–
60	2 1/4	7 11/16 195	5.3150 135	6 19/64 160	4 29/64 113.1	3/4 19	1 13/32 36	43/64 17	15/32 12	2 7/32 56.7	2.563 65.1	1.000 25.4	5/8 M16	**UCFC212-36**	FC212	UC212-36	5.0	52.4	36.2	1.65	14.4	–	–	–	–	–	–	–	–	–	–
														UCFC212		UC212	5.0					UCFC212C	UCFC212D	61.5	2 13/32	5.0	UCFC212FC	UCFC212FD	74	2 29/32	5.8
	2 3/8													**UCFC212-38**		UC212-38	5.0					–	–	–	–	–	–	–	–	–	–
	2 7/16													**UCFC212-39**		UC212-39	5.0					–	–	–	–	–	–	–	–	–	–
		7 5/8 194	5.5118 140	6 1/2 165	4 19/32 116.7	5/8 16	1 5/16 33	7/16 11	25/32 20	2 50.7	2.563 65.1	1.000 25.4	1/2 M14	**UCFCX12**	FCX12	UCX12	5.3	57.2	40.1	1.82	14.4	UCFCX12C	UCFCX12D	55.5	2 3/16	5.3	–	–	–	–	–
	2 7/16													**UCFCX12-39**		UCX12-39	5.3					–	–	–	–	–	–	–	–	–	–
65	2 1/2	8 1/16 205	5.7087 145	6 11/16 170	4 47/64 120.2	3/4 19	1 13/32 36	5/8 16	35/64 14	2 3/16 55.7	2.563 65.1	1.000 25.4	5/8 M16	**UCFC213-40**	FC213	UC213-40	5.6	57.2	40.1	1.82	14.4	–	–	–	–	–	–	–	–	–	–
														UCFC213		UC213	5.6					UCFC213C	UCFC213D	60.5	2 3/8	5.6	UCFC213FC	UCFC213FD	73	2 7/8	6.4
	2 1/2	7 5/8 194	5.5118 140	6 1/2 165	4 19/32 116.7	5/8 16	1 5/16 33	7/16 11	25/32 20	2 3/16 55.4	2.937 74.6	1.189 30.2	1/2 M14	**UCFCX13-40**	FCX13	UCX13-40	5.7	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
														UCFCX13		UCX13	5.7					UCFCX13C	UCFCX13D	60.5	2 3/8	5.7	–	–	–	–	–
70	2 3/4	8 15/32 215	5.9055 150	6 31/32 177	4 59/64 125.1	3/4 19	1 9/16 40	43/64 17	35/64 14	2 13/32 61.4	2.937 74.6	1.189 30.2	5/8 M16	**UCFC214-44**	FC214	UC214-44	6.8	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
														UCFC214		UC214	6.8					UCFC214C	UCFC214D	66.5	2 5/8	6.8	UCFC214FC	UCFC214FD	79	3 1/8	7.7
	2 3/4	8 3/4 222	6.4567 164	7 31/64 190	5 9/32 134.3	3/4 19	1 13/32 36	35/64 14	25/32 20	2 5/16 58.5	3.063 77.8	1.331 33.3	5/8 M16	**UCFCX14-44**	FCX14	UCX14-44	7.3	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
														UCFCX14		UCX14	7.3					UCFCX14C	UCFCX14D	63.5	2 1/2	7.3	–	–	–	–	–
75	2 15/16	8 21/32 220	6.2992 160	7 1/4 184	5 1/8 130.1	3/4 19	1 9/16 40	45/64 18	5/8 16	2 15/32 62.5	3.063 77.8	1.331 33.3	5/8 M16	**UCFC215-47**	FC215	UC215-47	7.2	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
														UCFC215		UC215	7.2					UCFC215C	UCFC215D	67.5	2 21/32	7.2	UCFC215FC	UCFC215FD	80	3 5/32	8.2
	3													**UCFC215-48**		UC215-48	7.2					–	–	–	–	–	–	–	–	–	–
	2 15/16	8 3/4 222	6.4567 164	7 31/64 190	5 9/32 134.3	3/4 19	1 3/8 35	15/32 12	55/64 22	2 13/32 61.3	3.252 82.6	1.311 33.3	5/8 M16	**UCFCX15-47**	FCX15	UCX15-47	8.0	72.7	53.0	2.30	14.6	–	–	–	–	–	–	–	–	–	–
														UCFCX15		UCX15	8.0					UCFCX15C	UCFCX15D	66.5	2 5/8	8.0	–	–	–	–	–
	3													**UCFCX15-48**		UCX15-48	8.0					–	–	–	–	–	–	–	–	–	–
80	3 1/8	9 7/16 240	6.6929 170	7 7/8 200	5 9/16 141.4	29/32 23	1 31/32 42	45/64 18	5/8 16	2 21/32 67.3	3.252 82.6	1.311 33.3	3/4 M20	**UCFC216-50**	FC216	UC216-50	8.7	72.7	53.0	2.30	14.6	–	–	–	–	–	–	–	–	–	–
														UCFC216		UC216	8.7					UCFC216C	UCFC216D	72.5	2 27/32	8.7	UCFC216FC	UCFC216FD	87	3 7/16	9.9
	–	10 1/4 260	7.3228 186	8 5/8 219	6 3/32 154.8	29/32 23	1 13/32 36	25/64 10	63/64 25	2 7/16 61.6	3.374 85.7	1.343 34.1	3/4 M20	**UCFCX16**	FCX16	UCX16	11.3	84.0	61.9	2.60	14.5	UCFCX16C	UCFCX16D	66.5	2 5/8	11.3	–	–	–	–	–
85	3 1/4	9 27/32 250	7.0866 180	8 3/16 208	5 51/64 147.1	29/32 23	1 25/32 45	45/64 18	45/64 18	2 3/4 69.6	3.374 85.7	1.343 34.1	3/4 M20	**UCFC217-52**	FC217	UC217-52	10.3	84.0	61.9	2.60	14.5	–	–	–	–	–	–	–	–	–	–
														UCFC217		UC217	10.3					UCFC217C	UCFC217D	74.5	2 15/16	10.3	UCFC217FC	UCFC217FD	89	3 1/2	11.7
		10 1/4 260	7.3228 186	8 5/8 219	6 3/32 154.8	29/32 23	1 13/32 36	25/64 10	63/64 25	2 5/8 66.3	3.780 96	1.563 39.7	3/4 M20	**UCFCX17**	FCX17	UCX17	12.9	96.1	71.5	2.91	14.5	UCFCX17C	UCFCX17D	71.5	2 13/16	12.9	–	–	–	–	–
	3 7/16													**UCFCX17-55**		UCX17-55	12.9					–	–	–	–	–	–	–	–	–	–
90	3 1/2	10 7/16 265	7.4803 190	8 21/32 220	6 1/8 155.5	29/32 23	1 31/32 50	55/64 22	45/64 18	3 3/32 78.3	3.780 96	1.563 39.7	3/4 M20	**UCFC218-56**	FC218	UC218-56	13.3	96.1	71.5	2.91	14.5	–	–	–	–	–	–	–	–	–	–
														UCFC218		UC218	13.3					UCFC218C	UCFC218D	83.5	3 9/32	13.3	UCFC218FC	UCFC218FD	98	3 27/32	14.8
	–	10 1/4 260	7.3228 186	8 5/8 219	6 3/32 154.8	29/32 23	1 11/16 43	15/32 12	1 7/64 28	2 7/8 73.1	4.094 104	1.689 42.9	3/4 M20	**UCFCX18**	FCX18	UCX18	13.5	109	81.9	3.23	14.4	–	–	–	–	–	UCFCX18C	UCFCX18C	92	3 5/8	15.4
100		10 7/8 276	8.1102 206	9 3/8 238	6 5/8 168.3	29/32 23	2 19/32 66	55/64 22	1 7/64 28	3 9/16 90.3	4.626 117.5	1.937 49.2	3/4 M20	**UCFCX20**	FCX20	UCX20	18.2	133	105	3.91	14.4	–	–	–	–	–	UCFCX20C	UCFCX20D	116	4 9/16	20.7
	3 15/16													**UCFCX20-63**		UCX20-63	18.2					–	–	–	–	–	–	–	–	–	–
	4													**UCFCX20-64**		UCX20-64	18.2					–	–	–	–	–	–	–	–	–	–

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210, X05~X09
A-R1/8................. 211~218, X10~X20

3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCFC206JL3, UC206L3)

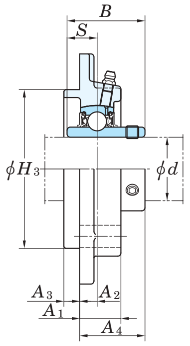
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

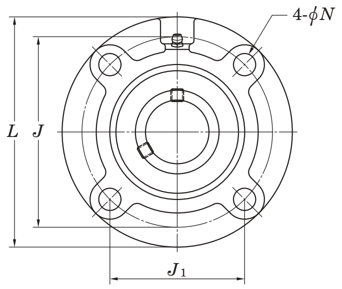
5. Housings of spheroidal graphite iron casting are also available.

UCFCX-E

Cylindrical bore (with set screws)

d 25 ~ 100 mm





Variations of tolerance of spigot joint outside diameter (Δ_{H3s}), variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}), tolerance of position of bolt hole (X), and tolerance of circumferential runout of spigot joint (Y)

Unit: mm

Housing No.	Δ_{H3s}	Δ_{A2s}	X	Y
FCX05E	0 –0.046	±0.5	0.7	0.2
FCX06E~FCX10E	0 –0.054			
FCX12E~FCX15E	0 –0.063	±0.8	1	0.3
FCX16E~FCX18E	0 –0.072			
FCX20E				0.4

Variations of tolerance of bolt hole diameter (Δ_{Ns})

Unit: mm

Housing No.	Δ_{Ns}
FCX05E~FCX20E	±0.2

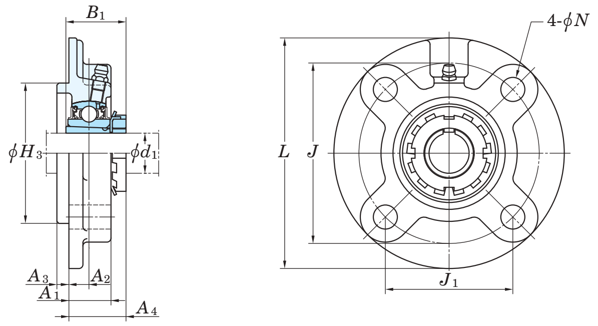
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm											Bolt Size inch / mm	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		L	H_3	J	J_1	N	A_1	A_2	A_3	A_4	B	S					C_r	C_{0r}	C_u	f_0	kg
25	1	4 3/8 111	3.000 76.2	3 5/8 92	2 9/16 65	3/8 9.5	15/16 24	25/64 10	15/64 6	1 9/32 32.2	1.500 38.1	0.626 15.9	5/16 M8	**UCFCX05E** **UCFCX05-16E**	FCX05E	UCX05 UCX05-16	19.5	11.3	0.514	13.9	1.2
30	1 3/16 1 1/4	5 127	3.375 85.725	4 9/64 105	2 59/64 74.2	15/32 12	7/8 22.5	5/16 8	3/8 9.5	1 5/16 33.4	1.689 42.9	0.689 17.5	3/8 M10	**UCFCX06E** **UCFCX06-19E** **UCFCX06-20E**	FCX06E	UCX06 UCX06-19 UCX06-20	25.7	15.4	0.700	13.9	1.5
35	1 3/8 1 7/16	5 1/4 133	3.625 92.075	4 3/8 111	3 3/32 78.5	15/32 12	1 1/32 26	23/64 9	7/16 11	1 17/32 39.2	1.937 49.2	0.748 19	3/8 M10	**UCFCX07-22E** **UCFCX07E** **UCFCX07-23E**	FCX07E	UCX07-22 UCX07 UCX07-23	29.1	17.8	0.809	14.0	1.9
40	1 1/2	5 1/4 133	3.625 92.075	4 3/8 111	3 3/32 78.5	15/32 12	1 1/32 26	23/64 9	7/16 11	1 17/32 39.2	1.937 49.2	0.748 19	3/8 M10	**UCFCX08-24E** **UCFCX08E**	FCX08E	UCX08-24 UCX08	34.1	21.3	0.968	14.0	2.0
45	1 3/4	6 3/32 155	4.250 107.95	5 1/8 130	3 5/8 91.9	35/64 14	31/32 25	5/16 8	15/32 12	1 19/32 40.6	2.031 51.6	0.748 19	7/16 M12	**UCFCX09-28E** **UCFCX09E**	FCX09E	UCX09-28 UCX09	35.1	23.3	1.06	14.4	2.6
50	1 15/16 2	6 3/8 162	4.5 114.3	5 23/64 136	3 25/32 96.2	35/64 14	31/32 25	9/32 7	5/8 16	1 19/32 40.4	2.189 55.6	0.874 22.2	7/16 M12	**UCFCX10-31E** **UCFCX10E** **UCFCX10-32E**	FCX10E	UCX10-31 UCX10 UCX10-32	43.4	29.4	1.34	14.4	3.2
60	2 7/16	7 5/8 194	5.500 139.7	6 1/2 165	4 19/32 116.7	5/8 16	1 5/16 33	7/16 11	25/32 20	2 50.7	2.563 65.1	1.000 25.4	1/2 M14	**UCFCX12E** **UCFCX12-39E**	FCX12E	UCX12 UCX12-39	57.2	40.1	1.82	14.4	5.3
65	2 1/2	7 5/8 194	5.500 139.7	6 1/2 165	4 19/32 116.7	5/8 16	1 5/16 33	7/16 11	25/32 20	2 3/16 55.4	2.937 74.6	1.189 30.2	1/2 M14	**UCFCX13-40E** **UCFCX13E**	FCX13E	UCX13-40 UCX13	62.2	44.1	2.01	14.5	5.7
70	2 3/4	8 3/4 222	6.375 161.925	7 31/64 190	5 9/32 134.3	3/4 19	1 13/32 36	35/64 14	25/32 20	2 5/16 58.5	3.063 77.8	1.331 33.3	5/8 M16	**UCFCX14-44E** **UCFCX14E**	FCX14E	UCX14-44 UCX14	67.4	48.3	2.17	14.5	7.3
75	2 15/16 3	8 3/4 222	6.375 161.925	7 31/64 190	5 9/32 134.3	3/4 19	1 3/8 35	15/32 12	55/64 22	2 13/32 61.3	3.252 82.6	1.311 33.3	5/8 M16	**UCFCX15-47E** **UCFCX15E** **UCFCX15-48E**	FCX15E	UCX15-47 UCX15 UCX15-48	72.7	53.0	2.30	14.6	8.0
80	–	10 1/4 260	7.375 187.325	8 5/8 219	6 3/32 154.8	29/32 23	1 13/32 36	25/64 10	63/64 25	2 7/16 61.6	3.374 85.7	1.343 34.1	3/4 M20	**UCFCX16E**	FCX16E	UCX16	84.0	61.9	2.60	14.5	11.3
85	3 7/16	10 1/4 260	7.375 187.325	8 5/8 219	6 3/32 154.8	29/32 23	1 13/32 36	25/64 10	63/64 25	2 5/8 66.3	3.780 96	1.563 39.7	3/4 M20	**UCFCX17E** **UCFCX17-55E**	FCX17E	UCX17 UCX17-55	96.1	71.5	2.91	14.5	12.9
90	–	10 1/4 260	7.375 187.325	8 5/8 219	6 3/32 154.8	29/32 23	1 11/16 43	15/32 12	1 7/64 28	2 7/8 73.1	4.094 104	1.689 42.9	3/4 M20	**UCFCX18E**	FCX18E	UCX18	109	81.9	3.23	14.4	13.5
100	3 15/16 4	10 7/8 276	8.125 206.375	9 3/8 238	6 5/8 168.3	29/32 23	2 19/32 66	55/64 22	1 7/64 28	3 9/16 90.3	4.626 117.5	1.937 49.2	3/4 M20	**UCFCX20E** **UCFCX20-63E** **UCFCX20-64E**	FCX20E	UCX20 UCX20-63 UCX20-64	133	105	3.91	14.4	18.2

Remarks 1. In Part No. of unit, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... X05~X09
A-R1/8 .... X10~X20
3. As for the triple-lip seal type product, supplementary code L3 follows the Part No. of unit or bearing. (Example of Part No. : UCFCX06EL3, UCX06L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

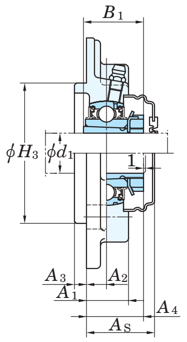
UKFC

Tapered bore (with adapter)

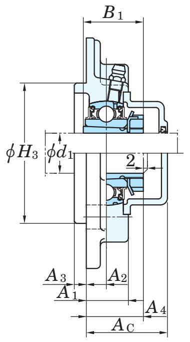
d_1 20 ~ 65 mm



With Pressed Steel Cover
(E1)



With Cast Iron Cover
(E3)



Variations of tolerance of spigot joint outside diameter (Δ_{H3s}), variations of tolerance of distance from mounting surface to center of spherical bore (Δ_{A2s}), tolerance of position of bolt hole (X), and tolerance of circumferential runout of spigot joint (Y)

Unit: mm

Housing No.		Δ_{H3s}	Δ_{A2s}	X	Y
FC205~FC206	FCX05	0 –0.046	±0.5	0.7	0.2
FC207~FC210	FCX06~FCX10	0 –0.054			
FC211~FC217	FCX11~FCX15	0 –0.063	±0.8	1	0.3
FC218	FCX16~FCX18	0 –0.072			
	FCX20				0.4

Variations of tolerance of bolt hole diameter (Δ_{Ns})

Unit: mm

Housing No.		Δ_{Ns}
FC204~FC218	FCX05~FCX20	±0.2

Shaft Dia.		Dimensions inch / mm										Bolt Size	Standard					Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Cover					With Cast Iron Cover				
mm	inch											inch mm	Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg					Unit No. Open End Type	Unit No. Closed End Type	Dimension mm	Dimension inch	Mass kg	Unit No. Open End Type	Unit No. Closed End Type	Dimension mm	Dimension inch	Mass kg
d_1		L	H_3	J	J_1	N	A_1	A_2	A_3	A_4	B_1							C_r	C_{0r}	C_u	f_0			A_s					A_c		
20	3/4	4 17/32 115	2.7559 70	3 35/64 90	2 1/2 63.6	15/32 12	13/16 21	25/64 10	15/64 6	1 3/16 30	1 3/8 35	3/8 M10	UKFC205	FC205	UK205	HE2305X H2305X	0.99 0.99	14.0	7.85	0.357	13.9	– UKFC205C	– UKFC205D	– 34.5	– 1 11/32	– 0.99	– UKFC205FC	– UKFC205FD	– 43	– 1 21/32	– 1.2
	3/4	4 3/8 111	2.9921 76	3 5/8 92	2 9/16 65	3/8 9.5	15/16 24	25/64 10	15/64 6	1 5/32 29.5	1 3/8 35	5/16 M8	UKFCX05	FCX05	UKX05	HE2305X H2305X	1.2 1.2	19.5	11.3	0.514	13.9	– UKFCX05C	– UKFCX05D	– 36.5	– 1 7/16	– 1.2	– –	– –	– –	– –	– –
25	1	4 29/32 125	3.1496 80	3 15/16 100	2 25/32 70.7	15/32 12	29/32 23	25/64 10	5/16 8	1 1/4 31.5	1 1/2 38	3/8 M10	UKFC206	FC206	UK206	H2306X HE2306X	1.3 1.3	19.5	11.3	0.514	13.9	UKFC206C –	UKFC206D –	36.5 –	1 7/16 –	1.3 –	UKFC206FC –	UKFC206FD –	45 –	1 25/32 –	1.6 –
	1	5 127	3.3465 85	4 9/64 105	2 59/64 74.2	15/32 12	7/8 22.5	5/16 8	3/8 9.5	1 5/32 29	1 1/2 38	3/8 M10	UKFCX06	FCX06	UKX06	H2306X HE2306X	1.5 1.5	25.7	15.4	0.700	13.9	UKFCX06C –	UKFCX06D –	38 –	1 1/2 –	1.5 –	– –	– –	– –	– –	– –
30	1 1/8	5 5/16 135	3.5433 90	4 21/64 110	3 1/16 77.8	35/64 14	1 1/32 26	7/16 11	5/16 8	1 3/8 35	1 11/16 43	7/16 M12	UKFC207	FC207	UK207	HS2307X H2307X	1.7 1.7	25.7	15.4	0.700	13.9	– UKFC207C	– UKFC207D	– 41	– 1 5/8	– 1.7	– UKFC207FC	– UKFC207FD	– 50	– 1 31/32	– 2.1
	1 1/8	5 1/4 133	3.6220 92	4 3/8 111	3 3/32 78.5	15/32 12	1 1/32 26	23/64 9	7/16 11	1 1/4 31.5	1 11/16 43	3/8 M10	UKFCX07	FCX07	UKX07	HS2307X H2307X	1.9 1.9	29.1	17.8	0.809	14.0	– UKFCX07C	– UKFCX07D	– 43.5	– 1 23/32	– 1.9	– –	– –	– –	– –	– –
35	1 1/4 1 3/8	5 23/32 145	3.9370 100	4 23/32 120	3 11/32 84.8	35/64 14	1 1/32 26	7/16 11	25/64 10	1 1/2 38	1 13/16 46	7/16 M12	UKFC208	FC208	UK208	HE2308X HS2308X H2308X	2.0 2.0 2.0	29.1	17.8	0.809	14.0	– – UKFC208C	– – UKFC208D	– – 45.5	– – 1 25/32	– – 2.0	– – UKFC208FC	– – UKFC208FD	– – 54	– – 2 1/8	– – 2.4
	1 1/4 1 3/8	5 1/4 133	3.6220 92	4 3/8 111	3 3/32 78.5	15/32 12	1 1/32 26	23/64 9	7/16 11	1 5/16 33.5	1 13/16 46	3/8 M10	UKFCX08	FCX08	UKX08	HE2308X HS2308X H2308X	1.9 1.9 1.9	34.1	21.3	0.968	14.0	– – UKFCX08C	– – UKFCX08D	– – 43.5	– – 1 23/32	– – 1.9	– – –	– – –	– – –	– – –	– – –
40	1 1/2	6 5/16 160	4.1339 105	5 13/64 132	3 43/64 93.3	5/8 16	1 1/32 26	25/64 10	15/32 12	1 17/32 39	1 31/32 50	1/2 M14	UKFC209	FC209	UK209	HE2309X H2309X	2.7 2.7	34.1	21.3	0.968	14.0	– UKFC209C	– UKFC209D	– 44.5	– 1 3/4	– 2.7	– UKFC209FC	– UKFC209FD	– 54	– 2 1/8	– 3.2
	1 1/2	6 3/32 155	4.2520 108	5 1/8 130	3 5/8 91.9	35/64 14	31/32 25	5/16 8	15/32 12	1 5/16 33.5	1 31/32 50	7/16 M12	UKFCX09	FCX09	UKX09	HE2309X H2309X	2.6 2.6	35.1	23.3	1.06	14.4	– UKFCX09C	– UKFCX09D	– 45	– 1 25/32	– 2.6	– –	– –	– –	– –	– –
45	1 3/4	6 1/2 165	4.3307 110	5 7/16 138	3 27/32 97.6	5/8 16	1 3/32 28	25/64 10	15/32 12	1 9/16 40	2 5/32 55	1/2 M14	UKFC210	FC210	UK210	HE2310X H2310X	3.0 3.0	35.1	23.3	1.06	14.4	– UKFC210C	– UKFC210D	– 47	– 1 27/32	– 3.0	– UKFC210FC	– UKFC210FD	– 58.5	– 2 5/16	– 3.5
	1 3/4	6 3/8 162	4.6457 118	5 23/64 136	3 25/32 96.2	35/64 14	31/32 25	9/32 7	5/8 16	1 11/32 34.5	2 5/32 55	7/16 M12	UKFCX10	FCX10	UKX10	HE2310X H2310X	3.1 3.1	43.4	29.4	1.34	14.4	– UKFCX10C	– UKFCX10D	– 45	– 1 25/32	– 3.1	– –	– –	– –	– –	– –
50	1 7/8 2	7 9/32 185	4.9213 125	5 29/32 150	4 11/64 106.1	3/4 19	1 7/32 31	33/64 13	15/32 12	1 25/32 45.5	2 5/16 59	5/8 M16	UKFC211	FC211	UK211	HS2311X H2311X HE2311X	4.3 4.3 4.3	43.4	29.4	1.34	14.4	– UKFC211C –	– UKFC211D –	– 51 –	– 2 –	– 4.3 –	– UKFC211FC –	– UKFC211FD –	– 62.5 –	– 2 15/32 –	– 4.9 –
	1 7/8 2	7 3/32 180	5 127	5 63/64 152	4 15/64 107.5	5/8 16	1 1/32 26	5/32 4	55/64 22	1 5/16 33	2 5/16 59	1/2 M14	UKFCX11	FCX11	UKX11	HS2311X H2311X HE2311X	4.0 4.0 4.0	52.4	36.2	1.65	14.4	– UKFCX11C –	– UKFCX11D –	– 48.5 –	– 1 29/32 –	– 4.0 –	– – –	– – –	– – –	– – –	– – –
55	2 1/8	7 11/16 195	5.3150 135	6 19/64 160	4 29/64 113.1	3/4 19	1 13/32 36	43/64 17	15/32 12	2 3/32 53.5	2 7/16 62	5/8 M16	UKFC212	FC212	UK212	HS2312X H2312X	4.9 4.9	52.4	36.2	1.65	14.4	– UKFC212C	– UKFC212D	– 61.5	– 2 13/32	– 4.9	– UKFC212FC	– UKFC212FD	– 74	– 2 29/32	– 5.7
	2 1/8	7 5/8 194	5.5118 140	6 1/2 165	4 19/32 116.7	5/8 16	1 5/16 33	7/16 11	25/32 20	1 21/32 42	2 7/16 62	1/2 M14	UKFCX12	FCX12	UKX12	HS2312X H2312X	5.1 5.1	57.2	40.1	1.82	14.4	– UKFCX12C	– UKFCX12D	– 55.5	– 2 3/16	– 5.1	– –	– –	– –	– –	– –
60	2 1/4 2 3/8	8 1/16 205	5.7087 145	6 11/16 170	4 47/64 120.2	3/4 19	1 13/32 36	5/8 16	35/64 14	2 3/32 53.5	2 9/16 65	5/8 M16	UKFC213	FC213	UK213	HE2313X H2313X HS2313X	5.5 5.5 5.5	57.2	40.1	1.82	14.4	– UKFC213C –	– UKFC213D –	– 60.5 –	– 2 3/8 –	– 5.5 –	– UKFC213FC –	– UKFC213FD –	– 73 –	– 2 7/8 –	– 6.4 –
	2 1/4 2 3/8	7 5/8 194	5.5118 140	6 1/2 165	4 19/32 116.7	5/8 16	1 5/16 33	7/16 11	25/32 20	1 25/32 45	2 9/16 65	1/2 M14	UKFCX13	FCX13	UKX13	HE2313X H2313X HS2313X	5.3 5.3 5.3	62.2	44.1	2.01	14.5	– UKFCX13C –	– UKFCX13D –	– 60.5 –	– 2 3/8 –	– 5.3 –	– – –	– – –	– – –	– – –	– – –
65	2 1/2	8 21/32 220	6.2992 160	7 1/4 184	5 1/8 130.1	3/4 19	1 9/16 40	45/64 18	5/8 16	2 5/16 58.5	2 7/8 73	5/8 M16	UKFC215	FC215	UK215	HE2315X H2315X	7.4 7.4	67.4	48.3	2.17	14.5	– UKFC215C	– UKFC215D	– 67.5	– 2 21/32	– 7.4	– UKFC215FC	– UKFC215FD	– 80	– 3 5/32	– 8.4
	2 1/2	8 3/4 222	6.4567 164	7 31/64 190	5 9/32 134.3	3/4 19	1 3/8 35	15/32 12	55/64 22	1 7/8 48	2 7/8 73	5/8 M16	UKFCX15	FCX15	UKX15	HE2315X H2315X	7.7 7.7	72.7	53.0	2.30	14.6	– UKFCX15C	– UKFCX15D	– 66.5	– 2 5/8	– 7.7	– –	– –	– –	– –	– –

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 205~210, X05~X09
A-R1/8 .... 211~218, X10~X20

3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
(Example of Part No. : UKFC206J + H2306X, UK206 + H2306X)

4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing.
(Example of Part No. : UKFC206JL3 + H2306X, UK206L3 + H2306X)

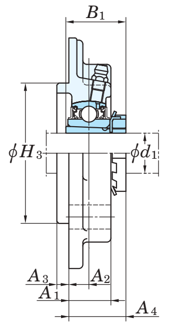
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.

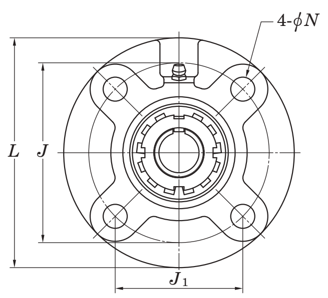
6. Housings of spheroidal graphite iron casting are also available.

UKFC

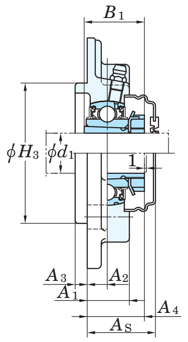
Tapered bore (with adapter)

d_1 70 ~ 90 mm

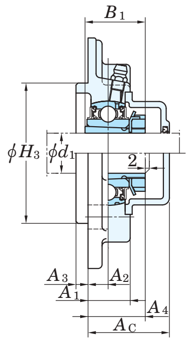




With Pressed Steel Cover (E1)



With Cast Iron Cover (E3)



Variations of tolerance of spigot joint outside diameter ($\varDelta_{H3s}$), variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$), tolerance of position of bolt hole (X), and tolerance of circumferential runout of spigot joint (Y)

Unit: mm

Housing No.		$\varDelta_{H3s}$	$\varDelta_{A2s}$	X	Y
FC205~FC206	FCX05	0 –0.046	±0.5	0.7	0.2
FC207~FC210	FCX06~FCX10	0 –0.054			
FC211~FC217	FCX11~FCX15	0 –0.063	±0.8	1	0.3
FC218	FCX16~FCX18	0 –0.072			
	FCX20				0.4

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.		$\varDelta_{Ns}$
FC204~FC218	FCX05~FCX20	±0.2

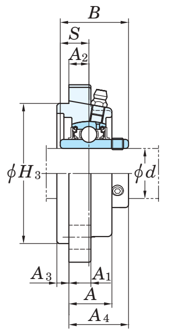
Shaft Dia. d_1 mm	Shaft Dia. d_1 inch	Dimensions inch / mm L	H_3	J	J_1	N	A_1	A_2	A_3	A_4	B_1	Bolt Size inch / mm	Standard Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass kg	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	With Pressed Steel Cover Unit No. Open End Type	Closed End Type	Dimension A_s mm	A_s inch	Mass kg	With Cast Iron Cover Unit No. Open End Type	Closed End Type	Dimension A_c mm	A_c inch	Mass kg
70	2 3/4	9 7/16 240	6.6929 170	7 7/8 200	5 9/16 141.4	29/32 23	1 31/32 42	45/64 18	5/8 16	2 15/32 62.5	3 1/16 78	3/4 M20	**UKFC216**	FC216	UK216	HE2316X H2316X	9.0 9.0	72.7	53.0	2.30	14.6	– UKFC216C	– UKFC216D	– 72.5	– 2 27/32	– 9.0	– UKFC216FC	– UKFC216FD	– 87	– 3 7/16	– 10.3
	2 3/4	10 1/4 260	7.3228 186	8 5/8 219	6 3/32 154.8	29/32 23	1 13/32 36	25/64 10	63/64 25	1 15/16 49	3 1/16 78	3/4 M20	**UKFCX16**	FCX16	UKX16	HE2316X H2316X	11.4 11.4	84.0	61.9	2.60	14.5	– UKFCX16C	– UKFCX16D	– 66.5	– 2 5/8	– 11.4	– –	– –	– –	– –	– –
75	3	9 27/32 250	7.0866 180	8 3/16 208	5 51/64 147.1	29/32 23	1 25/32 45	45/64 18	45/64 18	3 17/32 64.5	3 7/32 82	3/4 M20	**UKFC217**	FC217	UK217	H2317X HE2317X	10.4 10.4	84.0	61.9	2.60	14.5	UKFC217C –	UKFC217D –	74.5 –	2 15/16 –	10.4 –	UKFC217FC –	UKFC217FD –	89 –	3 1/2 –	11.8 –
	3	10 1/4 260	7.3228 186	8 5/8 219	6 3/32 154.8	29/32 23	1 13/32 36	25/64 10	63/64 25	2 1/16 52	3 7/32 82	3/4 M20	**UKFCX17**	FCX17	UKX17	H2317X HE2317X	12.6 12.6	96.1	71.5	2.91	14.5	UKFCX17C –	UKFCX17D –	71.5 –	2 13/16 –	12.6 –	– –	– –	– –	– –	– –
80	–	10 7/16 265	7.4803 190	8 21/32 220	6 1/8 155.5	29/32 23	1 31/32 50	55/64 22	45/64 18	2 13/16 71.5	3 3/8 86	3/4 M20	**UKFC218**	FC218	UK218	H2318X	13.3	96.1	71.5	2.91	14.5	UKFC218C	UKFC218D	83.5	3 9/32	13.3	UKFC218FC	UKFC218FD	98	3 27/32	14.9
	–	10 1/4 260	7.3228 186	8 5/8 219	6 3/32 154.8	29/32 23	1 11/16 43	15/32 12	1 7/64 28	2 5/32 55	3 3/8 86	3/4 M20	**UKFCX18**	FCX18	UKX18	H2318X	13.0	109	81.9	3.23	14.4	–	–	–	–	–	UKFCX18C	UKFCX18D	92	3 5/8	15.1
90	3 1/2	10 7/8 276	8.1102 206	9 3/8 238	6 5/8 168.3	29/32 23	2 19/32 66	55/64 22	1 7/64 28	2 23/32 69	3 13/16 97	3/4 M20	**UKFCX20**	FCX20	UKX20	HE2320X H2320X	17.1 17.1	133	105	3.91	14.4	– –	– –	– –	– –	– –	– UKFCX20C	– UKFCX20D	– 116	– 4 9/16	– 19.9

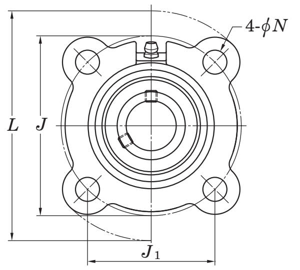
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 205~210, X05~X09
A-R1/8 .... 211~218, X10~X20
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables.
(Example of Part No. : UKFC206J + H2306X, UK206 + H2306X)
4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing.
(Example of Part No. : UKFC206JL3 + H2306X, UK206L3 + H2306X)
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Housings of spheroidal graphite iron casting are also available.

UCSFC-S6

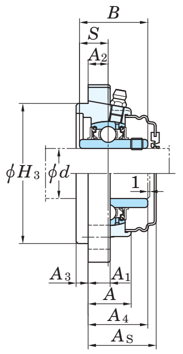
Cylindrical bore (with set screws)

d 20 ～ 40 mm





With Pressed Stainless Steel Covers
(E1)



Variations of tolerance of spigot joint outside diameter ($\varDelta_{H3s}$), variations of tolerance of distance from mounting surface to center of spherical bore ($\varDelta_{A2s}$), tolerance of position of bolt hole (X), and tolerance of circumferential runout of spigot joint (Y)

Unit: mm

Housing No.	$\varDelta_{H3s}$	$\varDelta_{A2s}$	X	Y
SFC204~SFC206	0 –0.046	±0.5	0.7	0.2
SFC207~SFC208	0 –0.054			

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
SFC204~SFC208	±0.2

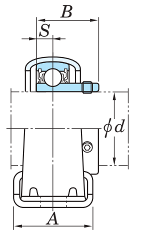
Shaft Dia.	Dimensions												Bolt Size	Standard				Basic		Fatigue	Factor	With Pressed Stainless Steel Covers			
mm	mm												mm	Unit No.	Housing No.	Bearing No.	Mass	Load Ratings kN		Load Limit kN		Unit No. Open End Type	Closed End Type	Dimension mm	Mass
d	L	H_3	J	J_1	N	A	A_1	A_2	A_3	A_4	B	S					kg	C_r	C_{0r}	C_u	f_0			A_s	kg
20	100	62	78	55.1	12	21	10	10	5	28.3	31	12.7	M10	**UCSFC204S6**	SFC204	UC204S6	0.54	10.9	5.35	0.243	13.2	UCSFC204CS6	UCSFC204DS6	32	0.54
25	115	70	90	63.6	12	21.5	10	10	6	29.8	34.1	14.3	M10	**UCSFC205S6**	SFC205	UC205S6	0.72	11.9	6.30	0.286	13.9	UCSFC205CS6	UCSFC205DS6	34	0.72
30	125	80	100	70.7	12	23	10	10	8	32.2	38.1	15.9	M10	**UCSFC206S6**	SFC206	UC206S6	0.92	16.5	9.05	0.411	13.9	UCSFC206CS6	UCSFC206DS6	36	0.92
35	135	90	110	77.8	14	26	12	11	8	36.4	42.9	17.5	M12	**UCSFC207S6**	SFC207	UC207S6	1.24	21.8	12.3	0.559	13.9	UCSFC207CS6	UCSFC207DS6	41	1.24
40	145	100	120	84.8	14	26	12	11	10	41.2	49.2	19	M12	**UCSFC208S6**	SFC208	UC208S6	1.56	24.8	14.3	0.650	14.0	UCSFC208CS6	UCSFC208DS6	45	1.56

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of the applicable grease nipple is B-1/4-28UNFN13.
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

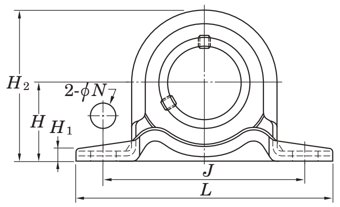
SBPP
Cylindrical bore
(with set screws)

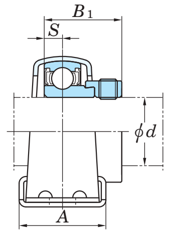
SAPP
Cylindrical bore
(with eccentric locking collar)

d 12 ~ 30 mm



SBPP





SAPP

Variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$) and variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Js}$	$\varDelta_{Ns}$
PP203~PP206	±0.4	±0.5

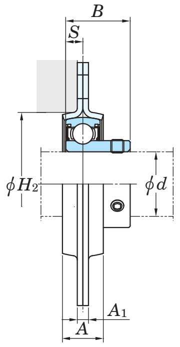
Shaft Dia mm	Shaft Dia inch	Dimensions inch mm										Bolt Size inch mm	Unit No.	Bearing No.	Unit No.	Bearing No.	Housing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass kg	
d		*H*	*L*	*A*	*J*	*N*	H_1	H_2	*S*	SBPP *B*	SAPP B_1							C_r	C_{0r}	C_u	f_0	SBPP	SAPP
12		7/8 22.2	3 3/8 86	31/32 25	2 43/64 68	3/8 9.5	1/8 3.2	1 23/32 43.8	0.236 6	0.866 22	1.122 28.5	5/16 M8	**SBPP201**	SB201	**SAPP201**	SA201	PP203	9.55	4.80	0.218	13.2	0.16	0.19
	1/2												**SBPP201-8**	SB201-8	**SAPP201-8**	SA201-8							
15													**SBPP202**	SB202	**SAPP202**	SA202							
	5/8												**SBPP202-10**	SB202-10	**SAPP202-10**	SA202-10							
17													**SBPP203**	SB203	**SAPP203**	SA203							
20	3/4	1 25.4	3 27/32 98	1 1/4 32	2 63/64 76	3/8 9.5	1/8 3.2	2 50.5	0.276 7	0.984 25	1.161 29.5	5/16 M8	**SBPP204-12**	SB204-12	**SAPP204-12**	SA204-12	PP204	12.8	6.65	0.302	13.2	0.23	0.23
													SBPP204	SB204	**SAPP204**	SA204							
25	7/8	1 1/8 28.6	4 1/4 108	1 1/4 32	3 25/64 86	29/64 11.5	5/32 4	2 7/32 56.6	0.295 7.5	1.063 27	1.201 30.5	3/8 M10	**SBPP205-14**	SB205-14	**SAPP205-14**	SA205-14	PP205	14.0	7.85	0.357	13.9	0.28	0.32
	15/16												**SBPP205-15**	SB205-15	**SAPP205-15**	SA205-15							
													SBPP205	SB205	**SAPP205**	SA205							
	1												**SBPP205-16**	SB205-16	**SAPP205-16**	SA205-16							
30	1 1/8	1 5/16 33.3	4 19/32 117	1 1/2 38	3 3/4 95	29/64 11.5	5/32 4	2 5/8 66.3	0.315 8	1.181 30	1.335 33.9	3/8 M10	**SBPP206-18**	SB206-18	**SAPP206-18**	SA206-18	PP206	19.5	11.3	0.514	13.9	0.47	0.50
													SBPP206	SB206	**SAPP206**	SA206							
	1 3/16												**SBPP206-19**	SB206-19	**SAPP206-19**	SA206-19							
	1 1/4												**SBPP206-20**	SB206-20	**SAPP206-20**	SA206-20							

Remark For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

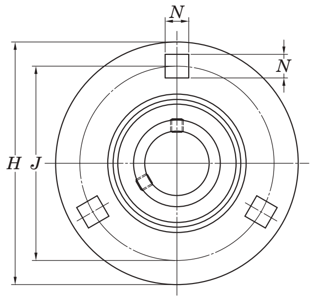
SBPF Cylindrical bore (with set screws)

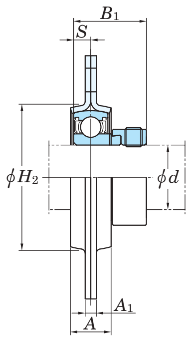
SAPF Cylindrical bore (with eccentric locking collar)

d 12 ～ 35 mm



SBPF





SAPF

Variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$)

Unit: mm

Housing No.	$\varDelta_{Js}$
PF203~PF207	±0.4

Variations of tolerance of bolt hole diameter ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
PF203~PF207	±0.25

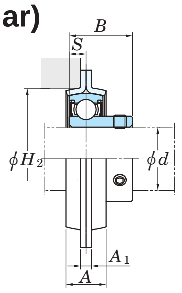
Shaft Dia d mm	Shaft Dia d inch	Dimensions inch / mm H	A	A_1	J	N	H_2	S	SBPF B	SAPF B_1	Bolt Size inch / mm	Unit No.	Bearing No.	Unit No.	Bearing No.	Housing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Mass kg SBPF	Mass kg SAPF
12		3 3/16 81	9/16 14	5/32 4	2 1/2 63.5	9/32 7.1	1 15/16 49	0.236 6	0.866 22	1.122 28.5	1/4 M6	**SBPF201**	SB201	**SAPF201**	SA201	PF203	9.55	4.80	0.218	13.2	0.27	0.3
	1/2											**SBPF201-8**	SB201-8	**SAPF201-8**	SA201-8							
15												**SBPF202**	SB202	**SAPF202**	SA202							
	5/8											**SBPF202-10**	SB202-10	**SAPF202-10**	SA202-10							
17												**SBPF203**	SB203	**SAPF203**	SA203							
20	3/4	3 17/32 90	5/8 16	5/32 4	2 13/16 71.5	23/64 9	2 5/32 55	0.276 7	0.984 25	1.161 29.5	5/16 M8	**SBPF204-12**	SB204-12	**SAPF204-12**	SA204-12	PF204	12.8	6.65	0.302	13.2	0.33	0.33
												SBPF204	SB204	**SAPF204**	SA204							
25	7/8	3 3/4 95	23/32 18	5/32 4	2 63/64 76	23/64 9	2 3/8 60	0.295 7.5	1.063 27	1.201 30.5	5/16 M8	**SBPF205-14**	SB205-14	**SAPF205-14**	SA205-14	PF205	14.0	7.85	0.357	13.9	0.38	0.42
	15/16											**SBPF205-15**	SB205-15	**SAPF205-15**	SA205-15							
												SBPF205	SB205	**SAPF205**	SA205							
	1											**SBPF205-16**	SB205-16	**SAPF205-16**	SA205-16							
30	1 1/8	4 7/16 113	3/4 19	13/64 5.2	3 9/16 90.5	7/16 11	2 25/32 71	0.315 8	1.181 30	1.335 33.9	3/8 M10	**SBPF206-18**	SB206-18	**SAPF206-18**	SA206-18	PF206	19.5	11.3	0.514	13.9	0.62	0.65
												SBPF206	SB206	**SAPF206**	SA206							
	1 3/16											**SBPF206-19**	SB206-19	**SAPF206-19**	SA206-19							
	1 1/4											**SBPF206-20**	SB206-20	**SAPF206-20**	SA206-20							
35	1 1/4	4 13/16 122	7/8 22	13/64 5.2	3 15/16 100	7/16 11	3 3/16 81	0.335 8.5	1.260 32	1.437 36.5	3/8 M10	**SBPF207-20**	SB207-20	**SAPF207-20**	SA207-20	PF207	25.7	15.4	0.700	13.9	0.82	0.9
	1 5/16													**SAPF207-21**	SA207-21							
	1 3/8											**SBPF207-22**	SB207-22	**SAPF207-22**	SA207-22							
												SBPF207	SB207	**SAPF207**	SA207							
	1 7/16											**SBPF207-23**	SB207-23	**SAPF207-23**	SA207-23							

Note 1) H_2 is the minimum size of the mounting hole.

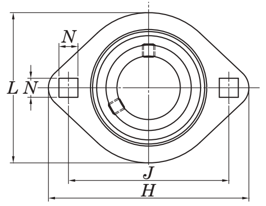
Remark For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

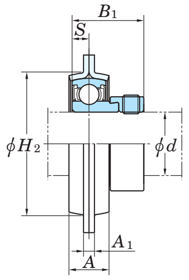
SBPFL Cylindrical bore (with set screws) SAPFL Cylindrical bore (with eccentric locking collar)

d 12 ~ 35 mm



SBPFL





SAPFL

Variations of tolerance of distance between centers of bolt holes (Δ_{Js})

Unit: mm

Housing No.	Δ_{Js}
PFL203~PFL207	±0.4

Variations of tolerance of bolt hole diameter (Δ_{Ns})

Unit: mm

Housing No.	Δ_{Ns}
PFL203~PFL207	±0.25

Shaft Dia d mm	Shaft Dia d inch	Dimensions (inch / mm) H	L	A	A_1	J	N	H_2	S	SBPFL B	SAPFL B_1	Bolt Size inch / mm	Unit No.	Bearing No.	Unit No.	Bearing No.	Housing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Mass kg SBPFL	SAPFL
12		3 3/16 81	2 5/16 59	9/16 14	5/32 4	2 1/2 63.5	9/32 7.1	1 15/16 49	0.236 6	0.866 22	1.122 28.5	1/4 M6	**SBPFL201**	SB201	**SAPFL201**	SA201	PFL203	9.55	4.80	0.218	13.2	0.19	0.22
	1/2												**SBPFL201-8**	SB201-8	**SAPFL201-8**	SA201-8							
15													**SBPFL202**	SB202	**SAPFL202**	SA202							
	5/8												**SBPFL202-10**	SB202-10	**SAPFL202-10**	SA202-10							
17													**SBPFL203**	SB203	**SAPFL203**	SA203							
	3/4	3 17/32 90	2 5/8 67	5/8 16	5/32 4	2 13/16 71.5	23/64 9	2 5/32 55	0.276 7	0.984 25	1.161 29.5	5/16 M8	**SBPFL204-12**	SB204-12	**SAPFL204-12**	SA204-12	PFL204	12.8	6.65	0.302	13.2	0.24	0.24
20													**SBPFL204**	SB204	**SAPFL204**	SA204							
	7/8	3 3/4 95	2 25/32 71	23/32 18	5/32 4	2 63/64 76	23/64 9	2 3/8 60	0.295 7.5	1.063 27	1.201 30.5	5/16 M8	**SBPFL205-14**	SB205-14	**SAPFL205-14**	SA205-14	PFL205	14.0	7.85	0.357	13.9	0.28	0.32
	15/16												**SBPFL205-15**	SB205-15	**SAPFL205-15**	SA205-15							
25													**SBPFL205**	SB205	**SAPFL205**	SA205							
	1												**SBPFL205-16**	SB205-16	**SAPFL205-16**	SA205-16							
	1 1/8	4 7/16 113	3 5/16 84	3/4 19	13/64 5.2	3 9/16 90.5	7/16 11	2 25/32 71	0.315 8	1.181 30	1.335 33.9	3/8 M10	**SBPFL206-18**	SB206-18	**SAPFL206-18**	SA206-18	PFL206	19.5	11.3	0.514	13.9	0.38	0.41
30													**SBPFL206**	SB206	**SAPFL206**	SA206							
	1 3/16												**SBPFL206-19**	SB206-19	**SAPFL206-19**	SA206-19							
	1 1/4												**SBPFL206-20**	SB206-20	**SAPFL206-20**	SA206-20							
	1 1/4	4 13/16 122	3 11/16 94	7/8 22	13/64 5.2	3 15/16 100	7/16 11	3 3/16 81	0.335 8.5	1.260 32	1.437 36.5	3/8 M10	**SBPFL207-20**	SB207-20	**SAPFL207-20**	SA207-20	PFL207	25.7	15.4	0.700	13.9	0.66	0.74
	1 5/16														**SAPFL207-21**	SA207-21							
	1 3/8												**SBPFL207-22**	SB207-22	**SAPFL207-22**	SA207-22							
35													**SBPFL207**	SB207	**SAPFL207**	SA207							
	1 7/16												**SBPFL207-23**	SB207-23	**SAPFL207-23**	SA207-23							

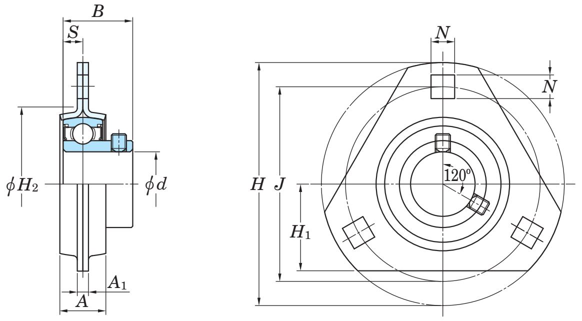
Note 1) H_2 is the minimum size of the mounting hole.

Remark For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

SBPFT

Cylindrical bore (with set screws)

d 12 ~ 35 mm



Variations of tolerance of distance between centers of bolt holes ($\varDelta_{Js}$)

Unit: mm

Housing No.	$\varDelta_{Js}$
PTF203~PTF207	±0.4

Variations of tolerance between bolt square hole side lengths ($\varDelta_{Ns}$)

Unit: mm

Housing No.	$\varDelta_{Ns}$
PTF203~PTF207	±0.25

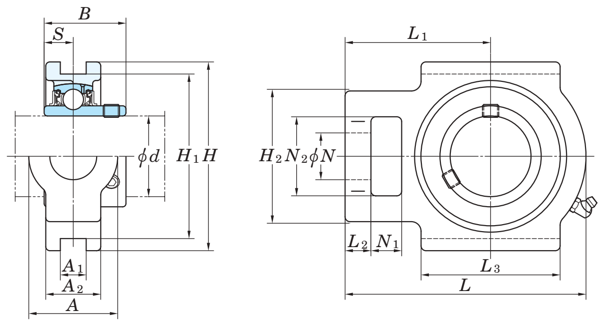
Shaft Dia. mm	Dimensions mm									Bolt Size mm	Unit No.	Housing No.		Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d	H	A	A_1	J	N	H_1	H_2	S	B						C_r	C_{0r}	C_u	f_0	kg
12	81	14	4	63.5	7.1	28	49	6	22	M6	**SBPFT201**	PFT203		SB201	9.55	4.80	0.218	13.2	0.22
15	81	14	4	63.5	7.1	28	49	6	22	M6	**SBPFT202**	PFT203		SB202	9.55	4.80	0.218	13.2	0.22
17	81	14	4	63.5	7.1	28	49	6	22	M6	**SBPFT203**	PFT203		SB203	9.55	4.80	0.218	13.2	0.21
20	90	16	4	71.5	9	33.33	55	7	25	M8	**SBPFT204**	PFT204		SB204	12.8	6.65	0.302	13.2	0.27
25	95	18	4	76	9	34	60	7.5	27	M8	**SBPFT205**	PFT205		SB205	14.0	7.85	0.357	13.9	0.32
30	113	19	5.2	90.5	11	40.5	71	8	30	M10	**SBPFT206**	PFT206		SB206	19.5	11.3	0.514	13.9	0.54
35	122	22	5.2	100	11	44	81	8.5	32	M10	**SBPFT207**	PFT207		SB207	25.7	15.4	0.700	13.9	0.71

Remark For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

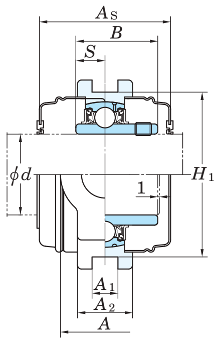
UCT

Cylindrical bore (with set screws)

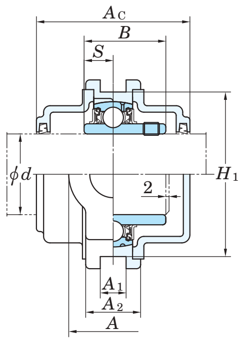
d 12 ~ (45) mm

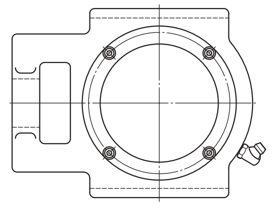


With Pressed Steel Covers
(E1)



With Cast Iron Covers
(E3)





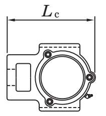
Cast iron cover fixing screw position
(standard)

Variations of tolerance of groove width ($\varDelta_{A1s}$), variations of tolerance of distance between both grooves ($\varDelta_{H1s}$), and tolerance of symmetry of both groove sides (X)

Unit: mm

Housing No.			$\varDelta_{A1s}$	$\varDelta_{H1s}$	X
T204~T210	TX05~TX10	T305~T310	+0.2 0	0 –0.5	0.5
T211~T217	TX11~TX17	T311~T318	+0.3 0	0 –0.8	0.6
		T319~T322			0.7
		T324~T328			0.8

Form and dimensions of L_c of T204JE3 and T205JE3 (housing with cast iron covers) are shown below.

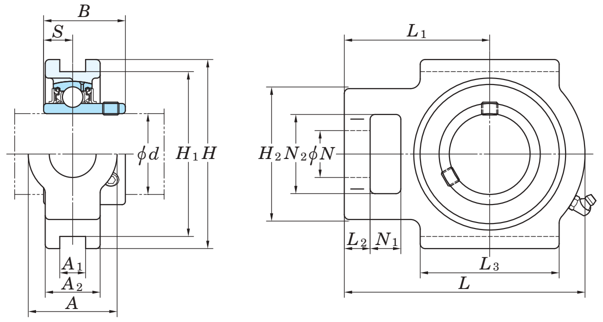


T204JE3 L_c = 97 mm
T205JE3 L_c = 102 mm

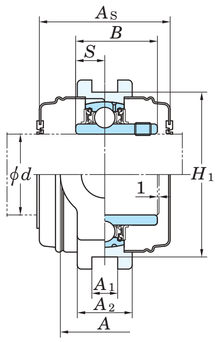
Shaft Dia.		Dimensions															Standard				Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm	inch	inch mm															Unit No.	Housing No.	Bearing No.	Mass	kN		kN		Unit No.		Dimension mm inch		Mass	Unit No.		Dimension mm inch		Mass
d		*A*	*A*1	*A*2	*H*	*H*1	*H*2	*L*	*L*1	*L*2	*L*3	*N*	*N*1	*N*2	*B*	*S*				kg	*C*r	*C*0r	*C*u	*f*0	Open Ends Type	Closed End Type	*A*s		kg	Open Ends Type	Closed End Type	*A*c		kg
12		1 1/4 32	15/32 12	13/16 21	3 1/2 89	2 63/64 76	2 51	3 11/16 94	2 13/32 61	13/32 10	2 51	3/4 19	5/8 16	1 1/4 32	1.220 31	0.500 12.7	**UCT201**	T204	UC201	0.81	12.8	6.65	0.302	13.2	UCT201C	UCT201CD	45	1 25/32	0.81	–	–	–	–	–
	1/2																**UCT201-8**		UC201-8	0.81					–	–	–	–	–	–	–	–	–	–
15																	**UCT202**		UC202	0.79					UCT202C	UCT202CD	45	1 25/32	0.79	–	–	–	–	–
	5/8																**UCT202-10**		UC202-10	0.79					–	–	–	–	–	–	–	–	–	–
17																	**UCT203**		UC203	0.78					UCT203C	UCT203CD	45	1 25/32	0.78	–	–	–	–	–
	3/4																**UCT204-12**		UC204-12	0.78					–	–	–	–	–	–	–	–	–	–
20																	**UCT204**		UC204	0.76					UCT204C	UCT204CD	45	1 25/32	0.76	UCT204FC	UCT204FCD	62	2 7/16	1.1
25	7/8	1 1/4 32	15/32 12	15/16 24	3 1/2 89	2 63/64 76	2 51	3 13/16 97	2 7/16 62	13/32 10	2 51	3/4 19	5/8 16	1 1/4 32	1.343 34.1	0.563 14.3	**UCT205-14**	T205	UC205-14	0.84	14.0	7.85	0.357	13.9	–	–	–	–	–	–	–	–	–	–
	15/16																**UCT205-15**		UC205-15	0.84					–	–	–	–	–	–	–	–	–	–
																	UCT205		UC205	0.84					UCT205C	UCT205CD	49	1 15/16	0.84	UCT205FC	UCT205FCD	66	2 19/32	1.2
	1																**UCT205-16**		UC205-16	0.84					–	–	–	–	–	–	–	–	–	–
		1 15/32 37	15/32 12	1 3/32 28	4 1/32 102	3 1/2 89	2 7/32 56	4 7/16 113	2 3/4 70	13/32 10	2 1/4 57	7/8 22	5/8 16	1 15/32 37	1.500 38.1	0.626 15.9	**UCTX05**	TX05	UCX05	1.4	19.5	11.3	0.514	13.9	UCTX05C	UCTX05CD	53	2 3/32	1.4	–	–	–	–	–
	1																**UCTX05-16**		UCX05-16	1.4					–	–	–	–	–	–	–	–	–	–
		1 13/32 36	15/32 12	1 1/32 26	3 1/2 89	3 5/32 80	2 7/16 62	4 13/16 122	3 76	15/32 12	2 9/16 65	1 1/32 26	5/8 16	1 13/32 36	1.496 38	0.591 15	**UCT305**	T305	UC305	1.4	21.2	10.9	0.495	12.6	–	–	–	–	–	UCT305C	UCT305CD	76	3	2.0
	1																**UCT305-16**		UC305-16	1.4					–	–	–	–	–	–	–	–	–	–
30	1 1/8	1 15/32 37	15/32 12	1 3/32 28	4 1/32 102	3 1/2 89	2 7/32 56	4 7/16 113	2 3/4 70	13/32 10	2 1/4 57	7/8 22	5/8 16	1 15/32 37	1.500 38.1	0.626 15.9	**UCT206-18**	T206	UC206-18	1.3	19.5	11.3	0.514	13.9	–	–	–	–	–	–	–	–	–	–
																	UCT206		UC206	1.3					UCT206C	UCT206CD	53	2 3/32	1.3	UCT206FC	UCT206FCD	70	2 3/4	1.8
	1 3/16																**UCT206-19**		UC206-19	1.3					–	–	–	–	–	–	–	–	–	–
	1 1/4																**UCT206-20**		UC206-20	1.3					–	–	–	–	–	–	–	–	–	–
		1 15/32 37	15/32 12	1 3/16 30	4 1/32 102	3 1/2 89	2 17/32 64	5 3/32 129	3 1/16 78	1/2 13	2 17/32 64	7/8 22	5/8 16	1 15/32 37	1.689 42.9	0.689 17.5	**UCTX06**	TX06	UCX06	1.7	25.7	15.4	0.700	13.9	UCTX06C	UCTX06CD	60	2 3/8	1.7	–	–	–	–	–
	1 3/16																**UCTX06-19**		UCX06-19	1.7					–	–	–	–	–	–	–	–	–	–
	1 1/4																**UCTX06-20**		UCX06-20	1.7					–	–	–	–	–	–	–	–	–	–
	–	1 5/8 41	5/8 16	1 3/32 28	3 15/16 100	3 35/64 90	2 3/4 70	5 13/32 137	3 11/32 85	9/16 14	2 29/32 74	1 3/32 28	23/32 18	1 5/8 41	1.693 43	0.669 17	**UCT306**	T306	UC306	1.8	26.7	15.0	0.682	13.3	–	–	–	–	–	UCT306C	UCT306CD	82	3 7/32	2.4
35	1 1/4	1 15/32 37	15/32 12	1 3/16 30	4 1/32 102	3 1/2 89	2 17/32 64	5 3/32 129	3 1/16 78	1/2 13	2 17/32 64	7/8 22	5/8 16	1 15/32 37	1.689 42.9	0.689 17.5	**UCT207-20**	T207	UC207-20	1.6	25.7	15.4	0.700	13.9	–	–	–	–	–	–	–	–	–	–
	1 5/16																**UCT207-21**		UC207-21	1.6					–	–	–	–	–	–	–	–	–	–
	1 3/8																**UCT207-22**		UC207-22	1.6					–	–	–	–	–	–	–	–	–	–
																	UCT207		UC207	1.6					UCT207C	UCT207CD	60	2 3/8	1.6	UCT207FC	UCT207FCD	78	3 1/16	2.3
	1 7/16																**UCT207-23**		UC207-23	1.6					–	–	–	–	–	–	–	–	–	–
	1 3/8	1 15/16 49	5/8 16	1 13/32 36	4 1/2 114	4 1/64 102	3 9/32 83	5 21/32 144	3 15/32 88	19/32 15	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1.937 49.2	0.748 19	**UCTX07-22**	TX07	UCX07-22	2.7	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
																	UCTX07		UCX07	2.7					UCTX07C	UCTX07CD	69	2 23/32	2.7	–	–	–	–	–
	1 7/16																**UCTX07-23**		UCX07-23	2.7					–	–	–	–	–	–	–	–	–	–
	–	1 25/32 45	5/8 16	1 1/4 32	4 3/8 111	3 15/16 100	2 15/16 75	5 29/32 150	3 11/16 94	19/32 15	3 5/32 80	1 3/16 30	25/32 20	1 25/32 45	1.890 48	0.748 19	**UCT307**	T307	UC307	2.3	33.4	19.3	0.877	13.2	–	–	–	–	–	UCT307C	UCT307CD	88	3 15/32	3.1
40	1 1/2	1 15/16 49	5/8 16	1 5/16 33	4 1/2 114	4 1/64 102	3 9/32 83	5 21/32 144	3 15/32 88	5/8 16	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1.937 49.2	0.748 19	**UCT208-24**	T208	UC208-24	2.5	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
	1 9/16																**UCT208-25**		UC208-25	2.5					–	–	–	–	–	–	–	–	–	–
																	UCT208		UC208	2.5					UCT208C	UCT208CD	69	2 23/32	2.5	UCT208FC	UCT208FCD	86	3 3/8	3.3
	1 1/2	1 15/16 49	5/8 16	1 13/32 36	4 19/32 117	4 1/64 102	3 9/32 83	5 21/32 144	3 7/16 87	19/32 15	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1.937 49.2	0.748 19	**UCTX08-24**	TX08	UCX08-24	2.6	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
																	UCTX08		UCX08	2.6					UCTX08C	UCTX08CD	69	2 23/32	2.6	–	–	–	–	–
	1 1/2	1 31/32 50	45/64 18	1 11/32 34	4 7/8 124	4 13/32 112	3 9/32 83	6 3/8 162	3 15/16 100	21/32 17	3 1/2 89	1 1/4 32	7/8 22	1 31/32 50	2.047 52	0.748 19	**UCT308-24**	T308	UC308-24	3.0	40.7	24.0	1.09	13.2	–	–	–	–	–	–	–	–	–	–
																	UCT308		UC308	3.0					–	–	–	–	–	UCT308C	UCT308CD	96	3 25/32	4.0
45	1 5/8	1 15/16 49	5/8 16	1 3/8 35	4 19/32 117	4 1/64 102	3 9/32 83	5 21/32 144	3 7/16 87	5/8 16	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1.937 49.2	0.748 19	**UCT209-26**	T209	UC209-26	2.4	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
	1 11/16																**UCT209-27**		UC209-27	2.4					–	–	–	–	–	–	–	–	–	–
	1 3/4																**UCT209-28**		UC209-28	2.4					–	–	–	–	–	–	–	–	–	–
																	UCT209		UC209	2.4					UCT209C	UCT209CD	69	2 23/32	2.4	UCT209FC	UCT209FCD	88	3 15/32	3.2
	1 3/4	1 15/16 49	5/8 16	1 1/2 38	4 19/32 117	4 1/64 102	3 9/32 83	5 7/8 149	3 17/32 90	5/8 16	3 3/8 86	1 5/32 29	3/4 19	1 15/16 49	2.031 51.6	0.748 19	**UCTX09-28**	TX09	UCX09-28	2.9	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
																	UCTX09		UCX09	2.9					UCTX09C	UCTX09CD	74	2 29/32	2.9	–	–	–	–	–

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
B-1/4-28UNF .... 201~210, X05~X09, 305~308
B-R1/8 .... 211~217, X10~X17, 309~328
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCT206JL3, UC206L3)
4. As for the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

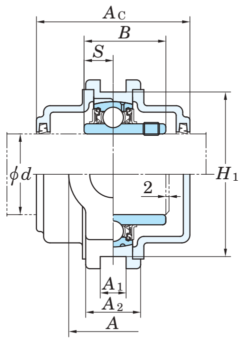
UCT
Cylindrical bore (with set screws)
d (45) ~ (75) mm

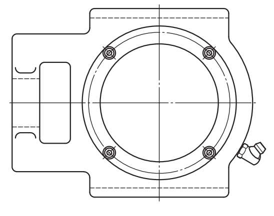


With Pressed Steel Covers
(E1)



With Cast Iron Covers
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of groove width ($\varDelta_{A1s}$), variations of tolerance of distance between both grooves ($\varDelta_{H1s}$), and tolerance of symmetry of both groove sides (X)

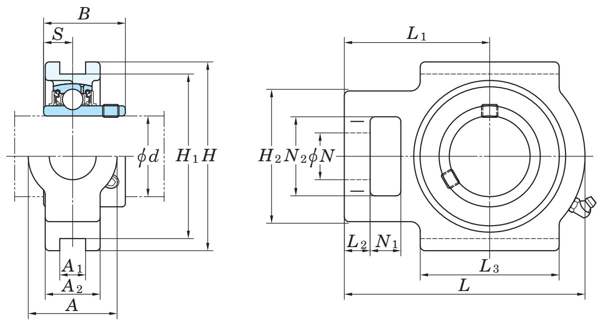
Unit: mm

Housing No.			$\varDelta_{A1s}$	$\varDelta_{H1s}$	X
T204~T210	TX05~TX10	T305~T310	+0.2 0	0 –0.5	0.5
T211~T217	TX11~TX17	T311~T318	+0.3 0	0 –0.8	0.6
		T319~T322			0.7
		T324~T328			0.8

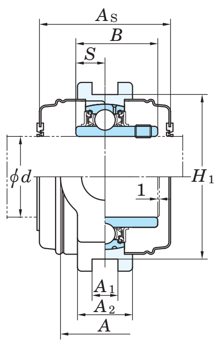
Shaft Dia.		Dimensions															Standard				Basic		Fatigue	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm	inch	inch mm															Unit No.	Housing No.	Bearing No.	Mass	Load Ratings kN		Load Limit kN		Unit No.		Dimension mm	inch	Mass	Unit No.		Dimension mm	inch	Mass
d		A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B	S				kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	A_s		kg	Open Ends Type	Closed End Type	A_c		kg
45	1 3/4	2 5/32 55	45/64 18	1 1/2 38	5 7/16 138	4 59/64 125	3 17/32 90	7 178	4 11/32 110	23/32 18	3 13/16 97	1 11/32 34	15/16 24	2 5/32 55	2.244 57	0.866 22	**UCT309-28**	T309	UC309-28	4.1	48.9	29.5	1.34	13.3	–	–	–	–	–	–	–	–	–	–
																	UCT309		UC309	4.1					–	–	–	–	–	UCT309C	UCT309CD	102	4 1/32	5.4
50	1 7/8	1 15/16 49	5/8 16	1 15/32 37	4 19/32 117	4 1/64 102	3 9/32 83	5 7/8 149	3 17/32 90	5/8 16	3 3/8 86	1 5/32 29	3/4 19	1 15/16 49	2.031 51.6	0.748 19	**UCT210-30**	T210	UC210-30	2.6	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
	1 15/16																**UCT210-31**		UC210-31	2.6					–	–	–	–	–	–	–	–	–	–
																	UCT210		UC210	2.6					UCT210C	UCT210CD	74	2 29/32	2.6	UCT210FC	UCT210FCD	97	3 13/16	3.6
	2																**UCT210-32**		UC210-32	2.6					–	–	–	–	–	–	–	–	–	–
	1 15/16	2 17/32 64	55/64 22	1 21/32 42	5 3/4 146	5 1/8 130	4 1/32 102	6 23/32 171	4 3/16 106	3/4 19	3 3/4 95	1 3/8 35	31/32 25	2 17/32 64	2.189 55.6	0.874 22.2	**UCTX10-31**	TX10	UCX10-31	4.4	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
																	UCTX10		UCX10	4.4					UCTX10C	UCTX10CD	76	3	4.4	–	–	–	–	–
	2																**UCTX10-32**		UCX10-32	4.4					–	–	–	–	–	–	–	–	–	–
	–	2 13/32 61	25/32 20	1 9/16 40	5 15/16 151	5 33/64 140	3 27/32 98	7 17/32 191	4 19/32 117	25/32 20	4 3/16 106	1 15/32 37	1 1/16 27	2 13/32 61	2.402 61	0.866 22	**UCT310**	T310	UC310	4.9	62.0	38.3	1.74	13.2	–	–	–	–	–	UCT310C	UCT310CD	110	4 11/32	6.5
55	2	2 17/32 64	55/64 22	1 1/2 38	5 3/4 146	5 1/8 130	4 1/32 102	6 23/32 171	4 3/16 106	3/4 19	3 3/4 95	1 3/8 35	31/32 25	2 17/32 64	2.189 55.6	0.874 22.2	**UCT211-32**	T211	UC211-32	4.0	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
	2 1/8																**UCT211-34**		UC211-34	4.0					–	–	–	–	–	–	–	–	–	–
																	UCT211		UC211	4.0					UCT211C	UCT211CD	76	3	4.0	UCT211FC	UCT211FCD	99	3 29/32	5.2
	2 3/16																**UCT211-35**		UC211-35	4.0					–	–	–	–	–	–	–	–	–	–
		2 17/32 64	55/64 22	1 23/32 44	5 3/4 146	5 1/8 130	4 1/32 102	7 5/8 194	4 11/16 119	3/4 19	4 1/32 102	1 3/8 35	1 1/4 32	2 17/32 64	2.563 65.1	1.000 25.4	**UCTX11**	TX11	UCX11	5.3	52.4	36.2	1.65	14.4	UCTX11C	UCTX11CD	89	3 1/2	5.3	–	–	–	–	–
	2 3/16																**UCTX11-35**		UCX11-35	5.3					–	–	–	–	–	–	–	–	–	–
	2 1/4																**UCTX11-36**		UCX11-36	5.3					–	–	–	–	–	–	–	–	–	–
	2	2 19/32 66	55/64 22	1 23/32 44	6 13/32 163	5 29/32 150	4 1/8 105	8 5/32 207	5 127	13/16 21	4 17/32 115	1 17/32 39	1 5/32 29	2 19/32 66	2.598 66	0.984 25	**UCT311-32**	T311	UC311-32	6.1	71.6	45.0	2.05	13.2	–	–	–	–	–	–	–	–	–	–
																	UCT311		UC311	6.1					–	–	–	–	–	UCT311C	UCT311CD	114	4 1/2	7.9
60	2 1/4	2 17/32 64	55/64 22	1 21/32 42	5 3/4 146	5 1/8 130	4 1/32 102	7 5/8 194	4 11/16 119	3/4 19	4 1/32 102	1 3/8 35	1 1/4 32	2 17/32 64	2.563 65.1	1.000 25.4	**UCT212-36**	T212	UC212-36	4.9	52.4	36.2	1.65	14.4	–	–	–	–	–	–	–	–	–	–
																	UCT212		UC212	4.9					UCT212C	UCT212CD	89	3 1/2	4.9	UCT212FC	UCT212FCD	114	4 1/2	6.4
	2 3/8																**UCT212-38**		UC212-38	4.9					–	–	–	–	–	–	–	–	–	–
	2 7/16																**UCT212-39**		UC212-39	4.9					–	–	–	–	–	–	–	–	–	–
		2 3/4 70	1 1/32 26	1 7/8 48	6 9/16 167	5 15/16 151	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2.563 65.1	1.000 25.4	**UCTX12**	TX12	UCX12	7.4	57.2	40.1	1.82	14.4	UCTX12C	UCTX12CD	89	3 1/2	7.4	–	–	–	–	–
	2 7/16																**UCTX12-39**		UCX12-39	7.4					–	–	–	–	–	–	–	–	–	–
	–	2 25/32 71	55/64 22	1 13/16 46	7 178	6 19/64 160	4 7/16 113	8 21/32 220	5 5/16 135	29/32 23	4 27/32 123	1 5/8 41	1 7/32 31	2 25/32 71	2.795 71	1.024 26	**UCT312**	T312	UC312	7.6	81.9	52.2	2.37	13.2	–	–	–	–	–	UCT312C	UCT312CD	124	4 7/8	9.9
65	2 1/2	2 3/4 70	1 1/32 26	1 23/32 44	6 9/16 167	5 15/16 151	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2.563 65.1	1.000 25.4	**UCT213-40**	T213	UC213-40	6.9	57.2	40.1	1.82	14.4	–	–	–	–	–	–	–	–	–	–
																	UCT213		UC213	6.9					UCT213C	UCT213CD	89	3 1/2	6.9	UCT213FC	UCT213FCD	114	4 1/2	8.6
	2 1/2	2 3/4 70	1 1/32 26	1 7/8 48	6 9/16 167	5 15/16 151	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2.937 74.6	1.189 30.2	**UCTX13-40**	TX13	UCX13-40	7.6	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
																	UCTX13		UCX13	7.6					UCTX13C	UCTX13CD	99	3 29/32	7.6	–	–	–	–	–
	2 1/2	3 5/32 80	1 1/32 26	1 31/32 50	7 15/32 190	6 11/16 170	4 9/16 116	9 3/8 238	5 3/4 146	31/32 25	5 9/32 134	1 11/16 43	1 1/4 32	2 3/4 70	2.953 75	1.181 30	**UCT313-40**	T313	UC313-40	9.3	92.7	59.9	2.68	13.2	–	–	–	–	–	–	–	–	–	–
																	UCT313		UC313	9.3					–	–	–	–	–	UCT313C	UCT313CD	122	4 13/16	11.4
70	2 3/4	2 3/4 70	1 1/32 26	1 13/16 46	6 9/16 167	5 15/16 151	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2.937 74.6	1.189 30.2	**UCT214-44**	T214	UC214-44	7.0	62.2	44.1	2.01	14.5	–	–	–	–	–	–	–	–	–	–
																	UCT214		UC214	7.0					UCT214C	UCT214CD	99	3 29/32	7.0	UCT214FC	UCT214FCD	124	4 7/8	8.9
	2 3/4	2 3/4 70	1 1/32 26	1 7/8 48	6 9/16 167	5 15/16 151	4 3/8 111	9 1/8 232	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3.063 77.8	1.331 33.3	**UCTX14-44**	TX14	UCX14-44	7.9	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
																	UCTX14		UCX14	7.9					UCTX14C	UCTX14CD	99	3 29/32	7.9	–	–	–	–	–
	2 3/4	3 17/32 90	1 1/32 26	2 1/16 52	7 15/16 202	7 3/32 180	5 1/8 130	9 29/32 252	6 3/32 155	31/32 25	5 1/2 140	1 13/16 46	1 13/32 36	3 11/32 85	3.071 78	1.299 33	**UCT314-44**	T314	UC314-44	11.1	104	68.2	2.96	13.2	–	–	–	–	–	–	–	–	–	–
																	UCT314		UC314	11.1					–	–	–	–	–	UCT314C	UCT314CD	124	4 7/8	13.4
75	2 15/16	2 3/4 70	1 1/32 26	1 7/8 48	6 9/16 167	5 15/16 151	4 3/8 111	9 1/8 232	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3.063 77.8	1.331 33.3	**UCT215-47**	T215	UC215-47	7.3	67.4	48.3	2.17	14.5	–	–	–	–	–	–	–	–	–	–
																	UCT215		UC215	7.3					UCT215C	UCT215CD	99	3 29/32	7.3	UCT215FC	UCT215FCD	124	4 7/8	9.2
	3																**UCT215-48**		UC215-48	7.3					–	–	–	–	–	–	–	–	–	–
	2 15/16	2 3/4 70	1 7/64 28	1 7/8 48	7 1/4 184	6 1/2 165	4 3/8 111	9 1/4 235	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3.252 82.6	1.311 33.3	**UCTX15-47**	TX15	UCX15-47	8.7	72.7	53.0	2.30	14.6	–	–	–	–	–	–	–	–	–	–
																	UCTX15		UCX15	8.7					UCTX15C	UCTX15CD	109	4 9/32	8.7	–	–	–	–	–
	3																**UCTX15-48**		UCX15-48	8.7					–	–	–	–	–	–	–	–	–	–

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
B-1/4-28UNF........ 201~210, X05~X09, 305~308
B-R1/8................. 211~217, X10~X17, 309~328
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCT206JL3, UC206L3)
4. As for the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

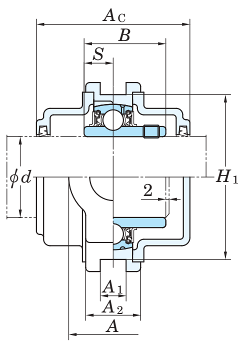
UCT
Cylindrical bore (with set screws)
d (75) ~ 140 mm

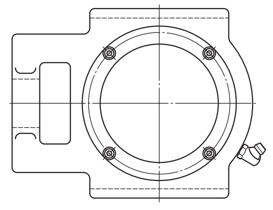


With Pressed Steel Covers
(E1)



With Cast Iron Covers
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of groove width ($\varDelta_{A1s}$), variations of tolerance of distance between both grooves ($\varDelta_{H1s}$), and tolerance of symmetry of both groove sides (X)

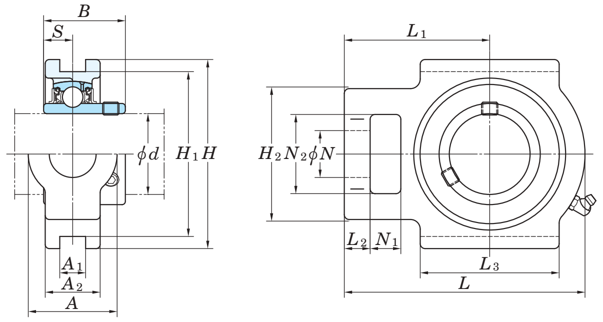
Unit: mm

Housing No.			$\varDelta_{A1s}$	$\varDelta_{H1s}$	X
T204~T210	TX05~TX10	T305~T310	+0.2 0	0 –0.5	0.5
T211~T217	TX11~TX17	T311~T318	+0.3 0	0 –0.8	0.6
		T319~T322			0.7
		T324~T328			0.8

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm															Standard				Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers					With Cast Iron Covers				
																	Unit No.	Housing No.	Bearing No.	Mass					Unit No.		Dimension		Mass	Unit No.		Dimension		Mass
d		A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B	S				kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	A_s mm	A_s inch	kg	Open Ends Type	Closed End Type	A_c mm	A_c inch	kg
75	2 15/16 3	3 17/32 90	1 1/32 26	2 5/32 55	8 1/2 216	7 9/16 192	5 3/16 132	10 5/16 262	6 5/16 160	31/32 25	5 29/32 150	1 13/16 46	1 13/32 36	3 11/32 85	3.228 82	1.260 32	**UCT315-47** **UCT315** **UCT315-48**	T315	UC315-47 UC315 UC315-48	13.0 13.0 13.0	113	77.2	3.24	13.2	– – –	– – –	– – –	– – –	– – –	– UCT315C –	– UCT315CD –	– 134 –	– 5 9/32 –	– 15.5 –
80	3 1/8	2 3/4 70	1 1/32 26	2 51	7 1/4 184	6 1/2 165	4 3/8 111	9 1/4 235	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3.252 82.6	1.311 33.3	**UCT216-50** **UCT216**	T216	UC216-50 UC216	8.2 8.2	72.7	53.0	2.30	14.6	– UCT216C	– UCT216CD	– 109	– 4 9/32	– 8.2	– UCT216FC	– UCT216FCD	– 138	– 5 7/16	– 10.6
	–	2 7/8 73	1 7/64 28	2 1/8 54	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 3/32 28	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3.374 85.7	1.343 34.1	**UCTX16**	TX16	UCX16	11.7	84.0	61.9	2.60	14.5	UCTX16C	UCTX16CD	113	4 7/16	11.7	–	–	–	–	–
	–	4 1/32 102	1 3/16 30	2 3/8 60	9 1/16 230	8 1/32 204	5 29/32 150	11 3/32 282	6 27/32 174	1 3/32 28	6 5/16 160	2 3/32 53	1 21/32 42	3 27/32 98	3.386 86	1.339 34	**UCT316**	T316	UC316	16.2	123	86.7	3.53	13.3	–	–	–	–	–	UCT316C	UCT316CD	138	5 7/16	19.1
85	3 1/4	2 7/8 73	1 3/16 30	2 1/8 54	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 5/32 29	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3.374 85.7	1.343 34.1	**UCT217-52** **UCT217**	T217	UC217-52 UC217	11.0 11.0	84.0	61.9	2.60	14.5	– UCT217C	– UCT217CD	– 113	– 4 7/16	– 11.0	– UCT217FC	– UCT217FCD	– 142	– 5 19/32	– 13.7
	3 7/16	2 7/8 73	1 7/64 28	2 1/8 54	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 3/32 28	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3.780 96	1.563 39.7	**UCTX17** **UCTX17-55**	TX17	UCX17 UCX17-55	11.7 11.7	96.1	71.5	2.91	14.5	UCTX17C –	UCTX17CD –	123 –	4 27/32 –	11.7 –	– –	– –	– –	– –	– –
	–	4 1/32 102	1 17/64 32	2 17/32 64	9 7/16 240	8 27/64 214	5 31/32 152	11 23/32 298	7 7/32 183	1 3/16 30	6 11/16 170	2 3/32 53	1 21/32 42	3 27/32 98	3.780 96	1.575 40	**UCT317**	T317	UC317	19.0	133	96.8	3.82	13.3	–	–	–	–	–	UCT317C	UCT317CD	146	5 3/4	22.3
90	3 1/2	4 11/32 110	1 17/64 32	2 19/32 66	10 1/32 255	8 31/32 228	6 5/16 160	12 9/32 312	7 9/16 192	1 3/16 30	6 7/8 175	2 1/4 57	1 13/16 46	4 3/16 106	3.780 96	1.575 40	**UCT318-56** **UCT318**	T318	UC318-56 UC318	21.6 21.6	143	107	4.11	13.3	– –	– –	– –	– –	– –	– UCT318C	– UCT318CD	– 150	– 5 29/32	– 25.4
95	–	4 11/32 110	1 3/8 35	2 27/32 72	10 5/8 270	9 29/64 240	6 1/2 165	12 11/16 322	7 3/4 197	1 7/32 31	7 3/32 180	2 1/4 57	1 13/16 46	4 3/16 106	4.055 103	1.614 41	**UCT319**	T319	UC319	24.9	153	119	4.45	13.3	–	–	–	–	–	UCT319C	UCT319CD	162	6 3/8	29.2
100	3 15/16 4	4 23/32 120	1 3/8 35	2 15/16 75	11 13/32 290	10 15/64 260	6 7/8 175	13 19/32 345	8 9/32 210	1 1/4 32	7 7/8 200	2 5/16 59	1 7/8 48	4 17/32 115	4.252 108	1.654 42	**UCT320** **UCT320-63** **UCT320-64**	T320	UC320 UC320-63 UC320-64	30.7 30.7 30.7	173	141	5.08	13.2	– – –	– – –	– – –	– – –	– – –	UCT320C – –	UCT320CD – –	174 – –	6 27/32 – –	36.3 – –
105	–	4 23/32 120	1 3/8 35	2 15/16 75	11 13/32 290	10 15/64 260	6 7/8 175	13 19/32 345	8 9/32 210	1 1/4 32	7 7/8 200	2 5/16 59	1 7/8 48	4 17/32 115	4.409 112	1.732 44	**UCT321**	T321	UC321	36.7	184	153	5.41	13.2	–	–	–	–	–	UCT321C	UCT321CD	178	7	42.7
110	–	5 1/8 130	1 1/2 38	3 5/32 80	12 19/32 320	11 7/32 285	7 9/32 185	15 5/32 385	9 1/4 235	1 1/2 38	8 15/32 215	2 9/16 65	2 1/16 52	4 29/32 125	4.606 117	1.811 46	**UCT322**	T322	UC322	39.7	205	180	6.15	13.2	–	–	–	–	–	UCT322C	UCT322CD	188	7 13/32	46.5
120	–	5 1/2 140	1 49/64 45	3 17/32 90	13 31/32 355	12 9/32 320	8 9/32 210	17 432	10 1/2 267	1 21/32 42	9 1/16 230	2 3/4 70	2 3/8 60	5 1/2 140	4.961 126	2.008 51	**UCT324**	T324	UC324	54.4	207	185	6.10	13.5	–	–	–	–	–	UCT324C	UCT324CD	196	7 23/32	63.9
130	–	5 29/32 150	1 31/32 50	3 15/16 100	15 5/32 385	13 25/32 350	8 21/32 220	18 5/16 465	11 7/32 285	1 25/32 45	9 7/16 240	2 15/16 75	2 9/16 65	5 29/32 150	5.315 135	2.126 54	**UCT326**	T326	UC326	69.3	229	214	6.79	13.6	–	–	–	–	–	UCT326C	UCT326CD	214	8 7/16	81.4
140	–	6 3/32 155	1 31/32 50	3 15/16 100	16 11/32 415	14 61/64 380	9 1/16 230	20 9/32 515	12 13/32 315	1 31/32 50	10 1/32 255	3 5/32 80	2 3/4 70	6 5/16 160	5.709 145	2.323 59	**UCT328**	T328	UC328	85.1	253	246	7.54	13.6	–	–	–	–	–	UCT328C	UCT328CD	222	8 3/4	101

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
B-1/4-28UNF........ 201~210, X05~X09, 305~308
B-R1/8................. 211~217, X10~X17, 309~328
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCT206JL3, UC206L3)
4. As for the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

UCT-E
Cylindrical bore (with set screws)
d 12 ~ 50 mm



Variations of tolerance of groove width ($\varDelta_{A1s}$), variations of tolerance of distance between both grooves ($\varDelta_{H1s}$), and tolerance of symmetry of both groove sides (X)

Unit: mm

Housing No.		$\varDelta_{A1s}$	$\varDelta_{H1s}$	X
T204E~T210E	TX05E~TX10E	+0.2 0	0 –0.5	0.5
T211E~T217E	TX11E~TX17E	+0.3 0	0 –0.8	0.6

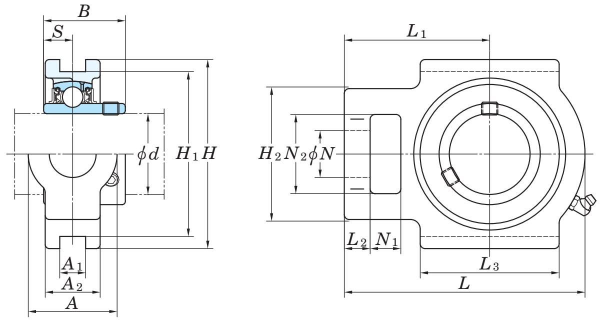
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm															Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B	S				C_r	C_{0r}	C_u	f_0	kg
12		1 1/4 32	17/32 13.5	13/16 21	3 1/2 89	3 76.2	2 51	3 11/16 94	2 13/32 61	13/32 10	2 51	3/4 19	5/8 16	1 1/4 32	1.220 31	0.500 12.7	**UCT201E**	T204E	UC201	12.8	6.65	0.302	13.2	0.81
	1/2																**UCT201-8E**		UC201-8					
15																	**UCT202E**		UC202					0.79
	5/8																**UCT202-10E**		UC202-10					
17																	**UCT203E**		UC203					0.78
	3/4																**UCT204-12E**		UC204-12					
20																	**UCT204E**		UC204					0.76
25	7/8	1 1/4 32	17/32 13.5	15/16 24	3 1/2 89	3 76.2	2 51	3 13/16 97	2 7/16 62	13/32 10	2 51	3/4 19	5/8 16	1 1/4 32	1.343 34.1	0.563 14.3	**UCT205-14E**	T205E	UC205-14	14.0	7.85	0.357	13.9	0.84
	15/16																**UCT205-15E**		UC205-15					
																	UCT205E		UC205					
	1																**UCT205-16E**		UC205-16					
		1 15/32 37	17/32 13.5	1 3/32 28	4 1/32 102	3 1/2 88.9	2 7/32 56	4 7/16 113	2 3/4 70	13/32 10	2 1/4 57	7/8 22	5/8 16	1 15/32 37	1.500 38.1	0.626 15.9	**UCTX05E**	TX05E	UCX05	19.5	11.3	0.514	13.9	1.4
	1																**UCTX05-16E**		UCX05-16					
30	1 1/8	1 15/32 37	17/32 13.5	1 3/32 28	4 1/32 102	3 1/2 88.9	2 7/32 56	4 7/16 113	2 3/4 70	13/32 10	2 1/4 57	7/8 22	5/8 16	1 15/32 37	1.500 38.1	0.626 15.9	**UCT206-18E**	T206E	UC206-18	19.5	11.3	0.514	13.9	1.3
																	UCT206E		UC206					
	1 3/16																**UCT206-19E**		UC206-19					
	1 1/4																**UCT206-20E**		UC206-20					
		1 15/32 37	17/32 13.5	1 3/16 30	4 1/32 102	3 1/2 88.9	2 17/32 64	5 3/32 129	3 1/16 78	1/2 13	2 17/32 64	7/8 22	5/8 16	1 15/32 37	1.689 42.9	0.689 17.5	**UCTX06E**	TX06E	UCX06	25.7	15.4	0.700	13.9	1.7
	1 3/16																**UCTX06-19E**		UCX06-19					
	1 1/4																**UCTX06-20E**		UCX06-20					
35	1 1/4	1 15/32 37	17/32 13.5	1 3/16 30	4 1/32 102	3 1/2 88.9	2 17/32 64	5 3/32 129	3 1/16 78	1/2 13	2 17/32 64	7/8 22	5/8 16	1 15/32 37	1.689 42.9	0.689 17.5	**UCT207-20E**	T207E	UC207-20	25.7	15.4	0.700	13.9	1.6
	1 5/16																**UCT207-21E**		UC207-21					
	1 3/8																**UCT207-22E**		UC207-22					
																	UCT207E		UC207					
	1 7/16																**UCT207-23E**		UC207-23					
	1 3/8	1 15/16 49	11/16 17.5	1 13/32 36	4 1/2 114	4 101.6	3 9/32 83	5 21/32 144	3 15/32 88	19/32 15	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1.937 49.2	0.748 19	**UCTX07-22E**	TX07E	UCX07-22	29.1	17.8	0.809	14.0	2.7
																	UCTX07E		UCX07					
	1 7/16																**UCTX07-23E**		UCX07-23					
40	1 1/2	1 15/16 49	11/16 17.5	1 5/16 33	4 1/2 114	4 101.6	3 9/32 83	5 21/32 144	3 15/32 88	19/32 16	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1.937 49.2	0.748 19	**UCT208-24E**	T208E	UC208-24	29.1	17.8	0.809	14.0	2.5
	1 9/16																**UCT208-25E**		UC208-25					
																	UCT208E		UC208					
	1 1/2	1 15/16 49	11/16 17.5	1 13/32 36	4 19/32 117	4 101.6	3 9/32 83	5 21/32 144	3 7/16 87	19/32 15	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1.937 49.2	0.748 19	**UCTX08-24E**	TX08E	UCX08-24	34.1	21.3	0.968	14.0	2.6
																	UCTX08E		UCX08					
45	1 5/8	1 15/16 49	11/16 17.5	1 3/8 35	4 19/32 117	4 101.6	3 9/32 83	5 21/32 144	3 7/16 87	5/8 16	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1.937 49.2	0.748 19	**UCT209-26E**	T209E	UC209-26	34.1	21.3	0.968	14.0	2.4
	1 11/16																**UCT209-27E**		UC209-27					
	1 3/4																**UCT209-28E**		UC209-28					
																	UCT209E		UC209					
	1 3/4	1 15/16 49	11/16 17.5	1 1/2 38	4 19/32 117	4 101.6	3 9/32 83	5 7/8 149	3 17/32 90	5/8 16	3 3/8 86	1 5/32 29	3/4 19	1 15/16 49	2.031 51.6	0.748 19	**UCTX09-28E**	TX09E	UCX09-28	35.1	23.3	1.06	14.4	2.9
																	UCTX09E		UCX09					
50	1 7/8	1 15/16 49	11/16 17.5	1 15/32 37	4 19/32 117	4 101.6	3 9/32 83	5 7/8 149	3 17/32 90	5/8 16	3 3/8 86	1 5/32 29	3/4 19	1 15/16 49	2.031 51.6	0.748 19	**UCT210-30E**	T210E	UC210-30	35.1	23.3	1.06	14.4	2.6
	1 15/16																**UCT210-31E**		UC210-31					
																	UCT210E		UC210					
	2																**UCT210-32E**		UC210-32					
	1 15/16	2 17/32 64	1 1/16 27	1 21/32 42	5 3/4 146	5 1/8 130.17	4 1/64 102	6 23/32 171	4 3/16 106	3/4 19	3 3/4 95	1 3/8 35	31/32 25	2 17/32 64	2.189 55.6	0.874 22.2	**UCTX10-31E**	TX10E	UCX10-31	43.4	29.4	1.34	14.4	4.4
																	UCTX10E		UCX10					
	2																**UCTX10-32E**		UCX10-32					

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
B-1/4-28UNF .... 201~210, X05~X09
B-R1/8 .... 211~217, X10~X17
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCT206EL3, UC206L3)
4. As for the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

UCT-E

Cylindrical bore (with set screws)

d 55 ~ 85 mm



Variations of tolerance of groove width ($\varDelta_{A1s}$), variations of tolerance of distance between both grooves ($\varDelta_{H1s}$), and tolerance of symmetry of both groove sides (X)

Unit: mm

Housing No.		$\varDelta_{A1s}$	$\varDelta_{H1s}$	X
T204E~T210E	TX05E~TX10E	+0.2 0	0 –0.5	0.5
T211E~T217E	TX11E~TX17E	+0.3 0	0 –0.8	0.6

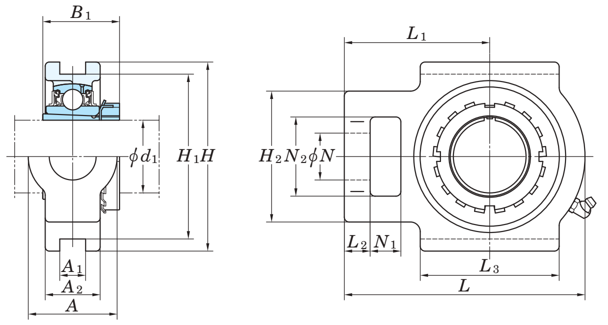
Shaft Dia.		Dimensions inch mm															Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
mm d	inch d	A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B	S				C_r	C_{0r}	C_u	f_0	kg
55	2 2 1/8 2 3/16	2 17/32 64	1 1/16 27	1 1/2 38	5 3/4 146	5 1/8 130.17	4 1/64 102	6 23/32 171	4 3/16 106	3/4 19	3 3/4 95	1 3/8 35	31/32 25	2 17/32 64	2.189 55.6	0.874 22.2	**UCT211-32E** **UCT211-34E** **UCT211E** **UCT211-35E**	T211E	UC211-32 UC211-34 UC211 UC211-35	43.4	29.4	1.34	14.4	4.0
	2 3/16 2 1/4	2 17/32 64	1 1/16 27	1 23/32 44	5 3/4 146	5 1/8 130.17	4 1/64 102	7 5/8 194	4 11/16 119	3/4 19	4 1/32 102	1 3/8 35	1 1/4 32	2 17/32 64	2.563 65.1	1.000 25.4	**UCTX11E** **UCTX11-35E** **UCTX11-36E**	TX11E	UCX11 UCX11-35 UCX11-36	52.4	36.2	1.65	14.4	5.3
60	2 1/4 2 3/8 2 7/16	2 17/32 64	1 1/16 27	1 21/32 42	5 3/4 146	5 1/8 130.17	4 1/64 102	7 5/8 194	4 11/16 119	3/4 19	4 1/32 102	1 3/8 35	1 1/4 32	2 17/32 64	2.563 65.1	1.000 25.4	**UCT212-36E** **UCT212E** **UCT212-38E** **UCT212-39E**	T212E	UC212-36 UC212 UC212-38 UC212-39	52.4	36.2	1.65	14.4	4.9
	2 7/16	2 3/4 70	1 1/16 27	1 7/8 48	6 9/16 167	5 15/16 150.8	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2.563 65.1	1.000 25.4	**UCTX12E** **UCTX12-39E**	TX12E	UCX12 UCX12-39	57.2	40.1	1.82	14.4	7.4
65	2 1/2	2 3/4 70	1 1/16 27	1 23/32 44	6 9/16 167	5 15/16 150.8	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2.563 65.1	1.000 25.4	**UCT213-40E** **UCT213E**	T213E	UC213-40 UC213	57.2	40.1	1.82	14.4	6.9
	2 1/2	2 3/4 70	1 1/16 27	1 7/8 48	6 9/16 167	5 15/16 150.8	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2.937 74.6	1.189 30.2	**UCTX13-40E** **UCTX13E**	TX13E	UCX13-40 UCX13	62.2	44.1	2.01	14.5	7.6
70	2 3/4	2 3/4 70	1 1/16 27	1 13/16 46	6 9/16 167	5 15/16 150.8	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2.937 74.6	1.189 30.2	**UCT214-44E** **UCT214E**	T214E	UC214-44 UC214	62.2	44.1	2.01	14.5	7.0
	2 3/4	2 3/4 70	1 1/16 27	1 7/8 48	6 9/16 167	5 15/16 150.8	4 3/8 111	9 1/8 232	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3.063 77.8	1.331 33.3	**UCTX14-44E** **UCTX14E**	TX14E	UCX14-44 UCX14	67.4	48.3	2.17	14.5	7.9
75	2 15/16 3	2 3/4 70	1 1/16 27	1 7/8 48	6 9/16 167	5 15/16 150.8	4 3/8 111	9 1/8 232	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3.063 77.8	1.331 33.3	**UCT215-47E** **UCT215E** **UCT215-48E**	T215E	UC215-47 UC215 UC215-48	67.4	48.3	2.17	14.5	7.3
	2 15/16 3	2 3/4 70	1 1/16 27	1 7/8 48	7 1/4 184	6 1/2 165	4 3/8 111	9 1/4 235	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3.252 82.6	1.311 33.3	**UCTX15-47E** **UCTX15E** **UCTX15-48E**	TX15E	UCX15-47 UCX15 UCX15-48	72.7	53.0	2.30	14.6	8.7
80	3 1/8	2 3/4 70	1 1/16 27	2 51	7 1/4 184	6 1/2 165	4 3/8 111	9 1/4 235	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3.252 82.6	1.311 33.3	**UCT216-50E** **UCT216E**	T216E	UC216-50 UC216	72.7	53.0	2.30	14.6	8.2
	–	3 1/2 89	1 13/16 46	2 11/16 68	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 3/32 28	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3.374 85.7	1.343 34.1	**UCTX16E**	TX16E	UCX16	84.0	61.9	2.60	14.5	12.4
85	3 1/4	3 1/2 89	1 13/16 46	2 11/16 68	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 5/32 29	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3.374 85.7	1.343 34.1	**UCT217-52E** **UCT217E**	T217E	UC217-52 UC217	84.0	61.9	2.60	14.5	12.1
	3 7/16	3 1/2 89	1 13/16 46	2 11/16 68	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 3/32 28	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3.780 96	1.563 39.7	**UCTX17E** **UCTX17-55E**	TX17E	UCX17 UCX17-55	96.1	71.5	2.91	14.5	13.3

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
B-1/4-28UNF .... 201~210, X05~X09
B-R1/8 .... 211~217, X10~X17
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCT206EL3, UC206L3)
4. As for the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
5. Housings of spheroidal graphite iron casting are also available.

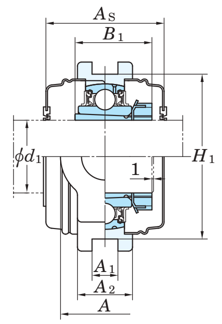
UKT

Tapered bore (with adapter)

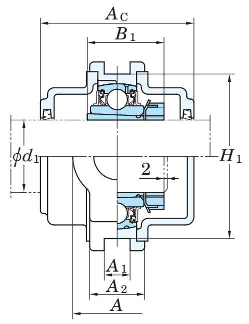
d_1 20 ~ 50 mm

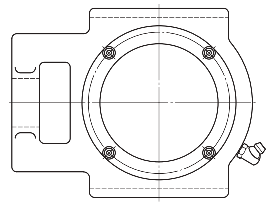


With Pressed Steel Covers
(E1)



With Cast Iron Covers
(E3)





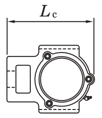
Cast iron cover fixing screw position
(standard)

Variations of tolerance of groove width (Δ_{A1s}), variations of tolerance of distance between both grooves (Δ_{H1s}), and tolerance of symmetry of both groove sides (X)

Unit: mm

Housing No.			Δ_{A1s}	Δ_{H1s}	X
T205~T210	TX05~TX10	T305~T310	+0.2 0	0 −0.5	0.5
T211~T217	TX11~TX17	T311~T318	+0.3 0	0 −0.8	0.6
		T319~T322			0.7
		T324~T328			0.8

Form and dimension of L_c of T205JE3 (housing with cast iron covers) are shown below.



T205JE3 $L_c = 102$ mm

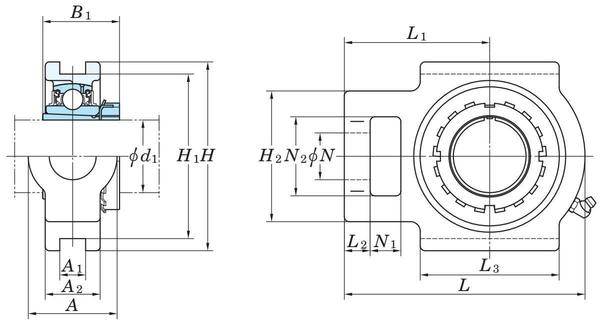
Shaft Dia.		Dimensions														Standard					Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm	inch	inch mm														Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass	kN		kN		Unit No.		Dimension		Mass	Unit No.		Dimension		Mass
d_1		A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B_1					kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	mm A_s	inch	kg	Open Ends Type	Closed End Type	mm A_c	inch	kg
20	3/4	1 1/4 32	15/32 12	15/16 24	3 1/2 89	2 63/64 76	2 51	3 13/16 97	2 7/16 62	13/32 10	2 51	3/4 19	5/8 16	1 1/4 32	1 3/8 35	**UKT205**	T205	UK205	HE2305X H2305X	0.88 0.88	14.0	7.85	0.357	13.9	– UKT205C	– UKT205CD	– 49	– 1 15/16	– 0.88	– UKT205FC	– UKT205FCD	– 66	– 2 19/32	– 1.3
	3/4	1 15/32 37	15/32 12	1 3/32 28	4 1/32 102	3 1/2 89	2 7/32 56	4 7/16 113	2 3/4 70	13/32 10	2 1/4 57	7/8 22	5/8 16	1 15/32 37	1 3/8 35	**UKTX05**	TX05	UKX05	HE2305X H2305X	1.3 1.3	19.5	11.3	0.514	13.9	– UKTX05C	– UKTX05CD	– 53	– 2 3/32	– 1.3	– –	– –	– –	– –	– –
	3/4	1 13/32 36	15/32 12	1 1/32 26	3 1/2 89	3 5/32 80	2 7/16 62	4 13/16 122	3 76	15/32 12	2 9/16 65	1 1/32 26	5/8 16	1 13/32 36	1 3/8 35	**UKT305**	T305	UK305	HE2305X H2305X	1.5 1.5	21.2	10.9	0.495	12.6	– –	– –	– –	– –	– –	– UKT305C	– UKT305CD	– 76	– 3	– 2.1
25	1	1 15/32 37	15/32 12	1 3/32 28	4 1/32 102	3 1/2 89	2 7/32 56	4 7/16 113	2 3/4 70	13/32 10	2 1/4 57	7/8 22	5/8 16	1 15/32 37	1 1/2 38	**UKT206**	T206	UK206	H2306X HE2306X	1.3 1.3	19.5	11.3	0.514	13.9	UKT206C –	UKT206CD –	53 –	2 3/32 –	1.3 –	UKT206FC –	UKT206FCD –	70 –	2 3/4 –	1.8 –
	1	1 15/32 37	15/32 12	1 3/16 30	4 1/32 102	3 1/2 89	2 17/32 64	5 3/32 129	3 1/16 78	1/2 13	2 17/32 64	7/8 22	5/8 16	1 15/32 37	1 1/2 38	**UKTX06**	TX06	UKX06	H2306X HE2306X	1.7 1.7	25.7	15.4	0.700	13.9	UKTX06C –	UKTX06CD –	60 –	2 3/8 –	1.7 –	– –	– –	– –	– –	– –
	1	1 5/8 41	5/8 16	1 3/32 28	3 15/16 100	3 35/64 90	2 3/4 70	5 13/32 137	3 11/32 85	9/16 14	2 29/32 74	1 3/32 28	23/32 18	1 5/8 41	1 1/2 38	**UKT306**	T306	UK306	H2306X HE2306X	1.9 1.9	26.7	15.0	0.682	13.3	– –	– –	– –	– –	– –	UKT306C –	UKT306CD –	82 –	3 7/32 –	2.5 –
30	1 1/8	1 15/32 37	15/32 12	1 3/16 30	4 1/32 102	3 1/2 89	2 17/32 64	5 3/32 129	3 1/16 78	1/2 13	2 17/32 64	7/8 22	5/8 16	1 15/32 37	1 11/16 43	**UKT207**	T207	UK207	HS2307X H2307X	1.7 1.7	25.7	15.4	0.700	13.9	– UKT207C	– UKT207CD	– 60	– 2 3/8	– 1.7	– UKT207FC	– UKT207FCD	– 78	– 3 1/16	– 2.5
	1 1/8	1 15/16 49	5/8 16	1 13/32 36	4 1/2 114	4 1/64 102	3 9/32 83	5 21/32 144	3 15/32 88	19/32 15	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1 11/16 43	**UKTX07**	TX07	UKX07	HS2307X H2307X	2.6 2.6	29.1	17.8	0.809	14.0	– UKTX07C	– UKTX07CD	– 69	– 2 23/32	– 2.6	– –	– –	– –	– –	– –
	1 1/8	1 25/32 45	5/8 16	1 1/4 32	4 3/8 111	3 15/16 100	2 15/16 75	5 29/32 150	3 11/16 94	19/32 15	3 5/32 80	1 3/16 30	25/32 20	1 25/32 45	1 11/16 43	**UKT307**	T307	UK307	HS2307X H2307X	2.4 2.4	33.4	19.3	0.877	13.2	– –	– –	– –	– –	– –	– UKT307C	– UKT307CD	– 88	– 3 15/32	– 3.3
35	1 1/4 1 3/8	1 15/16 49	5/8 16	1 5/16 33	4 1/2 114	4 1/64 102	3 9/32 83	5 21/32 144	3 15/32 88	5/8 16	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1 13/16 46	**UKT208**	T208	UK208	HE2308X HS2308X H2308X	2.5 2.5 2.5	29.1	17.8	0.809	14.0	– – UKT208C	– – UKT208CD	– – 69	– – 2 23/32	– – 2.5	– – UKT208FC	– – UKT208FCD	– – 86	– – 3 3/8	– – 3.4
	1 1/4 1 3/8	1 15/16 49	5/8 16	1 13/32 36	4 19/32 117	4 1/64 102	3 9/32 83	5 21/32 144	3 7/16 87	19/32 15	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1 13/16 46	**UKTX08**	TX08	UKX08	HE2308X HS2308X H2308X	2.6 2.6 2.6	34.1	21.3	0.968	14.0	– – UKTX08C	– – UKTX08CD	– – 69	– – 2 23/32	– – 2.6	– – –	– – –	– – –	– – –	– – –
	1 1/4 1 3/8	1 31/32 50	45/64 18	1 11/32 34	4 7/8 124	4 13/32 112	3 9/32 83	6 3/8 162	3 15/16 100	21/32 17	3 1/2 89	1 1/4 32	7/8 22	1 31/32 50	1 13/16 46	**UKT308**	T308	UK308	HE2308X HS2308X H2308X	3.0 3.0 3.0	40.7	24.0	1.09	13.2	– – –	– – –	– – –	– – –	– – –	– – UKT308C	– – UKT308CD	– – 96	– – 3 25/32	– – 4.0
40	1 1/2	1 15/16 49	5/8 16	1 3/8 35	4 19/32 117	4 1/64 102	3 9/32 83	5 21/32 144	3 7/16 87	5/8 16	3 9/32 83	1 5/32 29	3/4 19	1 15/16 49	1 31/32 50	**UKT209**	T209	UK209	HE2309X H2309X	2.5 2.5	34.1	21.3	0.968	14.0	– UKT209C	– UKT209CD	– 69	– 2 23/32	– 2.5	– UKT209FC	– UKT209FCD	– 88	– 3 15/32	– 3.4
	1 1/2	1 15/16 49	5/8 16	1 1/2 38	4 19/32 117	4 1/64 102	3 9/32 83	5 7/8 149	3 17/32 90	5/8 16	3 3/8 86	1 5/32 29	3/4 19	1 15/16 49	1 31/32 50	**UKTX09**	TX09	UKX09	HE2309X H2309X	2.9 2.9	35.1	23.3	1.06	14.4	– UKTX09C	– UKTX09CD	– 74	– 2 29/32	– 2.9	– –	– –	– –	– –	– –
	1 1/2	2 5/32 55	45/64 18	1 1/2 38	5 7/16 138	4 59/64 125	3 17/32 90	7 178	4 11/32 110	23/32 18	3 13/16 97	1 11/32 34	15/16 24	2 5/32 55	1 31/32 50	**UKT309**	T309	UK309	HE2309X H2309X	4.2 4.2	48.9	29.5	1.34	13.3	– –	– –	– –	– –	– –	– UKT309C	– UKT309CD	– 102	– 4 1/32	– 5.5
45	1 3/4	1 15/16 49	5/8 16	1 15/32 37	4 19/32 117	4 1/64 102	3 9/32 83	5 7/8 149	3 17/32 90	5/8 16	3 3/8 86	1 5/32 29	3/4 19	1 15/16 49	2 5/32 55	**UKT210**	T210	UK210	HE2310X H2310X	2.7 2.7	35.1	23.3	1.06	14.4	– UKT210C	– UKT210CD	– 74	– 2 29/32	– 2.7	– UKT210FC	– UKT210FCD	– 97	– 3 13/16	– 3.8
	1 3/4	2 17/32 64	55/64 22	1 21/32 42	5 3/4 146	5 1/8 130	4 1/32 102	6 23/32 171	4 3/16 106	3/4 19	3 3/4 95	1 3/8 35	31/32 25	2 17/32 64	2 5/32 55	**UKTX10**	TX10	UKX10	HE2310X H2310X	4.4 4.4	43.4	29.4	1.34	14.4	– UKTX10C	– UKTX10CD	– 76	– 3	– 4.4	– –	– –	– –	– –	– –
	1 3/4	2 13/32 61	25/32 20	1 9/16 40	5 15/16 151	5 33/64 140	3 27/32 98	7 17/32 191	4 19/32 117	25/32 20	4 3/16 106	1 15/32 37	1 1/16 27	2 13/32 61	2 5/32 55	**UKT310**	T310	UK310	HE2310X H2310X	5.0 5.0	62.0	38.3	1.74	13.2	– –	– –	– –	– –	– –	– UKT310C	– UKT310CD	– 110	– 4 11/32	– 6.7
50	1 7/8 2	2 17/32 64	55/64 22	1 1/2 38	5 3/4 146	5 1/8 130	4 1/32 102	6 23/32 171	4 3/16 106	3/4 19	3 3/4 95	1 3/8 35	31/32 25	2 17/32 64	2 5/16 59	**UKT211**	T211	UK211	HS2311X H2311X HE2311X	4.1 4.1 4.1	43.4	29.4	1.34	14.4	– UKT211C –	– UKT211CD –	– 76 –	– 3 –	– 4.1 –	– UKT211FC –	– UKT211FCD –	– 99 –	– 3 29/32 –	– 5.4 –
	1 7/8 2	2 17/32 64	55/64 22	1 23/32 44	5 3/4 146	5 1/8 130	4 1/32 102	7 5/8 194	4 11/16 119	3/4 19	4 1/32 102	1 3/8 35	1 1/4 32	2 17/32 64	2 5/16 59	**UKTX11**	TX11	UKX11	HS2311X H2311X HE2311X	5.1 5.1 5.1	52.4	36.2	1.65	14.4	– UKTX11C –	– UKTX11CD –	– 89 –	– 3 1/2 –	– 5.1 –	– – –	– – –	– – –	– – –	– – –
	1 7/8 2	2 19/32 66	55/64 22	1 23/32 44	6 13/32 163	5 29/32 150	4 1/8 105	8 5/32 207	5 127	13/16 21	4 17/32 115	1 17/32 39	1 5/32 29	2 19/32 66	2 5/16 59	**UKT311**	T311	UK311	HS2311X H2311X HE2311X	6.4 6.4 6.4	71.6	45.0	2.05	13.2	– – –	– – –	– – –	– – –	– – –	– UKT311C –	– UKT311CD –	– 114 –	– 4 1/2 –	– 8.3 –

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
B-1/4-28UNF .... 205~210, X05~X09, 305~308
B-R1/8 .... 211~217, X10~X17, 309~328
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables. (Example of Part No. : UKT206J + H2306X, UK206 + H2306X)
4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UKT206JL3 + H2306X, UK206L3 + H2306X)
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
6. Housings of spheroidal graphite iron casting are also available.

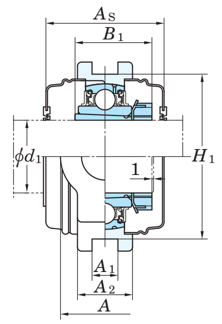
UKT

Tapered bore (with adapter)

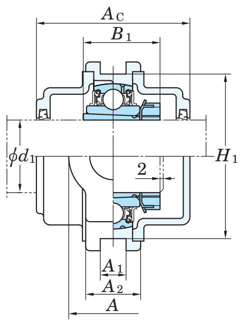
d_1 55 ~ 125 mm

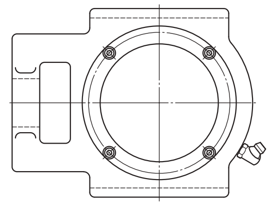


With Pressed Steel Covers
(E1)



With Cast Iron Covers
(E3)





Cast iron cover fixing screw position
(standard)

Variations of tolerance of groove width (Δ_{A1s}), variations of tolerance of distance between both grooves (Δ_{H1s}), and tolerance of symmetry of both groove sides (X)

Unit: mm

Housing No.			Δ_{A1s}	Δ_{H1s}	X
T205~T210	TX05~TX10	T305~T310	+0.2 0	0 –0.5	0.5
T211~T217	TX11~TX17	T311~T318	+0.3 0	0 –0.8	0.6
		T319~T322			0.7
		T324~T328			0.8

Shaft Dia.		Dimensions														Standard					Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm	inch	inch mm														Unit No.	Housing No.	Bearing No.	Adapter Assembly No.	Mass					Unit No.		Dimension		Mass	Unit No.		Dimension		Mass
d_1		A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B_1					kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	mm A_s	inch A_s	kg	Open Ends Type	Closed End Type	mm A_c	inch A_c	kg
55	2 1/8	2 17/32 64	55/64 22	1 21/32 42	5 3/4 146	5 1/8 130	4 1/32 102	7 5/8 194	4 11/16 119	3/4 19	4 1/32 102	1 3/8 35	1 1/4 32	2 17/32 64	2 7/16 62	**UKT212**	T212	UK212	HS2312X H2312X	4.8 4.8	52.4	36.2	1.65	14.4	– UKT212C	– UKT212CD	– 89	– 3 1/2	– 4.8	– UKT212FC	– UKT212FCD	– 114	– 4 1/2	– 6.3
	2 1/8	2 3/4 70	1 1/32 26	1 7/8 48	6 9/16 167	5 15/16 151	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2 7/16 62	**UKTX12**	TX12	UKX12	HS2312X H2312X	7.3 7.3	57.2	40.1	1.82	14.4	– UKTX12C	– UKTX12CD	– 89	– 3 1/2	– 7.3	– –	– –	– –	– –	– –
	2 1/8	2 25/32 71	55/64 22	1 13/16 46	7 178	6 19/64 160	4 7/16 113	8 21/32 220	5 5/16 135	29/32 23	4 27/32 123	1 5/8 41	1 7/32 31	2 25/32 71	2 7/16 62	**UKT312**	T312	UK312	HS2312X H2312X	7.5 7.5	81.9	52.2	2.37	13.2	– –	– –	– –	– –	– –	– UKT312C	– UKT312CD	– 124	– 4 7/8	– 9.9
60	2 1/4 2 3/8	2 3/4 70	1 1/32 26	1 23/32 44	6 9/16 167	5 15/16 151	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2 9/16 65	**UKT213**	T213	UK213	HE2313X H2313X HS2313X	6.8 6.8 6.8	57.2	40.1	1.82	14.4	– UKT213C –	– UKT213CD –	– 89 –	– 3 1/2 –	– 6.8 –	– UKT213FC –	– UKT213FCD –	– 114 –	– 4 1/2 –	– 8.5 –
	2 1/4 2 3/8	2 3/4 70	1 1/32 26	1 7/8 48	6 9/16 167	5 15/16 151	4 3/8 111	8 13/16 224	5 13/32 137	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2 9/16 65	**UKTX13**	TX13	UKX13	HE2313X H2313X HS2313X	7.2 7.2 7.2	62.2	44.1	2.01	14.5	– UKTX13C –	– UKTX13CD –	– 99 –	– 3 29/32 –	– 7.2 –	– – –	– – –	– – –	– – –	– – –
	2 1/4 2 3/8	3 5/32 80	1 1/32 26	1 31/32 50	7 15/32 190	6 11/16 170	4 9/16 116	9 3/8 238	5 3/4 146	31/32 25	5 9/32 134	1 11/16 43	1 1/4 32	2 3/4 70	2 9/16 65	**UKT313**	T313	UK313	HE2313X H2313X HS2313X	9.4 9.4 9.4	92.7	59.9	2.68	13.2	– – –	– – –	– – –	– – –	– – –	– UKT313C –	– UKT313CD –	– 122 –	– 4 13/16 –	– 11.6 –
65	2 1/2	2 3/4 70	1 1/32 26	1 13/16 48	6 9/16 167	5 15/16 151	4 3/8 111	8 13/16 232	5 13/32 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2 7/8 73	**UKT215**	T215	UK215	HE2315X H2315X	7.4 7.4	67.4	48.3	2.17	14.5	– UKT215C	– UKT215CD	– 99	– 3 29/32	– 7.4	– UKT215FC	– UKT215FCD	– 124	– 4 7/8	– 9.4
	2 1/2	2 3/4 70	1 7/64 28	1 7/8 48	7 1/4 184	6 1/2 165	4 3/8 111	9 1/4 235	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	2 7/8 73	**UKTX15**	TX15	UKX15	HE2315X H2315X	8.4 8.4	72.7	53.0	2.30	14.6	– UKTX15C	– UKTX15CD	– 109	– 4 9/32	– 8.4	– –	– –	– –	– –	– –
	2 1/2	3 17/32 90	1 1/32 26	2 5/32 55	8 1/2 216	7 9/16 192	5 3/16 132	10 5/16 262	6 5/16 160	31/32 25	5 29/32 150	1 13/16 46	1 13/32 36	3 11/32 85	2 7/8 73	**UKT315**	T315	UK315	HE2315X H2315X	13.1 13.1	113	77.2	3.24	13.2	– –	– –	– –	– –	– –	– UKT315C	– UKT315CD	– 134	– 5 9/32	– 15.9
70	2 3/4	2 3/4 70	1 1/32 26	2 51	7 1/4 184	6 1/2 165	4 3/8 111	9 1/4 235	5 1/2 140	13/16 21	4 3/4 121	1 5/8 41	1 1/4 32	2 3/4 70	3 1/16 78	**UKT216**	T216	UK216	HE2316X H2316X	8.5 8.5	72.7	53.0	2.30	14.6	– UKT216C	– UKT216CD	– 109	– 4 9/32	– 8.5	– UKT216FC	– UKT216FCD	– 138	– 5 7/16	– 11.0
	2 3/4	2 7/8 73	1 7/64 28	2 1/8 54	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 3/32 28	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3 1/16 78	**UKTX16**	TX16	UKX16	HE2316X H2316X	11.8 11.8	84.0	61.9	2.60	14.5	– UKTX16C	– UKTX16CD	– 113	– 4 7/16	– 11.8	– –	– –	– –	– –	– –
	2 3/4	4 1/32 102	1 3/16 30	2 3/8 60	9 1/16 230	8 1/32 204	5 29/32 150	11 3/32 282	6 27/32 174	1 3/32 28	6 5/16 160	2 3/32 53	1 21/32 42	3 27/32 98	3 1/16 78	**UKT316**	T316	UK316	HE2316X H2316X	16.3 16.3	123	86.7	3.53	13.3	– –	– –	– –	– –	– –	– UKT316C	– UKT316CD	– 138	– 5 7/16	– 19.4
75	3	2 7/8 73	1 3/16 30	2 1/8 54	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 5/32 29	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3 7/32 82	**UKT217**	T217	UK217	H2317X HE2317X	11.2 11.2	84.0	61.9	2.60	14.5	UKT217C –	UKT217CD –	113 –	4 7/16 –	11.2 –	UKT217FC –	UKT217FCD –	142 –	5 19/32 –	14.0 –
	3	2 7/8 73	1 7/64 28	2 1/8 54	7 25/32 198	6 13/16 173	4 7/8 124	10 1/4 260	6 3/8 162	1 3/32 28	6 3/16 157	1 7/8 48	1 1/2 38	2 7/8 73	3 7/32 82	**UKTX17**	TX17	UKX17	H2317X HE2317X	11.4 11.4	96.1	71.5	2.91	14.5	UKTX17C –	UKTX17CD –	123 –	4 27/32 –	11.4 –	– –	– –	– –	– –	– –
	3	4 1/32 102	1 17/64 32	2 17/32 64	9 7/16 240	8 27/64 214	5 31/32 152	11 23/32 298	7 7/32 183	1 3/16 30	6 11/16 170	2 3/32 53	1 21/32 42	3 27/32 98	3 7/32 82	**UKT317**	T317	UK317	H2317X HE2317X	18.9 18.9	133	96.8	3.82	13.3	– –	– –	– –	– –	– –	UKT317C –	UKT317CD –	146 –	5 3/4 –	22.4 –
80	–	4 11/32 110	1 17/64 32	2 19/32 66	10 1/32 255	8 31/32 228	6 5/16 160	12 9/32 312	7 9/16 192	1 3/16 30	6 7/8 175	2 1/4 57	1 13/16 46	4 3/16 106	3 3/8 86	**UKT318**	T318	UK318	H2318X	21.7	143	107	4.11	13.3	–	–	–	–	–	UKT318C	UKT318CD	150	5 29/32	25.9
85	3 1/4	4 11/32 110	1 3/8 35	2 27/32 72	10 5/8 270	9 29/64 240	6 1/2 165	12 11/16 322	7 3/4 197	1 7/32 31	7 3/32 180	2 1/4 57	1 13/16 46	4 3/16 106	3 17/32 90	**UKT319**	T319	UK319	HE2319X H2319X	25.2 25.2	153	119	4.45	13.3	– –	– –	– –	– –	– –	– UKT319C	– UKT319CD	– 162	– 6 3/8	– 29.9
90	3 1/2	4 23/32 120	1 3/8 35	2 15/16 75	11 13/32 290	10 15/64 260	6 7/8 175	13 19/32 345	8 9/32 210	1 1/4 32	7 7/8 200	2 5/16 59	1 7/8 48	4 17/32 115	3 13/16 97	**UKT320**	T320	UK320	HE2320X H2320X	30.4 30.4	173	141	5.08	13.2	– –	– –	– –	– –	– –	– UKT320C	– UKT320CD	– 174	– 6 27/32	– 36.6
100	4	5 1/8 130	1 1/2 38	3 5/32 80	12 19/32 320	11 7/32 285	7 9/32 185	15 5/32 385	9 1/4 235	1 1/2 38	8 15/32 215	2 9/16 65	2 1/16 52	4 29/32 125	4 1/8 105	**UKT322**	T322	UK322	H2322X HE2322X	39.5 39.5	205	180	6.15	13.2	– –	– –	– –	– –	– –	UKT322C –	UKT322CD –	188 –	7 13/32 –	46.4 –
110	–	5 1/2 140	1 49/64 45	3 17/32 90	13 31/32 355	12 9/32 320	8 9/32 210	17 432	10 1/2 267	1 21/32 42	9 1/16 230	2 3/4 70	2 3/8 60	5 1/2 140	4 13/32 112	**UKT324**	T324	UK324	H2324	54.7	207	185	6.10	13.5	–	–	–	–	–	UKT324C	UKT324CD	196	7 23/32	65.0
115	4 1/2	5 29/32 150	1 31/32 50	3 15/16 100	15 5/32 385	13 25/32 350	8 21/32 220	18 5/16 465	11 7/32 285	1 25/32 45	9 7/16 240	2 15/16 75	2 9/16 65	5 29/32 150	4 3/4 121	**UKT326**	T326	UK326	HE2326 H2326	69.1 69.1	229	214	6.79	13.6	– –	– –	– –	– –	– –	– UKT326C	– UKT326CD	– 214	– 8 7/16	– 82.4
125	–	6 3/32 155	1 31/32 50	3 15/16 100	16 11/32 415	14 61/64 380	9 1/16 230	20 9/32 515	12 13/32 315	1 31/32 50	10 1/32 255	3 5/32 80	2 3/4 70	6 5/16 160	5 5/32 131	**UKT328**	T328	UK328	H2328	85.1	253	246	7.54	13.6	–	–	–	–	–	UKT328C	UKT328CD	222	8 3/4	102

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)

2. Part No. of applicable grease nipples are shown below.
   B-1/4-28UNF .... 205~210, X05~X09, 305~308
   B-R1/8 .... 211~217, X10~X17, 309~328

3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables. (Example of Part No. : UKT206J + H2306X, UK206 + H2306X)

4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UKT206JL3 + H2306X, UK206L3 + H2306X)

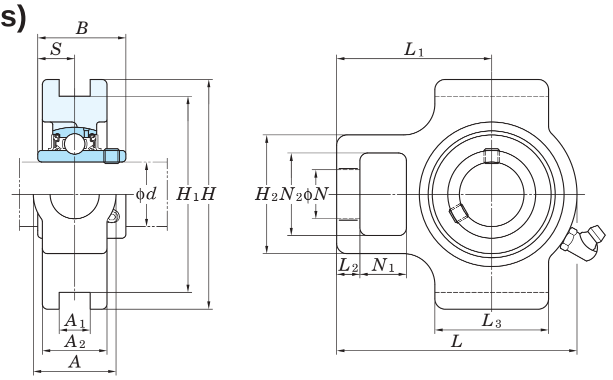
5. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.

6. Housings of spheroidal graphite iron casting are also available.

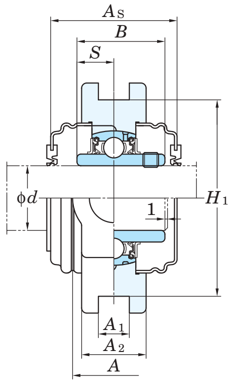
UCST-S6

Cylindrical bore (with set screws)

d 20 ～ 50 mm



With Pressed Stainless Steel Covers
(E1)



Variations of tolerance of groove width ($\varDelta_{A1s}$), variations of tolerance of distance between both grooves ($\varDelta_{H1s}$), and tolerance of symmetry of both groove sides (X)

Unit: mm

Housing No.	$\varDelta_{A1s}$	$\varDelta_{H1s}$	X
ST204~ST210	+0.2 0	0 –0.5	0.5

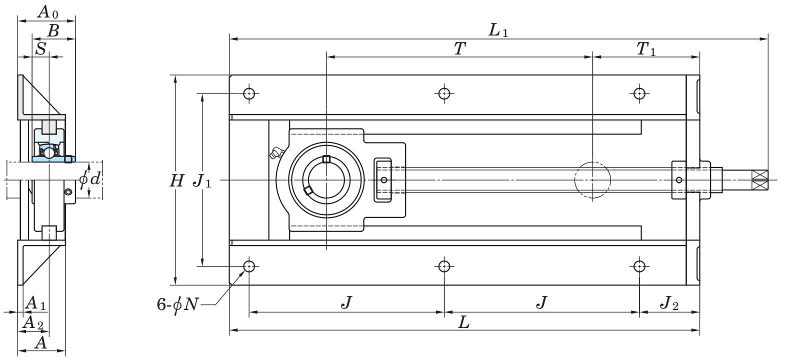
Shaft Dia. mm	Dimensions mm															Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass	With Pressed Stainless Steel Covers Unit No.		Dimension mm	Mass
d	A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B	S				C_r	C_{0r}	C_u	f_0	kg	Open Ends Type	Closed End Type	A_s	kg
20	32	12	23	89	76	46	89	59	9	44	19	18	32	31	12.7	**UCST204S6**	ST204	UC204S6	10.9	5.35	0.243	13.2	0.73	UCST204CS6	UCST204CDS6	45	0.73
25	32	12	25	89	76	46	93	60	9	44	19	18	32	34.1	14.3	**UCST205S6**	ST205	UC205S6	11.9	6.30	0.286	13.9	0.79	UCST205CS6	UCST205CDS6	49	0.79
30	37	12	27	102	89	52	106	67	9	50	22	18	37	38.1	15.9	**UCST206S6**	ST206	UC206S6	16.5	9.05	0.411	13.9	1.1	UCST206CS6	UCST206CDS6	53	1.1
35	37	12	31	102	89	56	119	75	11	56	22	18	37	42.9	17.5	**UCST207S6**	ST207	UC207S6	21.8	12.3	0.559	13.9	1.5	UCST207CS6	UCST207CDS6	60	1.5
40	49	16	32	114	102	74	135	85	14	64	29	20	49	49.2	19	**UCST208S6**	ST208	UC208S6	24.8	14.3	0.650	14.0	2.0	UCST208CS6	UCST208CDS6	69	2.0
45	49	16	34	117	102	74	137	85	14	66	29	20	49	49.2	19	**UCST209S6**	ST209	UC209S6	27.8	16.2	0.736	14.0	2.1	UCST209CS6	UCST209CDS6	69	2.1
50	49	16	35	117	102	74	143	87	14	72	29	20	49	51.6	19	**UCST210S6**	ST210	UC210S6	29.8	18.6	0.845	14.4	2.3	UCST210CS6	UCST210CDS6	74	2.3

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of the applicable grease nipple is B-1/4-28UNFN12.
3. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

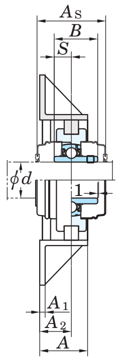
UCTH

Cylindrical bore (with set screws)

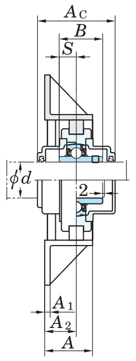
d 12 ~ 65 mm



With Pressed Steel Covers
(E1)



With Cast Iron Covers
(E3)



Variations of tolerance of distance between centers of bolt holes (Δ_{Js}, Δ_{J1s})

Unit: mm

Nominal unit code	Δ_{Js}	Δ_{J1s}
UCTH201~UCTH213	±0.5	±0.5

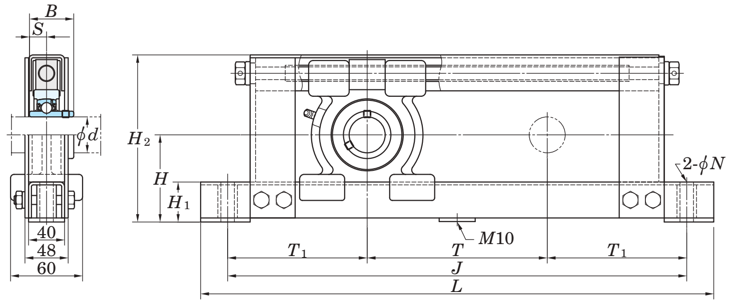
Shaft Dia.		Dimensions inch mm															Bolt Size inch mm	Standard Unit No.	Bearing No.	Mass	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers					With Cast Iron Covers				
mm	inch																								Unit No. Open Ends Type	Unit No. Closed End Type	Dimension mm	Dimension inch	Mass	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension mm	Dimension inch	Mass
d		H	L	L_1	A	J	J_1	J_2	N	T	T_1	A_1	A_2	A_0	B	S				kg	C_r	C_{0r}	C_u	f_0			A_s		kg			A_c		kg
12		7 7/8 200	12 17/32 318	14 13/16 376	1 31/32 50	4 39/64 117	6 1/16 154	2 9/16 65	15/32 12	6 1/32 153	3 15/32 88	1/4 6	1 7/64 28	1 13/16 46.3	1.220 31	0.500 12.7	3/8 M10	**UCTH201-150**	UC201	6.7	12.8	6.65	0.302	13.2	UCTH201C-150	UCTH201CD-150	45	1 25/32	6.7	–	–	–	–	–
	1/2																	**UCTH201-8-150**	UC201-8	6.7					–	–	–	–	–	–	–	–	–	–
15																		**UCTH202-150**	UC202	6.7					UCTH202C-150	UCTH202CD-150	45	1 25/32	6.7	–	–	–	–	–
	5/8																	**UCTH202-10-150**	UC202-10	6.7					–	–	–	–	–	–	–	–	–	–
17																		**UCTH203-150**	UC203	6.7					UCTH203C-150	UCTH203CD-150	45	1 25/32	6.7	–	–	–	–	–
	3/4																	**UCTH204-12-150**	UC204-12	6.7					–	–	–	–	–	–	–	–	–	–
20																		**UCTH204-150**	UC204	6.7					UCTH204C-150	UCTH204CD-150	45	1 25/32	6.7	UCTH204FC-150	UCTH204FCD-150	62	2 7/16	7.0
	7/8	7 7/8 200	12 17/32 318	14 27/32 377	1 31/32 50	4 39/64 117	6 1/16 154	2 9/16 65	15/32 12	5 31/32 152	3 15/32 88	1/4 6	1 7/64 28	1 7/8 47.8	1.343 34.1	0.563 14.3	3/8 M10	**UCTH205-14-150**	UC205-14	6.7	14.0	7.85	0.357	13.9	–	–	–	–	–	–	–	–	–	–
	15/16																	**UCTH205-15-150**	UC205-15	6.7					–	–	–	–	–	–	–	–	–	–
25																		**UCTH205-150**	UC205	6.7					UCTH205C-150	UCTH205CD-150	49	1 15/16	6.7	UCTH205FC-150	UCTH205FCD-150	66	2 19/32	7.1
	1																	**UCTH205-16-150**	UC205-16	6.7					–	–	–	–	–	–	–	–	–	–
	1 1/8	8 3/8 213	13 7/32 336	16 1/32 407	1 31/32 50	4 31/32 126	6 17/32 166	2 9/16 65	15/32 12	5 5/8 143	3 15/16 100	1/4 6	1 17/64 32	2 1/8 54.2	1.500 38.1	0.626 15.9	3/8 M10	**UCTH206-18-150**	UC206-18	8.0	19.5	11.3	0.514	13.9	–	–	–	–	–	–	–	–	–	–
30																		**UCTH206-150**	UC206	8.0					UCTH206C-150	UCTH206CD-150	53	2 3/32	8.0	UCTH206FC-150	UCTH206FCD-150	70	2 3/4	8.5
	1 3/16																	**UCTH206-19-150**	UC206-19	8.0					–	–	–	–	–	–	–	–	–	–
	1 1/4																	**UCTH206-20-150**	UC206-20	8.0					–	–	–	–	–	–	–	–	–	–
	1 1/4	8 3/8 213	16 15/16 430	19 11/16 500	1 31/32 50	6 13/16 173	6 17/32 166	2 9/16 65	15/32 12	8 5/8 219	4 7/32 107	1/4 6	1 17/64 32	2 1/4 57.4	1.689 42.9	0.689 17.5	3/8 M10	**UCTH207-20-230**	UC207-20	10.5	25.7	15.4	0.700	13.9	–	–	–	–	–	–	–	–	–	–
	1 5/16																	**UCTH207-21-230**	UC207-21	10.5					–	–	–	–	–	–	–	–	–	–
	1 3/8																	**UCTH207-22-230**	UC207-22	10.5					–	–	–	–	–	–	–	–	–	–
35																		**UCTH207-230**	UC207	10.5					UCTH207C-230	UCTH207CD-230	60	2 3/8	10.5	UCTH207FC-230	UCTH207FCD-230	78	3 1/16	11.2
	1 7/16																	**UCTH207-23-230**	UC207-23	10.5					–	–	–	–	–	–	–	–	–	–
	1 1/2	9 7/32 234	20 19/32 523	23 19/32 599	1 31/32 50	8 35/64 217	7 9/16 192	2 5/8 67	15/32 12	11 21/32 296	4 11/16 119	1/4 6	1 3/8 35	2 9/16 65.2	1.937 49.2	0.748 19	3/8 M10	**UCTH208-24-300**	UC208-24	12.5	29.1	17.8	0.809	14.0	–	–	–	–	–	–	–	–	–	–
	1 9/16																	**UCTH208-25-300**	UC208-25	12.5					–	–	–	–	–	–	–	–	–	–
40																		**UCTH208-300**	UC208	12.5					UCTH208C-300	UCTH208CD-300	69	2 23/32	12.5	UCTH208FC-300	UCTH208FCD-300	86	3 3/8	13.3
	1 5/8	9 7/32 234	20 19/32 523	23 17/32 598	1 31/32 50	8 35/64 217	7 9/16 192	2 5/8 67	15/32 12	11 11/16 297	4 21/32 118	1/4 6	1 3/8 35	2 9/16 65.2	1.937 49.2	0.748 19	3/8 M10	**UCTH209-26-300**	UC209-26	12.4	34.1	21.3	0.968	14.0	–	–	–	–	–	–	–	–	–	–
	1 11/16																	**UCTH209-27-300**	UC209-27	12.4					–	–	–	–	–	–	–	–	–	–
	1 3/4																	**UCTH209-28-300**	UC209-28	12.4					–	–	–	–	–	–	–	–	–	–
45																		**UCTH209-300**	UC209	12.4					UCTH209C-300	UCTH209CD-300	69	2 23/32	12.4	UCTH209FC-300	UCTH209FCD-300	88	3 15/32	13.2
	1 7/8	9 7/32 234	20 3/4 527	23 3/4 603	1 31/32 50	8 5/8 219	7 9/16 192	2 5/8 67	19/32 15	11 21/32 296	4 3/4 121	1/4 6	1 3/8 35	2 21/32 67.6	2.031 51.6	0.748 19	7/16 M12	**UCTH210-30-300**	UC210-30	12.6	35.1	23.3	1.06	14.4	–	–	–	–	–	–	–	–	–	–
	1 15/16																	**UCTH210-31-300**	UC210-31	12.6					–	–	–	–	–	–	–	–	–	–
50																		**UCTH210-300**	UC210	12.6					UCTH210C-300	UCTH210CD-300	74	2 29/32	12.6	UCTH210FC-300	UCTH210FCD-300	97	3 13/16	13.6
	2																	**UCTH210-32-300**	UC210-32	12.6					–	–	–	–	–	–	–	–	–	–
	2	11 31/32 304	21 15/32 545	24 3/4 629	2 9/16 65	9 1/16 230	9 7/16 240	2 15/32 63	19/32 15	11 15/32 291	5 9/16 141	1/4 6	1 1/2 38	2 13/16 71.4	2.189 55.6	0.874 22.2	7/16 M12	**UCTH211-32-300**	UC211-32	20.1	43.4	29.4	1.34	14.4	–	–	–	–	–	–	–	–	–	–
	2 1/8																	**UCTH211-34-300**	UC211-34	20.1					–	–	–	–	–	–	–	–	–	–
55																		**UCTH211-300**	UC211	20.1					UCTH211C-300	UCTH211CD-300	76	3	20.1	UCTH211FC-300	UCTH211FCD-300	99	3 29/32	21.3
	2 3/16																	**UCTH211-35-300**	UC211-35	20.1					–	–	–	–	–	–	–	–	–	–
	2 1/4	11 31/32 304	22 15/32 571	25 5/8 651	2 9/16 65	9 9/16 243	9 7/16 240	2 15/32 63	19/32 15	11 11/32 288	6 1/16 154	1/4 6	1 1/2 38	3 1/16 77.7	2.563 65.1	1.000 25.4	7/16 M12	**UCTH212-36-300**	UC212-36	21.4	52.4	36.2	1.65	14.4	–	–	–	–	–	–	–	–	–	–
60																		**UCTH212-300**	UC212	21.4					UCTH212C-300	UCTH212CD-300	89	3 1/2	21.4	UCTH212FC-300	UCTH212FCD-300	114	4 1/2	21.9
	2 3/8																	**UCTH212-38-300**	UC212-38	21.4					–	–	–	–	–	–	–	–	–	–
	2 7/16																	**UCTH212-39-300**	UC212-39	21.4					–	–	–	–	–	–	–	–	–	–
	2 1/2	13 1/16 332	23 31/32 609	28 1/16 713	2 9/16 65	10 15/64 260	10 15/64 260	2 5/8 67	19/32 15	11 13/16 300	7 178	1/4 6	1 11/16 43	3 1/4 82.7	2.563 65.1	1.000 25.4	7/16 M12	**UCTH213-40-300**	UC213-40	25.5	57.2	40.1	1.82	14.4	–	–	–	–	–	–	–	–	–	–
65																		**UCTH213-300**	UC213	25.5					UCTH213C-300	UCTH213CD-300	89	3 1/2	25.5	UCTH213FC-300	UCTH213FCD-300	114	4 1/2	27.2

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
B-1/4-28UNF .... 201~210
B-R1/8 .... 211~213
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCTH206JL3-150, UC206L3)
4. If heavy load ($P_r/C_r > 0.12$), vibration, or impact occurs, contact with JTEKT.
5. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
6. Tapered bore (with adapter) type products are also available.
(Example of Part No. : UKTH205J-150 + H2305X, UK205 + H2305X)

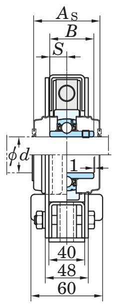
UCTL

Cylindrical bore (with set screws)

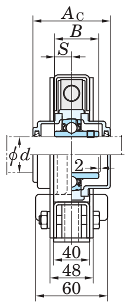
d 20 ～ 45 mm



With Pressed Steel Covers
(E1)



With Cast Iron Covers
(E3)



Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs}) and variations of tolerance of distance between centers of bolt holes (Δ_{Js})

Unit: mm

Nominal unit code	Δ_{Hs}	Δ_{Js}
UCTL204~UCTL207	±2	±0.5
UCTL208, UCTL209		±0.8

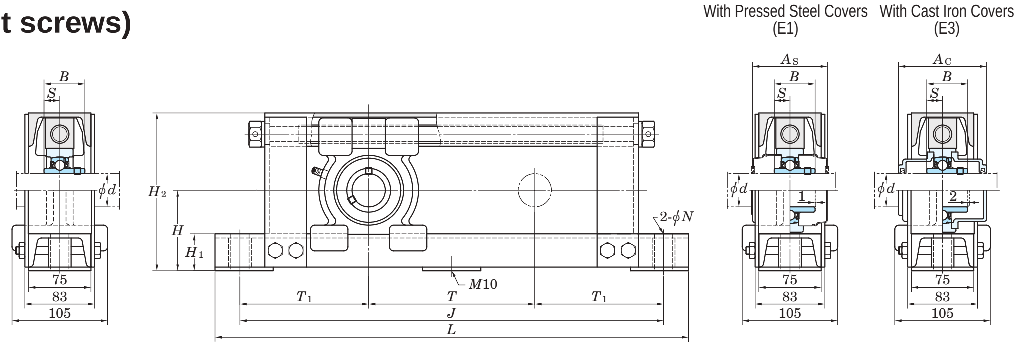
Shaft Dia. mm	Dimensions mm										Bolt Size mm	Standard			Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers				With Cast Iron Covers			
												Unit No.	Bearing No.	Mass					Unit No.		Dimension mm	Mass	Unit No.		Dimension mm	Mass
d	H	H_1	H_2	L	J	N	T	T_1	B	S				kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	A_s	kg	Open Ends Type	Closed End Type	A_c	kg
20	77	44	146	430	370	15	100	135	31	12.7	M12	**UCTL204-100**	UC204	6.0	12.8	6.65	0.302	13.2	UCTL204C-100	UCTL204CD-100	45	6.0	–	–	–	–
	77	44	146	530	470	15	200	135	31	12.7	M12	**UCTL204-200**	UC204	7.0	12.8	6.65	0.302	13.2	UCTL204C-200	UCTL204CD-200	45	7.0	–	–	–	–
	77	44	146	630	570	15	300	135	31	12.7	M12	**UCTL204-300**	UC204	7.5	12.8	6.65	0.302	13.2	UCTL204C-300	UCTL204CD-300	45	7.5	–	–	–	–
	77	44	146	730	670	15	400	135	31	12.7	M12	**UCTL204-400**	UC204	8.0	12.8	6.65	0.302	13.2	UCTL204C-400	UCTL204CD-400	45	8.0	–	–	–	–
25	82	44	156	440	380	15	100	140	34.1	14.3	M12	**UCTL205-100**	UC205	7.0	14.0	7.85	0.357	13.9	UCTL205C-100	UCTL205CD-100	49	7.0	–	–	–	–
	82	44	156	540	480	15	200	140	34.1	14.3	M12	**UCTL205-200**	UC205	7.5	14.0	7.85	0.357	13.9	UCTL205C-200	UCTL205CD-200	49	7.5	–	–	–	–
	82	44	156	640	580	15	300	140	34.1	14.3	M12	**UCTL205-300**	UC205	8.0	14.0	7.85	0.357	13.9	UCTL205C-300	UCTL205CD-300	49	8.0	–	–	–	–
	82	44	156	740	680	15	400	140	34.1	14.3	M12	**UCTL205-400**	UC205	9.0	14.0	7.85	0.357	13.9	UCTL205C-400	UCTL205CD-400	49	9.0	–	–	–	–
30	87	44	166	450	390	15	100	145	38.1	15.9	M12	**UCTL206-100**	UC206	7.0	19.5	11.3	0.514	13.9	UCTL206C-100	UCTL206CD-100	53	7.0	UCTL206FC-100	UCTL206FCD-100	70	7.5
	87	44	166	550	490	15	200	145	38.1	15.9	M12	**UCTL206-200**	UC206	8.0	19.5	11.3	0.514	13.9	UCTL206C-200	UCTL206CD-200	53	8.0	UCTL206FC-200	UCTL206FCD-200	70	8.5
	87	44	166	650	590	15	300	145	38.1	15.9	M12	**UCTL206-300**	UC206	9.0	19.5	11.3	0.514	13.9	UCTL206C-300	UCTL206CD-300	53	9.0	UCTL206FC-300	UCTL206FCD-300	70	9.5
	87	44	166	750	690	15	400	145	38.1	15.9	M12	**UCTL206-400**	UC206	9.5	19.5	11.3	0.514	13.9	UCTL206C-400	UCTL206CD-400	53	9.5	UCTL206FC-400	UCTL206FCD-400	70	10
35	92	44	176	460	400	15	100	150	42.9	17.5	M12	**UCTL207-100**	UC207	8.0	25.7	15.4	0.700	13.9	UCTL207C-100	UCTL207CD-100	60	8.0	UCTL207FC-100	UCTL207FCD-100	78	9.0
	92	44	176	560	500	15	200	150	42.9	17.5	M12	**UCTL207-200**	UC207	8.5	25.7	15.4	0.700	13.9	UCTL207C-200	UCTL207CD-200	60	8.5	UCTL207FC-200	UCTL207FCD-200	78	9.5
	92	44	176	660	600	15	300	150	42.9	17.5	M12	**UCTL207-300**	UC207	9.0	25.7	15.4	0.700	13.9	UCTL207C-300	UCTL207CD-300	60	9.0	UCTL207FC-300	UCTL207FCD-300	78	10
	92	44	176	760	700	15	400	150	42.9	17.5	M12	**UCTL207-400**	UC207	10	25.7	15.4	0.700	13.9	UCTL207C-400	UCTL207CD-400	60	10	UCTL207FC-400	UCTL207FCD-400	78	11
40	97	44	186	470	410	15	100	155	49.2	19	M12	**UCTL208-100**	UC208	8.5	29.1	17.8	0.809	14.0	UCTL208C-100	UCTL208CD-100	69	8.5	UCTL208FC-100	UCTL208FCD-100	86	9.5
	97	44	186	570	510	15	200	155	49.2	19	M12	**UCTL208-200**	UC208	9.0	29.1	17.8	0.809	14.0	UCTL208C-200	UCTL208CD-200	69	9.0	UCTL208FC-200	UCTL208FCD-200	86	10
	97	44	186	670	610	15	300	155	49.2	19	M12	**UCTL208-300**	UC208	10	29.1	17.8	0.809	14.0	UCTL208C-300	UCTL208CD-300	69	10	UCTL208FC-300	UCTL208FCD-300	86	11
	97	44	186	770	710	15	400	155	49.2	19	M12	**UCTL208-400**	UC208	10.5	29.1	17.8	0.809	14.0	UCTL208C-400	UCTL208CD-400	69	10.5	UCTL208FC-400	UCTL208FCD-400	86	11.5
45	100	44	192	480	420	15	100	160	49.2	19	M12	**UCTL209-100**	UC209	9.0	34.1	21.3	0.968	14.0	UCTL209C-100	UCTL209CD-100	69	9.0	UCTL209FC-100	UCTL209FCD-100	88	10
	100	44	192	580	520	15	200	160	49.2	19	M12	**UCTL209-200**	UC209	9.5	34.1	21.3	0.968	14.0	UCTL209C-200	UCTL209CD-200	69	9.5	UCTL209FC-200	UCTL209FCD-200	88	10.5
	100	44	192	680	620	15	300	160	49.2	19	M12	**UCTL209-300**	UC209	10.5	34.1	21.3	0.968	14.0	UCTL209C-300	UCTL209CD-300	69	10.5	UCTL209FC-300	UCTL209FCD-300	88	11.5
	100	44	192	780	720	15	400	160	49.2	19	M12	**UCTL209-400**	UC209	11	34.1	21.3	0.968	14.0	UCTL209C-400	UCTL209CD-400	69	11	UCTL209FC-400	UCTL209FCD-400	88	12

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter codes. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples is C-1/4-28UNF.
3. As for the triple-lip seal type product (204 and 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCTL206JL3-100, UC206L3)
4. The unit should be mounted so that load is applied to the frame mounting surface vertically and downward.
5. If heavy load ($P_r/C_r > 0.12$), vibration, or impact occurs, contact with JTEKT.
6. Tapered bore (with adapter) type bearing units are also available. (Example of Part No. : UKTL206J-100 + H2306X, UK206 + H2306X)
7. If frame parts need to be corrosion resistant, contact with JTEKT.
8. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

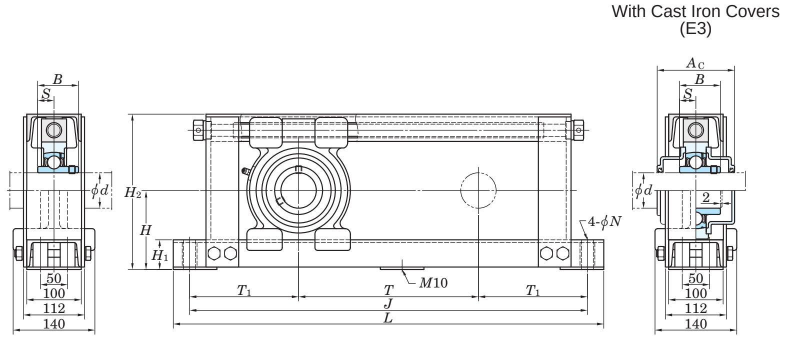
UCTU

Cylindrical bore (with set screws)

d 40 ~ 80 mm



UCTU200



UCTU300

Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs}) and variations of tolerance of distance between centers of bolt holes (Δ_{Js})

Unit: mm

Nominal unit code	Δ_{Hs}	Δ_{Js}
UCTU208~UCTU212 UCTU313~UCTU315	±2	±0.8
UCTU316~UCTU318		±1.2

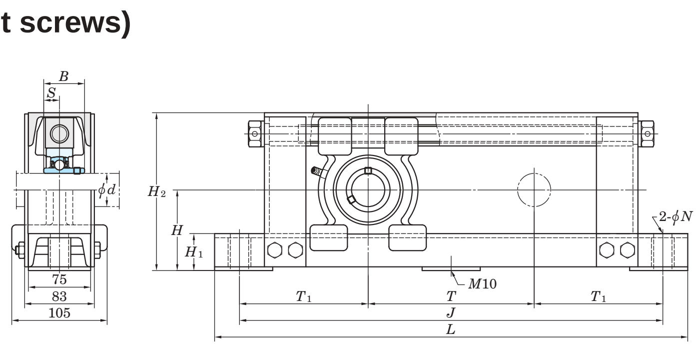
Shaft Dia.	Dimensions										Bolt Size	Standard			Basic Load Ratings		Fatigue Load Limit	Factor	With Pressed Steel Covers				With Cast Iron Covers			
mm	mm										mm	Unit No.	Bearing No.	Mass	kN		kN		Unit No.		Dimension mm	Mass	Unit No.		Dimension mm	Mass
d	H	H_1	H_2	L	J	N	T	T_1	B	S				kg	C_r	C_{0r}	C_u	f_0	Open Ends Type	Closed End Type	A_s	kg	Open Ends Type	Closed End Type	A_c	kg
40	97	44	190	870	810	22	500	155	49.2	19	M18	**UCTU208-500**	UC208	21	29.1	17.8	0.809	14.0	UCTU208C-500	UCTU208CD-500	69	21	UCTU208FC-500	UCTU208FCD-500	86	22
	97	44	190	970	910	22	600	155	49.2	19	M18	**UCTU208-600**	UC208	22	29.1	17.8	0.809	14.0	UCTU208C-600	UCTU208CD-600	69	22	UCTU208FC-600	UCTU208FCD-600	86	23
	97	44	190	1 070	1 010	22	700	155	49.2	19	M18	**UCTU208-700**	UC208	24	29.1	17.8	0.809	14.0	UCTU208C-700	UCTU208CD-700	69	24	UCTU208FC-700	UCTU208FCD-700	86	25
	97	44	190	1 170	1 110	22	800	155	49.2	19	M18	**UCTU208-800**	UC208	26	29.1	17.8	0.809	14.0	UCTU208C-800	UCTU208CD-800	69	26	UCTU208FC-800	UCTU208FCD-800	86	27
	97	44	190	1 270	1 210	22	900	155	49.2	19	M18	**UCTU208-900**	UC208	28	29.1	17.8	0.809	14.0	UCTU208C-900	UCTU208CD-900	69	28	UCTU208FC-900	UCTU208FCD-900	86	29
45	102	44	200	880	820	22	500	160	49.2	19	M18	**UCTU209-500**	UC209	22	34.1	21.3	0.968	14.0	UCTU209C-500	UCTU209CD-500	69	22	UCTU209FC-500	UCTU209FCD-500	88	23
	102	44	200	980	920	22	600	160	49.2	19	M18	**UCTU209-600**	UC209	24	34.1	21.3	0.968	14.0	UCTU209C-600	UCTU209CD-600	69	24	UCTU209FC-600	UCTU209FCD-600	88	25
	102	44	200	1 080	1 020	22	700	160	49.2	19	M18	**UCTU209-700**	UC209	25	34.1	21.3	0.968	14.0	UCTU209C-700	UCTU209CD-700	69	25	UCTU209FC-700	UCTU209FCD-700	88	26
	102	44	200	1 180	1 120	22	800	160	49.2	19	M18	**UCTU209-800**	UC209	27	34.1	21.3	0.968	14.0	UCTU209C-800	UCTU209CD-800	69	27	UCTU209FC-800	UCTU209FCD-800	88	28
	102	44	200	1 280	1 220	22	900	160	49.2	19	M18	**UCTU209-900**	UC209	29	34.1	21.3	0.968	14.0	UCTU209C-900	UCTU209CD-900	69	29	UCTU209FC-900	UCTU209FCD-900	88	30
50	107	44	210	890	830	22	500	165	51.6	19	M18	**UCTU210-500**	UC210	23	35.1	23.3	1.06	14.4	UCTU210C-500	UCTU210CD-500	74	23	UCTU210FC-500	UCTU210FCD-500	97	24
	107	44	210	990	930	22	600	165	51.6	19	M18	**UCTU210-600**	UC210	25	35.1	23.3	1.06	14.4	UCTU210C-600	UCTU210CD-600	74	25	UCTU210FC-600	UCTU210FCD-600	97	26
	107	44	210	1 090	1 030	22	700	165	51.6	19	M18	**UCTU210-700**	UC210	27	35.1	23.3	1.06	14.4	UCTU210C-700	UCTU210CD-700	74	27	UCTU210FC-700	UCTU210FCD-700	97	28
	107	44	210	1 190	1 130	22	800	165	51.6	19	M18	**UCTU210-800**	UC210	28	35.1	23.3	1.06	14.4	UCTU210C-800	UCTU210CD-800	74	28	UCTU210FC-800	UCTU210FCD-800	97	29
	107	44	210	1 290	1 230	22	900	165	51.6	19	M18	**UCTU210-900**	UC210	30	35.1	23.3	1.06	14.4	UCTU210C-900	UCTU210CD-900	74	30	UCTU210FC-900	UCTU210FCD-900	97	31
55	115	44	230	910	850	22	500	175	55.6	22.2	M18	**UCTU211-500**	UC211	25	43.4	29.4	1.34	14.4	UCTU211C-500	UCTU211CD-500	76	25	UCTU211FC-500	UCTU211FCD-500	99	26
	115	44	230	1 010	950	22	600	175	55.6	22.2	M18	**UCTU211-600**	UC211	27	43.4	29.4	1.34	14.4	UCTU211C-600	UCTU211CD-600	76	27	UCTU211FC-600	UCTU211FCD-600	99	28
	115	44	230	1 110	1 050	22	700	175	55.6	22.2	M18	**UCTU211-700**	UC211	28	43.4	29.4	1.34	14.4	UCTU211C-700	UCTU211CD-700	76	28	UCTU211FC-700	UCTU211FCD-700	99	29
	115	44	230	1 210	1 150	22	800	175	55.6	22.2	M18	**UCTU211-800**	UC211	30	43.4	29.4	1.34	14.4	UCTU211C-800	UCTU211CD-800	76	30	UCTU211FC-800	UCTU211FCD-800	99	31
	115	44	230	1 310	1 250	22	900	175	55.6	22.2	M18	**UCTU211-900**	UC211	32	43.4	29.4	1.34	14.4	UCTU211C-900	UCTU211CD-900	76	32	UCTU211FC-900	UCTU211FCD-900	99	33
60	120	44	240	920	860	22	500	180	65.1	25.4	M18	**UCTU212-500**	UC212	26	52.4	36.2	1.65	14.4	UCTU212C-500	UCTU212CD-500	89	26	UCTU212FC-500	UCTU212FCD-500	114	28
	120	44	240	1 020	960	22	600	180	65.1	25.4	M18	**UCTU212-600**	UC212	28	52.4	36.2	1.65	14.4	UCTU212C-600	UCTU212CD-600	89	28	UCTU212FC-600	UCTU212FCD-600	114	30
	120	44	240	1 120	1 060	22	700	180	65.1	25.4	M18	**UCTU212-700**	UC212	30	52.4	36.2	1.65	14.4	UCTU212C-700	UCTU212CD-700	89	30	UCTU212FC-700	UCTU212FCD-700	114	32
	120	44	240	1 220	1 160	22	800	180	65.1	25.4	M18	**UCTU212-800**	UC212	31	52.4	36.2	1.65	14.4	UCTU212C-800	UCTU212CD-800	89	31	UCTU212FC-800	UCTU212FCD-800	114	33
	120	44	240	1 320	1 260	22	900	180	65.1	25.4	M18	**UCTU212-900**	UC212	33	52.4	36.2	1.65	14.4	UCTU212C-900	UCTU212CD-900	89	33	UCTU212FC-900	UCTU212FCD-900	114	35
65	145	55	285	940	880	22	500	190	75	30	M18	**UCTU313-500**	UC313	40	92.7	59.9	2.68	13.2	–	–	–	–	UCTU313C-500	UCTU313CD-500	122	42
	145	55	285	1 040	980	22	600	190	75	30	M18	**UCTU313-600**	UC313	43	92.7	59.9	2.68	13.2	–	–	–	–	UCTU313C-600	UCTU313CD-600	122	45
	145	55	285	1 140	1 080	22	700	190	75	30	M18	**UCTU313-700**	UC313	46	92.7	59.9	2.68	13.2	–	–	–	–	UCTU313C-700	UCTU313CD-700	122	48
	145	55	285	1 240	1 180	22	800	190	75	30	M18	**UCTU313-800**	UC313	49	92.7	59.9	2.68	13.2	–	–	–	–	UCTU313C-800	UCTU313CD-800	122	51
	145	55	285	1 340	1 280	22	900	190	75	30	M18	**UCTU313-900**	UC313	51	92.7	59.9	2.68	13.2	–	–	–	–	UCTU313C-900	UCTU313CD-900	122	53
70	150	55	295	960	900	22	500	200	78	33	M18	**UCTU314-500**	UC314	44	104	68.2	2.96	13.2	–	–	–	–	UCTU314C-500	UCTU314CD-500	124	46
	150	55	295	1 060	1 000	22	600	200	78	33	M18	**UCTU314-600**	UC314	46	104	68.2	2.96	13.2	–	–	–	–	UCTU314C-600	UCTU314CD-600	124	48
	150	55	295	1 160	1 100	22	700	200	78	33	M18	**UCTU314-700**	UC314	48	104	68.2	2.96	13.2	–	–	–	–	UCTU314C-700	UCTU314CD-700	124	50
	150	55	295	1 260	1 200	22	800	200	78	33	M18	**UCTU314-800**	UC314	51	104	68.2	2.96	13.2	–	–	–	–	UCTU314C-800	UCTU314CD-800	124	53
	150	55	295	1 360	1 300	22	900	200	78	33	M18	**UCTU314-900**	UC314	53	104	68.2	2.96	13.2	–	–	–	–	UCTU314C-900	UCTU314CD-900	124	55
75	155	55	305	980	920	22	500	210	82	32	M18	**UCTU315-500**	UC315	54	113	77.2	3.24	13.2	–	–	–	–	UCTU315C-500	UCTU315CD-500	134	57
	155	55	305	1 080	1 020	22	600	210	82	32	M18	**UCTU315-600**	UC315	57	113	77.2	3.24	13.2	–	–	–	–	UCTU315C-600	UCTU315CD-600	134	60
	155	55	305	1 180	1 120	22	700	210	82	32	M18	**UCTU315-700**	UC315	59	113	77.2	3.24	13.2	–	–	–	–	UCTU315C-700	UCTU315CD-700	134	62
	155	55	305	1 280	1 220	22	800	210	82	32	M18	**UCTU315-800**	UC315	61	113	77.2	3.24	13.2	–	–	–	–	UCTU315C-800	UCTU315CD-800	134	64
	155	55	305	1 380	1 320	22	900	210	82	32	M18	**UCTU315-900**	UC315	64	113	77.2	3.24	13.2	–	–	–	–	UCTU315C-900	UCTU315CD-900	134	67
80	160	55	315	1 000	940	22	500	220	86	34	M18	**UCTU316-500**	UC316	57	123	86.7	3.53	13.3	–	–	–	–	UCTU316C-500	UCTU316CD-500	138	60
	160	55	315	1 100	1 040	22	600	220	86	34	M18	**UCTU316-600**	UC316	60	123	86.7	3.53	13.3	–	–	–	–	UCTU316C-600	UCTU316CD-600	138	63
	160	55	315	1 200	1 140	22	700	220	86	34	M18	**UCTU316-700**	UC316	62	123	86.7	3.53	13.3	–	–	–	–	UCTU316C-700	UCTU316CD-700	138	65
	160	55	315	1 300	1 240	22	800	220	86	34	M18	**UCTU316-800**	UC316	64	123	86.7	3.53	13.3	–	–	–	–	UCTU316C-800	UCTU316CD-800	138	67
	160	55	315	1 400	1 340	22	900	220	86	34	M18	**UCTU316-900**	UC316	67	123	86.7	3.53	13.3	–	–	–	–	UCTU316C-900	UCTU316CD-900	138	70

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
C-1/4-28UNF........ 208~210
C-R1/8................. 211, 212, 313~318
3. As for the triple-lip seal type product, supplementary code L3 follows the Part No. of unit or bearing.
(Example of Part No. : UCTU208JL3-500, UC208L3)
4. The unit should be mounted so that load is applied to the frame mounting surface vertically and downward.
5. If heavy load ($P_r/C_r > 0.12$), vibration, or impact occurs, contact with JTEKT.
6. Tapered bore (with adapter) type bearing units are also available. (Example of Part No. : UKTU208J-500 + H2308X, UK208 + H2308X)
7. If frame parts need to be corrosion resistant, contact with JTEKT.
8. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

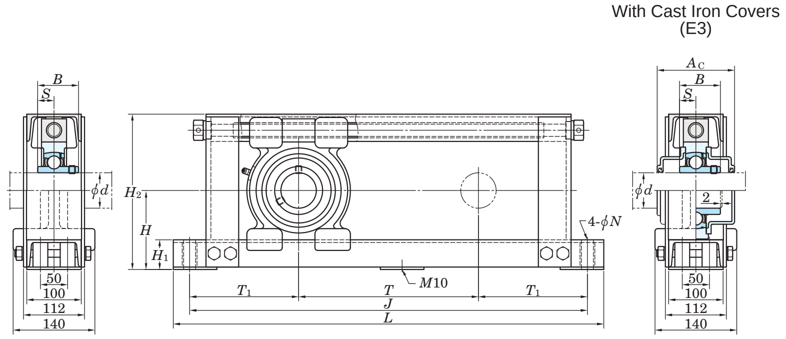
UCTU

Cylindrical bore (with set screws)

d 85 ~ 90 mm



UCTU200



UCTU300

Variations of tolerance of distance from mounting bottom to center of spherical bore (Δ_{Hs}) and variations of tolerance of distance between centers of bolt holes (Δ_{Js})

Unit: mm

Nominal unit code	Δ_{Hs}	Δ_{Js}
UCTU208~UCTU212 UCTU313~UCTU315	±2	±0.8
UCTU316~UCTU318		±1.2

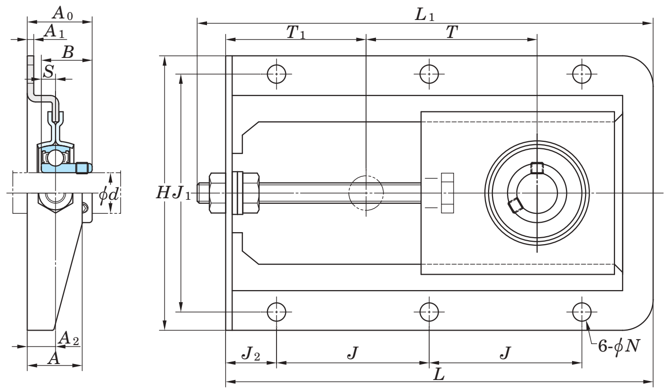
Shaft Dia. mm	Dimensions mm										Bolt Size mm	Standard			Basic Load Ratings kN		Fatigue Load Limit kN	Factor	With Pressed Steel Covers				With Cast Iron Covers			
												Unit No.	Bearing No.	Mass kg					Unit No. Open Ends Type	Unit No. Closed End Type	Dimension mm	Mass kg	Unit No. Open Ends Type	Unit No. Closed End Type	Dimension mm	Mass kg
d	H	H_1	H_2	L	J	N	T	T_1	B	S					C_r	C_{0r}	C_u	f_0			A_s				A_c	
85	165	55	325	1 020	960	22	500	230	96	40	M18	**UCTU317-500**	UC317	62	133	96.8	3.82	13.3	–	–	–	–	UCTU317C-500	UCTU317CD-500	146	65
	165	55	325	1 120	1 060	22	600	230	96	40	M18	**UCTU317-600**	UC317	64	133	96.8	3.82	13.3	–	–	–	–	UCTU317C-600	UCTU317CD-600	146	67
	165	55	325	1 220	1 160	22	700	230	96	40	M18	**UCTU317-700**	UC317	67	133	96.8	3.82	13.3	–	–	–	–	UCTU317C-700	UCTU317CD-700	146	70
	165	55	325	1 320	1 260	22	800	230	96	40	M18	**UCTU317-800**	UC317	69	133	96.8	3.82	13.3	–	–	–	–	UCTU317C-800	UCTU317CD-800	146	72
	165	55	325	1 420	1 360	22	900	230	96	40	M18	**UCTU317-900**	UC317	71	133	96.8	3.82	13.3	–	–	–	–	UCTU317C-900	UCTU317CD-900	146	74
90	170	55	335	1 050	990	22	500	245	96	40	M18	**UCTU318-500**	UC318	65	143	107	4.11	13.3	–	–	–	–	UCTU318C-500	UCTU318CD-500	150	68
	170	55	335	1 150	1 090	22	600	245	96	40	M18	**UCTU318-600**	UC318	67	143	107	4.11	13.3	–	–	–	–	UCTU318C-600	UCTU318CD-600	150	70
	170	55	335	1 250	1 190	22	700	245	96	40	M18	**UCTU318-700**	UC318	70	143	107	4.11	13.3	–	–	–	–	UCTU318C-700	UCTU318CD-700	150	73
	170	55	335	1 350	1 290	22	800	245	96	40	M18	**UCTU318-800**	UC318	72	143	107	4.11	13.3	–	–	–	–	UCTU318C-800	UCTU318CD-800	150	75
	170	55	335	1 450	1 390	22	900	245	96	40	M18	**UCTU318-900**	UC318	74	143	107	4.11	13.3	–	–	–	–	UCTU318C-900	UCTU318CD-900	150	77

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
C-1/4-28UNF........ 208~210
C-R1/8.................. 211, 212, 313~318
3. As for the triple-lip seal type product, supplementary code L3 follows the Part No. of unit or bearing.
(Example of Part No. : UCTU208JL3-500, UC208L3)
4. The unit should be mounted so that load is applied to the frame mounting surface vertically and downward.
5. If heavy load ($P_r/C_r > 0.12$), vibration, or impact occurs, contact with JTEKT.
6. Tapered bore (with adapter) type bearing units are also available. (Example of Part No. : UKTU208J-500 + H2308X, UK208 + H2308X)
7. If frame parts need to be corrosion resistant, contact with JTEKT.
8. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

SBPTH

Cylindrical bore (with set screws)

d 12 ~ 25 mm



Variations of tolerance of distance between centers of bolt holes ($\varDelta_{J\mathrm{s}}$, $\varDelta_{J1\mathrm{s}}$)

Unit: mm

Nominal unit code	$\varDelta_{J\mathrm{s}}$	$\varDelta_{J1\mathrm{s}}$
SBPTH201~SBPTH205	±0.7	±0.7

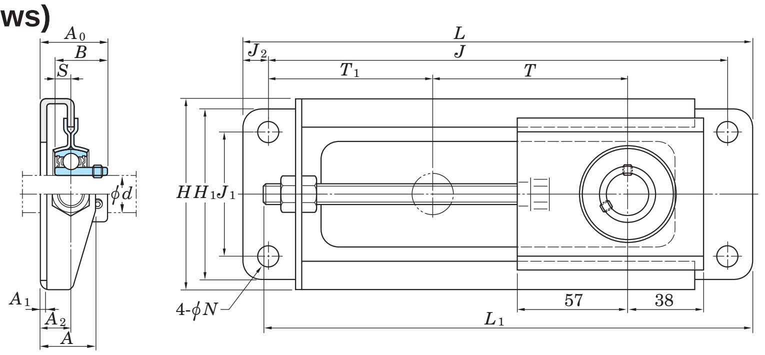
Shaft Dia. mm	Dimensions inch mm															Bolt Size inch mm	Unit No.		Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d	H	L	L_1	A	J	J_1	J_2	N	T	T_1	A_1	A_2	A_0	B	S					C_r	C_{0r}	C_u	f_0	kg
12	5 5/16 135	8 9/32 210	8 21/32 220	1 1/16 27	2 61/64 75	4 39/64 117	31/32 25	11/32 9	3 15/32 88	2 23/32 69	1/8 3.2	35/64 13.9	1 3/16 29.9	0.866 22	0.236 6	5/16 M8	**SBPTH201-90**		SB201	9.55	4.80	0.218	13.2	0.91
15	5 5/16 135	8 9/32 210	8 21/32 220	1 1/16 27	2 61/64 75	4 39/64 117	31/32 25	11/32 9	3 15/32 88	2 23/32 69	1/8 3.2	35/64 13.9	1 3/16 29.9	0.866 22	0.236 6	5/16 M8	**SBPTH202-90**		SB202	9.55	4.80	0.218	13.2	0.91
17	5 5/16 135	8 9/32 210	8 21/32 220	1 1/16 27	2 61/64 75	4 39/64 117	31/32 25	11/32 9	3 15/32 88	2 23/32 69	1/8 3.2	35/64 13.9	1 3/16 29.9	0.866 22	0.236 6	5/16 M8	**SBPTH203-90**		SB203	9.55	4.80	0.218	13.2	0.91
20	5 5/16 135	8 9/32 210	8 21/32 220	1 1/16 27	2 61/64 75	4 39/64 117	31/32 25	11/32 9	3 15/32 88	2 23/32 69	1/8 3.2	35/64 13.9	1 1/4 31.9	0.984 25	0.276 7	5/16 M8	**SBPTH204-90**		SB204	12.8	6.65	0.302	13.2	0.91
25	5 5/16 135	8 9/32 210	8 21/32 220	1 1/16 27	2 61/64 75	4 39/64 117	31/32 25	11/32 9	3 15/32 88	2 23/32 69	1/8 3.2	35/64 13.9	1 5/16 33.4	1.063 27	0.295 7.5	5/16 M8	**SBPTH205-90**		SB205	14.0	7.85	0.357	13.9	0.91

Remarks 1. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
2. If heavy load ($P_r/C_r > 0.12$), vibration, or impact occurs, contact with JTEKT.

SBNPTH

Cylindrical bore (with set screws)

d 12 ~ 25 mm



Variations of tolerance of distance between centers of bolt holes ($\varDelta_{J\mathrm{s}}$, $\varDelta_{J1\mathrm{s}}$)

Unit: mm

Nominal unit code	$\varDelta_{J\mathrm{s}}$	$\varDelta_{J1\mathrm{s}}$
SBNPTH201~SBNPTH205	±0.7	±0.7

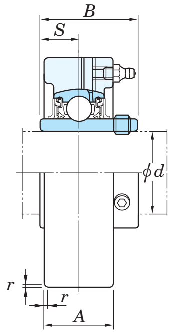
Shaft Dia. mm	**Dimensions** inch mm																**Bolt Size** inch mm	**Unit No.**		**Bearing No.**	**Basic Load Ratings** kN		**Fatigue Load Limit** kN	**Factor**	**Mass**
d	H	H_1	L	L_1	A	J	J_1	J_2	N	T	T_1	A_1	A_2	A_0	B	S					C_r	C_{0r}	C_u	f_0	kg
12	3 15/16 100	3 17/32 90	10 1/4 260	9 11/16 246	1 1/16 27	9 1/4 235	2 9/16 65	1/2 12.5	7/16 11	3 15/16 100	3 9/32 83.5	1/8 3.2	19/32 15	1 7/32 31	0.866 22	0.236 6	5/16 M8	**SBNPTH201-100**		SB201	9.55	4.80	0.218	13.2	0.93
15	3 15/16 100	3 17/32 90	10 1/4 260	9 11/16 246	1 1/16 27	9 1/4 235	2 9/16 65	1/2 12.5	7/16 11	3 15/16 100	3 9/32 83.5	1/8 3.2	19/32 15	1 7/32 31	0.866 22	0.236 6	5/16 M8	**SBNPTH202-100**		SB202	9.55	4.80	0.218	13.2	0.93
17	3 15/16 100	3 17/32 90	10 1/4 260	9 11/16 246	1 1/16 27	9 1/4 235	2 9/16 65	1/2 12.5	7/16 11	3 15/16 100	3 9/32 83.5	1/8 3.2	19/32 15	1 7/32 31	0.866 22	0.236 6	5/16 M8	**SBNPTH203-100**		SB203	9.55	4.80	0.218	13.2	0.93
20	3 15/16 100	3 17/32 90	10 1/4 260	9 11/16 246	1 1/16 27	9 1/4 235	2 9/16 65	1/2 12.5	7/16 11	3 15/16 100	3 9/32 83.5	1/8 3.2	19/32 15	1 5/16 33	0.984 25	0.276 7	5/16 M8	**SBNPTH204-100**		SB204	12.8	6.65	0.302	13.2	0.93
25	3 15/16 100	3 17/32 90	10 1/4 260	9 11/16 246	1 1/16 27	9 1/4 235	2 9/16 65	1/2 12.5	7/16 11	3 15/16 100	3 9/32 83.5	1/8 3.2	19/32 15	1 11/32 34.5	1.063 27	0.295 7.5	5/16 M8	**SBNPTH205-100**		SB205	14.0	7.85	0.357	13.9	0.93

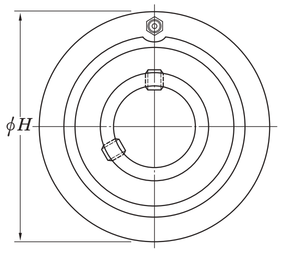
Remarks 1. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.
2. If heavy load ($P_r/C_r > 0.12$), vibration, or impact occurs, contact with JTEKT.

UCC

Cylindrical bore (with set screws)

d 12 ~ (45) mm





Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm					Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		H	A	r	B	S				C_r	C_{0r}	C_u	f_0	kg
12		2.835 72	25/32 20	0.06 1.5	1.220 31	0.500 12.7	**UCC201**	C204	UC201	12.8	6.65	0.302	13.2	0.52
	1/2						**UCC201-8**		UC201-8					
15							**UCC202**		UC202					0.50
	5/8						**UCC202-10**		UC202-10					
17							**UCC203**		UC203					0.49
	3/4						**UCC204-12**		UC204-12					0.47
20							**UCC204**		UC204					
25	7/8	3.150 80	55/64 22	0.06 1.5	1.343 34.1	0.563 14.3	**UCC205-14**	C205	UC205-14	14.0	7.85	0.357	13.9	0.64
	15/16						**UCC205-15**		UC205-15					
							UCC205		UC205					
	1						**UCC205-16**		UC205-16					
		3.543 90	1 1/16 27	0.06 1.5	1.500 38.1	0.626 15.9	**UCCX05**	CX05	UCX05	19.5	11.3	0.514	13.9	1.0
	1						**UCCX05-16**		UCX05-16					
		3.543 90	1 1/32 26	0.08 2	1.496 38	0.591 15	**UCC305**	C305	UC305	21.2	10.9	0.495	12.6	1.5
	1						**UCC305-16**		UC305-16					
30	1 1/8	3.346 85	1 1/16 27	0.06 1.5	1.500 38.1	0.626 15.9	**UCC206-18**	C206	UC206-18	19.5	11.3	0.514	13.9	0.81
							UCC206		UC206					
	1 3/16						**UCC206-19**		UC206-19					
	1 1/4						**UCC206-20**		UC206-20					
		3.937 100	1 3/16 30	0.08 2	1.689 42.9	0.689 17.5	**UCCX06**	CX06	UCX06	25.7	15.4	0.700	13.9	1.3
	1 3/16						**UCCX06-19**		UCX06-19					
	1 1/4						**UCCX06-20**		UCX06-20					
	–	3.937 100	1 7/64 28	0.08 2	1.693 43	0.669 17	**UCC306**	C306	UC306	26.7	15.0	0.682	13.3	1.7
35	1 1/4	3.543 90	1 7/64 28	0.08 2	1.689 42.9	0.689 17.5	**UCC207-20**	C207	UC207-20	25.7	15.4	0.700	13.9	0.93
	1 5/16						**UCC207-21**		UC207-21					
	1 3/8						**UCC207-22**		UC207-22					
							UCC207		UC207					
	1 7/16						**UCC207-23**		UC207-23					
	1 3/8	4.331 110	1 11/32 34	0.08 2	1.937 49.2	0.748 19	**UCCX07-22**	CX07	UCX07-22	29.1	17.8	0.809	14.0	1.7
							UCCX07		UCX07					
	1 7/16						**UCCX07-23**		UCX07-23					
	–	4.331 110	1 17/64 32	0.12 3	1.890 48	0.748 19	**UCC307**	C307	UC307	33.4	19.3	0.877	13.2	2.2
40	1 1/2	3.937 100	1 3/16 30	0.08 2	1.937 49.2	0.748 19	**UCC208-24**	C208	UC208-24	29.1	17.8	0.809	14.0	1.2
	1 9/16						**UCC208-25**		UC208-25					
							UCC208		UC208					
	1 1/2	4.724 120	1 1/2 38	0.08 2	1.937 49.2	0.748 19	**UCCX08-24**	CX08	UCX08-24	34.1	21.3	0.968	14.0	2.3
							UCCX08		UCX08					
	1 1/2	4.724 120	1 11/32 34	0.12 3	2.047 52	0.748 19	**UCC308-24**	C308	UC308-24	40.7	24.0	1.09	13.2	2.2
							UCC308		UC308					
45	1 5/8	4.331 110	1 7/32 31	0.08 2	1.937 49.2	0.748 19	**UCC209-26**	C209	UC209-26	34.1	21.3	0.968	14.0	1.5
	1 11/16						**UCC209-27**		UC209-27					
	1 3/4						**UCC209-28**		UC209-28					
							UCC209		UC209					

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 201~213, X05~X12, 305~308
A-R1/8 .... 309~328
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCC206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

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d (45) ~ 90 mm

Variations of tolerance of outside diameter (Δ_{Hs}), variations of tolerance of width (Δ_{As}), and tolerance of circumferential runout of outside diameter (Y)

Unit: mm

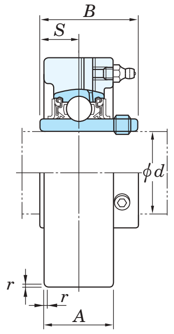
Housing No.			Δ_{Hs}	Δ_{As}	Y
C204~C205			0 –0.030	±0.2	0.2
C206~C210	CX05~CX08	C305~C308	0 –0.035		
	CX09~CX10	C309~C310	0 –0.040		
C211~C213	CX11~CX12	C311~C314		±0.3	0.3
		C315~C318	0 –0.046		
		C319			0.4
		C320~C322	0 –0.052		
		C324~C328	0 –0.057		

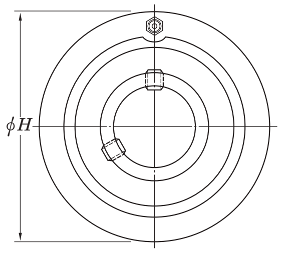
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm					Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		H	A	r	B	S				C_r	C_{0r}	C_u	f_0	kg
45	1 3/4	4.724 120	1 1/2 38	0.08 2	2.031 51.6	0.748 19	**UCCX09-28**	CX09	UCX09-28	35.1	23.3	1.06	14.4	2.3
							UCCX09		UCX09					
	1 3/4	5.118 130	1 1/2 38	0.12 3	2.244 57	0.866 22	**UCC309-28**	C309	UC309-28	48.9	29.5	1.34	13.3	2.8
							UCC309		UC309					
50	1 7/8	4.724 120	1 19/64 33	0.08 2	2.031 51.6	0.748 19	**UCC210-30**	C210	UC210-30	35.1	23.3	1.06	14.4	2.0
	1 15/16						**UCC210-31**		UC210-31					
							UCC210		UC210					
	2						**UCC210-32**		UC210-32					
	1 15/16	5.118 130	1 37/64 40	0.1 2.5	2.189 55.6	0.874 22.2	**UCCX10-31**	CX10	UCX10-31	43.4	29.4	1.34	14.4	2.8
							UCCX10		UCX10					
	2						**UCCX10-32**		UCX10-32					
	–	5.512 140	1 37/64 40	0.12 3	2.402 61	0.866 22	**UCC310**	C310	UC310	62.0	38.3	1.74	13.2	3.2
55	2	4.921 125	1 3/8 35	0.1 2.5	2.189 55.6	0.874 22.2	**UCC211-32**	C211	UC211-32	43.4	29.4	1.34	14.4	2.2
	2 1/8						**UCC211-34**		UC211-34					
							UCC211		UC211					
	2 3/16						**UCC211-35**		UC211-35					
		5.906 150	1 21/32 42	0.1 2.5	2.563 65.1	1.000 25.4	**UCCX11**	CX11	UCX11	52.4	36.2	1.65	14.4	4.0
	2 3/16						**UCCX11-35**		UCX11-35					
	2 1/4						**UCCX11-36**		UCX11-36					
	2	5.906 150	1 47/64 44	0.12 3	2.598 66	0.984 25	**UCC311-32**	C311	UC311-32	71.6	45.0	2.05	13.2	3.9
							UCC311		UC311					
60	2 1/4	5.118 130	1 1/2 38	0.1 2.5	2.563 65.1	1.000 25.4	**UCC212-36**	C212	UC212-36	52.4	36.2	1.65	14.4	2.6
							UCC212		UC212					
	2 3/8						**UCC212-38**		UC212-38					
	2 7/16						**UCC212-39**		UC212-39					
		6.299 160	1 47/64 44	0.1 2.5	2.563 65.1	1.000 25.4	**UCCX12**	CX12	UCX12	57.2	40.1	1.82	14.4	4.6
	2 7/16						**UCCX12-39**		UCX12-39					
	–	6.299 160	1 13/16 46	0.12 3	2.795 71	1.024 26	**UCC312**	C312	UC312	81.9	52.2	2.37	13.2	4.8
65	2 1/2	5.512 140	1 37/64 40	0.1 2.5	2.563 65.1	1.000 25.4	**UCC213-40**	C213	UC213-40	57.2	40.1	1.82	14.4	3.0
							UCC213		UC213					
	2 1/2	6.693 170	1 31/32 50	0.12 3	2.953 75	1.181 30	**UCC313-40**	C313	UC313-40	92.7	59.9	2.68	13.2	5.7
							UCC313		UC313					
70	2 3/4	7.087 180	2 3/64 52	0.12 3	3.071 78	1.299 33	**UCC314-44**	C314	UC314-44	104	68.2	2.96	13.2	6.7
							UCC314		UC314					
75	2 15/16	7.480 190	2 11/64 55	0.16 4	3.228 82	1.260 32	**UCC315-47**	C315	UC315-47	113	77.2	3.24	13.2	7.8
							UCC315		UC315					
	3						**UCC315-48**		UC315-48					
80	–	7.874 200	2 23/64 60	0.16 4	3.386 86	1.339 34	**UCC316**	C316	UC316	123	86.7	3.53	13.3	9.2
85	–	8.465 215	2 33/64 64	0.16 4	3.780 96	1.575 40	**UCC317**	C317	UC317	133	96.8	3.82	13.3	11.7
90	3 1/2	8.858 225	2 19/32 66	0.16 4	3.780 96	1.575 40	**UCC318-56**	C318	UC318-56	143	107	4.11	13.3	13.1
							UCC318		UC318					

UCC

Cylindrical bore (with set screws)

d 95 ~ 140 mm





Variations of tolerance of outside diameter ($\varDelta_{Hs}$), variations of tolerance of width ($\varDelta_{As}$), and tolerance of circumferential runout of outside diameter (Y)

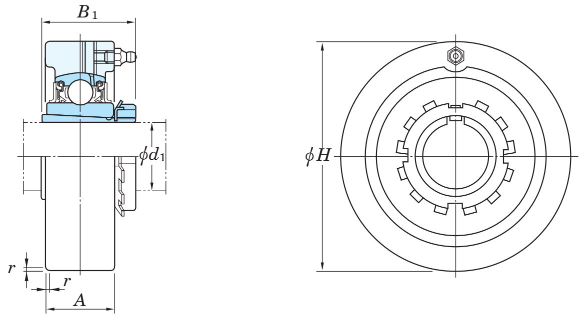
Unit: mm

Housing No.			$\varDelta_{Hs}$	$\varDelta_{As}$	Y
C204~C205			0 −0.030	±0.2	0.2
C206~C210	CX05~CX08	C305~C308	0 −0.035		
	CX09~CX10	C309~C310	0 −0.040		
C211~C213	CX11~CX12	C311~C314		±0.3	0.3
		C315~C318	0 −0.046		
		C319			0.4
		C320~C322	0 −0.052		
		C324~C328	0 −0.057		

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm					Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		H	A	r	B	S				C_r	C_{0r}	C_u	f_0	kg
95	–	9.449 240	2 53/64 72	0.16 4	4.055 103	1.614 41	**UCC319**	C319	UC319	153	119	4.45	13.3	15.8
100	3 15/16 4	10.236 260	2 61/64 75	0.16 4	4.252 108	1.654 42	**UCC320** **UCC320-63** **UCC320-64**	C320	UC320 UC320-63 UC320-64	173	141	5.08	13.2	19.6
105	–	10.236 260	2 61/64 75	0.16 4	4.409 112	1.732 44	**UCC321**	C321	UC321	184	153	5.41	13.2	27.0
110	–	11.811 300	3 5/32 80	0.2 5	4.606 117	1.811 46	**UCC322**	C322	UC322	205	180	6.15	13.2	29.2
120	–	12.598 320	3 35/64 90	0.2 5	4.961 126	2.008 51	**UCC324**	C324	UC324	207	185	6.10	13.5	35.9
130	–	13.386 340	3 15/16 100	0.24 6	5.315 135	2.126 54	**UCC326**	C326	UC326	229	214	6.79	13.6	43.0
140	–	14.173 360	3 15/16 100	0.24 6	5.709 145	2.323 59	**UCC328**	C328	UC328	253	246	7.54	13.6	52.9

Remarks
1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
   A-1/4-28UNF........ 201~213, X05~X12, 305~308
   A-R1/8.................. 309~328
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (L2) follows the Part No. of unit or bearing. (Example of Part No. : UCC206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings, see the dimensional tables of insert bearing for unit.

UKC
Tapered bore (with adapter)
d_1 20 ~ (50) mm



Shaft Dia. d_1 mm	Shaft Dia. d_1 inch	Dimensions inch / mm H	A	r	B_1	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Adapter Assembly No.	Mass kg
20	3/4	3.150 80	55/64 22	0.06 1.5	1 3/8 35	**UKC205**	C205	UK205	14.0	7.85	0.357	13.9	HE2305X H2305X	0.7
	3/4	3.543 90	1 1/16 27	0.06 1.5	1 3/8 35	**UKCX05**	CX05	UKX05	19.5	11.3	0.514	13.9	HE2305X H2305X	0.99
	3/4	3.543 90	1 1/32 26	0.08 2	1 3/8 35	**UKC305**	C305	UK305	21.2	10.9	0.495	12.6	HE2305X H2305X	1.6
25	1	3.346 85	1 1/16 27	0.06 1.5	1 1/2 38	**UKC206**	C206	UK206	19.5	11.3	0.514	13.9	H2306X HE2306X	0.89
	1	3.937 100	1 3/16 30	0.08 2	1 1/2 38	**UKCX06**	CX06	UKX06	25.7	15.4	0.700	13.9	H2306X HE2306X	1.3
	1	3.937 100	1 7/64 28	0.08 2	1 1/2 38	**UKC306**	C306	UK306	26.7	15.0	0.682	13.3	H2306X HE2306X	1.8
30	1 1/8	3.543 90	1 7/64 28	0.08 2	1 11/16 43	**UKC207**	C207	UK207	25.7	15.4	0.700	13.9	HS2307X H2307X	1.0
	1 1/8	4.331 110	1 11/32 34	0.08 2	1 11/16 43	**UKCX07**	CX07	UKX07	29.1	17.8	0.809	14.0	HS2307X H2307X	1.8
	1 1/8	4.331 110	1 17/64 32	0.12 3	1 11/16 43	**UKC307**	C307	UK307	33.4	19.3	0.877	13.2	HS2307X H2307X	2.2
35	1 1/4 1 3/8	3.937 100	1 3/16 30	0.08 2	1 13/16 46	**UKC208**	C208	UK208	29.1	17.8	0.809	14.0	HE2308X HS2308X H2308X	1.5
	1 1/4 1 3/8	4.724 120	1 1/2 38	0.08 2	1 13/16 46	**UKCX08**	CX08	UKX08	34.1	21.3	0.968	14.0	HE2308X HS2308X H2308X	2.4
	1 1/4 1 3/8	4.724 120	1 11/32 34	0.12 3	1 13/16 46	**UKC308**	C308	UK308	40.7	24.0	1.09	13.2	HE2308X HS2308X H2308X	2.2
40	1 1/2	4.331 110	1 7/32 31	0.08 2	1 31/32 50	**UKC209**	C209	UK209	34.1	21.3	0.968	14.0	HE2309X H2309X	1.8
	1 1/2	4.724 120	1 1/2 38	0.08 2	1 31/32 50	**UKCX09**	CX09	UKX09	35.1	23.3	1.06	14.4	HE2309X H2309X	2.4
	1 1/2	5.118 130	1 1/2 38	0.12 3	1 31/32 50	**UKC309**	C309	UK309	48.9	29.5	1.34	13.3	HE2309X H2309X	2.8
45	1 3/4	4.724 120	1 19/64 33	0.08 2	2 5/32 55	**UKC210**	C210	UK210	35.1	23.3	1.06	14.4	HE2310X H2310X	2.2
	1 3/4	5.118 130	1 37/64 40	0.1 2.5	2 5/32 55	**UKCX10**	CX10	UKX10	43.4	29.4	1.34	14.4	HE2310X H2310X	2.9
	1 3/4	5.512 140	1 37/64 40	0.12 3	2 5/32 55	**UKC310**	C310	UK310	62.0	38.3	1.74	13.2	HE2310X H2310X	3.2
50	1 7/8 2	4.921 125	1 3/8 35	0.1 2.5	2 5/16 59	**UKC211**	C211	UK211	43.4	29.4	1.34	14.4	HS2311X H2311X HE2311X	2.7

Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF .... 205~213, X05~X12, 305~308
A-R1/8 .... 309~328
3. In Part No. of unit with adapters and bearing with adapters, Part No. of applicable adapter follow the Part No. shown in the dimensional tables. (Example of Part No. : UKC206J + H2306X, UK206 + H2306X)
4. As for the triple-lip seal type product (205 is the double-lip seal type product), supplementary code L3 (or L2) follows the Part No. of unit or bearing.
(Example of Part No. : UKC206JL3 + H2306X, UK206L3 + H2306X)
5. As for the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.

Variations of tolerance of outside diameter (Δ_{Hs}), variations of tolerance of width (Δ_{As}), and tolerance of circumferential runout of outside diameter (Y)

Unit: mm

Housing No.			Δ_{Hs}	Δ_{As}	Y
C205			0 −0.030	±0.2	0.2
C206~C210	CX05~CX08	C305~C308	0 −0.035		
	CX09~CX10	C309~C310	0 −0.040		
C211~C213	CX11~CX12	C311~C314		±0.3	0.3
		C315~C318	0 −0.046		
		C319			0.4
		C320~C322	0 −0.052		
		C324~C328	0 −0.057		

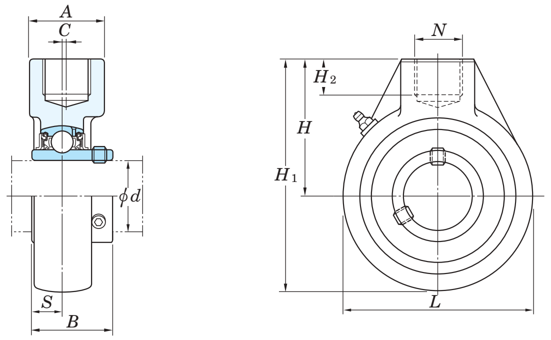
d_1 (50) ~ 125 mm

Shaft Dia. d_1 mm	Shaft Dia. d_1 inch	Dimensions inch / mm H	A	r	B_1	Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Adapter Assembly No.	Mass kg
50	1 7/8 2	5.906 150	1 21/32 42	0.1 2.5	2 5/16 59	**UKCX11**	CX11	UKX11	52.4	36.2	1.65	14.4	HS2311X H2311X HE2311X	4.1
	1 7/8 2	5.906 150	1 47/64 44	0.12 3	2 5/16 59	**UKC311**	C311	UK311	71.6	45.0	2.05	13.2	HS2311X H2311X HE2311X	4.1
55	2 1/8	5.118 130	1 1/2 38	0.1 2.5	2 7/16 62	**UKC212**	C212	UK212	52.4	36.2	1.65	14.4	HS2312X H2312X	3.1
	2 1/8	6.299 160	1 47/64 44	0.1 2.5	2 7/16 62	**UKCX12**	CX12	UKX12	57.2	40.1	1.82	14.4	HS2312X H2312X	4.4
	2 1/8	6.299 160	1 13/16 46	0.12 3	2 7/16 62	**UKC312**	C312	UK312	81.9	52.2	2.37	13.2	HS2312X H2312X	4.7
60	2 1/4 2 3/8	5.512 140	1 37/64 40	0.1 2.5	2 9/16 65	**UKC213**	C213	UK213	57.2	40.1	1.82	14.4	HE2313X H2313X HS2313X	3.3
	2 1/4 2 3/8	6.693 170	1 31/32 50	0.12 3	2 9/16 65	**UKC313**	C313	UK313	92.7	59.9	2.68	13.2	HE2313X H2313X HS2313X	5.8
65	2 1/2	7.480 190	2 11/64 55	0.16 4	2 7/8 73	**UKC315**	C315	UK315	113	77.2	3.24	13.2	HE2315X H2315X	8.0
70	2 3/4	7.874 200	2 23/64 60	0.16 4	3 1/16 78	**UKC316**	C316	UK316	123	86.7	3.53	13.3	HE2316X H2316X	9.2
75	3	8.465 215	2 33/64 64	0.16 4	3 7/32 82	**UKC317**	C317	UK317	133	96.8	3.82	13.3	H2317X HE2317X	11.6
80	–	8.858 225	2 19/32 66	0.16 4	3 3/8 86	**UKC318**	C318	UK318	143	107	4.11	13.3	H2318X	13.1
85	3 1/4	9.449 240	2 53/64 72	0.16 4	3 17/32 90	**UKC319**	C319	UK319	153	119	4.45	13.3	HE2319X H2319X	16.1
90	3 1/2	10.236 260	2 61/64 75	0.16 4	3 13/16 97	**UKC320**	C320	UK320	173	141	5.08	13.2	HE2320X H2320X	19.2
100	4	11.811 300	3 5/32 80	0.2 5	4 1/8 105	**UKC322**	C322	UK322	205	180	6.15	13.2	H2322X HE2322X	29.1
110	–	12.598 320	3 35/64 90	0.2 5	4 13/32 112	**UKC324**	C324	UK324	207	185	6.10	13.5	H2324	36.2
115	4 1/2	13.386 340	3 15/16 100	0.24 6	4 3/4 121	**UKC326**	C326	UK326	229	214	6.79	13.6	HE2326 H2326	42.8
125	–	14.173 360	3 15/16 100	0.24 6	5 5/32 131	**UKC328**	C328	UK328	253	246	7.54	13.6	H2328	52.9

UCHA

Cylindrical bore (with set screws)

d 12 ~ 75 mm



Note 1) Dimensions N screw hole is apply JIS B0203 (Taper Pipe Threads) standards.
It can not apply to the Parallel Pipe External Thread.
Also, below shown the dimensions of Taper Pipe Internal Thread.

Unit: mm

Nominal of Thread	Female Thread Major Diameter D	Female Thread Pitch Diameter D_2	Female Thread Minor Diameter D_1	Thread Number of Threads (in 25.4 mm) n	Apply Male Thread
Rp 3/4	26.441	25.279	24.117	14	R 3/4
Rp 1	33.249	31.770	30.291	11	R 1
Rp 1 1/2	41.910	40.431	38.952	11	R 1 1/2
Rp 1 1/4	47.803	46.324	44.845	11	R 1 1/4

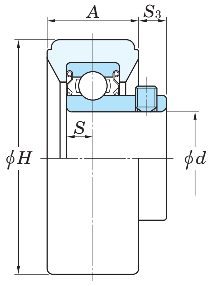
Shaft Dia. mm	Shaft Dia. inch	Dimensions inch mm									Unit No.	Housing No.	Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Mass
d		H	A	L	H_1	H_2	N [1)]	C	B	S				C_r	C_{0r}	C_u	f_0	kg
12		2 17/32 64	1 9/16 40	2 17/32 64	3 25/32 96	3/4 19	Rp 3/4	– –	1.220 31	0.500 12.7	**UCHA201**	HA204	UC201	12.8	6.65	0.302	13.2	0.77
	1/2										**UCHA201-8**		UC201-8					
15											**UCHA202**		UC202					0.75
	5/8										**UCHA202-10**		UC202-10					
17											**UCHA203**		UC203					0.74
	3/4										**UCHA204-12**		UC204-12					0.72
20											**UCHA204**		UC204					
25	7/8	2 17/32 64	1 9/16 40	3 1/16 78	4 1/16 103	3/4 19	Rp 3/4	– –	1.343 34.1	0.563 14.3	**UCHA205-14**	HA205	UC205-14	14.0	7.85	0.357	13.9	0.87
	15/16										**UCHA205-15**		UC205-15					
											UCHA205		UC205					
	1										**UCHA205-16**		UC205-16					
30	1 1/8	2 17/32 64	1 9/16 40	3 1/16 78	4 1/16 103	3/4 19	Rp 3/4	– –	1.500 38.1	0.626 15.9	**UCHA206-18**	HA206	UC206-18	19.5	11.3	0.514	13.9	0.83
											UCHA206		UC206					
	1 3/16										**UCHA206-19**		UC206-19					
	1 1/4										**UCHA206-20**		UC206-20					
35	1 1/4	2 3/4 70	1 9/16 40	3 5/8 92	4 9/16 116	3/4 19	Rp 3/4	– –	1.689 42.9	0.689 17.5	**UCHA207-20**	HA207	UC207-20	25.7	15.4	0.700	13.9	1.2
	1 5/16										**UCHA207-21**		UC207-21					
	1 3/8										**UCHA207-22**		UC207-22					
											UCHA207		UC207					
	1 7/16										**UCHA207-23**		UC207-23					
40	1 1/2	2 7/8 73	1 9/16 40	3 25/32 96	4 3/4 121	3/4 19	Rp 3/4	5/64 2	1.937 49.2	0.748 19	**UCHA208-24**	HA208	UC208-24	29.1	17.8	0.809	14.0	1.3
	1 9/16										**UCHA208-25**		UC208-25					
											UCHA208		UC208					
45	1 5/8	3 7/32 82	1 7/8 48	4 1/4 108	5 11/32 136	13/16 21	Rp 1	13/64 5	1.937 49.2	0.748 19	**UCHA209-26**	HA209	UC209-26	34.1	21.3	0.968	14.0	1.7
	1 11/16										**UCHA209-27**		UC209-27					
	1 3/4										**UCHA209-28**		UC209-28					
											UCHA209		UC209					
50	1 7/8	3 9/32 83	1 7/8 48	4 21/32 118	5 19/32 142	13/16 21	Rp 1	13/64 5	2.031 51.6	0.748 19	**UCHA210-30**	HA210	UC210-30	35.1	23.3	1.06	14.4	2.1
	1 15/16										**UCHA210-31**		UC210-31					
											UCHA210		UC210					
	2										**UCHA210-32**		UC210-32					
55	2	3 7/16 87	2 3/8 60	4 31/32 126	5 29/32 150	31/32 25	Rp 1 1/4	9/32 7	2.189 55.6	0.874 22.2	**UCHA211-32**	HA211	UC211-32	43.4	29.4	1.34	14.4	2.8
	2 1/8										**UCHA211-34**		UC211-34					
											UCHA211		UC211					
	2 3/16										**UCHA211-35**		UC211-35					
60	2 1/4	4 1/32 102	2 3/8 60	5 19/32 142	6 13/16 173	1 3/32 28	Rp 1 1/4	23/64 9	2.563 65.1	1.000 25.4	**UCHA212-36**	HA212	UC212-36	52.4	36.2	1.65	14.4	3.9
											UCHA212		UC212					
	2 3/8										**UCHA212-38**		UC212-38					
	2 7/16										**UCHA212-39**		UC212-39					
65	2 1/2	4 19/32 117	2 3/4 70	6 17/32 166	7 7/8 200	1 1/4 32	Rp 1 1/2	3/8 9.5	2.563 65.1	1.000 25.4	**UCHA213-40**	HA213	UC213-40	57.2	40.1	1.82	14.4	5.8
											UCHA213		UC213					
70	2 3/4	4 19/32 117	2 3/4 70	6 17/32 166	7 7/8 200	1 1/4 32	Rp 1 1/2	3/8 9.5	2.937 74.6	1.189 30.2	**UCHA214-44**	HA214	UC214-44	62.2	44.1	2.01	14.5	5.9
											UCHA214		UC214					
75	2 15/16	4 19/32 117	2 3/4 70	6 17/32 166	7 7/8 200	1 1/4 32	Rp 1 1/2	3/8 9.5	3.063 77.8	1.311 33.3	**UCHA215-47**	HA215	UC215-47	67.4	48.3	2.17	14.5	5.6
											UCHA215		UC215					
	3										**UCHA215-48**		UC215-48					

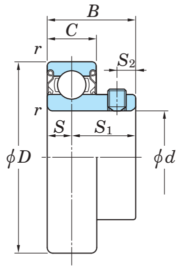
Remarks 1. In Part No. of unit and units with covers, fitting codes follow bore diameter numbers. (See **Table 2.5** in P.11.)
2. Part No. of applicable grease nipples are shown below.
A-1/4-28UNF........ 201~210
A-R1/8.................. 211~215
3. As for the triple-lip seal type product (from 201 to 205 are the double-lip seal type products), supplementary code L3 (or L2) follows the Part No. of unit or bearing. (Example of Part No. : UCHA206JL3, UC206L3)
4. For the dimensions and forms of applicable bearings and adapters, see the dimensional tables of insert bearing for unit and adapter assemblies.
5. Tapered bore (with adapter) type products are also available. (Example of Part No. : UKHA205J + H2305X, UK205 + H2305X)

RU-M series

Cylindrical bore (with set screws)

d 20 ~ 30 mm





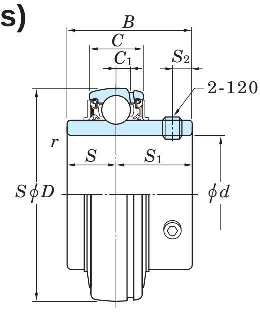
Shaft Dia. mm	Dimensions mm										Unit No.	Housing No.		Bearing No.	Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Set Screw Size	Mass
d	H	A	D	B	C	r (min.)	S	S_1	S_2	S_3					C_r	C_{0r}	C_u	f_0		kg
20	64	25	47	27	14	1	7	20	5	7.5	**RU12M**	R204		SBB204P1 1)	12.8	6.65	0.302	13.2	M6×0.75	0.20
25	64	25	52	27.5	15	1	7.5	20	5.5	7.5	**RU16M**	R205		SBB205P1 1)	14.0	7.85	0.357	13.9	M6×0.75	0.22
30	79	27	62	28.5	16	1	8	20.5	6	7	**RU19M**	R206		SBB206P1 1)	19.5	11.3	0.514	13.9	M6×0.75	0.34

Note 1) P1 indicates that the inner ring width is a special size.

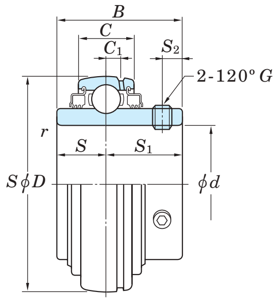
UC, SB, SU

Cylindrical bore (with set screws)

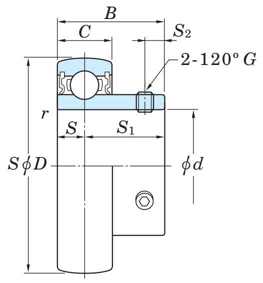
d 8 ~ (30) mm



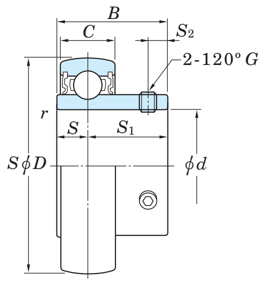
UC



UC-L3



SB



SU

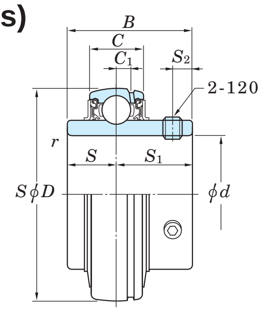
Shaft Dia. d		Dimensions								Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Bearing No.		Dimensions								Set Screw Size G		Mass
mm	inch	D		B		C		r (min.)		C_r	C_{0r}	C_u	f_0	Standard	L3 Type	C_1		S		S_1		S_2		mm	inch	kg
		mm	inch	mm	inch	mm	inch	mm	inch							mm	inch	mm	inch	mm	inch	mm	inch			
8	–	22	0.866	12	0.472	7	0.276	0.3	0.012	3.27	1.37	0.062	12.4	**SU08**	–	–	–	3.5	0.138	8.5	0.335	2.8	0.110	M3×0.35	–	0.012
10	–	26	1.024	15	0.591	8	0.315	0.3	0.012	4.55	1.95	0.089	12.3	**SU000**	–	–	–	5	0.197	10	0.394	3	0.118	M3×0.35	–	0.024
12	–	28	1.102	15	0.591	8	0.315	0.3	0.012	5.10	2.40	0.109	13.2	**SU001**	–	–	–	5	0.197	10	0.394	3	0.118	M3×0.35	–	0.026
		40	1.575	22	0.866	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SB201**	–	–	–	6	0.236	16	0.630	4	0.157	M5×0.5	–	0.10
		47	1.850	31	1.220	16	0.630	0.6	0.024	12.8	6.65	0.302	13.2	**UC201**	**UC201L2**	4	0.157	12.7	0.500	18.3	0.720	5	0.197	M6×0.75	–	0.21
–	1/2	40	1.575	22	0.866	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SB201-8**	–	–	–	6	0.236	16	0.630	4	0.157	–	No.10-32UNF	0.10
		47	1.850	31	1.220	16	0.630	0.6	0.024	12.8	6.65	0.302	13.2	**UC201-8**	**UC201-8L2**	4	0.157	12.7	0.500	18.3	0.720	5	0.197	–	1/4-28UNF	0.21
15	–	32	1.260	16.5	0.650	9	0.354	0.3	0.012	5.60	2.85	0.130	13.9	**SU002**	–	–	–	5.5	0.217	11	0.433	3.3	0.130	M4×0.5	–	0.038
		40	1.575	22	0.866	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SB202**	–	–	–	6	0.236	16	0.630	4	0.157	M5×0.5	–	0.10
		47	1.850	31	1.220	16	0.630	0.6	0.024	12.8	6.65	0.302	13.2	**UC202**	**UC202L2**	4	0.157	12.7	0.500	18.3	0.720	5	0.197	M6×0.75	–	0.19
–	5/8	40	1.575	22	0.866	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SB202-10**	–	–	–	6	0.236	16	0.630	4	0.157	–	No.10-32UNF	0.10
		47	1.850	31	1.220	16	0.630	0.6	0.024	12.8	6.65	0.302	13.2	**UC202-10**	**UC202-10L2**	4	0.157	12.7	0.500	18.3	0.720	5	0.197	–	1/4-28UNF	0.19
17	–	35	1.378	17.5	0.689	10	0.394	0.3	0.012	6.00	3.25	0.148	14.4	**SU003**	–	–	–	6	0.236	11.5	0.453	3.3	0.130	M4×0.5	–	0.050
		40	1.575	22	0.866	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SB203**	–	–	–	6	0.236	16	0.630	4	0.157	M5×0.5	–	0.10
		47	1.850	31	1.220	16	0.630	0.6	0.024	12.8	6.65	0.302	13.2	**UC203**	**UC203L2**	4	0.157	12.7	0.500	18.3	0.720	5	0.197	M6×0.75	–	0.18
–	3/4	47	1.850	25	0.984	14	0.551	1	0.039	12.8	6.65	0.302	13.2	**SB204-12**	–	–	–	7	0.276	18	0.709	5	0.197	–	1/4-28UNF	0.15
		47	1.850	31	1.220	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**UC204-12**	**UC204-12L2**	4	0.157	12.7	0.500	18.3	0.720	5	0.197	–	1/4-28UNF	0.16
20	–	42	1.654	21	0.827	12	0.472	0.6	0.024	9.40	5.05	0.230	13.9	**SU004**	–	–	–	7	0.276	14	0.551	4	0.157	M5×0.5	–	0.080
		47	1.850	25	0.984	14	0.551	1	0.039	12.8	6.65	0.302	13.2	**SB204**	–	–	–	7	0.276	18	0.709	5	0.197	M6×0.75	–	0.15
		47	1.850	31	1.220	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**UC204**	**UC204L2**	4	0.157	12.7	0.500	18.3	0.720	5	0.197	M6×0.75	–	0.16
–	7/8	52	2.047	27	1.063	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SB205-14**	–	–	–	7.5	0.295	19.5	0.768	5.5	0.217	–	1/4-28UNF	0.18
		52	2.047	34.1	1.343	17	0.669	1	0.039	14.0	7.85	0.357	13.9	**UC205-14**	**UC205-14L2**	5	0.197	14.3	0.563	19.8	0.780	5.5	0.217	–	1/4-28UNF	0.23
–	15/16	52	2.047	27	1.063	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SB205-15**	–	–	–	7.5	0.295	19.5	0.768	5.5	0.217	–	1/4-28UNF	0.18
		52	2.047	34.1	1.343	17	0.669	1	0.039	14.0	7.85	0.357	13.9	**UC205-15**	**UC205-15L2**	5	0.197	14.3	0.563	19.8	0.780	5.5	0.217	–	1/4-28UNF	0.21
25	–	47	1.850	22	0.866	12	0.472	0.6	0.024	10.1	5.85	0.266	14.5	**SU005**	–	–	–	7	0.276	15	0.591	4.5	0.177	M5×0.5	–	0.10
		52	2.047	27	1.063	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SB205**	–	–	–	7.5	0.295	19.5	0.768	5.5	0.217	M6×0.75	–	0.18
		52	2.047	34.1	1.343	17	0.669	1	0.039	14.0	7.85	0.357	13.9	**UC205**	**UC205L2**	5	0.197	14.3	0.563	19.8	0.780	5.5	0.217	M6×0.75	–	0.20
		62	2.441	38	1.496	22	0.866	1.1	0.043	21.2	10.9	0.495	12.6	**UC305**	–	6	0.236	15	0.591	23	0.906	6	0.236	M6×0.75	–	0.45
		62	2.441	38.1	1.500	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**UCX05**	**UCX05L3**	5	0.197	15.9	0.626	22.2	0.874	6	0.236	M6×0.75	–	0.39
–	1	52	2.047	27	1.063	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SB205-16**	–	–	–	7.5	0.295	19.5	0.768	5.5	0.217	–	1/4-28UNF	0.18
		52	2.047	34.1	1.343	17	0.669	1	0.039	14.0	7.85	0.357	13.9	**UC205-16**	**UC205-16L2**	5	0.197	14.3	0.563	19.8	0.780	5.5	0.217	–	1/4-28UNF	0.20
		62	2.441	38	1.496	22	0.866	1.1	0.043	21.2	10.9	0.495	12.6	**UC305-16**	–	6	0.236	15	0.591	23	0.906	6	0.236	M6×0.75	–	0.44
		62	2.441	38.1	1.500	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**UCX05-16**	**UCX05-16L3**	5	0.197	15.9	0.626	22.2	0.874	6	0.236	–	1/4-28UNF	0.38
–	1 1/8	62	2.441	30	1.181	16	0.630	1	0.039	19.5	11.3	0.514	13.9	**SB206-18**	–	–	–	8	0.315	22	0.866	6	0.236	–	1/4-28UNF	0.27
		62	2.441	38.1	1.500	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**UC206-18**	**UC206-18L2**	5	0.197	15.9	0.626	22.2	0.874	6	0.236	–	1/4-28UNF	0.34
30	–	55	2.165	24.5	0.965	13	0.512	1	0.039	13.2	8.25	0.375	14.7	**SU006**	–	–	–	7.5	0.295	17	0.669	5.5	0.217	M5×0.5	–	0.15
		62	2.441	30	1.181	16	0.630	1	0.039	19.5	11.3	0.514	13.9	**SB206**	–	–	–	8	0.315	22	0.866	6	0.236	M6×0.75	–	0.27
		62	2.441	38.1	1.500	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**UC206**	**UC206L3**	5	0.197	15.9	0.626	22.2	0.874	6	0.236	M6×0.75	–	0.32
		72	2.835	42.9	1.689	20	0.787	1	0.039	25.7	15.4	0.700	13.9	**UCX06**	**UCX06L3**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	M8×1	–	0.58
		72	2.835	43	1.693	24	0.945	1.1	0.043	26.7	15.0	0.682	13.3	**UC306**	–	6.5	0.256	17	0.669	26	1.024	6	0.236	M6×0.75	–	0.56
–	1 3/16	62	2.441	30	1.181	16	0.630	1	0.039	19.5	11.3	0.514	13.9	**SB206-19**	–	–	–	8	0.315	22	0.866	6	0.236	–	1/4-28UNF	0.27
		62	2.441	38.1	1.500	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**UC206-19**	**UC206-19L2**	5	0.197	15.9	0.626	22.2	0.874	6	0.236	–	1/4-28UNF	0.32
		72	2.835	42.9	1.689	20	0.787	1	0.039	25.7	15.4	0.700	13.9	**UCX06-19**	**UCX06-19L3**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	–	5/16-24UNF	0.58
–	1 1/4	62	2.441	30	1.181	16	0.630	1	0.039	19.5	11.3	0.514	13.9	**SB206-20**	–	–	–	8	0.315	22	0.866	6	0.236	–	1/4-28UNF	0.27
		62	2.441	38.1	1.500	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**UC206-20**	**UC206-20L2**	5	0.197	15.9	0.626	22.2	0.874	6	0.236	–	1/4-28UNF	0.30
		72	2.835	42.9	1.689	20	0.787	1	0.039	25.7	15.4	0.700	13.9	**UCX06-20**	**UCX06-20L3**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	–	5/16-24UNF	0.55
–	1 1/4	72	2.835	32	1.260	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SB207-20**	–	–	–	8.5	0.335	23.5	0.925	6	0.236	–	1/4-28UNF	0.42
		72	2.835	42.9	1.689	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**UC207-20**	**UC207-20L3**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	–	5/16-24UNF	0.54
–	1 5/16	72	2.835	42.9	1.689	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**UC207-21**	**UC207-21L3**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	–	5/16-24UNF	0.51

Remarks 1. SU type product is the “compact” series insert bearing for unit.
2. From UC201 to 205 are the double-lip seal type products (L2).
3. With all bearings, the type with lock pin are H fittings.
However, bearings with a bearing number of UC313 or more, with lock pin type are J fittings.

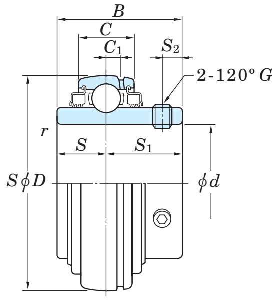
UC, SB, SU

Cylindrical bore (with set screws)

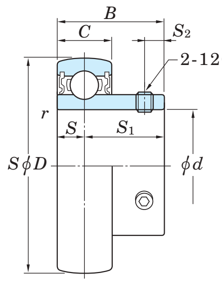
d (30) ~ (60) mm



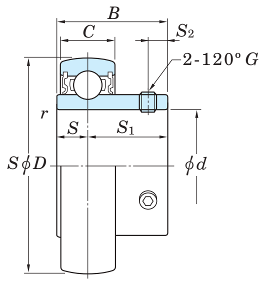
UC



UC-L3



SB



SU

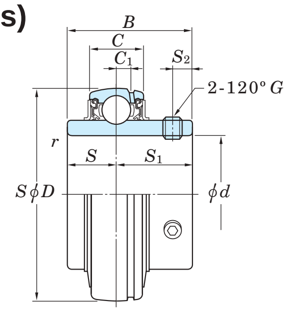
Shaft Dia. d mm	Shaft Dia. d inch	Dimensions D mm	D inch	B mm	B inch	C mm	C inch	r (min.) mm	r (min.) inch	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Bearing No. Standard	L3 Type	Dimensions C_1 mm	C_1 inch	S mm	S inch	S_1 mm	S_1 inch	S_2 mm	S_2 inch	Set Screw Size G mm	G inch	Mass kg
–	1 3/8	72	2.835	32	1.260	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SB207-22**	–	–	–	8.5	0.335	23.5	0.925	6	0.236	–	1/4-28UNF	0.42
		72	2.835	42.9	1.689	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**UC207-22**	**UC207-22L3**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	–	5/16-24UNF	0.48
		80	3.150	49.2	1.937	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**UCX07-22**	**UCX07-22L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	–	5/16-24UNF	0.75
35	–	72	2.835	32	1.260	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SB207**	–	–	–	8.5	0.335	23.5	0.925	6	0.236	M6×0.75	–	0.42
		72	2.835	42.9	1.689	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**UC207**	**UC207L3**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	M8×1	–	0.48
		80	3.150	49.2	1.937	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**UCX07**	**UCX07L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	M8×1	–	0.75
		80	3.150	48	1.890	26	1.024	1.5	0.059	33.4	19.3	0.877	13.2	**UC307**	**UC307L3**	7.5	0.295	19	0.748	29	1.142	8	0.315	M8×1	–	0.71
–	1 7/16	72	2.835	32	1.260	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SB207-23**	–	–	–	8.5	0.335	23.5	0.925	6	0.236	–	1/4-28UNF	0.42
		72	2.835	42.9	1.689	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**UC207-23**	**UC207-23L3**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	–	5/16-24UNF	0.45
		80	3.150	49.2	1.937	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**UCX07-23**	**UCX07-23L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	–	5/16-24UNF	0.72
–	1 1/2	80	3.150	34	1.339	18	0.709	1.1	0.043	29.1	17.8	0.809	14.0	**SB208-24**	–	–	–	9	0.354	25	0.984	8	0.315	–	5/16-24UNF	0.60
		80	3.150	49.2	1.937	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**UC208-24**	**UC208-24L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	–	5/16-24UNF	0.68
		85	3.346	49.2	1.937	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**UCX08-24**	**UCX08-24L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	–	5/16-24UNF	0.87
		90	3.543	52	2.047	28	1.102	1.5	0.059	40.7	24.0	1.09	13.2	**UC308-24**	**UC308-24L3**	8	0.315	19	0.748	33	1.299	10	0.394	M10×1.25	–	1.05
–	1 9/16	80	3.150	49.2	1.937	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**UC208-25**	**UC208-25L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	–	5/16-24UNF	0.60
40	–	80	3.150	34	1.339	18	0.709	1.1	0.043	29.1	17.8	0.809	14.0	**SB208**	–	–	–	9	0.354	25	0.984	8	0.315	M8×1	–	0.60
		80	3.150	49.2	1.937	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**UC208**	**UC208L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	M8×1	–	0.64
		85	3.346	49.2	1.937	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**UCX08**	**UCX08L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	M8×1	–	0.83
		90	3.543	52	2.047	28	1.102	1.5	0.059	40.7	24.0	1.09	13.2	**UC308**	**UC308L3**	8	0.315	19	0.748	33	1.299	10	0.394	M10×1.25	–	1.00
–	1 5/8	85	3.346	49.2	1.937	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**UC209-26**	**UC209-26L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	–	5/16-24UNF	0.78
–	1 11/16	85	3.346	49.2	1.937	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**UC209-27**	**UC209-27L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	–	5/16-24UNF	0.74
–	1 3/4	85	3.346	49.2	1.937	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**UC209-28**	**UC209-28L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	–	5/16-24UNF	0.70
		90	3.543	51.6	2.031	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**UCX09-28**	**UCX09-28L3**	6	0.236	19	0.748	32.6	1.283	9	0.354	–	3/8-24UNF	0.97
		100	3.937	57	2.244	30	1.181	1.5	0.059	48.9	29.5	1.34	13.3	**UC309-28**	**UC309-28L3**	8.5	0.335	22	0.866	35	1.378	10	0.394	M10×1.25	–	1.35
45	–	85	3.346	49.2	1.937	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**UC209**	**UC209L3**	6	0.236	19	0.748	30.2	1.189	8	0.315	M8×1	–	0.68
		90	3.543	51.6	2.031	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**UCX09**	**UCX09L3**	6	0.236	19	0.748	32.6	1.283	9	0.354	M10×1.25	–	0.95
		100	3.937	57	2.244	30	1.181	1.5	0.059	48.9	29.5	1.34	13.3	**UC309**	**UC309L3**	8.5	0.335	22	0.866	35	1.378	10	0.394	M10×1.25	–	1.33
–	1 7/8	90	3.543	51.6	2.031	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**UC210-30**	**UC210-30L3**	6	0.236	19	0.748	32.6	1.283	9	0.354	–	3/8-24UNF	0.87
–	1 15/16	90	3.543	51.6	2.031	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**UC210-31**	**UC210-31L3**	6	0.236	19	0.748	32.6	1.283	9	0.354	–	3/8-24UNF	0.82
		100	3.937	55.6	2.189	25	0.984	1.1	0.043	43.4	29.4	1.34	14.4	**UCX10-31**	**UCX10-31L3**	7	0.276	22.2	0.874	33.4	1.315	9	0.354	–	3/8-24UNF	1.32
50	–	90	3.543	51.6	2.031	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**UC210**	**UC210L3**	6	0.236	19	0.748	32.6	1.283	9	0.354	M10×1.25	–	0.80
		100	3.937	55.6	2.189	25	0.984	1.1	0.043	43.4	29.4	1.34	14.4	**UCX10**	**UCX10L3**	7	0.276	22.2	0.874	33.4	1.315	9	0.354	M10×1.25	–	1.29
		110	4.331	61	2.402	32	1.260	2	0.079	62.0	38.3	1.74	13.2	**UC310**	**UC310L3**	9	0.354	22	0.866	39	1.535	12	0.472	M12×1.5	–	1.69
–	2	90	3.543	51.6	2.031	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**UC210-32**	**UC210-32L3**	6	0.236	19	0.748	32.6	1.283	9	0.354	–	3/8-24UNF	0.78
		100	3.937	55.6	2.189	25	0.984	1.1	0.043	43.4	29.4	1.34	14.4	**UCX10-32**	**UCX10-32L3**	7	0.276	22.2	0.874	33.4	1.315	9	0.354	–	3/8-24UNF	1.26
–	2	100	3.937	55.6	2.189	25	0.984	1.5	0.059	43.4	29.4	1.34	14.4	**UC211-32**	**UC211-32L3**	7	0.276	22.2	0.874	33.4	1.315	9	0.354	–	3/8-24UNF	1.26
		120	4.724	66	2.598	34	1.339	2	0.079	71.6	45.0	2.05	13.2	**UC311-32**	**UC311-32L3**	10	0.394	25	0.984	41	1.614	12	0.472	M12×1.5	–	2.08
–	2 1/8	100	3.937	55.6	2.189	25	0.984	1.5	0.059	43.4	29.4	1.34	14.4	**UC211-34**	**UC211-34L3**	7	0.276	22.2	0.874	33.4	1.315	9	0.354	–	3/8-24UNF	1.15
55	–	100	3.937	55.6	2.189	25	0.984	1.5	0.059	43.4	29.4	1.34	14.4	**UC211**	**UC211L3**	7	0.276	22.2	0.874	33.4	1.315	9	0.354	M10×1.25	–	1.11
		110	4.331	65.1	2.563	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**UCX11**	**UCX11L3**	7.5	0.295	25.4	1.000	39.7	1.563	10.5	0.413	M10×1.25	–	1.80
		120	4.724	66	2.598	34	1.339	2	0.079	71.6	45.0	2.05	13.2	**UC311**	**UC311L3**	10	0.394	25	0.984	41	1.614	12	0.472	M12×1.5	–	1.90
–	2 3/16	100	3.937	55.6	2.189	25	0.984	1.5	0.059	43.4	29.4	1.34	14.4	**UC211-35**	**UC211-35L3**	7	0.276	22.2	0.874	33.4	1.315	9	0.354	–	3/8-24UNF	1.09
		110	4.331	65.1	2.563	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**UCX11-35**	**UCX11-35L3**	7.5	0.295	25.4	1.000	39.7	1.563	10.5	0.413	–	3/8-24UNF	1.78
–	2 1/4	110	4.331	65.1	2.563	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**UCX11-36**	**UCX11-36L3**	7.5	0.295	25.4	1.000	39.7	1.563	10.5	0.413	–	3/8-24UNF	1.7
–	2 1/4	110	4.331	65.1	2.563	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**UC212-36**	**UC212-36L3**	7.5	0.295	25.4	1.000	39.7	1.563	10.5	0.413	–	3/8-24UNF	1.67
60	–	110	4.331	65.1	2.563	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**UC212**	**UC212L3**	7.5	0.295	25.4	1.000	39.7	1.563	10.5	0.413	M10×1.25	–	1.54
		120	4.724	65.1	2.563	28	1.102	1.5	0.059	57.2	40.1	1.82	14.4	**UCX12**	**UCX12L3**	7.5	0.295	25.4	1.000	39.7	1.563	12	0.472	M12×1.5	–	2.05
		130	5.118	71	2.795	36	1.417	2.1	0.083	81.9	52.2	2.37	13.2	**UC312**	**UC312L3**	11.5	0.453	26	1.024	45	1.772	12	0.472	M12×1.5	–	2.60
–	2 3/8	110	4.331	65.1	2.563	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**UC212-38**	**UC212-38L3**	7.5	0.295	25.4	1.000	39.7	1.563	10.5	0.413	–	3/8-24UNF	1.52

Remarks 1. SU type product is the “compact” series insert bearing for unit.
2. From UC201 to 205 are the double-lip seal type products (L2).
3. With all bearings, the type with lock pin are H fittings.
However, bearings with a bearing number of UC313 or more, with lock pin type are J fittings.

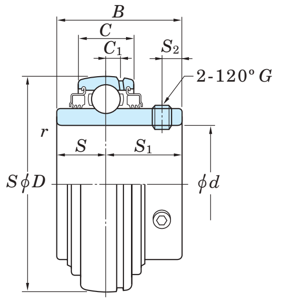
UC, SB, SU

Cylindrical bore (with set screws)

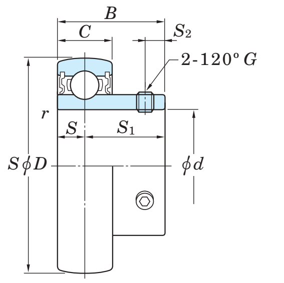
d (60) ~ 140 mm



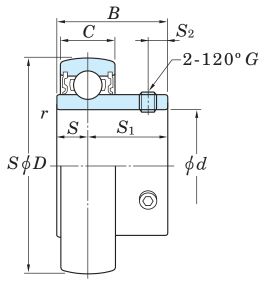
UC



UC-L3



SB



SU

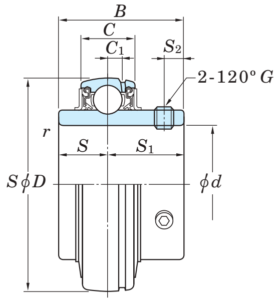
Shaft Dia. d mm	Shaft Dia. d inch	Dimensions D mm	D inch	B mm	B inch	C mm	C inch	r (min.) mm	r (min.) inch	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Bearing No. Standard	L3 Type	Dimensions C_1 mm	C_1 inch	S mm	S inch	S_1 mm	S_1 inch	S_2 mm	S_2 inch	Set Screw Size G mm	G inch	Mass kg
–	2 7/16	110	4.331	65.1	2.563	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**UC212-39**	**UC212-39L3**	7.5	0.295	25.4	1.000	39.7	1.563	10.5	0.413	–	3/8-24UNF	1.45
		120	4.724	65.1	2.563	28	1.102	1.5	0.059	57.2	40.1	1.82	14.4	**UCX12-39**	**UCX12-39L3**	7.5	0.295	25.4	1.000	39.7	1.563	12	0.472	–	1/2-20UNF	1.95
–	2 1/2	120	4.724	65.1	2.563	28	1.102	1.5	0.059	57.2	40.1	1.82	14.4	**UC213-40**	**UC213-40L3**	7.5	0.295	25.4	1.000	39.7	1.563	12	0.472	–	1/2-20UNF	1.94
		125	4.921	74.6	2.937	30	1.181	1.5	0.059	62.2	44.1	2.01	14.5	**UCX13-40**	**UCX13-40L3**	9	0.354	30.2	1.189	44.4	1.748	12	0.472	–	1/2-20UNF	2.61
		140	5.512	75	2.953	38	1.496	2.1	0.083	92.7	59.9	2.68	13.2	**UC313-40**	**UC313-40L3**	12	0.472	30	1.181	45	1.772	12	0.472	M12×1.5	–	3.24
65	–	120	4.724	65.1	2.563	28	1.102	1.5	0.059	57.2	40.1	1.82	14.4	**UC213**	**UC213L3**	7.5	0.295	25.4	1.000	39.7	1.563	12	0.472	M12×1.5	–	1.86
		125	4.921	74.6	2.937	30	1.181	1.5	0.059	62.2	44.1	2.01	14.5	**UCX13**	**UCX13L3**	9	0.354	30.2	1.189	44.4	1.748	12	0.472	M12×1.5	–	2.52
		140	5.512	75	2.953	38	1.496	2.1	0.083	92.7	59.9	2.68	13.2	**UC313**	**UC313L3**	12	0.472	30	1.181	45	1.772	12	0.472	M12×1.5	–	3.16
–	2 3/4	125	4.921	74.6	2.937	30	1.181	1.5	0.059	62.2	44.1	2.01	14.5	**UC214-44**	**UC214-44L3**	9	0.354	30.2	1.189	44.4	1.748	12	0.472	–	1/2-20UNF	2.06
		130	5.118	77.8	3.063	32	1.260	1.5	0.059	67.4	48.3	2.17	14.5	**UCX14-44**	**UCX14-44L3**	9	0.354	33.3	1.311	44.5	1.752	12	0.472	–	1/2-20UNF	2.75
		150	5.906	78	3.071	40	1.575	2.1	0.083	104	68.2	2.96	13.2	**UC314-44**	**UC314-44L3**	12.5	0.492	33	1.299	45	1.772	12	0.472	M12×1.5	–	3.91
70	–	125	4.921	74.6	2.937	30	1.181	1.5	0.059	62.2	44.1	2.01	14.5	**UC214**	**UC214L3**	9	0.354	30.2	1.189	44.4	1.748	12	0.472	M12×1.5	–	2.05
		130	5.118	77.8	3.063	32	1.260	1.5	0.059	67.4	48.3	2.17	14.5	**UCX14**	**UCX14L3**	9	0.354	33.3	1.311	44.5	1.752	12	0.472	M12×1.5	–	2.74
		150	5.906	78	3.071	40	1.575	2.1	0.083	104	68.2	2.96	13.2	**UC314**	**UC314L3**	12.5	0.492	33	1.299	45	1.772	12	0.472	M12×1.5	–	3.90
–	2 15/16	130	5.118	77.8	3.063	32	1.260	1.5	0.059	67.4	48.3	2.17	14.5	**UC215-47**	**UC215-47L3**	9	0.354	33.3	1.311	44.5	1.752	12	0.472	–	1/2-20UNF	2.23
		140	5.512	82.6	3.252	33	1.299	1.5	0.059	72.7	53.0	2.30	14.6	**UCX15-47**	**UCX15-47L3**	9	0.354	33.3	1.311	49.3	1.941	14	0.551	–	1/2-20UNF	3.43
		160	6.299	82	3.228	42	1.654	2.1	0.083	113	77.2	3.24	13.2	**UC315-47**	**UC315-47L3**	14.5	0.571	32	1.260	50	1.969	14	0.551	M14×1.5	–	4.72
75	–	130	5.118	77.8	3.063	32	1.260	1.5	0.059	67.4	48.3	2.17	14.5	**UC215**	**UC215L3**	9	0.354	33.3	1.311	44.5	1.752	12	0.472	M12×1.5	–	2.21
		140	5.512	82.6	3.252	33	1.299	1.5	0.059	72.7	53.0	2.30	14.6	**UCX15**	**UCX15L3**	9	0.354	33.3	1.311	49.3	1.941	14	0.551	M12×1.5	–	3.41
		160	6.299	82	3.228	42	1.654	2.1	0.083	113	77.2	3.24	13.2	**UC315**	**UC315L3**	14.5	0.571	32	1.260	50	1.969	14	0.551	M14×1.5	–	4.70
–	3	130	5.118	77.8	3.063	32	1.260	1.5	0.059	67.4	48.3	2.17	14.5	**UC215-48**	**UC215-48L3**	9	0.354	33.3	1.311	44.5	1.752	12	0.472	–	1/2-20UNF	2.12
		140	5.512	82.6	3.252	33	1.299	1.5	0.059	72.7	53.0	2.30	14.6	**UCX15-48**	**UCX15-48L3**	9	0.354	33.3	1.311	49.3	1.941	14	0.551	–	1/2-20UNF	3.32
		160	6.299	82	3.228	42	1.654	2.1	0.083	113	77.2	3.24	13.2	**UC315-48**	**UC315-48L3**	14.5	0.571	32	1.260	50	1.969	14	0.551	M14×1.5	–	4.61
–	3 1/8	140	5.512	82.6	3.252	33	1.299	2	0.079	72.7	53.0	2.30	14.6	**UC216-50**	**UC216-50L3**	9	0.354	33.3	1.311	49.3	1.941	14	0.551	–	1/2-20UNF	2.84
80	–	140	5.512	82.6	3.252	33	1.299	2	0.079	72.7	53.0	2.30	14.6	**UC216**	**UC216L3**	9	0.354	33.3	1.311	49.3	1.941	14	0.551	M12×1.5	–	2.79
		150	5.906	85.7	3.374	35	1.378	2	0.079	84.0	61.9	2.60	14.5	**UCX16**	**UCX16L3**	10	0.394	34.1	1.343	51.6	2.031	14	0.551	M12×1.5	–	3.87
		170	6.693	86	3.386	44	1.732	2.1	0.083	123	86.7	3.53	13.3	**UC316**	**UC316L3**	15	0.591	34	1.339	52	2.047	14	0.551	M14×1.5	–	5.60
–	3 1/4	150	5.906	85.7	3.374	35	1.378	2	0.079	84.0	61.9	2.60	14.5	**UC217-52**	**UC217-52L3**	10	0.394	34.1	1.343	51.6	2.031	14	0.551	–	1/2-20UNF	3.66
85	–	150	5.906	85.7	3.374	35	1.378	2	0.079	84.0	61.9	2.60	14.5	**UC217**	**UC217L3**	10	0.394	34.1	1.343	51.6	2.031	14	0.551	M12×1.5	–	3.45
		160	6.299	96	3.780	38	1.496	2	0.079	96.1	71.5	2.91	14.5	**UCX17**	**UCX17L3**	11	0.433	39.7	1.563	56.3	2.217	15	0.591	M12×1.5	–	5.05
		180	7.087	96	3.780	46	1.811	3	0.118	133	96.8	3.82	13.3	**UC317**	**UC317L3**	15	0.591	40	1.575	56	2.205	16	0.630	M16×1.5	–	6.90
–	3 7/16	160	6.299	96	3.780	38	1.496	2	0.079	96.1	71.5	2.91	14.5	**UCX17-55**	**UCX17-55L3**	11	0.433	39.7	1.563	56.3	2.217	15	0.591	–	1/2-20UNF	4.80
–	3 1/2	160	6.299	96	3.780	38	1.496	2	0.079	96.1	71.5	2.91	14.5	**UC218-56**	**UC218-56L3**	11	0.433	39.7	1.563	56.3	2.217	15	0.591	–	1/2-20UNF	4.46
		190	7.480	96	3.780	48	1.890	3	0.118	143	107	4.11	13.3	**UC318-56**	**UC318-56L3**	15.5	0.610	40	1.575	56	2.205	16	0.630	M16×1.5	–	8.03
90	–	160	6.299	96	3.780	38	1.496	2	0.079	96.1	71.5	2.91	14.5	**UC218**	**UC218L3**	11	0.433	39.7	1.563	56.3	2.217	15	0.591	M12×1.5	–	4.35
		170	6.693	104	4.094	40	1.575	2	0.079	109	81.9	3.23	14.4	**UCX18**	–	11.5	0.453	42.9	1.689	61.1	2.406	16	0.630	M14×1.5	–	6.00
		190	7.480	96	3.780	48	1.890	3	0.118	143	107	4.11	13.3	**UC318**	**UC318L3**	15.5	0.610	40	1.575	56	2.205	16	0.630	M16×1.5	–	7.87
95	–	200	7.874	103	4.055	50	1.969	3	0.118	153	119	4.45	13.3	**UC319**	**UC319L3**	16.5	0.650	41	1.614	62	2.441	18	0.709	M16×1.5	–	8.91
100	–	190	7.480	117.5	4.626	43	1.693	2.1	0.083	133	105	3.91	14.4	**UCX20**	–	13	0.512	49.2	1.937	68.3	2.689	18	0.709	M16×1.5	–	8.56
		215	8.465	108	4.252	54	2.126	3	0.118	173	141	5.08	13.2	**UC320**	**UC320L3**	18	0.709	42	1.654	66	2.598	20	0.787	M18×1.5	–	11.2
–	3 15/16	190	7.480	117.5	4.626	43	1.693	2.1	0.083	133	105	3.91	14.4	**UCX20-63**	–	13	0.512	49.2	1.937	68.3	2.689	18	0.709	–	5/8-18UNF	8.56
		215	8.465	108	4.252	54	2.126	3	0.118	173	141	5.08	13.2	**UC320-63**	**UC320-63L3**	18	0.709	42	1.654	66	2.598	20	0.787	M18×1.5	–	11.2
–	4	190	7.480	117.5	4.626	43	1.693	2.1	0.083	133	105	3.91	14.4	**UCX20-64**	–	13	0.512	49.2	1.937	68.3	2.689	18	0.709	–	5/8-18UNF	8.33
		215	8.465	108	4.252	54	2.126	3	0.118	173	141	5.08	13.2	**UC320-64**	**UC320-64L3**	18	0.709	42	1.654	66	2.598	20	0.787	M18×1.5	–	11.0
105	–	225	8.858	112	4.409	56	2.205	3	0.118	184	153	5.41	13.2	**UC321**	–	19	0.748	44	1.732	68	2.677	20	0.787	M18×1.5	–	12.7
110		240	9.449	117	4.606	60	2.362	3	0.118	205	180	6.15	13.2	**UC322**	**UC322L3**	20	0.787	46	1.811	71	2.795	20	0.787	M18×1.5	–	15.1
120		260	10.236	126	4.961	64	2.520	3	0.118	207	185	6.10	13.5	**UC324**	**UC324L3**	21	0.827	51	2.008	75	2.953	20	0.787	M18×1.5	–	19.0
130		280	11.024	135	5.315	68	2.677	4	0.157	229	214	6.79	13.6	**UC326**	**UC326L3**	22	0.866	54	2.126	81	3.189	20	0.787	M20×1.5	–	23.6
140		300	11.811	145	5.709	72	2.835	4	0.157	253	246	7.54	13.6	**UC328**	**UC328L3**	23	0.906	59	2.323	86	3.386	20	0.787	M20×1.5	–	29.4

Remarks 1. SU type product is the “compact” series insert bearing for unit.
2. From UC201 to 205 are the double-lip seal type products (L2).
3. With all bearings, the type with lock pin are H fittings.
However, bearings with a bearing number of UC313 or more, with lock pin type are J fittings.

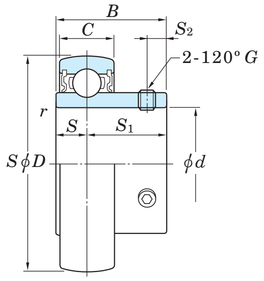
UC-S6, SU-S6 (Stainless-series)

Cylindrical bore (with set screws)

d 10 ~ 65 mm



UC-S6

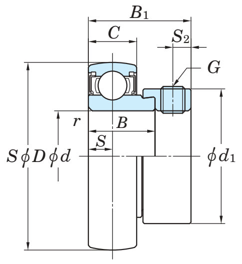


SU-S6

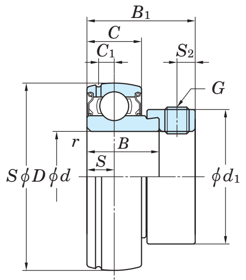
Shaft Dia. mm	Dimensions								Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Bearing No.	Dimensions								Set Screw Size *G*	Mass
d	*D*		*B*		*C*		*r* (min.)		C_r	C_{0r}	C_u	f_0		C_1		*S*		S_1		S_2		mm	kg
	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch		
10	26	1.024	15	0.591	8	0.315	0.3	0.012	3.9	1.55	0.070	12.3	**SU000S6**	–	–	5	0.197	10	0.394	3	0.118	M3×0.35	0.024
12	28	1.102	15	0.591	8	0.315	0.3	0.012	4.3	1.9	0.086	13.2	**SU001S6**	–	–	5	0.197	10	0.394	3	0.118	M3×0.35	0.026
	40	1.575	27.4	1.079	13	0.512	0.6	0.024	8.15	3.85	0.175	13.2	**UC201XS6**	3.5	0.138	11.5	0.453	15.9	0.626	4	0.157	M5×0.5	0.10
15	32	1.260	16.5	0.650	9	0.354	0.3	0.012	4.7	2.25	0.102	13.9	**SU002S6**	–	–	5.5	0.217	11	0.433	3.3	0.130	M4×0.5	0.038
	40	1.575	27.4	1.079	13	0.512	0.6	0.024	8.15	3.85	0.175	13.2	**UC202XS6**	3.5	0.138	11.5	0.453	15.9	0.626	4	0.157	M5×0.5	0.10
17	35	1.378	17.5	0.689	10	0.394	0.3	0.012	5.1	2.6	0.118	14.4	**SU003S6**	–	–	6	0.236	11.5	0.453	3.3	0.130	M4×0.5	0.050
	40	1.575	27.4	1.079	13	0.512	0.6	0.024	8.15	3.85	0.175	13.2	**UC203XS6**	3.5	0.138	11.5	0.453	15.9	0.626	4	0.157	M5×0.5	0.10
20	42	1.654	21	0.827	12	0.472	0.6	0.024	7.9	4	0.182	13.9	**SU004S6**	–	–	7	0.276	14	0.551	4	0.157	M5×0.5	0.080
	47	1.850	31	1.220	16	0.630	1	0.039	10.9	5.35	0.243	13.2	**UC204S6**	4	0.157	12.7	0.500	18.3	0.720	5	0.197	M6×0.75	0.16
25	47	1.850	22	0.866	12	0.472	0.6	0.024	8.5	4.65	0.211	14.5	**SU005S6**	–	–	7	0.276	15	0.591	4.5	0.177	M5×0.5	0.10
	52	2.047	34.1	1.343	17	0.669	1	0.039	11.9	6.3	0.286	13.9	**UC205S6**	5	0.197	14.3	0.563	19.8	0.780	5.5	0.217	M6×0.75	0.20
30	55	2.165	24.5	0.965	13	0.512	1	0.039	11.2	6.6	0.300	14.7	**SU006S6**	–	–	7.5	0.295	17	0.669	5.5	0.217	M5×0.5	0.15
	62	2.441	38.1	1.500	19	0.748	1	0.039	16.5	9.05	0.411	13.9	**UC206S6**	5	0.197	15.9	0.626	22.2	0.874	6	0.236	M6×0.75	0.32
35	72	2.835	42.9	1.689	20	0.787	1.1	0.043	21.8	12.3	0.559	13.9	**UC207S6**	5.5	0.217	17.5	0.689	25.4	1.000	6.5	0.256	M8×1	0.48
40	80	3.150	49.2	1.937	21	0.827	1.1	0.043	24.8	14.3	0.650	14.0	**UC208S6**	6	0.236	19	0.748	30.2	1.189	8	0.315	M8×1	0.64
45	85	3.346	49.2	1.937	22	0.866	1.1	0.043	27.8	16.2	0.736	14.0	**UC209S6**	6	0.236	19	0.748	30.2	1.189	8	0.315	M8×1	0.68
50	90	3.543	51.6	2.031	24	0.945	1.1	0.043	29.8	18.6	0.845	14.4	**UC210S6**	6	0.236	19	0.748	32.6	1.283	9	0.354	M8×1	0.80
55	100	3.937	55.6	2.189	25	0.984	1.5	0.059	36.8	23.5	1.07	14.4	**UC211S6**	7	0.276	22.2	0.874	33.4	1.315	9	0.354	M10×1.25	1.11
60	110	4.331	65.1	2.563	27	1.063	1.5	0.059	44.5	29.0	1.32	14.4	**UC212S6**	7.5	0.295	25.4	1.000	39.7	1.563	10.5	0.413	M10×1.25	1.54
65	120	4.724	65.1	2.563	28	1.102	1.5	0.059	48.6	32.1	1.46	14.4	**UC213S6**	7.5	0.295	25.4	1.000	39.7	1.563	12	0.472	M12×1.5	1.86

Remarks 1. S6 series product is the stainless-series insert bearing for unit.
2. S6 series products with lock pin type are J fittings.

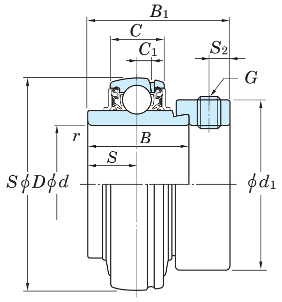
SA, SA-F, NA
Cylindrical bore
(with eccentric locking collar)
d 12 ~ (30) mm



SA



SA-F



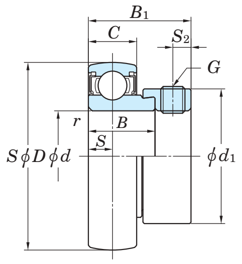
NA

Shaft Dia d		Dimensions										Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Bearing No.	Dimensions								Set Screw Size G		Mass
		D		B		B_1		C		r (min.)		C_r	C_{0r}	C_u	f_0		C_1		S		S_2		d_1				
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg
12	–	40	1.575	19	0.784	28.5	1.122	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SA201**	–	–	6	0.236	4.8	0.189	28.6	1.126	M6×0.75	–	0.13
		40	1.575	19.1	0.752	28.6	1.126	13	0.512	0.6	0.024	9.55	4.80	0.218	13.2	**SA201F**	3.4	0.134	6.5	0.256	4.8	0.189	28.6	1.126	M6×0.75	–	0.13
		47	1.850	34.2	1.346	43.7	1.720	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**NA201**	4	0.157	17.1	0.673	4.8	0.189	33.3	1.311	M6×0.75	–	0.29
–	1/2	40	1.575	19	0.784	28.5	1.122	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SA201-8**	–	–	6	0.236	4.8	0.189	28.6	1.126	–	1/4-28UNF	0.13
		40	1.575	19.1	0.752	28.6	1.126	13	0.512	0.6	0.024	9.55	4.80	0.218	13.2	**SA201-8F**	3.4	0.134	6.5	0.256	4.8	0.189	28.6	1.126	–	1/4-28UNF	0.13
		47	1.850	34.2	1.346	43.7	1.720	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**NA201-8**	4	0.157	17.1	0.673	4.8	0.189	33.3	1.311	–	1/4-28UNF	0.29
15	–	40	1.575	19	0.784	28.5	1.122	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SA202**	–	–	6	0.236	4.8	0.189	28.6	1.126	M6×0.75	–	0.13
		40	1.575	19.1	0.752	28.6	1.126	13	0.512	0.6	0.024	9.55	4.80	0.218	13.2	**SA202F**	3.4	0.134	6.5	0.256	4.8	0.189	28.6	1.126	M6×0.75	–	0.13
		47	1.850	34.2	1.346	43.7	1.720	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**NA202**	4	0.157	17.1	0.673	4.8	0.189	33.3	1.311	M6×0.75	–	0.27
–	5/8	40	1.575	19	0.784	28.5	1.122	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SA202-10**	–	–	6	0.236	4.8	0.189	28.6	1.126	–	1/4-28UNF	0.13
		47	1.850	34.2	1.346	43.7	1.720	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**NA202-10**	4	0.157	17.1	0.673	4.8	0.189	33.3	1.311	–	1/4-28UNF	0.26
17	–	40	1.575	19	0.784	28.5	1.122	12	0.472	0.6	0.024	9.55	4.80	0.218	13.2	**SA203**	–	–	6	0.236	4.8	0.189	28.6	1.126	M6×0.75	–	0.13
		40	1.575	19.1	0.752	28.6	1.126	13	0.512	0.6	0.024	9.55	4.80	0.218	13.2	**SA203F**	3.4	0.134	6.5	0.256	4.8	0.189	28.6	1.126	M6×0.75	–	0.13
		47	1.850	34.2	1.346	43.7	1.720	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**NA203**	4	0.157	17.1	0.673	4.8	0.189	33.3	1.311	M6×0.75	–	0.25
–	3/4	47	1.850	20	0.787	29.5	1.161	14	0.551	1	0.039	12.8	6.65	0.302	13.2	**SA204-12**	–	–	7	0.276	4.8	0.189	33.3	1.311	–	1/4-28UNF	0.15
		47	1.850	21.5	0.846	31	1.220	15	0.591	1	0.039	12.8	6.65	0.302	13.2	**SA204-12F**	3.7	0.146	7.5	0.295	4.8	0.189	33.3	1.311	–	1/4-28UNF	0.19
		47	1.850	34.2	1.346	43.7	1.720	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**NA204-12**	4	0.157	17.1	0.673	4.8	0.189	33.3	1.311	–	1/4-28UNF	0.23
20	–	47	1.850	20	0.787	29.5	1.161	14	0.551	1	0.039	12.8	6.65	0.302	13.2	**SA204**	–	–	7	0.276	4.8	0.189	33.3	1.311	M6×0.75	–	0.15
		47	1.850	21.5	0.846	31	1.220	15	0.591	1	0.039	12.8	6.65	0.302	13.2	**SA204F**	3.7	0.146	7.5	0.295	4.8	0.189	33.3	1.311	M6×0.75	–	0.19
		47	1.850	34.2	1.346	43.7	1.720	16	0.630	1	0.039	12.8	6.65	0.302	13.2	**NA204**	4	0.157	17.1	0.673	4.8	0.189	33.3	1.311	M6×0.75	–	0.22
–	7/8	52	2.047	21	0.827	30.5	1.201	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SA205-14**	–	–	7.5	0.295	4.8	0.189	38.1	1.500	–	1/4-28UNF	0.22
		52	2.047	34.9	1.374	44.4	1.748	17	0.669	1	0.039	14.0	7.85	0.357	13.9	**NA205-14**	5	0.197	17.5	0.689	4.8	0.189	38.1	1.500	–	1/4-28UNF	0.27
–	15/16	52	2.047	21	0.827	30.5	1.201	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SA205-15**	–	–	7.5	0.295	4.8	0.189	38.1	1.500	–	1/4-28UNF	0.22
		52	2.047	21.5	0.846	31	1.220	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SA205-15F**	3.7	0.146	7.5	0.295	4.8	0.189	38.1	1.500	–	1/4-28UNF	0.23
		52	2.047	34.9	1.374	44.4	1.748	17	0.669	1	0.039	14.0	7.85	0.357	13.9	**NA205-15**	5	0.197	17.5	0.689	4.8	0.189	38.1	1.500	–	1/4-28UNF	0.29
25	–	52	2.047	21	0.827	30.5	1.201	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SA205**	–	–	7.5	0.295	4.8	0.189	38.1	1.500	M6×0.75	–	0.22
		52	2.047	21.5	0.846	31	1.220	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SA205F**	3.7	0.146	7.5	0.295	4.8	0.189	38.1	1.500	M6×0.75	–	0.23
		52	2.047	34.9	1.374	44.4	1.748	17	0.669	1	0.039	14.0	7.85	0.357	13.9	**NA205**	5	0.197	17.5	0.689	4.8	0.189	38.1	1.500	M6×0.75	–	0.25
–	1	52	2.047	21	0.827	30.5	1.201	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SA205-16**	–	–	7.5	0.295	4.8	0.189	38.1	1.500	–	1/4-28UNF	0.22
		52	2.047	21.5	0.846	31	1.220	15	0.591	1	0.039	14.0	7.85	0.357	13.9	**SA205-16F**	3.7	0.146	7.5	0.295	4.8	0.189	38.1	1.500	–	1/4-28UNF	0.23
		52	2.047	34.9	1.374	44.4	1.748	17	0.669	1	0.039	14.0	7.85	0.357	13.9	**NA205-16**	5	0.197	17.5	0.689	4.8	0.189	38.1	1.500	–	1/4-28UNF	0.25
–	1 1/8	62	2.441	22	0.866	33.9	1.335	16	0.630	1	0.039	19.5	11.3	0.514	13.9	**SA206-18**	–	–	8	0.315	6	0.236	44.5	1.752	–	5/16-24UNF	0.3
		62	2.441	23.8	0.937	35.7	1.406	18	0.709	1	0.039	19.5	11.3	0.514	13.9	**SA206-18F**	4.7	0.185	9	0.354	6	0.236	44.5	1.752	–	5/16-24UNF	0.34
		62	2.441	36.5	1.437	48.4	1.906	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**NA206-18**	5	0.197	18.3	0.720	6	0.236	44.5	1.752	–	5/16-24UNF	0.43
30	–	62	2.441	22	0.866	33.9	1.335	16	0.630	1	0.039	19.5	11.3	0.514	13.9	**SA206**	–	–	8	0.315	6	0.236	44.5	1.752	M8×1	–	0.3
		62	2.441	23.8	0.937	35.7	1.406	18	0.709	1	0.039	19.5	11.3	0.514	13.9	**SA206F**	4.7	0.185	9	0.354	6	0.236	44.5	1.752	M8×1	–	0.34
		62	2.441	36.5	1.437	48.4	1.906	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**NA206**	5	0.197	18.3	0.720	6	0.236	44.5	1.752	M8×1	–	0.41
–	1 3/16	62	2.441	22	0.866	33.9	1.335	16	0.630	1	0.039	19.5	11.3	0.514	13.9	**SA206-19**	–	–	8	0.315	6	0.236	44.5	1.752	–	5/16-24UNF	0.3
		62	2.441	23.8	0.937	35.7	1.406	18	0.709	1	0.039	19.5	11.3	0.514	13.9	**SA206-19F**	4.7	0.185	9	0.354	6	0.236	44.5	1.752	–	5/16-24UNF	0.34
		62	2.441	36.5	1.437	48.4	1.906	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**NA206-19**	5	0.197	18.3	0.720	6	0.236	44.5	1.752	–	5/16-24UNF	0.41
–	1 1/4	62	2.441	22	0.866	33.9	1.335	16	0.630	1	0.039	19.5	11.3	0.514	13.9	**SA206-20**	–	–	8	0.315	6	0.236	44.5	1.752	–	5/16-24UNF	0.3
		62	2.441	23.8	0.937	35.7	1.406	18	0.709	1	0.039	19.5	11.3	0.514	13.9	**SA206-20F**	4.7	0.185	9	0.354	6	0.236	44.5	1.752	–	5/16-24UNF	0.34
		62	2.441	36.5	1.437	48.4	1.906	19	0.748	1	0.039	19.5	11.3	0.514	13.9	**NA206-20**	5	0.197	18.3	0.720	6	0.236	44.5	1.752	–	5/16-24UNF	0.38
–	1 1/4	72	2.835	23	0.906	36.5	1.437	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SA207-20**	–	–	8.5	0.335	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.5
		72	2.835	25.4	1.000	38.9	1.531	19	0.748	1.1	0.043	25.7	15.4	0.700	13.9	**SA207-20F**	5.7	0.224	9.5	0.335	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.57
		72	2.835	37.6	1.480	51.1	2.012	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**NA207-20**	5.5	0.217	18.8	0.740	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.68
–	1 5/16	72	2.835	23	0.906	36.5	1.437	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SA207-21**	–	–	8.5	0.335	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.5
		72	2.835	25.4	1.000	38.9	1.531	19	0.748	1.1	0.043	25.7	15.4	0.700	13.9	**SA207-21F**	5.7	0.224	9.5	0.335	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.57
		72	2.835	37.6	1.480	51.1	2.012	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**NA207-21**	5.5	0.217	18.8	0.740	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.65

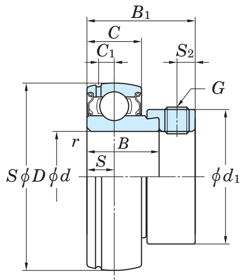
Remark Of all the products, the lock pin types are H fittings.

SA, SA-F, NA

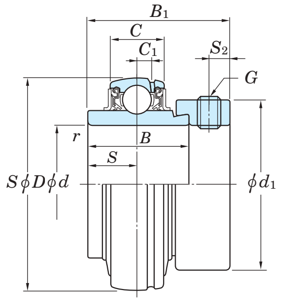
Cylindrical bore
(with eccentric locking collar)
d (30) ~ 75 mm



SA



SA-F



NA

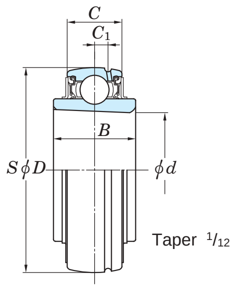
Shaft Dia		Dimensions										Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Bearing No.	Dimensions								Set Screw Size G		Mass
d		D		B		B_1		C		r (min.)		C_r	C_{0r}	C_u	f_0		C_1		S		S_2		d_1				
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg
–	1 3/8	72	2.835	23	0.906	36.5	1.437	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SA207-22**	–	–	8.5	0.335	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.5
		72	2.835	25.4	1.000	38.9	1.531	19	0.748	1.1	0.043	25.7	15.4	0.700	13.9	**SA207-22F**	5.7	0.224	9.5	0.335	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.57
		72	2.835	37.6	1.480	51.1	2.012	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**NA207-22**	5.5	0.217	18.8	0.740	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.61
35	–	72	2.835	23	0.906	36.5	1.437	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SA207**	–	–	8.5	0.335	6.8	0.268	55.6	2.189	M8×1	–	0.5
		72	2.835	25.4	1.000	38.9	1.531	19	0.748	1.1	0.043	25.7	15.4	0.700	13.9	**SA207F**	5.7	0.224	9.5	0.335	6.8	0.268	55.6	2.189	M8×1	–	0.57
		72	2.835	37.6	1.480	51.1	2.012	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**NA207**	5.5	0.217	18.8	0.740	6.8	0.268	55.6	2.189	M8×1	–	0.61
–	1 7/16	72	2.835	23	0.906	36.5	1.437	17	0.669	1.1	0.043	25.7	15.4	0.700	13.9	**SA207-23**	–	–	8.5	0.335	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.5
		72	2.835	25.4	1.000	38.9	1.531	19	0.748	1.1	0.043	25.7	15.4	0.700	13.9	**SA207-23F**	5.7	0.224	9.5	0.335	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.57
		72	2.835	37.6	1.480	51.1	2.012	20	0.787	1.1	0.043	25.7	15.4	0.700	13.9	**NA207-23**	5.5	0.217	18.8	0.740	6.8	0.268	55.6	2.189	–	5/16-24UNF	0.58
–	1 1/2	80	3.150	27	1.063	40.5	1.595	18	0.709	1.1	0.043	29.1	17.8	0.809	14.0	**SA208-24**	–	–	9	0.354	6.8	0.268	60.3	2.374	–	5/16-24UNF	0.67
		80	3.150	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	29.1	17.8	0.809	14.0	**SA208-24F**	6.4	0.252	11	0.433	6.8	0.268	60.3	2.374	–	5/16-24UNF	0.75
		80	3.150	42.8	1.685	56.3	2.217	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**NA208-24**	6	0.236	21.4	0.843	6.8	0.268	60.3	2.374	–	5/16-24UNF	0.83
–	1 9/16	80	3.150	27	1.063	40.5	1.595	18	0.709	1.1	0.043	29.1	17.8	0.809	14.0	**SA208-25**	–	–	9	0.354	6.8	0.268	60.3	2.374	–	5/16-24UNF	0.67
		80	3.150	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	29.1	17.8	0.809	14.0	**SA208-25F**	6.4	0.252	11	0.433	6.8	0.268	60.3	2.374	–	5/16-24UNF	0.75
		80	3.150	42.8	1.685	56.3	2.217	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**NA208-25**	6	0.236	21.4	0.843	6.8	0.268	60.3	2.374	–	5/16-24UNF	0.79
40	–	80	3.150	27	1.063	40.5	1.595	18	0.709	1.1	0.043	29.1	17.8	0.809	14.0	**SA208**	–	–	9	0.354	6.8	0.268	60.3	2.374	M8×1	–	0.67
		80	3.150	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	29.1	17.8	0.809	14.0	**SA208F**	6.4	0.252	11	0.433	6.8	0.268	60.3	2.374	M8×1	–	0.75
		80	3.150	42.8	1.685	56.3	2.217	21	0.827	1.1	0.043	29.1	17.8	0.809	14.0	**NA208**	6	0.236	21.4	0.843	6.8	0.268	60.3	2.374	M8×1	–	0.78
–	1 5/8	85	3.346	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**SA209-26F**	6	0.236	11	0.433	6.8	0.268	63.5	2.500	–	5/16-24UNF	0.82
		85	3.346	42.8	1.685	56.3	2.217	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**NA209-26**	6	0.236	21.4	0.843	6.8	0.268	63.5	2.500	–	5/16-24UNF	0.96
–	1 11/16	85	3.346	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**SA209-27F**	6	0.236	11	0.433	6.8	0.268	63.5	2.500	–	5/16-24UNF	0.82
		85	3.346	42.8	1.685	56.3	2.217	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**NA209-27**	6	0.236	21.4	0.843	6.8	0.268	63.5	2.500	–	5/16-24UNF	0.91
–	1 3/4	85	3.346	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**SA209-28F**	6	0.236	11	0.433	6.8	0.268	63.5	2.500	–	5/16-24UNF	0.82
		85	3.346	42.8	1.685	56.3	2.217	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**NA209-28**	6	0.236	21.4	0.843	6.8	0.268	63.5	2.500	–	5/16-24UNF	0.87
45	–	85	3.346	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**SA209F**	6	0.236	11	0.433	6.8	0.268	63.5	2.500	M8×1	–	0.82
		85	3.346	42.8	1.685	56.3	2.217	22	0.866	1.1	0.043	34.1	21.3	0.968	14.0	**NA209**	6	0.236	21.4	0.843	6.8	0.268	63.5	2.500	M8×1	–	0.85
–	1 7/8	90	3.543	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	35.1	23.3	1.06	14.4	**SA210-30F**	6.6	0.260	11	0.433	6.8	0.268	69.9	2.752	–	5/16-24UNF	0.85
		90	3.543	49.2	1.937	62.7	2.469	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**NA210-30**	6	0.236	24.6	0.969	6.8	0.268	69.9	2.752	–	5/16-24UNF	1.08
–	1 15/16	90	3.543	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	35.1	23.3	1.06	14.4	**SA210-31F**	6.6	0.260	11	0.433	6.8	0.268	69.9	2.752	–	5/16-24UNF	0.85
		90	3.543	49.2	1.937	62.7	2.469	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**NA210-31**	6	0.236	24.6	0.969	6.8	0.268	69.9	2.752	–	5/16-24UNF	1.04
50	–	90	3.543	30.2	1.189	43.7	1.720	22	0.866	1.1	0.043	35.1	23.3	1.06	14.4	**SA210F**	6.6	0.260	11	0.433	6.8	0.268	69.9	2.752	M8×1	–	0.85
		90	3.543	49.2	1.937	62.7	2.469	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**NA210**	6	0.236	24.6	0.969	6.8	0.268	69.9	2.752	M8×1	–	1.01
–	2	90	3.543	49.2	1.937	62.7	2.469	24	0.945	1.1	0.043	35.1	23.3	1.06	14.4	**NA210-32**	6	0.236	24.6	0.969	6.8	0.268	69.9	2.752	–	5/16-24UNF	0.99
		100	3.937	32.4	1.276	48.4	1.906	24	0.945	1.5	0.059	43.4	29.4	1.34	14.4	**SA211-32F**	7	0.276	12	0.472	8	0.315	76.2	3.000	–	3/8-24UNF	1.2
		100	3.937	55.5	2.185	71.4	2.811	25	0.984	1.5	0.059	43.4	29.4	1.34	14.4	**NA211-32**	7	0.276	27.8	1.094	8	0.315	76.2	3.000	–	3/8-24UNF	1.58
–	2 1/8	100	3.937	32.4	1.276	48.4	1.906	24	0.945	1.5	0.059	43.4	29.4	1.34	14.4	**SA211-34F**	7	0.276	12	0.472	8	0.315	76.2	3.000	–	3/8-24UNF	1.2
		100	3.937	55.5	2.185	71.4	2.811	25	0.984	1.5	0.059	43.4	29.4	1.34	14.4	**NA211-34**	7	0.276	27.8	1.094	8	0.315	76.2	3.000	–	3/8-24UNF	1.49
55	–	100	3.937	32.4	1.276	48.4	1.906	24	0.945	1.5	0.059	43.4	29.4	1.34	14.4	**SA211F**	7	0.276	12	0.472	8	0.315	76.2	3.000	M10×1.25	–	1.2
		100	3.937	55.5	2.185	71.4	2.811	25	0.984	1.5	0.059	43.4	29.4	1.34	14.4	**NA211**	7	0.276	27.8	1.094	8	0.315	76.2	3.000	M10×1.25	–	1.39
–	2 3/16	100	3.937	32.4	1.276	48.4	1.906	24	0.945	1.5	0.059	43.4	29.4	1.34	14.4	**SA211-35F**	7	0.276	12	0.472	8	0.315	76.2	3.000	–	3/8-24UNF	1.2
		100	3.937	55.5	2.185	71.4	2.811	25	0.984	1.5	0.059	43.4	29.4	1.34	14.4	**NA211-35**	7	0.276	27.8	1.094	8	0.315	76.2	3.000	–	3/8-24UNF	1.36
60	2 1/4	110	4.331	61.9	2.437	77.8	3.063	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**NA212-36**	7.5	0.295	31	1.220	8	0.315	84.2	3.315	–	3/8-24UNF	2.03
		110	4.331	61.9	2.437	77.8	3.063	27	1.063	1.5	0.059	52.4	36.2	1.65	14.4	**NA212**	7.5	0.295	31	1.220	8	0.315	84.2	3.315	M10×1.25	–	1.87
65	2 1/2	120	4.724	68.2	2.685	85.7	3.374	28	1.102	1.5	0.059	57.2	40.1	1.82	14.4	**NA213-40**	7.5	0.295	34.1	1.343	8.5	0.335	92	3.622	–	3/8-24UNF	2.51
		120	4.724	68.2	2.685	85.7	3.374	28	1.102	1.5	0.059	57.2	40.1	1.82	14.4	**NA213**	7.5	0.295	34.1	1.343	8.5	0.335	92	3.622	M10×1.25	–	2.45
70	2 3/4	125	4.921	68.2	2.685	85.7	3.374	30	1.181	1.5	0.059	62.2	44.1	2.01	14.5	**NA214-44**	9	0.354	34.1	1.343	8.5	0.335	97	3.819	–	3/8-24UNF	2.94
		125	4.921	68.2	2.685	85.7	3.374	30	1.181	1.5	0.059	62.2	44.1	2.01	14.5	**NA214**	9	0.354	34.1	1.343	8.5	0.335	97	3.819	M10×1.25	–	2.92
75		130	5.118	74.6	2.937	92.1	3.626	32	1.260	1.5	0.059	67.4	48.3	2.17	14.5	**NA215**	9	0.354	37.3	1.469	8.5	0.335	102	4.016	M10×1.25	–	2.74
	3	130	5.118	74.6	2.937	92.1	3.626	32	1.260	1.5	0.059	67.4	48.3	2.17	14.5	**NA215-48**	9	0.354	37.3	1.469	8.5	0.335	102	4.016	–	3/8-24UNF	2.72

Remark Of all the products, the lock pin types are H fittings.

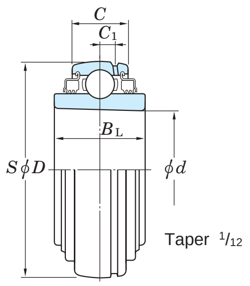
UK

Tapered bore (with adapter)

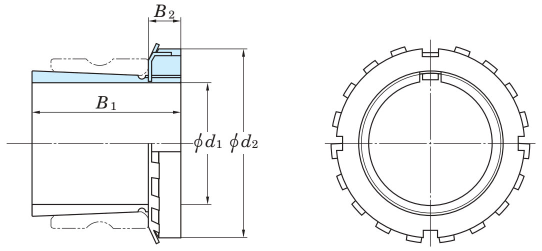
d_1 20 ~ (50) mm



UK



UK-L3



Adapter Assembly

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm						Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Bearing No.		Mass kg		H23 Series Adapter					
d_1		d	D	B	B_L	C	C_1	C_r	C_{0r}	C_u	f_0	Standard	L3 Type	Standard	L3 Type	Adapter Assembly No.	B_1	B_2	d_2	Mass kg	Sleeve No.
20	3/4	0.984 25	2.047 52	0.945 24	0.945 24	0.669 17	0.197 5	14.0	7.85	0.357	13.9	**UK205**	**UK205L2**	0.18	0.18	HE2305X H2305X	1.378 35	0.315 8	1.496 38	0.095	AE2305X A2305X
	3/4	0.984 25	2.441 62	1.063 27	– –	0.748 19	0.197 5	19.5	11.3	0.514	13.9	**UKX05**	–	0.27	–	HE2305X H2305X	1.378 35	0.315 8	1.496 38	0.095	AE2305X A2305X
	3/4	0.984 25	2.441 62	1.063 27	– –	0.866 22	0.236 6	21.2	10.9	0.495	12.6	**UK305**	–	0.40	–	HE2305X H2305X	1.378 35	0.315 8	1.496 38	0.095	AE2305X A2305X
25	1	1.181 30	2.441 62	1.063 27	1.063 27	0.748 19	0.197 5	19.5	11.3	0.514	13.9	**UK206**	**UK206L3**	0.29	0.29	H2306X HE2306X	1.496 38	0.315 8	1.772 45	0.13	A2306X HE2306X
	1	1.181 30	2.835 72	1.181 30	– –	0.787 20	0.217 5.5	25.7	15.4	0.700	13.9	**UKX06**	–	0.43	–	H2306X HE2306X	1.496 38	0.315 8	1.772 45	0.13	A2306X HE2306X
	1	1.181 30	2.835 72	1.181 30	– –	0.945 24	0.256 6.5	26.7	15.0	0.682	13.3	**UK306**	–	0.47	–	H2306X HE2306X	1.496 38	0.315 8	1.772 45	0.13	A2306X HE2306X
30	1 1/8	1.378 35	2.835 72	1.181 30	1.181 30	0.787 20	0.217 5.5	25.7	15.4	0.700	13.9	**UK207**	**UK207L3**	0.43	0.43	HS2307X H2307X	1.693 43	0.354 9	2.047 52	0.17	AS2307X A2307X
	1 1/8	1.378 35	3.150 80	1.339 34	– –	0.827 21	0.236 6	29.1	17.8	0.809	14.0	**UKX07**	–	0.53	–	HS2307X H2307X	1.693 43	0.354 9	2.047 52	0.17	AS2307X A2307X
	1 1/8	1.378 35	3.150 80	1.299 33	1.299 33	1.024 26	0.295 7.5	33.4	19.3	0.877	13.2	**UK307**	**UK307L3**	0.60	0.60	HS2307X H2307X	1.693 43	0.354 9	2.047 52	0.17	AS2307X A2307X
35	1 1/4 1 3/8	1.575 40	3.150 80	1.339 34	1.339 34	0.827 21	0.236 6	29.1	17.8	0.809	14.0	**UK208**	**UK208L3**	0.58	0.58	HE2308X HS2308X H2308X	1.811 46	0.394 10	2.283 58	0.22	AE2308X AS2308X A2308X
	1 1/4 1 3/8	1.575 40	3.346 85	1.417 36	– –	0.866 22	0.236 6	34.1	21.3	0.968	14.0	**UKX08**	–	0.58	–	HE2308X HS2308X H2308X	1.811 46	0.394 10	2.283 58	0.22	AE2308X AS2308X A2308X
	1 1/4 1 3/8	1.575 40	3.543 90	1.378 35	1.378 35	1.102 28	0.315 8	40.7	24.0	1.09	13.2	**UK308**	**UK308L3**	0.80	0.80	HE2308X HS2308X H2308X	1.811 46	0.394 10	2.283 58	0.22	AE2308X AS2308X A2308X
40	1 1/2	1.772 45	3.346 85	1.417 36	1.417 36	0.866 22	0.236 6	34.1	21.3	0.968	14.0	**UK209**	**UK209L3**	0.65	0.65	HE2309X H2309X	1.969 50	0.433 11	2.559 65	0.28	AE2309X A2309X
	1 1/2	1.772 45	3.543 90	1.417 36	– –	0.945 24	0.236 6	35.1	23.3	1.06	14.4	**UKX09**	–	0.67	–	HE2309X H2309X	1.969 50	0.433 11	2.559 65	0.28	AE2309X A2309X
	1 1/2	1.772 45	3.937 100	1.496 38	1.496 38	1.181 30	0.335 8.5	48.9	29.5	1.34	13.3	**UK309**	**UK309L3**	1.08	1.08	HE2309X H2309X	1.969 50	0.433 11	2.559 65	0.28	AE2309X A2309X
45	1 3/4	1.969 50	3.543 90	1.417 36	1.417 36	0.945 24	0.236 6	35.1	23.3	1.06	14.4	**UK210**	**UK210L3**	0.65	0.65	HE2310X H2310X	2.165 55	0.472 12	2.756 70	0.36	AE2310X A2310X
	1 3/4	1.969 50	3.937 100	1.575 40	– –	0.984 25	0.276 7	43.4	29.4	1.34	14.4	**UKX10**	–	0.89	–	HE2310X H2310X	2.165 55	0.472 12	2.756 70	0.36	AE2310X A2310X
	1 3/4	1.969 50	4.331 110	1.575 40	1.575 40	1.260 32	0.354 9	62.0	38.3	1.74	13.2	**UK310**	**UK310L3**	1.38	1.38	HE2310X H2310X	2.165 55	0.472 12	2.756 70	0.36	AE2310X A2310X
50	1 7/8 2	2.165 55	3.937 100	1.575 40	1.575 40	0.984 25	0.276 7	43.4	29.4	1.34	14.4	**UK211**	**UK211L3**	1.09	1.09	HS2311X H2311X HE2311X	2.323 59	0.472 12	2.953 75	0.42	AS2311X A2311X AE2311X
	1 7/8 2	2.165 55	4.331 110	1.850 47	– –	1.063 27	0.295 7.5	52.4	36.2	1.65	14.4	**UKX11**	–	1.15	–	HS2311X H2311X HE2311X	2.323 59	0.472 12	2.953 75	0.42	AS2311X A2311X AE2311X

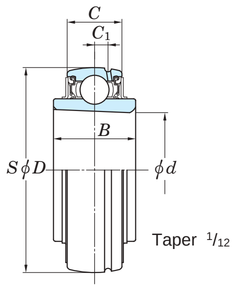
Remarks 1. In Part No. of unit with adapters, Part No. of applicable adapters follow the Part No. shown in the dimensional tables.
(Example of Part No. : UK206 + H2306X, UK206L3 + H2306X)

2. Adapter series applicable to UK200 series
UK200....................... H2300X series
UK200L3 (or L2) .... H2300X series
3. UK205 is the double-lip seal type product (L2).
4. Inch bore diameter series adapters are also available (see the dimensional tables of adapters assemblies).
5. Of all the products, the lock pin types are H fittings.

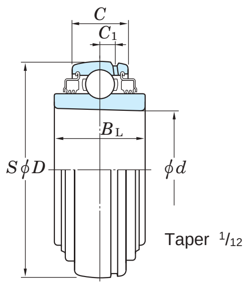
UK

Tapered bore (with adapter)

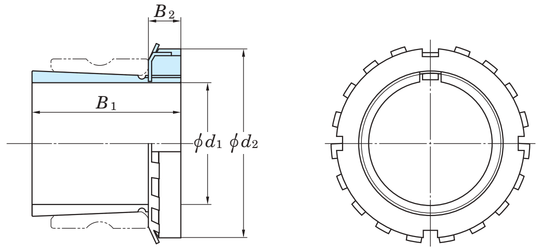
d_1 (50) ~ (90) mm



UK



UK-L3



Adapter Assembly

Shaft Dia.		Dimensions						Basic Load Ratings		Fatigue Load Limit	Factor	Bearing No.		Mass		H23 Series Adapter					
mm	inch	inch mm						kN		kN				kg		Adapter Assembly No.	Dimensions inch mm			Mass	Sleeve No.
d_1		d	D	B	B_L	C	C_1	C_r	C_{0r}	C_u	f_0	Standard	L3 Type	Standard	L3 Type		B_1	B_2	d_2	kg	
50	1 7/8 2	2.165 55	4.724 120	1.693 43	1.693 43	1.339 34	0.394 10	71.6	45.0	2.05	13.2	**UK311**	**UK311L3**	1.78	1.78	HS2311X H2311X HE2311X	2.323 59	0.472 12	2.953 75	0.42	AS2311X A2311X AE2311X
55	2 1/8	2.362 60	4.331 110	1.850 47	1.850 47	1.063 27	0.295 7.5	52.4	36.2	1.65	14.4	**UK212**	**UK212L3**	1.41	1.41	HS2312X H2312X	2.441 62	0.512 13	3.150 80	0.48	AS2312X A2312X
	2 1/8	2.362 60	4.724 120	1.850 47	– –	1.102 28	0.295 7.5	57.2	40.1	1.82	14.4	**UKX12**	–	1.45	–	HS2312X H2312X	2.441 62	0.512 13	3.150 80	0.48	AS2312X A2312X
	2 1/8	2.362 60	5.118 130	1.850 47	1.850 47	1.417 36	0.453 11.5	81.9	52.2	2.37	13.2	**UK312**	**UK312L3**	2.06	2.06	HS2312X H2312X	2.441 62	0.512 13	3.150 80	0.48	AS2312X A2312X
60	2 1/4 2 3/8	2.559 65	4.724 120	1.850 47	1.850 47	1.102 28	0.295 7.5	57.2	40.1	1.82	14.4	**UK213**	**UK213L3**	1.34	1.67	HE2313X H2313X HS2313X	2.559 65	0.551 14	3.346 85	0.56	AE2313X A2313X AS2313X
	2 1/4 2 3/8	2.559 65	4.921 125	2.008 51	– –	1.181 30	0.354 9	62.2	44.1	2.01	14.5	**UKX13**	–	1.62	–	HE2313X H2313X HS2313X	2.559 65	0.551 14	3.346 85	0.56	AE2313X A2313X AS2313X
	2 1/4 2 3/8	2.559 65	5.512 140	1.929 49	1.929 49	1.496 38	0.472 12	92.7	59.9	2.68	13.2	**UK313**	**UK313L3**	2.71	2.71	HE2313X H2313X HS2313X	2.559 65	0.551 14	3.346 85	0.56	AE2313X A2313X AS2313X
65	2 1/2	2.953 75	5.118 130	2.008 51	2.008 51	1.260 32	0.354 9	67.4	48.3	2.17	14.5	**UK215**	**UK215L3**	1.50	1.99	HE2315X H2315X	2.874 73	0.591 15	3.858 98	1.05	AE2315X A2315X
	2 1/2	2.953 75	5.512 140	2.165 55	– –	1.299 33	0.354 9	72.7	53.0	2.30	14.6	**UKX15**	–	2.10	–	HE2315X H2315X	2.874 73	0.591 15	3.858 98	1.05	AE2315X A2315X
	2 1/2	2.953 75	6.299 160	2.165 55	2.165 55	1.654 42	0.571 14.5	113	77.2	3.24	13.2	**UK315**	**UK315L3**	3.80	3.80	HE2315X H2315X	2.874 73	0.591 15	3.858 98	1.05	AE2315X A2315X
70	2 3/4	3.150 80	5.512 140	2.165 55	2.165 55	1.299 33	0.354 9	72.7	53.0	2.30	14.6	**UK216**	**UK216L3**	1.96	2.56	HE2316X H2316X	3.071 78	0.669 17	4.134 105	1.3	AE2316X A2316X
	2 3/4	3.150 80	5.906 150	2.244 57	– –	1.378 35	0.394 10	84.0	61.9	2.60	14.5	**UKX16**	–	2.64	–	HE2316X H2316X	3.071 78	0.669 17	4.134 105	1.3	AE2316X A2316X
	2 3/4	3.150 80	6.693 170	2.165 55	2.165 55	1.732 44	0.591 15	123	86.7	3.53	13.3	**UK316**	**UK316L3**	4.39	4.39	HE2316X H2316X	3.071 78	0.669 17	4.134 105	1.3	AE2316X A2316X
75	3	3.346 85	5.906 150	2.244 57	2.244 57	1.378 35	0.394 10	84.0	61.9	2.60	14.5	**UK217**	**UK217L3**	2.42	3.10	H2317X HE2317X	3.228 82	0.709 18	4.331 110	1.45	A2317X AE2317X
	3	3.346 85	6.299 160	2.480 63	– –	1.496 38	0.433 11	96.1	71.5	2.91	14.5	**UKX17**	–	3.25	–	H2317X HE2317X	3.228 82	0.709 18	4.331 110	1.45	A2317X AE2317X
	3	3.346 85	7.087 180	2.362 60	2.362 60	1.811 46	0.591 15	133	96.8	3.82	13.3	**UK317**	**UK317L3**	5.30	5.30	H2317X HE2317X	3.228 82	0.709 18	4.331 110	1.45	A2317X AE2317X
80	–	3.543 90	6.299 160	2.480 63	2.480 63	1.496 38	0.433 11	96.1	71.5	2.91	14.5	**UK218**	**UK218L3**	2.90	3.77	H2318X	3.386 86	0.709 18	4.724 120	1.7	A2318X
	–	3.543 90	6.693 170	2.559 65	– –	1.575 40	0.453 11.5	109	81.9	3.23	14.4	**UKX18**	–	3.80	–	H2318X	3.386 86	0.709 18	4.724 120	1.7	A2318X
	–	3.543 90	7.480 190	2.362 60	2.362 60	1.890 48	0.610 15.5	143	107	4.11	13.3	**UK318**	**UK318L3**	6.20	6.20	H2318X	3.386 86	0.709 18	4.724 120	1.7	A2318X
85	3 1/4	3.740 95	7.874 200	2.598 66	2.598 66	1.969 50	0.650 16.5	153	119	4.45	13.3	**UK319**	**UK319L3**	7.31	7.31	H2319X	3.543 90	0.748 19	4.921 125	1.95	A2319X
90	3 1/2	3.937 100	7.480 190	2.717 69	– –	1.693 43	0.512 13	133	105	3.91	14.4	**UKX20**	–	5.36	–	HE2320X H2320X	3.819 97	0.787 20	5.118 130	2.2	AE2320X A2320X

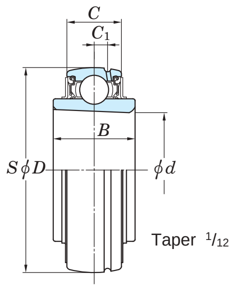
Remarks 1. In Part No. of unit with adapters, Part No. of applicable adapters follow the Part No. shown in the dimensional tables.
(Example of Part No. : UK206 + H2306X, UK206L3 + H2306X)

2. Adapter series applicable to UK200 series
UK200....................... H2300X series
UK200L3 (or L2) .... H2300X series
3. UK205 is the double-lip seal type product (L2).
4. Inch bore diameter series adapters are also available (see the dimensional tables of adapters assemblies).
5. Of all the products, the lock pin types are H fittings.

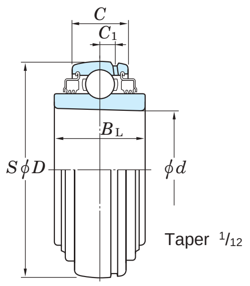
UK

Tapered bore (with adapter)

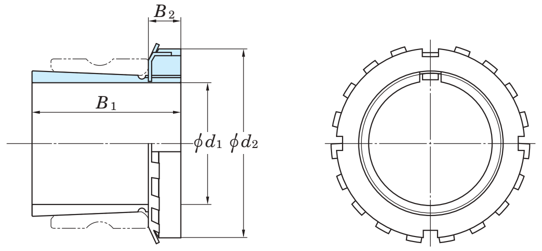
d_1 (90) ~ 125 mm



UK



UK-L3



Adapter Assembly

Shaft Dia. mm d_1	Shaft Dia. inch	Dimensions inch mm d	D	B	B_L	C	C_1	Basic Load Ratings kN C_r	C_{0r}	Fatigue Load Limit kN C_u	Factor f_0	Bearing No. Standard	L3 Type	Mass kg Standard	L3 Type	Adapter Assembly No.	H23 Series Adapter Dimensions inch mm B_1	B_2	d_2	Mass kg	Sleeve No.
90	3 $^1/_2$	3.937 100	8.465 215	2.677 68	2.677 68	2.126 54	0.709 18	173	141	5.08	13.2	**UK320**	**UK320L3**	8.70	8.70	HE2320X H2320X	3.819 97	0.787 20	5.118 130	2.2	AE2320X A2320X
100	4	4.331 110	9.449 240	3.071 78	3.071 78	2.362 60	0.787 20	205	180	6.15	13.2	**UK322**	**UK322L3**	12.2	12.2	H2322X HE2322X	4.134 105	0.827 21	5.709 145	2.75	A2322X AE2322X
110	–	4.724 120	10.236 260	3.425 87	3.425 87	2.520 64	0.827 21	207	185	6.10	13.5	**UK324**	**UK324L3**	16.1	16.1	H2324	4.409 112	0.866 22	6.102 155	3.2	A2324
115	4 $^1/_2$	5.118 130	11.024 280	3.425 87	3.425 87	2.677 68	0.866 22	229	214	6.79	13.6	**UK326**	**UK326L3**	18.8	18.8	HE2326 H2326	4.764 121	0.906 23	6.496 165	4.6	AE2326 A2326
125	–	5.512 140	11.811 300	3.819 97	3.819 97	2.835 72	0.906 23	253	246	7.54	13.6	**UK328**	**UK328L3**	23.9	23.9	H2328	5.157 131	0.945 24	7.087 180	5.5	A2328

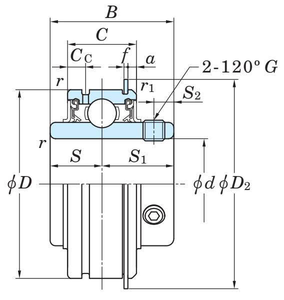
Remarks 1. In Part No. of unit with adapters, Part No. of applicable adapters follow the Part No. shown in the dimensional tables.
(Example of Part No. : UK206 + H2306X, UK206L3 + H2306X)

2. Adapter series applicable to UK200 series
UK200....................... H2300X series
UK200L3 (or L2) .... H2300X series
3. UK205 is the double-lip seal type product (L2).
4. Inch bore diameter series adapters are also available (see the dimensional tables of adapters assemblies).
5. Of all the products, the lock pin types are H fittings.

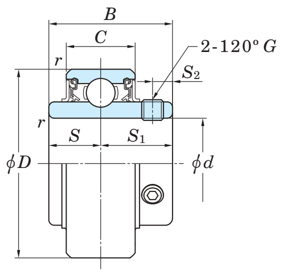
ER, RB

Cylindrical bore (with set screws), Cylindrical outside surface

d 12 ～ 60 mm



ER

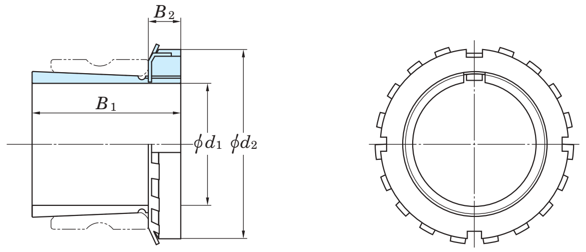


RB

Shaft Dia. mm	Shaft Dia. inch	Dimensions inch / mm					Basic Load Ratings kN		Fatigue Load Limit kN	Factor	Bearing No.		Dimensions inch / mm							Set Screw Size G		Mass kg	
d		D	B	C	r (min.)	r_1 (min.)	C_r	C_{0r}	C_u	f_0	(ER)	(RB)	S	S_1	S_2	C_c	a	f	D_2	mm	inch	(ER)	(RB)
12		1.850 47	1.220 31	0.630 16	0.024 0.6	0.020 0.5	12.8	6.65	0.302	13.2	ER201	RB201	0.500 12.7	0.720 18.3	0.197 5	0.157 4	0.094 2.38	0.042 1.07	2.067 52.5	M6×0.75	–	0.27	0.27
	1/2										ER201-8	RB201-8								–	1/4-28UNF	0.27	0.27
15											ER202	RB202								M6×0.75	–	0.25	0.25
	5/8										ER202-10	RB202-10								–	1/4-28UNF	0.25	0.25
17											ER203	RB203								M6×0.75	–	0.24	0.24
20	3/4	1.850 47	1.220 31	0.630 16	0.039 1	0.020 0.5	12.8	6.65	0.302	13.2	ER204-12	RB204-12	0.500 12.7	0.720 18.3	0.197 5	0.157 4	0.094 2.38	0.042 1.07	2.067 52.5	–	1/4-28UNF	0.22	0.22
											ER204	RB204								M6×0.75	–	0.22	0.22
25	7/8	2.047 52	1.343 34.1	0.748 19	0.039 1	0.020 0.5	14.0	7.85	0.357	13.9	ER205-14	RB205-14	0.563 14.3	0.780 19.8	0.217 5.5	0.197 5	0.094 2.38	0.042 1.07	2.272 57.7	–	1/4-28UNF	0.3	0.29
	15/16										ER205-15	RB205-15								–	1/4-28UNF	0.28	0.27
											ER205	RB205								M6×0.75	–	0.27	0.26
	1										ER205-16	RB205-16								–	1/4-28UNF	0.27	0.26
30	1 1/8	2.441 62	1.500 38.1	0.866 22	0.039 1	0.020 0.5	19.5	11.3	0.514	13.9	ER206-18	RB206-18	0.626 15.9	0.874 22.2	0.236 6	0.217 5.5	0.125 3.18	0.065 1.65	2.657 67.5	–	1/4-28UNF	0.41	0.4
											ER206	RB206								M6×0.75	–	0.39	0.38
	1 3/16										ER206-19	RB206-19								–	1/4-28UNF	0.39	0.38
	1 1/4										ER206-20	RB206-20								–	1/4-28UNF	0.37	0.36
35	1 1/4	2.835 72	1.689 42.9	0.945 24	0.043 1.1	0.020 0.5	25.7	15.4	0.700	13.9	ER207-20	RB207-20	0.689 17.5	1.000 25.4	0.256 6.5	0.217 5.5	0.125 3.18	0.065 1.65	3.087 78.4	–	5/16-24UNF	0.69	0.68
	1 5/16										ER207-21	RB207-21								–	5/16-24UNF	0.66	0.65
	1 3/8										ER207-22	RB207-22								–	5/16-24UNF	0.64	0.63
											ER207	RB207								M8×1	–	0.63	0.62
	1 7/16										ER207-23	RB207-23								–	5/16-24UNF	0.61	0.6
40	1 1/2	3.150 80	1.937 49.2	1.102 28	0.043 1.1	0.020 0.5	29.1	17.8	0.809	14.0	ER208-24	RB208-24	0.748 19	1.189 30.2	0.315 8	0.236 6	0.125 3.18	0.065 1.65	3.402 86.4	–	5/16-24UNF	0.85	0.84
	1 9/16										ER208-25	RB208-25								–	5/16-24UNF	0.82	0.81
											ER208	RB208								M8×1	–	0.81	0.78
45	1 5/8	3.346 85	1.937 49.2	1.102 28	0.043 1.1	0.020 0.5	34.1	21.3	0.968	14.0	ER209-26	–	0.748 19	1.189 30.2	0.315 8	0.236 6	0.125 3.18	0.065 1.65	3.598 91.4	–	5/16-24UNF	1.0	–
	1 11/16										ER209-27	–								–	5/16-24UNF	0.96	–
	1 3/4										ER209-28	–								–	5/16-24UNF	0.92	–
											ER209	–								M8×1	–	0.90	–
50	1 7/8	3.543 90	2.031 51.6	1.102 28	0.043 1.1	0.020 0.5	35.1	23.3	1.06	14.4	ER210-30	–	0.748 19	1.283 32.6	0.354 9	0.295 7.5	0.125 3.18	0.095 2.41	3.791 96.3	–	3/8-24UNF	1.05	–
	1 15/16										ER210-31	–								–	3/8-24UNF	1.0	–
											ER210	–								M10×1.25	–	0.98	–
	2										ER210-32	–								–	3/8-24UNF	0.96	–
55	2	3.937 100	2.189 55.6	1.181 30	0.059 1.5	0.020 0.5	43.4	29.4	1.34	14.4	ER211-32	–	0.874 22.2	1.315 33.4	0.354 9	0.295 7.5	0.125 3.18	0.095 2.41	4.185 106.3	–	3/8-24UNF	1.56	–
	2 1/8										ER211-34	–								–	3/8-24UNF	1.45	–
											ER211	–								M10×1.25	–	1.41	–
	2 3/16										ER211-35	–								–	3/8-24UNF	1.39	–
60	2 1/4	4.331 110	2.563 65.1	1.260 32	0.059 1.5	0.020 0.5	52.4	36.2	1.65	14.4	ER212-36	–	1.000 25.4	1.563 39.7	0.413 10.5	0.295 7.5	0.125 3.18	0.095 2.41	4.583 116.4	–	3/8-24UNF	2.02	–
											ER212	–								M10×1.25	–	1.89	–
	2 3/8										ER212-38	–								–	3/8-24UNF	1.87	–
	2 7/16										ER212-39	–								–	3/8-24UNF	1.8	–

H2300X

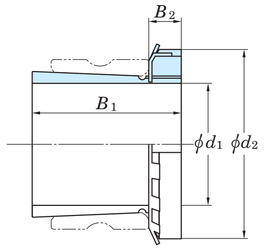
d_1 20 ~ 110 mm

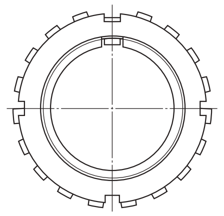


Shaft Dia. d_1				Dimensions			Adapter Assembly No.				Sleeve No.				Lock Nut No.	Washer No.	Mass kg			
mm	inch			inch mm																
(H)	(HE)	(HS)	(HA)	B_1	B_2	d_2	(H)	(HE)	(HS)	(HA)	(H)	(HE)	(HS)	(HA)			(H)	(HE)	(HS)	(HA)
20	–	–	–	1.378	0.315	1.496	**H2305X**	–	–	–	A2305X	–	–	–	AN05	AW05X	0.095	–	–	–
	3/4	–	–	35	8	38	–	**HE2305X**	–	–	–	AE2305X	–	–	AN05	AW05X	–	0.085	–	–
25	–	–	–				**H2306X**	–	–	–	A2306X	–	–	–	AN06	AW06X	0.13	–	–	–
	1	–	–	1.496	0.315	1.772	–	**HE2306X**	–	–	–	AE2306X	–	–	AN06	AW06X	–	0.12	–	–
	–	7/8	–	38	8	45	–	–	**HS2306X**	–	–	–	AS2306X	–	–	–	–	–	0.16	–
	–	–	15/16				–	–	–	**HA2306X**	–	–	–	AA2306X	–	–	–	–	–	0.14
30	–	–	–	1.693	0.354	2.047	**H2307X**	–	–	–	A2307X	–	–	–	AN07	AW07X	0.17	–	–	–
	–	–	1 3/16	43	9	52	–	–	–	**HA2307X**	–	–	–	AA2307X	–	–	–	–	–	0.17
35	–	–	–	1.811	0.394	2.283	**H2308X**	–	–	–	A2308X	–	–	–	AN08	AW08X	0.22	–	–	–
	1 1/4	–	–	46	10	58	–	**HE2308X**	–	–	–	AE2308X	–	–	AN08	AW08X	–	0.28	–	–
40	–	–	–	1.969	0.433	2.559	**H2309X**	–	–	–	A2309X	–	–	–	AN09	AW09X	0.28	–	–	–
	1 1/2	–	–	50	11	65	–	**HE2309X**	–	–	–	AE2309X	–	–	AN09	AW09X	–	0.32	–	–
	–	–	1 7/16				–	–	–	**HA2309X**	–	–	–	AA2309X	–	–	–	–	–	0.35
45	–	–	–				**H2310X**	–	–	–	A2310X	–	–	–	AN10	AW10X	0.36	–	–	–
	1 3/4	–	–	2.165	0.472	2.756	–	**HE2310X**	–	–	–	AE2310X	–	–	AN10	AW10X	–	0.37	–	–
	–	1 5/8	–	55	12	70	–	–	**HS2310X**	–	–	–	AS2310X	–	–	–	–	–	0.46	–
	–	–	1 11/16				–	–	–	**HA2310X**	–	–	–	AA2310X	–	–	–	–	–	0.42
50	–	–	–				**H2311X**	–	–	–	A2311X	–	–	–	AN11	AW11X	0.42	–	–	–
	2	–	–	2.323	0.472	2.953	–	**HE2311X**	–	–	–	AE2311X	–	–	AN11	AW11X	–	0.40	–	–
	–	1 7/8	–	59	12	75	–	–	**HS2311X**	–	–	–	AS2311X	–	AN11	AW11X	–	–	0.50	–
	–	–	1 15/16				–	–	–	**HA2311X**	–	–	–	AA2311X	–	–	–	–	–	0.45
55	–	–	–	2.441	0.512	3.150	**H2312X**	–	–	–	A2312X	–	–	–	AN12	AW12X	0.48	–	–	–
	–	2 1/8	–	62	13	80	–	–	**HS2312X**	–	–	–	AS2312X	–	AN12	AW12X	–	–	0.52	–
60	–	–	–				**H2313X**	–	–	–	A2313X	–	–	–	AN13	AW13X	0.56	–	–	–
	2 1/4	–	–	2.559	0.551	3.346	–	**HE2313X**	–	–	–	AE2313X	–	–	AN13	AW13X	–	0.69	–	–
	–	2 3/8	–	65	14	85	–	–	**HS2313X**	–	–	–	AS2313X	–	AN13	AW13X	–	–	0.55	–
	–	–	2 3/16				–	–	–	**HA2313X**	–	–	–	AA2313X	–	–	–	–	–	0.76
65	–	–	–				**H2315X**	–	–	–	A2315X	–	–	–	AN15	AW15X	1.05	–	–	–
	2 1/2	–	–	2.874	0.591	3.858	–	**HE2315X**	–	–	–	AE2315X	–	–	AN15	AW15X	–	1.15	–	–
	–	–	2 7/16	73	15	98	–	–	–	**HA2315X**	–	–	–	AA2315X	–	–	–	–	–	1.15
	–	2 5/8	–				–	–	**HS2315X**	–	–	–	AS2315X	–	–	–	–	–	0.9	–
70	–	–	–	3.071	0.669	4.134	**H2316X**	–	–	–	A2316X	–	–	–	AN16	AW16X	1.3	–	–	–
	2 3/4	–	–	78	17	105	–	**HE2316X**	–	–	–	AE2316X	–	–	AN16	AW16X	–	1.3	–	–
	–	–	2 11/16				–	–	–	**HA2316X**	–	–	–	AA2316X	–	–	–	–	–	1.41
75	–	–	–	3.228	0.709	4.331	**H2317X**	–	–	–	A2317X	–	–	–	AN17	AW17X	1.45	–	–	–
	3	–	–	82	18	110	–	**HE2317X**	–	–	–	AE2317X	–	–	AN17	AW17X	–	1.35	–	–
	–	–	2 15/16				–	–	–	**HA2317X**	–	–	–	HA2317X	–	–	–	–	–	1.48
80	–	–	–	3.386	0.709	4.724	**H2318X**	–	–	–	A2318X	–	–	–	AN18	AW18X	1.7	–	–	–
	3 1/4	–	–	86	18	120	–	**HE2318X**	–	–	–	AE2318X	–	–	–	–	–	1.49	–	–
	–	–	3 3/16				–	–	–	**HA2318X**	–	–	–	AA2318X	–	–	–	–	–	1.62
85	–	–	–	3.543	0.748	4.921	**H2319X**	–	–	–	A2319X	–	–	–	AN19	AW19X	1.95	–	–	–
	3 1/4	–	–	90	19	125	–	**HE2319X**	–	–	–	AE2319X	–	–	AN19	AW19X	–	2.15	–	–
90	–	–	–	3.819	0.787	5.118	**H2320X**	–	–	–	A2320X	–	–	–	AN20	AW20X	2.2	–	–	–
	3 1/2	–	–	97	20	130	–	**HE2320X**	–	–	–	AE2320X	–	–	AN20	AW20X	–	2.3	–	–
	–	–	3 7/16				–	–	–	**HA2320X**	–	–	–	AA2320X	–	–	–	–	–	2.47
100	–	–	–	4.134	0.827	5.709	**H2322X**	–	–	–	A2322X	–	–	–	AN22	AW22X	2.75	–	–	–
	4	–	–	105	21	145	–	**HE2322X**	–	–	–	AE2322X	–	–	AN22	AW22X	–	2.55	–	–
110	–	–	–	4.409	0.866	6.102	**H2324**	–	–	–	A2324	–	–	–	AN24	AW24	3.2	–	–	–
	4 1/4	–	–	112	22	155	–	**HE2324**	–	–	–	AE2324	–	–	–	–	–	3.5	–	–
	–	–	4 3/16				–	–	–	**HA2324**	–	–	–	AA2324	–	–	–	–	–	3.79

H2300X

d_1 **115 ~ 125 mm**





Shaft Dia. d_1				Dimensions			Adapter Assembly No.					Sleeve No.				Lock Nut No.	Washer No.	Mass kg			
mm	inch			inch mm																	
(H)	(HE)	(HS)	(HA)	B_1	B_2	d_2	(H)	(HE)	(HS)	(HA)		(H)	(HE)	(HS)	(HA)			(H)	(HE)	(HS)	(HA)
115	–	–	–	4.764 121	0.906 23	6.496 165	**H2326**	–	–	–		A2326	–	–	–	AN26	AW26	4.6	–	–	–
	4 1/2	–	–				–	**HE2326**	–	–		–	AE2326	–	–	AN26	AW26	–	4.7	–	–
	–	–	4 7/16				–	–	–	**HA2326**		–	–	–	AA2326	–	–	–	–	–	4.23
125	–	–	–	5.157 131	0.945 24	7.087 180	**H2328**	–	–	–		A2328	–	–	–	AN28	AW28	5.5	–	–	–
	5	–	–				–	**HE2328**	–	–		–	AE2328	–	–	–	–	–	5.1	–	–
	–	–	4 15/16				–	–	–	**HA2328**		–	–	–	AA2328	–	–	–	–	–	5.42

16 Parts and accessories

16.1 Part No. of pressed steel covers

Table 16.1 Part No. of pressed steel covers for UC type bearings

Bearing No.	Shaft dia. (mm)	Pressed steel cover No. Open end type	Pressed steel cover No. Closed end type
UC201	12	C– 4×12	D– 4
UC202	15	C– 4×15	D– 4
UC203	17	C– 4×17	D– 4
UC204	20	C– 4×20	D– 4
UC205	25	C– 5×25	D– 5
UC206	30	C– 6×30	D– 6
UC207	35	C– 7×35	D– 7
UC208	40	C– 8×40	D– 8
UC209	45	C– 9×45	D– 9
UC210	50	C–10×50	D–10
UC211	55	C–11×55	D–11
UC212	60	C–12×60	D–12
UC213	65	C–13×65	D–13
UC214	70	C–14×70	D–14
UC215	75	C–15×75	D–15
UC216	80	C–16×80	D–16
UC217	85	C–17×85	D–17
UC218	90	C–18×90	D–18
UCX05	25	C– 6×25	D– 6
UCX06	30	C– 7×30	D– 7
UCX07	35	C– 8×35	D– 8
UCX08	40	C– 9×40	D– 9
UCX09	45	C–10×45	D–10
UCX10	50	C–11×50	D–11
UCX11	55	C–12×55	D–12
UCX12	60	C–13×60	D–13
UCX13	65	C–14×65	D–14
UCX14	70	C–15×70	D–15
UCX15	75	C–16×75	D–16
UCX16	80	C–17×80	D–17
UCX17	85	C–18×85	D–18

Remark In the Part No. of the pressed steel covers for shouldered shaft, shaft diameter follows the basic code of the cover. For example, Part No. of the cover for a shaft with 30 mm diameter for UC206 is C–6×30.

Table 16.2 Part No. of pressed steel covers for UK type bearings

Bearing No.	Shaft dia. (mm)	Pressed steel cover No. Open end type	Pressed steel cover No. Closed end type
–			
–			
–			
–			
UK205	20	C– 5×20	D– 5
UK206	25	C– 6×25	D– 6
UK207	30	C– 7×30	D– 7
UK208	35	C– 8×35	D– 8
UK209	40	C– 9×40	D– 9
UK210	45	C–10×45	D–10
UK211	50	C–11×50	D–11
UK212	55	C–12×55	D–12
UK213	60	C–13×60	D–13
–			
UK215	65	C–15×65	D–15
UK216	70	C–16×70	D–16
UK217	75	C–17×75	D–17
UK218	80	C–18×80	D–18
UKX05	20	C– 6×20	D– 6
UKX06	25	C– 7×25	D– 7
UKX07	30	C– 8×30	D– 8
UKX08	35	C– 9×35	D– 9
UKX09	40	C–10×40	D–10
UKX10	45	C–11×45	D–11
UKX11	50	C–12×50	D–12
UKX12	55	C–13×55	D–13
UKX13	60	C–14×60	D–14
–			
UKX15	65	C–16×65	D–16
UKX16	70	C–17×70	D–17
UKX17	75	C–18×75	D–18

16.2 Part No. of cast iron covers

Table 16.3 Part No. of cast iron covers for UC type bearings

Bearing No.	Shaft dia. (mm)	Cast iron cover No.		Mounting bolt (reference)
		Open end type	Closed end type	
UC204	20	204FC×20	204FD	M3×0.5
		(204FC3×20)[1]	(204FD3)[1]	(M4×0.7)
UC205	25	205FC×25	205FD	M3×0.5
		(205FC3×25)[1]	(205FD3)[1]	(M4×0.7)
UC206	30	206FC×30	206FD	M4×0.7
UC207	35	207FC×35	207FD	M4×0.7
UC208	40	208FC×40	208FD	
UC209	45	209FC×45	209FD	
UC210	50	210FC×50	210FD	M4×0.7
UC211	55	211FC×55	211FD	
UC212	60	212FC×60	212FD	
UC213	65	213FC×65	213FD	M4×0.7
UC214	70	214FC×70	214FD	
UC215	75	215FC×75	215FD	
UC216	80	216FC×80	216FD	M5×0.8
UC217	85	217FC×85	217FD	
UC218	90	218FC×90	218FD	
UCX18	90	X18C×90	X18D	M5×0.8
		(X18C3×90)[2]	(X18D3)[2]	
UCX20	100	X20C×100	X20D	
		(X20C3×100)[2]	(X20D3)[2]	
UC305	25	305C×25	305D	M4×0.7
UC306	30	306C×30	306D	
UC307	35	307C×35	307D	
UC308	40	308C×40	308D	M5×0.8
UC309	45	309C×45	309D	
UC310	50	310C×50	310D	
UC311	55	311C×55	311D	M5×0.8
UC312	60	312C×60	312D	
UC313	65	313C×65	313D	
UC314	70	314C×70	314D	M5×0.8
UC315	75	315C×75	315D	
UC316	80	316C×80	316D	
UC317	85	317C×85	317D	M5×0.8
UC318	90	318C×90	318D	
UC319	95	319C×95	319D	
UC320	100	320C×100	320D	M5×0.8
UC321	105	321C×105	321D	
UC322	110	322C×110	322D	
UC324	120	324C×120	324D	M5×0.8
UC326	130	326C×130	326D	M8×1.25
UC328	140	328C×140	328D	

Table 16.4 Part No. of cast iron covers for UK type bearings

Bearing No.	Shaft dia. (mm)	Cast iron cover No.		Mounting bolt (reference)
		Open end type	Closed end type	
–				
UK205	20	205FC×20	205FD	M3×0.5
		(205FC3×20)[1]	(205FD3)[1]	(M4×0.7)
UK206	25	206FC×25	206FD	M4×0.7
UK207	30	207FC×30	207FD	M4×0.7
UK208	35	208FC×35	208FD	
UK209	40	209FC×40	209FD	
UK210	45	210FC×45	210FD	M4×0.7
UK211	50	211FC×50	211FD	
UK212	55	212FC×55	212FD	
UK213	60	213FC×60	213FD	M4×0.7
–				
UK215	65	215FC×65	215FD	
UK216	70	216FC×70	216FD	M5×0.8
UK217	75	217FC×75	217FD	
UK218	80	218FC×80	218FD	
UKX18	80	X18C×80	X18D	M5×0.8
		(X18C3×80)[2]	(X18D3)[2]	
UKX20	90	X20C×90	X20D	
		(X20C3×90)[2]	(X20D3)[2]	
UK305	20	305C×20	305D	M4×0.7
UK306	25	306C×25	306D	
UK307	30	307C×30	307D	
UK308	35	308C×35	308D	M5×0.8
UK309	40	309C×40	309D	
UK310	45	310C×45	310D	
UK311	50	311C×50	311D	M5×0.8
UK312	55	312C×55	312D	
UK313	60	313C×60	313D	
–				
UK315	65	315C×65	315D	M5×0.8
UK316	70	316C×70	316D	
UK317	75	317C×75	317D	M5×0.8
UK318	80	318C×80	318D	
UK319	85	319C×85	319D	
UK320	90	320C×90	320D	M5×0.8
–				
UK322	100	322C×100	322D	
UK324	110	324C×110	324D	M5×0.8
UK326	115	326C×115	326D	M8×1.25
UK328	125	328C×125	328D	

Note 1) Items in parentheses are applicable to the pillow block type (P), square-flanged type (F), rhombic-flanged type (FL), and the take-up type (T) bearings, and can be mounted to housings with three hexagon socket head cap screws (use four to mount other items).

2) Items in parentheses are applicable to the round-flanged type with joint (FC), and can be mounted to housings with three hexagon socket head cap screws (use four to mount other items).

Remark In the nominal No. of the cast iron covers for shouldered shaft, shaft diameter follows the basic code of the cover. For example, Part No. of the covers for a shaft with 60 mm diameter for UC210 is 210FC×60.

16.3 Part No. of stainless covers

Table 16.5 Part No. of stainless covers for UC-S6 type bearings

Bearing No.	Shaft dia. (mm)	Stainless cover No.	
		Open end type	Closed end type
UC204S6	20	C– 4×20J14	D– 4J14
UC205S6	25	C– 5×25J14	D– 5J14
UC206S6	30	C– 6×30J14	D– 6J14
UC207S6	35	C– 7×35J14	D– 7J14
UC208S6	40	C– 8×40J14	D– 8J14
UC209S6	45	C– 9×45J14	D– 9J14
UC210S6	50	C–10×50J14	D–10J14
UC211S6	55	C–11×55J14	D–11J14
UC212S6	60	C–12×60J14	D–12J14

16.4 Part No. of rubber coated covers

Table 16.6 Part No. of rubber coated covers for SU-S6 type bearings

Bearing No.	Shaft dia. (mm)	Rubber coated cover No.	
		Open end type	Closed end type
SU000S6	10	C–000	D–000
SU001S6	12	C–001	D–001
SU002S6	15	C–002	D–002
SU003S6	17	C–003	D–003
SU004S6	20	C–004	D–004
SU005S6	25	C–005	D–005
SU006S6	30	C–006	D–006

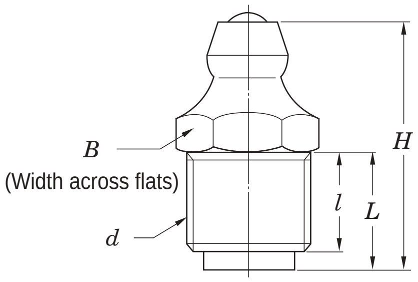
Table 16.7 Part No. of rubber coated covers for SU type bearings

Bearing No.	Shaft dia. (mm)	Rubber coated cover No.	
		Open end type	Closed end type
SU000	10	C–000	D–000
SU001	12	C–001	D–001
SU002	15	C–002	D–002
SU003	17	C–003	D–003
SU004	20	C–004	D–004
SU005	25	C–005	D–005
SU006	30	C–006	D–006

16.5 Nominal number and dimensions of grease nipples and reducing socket

Table 16.8 Nominal number and dimensions of grease nipple

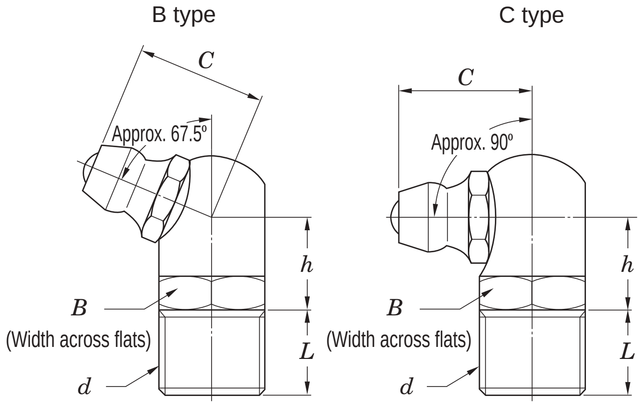
(1) Nominal number and dimensions of
A type grease nipple



Unit : mm

Nominal grease nipple No.	Nominal screw code d	B	H	L	l
A–1/4-28UNF	1/4-28UNF	7	13.5	5.4	4
A–PT1/8	PT1/8	10	20	9.5	8

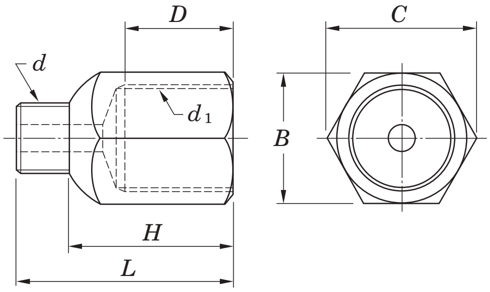
(2) Nominal number and dimensions of
B and C type grease nipples



Unit : mm

Nominal grease nipple No.	Nominal screw code d	Type	B	C	h	L
B–1/4-28UNF	1/4-28UNF	B	8	9.5	6.5	5
C–1/4-28UNF		C				
B–PT1/8	PT1/8	B	10	12.5	8.5	8
C–PT1/8		C				

Table 16.9 Nominal number and dimensions of reducing socket code

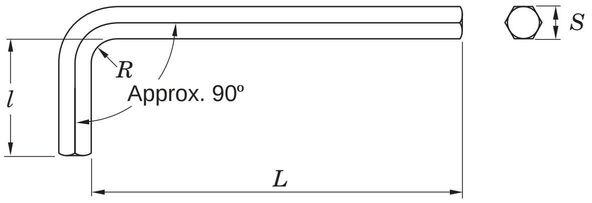


Unit : mm

Nominal No. of reducing socket	Nominal male thread code d	Nominal female thread code d_1	B	C	D	H	L
1/4-28UNF–PT1/8	1/4-28UNF	PT1/8	12	13.8	10	15	20
1/4-28UNF–PF1/8		PF1/8					
1/4-28UNF–PT1/4	1/4-28UNF	PT1/4	17	19.6	11	17	22
1/4-28UNF–PF1/4		PF1/4					
PT1/8–PT1/4	PT1/8	PT1/4	17	19.6	11	19	26
PT1/8–PF1/4		PF1/4					

16.6 Nominal number and dimensions of Allen key wrench

Table 16.10 Nominal number and dimensions of Allen key wrench



Unit : mm

Nominal No. of Allen key wrench	S	L (Approx.)	l (Approx.)	R (Approx.)	Applicable set screw
2.5	2.5	56	18	2.5	M5
3	3	63	20	3	M6
4	4	70	25	4	M8
5	5	80	28	5	M10
6	6	90	32	6	M12, M14
8	8	100	36	8	M16, M18
10	10	112	40	10	M20

17 Example of application

Koyo Insert Bearing Units are used in varied equipment, and their performance contributes to technical advantages, automation, and energy-saving of equipment.

Automatic warehouse system

Many insert bearing units are used in automatic warehouse systems for automation and energy-saving of the systems.

Automatic warehouse system

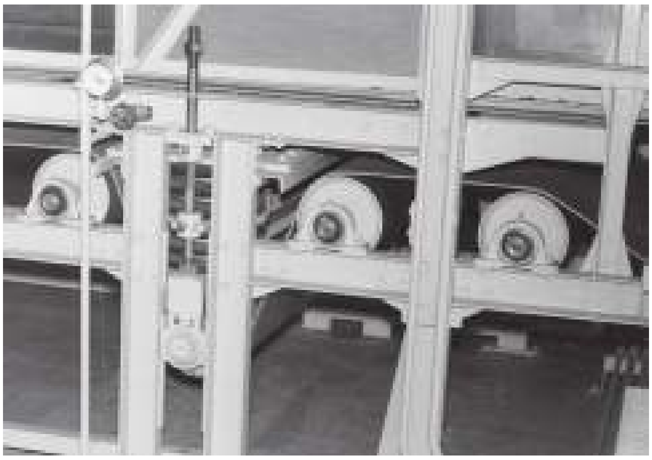
Mast driving system

Conveyor

Delivery center

Koyo Insert Bearing Units of various types including pillow block type, flange type, take-up type are used in conveyors of delivery centers.

Belt conveyor



Belt conveyor driving system

Belt conveyor driving system

Soft drink plant

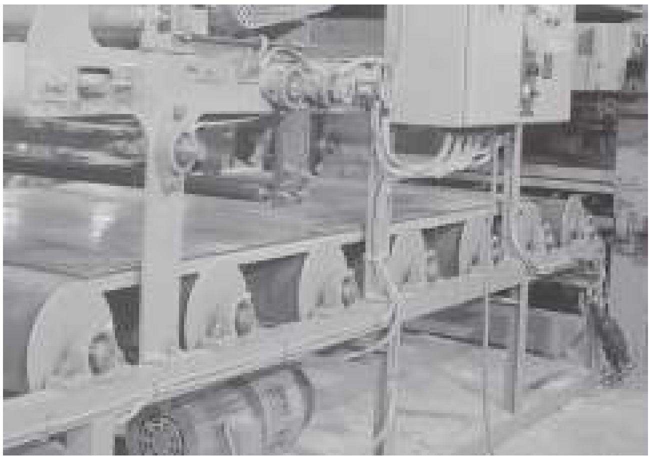
Since soft drink manufacturing facilities are frequently cleaned for hygiene control, covered unit, “compact” series unit, and stainless-series unit are suitable for them.

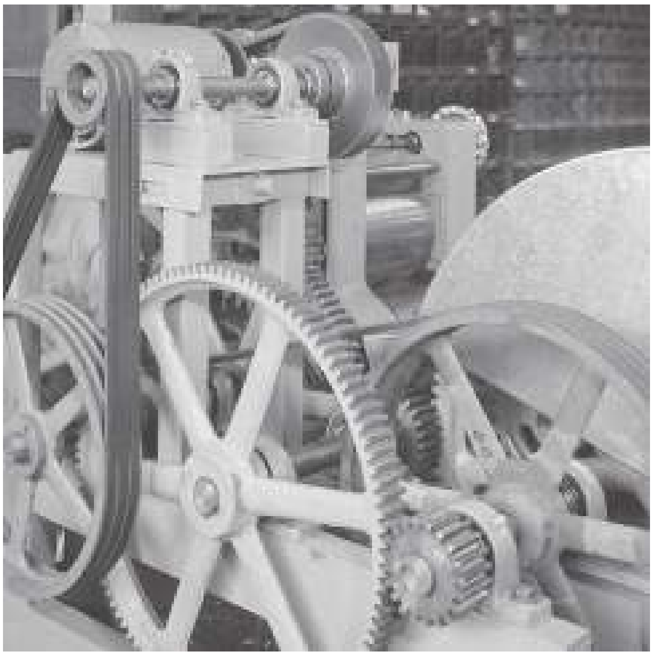

Bottle filling line conveyor

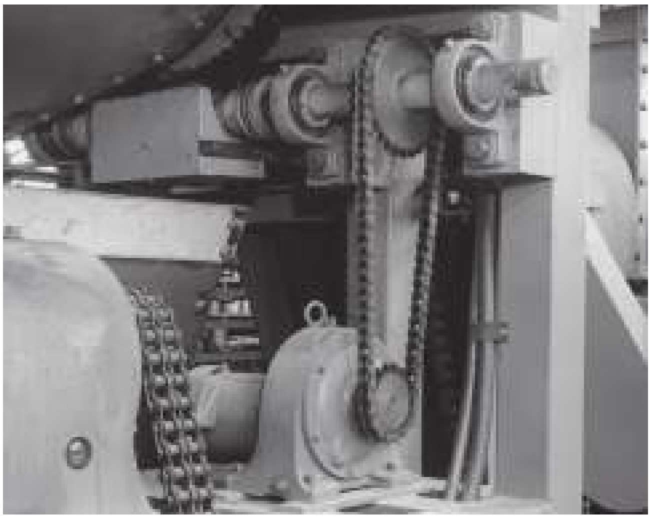

Pallet driving system

Noodle manufacturing plant

Triple-lip seal units or covered units are suitable for locations dusted with a great deal of noodle flour.


Feeding system

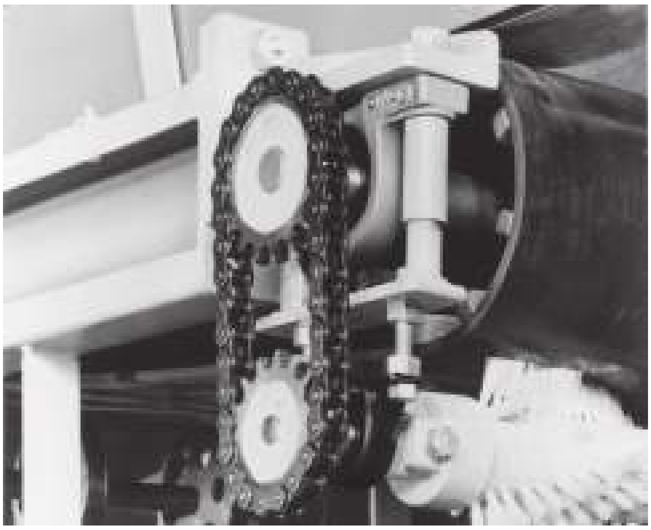

Noodle manufacturing machine driving system


Mixer driving system

Tea manufacturing plant

Koyo Insert Bearing Units contribute to the automation of tea manufacturing lines and downsizing of tea manufacturing machines.

Tea processor driving system



Conveyor driving system

Packing machine

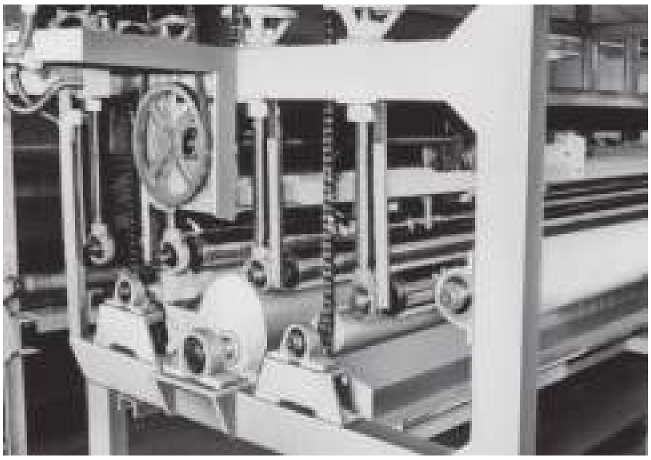
Koyo Insert Bearing Units, used in transmission units, cam shafts, and conveyors, contribute to high-efficiency and automation of packing lines.

Packing machine

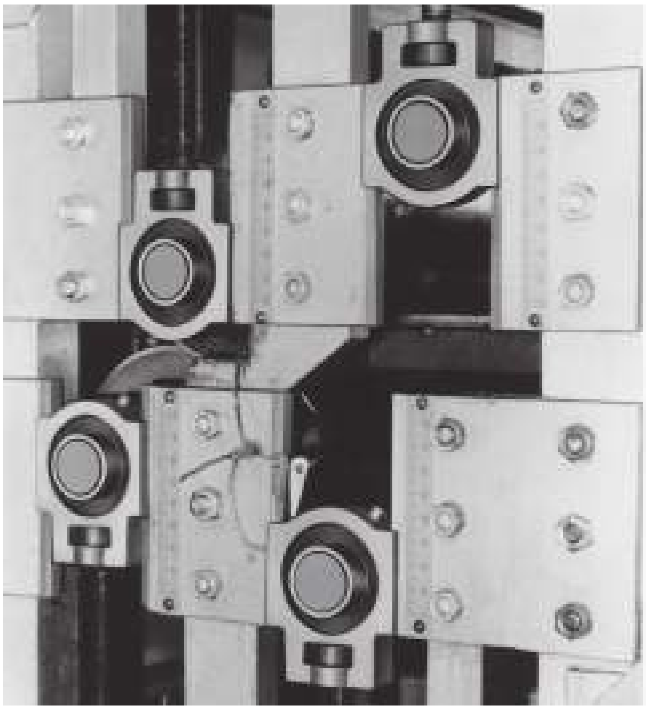
Cam shaft

Textile machine

Take-up units are suitable for locations where adjustment of distance between shaft axes is required, while hanger units are suitable for locations where the shaft must be hung because of the structure of the machine.



Carpet pasting system

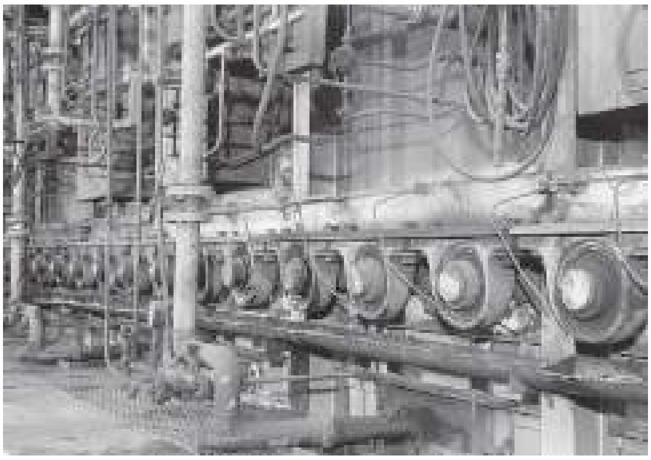


Carpet feeding shaft

Heat treatment system

The heat resistant unit is used for applications at a high temperature.

Carburizing furnace



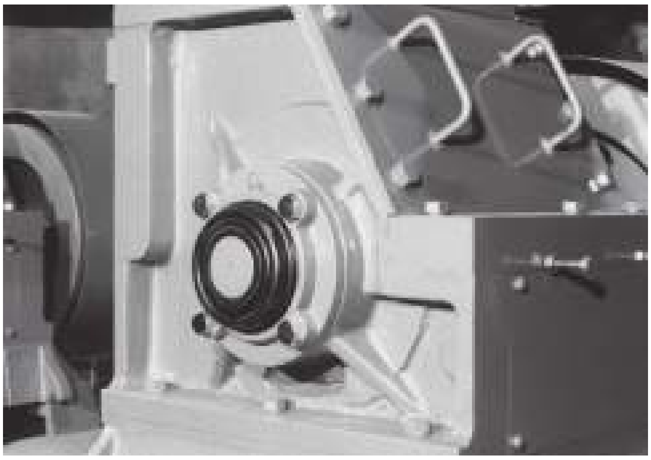
Heat treatment furnace

Agricultural machine

Koyo Insert Bearing Units contribute to downsizing and high-performance of agricultural machines. Triple-lip seal units or covered units are suitable for locations where are subject to a great deal of mud water and dusts.

Small wagon

Beat harvester power transmission system



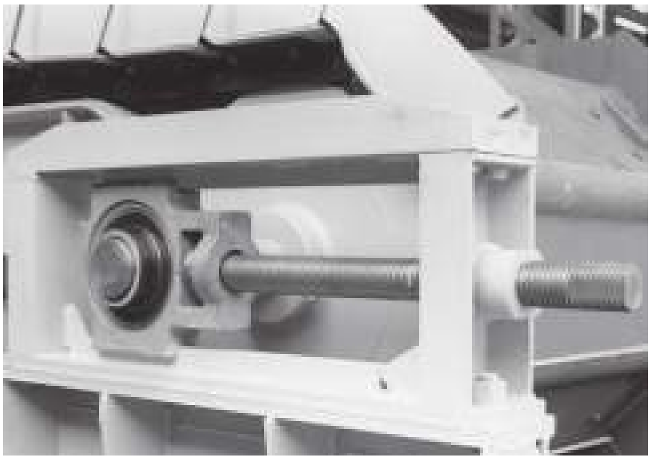
Grain mill

Construction machinery

Koyo Insert Bearing Units contribute to high-performance and longer service life of construction machinery used under severe environment.

Concrete mixer

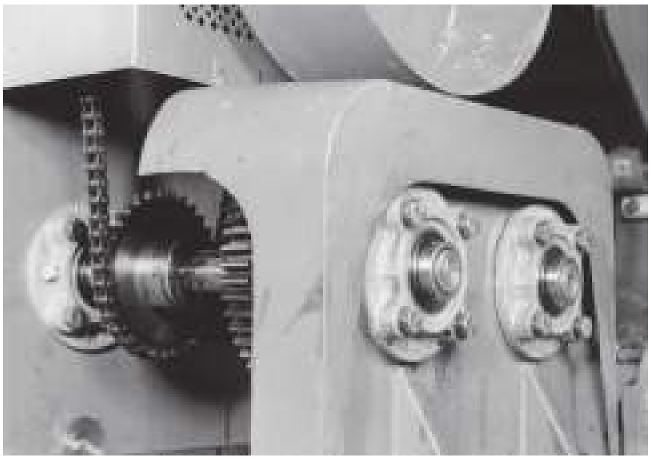
Conveyor



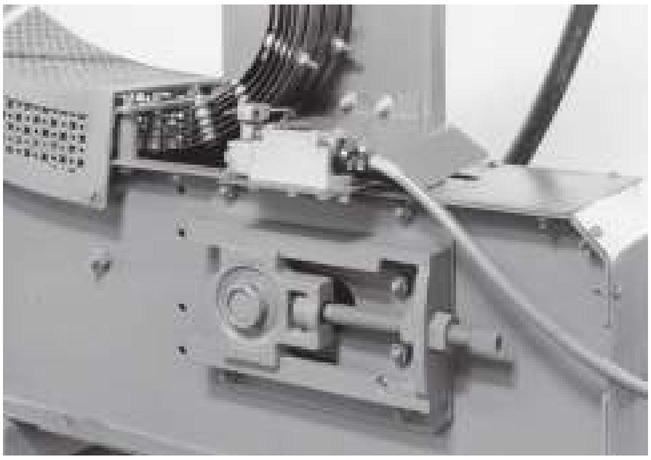
Conveyor

Other applications

Insert Bearing Units of various types appropriate for applications and specifications are used.



(Round-flanged type with spigot joint)

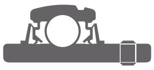
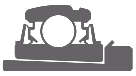


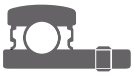
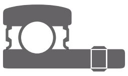
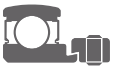
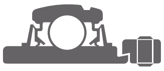
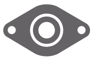
(Take-up type unit)

(Pillow block type unit)

Supplementary table (contents)

Supplementary table 1 Simplified chart of insert bearing unit combinations

Type	Housing for units	Insert bearing for units						
		Cylindrical bore (with set screws) 				Tapered bore (with adapter) 		
		UC200	UCX00	UC300	Stainless steel UC200S6	UK200	UKX00	UK300
Pillow block type 	P200, PX00, P300 PK200	UCP200	UCPX00	UCP300		UKP200	UKPX00	UKP300
	IP200, IP300 PA200, SPA200	UCIP200 UCPA200		UCIP300	UCSPA200S6	UKIP200		UKIP300
	PH200 LP200	UCPH200						
	P000, SP000 SP200 PP200				UCSP200S6			
Square-flanged type 	F200, FX00, F300 F200E, FX00E SF200 NF200 FS300	UCF200 UCF200E	UCFX00 UCFX00E	UCF300 UCFS300	UCSF200S6	UKF200	UKFX00	UKF300 UKFS300
Rhombic-flanged type 	FL200, FLX00, FL300 FL200E FA200	UCFL200 UCFL200E UCFA200	UCFLX00	UCFL300		UKFL200	UKFLX00	UKFL300
	FB200 LF200	UCFB200						
	FL000, SFL000 NFL200 SFL200				UCSFL200S6			
Round-flanged type with spigot joint 	FC200, FCX00, FCX00E SFC200	UCFC200	UCFCX00 UCFCX00E		UCFSC200S6	UKFC200	UKFCX00	
Pressed steel flange type 	PF200 PFL200 PFT200							
Take-up type 	T200, TX00, T300 T200E, TX00E ST200 T200+H	UCT200 UCT200E UCTH200	UCTX00 UCTX200E	UCT300	UCST200S6	UKT200	UKTX00	UKT300
	TL200 TU200, TU300	UCTL200 UCTU200		UCTU300		(UKTL200) (UKTU200)		(UKTU300)
	PTH200 NPTH200							
Cartridge type 	C200, CX00, C300	UCC200	UCCX00	UCC300		UKC200	UKCX00	UKC300
Hanger type 	HA200	UCHA200						

	Insert bearing for units					Housing for units	Type
	Cylindrical bore (with set screws) 			Cylindrical bore (with eccentric locking collar) 			
	"Compact" series SU000	Stainless steel SU000S6	SB200	SA200	NA200		
					NAP200 NAPK200	P200, PX00, P300 PK200	Pillow block type 
						IP200, IP300 PA200, SPA200	
			BLP200	ALP200		PH200 LP200	
	UP000	USP000S6	SBPP200	SAPP200		P000, SP000 SP200 PP200	
					NANF200	F200, FX00, F300 F200E, FX00E SF200 NF200 FS300	Square-flanged type 
						FL200, FLX00, FL300 FL200E FA200	Rhombic-flanged type 
			BLF200	ALF200		FB200 LF200	
	UFL000	USFL000S6			NANFL200	FL000, SFL000 NFL200 SFL200	
					NAFC200	FC200, FCX00, FCX00E SFC200	Round-flanged type with spigot joint 
			SBPF200 SBPFL200 SBPFT200	SAPF200 SAPFL200		PF200 PFL200 PFT200	Pressed steel flange type 
					NAT200	T200, TX00, T300 T200E, TX00E ST200 T200+H	Take-up type 
						TL200 TU200, TU300	
			SBPTH200 SBNPTH200			PTH200 NPTH200	
					NAC200	C200, CX00, C300	Cartridge type 
						HA200	Hanger type 

Supplementary table 2 Tightening torques of mounting bolts for housing and cast iron cover

(1) Tightening torques of mounting bolts for housing (recommended)

Nominal size of screws	Tightening torques N · m
M 6	2.6– 4.7
M 8	6 – 10
M10	12 – 21
M12	21 – 37
M14	34 – 60
M16	53 – 93
M18	77 – 137
M20	104 – 186
M22	143 – 256
M27	266 – 478
M30	360 – 645
M33	494 – 886
M36	631 –1 130

(2) Tightening torques of mounting bolts for cast iron cover (recommended)

Nominal size of screws	Tightening torques, N · m	Part No. of applicable cast iron covers (reference)		
		200 series	X00 series	300 series
M3	0.3– 0.6	204, 205	–	–
M4	0.8– 1.4	204FC3 (FD3), 205FC3 (FD3), 206–215	–	305–307
M5	1.5– 2.8	216–218	X18, X20	308–324
M8	6 –10	–	–	326, 328

Supplementary table 3 Tightening torques of set screws for inner ring and eccentric locking collar

(1) Tightening torques of set screws for inner ring and eccentric locking collar (metric series) (recommended)

Nominal size of screws	Tightening torques, N · m	Part No. of applicable bearings						
		UC200, RB200	UCX00	UC300	NA200	SB200	SU000	ER200
M 3X0.35	0.7						000, 001	
M 4X0.5	1.8	–				–	002, 003	
M 5X0.5	3	201X–203X	–	–		201–203	004–006	–
M 6X0.75	4	201–206	X05	305, 306	–	204–207	–	201–206
M 6X1	4	–	–	–	204, 205	–		
M 8X1	8.5	207–209	X06–X08	307	206–210	208		207–209
M10X1.25	17.5	210–212	X09–X11	308, 309	211, 212	–		210–212
M12X1.5	28	213–218	X12–X17	310–314	–			–
M14X1.5	35	–	X18	315, 316				
M16X1.5	56		X20	317–319				
M18X1.5	62		–	320–324				
M20X1.5	83			326, 328				

(2) Tightening torques of set screws for inner ring and eccentric locking collar (inch series) (recommended)

Nominal size of screws	Tightening torques, N · m	Part No. of applicable bearings		
		UC200, ER200, RB200	UCX00	SB200
10-32UNF	3	–	–	201, 202
1/4-28UNF	4	201–206	X05	204–207
5/16-24UNF	8.5	207–209	X06–X08	208
3/8-24UNF	17.5	210–212	X09–X11	–
1/2-20UNF	28	213–218	X12–X18	
5/8-18UNF	56	–	X20	

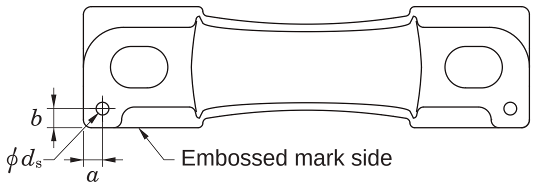
Supplementary table 4 Tightening torques of adapter lock nuts (reference)

Bore code	Tightening torques, N · m		
	UK200	UKX00	UK300
05	24.5	34	29
06	29	39	44
07	39	49	59
08	49	73	78
09	59	78	117
10	73	108	147
11	98	137	177
12	127	167	225
13	147	196	265
15	167	215	373

Bore code	Tightening torques, N · m		
	UK200	UKX00	UK300
16	196	255	441
17	225	294	530
18	265	343	608
19	–	–	706
20		490	883
22		–	1 220
24			1 470
26			1 770
28			2 150

Supplementary table 5 Machining dimensions of holes for housing dowel pins

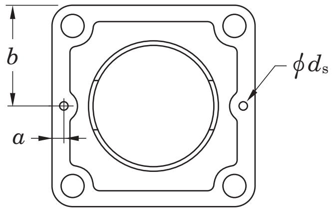
(1) Machining dimensions of holes for pillow block type housing (P) dowel pins (recommended)



Unit : mm

Nominal No.	a	b	d_s (reference)	Pin seat thickness
P203	6	6	4	16
P204	6	6	4	16
P205	6	6	4	16
P206	6	6	4	17
P207	8	8	5	18
P208	8	8	5	18
P209	8	8	5	20
P210	10	10	5	21
P211	10	10	6	23
P212	10	10	6	25
P213	10	10	6	27
P214	10	10	8	27
P215	12.5	12.5	8	28
P216	12	12	8	30
P217	12	12	8	32
P218	14	14	8	33
PX05	7	7	5	16
PX06	8	8	5	17
PX07	8	8	5	19
PX08	8	8	5	21
PX09	8	8	5	21
PX10	9	9	6	22
PX11	9	9	6	28
PX12	9	9	6	28
PX13	10	10	8	28
PX14	10	10	8	32
PX15	10	10	8	32
PX16	12	12	8	34
PX17	12	12	8	34
PX18	15	15	10	38
PX20	19	19	10	45
P305	8	8	5	16
P306	10	10	5	17
P307	10	10	5	19
P308	11	11	6	19
P309	11	11	6	21
P310	11	11	6	24
P311	12	12	8	27
P312	12	12	8	29
P313	12	12	8	32
P314	12	12	10	35
P315	14	14	10	35
P316	15	15	10	35
P317	15	15	10	40
P318	15	15	10	40
P319	15	15	10	46
P320	17	17	13	46
P321	17	17	13	46
P322	17	17	13	50
P324	17	17	13	50
P326	20	20	13	50
P328	20	20	13	60

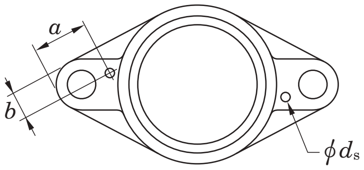
(2) Machining dimensions of holes for square-flanged type housing (F) dowel pins (recommended)



Unit : mm

Nominal No.	a	b	d_s (reference)	Pin seat thickness
F204	6	43	4	11
F205	6	47.5	4	13
F206	7.5	54	4	13
F207	7.5	58.5	5	15
F208	7.5	65	5	15
F209	7.5	68.5	5	16
F210	7.5	71.5	5	16
F211	9	81	6	18
F212	9	87.5	6	18
F213	9	93.5	6	22
F214	10	96.5	8	22
F215	10	100	8	22
F216	10	104	8	22
F217	10	110	8	24
F218	10	117.5	8	25
FX05	7.5	54	5	13
FX06	7.5	58.5	5	14
FX07	7.5	65	5	14
FX08	7.5	68.5	5	14
FX09	7.5	71.5	5	14
FX10	9	81	6	20
FX11	9	87.5	6	20
FX12	9	93.5	6	21
FX13	10	93.5	8	21
FX14	10	98.5	8	22
FX15	10	142	8	24
FX16	10	107	8	24
FX17	10	155	8	24
FX18	12	155	10	24
FX20	12	134	10	28
F305	7.5	55	5	13
F306	7.5	62.5	5	15
F307	7.5	67.5	5	16
F308	9	75	6	17
F309	9	80	6	18
F310	9	87.5	6	19
F311	10	92.5	8	20
F312	10	97.5	8	22
F313	10	104	8	22
F314	12	113	10	25
F315	12	118	10	25
F316	12	125	10	27
F317	12	130	10	27
F318	12	140	10	30
F319	12	145	10	30
F320	16	155	13	32
F321	16	155	13	32
F322	16	170	13	35
F324	16	185	13	40
F326	16	205	13	45
F328	16	225	13	55

(3) Machining dimensions of holes for Rombic-flanged type housing (FL) dowel pins (recommended)



Unit : mm

Nominal No.	a	b	d_s (reference)	Pin seat thickness
FL204	26	9	4	11
FL205	32	10	4	13
FL206	34	12	4	13
FL207	34	14	5	14
FL208	35	15	5	14
FL209	40	15	5	15
FL210	41	16	5	15
FL211	43	19	6	18
FL212	52	22	6	18
FL213	50	21	6	20
FL214	52	22	8	20
FL215	53	23	8	20
FL216	56	23	8	20
FL217	57	25	8	22
FL218	57	26	8	23
FLX05	27	12	5	13
FLX06	30	14	5	14
FLX07	32	15	5	14
FLX08	33	15	5	14
FLX09	35	16	5	14
FLX10	37	19	6	20
FL305	32	12	5	13
FL306	46	14	5	15
FL307	44	14	5	16
FL308	45	17	6	17
FL309	53	19	6	18
FL310	53	19	6	19
FL311	52	20	8	20
FL312	60	21	8	22
FL313	60	25	8	25
FL314	68	26	10	28
FL315	64	26	10	30
FL316	74	29	10	32
FL317	75	31	10	32
FL318	74	32	10	36
FL319	80	32	10	40
FL320	86	34	13	40
FL321	86	34	13	40
FL322	86	36	13	42
FL324	94	41	13	48

Supplementary table 6 Shaft tolerances (deviation from nominal dimensions)

Nominal shaft dia. (mm)		Deviation classes of shaft dia.															
Over	**Up to**	**d 6**	**e 6**	**f 6**	**g 5**	**g 6**	**h 5**	**h 6**	**h 7**	**h 8**	**h 9**	**h 10**	**js 5**	**js 6**	**js 7**	**j 5**	**j 6**
3	**6**	−30 −38	−20 −28	−10 −18	−4 −9	−4 −12	0 −5	0 −8	0 −12	0 −18	0 −30	0 −48	±2.5	±4	±6	+3 −2	+6 −2
6	**10**	−40 −49	−25 −34	−13 −22	−5 −11	−5 −14	0 −6	0 −9	0 −15	0 −22	0 −36	0 −58	±3	±4.5	±7.5	+4 −2	+7 −2
10	**18**	−50 −61	−32 −43	−16 −27	−6 −14	−6 −17	0 −8	0 −11	0 −18	0 −27	0 −43	0 −70	±4	±5.5	±9	+5 −3	+8 −3
18	**30**	−65 −78	−40 −53	−20 −33	−7 −16	−7 −20	0 −9	0 −13	0 −21	0 −33	0 −52	0 −84	±4.5	±6.5	±10.5	+5 −4	+9 −4
30	**50**	−80 −96	−50 −66	−25 −41	−9 −20	−9 −25	0 −11	0 −16	0 −25	0 −39	0 −62	0 −100	±5.5	±8	±12.5	+6 −5	+11 −5
50	**80**	−100 −119	−60 −79	−30 −49	−10 −23	−10 −29	0 −13	0 −19	0 −30	0 −46	0 −74	0 −120	±6.5	±9.5	±15	+6 −7	+12 −7
80	**120**	−120 −142	−72 −94	−36 −58	−12 −27	−12 −34	0 −15	0 −22	0 −35	0 −54	0 −87	0 −140	±7.5	±11	±17.5	+6 −9	+13 −9
120	**180**	−145 −170	−85 −110	−43 −68	−14 −32	−14 −39	0 −18	0 −25	0 −40	0 −63	0 −100	0 −160	±9	±12.5	±20	+7 −11	+14 −11
180	**250**	−170 −199	−100 −129	−50 −79	−15 −35	−15 −44	0 −20	0 −29	0 −46	0 −72	0 −115	0 −185	±10	±14.5	±23	+7 −13	+16 −13
250	**315**	−190 −222	−110 −142	−56 −88	−17 −40	−17 −49	0 −23	0 −32	0 −52	0 −81	0 −130	0 −210	±11.5	±16	±26	+7 −16	±16
315	**400**	−210 −246	−125 −161	−62 −98	−18 −43	−18 −54	0 −25	0 −36	0 −57	0 −89	0 −140	0 −230	±12.5	±18	±28.5	+7 −18	±18
400	**500**	−230 −270	−135 −175	−68 −108	−20 −47	−20 −60	0 −27	0 −40	0 −63	0 −97	0 −155	0 −250	±13.5	±20	±31.5	+7 −20	±20
500	**630**	−260 −304	−145 −189	−76 −120	−22 −54	−22 −66	0 −32	0 −44	0 −70	0 −110	0 −175	0 −280	±16	±22	±35	–	–
630	**800**	−290 −340	−160 −210	−80 −130	−24 −60	−24 −74	0 −36	0 −50	0 −80	0 −125	0 −200	0 −320	±18	±25	±40	–	–
800	**1 000**	−320 −376	−170 −226	−86 −142	−26 −66	−26 −82	0 −40	0 −56	0 −90	0 −140	0 −230	0 −360	±20	±28	±45	–	–

*$\varDelta_{dmp}$: Single plane mean bore diameter deviation

Unit : μm (Reference)

											Nominal shaft dia. (mm)		$\Delta_{d\mathrm{mp}}$* of bearing (class 0)
k 5	k 6	k 7	m 5	m 6	m 7	n 5	n 6	p 6	r 6	r 7	Over	Up to	
+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+16 +4	+13 +8	+16 +8	+20 +12	+23 +15	+27 +15	**3**	**6**	0 −8
+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+21 +6	+16 +10	+19 +10	+24 +15	+28 +19	+34 +19	**6**	**10**	0 −8
+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+25 +7	+20 +12	+23 +12	+29 +18	+34 +23	+41 +23	**10**	**18**	0 −8
+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+29 +8	+24 +15	+28 +15	+35 +22	+41 +28	+49 +28	**18**	**30**	0 −10
+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+34 +9	+28 +17	+33 +17	+42 +26	+50 +34	+59 +34	**30**	**50**	0 −12
+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+41 +11	+33 +20	+39 +20	+51 +32	+60 +41	+71 +41	**50**	**65**	0 −15
									+62 +43	+73 +43	**65**	**80**	
+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+48 +13	+38 +23	+45 +23	+59 +37	+73 +51	+86 +51	**80**	**100**	0 −20
									+76 +54	+89 +54	**100**	**120**	
+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+55 +15	+45 +27	+52 +27	+68 +43	+88 +63	+103 +63	**120**	**140**	0 −25
									+90 +65	+105 +65	**140**	**160**	
									+93 +68	+108 +68	**160**	**180**	
+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+63 +17	+51 +31	+60 +31	+79 +50	+106 +77	+123 +77	**180**	**200**	0 −30
									+109 +80	+126 +80	**200**	**225**	
									+113 +84	+130 +84	**225**	**250**	
+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+72 +20	+57 +34	+66 +34	+88 +56	+126 +94	+146 +94	**250**	**280**	0 −35
									+130 +98	+150 +98	**280**	**315**	
+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+78 +21	+62 +37	+73 +37	+98 +62	+144 +108	+165 +108	**315**	**355**	0 −40
									+150 +114	+171 +114	**355**	**400**	
+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+86 +23	+67 +40	+80 +40	+108 +68	+166 +126	+189 +126	**400**	**450**	0 −45
									+172 +132	+195 +132	**450**	**500**	
+32 0	+44 0	+70 0	+58 +26	+70 +26	+96 +26	+76 +44	+88 +44	+122 +78	+194 +150	+220 +150	**500**	**560**	0 −50
									+199 +155	+225 +155	**560**	**630**	
+36 0	+50 0	+80 0	+66 +30	+80 +30	+110 +30	+86 +50	+100 +50	+138 +88	+225 +175	+255 +175	**630**	**710**	0 −75
									+235 +185	+265 +185	**710**	**800**	
+40 0	+56 0	+90 0	+74 +34	+90 +34	+124 +34	+96 +56	+112 +56	+156 +100	+266 +210	+300 +210	**800**	**900**	0 −100
									+276 +220	+310 +220	**900**	**1 000**	

Supplementary table 7 Housing bore tolerances (deviation from nominal dimensions)

Nominal Bore dia. (mm)		Deviation classes of housing bore														
Over	**Up to**	**E 6**	**F 6**	**F 7**	**G 6**	**G 7**	**H 6**	**H 7**	**H 8**	**H 9**	**H 10**	**JS 5**	**JS 6**	**JS 7**	**J 6**	**J 7**
10	**18**	+ 43 + 32	+ 27 + 16	+ 34 + 16	+17 + 6	+ 24 + 6	+11 0	+ 18 0	+ 27 0	+ 43 0	+ 70 0	± 4	± 5.5	± 9	+ 6 – 5	+10 – 8
18	**30**	+ 53 + 40	+ 33 + 20	+ 41 + 20	+20 + 7	+ 28 + 7	+13 0	+ 21 0	+ 33 0	+ 52 0	+ 84 0	± 4.5	± 6.5	±10.5	+ 8 – 5	+12 – 9
30	**50**	+ 66 + 50	+ 41 + 25	+ 50 + 25	+25 + 9	+ 34 + 9	+16 0	+ 25 0	+ 39 0	+ 62 0	+100 0	± 5.5	± 8	±12.5	+10 – 6	+14 –11
50	**80**	+ 79 + 60	+ 49 + 30	+ 60 + 30	+29 +10	+ 40 + 10	+19 0	+ 30 0	+ 46 0	+ 74 0	+120 0	± 6.5	± 9.5	±15	+13 – 6	+18 –12
80	**120**	+ 94 + 72	+ 58 + 36	+ 71 + 36	+34 +12	+ 47 + 12	+22 0	+ 35 0	+ 54 0	+ 87 0	+140 0	± 7.5	±11	±17.5	+16 – 6	+22 –13
120	**180**	+110 + 85	+ 68 + 43	+ 83 + 43	+39 +14	+ 54 + 14	+25 0	+ 40 0	+ 63 0	+100 0	+160 0	± 9	±12.5	±20	+18 – 7	+26 –14
180	**250**	+129 +100	+ 79 + 50	+ 96 + 50	+44 +15	+ 61 + 15	+29 0	+ 46 0	+ 72 0	+115 0	+185 0	±10	±14.5	±23	+22 – 7	+30 –16
250	**315**	+142 +110	+ 88 + 56	+108 + 56	+49 +17	+ 69 + 17	+32 0	+ 52 0	+ 81 0	+130 0	+210 0	±11.5	±16	±26	+25 – 7	+36 –16
315	**400**	+161 +125	+ 98 + 62	+119 + 62	+54 +18	+ 75 + 18	+36 0	+ 57 0	+ 89 0	+140 0	+230 0	±12.5	±18	±28.5	+29 – 7	+39 –18
400	**500**	+175 +135	+108 + 68	+131 + 68	+60 +20	+ 83 + 20	+40 0	+ 63 0	+ 97 0	+155 0	+250 0	±13.5	±20	±31.5	+33 – 7	+43 –20
500	**630**	+189 +145	+120 + 76	+146 + 76	+66 +22	+ 92 + 22	+44 0	+ 70 0	+110 0	+175 0	+280 0	±16	±22	±35	–	–
630	**800**	+210 +160	+130 + 80	+160 + 80	+74 +24	+104 + 24	+50 0	+ 80 0	+125 0	+200 0	+320 0	±18	±25	±40	–	–
800	**1 000**	+226 +170	+142 + 86	+176 + 86	+82 +26	+116 + 26	+56 0	+ 90 0	+140 0	+230 0	+360 0	±20	±28	±45	–	–
1 000	**1 250**	+261 +195	+164 + 98	+203 + 98	+94 +28	+133 + 28	+66 0	+105 0	+165 0	+260 0	+420 0	±23.5	±33	±52.5	–	–

*Δ_{Dmp} : Single plane mean outside diameter deviation

Unit : μm (Reference)

K 5	K 6	K 7	M 5	M 6	M 7	N 5	N 6	N 7	P 6	P 7	R 7	Nominal Bore dia. (mm)		Δ_{Dmp}* of bearing (class 0)
												Over	Up to	
+2 −6	+2 −9	+6 −12	−4 −12	−4 −15	0 −18	−9 −17	−9 −20	−5 −23	−15 −26	−11 −29	−16 −34	10	18	0 −8
+1 −8	+2 −11	+6 −15	−5 −14	−4 −17	0 −21	−12 −21	−11 −24	−7 −28	−18 −31	−14 −35	−20 −41	18	30	0 −9
+2 −9	+3 −13	+7 −18	−5 −16	−4 −20	0 −25	−13 −24	−12 −28	−8 −33	−21 −37	−17 −42	−25 −50	30	50	0 −11
+3 −10	+4 −15	+9 −21	−6 −19	−5 −24	0 −30	−15 −28	−14 −33	−9 −39	−26 −45	−21 −51	−30 −60	50	65	0 −13
											−32 −62	65	80	
+2 −13	+4 −18	+10 −25	−8 −23	−6 −28	0 −35	−18 −33	−16 −38	−10 −45	−30 −52	−24 −59	−38 −73	80	100	0 −15
											−41 −76	100	120	
+3 −15	+4 −21	+12 −28	−9 −27	−8 −33	0 −40	−21 −39	−20 −45	−12 −52	−36 −61	−28 −68	−48 −88	120	140	(up to 150) 0 −18 (over to 150) 0 −25
											−50 −90	140	160	
											−53 −93	160	180	
+2 −18	+5 −24	+13 −33	−11 −31	−8 −37	0 −46	−25 −45	−22 −51	−14 −60	−41 −70	−33 −79	−60 −106	180	200	0 −30
											−63 −109	200	225	
											−67 −113	225	250	
+3 −20	+5 −27	+16 −36	−13 −36	−9 −41	0 −52	−27 −50	−25 −57	−14 −66	−47 −79	−36 −88	−74 −126	250	280	0 −35
											−78 −130	280	315	
+3 −22	+7 −29	+17 −40	−14 −39	−10 −46	0 −57	−30 −55	−26 −62	−16 −73	−51 −87	−41 −98	−87 −144	315	355	0 −40
											−93 −150	355	400	
+2 −25	+8 −32	+18 −45	−16 −43	−10 −50	0 −63	−33 −60	−27 −67	−17 −80	−55 −95	−45 −108	−103 −166	400	450	0 −45
											−109 −172	450	500	
0 −32	0 −44	0 −70	−26 −58	−26 −70	−26 −96	−44 −76	−44 −88	−44 −114	−78 −122	−78 −148	−150 −220	500	560	0 −50
											−155 −225	560	630	
0 −36	0 −50	0 −80	−30 −66	−30 −80	−30 −110	−50 −86	−50 −100	−50 −130	−88 −138	−88 −168	−175 −255	630	710	0 −75
											−185 −265	710	800	
0 −40	0 −56	0 −90	−34 −74	−34 −90	−34 −124	−56 −96	−56 −112	−56 −146	−100 −156	−100 −190	−210 −300	800	900	0 −100
											−220 −310	900	1 000	
0 −47	0 −66	0 −105	−40 −87	−40 −106	−40 −145	−66 −113	−66 −132	−66 −171	−120 −186	−120 −225	−250 −355	1 000	1 120	0 −125
											−260 −365	1 120	1 250	

Supplementary Table 8 (1) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Angle	rad [radian(s)]	° [degree(s)] ∗ ' [minute(s)] ∗ " [second(s)] ∗	1° = π / 180 rad 1' = π / 10 800 rad 1" = π / 648 000 rad	1 rad = 57.295 78°
Length	m [meter(s)]	Å [Angstrom unit] μ [micron(s)] in [inch(es)] ft [foot(feet)] yd [yard(s)] mile [mile(s)]	1 Å = 10^{-10} m = 0.1 nm = 100 pm 1 μ = 1 μm 1 in = 25.4 mm 1 ft = 12 in = 0.304 8 m 1 yd = 3 ft = 0.914 4 m 1 mile = 5 280 ft = 1 609.344 m	1 m = 10^{10} Å 1 m = 39.37 in 1 m = 3.280 8 ft 1 m = 1.093 6 yd 1 km = 0.621 4 mile
Area	m^2	a [are(s)] ha [hectare(s)] acre [acre(s)]	1 a = 100 m^2 1 ha = 10^4 m^2 1 acre = 4 840 yd^2 = 4 046.86 m^2	 1 km^2 = 247.1 acre
Volume	m^3	ℓ, L [liter(s)] ∗ cc [cubic centimeters] gal (US) [gallon(s)] floz (US) [fluid ounce(s)] barrel (US) [barrels(US)]	1 ℓ = 1 dm^3 = 10^{-3} m^3 1 cc = 1 cm^3 = 10^{-6} m^3 1 gal (US) = 231 in^3 = 3.785 41 dm^3 1 floz (US) = 29.573 5 cm^3 1 barrel (US) = 158.987 dm^3	1 m^3 = 10^3 ℓ 1 m^3 = 10^6 cc 1 m^3 = 264.17 gal 1 m^3 = 33 814 floz 1 m^3 = 6.289 8 barrel
Time	s [second(s)]	min [minute(s)] ∗ h [hour(s)] ∗ d [day(s)] ∗		
Angular velocity	rad/s			
Velocity	m/s	kn [knot(s)] m/h ∗	1 kn = 1 852 m/h	1 km/h = 0.539 96 kn
Acceleration	m/s^2	G	1 G = 9.806 65 m/s^2	1 m/s^2 = 0.101 97 G
Frequency	Hz [hertz]	c/s [cycle(s)/second]	1 c/s = 1 s^{-1} = 1 Hz	
Rotational frequency	s^{-1}	rpm [revolutions per minute] min^{-1} ∗ r/min	1 rpm = 1/60 s^{-1}	1 s^{-1} = 60 rpm
Mass	kg [kilogram(s)]	t [ton(s)] ∗ lb [pound(s)] gr [grain(s)] oz [ounce(s)] ton (UK) [ton(s) (UK)] ton (US) [ton(s) (US)] car [carat(s)]	1 t = 10^3 kg 1 lb = 0.453 592 37 kg 1 gr = 64.798 91 mg 1 oz = 1/16 lb = 28.349 5 g 1 ton (UK) = 1 016.05 kg 1 ton (US) = 907.185 kg 1 car = 200 mg	 1 kg = 2.204 6 lb 1 g = 15.432 4 gr 1 kg = 35.274 0 oz 1 t = 0.984 2 ton (UK) 1 t = 1.102 3 ton (US) 1 g = 5 car

Note 1) ∗ : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary Table 8 (2) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Density	kg/m^3			
Linear density	kg/m			
Momentum	kg · m/s			
Moment of momentum, **Angular momentum**	kg · m^2/s			
Moment of inertia	kg · m^2			
Force	N	dyn [dyne(s)]	1 dyn = 10^{-5} N	1 N = 10^5 dyn
	[newton(s)]	kgf [kilogram-force]	1 kgf = 9.806 65 N	1 N = 0.101 97 kgf
		gf [gram-force]	1 gf = 9.806 65 × 10^{-3} N	
		tf [ton-force]	1 tf = 9.806 65 × 10^3 N	
		lbf [pound-force]	1 lbf = 4.448 22 N	1 N = 0.224 809 lbf
Moment of force	N · m	gf · cm	1 gf · cm = 9.806 65 × 10^{-5} N · m	
	[newton	kgf · cm	1 kgf · cm = 9.806 65 × 10^{-2} N · m	
	meter(s)]	kgf · m	1 kgf · m = 9.806 65 N · m	1 N · m = 0.101 97 kgf · m
		tf · m	1 tf · m = 9.806 65 × 10^3 N · m	
		lbf · ft	1 lbf · ft = 1.355 82 N · m	1 N · m = 0.737 56 lbf · ft
Pressure,	Pa	gf/cm^2	1 gf/cm^2 = 9.806 65 × 10 Pa	
	[pascal(s)]	kgf/mm^2	1 kgf/mm^2 = 9.806 65 × 10^6 Pa	1 MPa = 0.101 97 kgf/mm^2
Normal stress		kgf/m^2	1 kgf/m^2 = 9.806 65 Pa	1 Pa = 0.101 97 kgf/m^2
	or N/m^2	lbf/in^2	1 lbf/in^2 = 6 894.76 Pa	1 Pa = 0.145 × 10^{-3} lbf/in^2
	{1 Pa = 1 N/m^2}	bar [bar(s)]	1 bar = 10^5 Pa	1 Pa = 10^{-2} mbar
		at [engineering air pressure]	1 at = 1kgf/cm^2 = 9.806 65 × 10^4 Pa	
		mH$_2$O, mAq [meter water column]	1 mH$_2$O = 9.806 65 × 10^3 Pa	
		atm [atmosphere]	1 atm = 101 325 Pa	
		mHg [meter mercury column]	1 mHg = $\frac{101\ 325}{0.76}$ Pa	
		Torr [torr]	1 Torr = 1mmHg = 133.322 Pa	1 Pa = 7.500 6 × 10^{-3} Torr
Viscosity	Pa · s	P [poise]	10^{-2} P = 1 cP = 1 mPa · s	
	[pascal second]	kgf · s/m^2	1 kgf · s/m^2 = 9.806 65 Pa · s	1 Pa · s = 0.101 97 kgf · s/m^2
Kinematic viscosity	m^2/s	St [stokes]	10^{-2} St = 1 cSt = 1 mm^2/s	
Surface tension	N/m			

Note 1) ∗ : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary Table 8 (3) SI units and conversion factors

Mass	SI units	Other Units1)	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J = 1 N · m}	eV [electron volt(s)] ∗ erg [erg(s)] kgf · m lbf · ft	1 eV = (1.602 189 2 ± 0.000 004 6) × 10^{-19} J 1 erg = 10^{-7} J 1 kgf · m = 9.806 65 J 1 lbf · ft = 1.355 82 J	 1 J = 10^{7} erg 1 J = 0.101 97 kgf · m 1 J = 0.737 56 lbf · ft
Power	W [watt(s)]	erg/s [ergs per second] kgf · m/s PS [French horse-power] HP [horse-power (British)] lbf · ft/s	1 erg/s = 10^{-7} W 1 kgf · m/s = 9.806 65 W 1 PS = 75 kgf · m/s = 735.5 W 1 HP = 550 lbf · ft/s = 745.7 W 1 lbf · ft/s = 1.355 82 W	 1 W = 0.101 97 kgf · m/s 1 W = 0.001 36 PS 1 W = 0.001 34 HP
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	°C [celsius(s)] {t °C = (t + 273.15) K}	°F [degree(s) Fahrenheit]	t°F = $\frac{5}{9}$ (t − 32) °C	t°C = ($\frac{5}{9}$ t + 32) °F
Linear expansion coefficient	K^{-1}	$°C^{-1}$ [per degree]		
Heat	J [joule(s)] {1 J = 1 N · m}	erg [erg(s)] kgf · m cal_{IT} [I. T. calories]	1 erg = 10^{-7} J 1 cal_{IT} = 4.186 8 J 1 Mcal_{IT} = 1.163 kW · h	1 J = 10^{7} erg 1 J = 0.238 85 cal_{IT} 1 kW · h = 0.86 × 10^{6} cal_{IT}
Thermal conductivity	W/ (m · K)	W/ (m · °C) cal/ (s · m · °C)	1 W/ (m · °C) = 1 W/ (m · K) 1 cal/ (s · m · °C) = 4.186 05 W/ (m · K)	
Coefficient of heat transfer	W/ (m^2 · K)	W/ (m^2 · °C) cal/ (s · m^2 · °C)	1 W/ (m^2 · °C) = 1 W/ (m^2 · K) 1 cal/ (s · m^2 · °C) = 4.186 05 W/ (m^2 · K)	
Heat capacity	J/K	J/°C	1 J/°C = 1 J/K	
Massic heat capacity	J/ (kg · K)	J/ (kg · °C)		

Note 1) ∗ : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary Table 8 (4) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge, quantity of electricity	C [coulomb(s)] {1 C = 1 A · s}	A · h ∗	1 A · h = 3.6 kC	
Tension, **electric potential**	V [volt(s)] {1 V = 1 W/A}			
Capacitance	F [farad(s)] {1 F = 1 C/V}			
Magnetic field strength	A/m	Oe [oersted(s)]	1 Oe = $\frac{10^3}{4\pi}$ A/m	1 A/m = $4\pi \times 10^{-3}$ Oe
Magnetic flux density	T [tesla(s)] $\left\{\begin{array}{l}1\ \mathrm{T} = 1\ \mathrm{N/(A \cdot m)} \\ \quad = 1\ \mathrm{Wb/m^2} \\ \quad = 1\ \mathrm{V \cdot s/m^2}\end{array}\right\}$	Gs [gauss(es)] γ [gamma(s)]	1 Gs = 10^{-4} T 1 γ = 10^{-9} T	1 T = 10^4 Gs 1 T = 10^9 γ
Magnetic flux	Wb [weber(s)] {1 Wb = 1 V · s}	Mx [maxwell(s)]	1 Mx = 10^{-8} Wb	1 Wb = 10^8 Mx
Self inductance	H [henry (– ries)] {1 H = 1 Wb/A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω = 1 V/A}			
Conductance (to direct current)	S [siemens] {1 S = 1 A/V}			
Active power	W $\left\{\begin{array}{l}1\ \mathrm{W} = 1\ \mathrm{J/s} \\ \quad = 1\ \mathrm{A \cdot V}\end{array}\right\}$			

Note 1) ∗ : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 9 Inch/millimeter conversion

Inch		Inches										
		0	1	2	3	4	5	6	7	8	9	10
		mm										
0	0	**0**	**25.4000**	**50.8000**	**76.2000**	**101.6000**	**127.0000**	**152.4000**	**177.8000**	**203.2000**	**228.6000**	**254.0000**
1/64	0.015625	0.3969	25.7969	51.1969	76.5969	101.9969	127.3969	152.7969	178.1969	203.5969	228.9969	254.3969
1/32	0.03125	0.7938	26.1938	51.5938	76.9938	102.3938	127.7938	153.1938	178.5938	203.9938	229.3938	254.7938
3/64	0.046875	1.1906	26.5906	51.9906	77.3906	102.7906	128.1906	153.5906	178.9906	204.3906	229.7906	255.1906
1/16	0.0625	1.5875	26.9875	52.3875	77.7875	103.1875	128.5875	153.9875	179.3875	204.7875	230.1875	255.5875
5/64	0.078125	1.9844	27.3844	52.7844	78.1844	103.5844	128.9844	154.3844	179.7844	205.1844	230.5844	255.9844
3/32	0.09375	2.3812	27.7812	53.1812	78.5812	103.9812	129.3812	154.7812	180.1812	205.5812	230.9812	256.3812
7/64	0.109375	2.7781	28.1781	53.5781	78.9781	104.3781	129.7781	155.1781	180.5781	205.9781	231.3781	256.7781
1/8	0.125	**3.1750**	**28.5750**	**53.9750**	**79.3750**	**104.7750**	**130.1750**	**155.5750**	**180.9750**	**206.3750**	**231.7750**	**257.1750**
9/64	0.140625	3.5719	28.9719	54.3719	79.7719	105.1719	130.5719	155.9719	181.3719	206.7719	232.1719	257.5719
5/32	0.15625	3.9688	29.3688	54.7688	80.1688	105.5688	130.9688	156.3688	181.7688	207.1688	232.5688	257.9688
11/64	0.171875	4.3656	29.7656	55.1656	80.5656	105.9656	131.3656	156.7656	182.1656	207.5656	232.9656	258.3656
3/16	0.1875	4.7625	30.1625	55.5625	80.9625	106.3625	131.7625	157.1625	182.5625	207.9625	233.3625	258.7625
13/64	0.203125	5.1594	30.5594	55.9594	81.3594	106.7594	132.1594	157.5594	182.9594	208.3594	233.7594	259.1594
7/32	0.21875	5.5562	30.9562	56.3562	81.7562	107.1562	132.5562	157.9562	183.3562	208.7562	234.1562	259.5562
15/64	0.234375	5.9531	31.3531	56.7531	82.1531	107.5531	132.9531	158.3531	183.7531	209.1531	234.5531	259.9531
1/4	0.25	**6.3500**	**31.7500**	**57.1500**	**82.5500**	**107.9500**	**133.3500**	**158.7500**	**184.1500**	**209.5500**	**234.9500**	**260.3500**
17/64	0.265625	6.7469	32.1469	57.5469	82.9469	108.3469	133.7469	159.1469	184.5469	209.9469	235.3469	260.7469
9/32	0.28125	7.1438	32.5438	57.9438	83.3438	108.7438	134.1438	159.5438	184.9438	210.3438	235.7438	261.1438
19/64	0.296875	7.5406	32.9406	58.3406	83.7406	109.1406	134.5406	159.9406	185.3406	210.7406	236.1406	261.5406
5/16	0.3125	7.9375	33.3375	58.7375	84.1375	109.5375	134.9375	160.3375	185.7375	211.1375	236.5375	261.9375
21/64	0.328125	8.3344	33.7344	59.1344	84.5344	109.9344	135.3344	160.7344	186.1344	211.5344	236.9344	262.3344
11/32	0.34375	8.7312	34.1312	59.5312	84.9312	110.3312	135.7312	161.1312	186.5312	211.9312	237.3312	262.7312
23/64	0.359375	9.1281	34.5281	59.9281	85.3281	110.7281	136.1281	161.5281	186.9281	212.3281	237.7281	263.1281
3/8	0.375	**9.5250**	**34.9250**	**60.3250**	**85.7250**	**111.1250**	**136.5250**	**161.9250**	**187.3250**	**212.7250**	**238.1250**	**263.5250**
25/64	0.390625	9.9219	35.3219	60.7219	86.1219	111.5219	136.9219	162.3219	187.7219	213.1219	238.5219	263.9219
13/32	0.40625	10.3188	35.7188	61.1188	86.5188	111.9188	137.3188	162.7188	188.1188	213.5188	238.9188	264.3188
27/64	0.421875	10.7156	36.1156	61.5156	86.9156	112.3156	137.7156	163.1156	188.5156	213.9156	239.3156	264.7156
7/16	0.4375	11.1125	36.5125	61.9125	87.3125	112.7125	138.1125	163.5125	188.9125	214.3125	239.7125	265.1125
29/64	0.453125	11.5094	36.9094	62.3094	87.7094	113.1094	138.5094	163.9094	189.3094	214.7094	240.1094	265.5094
15/32	0.46875	11.9062	37.3062	62.7062	88.1062	113.5062	138.9062	164.3062	189.7062	215.1062	240.5062	265.9062
31/64	0.484375	12.3031	37.7031	63.1031	88.5031	113.9031	139.3031	164.7031	190.1031	215.5031	240.9031	266.3031
1/2	0.5	**12.7000**	**38.1000**	**63.5000**	**88.9000**	**114.3000**	**139.7000**	**165.1000**	**190.5000**	**215.9000**	**241.3000**	**266.7000**
33/64	0.515625	13.0969	38.4969	63.8969	89.2969	114.6969	140.0969	165.4969	190.8969	216.2969	241.6969	267.0969
17/32	0.53125	13.4938	38.8938	64.2938	89.6938	115.0938	140.4938	165.8938	191.2938	216.6938	242.0938	267.4938
35/64	0.546875	13.8906	39.2906	64.6906	90.0906	115.4906	140.8906	166.2906	191.6906	217.0906	242.4906	267.8906
9/16	0.5625	14.2875	39.6875	65.0875	90.4875	115.8875	141.2875	166.6875	192.0875	217.4875	242.8875	268.2875
37/64	0.578125	14.6844	40.0844	65.4844	90.8844	116.2844	141.6844	167.0844	192.4844	217.8844	243.2844	268.6844
19/32	0.59375	15.0812	40.4812	65.8812	91.2812	116.6812	142.0812	167.4812	192.8812	218.2812	243.6812	269.0812
39/64	0.609375	15.4781	40.8781	66.2781	91.6781	117.0781	142.4781	167.8781	193.2781	218.6781	244.0781	269.4781
5/8	0.625	**15.8750**	**41.2750**	**66.6750**	**92.0750**	**117.4750**	**142.8750**	**168.2750**	**193.6750**	**219.0750**	**244.4750**	**269.8750**
41/64	0.640625	16.2719	41.6719	67.0719	92.4719	117.8719	143.2719	168.6719	194.0719	219.4719	244.8719	270.2719
21/32	0.65625	16.6688	42.0688	67.4688	92.8688	118.2688	143.6688	169.0688	194.4688	219.8688	245.2688	270.6688
43/64	0.671875	17.0656	42.4656	67.8656	93.2656	118.6656	144.0656	169.4656	194.8656	220.2656	245.6656	271.0656
11/16	0.6875	17.4625	42.8625	68.2625	93.6625	119.0625	144.4625	169.8625	195.2625	220.6625	246.0625	271.4625
45/64	0.703125	17.8594	43.2594	68.6594	94.0594	119.4594	144.8594	170.2594	195.6594	221.0594	246.4594	271.8594
23/32	0.71875	18.2562	43.6562	69.0562	94.4562	119.8562	145.2562	170.6562	196.0562	221.4562	246.8562	272.2562
47/64	0.734375	18.6531	44.0531	69.4531	94.8531	120.2531	145.6531	171.0531	196.4531	221.8531	247.2531	272.6531
3/4	0.75	**19.0500**	**44.4500**	**69.8500**	**95.2500**	**120.6500**	**146.0500**	**171.4500**	**196.8500**	**222.2500**	**247.6500**	**273.0500**
49/64	0.765625	19.4469	44.8469	70.2469	95.6469	121.0469	146.4469	171.8469	197.2469	222.6469	248.0469	273.4469
25/32	0.78125	19.8438	45.2438	70.6438	96.0438	121.4438	146.8438	172.2438	197.6438	223.0438	248.4438	273.8438
51/64	0.796875	20.2406	45.6406	71.0406	96.4406	121.8406	147.2406	172.6406	198.0406	223.4406	248.8406	274.2406
13/16	0.8125	20.6375	46.0375	71.4375	96.8375	122.2375	147.6375	173.0375	198.4375	223.8375	249.2375	274.6375
53/64	0.828125	21.0344	46.4344	71.8344	97.2344	122.6344	148.0344	173.4344	198.8344	224.2344	249.6344	275.0344
27/32	0.84375	21.4312	46.8312	72.2312	97.6312	123.0312	148.4312	173.8312	199.2312	224.6312	250.0312	275.4312
55/64	0.859375	21.8281	47.2281	72.6281	98.0281	123.4281	148.8281	174.2281	199.6281	225.0281	250.4281	275.8281
7/8	0.875	**22.2250**	**47.6250**	**73.0250**	**98.4250**	**123.8250**	**149.2250**	**174.6250**	**200.0250**	**225.4250**	**250.8250**	**276.2250**
57/64	0.890625	22.6219	48.0219	73.4219	98.8219	124.2219	149.6219	175.0219	200.4219	225.8219	251.2219	276.6219
29/32	0.90625	23.0188	48.4188	73.8188	99.2188	124.6188	150.0188	175.4188	200.8188	226.2188	251.6188	277.0188
59/64	0.921875	23.4156	48.8156	74.2156	99.6156	125.0156	150.4156	175.8156	201.2156	226.6156	252.0156	277.4156
15/16	0.9375	23.8125	49.2125	74.6125	100.0125	125.4125	150.8125	176.2125	201.6125	227.0125	252.4125	277.8125
61/64	0.953125	24.2094	49.6094	75.0094	100.4094	125.8094	151.2094	176.6094	202.0094	227.4094	252.8094	278.2094
31/32	0.96875	24.6062	50.0062	75.4062	100.8062	126.2062	151.6062	177.0062	202.4062	227.8062	253.2062	278.6062
63/64	0.984375	25.0031	50.4031	75.8031	101.2031	126.6031	152.0031	177.4031	202.8031	228.2031	253.6031	279.0031

Supplementary table 10 Mechanical properties of metal materials (reference)

(1) Modulus of longitudinal elasticity, elastic limit, and ultimate strength

Material	Main components and others	Specific gravity	Modulus of longitudinal elasticity (GPa)	Elastic limit σ_e (MPa)	Ultimate strength (MPa)		
					Tensile K_t	Compression K_c	Shear K_s
Gray cast iron (FC150)		7.1–7.3	69	29	118	590	108
(FC200)		7.1–7.3	98	88	137– 216	740	206
(FC250)		7.1–7.3	103	88	176– 314	880	206
White heart malleable cast iron	Residual carbon : 1.6% or less	7.1–7.3	158	196	314– 392	820	382
Black heart malleable cast iron		7.2–7.6	158	196	274– 392	820	382
Carbon steel	General	7.7–7.8	196–216	176–245	314– 830	–	–
Extra mild steel	C 0.05–0.15%	7.8	196	118	Up to 372	Virtually identical to tensile strength, provided buckling can be ignored	0.8 K_t
Mild steel	C 0.15–0.25%	7.8	204	157	372– 392		0.75 K_t
Middle hard steel	C 0.25–0.40%	7.8	206	245–294	490– 590		0.75 K_t
Hard steel	C 0.40–0.50%	7.8	216	343	590– 690		0.7 K_t
Maximum hard steel	C 0.50–0.65%	7.8	216	372	690– 830		0.65 K_t
Mild steel	C 0.18% hot rolling	7.8	206	176	421		314
Hard steel	Oil hardening, tempering at 700 ℃	7.8	206	343	590		461
Tool steel	C 0.60–1.50% hardening	7.8	216	441	660		820
Cast steel	General	7.8–7.9	206–211	176–245	343– 600	343–600	284–382
Cast steel (mild)	C 0.15–0.22%	7.8–7.9	206	196	363– 431	363–431	284
Cast steel (middle hard)	C 0.22–0.30%	7.8–7.9	211	225	392– 490	392–490	333
Cast steel (hard)	C 0.30–0.40%	7.9	211	245	490– 590	490–590	382
Nickel steel	C 0.25–0.35% Ni 2–5%	7.85	206–216	333	640– 830	640	401
Chrome steel	C 0.13–0.48% Cr 0.9–1.2%	7.85	206–216	–	780– 980	–	–
Nickel chrome steel	C, Ni, Cr included	7.85	206–216	–	740– 980	–	382–500
Chromium molybdenum steel	C, Cr, Mo included	7.85	206–216	–	830– 980	–	–
Manganese steel	C 0.2–0.46% Mn 1–1.4%	7.85	206–216	–	440–1 080	–	–
Spring steel		7.86	216	735	1 080–1 670	1 670	–
Stainless steel	C, Cr, Ni included	7.75	206–216	–	620	–	410
Brass casting	Cu 60% Zn 40%	8.5	69	–	176– 216	108	147
Brass (forged plate)	Cu 60% Zn 40%	8.4	78– 98	–	274– 392	314	206
Brass (forged rod)	Cu 60% Zn 40%	8.4	82	–	520	314	314
Phosphor bronze casting	Cu 90% Sn 10% P 0.1%	8.8	93–103	–	196– 294	137	176
Phosphor bronze (forging)	Cu 90% Sn 10% P 0.1%	8.8	132	–	294– 980	206	382
Tin		7.28	39– 54	–	27	–	–
Lead		11.34	15– 17	–	20	–	–
Zinc		7.1	78–127	–	78– 176	–	–

(2) Allowable stress

Unit : MPa

Material	Tensile K_t			Compression K_c		Bending K_b			Shear K_s			Torsion K_d		
	a	*b*	*c*	*a*	*b*	*a*	*b*	*c*	*a*	*b*	*c*	*a*	*b*	*c*
Cast iron (cast)	29– 34	20– 23	10–12	88– 98	59– 65	45– 59	30– 39	15–20	29– 34	20–23	10–12	26– 34	18–23	88–118
Cast iron (machined)	29– 34	20– 23	10–12	88– 98	59– 65	55– 71	–	–	29– 34	20–23	10–12	26– 34	18–23	88–118
Malleable cast iron	44– 69	29– 46	15–23	59– 88	39– 59	44– 98	29– 46	15–23	–	–	–	29– 39	20–26	10– 13
Cast steel	59–118	39– 78	20–39	88–147	59– 98	74–118	49– 78	25–39	47– 94	31–63	16–31	47– 94	31–63	16– 31
Mild steel	98–157	66–105	32–52	98–157	66–105	88–147	59– 98	35–49	78–127	52–85	26–42	78–137	52–91	26– 46
Middle hard steel	118–176	78–118	39–59	118–176	78–118	118–176	78–118	39–59	94–137	63–94	31–47	88–137	59–94	29– 47
Nickel steel	118–176	78–118	39–59	118–176	78–118	118–176	78–118	39–59	94–137	63–94	31–47	88–137	59–92	29– 47
Carbon steel casting	88–118	59– 78	29–39	88–118	59– 78	88–118	59– 78	29–39	71– 93	47–63	24–31	35– 47	24–31	12– 16
Brass (rolled)	10– 59	26– 35	13–20	39– 59	26– 39	39– 59	26– 39	13–20	34– 47	21–31	11–16	31– 47	21–31	11– 16
Bronze	29– 39	20– 26	10–13	29– 39	20– 26	29– 39	20– 26	10–13	–	–	–	–	–	–
Phosphor bronze	59– 88	39– 59	20–29	59– 88	39– 59	59– 88	39– 59	20–29	44– 69	29–46	15–23	44– 69	29–46	15– 23
Aluminum casting	10– 12	7– 8	2– 4	–	–	15– 20	10– 13	5– 7	–	–	–	–	–	–

Remarks 1. *a* is applicable in the case of static load, *b* is applicable in the case of dynamic load, and *c* is applicable to in the case of repeated load.
2. Bending allowable stress K_b and torsion allowable stress K_d of cast iron are applicable when the cross section is round and safety factor is within a range from 5 to 6.

Supplementary table 11 Steel hardness conversion

Rockwell	Vickers	Brinell		Rockwell		Shore
C scale 1 471.0 N (150 kgf)		Standard steel ball	Tungsten carbide steel ball	A scale 588.4 N (60 kgf)	B scale 980.7 N (100 kgf)	
68	940			85.6		97
67	900			85.0		95
66	865			84.5		92
65	832		739	83.9		91
64	800		722	83.4		88
63	772		705	82.8		87
62	746		688	82.3		85
61	720		670	81.8		83
60	697		654	81.2		81
59	674		634	80.7		80
58	653		615	80.1		78
57	633		595	79.6		76
56	613		577	79.0		75
55	595	–	560	78.5		74
54	577	–	543	78.0		72
53	560	–	525	77.4		71
52	544	500	512	76.8		69
51	528	487	496	76.3		68
50	513	475	481	75.9		67
49	498	464	469	75.2		66
48	484	451	455	74.7		64
47	471	442	443	74.1		63
46	458	432	432	73.6		62
45	446	421		73.1		60
44	434	409		72.5		58
43	423	400		72.0		57
42	412	390		71.5		56
41	402	381		70.9		55
40	392	371		70.4	–	54
39	382	362		69.9	–	52
38	372	353		69.4	–	51
37	363	344		68.9	–	50
36	354	336		68.4	(109.0)	49
35	345	327		67.9	(108.5)	48
34	336	319		67.4	(108.0)	47
33	327	311		66.8	(107.5)	46
32	318	301		66.3	(107.0)	44
31	310	294		65.8	(106.0)	43
30	302	286		65.3	(105.5)	42
29	294	279		64.7	(104.5)	41
28	286	271		64.3	(104.0)	41
27	279	264		63.8	(103.0)	40
26	272	258		63.3	(102.5)	38
25	266	253		62.8	(101.5)	38
24	260	247		62.4	(101.0)	37
23	254	243		62.0	100.0	36
22	248	237		61.5	99.0	35
21	243	231		61.0	98.5	35
20	238	226		60.5	97.8	34
(18)	230	219		–	96.7	33
(16)	222	212		–	95.5	32
(14)	213	203		–	93.9	31
(12)	204	194		–	92.3	29
(10)	196	187			90.7	28
(8)	188	179			89.5	27
(6)	180	171			87.1	26
(4)	173	165			85.5	25
(2)	166	158			83.5	24
(0)	160	152			81.7	24

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Koyo TOYODA

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Koyo®

Traction Drive Unit

Reducer for high-accuracy feeding

Minimal rotation irregularity

No backlash

Low noise, low vibration

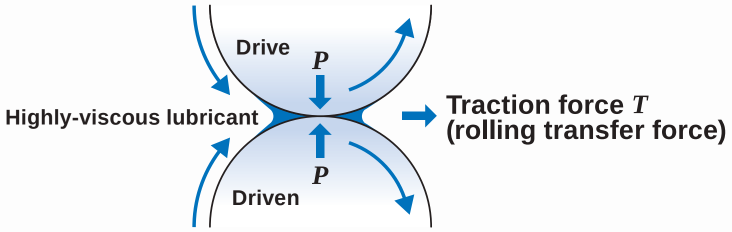
JTEKT CORPORATION

CAT.NO.B1011E

A Traction Drive Unit
conceived from bearing core technologies

The traction drive unit is a power transmission based on the rolling contact between rollers and is capable of smooth, rattle-free power transfer. High-accuracy and high-strength rollers are subjected to elastic deformation prior to assembly, achieving high pressure force. Additionally, by introducing traction grease that becomes highly viscous under high pressure, it is possible to achieve excellent power transfer while securing lubricity.

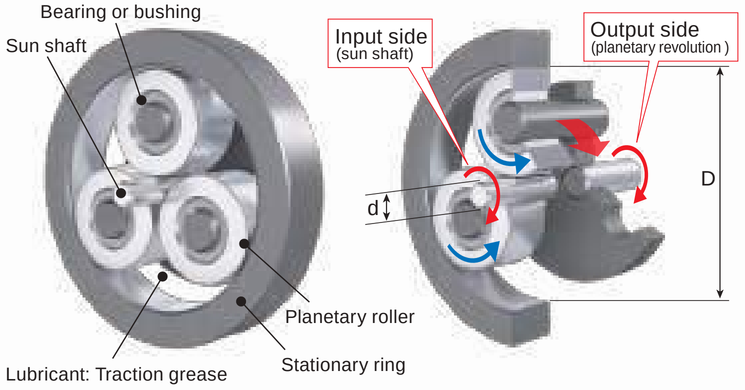
Principle and Structure



Traction force $T=\mu P$

μ:Traction coefficient

P:Pressure force



Reduction ratio $i=\dfrac{D+d}{d}$

D:Stationary ring bore diameter

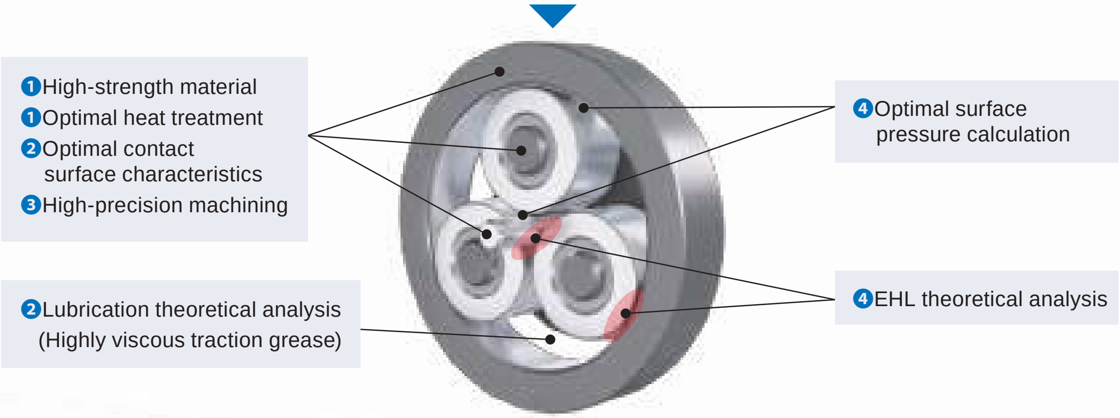
d:Sun shaft outer diameter

Reduction ratio: 3 - 12 (1-stage)
Large reduction ratio is possible
if made multistage

Application of JTEKT Core Technologies

Taking bearing technologies accumulated over many years under the KOYO brand and applying them to traction drive units.

- ❶Materials, heat treatment technology
- ❸High-precision machining technology
- ❷Tribology technology
- ❹Analysis technology



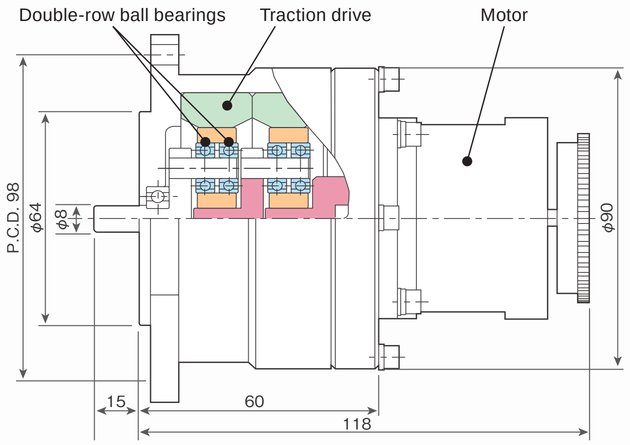
Rotation stability | **No backlash** | **Low noise, low vibration**

Ideal for High-accuracy Feeding

Specification Examples

No Backlash Type

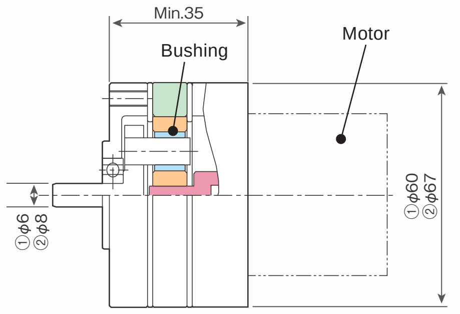
Backlash has been eliminated and friction reduced by adjusting the internal clearance of the ball bearings in the planetary roller.



Reduction ratio	100 (2-stage reduction)
Torque (output shaft)	2N•m
Rotating speed fluctuation coefficient	±0.5% or less
Backlash	0.01deg or less

Compact Type

The compact design incorporates a bushing in the planetary roller.



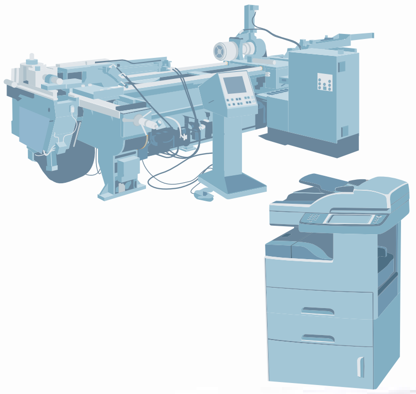
	①	②
Reduction ratio	10	5
Torque (output shaft)	2〜4N•m	7.5〜12N•m
Rotating speed fluctuation coefficient	±0.5% or less	

Customization according to customer requests is available, so please do not hesitate to contact us.

Application Examples

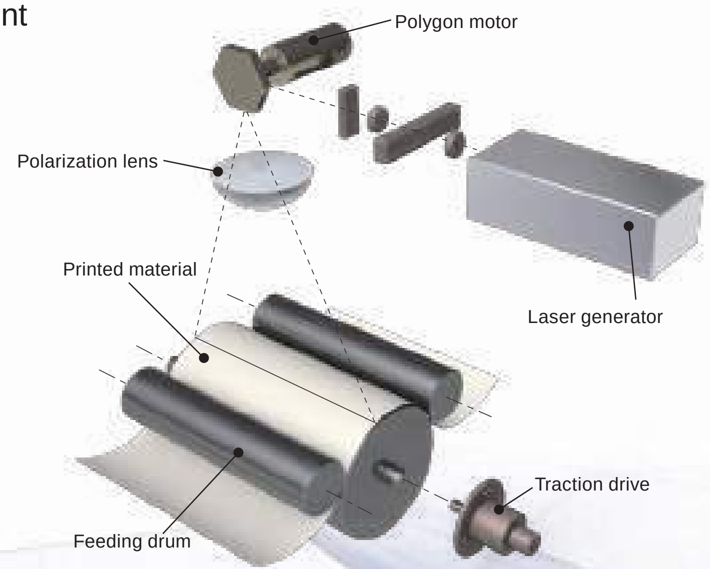
- Printers
- Machine tools
- FPD manufacturing equipment
- ROBOT

And more



Eliminate speed irregularity of feeding drum

Contributes to improving image quality



Reducer with a Minimal Rotation Irregularity Unachievable Using Gears

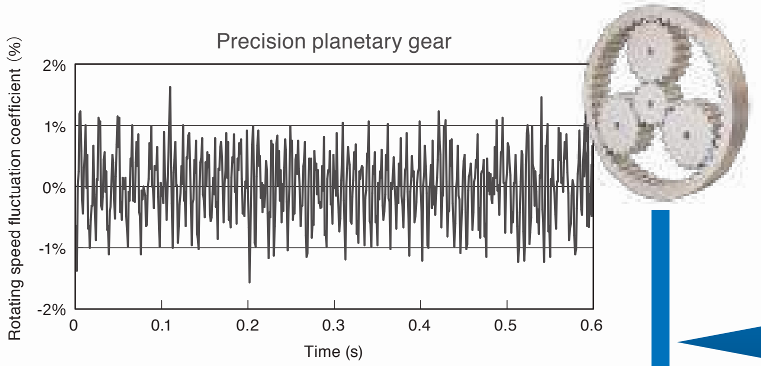
Features

Comparison with planetary gear

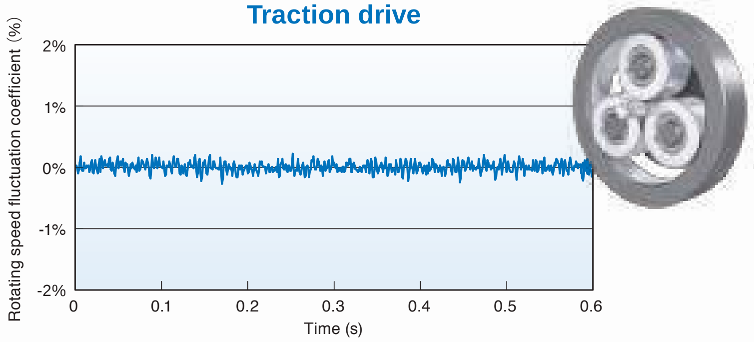
Mechanism	Rotation irregularity	Backlash	Noise/Vibration	High-speed performance	Torque capacity
Traction drive	◎	◎	◎	○	△
Planetary gear	△	△	△	△	◎

Measurement examples

1 Rotation irregularity



Reduced by 80%

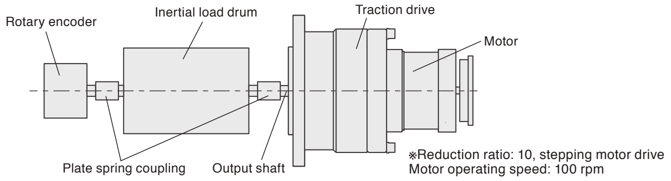


Rotating speed fluctuation coefficient (%) = (Rotation irregularity)

$$\frac{\text{Speed fluctuation}}{\text{Average rotating speed of output shaft}} \times 100$$

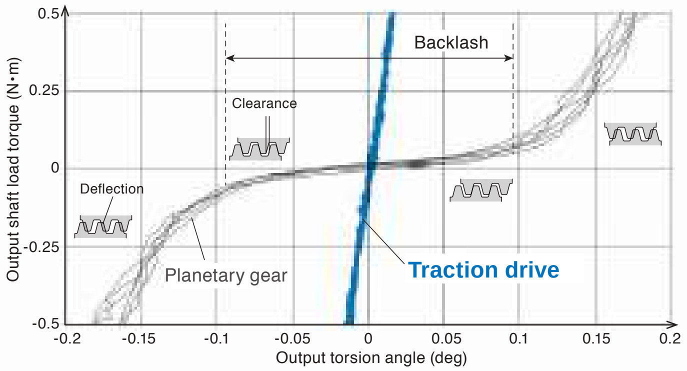
Measurement method

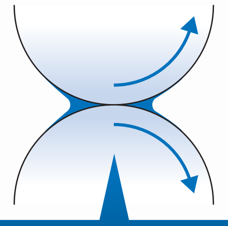
Run the motor at a set speed measuring rotating speed of the output shaft using the rotary encoder



※Reduction ratio: 10, stepping motor drive
Motor operating speed: 100 rpm

2 Backlash

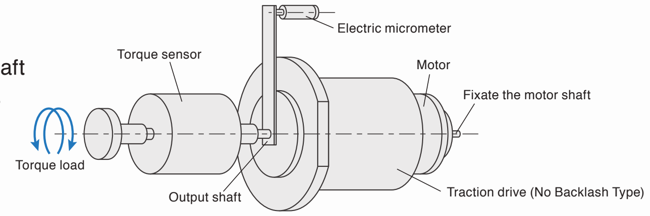




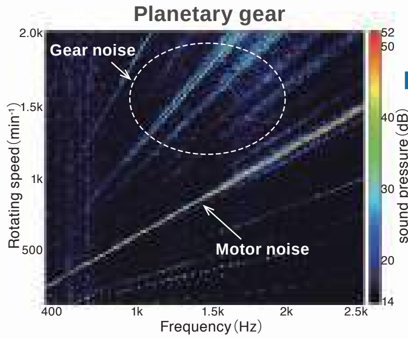
No Backlash

Measurement method

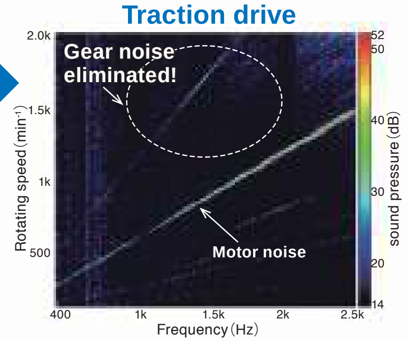
Measure the torsion angle of the output shaft when the motor shaft is fixed and torque is applied to the output shaft clockwise and counter-clockwise



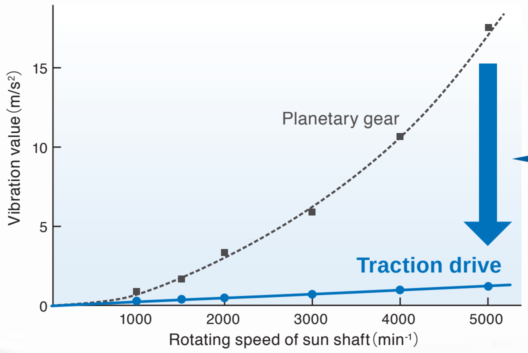
3 Noise



Gear noise eliminated!



4 Vibration



Vibration reduced by approx. 90%

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Koyo®

Precision Ball & Roller Bearings for Machine Tools

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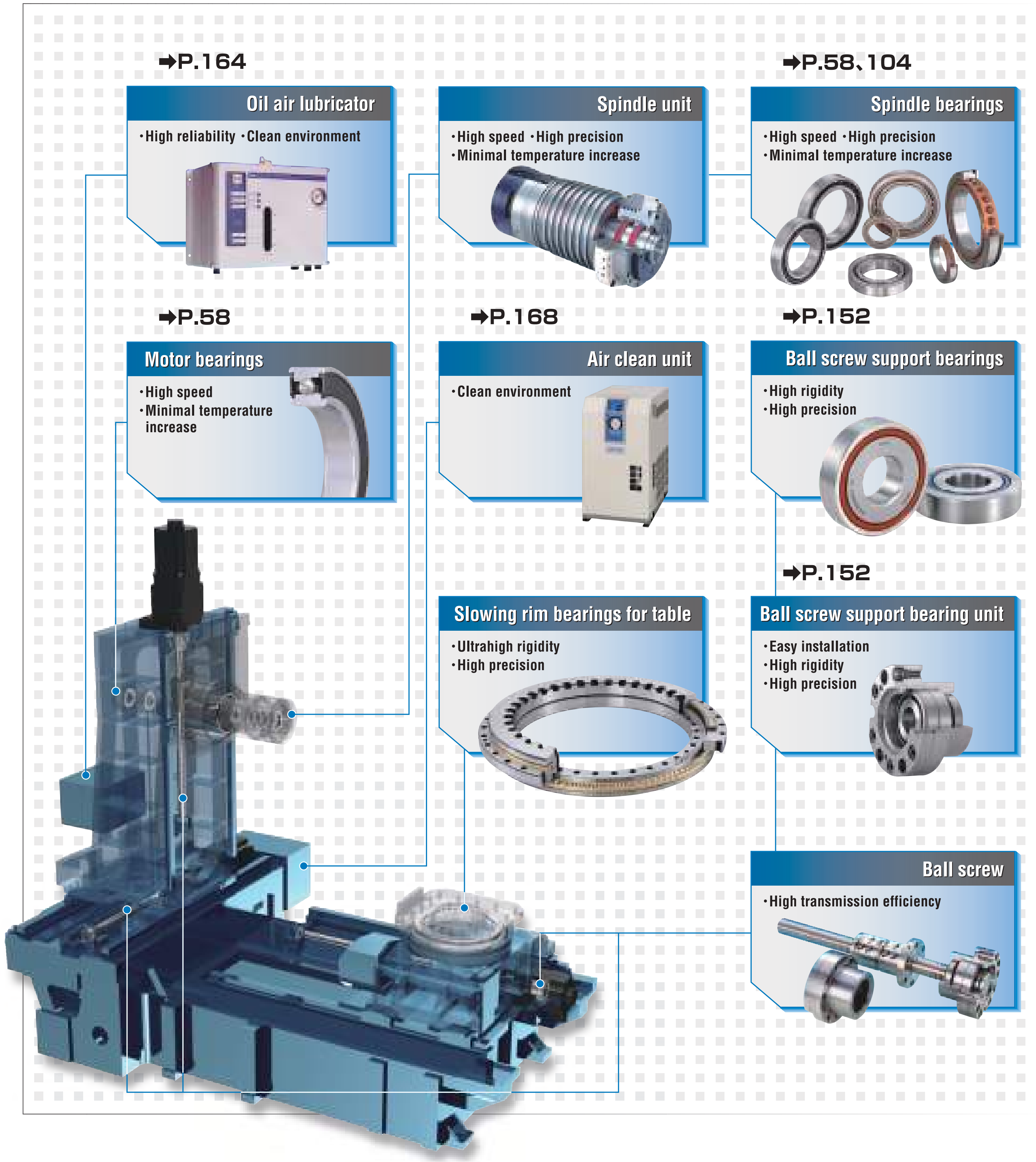
JTEKT
Koyo TOYODA

CAT. NO. B2005E-3

Proposal of Various Products for Machine Tools

PRODUCT LINE-UP FOR MACHINING CENTERS



➡P.164

Oil air lubricator

- High reliability ・Clean environment

Spindle unit

- High speed ・High precision
- Minimal temperature increase

➡P.58、104

Spindle bearings

- High speed ・High precision
- Minimal temperature increase

➡P.58

Motor bearings

- High speed
- Minimal temperature increase

➡P.168

Air clean unit

- Clean environment

➡P.152

Ball screw support bearings

- High rigidity
- High precision

Slowing rim bearings for table

- Ultrahigh rigidity
- High precision

➡P.152

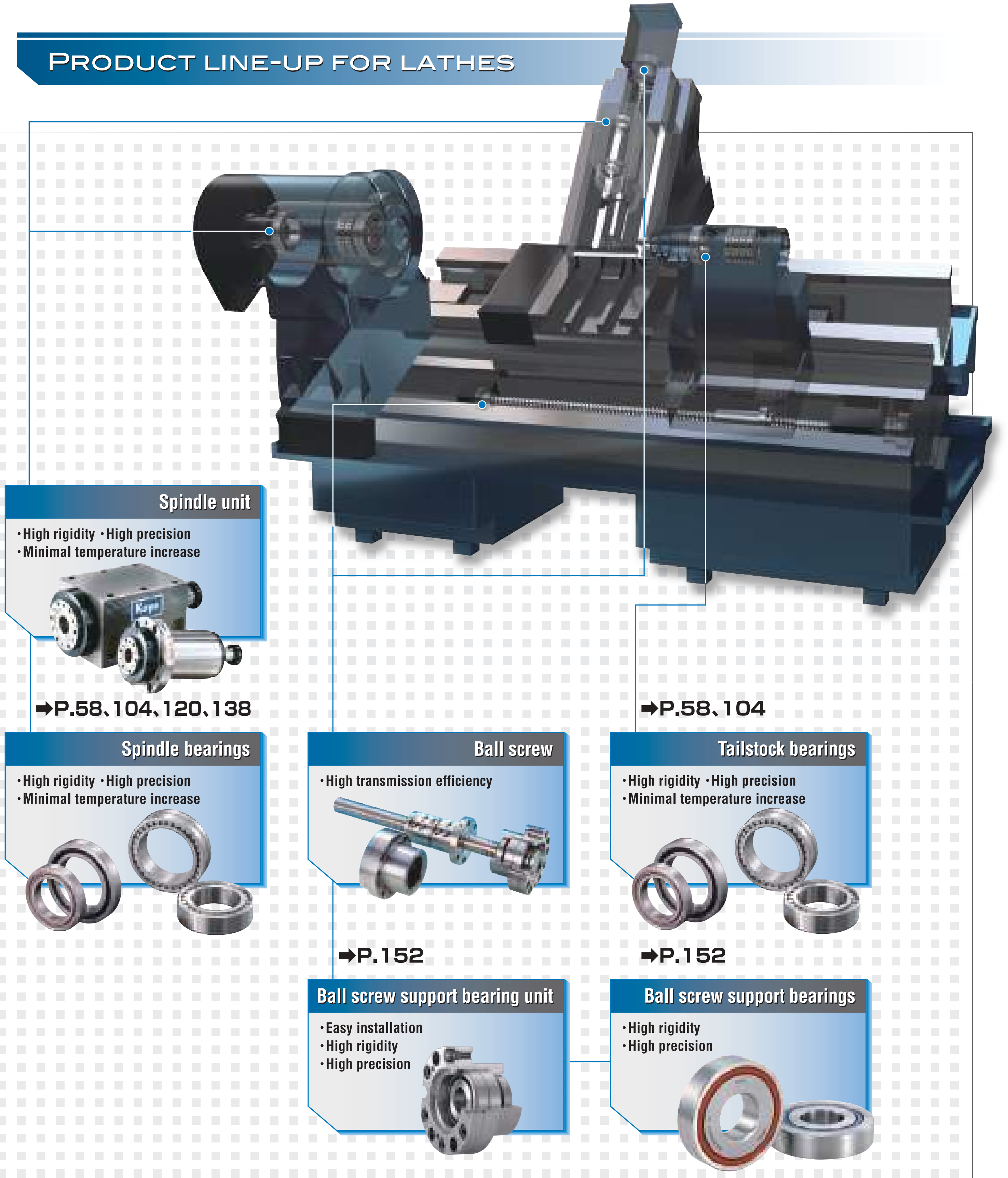
Ball screw support bearing unit

- Easy installation
- High rigidity
- High precision

Ball screw

- High transmission efficiency

PRODUCT LINE-UP FOR LATHES



Spindle unit

- High rigidity ・High precision
- Minimal temperature increase

➡P.58、104、120、138

Spindle bearings

- High rigidity ・High precision
- Minimal temperature increase

Ball screw

- High transmission efficiency

➡P.58、104

Tailstock bearings

- High rigidity ・High precision
- Minimal temperature increase

➡P.152

Ball screw support bearing unit

- Easy installation
- High rigidity
- High precision

➡P.152

Ball screw support bearings

- High rigidity
- High precision

Please consult JTEKT for detailed information on products not listed in this catalog.

Koyo®

Precision Ball & Roller Bearings for Machine Tools

CAT. NO. B2005E-3

Catalog
Precision Ball & Roller Bearings for Machine Tools Preface

Thank you for your valuable support of **KOYO** products.

Nowadays, there is a pressing demand in the industrial world for sophisticating machine tools in all aspects.
Accordingly, ball & roller bearings for machine tools must be more compact and lightweight and exhibit such features as longer service life, higher performance, and higher reliability. This is made possible only through a wide range of high technologies.

We are confident that this catalog will be of help to the user in the design of machine tools and in the use of precision rolling bearings.

JTEKT continually offers the best technologies, quality, and services, through inspiration from the market and putting efforts into research and technical developments.
We hope that you will be as satisfied with our products and services as you have been in the past.

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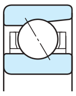
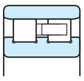
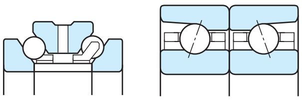
I Precision Ball & Roller Bearings
Technical Descriptions

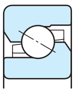
Precision Ball & Roller Bearings
Bearing Dimension Tables

Angular Contact Ball Bearings


Cylindrical Roller Bearings


Angular Contact Ball Bearings for Axial Load


Tapered Roller Bearings


Support Bearings and Support Bearing Units for Precision Ball Screws


II Oil / Air Lubrication System

III Handling of Bearings

IV Examples of Bearing Failures

V Supplementary Tables

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Ⅰ. Precision Ball & Roller Bearings

Technical Descriptions

Bearing Dimension Tables

Ⅱ. Oil / Air Lubrication System

Ⅲ. Handling of Bearings

Ⅳ. Examples of Bearing Failures

Ⅴ. Supplementary Tables

Koyo®

Ⅰ. Precision Ball & Roller Bearings

I. Precision Ball & Roller Bearings

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Technical Descriptions

Precision Ball & Roller Bearings

Technical Descriptions

1. Types and structures of precision ball & roller bearings for machine tools

Table 1. 1(1) Types and structures of precision ball & roller bearings for machine tools

1 Spindle bearings

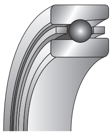
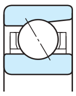
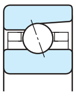
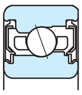
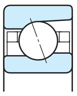
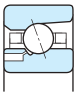
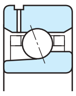
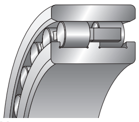
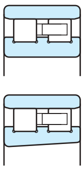
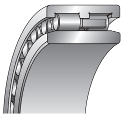
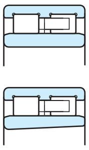
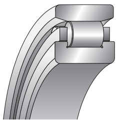
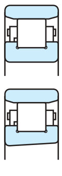
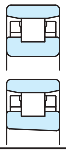
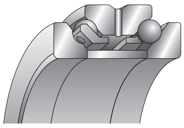
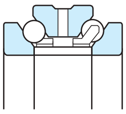
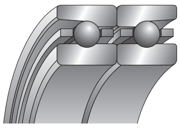
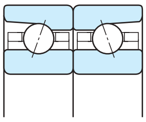
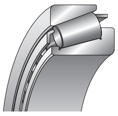
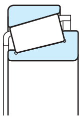
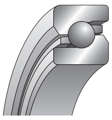
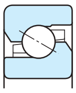
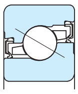
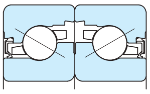
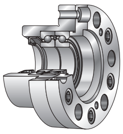
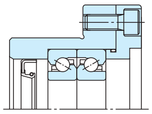
Bearing types	Cross-sections	Bearing series		Contact angles	Features and descriptions	Page No.
 Angular contact ball bearings		Standard types	79C 70C 72C	15°	· Some bearing series support contact angle of 40° (B).	58
			70 72	30°		
	High Ability   Both-side sealed type	High-speed types	HAR9C HAR0C	15°	· Improvements in high-speed performance are made through the use of balls that have a smaller diameter than standard bearing balls. Also, a large number of balls contributes to higher rigidity. · Rolling elements are available in steel and in ceramic. · Consult JTEKT, as the HAR000 series can correspond to the non-contact seal.	
			HAR9CA HAR0CA	20°		
			HAR9 HAR0	30°		
	High Ability 		3NCHAC9C 3NCHAC0C	15°	· Large-diameter balls enable high load-carrying capacity.	
			3NCHAC9CA 3NCHAC0CA	20°	· Ceramic balls realize excellent high-speed performance.	
	High Ability 	Ultrahigh-speed types	3NCHAD0CA	20°	· These bearings have holes for oil / air lubrication. They are suitable for ultrahigh-speed applications. · Ceramic balls realize excellent high-speed performance.	
	High Ability NX series 	Extremely ultrahigh-speed types	3NCHAX9CA 3NCHAX0CA	20°	· This type of bearing produces less heat and has better high-speed performance than conventional High Ability Series products.	
 NN-type double row cylindrical roller bearings		Standard types	NN30 NN30K	—	· Bearings with tapered bores (K) are also available for applications using tapered shafts. · For radial internal clearance values, use non-interchangeable bearings. · Bearings provided with a lubrication hole or groove on the outer ring are also available (W)	104
 NNU-type double row cylindrical roller bearings			NNU49 NNU49K			
 N-type single row cylindrical roller bearings			N10 N10K	—	· Bearings with tapered bores (K) are also available for applications using tapered shafts. · For radial internal clearance values, use non-interchangeable bearings. · This type of bearing produces less heat and has better high-speed performance than double row cylindrical roller bearings.	
	High Ability NX series 	Ultrahigh-speed types	HAN10B HAN10BK	—	· This type of bearing produces less heat and has better high-speed performance than conventional single-row cylindrical roller bearings.	

Table 1. 1(2) Types and structures of precision ball & roller bearings for machine tools

Bearing types	Cross-sections	Bearing series	Contact angles	Features and descriptions	Page No.
 Double-direction angular contact thrust ball bearings		2344B	60°	· Placed on the small tapered-bore diameter side of NN30K, or used together with NN30.	120
		2347B		· Placed on the large tapered-bore diameter side of NN30K.	
		2394B	60°	· Placed on the small tapered-bore diameter side of NNU49K, or used together with NNU49.	
		2397B		· Placed on the large tapered-bore diameter side of NNU49K.	
 High-speed pair-mounted angular contact ball bearings		ACT0DB	30°	· High-speed bearings of the same bore and outside diameters as double-direction angular contact thrust ball bearings 2344B. · They are placed on the small tapered-bore diameter side of NN30K.	
		ACT0BDB	40°		
 Tapered roller bearings		329JR 320JR 302JR 322JR	Nominal contact angles: greater than 10° and equal to or less than 17°	· Metric series single row tapered roller bearings complying with ISO standards.	138

2 Support bearings and support bearing units for precision ball screws

Bearing types	Cross-sections	Bearing series	Contact angles	Features and descriptions	Page No.
 Support bearings for precision ball screws	  Both-side sealed type  Matching example of one-side sealed type	SAC	60°	· Standard preloads are specified, respectively, for 2-, 3-, and 4-row matched bearings. · Flush-ground G-type bearings are also available. · The support bearing for precision ball screws can correspond to the type with contact-seal. Consult JTEKT if desiring information about the type with seal and the matching method.	152
 Support bearing units for precision ball screws		BSU	(60°)	· Support bearing units consist of a support bearing for precision ball screws (SAC) and a precision housing. · Fitting this bearing unit is very simple.	

2. Selection of bearings

In order to select the optimum bearing to realize the intended design of a machine, it is necessary to consider specific operating conditions of the machine, bearing requirements, designs of parts around the bearing, marketability, and cost performance.

Table 2. 1 specifies the general procedure for selecting a bearing, and operating conditions to be taken into consideration. Note, however, that when selecting a bearing, priority should be given to meeting the most critical requirement rather than following a given procedure.

Table 2. 1 Procedure for selecting bearings and operating conditions to be taken into consideration

Selection procedure	Operating condition to be taken into consideration	Related information on bearings	Page No.
① Bearing types and arrangements	· Installation space · Magnitude, direction, and types of load applied to bearings · Rotational speeds · Running accuracy · Noise/frictional torque · Rigidity · Method of mounting and dismounting · Bearing arrangements · Marketability and cost performance	· Bearing types · Bearing arrangement examples	15 16
② Bearing dimensions	· Dimensions of bearing mounting positions · Dynamic equivalent load and rating life · Rotational speeds	· Bearing rating life · Basic dynamic load ratings · Dynamic equivalent loads · Permissible axial loads	18 18 24 28
③ Bearing tolerance class	· Running accuracy (runout) · Noise/frictional torque · Rotational speeds	· Bearing tolerances (Dimension tables)	
④ Fitting and internal clearance	· Loading condition · Operational temperature distribution · Shaft and housing materials · Dimensions and tolerances } · Fitting · Temperature differences between inner ring and outer ring · Rotational speed · Amount of preload	· Recommended fitting · Running accuracy of shafts and housings · Bearing preload · Internal clearance of bearings (Dimension tables)	32 39 29
⑤ Type and material of cage	· Rotational speeds · Noise · Lubrication methods		
⑥ Lubrication method, lubricant, and sealing device	· Operating temperatures · Rotational speeds · Sealing device · Lubrication methods · Lubricants	· Limiting speeds of bearings · Lubrication of bearings	34 35
⑦ Method of mounting and dismounting, and mounting dimensions	· Method of mounting and dismounting	· Handling of bearings	172
Decision on final specifications of bearing and parts around bearing			

For more information about specifications, fill out the supplementary **table 7 "Specification report of bearing for main shaft of machine tool"** on page 204, and contact **JTEKT**.

3. Selection of bearing types

When selecting a bearing type, it is of critical importance to fully understand the operating conditions of the bearing.

Table 3. 1 shows principal items to be considered and how to select a bearing type.

Table 3. 1 Selection of bearing types

Items to be considered	How to select a type
① Installation space Bearing can be installed in target equipment	· When designing a shaft system, critical factors on the whole are shaft rigidity and strength, therefore, shaft diameter, namely, the bore diameter of the bearing is determined first. · The installation space determined by types and the dimension series of the bearings used for the spindles of machine tools are shown in **Fig. 3. 1**. Select the optimum bearing from the types illustrated.
② Load Load magnitude, type and direciton which applied The load capacity of the bearing is expressed in terms of the basic load rating, the value of which is given in the bearing dimension tables.	· Select the optimum bearing type taking into consideration the magnitude of the load applied to the bearing, whether the load is axial or radial, whether, in the case of axial load, the load is unidirectional or bidirectional, the level of vibration and shock, and other relevant factors. · Radial load capacity varies as shown below with the bore diameter remaining the same. (Small) → (Large) Angular contact ball bearings Cylindrical roller bearings Tapered roller bearings
③ Rotational speeds Bearing types compatible with the machine's operating speed Standard values for rotational speed limits of bearings are expressed in limiting speed given in the bearing dimension tables.	· Limiting speeds of bearings largely depends not only on the bearing type, but also on other factors such as bearing size, running accuracy, type and materials of the cage, magnitude of load, and lubrication. Select a bearing taking these fully into consideration. · In general, angular contact ball bearings and cylindrical roller bearings are often used for high-speed applications.
④ Running accuracy Bearing types meeting requirements for running accuracy Dimension and running accuracies are standardized by JIS and the like for each bearing type.	· The spindles of machine tools, which need to rotate with high accuracy, require precision bearings meeting tolerance class 5 or better. · In general, angular contact ball bearings and cylindrical roller bearings are used.
⑤ Rigidity Bearing types meeting the rigidity requirements for machine shaft systems When a load is applied to a bearing, elastic deformation occurs at the contacts between the raceway and rolling elements.The smaller the elastic deformation, the higher the rigidity.	· In order to improve the machining precision of a machine tool, the rigidity of bearings as well as the rigidity of the shaft should be improved. · In general, roller bearings exhibit a high rigidity, while ball bearings exhibit low rigidity. Bearings of the same type and dimensions vary in rigidity with the number of rolling elements and contact angle. · The rigidity of a bearing is increased by applying a preload to the bearing (to provide a clearance of a negative value). This method is suitable for angular contact ball bearings and tapered roller bearings.
⑥ Mounting and dismounting Bearing types should be selected taking into consideration the frequency and method of mounting and dismounting on occasions such as periodic inspection	· If the bearing is to be mounted and dismounted frequently, cylindrical roller bearings and tapered roller bearings are advantageous, as the inner ring and outer ring are separable.

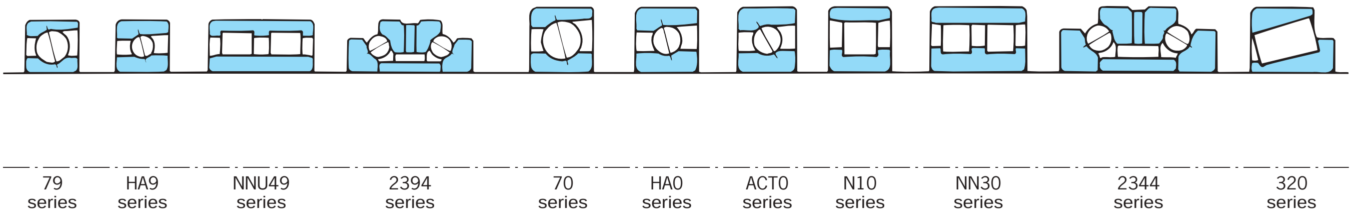


Fig. 3. 1 Installation space determined by types and dimension series of precision rolling bearings for machine tools

4. Spindle bearing arrangements

Fig. 4. 1 presents typical arrangements for spindle bearings for machine tools.

For high-speed spindles, the use of ceramic bearings enables higher speed.

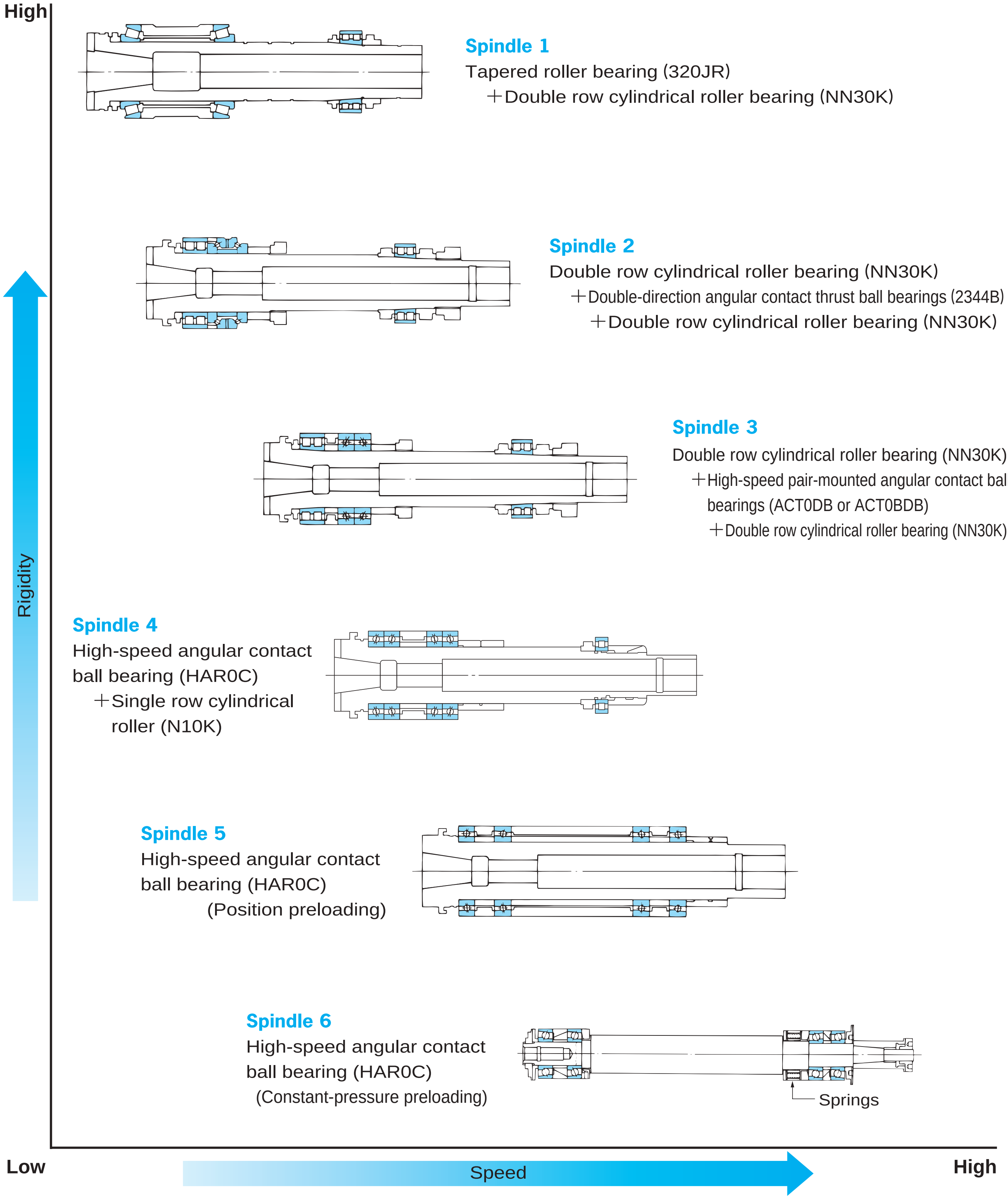


Fig. 4. 1 Examples of spindle bearing arrangements

Table 4. 1 Detailed examples of spindle bearing arrangements

(The d_mn value represents the product of the pitch diameter of ball set d_m and the rotational speed n.)

Spindle	d_mn Value	Features	Principal applications
1	Grease lubrication: 0.2×10^6	Both radial and axial loads are accepted by the tapered roller bearing. This arrangement produces high rigidity but is not suitable for high-speed operation.	Large lathes General-purpose lathes Milling machines
2	Grease lubrication: 0.4×10^6	In this structure, radial load is accepted by a double row cylindrical roller bearing and axial load is accepted by a double-direction angular contact thrust ball bearing. This arrangement produces high rigidity.	CNC lathes Machining centers Boring machines Milling machines
3	Grease lubrication: 0.5×10^6	A high-speed matched pair angular contact ball bearing is used instead of the double-direction angular contact thrust ball bearing in Spindle 2. Contact angles of the high-speed pair-mounted angular contact ball bearings are 30° for ACT0DB and 40° for ACT0BDB.	CNC lathes Machining centers Milling machines
4	Grease lubrication: 0.7×10^6 Oil / air lubrication: 1.05×10^6	Both radial and axial loads are accepted by the angular contact ball bearing. This arrangement is superior to Spindle 3 in high-speed performance, but inferior in radial and axial rigidity.	CNC lathes Machining centers Milling machines
5	Grease lubrication: 0.85×10^6 Oil / air lubrication: 1.1×10^6	High-speed angular contact ball bearings are used in both the front and rear to provide greater high-speed performance. Factors such as thermal expansion should be taken into consideration for preload settings.	Boring machines Machining centers
6	Grease lubrication: 1.0×10^6 Oil / air lubrication: 1.45×10^6	Constant-pressure preloading is used to prevent increase in preload due to heat. This arrangement produces a lower rigidity than that produced by position preloading, but is superior in high-speed performance.	Grinding machines

5. Service life of bearings

5. 1 Rating life of bearings

When a bearing rotates under a load, the surfaces of the inner and outer ring raceways and the surfaces of the rolling elements are constantly subjected to repetitive loads. Even under proper operating conditions this results in scale-like damage (known as flaking) of the surfaces due to fatigue.

The total number of rotations before this damage occurs is known as "(fatigue) service life" of the bearing.

A substantial variation in "(fatigue) service life" occurs even if bearings of the same structure, dimensions, materials, machining method, etc. are operated under the same conditions.

This variation in fatigue, an intrinsic phenomenon to the material, should be examined statistically.

The total number of rotations at which 90% of the same type of bearings individually operated under the same conditions are free of damage caused by rolling fatigue (in other words, service life of 90% reliability), is referred to as "basic rating life of the bearing."

In some cases, however, bearings, when actually mounted and operated on a machine, may become inoperative due to causes other than damage by fatigue (wear, seizure, creep, fretting, brinelling, cracking, etc.).

By giving sufficient consideration to the selection of bearings, installation, lubrication, and the like, it is possible to avoid such causes.

5. 2 Service life calculation of bearings

5. 2. 1 Basic dynamic load ratings

The strength of a bearing against rolling fatigue—that is, the basic dynamic load rating representing the bearing load capacity—is the net radial load (in the case of a radial bearing) or central axial load (in the case of a thrust bearing) such that its magnitude and direction are constant and the bearing can attain a basic rating life of 1 million rotations under the condition that the inner ring rotates while the outer ring is stationary (or vice versa).

These are called "basic dynamic radial load rating (C_r)" or "basic dynamic axial load rating (C_a)," respectively. Values for these items are given in the bearing dimension tables.

5. 2. 2 Basic rating life

The relationship among the basic dynamic load rating, the dynamic equivalent load, and the basic rating life is expressed by equation (5. 1).

If a bearing is to be operated at a constant rotational speed, its service life is conveniently expressed in hours as determined by equation (5. 2).

(Total number of rotations)

$$L_{10}=\left(\frac{C}{P}\right)^{p} \quad \cdots\cdots\cdots\cdots (5.\ 1)$$

(Hours)

$$L_{10\mathrm{h}}=\frac{10^{6}}{60n}\left(\frac{C}{P}\right)^{p} \quad \cdots\cdots\cdots\cdots (5.\ 2)$$

where,

L_{10} : basic rating life 10^6 rotations

$L_{10\mathrm{h}}$: basic rating life h

P : dynamic equivalent load N

C : basic dynamic load rating N

n : rotational speed min^{-1}

p : $p=3$ for ball bearings

$p=10/3$ for roller bearings

When a bearing is operated with a dynamic equivalent load of P and a rotational speed of n, the basic dynamic load rating C of the bearing, which is suitable for meeting the design service life, is given by equation (5. 3). Thus the bearing dimensions are determined by selecting a bearing from the bearing dimension tables, which meets requirement C.

$$C=P\left(L_{10\mathrm{h}}\times\frac{60n}{10^{6}}\right)^{1/p} \quad \cdots\cdots\cdots\cdots (5.\ 3)$$

[Reference] A method for determining the rating life of a bearing in a simplified method

A formula for determining service life, in which a service life coefficient (f_h) and speed coefficient (f_n) are applied in equation (5. 2), is shown below.

$$L_{10h}=500\,f_h^{\,p} \quad \cdots\cdots (5.\ 4)$$

Service life coefficient :

$$f_h=f_n\frac{C}{P} \quad \cdots\cdots (5.\ 5)$$

Speed coefficient :

$$f_n=\left(\frac{10^6}{500\times 60\,n}\right)^{1/p}$$

$$=(0.03\,n)^{-1/p} \cdots\cdots (5.\ 6)$$

Values of f_n, f_h, and L_{10h} are approximated by the nomograms shown in **Fig. 5. 1**.

How to use nomograms

■ Operating conditions (example)

· Cylindrical roller bearing

NN3014K $C=96.9$ kN

· Rotational speed

$n=7\,000$ min^{-1}

· Dynamic equivalent load

$P=4.9$ kN

① Speed coefficient :

Since $n=7\,000$

f_n reads: $f_n=0.2$

② Service life coefficient :

f_h is obtained as follows.

$$f_h=f_n\frac{C}{P}=0.2\times\frac{96.9}{4.9}=3.96$$

③ Rating life :

Since $f_h=3.96$,

L_{10h} is: $L_{10h}=49\,000$

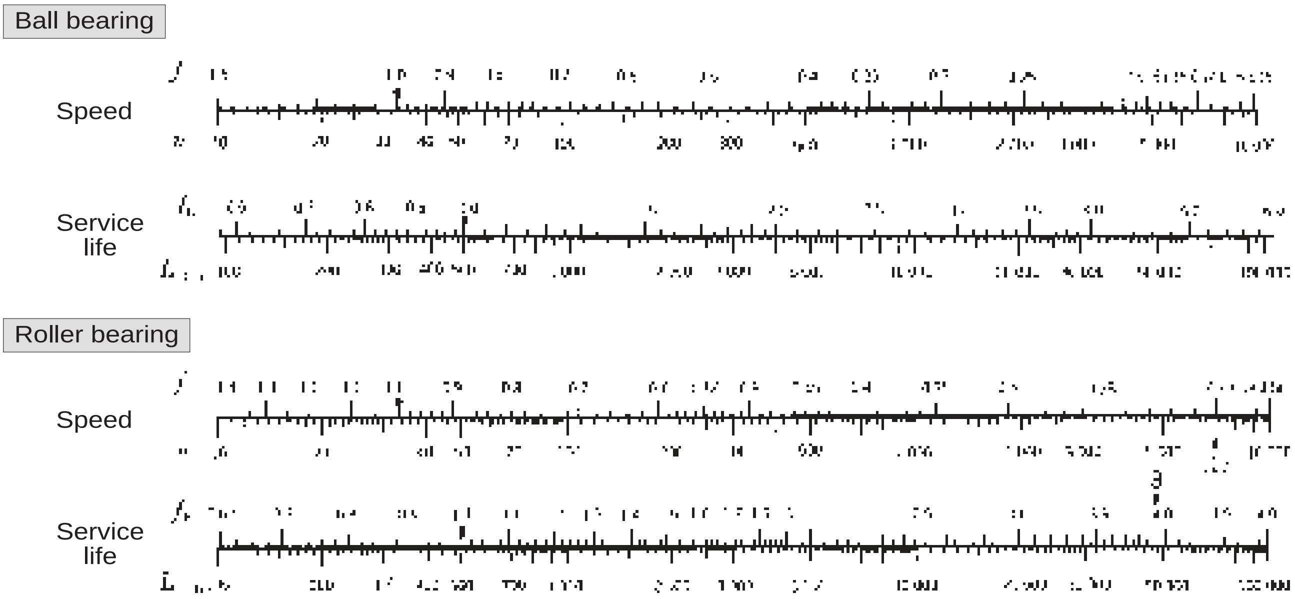


Fig. 5. 1 Rotational speed (n) vs. speed coefficient (f_n) and service life coefficient (f_h) vs. service life (L_{10h})

5. 2. 3 Modified rating life L_{nm}

The life of rolling bearings was standardized as a basic rating life in the 1960s, but in actual applications, sometimes the actual life and the basic rating life have been quite different due to the lubrication status and the influence of the usage environment. To make the calculated life closer to the actual life, a corrected rating life has been considered since the 1980s. In this corrected rating life, bearing characteristic factor a_2 (a correction factor for the case in which the characteristics related to the life are changed due to the bearing materials, manufacturing process, and design) and usage condition factor a_3 (a correction factor that takes into account usage conditions that have a direct influence on the bearing life, such as the lubrication) or factor a_{23} formed from the interdependence of these two factors, are considered with the basic rating life. These factors were handled differently by each bearing manufacturer, but they have been standardized as a modified rating life in **ISO 281** in 2007. In 2013, **JIS B 1518** (dynamic load ratings and rating life) was amended to conform to the ISO.

The basic rating life (L_{10}) shown in equation (5. 1) is the (fatigue) life with a dependability of 90% under normal usage conditions for rolling bearings that have standard factors such as internal design, materials, and manufacturing quality. **JIS B 1518**:2013 specifies a calculation method based on **ISO 281**:2007. To calculate accurate bearing life under a variety of operating conditions, it is necessary to consider elements such as the effect of changes in factors that can be anticipated when using different reliabilities and system approaches, and interactions between factors. Therefore, the specified calculation method considers additional stress due to the lubrication status, lubricant contamination, and fatigue load limit C_u (refer to **2)** b) on the inside of the bearing. The life that uses this life modification factor a_{ISO}, which considers the above factors, is called modified rating life L_{nm} and is calculated with the following equation (5. 7).

$$L_{nm}=a_1\, a_{ISO}\, L_{10} \quad \cdots\cdots\cdots\cdots\cdots\cdots(5.\ 7)$$

In this equation,

L_{nm} : Modified rating life 10^6 rotations

This rating life has been modified for one of or a combination of the following: reliability of 90% or higher, fatigue load limit, special bearing characteristics, lubrication contamination, and special operating conditions.

L_{10} : Basic rating life 10^6 rotations (reliability: 90%)

a_1 : Life modification factor for reliability ··························refer to section **1)**

a_{ISO} : Life modification factor ··························refer to section **2)**

[Remark] When bearing dimensions are to be selected given L_{nm} greater than 90% in reliability, the strength of shaft and housing must be considered.

1) Life modification factor for reliability a_1

The term "reliability" is defined as "for a group of apparently identical rolling bearings, operating under the same conditions, the percentage of the group that is expected to attain or exceed a specified life" in **ISO 281**:2007. Values of a_1 used to calculate a modified rating life with a reliability of 90% or higher (a failure probability of 10% or less) are shown in **Table 5. 1**.

Table 5. 1 Life modification factor for reliability a_1

Reliability, %	L_{nm}	a_1
90	L_{10m}	1
95	L_{5m}	0.64
96	L_{4m}	0.55
97	L_{3m}	0.47
98	L_{2m}	0.37
99	L_{1m}	0.25
99.2	$L_{0.8m}$	0.22
99.4	$L_{0.6m}$	0.19
99.6	$L_{0.4m}$	0.16
99.8	$L_{0.2m}$	0.12
99.9	$L_{0.1m}$	0.093
99.92	$L_{0.08m}$	0.087
99.94	$L_{0.06m}$	0.080
99.95	$L_{0.05m}$	0.077

(**Table 5. 1** Citation from **JIS B 1518**:2013)

2) Life modification factor a_{ISO}

a) System approach

The various influences on bearing life are dependent on each other. The system approach of calculating the modified life has been evaluated as a practical method for determining life modification factor a_{ISO} (ref. **Fig. 5. 2**). Life modification factor a_{ISO} is calculated with the following equation. A diagram is available for each bearing type (radial ball bearings, radial roller bearings, thrust ball bearings, and thrust roller bearings). (Each diagram (**Figs. 5. 3** to **5. 6**) is a citation from **JIS B 1518**:2013.)

Note that in practical use, this is set so that life modification factor $a_{ISO} \leqq 50$.

$$a_{ISO}=f\left(\frac{e_c\,C_u}{P},\ \kappa\right) \quad \cdots\cdots\cdots\cdots\cdots(5.\ 8)$$

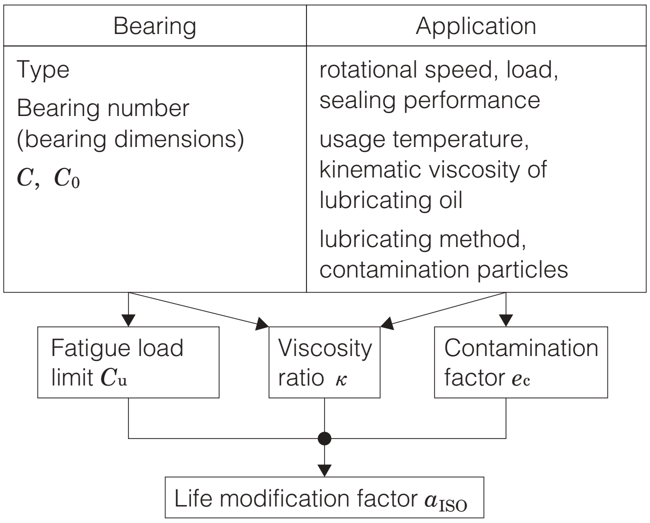


Fig. 5. 2 System approach

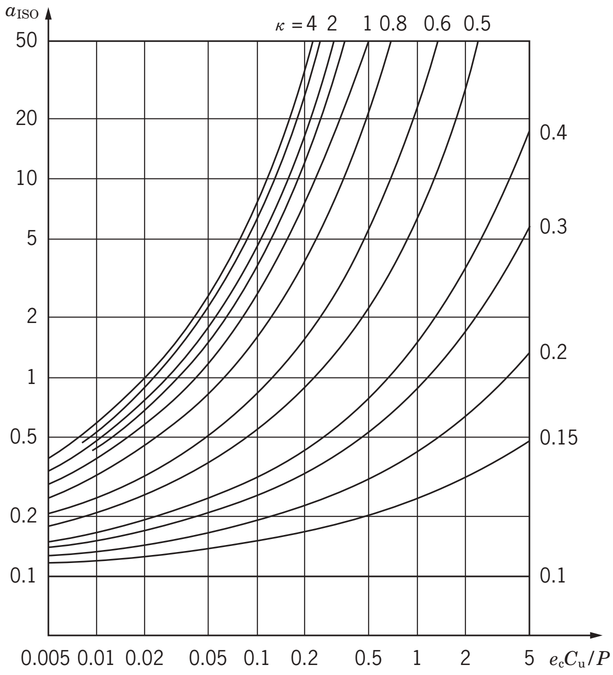


Fig. 5. 3 Life modification factor a_{ISO}
(Radial ball bearings)

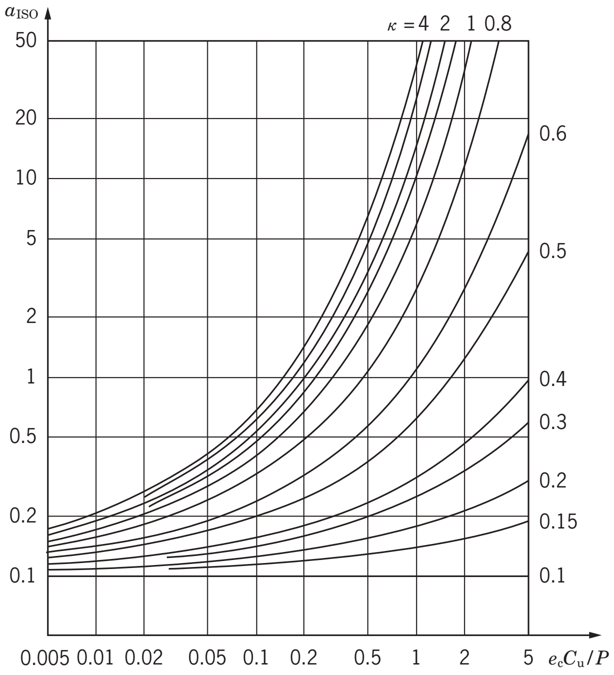


Fig. 5. 4 Life modification factor a_{ISO}
(Radial roller bearings)

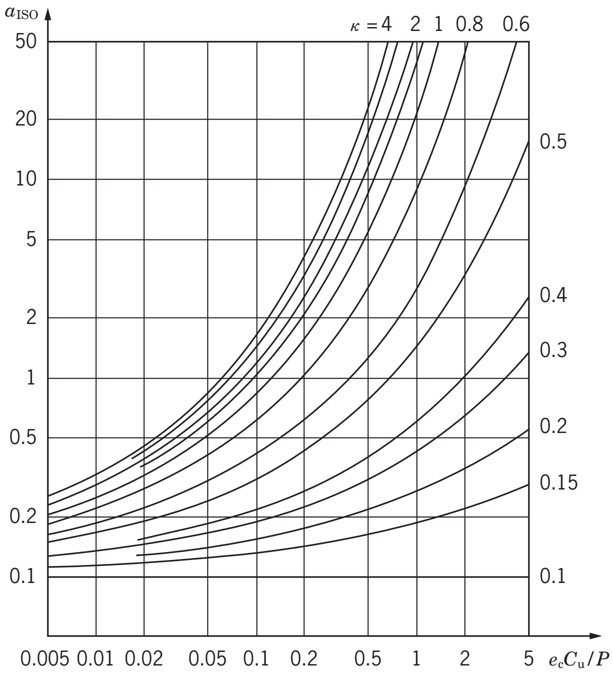


Fig. 5. 5 Life modification factor a_{ISO}
(Thrust ball bearings)

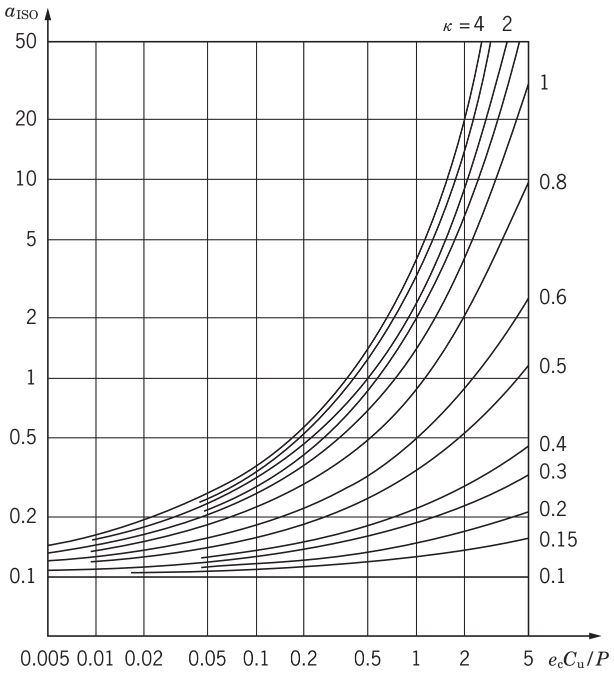


Fig. 5. 6 Life modification factor a_{ISO}
(Thrust roller bearings)

(**Figs. 5. 3** to **5. 6** Citation from **JIS B 1518**:2013)

b) Fatigue load limit C_u

For regulated steel materials or alloy steel that has equivalent quality, the fatigue life is unlimited so long as the load condition does not exceed a certain value and so long as the lubrication conditions, lubrication cleanliness class, and other operating conditions are favorable. For general high-quality materials and bearings with high manufacturing quality, the fatigue stress limit is reached at a contact stress of approximately 1.5 GPa between the raceway and rolling elements. If one or both of the material quality and manufacturing quality are low, the fatigue stress limit will also be low.

The term "fatigue load limit" C_u is defined as "bearing load under which the fatigue stress limit is just reached in the most heavily loaded raceway contact" in **ISO 281**:2007. and is affected by factors such as the bearing type, size, and material.

For details on the fatigue load limits of special bearings and other bearings not listed in this catalog, contact JTEKT.

c) Contamination factor e_c

If solid particles in the contaminated lubricant are caught between the raceway and the rolling elements, indentations may form on one or both of the raceway and the rolling elements. These indentations will lead to localized increases in stress, which will decrease the life. This decrease in life attributable to the contamination of the lubricant can be calculated from the contamination level as contamination factor e_c.

D_{pw} shown in this table is the pitch diameter of ball/roller set, which is expressed simply as $D_{pw}=(D+d)/2$. (D: Outside diameter, d: Bore diameter)

For information such as details on special lubricating conditions or detailed investigations, contact JTEKT.

Table 5. 2 Values of contamination factor e_c

Contamination level	e_c	
	D_{pw}<100 mm	D_{pw}≧100 mm
Extremely high cleanliness: The size of the particles is approximately equal to the thickness of the lubricant oil film, this is found in laboratory-level environments.	1	1
High cleanliness: The oil has been filtered by an extremely fine filter, this is found with standard grease-packed bearings and sealed bearings.	0.8 to 0.6	0.9 to 0.8
Standard cleanliness: The oil has been filtered by a fine filter, this is found with standard grease-packed bearings and shielded bearings.	0.6 to 0.5	0.8 to 0.6
Minimal contamination: The lubricant is slightly contaminated.	0.5 to 0.3	0.6 to 0.4
Normal contamination: This is found when no seal is used and a coarse filter is used in an environment in which wear debris and particles from the surrounding area penetrate into the lubricant.	0.3 to 0.1	0.4 to 0.2
High contamination: This is found when the surrounding environment is considerably contaminated and the bearing sealing is insufficient.	0.1 to 0	0.1 to 0
Extremely high contamination	0	0

(**Table 5. 2** Citation from **JIS B 1518**:2013)

d) Viscosity ratio κ

The lubricant forms an oil film on the roller contact surface, which separates the raceway and the rolling elements. The status of the lubricant oil film is expressed by viscosity ratio κ , the actual kinematic viscosity at the operating temperature ν divided by the reference kinematic viscosity ν_1 as shown in the following equation.

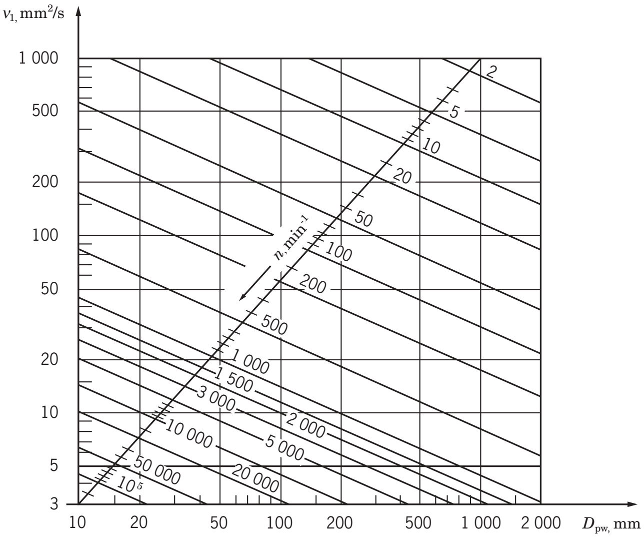
A κ greater than 4, equal to 4, or less than 0.1 is not applicable.

For details on lubricants such as grease and lubricants with extreme pressure additives, contact JTEKT.

$$\kappa = \frac{\nu}{\nu_1} \quad \cdots\cdots(5.\ 9)$$

ν : Actual kinematic viscosity at the operating temperature; the viscosity of the lubricant at the operating temperature

ν_1 : Reference kinematic viscosity; determined according to the speed and pitch diameter of ball/roller set D_{pw} of the bearing (ref. **Fig. 5. 7**)



(**Fig. 5. 7** Citation from **JIS B 1518**:2013)

Fig. 5. 7 Reference kinematic viscosity ν_1

5. 2. 4 Service life of bearing system comprising two or more bearings

Even for systems which comprise two or more bearings, if one bearing is damaged, the entire system malfunctions.

Where all bearings used in an application are regarded as one system, the service life of the bearing system can be calculated using the following equation.

$$\frac{1}{L^e} = \frac{1}{L_1^{\,e}} + \frac{1}{L_2^{\,e}} + \frac{1}{L_3^{\,e}} + \cdots\cdots\cdots\cdots\cdots \text{(5. 10)}$$

where :

L : rating life of system

L_1 , L_2 , L_3 ··· : rating life of each bearing

e: constant e=10/9 ······ball bearing
e= 9/8 ······roller bearing
The mean value is for a system using both ball and roller bearings.

[Example]

When a shaft is supported by two roller bearings whose service lives are 50 000 hours and 30 000 hours respectively, the rating life of the bearing system supporting this shaft is calculated as follows, using equation (5. 10) :

$$\frac{1}{L^{9/8}} = \frac{1}{50\ 000^{9/8}} + \frac{1}{30\ 000^{9/8}}$$

$L \fallingdotseq 20\ 000$ h

The equation suggests that the rating life of these bearings as a system becomes shorter than that of the bearing with the shorter life.

This fact is very important in estimating bearing service life for applications using two or more bearings.

5. 3 Dynamic equivalent loads

Bearings are used under different conditions. For example, they are often subjected to a resultant load consisting of radial and axial loads, the magnitudes of which may vary.

Consequently, it is not possible to directly compare the actual load that a bearing receives and the basic dynamic load rating.

In such a case, a calculation is carried out for comparison and examination, in which a load having a constant magnitude and direction, is applied to the bearing center such that it would make the service life of the bearing the same as that resulting from the actual load and rotational speed.

This theoretical load is known as the dynamic equivalent load (P).

5. 3. 1 Calculation of dynamic equivalent load

The dynamic equivalent loads of a radial bearing and a thrust bearing ($\alpha \neq 90°$) receiving a resultant load constant in magnitude and direction is obtained as illustrated below.

$$P=XF_r+YF_a \quad \cdots\cdots\cdots\cdots (5.\,11)$$

---

where,

P : dynamic equivalent load N

(For radial bearings, "P_r : dynamic equivalent radial load" and for thrust bearings, "P_a : dynamic equivalent axial load," respectively, are used.)

F_r : radial load N

F_a : axial load N

X : radial load coefficient

Y : axial load coefficient

(Values of X and Y are noted in the bearing dimension tables.)

---

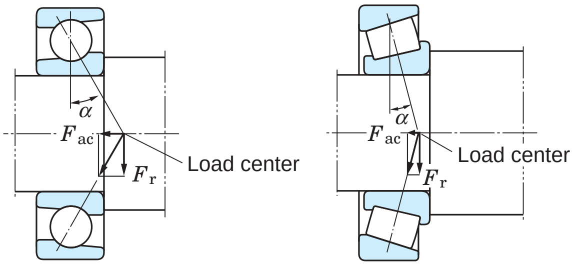
1) If $F_a/F_r \leqq e$ for a single row radial bearing, $X=1$ and $Y=0$ are used.
Hence, the dynamic equivalent load will be $P_r=F_r$.

(e denotes the limit of F_a/F_r, whose values are listed in the bearing dimension tables.)

2) Application of a radial load to a single row angular contact ball bearing, or tapered roller bearing, produces a component of force (F_{ac}) in the axial direction (**Fig. 5. 8**).
Therefore, a pair of bearings are usually used to arrange face-to-face or back-to-back.

The component of force in the axial direction is determined by the following equation.

$$F_{ac}=\frac{F_r}{2Y} \quad \cdots\cdots\cdots\cdots (5.\,12)$$

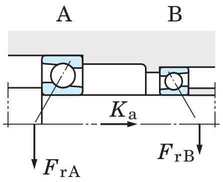
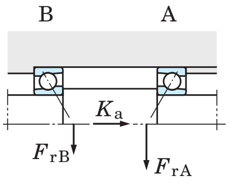
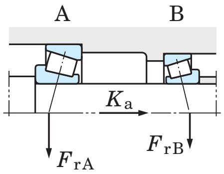
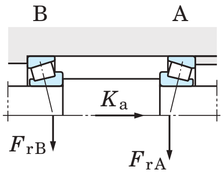
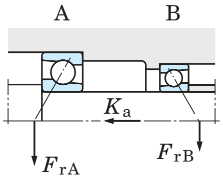
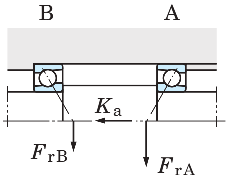
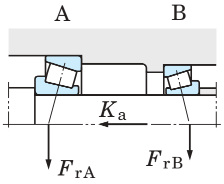
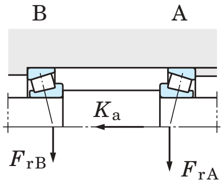


(Dimensions representing the position of load center are noted in the bearing dimension tables.)

Fig. 5. 8 Components of force in axial direction

Table 5. 3 (page 25) shows ways of determining the dynamic equivalent load where a radial load and external axial load (K_a) are applied to these bearings.

Table 5. 3　Calculations of dynamic equivalent loads for two opposing single row angular contact ball bearings or tapered roller bearings

Bearing arrangement		Loading condition	Bearing	Axial load	Dynamic equivalent load
Back-to-back	**Face-to-face**				
		$\frac{F_{rB}}{2Y_B}+K_a \geqq \frac{F_{rA}}{2Y_A}$	Bearing A	$\frac{F_{rB}}{2Y_B}+K_a$	$P_A=XF_{rA}+Y_A\left(\frac{F_{rB}}{2Y_B}+K_a\right)$ Note that $P_A=F_{rA}$ if $P_A<F_{rA}$
			Bearing B	—	$P_B=F_{rB}$
		$\frac{F_{rB}}{2Y_B}+K_a < \frac{F_{rA}}{2Y_A}$	Bearing A	—	$P_A=F_{rA}$
			Bearing B	$\frac{F_{rA}}{2Y_A}-K_a$	$P_B=XF_{rB}+Y_B\left(\frac{F_{rA}}{2Y_A}-K_a\right)$ Note that $P_B=F_{rB}$ if $P_B<F_{rB}$
		$\frac{F_{rB}}{2Y_B} \leqq \frac{F_{rA}}{2Y_A}+K_a$	Bearing A	—	$P_A=F_{rA}$
			Bearing B	$\frac{F_{rA}}{2Y_A}+K_a$	$P_B=XF_{rB}+Y_B\left(\frac{F_{rA}}{2Y_A}+K_a\right)$ Note that $P_B=F_{rB}$ if $P_B<F_{rB}$
		$\frac{F_{rB}}{2Y_B} > \frac{F_{rA}}{2Y_A}+K_a$	Bearing A	$\frac{F_{rB}}{2Y_B}-K_a$	$P_A=XF_{rA}+Y_A\left(\frac{F_{rB}}{2Y_B}-K_a\right)$ Note that $P_A=F_{rA}$ if $P_A<F_{rA}$
			Bearing B	—	$P_B=F_{rB}$

[Remarks] 1. These calculations are applicable where during operation the internal clearance and preload are 0 (zero).
2. Radial loads are assumed to be positive even if they are applied in the opposite direction of the arrows shown above.

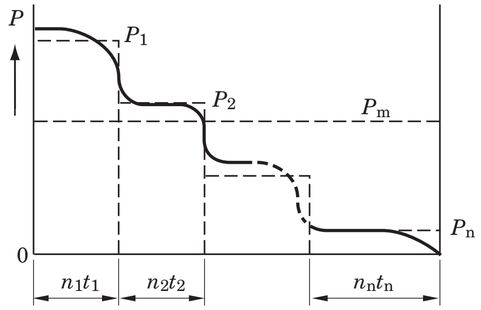
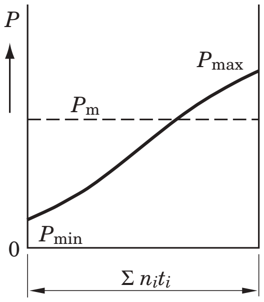
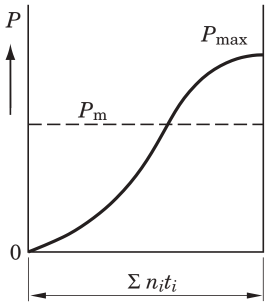
5. 3. 2 Mean dynamic equivalent loads for variable loads

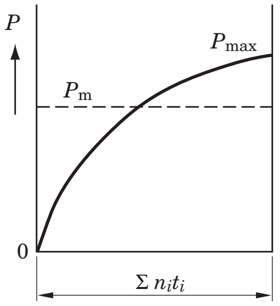
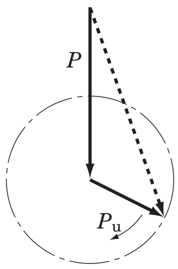
When a load, applied to a bearing, varies in magnitude and direction, it is necessary to obtain a mean dynamic equivalent load that may result in the same service life as would result under actual variation conditions.

Ways of determining the mean dynamic equivalent load P_m suitable for different variation conditions are shown in **Table 5. 4**, **(1)** to **(4)**.

In the case when a stationary load and a rotational load are applied simultaneously, as shown in **(5)**, the mean dynamic equivalent load is given by equation (5. 17).

Table 5. 4 Ways of determining mean dynamic equivalent loads from variable loads

(1) Stepwise variation	**(2) Simple variation**	**(3) Sine like curve variation**
		
$P_m = \sqrt[p]{\dfrac{P_1^p n_1 t_1 + P_2^p n_2 t_2 + \cdots\cdots + P_n^p n_n t_n}{n_1 t_1 + n_2 t_2 + \cdots\cdots + n_n t_n}}$ …… (5. 13)	$P_m = \dfrac{P_{min} + 2P_{max}}{3}$ …… (5. 14)	$P_m = 0.68 P_{max}$ …… (5. 15)

(4) **Sine like curve variation** (**Upper portion of a sine curve**)	**(5)** **Stationary and rotational loads being applied at the same time**
	
$P_m = 0.75 P_{max}$ …… (5. 16)	$P_m = f_m(P + P_u)$ …… (5. 17)

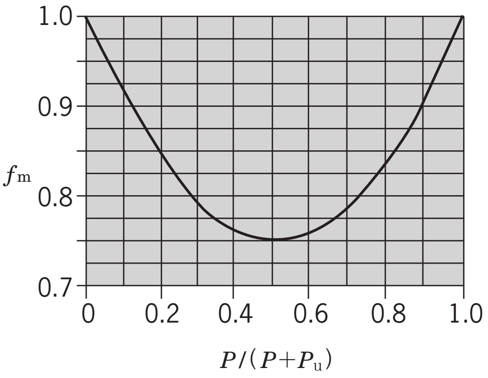


Fig. 5. 9 f_m Coefficient

- In **(1)** to **(4)** in **Table 5. 4**:

P_{m} : mean dynamic equivalent load N
P_1 : dynamic equivalent load applied at a rotational speed of n_1 for t_1 hours N
P_2 : dynamic equivalent load applied at a rotational speed of n_2 for t_2 hours N
$\vdots$ $\vdots$ $\vdots$
P_{n} : dynamic equivalent load applied at a rotational speed of n_n for t_n hours N
$P_{\min}$: minimum dynamic equivalent load N
$P_{\max}$: maximum dynamic equivalent load N
$\Sigma n_i t_i$: total number of rotations in a period from t_1 to t_i
p : $p=3$ for ball bearings
$p=10/3$ for roller bearings

(Reference) The mean rotational speed n_{m} is obtained by the following equation.

$$n_{\mathrm{m}}=\frac{n_1t_1+n_2t_2+\cdots\cdots+n_{\mathrm{n}}t_{\mathrm{n}}}{t_1+t_2+\cdots\cdots+t_{\mathrm{n}}}$$

- In **(5)** in **Table 5. 4**:

P_{m} : mean dynamic equivalent load N
f_{m} : coefficient (see **Fig. 5. 9**)
P : stationary load N
P_{u} : rotational load N

5. 4 Basic static load rating and static equivalent load

5. 4. 1 Basic static load rating

Excessive static load or impact load even at very low rotation causes partial permanent deformation of the rolling element and raceway contacting surfaces. This permanent deformation increases with the load; if it exceeds a certain limit, smooth rotation will be hindered.

The basic static load rating is the static load which responds to the calculated contact stress shown below, at the contact center between the raceway and rolling elements which receive the maximum load.

- Self-aligning ball bearings ··· 4 600 MPa
- Other ball bearings ··············· 4 200 MPa
- Roller bearings ······················ 4 000 MPa

The total extent of contact stress-caused permanent deformation on surfaces of rolling elements and raceway will be approximately 0.000 1 times greater than the rolling element diameter.

The basic static load rating for radial bearings is specified as the basic static radial load rating, and for thrust bearings, as the basic static axial load rating. These load ratings are listed in the bearing specification table, using $C_{0\mathrm{r}}$ and $C_{0\mathrm{a}}$ respectively.

These values are prescribed by ISO 78/1987 and are subject to change by conformance to the latest ISO standards.

5. 4. 2 Static equivalent load

The static equivalent load is a theoretical load calculated such that, during rotation at very low speed or when bearings are stationary, the same contact stress as that imposed under actual loading condition is generated at the contact center between raceway and rolling element to which the maximum load is applied.

For radial bearings, radial load passing through the bearing center is used for the calculation; for thrust bearings, axial load in a direction along the bearing axis is used.

The static equivalent load can be calculated using the following equations.

[Radial bearings]

···The greater value obtained by the following two equations is used.

$$P_{0\mathrm{r}}=X_0F_{\mathrm{r}}+Y_0F_{\mathrm{a}} \quad\cdots\cdots\cdots\cdots \quad (5.\ 18)$$

$$P_{0\mathrm{r}}=F_{\mathrm{r}} \quad\cdots\cdots\cdots\cdots \quad (5.\ 19)$$

[Thrust bearings]

($\alpha\neq90°$)

$$P_{0\mathrm{a}}=X_0F_{\mathrm{r}}+F_{\mathrm{a}} \quad\cdots\cdots\cdots\cdots \quad (5.\ 20)$$

[When $F_{\mathrm{a}}<X_0F_{\mathrm{r}}$, the solution becomes less accurate.]

($\alpha=90°$)

$$P_{0\mathrm{a}}=F_{\mathrm{a}} \quad\cdots\cdots\cdots\cdots \quad (5.\ 21)$$

---

where,

$P_{0\mathrm{r}}$: static equivalent radial load N
$P_{0\mathrm{a}}$: static equivalent axial load N
F_{r} : radial load N
F_{a} : axial load N
X_0 : static radial load factor
Y_0 : static axial load factor

(values of X_0 and Y_0 are listed in the bearing specification table.)

5. 4. 3 Safety coefficient

The allowable static equivalent load for a bearing is determined by the basic static load rating of the bearing; however, bearing service life, which is affected by permanent deformation, differs in accordance with the performance required of the bearing and operating conditions.

Therefore, a safety coefficient is designated, based on empirical data, so as to ensure safety in relation to basic static load rating.

$$f_s = \frac{C_0}{P_0} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (5.\ 22)$$

where,

f_s : safety coefficient (ref. **Table 5. 5**)

C_0 : basic static load rating N

P_0 : static equivalent load N

Table 5. 5 Values of safety coefficient f_s

Operating condition		f_s (min.)	
		Ball bearing	**Roller bearing**
With bearing rotation	When high accuracy is required	2	3
	Normal operation	1	1.5
	When impact load is applied	1.5	3
Without bearing rotation (occasional oscillation)	Normal operation	0.5	1
	When impact load or uneven distribution load is applied	1	2

[Remark] For spherical thrust roller bearings, $f_s \geqq 4$.

5. 5 Service life of greases

The previous section explained the fatigue service life of bearings. Spindle bearings for machine tools, however, rarely have a problem of bearing service life caused by load.

When grease lubrication is used, ineffective lubrication may occasionally occur, resulting in bearing failures. It is therefore necessary to give sufficient consideration to selecting the brand and the amount of grease to be used, for given operating conditions.

Refer to "**8. Lubrication of bearings**" for grease lubrication.

5. 6 Permissible axial loads

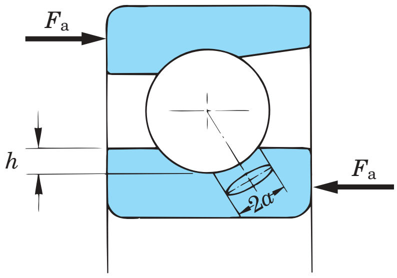
A large axial load may be applied to the bearings for main shafts of machine tools when, for example, tools are changed.

Application of a large axial load to an angular contact ball bearing may cause the contact ellipse formed between the ball and raceway surface to deviate beyond the raceway surface (see **Fig. 5. 10**).

Furthermore, if the stress becomes excessive, the rolling elements and raceway surface may sustain permanent deformation (nicks), possibly resulting in increased runout or vibration.

The smaller one of the following values is defined as the permissible axial load (static). And the permissible axial load (static) for each bearing is shown in the dimension list of the bearings.

- The load generated when the end of the contact ellipse formed between the ball and the raceway reaches the shoulder of the inner or outer ring.
- The load generated when the pressure of the contact surface between the ball and the raceway reaches the standard value calculated based on the actual results.



where,

h : bearing shoulder height

a : half length of the contact ellipses' major axis

F_a : axial load

Fig. 5. 10 Contact ellipse

6. Rigidity and preload of bearings

6. 1 Rigidity of bearings

The rigidity of a bearing has a considerable influence on the rigidity of the spindle of the machine tool. The rigidity of a bearing can be improved by the following methods.

① Roller bearings, in which line contact is made between the raceway surface and the rolling element, are used when a high radial rigidity is required.

② In the case where high axial rigidity is required, stack mounting angular contact ball bearings, are generally used.

Furthermore, bearings with a large contact angle are used.

③ For high-speed and high-rigidity requirements, it is effective to reduce the diameter and increase the number of rolling elements.

It is also possible to improve the rigidity of a bearing by using ceramics (silicon nitride) for the rolling elements which is superior in Young's modulus.

Bearings having ceramic rolling elements also offer improved high-speed performance since their density is lower than that of bearing steel, yielding a small centrifugal force even under high-speed rotation.

④ Apply a preload to the bearing.

6. 2 Preload of bearings

Preloading means setting the inner clearance to be a negative value and loading the bearing after mounting it.

In case of the angular contact ball bearing and tapered roller bearing, an axial load is applied when preloading. And in case of the cylindrical roller bearing, a radial load is applied when preloading.

6. 2. 1 Objective of preload

■ To improve rigidity

■ To improve the positioning accuracy in the radial and axial directions, and to improve the running accuracy as well, by minimizing the runout of the shaft

■ To reduce smearing by controlling whirl slip, orbital slip, and rotational slip of rolling elements in high-speed rotations

■ To prevent noise caused by vibration and resonance

6. 2. 2 Methods for preloading

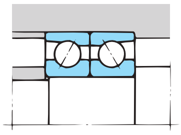
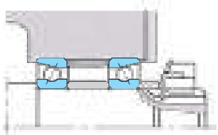
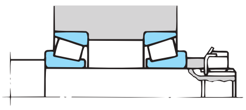
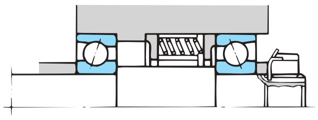
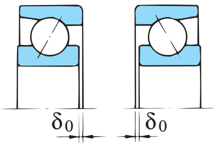
There are two major methods for preloading the angular contact ball bearing and tapered roller bearing; position preloading and constant-pressure preloading.

In the position preloading method, the bearing and spacer, whose dimensions are adjusted to the specified values beforehand, are used. In the constant-pressure preloading method, coil springs or disk springs are used to preload the bearing.

Usage examples and comparison of these methods are shown in **Fig. 6. 1**.

Also, these preloading methods can be switched over when rotating, and the amount of the preload (load) can be gradually changed in accordance with the speed of the rotation.

Table 6. 1 Methods for preloading

Position preloading			Constant-pressure preloading
When applying the same preload, the displacement to load is smaller and the rigidity is higher than when using the constant-pressure preloading method. When rotating at high speed, the use of this method is limited because the preload amount varies depending on the mounting conditions, centrifugal force and temperature rise.			This method is applicable when rotating at high speed because there is less preload variation when rotating than when using the position preloading method, and almost constant preload can be maintained. However, the improvement of the rigidity of the shaft is not as good as when using the position preloading method.
			
① A method using matched pair bearings with the preload adjusted.  	② A method using a spacer of preadjusted size.	③ A method using a nut or bolt capable of adjusting the amount of preload in the axial direction. (In this case, confirm that the appropriate preload is applied while measuring the starting torque, etc. This method is not suitable for conditions which require high precision, because the bearing tends to tilt easily. In these conditions, methods 1) and 2) are recommended.)	A method using coil springs or disk springs to apply preload. When using the coil springs, place them on the circumference at regular intervals so that the pressure is applied equally.

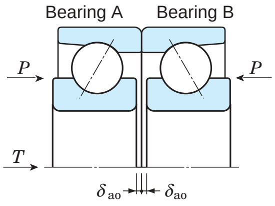
6. 2. 3 Preload and axial rigidity

Fig. 6. 1 shows the relationship between preload (position preload) and rigidity, namely, axial displacement of a back-to-back arrangement bearing.

Applying a preload P (by tightening the inner ring in the axial direction), as shown in **Fig. 6. 1**, results in bearings A and B respectively being displaced by δ_{ao}. The clearance between the inner rings $2\delta_{ao}$ will then become 0 (zero).

When an external axial load T is applied to these bearings, their resultant displacement as a pair-mounted bearing set can be obtained as δ_a.

P : amount of preload
T : external axial load
T_A : axial load applied to bearing A
T_B : axial load applied to bearing B
δ_a : displacement of pair-mounted bearing set
δ_{aA} : displacement of bearing A
δ_{aB} : displacement of bearing B
$2\delta_{aO}$: clearance between inner rings before applying preload



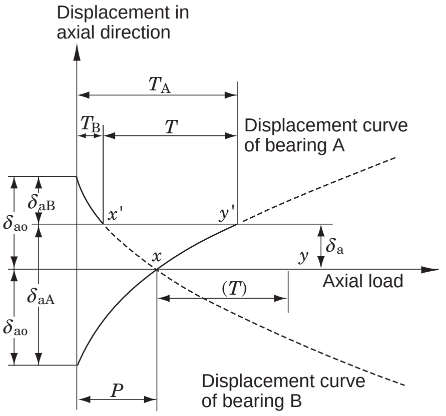


Fig. 6. 1 Preload diagram for position preloading

[Reference] How to determine δ_a in Fig. 6. 1

① Obtain the displacement curve of bearing A.
② Obtain the displacement curve of bearing B: this is the curve symmetrical with respect to the transverse axis and the intersection x at the preload P.
③ Assuming an external load T, obtain a line x–y on the transverse axis passing through x. By parallel displacement of line x–y along the displacement curve of bearing B, the intersection y' passing through the displacement curve of bearing A is obtained.
④ δ_a is determined as the distance between the lines x'–y' and x–y.

Fig. 6. 2 shows the relationship between preload and rigidity when a constant-pressure preload is applied to the same pair-mounted bearing as shown in **Fig. 6. 1**.

Since the rigidity of the spring is negligible in this case, the rigidity of the bearing is approximately equal to that of a single bearing given a preload P.

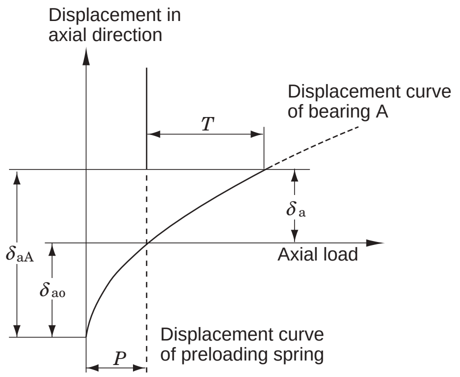


Fig. 6. 2 Preload diagram of constant-pressure preloading

Comparison of axial rigidity of the position preloading and the constant-pressure preloading is shown in **Fig. 6. 3**.

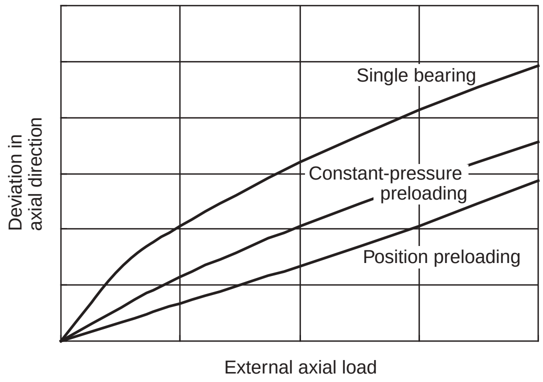


Fig. 6. 3 Comparison of axial rigidity

6. 2. 4 Amount of preload

If the amount of preload to the bearing is increased, the rigidity is improved.

However, as the load is applied to the bearing, the life may become shorter and abnormal heat may be generated, resulting in serious failure, including early damage, seizure, etc.

Also, in case of position preloading, the amount of preload varies depending on the mounting conditions, including fitting of the bearing, the centrifugal force generated during the operation and the temperature rise.

6. 2. 5 Variation of position preloading due to fitting and rotation

1) Preload in mounting the bearing

The angular contact ball bearing is shown as a model in **Fig. 6. 4a**.

In case of the bearing for the main shaft of a machine tool, for which the inner ring is usually rotated, the interference fit is employed for the inner ring, and the clearance fit is employed for the outer ring. However, the diameter of the inner ring raceway will expand due to interference, and the axial clearance changes as shown in **Fig. 6. 4b**, resulting in the increase in the amount of preload.

Furthermore, if the inner ring is tightened by the shaft nut, etc., the width of the inner ring and the spacer will shrink, resulting in increase in preload.

This is the preload generated when the bearing is mounted.

2) Change of preload during rotation

During rotation, the preload is changed by centrifugal force and temperature rise.

When rotating, the inner ring is affected by the centrifugal force and the raceway expands. Due to this expansion, the preload increases as shown in **Fig. 6. 4c**.

Influence of temperature rise is described below.

When rotating, the temperature of the bearing increases and the components expand because of rotation resistance, stirring resistance generated by the lubricant, and other external factors.

The temperature increase of the inner ring and the rolling elements is larger than that of the outer ring, which radiates heat easily. Therefore, the internal clearance changes because of the expansion as shown in **Fig. 6. 4d**, and the preload is increased.

Also, the temperature difference is generated between the outer ring and the housing, and the outer ring becomes hotter than the housing, reducing the clearance of the fitting surface of the outer ring. If the clearance of the fitting surface of the outer ring is too small, the fitting of the outer ring becomes interference fitting because of the temperature difference, and the internal clearance changes due to the shrinkage of the raceway of the outer ring, increasing the preload as shown in **Fig. 6. 4e**.

As a result, it is also important to take into consideration the case where the housing cools off excessively.

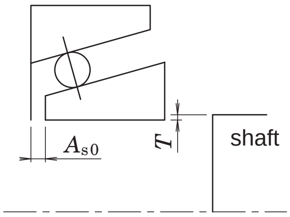


Fig. 6. 4a Bearing before mounting

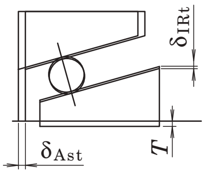


Fig. 6. 4b Change of dimension due to inner ring interference

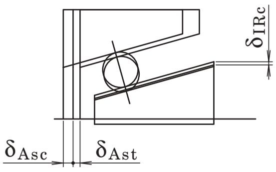


Fig. 6. 4c Change of dimension due to centrifugal expansion of inner ring raceway

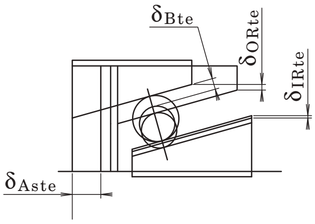


Fig. 6. 4d Change of dimension due to heat expansion

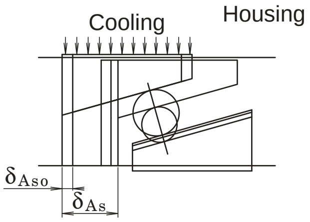


Fig. 6. 4e Change of dimension due to shrinkage of outer ring raceway

A_{s0} : initial stand-out value (The sum of the stand-out value of a pair of bearings is the size of the clearance for which the preload is provided.)
T : interference of inner ring
δ_{IRt} : expansion of inner ring raceway due to inner ring interference
δ_{Ast} : change of bearing stand-out value due to inner ring interference
δ_{IRc} : centrifugal expansion of inner ring raceway
δ_{Asc} : change of bearing stand-out value due to centrifugal expansion of inner ring raceway
δ_{IRte} : heat expansion of inner ring raceway
δ_{ORte} : heat expansion of outer ring raceway
δ_{Bte} : heat expansion of rolling element
δ_{Aste} : change of bearing stand-out value due to temperature rise of each component
δ_{Aso} : change of bearing stand-out value due to shrinkage of outer ring raceway
δ_{As} : total of change of stand-out value due to mounting conditions and rotation

6. 2. 6 Selecting preload and fitting

To maintain the initial performance of the bearing and use it in stable condition, it is necessary to select an ideal preloading method and preload amount considering the use conditions as well as the mounting conditions.

Especially, when using the bearing at high speed, it is indispensable to select an ideal preload, taking into consideration the preload change, the pressure between the raceway and the rolling elements generated by centrifugal force, and the factors which cause spin slide of the angular contact ball bearing.

The standard preload amount of each bearing is shown in the table of bearing dimensions. Also, the interferences of the bearings for main shafts in standard use condition are shown in **Figs. 6. 2** and **6. 3**.

Consult JTEKT for detailed information about preloads and fittings when using the bearings at high speed with value $d_m n$ set at 80×10^4 or more or with a heavy load of $C_r/P_r<13$.

Table 6. 2 Shaft fits (in the case of a rotating inner ring)

Bearing type		Shaft diameter (mm) over	up to	Tolerance class of bearing and fits			
				Class 5		Classes 4, 2	
				Tolerance class of shaft or dimensional tolerance of shaft diameter (μm)	Target interference (μm)	Tolerance class of shaft or dimensional tolerance of shaft diameter (μm)	Target interference (μm)
Angular contact ball bearings	General	All shaft diameter		js 5	—	js 4	—
	Amount of preload preset for matched pair bearings	6	10	0 −4	0~2	0 −2.5	0~2
		10	18	+1 −4	0~2	0 −3	0~2
		18	30	+1 −5	0~2.5	+1 −3	0~2.5
		30	50	+1 −6	0~3.5	+1 −4	0~3.5
		50	80	+2 −6	0~4	+1 −4	0~4
		80	120	+3 −7	0~4.5	+2 −4	0~4.5
		120	180	+4 −8	0~5	+2 −6	0~5
		180	250	+5 −9	0~6	+3 −6	0~6
Cylindrical roller bearings (cylindrical bored in inner ring)		25	40	js 4	—	js 3	—
		40	140	k 4	—	k 3	—
		140	200	m 5	—	m 4	—
		200	400	n 5	—	n 4	—
Double-direction angular contact thrust ball bearings High-speed matched pair angular contact ball bearings Support bearings for precision ball screws		All shaft diameter		h 5	—	h 4	—
Tapered roller bearings (metric series)		25	40	js 5	—	—	
		40	140	k 5	—		
		140	200	m 5	—		

[Remark] Consult **JTEKT** for specific operating conditions (high-speed rotation, rotating outer ring, heavy load, etc.).

Table 6. 3 Housing fits (in the case of a rotating inner ring)

Bearing type		Housing bore diameter (mm)		Bearing on fixed side				Bearing on free side			
				Tolerance class of bearing and fits				Tolerance class of bearing and fits			
				Class 5		Classes 4, 2		Class 5		Classes 4, 2	
		over	up to	Tolerance class of housing bore	Target clearance (μm)	Tolerance class of housing bore	Target clearance (μm)	Tolerance class of housing bore	Target clearance (μm)	Tolerance class of housing bore	Target clearance (μm)
Angular contact ball bearings	General	All housing bore diameter		JS 5	—	JS 4	—	H 5	—	H 4	—
	Amount of preload preset for matched pair bearings	Housing bore diameter (mm)		(Bearing on fixed side)				(Bearing on free side)			
				(Tolerance class of bearing and fits)				(Tolerance class of bearing and fits)			
				Classes 5, 4, 2				Classes 5, 4, 2			
		over	up to	Dimensional tolerance of housing bore (μm)		Target clearance (μm)		Dimensional tolerance of housing bore (μm)		Target clearance (μm)	
		18	30	±4.5		0~4		+9 0		6~10	
		30	50	±5.5		0~4		+11 0		7~11	
		50	80	±6.5		0~5		+13 0		8~13	
		80	120	±7.5		0~5		+15 0		10~15	
		120	180	±9		0~6		+18 0		13~19	
		180	250	±10		0~7		+20 0		17~24	
		250	315	±11.5		0~7		+23 0		22~29	
		315	400	±12.5		0~8		+25 0		26~33	
(Bearing type)		Housing bore diameter (mm)		Class 5		Classes 4, 2		Class 5		Classes 4, 2	
		over	up to	Tolerance class of housing bore	Target clearance (μm)	Tolerance class of housing bore	Target clearance (μm)	Tolerance class of housing bore	Target clearance (μm)	Tolerance class of housing bore	Target clearance (μm)
Cylindrical roller bearings		All housing bore diameter		K 5	0	K 4	0	————			
Double-direction angular contact thrust ball bearings High-speed matched pair angular contact ball bearings				K 5	—	K 4	—				
Support bearings for precision ball screws				H 6	—	H 6	—				
Tapered roller bearings (metric series)				K 5	—	——		H 5	—	——	

[Remark] Consult **JTEKT** for specific operating conditions (high-speed rotation, outer ring rotation, heavy load, etc.).

7. Limiting speeds of bearings

The rotational speed of a bearing is restricted chiefly by temperature increases caused by frictional heat generated within the bearing. When a speed limit is reached, it becomes impossible to continue operation due to seizure and the like.

The permissible rotational speed of a bearing represents the value of limiting speed at which the bearing can continue operation without cousing seizure-generated temperatures.

Accordingly, the limiting speed differs with bearing types, dimensions, accuracy, lubrication methods, quality and quantity of lubricant, shape and material of cages, loading conditions (including amount of preload), etc.

The limiting speed for grease lubrication or oil (oil / air) lubrication of bearings are given in their dimension tables.

These values are the limiting speed that are applicable where a bearing of a standard design is operated under normal loading conditions ($C_r/P_r \geqq 13$, $F_a/F_r \leqq$approx. 0.2).

C_r : basic dynamic load rating
P_r : dynamic equivalent load
F_r : radial load
F_a : axial load

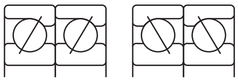
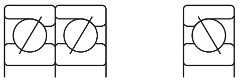
Spindle bearings for machine tools are used in one of 2-, 3-, or 4-row combinations. The limiting speed of a stack mounting bearing is lower than that of a single row bearing.

The speed coefficients are shown in **Table 7. 1**. In this table, the correlations between the preload amounts and the matching methods of the bearings mounted to the shafts with position preloading are shown. Differences are made due to the heat radiation and the variation in the preload amount of each bearing.

Where a lubricant can efficiently remove the heat generated in the bearing, the limiting speed of a bearing will be greater than those given in the bearing dimension tables.

If the rotational speed of a bearing exceeds 80% of the value listed in the bearing dimension tables, careful consideration should be given to the amount of preload, lubrication method, lubricant, distance between the bearings, etc. Consult JTEKT.

Table 7. 1　Speed coefficients

Matching method	Prefix	Preload in mounting			
		Preload S	Preload L	Preload M	Preload H
	DB	0.85	0.80	0.65	0.55
	DBB	0.80	0.75	0.60	0.45
	DBD	0.75	0.70	0.55	0.40

* The speed coefficients vary depending on the distance between the bearings.

8. Lubrication

Lubrication is a critical issue for bearings, on which their performance greatly depends.
The suitability of a lubricant and lubrication method has great influence on the performance of a bearing.

Lubrication plays the following roles.

- Lubrication of each part of the bearing reduces wear and friction.
- Removes heat in the bearing generated by friction and other causes.
- Extends the service life of bearings by constantly forming an adequate oil film on the rolling contact surfaces.
- Rust prevention and dust proofing for bearings

Lubrication is very important for spindle bearings of machine tools since such bearings require a low temperature increase under high-speed operation.

Relationships between the quantity of lubricant and power loss and between the quantity of lubricant and the temperature increase of the bearing are shown in **Fig. 8. 1**. Relationships between the viscosity of lubricant and power loss and between the viscosity of lubricant and the temperature increase of the bearing are shown in **Fig. 8. 2**.

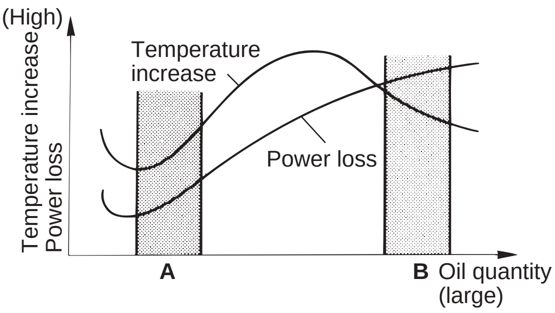


Fig. 8. 1 Relationships between lubricant quantity and power loss and between lubricant quantity and the temperature increase of the bearing

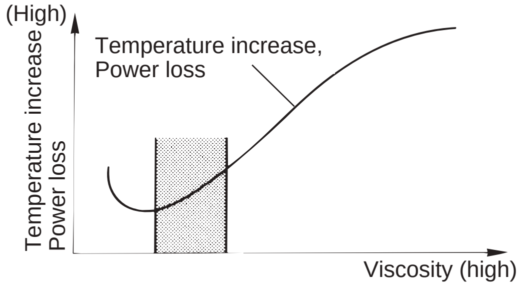


Fig. 8. 2 Relationships between viscosity of lubricant and power loss and between viscosity of lubricant and the temperature increase of the bearing

The quantity of lubricant needed to meet the low temperature increase requirement lies in zone A where the quantity of oil is small so the agitation loss is low, and zone B in which a large quantity of oil transfers heat from the bearing to the outside. Regarding the viscosity of lubricant, those which are of relatively low viscosity are suitable for meeting the above-mentioned requirement.

Note, however, that an excessively small quantity of oil or excessively low viscosity will not maintain a suitable lubricant film during operation, and further induce the chances of seizure.

For bearing lubrication methods, grease, oil / air, or oil mist lubrication is recommended in zone A in **Fig. 8. 1**, and jet lubrication, in zone B.

Table 8. 1 shows a comparison of features for various lubrication methods. It is important to select a lubrication method and a lubricant to best suit to the machine specifications.

Table 8. 1 Comparison of features of different lubrication methods

○ : advantageous
△ : somewhat disadvantageous
× : disadvantageous

Lubrication method Item	Grease lubrication	Oil / air lubrication	Oil mist lubrication	Jet lubrication
Total cost	○	△	△	×
Temperature increase of bearing	△	○	△	○
High-speed reliability	×	○	△	○
Power loss	○	○	○	×
Volume occupied by lubricator	○	△	△	×
Environmental contamination	○	△	×	△
Service life of lubricant	×	○	○	○

8. 1 Grease lubrication

Grease lubrication is most usually employed because it requires no special lubricator and the use of a relatively simple housing structure is sufficient.

However, to meet machine tool bearing requirements (high-speed operation, low temperature increase, and long service life of sealed grease), the following should be taken into consideration.

8. 1. 1 Types of grease

In order to meet the low level temperature increase requirement of a bearings during operation, a grease low in base oil viscosity is suitable.

In general, grease NLGI 2 in consistency and approximately 10-30 mm^2/s in base oil viscosity is often used for spindle bearings of machine tools. In cases where bearings are subjected to high loads, a grease with a base oil viscosity of approximately 100 mm^2/s, and an extreme-pressure agent may be used to secure lubricant film during operation.

Table 8. 2 shows grease for spindle bearings of machine tools.

8. 1. 2 Sealing device

For spindle bearings of machine tools, it is important to use a reliable sealing device to prevent mixing of coolant, chips, wear particle of drive belt, gear lubricant, and so forth.

Where grease lubrication is adopted, foreign matter have a great influence on the service life of a bearing.

An example of sealing device for grease lubrication is shown in **Fig. 8. 3**.

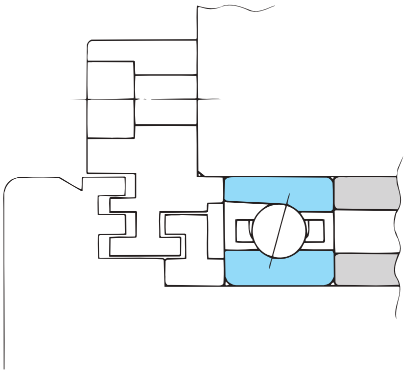


Fig. 8. 3 Example of sealing device for grease lubrication (labyrinth seal)

Table 8. 2 Grease for spindle bearings of machine tools (representative examples)

Grease name	Manufacturer	Thickener	Base oil	Base oil viscosity mm^2/s (40℃)	Application
Beacon 325 Maltemp PS 2 Isoflex NBU 15 Klüberspeed BF 72-22	Exxon Mobil Kyodo oil NOK klüber NOK klüber	Lithium Lithium Barium complex Urea	Diester Diester+mineral oil Ester Ester	12 14 20 22	High-speed operation, low temperature
Stabrags NBU 8 EP Alvania No. 2	NOK klüber Showa shell sekiyu	Barium complex Lithium	Mineral oil Mineral oil	95 130	High-load operation, wear resistance

8. 2 Oil lubrication

8. 2. 1 Oil / air lubrication

In this lubrication method, a small amount of oil of a specified quantity is supplied intermittently to each bearing by compressed air.

A schematic drawing of an oil / air lubrication system is shown in **Fig. 8. 4**.

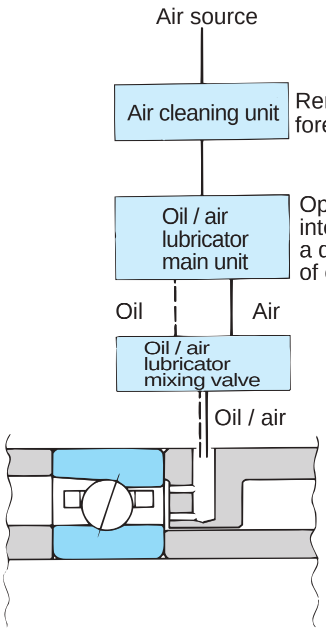


Fig. 8. 4 Oil / air lubrication system

Since oil / air lubrication has features as shown below, it has become popular in many high-speed spindle.

1. Compared with grease lubrication, oil / air lubrication allows bearings to meet the low temperature increase and high-speed operation requirements (see **Fig. 8. 5**).

   This lubrication method eliminates concerns about the service life of lubricant as new oil is constantly supplied to the bearings. Furthermore, compressed air, which increases the pressure in the housing, is effective in preventing foreign matter from entering into the housing.

2. Compared with oil mist lubrication, oil / air lubrication is simple to adjust the quantity of oil with a high degree of accuracy. This leads to a high reliability for bearings during high-speed operation.

   In addition, unlike oil mist lubrication, oil / air lubrication is free from environmental contamination and also reduces oil consumption.

3. Compared with jet lubrication, oil / air lubrication suppresses power losses of bearings (see **Fig. 8. 6**).

   This feature saves space because a smaller drive motor and cooling unit can be used.

   The structure of the main shaft can also be simple and compact.

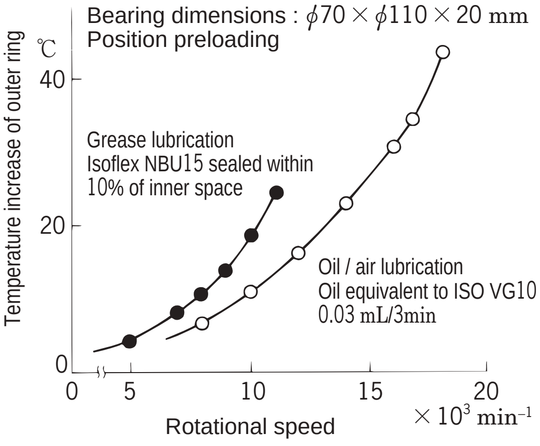


Fig. 8. 5 Comparison of the temperature increase between oil / air lubrication and grease lubrication

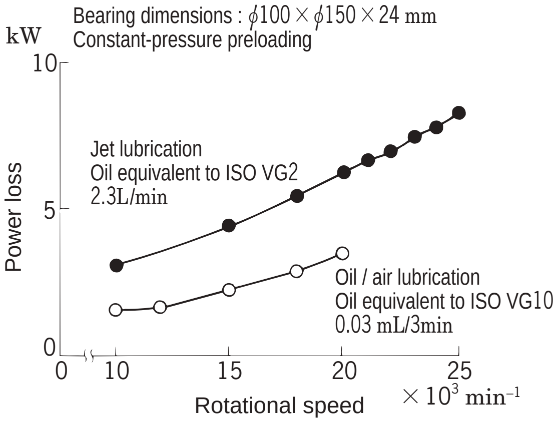


Fig. 8. 6 Comparison of power loss between oil / air lubrication and jet lubrication

In order to take advantage of oil / air lubrication features, **JTEKT** has produced oil / air lubricators and air cleaning units, of which we have special knowhow and have shipped to many customers.

Consult **JTEKT** for the appliation of the oil / air lubrication systems.

For details of the oil / air lubricator and air cleaning unit, see "**Ⅱ. Oil / Air Lubrication System.**"

Refer to **Table 9. 4** on page 41 for information about the dimensions of the spacers for oil / air lubrication.

Refer to **Supplementary table 6** on page 203 for information about the blow intervals of the oil / air.

8. 2. 2 Oil mist lubrication

Similar to oil / air lubrication, oil mist lubrication supplies a small quantity of oil to each bearing by compressed air.

Fig. 8. 7 shows an oil mist lubrication system.

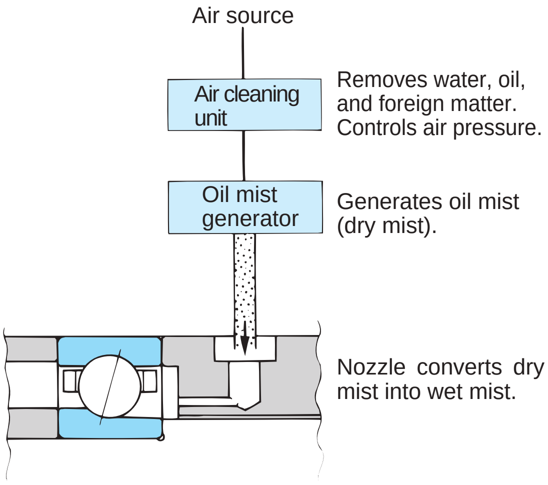


Fig. 8. 7 Oil mist lubrication system

The cost of oil mist lubrication is relatively low. The high-speed performance attained by this method is better than by grease lubrication.

To obtain maximum performance from this method, due consideration should be given to the following.

1. Oil quantity settings

The quantity of oil is set by the rate at which the oil mist generator produces oil drops. Since the rate of oil turned to mist depends on the type of oil, air pressure, flow rate, etc., it is important to determine the amount of oil drops required after the characteristics of the whole system have been sufficiently understood.

2. Distribution of mist to several bearings

In general, a single oil mist generator is used to distribute the mist to several bearings.

Each bearing should be checked to see if it is supplied with an adequate quantity of oil.

3. Installation of suitable nozzle(s)

The nozzle converts dry mist into wet mist suitable for lubrication of bearings and supplies mist to the inside of bearings.

For reliable operation, the nozzle design should be given sufficient consideration.

A well-designed nozzle reduces the quantity of oil so that contamination by oil mist will also be reduced.

8. 2. 3 Jet lubrication

Jet lubrication is a method in which a large quantity of lubricant is injected at a high velocities through the bearing side to lubricate and cool the bearing simultaneously.

Fig. 8. 8 shows a jet lubrication system.

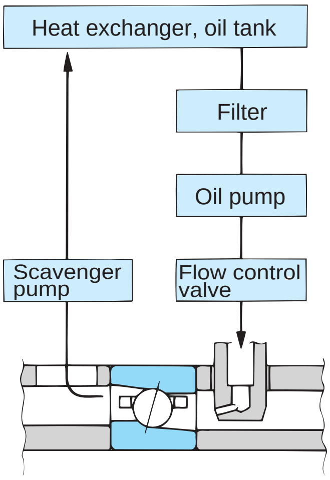


Fig. 8. 8 Jet lubrication system

Owing to its high reliability for high-speed operation, the jet lubrication is often applied to such bearings designed for high-speed and high-temperature operation, for example, gas turbine engines. Also, jet lubrication is sometimes employed for the high-speed spindles of machine tools. If this is the case, give due consideration to the following points.

1. Use oil of extremely low viscosity of approximately 2 mm^2/s to restrain power loss and temperature increase.

2. To improve cooling efficiency, set the velocity of the lubricant ejected from the nozzle to at least 20% of the peripheral speed of the outer surface of the inner ring, thereby allowing more oil to pass through the bearing.

   Installing several nozzles on the circumference for a larger quantity of oil is also effective to some degree.

3. A pump or similar device should be used to discharge oil smoothly. For this reason, the discharge port should be as large as possible to ensure a smooth discharge of oil.

   After discharge, the lubricant should be cooled with a heat exchanger of adequate capacity in order to minimize temperature changes.

   It is also essential to maintain clean lubricant by installing an appropriate filter, ensuring an airtight oil tank, and so forth.

9. Designing peripheral parts of bearings

9. 1 Tolerances of shafts and housings

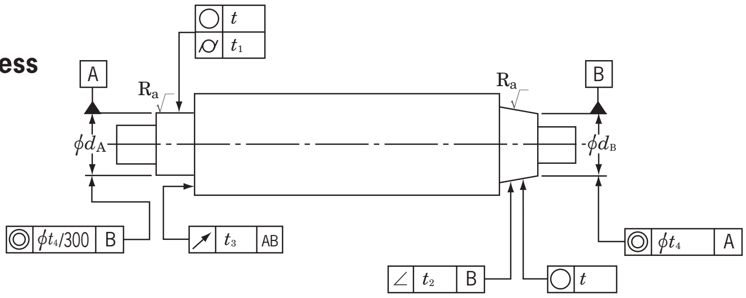
When the inner and outer rings of a bearing are mounted on a shaft and a housing with a certain interference, the shapes of the shaft and housing tend to influence the raceway surface of the bearing leading to a change in running accuracy.

Therefore, shafts and housings need to be finished to maximum possible precision.

Recommended values for tolerances and surface roughness of shafts and housings are shown in **Tables 9. 1** and **9. 2**.

Refer to "**Ⅲ. Handling of Bearings**" for details about handling and mounting of the bearings.

Table 9. 1 Tolerances and surface roughness of shafts

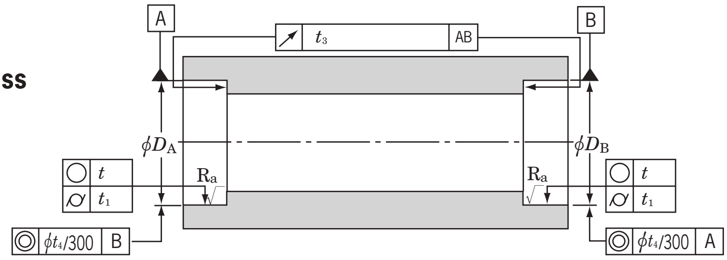


Unit : µm

Shaft diameter (mm)		Roundness(◯)		Cylindricity(⌭)		Inclination(∠)	Deflection(↗)		Coaxiality(◎)		Roughness	
		t		t_1		t_2	t_3		t_4		R_a	
		Tolerance class of bearing		Tolerance class of bearing		Tolerance class of bearing	Tolerance class of bearing		Tolerance class of bearing		Tolerance class of bearing	
over	up to	Class 5	Classes 4, 2	Class 5	Classes 4, 2	Classes 4, 2	Class 5	Classes 4, 2	Class 5	Classes 4, 2	Class 5	Classes 4, 2
18	**30**	2	1.2	2	1.2	2	4		9	6	0.2	0.1
30	**50**	2	1.2	2	1.2	2	4		11	7	0.2	0.1
50	**80**	2.5	1.5	2.5	1.5	2.5	5		13	8	0.2	0.1
80	**120**	3	2	3	2	3	6		15	10	0.4	0.2
120	**180**	4	2.5	4	2.5	4	8		18	12	0.4	0.2
180	**250**	5	3.5	5	3.5	5	10		20	14	0.4	0.2
250	**315**	6	4	6	4	6	12		23	16	0.4	0.2
315	**400**	6.5	4.5	6.5	4.5	6.5	13		25	18	0.4	0.2

[Remarks]
1. Tolerances, symbols, and reference planes for shafts comply with ISO/R1101.
2. When determining the tolerance in relation to the permissible accuracy of shapes, the shaft diameters d_A and d_B are used as reference dimensions.

Table 9. 2 Tolerances and surface roughness of housings

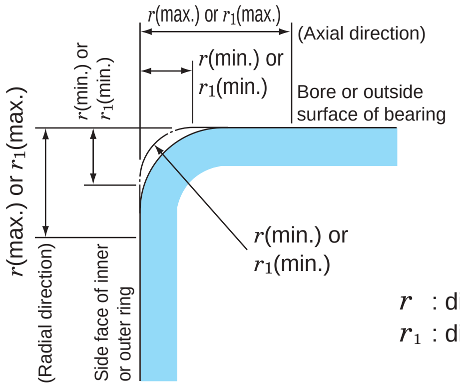


Unit : µm

Housing bore diameter (mm)		Roundness(◯)		Cylindricity(⌭)		Deflection(↗)		Coaxiality(◎)		Roughness	
		t		t_1		t_3		t_4		R_a	
		Tolerance class of bearing		Tolerance class of bearing		Tolerance class of bearing		Tolerance class of bearing		Tolerance class of bearing	
over	up to	Class 5	Classes 4, 2	Class 5	Classes 4, 2	Class 5	Classes 4, 2	Class 5	Classes 4, 2	Class 5	Classes 4, 2
18	**30**	2	1.2	2	1.2	4		9	6	0.3	0.1
30	**50**	2	1.2	2	1.2	4		11	7	0.3	0.1
50	**80**	2.5	1.5	2.5	1.5	5		13	8	0.4	0.2
80	**120**	3	2	3	2	6		15	10	0.8	0.4
120	**180**	4	2.5	4	2.5	8		18	12	0.8	0.4
180	**250**	5	3.5	5	3.5	10		20	14	0.8	0.4
250	**315**	6	4	6	4	12		23	16	1.6	0.8
315	**400**	6.5	4.5	6.5	4.5	13		25	18	1.6	0.8
400	**500**	7.5	5	7.5	5	15		27	20	1.6	0.8
500	**630**	8	5.5	8	5.5	16		30	22	1.6	0.8

[Remarks]
1. Tolerances, symbols, and reference planes for housings comply with ISO/R1101.
2. When determining the tolerance in relation to the permissible accuracy of shapes, the housing bore diameters D_A and D_B are used as reference dimensions.

9. 2 Limits of chamfer dimensions and fillet radii of shafts and housings



[Remark]

An imaginary arc with a radius of r (min) is defined as being tangent to both the side face of the inner ring and the bore surface of the bearing; or to both the side face of outer ring and the outside surface of the bearing. Although an exact shape is not specified for chamfered surfaces, the outline in the axial plane shall not extend beyond the imaginary arc.

r : dimension for chamfering inner and outer rings
r_1 : dimension for chamfering the front and the likes of the inner and outer rings

Table 9. 3 Limits of chamfer dimensions and fillet radii of shafts and housings

(1) Radial bearings (not applicable to tapered roller bearings)

Unit : mm

r(min.) or r_1(min.)	Nominal bore diameter d (mm)		r(max.) or r_1(max.)		(Refer.) Fillet radius of shaft or housing r_a
	over	up to	Radial direction	Axial 1) direction	max.
0.05	—	—	0.1	0.2	0.05
0.08	—	—	0.16	0.3	0.08
0.1	—	—	0.2	0.4	0.1
0.15	—	—	0.3	0.6	0.15
0.2	—	—	0.5	0.8	0.2
0.3	—	40	0.6	1	0.3
	40	—	0.8	1	
0.6	—	40	1	2	0.6
	40	—	1.3	2	
1	—	50	1.5	3	1
	50	—	1.9	3	
1.1	—	120	2	3.5	1
	120	—	2.5	4	
1.5	—	120	2.3	4	1.5
	120	—	3	5	
2	—	80	3	4.5	2
	80	220	3.5	5	
	220	—	3.8	6	
2.1	—	280	4	6.5	2
	280	—	4.5	7	
2.5	—	100	3.8	6	2
	100	280	4.5	6	
	280	—	5	7	
3	—	280	5	8	2.5
	280	—	5.5	8	
4	—	—	6.5	9	3
5	—	—	8	10	4
6	—	—	10	13	5
7.5	—	—	12.5	17	6
9.5	—	—	15	19	8
12	—	—	18	24	10
15	—	—	21	30	12
19	—	—	25	38	15

[Note] 1) For bearings 2mm or less in nominal width, the value of r (max.) in the axial direction shall be the same as that in the radial direction.

(2) Metric tapered roller bearings

Unit : mm

r(min.) or r_1(min.) 2)	Nominal bore 1) or nominal outside diameter d or D(mm)		r(max.) or r_1(max.)		(Refer.) Fillet radius of shaft or housing r_a
	over	up to	Radial direction	Axial direction	max.
0.3	—	40	0.7	1.4	0.3
	40	—	0.9	1.6	
0.6	—	40	1.1	1.7	0.6
	40	—	1.3	2	
1	—	50	1.6	2.5	1
	50	—	1.9	3	
1.5	—	120	2.3	3	1.5
	120	250	2.8	3.5	
	250	—	3.5	4	
2	—	120	2.8	4	2
	120	250	3.5	4.5	
	250	—	4	5	
2.5	—	120	3.5	5	2
	120	250	4	5.5	
	250	—	4.5	6	
3	—	120	4	5.5	2.5
	120	250	4.5	6.5	
	250	400	5	7	
	400	—	5.5	7.5	
4	—	120	5	7	3
	120	250	5.5	7.5	
	250	400	6	8	
	400	—	6.5	8.5	
5	—	180	6.5	8	4
	180	—	7.5	9	
6	—	180	7.5	10	5
	180	—	9	11	
7.5	—	—	*12.5*	*17*	*6*
9.5	—	—	*15*	*19*	*8*

[Notes] 1) Inner rings are classified by d, outer rings, by D.
2) Values in italics comply with **JTEKT** standards.

9. 3 Spacers for oil / air lubrication

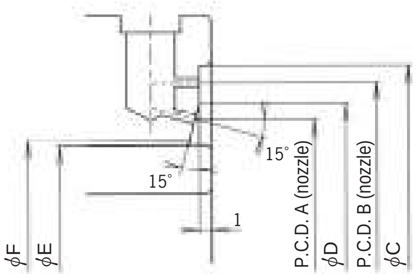
The dimensions of the spacers for oil / air lubrication are shown in **Table 9. 4**.

Table 9. 4(1) Dimensions of the spacers for oil / air lubrication Angular contact ball bearings

7000 series

7200 series

7900 series



* Commonly used in contact angles of 15° and 30°.
** Cage: Outer ring guided
Arrangement: These are the recommended dimensions for a back-to-back (DB) arrangement.

Nozzle diameter

7000, 7200 series		7900 series	
Bore dia. No.	Nozzle diameter (ϕ)	Bore dia. No.	Nozzle diameter (ϕ)
00-09	0.8	00-10	0.8
10-40	1.0	11-40	1.0

Unit : mm

Bore dia. No.	Nominal bore dia.	7000 series						7200 series						7900 series					
		A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
00	**10**	15.2	20.7	23.5	18.0	11.5	12.5	18.2	23.5	26.3	20.9	14.5	15.5	14.7	18.1	20.9	16.4	11.0	12.0
01	**12**	18.4	23.8	26.6	21.1	14.7	15.7	19.0	25.9	28.7	22.5	15.3	16.3	16.7	20.1	22.9	18.4	13.0	14.0
02	**15**	21.3	26.7	29.5	24.0	17.6	18.6	22.8	29.4	32.2	26.1	19.1	20.1	19.7	24.0	26.8	21.9	16.0	17.0
03	**17**	24.6	29.8	32.6	27.2	20.9	21.9	25.8	33.4	36.2	29.6	22.1	23.1	21.7	26.0	28.8	23.9	18.0	19.0
04	**20**	28.5	35.8	38.6	32.2	24.8	25.8	30.5	39.6	42.4	35.1	26.8	27.8	26.2	31.8	34.6	29.0	22.5	23.5
05	**25**	33.0	40.2	43.0	36.6	29.3	30.3	35.3	44.1	46.9	39.7	31.6	32.6	32.0	37.3	40.1	34.7	28.3	29.3
06	**30**	39.0	47.1	49.9	43.1	35.3	36.3	41.7	52.7	55.5	47.2	38.0	39.0	36.3	41.7	44.5	39.0	32.6	33.6
07	**35**	45.0	54.0	56.8	49.5	41.3	42.3	48.3	61.3	64.1	54.8	44.6	45.6	41.7	48.4	51.2	45.1	38.0	39.0
08	**40**	50.5	59.3	62.1	54.9	46.8	47.8	53.2	67.0	69.8	60.1	49.5	50.5	47.9	54.8	57.6	51.4	44.2	45.2
09	**45**	55.4	65.4	68.2	60.4	51.7	52.7	56.8	71.7	74.5	64.3	53.1	54.1	53.2	60.9	63.7	57.1	49.5	50.5
10	**50**	60.9	70.9	73.9	65.9	57.0	58.0	63.5	78.1	81.1	70.8	59.6	60.6	57.7	65.3	68.1	61.5	54.0	55.0
11	**55**	66.8	78.7	81.7	72.8	62.9	63.9	70.7	87.6	90.6	79.2	66.8	67.8	64.1	72.1	74.9	68.1	60.2	61.2
12	**60**	71.9	83.9	86.9	77.9	68.0	69.0	77.7	96.6	99.6	87.2	73.8	74.8	68.8	77.5	80.5	73.2	64.9	65.9
13	**65**	77.2	89.0	92.0	83.1	73.3	74.3	82.4	102.5	105.5	92.5	78.5	79.5	73.8	82.1	85.1	78.0	69.9	70.9
14	**70**	83.3	97.2	100.2	90.3	79.4	80.4	87.2	108.0	111.0	97.6	83.3	84.3	80.8	90.4	93.4	85.6	76.9	77.9
15	**75**	88.3	102.1	105.1	95.2	84.4	85.4	91.7	113.5	116.5	102.6	87.8	88.8	85.6	95.0	98.0	90.3	81.7	82.7
16	**80**	94.7	110.5	113.5	102.6	90.8	91.8	98.7	121.5	124.5	110.1	94.8	95.8	92.3	100.3	103.3	96.3	88.4	89.4
17	**85**	100.8	116.5	119.5	108.7	96.9	97.9	105.2	130.0	133.0	117.6	101.3	102.3	101.1	108.7	111.7	104.9	97.2	98.2
18	**90**	106.1	123.8	126.8	115.0	102.2	103.2	111.7	138.5	141.5	125.1	107.8	108.8	104.2	113.7	116.7	109.0	100.3	101.3
19	**95**	119.6	130.7	133.7	125.2	115.7	116.7	118.3	146.9	149.9	132.6	114.4	115.4	107.0	118.4	121.4	112.7	103.1	104.1
20	**100**	121.0	132.4	135.4	126.7	117.1	118.1	125.8	156.4	159.4	141.1	121.9	122.9	112.9	127.3	130.3	120.1	109.0	110.0
21	**105**	125.1	144.2	147.2	134.7	121.2	122.2	144.6	165.4	168.4	155.0	140.7	141.7	120.7	132.4	135.4	126.6	116.8	117.8
22	**110**	129.7	151.0	154.0	140.4	125.8	126.8	150.7	171.8	174.6	161.3	146.8	147.8	123.2	137.3	140.3	130.3	119.3	120.3
24	**120**	138.5	161.0	164.0	149.8	134.6	135.6	163.3	186.7	189.7	175.0	159.4	160.4	137.5	150.7	153.7	144.1	133.6	134.6
26	**130**	153.5	177.0	180.0	165.3	149.6	150.6	174.7	199.4	202.4	187.1	170.8	171.8	149.4	164.2	167.2	156.8	145.5	146.5
28	**140**	171.7	187.1	190.1	179.4	167.8	168.8	178.1	214.7	217.7	196.4	174.2	175.2	159.4	174.2	177.2	166.8	155.5	156.5
30	**150**	174.8	200.5	203.5	187.7	170.9	171.9	191.4	231.7	234.7	211.6	187.5	188.5	170.6	191.2	194.2	180.9	166.7	167.7
32	**160**	188.2	213.7	216.7	201.0	184.3	185.3	207.4	245.7	248.7	226.6	203.5	204.5	180.7	201.2	204.2	191.0	176.8	177.8
34	**170**	201.7	231.0	234.0	216.4	197.8	198.8	220.8	262.6	265.6	241.7	216.9	217.9	190.7	211.2	214.2	201.0	186.8	187.8
36	**180**	215.0	247.8	250.8	231.4	211.1	212.1	229.0	274.5	277.5	251.8	225.1	226.1	204.1	228.1	231.1	216.1	200.2	201.2
38	**190**	225.1	257.9	260.9	241.5	221.2	222.2	244.1	289.5	292.5	266.8	240.2	241.2	214.1	238.1	241.1	226.1	210.2	211.2
40	**200**	238.5	274.8	277.8	256.7	234.6	235.6	257.3	306.3	309.3	281.8	253.4	254.4	227.5	255.0	258.0	241.3	223.6	224.6

Table 9. 4(2) Dimensions of the spacers for oil / air lubrication

High Ability

Angular contact ball bearings

HAR000 series

HAR900 series

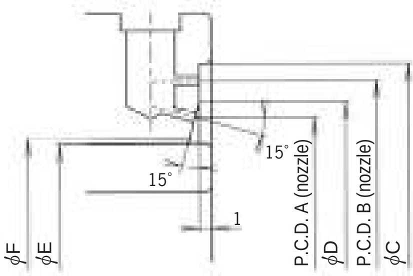
3NCHAR000 series

3NCHAR900 series

* Commonly used in contact angles of 15°, 20° and 30°

** Cage: Outer ring guided

Arrangement: These are the recommended dimensions for a back-to-back (DB) arrangement.



Nozzle diameter

HAR000, 3NCHAR000 series		HAR900, 3NCHAR900 series	
Bore dia. No.	Nozzle diameter (φ)	Bore dia. No.	Nozzle diameter (φ)
06-10	0.8	08-10	0.8
11-34	1.0	11-34	1.0

Unit : mm

Bore dia. No.	Nominal bore dia.	HAR000, 3NCHAR000 series						HAR900, 3NCHAR900 series					
		A	B	C	D	E	F	A	B	C	D	E	F
06	30	39.7	45.9	48.7	42.8	36.0	37.0	—	—	—	—	—	—
07	35	45.6	51.9	54.7	48.8	41.9	42.9	—	—	—	—	—	—
08	40	51.4	57.4	60.2	54.4	47.7	48.7	49.1	53.7	56.5	51.4	45.4	46.4
09	45	57.0	63.6	66.4	60.3	53.3	54.3	54.6	59.2	62.0	56.9	50.9	51.9
10	50	62.5	68.6	71.6	65.6	58.6	59.6	58.8	64.1	66.9	61.5	55.1	56.1
11	55	69.7	76.6	79.6	73.2	65.8	66.8	65.3	70.6	73.6	68.0	61.4	62.4
12	60	74.7	81.6	84.6	78.2	70.8	71.8	70.3	75.6	78.6	73.0	66.4	67.4
13	65	79.4	86.6	89.6	83.0	75.5	76.5	75.1	80.9	83.9	78.0	71.2	72.2
14	70	86.2	95.0	98.0	90.6	82.3	83.3	82.6	88.6	91.6	85.6	78.7	79.7
15	75	91.2	99.9	102.9	95.6	87.3	88.3	88.5	93.6	96.6	91.1	84.6	85.6
16	80	98.1	107.9	110.9	103.0	94.2	95.2	93.5	98.6	101.6	96.1	89.6	90.6
17	85	104.0	112.9	115.9	108.5	100.1	101.1	100.7	106.5	109.5	103.6	96.8	97.8
18	90	110.7	121.4	124.4	116.1	106.8	107.8	104.7	111.5	114.5	108.1	100.8	101.8
19	95	115.7	126.4	129.4	121.1	111.8	112.8	110.7	116.5	119.5	113.6	106.8	107.8
20	100	119.4	131.3	134.3	125.4	115.5	116.5	116.4	124.9	127.9	120.7	112.5	113.5
21	105	127.6	139.1	142.1	133.4	123.7	124.7	122.6	129.9	132.9	126.3	118.7	119.7
22	110	136.5	147.3	150.3	141.9	132.6	133.6	127.6	134.9	137.9	131.3	123.7	124.7
24	120	146.5	157.3	160.3	151.9	142.6	143.6	139.9	147.9	150.9	143.9	136.0	137.0
26	130	160.7	173.7	176.7	167.2	156.8	157.8	152.2	160.9	163.9	156.6	148.3	149.3
28	140	170.7	183.7	186.7	177.2	166.8	167.8	162.2	170.9	173.9	166.6	158.3	159.3
30	150	182.7	197.2	200.2	190.0	178.8	179.8	176.5	187.3	190.3	181.9	172.6	173.6
32	160	195.1	210.2	213.2	202.7	191.2	192.2	186.5	197.3	200.3	191.9	182.6	183.6
34	170	209.6	226.1	229.1	217.9	205.7	206.7	196.5	207.3	210.3	201.9	192.6	193.6

Table 9. 4(3) Dimensions of the spacers for oil / air lubrication

High Ability

Angular contact ball bearings

3NCHAC000 series

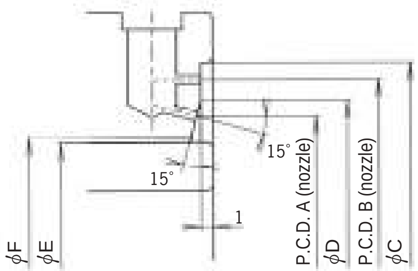
3NCHAC900 series

3NCHAX000 series

3NCHAX900 series

* Commonly used in contact angles of 15° and 20°

** Cage: Outer ring guided
Arrangement: These are the recommended dimensions for a back-to-back (DB) arrangement.



Nozzle diameter

3NCHAC000, 3NCHAX000 series		3NCHAC900, 3NCHAX900 series	
Bore dia. No.	Nozzle diameter (ϕ)	Bore dia. No.	Nozzle diameter (ϕ)
00-09	0.8	00-10	0.8
10-34	1.0	11-34	1.0

Unit : mm

Bore dia. No.	Nominal bore dia.	3NCHAC000, 3NCHAX000 series						3NCHAC900, 3NCHAX900 series					
		A	B	C	D	E	F	A	B	C	D	E	F
00	**10**	15.7	20.7	23.5	18.2	12.0	13.0	15.0	18.1	20.9	16.6	11.3	12.3
01	**12**	18.8	23.8	26.6	21.3	15.1	16.1	16.7	20.1	22.9	18.4	13.0	14.0
02	**15**	21.8	26.7	29.5	24.3	18.1	19.1	20.0	24.0	26.8	22.0	16.3	17.3
03	**17**	25.1	29.8	32.6	27.5	21.4	22.4	22.3	26.0	28.8	24.2	18.6	19.6
04	**20**	29.1	35.8	38.6	32.5	25.4	26.4	26.6	31.8	34.6	29.2	22.9	23.9
05	**25**	33.6	40.2	43.0	36.9	29.9	30.9	32.4	37.3	40.1	34.9	28.7	29.7
06	**30**	39.7	47.1	49.9	43.4	36.0	37.0	36.8	41.7	44.5	39.3	33.1	34.1
07	**35**	45.8	54.0	56.8	49.9	42.1	43.1	42.2	48.4	51.2	45.3	38.5	39.5
08	**40**	51.2	59.3	62.1	55.3	47.5	48.5	48.5	54.8	57.6	51.7	44.8	45.8
09	**45**	56.2	65.4	68.2	60.8	52.5	53.5	53.8	60.9	63.7	57.4	50.1	51.1
10	**50**	61.7	70.9	73.9	66.3	57.8	58.8	58.2	65.3	68.1	61.8	54.5	55.5
11	**55**	67.7	78.7	81.7	73.2	63.8	64.8	64.7	72.1	74.9	68.4	61.0	62.0
12	**60**	72.8	83.9	86.9	78.4	68.9	69.9	69.5	77.5	80.5	73.5	65.6	66.6
13	**65**	78.1	89.0	92.0	83.6	74.2	75.2	74.1	82.1	85.1	78.1	70.2	71.2
14	**70**	84.4	97.2	100.2	90.8	80.5	81.5	81.6	90.4	93.4	86.0	77.7	78.7
15	**75**	89.4	102.1	105.1	95.8	85.5	86.5	86.4	95.0	98.0	90.7	82.5	83.5
16	**80**	96.0	110.5	113.5	103.3	92.1	93.1	91.5	100.3	103.3	95.9	87.6	88.6
17	**85**	102.0	116.5	119.5	109.3	98.1	99.1	98.2	108.7	111.7	103.5	94.3	95.3
18	**90**	107.5	123.8	126.8	115.7	103.6	104.6	103.2	113.7	116.7	108.5	99.3	100.3
19	**95**	119.6	130.7	133.7	125.2	115.7	116.7	107.9	118.4	121.4	113.2	104.0	105.0
20	**100**	117.8	134.0	137.0	125.9	113.9	114.9	114.0	127.3	130.3	120.7	110.1	111.1
21	**105**	126.7	144.2	147.2	135.5	122.8	123.8	121.8	132.3	135.3	127.1	117.9	118.9
22	**110**	131.4	151.0	154.0	141.2	127.5	128.5	124.3	137.3	140.3	130.8	120.4	121.4
24	**120**	140.2	161.0	164.0	150.6	136.3	137.3	138.9	150.8	153.8	144.9	135.0	136.0
26	**130**	155.4	177.0	180.0	166.2	151.5	152.5	151.2	164.5	167.5	157.9	147.3	148.3
28	**140**	169.7	187.1	190.1	178.4	165.8	166.8	157.8	174.3	177.3	166.1	153.9	154.9
30	**150**	177.5	200.5	203.5	189.0	173.6	174.6	171.8	191.2	194.2	181.5	167.9	168.9
32	**160**	193.8	214.0	217.0	203.9	189.9	190.9	185.0	201.2	204.2	193.1	181.1	182.1
34	**170**	207.8	230.7	233.7	219.3	203.9	204.9	195.0	211.2	214.2	203.1	191.1	192.1

Table 9. 4(4) Dimensions of the spacers for oil / air lubrication

High Ability

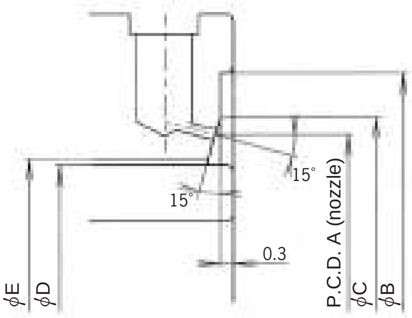
Angular contact ball bearings

3NCHAD000 series

* These are the recommended dimensions for a back-to-back (DB) arrangement.

Unit : mm

Bore dia. No.	Nominal bore dia.	3NCHAD000 series A	B	C	D	E
07	35	41.3	54.7	43.3	39.1	39.7
08	40	46.4	60.2	48.6	44.2	44.8
09	45	52.2	66.4	54.4	49.6	50.2
10	50	57.2	71.6	59.4	54.6	55.2
11	55	63.8	79.6	66.3	61.0	61.6
12	60	68.8	84.6	71.3	66.0	66.6
13	65	73.8	89.6	76.3	71.0	71.6
14	70	79.6	98.0	82.4	76.8	77.4
15	75	84.6	102.9	87.4	81.8	82.4
16	80	91.7	110.9	94.4	87.9	89.5
17	85	96.7	115.9	99.4	92.9	94.5
18	90	101.9	124.4	105.2	98.1	99.7
19	95	106.9	129.4	110.2	103.1	104.7
20	100	112.7	134.3	115.6	107.5	109.7
21	105	119.3	142.1	122.4	114.1	116.3
22	110	125.6	150.3	129.0	120.4	122.6
24	120	135.6	160.3	139.0	130.4	132.6
26	130	148.4	176.7	152.1	141.6	145.4



Nozzle diameter

3NCHAD000 series	
Bore dia. No.	Nozzle diameter (φ)
07-10	0.8
11-26	1.0

These bearings are useful only with oil / air lubrication.
Please use with lubricating spacers as shown below.

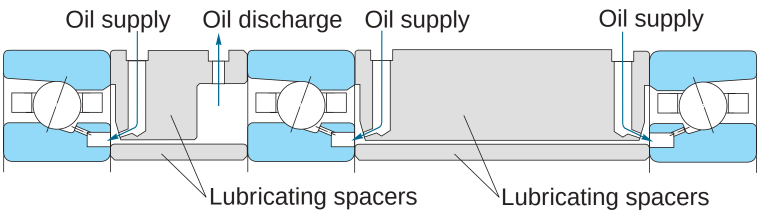
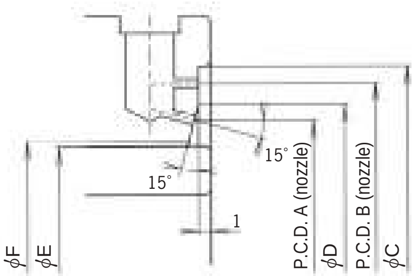


Table 9. 4(5) Dimensions of the spacers for oil / air lubrication Cylindrical Roller bearings

NN3000 series

N1000 series

3NCN1000 series



Nozzle diameter

NN3000 series		N1000, 3NCN1000 series	
Bore dia. No.	Nozzle diameter (ϕ)	Bore dia. No.	Nozzle diameter (ϕ)
05-09	0.8	06-10	0.8
10-40	1.0	11-32	1.0

Unit : mm

Bore dia. No.	Nominal bore dia.	NN3000 series						N1000, 3NCN1000 series					
		A	B	C	D	E	F	A	B	C	D	E	F
05	**25**	34.9	40.7	41.9	37.7	31.9	32.9	—	—	—	—	—	—
06	**30**	40.6	47.4	48.6	43.4	37.5	38.5	40.7	47.3	48.6	43.5	37.5	38.5
07	**35**	47.4	53.9	55.1	50.1	44.0	45.0	47.0	53.7	55.2	49.8	44.0	45.0
08	**40**	53.6	60.0	61.2	56.4	50.0	51.0	54.0	60.0	61.4	56.8	50.0	51.0
09	**45**	58.5	66.2	67.4	61.3	54.5	55.5	58.1	67.2	68.8	60.9	53.5	54.5
10	**50**	63.4	71.1	72.3	66.2	59.5	60.5	62.1	71.2	72.8	64.9	57.5	58.5
11	**55**	70.5	79.5	80.8	73.3	66.0	67.0	71.1	79.7	81.6	73.9	66.0	67.0
12	**60**	75.5	84.5	85.9	78.3	71.1	72.1	76.2	84.8	86.6	79.0	71.1	72.1
13	**65**	80.5	89.5	91.0	83.3	76.0	77.0	80.5	89.2	91.1	83.3	75.5	76.5
14	**70**	88.2	98.2	100.0	91.2	83.0	84.0	88.6	98.5	100.8	91.4	83.0	84.0
15	**75**	93.2	103.3	105.0	96.2	88.0	89.0	93.8	103.5	105.8	96.8	88.0	89.0
16	**80**	100.0	110.8	113.0	103.0	94.0	95.0	100.7	111.4	113.9	103.7	94.0	95.0
17	**85**	105.0	115.8	118.0	108.0	99.0	100.0	105.4	116.4	118.8	108.4	99.0	100.0
18	**90**	112.6	124.5	127.0	115.6	106.0	107.0	112.7	125.2	128.1	115.7	106.0	107.0
19	**95**	117.5	129.5	132.0	120.5	111.0	112.0	117.7	130.2	132.8	120.7	111.0	112.0
20	**100**	122.5	134.5	137.0	125.5	116.0	117.0	120.1	135.5	139.8	123.1	114.0	115.0
21	**105**	128.3	143.0	146.4	131.3	121.4	122.4	125.8	142.5	147.5	128.8	119.9	120.9
22	**110**	136.4	152.0	155.2	139.4	128.4	129.4	135.8	151.5	156.0	138.8	128.4	129.4
24	**120**	146.4	162.0	165.2	149.4	138.4	139.4	143.3	162.3	167.8	146.3	136.4	137.4
26	**130**	160.4	178.5	182.6	163.4	151.4	152.4	159.8	179.3	183.8	162.8	149.4	150.4
28	**140**	170.5	188.5	192.8	173.5	161.4	162.4	167.7	187.0	193.8	170.7	159.4	160.4
30	**150**	183.2	202.4	206.8	186.2	173.4	174.4	179.9	202.0	209.3	182.9	170.9	171.9
32	**160**	192.9	214.0	219.8	195.9	182.4	183.4	191.0	218.5	223.8	194.0	181.4	182.4
34	**170**	207.2	230.0	237.0	210.2	195.4	196.4	—	—	—	—	—	—
36	**180**	221.6	248.3	256.2	224.6	208.4	209.4	—	—	—	—	—	—
38	**190**	229.5	259.0	266.2	232.5	216.4	217.4	—	—	—	—	—	—
40	**200**	248.0	276.0	283.4	251.0	233.4	234.4	—	—	—	—	—	—

10. Heat treatment and materials technology

At JTEKT, we use our proprietary heat treatment technology to produce bearings with long service lives and a variety of cages that provide the optimal performance for specific usage applications.

This section will introduce the heat treatment and materials technology of JTEKT.

10. 1 Rings

10. 1. 1 SH bearing overview

SH bearings are bearings for which special heat treatment (SH treatment) has been applied to the inner and outer rings.

By forming a compressive residual stress layer on the ring surface (the goal of which is the improvement of the service life), we have improved the surface hardness. (See **Fig. 10. 1** and **Fig. 10. 2**.)

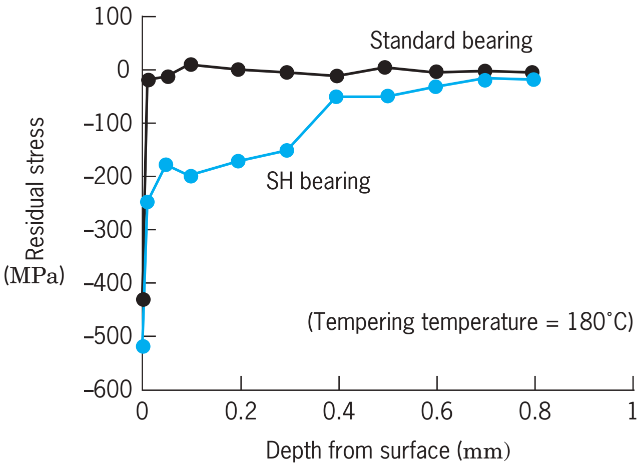


Fig. 10. 1 Compressive residual stress layer

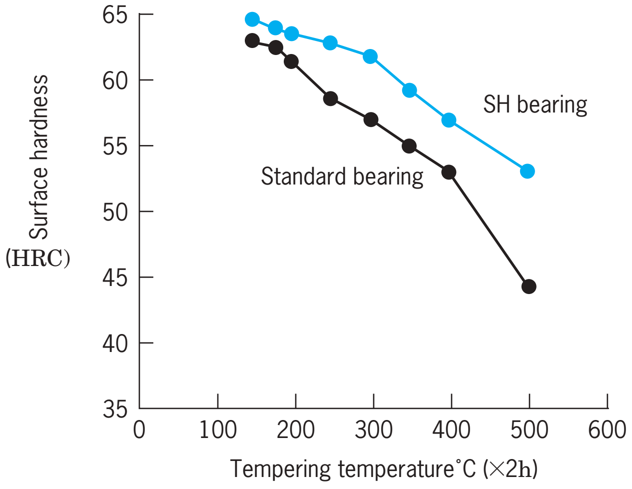


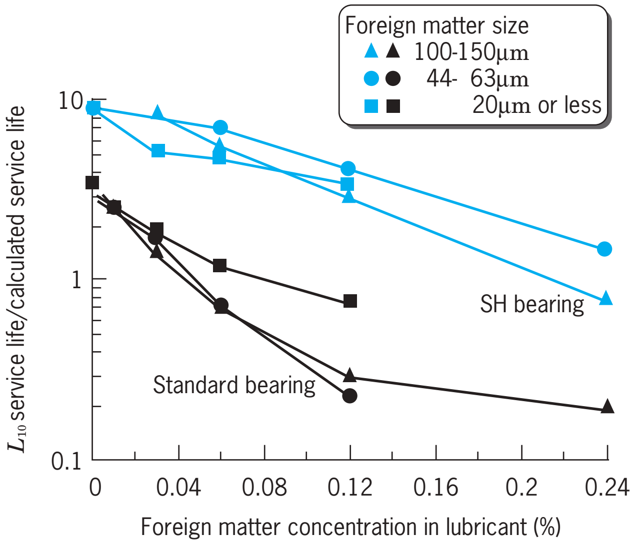
Fig. 10. 2 Surface hardness

10. 1. 2 Performance

In clean oil, these bearings achieve a bearing rating life that is two or more times that of standard bearings.

(Also, in dirty oil, these bearings achieve a bearing rating life that is three or more times that of standard bearings.)

(See **Fig. 10. 3**.)



Test bearing : Ball bearing 63/22 (equivalent)
Tester : KS radial tester
Lubricant : Oil bath with turbine oil #68
Foreign matter : Bearing steel powder

Fig. 10. 3 Relationship between lubricant cleanliness and bearing service life

10. 2 Cage material

Compared to metal, engineering plastic is lighter and has better self-lubricating and wear resistance properties. When it is used in cages, it generates a small amount of heat and causes little grease degradation due to wear. Therefore, engineering plastic is widely used in precision bearings for machine tool use.

10. 2. 1 Types and features of cage materials

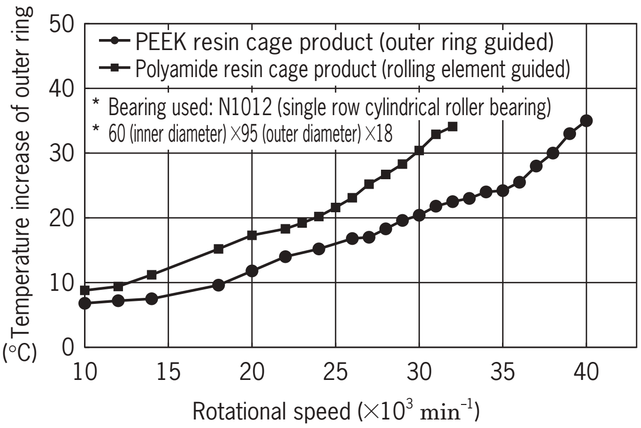
Material	Cage code	Features
Brass	FW·FY	Excellent heat resistance and hardness
Polyamide resin	FG	A standard thermo plastic resin with low cost and excellent wear resistance and oil resistance
Phenolic resin	FT	A cloth base material impregnated with phenolic resin; excellent heat resistance, wear resistance, and oil resistance
PEEK resin	PG	The highest level of heat resistance among all thermo plastic resins and excellent properties such as wear resistance, creep resistance, and fatigue characteristics

10. 2. 2 Scope of cage materials

Material	Angular contact ball bearings	
	Oil/air lubrication	Grease lubrication
Brass		
Polyamide resin		Ball guided
Phenolic resin	Outer ring guided	
PEEK resin	Outer ring guided	

Material	Cylindrical roller bearings	
	Oil/air lubrication	Grease lubrication
Brass	Roller guided	Roller guided
Polyamide resin	Roller guided	Roller guided
Phenolic resin		
PEEK resin	Outer ring guided	

10. 2. 3 Example evaluation of the high-speed properties of a PEEK resin cage product and a polyamide resin cage product



Angular contact ball bearings
Outer ring guided
Phenolic resin cage

Angular contact ball bearings
Ball guided
Polyamide resin cage

Double row cylindrical roller bearings
Roller guided
Brass cage

Single row cylindrical roller bearings
Roller guided
Brass cage

Single row cylindrical roller bearings
Roller guided
Polyamide resin cage

Single row cylindrical roller bearings
Outer ring guided
PEEK resin cage

11. High Ability angular contact ball bearings

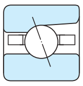
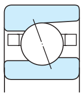
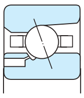
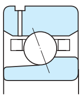
High Ability angular contact ball bearings are optimized for use on machine-tool spindles. They excel in high-speed performance and rapid acceleration/deceleration, and are especially superior in ultrahigh-speed applications when used with oil / air lubrication. Even with grease lubrication, these bearings are superior to conventional products in high-speed applications.

11. 1 Types and applications

High Ability angular contact bearings are available in the varieties listed in **Table 11. 1**, all of which differ in structure and rolling-element material.

Select the type that is best suited for the application.

Table 11. 1 High Ability bearing types and principal applications

Principal applications	Taype	Specification		
		Bearing dimension series	Contact angle	Material of rolling element
High-speed, high-rigidity type	Type R 	10 19	15° 20° 30°	Steel or ceramics
High-speed, high load-rating type	Type C 	10 19	15° 20°	ceramics
Ultrahigh-speed, low-noise type for oil / air lubrication	Type D 	10	20°	ceramics
Extremely ultrahigh-speed type for oil / air lubrication	Type X 	10 19	20°	ceramics

11. 2 Features

● 20 to 30% reduction in temperature increase (compared with JTEKT's conventional products)

JTEKT has conducted various tests and analyses and developed elaborate machining techniques to improve the performance of bearings used with machining tool spindles. The result is a substantial reduction in frictional heat generated in bearings rotating at a high speed.

● 1.2- to 1.5-time increases in speed limits (compared with JTEKT's conventional products)

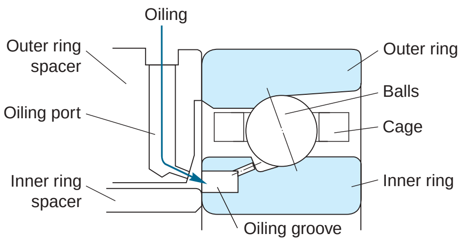
Speed limits have been extended through re-designing for high-speed rotation and heat reduction. Use of ceramic balls as rolling elements enables additional high-speed rotation.

● Improved high-speed performance achieved by position preloading

Low increases in temperature during operation ensure reduced changes in preload. Preload can be given by position preloading even at high speeds, which has been hitherto unavailable with conventional systems. The result is high-precision machining with stability.

● Conventional bearings easily replaced

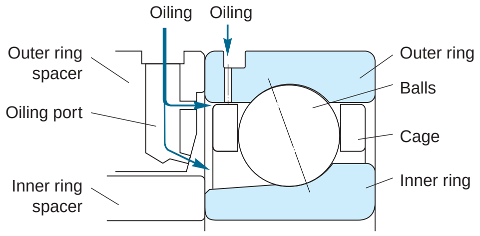
Dimensions of High Ability bearings conform to ISO standards. Replacement of conventional bearings with High Ability bearings requires minimal geometry changes of the present spindle or housing.



The oiling nozzle should be aligned with the oiling groove in the inner ring.

Fig. 11. 1 Lubrication method for Type D

High Ability Type D bearings are designed for oil / air lubrication. Their inner rings have an oiling groove to ensure lubrication on the rolling contact surface for improved lubrication reliability.



Lubrication is accomplished from one side via the outer ring.

Fig. 11. 2 Lubrication method used in Type X

The oiling port in Type X is provided at its outer ring to ensure improved lubrication reliability on the guide ways of the cage. High Ability Type X bearings deliver the best high-speed performance.

11. 3 Performance

High Ability bearings exhibit their maximum performance when used in pairs or when more than two units are combined and when preload is given by position preloading. Shown below is the operating performance of High Ability bearings with preload given by position preloading.

1) Performance of Types R and C

Fig. 11. 3 compares relationships between rotational speed and increases in bearing temperature of Types R and C and conventional high-precision bearings.

High Ability bearings exhibit smaller temperature increases and higher speed limits than conventional bearings whether grease lubrication or oil / air lubrication is applied.

As shown in **Fig. 11. 4**, this type has excellent anti-seizure characteristics with small quantity of lubricant oil in comparison with a conventional type. Thus, the quantity of the lubricant oil can be reduced.

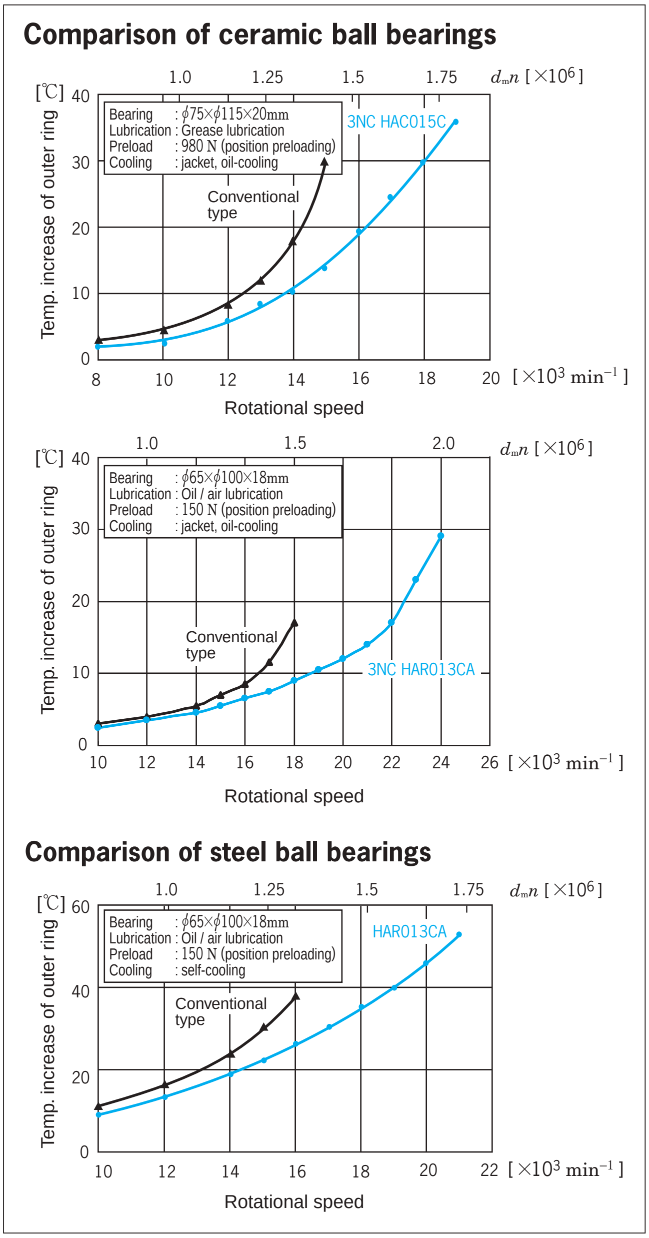


Fig. 11. 3 Comparison of increases in bearing temp.

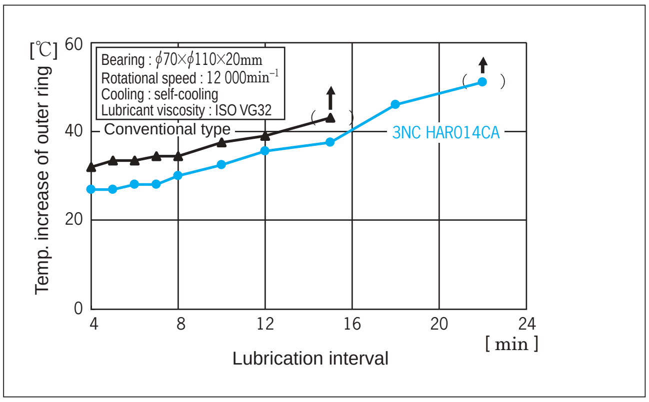


Fig. 11. 4 Comparison of seizure limit oil quantity of Type R and conventional type

High Ability bearings also allow the possible change in lubrication of the spindle from oil / air to grease.

Fig. 11. 5 shows an evaluation example.

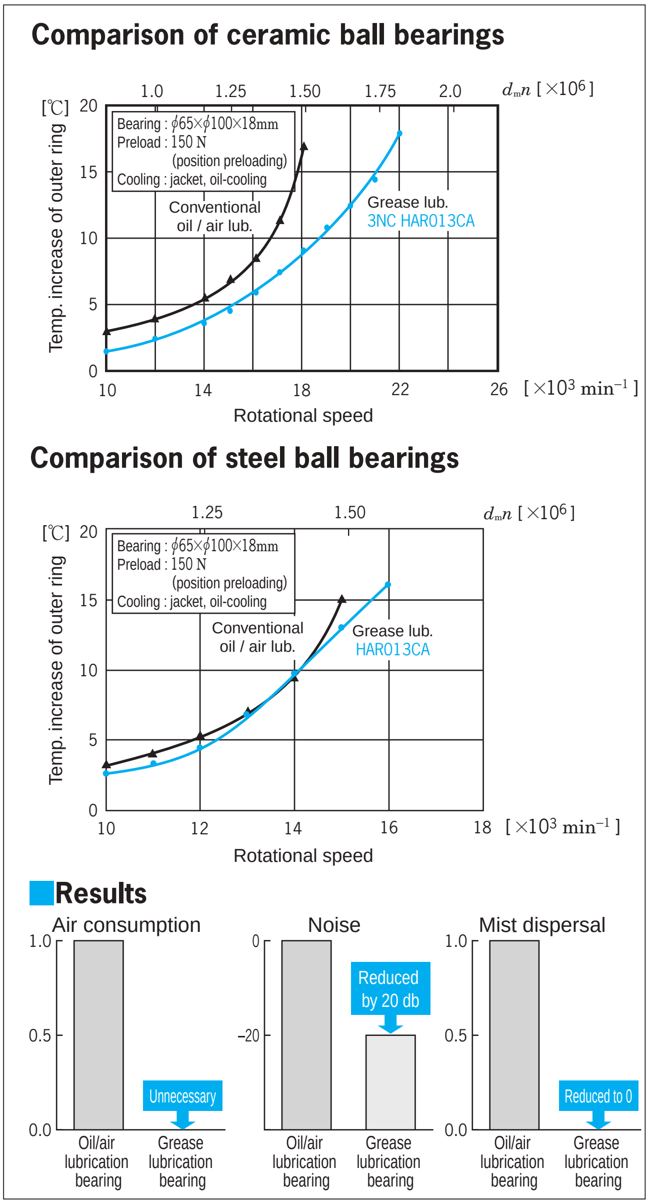


Fig. 11. 5 Comparison of high-speed performance achieved by grease lubrication

2) Performance of Type D

Fig. 11. 6 compares the high-speed performance of Types D and R.

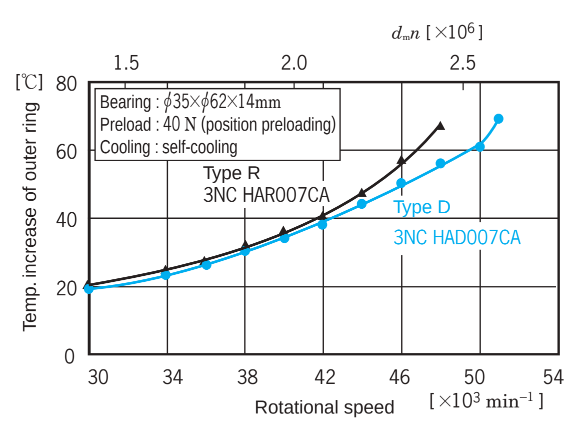


Fig. 11. 6 Comparison of increases in the bearing temp. of Types R and D

Also, Type D causes little wind roar when the bearing is rotating, and is effective in reducing the noise of the spindle device and the air consumption. (**Figs. 11. 7** and **11. 8**)

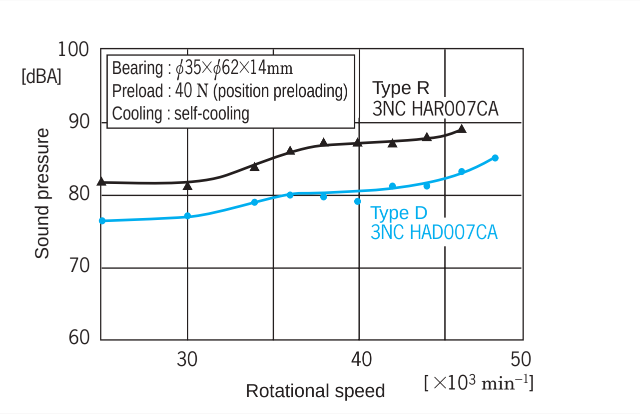


Fig. 11. 7 Comparison of noise by Types R and D

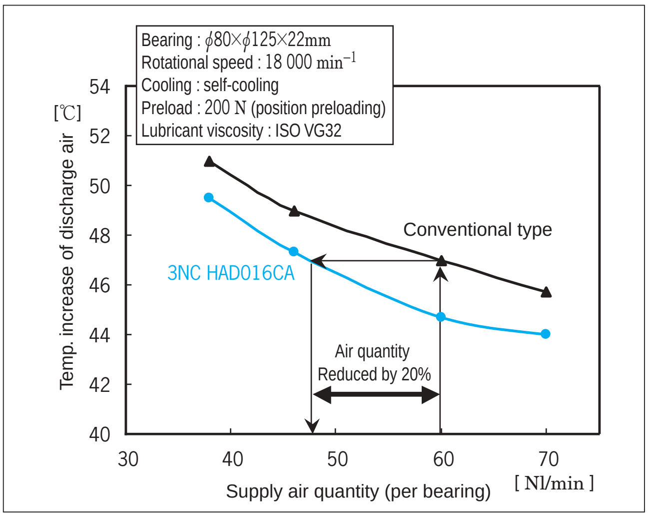


Fig. 11. 8 Comparison of air quantity of Type D and conventional type

3) Performance of Type X

Fig. 11. 9 shows an evaluation example of the Type X bearing operated with a preload given by constant pressure preloading. The maximum rotational speed achieved in this test, or 45 000 min^{-1}, equals 4.05×10^6 in d_mn value.

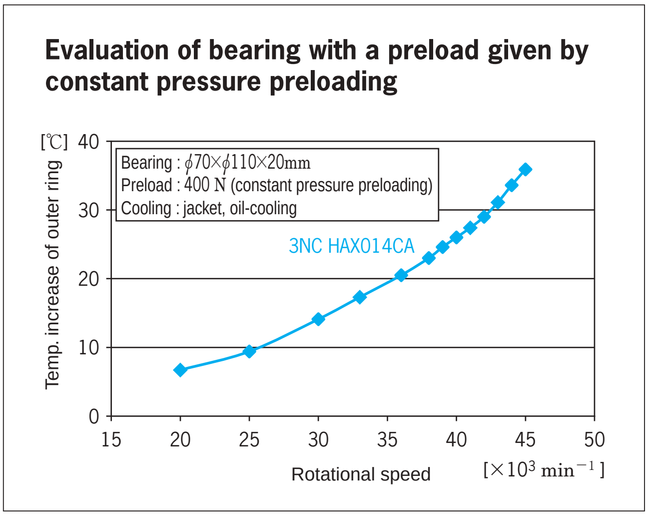


Fig. 11. 9 Temp. increases in Type X bearing

12. Ceramic bearings for machine tool spindles

Compared with bearing steel, ceramics [silicon nitride (Si_3N_4)] has superior properties such as light weight and high elasticity.

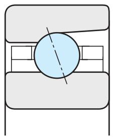
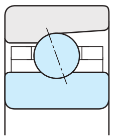
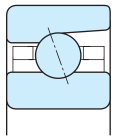
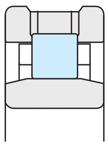
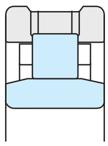
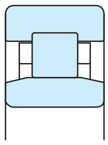
One of the advantages of ceramics when used as a material for bearings is a reduction in the slip of rolling elements caused by centrifugal force and gyroscopic moments under high-speed rotation. Ceramic material is highly effective for meeting the low temperature increase requirements of the bearing.

Other advantages include improved rigidity and improvements in seizure life and grease service life. Ceramic bearings, although varying depending on operating conditions, allow approximately 30% to 50% improvement in speed as compared with steel bearings.

12. 1 Ceramic bearing structures and types

There are three types of ceramic bearings differing in their combinations of ceramic parts. Select the most suitable one from **Table 12. 1** according to the machine tool specifications.

Table 12. 1 Ceramic bearing structures and types

	Codes, types, and structures of ceramic bearings		
Code [1]	**3NC**	**6NC**	**NC**
Description	Rolling element : ceramics	Inner ring Rolling element : ceramics	Inner and outer rings Rolling element : ceramics (Full-ceramic)
Angular contact ball bearing			
Cylindrical roller bearing			

Note 1) A code is placed before a basic bearing number.

12. 2 Properties of ceramics (Si_3N_4)

Sintered in a high temperature and high-pressure gas atmospheric condition (HIP), ceramics (silicon nitride) has many superior properties such as heat resistance, light weight, low coefficient of linear expansion, and a high elastic modulus.

Table 12. 2 shows a comparison of properties with ceramics and bearing steel.

Table 12. 2 Comparison of properties with ceramics and bearing steel

Item	Unit	Ceramics (Si_3N_4)	Bearing steel (SUJ2)
Heat resistance (in the air)	℃	800	120
Density	g/cm^3	3.2	7.8
Coefficient of linear expansion	K^{-1}	3.2×10^{-6}	12.5×10^{-6}
Vickers' hardness	HV	1 300~2 000	700~800
Young's modulus	GPa	320	208
Poisson's ratio	——	0.29	0.3
Thermal conductivity	W/(m·K)	20	41.9~50.2
Corrosion resistance	——	Good	Not good
Magnetism	——	Non-magnetic material	Ferromagnetic material
Electrical conductivity	——	Not applicable (insulant)	Applicable (electric conductor)
Bonding form of material	——	Covalent bond	Metallic bond

12.3 Load ratings of ceramic bearings

JTEKT has adopted the following values as a standard for load ratings of ceramic bearings. These values are determined from a number of experiments and their results.

(1) Dynamic load rating :
Dynamic load rating of steel bearings $(C)\times1.0$ or greater

(2) Static load rating :
Static load rating of steel bearings $(C_0)\times1.0$

The load applied to a spindle bearing for a machine tool is generally very small as compared with bearing load ratings. Accordingly, it is rare that a bearing reaches its fatigue service life or brinelling occur in its raceway surfaces.

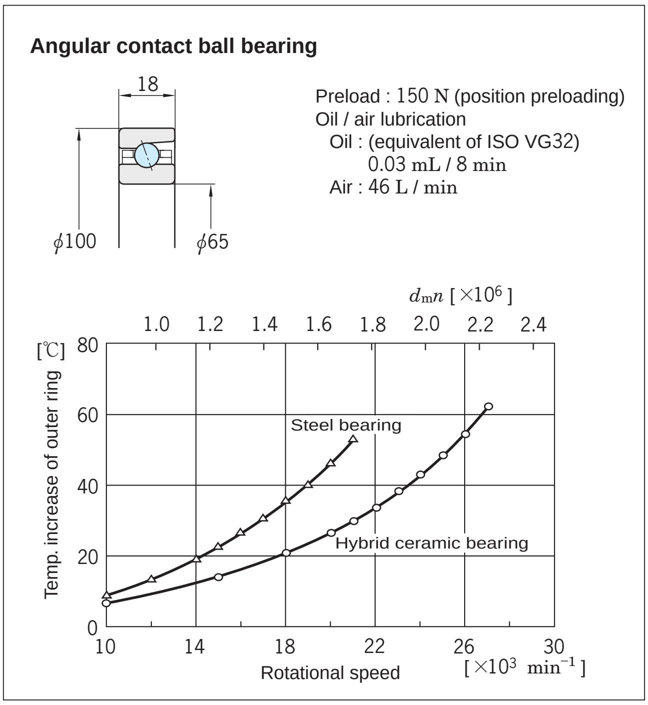
Sufficient care, however, should be taken to ensure that no impact load is applied to the bearing during handling and operation.

12. 4 Sample test data of ceramic bearings

1) High-speed performance of bearings

Ceramic is superior to bearing steel in high-speed rotation performance because it has lower density and linear expansion coefficient.

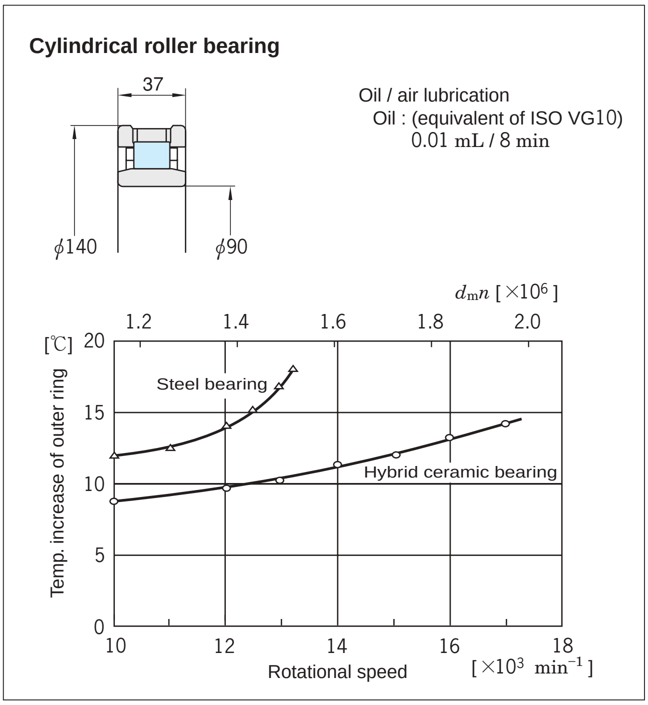
■ Comparison with steel bearing (1)



Preload : 150 N (position preloading)
Oil / air lubrication
Oil : (equivalent of ISO VG32)
0.03 mL / 8 min
Air : 46 L / min

Fig. 12. 1 Comparison of Angular contact ball bearing

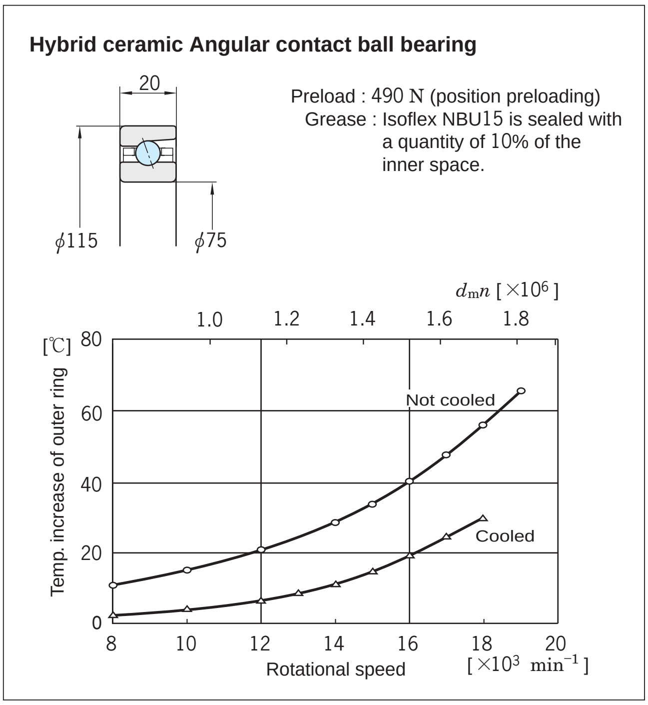
■ Comparison with steel bearing (2)



Oil / air lubrication
Oil : (equivalent of ISO VG10)
0.01 mL / 8 min

Fig. 12. 2 Comparison of cylindrical roller bearing

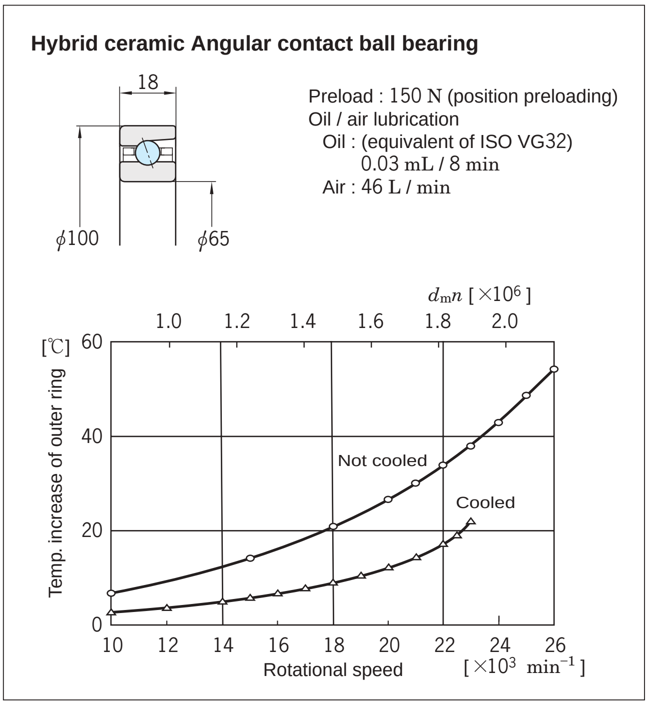
■ High-speed performance (1)



Preload : 490 N (position preloading)
Grease : Isoflex NBU15 is sealed with a quantity of 10% of the inner space.

Fig. 12. 3 High speed performance with grease lub.

■ High-speed performance (2)



Preload : 150 N (position preloading)
Oil / air lubrication
Oil : (equivalent of ISO VG32)
0.03 mL / 8 min
Air : 46 L / min

Fig. 12. 4 High speed performance with oil / air lub.

The 6NC type hybrid ceramic bearings, whose balls and inner ring are both made of ceramic, are superior in high-speed performance to the 3NC type.

In addition, the low-torque 6NC type bearings exhibit lower power losses at high rotational speeds.

■ High-speed performance (3)

Hybrid ceramic Angular contact ball bearing

Oil / air lubrication
Oil : (equivalent of ISO VG10) supplied at 0.05 mL / 2 min
Air : 60 L / min
Cooling : Jacket, oil cooling (10 L / min, control by room temperature)

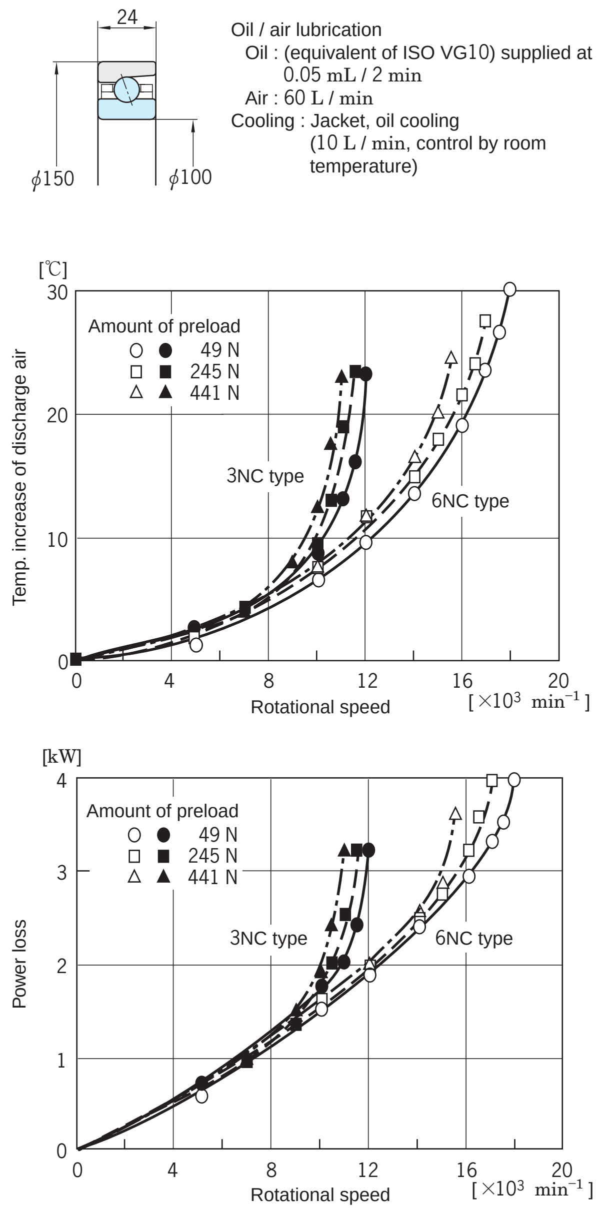


Fig. 12. 5 Comparison of 3NC type and 6NC type hybrid ceramic bearings

Since ceramics and steel have different coefficients of linear expansion, Young's moduli, and Poisson's ratios, care should be taken when fitting for mounting a 6NC type hybrid ceramic bearing on a shaft is selected.

Consult **JTEKT**.

2) Rigidity of bearing

Since ceramics have a greater Young's modulus than bearing steel, the rigidity of a ceramic bearing is higher than that of a steel bearing.

Angular contact ball bearing

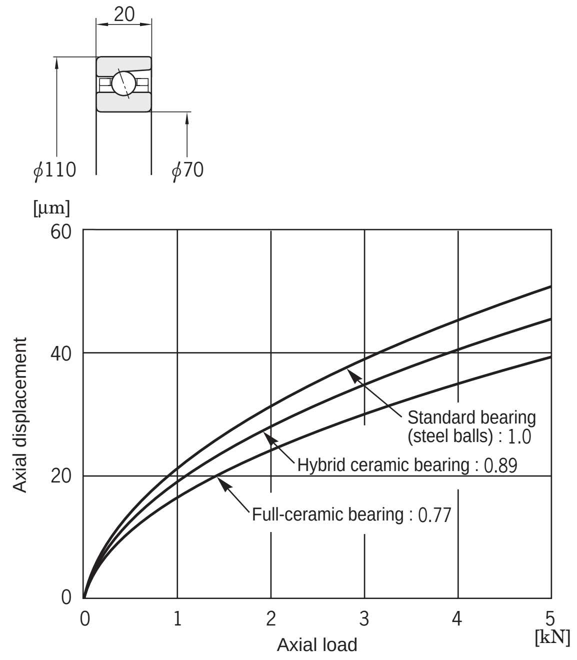


Fig. 12. 6 Comparison of axial displacement

3) Changes in shaft dimensions

Compared with steel bearings, ceramic bearings have higher rigidity and lower temperature increase, thus reducing the risk of changes in shaft dimensions.

Hybrid ceramic angular contact ball bearing

Oil / air lubrication
Oil : (equivalent of ISO VG10) supplied at 0.004 mL / min
Air : 50 L / min
Grease lubrication
Isoflex NBU15 is sealed with a quantity of 10% of the inner space.

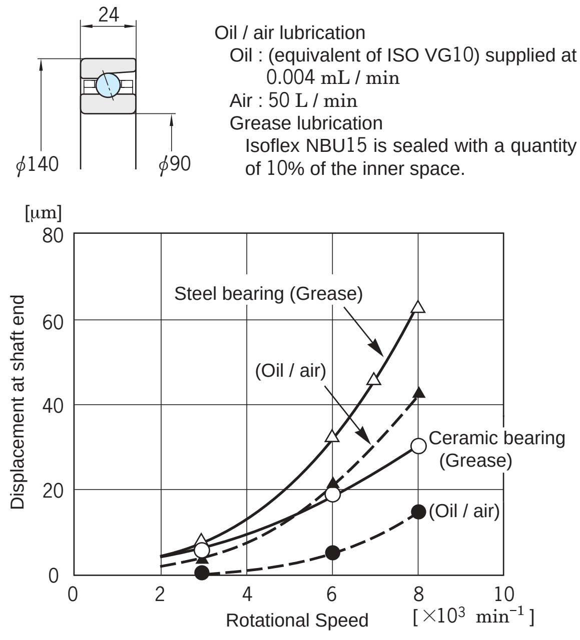
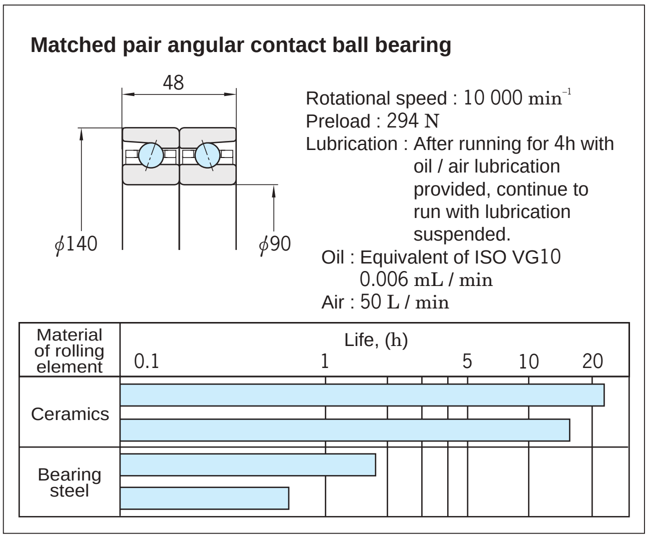


Fig. 12. 7 Comparison of displacement at shaft end

4) Fatigue service life and seizure life of bearings

Ceramic bearings are superior to steel bearings in both seizure life and fatigue service life.

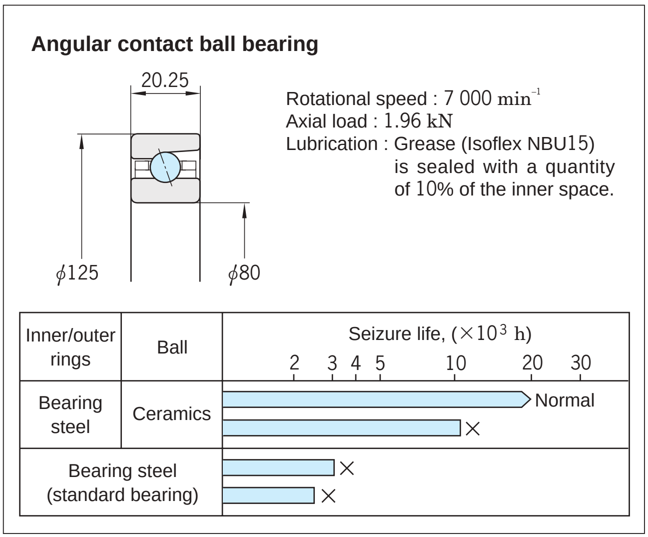
■ Seizure life test results (1)


Matched pair angular contact ball bearing

Rotational speed : 10 000 min^{-1}
Preload : 294 N
Lubrication : After running for 4h with oil / air lubrication provided, continue to run with lubrication suspended.
Oil : Equivalent of ISO VG10 0.006 mL / min
Air : 50 L / min

Fig. 12. 8 Seizure life test results of hybrid ceramic bearings and steel bearings

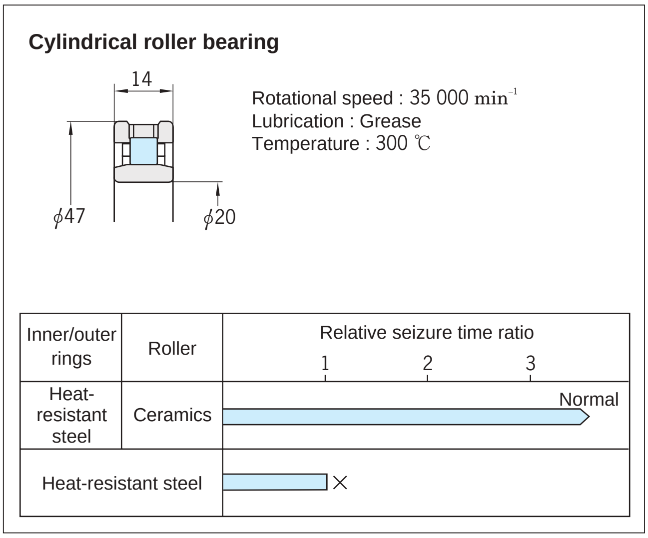
■ Seizure life test results (2)


Angular contact ball bearing

Rotational speed : 7 000 min^{-1}
Axial load : 1.96 kN
Lubrication : Grease (Isoflex NBU15) is sealed with a quantity of 10% of the inner space.

Fig. 12. 9 Seizure life test results of hybrid ceramic bearing and steel bearing

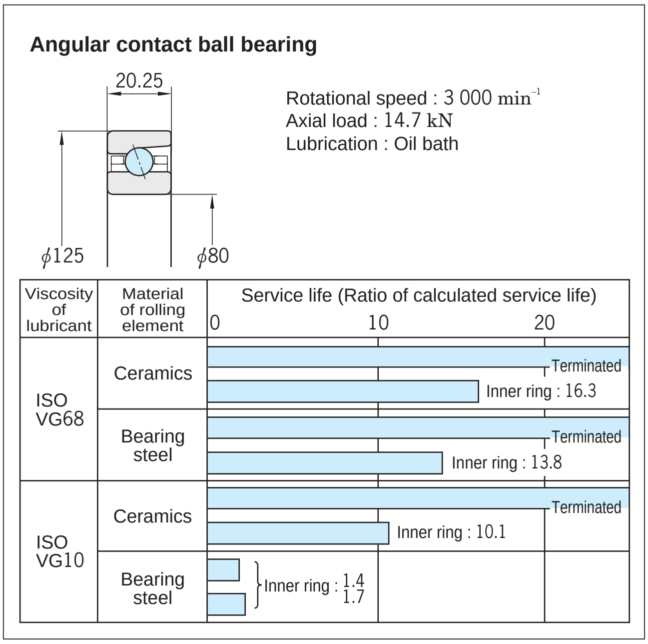
■ Seizure life test results (3)


Cylindrical roller bearing

Rotational speed : 35 000 min^{-1}
Lubrication : Grease
Temperature : 300 ℃

Fig. 12. 10 Seizure life test results of hybrid ceramic bearings and heat resisting steel bearings

■ Fatigue service life test result


Angular contact ball bearing

Rotational speed : 3 000 min^{-1}
Axial load : 14.7 kN
Lubrication : Oil bath

Fig. 12. 11 Life test results of a hybrid ceramic bearing

Precision Ball & Roller Bearings

Bearing Dimension Tables

1. Angular Contact Ball Bearings

Contents

1. Angular contact ball bearings

The angular contact ball bearing can receive a radial load, unidirectional axial load, or a combination of the above loads.

There are four different contact angles to choose from when angular contact ball bearings are considered: 15° (contact angle symbol: C), 20° (CA), 30° (A: to be omitted), and 40° (B).

Of these types, the 15° (contact angle symbol: C), 20° (CA) and 30° (A) bearings are usually used for spindle of machine tools (see **Fig. 1. 1**).

The greater the contact angle, the higher the axial rigidity, and the smaller the contact angle, the more advantageous for high-speed rotations.

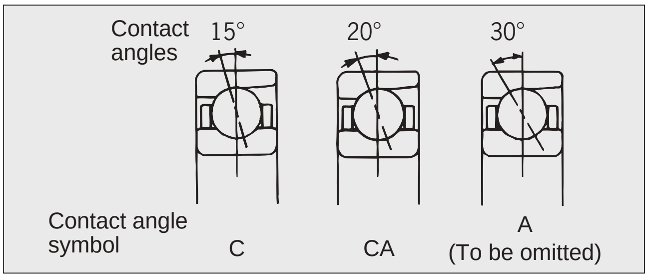
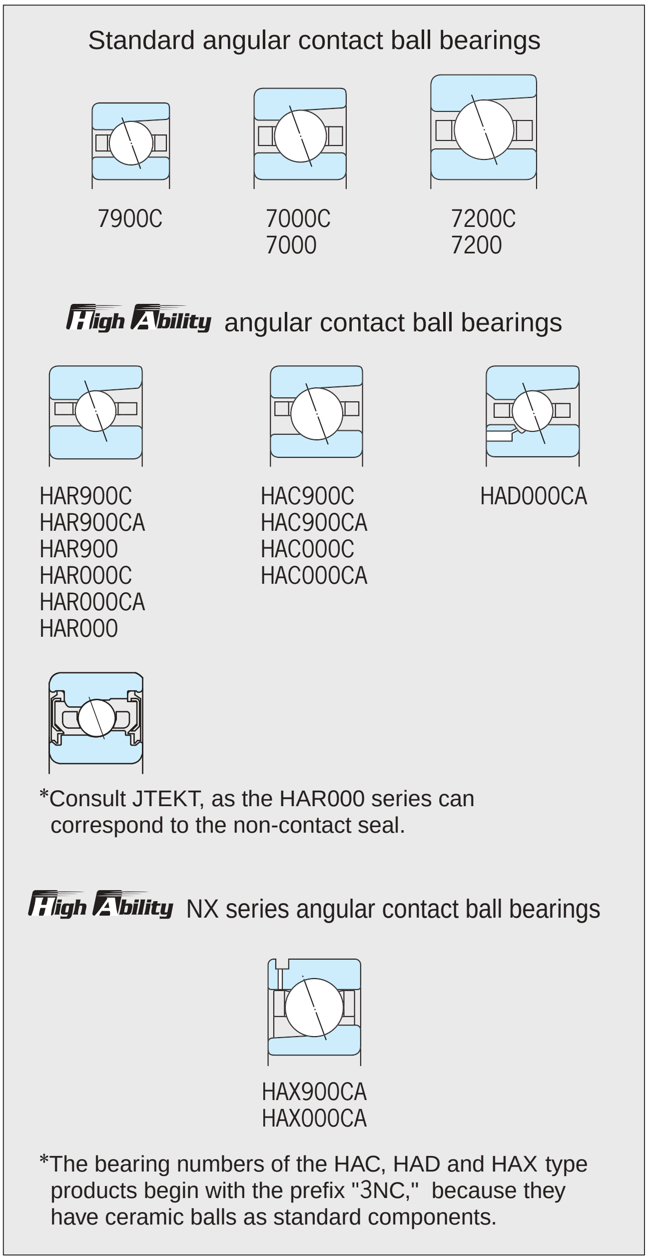


Fig. 1. 1 Contact angles of angular contact ball bearings

1. 1 Types and features of angular contact ball bearings



*Consult JTEKT, as the HAR000 series can correspond to the non-contact seal.

*The bearing numbers of the HAC, HAD and HAX type products begin with the prefix "3NC," because they have ceramic balls as standard components.

Fig. 1. 2 Types and series of angular contact ball bearings

1) Standard angular contact ball bearings

7900C
7000C, 7000 series
7200C, 7200

The standard cage is of the ball-guided type and is made from polyamide resin.

2) High Ability angular contact ball bearings

HAR900C, HAR900CA, HAR900 HAR000C, HAR000CA, HAR000	High-rigidity type
HAC000C, HAC000CA, HAC900C HAC900CA	High load-rating type
HAD000CA	Ultrahigh-speed type

- The High Ability angular contact ball bearings are optimized for use on high-speed machine tool spindles. They are available in three types: high-rigidity type, high load-rating type, and ultrahigh-speed type. (The ultrahigh-speed type is used with oil / air lubrication.)
- The standard contact angle of these bearings is 20°. The high-rigidity type products are also available with a contact angle of 15° and 30°. The high load-rating type products are also available with a contact angle of 15°.
- These bearings have ceramic balls and an outer ring-guided cage made from reinforced phenol resin as standard components.

  Steel-ball products and ball-guided cage products are also available to suit your needs.

3) High Ability NX series angular contact ball bearings

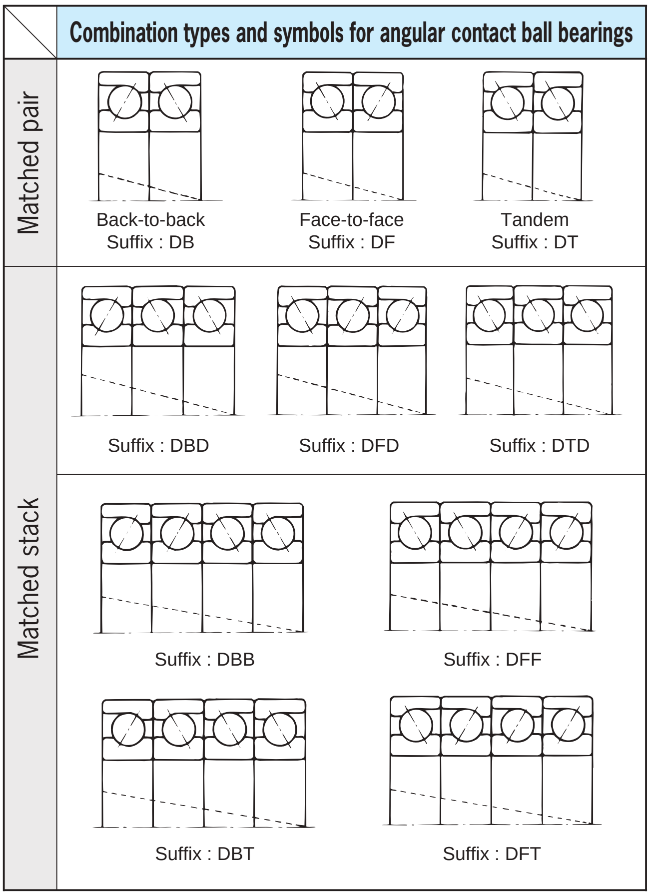
HAX000CA, HAX900CA	Extremely ultrahigh-speed type

- The High Ability NX Series angular contact ball produces less heat and has better high-speed performance than conventional High Ability Series products.
- The standard contact angle of these bearings is 20°. This type of bearing has ceramic balls and an outer ring-guided cage made from PEEK resin.

1. 2 Matched pair angular contact ball bearings

Angular contact ball bearings are used in matched pair, or in combinations of more than two bearings. **Table 1. 1** shows combination types and symbols for angular contact ball bearings.

Table 1. 1 Combination types and symbols for angular contact ball bearings



[Remark] - - - - - indicates the direction of the "V" mark.

Matched pair angular contact ball bearings are adjusted to a preset amount of preload and axial clearance.

The standard preloads are divided into 4 classes : slight preload (symbol : S), light preload (L), medium preload (M), and heavy preload (H). **Table 1. 4** (page 63) shows amounts of standard preloads.

Type G bearings

The type G bearing has both sides machined (flush-ground) to obtain the same stand-out between the inner and outer rings (see **Fig. 1. 3**).

This makes it possible to select any desired combination(s) from **Table 1. 1**.

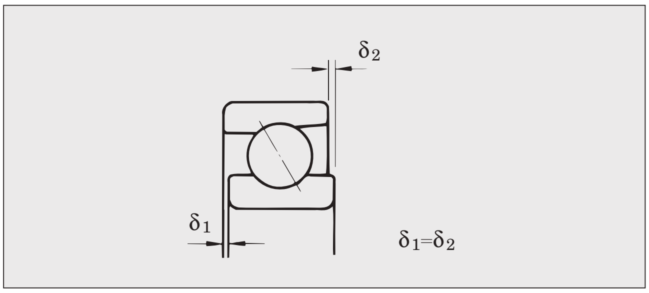


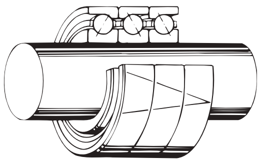
Fig. 1. 3 Flush-ground type G bearings

- Examples of identification numbers of type G bearings

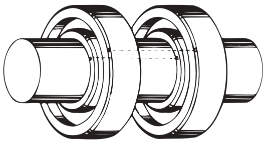
7010GL : Adjustment is made so that any combination of two or more bearings presents light preload (preload symbol : L).

7010GL×2 : Adjustment is made so that any combination of this set of two bearings presents light preload (preload symbol : L).

Cautions for assembly



(Combination mark)



(Mark indicating position of maximum eccentricity)

① A "V" mark is put on the outside surfaces of the outer rings of matched pair or matched stack angular contact ball bearings, to indicate their combination mode. Combine them in such a way that the marks on the outer ring form a "V".

② Chamfered edges of the inner and outer rings are marked with a circle "○", which shows the position of maximum eccentricity.

Mount bearings so that the "○" marks on the inner and outer rings are opposite (180°) to the position of maximum eccentricity of the shaft or housing. By doing so, maximum running accuracy is obtained.

1. 3 Composition of bearing numbers (angular contact ball bearings)

7018C-5K5DBL /27AFTP5

3NCHAC018C-5K5DBCS5/27AFGP4

Ceramic bearing

Bearing type symbols
7 : angular contact ball bearing
HAR, HAC, HAD : High Ability angular contact ball bearings
HAX : High Ability NX series angular contact ball bearings

Dimension series symbols
9 : dimension series 19
0 : dimension series 10
2 : dimension series 02

Bore diameter number
18 : nominal bore diameter : 90 mm
(bore diameter number × 5 equals nominal bore diameter.)

Contact angle symbols
A : nominal contact angle : 30° (A is to be omitted.)
C : nominal contact angle : 15°
CA : nominal contact angle : 20°

Cage guiding system symbols
No specified : outer ring-guiding
–5 : ball-guiding

Special permissible dimensional deviation symbols
K5 : **JTEKT**'s special permissible dimensional deviations are used for the bore diameter of the inner ring and the outside diameter of the outer ring.
No specified : If standard permissible dimensional deviations are used.

Matched pair or stack symbols
DB : back-to-back
DF : face-to-face
DT : tandem
For suffixes that denote bearings which consist of three or four bearings, see **Table 1. 1** (page 59).
G : Type G bearing (flush-ground bearing)

Preload symbol* or **clearance symbols**
(*In some cases, a symbol denoting the specific preload is used.)
S : slight preload
L : light preload
M : medium preload
H : heavy preload
CS : clearance
CY : negative clearance (preload)
(CS5 : The mean value of the clearance is 5µm.)
(For amount of preload, see **Table 1. 4** (page 63).)

Spacer number/symbols
No specified : If no spacer is provided.
/27 : spacer with lubrication hole, 27 mm in nominal width
A : spacer not provided with lubrication hole (symbol A is not used if the spacer has a lubrication hole.)

Cage symbols
FG : molded cage made of polyamide resin
FT : machined cage made of reinforced phenolic
FY : machined cage made of copper alloy
PG : PEEK resin cage

Tolerance class symbols
P5 : JIS class 5
P4 : JIS class 4
P2 : JIS class 2

1. 4 Tolerance of bearings

The tolerance of the precision angular contact ball bearing is compliant with permissible dimensional deviations and limits of classes 5, 4, and 2 as specified in JIS B 1514 for radial bearings (tapered roller bearings not included).

Permissible dimensional deviations and limits of radial bearings are shown in **Table 1. 2**.

Table 1. 3 (page 62) shows **JTEKT**'s special permissible dimensional deviations (K5) used to facilitate multi-row combinations (K5 is used for the bore diameter of the inner ring and the outside diameter of the outer ring).

Table 1. 2(1) Permissible dimensional deviations and limits of angular contact ball and cylindrical roller bearings

(1) Inner ring

Unit : μm

Nominal bore diameter d (mm)		Single plane mean bore diameter deviation Δ_{dmp}						Single bore diameter deviation Δ_{ds}[1]				Single plane bore diameter variation V_{dsp}					Mean bore diameter variation V_{dmp}		
												Diameter series 7, 8, 9		Diameter series 0, 1, 2, 3, 4		–			
		Class 5		Class 4		Class 2		Class 4		Class 2		Class 5	Class 4	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.		max.		max.	max.		
10	**18**	0	– 5	0	– 4	0	–2.5	0	– 4	0	–2.5	5	4	4	3	2.5	3	2	1.5
18	**30**	0	– 6	0	– 5	0	–2.5	0	– 5	0	–2.5	6	5	5	4	2.5	3	2.5	1.5
30	**50**	0	– 8	0	– 6	0	–2.5	0	– 6	0	–2.5	8	6	6	5	2.5	4	3	1.5
50	**80**	0	– 9	0	– 7	0	–4	0	– 7	0	–4	9	7	7	5	4	5	3.5	2
80	**120**	0	–10	0	– 8	0	–5	0	– 8	0	–5	10	8	8	6	5	5	4	2.5
120	**150**	0	–13	0	–10	0	–7	0	–10	0	–7	13	10	10	8	7	7	5	3.5
150	**180**	0	–13	0	–10	0	–7	0	–10	0	–7	13	10	10	8	7	7	5	3.5
180	**250**	0	–15	0	–12	0	–8	0	–12	0	–8	15	12	12	9	8	8	6	4
250	**315**	0	–18	*0*	*–15*	–	–	*0*	*–15*	–	–	18	*15*	14	*11*	–	9	*8*	–
315	**400**	0	–23	*0*	*–18*	–	–	*0*	*–18*	–	–	23	*18*	18	*14*	–	12	*9*	–

Nominal bore diameter d (mm)		Radial runout of assembled bearing inner ring K_{ia}			S_d			S_{ia}[2]			Single inner ring width deviation Δ_{Bs}				Single inner ring width deviation Δ_{Bs}[3]		Inner ring width variation V_{Bs}		
		Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Classes 5, 4		Class 2		Classes 5, 4		Class 5	Class 4	Class 2
over	up to	max.			max.			max.			upper	lower	upper	lower	upper	lower	max.		
10	**18**	4	2.5	1.5	7	3	1.5	7	3	1.5	0	– 80	0	– 80	0	–250	5	2.5	1.5
18	**30**	4	3	2.5	8	4	1.5	8	4	2.5	0	–120	0	–120	0	–250	5	2.5	1.5
30	**50**	5	4	2.5	8	4	1.5	8	4	2.5	0	–120	0	–120	0	–250	5	3	1.5
50	**80**	5	4	2.5	8	5	1.5	8	5	2.5	0	–150	0	–150	0	–250	6	4	1.5
80	**120**	6	5	2.5	9	5	2.5	9	5	2.5	0	–200	0	–200	0	–380	7	4	2.5
120	**150**	8	6	2.5	10	6	2.5	10	7	2.5	0	–250	0	–250	0	–380	8	5	2.5
150	**180**	8	6	5	10	6	4	10	7	5	0	–250	0	–250	0	–380	8	5	4
180	**250**	10	8	5	11	7	5	13	8	5	0	–300	0	–300	0	–500	10	6	5
250	**315**	13	*10*	–	13	*8*	–	15	*9*	–	0	–350[4]	–	–	0	–500[4]	13	*8*	–
315	**400**	15	*13*	–	15	*9*	–	20	*12*	–	0	–400[4]	–	–	0	–630[4]	15	*9*	–

S_d : Perpendicularity of inner ring face with respect to the bore

S_{ia} : Axial runout of assembled bearing inner ring

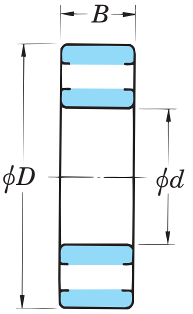
[Notes] 1) Tolerance class 4 is applied to bearings of diameter series 0, 1, 2, 3, and 4.

2) Applied to angular contact ball bearings.

3) Applied to individual bearing rings manufactured for matched pair or stack bearings.

4) Class 5 tolerance complies with JIS; class 4 tolerance is **JTEKT** standard.

[Remark] Values in italics comply with **JTEKT** standards.



d : nominal bore diameter
D : nominal outside diameter
B : nominal bearing width

Table 1. 2(2) Permissible dimensional deviations and limits of angular contact ball and cylindrical roller bearings

(2) Outer ring

Unit : μm

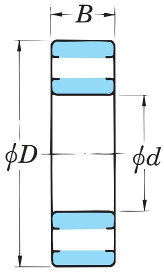
Nominal outside diameter D (mm)		Single plane mean outside diameter deviation Δ_{Dmp}						Single outside diameter deviation Δ_{Ds}[1]				Single plane outside diameter variation V_{Dsp}					Mean outside diameter variation V_{Dmp}		
		Class 5		Class 4		Class 2		Class 4		Class 2		Diameter series 7, 8, 9		Diameter series 0, 1, 2, 3, 4		–			
												Class 5	Class 4	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.		max.		max.	max.		
18	**30**	0	– 6	0	– 5	0	– 4	0	– 5	0	– 4	6	5	5	4	4	3	2.5	2
30	**50**	0	– 7	0	– 6	0	– 4	0	– 6	0	– 4	7	6	5	5	4	4	3	2
50	**80**	0	– 9	0	– 7	0	– 4	0	– 7	0	– 4	9	7	7	5	4	5	3.5	2
80	**120**	0	–10	0	– 8	0	– 5	0	– 8	0	– 5	10	8	8	6	5	5	4	2.5
120	**150**	0	–11	0	– 9	0	– 5	0	– 9	0	– 5	11	9	8	7	5	6	5	2.5
150	**180**	0	–13	0	–10	0	– 7	0	–10	0	– 7	13	10	10	8	7	7	5	3.5
180	**250**	0	–15	0	–11	0	– 8	0	–11	0	– 8	15	11	11	8	8	8	6	4
250	**315**	0	–18	0	–13	0	– 8	0	–13	0	– 8	18	13	14	10	8	9	7	4
315	**400**	0	–20	0	–15	0	–10	0	–15	0	–10	20	15	15	11	10	10	8	5
400	**500**	0	–23	*0*	*–17*	–	–	*0*	*–17*	–	–	23	*17*	17	*13*	–	12	*9*	–
500	**630**	0	–28	*0*	*–20*	–	–	*0*	*–20*	–	–	28	*20*	21	*15*	–	14	*10*	–

Nominal outside diameter D (mm)		Radial runout of assembled bearing outer ring K_{ea}			Perpendicularity of outer ring outside surface with respect to the face S_D			Axial runout of assembled bearing outer ring S_{ea}[2]			Deviation of a single outer ring width Δ_{Cs}		Ring width variation V_{Cs}		
		Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Classes 5, 4, 2		Class 5	Class 4	Class 2
over	up to	max.			max.			max.			upper	lower	max.		
18	**30**	6	4	2.5	8	4	1.5	8	5	2.5	Same as tolerance Δ_{Bs}, d being that of the same bearing.		5	2.5	1.5
30	**50**	7	5	2.5	8	4	1.5	8	5	2.5			5	2.5	1.5
50	**80**	8	5	4	8	4	1.5	10	5	4			6	3	1.5
80	**120**	10	6	5	9	5	2.5	11	6	5			8	4	2.5
120	**150**	11	7	5	10	5	2.5	13	7	5			8	5	2.5
150	**180**	13	8	5	10	5	2.5	14	8	5			8	5	2.5
180	**250**	15	10	7	11	7	4	15	10	7			10	7	4
250	**315**	18	11	7	13	8	5	18	10	7			11	7	5
315	**400**	20	13	8	13	10	7	20	13	8			13	8	7
400	**500**	23	*15*	–	15	*12*	–	23	*15*	–			15	*9*	–
500	**630**	25	*18*	–	18	*13*	–	25	*18*	–			18	*11*	–

[Notes] 1) Tolerance class 4 is applied to bearings of diameter series 0, 1, 2, 3, and 4.

2) Applied to angular contact ball bearings.

[Remark] Values in italics comply with **JTEKT** standards.

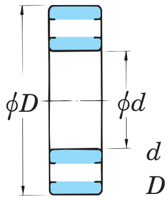


d : nominal bore diameter
D : nominal outside diameter
B : nominal bearing width

Table 1. 3 JTEKT's specific tolerances of angular contact ball bearings (K5)[1]

Unit : μm

Nominal bore diameterd d (mm)		Single plane mean bore or outside diameter deviation Δ_{dmp}, Δ_{Dmp}			
		Class 5		Class 4	
over	up to	upper	lower	upper	lower
–	**50**	–1	–4	–1	–3
50	**80**	–1	–5	–1	–4
80	**120**	–1	–5	–1	–4
120	**150**	–1	–5	–1	–4
150	**180**	–1	–5	–1	–4
180	**250**	–1	–5	–1	–4



d : nominal bore diameter
D : nominal outside diameter

[Note] 1) K5 denotes specially formulated **JTEKT** standards for the purpose of minimizing individual differences in performance, which may occur as a result of fitting stack-mounted to bearings.

1. 5 Standard preloads for matched pair angular contact ball bearings

Back-to-back and face-to-face matched pair bearings are often used under a preload.
By applying a preload to a bearing, the following effects are realized.

1) The rigidity of a bearing can be improved.
2) Running accuracy is improved.
3) Abnormal noise caused by vibration and resonance is prevented.

A greater preload results in higher bearing rigidity.
However, such preload also influences other parameters of the bearing : service life, temperature, frictional torque, etc.
Therefore, it is important to select an adequate preload, taking into consideration the rotational speed and lubrication conditions.

JTEKT offers 4 types of preset preloads, slight preload (S), light preload (L), medium preload (M), and heavy preload (H). This will enable the user to select any desired preload suitable for individual applications (see **Table 1. 4**).

As a guide for selecting the preload, light or medium preload is used for spindles of grinding machines, while medium or heavy preloads are used for spindle of lathes and milling machines.

Table 1. 4(1) Standard preloads for matched pair angular contact ball bearings

(S : slight preload; L : light preload; M : medium preload; H : heavy preload) Unit : N

Bore dia. No.	Bore dia. (mm)	7900C			7000C				7000		
		S	L	M	S	L	M	H	L	M	H
00	**10**	5	15	30	6	20	50	100	30	80	145
01	**12**	7	20	40	6	20	50	100	30	80	145
02	**15**	8	25	50	10	30	80	145	50	145	245
03	**17**	8	25	50	15	40	100	195	60	145	295
04	**20**	15	40	80	15	40	100	245	60	145	295
05	**25**	15	50	100	20	60	145	295	100	245	490
06	**30**	15	50	100	25	80	195	390	145	295	635
07	**35**	25	70	140	35	100	245	490	145	390	785
08	**40**	25	80	155	35	100	295	590	145	390	785
09	**45**	35	100	195	50	145	345	635	245	540	980
10	**50**	35	100	195	50	145	390	735	245	635	1 180
11	**55**	40	120	235	65	195	440	880	295	785	1 370
12	**60**	40	120	235	65	195	490	980	390	880	1 570
13	**65**	50	145	295	85	245	540	1 090	440	980	1 770
14	**70**	65	195	390	85	245	635	1 270	490	1 080	2 060
15	**75**	65	195	390	100	295	685	1 370	590	1 180	2 150
16	**80**	65	195	390	100	295	735	1 470	635	1 370	2 350
17	**85**	85	245	490	130	390	880	1 770	735	1 570	2 550
18	**90**	100	295	590	145	440	980	1 960	785	1 670	2 840
19	**95**	100	295	590	160	490	1 080	2 060	880	1 770	3 140
20	**100**	100	345	685	175	540	1 180	2 150	880	1 960	3 530
21	**105**	100	345	685	195	590	1 270	2 350	980	2 150	3 920
22	**110**	145	390	785	210	635	1 470	2 550	1 080	2 350	4 410
24	**120**	145	490	980	225	685	1 670	2 840	1 180	2 650	4 900
26	**130**	195	590	1 180	245	735	1 770	3 140	1 370	3 140	5 390
28	**140**	195	635	1 270	260	785	1 960	3 920	1 470	3 430	5 880
30	**150**	245	735	1 470	275	835	2 150	4 410	1 770	3 920	6 860
32	**160**	245	785	1 570	290	880	2 350	4 900	2 150	4 410	7 840
34	**170**	345	880	1 810	325	980	2 450	5 390	2 450	4 900	8 820
36	**180**	345	1 130	2 250	440	1 180	2 600	5 880	2 790	5 590	9 120
38	**190**	345	1 170	2 400	490	1 320	2 790	6 370	3 140	6 180	9 410
40	**200**	440	1 620	3 090	590	1 470	2 940	6 860	3 430	6 860	9 800

* Table 1.4 shows the standard preloads for matched pairs (DB, DF).
The standard preloads for matched triplicates (DBD, DFD) are obtained by multiplying the preloads in this table by 1.359.

Table 1. 4(2) Standard preloads for matched pair angular contact ball bearings

(S : slight preload; L : light preload; M : medium preload; H : heavy preload) Unit : N

Bore dia. No.	Bore dia. (mm)	7200C				7200		
		S	L	M	H	L	M	H
00	**10**	10	30	80	145	50	145	245
01	**12**	15	40	100	195	60	145	295
02	**15**	15	50	145	245	80	245	390
03	**17**	25	70	145	345	100	245	540
04	**20**	25	80	195	390	145	295	635
05	**25**	35	100	245	490	145	390	785
06	**30**	35	100	295	590	145	590	930
07	**35**	50	145	390	785	245	785	1 270
08	**40**	65	195	440	880	390	880	1 570
09	**45**	85	245	540	1 080	490	1 080	1 770
10	**50**	85	245	590	1 180	540	1 180	2 060
11	**55**	100	295	735	1 470	635	1 370	2 450
12	**60**	115	345	785	1 670	785	1 470	2 940
13	**65**	130	390	930	1 860	835	1 670	3 330
14	**70**	160	490	980	2 060	930	1 860	3 720
15	**75**	195	590	1 180	2 350	980	2 150	3 920
16	**80**	225	685	1 370	2 750	1 080	2 450	4 310
17	**85**	260	785	1 570	2 940	1 270	2 940	4 900
18	**90**	260	785	1 770	3 430	1 470	3 230	5 390
19	**95**	290	880	1 960	3 920	1 670	3 430	5 880
20	**100**	325	980	2 150	4 410	1 860	3 920	6 370
21	**105**	360	1 080	2 350	4 900	2 060	4 310	7 060
22	**110**	385	1 180	2 450	5 290	2 250	4 900	7 840
24	**120**	420	1 270	2 840	5 490	2 450	5 390	8 820
26	**130**	485	1 470	3 140	5 880	2 750	5 880	9 310
28	**140**	520	1 570	3 430	6 370	2 940	6 370	9 800
30	**150**	585	1 770	3 720	6 860	3 330	6 860	10 300
32	**160**	645	1 960	4 120	7 840	3 630	7 350	10 800
34	**170**	645	2 150	4 410	8 330	3 920	7 840	11 800
36	**180**	685	2 300	4 710	8 830	4 220	8 340	12 500
38	**190**	735	2 450	5 000	9 320	4 510	8 830	13 100
40	**200**	785	2 650	5 300	9 810	4 810	9 320	13 400

1. 6 Axial load and displacement (angular contact ball bearings)

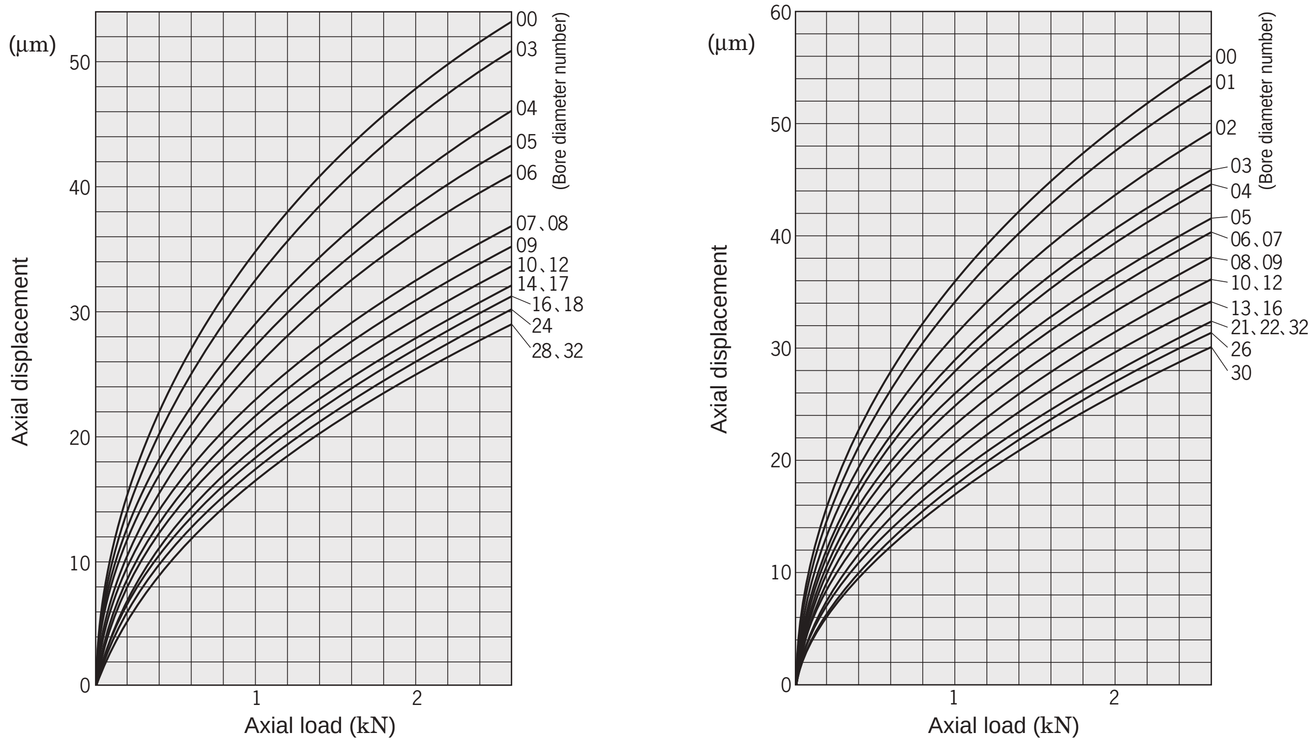
Fig. 1. 4 shows relationships between axial load and displacement of **KOYO** angular contact ball bearings.

The graphs indicate that the greater the contact angle of a bearing, the smaller the axial displacement (high rigidity).

The displacement curve of duplex bearings under a given preload is determined by the method shown in **Fig. 6. 1** on page 30.

(1) 7900C series (contact angle : 15°)

(2) 7000C series (contact angle : 15°)



(3) 7000 series (contact angle : 30°)

(4) 7200C series (contact angle : 15°)

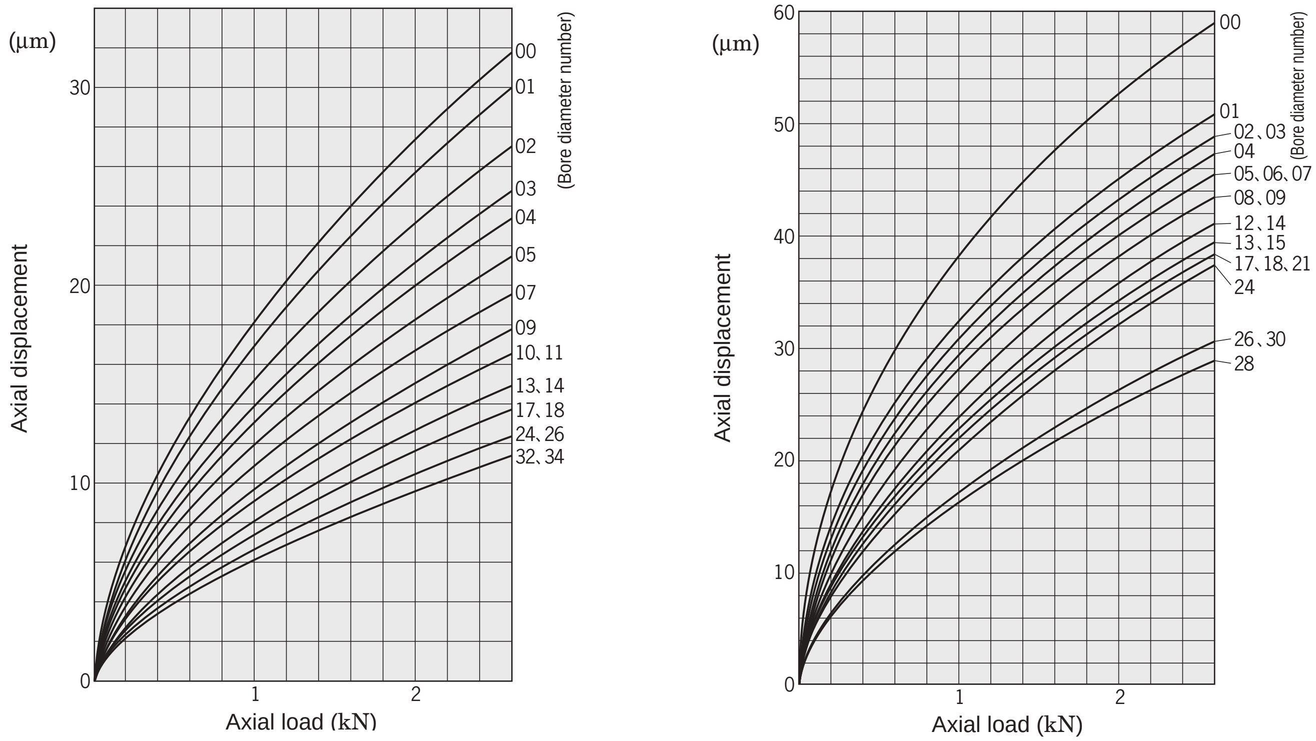
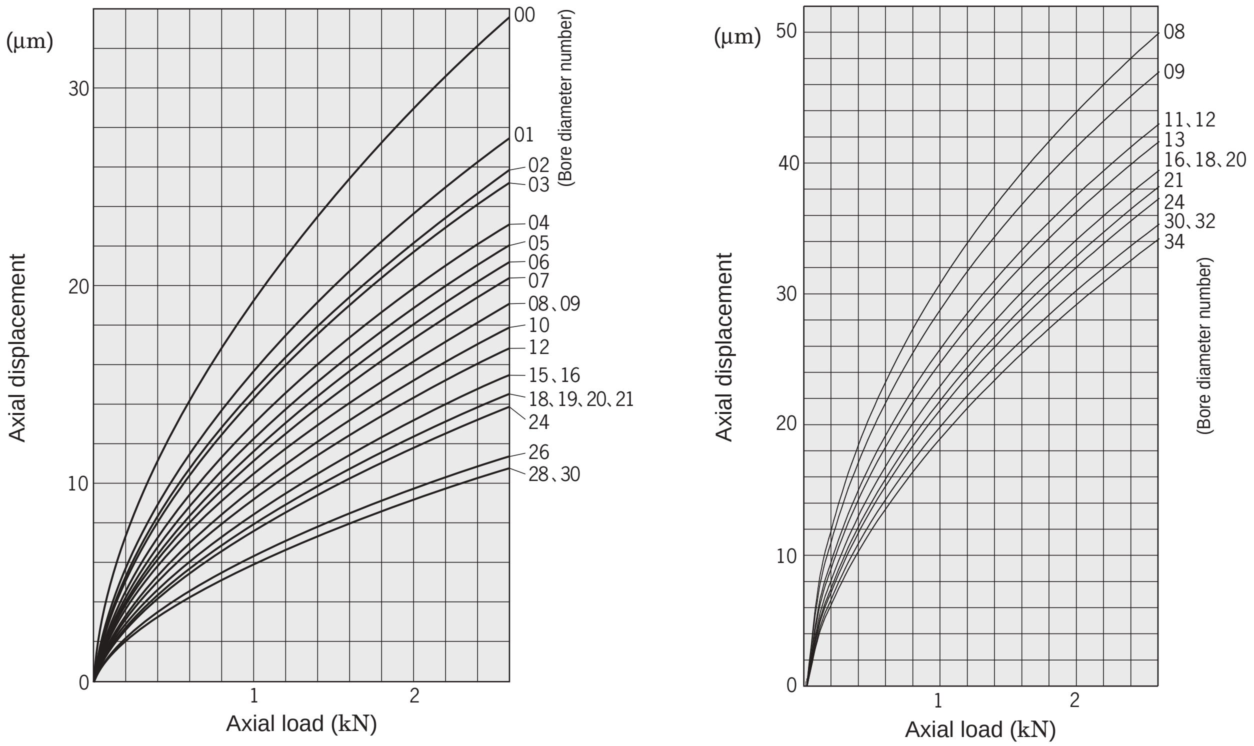
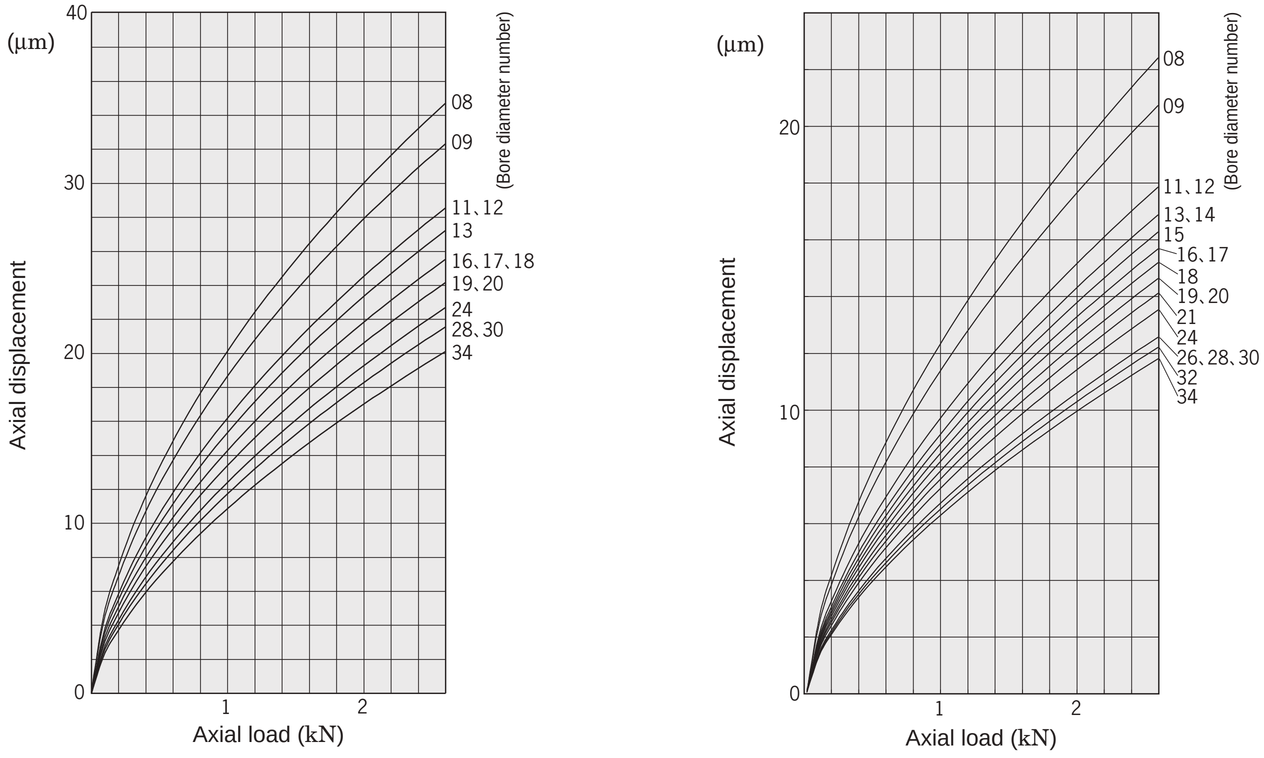


Fig. 1. 4 (1) Relationships between axial load and displacement (angular contact ball bearings)

*The axial displacements shown above are values of the single-row bearings not preloaded.


(5) 7200 series (contact angle : 30°)

(6) HAR900C series (contact angle : 15°)

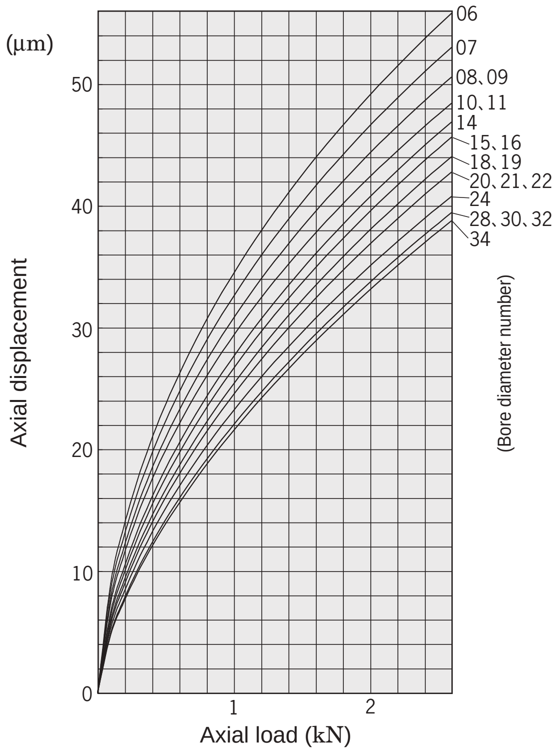

(7) HAR900CA series (contact angle : 20°)

(8) HAR900 series (contact angle : 30°)

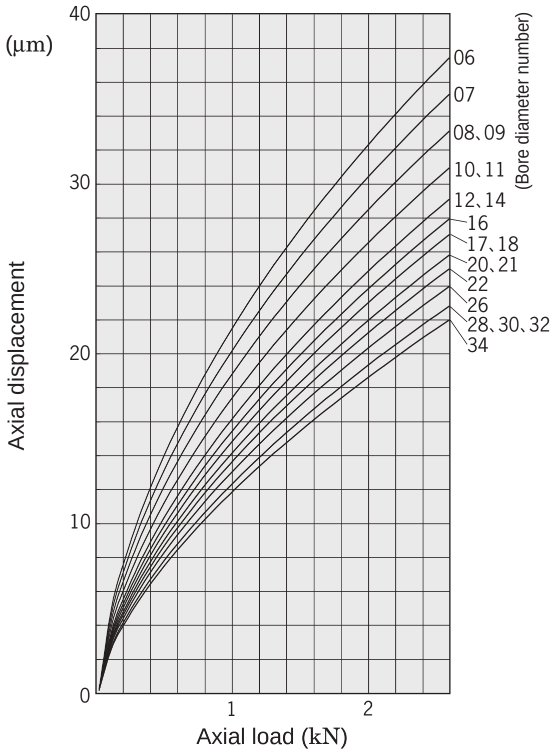
Fig. 1. 4 (2) Relationships between axial load and displacement (angular contact ball bearings)

*The axial displacements shown above are values of the single-row bearings not preloaded.

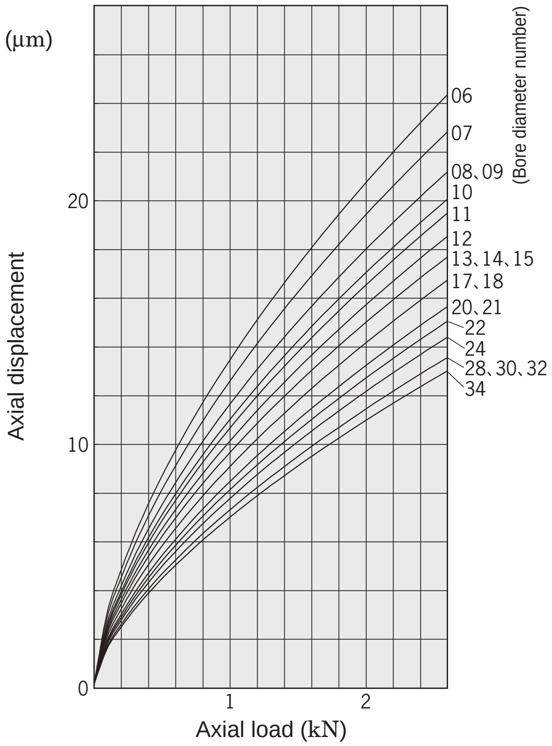
(9) HAR000C series (contact angle : 15°)



(10) HAR000CA series (contact angle : 20°)



(11) HAR000 series (contact angle : 30°)



(12) 3NCHAR900C series (contact angle : 15°)

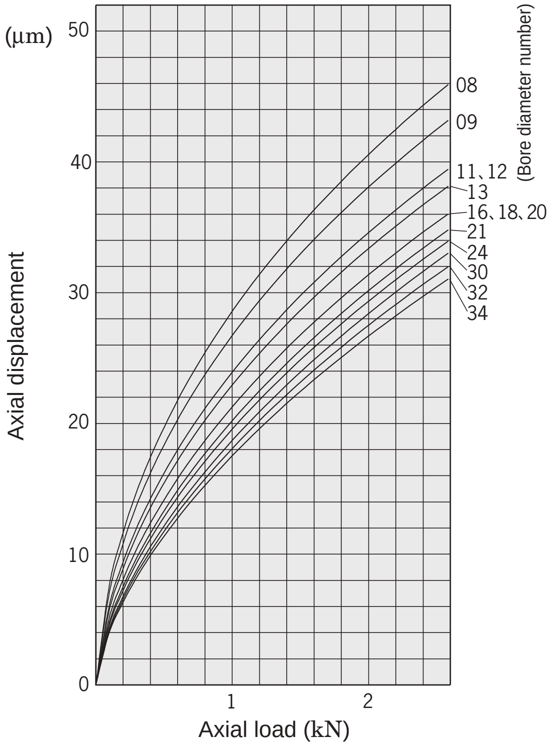
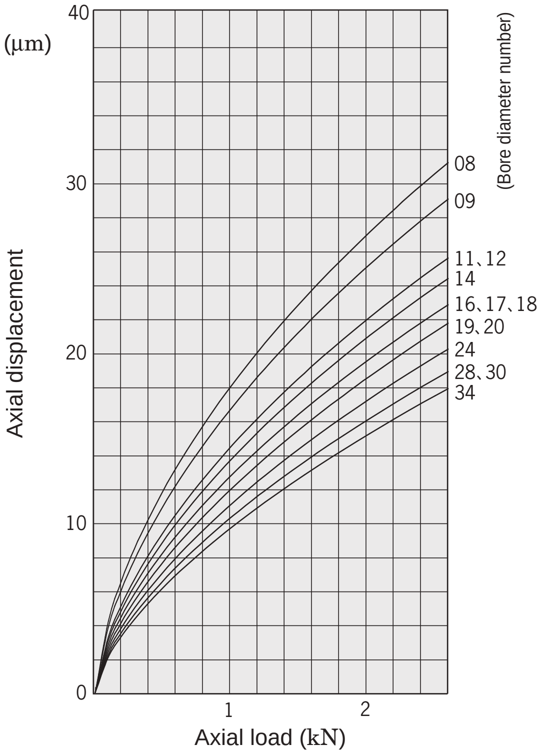


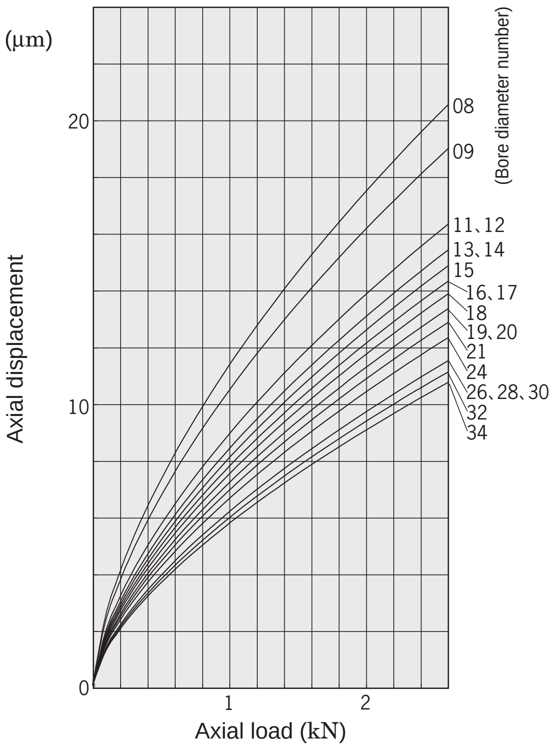
Fig. 1. 4 (3) Relationships between axial load and displacement (angular contact ball bearings)

*The axial displacements shown above are values of the single-row bearings not preloaded.

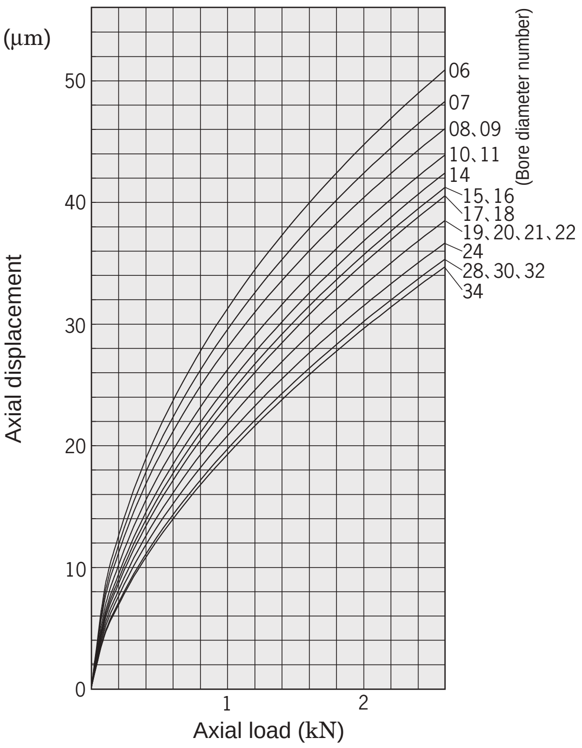
(13) 3NCHAR900CA series (contact angle : 20°)



(14) 3NCHAR900 series (contact angle : 30°)



(15) 3NCHAR000C series (contact angle : 15°)



(16) 3NCHAR000CA series (contact angle : 20°)

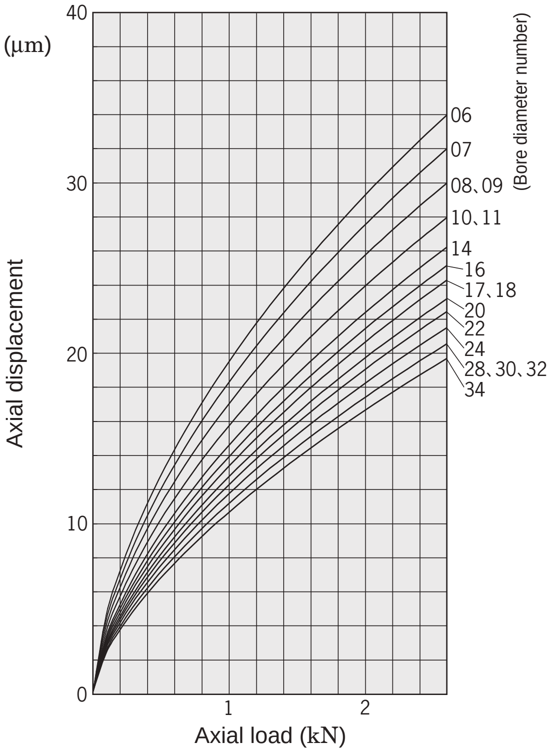
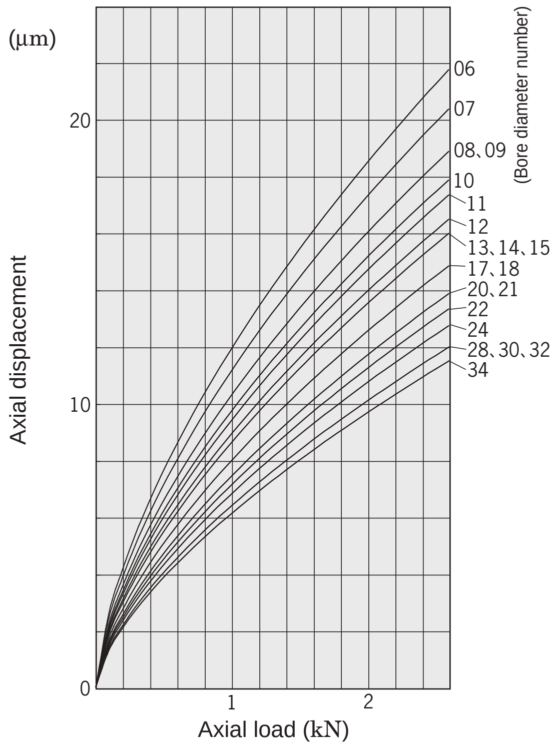


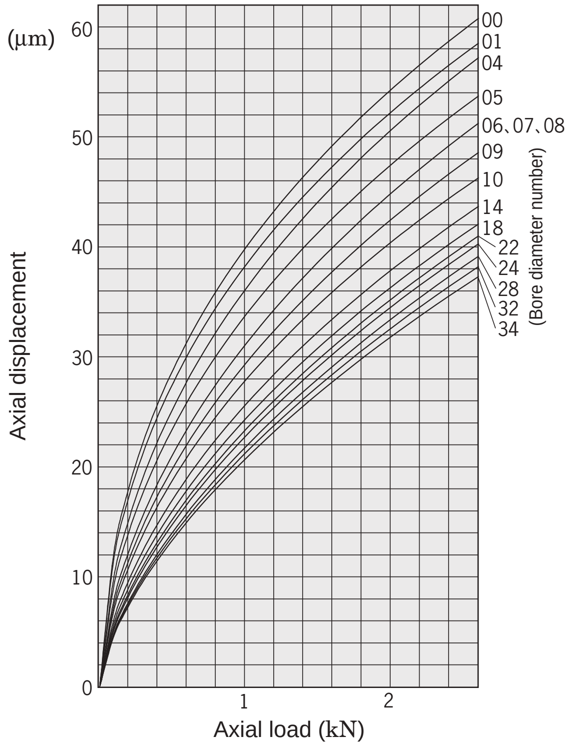
Fig. 1. 4 (4) Relationships between axial load and displacement (angular contact ball bearings)

*The axial displacements shown above are values of the single-row bearings not preloaded.

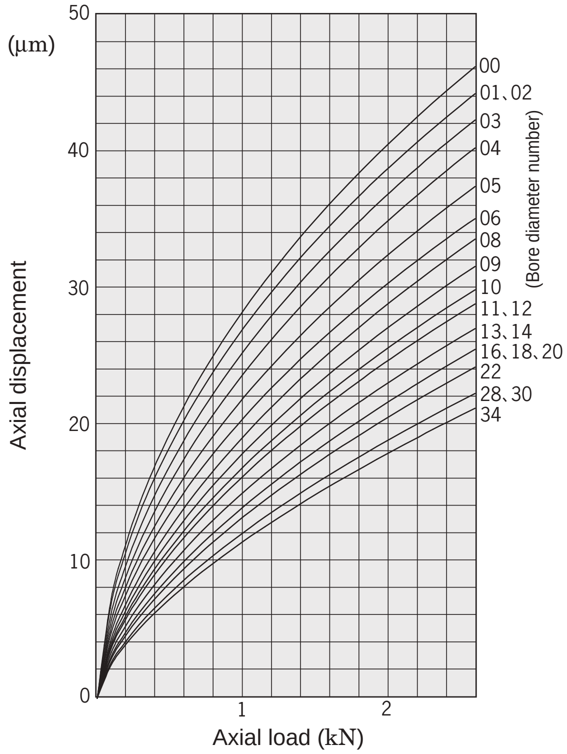
(17) 3NCHAR000 series (contact angle : 30°)



(18) 3NCHAC900C series (contact angle : 15°)



(19) 3NCHAC900CA series (contact angle : 20°)



(20) 3NCHAC000C series (contact angle : 15°)

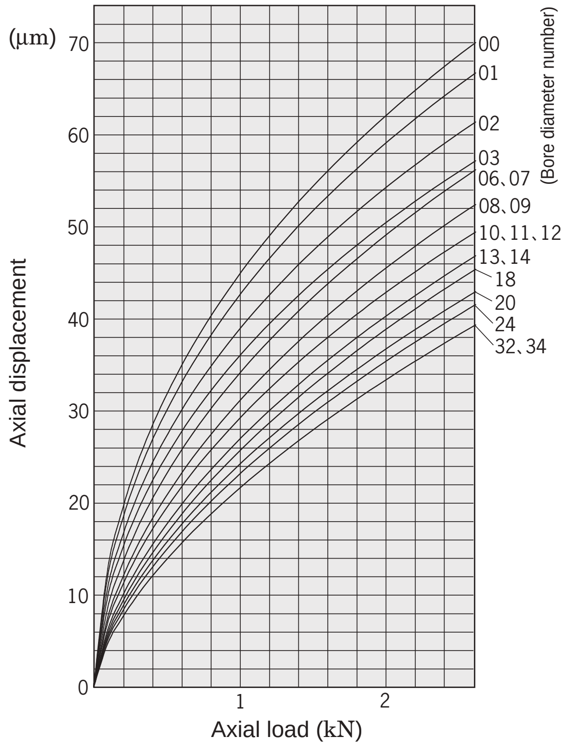
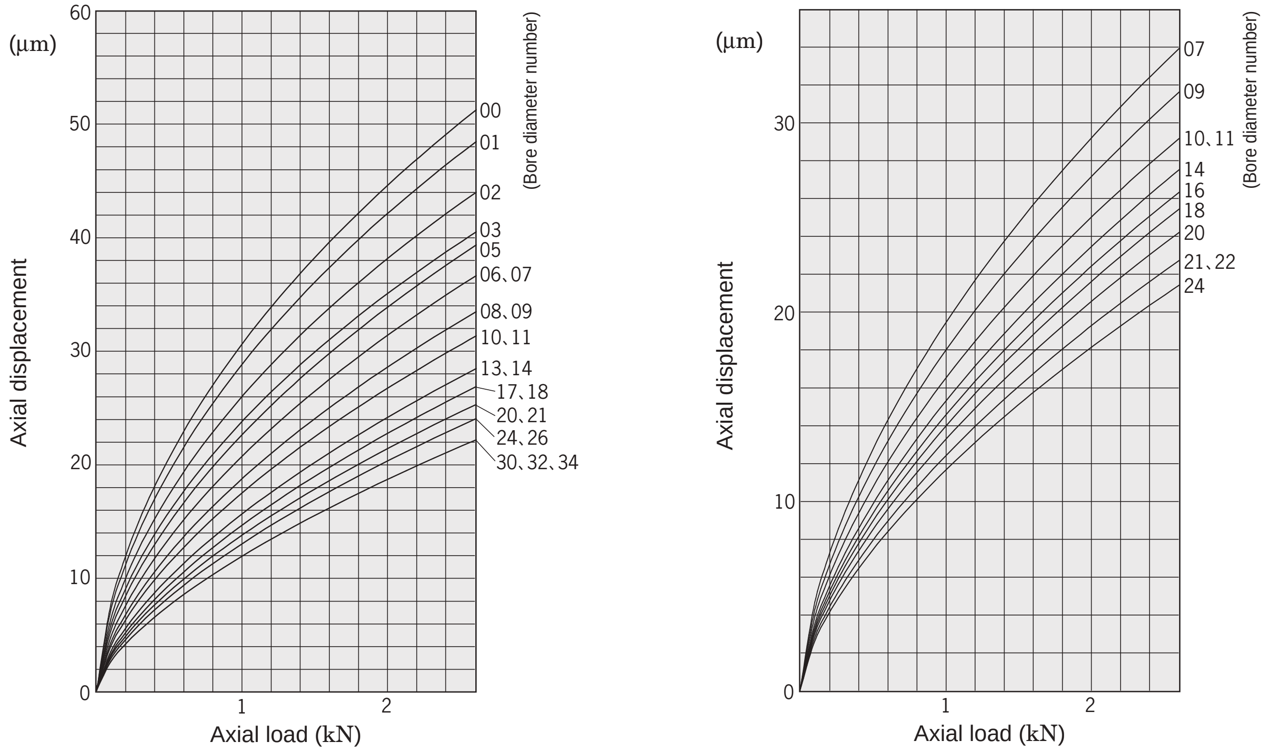


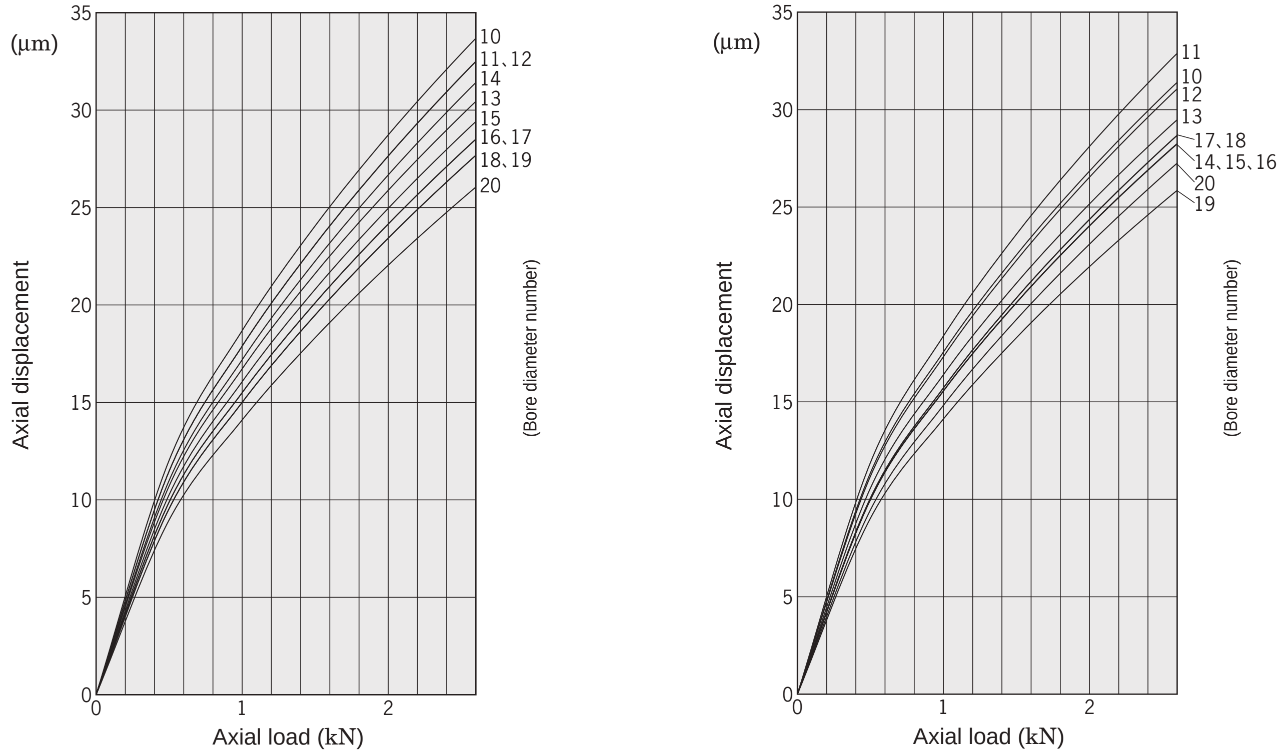
Fig. 1. 4 (5) Relationships between axial load and displacement (angular contact ball bearings)

*The axial displacements shown above are values of the single-row bearings not preloaded.



(21) 3NCHAC000CA series (contact angle : 20°)

(22) 3NCHAD000CA series (contact angle : 20°)



(23) 3NCHAX000CA series (contact angle : 20°)

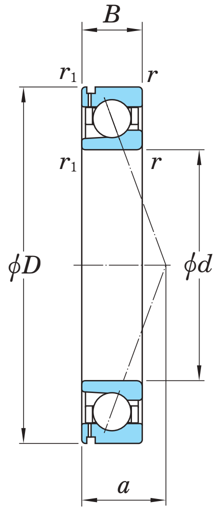
(24) 3NCHAX900CA series (contact angle : 20°)

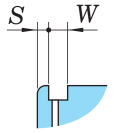
Fig. 1. 4 (6) Relationships between axial load and displacement (angular contact ball bearings)

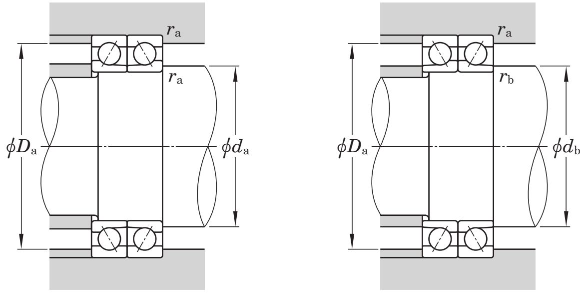
*The axial displacements shown above are values of the single-row bearings not preloaded.

High Ability NX series

3NCHAX000CA series
3NCHAX900CA series







We recommend that recesses be added at r_a and r_b.

Static equivalent load $P_0 = X_0F_r + Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
20°	0.5	0.42	1	0.84

Note that in the case of single row or tandem, assume $P_0 = F_r$ if $P_0 < F_r$.

Dynamic equivalent load $P = XF_r + YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$		$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
			X	Y	X	Y	X	Y	X	Y
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63

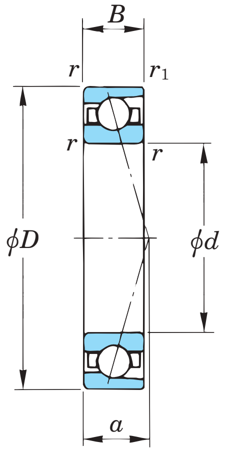
1) For i, use 2 for DB & DF and 1 for single & DT.

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min^{-1}) Oil lub.	Load center (mm) a	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	r_a max.	r_b max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
50	72	12	0.6	0.3	**3NCHAX910CA**	13.5	6.50	0.240	65 000	17.1	0.109	6.32	1.5	2.0	54.50	52.5	67.50	0.6	0.3	6 000	0.01~0.02	**3NCHAX910CA**
	80	16	1	0.6	**3NCHAX010CA**	19.2	8.65	0.450	61 000	19.9	0.219	8.37	2.0	2.0	55.50	54.5	74.50	1.0	0.6	10 000	0.01~0.02	**3NCHAX010CA**
55	80	13	0.6	0.3	**3NCHAX911CA**	14.0	6.70	0.240	59 000	18.8	0.154	6.48	1.5	2.0	60.50	59.5	74.50	0.6	0.3	6 000	0.01~0.02	**3NCHAX911CA**
	90	18	1.1	0.6	**3NCHAX011CA**	26.0	11.9	0.620	55 000	22.2	0.327	11.5	2.2	2.0	62.00	59.5	83.00	1.0	0.6	12 000	0.01~0.02	**3NCHAX011CA**
60	85	13	0.6	0.3	**3NCHAX912CA**	14.7	7.45	0.270	55 000	19.8	0.160	7.21	1.5	2.0	65.50	64.5	79.50	0.6	0.3	8 000	0.01~0.02	**3NCHAX912CA**
	95	18	1.1	0.6	**3NCHAX012CA**	25.9	12.1	0.630	51 000	23.1	0.344	11.7	2.2	2.0	67.00	64.5	88.00	1.0	0.6	12 000	0.01~0.02	**3NCHAX012CA**
65	90	13	0.6	0.3	**3NCHAX913CA**	15.5	8.15	0.300	51 000	20.6	0.178	7.93	1.5	2.0	70.50	69.5	84.50	0.6	0.3	8 000	0.01~0.02	**3NCHAX913CA**
	100	18	1.1	0.6	**3NCHAX013CA**	27.6	13.6	0.700	48 000	24.1	0.387	13.1	2.2	2.0	72.00	69.5	93.00	1.0	0.6	15 000	0.01~0.02	**3NCHAX013CA**
70	100	16	1	0.6	**3NCHAX914CA**	22.6	12.0	0.440	47 000	23.5	0.307	11.6	2.0	2.5	75.50	74.5	94.50	1.0	0.6	10 000	0.01~0.02	**3NCHAX914CA**
	110	20	1.1	0.6	**3NCHAX014CA**	33.5	16.1	0.930	44 000	26.4	0.512	15.6	2.2	2.5	77.00	74.5	103.0	1.0	0.6	15 000	0.01~0.02	**3NCHAX014CA**
75	105	16	1	0.6	**3NCHAX915CA**	22.4	12.1	0.440	44 000	24.4	0.309	11.7	2.0	2.5	80.50	79.5	99.50	1.0	0.6	10 000	0.01~0.02	**3NCHAX915CA**
	115	20	1.1	0.6	**3NCHAX015CA**	35.8	18.1	0.930	42 000	27.3	0.546	17.5	2.2	2.5	82.00	79.5	108.0	1.0	0.6	15 000	0.01~0.02	**3NCHAX015CA**
80	110	16	1	0.6	**3NCHAX916CA**	22.2	12.2	0.440	42 000	25.3	0.321	11.8	2.0	2.5	85.50	84.5	104.5	1.0	0.6	10 000	0.01~0.02	**3NCHAX916CA**
	125	22	1.1	0.6	**3NCHAX016CA**	45.0	23.0	1.20	39 000	29.7	0.723	22.3	2.2	2.5	87.00	84.5	118.0	1.0	0.6	15 000	0.01~0.02	**3NCHAX016CA**
85	120	18	1.1	0.6	**3NCHAX917CA**	28.7	15.5	0.560	39 000	27.6	0.448	14.9	2.2	3.0	92.00	89.5	113.0	1.0	0.6	12 000	0.01~0.02	**3NCHAX917CA**
	130	22	1.1	0.6	**3NCHAX017CA**	44.8	23.2	1.20	37 000	30.7	0.748	22.5	2.2	2.5	92.00	89.5	123.0	1.0	0.6	18 000	0.01~0.02	**3NCHAX017CA**
90	125	18	1.1	0.6	**3NCHAX918CA**	28.5	15.5	0.550	37 000	28.6	0.470	15.0	2.2	3.0	97.00	94.5	118.0	1.0	0.6	12 000	0.01~0.02	**3NCHAX918CA**
	140	24	1.5	1	**3NCHAX018CA**	55.0	28.8	1.40	34 000	32.9	0.986	27.8	2.5	3.0	98.50	95.5	131.5	1.5	1.0	18 000	0.01~0.02	**3NCHAX018CA**
95	130	18	1.1	0.6	**3NCHAX919CA**	31.6	18.5	0.630	35 000	29.5	0.499	17.9	2.2	3.0	102.0	99.5	123.0	1.0	0.6	12 000	0.01~0.02	**3NCHAX919CA**
	145	24	1.5	1	**3NCHAX019CA**	54.8	29.0	1.40	33 000	34.2	0.994	28.1	2.5	3.0	103.5	100.5	136.5	1.5	1.0	18 000	0.01~0.02	**3NCHAX019CA**
100	140	20	1.1	0.6	**3NCHAX920CA**	42.0	23.2	0.770	33 000	31.8	0.643	22.5	2.2	3.0	107.0	104.5	133.0	1.0	0.6	15 000	0.01~0.02	**3NCHAX920CA**
	150	24	1.5	1	**3NCHAX020CA**	58.1	32.1	1.50	32 000	34.7	1.07	31.1	2.5	3.0	108.5	105.5	141.5	1.5	1.0	20 000	0.01~0.02	**3NCHAX020CA**

[Remarks]
1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. CA in the bearing number indicates a nominal contact angle of 20°.

Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r \times 1.62$	$C_{0r} \times 2$
3-row	$C_r \times 2.16$	$C_{0r} \times 3$
4-row	$C_r \times 2.64$	$C_{0r} \times 4$



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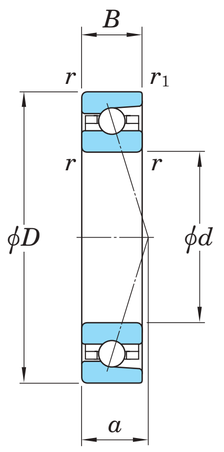

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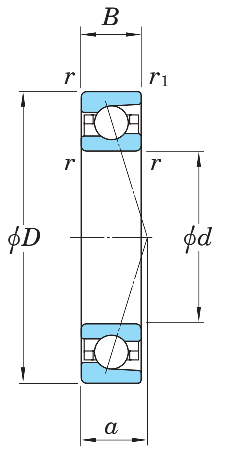

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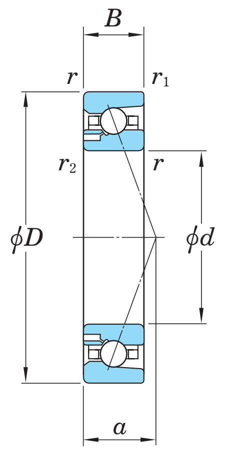

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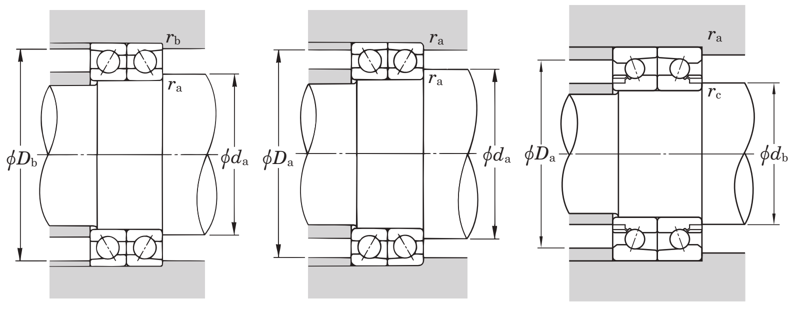


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ 1)	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$		$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d 10 ~ (17)

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
10	22	6	0.3	0.15	—	**7900C-5**	3.75	1.50	0.060	14.2	78 000	120 000	5.1	0.44	0.008	1.1	—	—	12.5	—	19.5	20.8	0.3	0.15	—	1 500	0.01~0.02	**7900C-5**
	22	6	0.3	0.15	—	**3NCHAC900C**	2.55	0.750	0.040	7.20	130 000	210 000	5.1	0.43	0.008	0.62	—	—	12.5	—	19.5	20.8	0.3	0.15	—	1 500	0.01~0.02	**3NCHAC900C**
	22	6	0.3	0.15	—	**3NCHAC900CA**	2.50	0.750	0.040	—	120 000	200 000	5.9	0.43	0.008	0.76	—	—	12.5	—	19.5	20.8	0.3	0.15	—	1 500	0.01~0.02	**3NCHAC900CA**
	26	8	0.3	0.15	—	**7000C-5**	6.60	2.45	0.130	12.5	67 000	100 000	6.4	0.89	0.021	1.9	—	—	12.5	—	23.5	24.8	0.3	0.15	—	2 000	0.01~0.02	**7000C-5**
	26	8	0.3	0.15	—	**7000-5**	6.25	2.35	0.120	—	51 000	67 000	9.1	0.86	0.021	0.7	—	—	12.5	—	23.5	24.8	0.3	0.15	—	2 000	0.01~0.02	**7000-5**
	26	8	0.3	0.15	—	**3NCHAC000C**	4.40	1.25	0.070	6.40	110 000	190 000	6.4	0.92	0.016	0.99	—	—	12.5	—	23.5	24.8	0.3	0.15	—	2 000	0.01~0.02	**3NCHAC000C**
	26	8	0.3	0.15	—	**3NCHAC000CA**	4.35	1.25	0.060	—	110 000	180 000	7.2	0.92	0.016	1.24	—	—	12.5	—	23.5	24.8	0.3	0.15	—	2 000	0.01~0.02	**3NCHAC000CA**
	30	9	0.6	0.3	—	**7200C-5**	6.25	2.35	0.120	13.4	57 000	92 000	7.2	1.3	0.031	2.22	—	—	14.5	—	25.5	27.5	0.6	0.3	—	3 000	0.01~0.02	**7200C-5**
	30	9	0.6	0.3	—	**7200-5**	5.85	2.20	0.110	—	44 000	57 000	10.4	1.3	0.031	1	—	—	14.5	—	25.5	27.5	0.6	0.3	—	3 000	0.01~0.02	**7200-5**
12	24	6	0.3	0.15	—	**7901C-5**	4.00	1.70	0.070	14.7	70 000	100 000	5.4	0.49	0.010	1.2	—	—	14.5	—	21.5	22.8	0.3	0.15	—	2 000	0.01~0.02	**7901C-5**
	24	6	0.3	0.15	—	**3NCHAC901C**	2.70	0.850	0.050	7.10	110 000	190 000	5.4	0.48	0.009	0.7	—	—	14.5	—	21.5	22.8	0.3	0.15	—	2 000	0.01~0.02	**3NCHAC901C**
	24	6	0.3	0.15	—	**3NCHAC901CA**	2.65	0.850	0.040	—	100 000	180 000	6.3	0.48	0.009	0.86	—	—	14.5	—	21.5	22.8	0.3	0.15	—	2 000	0.01~0.02	**3NCHAC901CA**
	28	8	0.3	0.15	—	**7001C-5**	7.25	2.95	0.150	13.4	57 000	92 000	6.7	1.1	0.024	1.97	—	—	14.5	—	25.5	26.8	0.3	0.15	—	2 000	0.01~0.02	**7001C-5**
	28	8	0.3	0.15	—	**7001-5**	6.75	2.75	0.140	—	44 000	57 000	9.9	1.1	0.024	0.74	—	—	14.5	—	25.5	26.8	0.3	0.15	—	2 000	0.01~0.02	**7001-5**
	28	8	0.3	0.15	—	**3NCHAC001C**	4.85	1.50	0.080	6.80	100 000	170 000	6.7	1.1	0.017	1.18	—	—	14.5	—	25.5	26.8	0.3	0.15	—	2 000	0.01~0.02	**3NCHAC001C**
	28	8	0.3	0.15	—	**3NCHAC001CA**	4.80	1.45	0.080	—	95 000	160 000	7.7	1.1	0.017	1.46	—	—	14.5	—	25.5	26.8	0.3	0.15	—	2 000	0.01~0.02	**3NCHAC001CA**
	32	10	0.6	0.3	—	**7201C-5**	9.90	3.85	0.300	12.5	54 000	85 000	7.9	1.7	0.038	2.28	—	—	16.5	—	27.5	29.5	0.6	0.3	—	3 000	0.01~0.02	**7201C-5**
	32	10	0.6	0.3	—	**7201-5**	9.30	3.65	0.280	—	42 000	54 000	11.4	1.7	0.038	1.05	—	—	16.5	—	27.5	29.5	0.6	0.3	—	3 000	0.01~0.02	**7201-5**
15	28	7	0.3	0.15	—	**7902C-5**	5.15	2.65	0.110	14.5	58 000	91 000	6.4	0.68	0.015	2.86	—	—	17.5	—	25.5	26.8	0.3	0.15	—	2 000	0.01~0.02	**7902C-5**
	28	7	0.3	0.15	—	**3NCHAC902C**	4.05	1.35	0.070	7.40	98 000	160 000	6.4	0.65	0.014	1.07	—	—	17.5	—	25.5	26.8	0.3	0.15	—	2 000	0.01~0.02	**3NCHAC902C**
	28	7	0.3	0.15	—	**3NCHAC902CA**	3.95	1.30	0.070	—	91 000	150 000	7.4	0.65	0.014	1.32	—	—	17.5	—	25.5	26.8	0.3	0.15	—	2 000	0.01~0.02	**3NCHAC902CA**
	32	9	0.3	0.15	—	**7002C-5**	8.25	3.70	0.190	14.1	50 000	79 000	7.6	1.3	0.035	2.84	—	—	17.5	—	29.5	30.8	0.3	0.15	—	3 000	0.01~0.02	**7002C-5**
	32	9	0.3	0.15	—	**7002-5**	7.65	3.45	0.180	—	39 000	50 000	11.3	1.3	0.035	1	—	—	17.5	—	29.5	30.8	0.3	0.15	—	3 000	0.01~0.02	**7002-5**
	32	9	0.3	0.15	—	**3NCHAC002C**	5.55	1.90	0.100	7.20	89 000	140 000	7.6	1.4	0.026	1.5	—	—	17.5	—	29.5	30.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC002C**
	32	9	0.3	0.15	—	**3NCHAC002CA**	5.50	1.85	0.100	—	84 000	140 000	8.8	1.4	0.026	1.85	—	—	17.5	—	29.5	30.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC002CA**
	35	11	0.6	0.3	—	**7202C-5**	10.8	4.55	0.340	13.3	46 000	74 000	8.9	2.3	0.048	2.33	—	—	19.5	—	30.5	32.5	0.6	0.3	—	5 000	0.01~0.02	**7202C-5**
	35	11	0.6	0.3	—	**7202-5**	10.1	4.25	0.300	—	35 000	46 000	12.9	2.3	0.048	1.1	—	—	19.5	—	30.5	32.5	0.6	0.3	—	5 000	0.01~0.02	**7202-5**
17	30	7	0.3	0.15	—	**7903C-5**	6.25	2.95	0.120	14.9	51 000	81 000	6.7	0.68	0.016	2.86	—	—	19.5	—	27.5	28.8	0.3	0.15	—	3 000	0.01~0.02	**7903C-5**
	30	7	0.3	0.15	—	**3NCHAC903C**	4.25	1.50	0.080	7.60	88 000	140 000	6.7	0.88	0.014	1.2	—	—	19.5	—	27.5	28.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC903C**
	30	7	0.3	0.15	—	**3NCHAC903CA**	4.15	1.45	0.080	—	81 000	130 000	7.9	0.88	0.014	1.47	—	—	19.5	—	27.5	28.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC903CA**

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

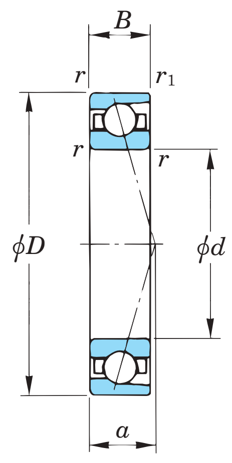
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	C_r×1.62	C_{0r}×2
3-row	C_r×2.16	C_{0r}×3
4-row	C_r×2.64	C_{0r}×4

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting			
		Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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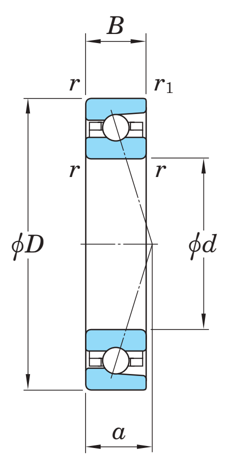

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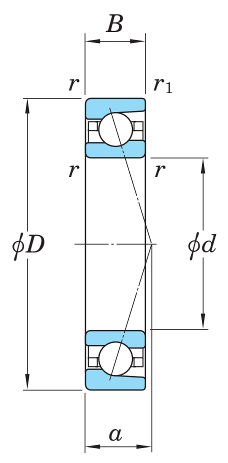

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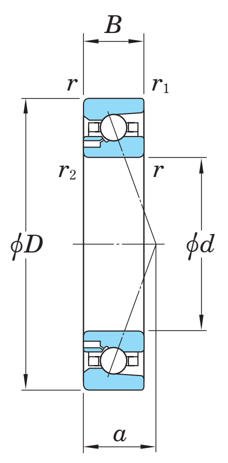

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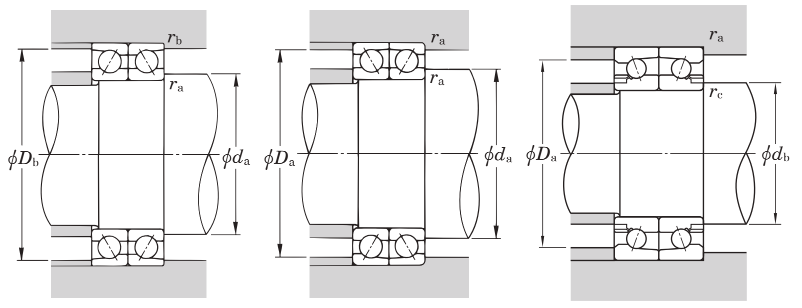


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem $\frac{F_a}{F_r}\leqq e$		Single row/Tandem $\frac{F_a}{F_r}>e$		Back-to-back/Face-to-face $\frac{F_a}{F_r}\leqq e$		Back-to-back/Face-to-face $\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

[1] For i, use 2 for DB & DF and 1 for single & DT.

d (17) ~ (30)

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
17	35	10	0.3	0.15	—	**7003C-5**	9.15	4.45	0.230	14.6	44 000	71 000	8.6	1.8	0.045	2.9	—	—	19.5	—	32.5	33.8	0.3	0.15	—	3 000	0.01~0.02	**7003C-5**
	35	10	0.3	0.15	—	**7003-5**	8.40	4.15	0.210	—	35 000	44 000	12.7	1.6	0.045	1.03	—	—	19.5	—	32.5	33.8	0.3	0.15	—	3 000	0.01~0.02	**7003-5**
	35	10	0.3	0.15	—	**3NCHAC003C**	6.20	2.30	0.120	7.40	79 000	130 000	8.6	1.7	0.035	1.82	—	—	19.5	—	32.5	33.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC003C**
	35	10	0.3	0.15	—	**3NCHAC003CA**	6.10	2.25	0.120	—	74 000	120 000	9.8	1.7	0.035	2.14	—	—	19.5	—	32.5	33.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC003CA**
	40	12	0.6	0.3	—	**7203C-5**	13.6	5.90	0.440	13.4	40 000	65 000	9.9	3.2	0.070	3.6	—	—	21.5	—	35.5	37.5	0.6	0.3	—	5 000	0.01~0.02	**7203C-5**
	40	12	0.6	0.3	—	**7203-5**	12.7	5.50	0.380	—	30 000	40 000	14.4	3.1	0.070	1.86	—	—	21.5	—	35.5	37.5	0.6	0.3	—	5 000	0.01~0.02	**7203-5**
20	37	9	0.3	0.15	—	**7904C-5**	9.10	4.55	0.240	14.9	44 000	68 000	8.3	1.5	0.035	2.9	—	—	22.5	—	34.5	35.8	0.3	0.15	—	3 000	0.01~0.02	**7904C-5**
	37	9	0.3	0.15	—	**3NCHAC904C**	6.20	2.35	0.120	7.60	74 000	120 000	8.3	1.7	0.031	1.86	—	—	22.5	—	34.5	35.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC904C**
	37	9	0.3	0.15	—	**3NCHAC904CA**	6.10	2.30	0.120	—	68 000	110 000	9.7	1.7	0.031	2.14	—	—	22.5	—	34.5	35.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC904CA**
	42	12	0.6	0.3	—	**7004C-5**	13.9	6.60	0.450	14.1	37 000	60 000	10.2	3.2	0.079	3.4	—	—	24.5	—	37.5	39.5	0.6	0.3	—	5 000	0.01~0.02	**7004C-5**
	42	12	0.6	0.3	—	**7004-5**	12.9	6.10	0.390	—	29 000	37 000	15.1	3.2	0.079	1.65	—	—	24.5	—	37.5	39.5	0.6	0.3	—	5 000	0.01~0.02	**7004-5**
	42	12	0.6	0.3	—	**3NCHAC004C**	9.35	3.35	0.170	7.20	67 000	110 000	10.2	3.4	0.056	2.67	—	—	24.5	—	37.5	39.5	0.6	0.3	—	5 000	0.01~0.02	**3NCHAC004C**
	42	12	0.6	0.3	—	**3NCHAC004CA**	9.20	3.30	0.170	—	61 000	100 000	11.7	3.4	0.056	3.29	—	—	24.5	—	37.5	39.5	0.6	0.3	—	5 000	0.01~0.02	**3NCHAC004CA**
	47	14	1	0.6	—	**7204C-5**	19.4	9.00	0.670	13.4	35 000	54 000	11.6	5.3	0.112	4.8	—	—	25.5	—	41.5	42.5	1	0.6	—	5 000	0.01~0.02	**7204C-5**
	47	14	1	0.6	—	**7204-5**	18.1	8.40	0.580	—	26 000	35 000	17	5.2	0.112	2.34	—	—	25.5	—	41.5	42.5	1	0.6	—	5 000	0.01~0.02	**7204-5**
25	42	9	0.3	0.15	—	**7905C-5**	9.75	5.45	0.280	15.5	36 000	57 000	9.1	1.9	0.041	3	—	—	27.5	—	39.5	40.8	0.3	0.15	—	3 000	0.01~0.02	**7905C-5**
	42	9	0.3	0.15	—	**3NCHAC905C**	6.75	2.75	0.140	7.90	61 000	100 000	9.1	1.9	0.037	2.23	—	—	27.5	—	39.5	40.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC905C**
	42	9	0.3	0.15	—	**3NCHAC905CA**	6.60	2.70	0.140	—	57 000	96 000	10.7	1.9	0.037	2.72	—	—	27.5	—	39.5	40.8	0.3	0.15	—	3 000	0.01~0.02	**3NCHAC905CA**
	47	12	0.6	0.3	—	**7005C-5**	15.4	8.00	0.510	14.7	33 000	51 000	10.8	3.6	0.091	3.98	—	—	29.5	—	42.5	44.5	0.6	0.3	—	5 000	0.01~0.02	**7005C-5**
	47	12	0.6	0.3	—	**7005-5**	14.1	7.40	0.450	—	25 000	33 000	16.4	3.6	0.091	1.94	—	—	29.5	—	42.5	44.5	0.6	0.3	—	5 000	0.01~0.02	**7005-5**
	47	12	0.6	0.3	—	**3NCHAC005C**	10.4	4.10	0.210	7.50	58 000	96 000	10.8	3.8	0.066	3.26	—	—	29.5	—	42.5	44.5	0.6	0.3	—	5 000	0.01~0.02	**3NCHAC005C**
	47	12	0.6	0.3	—	**3NCHAC005CA**	10.2	4.00	0.210	—	54 000	91 000	12.6	3.8	0.066	4	—	—	29.5	—	42.5	44.5	0.6	0.3	—	5 000	0.01~0.02	**3NCHAC005CA**
	52	15	1	0.6	—	**7205C-5**	20.7	10.2	0.710	14.0	30 000	49 000	12.7	6.6	0.135	5.26	—	—	30.5	—	46.5	47.5	1	0.6	—	8 000	0.01~0.02	**7205C-5**
	52	15	1	0.6	—	**7205-5**	19.2	9.50	0.620	—	23 000	30 000	18.8	6.5	0.135	2.56	—	—	30.5	—	46.5	47.5	1	0.6	—	8 000	0.01~0.02	**7205-5**
30	47	9	0.3	0.15	—	**7906C-5**	10.4	6.25	0.320	15.9	32 000	50 000	9.7	2.2	0.046	3.04	—	—	32.5	—	44.5	45.8	0.3	0.15	—	5 000	0.01~0.02	**7906C-5**
	47	9	0.3	0.15	—	**3NCHAC906C**	7.20	3.20	0.160	8.10	54 000	91 000	9.7	2.3	0.041	2.57	—	—	32.5	—	44.5	45.8	0.3	0.15	—	5 000	0.01~0.02	**3NCHAC906C**
	47	9	0.3	0.15	—	**3NCHAC906CA**	7.05	3.10	0.160	—	50 000	85 000	11.5	2.3	0.041	3.13	—	—	32.5	—	44.5	45.8	0.3	0.15	—	5 000	0.01~0.02	**3NCHAC906CA**
	55	13	1	0.6	—	**7006C-5**	19.8	11.0	0.690	14.9	28 000	44 000	12.2	4.9	0.133	5.34	—	—	35.5	—	49.5	50.5	1	0.6	—	5 000	0.01~0.02	**7006C-5**
	55	13	1	0.6	—	**7006-5**	18.2	10.1	0.610	—	21 000	28 000	18.8	4.9	0.133	2.6	—	—	35.5	—	49.5	50.5	1	0.6	—	5 000	0.01~0.02	**7006-5**
	55	13	1	0.6	—	**HAR006C**	10.9	4.85	0.250	7.90	36 000	56 000	12.2	4.4	0.116	6.14	—	—	35.5	—	49.5	50.5	1	0.6	—	5 000	0.01~0.02	**HAR006C**

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

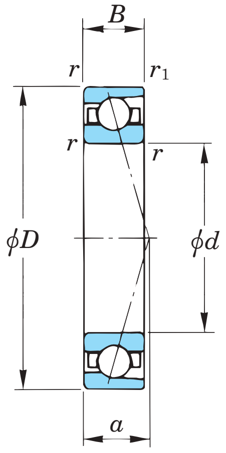
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	C_r×1.62	C_{0r}×2
3-row	C_r×2.16	C_{0r}×3
4-row	C_r×2.64	C_{0r}×4

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting Preload S	Preload L	Preload M	Preload H
∅ ⃠	DB	0.85	0.80	0.65	0.55
∅∅ ⃠⃠	DBB	0.80	0.75	0.60	0.45
∅∅ ⃠	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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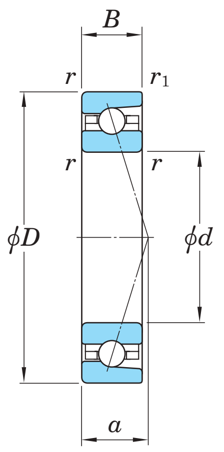
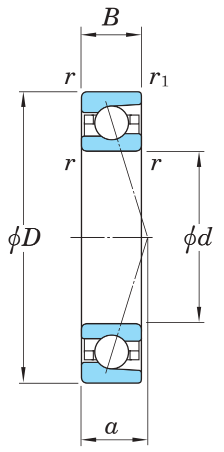


HAR



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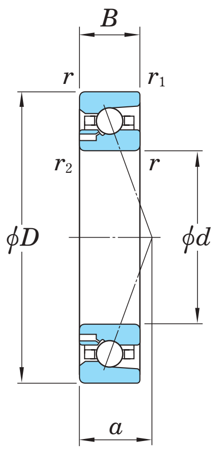

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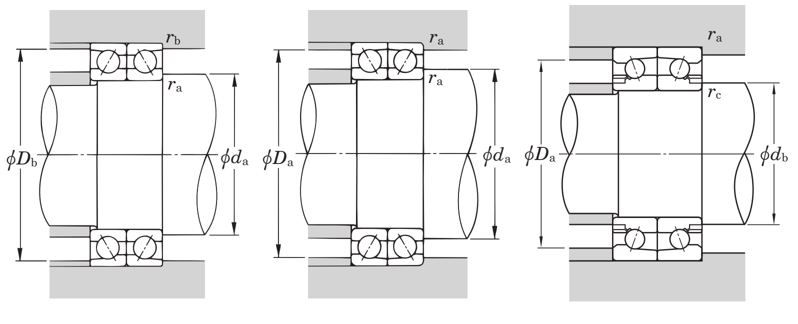


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/Tandem		Back-to-back/Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$		$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

[1] For i, use 2 for DB & DF and 1 for single & DT.

d (30) ~ (40)

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No. [1]	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
30	55	13	1	0.6	—	**HAR006CA**	10.7	4.75	0.250	—	35 000	53 000	14.2	4.4	0.116	7.25	—	—	35.5	—	49.5	50.5	1	0.6	—	5 000	0.01~0.02	**HAR006CA**
	55	13	1	0.6	—	**HAR006**	10.0	4.45	0.230	—	25 000	33 000	18.8	4.4	0.116	6.37	—	—	35.5	—	49.5	50.5	1	0.6	—	5 000	0.01~0.02	**HAR006**
	55	13	1	0.6	—	**3NCHAC006C**	13.5	5.60	0.290	7.60	49 000	82 000	12.2	5.4	0.097	4.48	—	—	35.5	—	49.5	50.5	1	0.6	—	5 000	0.01~0.02	**3NCHAC006C**
	55	13	1	0.6	—	**3NCHAC006CA**	13.2	5.50	0.280	—	46 000	77 000	14.2	5.4	0.097	5.49	—	—	35.5	—	49.5	50.5	1	0.6	—	5 000	0.01~0.02	**3NCHAC006CA**
	62	16	1	0.6	—	**7206C-5**	28.8	14.7	1.00	14.0	25 000	40 000	14.3	9.3	0.208	7.61	—	—	35.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**7206C-5**
	62	16	1	0.6	—	**7206-5**	26.7	13.7	0.890	—	19 000	25 000	21.5	9.3	0.208	3.7	—	—	35.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**7206-5**
35	55	10	0.6	0.3	—	**7907C-5**	15.7	9.70	0.550	15.7	28 000	43 000	11	3	0.074	5.2	—	—	39.5	—	50.5	52.5	0.6	0.3	—	5 000	0.01~0.02	**7907C-5**
	55	10	0.6	0.3	—	**3NCHAC907C**	10.8	4.90	0.250	8.00	46 000	78 000	11	3.5	0.063	3.96	—	—	39.5	—	50.5	52.5	0.6	0.3	—	5 000	0.01~0.02	**3NCHAC907C**
	55	10	0.6	0.3	—	**3NCHAC907CA**	10.6	4.80	0.250	—	43 000	72 000	13.2	3.5	0.063	4.83	—	—	39.5	—	50.5	52.5	0.6	0.3	—	5 000	0.01~0.02	**3NCHAC907CA**
	62	14	1	0.6	—	**7007C-5**	23.9	13.7	0.840	15.0	23 000	39 000	13.5	7	0.170	6.63	—	—	40.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**7007C-5**
	62	14	1	0.6	—	**7007-5**	21.9	12.6	0.740	—	18 000	23 000	21.2	6.9	0.170	3.22	—	—	40.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**7007-5**
	62	14	1	0.6	—	**HAR007C**	11.6	5.55	0.290	8.10	32 000	49 000	13.5	5.5	0.158	7.02	—	—	40.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**HAR007C**
	62	14	1	0.6	—	**HAR007CA**	11.3	5.40	0.280	—	30 000	46 000	15.8	5.5	0.158	7.44	—	—	40.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**HAR007CA**
	62	14	1	0.6	—	**HAR007**	10.6	5.05	0.260	—	21 000	29 000	21	5.5	0.158	6.58	—	—	40.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**HAR007**
	62	14	1	0.6	—	**3NCHAC007C**	16.3	7.00	0.360	7.60	43 000	71 000	13.6	7.1	0.129	5.59	—	—	40.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**3NCHAC007C**
	62	14	1	0.6	—	**3NCHAC007CA**	16.0	6.85	0.350	—	40 000	67 000	15.9	7.1	0.129	6.85	—	—	40.5	—	56.5	57.5	1	0.6	—	8 000	0.01~0.02	**3NCHAC007CA**
	62	14	1	0.6	0.3	**3NCHAD007CA**	10.5	4.90	0.250	—	—	72 000	15.8	—	0.157	4.9	—	—	40.5	38.5	56.5	57.5	1	0.6	0.3	8 000	0.01~0.02	**3NCHAD007CA**
	72	17	1.1	0.6	—	**7207C-5**	38.0	20.1	1.40	14.0	22 000	35 000	15.8	13	0.295	10.8	—	—	42	—	65	67.5	1	0.6	—	8 000	0.01~0.02	**7207C-5**
	72	17	1.1	0.6	—	**7207-5**	35.2	18.6	1.20	—	16 000	22 000	24.2	13	0.295	5.43	—	—	42	—	65	67.5	1	0.6	—	8 000	0.01~0.02	**7207-5**
40	62	12	0.6	0.3	—	**7908C-5**	19.7	12.4	0.710	15.7	25 000	37 000	12.8	5.2	0.107	6.59	—	—	44.5	—	57.5	59.5	0.6	0.3	—	5 000	0.01~0.02	**7908C-5**
	62	12	0.6	0.3	—	**HAR908C**	7.95	4.05	0.210	8.40	30 000	46 000	12.8	4.1	0.115	5.18	—	—	44.5	—	57.5	59.5	0.6	0.3	—	5 000	0.01~0.02	**HAR908C**
	62	12	0.6	0.3	—	**HAR908CA**	7.75	3.95	0.210	—	29 000	43 000	15.3	4.1	0.115	6.08	—	—	44.5	—	57.5	59.5	0.6	0.3	—	5 000	0.01~0.02	**HAR908CA**
	62	12	0.6	0.3	—	**HAR908**	7.20	3.70	0.190	—	21 000	28 000	20.7	4.1	0.115	4.79	—	—	44.5	—	57.5	59.5	0.6	0.3	—	5 000	0.01~0.02	**HAR908**
	62	12	0.6	0.3	—	**3NCHAC908C**	13.6	6.30	0.330	8.00	40 000	68 000	12.8	5.4	0.093	5.1	—	—	44.5	—	57.5	59.5	0.6	0.3	—	5 000	0.01~0.02	**3NCHAC908C**
	62	12	0.6	0.3	—	**3NCHAC908CA**	13.3	6.20	0.320	—	37 000	64 000	15.3	5.4	0.093	6.22	—	—	44.5	—	57.5	59.5	0.6	0.3	—	5 000	0.01~0.02	**3NCHAC908CA**
	68	15	1	0.6	—	**7008C-5**	25.7	15.9	0.940	15.4	22 000	35 000	14.8	8.8	0.210	7.53	—	—	45.5	—	62.5	63.5	1	0.6	—	8 000	0.01~0.02	**7008C-5**
	68	15	1	0.6	—	**7008-5**	23.4	14.6	0.830	—	16 000	22 000	23.2	8.7	0.210	3.66	—	—	45.5	—	62.5	63.5	1	0.6	—	8 000	0.01~0.02	**7008-5**
	68	15	1	0.6	—	**HAR008C**	12.2	6.20	0.320	8.20	28 000	43 000	14.7	6.6	0.200	7.88	—	—	45.5	—	62.5	63.5	1	0.6	—	8 000	0.01~0.02	**HAR008C**
	68	15	1	0.6	—	**HAR008CA**	11.9	6.05	0.310	—	26 000	42 000	17.3	6.6	0.200	9.27	—	—	45.5	—	62.5	63.5	1	0.6	—	8 000	0.01~0.02	**HAR008CA**
	68	15	1	0.6	—	**HAR008**	11.1	5.65	0.290	—	19 000	26 000	23.1	6.6	0.200	7.75	—	—	45.5	—	62.5	63.5	1	0.6	—	8 000	0.01~0.02	**HAR008**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

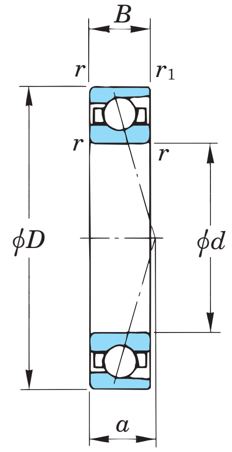
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r\times1.62$	$C_{0r}\times2$
3-row	$C_r\times2.16$	$C_{0r}\times3$
4-row	$C_r\times2.64$	$C_{0r}\times4$

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting			
		Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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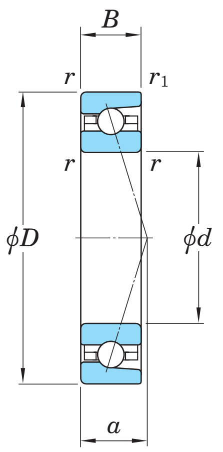

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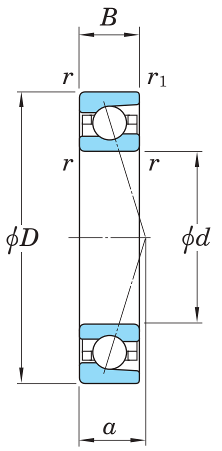

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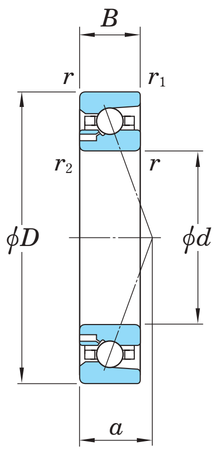

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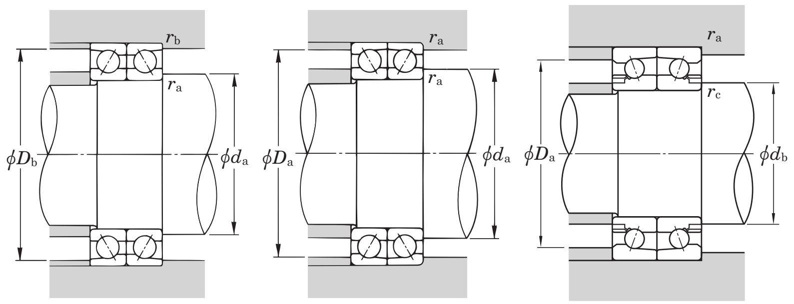


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0 = X_0F_r + Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0 = F_r$ if $P_0 < F_r$.

Dynamic equivalent load $P = XF_r + YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem $\frac{F_a}{F_r} \leqq e$		Single row/Tandem $\frac{F_a}{F_r} > e$		Back-to-back/Face-to-face $\frac{F_a}{F_r} \leqq e$		Back-to-back/Face-to-face $\frac{F_a}{F_r} > e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

[1] For i, use 2 for DB & DF and 1 for single & DT.

d (40) ~ (50)

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No.[1]	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume $(\mathrm{cm}^3/\mathrm{row})$	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
40	68	15	1	0.6	—	**3NCHAC008C**	17.7	8.10	0.420	7.80	39 000	64 000	14.7	8.7	0.161	6.5	—	—	45.5	—	62.5	63.5	1	0.6	—	8 000	0.01~0.02	**3NCHAC008C**
	68	15	1	0.6	—	**3NCHAC008CA**	17.3	7.90	0.410	—	36 000	61 000	17.3	8.7	0.161	7.95	—	—	45.5	—	62.5	63.5	1	0.6	—	8 000	0.01~0.02	**3NCHAC008CA**
	68	15	1	0.6	0.3	**3NCHAD008CA**	11.1	5.50	0.280	—	—	64 000	17.3	—	0.197	5.55	—	—	45.5	43.5	62.5	63.5	1	0.6	0.3	8 000	0.01~0.02	**3NCHAD008CA**
	80	18	1.1	0.6	—	**7208C-5**	45.4	25.2	1.70	14.2	19 000	30 000	17	15	0.382	15.5	—	—	47	—	73	75.5	1	0.6	—	10 000	0.01~0.02	**7208C-5**
	80	18	1.1	0.6	—	**7208-5**	42.0	23.3	1.50	—	15 000	19 000	26.3	15	0.382	8.31	—	—	47	—	73	75.5	1	0.6	—	10 000	0.01~0.02	**7208-5**
45	68	12	0.6	0.3	—	**7909C-5**	20.8	14.1	0.770	16.0	22 000	35 000	13.6	5.7	0.127	6.84	—	—	49.5	—	63.5	65.5	0.6	0.3	—	6 000	0.01~0.02	**7909C-5**
	68	12	0.6	0.3	—	**HAR909C**	8.50	4.70	0.240	8.50	26 000	42 000	13.6	4.6	0.136	5.97	—	—	49.5	—	63.5	65.5	0.6	0.3	—	6 000	0.01~0.02	**HAR909C**
	68	12	0.6	0.3	—	**HAR909CA**	8.30	4.55	0.240	—	26 000	39 000	16.3	4.6	0.136	7	—	—	49.5	—	63.5	65.5	0.6	0.3	—	6 000	0.01~0.02	**HAR909CA**
	68	12	0.6	0.3	—	**HAR909**	7.70	4.25	0.220	—	18 000	25 000	22.3	4.6	0.136	5.14	—	—	49.5	—	63.5	65.5	0.6	0.3	—	6 000	0.01~0.02	**HAR909**
	68	12	0.6	0.3	—	**3NCHAC909C**	14.4	7.15	0.370	8.10	37 000	61 000	13.6	6.2	0.109	5.78	—	—	49.5	—	63.5	65.5	0.6	0.3	—	6 000	0.01~0.02	**3NCHAC909C**
	68	12	0.6	0.3	—	**3NCHAC909CA**	14.1	7.00	0.360	—	35 000	58 000	16.3	6.2	0.109	7.04	—	—	49.5	—	63.5	65.5	0.6	0.3	—	6 000	0.01~0.02	**3NCHAC909CA**
	75	16	1	0.6	—	**7009C-5**	30.5	19.3	1.15	15.4	19 000	30 000	16	11	0.260	9.14	—	—	50.5	—	69.5	70.5	1	0.6	—	10 000	0.01~0.02	**7009C-5**
	75	16	1	0.6	—	**7009-5**	27.8	17.7	1.00	—	15 000	19 000	25.3	11	0.260	4.44	—	—	50.5	—	69.5	70.5	1	0.6	—	10 000	0.01~0.02	**7009-5**
	75	16	1	0.6	—	**HAR009C**	13.6	7.10	0.370	8.30	25 000	39 000	16	8.4	0.251	9.03	—	—	50.5	—	69.5	70.5	1	0.6	—	10 000	0.01~0.02	**HAR009C**
	75	16	1	0.6	—	**HAR009CA**	13.3	6.95	0.360	—	25 000	37 000	18.9	8.4	0.251	10.6	—	—	50.5	—	69.5	70.5	1	0.6	—	10 000	0.01~0.02	**HAR009CA**
	75	16	1	0.6	—	**HAR009**	12.4	6.45	0.330	—	18 000	23 000	25.3	8.4	0.251	9.56	—	—	50.5	—	69.5	70.5	1	0.6	—	10 000	0.01~0.02	**HAR009**
	75	16	1	0.6	—	**3NCHAC009C**	20.9	9.80	0.510	7.80	35 000	58 000	16	11	0.205	7.89	—	—	50.5	—	69.5	70.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC009C**
	75	16	1	0.6	—	**3NCHAC009CA**	20.5	9.60	0.500	—	32 000	54 000	18.9	11	0.205	9.64	—	—	50.5	—	69.5	70.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC009CA**
	75	16	1	0.6	0.3	**3NCHAD009CA**	12.4	6.30	0.330	—	—	58 000	18.9	—	0.249	6.36	—	—	50.5	48.5	69.5	70.5	1	0.6	0.3	10 000	0.01~0.02	**3NCHAD009CA**
	85	19	1.1	0.6	—	**7209C-5**	51.0	28.7	1.95	14.2	18 000	29 000	18.1	18	0.430	16.8	—	—	52	—	78	80.5	1	0.6	—	10 000	0.01~0.02	**7209C-5**
	85	19	1.1	0.6	—	**7209-5**	47.2	26.6	1.70	—	14 000	18 000	28	18	0.430	8.74	—	—	52	—	78	80.5	1	0.6	—	10 000	0.01~0.02	**7209-5**
50	72	12	0.6	0.3	—	**7910C-5**	21.8	15.7	0.840	16.2	21 000	32 000	14.2	6.2	0.128	7.42	—	—	54.5	—	67.5	69.5	0.6	0.3	—	6 000	0.01~0.02	**7910C-5**
	72	12	0.6	0.3	—	**HAR910C**	11.4	6.30	0.330	8.50	25 000	39 000	14.2	5.6	0.131	8.06	—	—	54.5	—	67.5	69.5	0.6	0.3	—	6 000	0.01~0.02	**HAR910C**
	72	12	0.6	0.3	—	**HAR910CA**	11.1	6.15	0.320	—	23 000	36 000	17.1	5.6	0.131	9.13	—	—	54.5	—	67.5	69.5	0.6	0.3	—	6 000	0.01~0.02	**HAR910CA**
	72	12	0.6	0.3	—	**HAR910**	10.3	5.75	0.300	—	16 000	22 000	23.6	5.6	0.131	5.16	—	—	54.5	—	67.5	69.5	0.6	0.3	—	6 000	0.01~0.02	**HAR910**
	72	12	0.6	0.3	—	**3NCHAC910C**	15.2	7.95	0.410	8.20	35 000	57 000	14.2	6.5	0.109	6.45	—	—	54.5	—	67.5	69.5	0.6	0.3	—	6 000	0.01~0.02	**3NCHAC910C**
	72	12	0.6	0.3	—	**3NCHAC910CA**	14.9	7.95	0.400	—	32 000	54 000	17.1	6.5	0.109	7.85	—	—	54.5	—	67.5	69.5	0.6	0.3	—	6 000	0.01~0.02	**3NCHAC910CA**
	80	16	1	0.6	—	**7010C-5**	32.5	21.9	1.25	15.7	18 000	29 000	16.8	12	0.290	10.2	—	—	55.5	—	74.5	75.5	1	0.6	—	10 000	0.01~0.02	**7010C-5**
	80	16	1	0.6	—	**7010-5**	29.5	20.1	1.10	—	13 000	18 000	26.9	12	0.290	4.97	—	—	55.5	—	74.5	75.5	1	0.6	—	10 000	0.01~0.02	**7010-5**
	80	16	1	0.6	—	**HAR010C**	14.2	7.85	0.410	8.40	23 000	36 000	16.7	10	0.273	9.98	—	—	55.5	—	74.5	75.5	1	0.6	—	10 000	0.01~0.02	**HAR010C**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

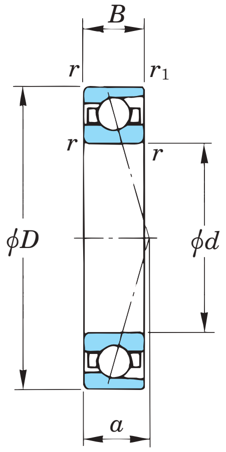
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r \times 1.62$	$C_{0r} \times 2$
3-row	$C_r \times 2.16$	$C_{0r} \times 3$
4-row	$C_r \times 2.64$	$C_{0r} \times 4$

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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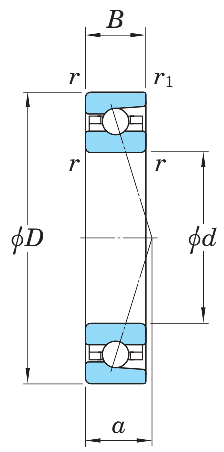

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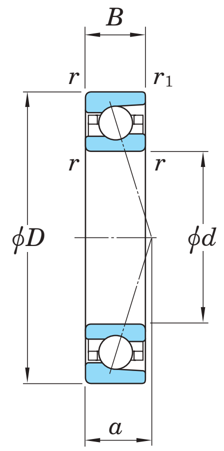

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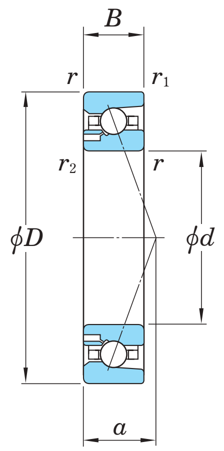

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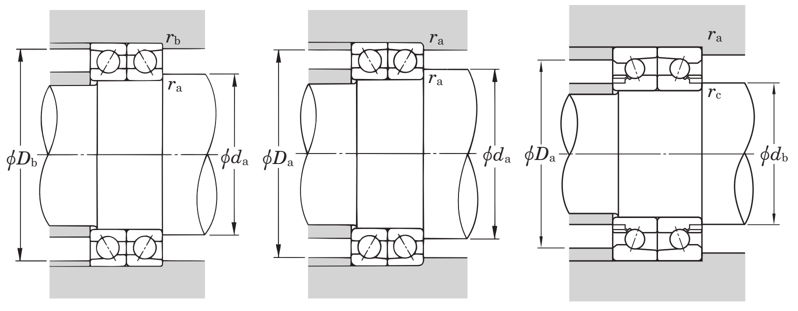


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem X_0	Single row/ Tandem Y_0	Back-to-back/ Face-to-face X_0	Back-to-back/ Face-to-face Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem $\frac{F_a}{F_r}\leqq e$ X	Y	$\frac{F_a}{F_r}>e$ X	Y	Back-to-back/Face-to-face $\frac{F_a}{F_r}\leqq e$ X	Y	$\frac{F_a}{F_r}>e$ X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d (50) ~ (60)

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No. 1)	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
50	80	16	1	0.6	—	**HAR010CA**	13.9	7.65	0.400	—	22 000	35 000	19.8	10	0.273	11.7	—	—	55.5	—	74.5	75.5	1	0.6	—	10 000	0.01~0.02	**HAR010CA**
	80	16	1	0.6	—	**HAR010**	12.9	7.15	0.370	—	16 000	21 000	26.8	10	0.273	10.4	—	—	55.5	—	74.5	75.5	1	0.6	—	10 000	0.01~0.02	**HAR010**
	80	16	1	0.6	—	**3NCHAC010C**	22.4	11.2	0.580	8.00	32 000	53 000	16.8	12	0.219	9	—	—	55.5	—	74.5	75.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC010C**
	80	16	1	0.6	—	**3NCHAC010CA**	21.9	10.9	0.560	—	29 000	50 000	19.9	12	0.219	10.9	—	—	55.5	—	74.5	75.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC010CA**
	80	16	1	0.6	0.3	**3NCHAD010CA**	13.5	7.35	0.380	—	—	53 000	19.8	—	0.269	7.4	—	—	55.5	53.5	74.5	75.5	1	0.6	0.3	10 000	0.01~0.02	**3NCHAD010CA**
	90	20	1.1	0.6	—	**7210C-5**	53.5	31.8	2.05	14.6	16 000	26 000	19.4	23	0.485	18.1	—	—	57	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**7210C-5**
	90	20	1.1	0.6	—	**7210-5**	49.2	29.4	1.80	—	12 000	16 000	30.4	22	0.485	9.44	—	—	57	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**7210-5**
55	80	13	1	0.6	—	**7911C-5**	24.6	18.5	0.980	16.3	18 000	29 000	15.5	8.1	0.178	8.27	—	—	60.5	—	74.5	75.5	1	0.6	—	6 000	0.01~0.02	**7911C-5**
	80	13	1	0.6	—	**HAR911C**	12.6	7.65	0.400	8.60	22 000	35 000	15.5	6.5	0.189	9.8	—	—	60.5	—	74.5	75.5	1	0.6	—	6 000	0.01~0.02	**HAR911C**
	80	13	1	0.6	—	**HAR911CA**	12.3	7.50	0.390	—	22 000	33 000	18.8	6.5	0.189	10.7	—	—	60.5	—	74.5	75.5	1	0.6	—	6 000	0.01~0.02	**HAR911CA**
	80	13	1	0.6	—	**HAR911**	11.4	6.95	0.360	—	15 000	21 000	26	6.5	0.189	8.84	—	—	60.5	—	74.5	75.5	1	0.6	—	6 000	0.01~0.02	**HAR911**
	80	13	1	0.6	—	**3NCHAC911C**	17.3	9.40	0.490	8.30	30 000	51 000	15.5	8.3	0.154	7.61	—	—	60.5	—	74.5	75.5	1	0.6	—	6 000	0.01~0.02	**3NCHAC911C**
	80	13	1	0.6	—	**3NCHAC911CA**	16.9	9.20	0.470	—	29 000	49 000	18.8	8.3	0.154	9.25	—	—	60.5	—	74.5	75.5	1	0.6	—	6 000	0.01~0.02	**3NCHAC911CA**
	90	18	1.1	0.6	—	**7011C-5**	42.6	28.6	1.65	15.5	16 000	26 000	18.7	17	0.420	13.3	—	—	62	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**7011C-5**
	90	18	1.1	0.6	—	**7011-5**	38.9	26.3	1.50	—	12 000	16 000	29.9	17	0.420	6.35	—	—	62	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**7011-5**
	90	18	1.1	0.6	—	**HAR011C**	17.6	9.90	0.510	8.40	21 000	32 000	18.7	13	0.403	12.6	—	—	62	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**HAR011C**
	90	18	1.1	0.6	—	**HAR011CA**	17.2	9.70	0.500	—	19 000	30 000	22.2	13	0.403	14.8	—	—	62	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**HAR011CA**
	90	18	1.1	0.6	—	**HAR011**	16.0	9.00	0.470	—	14 000	19 000	29.9	13	0.403	12.8	—	—	62	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**HAR011**
	90	18	1.1	0.6	—	**3NCHAC011C**	29.4	14.6	0.750	7.90	29 000	47 000	18.7	17	0.319	11.7	—	—	62	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC011C**
	90	18	1.1	0.6	—	**3NCHAC011CA**	28.7	14.3	0.740	—	26 000	44 000	22.2	17	0.319	14.3	—	—	62	—	83	85.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC011CA**
	90	18	1.1	0.6	0.3	**3NCHAD011CA**	16.2	8.90	0.460	—	—	47 000	22.2	—	0.395	8.94	—	—	62	58.5	83	85.5	1	0.6	0.3	12 000	0.01~0.02	**3NCHAD011CA**
	100	21	1.5	1	—	**7211C-5**	66.1	40.2	2.60	14.6	15 000	23 000	21.1	29	0.635	23.5	—	—	63.5	—	91.5	94.5	1.5	1	—	12 000	0.01~0.02	**7211C-5**
	100	21	1.5	1	—	**7211-5**	60.9	37.1	2.30	—	11 000	15 000	33.3	29	0.635	12.4	—	—	63.5	—	91.5	94.5	1.5	1	—	12 000	0.01~0.02	**7211-5**
60	85	13	1	0.6	—	**7912C-5**	29.0	21.8	1.15	16.3	16 000	26 000	16.3	8.8	0.187	11.3	—	—	65.5	—	79.5	80.5	1	0.6	—	8 000	0.01~0.02	**7912C-5**
	85	13	1	0.6	—	**HAR912C**	12.4	7.75	0.400	8.60	21 000	32 000	16.2	7	0.202	9.89	—	—	65.5	—	79.5	80.5	1	0.6	—	8 000	0.01~0.02	**HAR912C**
	85	13	1	0.6	—	**HAR912CA**	12.1	7.55	0.390	—	19 000	30 000	19.7	7	0.202	11.5	—	—	65.5	—	79.5	80.5	1	0.6	—	8 000	0.01~0.02	**HAR912CA**
	85	13	1	0.6	—	**HAR912**	11.3	7.00	0.360	—	14 000	19 000	27.4	7	0.202	9.95	—	—	65.5	—	79.5	80.5	1	0.6	—	8 000	0.01~0.02	**HAR912**
	85	13	1	0.6	—	**3NCHAC912C**	20.4	11.1	0.570	8.30	29 000	47 000	16.3	9.5	0.156	8.95	—	—	65.5	—	79.5	80.5	1	0.6	—	8 000	0.01~0.02	**3NCHAC912C**
	85	13	1	0.6	—	**3NCHAC912CA**	19.9	10.8	0.560	—	26 000	44 000	19.8	9.5	0.156	10.8	—	—	65.5	—	79.5	80.5	1	0.6	—	8 000	0.01~0.02	**3NCHAC912CA**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

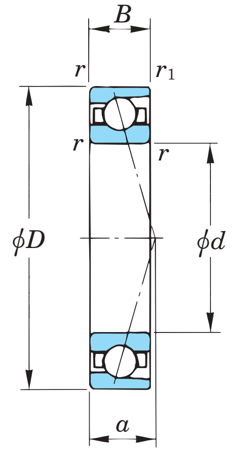
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r\times1.62$	$C_{0r}\times2$
3-row	$C_r\times2.16$	$C_{0r}\times3$
4-row	$C_r\times2.64$	$C_{0r}\times4$

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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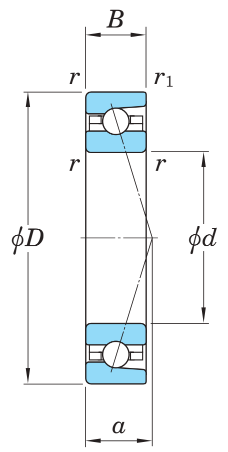

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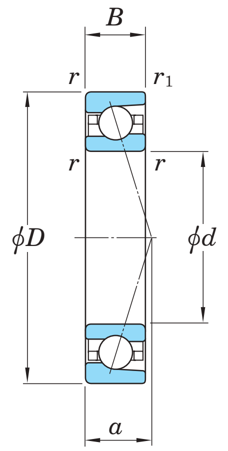

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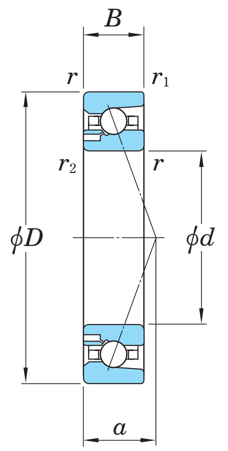

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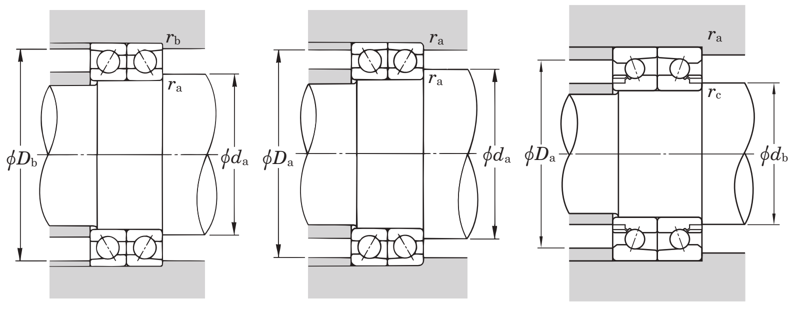


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ 1)	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$		$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d (60) ~ (70)

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No. 1)	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
60	95	18	1.1	0.6	—	**7012C-5**	43.8	30.6	1.75	15.7	15 000	23 000	19.4	19	0.450	13.5	—	—	67	—	88	90.5	1	0.6	—	12 000	0.01~0.02	**7012C-5**
	95	18	1.1	0.6	—	**7012-5**	39.9	28.1	1.55	—	11 000	15 000	31.4	19	0.450	6.37	—	—	67	—	88	90.5	1	0.6	—	12 000	0.01~0.02	**7012-5**
	95	18	1.1	0.6	—	**HAR012C**	18.4	10.8	0.560	8.50	19 000	30 000	19.4	15	0.433	13.8	—	—	67	—	88	90.5	1	0.6	—	12 000	0.01~0.02	**HAR012C**
	95	18	1.1	0.6	—	**HAR012CA**	17.9	10.6	0.550	—	19 000	29 000	23.1	15	0.433	16.1	—	—	67	—	88	90.5	1	0.6	—	12 000	0.01~0.02	**HAR012CA**
	95	18	1.1	0.6	—	**HAR012**	16.7	9.85	0.510	—	13 000	18 000	31.4	15	0.433	13.9	—	—	67	—	88	90.5	1	0.6	—	12 000	0.01~0.02	**HAR012**
	95	18	1.1	0.6	—	**3NCHAC012C**	30.3	15.6	0.810	8.00	26 000	44 000	19.4	19	0.340	12.5	—	—	67	—	88	90.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC012C**
	95	18	1.1	0.6	—	**3NCHAC012CA**	29.6	15.3	0.790	—	25 000	42 000	23.1	19	0.340	15.3	—	—	67	—	88	90.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC012CA**
	95	18	1.1	0.6	0.3	**3NCHAD012CA**	17.0	9.75	0.500	—	—	44 000	23.1	—	0.427	9.84	—	—	67	63.5	88	90.5	1	0.6	0.3	12 000	0.01~0.02	**3NCHAD012CA**
	110	22	1.5	1	—	**7212C-5**	80.0	49.5	3.20	14.5	13 000	21 000	22.7	36	0.820	29.5	—	—	68.5	—	101.5	104.5	1.5	1	—	15 000	0.01~0.02	**7212C-5**
	110	22	1.5	1	—	**7212-5**	73.7	45.7	2.85	—	10 000	13 000	36.1	36	0.820	15.7	—	—	68.5	—	101.5	104.5	1.5	1	—	15 000	0.01~0.02	**7212-5**
65	90	13	1	0.6	—	**7913C-5**	25.9	21.2	1.10	16.5	16 000	25 000	16.9	9.4	0.205	9.52	—	—	70.5	—	84.5	85.5	1	0.6	—	8 000	0.01~0.02	**7913C-5**
	90	13	1	0.6	—	**HAR913C**	14.7	9.45	0.490	8.60	19 000	30 000	16.9	7.9	0.212	12	—	—	70.5	—	84.5	85.5	1	0.6	—	8 000	0.01~0.02	**HAR913C**
	90	13	1	0.6	—	**HAR913CA**	14.3	9.25	0.480	—	19 000	29 000	20.6	7.9	0.212	14.1	—	—	70.5	—	84.5	85.5	1	0.6	—	8 000	0.01~0.02	**HAR913CA**
	90	13	1	0.6	—	**HAR913**	13.3	8.55	0.440	—	13 000	18 000	28.9	7.9	0.212	11.2	—	—	70.5	—	84.5	85.5	1	0.6	—	8 000	0.01~0.02	**HAR913**
	90	13	1	0.6	—	**3NCHAC913C**	18.4	10.8	0.560	8.30	26 000	44 000	16.9	9.2	0.181	8.79	—	—	70.5	—	84.5	85.5	1	0.6	—	8 000	0.01~0.02	**3NCHAC913C**
	90	13	1	0.6	—	**3NCHAC913CA**	17.9	10.6	0.550	—	25 000	42 000	20.6	9.2	0.181	10.6	—	—	70.5	—	84.5	85.5	1	0.6	—	8 000	0.01~0.02	**3NCHAC913CA**
	100	18	1.1	0.6	—	**7013C-5**	46.3	34.3	1.90	15.9	14 000	22 000	20.1	19	0.470	18.7	—	—	72	—	93	95.5	1	0.6	—	15 000	0.01~0.02	**7013C-5**
	100	18	1.1	0.6	—	**7013-5**	42.1	31.4	1.70	—	10 000	14 000	33	19	0.470	9.89	—	—	72	—	93	95.5	1	0.6	—	15 000	0.01~0.02	**7013-5**
	100	18	1.1	0.6	—	**HAR013C**	19.1	11.8	0.610	8.50	18 000	29 000	20.1	16	0.462	14.9	—	—	72	—	93	95.5	1	0.6	—	15 000	0.01~0.02	**HAR013C**
	100	18	1.1	0.6	—	**HAR013CA**	18.6	11.5	0.590	—	18 000	26 000	24	16	0.462	17.5	—	—	72	—	93	95.5	1	0.6	—	15 000	0.01~0.02	**HAR013CA**
	100	18	1.1	0.6	—	**HAR013**	17.3	10.7	0.550	—	12 000	16 000	32.8	16	0.462	14.9	—	—	72	—	93	95.5	1	0.6	—	15 000	0.01~0.02	**HAR013**
	100	18	1.1	0.6	—	**3NCHAC013C**	32.2	17.5	0.900	8.10	25 000	42 000	20.1	20	0.365	14	—	—	72	—	93	95.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC013C**
	100	18	1.1	0.6	—	**3NCHAC013CA**	31.5	17.1	0.880	—	23 000	39 000	24.1	20	0.365	17.1	—	—	72	—	93	95.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC013CA**
	100	18	1.1	0.6	0.3	**3NCHAD013CA**	17.7	10.7	0.550	—	—	42 000	24	—	0.456	10.7	—	—	72	68.5	93	95.5	1	0.6	0.3	15 000	0.01~0.02	**3NCHAD013CA**
	120	23	1.5	1	—	**7213C-5**	91.4	58.7	3.80	14.6	12 000	19 000	23.9	41	1.02	34.6	—	—	73.5	—	111.5	114.5	1.5	1	—	15 000	0.01~0.02	**7213C-5**
	120	23	1.5	1	—	**7213-5**	84.1	54.2	3.35	—	9 800	12 000	38.2	40	1.02	18.3	—	—	73.5	—	111.5	114.5	1.5	1	—	15 000	0.01~0.02	**7213-5**
70	100	16	1	0.6	—	**7914C-5**	36.2	29.0	1.55	16.4	15 000	22 000	19.4	16	0.332	12.9	—	—	75.5	—	94.5	95.5	1	0.6	—	10 000	0.01~0.02	**7914C-5**
	100	16	1	0.6	—	**HAR914C**	16.1	10.5	0.540	8.70	18 000	28 000	19.4	12	0.356	13.3	—	—	75.5	—	94.5	95.5	1	0.6	—	10 000	0.01~0.02	**HAR914C**
	100	16	1	0.6	—	**HAR914CA**	15.7	10.2	0.530	—	16 000	26 000	23.5	12	0.356	15.6	—	—	75.5	—	94.5	95.5	1	0.6	—	10 000	0.01~0.02	**HAR914CA**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

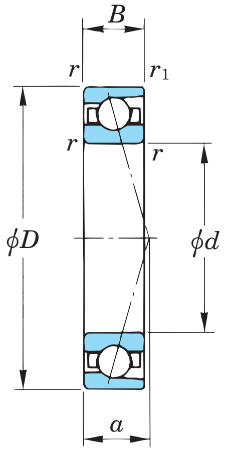
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	C_r×1.62	C_{0r}×2
3-row	C_r×2.16	C_{0r}×3
4-row	C_r×2.64	C_{0r}×4

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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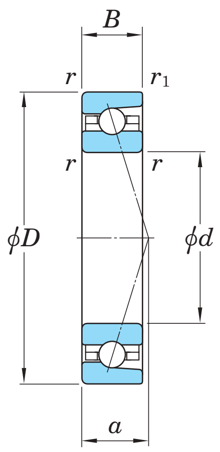

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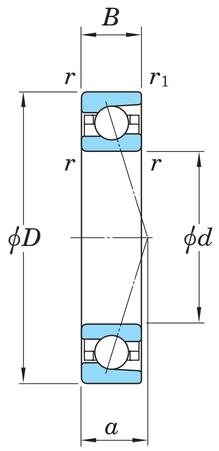

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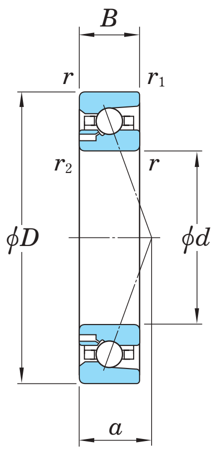

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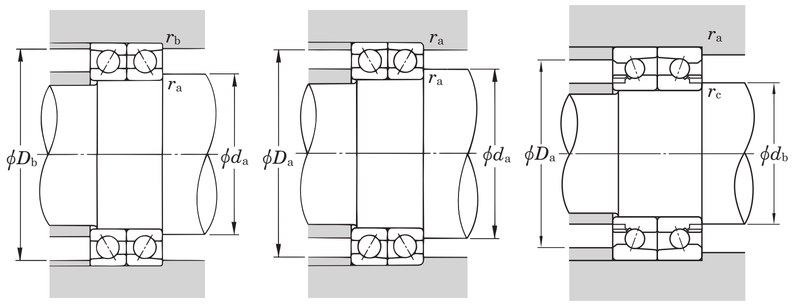


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ 1)	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$		$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d (70) ~ 75

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No. 1)	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
70	100	16	1	0.6	—	**HAR914**	14.6	9.45	0.490	—	12 000	16 000	32.5	12	0.356	12.9	—	—	75.5	—	94.5	95.5	1	0.6	—	10 000	0.01~0.02	**HAR914**
	100	16	1	0.6	—	**3NCHAC914C**	25.4	14.7	0.760	8.30	25 000	40 000	19.4	15	0.291	11.9	—	—	75.5	—	94.5	95.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC914C**
	100	16	1	0.6	—	**3NCHAC914CA**	24.8	14.4	0.740	—	22 000	39 000	23.5	15	0.291	14.5	—	—	75.5	—	94.5	95.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC914CA**
	110	20	1.1	0.6	—	**7014C-5**	58.6	43.0	2.45	15.7	13 000	21 000	22.1	27	0.660	21	—	—	77	—	103	105.5	1	0.6	—	15 000	0.01~0.02	**7014C-5**
	110	20	1.1	0.6	—	**7014-5**	53.3	39.4	2.15	—	10 000	13 000	36	27	0.660	10.4	—	—	77	—	103	105.5	1	0.6	—	15 000	0.01~0.02	**7014-5**
	110	20	1.1	0.6	—	**HAR014C**	25.9	15.5	0.800	8.40	16 000	26 000	22.1	23	0.629	19.7	—	—	77	—	103	105.5	1	0.6	—	15 000	0.01~0.02	**HAR014C**
	110	20	1.1	0.6	—	**HAR014CA**	25.3	15.1	0.780	—	16 000	25 000	26.4	23	0.629	23.1	—	—	77	—	103	105.5	1	0.6	—	15 000	0.01~0.02	**HAR014CA**
	110	20	1.1	0.6	—	**HAR014**	23.6	14.1	0.730	—	11 000	15 000	36	23	0.629	20.3	—	—	77	—	103	105.5	1	0.6	—	15 000	0.01~0.02	**HAR014**
	110	20	1.1	0.6	—	**3NCHAC014C**	40.5	21.9	1.15	8.00	23 000	39 000	22.1	28	0.500	17.6	—	—	77	—	103	105.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC014C**
	110	20	1.1	0.6	—	**3NCHAC014CA**	39.6	21.4	1.10	—	22 000	36 000	26.4	28	0.500	21.5	—	—	77	—	103	105.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC014CA**
	110	20	1.1	0.6	0.3	**3NCHAD014CA**	23.9	13.9	0.720	—	—	39 000	26.4	—	0.635	14	—	—	77	73.5	103	105.5	1	0.6	0.3	15 000	0.01~0.02	**3NCHAD014CA**
	125	24	1.5	1	—	**7214C-5**	94.9	60.2	3.90	14.6	12 000	19 000	25.1	48	1.12	35.3	—	—	78.5	—	116.5	119.5	1.5	1	—	15 000	0.01~0.02	**7214C-5**
	125	24	1.5	1	—	**7214-5**	87.3	55.6	3.40	—	9 200	12 000	40.2	48	1.12	18.6	—	—	78.5	—	116.5	119.5	1.5	1	—	15 000	0.01~0.02	**7214-5**
75	105	16	1	0.6	—	**7915C-5**	36.7	30.5	1.60	16.5	13 000	21 000	20.1	17	0.350	13.5	—	—	80.5	—	99.5	100.5	1	0.6	—	10 000	0.01~0.02	**7915C-5**
	105	16	1	0.6	—	**HAR915C**	16.6	11.2	0.580	8.70	16 000	26 000	20.1	12	0.370	14.3	—	—	80.5	—	99.5	100.5	1	0.6	—	10 000	0.01~0.02	**HAR915C**
	105	16	1	0.6	—	**HAR915CA**	16.2	10.9	0.560	—	16 000	25 000	24.4	12	0.370	16.7	—	—	80.5	—	99.5	100.5	1	0.6	—	10 000	0.01~0.02	**HAR915CA**
	105	16	1	0.6	—	**HAR915**	15.0	10.1	0.520	—	11 000	15 000	34	12	0.370	13.8	—	—	80.5	—	99.5	100.5	1	0.6	—	10 000	0.01~0.02	**HAR915**
	105	16	1	0.6	—	**3NCHAC915C**	25.9	15.5	0.800	8.40	23 000	39 000	20.1	16	0.311	12.5	—	—	80.5	—	99.5	100.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC915C**
	105	16	1	0.6	—	**3NCHAC915CA**	25.3	15.1	0.780	—	22 000	36 000	24.4	16	0.311	15.2	—	—	80.5	—	99.5	100.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC915CA**
	115	20	1.1	0.6	—	**7015C-5**	60.1	45.6	2.55	15.9	12 000	19 000	22.7	29	0.690	22	—	—	82	—	108	110.5	1	0.6	—	15 000	0.01~0.02	**7015C-5**
	115	20	1.1	0.6	—	**7015-5**	54.6	41.7	2.25	—	9 500	12 000	37.4	28	0.690	10.6	—	—	82	—	108	110.5	1	0.6	—	15 000	0.01~0.02	**7015-5**
	115	20	1.1	0.6	—	**HAR015C**	26.4	16.2	0.840	8.50	16 000	25 000	22.7	25	0.665	20.6	—	—	82	—	108	110.5	1	0.6	—	15 000	0.01~0.02	**HAR015C**
	115	20	1.1	0.6	—	**HAR015CA**	25.7	15.8	0.820	—	15 000	23 000	27.3	25	0.665	24.2	—	—	82	—	108	110.5	1	0.6	—	15 000	0.01~0.02	**HAR015CA**
	115	20	1.1	0.6	—	**HAR015**	24.0	14.7	0.760	—	11 000	15 000	37.4	25	0.665	21	—	—	82	—	108	110.5	1	0.6	—	15 000	0.01~0.02	**HAR015**
	115	20	1.1	0.6	—	**3NCHAC015C**	41.7	23.2	1.20	8.10	22 000	36 000	22.7	28	0.539	18.7	—	—	82	—	108	110.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC015C**
	115	20	1.1	0.6	—	**3NCHAC015CA**	40.7	22.7	1.15	—	21 000	35 000	27.3	28	0.539	22.8	—	—	82	—	108	110.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC015CA**
	115	20	1.1	0.6	0.3	**3NCHAD015CA**	24.4	14.6	0.750	—	—	36 000	27.3	—	0.657	14.7	—	—	82	78.5	108	110.5	1	0.6	0.3	15 000	0.01~0.02	**3NCHAD015CA**
	130	25	1.5	1	—	**7215C-5**	108	70.6	4.50	14.6	11 000	18 000	26.2	54	1.23	41.1	—	—	83.5	—	121.5	124.5	1.5	1	—	15 000	0.01~0.02	**7215C-5**
	130	25	1.5	1	—	**7215-5**	99.0	65.2	3.95	—	8 800	11 000	42.1	53	1.23	21.6	—	—	83.5	—	121.5	124.5	1.5	1	—	15 000	0.01~0.02	**7215-5**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

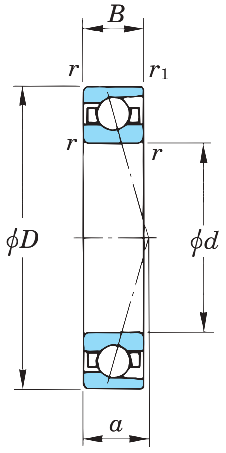
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r\times1.62$	$C_{0r}\times2$
3-row	$C_r\times2.16$	$C_{0r}\times3$
4-row	$C_r\times2.64$	$C_{0r}\times4$

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting Preload S	Preload L	Preload M	Preload H
∅ ⃠	DB	0.85	0.80	0.65	0.55
∅∅ ⃠⃠	DBB	0.80	0.75	0.60	0.45
∅∅ ⃠	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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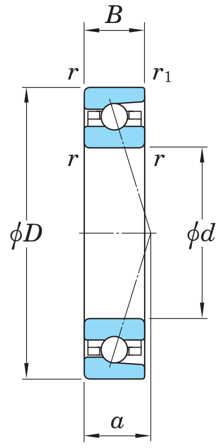

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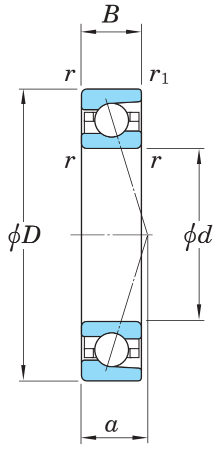

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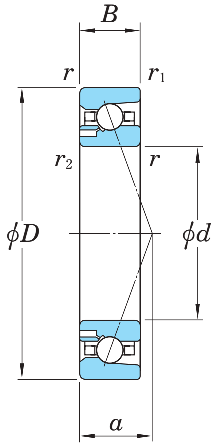

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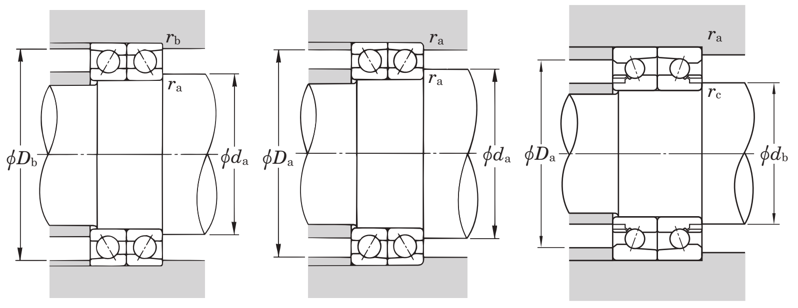


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$		$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d 80 ~ (85)

Boundary dimensions (mm)						Bearing No. [1]	Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min⁻¹)		Load center (mm)	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN)	Dimensions of lubrication groove (mm)		Mounting dimensions (mm)							Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
d	D	B	r min.	r_1 min.	r_2 min.		C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.	a			(static)	S	W	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.			
80	110	16	1	0.6	—	**7916C-5**	37.3	31.6	1.65	16.5	13 000	21 000	20.7	18	0.368	14	—	—	85.5	—	104.5	105.5	1	0.6	—	10 000	0.01~0.02	**7916C-5**
	110	16	1	0.6	—	**HAR916C**	17.0	11.9	0.620	8.80	16 000	25 000	20.7	13	0.398	15.2	—	—	85.5	—	104.5	105.5	1	0.6	—	10 000	0.01~0.02	**HAR916C**
	110	16	1	0.6	—	**HAR916CA**	16.6	11.6	0.600	—	15 000	23 000	25.3	13	0.398	17.8	—	—	85.5	—	104.5	105.5	1	0.6	—	10 000	0.01~0.02	**HAR916CA**
	110	16	1	0.6	—	**HAR916**	15.4	10.8	0.560	—	11 000	15 000	35.4	13	0.398	14.6	—	—	85.5	—	104.5	105.5	1	0.6	—	10 000	0.01~0.02	**HAR916**
	110	16	1	0.6	—	**3NCHAC916C**	26.4	16.2	0.840	8.50	22 000	36 000	20.7	17	0.325	13.1	—	—	85.5	—	104.5	105.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC916C**
	110	16	1	0.6	—	**3NCHAC916CA**	25.7	15.8	0.820	—	21 000	35 000	25.3	17	0.325	15.9	—	—	85.5	—	104.5	105.5	1	0.6	—	10 000	0.01~0.02	**3NCHAC916CA**
	125	22	1.1	0.6	—	**7016C-5**	73.3	55.3	3.10	15.7	11 000	18 000	24.7	37	0.930	23.5	—	—	87	—	118	120.5	1	0.6	—	15 000	0.01~0.02	**7016C-5**
	125	22	1.1	0.6	—	**7016-5**	66.7	50.6	2.75	—	8 800	11 000	40.6	37	0.930	10.8	—	—	87	—	118	120.5	1	0.6	—	15 000	0.01~0.02	**7016-5**
	125	22	1.1	0.6	—	**HAR016C**	30.9	19.2	0.980	8.40	14 000	22 000	24.7	31	0.903	24.5	—	—	87	—	118	120.5	1	0.6	—	15 000	0.01~0.02	**HAR016C**
	125	22	1.1	0.6	—	**HAR016CA**	30.1	18.8	0.960	—	13 000	21 000	29.7	31	0.903	28.7	—	—	87	—	118	120.5	1	0.6	—	15 000	0.01~0.02	**HAR016CA**
	125	22	1.1	0.6	—	**HAR016**	28.1	17.5	0.890	—	9 800	13 000	40.6	31	0.903	24.6	—	—	87	—	118	120.5	1	0.6	—	15 000	0.01~0.02	**HAR016**
	125	22	1.1	0.6	—	**3NCHAC016C**	50.7	28.1	1.45	8.00	19 000	32 000	24.7	38	0.714	22.6	—	—	87	—	118	120.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC016C**
	125	22	1.1	0.6	—	**3NCHAC016CA**	49.6	27.5	1.40	—	18 000	30 000	29.7	38	0.714	27.6	—	—	87	—	118	120.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC016CA**
	125	22	1.1	0.6	0.3	**3NCHAD016CA**	28.6	17.3	0.890	—	—	32 000	29.7	—	0.885	17.5	—	—	87	83.5	118	120.5	1	0.6	0.3	15 000	0.01~0.02	**3NCHAD016CA**
	140	26	2	1	—	**7216C-5**	116	77.5	4.70	14.7	10 000	16 000	27.7	63	1.50	44.5	—	—	90	—	130	134.5	2	1	—	18 000	0.01~0.02	**7216C-5**
	140	26	2	1	—	**7216-5**	107	71.5	4.10	—	8 100	10 000	44.8	63	1.50	23.3	—	—	90	—	130	134.5	2	1	—	18 000	0.01~0.02	**7216-5**
85	120	18	1.1	0.6	—	**7917C-5**	48.6	40.6	2.10	16.5	12 000	19 000	22.7	25	0.523	19.5	—	—	92	—	113	115.5	1	0.6	—	12 000	0.01~0.02	**7917C-5**
	120	18	1.1	0.6	—	**HAR917C**	20.4	14.2	0.720	8.70	14 000	22 000	22.7	18	0.570	18.1	—	—	92	—	113	115.5	1	0.6	—	12 000	0.01~0.02	**HAR917C**
	120	18	1.1	0.6	—	**HAR917CA**	19.9	13.8	0.710	—	13 000	21 000	27.7	18	0.570	21.2	—	—	92	—	113	115.5	1	0.6	—	12 000	0.01~0.02	**HAR917CA**
	120	18	1.1	0.6	—	**HAR917**	18.5	12.8	0.650	—	9 800	13 000	38.6	18	0.570	17	—	—	92	—	113	115.5	1	0.6	—	12 000	0.01~0.02	**HAR917**
	120	18	1.1	0.6	—	**3NCHAC917C**	34.2	20.6	1.05	8.40	19 000	32 000	22.7	24	0.473	16.7	—	—	92	—	113	115.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC917C**
	120	18	1.1	0.6	—	**3NCHAC917CA**	33.4	20.1	1.05	—	18 000	30 000	27.6	24	0.473	20.3	—	—	92	—	113	115.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC917CA**
	130	22	1.1	0.6	—	**7017C-5**	75.1	58.7	3.15	15.9	10 000	16 000	25.5	39	0.970	28.2	—	—	92	—	123	125.5	1	0.6	—	18 000	0.01~0.02	**7017C-5**
	130	22	1.1	0.6	—	**7017-5**	68.2	53.7	2.75	—	8 200	10 000	42.3	39	0.970	14	—	—	92	—	123	125.5	1	0.6	—	18 000	0.01~0.02	**7017-5**
	130	22	1.1	0.6	—	**HAR017C**	31.4	20.1	1.00	8.50	13 000	21 000	25.4	33	0.947	25.6	—	—	92	—	123	125.5	1	0.6	—	18 000	0.01~0.02	**HAR017C**
	130	22	1.1	0.6	—	**HAR017CA**	30.7	19.6	0.980	—	13 000	19 000	30.6	33	0.947	30	—	—	92	—	123	125.5	1	0.6	—	18 000	0.01~0.02	**HAR017CA**
	130	22	1.1	0.6	—	**HAR017**	28.5	18.3	0.910	—	9 200	12 000	42	33	0.947	26.3	—	—	92	—	123	125.5	1	0.6	—	18 000	0.01~0.02	**HAR017**
	130	22	1.1	0.6	—	**3NCHAC017C**	52.1	29.8	1.50	8.10	18 000	30 000	25.5	40	0.741	24	—	—	92	—	123	125.5	1	0.6	—	18 000	0.01~0.02	**3NCHAC017C**
	130	22	1.1	0.6	—	**3NCHAC017CA**	51.0	29.2	1.45	—	16 000	29 000	30.7	40	0.741	29.3	—	—	92	—	123	125.5	1	0.6	—	18 000	0.01~0.02	**3NCHAC017CA**
	130	22	1.1	0.6	0.3	**3NCHAD017CA**	29.1	18.2	0.910	—	—	30 000	30.6	—	0.924	18.3	—	—	92	88.5	123	125.5	1	0.6	0.3	18 000	0.01~0.02	**3NCHAD017CA**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

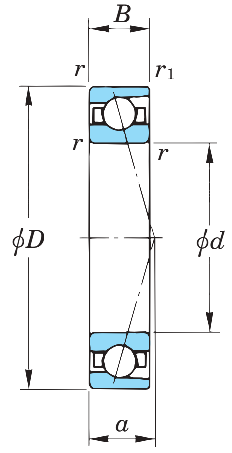
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	C_r×1.62	C_{0r}×2
3-row	C_r×2.16	C_{0r}×3
4-row	C_r×2.64	C_{0r}×4

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting			
		Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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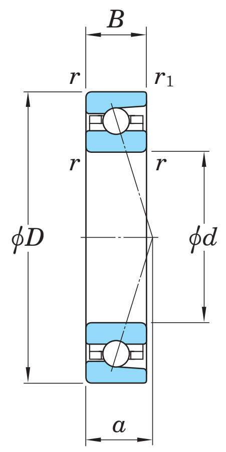
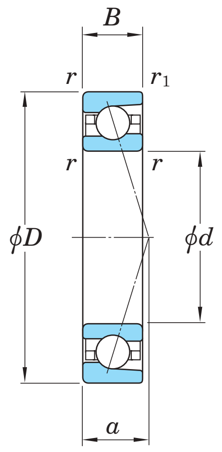


HAR



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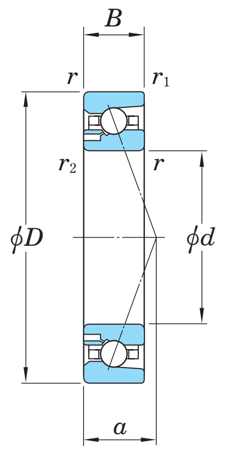

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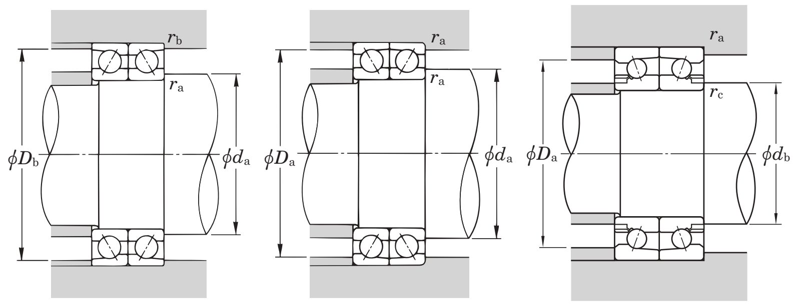


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$		$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d (85) ~ (95)

Boundary dimensions (mm)						Bearing No. [1]	Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min⁻¹)		Load center (mm)	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm)		Mounting dimensions (mm)							Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
d	D	B	r min.	r_1 min.	r_2 min.		C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.	a				S	W	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.			
85	150	28	2	1	—	**7217C-5**	134	90.6	5.35	14.7	9 900	15 000	29.7	76	1.87	52.9	—	—	95	—	140	144.5	2	1	—	18 000	0.01~0.02	**7217C-5**
	150	28	2	1	—	**7217-5**	123	83.6	4.70	—	7 500	9 900	47.9	75	1.87	27.9	—	—	95	—	140	144.5	2	1	—	18 000	0.01~0.02	**7217-5**
90	125	18	1.1	0.6	—	**7918C-5**	49.5	42.6	2.15	16.6	11 000	18 000	23.4	26	0.551	20.4	—	—	97	—	118	120.5	1	0.6	—	12 000	0.01~0.02	**7918C-5**
	125	18	1.1	0.6	—	**HAR918C**	21.1	15.1	0.750	8.80	13 000	21 000	23.4	19	0.598	19.3	—	—	97	—	118	120.5	1	0.6	—	12 000	0.01~0.02	**HAR918C**
	125	18	1.1	0.6	—	**HAR918CA**	20.5	14.7	0.730	—	13 000	19 000	28.6	19	0.598	22.6	—	—	97	—	118	120.5	1	0.6	—	12 000	0.01~0.02	**HAR918CA**
	125	18	1.1	0.6	—	**HAR918**	19.0	13.7	0.680	—	9 200	12 000	40	19	0.598	18	—	—	97	—	118	120.5	1	0.6	—	12 000	0.01~0.02	**HAR918**
	125	18	1.1	0.6	—	**3NCHAC918C**	34.9	21.6	1.10	8.40	18 000	30 000	23.4	27	0.465	17.5	—	—	97	—	118	120.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC918C**
	125	18	1.1	0.6	—	**3NCHAC918CA**	34.1	21.1	1.05	—	16 000	29 000	28.6	27	0.465	21.2	—	—	97	—	118	120.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC918CA**
	140	24	1.5	1	—	**7018C-5**	89.6	69.1	3.65	15.7	10 000	16 000	27.4	47	1.26	37.3	—	—	98.5	—	131.5	134.5	1.5	1	—	18 000	0.01~0.02	**7018C-5**
	140	24	1.5	1	—	**7018-5**	81.5	63.3	3.25	—	7 800	10 000	45.2	47	1.26	19	—	—	98.5	—	131.5	134.5	1.5	1	—	18 000	0.01~0.02	**7018-5**
	140	24	1.5	1	—	**HAR018C**	41.0	26.1	1.25	8.40	12 000	19 000	27.4	43	1.21	33.1	—	—	98.5	—	131.5	134.5	1.5	1	—	18 000	0.01~0.02	**HAR018C**
	140	24	1.5	1	—	**HAR018CA**	40.0	25.4	1.25	—	12 000	18 000	32.9	43	1.21	38.9	—	—	98.5	—	131.5	134.5	1.5	1	—	18 000	0.01~0.02	**HAR018CA**
	140	24	1.5	1	—	**HAR018**	37.3	23.7	1.15	—	8 600	11 000	45.2	43	1.21	33.4	—	—	98.5	—	131.5	134.5	1.5	1	—	18 000	0.01~0.02	**HAR018**
	140	24	1.5	1	—	**3NCHAC018C**	62.0	35.2	1.70	8.00	16 000	29 000	27.4	51	0.943	28.3	—	—	98.5	—	131.5	134.5	1.5	1	—	18 000	0.01~0.02	**3NCHAC018C**
	140	24	1.5	1	—	**3NCHAC018CA**	60.6	34.4	1.65	—	16 000	26 000	32.9	51	0.943	34.5	—	—	98.5	—	131.5	134.5	1.5	1	—	18 000	0.01~0.02	**3NCHAC018CA**
	140	24	1.5	1	0.3	**3NCHAD018CA**	38.0	23.5	1.15	—	—	29 000	32.9	—	1.15	23.6	—	—	98.5	94	131.5	134.5	1.5	1	0.3	18 000	0.01~0.02	**3NCHAD018CA**
	160	30	2	1	—	**7218C-5**	153	105	6.00	14.6	9 300	15 000	31.7	93	2.30	62.3	—	—	100	—	150	154.5	2	1	—	20 000	0.01~0.02	**7218C-5**
	160	30	2	1	—	**7218-5**	141	96.7	5.30	—	7 100	9 300	51.1	92	2.30	33	—	—	100	—	150	154.5	2	1	—	20 000	0.01~0.02	**7218-5**
95	130	18	1.1	0.6	—	**7919C-5**	50.3	44.1	2.15	16.5	11 000	16 000	24.1	27	0.574	20.9	—	—	102	—	123	125.5	1	0.6	—	12 000	0.01~0.02	**7919C-5**
	130	18	1.1	0.6	—	**HAR919C**	21.6	16.0	0.780	8.80	13 000	19 000	24.1	19	0.626	20.5	—	—	102	—	123	125.5	1	0.6	—	12 000	0.01~0.02	**HAR919C**
	130	18	1.1	0.6	—	**HAR919CA**	21.1	15.6	0.760	—	12 000	19 000	29.5	19	0.626	23.9	—	—	102	—	123	125.5	1	0.6	—	12 000	0.01~0.02	**HAR919CA**
	130	18	1.1	0.6	—	**HAR919**	19.6	14.5	0.710	—	8 800	11 000	41.5	19	0.626	19	—	—	102	—	123	125.5	1	0.6	—	12 000	0.01~0.02	**HAR919**
	130	18	1.1	0.6	—	**3NCHAC919C**	35.6	22.6	1.10	8.50	18 000	29 000	24.1	26	0.491	18.3	—	—	102	—	123	125.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC919C**
	130	18	1.1	0.6	—	**3NCHAC919CA**	34.7	22.1	1.10	—	16 000	28 000	29.5	26	0.491	22.2	—	—	102	—	123	125.5	1	0.6	—	12 000	0.01~0.02	**3NCHAC919CA**
	145	24	1.5	1	—	**7019C-5**	91.7	73.4	3.70	15.9	9 600	15 000	28.3	50	1.32	37.8	—	—	103.5	—	136.5	139.5	1.5	1	—	18 000	0.01~0.02	**7019C-5**
	145	24	1.5	1	—	**7019-5**	83.3	67.1	3.25	—	7 200	9 600	47.2	50	1.32	19.1	—	—	103.5	—	136.5	139.5	1.5	1	—	18 000	0.01~0.02	**7019-5**
	145	24	1.5	1	—	**HAR019C**	41.8	27.2	1.30	8.50	12 000	18 000	28.1	45	1.28	34.6	—	—	103.5	—	136.5	139.5	1.5	1	—	18 000	0.01~0.02	**HAR019C**
	145	24	1.5	1	—	**HAR019CA**	40.8	26.6	1.25	—	11 000	18 000	33.8	45	1.28	40.6	—	—	103.5	—	136.5	139.5	1.5	1	—	18 000	0.01~0.02	**HAR019CA**
	145	24	1.5	1	—	**HAR019**	38.0	24.7	1.15	—	8 200	11 000	46.6	45	1.28	33.5	—	—	103.5	—	136.5	139.5	1.5	1	—	18 000	0.01~0.02	**HAR019**
	145	24	1.5	1	—	**3NCHAC019C**	63.7	37.3	1.75	8.10	16 000	26 000	28.3	55	0.960	30.1	—	—	103.5	—	136.5	139.5	1.5	1	—	18 000	0.01~0.02	**3NCHAC019C**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

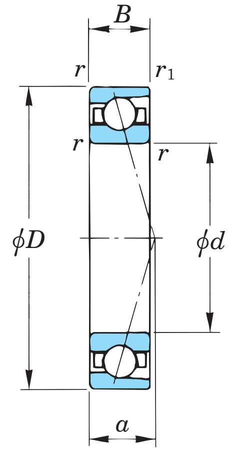
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r\times1.62$	$C_{0r}\times2$
3-row	$C_r\times2.16$	$C_{0r}\times3$
4-row	$C_r\times2.64$	$C_{0r}\times4$

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting			
		Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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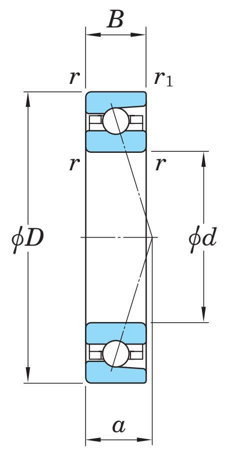

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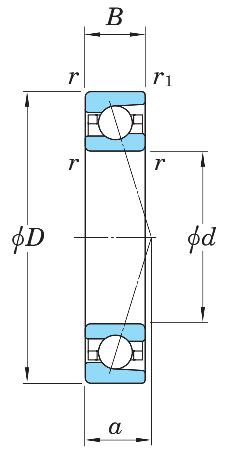

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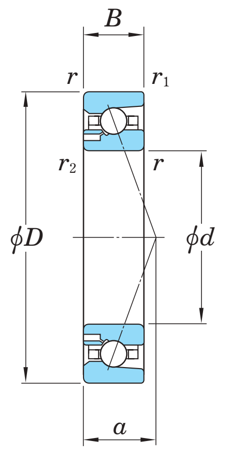

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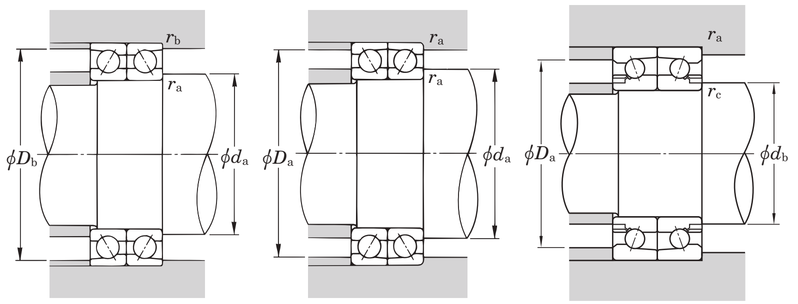


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$		$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

[1] For i, use 2 for DB & DF and 1 for single & DT.

d (95) ~ (105)

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No. [1]	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
95	145	24	1.5	1	—	**3NCHAC019CA**	62.3	36.5	1.70	—	15 000	25 000	34.2	55	0.960	36.7	—	—	103.5	—	136.5	139.5	1.5	1	—	18 000	0.01~0.02	**3NCHAC019CA**
	145	24	1.5	1	0.3	**3NCHAD019CA**	38.7	24.6	1.15	—	—	28 000	33.8	—	1.25	24.8	—	—	103.5	99	136.5	139.5	1.5	1	0.3	18 000	0.01~0.02	**3NCHAD019CA**
	170	32	2.1	1.1	—	**7219C-5**	166	112	6.30	14.6	8 800	14 000	33.8	116	2.78	65.9	—	—	107	—	158	163	2	1	—	20 000	0.01~0.02	**7219C-5**
	170	32	2.1	1.1	—	**7219-5**	153	103	5.50	—	6 700	8 800	54.3	115	2.78	34.8	—	—	107	—	158	163	2	1	—	20 000	0.01~0.02	**7219-5**
100	140	20	1.1	0.6	—	**7920C-5**	69.4	58.5	2.85	16.3	10 000	15 000	26.1	35	0.773	31.9	—	—	107	—	133	135.5	1	0.6	—	15 000	0.01~0.02	**7920C-5**
	140	20	1.1	0.6	—	**HAR920C**	30.2	21.7	1.05	8.70	12 000	18 000	26.1	28	0.839	27.8	—	—	107	—	133	135.5	1	0.6	—	15 000	0.01~0.02	**HAR920C**
	140	20	1.1	0.6	—	**HAR920CA**	29.4	21.2	1.00	—	11 000	18 000	31.8	28	0.839	32.5	—	—	107	—	133	135.5	1	0.6	—	15 000	0.01~0.02	**HAR920CA**
	140	20	1.1	0.6	—	**HAR920**	27.3	19.7	0.930	—	8 200	11 000	44.6	28	0.839	27.5	—	—	107	—	133	135.5	1	0.6	—	15 000	0.01~0.02	**HAR920**
	140	20	1.1	0.6	—	**3NCHAC920C**	48.7	29.7	1.40	8.30	16 000	28 000	26.1	38	0.632	24	—	—	107	—	133	135.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC920C**
	140	20	1.1	0.6	—	**3NCHAC920CA**	47.6	29.0	1.35	—	15 000	26 000	31.8	38	0.632	29.2	—	—	107	—	133	135.5	1	0.6	—	15 000	0.01~0.02	**3NCHAC920CA**
	150	24	1.5	1	—	**7020C-5**	94.2	77.2	3.80	16.0	9 300	15 000	28.7	51	1.37	38.1	—	—	108.5	—	141.5	144.5	1.5	1	—	20 000	0.01~0.02	**7020C-5**
	150	24	1.5	1	—	**7020-5**	85.5	70.6	3.35	—	7 100	9 300	48.1	51	1.37	19.2	—	—	108.5	—	141.5	144.5	1.5	1	—	20 000	0.01~0.02	**7020-5**
	150	24	1.5	1	—	**HAR020C**	42.5	28.4	1.30	8.50	11 000	18 000	28.7	47	1.32	36.1	—	—	108.5	—	141.5	144.5	1.5	1	—	20 000	0.01~0.02	**HAR020C**
	150	24	1.5	1	—	**HAR020CA**	41.5	27.7	1.30	—	11 000	16 000	34.7	47	1.32	42.4	—	—	108.5	—	141.5	144.5	1.5	1	—	20 000	0.01~0.02	**HAR020CA**
	150	24	1.5	1	—	**HAR020**	38.6	25.8	1.20	—	7 900	10 000	48.1	47	1.32	37.4	—	—	108.5	—	141.5	144.5	1.5	1	—	20 000	0.01~0.02	**HAR020**
	150	24	1.5	1	—	**3NCHAC020C**	65.5	39.3	1.80	8.10	15 000	26 000	28.7	56	1.03	31.7	—	—	108.5	—	141.5	144.5	1.5	1	—	20 000	0.01~0.02	**3NCHAC020C**
	150	24	1.5	1	—	**3NCHAC020CA**	64.0	38.4	1.75	—	15 000	25 000	34.7	56	1.03	38.6	—	—	108.5	—	141.5	144.5	1.5	1	—	20 000	0.01~0.02	**3NCHAC020CA**
	150	24	1.5	1	0.3	**3NCHAD020CA**	39.5	25.7	1.20	—	—	26 000	34.7	—	1.28	25.9	—	—	108.5	104	141.5	144.5	1.5	1	0.3	20 000	0.01~0.02	**3NCHAD020CA**
	180	34	2.1	1.1	—	**7220C-5**	186	127	6.95	14.6	8 200	13 000	35.9	140	3.32	74.2	—	—	112	—	168	173	2	1	—	25 000	0.01~0.02	**7220C-5**
	180	34	2.1	1.1	—	**7220-5**	171	117	6.10	—	6 300	8 200	57.7	139	3.32	39	—	—	112	—	168	173	2	1	—	25 000	0.01~0.02	**7220-5**
105	145	20	1.1	0.6	—	**7921C-5**	70.8	61.5	2.90	16.4	9 900	15 000	26.7	37	0.810	34	—	—	112	—	138	140.5	1	0.6	—	15 000	0.02~0.04	**7921C-5**
	145	20	1.1	0.6	—	**HAR921C**	31.1	23.1	1.05	8.70	11 000	18 000	26.7	29	0.874	29.6	—	—	112	—	138	140.5	1	0.6	—	15 000	0.02~0.04	**HAR921C**
	145	20	1.1	0.6	—	**HAR921CA**	30.3	22.5	1.05	—	11 000	16 000	32.7	29	0.874	34.6	—	—	112	—	138	140.5	1	0.6	—	15 000	0.02~0.04	**HAR921CA**
	145	20	1.1	0.6	—	**HAR921**	28.2	20.9	0.970	—	7 900	10 000	46.1	29	0.874	29.1	—	—	112	—	138	140.5	1	0.6	—	15 000	0.02~0.04	**HAR921**
	145	20	1.1	0.6	—	**3NCHAC921C**	49.8	31.2	1.45	8.30	15 000	26 000	26.7	40	0.658	25.3	—	—	112	—	138	140.5	1	0.6	—	15 000	0.02~0.04	**3NCHAC921C**
	145	20	1.1	0.6	—	**3NCHAC921CA**	48.7	30.5	1.40	—	15 000	25 000	32.7	40	0.658	30.7	—	—	112	—	138	140.5	1	0.6	—	15 000	0.02~0.04	**3NCHAC921CA**
	160	26	2	1	—	**7021C-5**	110	89.6	4.30	15.9	8 600	13 000	31	68	1.73	48.9	—	—	115	—	150	154.5	2	1	—	20 000	0.02~0.04	**7021C-5**
	160	26	2	1	—	**7021-5**	99.7	81.9	3.80	—	6 500	8 600	51.8	68	1.73	25	—	—	115	—	150	154.5	2	1	—	20 000	0.02~0.04	**7021-5**
	160	26	2	1	—	**HAR021C**	48.2	32.5	1.45	8.50	11 000	16 000	30.8	57	1.68	41.4	—	—	115	—	150	154.5	2	1	—	20 000	0.02~0.04	**HAR021C**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.

2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.

3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

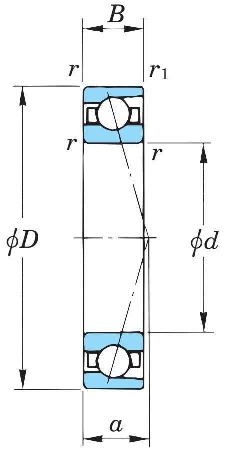
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r\times1.62$	$C_{0r}\times2$
3-row	$C_r\times2.16$	$C_{0r}\times3$
4-row	$C_r\times2.64$	$C_{0r}\times4$

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting			
		Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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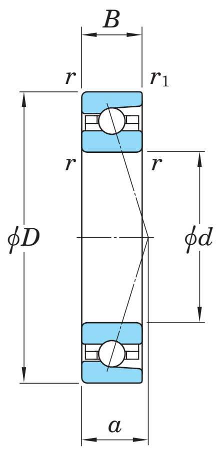

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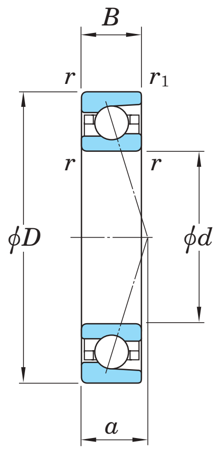

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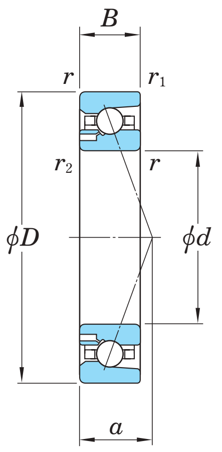

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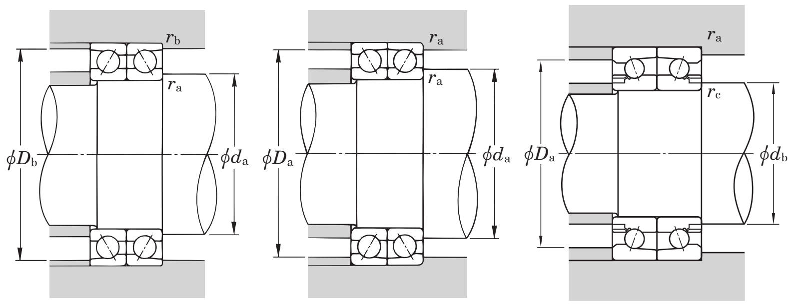


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem X_0	Single row/ Tandem Y_0	Back-to-back/ Face-to-face X_0	Back-to-back/ Face-to-face Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ 1)	e	Single row/Tandem $\frac{F_a}{F_r}\leqq e$ X	Single row/Tandem $\frac{F_a}{F_r}\leqq e$ Y	Single row/Tandem $\frac{F_a}{F_r}>e$ X	Single row/Tandem $\frac{F_a}{F_r}>e$ Y	Back-to-back/Face-to-face $\frac{F_a}{F_r}\leqq e$ X	Back-to-back/Face-to-face $\frac{F_a}{F_r}\leqq e$ Y	Back-to-back/Face-to-face $\frac{F_a}{F_r}>e$ X	Back-to-back/Face-to-face $\frac{F_a}{F_r}>e$ Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d (105) ~ (120)

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No. 1)	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
105	160	26	2	1	—	**HAR021CA**	47.1	31.7	1.45	—	10 000	15 000	37.1	57	1.68	48.6	—	—	115	—	150	154.5	2	1	—	20 000	0.02~0.04	**HAR021CA**
	160	26	2	1	—	**HAR021**	43.8	29.5	1.35	—	7 500	10 000	51.2	57	1.68	42	—	—	115	—	150	154.5	2	1	—	20 000	0.02~0.04	**HAR021**
	160	26	2	1	—	**3NCHAC021C**	76.2	45.6	2.05	8.10	15 000	25 000	31	71	1.28	36.7	—	—	115	—	150	154.5	2	1	—	20 000	0.02~0.04	**3NCHAC021C**
	160	26	2	1	—	**3NCHAC021CA**	74.6	44.6	2.00	—	13 000	23 000	37.5	71	1.28	44.8	—	—	115	—	150	154.5	2	1	—	20 000	0.02~0.04	**3NCHAC021CA**
	160	26	2	1	0.6	**3NCHAD021CA**	47.1	31.8	1.45	—	—	25 000	37.1	—	1.65	32	—	—	115	110	150	154.5	2	1	0.6	20 000	0.02~0.04	**3NCHAD021CA**
	190	36	2.1	1.1	—	**7221C-5**	203	143	7.60	14.6	7 700	12 000	38	171	3.95	84.8	—	—	117	—	178	183	2	1	—	30 000	0.02~0.04	**7221C-5**
	190	36	2.1	1.1	—	**7221-5**	187	132	6.70	—	5 800	7 700	61	171	3.95	44.8	—	—	117	—	178	183	2	1	—	30 000	0.02~0.04	**7221-5**
110	150	20	1.1	0.6	—	**7922C-5**	72.2	64.4	2.95	16.5	9 500	15 000	27.4	40	0.840	34.2	—	—	117	—	143	145.5	1	0.6	—	15 000	0.02~0.04	**7922C-5**
	150	20	1.1	0.6	—	**HAR922C**	31.4	23.8	1.10	8.70	11 000	16 000	27.4	30	0.909	30.5	—	—	117	—	143	145.5	1	0.6	—	15 000	0.02~0.04	**HAR922C**
	150	20	1.1	0.6	—	**HAR922CA**	30.6	23.2	1.05	—	10 000	16 000	33.7	30	0.909	35.7	—	—	117	—	143	145.5	1	0.6	—	15 000	0.02~0.04	**HAR922CA**
	150	20	1.1	0.6	—	**HAR922**	28.4	21.6	0.980	—	7 700	10 000	47.5	30	0.909	29.9	—	—	117	—	143	145.5	1	0.6	—	15 000	0.02~0.04	**HAR922**
	150	20	1.1	0.6	—	**3NCHAC922C**	50.9	32.7	1.50	8.40	15 000	25 000	27.4	41	0.687	26.5	—	—	117	—	143	145.5	1	0.6	—	15 000	0.02~0.04	**3NCHAC922C**
	150	20	1.1	0.6	—	**3NCHAC922CA**	49.7	31.9	1.45	—	14 000	23 000	33.7	41	0.687	32.1	—	—	117	—	143	145.5	1	0.6	—	15 000	0.02~0.04	**3NCHAC922CA**
	170	28	2	1	—	**7022C-5**	126	101	4.85	15.7	8 200	13 000	32.8	80	2.14	50.3	—	—	120	—	160	164.5	2	1	—	20 000	0.02~0.04	**7022C-5**
	170	28	2	1	—	**7022-5**	115	92.8	4.30	—	6 300	8 200	54.4	80	2.14	25.2	—	—	120	—	160	164.5	2	1	—	20 000	0.02~0.04	**7022-5**
	170	28	2	1	—	**HAR022C**	54.2	37.0	1.60	8.50	10 000	16 000	32.8	68	2.11	47.1	—	—	120	—	160	164.5	2	1	—	20 000	0.02~0.04	**HAR022C**
	170	28	2	1	—	**HAR022CA**	52.9	36.1	1.60	—	9 900	15 000	39.5	68	2.11	55.2	—	—	120	—	160	164.5	2	1	—	20 000	0.02~0.04	**HAR022CA**
	170	28	2	1	—	**HAR022**	49.3	33.6	1.45	—	7 100	9 500	54.4	68	2.11	47	—	—	120	—	160	164.5	2	1	—	20 000	0.02~0.04	**HAR022**
	170	28	2	1	—	**3NCHAC022C**	87.4	51.6	2.25	8.00	14 000	23 000	32.8	89	1.60	41.6	—	—	120	—	160	164.5	2	1	—	20 000	0.02~0.04	**3NCHAC022C**
	170	28	2	1	—	**3NCHAC022CA**	85.5	50.4	2.20	—	13 000	22 000	39.5	89	1.60	50.7	—	—	120	—	160	164.5	2	1	—	20 000	0.02~0.04	**3NCHAC022CA**
	170	28	2	1	0.6	**3NCHAD022CA**	52.9	36.1	1.60	—	—	23 000	39.5	—	2.06	36.4	—	—	120	115	160	164.5	2	1	0.6	20 000	0.02~0.04	**3NCHAD022CA**
	200	38	2.1	1.1	—	**7222C-5**	220	160	8.35	14.5	7 200	11 000	40	202	4.65	95.9	—	—	122	—	188	193	2	1	—	30 000	0.02~0.04	**7222C-5**
	200	38	2.1	1.1	—	**7222-5**	202	148	7.30	—	5 600	7 200	64.3	202	4.65	50.9	—	—	122	—	188	193	2	1	—	30 000	0.02~0.04	**7222-5**
120	165	22	1.1	0.6	—	**7924C-5**	89.7	81.2	3.55	16.5	8 600	13 000	30.1	57	1.15	44.9	—	—	127	—	158	160.5	1	0.6	—	15 000	0.02~0.04	**7924C-5**
	165	22	1.1	0.6	—	**HAR924C**	36.7	28.4	1.25	8.80	10 000	15 000	30.1	40	1.25	36.3	—	—	127	—	158	160.5	1	0.6	—	15 000	0.02~0.04	**HAR924C**
	165	22	1.1	0.6	—	**HAR924CA**	35.8	27.7	1.20	—	9 800	15 000	36.9	40	1.25	42.4	—	—	127	—	158	160.5	1	0.6	—	15 000	0.02~0.04	**HAR924CA**
	165	22	1.1	0.6	—	**HAR924**	33.2	25.7	1.10	—	7 000	9 300	52.1	40	1.25	34.8	—	—	127	—	158	160.5	1	0.6	—	15 000	0.02~0.04	**HAR924**
	165	22	1.1	0.6	—	**3NCHAC924C**	63.2	41.2	1.80	8.40	14 000	23 000	30.1	55	0.934	33.4	—	—	127	—	158	160.5	1	0.6	—	15 000	0.02~0.04	**3NCHAC924C**
	165	22	1.1	0.6	—	**3NCHAC924CA**	61.7	40.3	1.75	—	13 000	22 000	36.9	55	0.934	40.5	—	—	127	—	158	160.5	1	0.6	—	15 000	0.02~0.04	**3NCHAC924CA**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

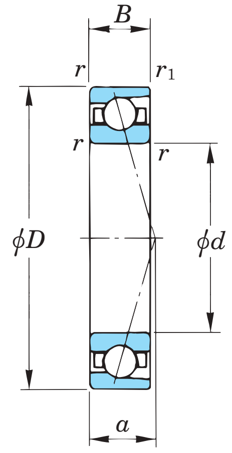
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r\times1.62$	$C_{0r}\times2$
3-row	$C_r\times2.16$	$C_{0r}\times3$
4-row	$C_r\times2.64$	$C_{0r}\times4$

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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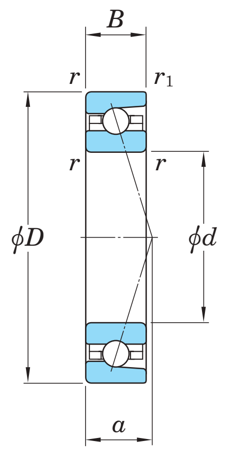

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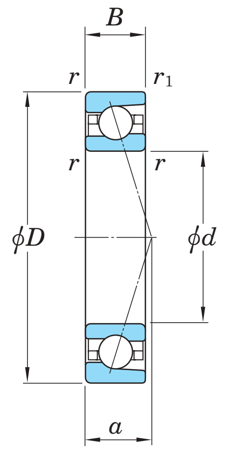

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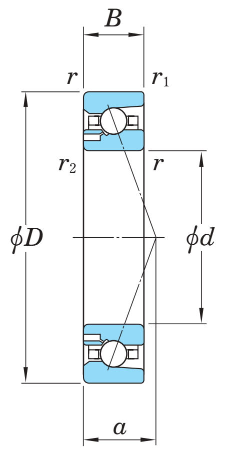

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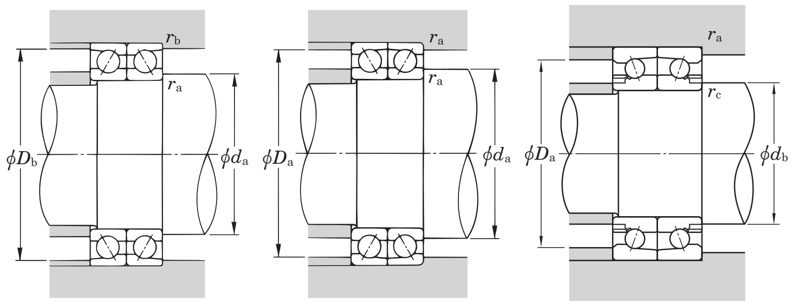


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0 = X_0F_r + Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0 = F_r$ if $P_0 < F_r$.

Dynamic equivalent load $P = XF_r + YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ [1]	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$		$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

[1] For i, use 2 for DB & DF and 1 for single & DT.

d (120) ~ (140)

Boundary dimensions (mm)						Bearing No. [1]	Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min⁻¹)		Load center (mm)	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN)	Dimensions of lubrication groove (mm)		Mounting dimensions (mm)							Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
d	D	B	r min.	r_1 min.	r_2 min.		C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.	a			(static)	S	W	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.			
120	180	28	2	1	—	**7024C-5**	133	113	5.10	16.0	7 700	12 000	34.1	85	2.27	60.8	—	—	130	—	170	174.5	2	1	—	20 000	0.02~0.04	**7024C-5**
	180	28	2	1	—	**7024-5**	121	103	4.50	—	5 800	7 700	57.3	78	2.27	31.9	—	—	130	—	170	174.5	2	1	—	20 000	0.02~0.04	**7024-5**
	180	28	2	1	—	**HAR024C**	56.1	39.9	1.70	8.50	9 800	15 000	34.1	73	2.26	50.9	—	—	130	—	170	174.5	2	1	—	20 000	0.02~0.04	**HAR024C**
	180	28	2	1	—	**HAR024CA**	54.8	39.0	1.65	—	9 300	14 000	41.3	73	2.26	59.7	—	—	130	—	170	174.5	2	1	—	20 000	0.02~0.04	**HAR024CA**
	180	28	2	1	—	**HAR024**	50.9	36.2	1.55	—	6 700	8 800	57.3	73	2.26	50.3	—	—	130	—	170	174.5	2	1	—	20 000	0.02~0.04	**HAR024**
	180	28	2	1	—	**3NCHAC024C**	92.5	57.5	2.40	8.10	13 000	22 000	34.1	95	1.72	46.4	—	—	130	—	170	174.5	2	1	—	20 000	0.02~0.04	**3NCHAC024C**
	180	28	2	1	—	**3NCHAC024CA**	90.4	56.2	2.35	—	12 000	21 000	41.3	95	1.72	56.5	—	—	130	—	170	174.5	2	1	—	20 000	0.02~0.04	**3NCHAC024CA**
	180	28	2	1	0.6	**3NCHAD024CA**	54.8	39.0	1.65	—	—	22 000	41.3	—	2.21	39.3	—	—	130	125	170	174.5	2	1	0.6	20 000	0.02~0.04	**3NCHAD024CA**
	215	40	2.1	1.1	—	**7224C-5**	237	180	8.95	14.6	6 800	10 000	42.5	241	5.49	108	—	—	132	—	203	208	2	1	—	30 000	0.02~0.04	**7224C-5**
	215	40	2.1	1.1	—	**7224-5**	218	166	7.85	—	5 100	6 800	68.5	240	5.49	57.5	—	—	132	—	203	208	2	1	—	30 000	0.02~0.04	**7224-5**
130	180	24	1.5	1	—	**7926C-5**	109	99.9	4.20	16.4	7 800	12 000	32.8	61	1.50	53.4	—	—	138.5	—	171.5	174.5	1.5	1	—	20 000	0.02~0.04	**7926C-5**
	180	24	1.5	1	—	**HAR926C**	43.9	35.1	1.45	8.80	9 300	14 000	32.8	51	1.66	44.9	—	—	138.5	—	171.5	174.5	1.5	1	—	20 000	0.02~0.04	**HAR926C**
	180	24	1.5	1	—	**HAR926CA**	42.8	34.3	1.40	—	8 900	13 000	40.2	51	1.66	52.5	—	—	138.5	—	171.5	174.5	1.5	1	—	20 000	0.02~0.04	**HAR926CA**
	180	24	1.5	1	—	**HAR926**	39.7	31.8	1.30	—	6 400	8 500	56.7	51	1.66	42.3	—	—	138.5	—	171.5	174.5	1.5	1	—	20 000	0.02~0.04	**HAR926**
	180	24	1.5	1	—	**3NCHAC926C**	76.6	50.8	2.10	8.30	12 000	21 000	32.8	72	1.23	41.1	—	—	138.5	—	171.5	174.5	1.5	1	—	20 000	0.02~0.04	**3NCHAC926C**
	180	24	1.5	1	—	**3NCHAC926CA**	74.8	49.6	2.05	—	12 000	19 000	40.3	72	1.23	49.9	—	—	138.5	—	171.5	174.5	1.5	1	—	20 000	0.02~0.04	**3NCHAC926CA**
	200	33	2	1	—	**7026C-5**	161	137	5.95	15.9	7 000	11 000	38.6	130	3.43	74.7	—	—	140	—	190	194.5	2	1	—	20 000	0.02~0.04	**7026C-5**
	200	33	2	1	—	**7026-5**	147	125	5.25	—	5 300	7 000	64.1	129	3.43	39.4	—	—	140	—	190	194.5	2	1	—	20 000	0.02~0.04	**7026-5**
	200	33	2	1	—	**HAR026C**	70.4	48.4	1.95	8.50	8 800	13 000	38.6	115	3.38	61.6	—	—	140	—	190	194.5	2	1	—	20 000	0.02~0.04	**HAR026C**
	200	33	2	1	—	**HAR026CA**	68.7	47.2	1.90	—	8 400	12 000	46.5	115	3.38	72.2	—	—	140	—	190	194.5	2	1	—	20 000	0.02~0.04	**HAR026CA**
	200	33	2	1	—	**HAR026**	64.0	43.9	1.75	—	6 000	8 100	64.1	115	3.38	62.3	—	—	140	—	190	194.5	2	1	—	20 000	0.02~0.04	**HAR026**
	200	33	2	1	—	**3NCHAC026C**	112	69.7	2.80	8.10	12 000	19 000	38.6	139	2.68	56.3	—	—	140	—	190	194.5	2	1	—	20 000	0.02~0.04	**3NCHAC026C**
	200	33	2	1	—	**3NCHAC026CA**	110	68.2	2.75	—	11 000	19 000	46.5	139	2.68	68.6	—	—	140	—	190	194.5	2	1	—	20 000	0.02~0.04	**3NCHAC026CA**
	200	33	2	1	0.6	**3NCHAD026CA**	68.7	47.2	1.90	—	—	19 000	46.5	—	3.30	47.6	—	—	140	135	190	194.5	2	1	0.6	20 000	0.02~0.04	**3NCHAD026CA**
	230	40	3	1.1	—	**7226C-5**	266	214	8.25	14.7	6 300	10 000	44.1	258	6.21	116	—	—	144	—	216	223	2.5	1	—	30 000	0.02~0.04	**7226C-5**
	230	40	3	1.1	—	**7226-5**	245	198	7.60	—	4 700	6 300	72	257	6.21	62.1	—	—	144	—	216	223	2.5	1	—	30 000	0.02~0.04	**7226-5**
140	190	24	1.5	1	—	**7928C-5**	110	105	4.20	16.6	7 400	11 000	34.1	66	1.59	55.6	—	—	148.5	—	181.5	184.5	1.5	1	—	20 000	0.02~0.04	**7928C-5**
	190	24	1.5	1	—	**HAR928C**	44.0	36.2	1.45	8.80	8 800	13 000	34.1	57	1.76	46.3	—	—	148.5	—	181.5	184.5	1.5	1	—	20 000	0.02~0.04	**HAR928C**
	190	24	1.5	1	—	**HAR928CA**	42.9	35.3	1.40	—	8 400	12 000	42	57	1.76	54.2	—	—	148.5	—	181.5	184.5	1.5	1	—	20 000	0.02~0.04	**HAR928CA**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

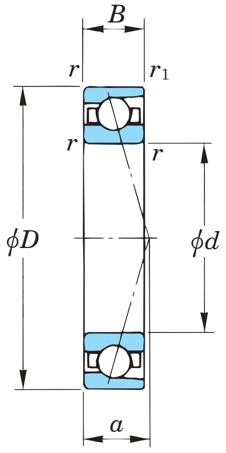
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	$C_r \times 1.62$	$C_{0r} \times 2$
3-row	$C_r \times 2.16$	$C_{0r} \times 3$
4-row	$C_r \times 2.64$	$C_{0r} \times 4$

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting			
		Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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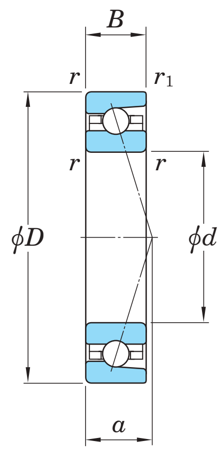

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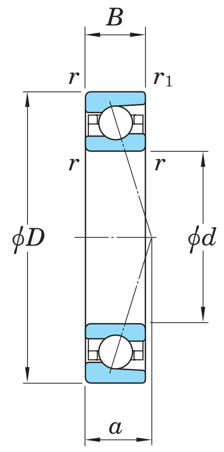

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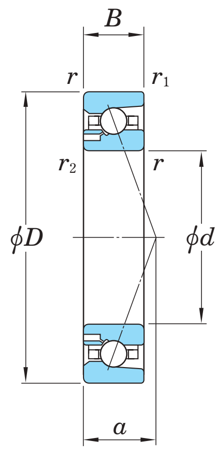

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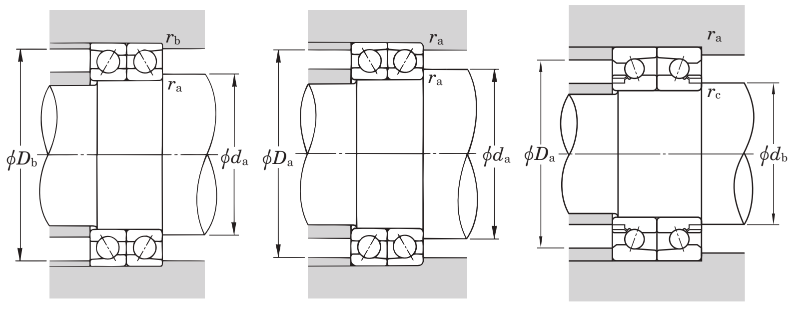


We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem		Back-to-back/ Face-to-face	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ 1)	e	Single row/Tandem				Back-to-back/Face-to-face			
			$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$		$\frac{F_a}{F_r}\leqq e$		$\frac{F_a}{F_r}>e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40				1.40		1.57		2.28
	0.714	0.43				1.30		1.46		2.11
	1.07	0.46				1.23		1.38		2.00
	1.43	0.47				1.19		1.34		1.93
	2.14	0.50				1.12		1.26		1.82
	3.57	0.55				1.02		1.14		1.66
	5.35	0.56				1.00		1.12		1.63
	7.14	0.56				1.00		1.12		1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d (140) ~ (160)

Boundary dimensions (mm)						Bearing No. 1)	Basic load ratings (kN)		Fatigue load limit (kN)	Factor	Limiting speeds (min⁻¹)		Load center (mm)	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN)	Dimensions of lubrication groove (mm)		Mounting dimensions (mm)							Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
d	D	B	r min.	r_1 min.	r_2 min.		C_r	C_{0r}	C_u	f_0	Grease lub.	Oil lub.	a			(static)	S	W	d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.			
140	190	24	1.5	1	—	**HAR928**	39.8	32.8	1.30	—	6 000	8 100	59.6	57	1.76	43.3	—	—	148.5	—	181.5	184.5	1.5	1	—	20 000	0.02~0.04	**HAR928**
	190	24	1.5	1	—	**3NCHAC928C**	77.9	53.2	2.15	8.40	12 000	19 000	34.1	77	1.31	43.2	—	—	148.5	—	181.5	184.5	1.5	1	—	20 000	0.02~0.04	**3NCHAC928C**
	190	24	1.5	1	—	**3NCHAC928CA**	76.0	52.0	2.10	—	11 000	19 000	42	77	1.31	52.4	—	—	148.5	—	181.5	184.5	1.5	1	—	20 000	0.02~0.04	**3NCHAC928CA**
	210	33	2	1	—	**7028C-5**	165	145	6.00	16.0	6 500	10 000	39.9	137	3.64	78.3	—	—	150	—	200	204.5	2	1	—	25 000	0.02~0.04	**7028C-5**
	210	33	2	1	—	**7028-5**	150	133	5.30	—	5 000	6 400	67	136	3.64	41.3	—	—	150	—	200	204.5	2	1	—	25 000	0.02~0.04	**7028-5**
	210	33	2	1	—	**HAR028C**	76.7	56.2	2.20	8.50	8 400	12 000	39.9	120	3.62	71.6	—	—	150	—	200	204.5	2	1	—	25 000	0.02~0.04	**HAR028C**
	210	33	2	1	—	**HAR028CA**	74.8	54.8	2.15	—	7 900	12 000	48.3	120	3.62	84	—	—	150	—	200	204.5	2	1	—	25 000	0.02~0.04	**HAR028CA**
	210	33	2	1	—	**HAR028**	69.6	51.0	2.00	—	5 700	7 500	67	120	3.62	71.9	—	—	150	—	200	204.5	2	1	—	25 000	0.02~0.04	**HAR028**
	210	33	2	1	—	**3NCHAC028C**	115	73.8	2.90	8.20	11 000	19 000	40	146	2.84	59.6	—	—	150	—	200	204.5	2	1	—	25 000	0.02~0.04	**3NCHAC028C**
	210	33	2	1	—	**3NCHAC028CA**	112	72.1	2.80	—	10 000	18 000	48.4	146	2.84	72.6	—	—	150	—	200	204.5	2	1	—	25 000	0.02~0.04	**3NCHAC028CA**
	250	42	3	1.1	—	**7228C-5**	297	254	9.40	14.8	5 700	9 100	47.1	301	7.76	136	—	—	154	—	236	243	2.5	1	—	35 000	0.02~0.04	**7228C-5**
	250	42	3	1.1	—	**7228-5**	273	234	8.65	—	4 300	5 700	77.3	300	7.76	72.8	—	—	154	—	236	243	2.5	1	—	35 000	0.02~0.04	**7228-5**
150	210	28	2	1	—	**7930C-5**	148	132	5.45	16.3	6 700	10 000	38.1	117	2.47	69	—	—	160	—	200	204.5	2	1	—	20 000	0.02~0.04	**7930C-5**
	210	28	2	1	—	**HAR930C**	61.2	48.9	1.90	8.70	8 100	12 000	38.1	85	2.68	62.5	—	—	160	—	200	204.5	2	1	—	20 000	0.02~0.04	**HAR930C**
	210	28	2	1	—	**HAR930CA**	59.7	47.6	1.85	—	7 700	11 000	46.8	85	2.68	73.1	—	—	160	—	200	204.5	2	1	—	20 000	0.02~0.04	**HAR930CA**
	210	28	2	1	—	**HAR930**	55.4	44.2	1.70	—	5 600	7 400	66	85	2.68	60.3	—	—	160	—	200	204.5	2	1	—	20 000	0.02~0.04	**HAR930**
	210	28	2	1	—	**3NCHAC930C**	104	69.8	2.70	8.30	10 000	16 000	38.1	118	2.00	56.5	—	—	160	—	200	204.5	2	1	—	20 000	0.02~0.04	**3NCHAC930C**
	210	28	2	1	—	**3NCHAC930CA**	102	68.2	2.65	—	9 800	16 000	46.8	118	2.00	68.7	—	—	160	—	200	204.5	2	1	—	20 000	0.02~0.04	**3NCHAC930CA**
	225	35	2.1	1.1	—	**7030C-5**	188	169	6.70	16.1	6 000	9 500	42.8	169	4.43	89.9	—	—	162	—	213	218	2	1	—	25 000	0.02~0.04	**7030C-5**
	225	35	2.1	1.1	—	**7030-5**	171	154	5.95	—	4 600	6 000	72.1	168	4.43	47.1	—	—	162	—	213	218	2	1	—	25 000	0.02~0.04	**7030-5**
	225	35	2	1	—	**HAR030C**	90.3	66.1	2.50	8.50	7 400	11 000	42.6	150	4.36	84.2	—	—	160	—	215	219.5	2	1	—	25 000	0.02~0.04	**HAR030C**
	225	35	2	1	—	**HAR030CA**	88.1	64.5	2.45	—	7 000	10 000	51.6	150	4.36	98.8	—	—	160	—	215	219.5	2	1	—	25 000	0.02~0.04	**HAR030CA**
	225	35	2	1	—	**HAR030**	82.0	60.0	2.25	—	5 000	6 700	71.6	150	4.36	82.9	—	—	160	—	215	219.5	2	1	—	25 000	0.02~0.04	**HAR030**
	225	35	2.1	1.1	—	**3NCHAC030C**	131	85.7	3.20	8.20	9 900	16 000	42.8	176	3.44	69.2	—	—	162	—	213	218	2	1	—	25 000	0.02~0.04	**3NCHAC030C**
	225	35	2.1	1.1	—	**3NCHAC030CA**	128	83.7	3.15	—	9 300	15 000	51.9	176	3.44	84.2	—	—	162	—	213	218	2	1	—	25 000	0.02~0.04	**3NCHAC030CA**
160	220	28	2	1	—	**7932C-5**	151	144	5.45	16.5	6 300	9 800	39.5	116	2.60	75.1	—	—	170	—	210	214.5	2	1	—	25 000	0.02~0.04	**7932C-5**
	220	28	2	1	—	**HAR932C**	62.7	51.8	1.95	8.80	7 200	11 000	39.5	90	2.83	66.3	—	—	170	—	210	214.5	2	1	—	25 000	0.02~0.04	**HAR932C**
	220	28	2	1	—	**HAR932CA**	61.2	50.5	1.90	—	7 000	10 000	48.6	90	2.83	77.5	—	—	170	—	210	214.5	2	1	—	25 000	0.02~0.04	**HAR932CA**
	220	28	2	1	—	**HAR932**	56.7	46.9	1.75	—	5 000	6 500	68.8	90	2.83	63.6	—	—	170	—	210	214.5	2	1	—	25 000	0.02~0.04	**HAR932**
	220	28	2	1	—	**3NCHAC932C**	106	73.3	2.75	8.40	9 900	16 000	39.5	124	2.11	59.4	—	—	170	—	210	214.5	2	1	—	25 000	0.02~0.04	**3NCHAC932C**

[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

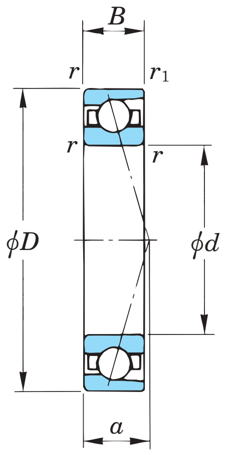
Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	C_r×1.62	C_{0r}×2
3-row	C_r×2.16	C_{0r}×3
4-row	C_r×2.64	C_{0r}×4

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting			
		Preload S	Preload L	Preload M	Preload H
∅ ⦸	DB	0.85	0.80	0.65	0.55
∅∅ ⦸⦸	DBB	0.80	0.75	0.60	0.45
∅∅ ⦸	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.



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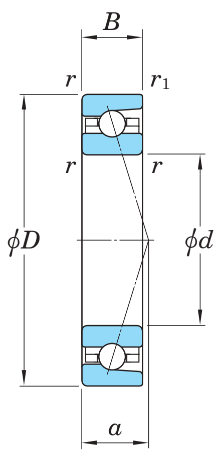
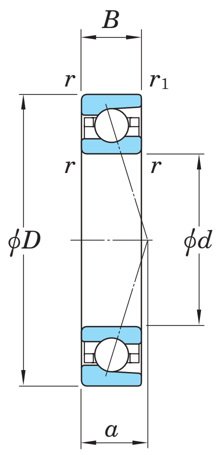
7900
7200



HAR



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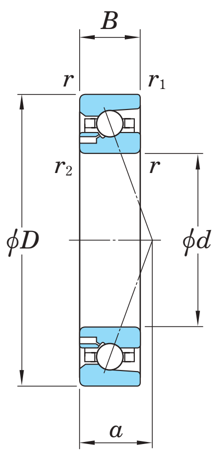
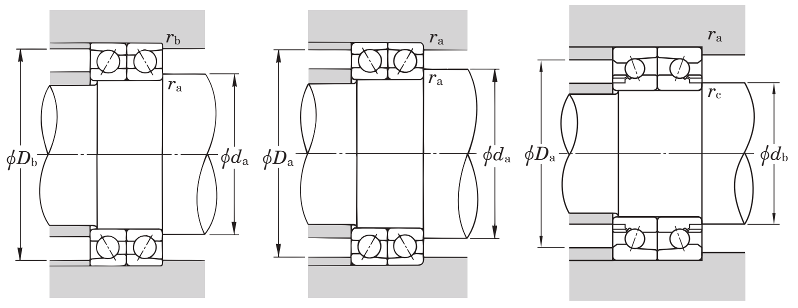


3NCHAD



We recommend that recesses be added at r_a, r_b, and r_c.

Static equivalent load $P_0=X_0F_r+Y_0F_a$

Contact angle	Single row/ Tandem X_0	Single row/ Tandem Y_0	Back-to-back/ Face-to-face X_0	Back-to-back/ Face-to-face Y_0
15°	0.5	0.46	1	0.92
20°	0.5	0.42	1	0.84
30°	0.5	0.33	1	0.66

Note that in the case of single row or tandem, assume $P_0=F_r$ if $P_0<F_r$.

Dynamic equivalent load $P=XF_r+YF_a$

Contact angle	$\frac{if_0F_a}{C_{0r}}$ 1)	e	Single row/Tandem $\frac{F_a}{F_r}\leqq e$ X	Single row/Tandem $\frac{F_a}{F_r}\leqq e$ Y	Single row/Tandem $\frac{F_a}{F_r}>e$ X	Single row/Tandem $\frac{F_a}{F_r}>e$ Y	Back-to-back/Face-to-face $\frac{F_a}{F_r}\leqq e$ X	Back-to-back/Face-to-face $\frac{F_a}{F_r}\leqq e$ Y	Back-to-back/Face-to-face $\frac{F_a}{F_r}>e$ X	Back-to-back/Face-to-face $\frac{F_a}{F_r}>e$ Y
15°	0.178 0.357 0.714 1.07 1.43 2.14 3.57 5.35 7.14	0.38 0.40 0.43 0.46 0.47 0.50 0.55 0.56 0.56	1	0	0.44	1.47 1.40 1.30 1.23 1.19 1.12 1.02 1.00 1.00	1	1.65 1.57 1.46 1.38 1.34 1.26 1.14 1.12 1.12	0.72	2.39 2.28 2.11 2.00 1.93 1.82 1.66 1.63 1.63
20°		0.57	1	0	0.43	1	1	1.09	0.70	1.63
30°		0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

1) For i, use 2 for DB & DF and 1 for single & DT.

d (160) ~ 190

Boundary dimensions (mm) d	D	B	r min.	r_1 min.	r_2 min.	Bearing No.	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Factor f_0	Limiting speeds (min⁻¹) Grease lub.	Oil lub.	Load center (mm) a	Interspace volume (cm³/row)	(Refer.) Mass (kg/row)	Permissible axial load (kN) (static)	Dimensions of lubrication groove (mm) S	W	Mounting dimensions (mm) d_a min.	d_b min.	D_a max.	D_b max.	r_a max.	r_b max.	r_c max.	Nut axial tension (N)	Interference of retaining plate (mm)	Bearing No.
160	220	28	2	1	—	**3NCHAC932CA**	104	71.6	2.70	—	9 200	15 000	48.6	124	2.11	72.1	—	—	170	—	210	214.5	2	1	—	25 000	0.02~0.04	**3NCHAC932CA**
	240	38	2.1	1.1	—	**7032C-5**	214	193	7.50	16.0	5 600	8 900	45.8	232	5.45	111	—	—	172	—	228	233	2	1	—	30 000	0.02~0.04	**7032C-5**
	240	38	2.1	1.1	—	**7032-5**	194	176	6.65	—	4 300	5 600	76.8	232	5.45	60.7	—	—	172	—	228	233	2	1	—	30 000	0.02~0.04	**7032-5**
	240	38	2.1	1.1	—	**HAR032C**	97.8	72.7	2.65	8.50	7 000	10 000	45.8	186	5.40	92.7	—	—	172	—	228	233	2	1	—	30 000	0.02~0.04	**HAR032C**
	240	38	2.1	1.1	—	**HAR032CA**	95.5	71.0	2.60	—	6 500	10 000	55.4	186	5.40	108	—	—	172	—	228	233	2	1	—	30 000	0.02~0.04	**HAR032CA**
	240	38	2.1	1.1	—	**HAR032**	88.8	66.0	2.40	—	4 700	6 300	76.7	186	5.40	90	—	—	172	—	228	233	2	1	—	30 000	0.02~0.04	**HAR032**
	240	38	2.1	1.1	—	**3NCHAC032C**	149	98.1	3.60	8.10	9 300	15 000	45.8	223	4.23	79.3	—	—	172	—	228	233	2	1	—	30 000	0.02~0.04	**3NCHAC032C**
	240	38	2.1	1.1	—	**3NCHAC032CA**	145	95.9	3.50	—	8 800	15 000	55.4	223	4.23	96.5	—	—	172	—	228	233	2	1	—	30 000	0.02~0.04	**3NCHAC032CA**
170	230	28	2	1	—	**7934C-5**	153	151	5.50	16.6	5 800	9 200	40.8	115	3.21	78.1	—	—	180	—	220	224.5	2	1	—	25 000	0.02~0.04	**7934C-5**
	230	28	2	1	—	**HAR934C**	64.2	54.8	2.00	8.80	7 000	10 000	40.8	94	2.97	70.2	—	—	180	—	220	224.5	2	1	—	25 000	0.02~0.04	**HAR934C**
	230	28	2	1	—	**HAR934CA**	62.6	53.4	1.95	—	6 500	10 000	50.4	94	2.97	82	—	—	180	—	220	224.5	2	1	—	25 000	0.02~0.04	**HAR934CA**
	230	28	2	1	—	**HAR934**	58.0	49.6	1.80	—	4 700	6 300	71.7	94	2.97	66.9	—	—	180	—	220	224.5	2	1	—	25 000	0.02~0.04	**HAR934**
	230	28	2	1	—	**3NCHAC934C**	108	76.7	2.80	8.40	9 300	15 000	40.8	148	3.07	62.3	—	—	180	—	220	224.5	2	1	—	25 000	0.02~0.04	**3NCHAC934C**
	230	28	2	1	—	**3NCHAC934CA**	105	74.9	2.75	—	8 800	15 000	50.4	148	3.07	75.6	—	—	180	—	220	224.5	2	1	—	25 000	0.02~0.04	**3NCHAC934CA**
	260	42	2.1	1.1	—	**7034C-5**	256	234	8.95	15.9	5 100	8 100	49.8	301	7.57	128	—	—	182	—	248	253	2	1	—	30 000	0.02~0.04	**7034C-5**
	260	42	2.1	1.1	—	**7034-5**	232	214	7.90	—	3 900	5 100	83.1	301	7.58	67.8	—	—	182	—	248	253	2	1	—	30 000	0.02~0.04	**7034-5**
	260	42	2.1	1.1	—	**HAR034C**	115	86.4	3.05	8.50	6 400	9 900	49.8	236	7.32	110	—	—	182	—	248	253	2	1	—	30 000	0.02~0.04	**HAR034C**
	260	42	2.1	1.1	—	**HAR034CA**	112	84.3	2.95	—	6 100	9 300	60.1	236	7.32	129	—	—	182	—	248	253	2	1	—	30 000	0.02~0.04	**HAR034CA**
	260	42	2.1	1.1	—	**HAR034**	104	78.4	2.75	—	4 300	5 800	83.1	236	7.32	109	—	—	182	—	248	253	2	1	—	30 000	0.02~0.04	**HAR034**
	260	42	2.1	1.1	—	**3NCHAC034C**	177	119	4.20	8.10	8 800	14 000	49.8	299	5.76	96.2	—	—	182	—	248	253	2	1	—	30 000	0.02~0.04	**3NCHAC034C**
	260	42	2.1	1.1	—	**3NCHAC034CA**	173	117	4.10	—	8 200	13 000	60.1	299	5.76	117	—	—	182	—	248	253	2	1	—	30 000	0.02~0.04	**3NCHAC034CA**
180	250	33	2	1	—	**7936C-5**	200	188	7.05	16.4	5 400	8 500	45.3	178	4.68	100	—	—	190	—	240	244.5	2	1	—	25 000	0.02~0.04	**7936C-5**
190	260	33	2	1	—	**7938C-5**	198	197	6.85	16.5	5 100	7 900	46.6	195	4.83	113	—	—	200	—	250	254.5	2	1	—	25 000	0.02~0.04	**7938C-5**

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4** on page 41 to 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.
3. C, CA, and no character string in the bearing number indicate nominal contact angles of 15°, 20°, and 30°, respectively.

Basic load ratings in case of multiple-row combination bearing

	Basic dynamic load ratings	Basic static load ratings
2-row	C_r×1.62	C_{0r}×2
3-row	C_r×2.16	C_{0r}×3
4-row	C_r×2.64	C_{0r}×4

Speed coefficients in case of multiple-row combination bearing

Combination types	Combination symbols	Preload when mounting: Preload S	Preload L	Preload M	Preload H
∅ ⃠	DB	0.85	0.80	0.65	0.55
∅∅ ⃠⃠	DBB	0.80	0.75	0.60	0.45
∅∅ ⃠	DBD	0.75	0.70	0.55	0.40

*Speed coefficients also vary depending on the distance of bearings.
*Consult JTEKT for information on High Ability bearings.

2. Cylindrical Roller Bearings

Contents

Page

■ Bearing dimension tables

2. Cylindrical roller bearings

The cylindrical roller bearing has high radial rigidity and is suitable for high-speed rotation through an arrangement of many rollers and a line contact which is made between the rollers and raceways.

The bores of cylindrical roller bearings are either cylindrical or tapered. With a bearing having a tapered bore, its radial internal clearance can be set with ease to a given value by adjusting the extent to which the bearing is pushed onto the shaft.

2. 1 Types and features of cylindrical roller bearings

The cylindrical roller bearing is divided into two types: double row and single row bearings. Both having outer ring which is separable from the inner to facilitate mounting and dismounting from shaft and housing (see **Fig. 2. 1**).

1) Double row cylindrical roller bearings

The double row cylindrical roller bearing is classified into the NN30 and NNU49 series.

Some of these bearings have a lubrication groove and holes provided at the center of the outside surface of the outer rings in order to attain a sufficient supply of lubricant to the inside of the bearing (the suffix W is added).

2) Single row cylindrical roller bearings

Single row cylindrical roller bearings for the spindles of machine tools are often selected from the N10 series.

The bore and outside diameters of the N10 series are the same as those of the NN30: double row cylindrical roller bearing series.

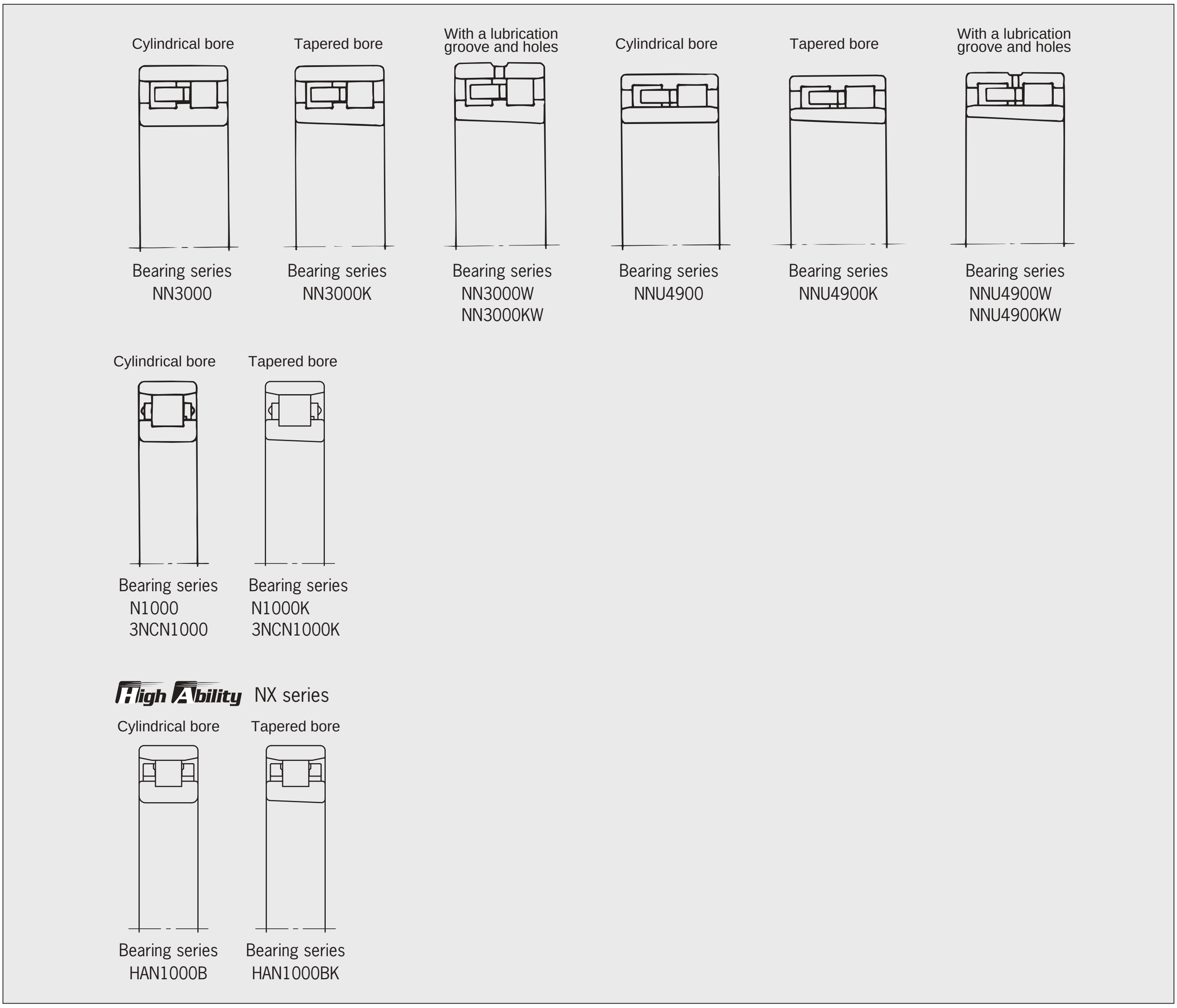


Fig. 2. 1 Types and series of cylindrical roller bearings for machine tool spindles

2. 2 Composition of bearing numbers (cylindrical roller bearings)

NN3009 KWC1NAFWP4
N1009 C1NAFYP4
HAN1009BK C1NAPGP4

Bearing type symbols
NN : double row/ inner ring with rib
NNU : double row/ outer ring with rib
N : single row/ inner ring with rib
HAN : High Ability NX series single row/ inner ring with rib Ultrahigh-speed type

Dimension series symbols
30 : dimension series 30
49 : dimension series 49
10 : dimension series 10

Bore diameter number
09 : nominal bore diameter : 45 mm
(Bore diameter number × 5 equals nominal bore diameter.)

Internal design code

Ring shape symbols
K : bearing with tapered bore (1/12 taper)
W : outer ring with a lubrication groove and holes

Tolerance class symbols
P5 : JIS class 5
P4 : JIS class 4
P2 : JIS class 2

Cage symbols
FW : separable machined cage made of copper alloy
FY : integrated machined cage made of copper alloy (Double row bearing) Machined cage made of copper alloy with rivets (single row bearing)
FG : molded cage made of polyamide resin
(Consult **JTEKT** for detailed information about the available types.)
PG : PEEK resin cage

Internal clearance symbols
C9NA ~C3NA : radial internal clearance of non-interchangeable bearings
(For values of radial internal clearances, see **Table 2. 2** (page 107).)

For ceramic bearings

3NCN1009C1NAFYP4

Ceramic bearing

2. 3 Tolerance of cylindrical roller bearings

1) Boundary dimension and running accuracies

The tolerance of precision cylindrical roller bearings is compliant with permissible dimensional deviations and limits of classes 5, 4, and 2 as specified in JIS B 1514 for radial bearings (tapered roller bearings not included).

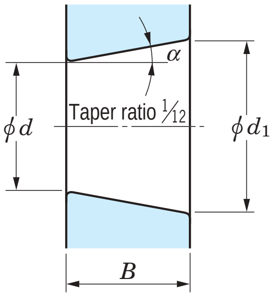
Permissible dimensional deviations and limits to boundary dimension and running accuracies are shown in **Table 1. 2** on page 61.

2) Permissible dimensional deviations and limits for tapered bores

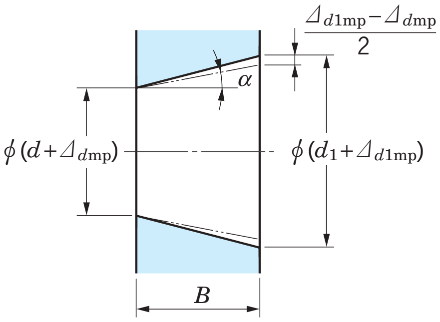
The dimensional deviations and limits for tapered bores of radial bearings of class 0 only are specified in JIS B 1514.

JTEKT has formulated special standards for dimensional deviations and limits for tapered bores of radial bearings of classes 5, 4, and 2 (see **Table 2. 1**).

Table 2. 1 Dimensional deviations and limits for tapered bores of radial bearings (classes 5, 4, and 2)



Theoretical tapered bore



Tapered bore with single plane mean bore diameter deviation

Unit : μm

Nominal bore diameter d (mm)		Δ_{dmp}				$\Delta_{d1mp}-\Delta_{dmp}$ [1)]		V_{dsp} [2)]				
								Diameter series 9		Diameter series 0		—
		Class 5		Classes 4, 2		Classes 5, 4, 2		Class 5	Class 4	Class 5	Class 4	Class 2
over	up to	upper	lower	upper	lower	upper	lower	max.		max.		max.
18	**30**	+10	0	+ 6	0	+ 3	0	6	5	5	4	2.5
30	**50**	+12	0	+ 8	0	+ 3	0	8	6	6	5	2.5
50	**80**	+15	0	+ 9	0	+ 5	0	9	7	7	5	4
80	**120**	+20	0	+10	0	+ 6	0	10	8	8	6	5
120	**180**	+25	0	+13	0	+ 8	0	13	10	10	8	7
180	**250**	+30	0	+15	0	+ 9	0	15	12	12	9	8
250	**315**	+35	0	+18	0	+10	0	18	15	14	11	—
315	**400**	+40	0	+23	0	+12	0	23	18	18	14	—

[Notes] 1) Permissible dimensional deviation for the taper angle is $4°46'18.8"^{+26"}_{0}$

2) Applied to all radial planes of tapered bores.

[Remarks] 1. **Scope** These values are applied to the tapered bores with a reference taper ratio of 1/12.

2. **Symbols for quantities**

d_1 : reference diameter at theoretical large end of tapered bore $d_1 = d + \frac{1}{12}B$

Δ_{dmp} : single plane mean bore diameter deviation at theoretical small end of tapered bore

Δ_{d1mp} : single plane mean bore diameter deviation at theoretical large end of tapered bore

V_{dsp} : single plane bore diameter variation

B : nominal inner ring width

α : $\frac{1}{2}$ of the nominal taper angle of tapered bore

$\alpha = 2°23'9.4"$
$= 2.385\ 94°$
$= 0.041\ 643$ rad

2. 4 Radial internal clearances of cylindrical roller bearings

In order to minimize variations in the running accuracy of machine tool spindles, the values of the radial internal clearance should be same as those of special radial internal clearance of non-interchangeable bearings.

Table 2. 2 shows values of non-interchangeable radial internal clearances for cylindrical roller bearings.

Since the inner and outer rings of cylindrical roller bearings for spindles of machine tools are not interchangeable, care should be taken when using them.

Table 2. 2 Values of radial internal clearances for cylindrical roller bearings

(1) Bearings with cylindrical bores

Unit : μm

Nominal bore diameter d (mm)		Values of non-interchangeable clearances of bearings with cylindrical bores							
		C1NA		C2NA		CNNA		C3NA	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.
24	**30**	5	10	10	25	25	35	40	50
30	**40**	5	12	12	25	25	40	45	55
40	**50**	5	15	15	30	30	45	50	65
50	**65**	5	15	15	35	35	50	55	75
65	**80**	10	20	20	40	40	60	70	90
80	**100**	10	25	25	45	45	70	80	105
100	**120**	10	25	25	50	50	80	95	120
120	**140**	15	30	30	60	60	90	105	135
140	**160**	15	35	35	65	65	100	115	150
160	**180**	15	35	35	75	75	110	125	165
180	**200**	20	40	40	80	80	120	140	180
200	**225**	20	45	45	90	90	135	155	200
225	**250**	25	50	50	100	100	150	170	215
250	**280**	25	55	55	110	110	165	185	240
280	**315**	30	60	60	120	120	180	205	265
315	**355**	30	65	65	135	135	200	225	295
355	**400**	35	75	75	150	150	225	255	330

(2) Bearings with tapered bores

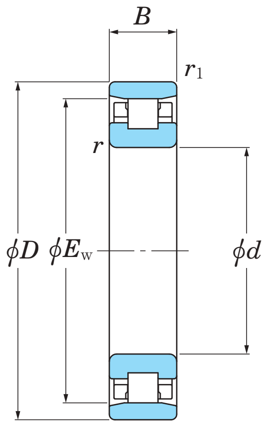
Unit : μm

Nominal bore diameter d (mm)		Values of non-interchangeable clearances of bearings with tapered bores											
		C9NA[1]		C0NA		C1NA		C2NA		CNNA		C3NA	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
24	**30**	5	10	10	20	10	25	25	35	40	50	50	60
30	**40**	5	12	10	20	12	25	25	40	45	55	55	70
40	**50**	5	15	10	20	15	30	30	45	50	65	65	80
50	**65**	5	15	10	20	15	35	35	50	55	75	75	90
65	**80**	10	20	15	30	20	40	40	60	70	90	90	110
80	**100**	10	25	20	35	25	45	45	70	80	105	105	125
100	**120**	10	25	20	35	25	50	50	80	95	120	120	145
120	**140**	15	30	25	40	30	60	60	90	105	135	135	160
140	**160**	15	35	30	45	35	65	65	100	115	150	150	180
160	**180**	15	35	30	45	35	75	75	110	125	165	165	200
180	**200**	20	40	30	50	40	80	80	120	140	180	180	220
200	**225**	20	45	35	55	45	90	90	135	155	200	200	240
225	**250**	25	50	40	65	50	100	100	150	170	215	215	265
250	**280**	25	55	40	65	55	110	110	165	185	240	240	295
280	**315**	30	60	45	75	60	120	120	180	205	265	265	325
315	**355**	30	65	45	75	65	135	135	200	225	295	295	360
355	**400**	35	75	50	90	75	150	150	225	255	330	330	405

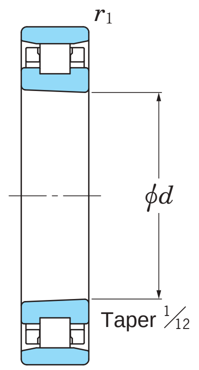
[Note] 1) The clearance C9NA is applied to cylindrical roller bearings with tapered bores made to JIS tolerance classes 5 and 4.

High Ability NX series

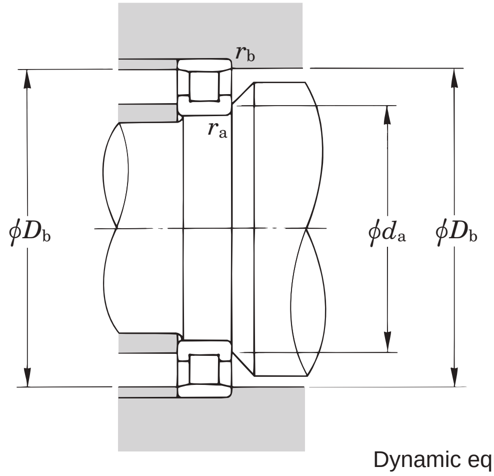
HAN1000B/BK series



Cylindrical bore



Tapered bore



Dynamic equivalent load $P_r = F_r$

Static equivalent load $P_{0r} = F_r$

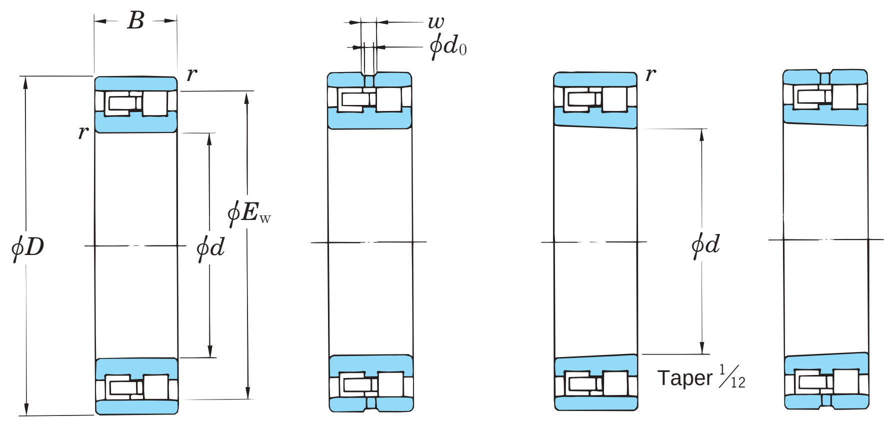
Boundary dimensions (mm)						Bearing No.		Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})	Mounting dimensions (mm)					(Refer.) Mass (kg)	
d	D	B	r min.	r_1 min.	E_W	Cylindrical bore	Tapered bore	C_r	C_{0r}	C_u	Oil lub.	d_a min.	D_b max.	D_b min.	r_a max.	r_b max.	Cylindrical bore	Tapered bore
45	75	16	1	0.6	67.5	**HAN1009B**	**HAN1009BK**	36.9	29.9	3.90	40 000	50	70	68.5	1	0.6	0.224	0.219
50	80	16	1	0.6	72.5	**HAN1010B**	**HAN1010BK**	40.4	34.5	4.50	37 000	55	75	73.5	1	0.6	0.257	0.251
55	90	18	1.1	1	81.0	**HAN1011B**	**HAN1011BK**	43.5	39.5	5.20	33 000	61.5	83.5	82	1	1	0.380	0.373
60	95	18	1.1	1	86.1	**HAN1012B**	**HAN1012BK**	44.8	42.0	5.50	31 000	66.5	88.5	87	1	1	0.407	0.400
65	100	18	1.1	1	91.0	**HAN1013B**	**HAN1013BK**	46.2	44.5	5.90	29 000	71.5	93.5	92	1	1	0.442	0.433
70	110	20	1.1	1	100	**HAN1014B**	**HAN1014BK**	72.9	70.4	9.10	27 000	76.5	103.5	101	1	1	0.599	0.586
75	115	20	1.1	1	105	**HAN1015B**	**HAN1015BK**	66.8	63.8	9.20	25 000	81.5	108.5	106	1	1	0.655	0.640
80	125	22	1.1	1	113	**HAN1016B**	**HAN1016BK**	71.4	71.5	10.2	23 000	86.5	118.5	114	1	1	0.886	0.869
85	130	22	1.1	1	118	**HAN1017B**	**HAN1017BK**	70.9	71.9	10.1	22 000	91.5	123	119	1	1	0.879	0.861
90	140	24	1.5	1.1	127	**HAN1018B**	**HAN1018BK**	103	104	11.3	21 000	98	132	129	1.5	1	1.13	1.11
95	145	24	1.5	1.1	132	**HAN1019B**	**HAN1019BK**	111	110	12.3	20 000	103	137	134	1.5	1	1.20	1.18
100	150	24	1.5	1.1	137	**HAN1020B**	**HAN1020BK**	120	123	12.2	19 000	108	142	139	1.5	1	1.29	1.27

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4(5)** on page 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.

NN3000(K) series

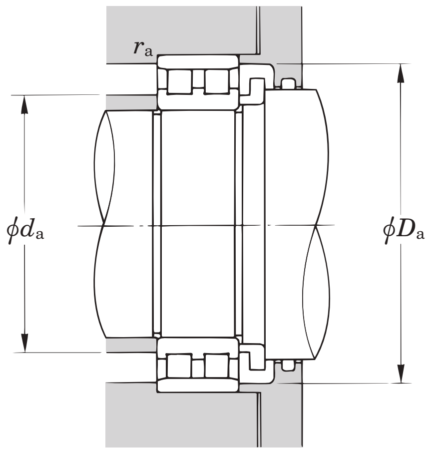
Cylindrical bore

Tapered bore



With a lubrication groove and holes[1)]

With a lubrication groove and holes[1)]



Dynamic equivalent load $P_r = F_r$

Static equivalent load $P_{0r} = F_r$

Boundary dimensions (mm) d	D	B	r min.	E_W	Bearing No.[1)2)] Cylindrical bore	Tapered bore	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Dimensions of lubrication groove and holes (mm) d_0	w	Mounting dimensions (mm) d_a min.	D_a max.	D_a min.	r_a max.	Interspace volume (cm^3)	(Refer.) Mass (kg) Cylindrical bore	Tapered bore
25	47	16	0.6	41.3	**NN3005**	**NN3005K**	32.2	30.0	5.20	19 000	23 000	2	4	29	43	42	0.6	3.5	0.127	0.123
30	55	19	1	48.5	**NN3006**	**NN3006K**	46.0	44.1	4.95	16 000	20 000	2	4	35	50	49	1	6	0.198	0.192
35	62	20	1	55	**NN3007**	**NN3007K**	49.1	50.0	5.65	14 000	17 000	2	4	40	57	56	1	8	0.253	0.246
40	68	21	1	61	**NN3008**	**NN3008K**	52.0	55.9	6.35	13 000	15 000	2	4	45	63	62	1	10	0.307	0.298
45	75	23	1	67.5	**NN3009**	**NN3009K**	67.1	71.9	8.75	12 000	14 000	3	6	50	70	69	1	13	0.404	0.382
50	80	23	1	72.5	**NN3010**	**NN3010K**	66.4	72.6	8.85	11 000	13 000	3	6	55	75	74	1	14	0.429	0.415
55	90	26	1.1	81	**NN3011**	**NN3011K**	89.6	101	13.2	9 600	12 000	3	6	61.5	83.5	82	1	20	0.637	0.618
60	95	26	1.1	86.1	**NN3012**	**NN3012K**	91.6	106	13.9	9 000	11 000	3	6	66.5	88.5	87	1	22	0.685	0.664
65	100	26	1.1	91	**NN3013**	**NN3013K**	93.6	111	14.6	8 400	10 000	3	6	71.5	93.5	92	1	23	0.728	0.705
70	110	30	1.1	100	**NN3014**	**NN3014K**	122	148	20.6	7 600	9 200	3	6	76.5	103.5	101	1	33	1.04	1.02
75	115	30	1.1	105	**NN3015**	**NN3015K**	124	155	21.5	7 200	8 700	3	6	81.5	108.5	106	1	35	1.11	1.08
80	125	34	1.1	113	**NN3016**	**NN3016K**	149	186	26.6	6 700	8 100	4	7	86.5	118.5	114	1	48	1.55	1.50
85	130	34	1.1	118	**NN3017**	**NN3017K**	152	194	27.3	6 400	7 700	4	7	91.5	123.5	119	1	50	1.63	1.58
90	140	37	1.5	127	**NN3018**	**NN3018K**	179	228	29.3	5 900	7 100	4	7	98	132	129	1.5	65	2.07	2.01
95	145	37	1.5	132	**NN3019**	**NN3019K**	188	246	31.3	5 700	6 800	4	7	103	137	134	1.5	67	2.17	2.10
100	150	37	1.5	137	**NN3020**	**NN3020K**	191	256	32.1	5 500	6 500	4	7	108	142	139	1.5	68	2.28	2.21
105	160	41	2	146	**NN3021**	**NN3021K**	247	322	42.5	5 200	6 200	4	7	114	151	148	2	94	2.88	2.81
110	170	45	2	155	**NN3022**	**NN3022K**	278	361	47.9	4 800	5 800	4	7	119	161	157	2	117	3.65	3.56
120	180	46	2	165	**NN3024**	**NN3024K**	291	392	51.1	4 500	5 400	4	7	129	171	167	2	127	4.00	3.87
130	200	52	2	182	**NN3026**	**NN3026K**	356	476	57.7	4 100	4 900	5	8.5	139	191	183	2	185	5.94	5.76
140	210	53	2	192	**NN3028**	**NN3028K**	372	516	61.5	3 800	4 600	6	10	149	201	194	2	193	6.41	6.21
150	225	56	2.1	206	**NN3030**	**NN3030K**	418	587	70.1	3 500	4 200	6	10	161	214	208	2	239	7.74	7.50
160	240	60	2.1	219	**NN3032**	**NN3032K**	499	695	79.6	3 300	4 000	6	10	171	229	221	2	281	9.38	9.08
170	260	67	2.1	236	**NN3034**	**NN3034K**	592	824	105	3 000	3 600	6	10	181	249	238	2	371	12.8	12.4

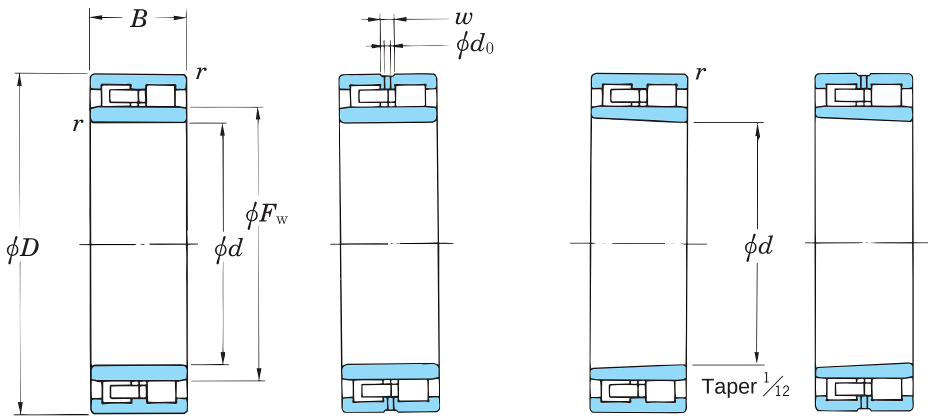
[Note] 1) The symbol W is added to the end of bearing numbers to denote bearings whose outer ring has a lubrication groove and holes.
2) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4(5)** on page 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.

NNU4900(K) series

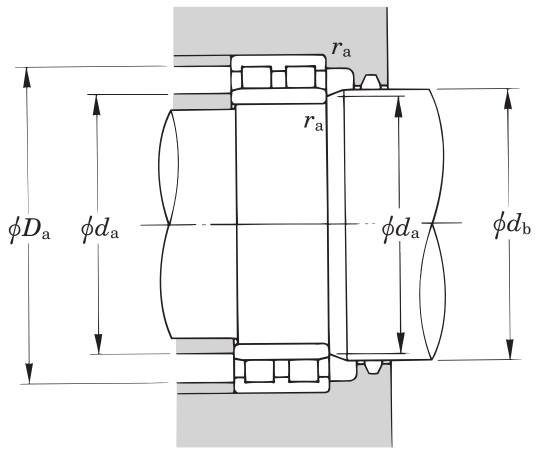
Cylindrical bore

Tapered bore



With a lubrication groove and holes[1)]

With a lubrication groove and holes[1)]

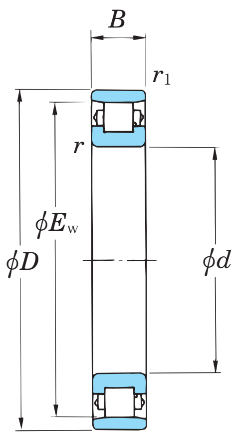


Dynamic equivalent load $P_r = F_r$
Static equivalent load $P_{0r} = F_r$

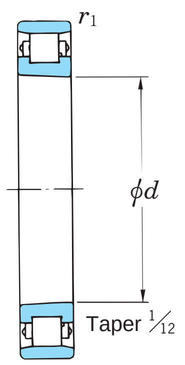
Boundary dimensions (mm)					Bearing No.[1)]		Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Dimensions of lubrication groove and holes (mm)		Mounting dimensions (mm)					Interspace volume (cm^3)	(Refer.) Mass (kg)	
d	D	B	r min.	F_W	Cylindrical bore	Tapered bore	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	d_0	w	d_a min.	d_a max.	d_b min.	D_a max.	r_a max.		Cylindrical bore	Tapered bore
100	140	40	1.1	113	**NNU4920**	**NNU4920K**	173	258	32.9	5 600	6 800	2.5	6	106.5	111	115	133.5	1	61	1.95	1.87
105	145	40	1.1	118	**NNU4921**	**NNU4921K**	196	306	40.2	5 400	6 500	2.5	6	111.5	116	120	138.5	1	61	2.00	1.91
110	150	40	1.1	123	**NNU4922**	**NNU4922K**	204	326	42.4	5 200	6 200	2.5	6	116.5	121	125	143.5	1	60	2.10	2.01
120	165	45	1.1	134.5	**NNU4924**	**NNU4924K**	234	373	47.6	4 700	5 700	3	7	126.5	132	137	158.5	1	84	2.90	2.77
130	180	50	1.5	146	**NNU4926**	**NNU4926K**	269	428	50.2	4 300	5 200	3	7	138	143.5	148	172	1.5	116	3.90	3.73
140	190	50	1.5	156	**NNU4928**	**NNU4928K**	277	456	52.5	4 000	4 800	3	7	148	153.5	158	182	1.5	125	4.15	3.97
150	210	60	2	168.5	**NNU4930**	**NNU4930K**	430	692	80.7	3 700	4 400	4	7	159	166	171	201	2	192	6.50	6.22
160	220	60	2	178.5	**NNU4932**	**NNU4932K**	425	695	79.8	3 400	4 100	4	7	169	176	182	211	2	186	6.95	6.65
170	230	60	2	188.5	**NNU4934**	**NNU4934K**	451	763	86.4	3 200	3 900	4	7	179	186	192	221	2	216	7.20	6.88
180	250	69	2	202	**NNU4936**	**NNU4936K**	572	964	117	3 000	3 600	4	7	189	199.5	205	241	2	297	10.5	10.1
190	260	69	2	210	**NNU4938**	**NNU4938K**	581	996	119	2 900	3 400	5	8.5	199	207	215	251	2	313	11.0	10.5

[Note] 1) The symbol W is added to the end of bearing numbers to denote bearings whose outer ring has a lubrication groove and holes.

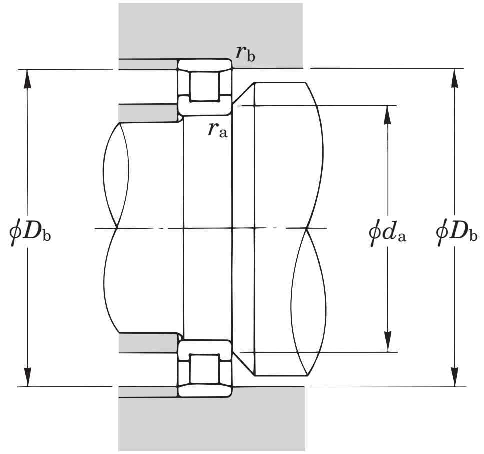
N1000(K) series



Cylindrical bore



Tapered bore



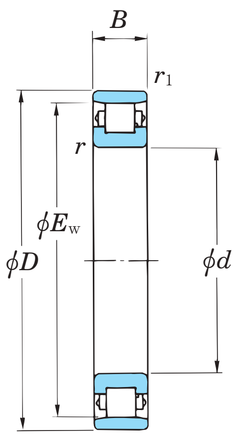
Dynamic equivalent load $P_r = F_r$
Static equivalent load $P_{0r} = F_r$

Boundary dimensions (mm)						Bearing No.[1]		Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Mounting dimensions (mm)					Interspace volume	(Refer.) **Mass** (kg)	
d	D	B	r min.	r_1 min.	E_W	Cylindrical bore	Tapered bore	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	d_a min.	D_b max.	D_b min.	r_a max.	r_b max.	(cm³)	Cylindrical bore	Tapered bore
30	55	13	1	0.6	48.5	**N1006**	**N1006K**	23.4	18.4	2.05	18 000	21 000	35	50	49.5	1	0.6	4.8	0.138	0.135
35	62	14	1	0.6	55	**N1007**	**N1007K**	25.3	21.3	2.40	15 000	18 000	40	57	56	1	0.6	6.4	0.176	0.173
40	68	15	1	0.6	61	**N1008**	**N1008K**	28.2	25.4	2.90	14 000	16 000	45	63	62	1	0.6	8.3	0.215	0.210
45	75	16	1	0.6	68.5	**N1009**	**N1009K**	40.7	34.2	4.45	13 000	15 000	50	70	68.5	1	0.6	11	0.268	0.262
50	80	16	1	0.6	72.5	**N1010**	**N1010K**	44.1	38.9	5.10	11 000	13 000	55	75	73.5	1	0.6	12	0.292	0.285
55	90	18	1.1	1	81	**N1011**	**N1011K**	47.1	43.9	5.75	10 000	12 000	61.5	83.5	82	1	1	17	0.429	0.420
60	95	18	1.1	1	86.1	**N1012**	**N1012K**	48.3	46.4	6.10	9 600	11 000	66.5	88.5	87	1	1	18	0.458	0.448
65	100	18	1.1	1	91.5	**N1013**	**N1013K**	51.3	51.2	6.75	9 000	11 000	71.5	93.5	92	1	1	20	0.486	0.475
70	110	20	1.1	1	100	**N1014**	**N1014K**	72.9	70.4	10.1	8 300	9 700	76.5	103.5	101	1	1	27	0.676	0.662
75	115	20	1.1	1	106	**N1015**	**N1015K**	68.4	74.5	9.95	7 800	9 100	81.5	108.5	106	1	1	29	0.711	0.696
80	125	22	1.1	1	113	**N1016**	**N1016K**	79.3	82.2	11.7	7 200	8 500	86.5	118.5	114	1	1	36	0.957	0.937
85	130	22	1.1	1	118	**N1017**	**N1017K**	81.3	86.2	12.2	6 900	8 100	91.5	123	119	1	1	39	1.01	0.989
90	140	24	1.5	1.1	129	**N1018**	**N1018K**	121	122	16.7	6 400	7 500	98	132	129	1.5	1	52	1.30	1.27
95	145	24	1.5	1.1	133	**N1019**	**N1019K**	125	129	17.5	6 200	7 200	103	137	134	1.5	1	53	1.36	1.34
100	150	24	1.5	1.1	139	**N1020**	**N1020K**	99.8	129	13.9	5 900	6 900	108	142	139	1.5	1	56	1.42	1.39
105	160	26	2	1.1	146	**N1021**	**N1021K**	136	149	19.6	5 500	6 500	114	151	148	2	1	66	1.82	1.78
110	170	28	2	1.1	157	**N1022**	**N1022K**	147	171	21.1	5 200	6 100	119	161	157	2	1	84	2.24	2.20
120	180	28	2	1.1	167	**N1024**	**N1024K**	173	181	22.6	4 800	5 700	129	171	167	2	1	92	2.40	2.35
130	200	33	2	1.1	182	**N1026**	**N1026K**	215	238	29.5	4 400	5 100	139	191	184	2	1	135	3.64	3.57
140	210	33	2	1.1	192	**N1028**	**N1028K**	220	250	30.5	4 100	4 800	149	201	194	2	1	140	3.88	3.80
150	225	35	2.1	1.5	207.5	**N1030**	**N1030K**	252	281	32.8	3 800	4 400	161	214	208	2	1.5	177	4.68	4.58
160	240	38	2.1	1.5	219	**N1032**	**N1032K**	297	330	42.8	3 500	4 100	171	229	221	2	1.5	191	5.80	5.68

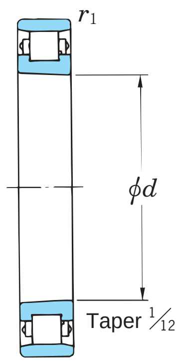
[Note] 1) The blue bearing numbers indicate recommended products.

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4(5)** on page 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.

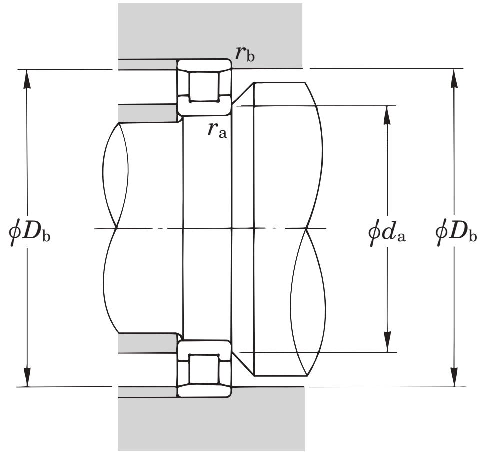
3NCN1000(K) series Ceramic bearings



Cylindrical bore



Tapered bore



Dynamic equivalent load $P_r = F_r$
Static equivalent load $P_{0r} = F_r$

Boundary dimensions (mm)						Bearing No.		Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Mounting dimensions (mm)					Interspace volume (cm^3)	(Refer.) Mass (kg)	
d	D	B	r min.	r_1 min.	E_W	Cylindrical bore	Tapered bore	C_r	C_{0r}	C_u	Grease lub.	Oil lub.	d_a min.	D_b max.	min.	r_a max.	r_b max.		Cylindrical bore	Tapered bore
30	55	13	1	0.6	48.5	**3NCN1006**	**3NCN1006K**	23.4	18.4	2.05	23 000	27 000	35	50	49.5	1	0.6	4.8	0.126	0.123
35	62	14	1	0.6	55	**3NCN1007**	**3NCN1007K**	25.3	21.3	2.40	20 000	23 000	40	57	56	1	0.6	6.4	0.163	0.160
40	68	15	1	0.6	61	**3NCN1008**	**3NCN1008K**	28.2	25.4	2.90	18 000	21 000	45	63	62	1	0.6	8.3	0.199	0.194
45	75	16	1	0.6	68.5	**3NCN1009**	**3NCN1009K**	40.7	34.2	4.45	17 000	20 000	50	70	68.5	1	0.6	11	0.238	0.232
50	80	16	1	0.6	72.5	**3NCN1010**	**3NCN1010K**	44.1	38.9	5.10	14 000	17 000	55	75	73.5	1	0.6	12	0.259	0.252
55	90	18	1.1	1	81	**3NCN1011**	**3NCN1011K**	47.1	43.9	5.75	13 000	16 000	61.5	83.5	82	1	1	17	0.392	0.383
60	95	18	1.1	1	86.1	**3NCN1012**	**3NCN1012K**	48.3	46.4	6.10	12 000	14 000	66.5	88.5	87	1	1	18	0.419	0.409
65	100	18	1.1	1	91.5	**3NCN1013**	**3NCN1013K**	51.3	51.2	6.75	12 000	14 000	71.5	93.5	92	1	1	20	0.445	0.434
70	110	20	1.1	1	100	**3NCN1014**	**3NCN1014K**	72.9	70.4	10.1	11 000	13 000	76.5	103.5	101	1	1	27	0.618	0.604
75	115	20	1.1	1	106	**3NCN1015**	**3NCN1015K**	68.4	74.5	9.95	10 000	12 000	81.5	108.5	106	1	1	29	0.635	0.620
80	125	22	1.1	1	113	**3NCN1016**	**3NCN1016K**	79.3	82.2	11.7	9 400	11 000	86.5	118.5	114	1	1	36	0.874	0.854
85	130	22	1.1	1	118	**3NCN1017**	**3NCN1017K**	81.3	86.2	12.2	9 000	11 000	91.5	123	119	1	1	39	0.923	0.902
90	140	24	1.5	1.1	129	**3NCN1018**	**3NCN1018K**	121	122	16.7	8 300	9 800	98	132	129	1.5	1	52	1.14	1.11
95	145	24	1.5	1.1	133	**3NCN1019**	**3NCN1019K**	125	129	17.5	8 100	9 400	103	137	134	1.5	1	53	1.19	1.17
100	150	24	1.5	1.1	139	**3NCN1020**	**3NCN1020K**	99.8	129	13.9	7 700	9 000	108	142	139	1.5	1	56	1.25	1.22
105	160	26	2	1.1	146	**3NCN1021**	**3NCN1021K**	136	149	19.6	7 200	8 500	114	151	148	2	1	66	1.64	1.60
110	170	28	2	1.1	157	**3NCN1022**	**3NCN1022K**	147	171	21.1	6 800	7 900	119	161	157	2	1	84	2.02	1.98
120	180	28	2	1.1	167	**3NCN1024**	**3NCN1024K**	173	181	22.6	6 200	7 400	129	171	167	2	1	92	2.10	2.05
130	200	33	2	1.1	182	**3NCN1026**	**3NCN1026K**	215	238	29.5	5 700	6 600	139	191	184	2	1	135	3.23	3.16
140	210	33	2	1.1	192	**3NCN1028**	**3NCN1028K**	220	250	30.5	5 300	6 200	149	201	194	2	1	140	3.45	3.37
150	225	35	2.1	1.5	207.5	**3NCN1030**	**3NCN1030K**	252	281	32.8	4 900	5 700	161	214	208	2	1.5	177	4.14	4.04
160	240	38	2.1	1.5	219	**3NCN1032**	**3NCN1032K**	297	330	42.8	4 600	5 300	171	229	221	2	1.5	191	5.13	5.01

[Remarks] 1. For the dimensions of the spacers for oil / air lubrication, refer to **Table 9. 4(5)** on page 45.
2. For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.

3. Angular Contact Ball Bearings for Axial Load

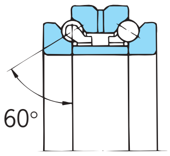
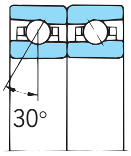
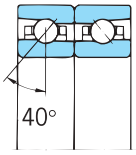
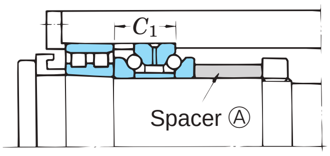
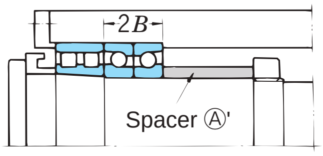
Contents

3. Angular contact ball bearings for axial load

JTEKT produces double direction angular contact thrust and high-speed matched pair angular contact ball bearings to receive the axial loads from spindles of machine tools.

3. 1 Types and features of angular contact ball bearings for axial load

Table 3. 1 Types and features of angular contact ball bearings for axial load

Type Diameter series	Double direction angular contact thrust ball bearings	High-speed matched pair angular contact ball bearings		To combine with double row cylindrical roller bearings
				Remark: These bearings are used primarily in combination with double row cylindrical roller bearings for radial load. Combinations are as shown below.
0	2344 B	ACT 0 DB	ACT 0 BDB	Placed next to the small tapered bore diameter side of NN30K, or used in tandem with NN30 (cylindrical bore).
	2347 B	—	—	Placed next to the large tapered bore diameter side of NN30K.
9	2394 B	—	—	Placed next to the small tapered bore diameter side of NNU49K, or used in tandem with NNU49 (cylindrical bore).
	2397 B	—	—	Placed next to the large tapered-bore diameter side of NNU49K.
Features	● Axial load can be applied in both directions, and the rigidity in the axial direction is high. ● Bearings having greater contact angles are more suitable where rigidity is a priority, and those having smaller contact angles are more appropriate where high-speed performance is a priority.	● Negative tolerances on the outside diameters are used to permit axial load only. ● Having small contact angles, these are suitable for high-speed rotations. ● These bearings are interchangeable with 2344 B series.		———
Interchangeability	 Example of mounting in tandem with 2344 B  Example of mounting in tandem with ACT 0 DB or ACT 0 BDB Since the combined width "$2B$" of ACT 0 DB and ACT 0 BDB is equal to dimension "C_1" of 2344 B, it is not necessary to change shaft and housing dimensions. Changing the width of spacer Ⓐ is sufficient.			

3. 2 Composition of bearing numbers (angular contact ball bearings for axial load)

Double direction angular contact thrust ball bearings

2 3 4 4 18 B FY P4

Double direction angular contact thrust ball bearings

Contact angle symbols
3 : nominal contact angle 60°

Diameter series symbols
4 : diameter series 0
9 : diameter series 9

Bearing bore diameter classification symbols
4 : small bore diameter type
7 : large bore diameter type

Tolerance class symbols
P5 : equivalent of JIS class 5
P4 : equivalent of JIS class 4

Cage symbols
FY : machined cage made of copper alloy

Outer ring configuration symbols
B : integrated outer ring type

Bore diameter number
18 : nominal bore diameter 90 mm
(Bore diameter number × 5 equals nominal bore diameter.)

High-speed matched pair angular contact ball bearings

ACT 0 18 B DB M FT P4

High-speed matched pair angular contact ball bearings

Diameter series 0

Bore diameter number
18 : nominal bore diameter 90 mm
(Bore diameter number × 5 equals nominal bore diameter.)

Contact angle symbols
A (to be omitted) : nominal contact angle 30°
B : nominal contact angle 40°

Back-to-back symbols

Tolerance class symbols
P5 : equivalent of JIS class 5
P4 : equivalent of JIS class 4

Cage symbols
FG : molded cage made of polyamide resin (ball-guiding type)
FT : machined cage made of reinforced phenolic resin (outer ring-guiding type)
FY : machined cage made of copper alloy (outer ring-guiding type)

Preload symbols
L : light preload
M : medium preload
(See **Table 3. 4** (page 125) for preload values.)

3. 3 Tolerance of angular contact ball bearings for axial load

The tolerance of double direction angular contact thrust ball bearings is shown in **Table 3. 2**.
The tolerance of high-speed matched pair angular contact ball bearings is shown in **Table 3. 3** (page 123 and 124).

The tolerance of these bearings complies with **JTEKT** standards Classes 5 and 4 (equivalent of JIS Classes 5 and 4).

Table 3. 2 Permissible dimensional deviations and limits to double direction angular contact thrust ball bearings (JTEKT standards)

(1) Inner ring and assembled bearing width

Unit : μm

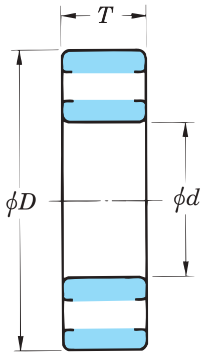
Nominal bore diameter d (mm)		$\Delta_{d\mathrm{mp}}$ or $\Delta_{d\mathrm{s}}$ 1)				Actual bearing width deviation $\Delta_{T\mathrm{s}}$		Inner ring width variation $V_{B\mathrm{s}}$		Perpendicularity of inner ring face with respect to the bore S_d		Axial runout of assembled bearing inner ring S_{ia}	
		Class 5		Class 4		Classes 5, 4		Class 5	Class 4	Class 5	Class 4	Class 5	Class 4
over	up to	upper	lower	upper	lower	upper	lower	max.		max.		max.	
18	**30**	0	– 6	0	– 5	0	– 300	5	2.5	8	4	5	3
30	**50**	0	– 8	0	– 6	0	– 400	5	3	8	4	5	3
50	**80**	0	– 9	0	– 7	0	– 500	6	4	8	4	6	5
80	**120**	0	–10	0	– 8	0	– 600	7	4	9	5	6	5
120	**180**	0	–13	0	–10	0	– 700	8	5	10	6	8	6
180	**250**	0	–15	0	–12	0	– 800	10	6	11	7	8	6
250	**315**	0	–18	0	–15	0	– 900	13	7	13	8	10	8
315	**400**	0	–23	0	–18	0	–1 000	15	9	15	9	13	10

(2) Outer ring

Unit : μm

Nominal outside diameter D (mm)		$\Delta_{D\mathrm{mp}}$ or $\Delta_{D\mathrm{s}}$ 2)		Outer ring width variation $V_{C\mathrm{s}}$		Perpendicularity of outer ring outside surface with respect to the face S_D		Axial runout of assembled bearing outer ring S_{ea}
		Classes 5, 4		Class 5	Class 4	Class 5	Class 4	Classes 5, 4
over	up to	upper	lower	max.		max.		max.
30	**50**	– 30	– 40	5	2.5	8	4	Same as permissible values S_{ia}, d being that of the same bearing.
50	**80**	– 40	– 50	6	3	8	4	
80	**120**	– 50	– 60	8	4	9	5	
120	**150**	– 60	– 75	8	5	10	5	
150	**180**	– 60	– 75	8	5	10	5	
180	**250**	– 75	– 90	10	7	11	7	
250	**315**	– 90	–105	11	7	13	8	
315	**400**	–110	–125	13	8	13	10	
400	**500**	–120	–140	15	10	15	13	

[Notes] 1) Single plane mean bore diameter deviation or single bore diameter deviation
2) Single plane outside diameter deviation or single outside diameter deviation



d : nominal bore diameter
D : nominal outside diameter
T : nominal bearing width

Table 3. 3(1) Permissible dimensional deviations and limits of high-speed matched pair angular contact ball bearings (JTEKT standards)

(1) Inner ring

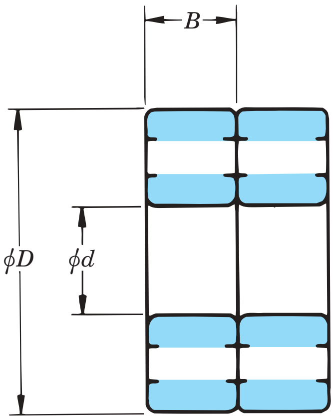
Unit : µm

Nominal bore diameter d (mm)		Single plane mean bore diameter deviation $\Delta_{d\text{mp}}$				Single bore diameter deviation $\Delta_{d\text{s}}$[1]		Single plane bore diameter variation $V_{d\text{sp}}$		Mean bore diameter variation $V_{d\text{mp}}$	
								Diameter series 9, 0			
		Class 5		Class 4		Class 4		Class 5	Class 4	Class 5	Class 4
over	up to	upper	lower	upper	lower	upper	lower	max.		max.	
18	**30**	0	– 6	0	– 5	0	– 5	6	5	3	2.5
30	**50**	0	– 8	0	– 6	0	– 6	8	6	4	3
50	**80**	0	– 9	0	– 7	0	– 7	9	7	5	3.5
80	**120**	0	–10	0	– 8	0	– 8	10	8	5	4
120	**150**	0	–13	0	–10	0	–10	13	10	7	5
150	**180**	0	–13	0	–10	0	–10	13	10	7	5
180	**250**	0	–15	0	–12	0	–12	15	12	8	6
250	**315**	0	–18	0	–15	0	–15	18	15	9	8
315	**400**	0	–23	0	–18	0	–18	23	18	12	9

Nominal bore diameter d (mm)		Radial runout of assembled bearing inner ring K_{ia}		Perpendicularity of inner ring face with respect to the bore S_d		Axial runout of assembled bearing inner ring S_{ia}		Single inner ring width deviation $\Delta_{B\text{s}}$		Single inner ring width deviation $\Delta_{B\text{s}}$[2]		Inner ring width variation $V_{B\text{s}}$	
		Class 5	Class 4	Class 5	Class 4	Class 5	Class 4	Classes 5, 4		Classes 5, 4		Class 5	Class 4
over	up to	max.		max.		max.		upper	lower	upper	lower	max.	
18	**30**	4	3	8	4	8	4	0	–120	0	–250	5	2.5
30	**50**	5	4	8	4	8	4	0	–120	0	–250	5	3
50	**80**	5	4	8	5	8	5	0	–150	0	–250	6	4
80	**120**	6	5	9	5	9	5	0	–200	0	–380	7	4
120	**150**	8	6	10	6	10	7	0	–250	0	–380	8	5
150	**180**	8	6	10	6	10	7	0	–250	0	–380	8	5
180	**250**	10	8	11	7	13	8	0	–300	0	–500	10	6
250	**315**	13	10	13	8	15	9	0	–350	0	–500	13	8
315	**400**	15	13	15	9	20	12	0	–400	0	–630	15	9

[Notes] 1) Tolerance class 4 is applied to bearings of diameter series 0.

2) Applied to individual bearing rings manufactured for matched pair or stack bearings.



d : nominal bore diameter
D : nominal outside diameter
B : nominal bearing width

Table 3. 3(2) Permissible dimensional deviations and limits for high-speed matched pair angular contact ball bearings (JTEKT standards)

(2) Outer ring

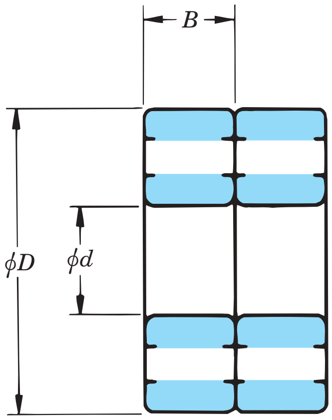
Unit : μm

Nominal outside diameter D (mm)		Δ_{Dmp} or Δ_{Ds} 1), 2)		Single plane outside diameter variation V_{Dsp} Diameter series 9, 0		Mean outside diameter variation V_{Dmp}	
		Classes 5, 4		Class 5	Class 4	Class 5	Class 4
over	up to	upper	lower	max.		max.	
50	**80**	–32	– 47	9	7	5	3.5
80	**120**	–39	– 56	10	8	5	4
120	**150**	–44	– 66	11	9	6	5
150	**180**	–44	– 68	13	10	7	5
180	**250**	–51	– 79	15	11	8	6
250	**315**	–56	– 89	18	13	9	7
315	**400**	–63	– 99	20	15	10	8
400	**500**	–71	–111	23	17	12	9

Nominal outside diameter D (mm)		Radial runout of assembled bearing outer ring K_{ea}		Perpendicularity of outer ring out side surface with respect to the face S_D		Axial runout of assembled bearing outer ring S_{ea}		Deviation of a single outer ring width Δ_{Cs}		Ring width variation V_{Cs}	
		Class 5	Class 4	Class 5	Class 4	Class 5	Class 4	Classes 5, 4		Class 5	Class 4
over	up to	max.		max.		max.		upper	lower	max.	
50	**80**	8	5	8	4	10	5	Same as tolerance Δ_{Bs}, d being that of the same bearing.		6	3
80	**120**	10	6	9	5	11	6			8	4
120	**150**	11	7	10	5	13	7			8	5
150	**180**	13	8	10	5	14	8			8	5
180	**250**	15	10	11	7	15	10			10	7
250	**315**	18	11	13	8	18	10			11	7
315	**400**	20	13	13	10	20	13			13	8
400	**500**	23	15	15	12	23	15			15	9

[Notes] 1) Single plane mean outside diameter deviation or single outside diameter deviation

2) Dimensional tolerance for outside diameter of class 4 is applied to bearings of diameter series 0.



d : nominal bore diameter
D : nominal outside diameter
B : nominal bearing width

3. 4 Standard preloads for high-speed matched pair angular contact ball bearings

Table 3. 4 shows standard preloads for high-speed matched pair angular contact ball bearings.

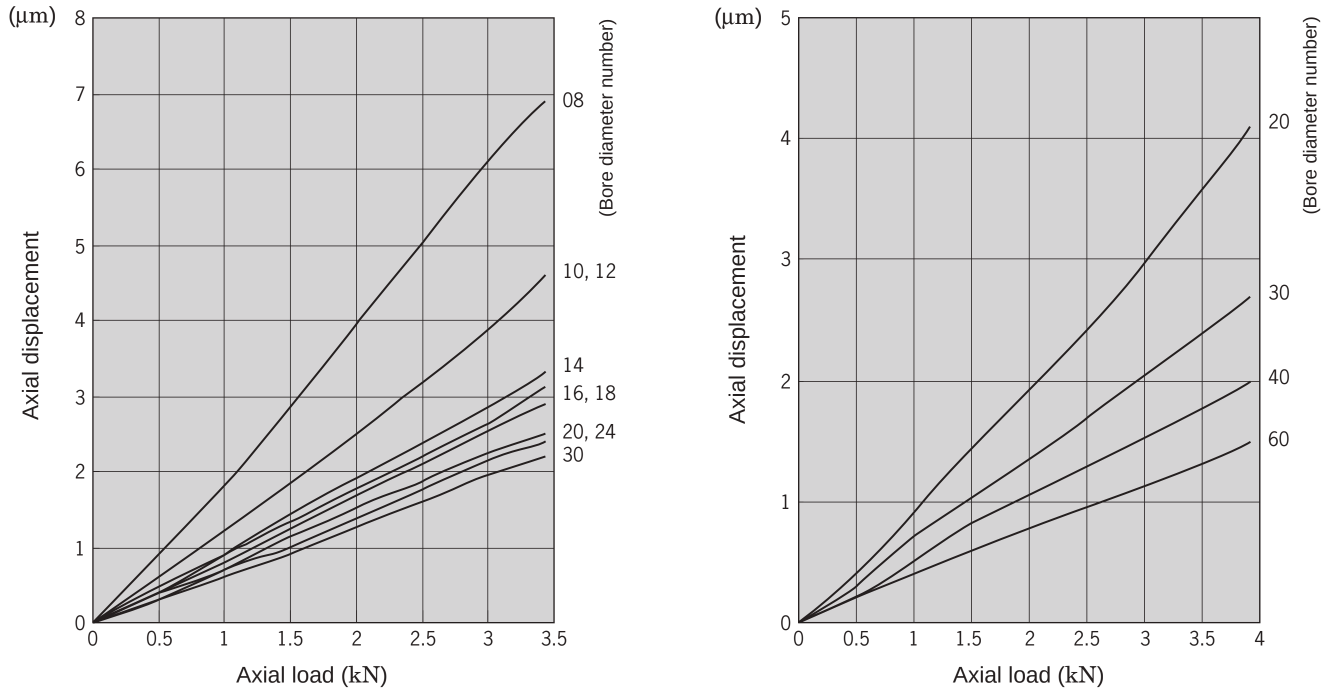
Table 3. 4 Standard preloads for high-speed matched pair angular contact ball bearings

(L : light preload; M : medium preload) Unit : N

Bore diameter number	ACT 000		ACT 000 B	
	L	M	L	M
06	195	345	295	685
07	195	390	390	735
08	245	440	440	835
09	245	490	490	930
10	295	540	540	1 030
11	390	685	685	1 270
12	390	735	735	1 420
13	440	835	785	1 520
14	590	1 130	1 030	2 010
15	590	1 130	1 080	2 110
16	685	1 370	1 270	2 500
17	735	1 420	1 320	2 600
18	980	1 860	1 770	3 380
19	980	1 960	1 860	3 530
20	1 030	2 010	1 910	3 680
21	1 180	2 250	2 150	3 770
22	1 320	2 600	2 450	4 760
24	1 420	2 800	2 550	5 100
26	1 770	3 380	3 230	6 230
28	2 010	3 920	3 720	7 210
30	2 400	4 610	4 410	8 480
32	2 500	4 850	4 660	8 920
34	3 090	6 030	5 730	9 320
36	3 530	6 860	6 570	10 500
38	3 780	7 160	6 960	10 800
40	4 410	8 530	8 040	13 000
44	5 200	9 710	8 430	15 300
48	5 540	10 000	8 680	15 800
52	6 620	12 400	10 800	19 600
56	6 820	12 700	11 100	20 200
60	7 700	14 400	12 700	23 000
64	7 750	14 500	12 700	23 000

3. 5 Axial load and displacement (angular contact ball bearings for axial load)

Fig. 3. 1 show relationships between axial load and displacement respectively for double direction angular contact thrust and high-speed matched pair angular contact ball bearings when a standard preload is applied.

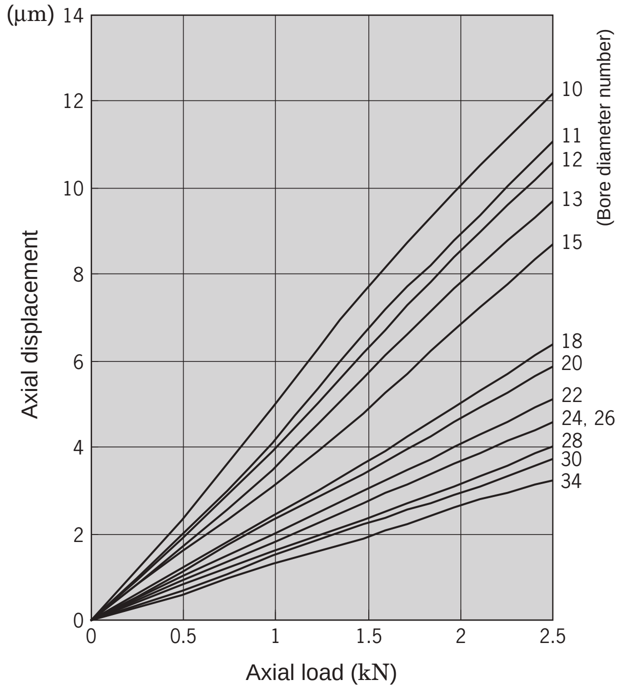

(1) 234400B and 234700B series (contact angle : 60°)

(2) 239400B and 239700B series (contact angle : 60°)

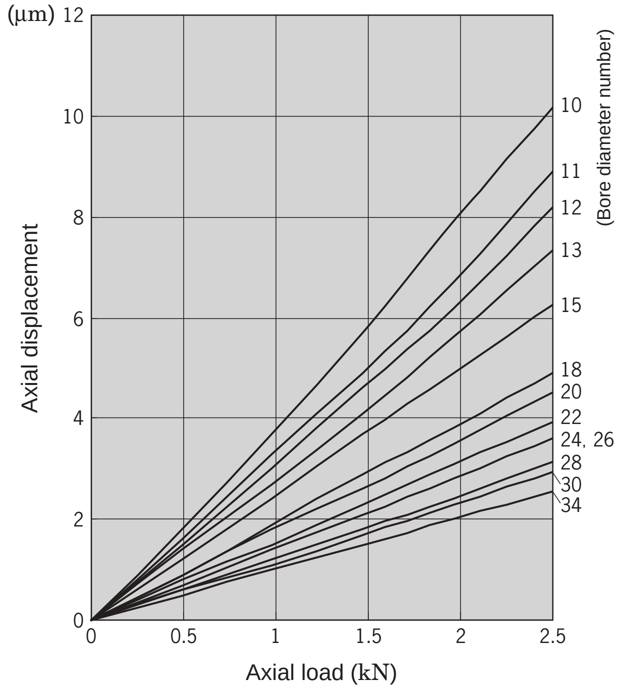
Fig. 3. 1(1) Relationships between axial load and displacement (double direction angular contact thrust ball bearings)

(3) ACT000 series (contact angle 30°)

a) When preload L is applied

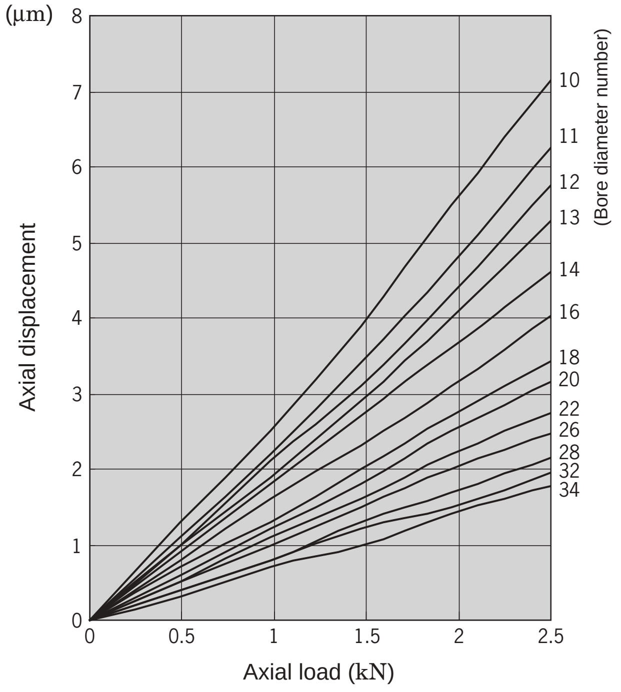


b) When preload M is applied



(4) ACT000B series (contact angle 40°)

a) When preload L is applied



b) When preload M is applied

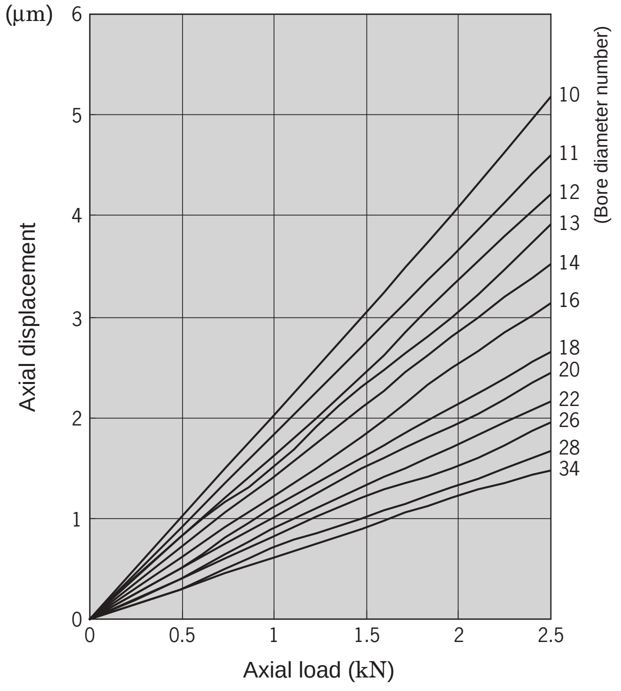
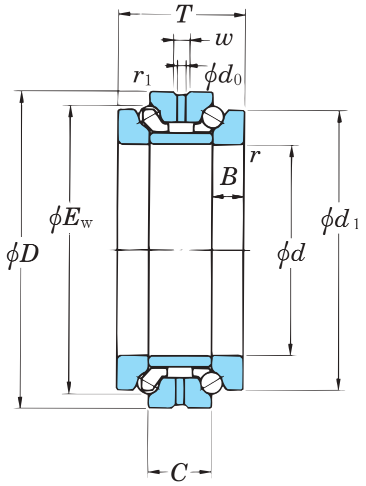
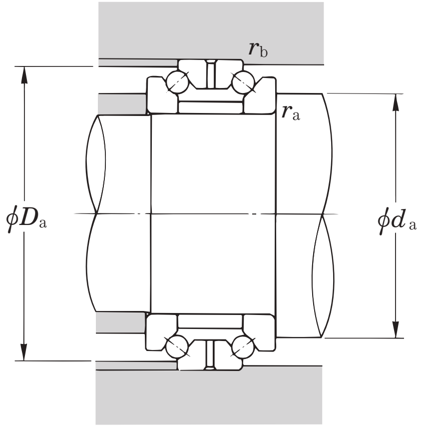


Fig. 3. 1(2) Relationships between axial load and displacement (high-speed matched pair angular contact ball bearings)

234400B series
234700B series

Contact angle 60°





Dynamic equivalent load $P_a = F_a$

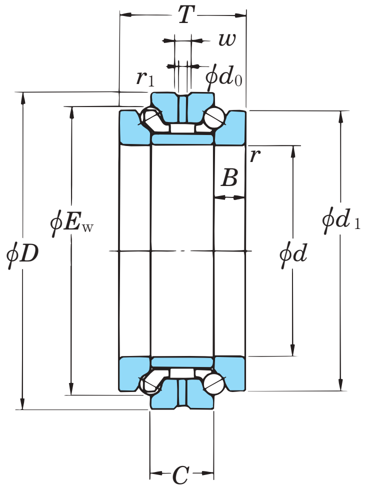
Static equivalent load $P_{0a} = F_a$

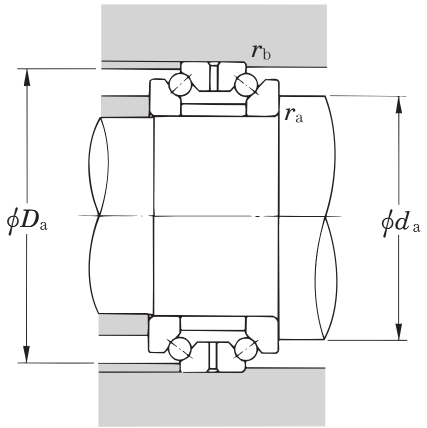
Boundary dimensions (mm)							Bearing No.[1]		Basic load ratings (kN)		Limiting speeds (min^{-1})		Dimensions (mm)					Mounting dimensions (mm)				Amount of grease fill (cm^3/row)	(Refer.) Mass (kg)	
d Small bore dia. type	d Large bore dia. type	D	T	C	r min.	r_1 min.	Small bore dia. type	Large bore dia. type	C_a	C_{0a}	Grease lub.	Oil lub.	E_w[2]	d_1	B	d_0	w	d_a min.	D_a max.	r_a max.	r_b max.		Small bore dia. type	Large bore dia. type
25	—	47	28	14	0.6	0.3	**234405B**	—	16.5	19.9	7 700	11 000	41.3	40	7	2	4.5	33	44	0.6	0.3	0.18~0.26	0.194	—
30	32	55	32	16	1	0.6	**234406B**	**234706B**	17.5	23.6	6 700	9 500	48.5	47	8	2	4.5	40	50.5	1	0.6	0.3~0.45	0.296	0.272
35	37	62	34	17	1	0.6	**234407B**	**234707B**	26.0	34.8	6 100	8 700	55	53	8.5	2	4.5	45.5	57.5	1	0.6	0.4~0.6	0.388	0.367
40	42	68	36	18	1	0.6	**234408B**	**234708B**	29.9	41.7	5 700	8 100	61	58.5	9	2	4.5	50	63.5	1	0.6	0.5~0.75	0.475	0.437
45	47	75	38	19	1	0.6	**234409B**	**234709B**	32.5	50.1	5 200	7 500	67.5	65	9.5	2	4.5	56.5	70.5	1	0.6	0.65~0.98	0.602	0.554
50	52	80	38	19	1	0.6	**234410B**	**234710B**	33.5	54.4	5 100	7 300	72.5	70	9.5	2	4.5	61.5	75.5	1	0.6	0.7~1.1	0.654	0.602
55	57	90	44	22	1.1	0.6	**234411B**	**234711B**	46.5	71.7	4 400	6 400	81	78	11	4	8	67.5	84	1	0.6	1~1.5	0.978	0.900
60	62	95	44	22	1.1	0.6	**234412B**	**234712B**	47.0	75.2	4 300	6 200	86.1	83	11	4	8	72.5	89	1	0.6	1.1~1.7	1.04	0.957
65	67	100	44	22	1.1	0.6	**234413B**	**234713B**	48.8	81.8	4 200	6 000	91	88	11	4	8	77.5	94	1	0.6	1.2~1.7	1.11	1.02
70	73	110	48	24	1.1	0.6	**234414B**	**234714B**	59.4	103	3 800	5 500	100	97	12	4	8	85	104	1	0.6	1.7~2.5	1.52	1.40
75	78	115	48	24	1.1	0.6	**234415B**	**234715B**	61.4	111	3 700	5 300	105	102	12	4	8	90	109	1	0.6	1.8~2.6	1.62	1.49
80	83	125	54	27	1.1	0.6	**234416B**	**234716B**	72.0	132	3 400	4 800	113	110	13.5	4	8	96.5	119	1	0.6	2.4~3.6	2.19	2.03
85	88	130	54	27	1.1	0.6	**234417B**	**234717B**	72.8	137	3 300	4 700	118	115	13.5	4	8	102	124	1	0.6	2.5~3.8	2.30	2.12
90	93	140	60	30	1.5	1	**234418B**	**234718B**	84.3	160	3 000	4 300	127	123	15	4	8	109	133.5	1.5	1	3.3~4.9	3.03	2.79
95	98	145	60	30	1.5	1	**234419B**	**234719B**	85.0	166	3 000	4 200	132	128	15	4	8	114	138.5	1.5	1	3.4~5	3.17	2.92
100	103	150	60	30	1.5	1	**234420B**	**234720B**	85.9	172	2 900	4 100	137	133	15	4	8	119	143.5	1.5	1	3.4~5.1	3.33	3.06
105	109	160	66	33	2	1	**234421B**	**234721B**	98.5	199	2 700	3 800	146	142	16.5	6	12	127	152	2	1	4.7~7.1	4.15	3.82
110	114	170	72	36	2	1	**234422B**	**234722B**	120	235	2 500	3 500	155	150	18	6	12	133	162	2	1	5.9~8.8	5.38	4.95
120	124	180	72	36	2	1	**234424B**	**234724B**	123	252	2 400	3 400	165	160	18	6	12	143	172	2	1	6.4~9.5	5.77	5.31
130	135	200	84	42	2	1	**234426B**	**234726B**	174	340	2 100	3 000	182	177	21	6	12	155	192	2	1	9.3~13.9	8.63	7.94
140	145	210	84	42	2	1	**234428B**	**234728B**	180	366	2 000	2 900	192	187	21	6	12	165	202	2	1	9.7~14.5	9.18	8.44
150	155	225	90	45	2.1	1.1	**234430B**	**234730B**	184	394	1 900	2 700	206	200	22.5	6	14	178	215	2	1	12~17.9	11.3	10.4
160	165	240	96	48	2.1	1.1	**234432B**	**234732B**	216	460	1 700	2 500	219	212	24	6	14	189	230	2	1	14.1~21.1	13.3	12.2
170	176	260	108	54	2.1	1.1	**234434B**	**234734B**	254	547	1 600	2 200	236	230	27	6	14	203	250	2	1	18.6~27.8	18.1	16.6

[Notes] 1) The small bore diameter type bearing is placed next to the small tapered-bore diameter side of the NN30K, or used in tandem with NN30.
The large bore diameter type bearing is placed next to the large tapered-bore diameter side of NN30K.
2) The dimension E_w is used as a reference for the ball set outside diameter.

239400B series
239700B series

Contact angle 60°





Dynamic equivalent load $P_a = F_a$

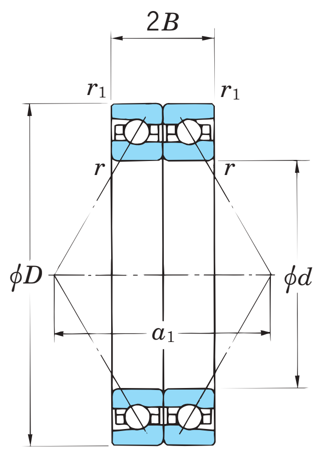
Static equivalent load $P_{0a} = F_a$

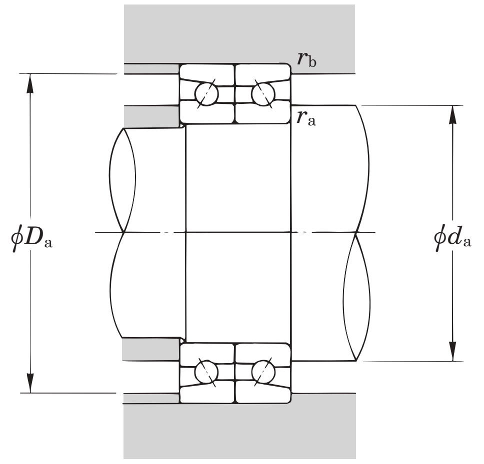
Boundary dimensions (mm)							Bearing No.[1]		Basic load ratings (kN)		Limiting speeds (min^{-1})		Dimensions (mm)					Mounting dimensions (mm)				Amount of grease fill (cm^3/row)	(Refer.) Mass (kg)	
d Small bore dia. type	d Large bore dia. type	D	T	C	r min.	r_1 min.	Small bore dia. type	Large bore dia. type	C_a	C_{0a}	Grease lub.	Oil lub.	E_w[2]	d_1	B	d_0	w	d_a min.	D_a max.	r_a max.	r_b max.		Small bore dia. type	Large bore dia. type
100	—	140	48	24	1.1	0.6	**239420B**	—	65.3	135	2 800	3 800	131	126	12	4	8	114	134	1	0.6	3.1~4.6	2.08	—
105	—	145	48	24	1.1	0.6	**239421B**	—	67.0	143	2 700	3 800	136	131	12	4	8	119	139	1	0.6	3.1~4.6	2.16	—
110	—	150	48	24	1.1	0.6	**239422B**	—	67.4	148	2 700	3 700	141	136	12	4	8	124	144	1	0.6	3~4.5	2.25	—
120	124	165	54	27	1.1	0.6	**239424B**	**239724B**	81.1	185	2 400	3 300	154.5	150	13.5	4	8	138	160	1	0.6	4.2~6.3	3.12	2.81
130	134	180	60	30	1.5	1	**239426B**	**239726B**	93.8	217	2 100	3 000	168	163	15	4	8	150	172	1.5	1	5.8~8.7	4.19	3.77
140	144	190	60	30	1.5	1	**239428B**	**239728B**	94.9	229	2 100	2 900	178	173	15	4	8	160	182	1.5	1	6.3~9.4	4.47	4.03
150	155	210	72	36	2	1	**239430B**	**239730B**	134	312	1 800	2 500	196.5	190	18	4	8	174	200	2	1	9.6~14.4	7.01	6.31
160	165	220	72	36	2	1	**239432B**	**239732B**	136	329	1 700	2 400	206.5	200	18	4	8	184	210	2	1	9.3~14	7.40	6.66
170	175	230	72	36	2	1	**239434B**	**239734B**	139	346	1 700	2 300	216.5	210	18	4	8	194	220	2	1	10.8~16.2	7.79	7.01
180	186	250	84	42	2	1	**239436B**	**239736B**	196	460	1 500	2 100	234	227	21	4	8	207	240	2	1	14.9~22.3	11.3	10.2
190	196	260	84	42	2	1	**239438B**	**239738B**	196	474	1 400	2 000	242	237	21	4	8	217	250	2	1	15.7~23.5	11.9	10.7

[Notes] 1) The small bore diameter type bearing is placed next to the small tapered-bore diameter side of the NNU49K, or used in tandem with NNU49.
The large bore diameter type bearing is placed next to the large tapered-bore diameter side of NNU49K.

2) The dimension E_w is used as a reference for the ball set outside diameter.

ACT000DB/BDB series





Dynamic equivalent load $P_a = F_a$
Static equivalent load $P_{0a} = F_a$

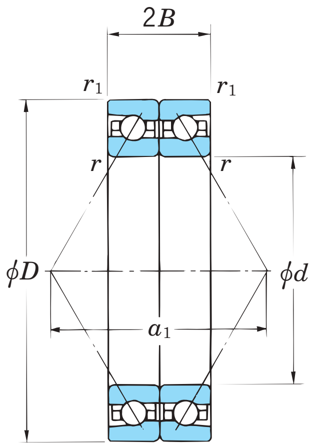
d 30 ~ 95

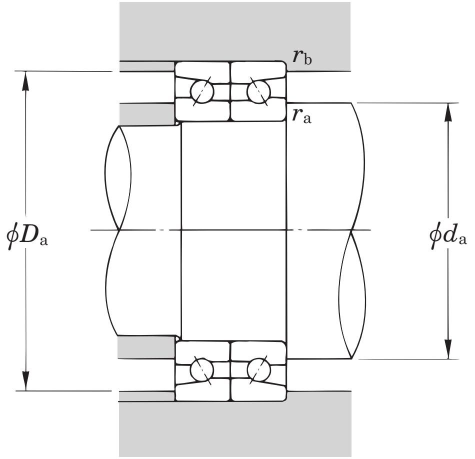
Boundary dimensions (mm)					Bearing No.[1]	Basic load ratings (kN)		Limiting speeds (min⁻¹)			Permissible axial load (kN)	Load center spread (mm)	Mounting dimensions (mm)				Interspace volume	(Refer.) Mass
d	D	$2B$	r min.	r_1 min.		C_a	C_{0a}	Grease lub.	Oil lub.		(static)	a_1	d_a min.	D_a max.	r_a max.	r_b max.	(cm³/row)	(kg/row)
30	55	24	1	0.6	**ACT006DB**	18.9	26.6	15 000	20 000		2.92	48.5	41	50	1	0.6	3	0.235
	55	24	1	0.6	**ACT006BDB**	22.6	30.5	13 000	18 000		9.86	59.6	41	50	1	0.6	3	0.235
35	62	25.5	1	0.6	**ACT007DB**	19.8	30.2	13 000	17 000		3.25	53.5	46	57	1	0.6	4.2	0.312
	62	25.5	1	0.6	**ACT007BDB**	23.6	34.5	12 000	15 000		10.9	66.2	46	57	1	0.6	4.2	0.312
40	68	27	1	0.6	**ACT008DB**	20.6	33.8	12 000	15 000		3.58	58.2	51	63	1	0.6	5	0.391
	68	27	1	0.6	**ACT008BDB**	24.5	37.7	11 000	14 000		12.1	72.3	51	63	1	0.6	5	0.391
45	75	28.5	1	0.6	**ACT009DB**	23.0	38.6	11 000	14 000		3.84	63.1	56	70	1	0.6	5.7	0.536
	75	28.5	1	0.6	**ACT009BDB**	27.3	42.7	9 500	13 000		13.2	78.8	56	70	1	0.6	5.7	0.536
50	80	28.5	1	0.6	**ACT010DB**	23.9	41.7	9 700	13 000		4.2	51.8	61	75	1	0.6	8	0.551
	80	28.5	1	0.6	**ACT010BDB**	28.4	46.3	8 800	12 000		14.5	83	61	75	1	0.6	8	0.551
55	90	33	1.1	0.6	**ACT011DB**	29.6	52.8	8 700	11 000		5.63	58.4	68	84	1	0.6	12	0.831
	90	33	1.1	0.6	**ACT011BDB**	35.1	58.6	7 900	10 000		19	89.3	68	84	1	0.6	12	0.831
60	95	33	1.1	0.6	**ACT012DB**	30.7	56.9	8 100	11 000		6.11	61.2	73	89	1	0.6	13	0.887
	95	33	1.1	0.6	**ACT012BDB**	36.4	63.1	7 400	9 700		20.6	93.5	73	89	1	0.6	13	0.887
65	100	33	1.1	0.6	**ACT013DB**	31.8	60.9	7 600	10 000		6.59	64.1	78	94	1	0.6	14	0.943
	100	33	1.1	0.6	**ACT013BDB**	37.7	67.6	6 900	9 000		22.2	85.8	78	94	1	0.6	14	0.945
70	110	36	1.1	0.6	**ACT014DB**	43.5	82.1	7 000	9 200		8.39	70	85	104	1	0.6	16	1.33
	110	36	1.1	0.6	**ACT014BDB**	51.7	91.1	6 300	8 300		28.8	93.5	85	104	1	0.6	16	1.33
75	115	36	1.1	0.6	**ACT015DB**	44.1	84.9	6 600	8 700		8.74	72.8	90	109	1	0.6	20	1.35
	115	36	1.1	0.6	**ACT015BDB**	52.3	94.2	6 000	7 800		30	97.7	90	109	1	0.6	20	1.35
80	125	40.5	1.1	0.6	**ACT016DB**	51.7	101	6 100	8 000		10.8	79.4	97	118	1	0.6	27	1.86
	125	40.5	1.1	0.6	**ACT016BDB**	61.3	112	5 500	7 200		36.6	106.3	97	118	1	0.6	27	1.86
85	130	40.5	1.1	0.6	**ACT017DB**	52.4	105	5 800	7 600		11.2	82.3	102	123	1	0.6	29	1.94
	130	40.5	1.1	0.6	**ACT017BDB**	62.1	116	5 200	6 900		38	110.5	102	123	1	0.6	29	1.94
90	140	45	1.5	1	**ACT018DB**	68.8	138	5 400	7 100		14.2	88.9	109	132	1.5	1	39	2.55
	140	45	1.5	1	**ACT018BDB**	81.7	153	4 900	6 400		48.7	119	109	132	1.5	1	39	2.55
95	145	45	1.5	1	**ACT019DB**	69.8	143	5 200	6 800		14.8	91.8	114	137	1.5	1	40	2.62
	145	45	1.5	1	**ACT019BDB**	82.8	159	4 700	6 200		50.6	123.2	114	137	1.5	1	40	2.62

[Note] 1) The blue bearing numbers indicate recommended products.

[Remark] 1) This bearing is interchangeable with 234400B as their bore and outside diameters are the same.

ACT000DB/BDB series





d 100 ~ 170

Dynamic equivalent load $P_a = F_a$
Static equivalent load $P_{0a} = F_a$

Boundary dimensions (mm)					Bearing No.[1]	Basic load ratings (kN)		Limiting speeds (min⁻¹)			Permissible axial load (kN)	Load center spread (mm)	Mounting dimensions (mm)				Interspace volume	(Refer.) Mass
d	D	$2B$	r min.	r_1 min.		C_a	C_{0a}	Grease lub.	Oil lub.		(static)	a_1	d_a min.	D_a max.	r_a max.	r_b max.	(cm³/row)	(kg/row)
100	150	45	1.5	1	**ACT020DB**	70.8	148	5 000	6 500		15.3	94.7	119	143	1.5	1	42	2.77
	150	45	1.5	1	**ACT020BDB**	84.0	164	4 500	5 900		52.5	127.4	119	143	1.5	1	42	2.77
105	160	49.5	2	1	**ACT021DB**	80.5	170	4 700	6 100		18.2	101.2	125	151	2	1	50	3.61
	160	49.5	2	1	**ACT021BDB**	95.5	188	4 200	5 500		63.2	135.9	125	151	2	1	50	3.61
110	170	54	2	1	**ACT022DB**	90.6	193	4 400	5 800		19.6	107.8	132	160	2	1	64	4.52
	170	54	2	1	**ACT022BDB**	107	214	4 000	5 200		71.3	144.5	132	160	2	1	64	4.52
120	180	54	2	1	**ACT024DB**	93.2	206	4 100	5 400		21	113.6	142	170	2	1	69	4.83
	180	54	2	1	**ACT024BDB**	111	228	3 700	4 900		76.4	152.9	142	170	2	1	69	4.83
130	200	63	2	1	**ACT026DB**	118	253	3 700	4 800		25.9	126.8	156	188	2	1	106	7.21
	200	63	2	1	**ACT026BDB**	140	281	3 300	4 400		93	170	156	188	2	1	106	7.21
140	210	63	2	1	**ACT028DB**	128	290	3 400	4 500		29.9	132.5	166	198	2	1	110	7.69
	210	63	2	1	**ACT028BDB**	151	323	3 100	4 100		107	178.3	166	198	2	1	110	7.65
150	225	67.5	2.1	1.1	**ACT030DB**	150	344	3 200	4 200		34.7	142	178	213	2	1	138	9.39
	225	67.5	2.1	1.1	**ACT030BDB**	179	382	2 900	3 800		125	191.1	178	213	2	1	138	9.39
160	240	72	2.1	1.1	**ACT032DB**	163	377	3 000	3 900		39.1	151.5	190	227	2	1	167	11.4
	240	72	2.1	1.1	**ACT032BDB**	193	419	2 700	3 500		139	203.8	190	227	2	1	167	11.4
170	260	81	2.1	1.1	**ACT034DB**	191	449	2 700	3 600		45.7	164.6	204	245	2	1	221	15.7
	260	81	2.1	1.1	**ACT034BDB**	227	499	2 500	3 200		163	221	204	245	2	1	221	15.7

[Note] 1) The blue bearing numbers indicate recommended products.

[Remark] 1) This bearing is interchangeable with 234400B as their bore and outside diameters are the same.

4. Tapered Roller Bearings

Contents

4. Tapered roller bearings

The tapered roller bearing is a bearing in which tapered rollers (truncated conical rollers) are inserted between the outer ring and inner ring. The rollers are guided by the inner ring back face rib (see **Fig. 4. 1**).

A radial load and an axial load can be simultaneously applied to the tapered roller bearing. This bearing has high rigidity.

In addition, tapered roller bearings allow easy adjustments of preload.

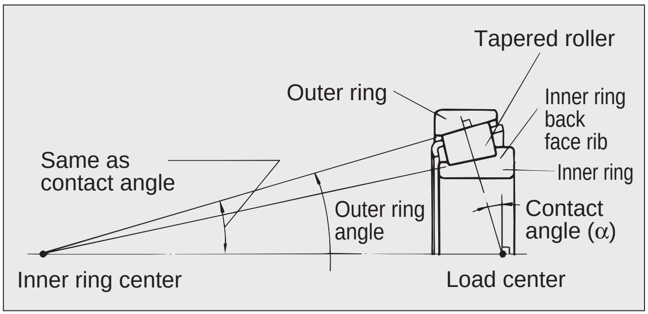


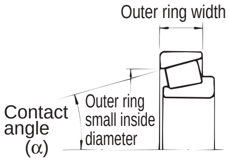
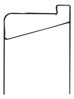
Fig. 4. 1 Structure of tapered roller bearing

Since the single row tapered roller bearing can receive only a unidirectional axial load, a pair of single row bearings are mounted apart and facing each other, or they are often used in a face-to-face or back-to-back arrangement.

4. 1 Types and features of tapered roller bearings

Two types of tapered roller bearings are available for machine tools: the single row tapered roller bearing (auxiliary symbol: JR) and the tapered roller bearing with flanged outer ring (auxiliary symbol: B) (see **Table 4. 1**).

Table 4. 1 Types and features of tapered roller bearings for machine tools

Types	Features
Tapered roller bearing with J designation  ISO sub-unit specifications	Bearings whose basic numbers are followed by "J" are made to the ISO sub-unit specifications. Consequently, inner ring assembles and outer rings, if given the same bearing number, are interchangeable on an international level. Reference: The symbol R denotes high load capacity bearings.
Tapered roller bearing with flanged outer ring 	This bearing allows easy positioning in axial direction using a simple housing structure.

4. 2 Composition of bearing numbers (metric series tapered roller bearings)

30215JRBP5

Tapered roller bearing — 3

Dimension series symbols — 02
29 : dimension series 29
20 : dimension series 20
02 : dimension series 02
22 : dimension series 22

Bore diameter number — 15
15 : nominal bore diameter 75 mm
(Bore diameter number × 5 equals nominal bore diameter.)

Designed to ISO sub-unit — J

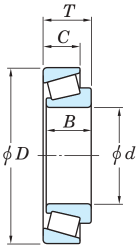
High load capacity bearing — R

Outer ring shape symbols — B
B : flanged outer ring
No specified : standard type

Tolerance class symbols — P5
P5 : JIS class 5
P4 : JIS class 4

4. 3　Tolerance of tapered roller bearings

The tolerance of the tapered roller bearing is compliant with permissible dimensional deviations and limits of classes 5 and 4 as specified in JIS B 1514 for tapered roller bearings.
Permissible dimensional deviations and limits to tapered roller bearings are shown in **Table 4. 2**.



d : nominal bore diameter
D : nominal outside diameter
B : nominal inner ring width
C : nominal outer ring width
T : nominal bearing width

Table 4. 2　Permissible dimensional deviations and limits to metric tapered roller bearings

(1)　Inner ring

Unit : μm

Nominal bore diameter d (mm)		Single plane mean bore diameter deviation $\Delta_{d\mathrm{mp}}$				Single bore diameter deviation $\Delta_{d\mathrm{s}}$		Single plane bore diameter variation $V_{d\mathrm{sp}}$		Mean bore diameter variation $V_{d\mathrm{mp}}$	
		Class 5		Class 4		Class 4		Class 5	Class 4	Class 5	Class 4
over	up to	upper	lower	upper	lower	upper	lower	max.		max.	
10	**18**	0	– 7	0	– 5	0	– 5	5	4	5	4
18	**30**	0	– 8	0	– 6	0	– 6	6	5	5	4
30	**50**	0	–10	0	– 8	0	– 8	8	6	5	5
50	**80**	0	–12	0	– 9	0	– 9	9	7	6	5
80	**120**	0	–15	0	–10	0	–10	11	8	8	5
120	**180**	0	–18	0	–13	0	–13	14	10	9	7

Nominal bore diameter d (mm)		Radial runout of assembled bearing inner ring K_{ia}		Face runout with bore S_d		Assembled bearing inner ring back face runout with raceway S_{ia}	Single inner ring width deviation $\Delta_{B\mathrm{s}}$		Actual bearing width deviation $\Delta_{T\mathrm{s}}$	
		Class 5	Class 4	Class 5	Class 4	Class 4	Classes 5, 4		Classes 5, 4	
over	up to	max.		max.		max.	upper	lower	upper	lower
10	**18**	5	3	7	3	3	0	–200	+200	–200
18	**30**	5	3	8	4	4	0	–200	+200	–200
30	**50**	6	4	8	4	4	0	–240	+200	–200
50	**80**	7	4	8	5	4	0	–300	+200	–200
80	**120**	8	5	9	5	5	0	–400	+200	–200
120	**180**	11	6	10	6	7	0	–500	+350	–250

(2)　Outer ring

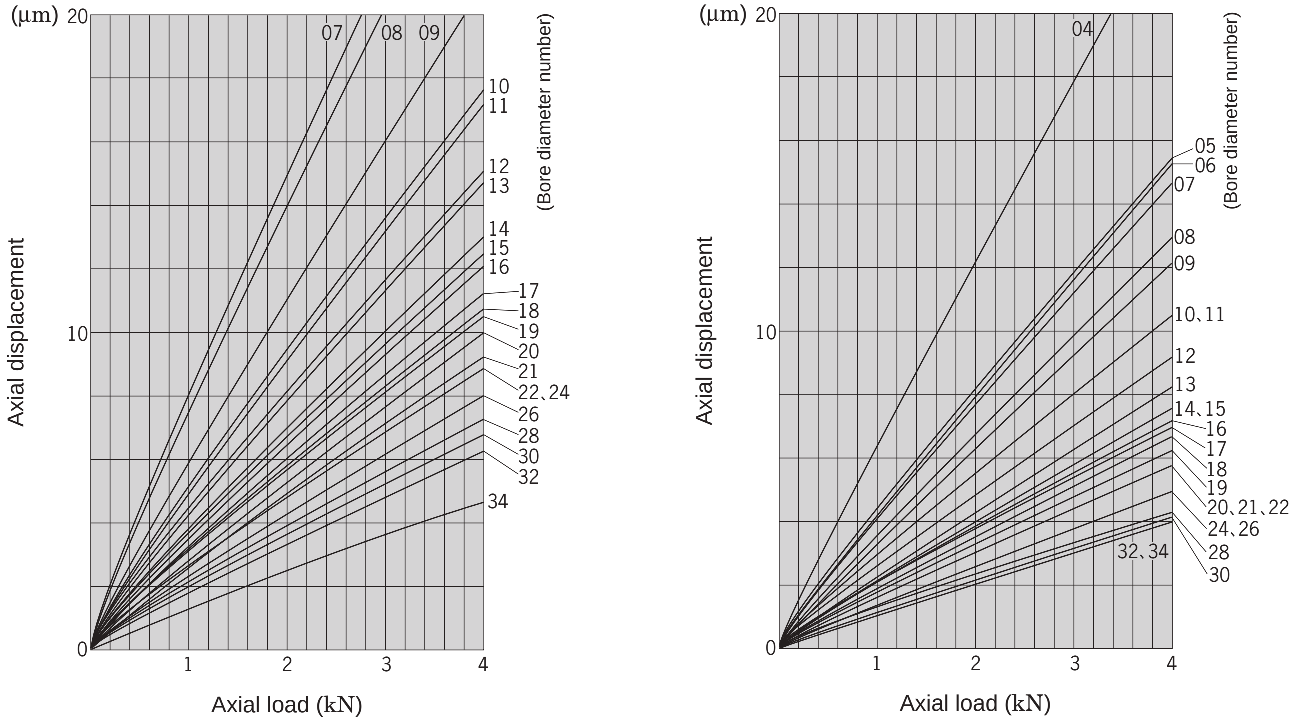
Unit : μm

Nominal outside diameter D (mm)		Single plane mean outside diameter deviation $\Delta_{D\mathrm{mp}}$				Single outside diameter deviation $\Delta_{D\mathrm{s}}$		Single radial plane outside diameter variation $V_{D\mathrm{sp}}$		Mean outside diameter variation $V_{D\mathrm{mp}}$		Radial runout of assembled bearing outer ring K_{ea}		Variation of outside surface generatrix inclination with face S_D		Assembled bearing outer ring back face runout with raceway S_{ea}	Single outer ring width deviation $\Delta_{C\mathrm{s}}$	
		Class 5		Class 4		Class 4		Class 5	Class 4	Class 5	Class 4	Class 5	Class 4	Class 5	Class 4	Class 4	Classes 5, 4	
over	up to	upper	lower	upper	lower	upper	lower	max.		max.		max.		max.		max.	upper	lower
18	**30**	0	– 8	0	– 6	0	– 6	6	5	5	4	6	4	8	4	5	Same as tolerance $\Delta_{B\mathrm{s}}$, d being that of the same bearing.	
30	**50**	0	– 9	0	– 7	0	– 7	7	5	5	5	7	5	8	4	5		
50	**80**	0	–11	0	– 9	0	– 9	8	7	6	5	8	5	8	4	5		
80	**120**	0	–13	0	–10	0	–10	10	8	7	5	10	6	9	5	6		
120	**150**	0	–15	0	–11	0	–11	11	8	8	6	11	7	10	5	7		
150	**180**	0	–18	0	–13	0	–13	14	10	9	7	13	8	10	5	8		
180	**250**	0	–20	0	–15	0	–15	15	11	10	8	15	10	11	7	10		
250	**315**	0	–25	0	–18	0	–18	19	14	13	9	18	11	13	8	10		

4. 4 Axial load and displacement (tapered roller bearings)

Fig 4. 2 shows relationships between axial load and displacement of **KOYO** tapered roller bearings.

(1) 32900JR series (2) 32000JR series



(3) 30200JR series (4) 32200JR series

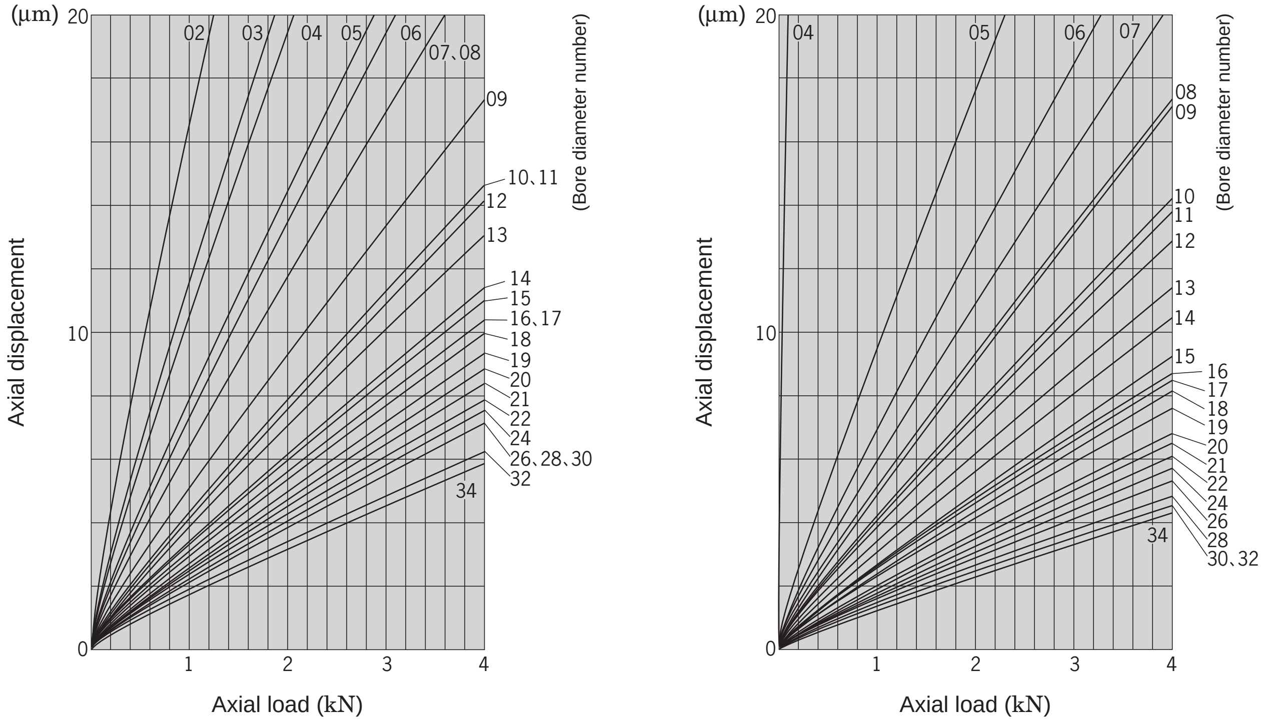
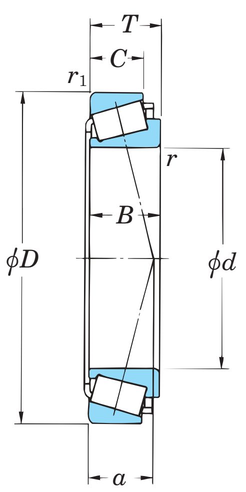


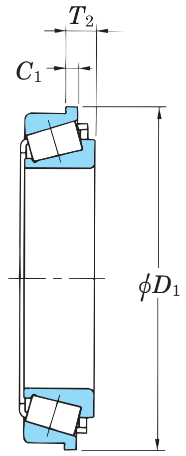
Fig. 4. 2 Relationships between axial load and displacement (tapered roller bearings)

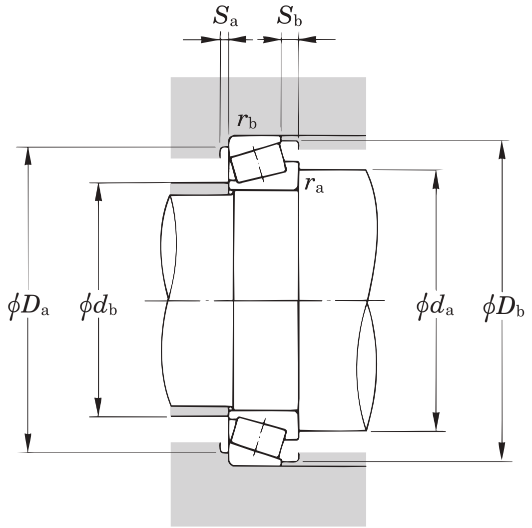
*The axial displacements shown above are values of the single-row bearings not preloaded.

32000JR



32000JRB





Dynamic equivalent load $P = XF_r + YF_a$

$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	0	0.4	Y_1

Static equivalent load $P_0 = 0.5F_r + Y_0F_a$

Note that if $P_0 < F_r$, it is assumed that $P_0 = F_r$.

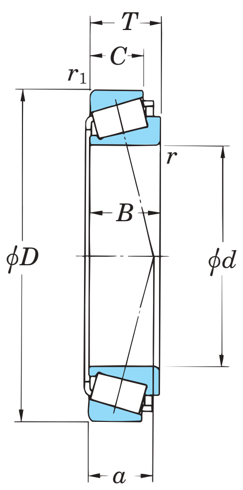
For e, Y_1, and Y_0, use values given in the table.

d 17 ~ 55

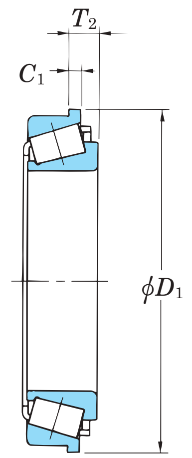
Boundary dimensions (mm)							Bearing No.[1]	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Load center (mm)	Flange dimensions (mm)			Mounting dimensions (mm)									Constant	Axial load coefficients		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	a	D_1	C_1	T_2	d_a min.	d_b max.	D_a max.	D_a min.	D_b max.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
17	40	13.25	12	11	1	1	**30203JR**	26.0	20.7	2.85	10 000	14 000	10.1	44	3	5.25	22.5	23	34.5	33	37	2	2	1	1	0.35	1.74	0.96	0.081
20	42	15	15	12	0.6	0.6	**32004JR**	34.1	31.5	4.35	9 700	13 000	10.5	46	3	6	24.5	25	37.5	35	39	3	3	0.6	0.6	0.37	1.6	0.88	0.102
	47	15.25	14	12	1	1	**30204JR**	33.8	27.2	3.80	8 700	12 000	11.8	51	3	6.25	25.5	27	41.5	39	44	2	3	1	1	0.35	1.74	0.96	0.127
	47	19.25	18	15	1	1	**32204JR**	41.4	34.7	4.90	8 900	12 000	12.5	51	3	7.25	25.5	27	41.5	39	43	2	4	1	1	0.33	1.81	1	0.159
25	47	15	15	11.5	0.6	0.6	**32005JR**	37.8	37.7	5.20	8 300	11 000	11.8	51	3	6.5	29.5	30	42.5	40	44	3	3.5	0.6	0.6	0.43	1.39	0.77	0.118
	52	16.25	15	13	1	1	**30205JR**	39.3	33.7	4.75	7 800	10 000	12.9	57	3.5	6.75	30.5	31	46.5	44	48	2	3	1	1	0.37	1.6	0.88	0.156
	52	19.25	18	16	1	1	**32205JR**	49.7	44.8	6.35	7 900	11 000	13.5	57	3.5	6.75	30.5	31	46.5	43	48	2	4	1	1	0.36	1.67	0.92	0.188
30	55	17	17	13	1	1	**32006JR**	47.9	48.0	6.75	7 000	9 400	13.6	59	3	7	35.5	35	49.5	47	52	3	4	1	1	0.43	1.39	0.77	0.177
	62	17.25	16	14	1	1	**30206JR**	51.8	44.8	6.45	6 500	8 700	14.1	67	3.5	6.75	35.5	37	56.5	53	57	2	3	1	1	0.37	1.6	0.88	0.236
	62	21.25	20	17	1	1	**32206JR**	63.3	57.9	8.40	6 500	8 700	15.9	67	4	8.25	35.5	37	56.5	52	58	2	4	1	1	0.37	1.6	0.88	0.292
35	55	14	14	11.5	0.6	0.6	**32907JR-2**	32.8	36.5	5.10	6 600	8 800	10.9	59	3	5.5	39.5	40	50.5	49	52	2.5	2.5	0.6	0.6	0.29	2.06	1.13	0.120
	62	18	18	14	1	1	**32007JR**	57.0	59.4	8.40	6 200	8 200	15.1	66	3	7	40.5	40	56.5	54	59	4	4	1	1	0.45	1.32	0.73	0.231
	72	18.25	17	15	1.5	1.5	**30207JR**	68.8	60.9	8.95	5 600	7 400	15.3	77	4	7.25	43.5	44	63.5	62	67	3	3	1.5	1.5	0.37	1.6	0.88	0.344
	72	24.25	23	19	1.5	1.5	**32207JR**	86.9	82.4	12.2	5 600	7 500	18.2	77	4.5	9.75	43.5	43	63.5	61	67	3	5	1.5	1.5	0.37	1.6	0.88	0.453
40	62	15	15	12	0.6	0.6	**32908JR**	42.1	48.5	6.90	5 900	7 800	11.9	66	3	6	44.5	45	57.5	55	59	3	3	0.6	0.6	0.29	2.07	1.14	0.164
	68	19	19	14.5	1	1	**32008JR**	67.2	71.4	10.3	5 600	7 400	15.1	72	3.5	8	45.5	46	62.5	60	65	4	4.5	1	1	0.38	1.58	0.87	0.282
	80	19.75	18	16	1.5	1.5	**30208JR**	78.4	69.2	10.3	5 000	6 700	17	85	4	7.75	48.5	49	71.5	69	75	3	3.5	1.5	1.5	0.37	1.6	0.88	0.434
	80	24.75	23	19	1.5	1.5	**32208JR**	97.0	90.8	13.6	5 000	6 600	19.4	85	4.5	10.25	48.5	48	71.5	68	75	3	5.5	1.5	1.5	0.37	1.6	0.88	0.554
45	68	15	15	12	0.6	0.6	**32909JR**	43.5	52.4	7.45	5 300	7 100	12.5	73	3	6	49.5	50	63.5	61	64	3	3	0.6	0.6	0.32	1.88	1.04	0.190
	75	20	20	15.5	1	1	**32009JR**	78.8	86.5	12.6	5 000	6 600	16.5	79	3.5	8	50.5	51	69.5	67	72	4	4.5	1	1	0.39	1.53	0.84	0.354
	85	20.75	19	16	1.5	1.5	**30209JR**	83.9	77.4	11.6	4 600	6 100	18.9	90	4	8.75	53.5	54	76.5	74	80	3	4.5	1.5	1.5	0.4	1.48	0.81	0.502
	85	24.75	23	19	1.5	1.5	**32209JR-1**	105	104	15.6	4 600	6 100	20.3	90	4.5	10.25	53.5	53	76.5	73	81	3	5.5	1.5	1.5	0.4	1.48	0.81	0.597
50	72	15	15	12	0.6	0.6	**32910JR**	45.0	56.3	8.00	4 900	6 600	13.7	77	3	6	54.5	55	67.5	65	69	3	3	0.6	0.6	0.34	1.76	0.97	0.195
	80	20	20	15.5	1	1	**32010JR**	82.7	94.5	13.8	4 600	6 100	17.7	84	3.5	8	55.5	56	74.5	72	77	4	4.5	1	1	0.42	1.42	0.78	0.389
	90	21.75	20	17	1.5	1.5	**30210JR**	95.6	91.7	13.8	4 300	5 700	20.1	95	4	8.75	58.5	58	81.5	79	85	3	4.5	1.5	1.5	0.42	1.43	0.79	0.566
	90	24.75	23	19	1.5	1.5	**32210JR**	106	105	15.9	4 300	5 700	20.6	95	4.5	10.25	58.5	58	81.5	78	85	3	5.5	1.5	1.5	0.42	1.43	0.79	0.643
55	80	17	17	14	1	1	**32911JR**	55.8	73.3	10.6	4 400	5 900	14.5	85	3	6	61	61	74	72	76	3	3	1	1	0.31	1.94	1.07	0.285
	90	23	23	17.5	1.5	1.5	**32011JR**	106	121	18.2	4 100	5 500	19.8	94	4	9.5	63.5	63	81.5	81	86	4	5.5	1.5	1.5	0.41	1.48	0.81	0.569
	100	22.75	21	18	2	1.5	**30211JR**	118	113	17.3	3 900	5 200	20.7	106	4.5	9.25	65	64	90	88	94	4	4.5	2	1.5	0.4	1.48	0.81	0.732
	100	26.75	25	21	2	1.5	**32211JR-1**	134	133	20.5	3 900	5 200	23	106	5	10.75	65	63	90	87	95	4	5.5	2	1.5	0.4	1.48	0.81	0.863

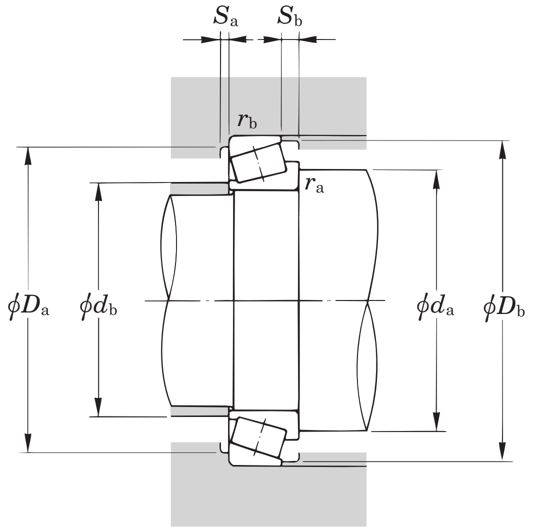
[Note] 1) The bearing number of a tapered roller bearing with a flanged outer ring contains the auxiliary symbol B.
Example 30203JRB

32000JR



32000JRB





Dynamic equivalent load $P=XF_r+YF_a$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	0	0.4	Y_1

Static equivalent load $P_0=0.5F_r+Y_0F_a$

Note that if $P_0<F_r$, it is assumed that $P_0=F_r$.

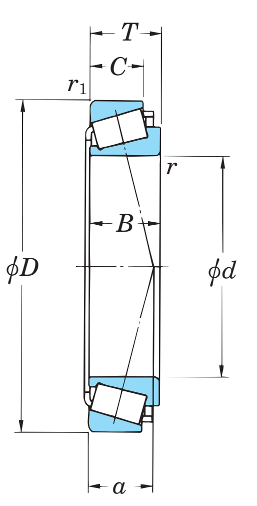
For e, Y_1, and Y_0, use values given in the table.

d 60 ~ (95)

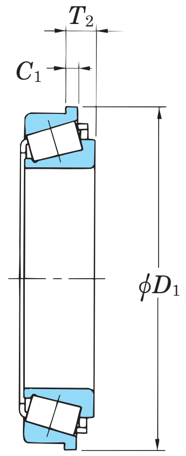
Boundary dimensions (mm)							Bearing No.[1]	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Load center (mm)	Flange dimensions (mm)			Mounting dimensions (mm)									Constant	Axial load coefficients		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	a	D_1	C_1	T_2	d_a min.	d_b max.	D_a max.	D_a min.	D_b max.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
60	85	17	17	14	1	1	**32912JR**	57.6	78.2	11.3	4 100	5 500	15.6	90	3	6	65.5	66	79.5	77	81	3	3	1	1	0.33	1.81	1	0.306
	95	23	23	17.5	1.5	1.5	**32012JR**	108	127	19.0	3 900	5 200	21	99	4	9.5	68.5	67	86.5	85	91	4	5.5	1.5	1.5	0.43	1.39	0.77	0.621
	110	23.75	22	19	2	1.5	**30212JR**	133	127	19.7	3 500	4 700	21.9	116	4.5	9.25	70	70	100	96	103	4	4.5	2	1.5	0.4	1.48	0.81	0.945
	110	29.75	28	24	2	1.5	**32212JR**	164	167	25.9	3 500	4 700	25.1	116	5	10.75	70	69	100	95	104	4	5.5	2	1.5	0.4	1.48	0.81	1.19
65	90	17	17	14	1	1	**32913JR**	59.2	83.1	12.0	3 900	5 200	16.8	95	3	6	70.5	70	84.5	81	86	3	3	1	1	0.35	1.7	0.93	0.327
	100	23	23	17.5	1.5	1.5	**32013JR**	113	137	20.6	3 600	4 800	22.5	104	4	9.5	73.5	72	91.5	90	97	4	5.5	1.5	1.5	0.46	1.31	0.72	0.664
	120	24.75	23	20	2	1.5	**30213JR**	160	156	24.3	3 200	4 300	24.2	127	4.5	9.25	75	77	110	106	113	4	4.5	2	1.5	0.4	1.48	0.81	1.18
	120	32.75	31	27	2	1.5	**32213JR**	196	203	31.7	3 200	4 300	26.6	127	6	11.75	75	76	110	104	115	4	5.5	2	1.5	0.4	1.48	0.81	1.58
70	100	20	20	16	1	1	**32914JR**	89.0	115	17.2	3 500	4 700	17.8	105	3	7	75.5	77	94.5	91	96	4	4	1	1	0.32	1.9	1.05	0.496
	110	25	25	19	1.5	1.5	**32014JR**	136	163	24.8	3 300	4 400	23.6	116	4.5	10.5	78.5	78	101.5	98	105	5	6	1.5	1.5	0.43	1.38	0.76	0.884
	125	26.25	24	21	2	1.5	**30214JR**	173	173	27.1	3 100	4 100	25.9	132	5	10.25	80	81	116.5	110	118	4	5	2	1.5	0.42	1.43	0.79	1.32
	125	33.25	31	27	2	1.5	**32214JR**	212	225	35.2	3 100	4 100	29.2	132	6	12.25	80	80	116.5	108	119	4	6	2	1.5	0.42	1.43	0.79	1.71
75	105	20	20	16	1	1	**32915JR**	92.2	123	18.4	3 300	4 400	18.9	111	3	7	80.5	81	99.5	96	101	4	4	1	1	0.33	1.8	0.99	0.526
	115	25	25	19	1.5	1.5	**32015JR**	139	169	25.8	3 100	4 200	25.1	121	4.5	10.5	83.5	83	106.5	103	110	5	6	1.5	1.5	0.46	1.31	0.72	0.930
	130	27.25	25	22	2	1.5	**30215JR**	178	181	28.2	2 900	3 900	27.6	137	5	10.25	85	86	121.5	115	124	4	5	2	1.5	0.44	1.38	0.76	1.42
	130	33.25	31	27	2	1.5	**32215JR**	218	234	36.4	2 900	3 900	30.2	137	6	12.25	85	85	121.5	114	125	4	6	2	1.5	0.44	1.38	0.76	1.77
80	110	20	20	16	1	1	**32916JR**	95.1	131	19.5	3 100	4 200	20.1	116	3	7	85.5	86	104.5	101	106	4	4	1	1	0.35	1.71	0.94	0.556
	125	29	29	22	1.5	1.5	**32016JR**	185	225	34.6	2 900	3 900	26.7	131	5	12	88.5	89	116.5	112	120	6	7	1.5	1.5	0.42	1.42	0.78	1.32
	140	28.25	26	22	2.5	2	**30216JR**	202	202	31.2	2 700	3 600	28.6	147	5	11.25	92	91	130	124	132	4	6	2	2	0.42	1.43	0.79	1.72
	140	35.25	33	28	2.5	2	**32216JR**	253	271	41.5	2 700	3 600	31.7	147	6	13.25	92	90	130	122	134	4	7	2	2	0.42	1.43	0.79	2.17
85	120	23	23	18	1.5	1.5	**32917JR**	122	165	25.0	2 900	3 900	21.2	126	3	8	93.5	93	111.5	109	115	5	5	1.5	1.5	0.33	1.83	1.01	0.794
	130	29	29	22	1.5	1.5	**32017JR**	189	234	35.5	2 800	3 700	28	136	5	12	93.5	94	121.5	117	125	6	7	1.5	1.5	0.44	1.36	0.75	1.38
	150	30.5	28	24	2.5	2	**30217JR**	228	231	35.1	2 500	3 400	30.4	158	5	11.5	97	97	140	132	141	5	6.5	2	2	0.42	1.43	0.79	2.17
	150	38.5	36	30	2.5	2	**32217JR**	290	315	47.5	2 500	3 400	34.2	158	7	15.5	97	96	140	130	142	5	8.5	2	2	0.42	1.43	0.79	2.80
90	125	23	23	18	1.5	1.5	**32918JR**	126	175	26.2	2 800	3 700	22.3	131	3	8	98.5	97	116.5	114	120	5	5	1.5	1.5	0.34	1.75	0.96	0.834
	140	32	32	24	2	1.5	**32018JR**	224	276	41.5	2 600	3 500	29.8	146	5.5	13.5	100	100	131.5	125	134	6	8	2	1.5	0.42	1.42	0.78	1.80
	160	32.5	30	26	2.5	2	**30218JR**	255	261	39.0	2 400	3 200	32.6	168	6	12.5	102	103	150	140	150	5	6.5	2	2	0.42	1.43	0.79	2.65
	160	42.5	40	34	2.5	2	**32218JR**	329	362	53.7	2 400	3 200	37	168	8	16.5	102	102	150	138	152	5	8.5	2	2	0.42	1.43	0.79	3.47
95	130	23	23	18	1.5	1.5	**32919JR**	130	186	27.4	2 600	3 500	23.5	133	3	8	103.5	102	121.5	119	125	5	5	1.5	1.5	0.36	1.68	0.92	0.876
	145	32	32	24	2	1.5	**32019JR**	229	287	42.6	2 500	3 300	31.2	151	5.5	13.5	105	105	136.5	130	140	6	8	2	1.5	0.44	1.36	0.75	1.88

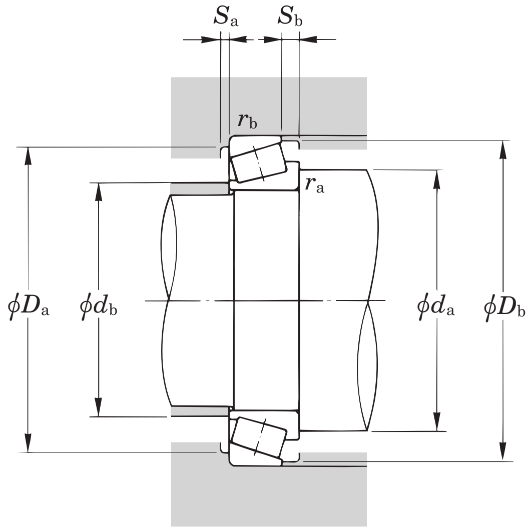
[Note] 1) The bearing number of a tapered roller bearing with a flanged outer ring contains the auxiliary symbol B.
Example 32912JRB

32000JR



32000JRB





Dynamic equivalent load $P=XF_r+YF_a$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	0	0.4	Y_1

Static equivalent load $P_0=0.5F_r+Y_0F_a$

Note that if $P_0<F_r$, it is assumed that $P_0=F_r$.

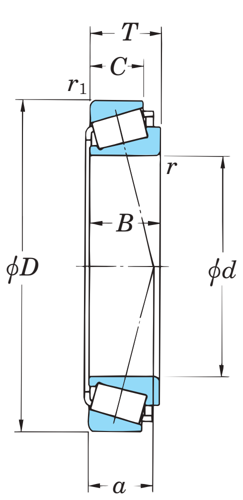
For e, Y_1, and Y_0, use values given in the table.

d (95) ~ 150

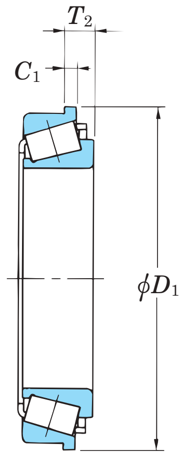
Boundary dimensions (mm)							Bearing No. [1]	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min^{-1})		Load center (mm)	Flange dimensions (mm)			Mounting dimensions (mm)									Constant	Axial load coefficients		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	a	D_1	C_1	T_2	d_a min.	d_b max.	D_a max.	D_a min.	D_b max.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
95	170	34.5	32	27	3	2.5	**30219JR**	289	299	44.0	2 200	3 000	34.9	179	6.5	14	109	110	158	149	159	5	7.5	2.5	2	0.42	1.43	0.79	3.20
	170	45.5	43	37	3	2.5	**32219JR**	389	439	64.1	2 200	3 000	38.9	179	8	16.5	109	108	158	145	161	5	8.5	2.5	2	0.42	1.43	0.79	4.34
100	140	25	25	20	1.5	1.5	**32920JR**	158	217	32.0	2 400	3 300	24	147	4	9	108.5	108	131.5	128	135	5	5	1.5	1.5	0.33	1.82	1	1.19
	150	32	32	24	2	1.5	**32020JR**	233	298	43.8	2 400	3 200	32.6	156	5.5	13.5	110	109	141.5	134	144	6	8	2	1.5	0.46	1.31	0.72	1.95
	180	37	34	29	3	2.5	**30220JR**	323	338	49.1	2 100	2 800	36.8	190	7	15	114	116	168	157	168	5	8	2.5	2	0.42	1.43	0.79	3.83
	180	49	46	39	3	2.5	**32220JR**	435	495	63.9	2 100	2 800	42.1	190	8	18	114	114	168	154	171	5	10	2.5	2	0.42	1.43	0.79	5.21
105	145	25	25	20	1.5	1.5	**32921JR**	160	224	32.6	2 400	3 100	25.1	152	4	9	113.5	113	136.5	133	140	5	5	1.5	1.5	0.34	1.75	0.96	1.23
	160	35	35	26	2.5	2	**32021JR**	270	344	49.9	2 200	3 000	34.5	168	6.5	15.5	117	116	150	143	154	6	9	2	2	0.44	1.35	0.74	2.45
	190	39	36	30	3	2.5	**30221JR**	360	380	52.3	2 000	2 600	39	200	7	16	119	122	178	165	178	6	9	2.5	2	0.42	1.43	0.79	4.49
	190	53	50	43	3	2.5	**32221JR**	490	567	73.0	2 000	2 700	44.8	200	9	19	119	120	178	161	180	6	10	2.5	2	0.42	1.43	0.79	6.37
110	150	25	25	20	1.5	1.5	**32922JR**	162	231	33.3	2 300	3 000	26.3	157	4	9	118.5	118	141.5	138	145	5	5	1.5	1.5	0.36	1.69	0.93	1.28
	170	38	38	29	2.5	2	**32022JR**	312	395	56.7	2 100	2 800	36.1	178	6.5	15.5	122	122	160	152	163	7	9	2	2	0.43	1.39	0.77	3.12
	200	41	38	32	3	2.5	**30222JR**	405	434	58.1	1 900	2 500	40.8	210	7	16	124	129	188	174	188	6	9	2.5	2	0.42	1.43	0.79	5.33
	200	56	53	46	3	2.5	**32222JR**	547	640	80.4	1 900	2 500	46.7	210	10	20	124	126	188	170	190	6	10	2.5	2	0.42	1.43	0.79	7.45
120	165	29	29	23	1.5	1.5	**32924JR**	215	298	42.5	2 100	2 700	29.4	172	5	11	128.5	128	156.5	152	160	6	6	1.5	1.5	0.35	1.72	0.95	1.77
	180	38	38	29	2.5	2	**32024JR**	325	427	60.0	2 000	2 600	38.8	188	6.5	15.5	132	131	170	161	173	7	9	2	2	0.46	1.31	0.72	3.34
	215	43.5	40	34	3	2.5	**30224JR**	435	473	61.7	1 700	2 300	44.2	225	8	17.5	134	140	203	187	203	6	9.5	2.5	2	0.44	1.38	0.76	6.36
	215	61.5	58	50	3	2.5	**32224JR**	589	691	84.0	1 700	2 300	51.6	225	11	22.5	134	136	203	181	204	7	11.5	2.5	2	0.44	1.38	0.76	9.04
130	180	32	32	25	2	1.5	**32926JR**	251	368	51.2	1 900	2 500	31.4	187	5	12	140	141	171.5	165	174	6	7	2	1.5	0.34	1.77	0.97	2.42
	200	45	45	34	2.5	2	**32026JR**	428	563	77.4	1 800	2 300	42.9	208	8	19	142	144	190	178	192	8	11	2	2	0.43	1.38	0.76	5.04
	230	43.75	40	34	4	3	**30226JR**	472	511	65.7	1 600	2 100	46.2	241	8	17.75	148	152	216	203	218	7	9.5	3	2.5	0.44	1.38	0.76	7.24
	230	67.75	64	54	4	3	**32226JR**	693	830	99.9	1 600	2 200	56	241	11	24.75	148	146	216	193	219	7	13.5	3	2.5	0.44	1.38	0.76	11.5
140	190	32	32	25	2	1.5	**32928JR**	258	390	53.2	1 800	2 300	33.6	197	5	12	150	150	181.5	174	184	6	7	2	1.5	0.36	1.67	0.92	2.57
	210	45	45	34	2.5	2	**32028JR**	435	585	79.2	1 700	2 200	45.6	218	8	19	152	153	200	187	202	8	11	2	2	0.46	1.31	0.72	5.28
	250	45.75	42	36	4	3	**30228JR**	526	570	71.8	1 500	1 900	49.4	261	9	18.75	158	163	236	219	237	9	9.5	3	2.5	0.44	1.38	0.76	8.97
	250	71.75	68	58	4	3	**32228JR**	796	961	112	1 500	2 000	60	261	12	25.75	158	158	236	210	238	9	13.5	3	2.5	0.44	1.38	0.76	14.7
150	210	38	38	30	2.5	2	**32930JR**	358	536	72.1	1 600	2 100	36.1	218	6	14	162	163	200	194	202	7	8	2	2	0.33	1.83	1.01	3.96
	225	48	48	36	3	2.5	**32030JR**	492	668	79.6	1 500	2 000	48.8	233	8.5	20.5	164	164	213	200	216	8	12	2.5	2	0.46	1.31	0.72	6.41
	270	49	45	38	4	3	**30230JR**	604	664	80.9	1 300	1 800	52.4	282	9	20	168	175	256	234	255	9	11	3	2.5	0.44	1.38	0.76	11.6
	270	77	73	60	4	3	**32230JR**	881	1070	122	1 300	1 800	65.2	282	12	29	168	170	256	226	254	8	17	3	2.5	0.44	1.38	0.76	18.2

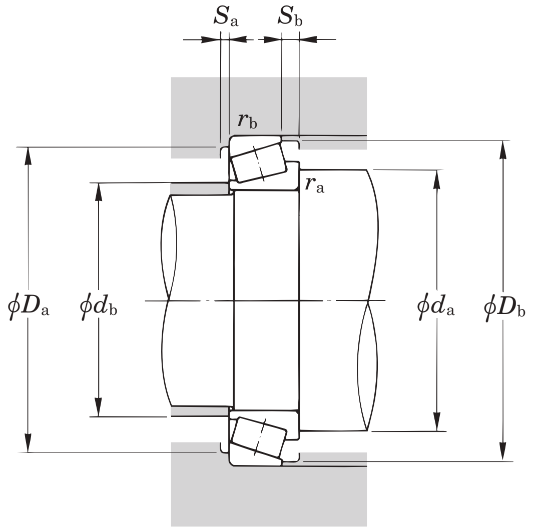
[Note] 1) The bearing number of a tapered roller bearing with a flanged outer ring contains the auxiliary symbol B.
Example 30219JRB

32000JR



32000JRB





Dynamic equivalent load $P=XF_r+YF_a$

$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	0	0.4	Y_1

Static equivalent load $P_0=0.5F_r+Y_0F_a$

Note that if $P_0<F_r$, it is assumed that $P_0=F_r$.

For e, Y_1, and Y_0, use values given in the table.

d 160 ~ 170

Boundary dimensions (mm)							Bearing No. 1)	Basic load ratings (kN)		Fatigue load limit (kN)	Limiting speeds (min⁻¹)		Load center (mm)	Flange dimensions (mm)			Mounting dimensions (mm)										Constant	Axial load coefficients		(Refer.) Mass (kg)
d	D	T	B	C	r min.	r_1 min.		C_r	C_{0r}	C_u	Grease lub.	Oil lub.	a	D_1	C_1	T_2	d_a min.	d_b max.	D_a max.	D_a min.	D_b max.	S_a min.	S_b min.	r_a max.	r_b max.	e	Y_1	Y_0	
160	220	38	38	30	2.5	2	**32932JR**	368	568	75.2	1 500	2 000	38.4	228	6	14	172	173	210	204	212	7	8	2	2	0.35	1.73	0.95	4.19
	240	51	51	38	3	2.5	**32032JR**	553	758	90.3	1 400	1 900	52.1	248	9	22	174	175	228	213	231	8	13	2.5	2	0.46	1.31	0.72	7.75
	290	52	48	40	4	3	**30232JR**	679	750	89.3	1 200	1 600	56.3	302	11	23	178	189	276	252	269	8	12	3	2.5	0.44	1.38	0.76	14.1
	290	84	80	67	4	3	**32232JR**	994	1210	137	1 200	1 700	70.3	304	14	31	178	182	276	242	274	10	17	3	2.5	0.44	1.38	0.76	23.2
170	230	38	38	30	2.5	2	**32934JR**	370	606	78.8	1 400	1 900	42	238	6	14	182	183	220	213	222	7	8	2	2	0.38	1.57	0.86	4.49
	260	57	57	43	3	2.5	**32034JR**	661	905	105	1 300	1 700	55.8	268	10	24	184	187	248	230	249	10	14	2.5	2	0.44	1.35	0.74	10.5
	310	57	52	43	5	4	**30234JR**	776	867	103	1 100	1 500	61.2	322	11	25	192	202	292	269	288	8	14	4	3	0.44	1.38	0.76	17.8
	310	91	86	71	5	4	**32234JR**	1120	1380	152	1 100	1 500	76.2	324	14	34	192	195	292	259	294	10	20	4	3	0.44	1.38	0.76	28.9

[Note] 1) The bearing number of a tapered roller bearing with a flanged outer ring contains the auxiliary symbol B.
Example 32932JRB

5. Support Bearings and Support Bearing Units for Precision Ball Screws

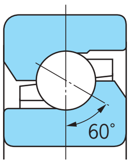
Contents

5. Support bearings and support bearing units for precision ball screws

5. 1 Structure and features

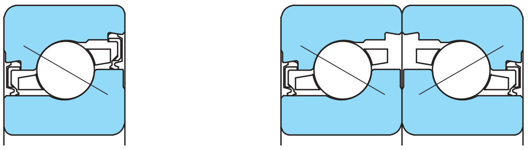
Support bearings for precision ball screws

The SAC type support bearings are angular contact thrust ball bearings specifically for supporting the screw shafts of precision ball screws (see **Fig. 5. 1**).



The bearings supporting the precision ball screws correspond to the type with contact seal.

Consult **JTEKT** for details about the type with contact seal and the pair patterns.



Both-side sealed type

Matching example of one-side sealed type

Fig. 5. 1 Structure of support bearings for precision ball screws

These bearings have many, small-diameter balls and thick section inner and outer rings.

The contact angle of these bearings is 60° enabling a high axial load and a certain degree of radial load to be applied simultaneously.

1) Features of support bearings for precision ball screws

· High rigidity
Has higher rigidity against axial load than conventional standard bearings (see **Fig. 5. 2**).

· Compact and lightweight
Since this bearing eliminates the need for an additional radial bearing or thrust bearing, it allows a compact surrounding design, thereby contributing to a reduction in the weight of the total system.

· High precision
A high-precision bearing suitable for precision ball screws.

· Preload adjustments not required
Preload is preadjusted to ensure an adequate preload after mounting. As a result, complicated adjustments are not required during mounting.

· Low torque
Requires lower friction torque than the tapered roller bearing or thrust roller bearing.

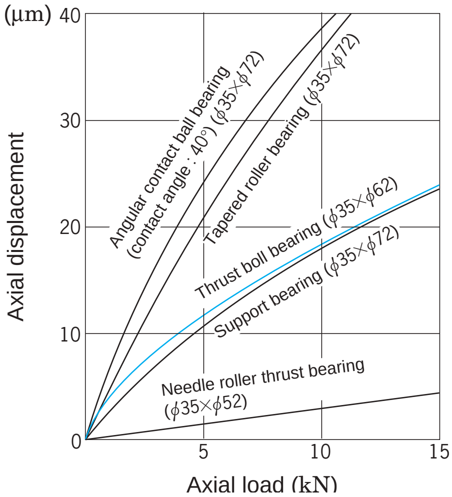
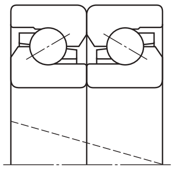
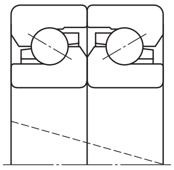
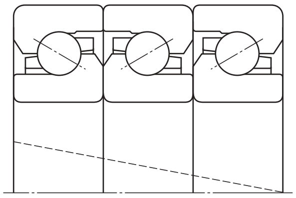
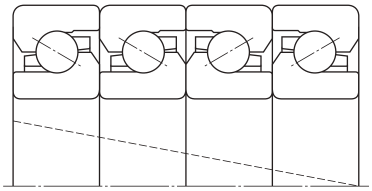


Fig. 5. 2 Relationship between axial load and displacement (comparison between support bearings and other bearings)

*The axial displacements shown above are values of the single-row bearings not preloaded.

2) Matched pair or stack support bearings

Table 5. 1 Types and suffixes of support bearings

	Type and suffix of support bearing	
Combination of two	 Suffix DB	 Suffix DF
Combination of three	 Suffix DFD	
Combination of four	 Suffix DFF	

[Remarks] 1. A "V" mark is put on the outside surfaces of the outer rings of matched pair and stack bearings to indicate their combination type. For handling precautions of the type G bearing, refer to the bearing dimension table "**1. 2 Matched pair angular contact ball bearings.**"
2. Type G bearings are also manufactured, which enable any desired combinations. For descriptions of the type G bearing, refer to the bearing dimension table "**1. 2 Matched pair angular contact ball bearings.**"

Support bearing units for precision ball screws

The support bearing unit for precision ball screws is a unit product combining the SAC type support bearing and a housing machined to a high precision.

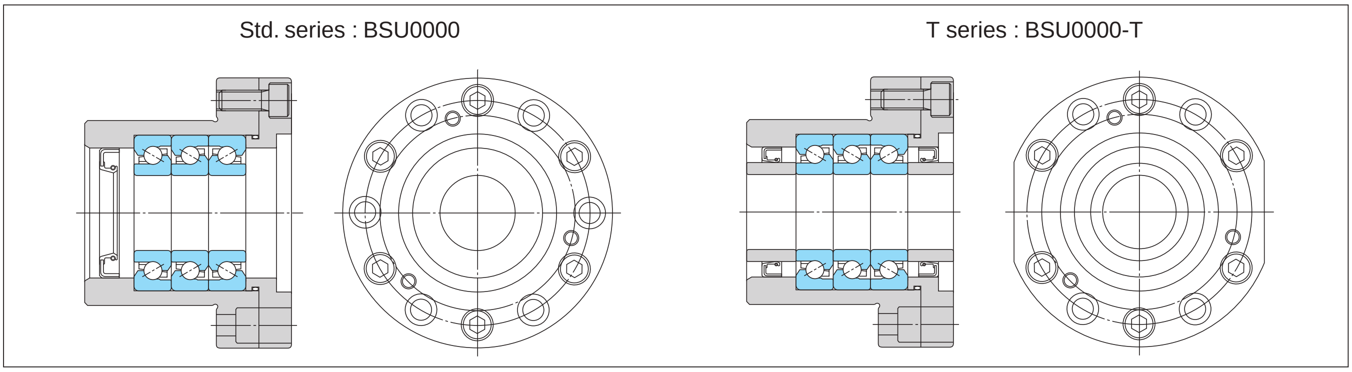
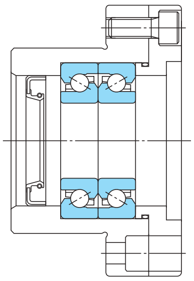
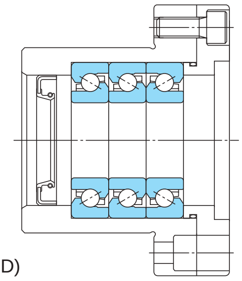
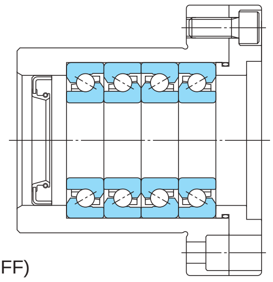


Fig. 5. 3 Series and structures of support bearing units for precision ball screws

1) Types of matched pair or stack bearing

Table 5. 2 Types of matched pair or stack bearing

	Type and symbol
Combination of two bearings	 (Suffix : DF)
Combination of three bearings	 (Suffix : DFD)
Combination of four bearings	 (Suffix : DFF)

2) Features of support bearing units for precision ball screws

- Simple mounting work

This is a unit product consisting of a bearing where the preload is adjusted and an adequate quantity of grease is sealed within the bearing, and is mounted in a compact housing.

Thus the support bearing unit can be easily mounted on a machine.

- Excellent dust-proof performance

Having a high-performance built in oil seal the support bearing unit, with low torque operation, is excellent in dust-proof performance.

- Capability of coping with any desired design

In addition to the standard products listed in the dimension tables, **JTEKT** manufactures support bearing units to meet the support structures of various ball screws.

Consult **JTEKT** for more information.

5. 2 Composition of identification numbers (support bearings and support bearing units for precision ball screws)

Support bearings for precision ball screws

SAC 20 47 B DB MG 4Z

Support bearing for precision ball screws

Nominal bore diameter
20 : 20 mm

Nominal outside diameter
47 : 47 mm

Internal design code

Matched pair or stack symbols
DB : back-to-back
DF : face-to-face
DFD : three bearings making up face-to-face + tandem
DFF : four bearings making up face-to-face + tandem

Cage symbols
MG : molded cage made of polyamide resin

Tolerance class symbols
4Z : **JTEKT** standards class 4 (Equivalent of JIS class 4)
5Z : **JTEKT** standards class 5 (Equivalent of JIS class 5)

[Remark]
Amount of preload is standardized for each matched pair type.

Support bearing units for precision ball screws

BSU 30 62 B DFD –T

Support bearing unit for precision ball screws

Nominal bore diameter
30 : 30 mm

Nominal outside diameter
62 : 62 mm

Internal design code

Matched pair or stack symbols
DF : face-to-face
DFD : three bearings making up face-to-face + tandem
DFF : four bearings making up face-to-face + tandem

Series code
no code : std. series
–T : T series

5. 3 Tolerance of support bearings for precision ball screws

The support bearings for precision ball screws are manufactured to specific **JTEKT** standards suitable for the requirements of precision ball screws (see **Table 5. 3**).

Table 5. 3 Permissible dimensional deviations and limits of support bearings for precision ball screws

(1) Inner ring

Unit : μm

Nominal bore diameter d (mm)		Single plane mean bore diameter deviation Δ_{dmp}				Single bore diameter deviation Δ_{ds}				Single inner ring width deviation Δ_{Bs}		Inner ring width variation V_{Bs}		K_{ia}		Perpendicularity of inner ring face with respect to the bore S_d		S_{ia}	
		Class 5Z		Class 4Z		Class 5Z		Class 4Z		Classes 5Z, 4Z		Class 5Z	Class 4Z	Class 5Z	Class 4Z	Class 5Z	Class 4Z	Class 5Z	Class 4Z
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.		max.		max.		max.	
10	**18**	0	− 5	0	− 4	0	− 5	0	− 4	0	− 80	5	2.5	4	2.5	7	3	5	3
18	**30**	0	− 6	0	− 5	0	− 6	0	− 5	0	− 120	5	2.5	4	3	8	4	5	3
30	**50**	0	− 8	0	− 6	0	− 8	0	− 6	0	− 120	5	3	5	4	8	4	6	3
50	**80**	0	− 9	0	− 7	0	− 9	0	− 7	0	− 150	6	4	5	4	8	5	7	4

K_{ia} : Radial runout of assembled bearing inner ring

S_{ia} : Axial runout of assembled bearing inner ring

(2) Outer ring

Unit : μm

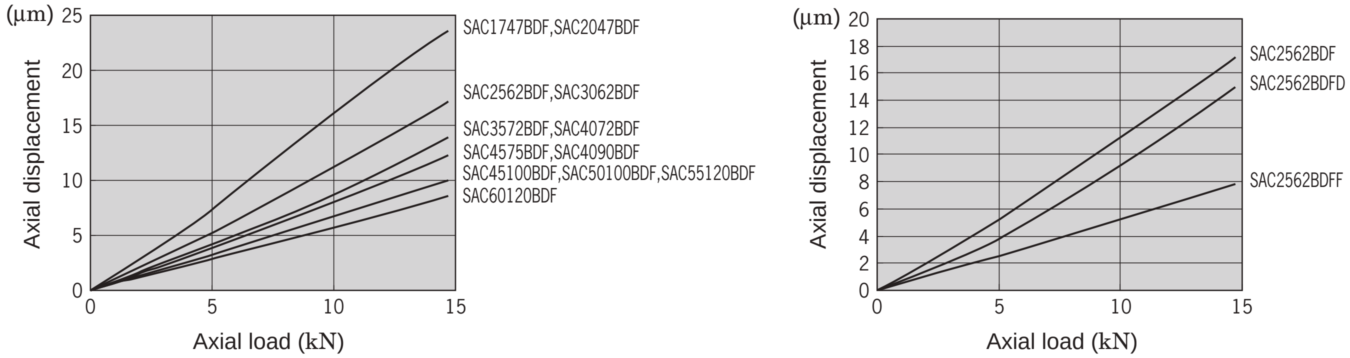
Nominal outside diameter D (mm)		Single plane mean outside diameter deviation Δ_{Dmp}				Single outside diameter deviation Δ_{Ds}				Deviation of a single outer ring width Δ_{Cs}		Ring width variation V_{Cs}		K_{ea}		S_D		S_{ea}	
		Class 5Z		Class 4Z		Class 5Z		Class 4Z		Classes 5Z, 4Z		Class 5Z	Class 4Z	Class 5Z	Class 4Z	Class 5Z	Class 4Z	Class 5Z	Class 4Z
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.		max.		max.		max.	
30	**50**	0	− 7	0	− 6	0	− 7	0	− 6	Same as tolerance Δ_{Bs}, d being that of the same bearing.		5	2.5	7	5	8	4	Same as tolerance S_{ia}, d being that of the same bearing.	
50	**80**	0	− 9	0	− 7	0	− 9	0	− 7			6	3	8	5	8	4		
80	**120**	0	− 10	0	− 8	0	− 10	0	− 8			8	4	10	6	9	5		

K_{ea} : Radial runout of assembled bearing outer ring

S_D : Perpendicularity of outer ring surface with respect to the face

S_{ea} : Axial runout of assembled bearing outer ring

5. 4 Axial load and displacement (support bearings for precision ball screws)



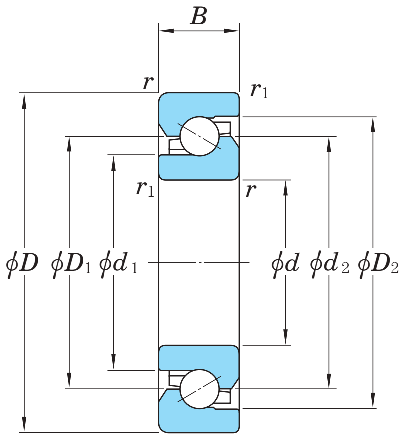
(Matched pair, standard preload)

(Comparison of number of bearing rows)

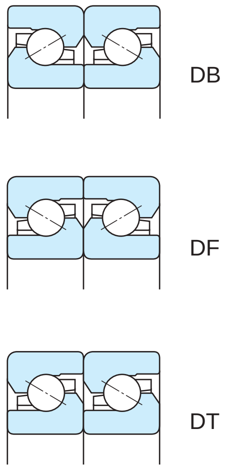
Fig. 5. 4 Relationship between axial load and displacement (support bearings for precision ball screws)

SAC0000B, SAC00000B series

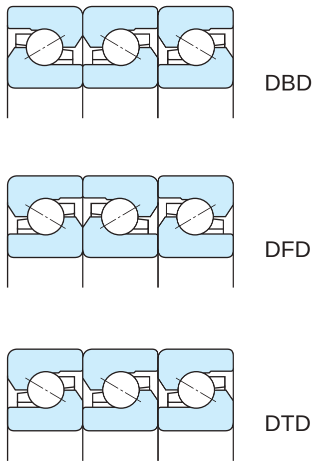
Contact angle 60°



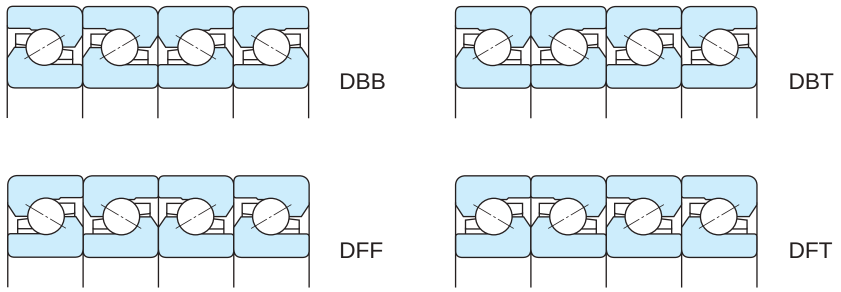
Two-bearing combination



Three-bearing combination



Four-bearing combination



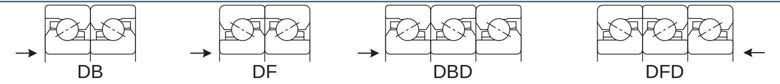
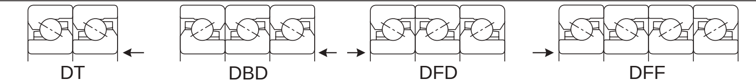
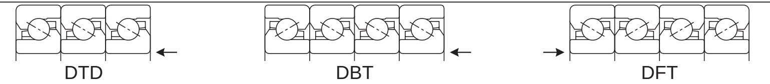
Boundary dimensions (mm)					Basic dynamic[1)] load rating (kN)	Max. axial loads (kN)			Limiting speeds (min^{-1})		Bearing[2)] No.	Interspace volume (cm^3/row)	Dimensions (mm)				Standard preloads (kN)			Starting torques (mN·m)			Axial spring constants (N/µm)			(Refer.) Mass (kg/row)
d	D	B	r min.	r_1 min.	C_a	Single row	Double row	Triple row	Grease lub.	Oil lub.			d_1	d_2	D_1	D_2	Two bearings	Three bearings	Four bearings	Two bearings	Three bearings	Four bearings	Two bearings	Three bearings	Four bearings	
17	47	15	1	0.6	32.5	34.3	68.6	103	6 300	8 000	**SAC1747B**	3.7	25.5	33.7	33.5	41	2.15	2.92	4.3	140	180	280	695	1 030	1 390	0.130
20	47	15	1	0.6	32.5	34.3	68.6	103	6 300	8 000	**SAC2047B**	3.7	26.8	33.7	33.5	41	2.15	2.92	4.3	140	180	280	695	1 030	1 390	0.120
25	62	15	1	0.6	37.8	48.1	96.2	144	4 600	6 000	**SAC2562B**	4.9	38	46.2	46	53.5	3.04	4.13	6.08	200	260	400	970	1 440	1 940	0.240
30	62	15	1	0.6	37.8	48.1	96.2	144	4 600	6 000	**SAC3062B**	4.9	38	46.2	46	53.5	3.04	4.13	6.08	200	260	400	970	1 440	1 940	0.210
35	72	15	1	0.6	41.0	58.8	118	176	3 700	5 000	**SAC3572B**	6.2	48	56.3	55.9	63.5	3.73	5.07	7.46	240	320	480	1 180	1 760	2 360	0.290
40	72	15	1	0.6	41.0	58.8	118	176	3 700	4 800	**SAC4072B**	6.2	48	56.3	55.9	63.5	3.73	5.07	7.46	240	320	480	1 180	1 760	2 360	0.260
	90	20	1	0.6	81.8	122	244	366	3 100	4 000	**SAC4090B**	15	54.5	67.5	66.8	78.5	5	6.8	10	440	610	880	1 270	1 890	2 540	0.620
45	75	15	1	0.6	42.5	64.4	129	193	3 400	4 300	**SAC4575B**	6.9	54	61.7	61.5	69	3.89	5.29	7.78	250	330	500	1 270	1 890	2 540	0.250
	100	20	1	0.6	86.0	137	274	411	2 800	3 600	**SAC45100B**	16	61.5	74.2	74	85.5	5.95	8.09	11.9	540	730	1 080	1 450	2 150	2 900	0.790
50	100	20	1	0.6	87.9	144	288	432	2 700	3 400	**SAC50100B**	17	65.8	78.2	78	89.5	6	8.15	12	540	730	1 080	1 500	2 230	3 000	0.650
55	100	20	1	0.6	87.9	144	288	432	2 700	3 400	**SAC55100B**	17	65.8	78.2	78	89.5	6	8.15	12	540	730	1 080	1 500	2 230	3 000	0.650
	120	20	1	0.6	92.4	166	332	498	2 300	3 000	**SAC55120B**	20	79.5	92.2	92	103.6	7.08	9.62	14.2	640	860	1 280	1 740	2 590	3 480	1.15
60	120	20	1	0.6	92.4	166	332	498	2 300	3 000	**SAC60120B**	20	78.3	92.2	92	103.6	7.08	9.62	14.2	640	860	1 280	1 740	2 590	3 480	1.15

[Notes] 1) The value of the basic dynamic load rating of a single bearing is shown. For those of matched pair and stack bearings, see table below.

2) The identification of a matched bearing is composed of the bearing number of a single row bearing followed by the suffix (DB, DF, etc.).

[Remarks] 1. We recommend a nut axial tension of two to three times the bearing preload.

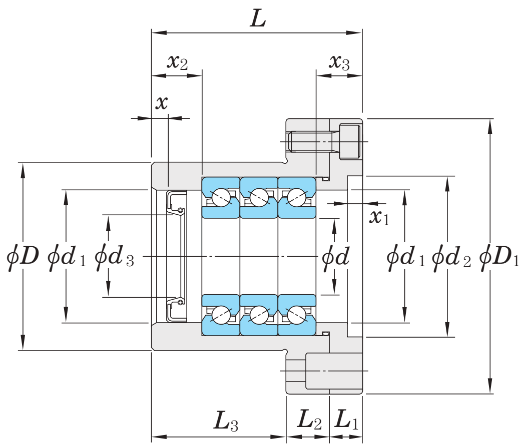
2. We recommend a retaining plate holding allowance of 0.01 to 0.03 mm.

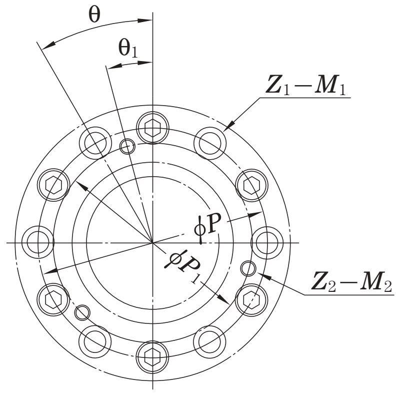
Number of rows to receive axial load	Basic dynamic load rating	Sample combination (arrow indicates direction of load.)
Single row	C_a	
Double row	$C_a \times 1.625$	
Triple row	$C_a \times 2.16$	

Dynamic equivalent load $P_a = XF_r + YF_a$

Sample combination		Two bearings		Three bearings			Four bearings		
		DB DF	DT	DBD DFD		DTD	DBT DFT	DBB DFF	DBT DFT
Number of rows to receive axial load		Single row	Double row	Single row	Double row	Triple row	Single row	Double row	Triple row
$\frac{F_a}{F_r} \leqq 2.17$	X	1.9	—	1.43	2.33	—	1.17	2.33	2.53
	Y	0.54	—	0.77	0.35	—	0.89	0.35	0.26
$\frac{F_a}{F_r} > 2.17$	X	0.92							
	Y	1							

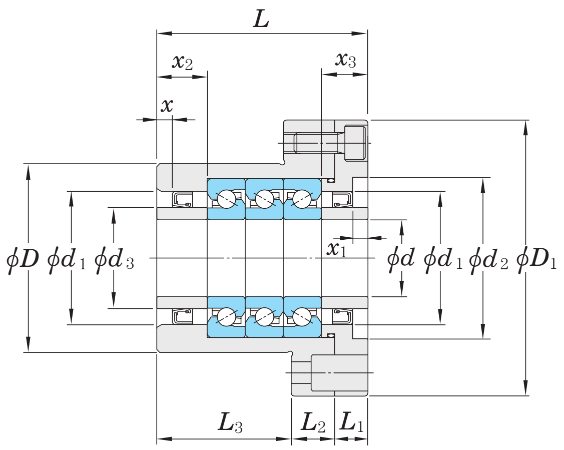
BSU0000BDF(DFD, DFF) series

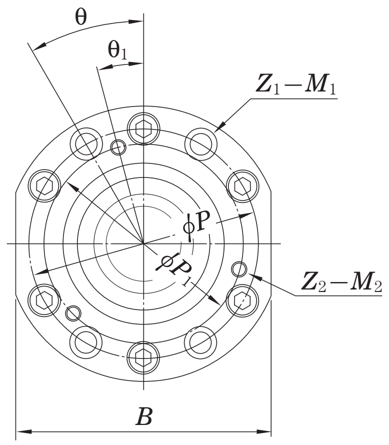




Dimensions (mm)													Applicable shaft dia. d_3 (mm)	Unit identification number	Quantity of bearing	Mounting hole of housing			Tapped hole for Dust-proof cover/Damper			Standard preload (kN)	Starting torque (mN·m)	(Refer.) Mass (kg)
d	D	D_1	L	L_1	L_2	L_3	d_1	d_2	x	x_1	x_2	x_3				P (mm)	θ (°)	Z_1−M_1 (No. of holes−threads)	P_1 (mm)	θ_1 (°)	Z_2−M_2 (No. of holes−threads)			
17	60	90	65	15	15	35	38	47	6	6	15	20	28	**BSU1747BDF**	2	75	45	4-M6	75	22.5	4-M6	2.15	140	1.72
20	60	90	65	15	15	35	38	47	6	6	15	20	28	**BSU2047BDF**	2	75	45	4-M6	75	22.5	4-M6	2.15	140	1.70
25	74	108	68	13	17	38	52	63	6	6	20	18	32	**BSU2562BDF**	2	90	30	6-M8	78	15	3-M6	3.04	200	2.45
	74	108	83	13	17	53	52	63	6	6	20	18	32	**BSU2562BDFD**	3	90	30	6-M8	78	15	3-M6	4.13	260	2.85
30	74	108	68	13	17	38	52	63	6	6	20	18	40	**BSU3062BDF**	2	90	30	6-M8	78	15	3-M6	3.04	200	2.38
	74	108	83	13	17	53	52	63	6	6	20	18	40	**BSU3062BDFD**	3	90	30	6-M8	78	15	3-M6	4.13	260	2.74
35	84	118	68	13	17	38	60	73	6	6	20	18	45	**BSU3572BDF**	2	100	30	6-M8	88	15	3-M6	3.73	240	2.81
	84	118	83	13	17	53	60	73	6	6	20	18	45	**BSU3572BDFD**	3	100	30	6-M8	88	15	3-M6	5.07	320	3.28
	84	118	98	13	17	68	60	73	6	6	20	18	45	**BSU3572BDFF**	4	100	30	6-M8	88	15	3-M6	7.46	480	3.74
40	84	118	68	13	17	38	60	73	6	6	20	18	50	**BSU4072BDF**	2	100	30	6-M8	88	15	3-M6	3.73	240	2.77
	84	118	83	13	17	53	60	73	6	6	20	18	50	**BSU4072BDFD**	3	100	30	6-M8	88	15	3-M6	5.07	320	3.20
	84	118	98	13	17	68	60	73	6	6	20	18	50	**BSU4072BDFF**	4	100	30	6-M8	88	15	3-M6	7.46	480	3.64

BSU0000BDF(DFD, DFF) - T series





Dimensions (mm)															Unit identification number	Quantity of bearing	Mounting hole of housing			Tapped hole for Dust-proof cover/Damper			Standard preload	Starting torque	(Refer.) Mass
d	D	D_1	B	L	L_1	L_2	L_3	d_1	d_2	d_3	x	x_1	x_2	x_3			P (mm)	θ (°)	Z_1-M_1 (No. of holes–threads)	P_1 (mm)	θ_1 (°)	Z_2-M_2 (No. of holes–threads)	(kN)	(mN·m)	(kg)
17	60	90	80	65	15	15	35	38	47	28	6	6	15	20	**BSU1747BDF - T**	2	75	22.5	6-M6	57	10	4-M6	2.15	140	1.36
20	60	90	80	65	15	15	35	38	47	28	6	6	15	20	**BSU2047BDF - T**	2	75	22.5	6-M6	57	10	4-M6	2.15	140	1.32
25	74	108	100	68	13	17	38	52	63	32	6	6	20	18	**BSU2562BDF - T**	2	90	30	4-M8	78	15	3-M6	3.04	200	1.46
	74	108	100	83	13	17	53	52	63	32	6	6	20	18	**BSU2562BDFD - T**	3	90	30	4-M8	78	15	3-M6	4.13	260	2.44
30	74	108	100	68	13	17	38	52	63	40	6	6	20	18	**BSU3062BDF - T**	2	90	30	4-M8	78	15	3-M6	3.04	200	1.40
	74	108	100	83	13	17	53	52	63	40	6	6	20	18	**BSU3062BDFD - T**	3	90	30	4-M8	78	15	3-M6	4.13	260	2.47
35	84	118	105	68	13	17	38	60	73	45	6	6	20	18	**BSU3572BDF - T**	2	100	30	4-M8	88	15	3-M6	3.73	240	1.29
	84	118	105	83	13	17	53	60	73	45	6	6	20	18	**BSU3572BDFD - T**	3	100	30	4-M8	88	15	3-M6	5.07	320	2.68
	84	118	105	98	13	17	68	60	73	45	6	6	20	18	**BSU3572BDFF - T**	4	100	30	4-M8	88	15	3-M6	7.46	480	3.62
40	84	118	105	68	13	17	38	60	73	50	6	6	20	18	**BSU4072BDF - T**	2	100	30	4-M8	88	15	3-M6	3.73	240	1.24
	84	118	105	83	13	17	53	60	73	50	6	6	20	18	**BSU4072BDFD - T**	3	100	30	4-M8	88	15	3- M6	5.07	320	2.72
	84	118	105	98	13	17	68	60	73	50	6	6	20	18	**BSU4072BDFF - T**	4	100	30	4-M8	88	15	3-M6	7.46	480	3.64

Ⅱ. Oil / Air Lubrication System

Contents Page

1. Oil / air lubricator

1. 1 Oil / air lubrication

Oil / air is a new method of lubrication, which was developed to prevent atmospheric contamination caused by oil mist leakage, a phenomenon caused by the high speed of the spindles of machine tools combined with oil mist lubrication.

In oil / air lubrication, an extremely small quantity of oil is supplied and sprayed by air pressure directly into the bearings.

JTEKT has produced an oil / air lubricator and an air cleaning unit, for use as a lubrication system.

1) Features of oil / air lubrication

① Ensures a low level of temperature increase and power loss of bearing and enables a high rotation speed.

Supplies the necessary quantity of oil to each bearing in a reliable manner.

② High reliability.

Since new oil is constantly supplied to bearings, the user does not need to be concerned about the service life of the lubrication oil.

Furthermore, compressed air, which increases the internal pressure of the spindle, is effective in preventing dust or cutting fluid from entering from outside.

③ No atmospheric contamination.

A small quantity of oil flows on the surfaces of piping walls controlled by compressed air. This mechanism eliminates atmospheric contamination caused by oil mist leakage from oil mist lubrication.

3) Example of connections of oil / air lubrication system

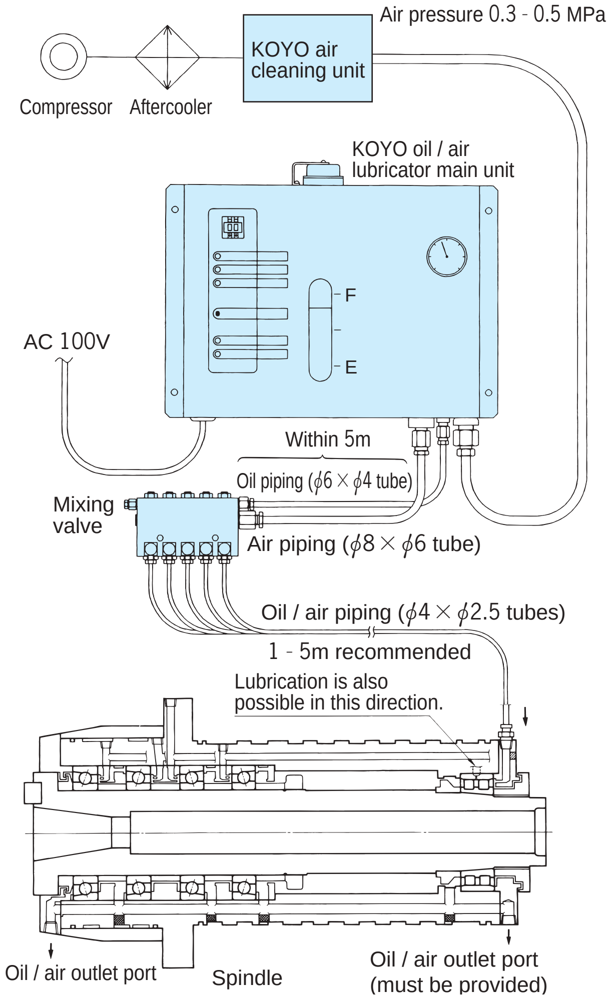


Fig. 1. 2 Example of connections of oil / air lubrication systems

2) System diagram of oil / air lubrication

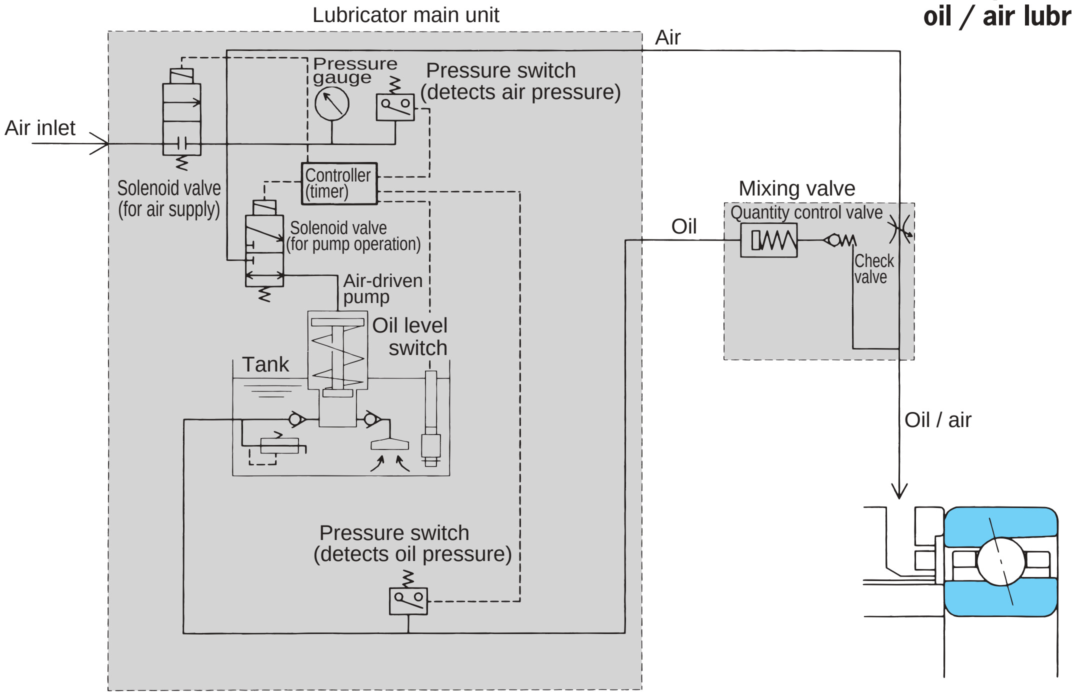


Fig. 1. 1 System diagram of oil / air lubrication

1. 2 Oil / air lubricator

1) Features of KOYO oil / air lubricator

① Lubrication (discharge) intervals can be set to desired values.

The lubricator allows adjustment of lubrication (discharge) intervals from 1 to 99 minutes so that optimum settings for lubrication (discharge) intervals can be selected.

A lock mechanism is provided.

② A solenoid valve used to stop air flow is fitted.

It is included with the standard accessories. The valve stops air flow when the machine body stops. This eliminates the need for valve operation when shutting down the machine when not in use.

③ Oil can be discharged continuously by manual operation.

Before starting oil / air lubricator, the air in the piping must be discharged (air bleed).

The lubricator has a circuit built in that allows a single or a successive 11 round oil discharge by manual operation.

④ A unique safety device is built in.

A level switch is attached to the oil tank, and pressure switches are attached to main oil and air pipes.

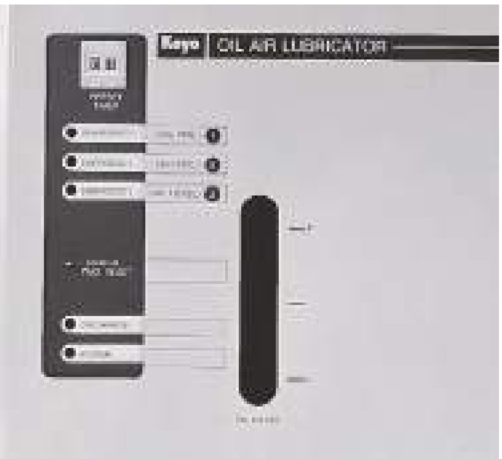
In the event of failure of the lubricator, the location of the failure is indicated by a lamp. In addition, an abnormality signal can be output from the abnormality signal contact points (EMG NO-EMGCOM and EMG NC-EMGCOM terminals on the side of the controller).

■ **KOYO** oil / air lubricator

■ **KOYO** mixing valve

(Discharges a small quantity of oil at a fixed rate into the compressed air flow for oil / air lubrication.)

■ Controller side view



■ Controller front view

2) Model number of oil / air lubricator (including mixing valve)

Model number **L A S 1 A 4 B - 1**

KOYO oil / air lubricator — LAS

Mixing valve model number — 1

4B

- Oil discharge quantity symbol (see **Table 1. 1**)
- Number of discharge ports*1) 4 : four B ports

1A

- Oil discharge quantity symbol (see **Table 1. 1**)
- Number of discharge ports*1) 1 : one A port

*1) The standard number of oil discharge ports is 5. As it is changeable, specify according to need. The number of maximum available ports is 8 per block.

Table 1. 1 Symbols of mixing valves and oil discharge quantity

Symbol of mixing valve	Oil discharge quantity (mL/stroke)
A	0.01
B	0.03
C	0.05
D	0.10

For the discharge intervals of the oil / air, refer to **Supplementary table 6** on page 203.

3) Outline drawing and specifications of oil / air lubricator

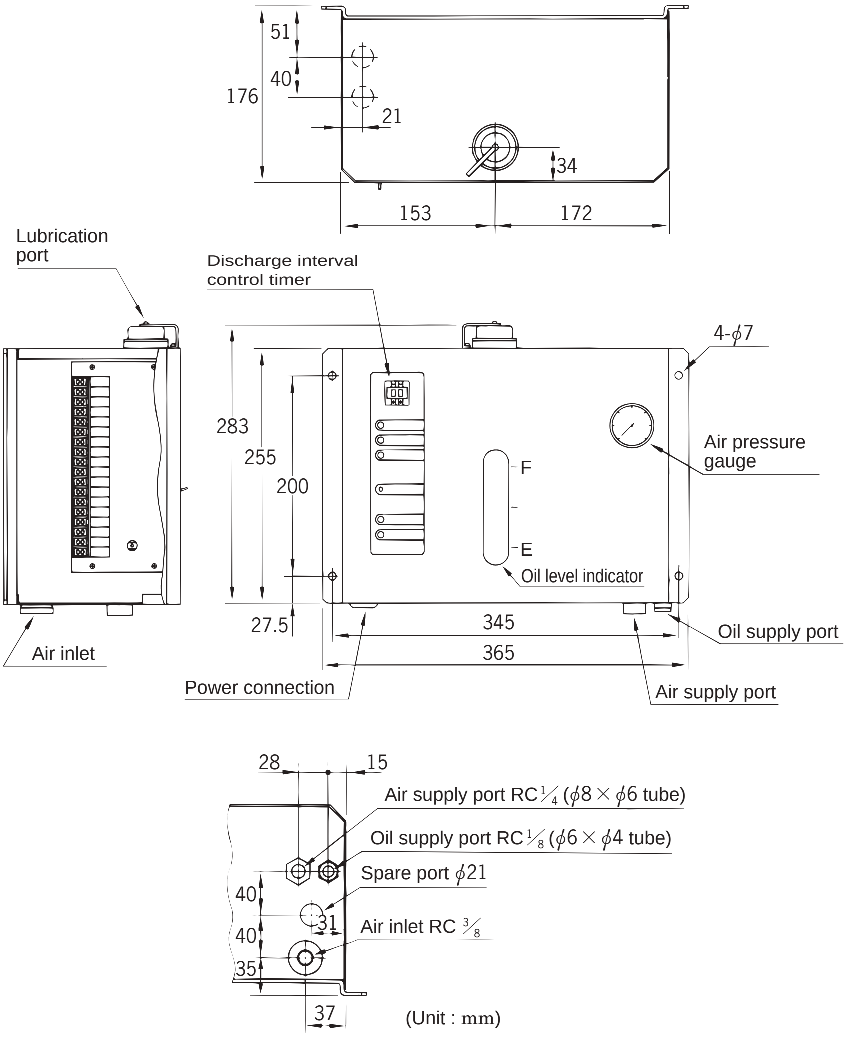


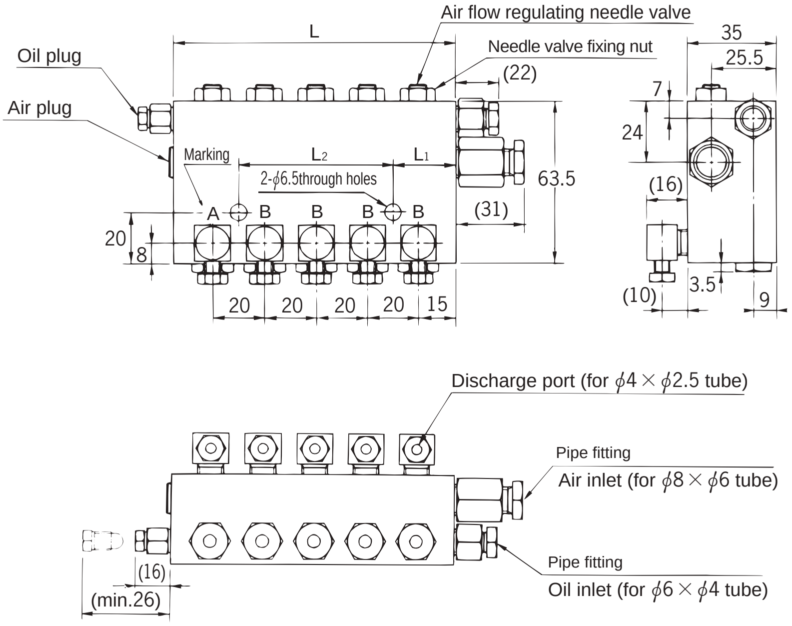
Fig. 1. 3 Outline drawing and specifications of oil / air lubricator

Table 1. 2 Specifications

Item	Specification
Supply voltage	AC100V, 50 / 60Hz
Power consumption	With pump in operation : approx. 20W Pump not in operation : approx. 12W
Service air pressure	0.3-0.5 MPa
Viscosity of oil used	10-100mm^2/s
Lubrication (discharge) intervals	Any desired value between 1 and 99 minutes in one-minute intervals
Tank capacity	1.8L (effective oil quantity : 1.4L)
Capacity of abnormality signal contact points	Contact point a : (EMG NO) 250V AC, 5A 30V DC, 5A Contact point b : (EMG NC) 250V AC, 2A 30V DC, 3A
Mass (refer.)	15 kg

[Note] AC200V is also available. Consult JTEKT.

4) Outline drawing and specifications of mixing valve



(Unit : mm)

Specifications

- The standard number of oil discharge ports is 5. As it is changeable, specify according to need (8 ports per block at maximum).

No. of ports	2	3	4	5	6	7	8
L	50	70	90	110	130	150	170
L_1	5	5	25	25	25	25	25
L_2	40	60	40	60	80	100	120

Fig. 1. 4 Outline drawing of KOYO mixing valve (example of 1A4B-1)

2. Air cleaning unit

Clean, dry air is required for oil / air lubrication, pneumatic bearings, etc.

JTEKT has developed and commercialized the air cleaning unit KAU05, a compact unit consisting of filters, an air dryer, mist separators, and other parts.

This unit efficiently and effectively removes moisture, oil, dust, etc. contained in compressed air.

(Front) (Rear)

■ **KOYO** air cleaning unit KAU05

1) Features of KOYO air cleaning units

① Removes moisture efficiently by refrigerated air dryer.

② Its micro-mist separator removes oil content 99.999 9% and solid foreign matter 0.01μm or greater in particle size.

③ Contains a differential pressure detection switch, which indicates clogging of filter.

In addition, an output signal is obtained from terminals attached on the differential pressure detection switch.

2) Piping system diagram

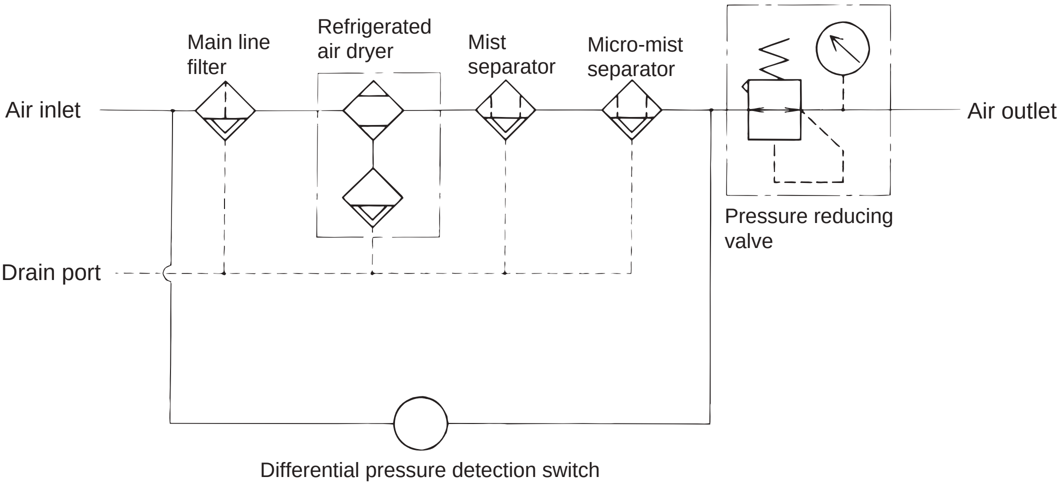


Fig. 2. 1 Piping system diagram of air cleaning unit

3) Outline drawing and specifications of air cleaning unit

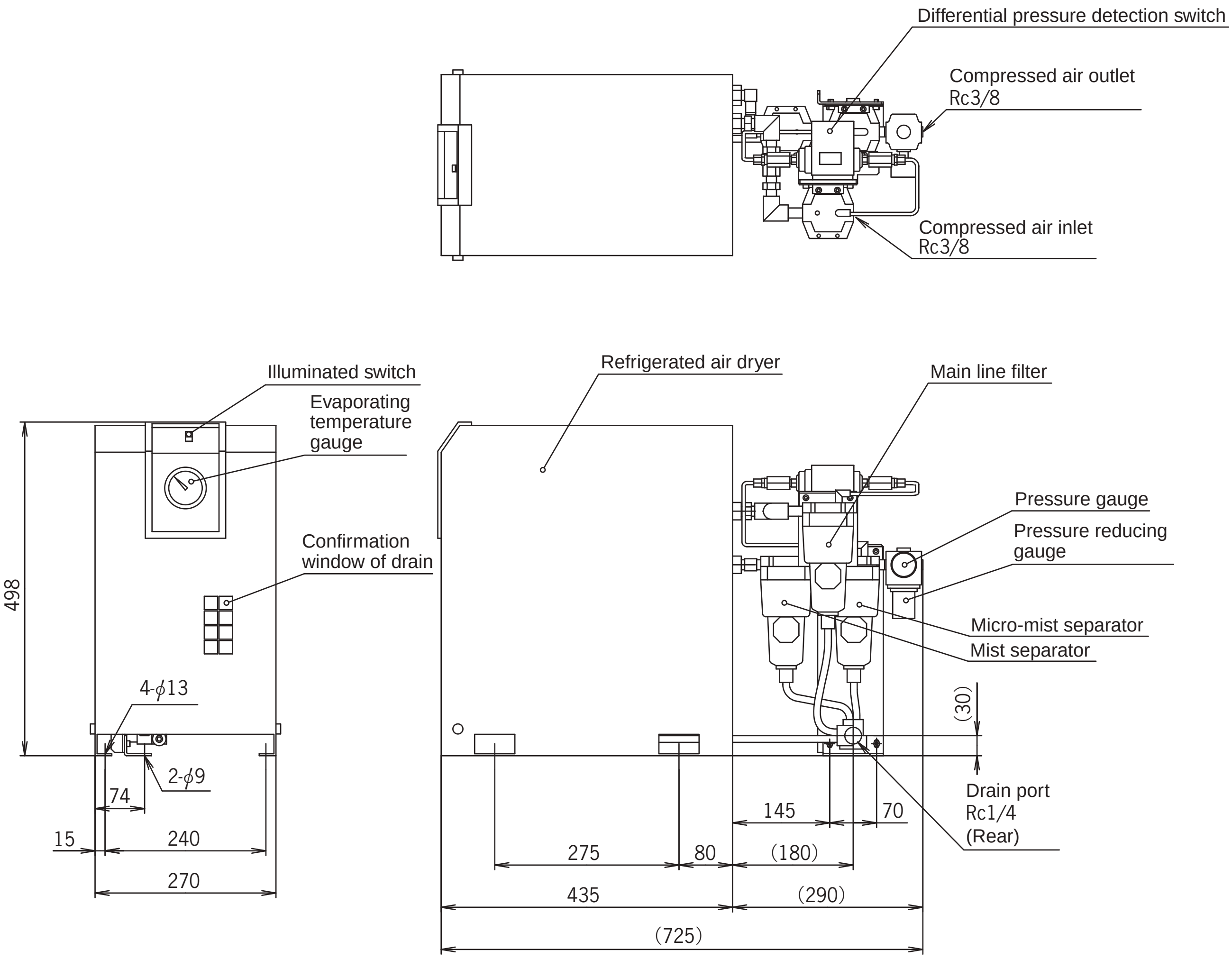


Fig. 2. 2 Outline drawing of KOYO air cleaning unit

Table 2. 1 Specifications of KOYO air cleaning unit KAU05

Item	Specification
Treatment air flow rate	0.52/0.57 m^3/min
Inlet air pressure	0.7 MPa
Maximum temperature of inlet air	50 ℃
Main line filter	3 to 50 μm (95%-arresting particle size)
Mist separator	0.3 μm (95%-arresting particle size)
Micro-mist separator	0.01 μm (95%-arresting particle size)
Oil content separation efficiency	99.999 9%
Solid substance separation efficiency	100% if 0.01 μm or greater
Supply voltage	Single-phase 100 V AC (50/60 Hz)*
Power consumption	180/202 W (50/60 Hz) (at 100 V)
Mass (refer.)	26 kg

*AC 200V is also avilable.

Ⅲ. Handling of Bearings

Contents

Page

1. Handling and mounting of bearings

1. 1 Handling precautions of bearings

1. 1. 1 Handling of bearings

Since ball & roller bearings are made to a higher precision than general mechanical parts, they should be handled carefully.

① Maintain bearings and their surroundings in a clean condition.
② Handle with care.
A severe shock to a bearing by rough handling may result in damage such as flaws, nicks and chipping.
③ Use correct handling tools.
④ Exercise care for rust prevention of bearings.
Avoid handling and storing them in a highly humid atmosphere.
⑤ Bearing should be handled by an experienced person.
⑥ Standard operating procedure for handling bearings should be established.
- Storage of bearings
- Cleaning of bearings and their peripheral parts
- Inspection of dimensions and finish of peripheral parts of bearings
- Mounting
- Dismounting
- Inspection after mounting
- Maintenance and inspection
- Replenishment of lubricant

1. 1. 2 Storage of bearings

Bearings are shipped after a high-quality anticorrosive oil is applied to them followed by a suitable wrapping and packing.

Their quality is guaranteed as long as the wrapping and packing are not damaged.

Bearing, if they are to be stored for a long time, should be stored on a shelf at least 30cm from the ground at 65% or less humidity at a temperature of around 20℃. Avoid direct exposure to sunlight. Keep bearings at a distance from walls.

1. 2 Mounting of bearings

The mounting condition of the bearings affects the accuracy, performance and life of machines.

To optimize the performance of the bearings, it is necessary to strictly follow the procedure and instructions to mount them.

The procedure for mounting the bearings is shown in **Fig. 1. 1**.

In this section, a general procedure for mounting the bearings is described in accordance with the workflow shown in **Fig. 1. 1**.

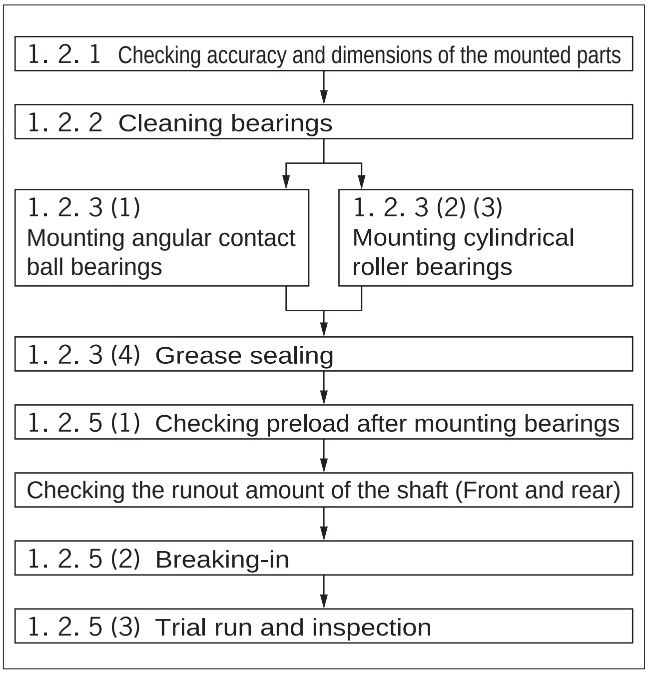


Fig. 1. 1 Mounting workflow

1. 2. 1 Checking dimensions of peripheral parts of bearings

Before mounting the bearing, clean the shaft, housing, spacer, etc. Ensure that the inside of the housing is absolutely free from any residual wrapping material (SiC, Al_2O_3, etc.), molding sand, or chips.

Next, inspect other parts. Check that the dimensions, shapes and roughness are as shown in the drawing, and there is no flaw, burr or barb. Measure the bearing diameter and the bore diameter of the housing at several positions as shown in **Figs. 1. 2** and **1. 3**, and confirm that the fitting is made correctly.

Record the measured values of these parts along with the inspection number of the bearing to be mounted.

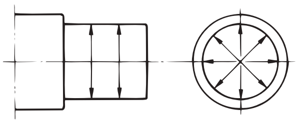


Fig. 1. 2 Measuring positions of shaft diameter

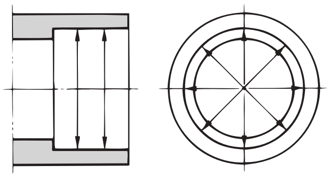
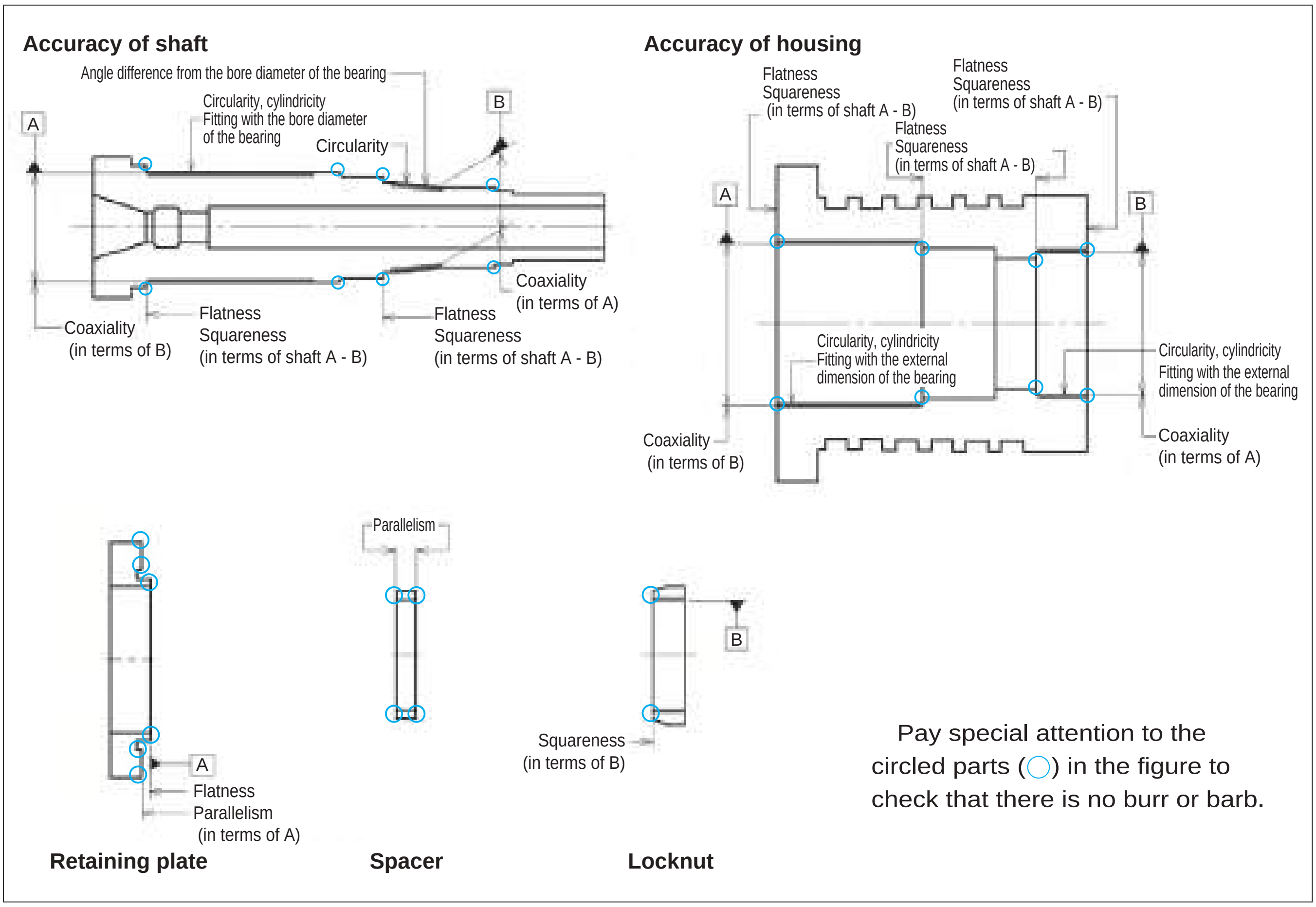


Fig. 1. 3 Measuring positions of housing bore diameter

Besides, pay attention to the fillet radii and the squareness of the shoulders of the shaft and housing. (See **Fig. 1. 4**.)

For the tolerances for the shaft diameters and the bore diameters of the housing, refer to **Tables 6. 2** and **6. 3** (on pages 32 and 33) of "**6. Rigidity and preload of bearings**".

Also, for the accuracy of the shaft and housing as well as the fillet radii, refer to "**9. Designing peripheral parts of bearings**" (on page 39).



Pay special attention to the circled parts (○) in the figure to check that there is no burr or barb.

Fig. 1. 4 Points for checking the accuracy

1. 2. 2 Cleaning bearings

After preparing the parts necessary for mounting the bearings, unwrap the bearings just before starting to mount them.

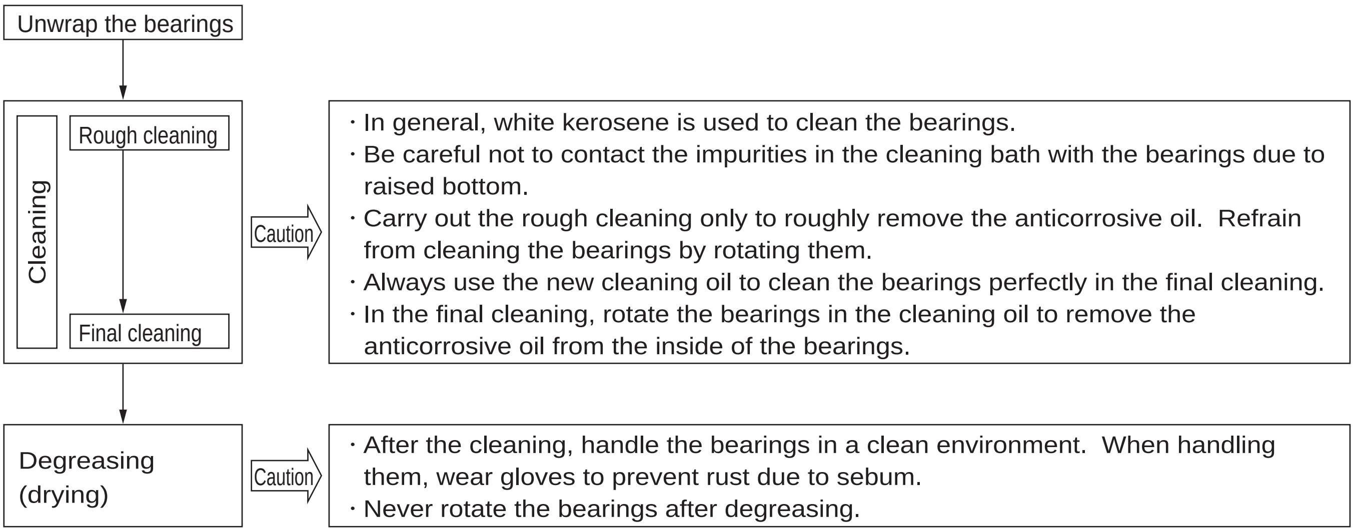
Anticorrosive oil is applied to the bearings to prevent corrosion. After unwrapping the bearings, clean them to remove the anticorrosive oil following the procedure shown in **Fig. 1. 5**.

After cleaning, degrease and dry the bearings. Then, seal grease (in case of grease lubrication) and mount the bearings.

Point

- Be especially careful when cleaning the oil / air lubrication supply and discharge piping, air purge piping, and similar piping.
- After cleaning, ensure that no foreign matter adheres to the piping and store the piping in a clean environment.

<Workflow>



- In general, white kerosene is used to clean the bearings.
- Be careful not to contact the impurities in the cleaning bath with the bearings due to raised bottom.
- Carry out the rough cleaning only to roughly remove the anticorrosive oil. Refrain from cleaning the bearings by rotating them.
- Always use the new cleaning oil to clean the bearings perfectly in the final cleaning.
- In the final cleaning, rotate the bearings in the cleaning oil to remove the anticorrosive oil from the inside of the bearings.

- After the cleaning, handle the bearings in a clean environment. When handling them, wear gloves to prevent rust due to sebum.
- Never rotate the bearings after degreasing.

Point

- Ensure that the bearings are cleaned directly before assembly.
- Never rotate bearings that have been degreased (dried).
- After cleaning, to prevent foreign matter from getting into the bearings, ensure that the bearings are handled in a clean environment.

Fig. 1. 5 Cleaning workflow

1. 2. 3　Mounting bearings

The preparation before mounting the bearings varies depending on the bearing types and lubrication as shown in **Fig. 1. 6**.

For details, see **Fig. 1. 6** to mount the bearings.

In case of the angular contact ball bearings, the fitting mark is indicated on the outside surface of the bearing (see page 59). Mount the bearing in the correct direction referring to the fitting mark.

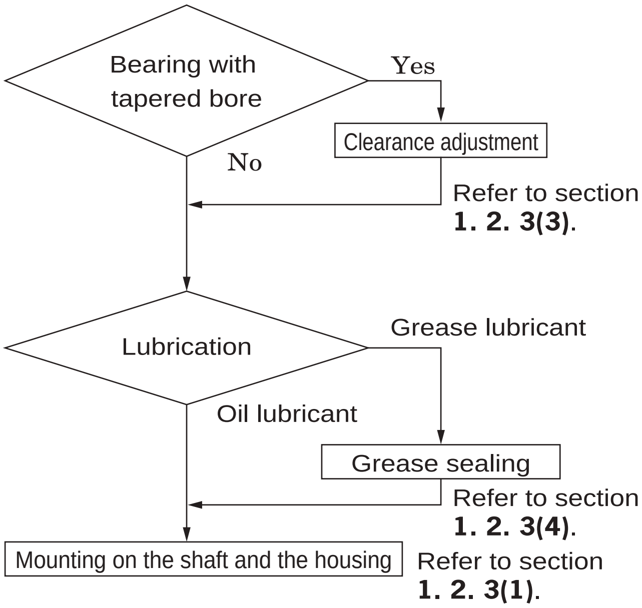


Fig. 1. 6　Preparation before mounting

1. 2. 3(1)　Mounting on shaft and housing

① Bearing mounting

Mounting method of the bearings differs depending on types and fitting conditions.

In case of the bearings for machine tool spindles, the inner ring is usually rotated. Therefore, the interference fit is applied for the inner rings, and the clearance fit is applied for the outer rings.

As a method of interference fit, the shrinkage fit is usually applied for the cylindrical bore bearings. In case of the bearings with tapered bore, the inner ring is press fitted in the taper shaft. In this case, the bearing internal clearance needs to be adjusted as described in section **1.2.3(3)** beforehand, because it is necessary to control the radial internal clearance after fitting.

The clearance fit is used to fit the outer ring in the housing. To facilitate the mounting, the housing is heated to expand the bore diameter before mounting the bearing.

The bearing before mounting, which is used for oil lubrication, is very susceptible to flaws, because it is cleaned and degreased and is in metallic contact with a rolling element and raceway. To protect the raceway during the mounting, it is recommended to apply a small quantity of oil used for the machine to be mounted inside the bearing.

●Shrinkage fit

Heat the bearing assembly or inner ring on an induction heater or hot plate to induce expansion before mounting it onto a shaft.

If this method is used, no force is applied to the bearing and operation is carried out in a short time.

When a hot plate is used to heat up a bearing assembly, the use of a jig as shown in **Fig. 1. 7** enables efficient heating of the inner ring.

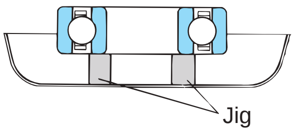


Fig. 1. 7　Inner ring heating jig

Specify the heating temperature of the bearing in accordance with the size and the required expansion, referring to **Fig. 1. 8**. Specify the temperature about 20 to 30℃ higher than the required temperature, taking into consideration the temperature to be reduced during the operation.

However, never heat the bearing up to 120℃ or more.

After mounting the bearing, shrinkage will occur in the width as the bearing cools off. Therefore, fit the inner ring and the shoulder firmly using a locknut to prevent clearance between them.

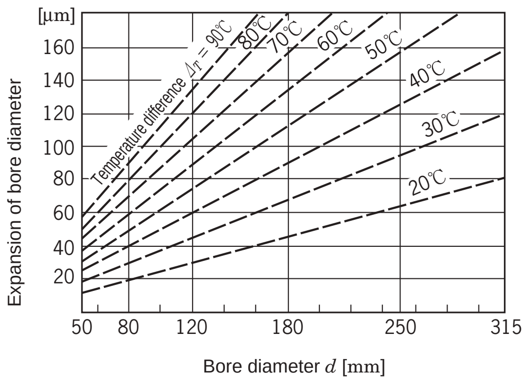


Fig. 1. 8　Heating temperature and expansion of inner rings

●Press fit

Be sure to use the specific jig to mount the inner ring to the shaft and the outer ring to the housing. When press fitting the inner ring and the outer ring, hold only the inner ring and the outer ring, respectively, and apply gently uniform pressure to the whole circumference surface.

Never mount the rings using hammer.

To facilitate the mounting, it is recommended to apply a small quantity of lubricant to the shaft or housing before press fitting.

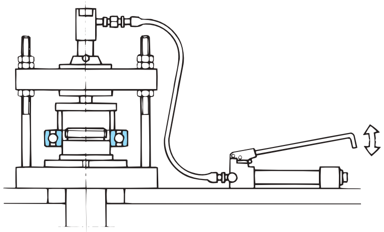
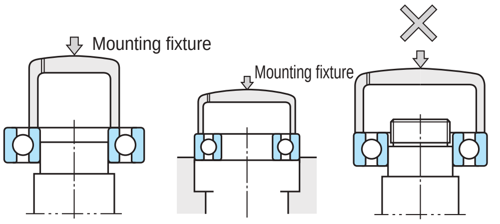
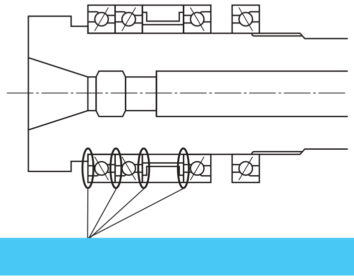


Fig. 1. 9 Press fitting by pressing machine



(Inner ring press fit) (Outer ring press fit) (Inner ring press fit)

Fig. 1. 10 Example of press fitting jig



Point

- Ensure that contact is made for each mating surface.
- Take special care to ensure that no foreign matter or the like has been introduced.

Fig. 1. 11 Cautions for bearing assembly

[Reference] Force is necessary to press fit or remove bearings

The force necessary to press fit or remove inner rings of bearings differs depending on the finish of shafts and how much interference the bearings allow. The standard values can be obtained by using the following equations.

(In the case of solid shafts)

$$K_a = 9.8\, f_k \cdot \varDelta_{deff} \cdot B \left(1 - \frac{d^2}{D_i^2}\right) \times 10^3 \quad \cdots\cdots\cdots\cdots (1.\ 1)$$

(In the case of hollow shafts)

$$K_a = 9.8\, f_k \cdot \varDelta_{deff} \cdot B \frac{\left(1 - \frac{d^2}{D_i^2}\right)\left(1 - \frac{d_0^2}{d^2}\right)}{\left(1 - \frac{d_0^2}{D_i^2}\right)} \times 10^3 \quad \cdots\cdots\cdots\cdots (1.\ 2)$$

Where:

K_a : force necessary for press fit or removal N
$\varDelta_{deff}$: effective interference mm
f_k : resistance coefficient
(Coefficient taking into consideration friction between shafts and inner rings ... refer to the table below.)
B : nominal inner ring width mm
d : nominal inner ring bore diameter mm
D_i : average outside diameter of inner ring mm
d_0 : hollow shaft bore diameter mm

Value of resistance coefficient f_k

Conditions	f_k
· Press fitting bearings on to cylindrical shafts	4
· Removing bearings from cylindrical shafts	6
· Press fitting bearings on to tapered shafts or tapered sleeves	5.5
· Removing bearings from tapered shafts or tapered sleeves	4.5
· Press fitting tapered sleeves between shafts and bearings	10
· Removing tapered sleeves from the space between shafts and bearings	11

② Tightening of bearings

●Tightening of inner ring

As a way of fixing the inner ring to a shaft, a locknut is usually used. **Fig. 1. 12** shows an example of fixing an inner ring using a locknut.

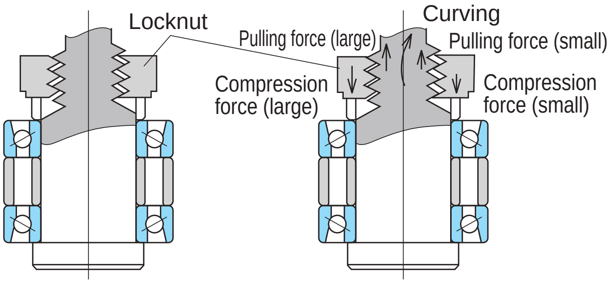


Fig. 1. 12 Example of fixing on inner ring using a locknut

As a clearance is present between thread of the locknut and that of the shaft, fixing the inner ring by using a locknut results in the center of the locknut deviating from the center of the shaft. This deviation in turn causes inclination of the inner ring or bending of the shaft.

As a result, the running accuracy of the shaft is decreased or an abnomal temperature increase is experienced due to the high load applied to the bearing (see **Fig. 1. 13**).

To settle this problem, positioning (centering) of the locknut is necessary after tightening.

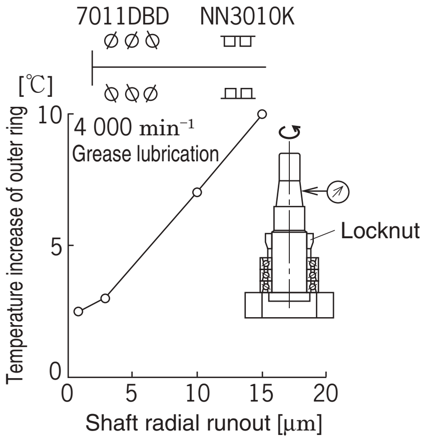


Fig. 1. 13 Relationship between shaft radial runout and temperature increase of the outer ring caused by the faulty positioning of the inner ring

Furthermore, the axial force generated by tightening the locknut leads to compressive strain of the inner ring and inner ring spacer, which in the case of position preloading, influence the amount of preload applied to the bearing.

For those applications which are considerably affected by preload, such as a high-speed spindle, this compressive strain should be taken into consideration. Consideration to other types of bearing supports are the inclination of inner rings, bending of shafts, and axial forces. In cases where a interference fit sleeve is used to fix a bearing, the tolerance of the sleeve is of vital importance since positioning becomes difficult once the bearing is fitted.

Tightening forces (shaft forces) of the locknuts or sleeves used to fix the inner rings are indicated as standard values in the bearing dimension table.

Note that if the interference of inner ring is large and the number of bearing rows is large, the press fitting force also becomes large.

●Tightening of outer rings

Outer rings are fixed to the housing usually by means of a retaining plate.

The retaining plate is fastened to the housing with several bolts. Inadvertent fastening of the retaining plate, however, may result in an inclination and / or deformation of the outer ring.

If inclination and / or deformation occurs in the outer ring, the rolling elements and the cage cannot rotate properly, possibly causing unusual noise generation.

In order to prevent this, it is necessary to tighten the retaining plate fastening bolts with an even torque in diagonal sequence. The fastening bolts should not be fastened individually to the final torque, but in a step-by-step sequence (see **Fig. 1. 14**).

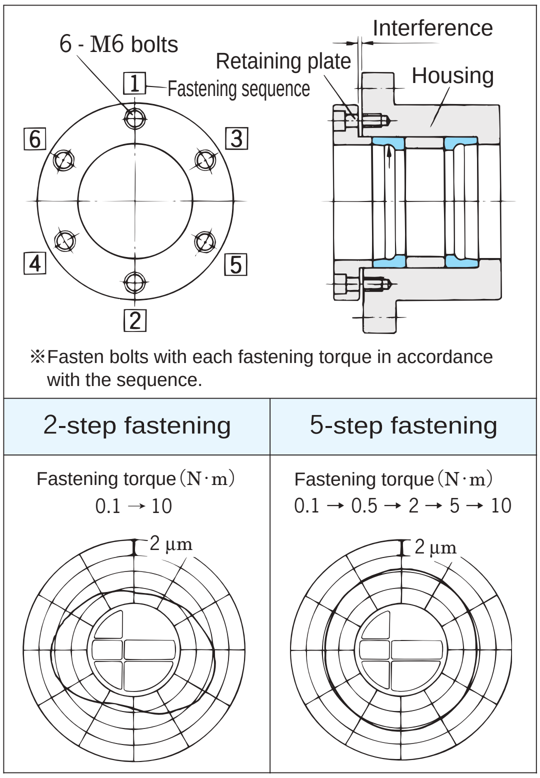


Fig. 1. 14 Raceway roundness variations with respect to the various fastening method

A slight interference is provided between the housing and retaining plate to hold the outer ring firmly.

If variations on the interference exist on the circumference due to poor tolerance of the retaining plate or housing, fastening the retaining plate may cause inclination of the outer ring.

When securing the outer ring using the retaining plate, if the interference is excessive, the preload will become less than the set value, increasing the likelihood of the pressing force becoming uneven. In addition, if the interference is insufficient, the preload will become more than the set value, causing the pressing force to be insufficient, thus leading to creeping of the outer ring.

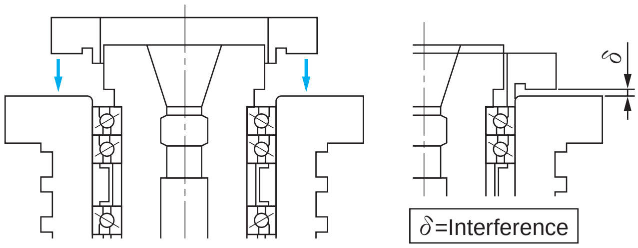


Fig. 1. 15 Interference of retaining plate

Therefore, sufficient care should be taken to ensure tolerance of the retaining plate and housing.

For the interference between the housing and retaining plate, refer to the dimension table for each bearing.

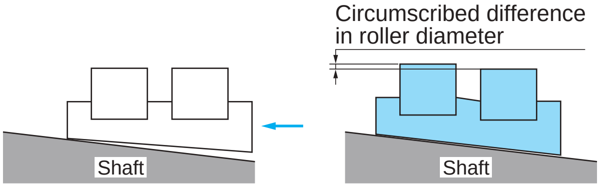
1. 2. 3(2) Management of spindle taper angle

When using cylindrical roller bearings with a tapered bore, the angle of the spindle taper and the angle of the bearing taper must be managed. Managing the taper angles ensures the high precision of the spindle.

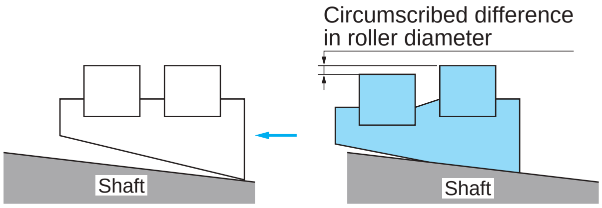
To manage the taper angle, apply a thin coating of blue paste to the bearing bore and check the contact locations with the spindle.

A large difference in the angle between the spindle and the bearing bore will result in an increased difference in the circumscribed roller diameter between two rollers. This may lead to a failure.

☆ If bore taper angle of inner ring is less than shaft taper



☆ If shaft taper is less than bore taper angle of inner ring



Problem details: Increased difference between
circumscribed diameter of rollers

Fig. 1. 16 Example of poor accuracy for tapered hole

1. 2. 3(3) Adjusting of clearance

In case of the cylindrical roller bearing with tapered bore, it is necessary to adjust the dimension of the spacer to adjust the radial clearance of the bearing.

The adjustment is made as follows.

(1) Lightly apply low-viscosity oil (kerosene, etc.) to the taper part of the shaft and fit slightly the inner ring of the cylindrical roller bearing into the shaft (**Fig. 1. 17**).

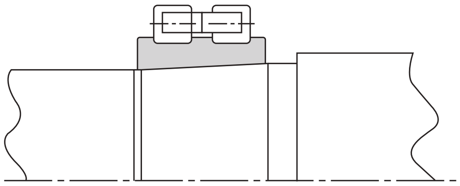


Fig. 1. 17 Temporary mounting of inner ring

(2) Using a block gauge, measure the distance between the end face of the inner ring and that of the shoulder (**Fig. 1. 18**).

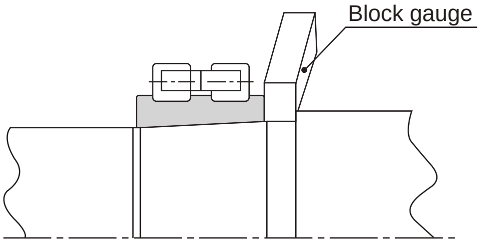


Fig. 1. 18 Width of spacer

(3) Temporarily adjust the width of the spacer.

Adjust the width of the spacer to the distance between the end face of the inner ring and that of the shoulder as measured in step (2). It is recommendable to make the outside diameter of the spacer larger than the diameter of the shaft shoulder to facilitate the pulling-out (Useful when pulling out the inner ring).

Point

- After machining, the parallelism of the lateral spacer sides must be 0.001 mm or less.
- Designing a spacer outer diameter larger than the diameter of the shaft shoulder will facilitate later work.

(4) After degreasing the outside surface and the bore, fit the temporarily adjusted spacer and mount the inner ring onto the shaft.

Be careful not to make clearance between the end face of the spacer and that of the inner ring and clearance between the end face of the spacer and that of the shaft shoulder (**Fig. 1. 19**).

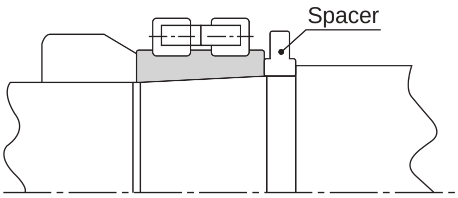


Fig. 1. 19 Mounting of spacer

(5) Place the dial gauge on the outside surface of the outer ring, and move the outer ring upward and downward on the axial line of the dial gauge needle to measure the residual radial internal clearance (**Fig. 1. 20**).

(6) After measurement, pull the bearing and the spacer out of the shaft.

Never hit the bearing to pull it out (Hit gently the end face of the spacer of large outside diameter).

(7) Based on the radial internal clearance measured in step (5), use the equation shown below to calculate the adjustment value of the inner ring to obtain the desired residual radial internal clearance.

In case of taper 1/12,

Adjustment value $\varDelta_A = (R_{sa} - R_{sb} - R_{sc}) \times 12/K$

Where:

R_{sa}: measured radial internal clearance ...... the value measured in step (5)
R_{sb}: desired radial internal clearance
R_{sc}: contraction of the outer ring raceway due to fitting (0 in case of clearance fit)
K : expansion coefficient of the inner ring raceway due to press fitting

Formula to calculate R_{sc}

$$R_{sc} = \varDelta_{Deff}\frac{D_e}{D} \cdot \frac{\left(1 - \dfrac{D^2}{D_h^2}\right)}{\left(1 - \dfrac{D_e^2}{D_h^2}\right)}$$

Formula to calculate K

$$K = \frac{d}{D_i}\frac{\left(1 - \dfrac{d_0^2}{d^2}\right)}{\left(1 - \dfrac{d_0^2}{D_i^2}\right)}$$

Where:

$\varDelta_{Deff}$: effective interference of outer ring
D_h : outside diameter of housing
D_e : outer ring raceway contact diameter
  ball bearing······$D_e \fallingdotseq 0.2\ (4D+d)$
  roller bearing ···$D_e \fallingdotseq 0.25\ (3D+d)$
D : nominal outer ring outside diameter
d : nominal inner ring bore diameter (shaft diameter)
d_0 : bore diameter of hollow shaft
D_i : inner ring raceway contact diameter
  ball bearing······$D_i \fallingdotseq 0.2\ (D+4d)$
  roller bearing ···$D_i \fallingdotseq 0.25\ (D+3d)$

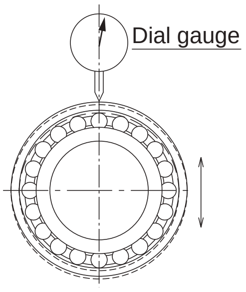


Fig. 1. 20 Measurement of residual radial clearance

Point

- Gently tap the spacer when pulling out the inner ring. Never tap the bearing under any circumstances!

(8) Adjust the width of the spacer.

The width of the spacer must be the value temporarily adjusted minus the adjustment value calculated in step (7).

Point

- After machining, the parallelism of the lateral spacer sides must be 0.001 mm or less.
- After machining, be sure to clean the spacer sufficiently.

(9) After cleaning, mount the bearing and the spacer onto the shaft.

Push inner ring sufficiently so that the end face of the spacer and that of the inner ring as well as the end face of the spacer and that of the shaft shoulder contact each other completely (**Fig. 1. 21**).

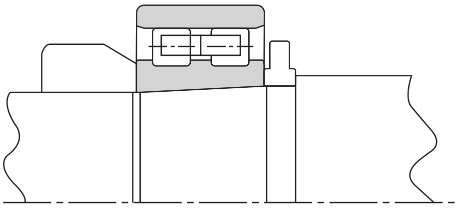


Fig. 1. 21 Mounting of bearing

(10) As in step (5), check the residual radial internal clearance of the bearing.

If the desired value of the radial internal clearance is not obtained, return to step (7) and make adjustment again.

(11) After checking that the desired value of the radial internal clearance in obtained in step (10), pull the bearing and spacer out of the shaft temporarily to clean and degrease them. In case of grease lubrication, seal them with the specified amount of grease, and then reassemble them.

Point

- Make sure that no temperature differences exist between components.
- Ensure proper fitting between the shaft and the bearing bore and between the housing and the bearing outer diameter.
- When using cylindrical roller bearings with a tapered bore, take note of the difference in taper angles of the shaft and the bearing bore.
- Be cautious of burrs and barbs on surfaces in contact with the bearing.

✻Pay special attention to accuracy upon reinstallation following a seizure.

1. 2. 3(4) Grease sealing

If the sealed amount of grease or the sealing method is not appropriate, overheating or instability (**Fig. 1. 22**) may result during breaking-in, and an extended time of breaking-in may become necessary.

Therefore, be sure to seal the bearing with an appropriate amount of grease in correct manner.

Sealing method of grease is described below.

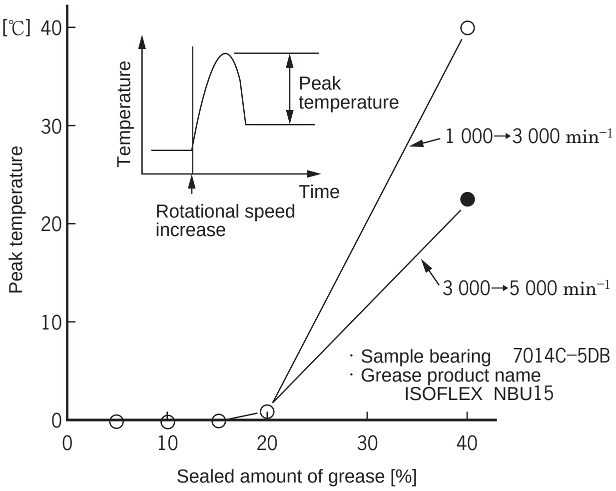


Fig. 1. 22 Relationship between sealed amount of grease and peak temperature

① Preparation before sealing

- Clean and degrease the bearing. And check that there is no stain of anticorrosive oil or foreign matter on the interspace and outer surfaces of the bearing.
- An appropriate amount of grease must be applied uniformly to the specified locations in the bearing. To apply grease, it is recommended to use a specific tool with measuring gauge, which has a nozzle tip.
- The tool used to apply grease also has to be cleaned off and degreased.
- Before applying grease, check the amount of grease to be sealed. The amount should be 10 to 15% of the space capacity of the bearing. (The space capacity of each bearing and the sealed amount of grease are shown in the bearing dimension table.)

② Method for grease sealing

Grease must be applied uniformly to the bearing raceway surface and the retainer guide as shown in **Fig. 1. 23**.

After applying grease, manually rotate the bearing to let the grease spread all over the inside of the bearing.

Also, after applying grease, be careful to prevent foreign matter and dust from adhering to the bearing.

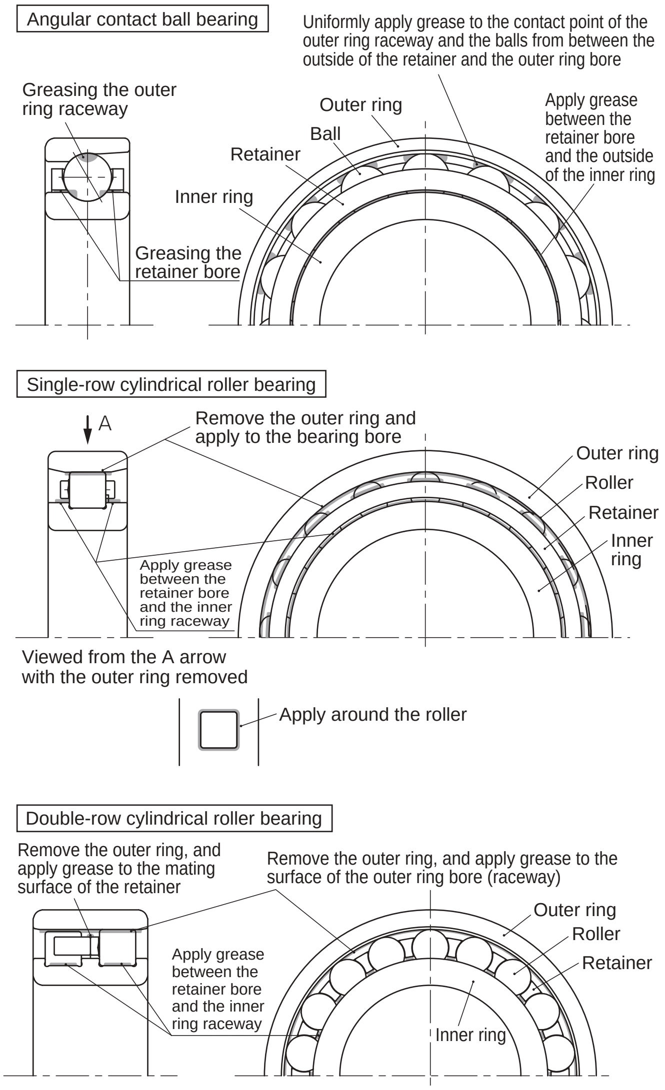


Fig. 1. 23 Grease sealing points

Point

- To apply grease, a tool with a nozzle-like tip similar to a syringe will facilitate work.
- Clean and dry the grease application tool before performing the work.
- Control the amount of grease according to capacity or amount.
- After applying grease, handle the bearing carefully as foreign matter will easily adhere to the bearing.
- Apply the grease evenly and little by little.

1. 2. 4 Mounting of ball screw support bearings

The methods for cleaning parts and applying grease are the same as for spindle bearings. Refer to sections **1. 2. 1 Checking dimensions of peripheral parts of bearings**, **1. 2. 2 Cleaning bearings**, and **1. 2. 3(4) Grease sealing** in **1. Handling and mounting of bearings**.

To use the ball screw support bearings, first create a housing assembly (unit) with the bearings already mounted in the housing.

Refer to “Tightening of outer rings” under **1. 2. 3(1) Mounting on shaft and housing** for how to mount the support bearing to the housing.

Be sure to wash the support bearing assembly part of the ball screw shaft.

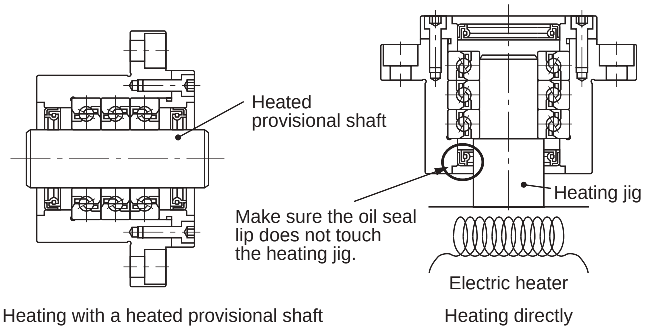
The following section describes the procedure using a unit component as an example.

1. 2. 4(1) Mounting on shaft

The fitting of the inner ring of the ball screw support bearing is what’s referred to as a “transition fit.” Begin by heating the inner ring beforehand (**Fig. 1. 24**).

The inner ring can be heated by inserting a provisional shaft that has been heated into the bore of the inner ring or by directly heating the inner ring using a jig heated using a heater or the like.

When heating the inner ring directly, make sure the unit’s oil seal lip does not touch the heating jig.



Heating with a heated provisional shaft

Heating directly

Fig. 1. 24 Heating the inner ring

1. 2. 4(2) Mounting on the machine body

Once the inner ring has been heated, mount the unit on the ball screw shaft as shown in **Fig. 1. 25**.

Make sure the ball screw shaft has passed through the machine body beforehand.

To mount the unit, insert the inner collar onto the shaft with a clearance fit, and then insert the unit with a heated inner ring onto the shaft.

After inserting the unit onto the shaft, insert the other inner collar onto the shaft with a clearance fit.

Next, tighten the inner ring and the shaft with the shaft nut, and tighten the housing onto the machine body with the bolt.

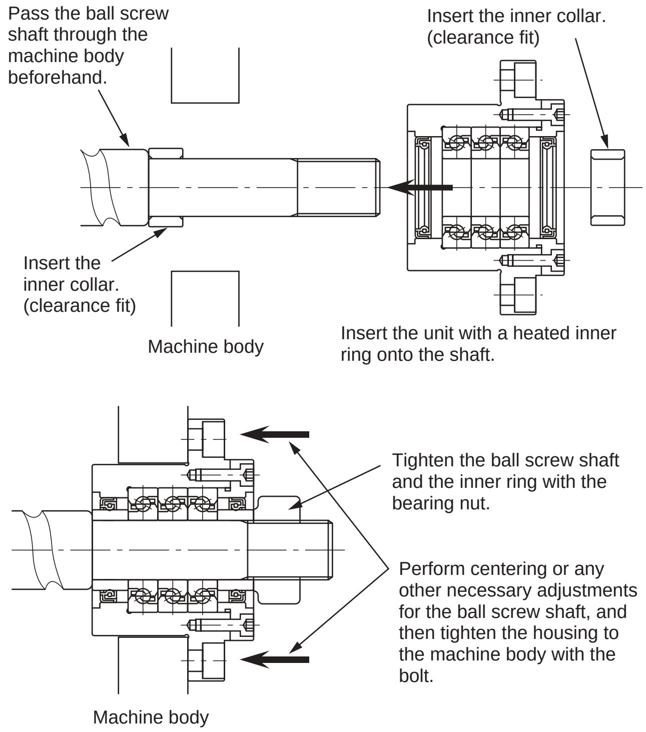


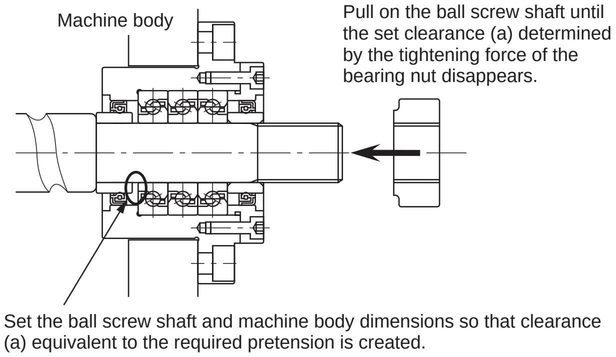
Fig. 1. 25 Mounting of the ball screw support unit

1. 2. 4(3) Applying pretension

The ball screw shaft can be used with pretension applied beforehand.

Fig. 1. 26 shows an example of this method.

After tightening one end of the ball screw, insert the unit at the other end onto the shaft. Set the dimensions of the ball screw and machine body in advance so that an axial clearance equivalent to the necessary pretension is created. When the inner ring and ball screw shaft are tightened using the shaft nut, the set clearance will disappear. The required pretension can be applied to the ball screw shaft by eliminating the clearance.



Point

- After tightening, make sure no residual clearance exists between the shaft shoulder and the inner collar and between the inner collar and the inner ring.

Fig. 1. 26 Applying pretension

1. 2. 5 Check after mounting bearings

1. 2. 5(1) Checking of preload

Preload of the bearing affects its rigidity and heat generation. If the preload is inadequate, not only the standard performance is not obtained, but also the life span is shortened and seizure results.

Therefore, it is important to check that the specified preload is applied to the bearing after completing the mounting of the bearing.

In this section, the following methods for checking the preload, which are generally used, are described.

① Check using the starting torque

If the preload of the bearing becomes large, the starting torque also tends to increases. Therefore, the preload can be checked by measuring the starting torque value.

Wind the thread on the shaft or the outer ring and fix it. By pulling the thread tangentially, measure the tension of the thread when the bearing starts to rotate using a tension gauge, etc. After obtaining the starting torque, the preload can be presumed referring to the correlation between the starting torque and the preload (**Fig. 1.27**).

The starting torque can be measured easily. However, in case of the bearings used with low preload (e.g. angular contact ball bearing used as a spindle), the measurement error can be large because the starting torque is small. This method is recommendable when using the ball screw support bearings by applying heavy preload to them.

Note that it is necessary to standardize the sampling and measurement conditions because the condition of the lubricant and pulling speed affect the measurement result.

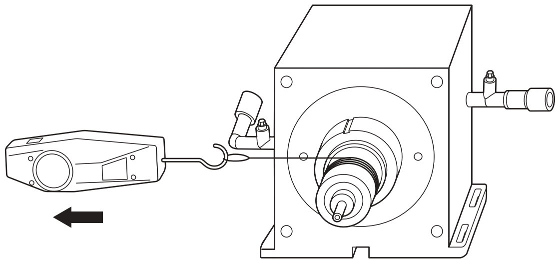


Fig. 1. 27 Measuring starting torque

② Check using the axial rigidity

The preload is confirmed referring to the correlation between the shaft end axial deviation measured by applying the axial load to the shaft end, and the axial rigidity and the preload (**Fig. 1.28**).

This method is not recommendable when using a main shaft of high rigidity because the deviation is very small.

To use this method, a large-sized facility such as a load applying device is necessary. Also, it is necessary to standardize the sampling and measurement conditions because the parts other than the bearing have elastic deformability.

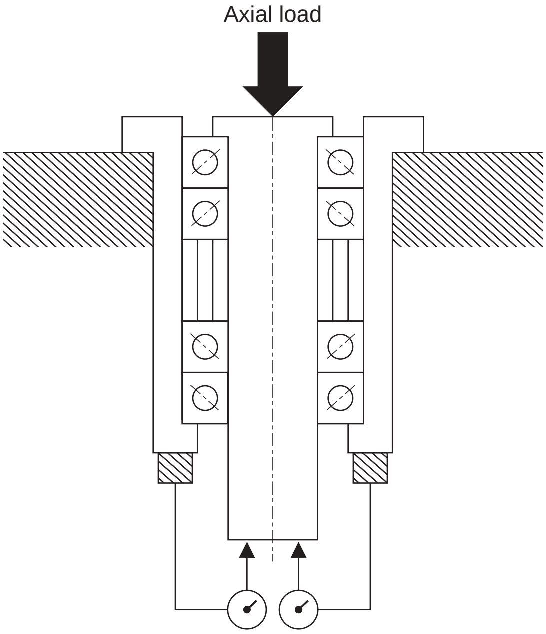


Fig. 1. 28 Measuring axial rigidity

③ Check using the proper vibrations

The preload is confirmed referring to the correlation between the spring constant of the bearing and the preload (**Fig. 1.29**).

This method guarantees accuracy and repeatability of measured values.

However, the fixing method has to be meticulously inspected and standardized because the results are affected by the fixing method.

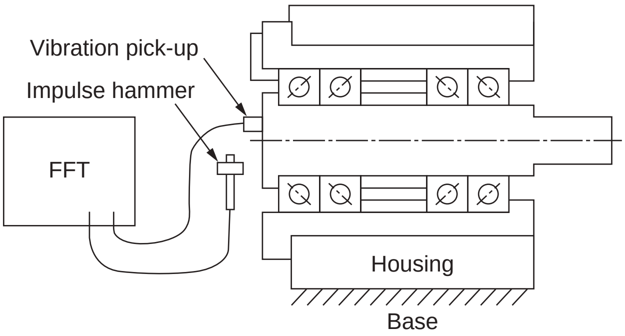


Fig. 1. 29 Measuring eigenfrequency

1. 2. 5(2) Breaking-in

In case of the bearings for grease lubrication, after installation of a bearing, problems are likely to occur due to rapid temperature rise caused by the immediate application of the maximum specified rotational speed. Therefore, breaking-in of the bearing is recommended, in which rotational speed is increased gradually.

Specifically, roller bearings require adequate breaking-in.

Fig. 1. 30 shows an example of breaking-in.

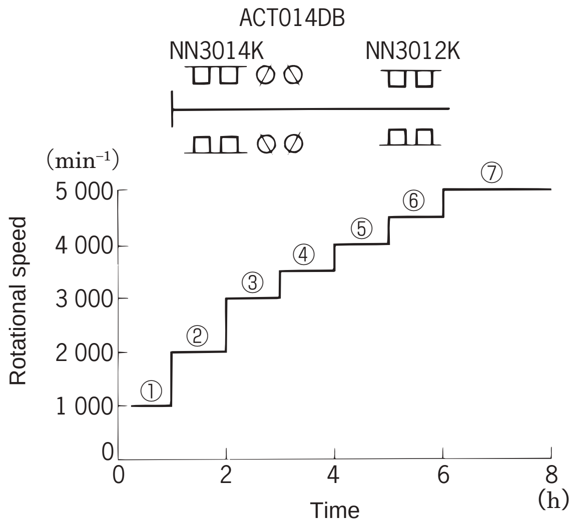


Fig. 1. 30 Example of breaking-in (In case of 5 000 min^{-1} max. speed)

If carrying out the break-in, after increasing the rotational speed, wait until the temperature of the bearing stops to increase or starts to decrease. Then, increase the rotational speed further. (Refer to **Fig.1.31**.)

Never increase the rotational speed when the temperature of the bearing is increasing.

The higher the temperature of the bearing becomes, the faster the grease deteriorates. Therefore, it is important to monitor the temperature during the breaking-in. When the temperature reaches a certain level, stop the operation temporarily. After the bearing cools off, resume the break-in starting from the rotational speed at which the operation was stopped or lower.

If the temperature is measured on the outside surface of the housing or retaining plate, the temperature at which the operation should be stopped is the room temperature plus 30 to 40℃ (Supposing that the room temperature is 15 to 25℃).

The break-in is not required for the bearings lubricated with oil. However, if the bearings are used for the first time or after stored for an extended period of time, it is recommended to carry out the break-in because an abrupt increase of temperature may be expected due to the oil remaining in the lubrication duct and the inside of the bearing (excessive oil quantity).

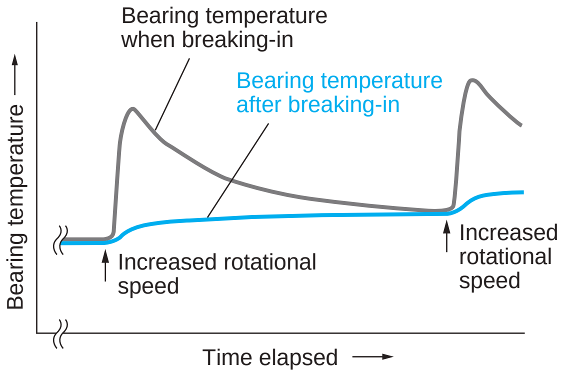


Fig. 1. 31 Bearing temperature increase before and after breaking-in

Point

- · The breaking-in pattern should be based on a pattern of increased rotational speed ⇒ temperature equilibration ⇒ increased rotational speed.
- · Set the amount of the rotational speed increase to be smaller than the maximum rotational speed of the vicinity.
- · Even oil lubrication is affected by initial lubrication. Therefore, we recommend that you perform breaking-in.

1. 2. 5(3) Trial run and inspection

A trial run and inspection are carried out when bearings have been mounted, in order to check whether the mounting is adequate.

In the case of a small spindle, the rotation condition is examined initially by rotating it manually. After confirming that the below conditions do not exist, a further inspection is carried out by a powered run.

· Unsmoothness	Possible causes include the inserfion of foreign matter and flaws on the rolling surfaces. Grease used in grease lubrication may cause a phenomenon of unsmoothness at the initial stage. In such cases, unsmoothness disappears after breaking-in.
· Excessive torque (heavy)	Possible causes are friction in the sealing device, insufficient clearance, etc.
· Uneven rotational torque	Possible causes are difective mounting, and / or errors in mounting dimensions.

In the case of a large spindle that cannot be rotated manually, start it under unloaded condition and immediately after starting, turn the power off and allow to coast.

After verifying that the shaft is free of abnormal vibration or noise and rotates smoothly, proceed to powered run.

Powered run should be started with no load applied and at a low speed, before being increased gradually to a given condition.

Noise, temperature increase, and vibration are principal judging factors in powered run and inspection. If a faulty condition such as shown in **Tables 1. 1** and **1. 2** occurs, conduct a further inspection immediately.

In some cases, it is necessary to remove the bearing for inspection.

Table 1. 1 Bearing noises, causes, and countermeasures

Noise types		Causes	Countermeasures
Cyclic	Flaw noise (similar to noise when punching a rivet1)) Brinelling noise (unclear siren-line noise1))	Flaw on raceway Brinelling on raceway	Improve mounting procedure, cleaning method and rust preventive method. Replace bearing.
	Flaking noise (similar to a large hammering noise1))	Flaking on raceway	Replace bearing.
Not cyclic	Dirt noise (an irregular sandy noise1))	Insertion of foreign matter	Improve cleaning method, sealing device. Use clean lubricant. Replace bearing.
	Flaw noise, flaking noise	Flaws and flaking on rolling elements	Replace bearing.
	Squeak noise (often heard in cylindrical roller bearing with grease lubrication, especially in winter or at low temperature)	If noise is caused by improper lubrication, a proper lubricant should be selected. In general, however, serious damage will not be caused by an improper lubricant if used continuously.	
Others	Abnormally large metallic sound	Abnormal load Incorrect mounting Insufficient amount of or improper lubricant	Review fitting, clearance. Adjust preload. Improve accuracy in processing and mounting shafts and housings. Improve sealing device. Refill lubricant. Select proper lubricant.

[Note] 1) In case of slow or medium rotation.

Table 1. 2 Causes and countermeasures for abnormal temperature rise

Causes	Countermeasures
Too much lubricant	Reduce lubricant amount
Insufficient lubricant	Refill lubricant
Improper lubricant	Select proper lubricant
Abnormal load	Review fitting and clearance conditions and adjust preload
Improper mounting (excessive friction)	Improve accuracy in processing and mounting shaft and housing. Review fitting. Improve sealing device.

Normally, listening rods are employed for bearing noise inspections. The device, which detects abnormalities through sound vibration, and the system, which utilizes acoustic emission for abnormality detection, are useful for more precise inspection.

In general, bearing temperature can be estimated from housing temperature, but the most accurate method is to measure the temperature of outer rings directly via lubrication holes.

Normally, bearing temperature begins to rise gradually when operation is just starting; and, unless the bearing has some abnormality, the temperature stabilizes within one or two hours.

Therefore, a rapid rise in temperature or unusually high temperature indicates some abnormality.

1. 2. 6 Dismounting of bearings

Dismounting a bearing for reuse or identification of causes of failure should be carried out in a careful manner similar to that of when mounted. Care should be taken to avoid damage to the bearing and other parts.

Specifically, when dismounting a bearing involving an interference, the dismounting process of the bearing should be taken into consideration at the designing stage of the shaft and housing.

It is recommended to make a jig for dismounting where appropriate.

Ⅳ. Examples of Bearing Failures

Contents

Page

1. Bearing failures, causes and countermeasures

It is necessary to carry out the maintenance and inspection to use the machine equipment always in stable conditions.

The bearing is an important part of the machine installation. If the bearing is damaged, the machine may become nonoperating and other inadvertent effects may occur.

Rotation noise, vibrations, temperature and torque are important phenomena to determine the status of the bearing. If any abnormality is perceived in such phenomena, it is necessary to immediately find the cause of the problem and take appropriate measures.

In **Table 1. 1**, bearing failures, possible causes and countermeasures are shown.

Table 1. 1 Bearing failures, causes and countermeasures

Phenomena		Causes	Countermeasures	Notes
Temperature rise	Excessive	Excessively small quantity of lubricant	Check the quantity of the enclosed grease and the oil / air blow. Check that there is no leakage in the oil / air pipe.	Usually this phenomenon is accompanied by metallic noise. Grease may be deteriorated or leaking if this phenomenon occurs during normal operation in case of grease lubrication.
		Excessively large quantity of lubricant	Check the quantity of the enclosed grease and the oil / air blow.	In case of grease lubrication, the breaking-in may be insufficient.
		Angular contact ball bearing: excessive preload Cylindrical roller bearing: excessive negative clearance	Check the bearing axial clearance and mounting conditions.	Refer to case ① (page 189).
		Inadequate mounting precision	Check that there is no misalignment.	If reinstalling the bearing, it is necessary to check the precision of the parts after dismounting it.
		Insufficient cooling	Check the availability of the cooling capacity required.	
		External factors	Check that the belt tension is not excessive, the built-in motor is not heated excessively, and the coupling core is precisely placed.	
		Deterioration of bearing	Replace the bearing.	Usually this phenomenon is accompanied by torque rise.
	Instable	Oil / air lubrication: bad exhaust Grease lubrication: insufficient breaking-in	Check the oil / air exhaust route.	In case of oil / air lubrication, if the oil blows intermittently (irregularly) from the exhaust port, the exhaust (oil drainage) is not carried out correctly.
Noise	Metallic noise	Excessively small quantity of lubricant	Check the quantity of the enclosed grease and the oil / air blow. Check that there is no leakage in the oil / air pipe.	This phenomenon is accompanied by excessive temperature rise. Grease may be deteriorated or leaking if this phenomenon occurs during normal operation in case of grease lubrication.
	Continuous noise	Contact and interference between all rotating parts and all non-rotating parts	Check the conditions of the mounted parts, including the labyrinth.	If this phenomenon occurs during normal operation, it may be the secondary phenomenon of a temporal failure.
		Unbalanced shaft and imprecise rotation	Adjust the shaft balance. Readjust the rotational accuracy.	This phenomenon is accompanied by buzzing noise. If this phenomenon occurs during normal operation, it may be the secondary phenomenon of a temporal failure.
		Rough surface and brinelling of raceway	Replace the bearing in the case of entry of foreign matter, flaking, or excessive load.	Refer to cases ② and ③ (page 189 and 190). If there is no measure taken, this phenomenon may occur repeatedly.
	Intermittent noise	Noise of cages, and slippage because of preload leakage	If the preload is excessively small, check the axial clearance and mounting conditions of the bearing.	
Vibrations		Unbalanced shaft	Adjust the shaft balance. Readjust the rotational accuracy.	
		Excessive radial clearance of cylindrical roller bearing	Check the radial clearance of the bearing. Check the mounting conditions.	In case of the bearing with tapered bore, the shaft nut may be loose. Also, the wear may have worsened.
		Rough surface and brinelling of raceway	Replace the bearing in the case of entry of foreign matter, flaking, or excessive load.	Refer to cases ② and ③ (page 189 and 190).

Case ① Excessive bearing preload

Causes

1) Inadequate fitting

- Excessively large interference fitting of the inner ring
  ⇒Due to the increase of interference of the inner ring and the shaft, the diameter of the raceway expands and the preload increases.
- Excessively small clearance fitting of the outer ring
  ⇒If a temperature difference is generated between the outer ring and the housing, the outer ring is compressed and the diameter of the raceway shrinks, resulting in an increase in preload.

2) Inadequate tightening force of the bearing

- If the tightening force of the inner ring (nut shaft force etc.) is excessively large, the inner ring is deformed in axial direction and the preload increases.

3) Excessive cooling of the housing

- If the outer surface of the housing is excessively cooled, the phenomenon described in item **1)** is generated and the preload increases.

4) Failure in constant-pressure preloading and variable preloading system

- If the outer ring cannot be moved smoothly by the constant-pressure preloading and the preload variable spindle, the same phenomenon as in the case of the position preloading is generated, and an excessive preload is applied to the bearing.

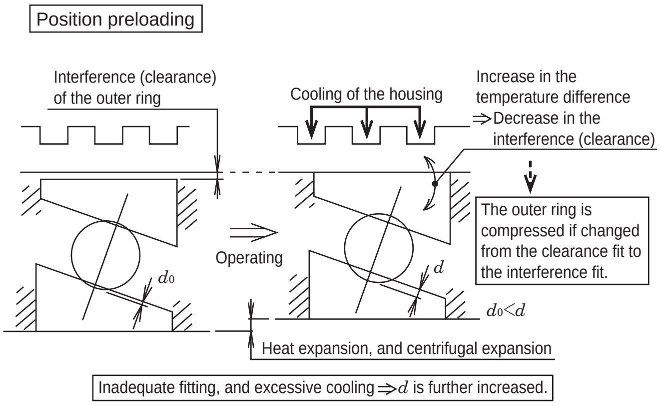


Fig. 1. 1 Cause of increase in preload

Case ② Entry of foreign matter

Major types of foreign matter are as follows.

- Coolant
- Chippings
- Iron chips (housing material)

Causes

1) Poor sealing performance

If the labyrinth is not adequately configured for use conditions, the sufficient sealing effect is not obtained, and foreign matter including coolant, may be trapped in the bearing.

2) Part not cleaned sufficiently

If the parts are not cleaned sufficiently, foreign matter such as small burrs and barbs may exist. This foreign matter may fall into the inside of the bearing during the operation.

3) Dirty lubricant

If the oil lubricant is not completely washed out of the pipe, or if the environment for the enclosing grease is not adequate, foreign matter may be trapped in the lubricant and the bearing may be damaged.

Fig. 1. 2 Example of biting flaws formed in raceway because of entry of foreign matter

Case ③ Damage on the raceway surface (nick and flaking)

Causes

1) Nick

Nick may be produced on the raceway surface if the main shaft is hit, any excessive load is applied to the bearing because of the clamping and unclamping of the tool, or the bearing is not properly handled.

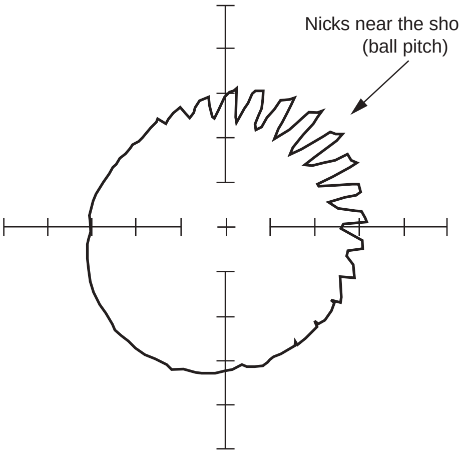


Fig. 1. 3 Example of nicks

2) Flaking

As the bearing becomes old, the flaking occurs if the load is applied repeatedly to the raceway surface.

However, even in case of a new bearing, the flaking may occur if an excessive load is applied to the bearing or the oil film is formed insufficiently.

Also, the flaking may be generated by the brinelling (nicks).

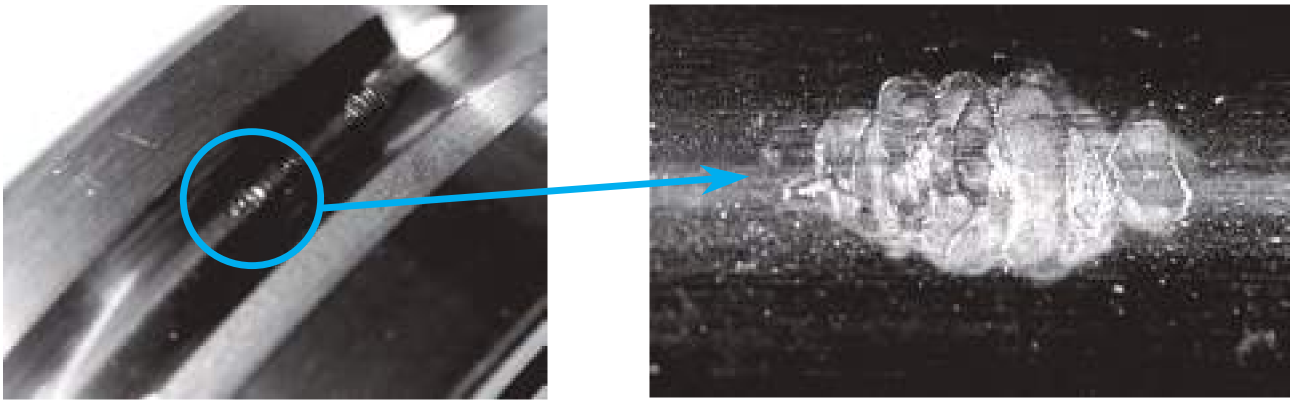


Fig. 1. 4 Example of flaking

Ⅴ. Supplementary Tables

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Page

Supplementary table 1 Shaft tolerances (deviation from nominal dimensions)

Unit : µm

Nominal shaft dia. (mm)		Deviation classes of shaft diameter																															Nominal shaft dia. (mm)	
over	up to	g4	g5	g6	h4	h5	h6	h7	js3	js4	js5	js6	js7	j5	j6	j7	k3	k4	k5	k6	k7	m4	m5	m6	m7	n4	n5	n6	p6	r5	r6	r7	over	up to
3	6	–4 –8	–4 –9	–4 –12	0 –4	0 –5	0 –8	0 –12	±1.2	±2	±2.5	±4	±6	+3 –2	+6 –2	+8 –4	+2.5 0	+5 +1	+6 +1	+9 +1	+13 +1	+8 +4	+9 +4	+12 +4	+16 +4	+12 +8	+13 +8	+16 +8	+20 +12	+20 +15	+23 +15	+27 +15	3	6
6	10	–5 –9	–5 –11	–5 –14	0 –4	0 –6	0 –9	0 –15	±1.2	±2	±3	±4.5	±7.5	+4 –2	+7 –2	+10 –5	+2.5 0	+5 +1	+7 +1	+10 +1	+16 +1	+10 +6	+12 +6	+15 +6	+21 +6	+14 +10	+16 +10	+19 +10	+24 +15	+25 +19	+28 +19	+34 +19	6	10
10	18	–6 –11	–6 –14	–6 –17	0 –5	0 –8	0 –11	0 –18	±1.5	±2.5	±4	±5.5	±9	+5 –3	+8 –3	+12 –6	+3 0	+6 +1	+9 +1	+12 +1	+19 +1	+12 +7	+15 +7	+18 +7	+25 +7	+17 +12	+20 +12	+23 +12	+29 +18	+31 +23	+34 +23	+41 +23	10	18
18	30	–7 –13	–7 –16	–7 –20	0 –6	0 –9	0 –13	0 –21	±2	±3	±4.5	±6.5	±10.5	+5 –4	+9 –4	+13 –8	+4 0	+8 +2	+11 +2	+15 +2	+23 +2	+14 +8	+17 +8	+21 +8	+29 +8	+21 +15	+24 +15	+28 +15	+35 +22	+37 +28	+41 +28	+49 +28	18	30
30	50	–9 –16	–9 –20	–9 –25	0 –7	0 –11	0 –16	0 –25	±2	±3.5	±5.5	±8	±12.5	+6 –5	+11 –5	+15 –10	+4 0	+9 +2	+13 +2	+18 +2	+27 +2	+16 +9	+20 +9	+25 +9	+34 +9	+24 +17	+28 +17	+33 +17	+42 +26	+45 +34	+50 +34	+59 +34	30	50
50	80	–10 –18	–10 –23	–10 –29	0 –8	0 –13	0 –19	0 –30	±2.5	±4	±6.5	±9.5	±15	+6 –7	+12 –7	+18 –12	+5 0	+10 +2	+15 +2	+21 +2	+32 +2	+19 +11	+24 +11	+30 +11	+41 +11	+28 +20	+33 +20	+39 +20	+51 +32	+54 +41	+60 +41	+71 +41	50	65
																														+56 +43	+62 +43	+73 +43	65	80
80	120	–12 –22	–12 –27	–12 –34	0 –10	0 –15	0 –22	0 –35	±3	±5	±7.5	±11	±17.5	+6 –9	+13 –9	+20 –15	+6 0	+13 +3	+18 +3	+25 +3	+38 +3	+23 +13	+28 +13	+35 +13	+48 +13	+33 +23	+38 +23	+45 +23	+59 +37	+66 +51	+73 +51	+86 +51	80	100
																														+69 +54	+76 +54	+89 +54	100	120
120	180	–14 –26	–14 –32	–14 –39	0 –12	0 –18	0 –25	0 –40	±4	±6	±9	±12.5	±20	+7 –11	+14 –11	+22 –18	+8 0	+15 +3	+21 +3	+28 +3	+43 +3	+27 +15	+33 +15	+40 +15	+55 +15	+39 +27	+45 +27	+52 +27	+68 +43	+81 +63	+88 +63	+103 +63	120	140
																														+83 +65	+90 +65	+105 +65	140	160
																														+86 +68	+93 +68	+108 +68	160	180
180	250	–15 –29	–15 –35	–15 –44	0 –14	0 –20	0 –29	0 –46	±5	±7	±10	±14.5	±23	+7 –13	+16 –13	+25 –21	+10 0	+18 +4	+24 +4	+33 +4	+50 +4	+31 +17	+37 +17	+46 +17	+63 +17	+45 +31	+51 +31	+60 +31	+79 +50	+97 +77	+106 +77	+123 +77	180	200
																														+100 +80	+109 +80	+126 +80	200	225
																														+104 +84	+113 +84	+130 +84	225	250
250	315	–17 –33	–17 –40	–17 –49	0 –16	0 –23	0 –32	0 –52	±6	±8	±11.5	±16	±26	+7 –16	±16	±26	+12 0	+20 +4	+27 +4	+36 +4	+56 +4	+36 +20	+43 +20	+52 +20	+72 +20	+50 +34	+57 +34	+66 +34	+88 +56	+117 +94	+126 +94	+146 +94	250	280
																														+121 +98	+130 +98	+150 +98	280	315
315	400	–18 –36	–18 –43	–18 –54	0 –18	0 –25	0 –36	0 –57	±6.5	±9	±12.5	±18	±28.5	+7 –18	±18	+29 –28	+13 0	+22 +4	+29 +4	+40 +4	+61 +4	+39 +21	+46 +21	+57 +21	+78 +21	+55 +37	+62 +37	+73 +37	+98 +62	+133 +108	+144 +108	+165 +108	315	355
																														+139 +114	+150 +114	+171 +114	355	400
400	500	–20 –40	–20 –47	–20 –60	0 –20	0 –27	0 –40	0 –63	±7.5	±10	±13.5	±20	±31.5	+7 –20	±20	+31 –32	+15 0	+25 +5	+32 +5	+45 +5	+68 +5	+43 +23	+50 +23	+63 +23	+86 +23	+60 +40	+67 +40	+80 +40	+108 +68	+153 +126	+166 +126	+189 +126	400	450
																														+159 +132	+172 +132	+195 +132	450	500
500	630	–22 –44	–22 –54	–22 –66	0 –22	0 –32	0 –44	0 –70	±8	±11	±16	±22	±35	—	—	—	+16 0	+22 0	+32 0	+44 0	+70 0	+48 +26	+58 +26	+70 +26	+96 +26	+66 +44	+76 +44	+88 +44	+122 +78	+182 +150	+194 +150	+220 +150	500	560
																														+187 +155	+199 +155	+225 +155	560	630
630	800	–24 –49	–24 –60	–24 –74	0 –25	0 –36	0 –50	0 –80	±9	±12.5	±18	±25	±40	—	—	—	+18 0	+25 0	+36 0	+50 0	+80 0	+55 +30	+66 +30	+80 +30	+110 +30	+75 +50	+86 +50	+100 +50	+138 +88	+211 +175	+225 +175	+255 +175	630	710
																														+221 +185	+235 +185	+265 +185	710	800
800	1 000	–26 –54	–26 –66	–26 –82	0 –28	0 –40	0 –56	0 –90	±10.5	±14	±20	±28	±45	—	—	—	+21 0	+28 0	+40 0	+56 0	+90 0	+62 +34	+74 +34	+90 +34	+124 +34	+84 +56	+96 +56	+112 +56	+156 +100	+250 +210	+266 +210	+300 +210	800	900
																														+260 +220	+276 +220	+310 +220	900	1 000

Supplementary table 2　Housing bore tolerances (deviation from nominal dimensions)

Unit : μm

Nominal bore dia. (mm)		Deviation classes of housing bore diameter													
over	up to	G5	G6	G7	H4	H5	H6	H7	H8	JS4	JS5	JS6	JS7	J6	J7
10	**18**	+14 +6	+17 +6	+24 +6	+5 0	+8 0	+11 0	+18 0	+27 0	±2.5	±4	±5.5	±9	+6 –5	+10 –8
18	**30**	+16 +7	+20 +7	+28 +7	+6 0	+9 0	+13 0	+21 0	+33 0	±3	±4.5	±6.5	±10.5	+8 –5	+12 –9
30	**50**	+20 +9	+25 +9	+34 +9	+7 0	+11 0	+16 0	+25 0	+39 0	±3.5	±5.5	±8	±12.5	+10 –6	+14 –11
50	**80**	+23 +10	+29 +10	+40 +10	+8 0	+13 0	+19 0	+30 0	+46 0	±4	±6.5	±9.5	±15	+13 –6	+18 –12
80	**120**	+27 +12	+34 +12	+47 +12	+10 0	+15 0	+22 0	+35 0	+54 0	±5	±7.5	±11	±17.5	+16 –6	+22 –13
120	**180**	+32 +14	+39 +14	+54 +14	+12 0	+18 0	+25 0	+40 0	+63 0	±6	±9	±12.5	±20	+18 –7	+26 –14
180	**250**	+35 +15	+44 +15	+61 +15	+14 0	+20 0	+29 0	+46 0	+72 0	±7	±10	±14.5	±23	+22 –7	+30 –16
250	**315**	+40 +17	+49 +17	+69 +17	+16 0	+23 0	+32 0	+52 0	+81 0	±8	±11.5	±16	±26	+25 –7	+36 –16
315	**400**	+43 +18	+54 +18	+75 +18	+18 0	+25 0	+36 0	+57 0	+89 0	±9	±12.5	±18	±28.5	+29 –7	+39 –18
400	**500**	+47 +20	+60 +20	+83 +20	+20 0	+27 0	+40 0	+63 0	+97 0	±10	±13.5	±20	±31.5	+33 –7	+43 –20
500	**630**	+54 +22	+66 +22	+92 +22	+22 0	+32 0	+44 0	+70 0	+110 0	±11	±16	±22	±35	—	—
630	**800**	+60 +24	+74 +24	+104 +24	+25 0	+36 0	+50 0	+80 0	+125 0	±12.5	±18	±25	±40	—	—
800	**1 000**	+66 +26	+82 +26	+116 +26	+28 0	+40 0	+56 0	+90 0	+140 0	±14	±20	±28	±45	—	—
1 000	**1 250**	+75 +28	+94 +28	+133 +28	+33 0	+47 0	+66 0	+105 0	+165 0	±16.5	±23.5	±33	±52.5	—	—

															Nominal bore dia. (mm)	
K4	K5	K6	K7	M4	M5	M6	M7	N4	N5	N6	N7	P5	P6	P7	over	up to
+1 –4	+2 –6	+2 –9	+6 –12	–5 –10	–4 –12	–4 –15	0 –18	–10 –15	–9 –17	–9 –20	–5 –23	–15 –23	–15 –26	–11 –29	**10**	**18**
0 –6	+1 –8	+2 –11	+6 –15	–6 –12	–5 –14	–4 –17	0 –21	–13 –19	–12 –21	–11 –24	–7 –28	–19 –28	–18 –31	–14 –35	**18**	**30**
+1 –6	+2 –9	+3 –13	+7 –18	–6 –13	–5 –16	–4 –20	0 –25	–14 –21	–13 –24	–12 –28	–8 –33	–22 –33	–21 –37	–17 –42	**30**	**50**
+1 –7	+3 –10	+4 –15	+9 –21	–8 –16	–6 –19	–5 –24	0 –30	–17 –25	–15 –28	–14 –33	–9 –39	–27 –40	–26 –45	–21 –51	**50**	**65**
															65	**80**
+1 –9	+2 –13	+4 –18	+10 –25	–9 –19	–8 –23	–6 –28	0 –35	–19 –29	–18 –33	–16 –38	–10 –45	–32 –47	–30 –52	–24 –59	**80**	**100**
															100	**120**
+1 –11	+3 –15	+4 –21	+12 –28	–11 –23	–9 –27	–8 –33	0 –40	–23 –35	–21 –39	–20 –45	–12 –52	–37 –55	–36 –61	–28 –68	**120**	**140**
															140	**160**
															160	**180**
0 –14	+2 –18	+5 –24	+13 –33	–13 –27	–11 –31	–8 –37	0 –46	–27 –41	–25 –45	–22 –51	–14 –60	–44 –64	–41 –70	–33 –79	**180**	**200**
															200	**225**
															225	**250**
0 –16	+3 –20	+5 –27	+16 –36	–16 –32	–13 –36	–9 –41	0 –52	–30 –46	–27 –50	–25 –57	–14 –66	–49 –72	–47 –79	–36 –88	**250**	**280**
															280	**315**
+1 –17	+3 –22	+7 –29	+17 –40	–16 –34	–14 –39	–10 –46	0 –57	–32 –50	–30 –55	–26 –62	–16 –73	–55 –80	–51 –87	–41 –98	**315**	**355**
															355	**400**
0 –20	+2 –25	+8 –32	+18 –45	–18 –38	–16 –43	–10 –50	0 –63	–35 –55	–33 –60	–27 –67	–17 –80	–61 –88	–55 –95	–45 –108	**400**	**450**
															450	**500**
0 –22	0 –32	0 –44	0 –70	–26 –48	–26 –58	–26 –70	–26 –96	–44 –66	–44 –76	–44 –88	–44 –114	–78 –110	–78 –122	–78 –148	**500**	**560**
															560	**630**
0 –25	0 –36	0 –50	0 –80	–30 –55	–30 –66	–30 –80	–30 –110	–50 –75	–50 –86	–50 –100	–50 –130	–88 –124	–88 –138	–88 –168	**630**	**710**
															710	**800**
0 –28	0 –40	0 –56	0 –90	–34 –62	–34 –74	–34 –90	–34 –124	–56 –84	–56 –96	–56 –112	–56 –146	–100 –140	–100 –156	–100 –190	**800**	**900**
															900	**1 000**
0 –33	0 –47	0 –66	0 –105	–40 –73	–40 –87	–40 –106	–40 –145	–66 –99	–66 –113	–66 –132	–66 –171	–120 –167	–120 –186	–120 –225	**1 000**	**1 120**
															1 120	**1 250**

Supplementary table 3 Numerical values for standard tolerance grades IT (ISO 286-1)

Basic size (mm)		Standard tolerance grades (IT)																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14 1)	15 1)	16 1)	17 1)	18 1)
over	up to	Tolerances (μm)											Tolerances (mm)						
—	3	0.8	1.2	2	3	4	6	10	14	25	40	60	0.10	0.14	0.26	0.40	0.60	1.00	1.40
3	6	1	1.5	2.5	4	5	8	12	18	30	48	75	0.12	0.18	0.30	0.48	0.75	1.20	1.80
6	10	1	1.5	2.5	4	6	9	15	22	36	58	90	0.15	0.22	0.36	0.58	0.90	1.50	2.20
10	18	1.2	2	3	5	8	11	18	27	43	70	110	0.18	0.27	0.43	0.70	1.10	1.80	2.70
18	30	1.5	2.5	4	6	9	13	21	33	52	84	130	0.21	0.33	0.52	0.84	1.30	2.10	3.30
30	50	1.5	2.5	4	7	11	16	25	39	62	100	160	0.25	0.39	0.62	1.00	1.60	2.50	3.90
50	80	2	3	5	8	13	19	30	46	74	120	190	0.30	0.46	0.74	1.20	1.90	3.00	4.60
80	120	2.5	4	6	10	15	22	35	54	87	140	220	0.35	0.54	0.87	1.40	2.20	3.50	5.40
120	180	3.5	5	8	12	18	25	40	63	100	160	250	0.40	0.63	1.00	1.60	2.50	4.00	6.30
180	250	4.5	7	10	14	20	29	46	72	115	185	290	0.46	0.72	1.15	1.85	2.90	4.60	7.20
250	315	6	8	12	16	23	32	52	81	130	210	320	0.52	0.81	1.30	2.10	3.20	5.20	8.10
315	400	7	9	13	18	25	36	57	89	140	230	360	0.57	0.89	1.40	2.30	3.60	5.70	8.90
400	500	8	10	15	20	27	40	63	97	155	250	400	0.63	0.97	1.55	2.50	4.00	6.30	9.70
500	630	—	—	—	—	—	44	70	110	175	280	440	0.70	1.10	1.75	2.80	4.40	7.00	11.00
630	800	—	—	—	—	—	50	80	125	200	320	500	0.80	1.25	2.00	3.20	5.00	8.00	12.50
800	1 000	—	—	—	—	—	56	90	140	230	360	560	0.90	1.40	2.30	3.60	5.60	9.00	14.00
1 000	1 250	—	—	—	—	—	66	105	165	260	420	660	1.05	1.65	2.60	4.20	6.60	10.50	16.50
1 250	1 600	—	—	—	—	—	78	125	195	310	500	780	1.25	1.95	3.10	5.00	7.80	12.50	19.50
1 600	2 000	—	—	—	—	—	92	150	230	370	600	920	1.50	2.30	3.70	6.00	9.20	15.00	23.00
2 000	2 500	—	—	—	—	—	110	175	280	440	700	1 100	1.75	2.80	4.40	7.00	11.00	17.50	28.00
2 500	3 150	—	—	—	—	—	135	210	330	540	860	1 350	2.10	3.30	5.40	8.60	13.50	21.00	33.00

[Note] 1) Standard tolerance grades IT 14 to IT 18 (incl.) shall not be used for basic sizes less than or equal to 1 mm.

Supplementary table 4　Steel hardness conversion

Rockwell	Vicker's	Brinell		Rockwell		Shore
C-scale 1 471.0 N(150 kgf)		Standard ball	Tungsten carbide ball	A-scale 588.4 N(60 kgf)	B-scale 980.7 N(100 kgf)	
68	940			85.6		97
67	900			85.0		95
66	865			84.5		92
65	832		739	83.9		91
64	800		722	83.4		88
63	772		705	82.8		87
62	746		688	82.3		85
61	720		670	81.8		83
60	697		654	81.2		81
59	674		634	80.7		80
58	653		615	80.1		78
57	633		595	79.6		76
56	613		577	79.0		75
55	595	—	560	78.5		74
54	577	—	543	78.0		72
53	560	—	525	77.4		71
52	544	500	512	76.8		69
51	528	487	496	76.3		68
50	513	475	481	75.9		67
49	498	464	469	75.2		66
48	484	451	455	74.7		64
47	471	442	443	74.1		63
46	458	432		73.6		62
45	446	421		73.1		60
44	434	409		72.5		58
43	423	400		72.0		57
42	412	390		71.5		56
41	402	381		70.9		55
40	392	371		70.4	—	54
39	382	362		69.9	—	52
38	372	353		69.4	—	51
37	363	344		68.9	—	50
36	354	336		68.4	(109.0)	49
35	345	327		67.9	(108.5)	48
34	336	319		67.4	(108.0)	47
33	327	311		66.8	(107.5)	46
32	318	301		66.3	(107.0)	44
31	310	294		65.8	(106.0)	43
30	302	286		65.3	(105.5)	42
29	294	279		64.7	(104.5)	41
28	286	271		64.3	(104.0)	41
27	279	264		63.8	(103.0)	40
26	272	258		63.3	(102.5)	38
25	266	253		62.8	(101.5)	38
24	260	247		62.4	(101.0)	37
23	254	243		62.0	100.0	36
22	248	237		61.5	99.0	35
21	243	231		61.0	98.5	35
20	238	226		60.5	97.8	34
(18)	230	219		—	96.7	33
(16)	222	212		—	95.5	32
(14)	213	203		—	93.9	31
(12)	204	194		—	92.3	29
(10)	196	187			90.7	28
(8)	188	179			89.5	27
(6)	180	171			87.1	26
(4)	173	165			85.5	25
(2)	166	158			83.5	24
(0)	160	152			81.7	24

Supplementary table 5(1) SI units and conversion factors

Mass	SI units	Other units 1)	Conversion into SI units	Conversion from SI units
Angle	rad [radian(s)]	° [degree(s)] * ' [minute(s)] * " [second(s)] *	1° = π /180 rad 1' = π /10 800 rad 1" = π /648 000 rad	1 rad = 57.295 78°
Length	m [meter(s)]	Å [Angstrom unit] μ [micron(s)] in [inch(es)] ft [foot(feet)] yd [yard(s)] mile [mile(s)]	1Å = 10^{-10}m = 0.1 nm = 100 pm 1μ = 1 μm 1in = 25.4 mm 1ft = 12 in = 0.304 8 m 1yd = 3 ft = 0.914 4 m 1mile = 5 280 ft = 1 609.344 m	1m = 10^{10}Å 1m = 39.37 in 1m = 3.280 8 ft 1m = 1.093 6 yd 1km = 0.621 4 mile
Area	m^2	a [are(s)] ha [hectare(s)] acre [acre(s)]	1a = 100 m^2 1ha = 10^4 m^2 1acre = 4 840 yd^2 = 4 046.86 m^2	 1km^2 = 247.1 acre
Volume	m^3	ℓ , L [liter(s)] * cc [cubic centimeters] gal(US) [gallon(s)] floz(US) [fluid ounce(s)] barrel(US) [barrels(US)]	1 ℓ = 1 dm^3 = 10^{-3} m^3 1cc = 1 cm^3 = 10^{-6} m^3 1gal(US) = 231 in^3 = 3.785 41dm^3 1floz(US) = 29.573 5 cm^3 1barrel(US) = 158.987 dm^3	1m^3 = 10^3 ℓ 1m^3 = 10^6 cc 1m^3 = 264.17 gal 1m^3 = 33 814 floz 1m^3 = 6.289 8 barrel
Time	s [second(s)]	min [minute(s)] * h [hour(s)] * d [day(s)] *		
Angular velocity	rad / s			
Velocity	m / s	kn [knot(s)] m / h *	1kn = 1 852 m / h	1km / h = 0.539 96 kn
Acceleration	m / s^2	G	1G = 9.806 65 m / s^2	1m / s^2 = 0.101 97 G
Frequency	Hz [hertz]	c / s [cycle(s)/second]	1c / s = 1s^{-1} = 1 Hz	
Rotational frequency	s^{-1}	rpm [revolutions per minute] min^{-1} * r / min	1rpm = 1 / 60 s^{-1}	1s^{-1} = 60 rpm
Mass	kg [kilogram(s)]	t [ton(s)] * lb [pound(s)] gr [grain(s)] oz [ounce(s)] ton (UK) [ton(s) (UK)] ton (US) [ton(s) (US)] car [carat(s)]	1t = 10^3 kg 1lb = 0.453 592 37 kg 1gr = 64.798 91 mg 1oz = 1/16 lb = 28.349 5 g 1ton(UK) = 1 016.05 kg 1ton(US) = 907.185 kg 1car = 200 mg	 1kg = 2.204 6 lb 1g = 15.432 4 gr 1kg = 35.274 0 oz 1t = 0.984 2 ton (UK) 1t = 1.102 3 ton (US) 1g = 5 car

[Notes] 1) * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 5(2) SI units and conversion factors

Mass	SI units	Other units [1]	Conversion into SI units	Conversion from SI units
Density	$\mathrm{kg/m^3}$			
Linear density	$\mathrm{kg/m}$			
Momentum	$\mathrm{kg\cdot m/s}$			
Moment of momentum, angular momentum	$\mathrm{kg\cdot m^2/s}$			
Moment of inertia	$\mathrm{kg\cdot m^2}$			
Force	N [newton(s)]	dyn [dyne(s)] kgf [kilogram-force] gf [gram-force] tf [ton-force] lbf [pound-force]	1 dyn $= 10^{-5}$ N 1 kgf $=$ 9.806 65 N 1 gf $= 9.806\ 65\times10^{-3}$ N 1 tf $= 9.806\ 65\times10^{3}$ N 1 lbf $=$ 4.448 22N	1N $= 10^{5}$ dyn 1N $=$ 0.101 97 kgf 1N $=$ 0.224 809 lbf
Moment of force	N·m [Newton meter(s)]	gf·cm kgf·cm kgf·m tf·m lbf·ft	1 gf·cm $= 9.806\ 65\times10^{-5}$ N·m 1 kgf·cm $= 9.806\ 65\times10^{-2}$ N·m 1 kgf·m $=$ 9.806 65 N·m 1 tf·m $= 9.806\ 65\times10^{3}$ N·m 1 lbf·ft $=$ 1.355 82 N·m	1N·m $=$ 0.101 97 kgf·m 1N·m $=$ 0.737 56 lbf·ft
Pressure, **Normal stress**	Pa [Pascal(s)] or $\mathrm{N/m^2}$ {1 Pa $=$ 1 $\mathrm{N/m^2}$}	$\mathrm{gf/cm^2}$ $\mathrm{kgf/mm^2}$ $\mathrm{kgf/m^2}$ $\mathrm{lbf/in^2}$ bar [bar(s)] at [engineering air pressure] $\mathrm{mH_2O}$, mAq [meter water column] atm [atmosphere] mHg [meter merury column] Torr [torr]	1 $\mathrm{gf/cm^2}$ $= 9.806\ 65\times10$ Pa 1 $\mathrm{kgf/mm^2}$ $= 9.806\ 65\times10^{6}$ Pa 1 $\mathrm{kgf/m^2}$ $=$ 9.806 65 Pa 1 $\mathrm{lbf/in^2}$ $=$ 6 894.76 Pa 1 bar $= 10^{5}$ Pa 1 at $=$ 1 $\mathrm{kgf/cm^2}$ $= 9.806\ 65\times10^{4}$ Pa 1 $\mathrm{mH_2O}$ $= 9.806\ 65\times10^{3}$ Pa 1 atm $=$ 101 325 Pa 1 mHg $= \frac{101\ 325}{0.76}$ Pa 1 Torr $=$ 1 mmHg $=$ 133.322 Pa	1MPa $=$ 0.101 97 $\mathrm{kgf/mm^2}$ 1Pa $=$ 0.101 97 $\mathrm{kgf/m^2}$ 1Pa $= 0.145\times10^{-3}$ $\mathrm{lbf/in^2}$ 1Pa $= 10^{-2}$ mbar 1Pa $= 7.500\ 6\times10^{-3}$ Torr
Viscosity	Pa·s [pascal second]	P [poise] $\mathrm{kgf\cdot s/m^2}$	10^{-2} P $=$ 1 cP $=$ 1 mPa·s 1 $\mathrm{kgf\cdot s/m^2}$ $=$ 9.806 65 Pa·s	1Pa·s $=$ 0.101 97 $\mathrm{kgf\cdot s/m^2}$
Kinematic viscosity	$\mathrm{m^2/s}$	St [stokes]	10^{-2} St $=$ 1 cSt $=$ 1 $\mathrm{mm^2/s}$	
Surface tension	$\mathrm{N/m}$			

Supplementary table 5(3) SI units and conversion factors

Mass	SI units	Other units [1]	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J = 1 N·m}	eV [electron volt(s)] * erg [erg(s)] kgf·m lbf·ft	1eV = (1.602 189 2 ± 0.000 004 6) × 10^{-19} J 1 erg = 10^{-7} J 1kgf·m = 9.806 65 J 1 lbf·ft = 1.355 82 J	 1 J = 10^{7} erg 1 J = 0.101 97 kgf·m 1 J = 0.737 56 lbf·ft
Power	W [watt(s)]	erg / s [ergs per second] kgf·m / s PS [French horse-power] HP [horse-power (British)] lbf·ft / s	1 erg / s = 10^{-7} W 1 kgf·m / s = 9.806 65 W 1 PS = 75 kgf·m / s = 735.5 W 1 HP = 550 lbf·ft / s = 745.7 W 1 lbf·ft / s = 1.355 82 W	 1 W = 0.101 97 kgf·m / s 1 W = 0.001 36 PS 1 W = 0.001 34 HP
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	℃ [Celsius(s)] {t℃ = (t+273.15)K}	℉ [degree(s) Fahrenheit]	t ℉ = $\frac{5}{9}$(t−32)℃	t ℃ = ($\frac{9}{5}$t+32)℉
Linear expansion coefficient	K^{-1}	$℃^{-1}$ [per degree]		
Heat	J [joule(s)] {1 J = 1 N·m}	erg [erg(s)] kgf·m cal_{IT} [I. T. calories]	1 erg = 10^{-7} J 1 cal_{IT} = 4.186 8 J 1 $Mcal_{IT}$ = 1.163 kW·h	1 J = 10^{7} erg 1 J = 0.238 85 cal_{IT} 1 kW·h = 0.86 × 10^{6} cal_{IT}
Thermal conductivity	W / (m·K)	W / (m·℃) cal / (s·m·℃)	1 W / (m·℃) = 1 W / (m·K) 1 cal / (s·m·℃) = 4.186 05 W / (m·K)	
Coefficient of heat transfer	W / (m^2·K)	W / (m^2·℃) cal / (s·m^2·℃)	1 W / (m^2·℃) = 1 W / (m^2·K) 1 cal / (s·m^2·℃) = 4.186 05 W / (m^2·K)	
Heat capacity	J / K	J / ℃	1 J / ℃ = 1 J / K	
Massic heat capacity	J / (kg·K)	J / (kg·℃)		

[Notes] 1) * : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 5(4) SI units and conversion factors

Mass	SI units	Other units [1)]	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge, quantity of electricity	C [coulomb(s)] {1 C = 1 A·s}	A·h *	1 A·h = 3.6 kC	
Tension, electric potential	V [volt(s)] {1 V = 1 W / A}			
Capacitance	F [farad(s)] {1 F = 1 C / V}			
Magnetic field strength	A / m	Oe [oersted(s)]	$1\ \mathrm{Oe} = \frac{10^3}{4\pi}\ \mathrm{A/m}$	$1\ \mathrm{A/m} = 4\pi \times 10^{-3}\ \mathrm{Oe}$
Magnetic flux density	T [tesla(s)] $\left\{\begin{array}{l}1\ \mathrm{T} = 1\ \mathrm{N/(A{\cdot}m)}\\ = 1\ \mathrm{Wb/m^2}\\ = 1\ \mathrm{V{\cdot}s/m^2}\end{array}\right\}$	Gs [gauss(es)] γ [gamma(s)]	$1\ \mathrm{Gs} = 10^{-4}\ \mathrm{T}$ $1\ \gamma = 10^{-9}\ \mathrm{T}$	$1\ \mathrm{T} = 10^4\ \mathrm{Gs}$ $1\ \mathrm{T} = 10^9\ \gamma$
Magnetic flux	Wb [weber(s)] {1 Wb = 1 V·s}	Mx [maxwell(s)]	$1\ \mathrm{Mx} = 10^{-8}\ \mathrm{Wb}$	$1\ \mathrm{Wb} = 10^8\ \mathrm{Mx}$
Self inductance	H [henry(-ries)] {1 H = 1 Wb / A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω = 1 V / A}			
Conductance (to direct current)	S [siemens] {1 S = 1 A / V}			
Active power	W $\left\{\begin{array}{l}1\ \mathrm{W} = 1\ \mathrm{J/s}\\ = 1\ \mathrm{A{\cdot}V}\end{array}\right\}$			

[Refer.] Principal units conversion table

Force

N	dyn	kgf
1	1×10^{5}	$1.019\ 72\times10^{-1}$
1×10^{-5}	1	$1.019\ 72\times10^{-6}$
9.806 65	$9.806\ 65\times10^{5}$	1

Torque

N·m	mN·m	μN·m	kgf·m	kgf·cm	gf·cm
1	1×10^{3}	1×10^{6}	$1.019\ 72\times10^{-1}$	$1.019\ 72\times10$	$1.019\ 72\times10^{4}$
1×10^{-3}	1	1×10^{3}	$1.019\ 72\times10^{-4}$	$1.019\ 72\times10^{-2}$	$1.019\ 72\times10$
1×10^{-6}	1×10^{-3}	1	$1.019\ 72\times10^{-7}$	$1.019\ 72\times10^{-5}$	$1.019\ 72\times10^{-2}$
9.806 65	$9.806\ 65\times10^{3}$	$9.806\ 65\times10^{6}$	1	1×10^{2}	1×10^{5}
$9.806\ 65\times10^{-2}$	$9.806\ 65\times10$	$9.806\ 65\times10^{4}$	1×10^{-2}	1	1×10^{3}
$9.806\ 65\times10^{-5}$	$9.806\ 65\times10^{-2}$	$9.806\ 65\times10$	1×10^{-5}	1×10^{-3}	1

Stress

Pa or N/m^2	MPa or N/mm^2	kgf/mm^2	kgf/cm^2
1	1×10^{-6}	$1.019\ 72\times10^{-7}$	$1.019\ 72\times10^{-5}$
1×10^{6}	1	$1.019\ 72\times10^{-1}$	$1.019\ 72\times10$
$9.806\ 65\times10^{6}$	9.806 65	1	1×10^{2}
$9.806\ 65\times10^{4}$	$9.806\ 65\times10^{-2}$	1×10^{-2}	1

[Note] 1 Pa=1 N/m^2, 1 MPa=1 N/mm^2

Pressure

Pa	kPa	MPa	bar	kgf/cm^2	atm	mmH$_2$O	mmHg or Torr
1	1×10^{-3}	1×10^{-6}	1×10^{-5}	$1.019\ 72\times10^{-5}$	$9.869\ 23\times10^{-6}$	$1.019\ 72\times10^{-1}$	$7.500\ 62\times10^{-3}$
1×10^{3}	1	1×10^{-3}	1×10^{-2}	$1.019\ 72\times10^{-2}$	$9.869\ 23\times10^{-3}$	$1.019\ 72\times10^{2}$	7.500 62
1×10^{6}	1×10^{3}	1	1×10	$1.019\ 72\times10$	9.869 23	$1.019\ 72\times10^{5}$	$7.500\ 62\times10^{3}$
1×10^{5}	1×10^{2}	1×10^{-1}	1	1.019 72	$9.869\ 23\times10^{-1}$	$1.019\ 72\times10^{4}$	$7.500\ 62\times10^{2}$
$9.806\ 65\times10^{4}$	$9.806\ 65\times10$	$9.806\ 65\times10^{-2}$	$9.806\ 65\times10^{-1}$	1	$9.678\ 41\times10^{-1}$	1×10^{4}	$7.355\ 59\times10^{2}$
$1.013\ 25\times10^{5}$	$1.013\ 25\times10^{2}$	$1.013\ 25\times10^{-1}$	1.013 25	1.033 23	1	$1.033\ 23\times10^{4}$	$7.600\ 00\times10^{2}$
9.806 65	$9.806\ 65\times10^{-3}$	$9.806\ 65\times10^{-6}$	$9.806\ 65\times10^{-5}$	1×10^{-4}	$9.678\ 41\times10^{-5}$	1	$7.355\ 59\times10^{-2}$
$1.333\ 22\times10^{2}$	$1.333\ 22\times10^{-1}$	$1.333\ 22\times10^{-4}$	$1.333\ 22\times10^{-3}$	$1.359\ 51\times10^{-3}$	$1.315\ 79\times10^{-3}$	$1.359\ 51\times10$	1

[Note] 1 Pa=1 N/m^2

Kinematic viscosity

m^2/s	cSt	St
1	1×10^{6}	1×10^{4}
1×10^{-6}	1	1×10^{-2}
1×10^{-4}	1×10^{2}	1

[Note] 1 cSt=1 mm^2/s, 1 St=1 cm^2/s

Supplementary table 6 Lubrication (discharge) intervals of the oil / air

<table>
<tr><th rowspan="3">Preloading method</th><th rowspan="3">Material of rolling element</th><th rowspan="3">Oil viscosity</th><th colspan="11">$d_m n$ value ($\times 10^4$)</th></tr>
<tr><th>over</th><th>—</th><th>70</th><th>85</th><th>100</th><th>125</th><th>150</th><th>175</th><th>200</th><th>225</th><th>250</th></tr>
<tr><th>up to</th><th>70</th><th>85</th><th>100</th><th>125</th><th>150</th><th>175</th><th>200</th><th>225</th><th>250</th><th></th></tr>
<tr><td rowspan="12">Position preloading</td><td rowspan="6">Bearing steel (SUJ2)</td><td rowspan="2">ISO VG10</td><td>Standard</td><td>5-10 Minute</td><td colspan="2">3-8 Minute</td><td>2-6 Minute</td><td></td><td rowspan="6" colspan="5">Consult JTEKT.</td></tr>
<tr><td>High Ability</td><td colspan="2">5-10 Minute</td><td colspan="2">3-8 Minute</td><td>2-6 Minute</td></tr>
<tr><td rowspan="2">ISO VG22</td><td>Standard</td><td>6-12 Minute</td><td colspan="2">4-10 Minute</td><td>3-6 Minute</td><td></td></tr>
<tr><td>High Ability</td><td colspan="2">6-12 Minute</td><td colspan="2">4-10 Minute</td><td>3-6 Minute</td></tr>
<tr><td rowspan="2">ISO VG32</td><td>Standard</td><td>10-18 Minute</td><td colspan="2">6-15 Minute</td><td>4-12 Minute</td><td></td></tr>
<tr><td>High Ability</td><td colspan="2">10-18 Minute</td><td colspan="2">6-15 Minute</td><td>4-12 Minute</td></tr>
<tr><td rowspan="6">Ceramics (Si_3N_4)</td><td rowspan="2">ISO VG10</td><td>Standard</td><td colspan="2">4-10 Minute</td><td colspan="2">2-8 Minute</td><td>1-5 Minute</td><td></td><td rowspan="6" colspan="4">Consult JTEKT.</td></tr>
<tr><td>High Ability</td><td colspan="3">4-10 Minute</td><td colspan="2">2-8 Minute</td><td>1-5 Minute</td></tr>
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<tr><td rowspan="12">Constant-pressure preloading</td><td rowspan="6">Bearing steel (SUJ2)</td><td rowspan="2">ISO VG10</td><td>Standard</td><td colspan="3">4-10 Minute</td><td colspan="2">2-8 Minute</td><td></td><td rowspan="6" colspan="4">Consult JTEKT.</td></tr>
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</table>

[Remarks]
1. The discharge intervals indicated are reference values supposing that the oil quantity of one discharge is 0.03ml in case of the angular contact ball bearing.
2. If the cylindrical roller bearing is used, suppose that the discharge interval is the same, and the oil quantity of one discharge is 0.01ml.
3. Select the optimal value of the required oil quantity by carrying out the test on the machine referring to the table above, because the optimal value varies depending on the type of the bearing, environment and use conditions.
4. ISO VG22 or VG32 is recommended in case of the main shaft driven by the built-in motor.

Supplementary table 7 Specification report of bearing for main shaft of machine tool

Examination certificate No.

Please fill in the space provided ▭.

＊Please attach the drawings, which show the configuration of the main shaft, dimensions, external load and loading position and direction.

No	Item		Details
1	Machine used	Name	
	☐Newly developed ☐Improved ☐Existing ☐Additional machine consideration	Type	☐Machining center ☐Lathe ☐Sanding machine ☐Others ( )
		Mounting direction of main shaft	☐Horizontal ☐Vertical upward ☐Vertical downward ☐Others ( )
		Weight of rotating part	①Other than the built-in type Weight of rotating part : N ②The built-in type Rotating unit weight (Not including rotor) : N Rotor weight : N
2	Bearing used	Bearing number	Bearing①
			Bearing②
			Bearing③
			Bearing④
		Matching	(DB, DF etc...)
		Spacer	☐Not available
			☐Available Dimension and location: (____The number of row is counted from the left.) Row No. -Row No. : mm Row No. -Row No. : mm Row No. -Row No. : mm Row No. -Row No. : mm Row No. -Row No. : mm Row No. -Row No. : mm
			Manufacture: ☐Manufactured by JTEKT ☐Supplied ☐Manufactured by you (JTEKT supplies only the bearings.) ☐Others
			Shape: ☐Standard design by JTEKT ☐Specified by you (Description must be attached.)
3	Maximum velocity		min^{-1}
4	Main shaft bore		① mm ② mm (Main shaft bore in the mounting part of the bearing)
5	Lubrication method		☐Grease ☐Oil / air ☐Oil mist ☐Jet ☐Others ( )
6	Preloading method ＊After examination, other methods may be recommended.		☐Position preloading ☐Constant-pressure preloading ☐Preload change (position preloading ←→ position preloading) Change rotation velocity min^{-1} ☐Preload change (position preloading ←→ constant-pressure preloading) Change rotation velocity min^{-1} ☐Others ( ) (Desired preload amount N/ min^{-1}hour)
7	Driving method		☐Built-in motor ☐Coupling ☐Others ( ) ☐Gear ☐Belt ＊When consideration of the gear and belt loads is necessary, please contact us with the load and position.
8	Cooling		☐Not available ☐Available Cooled part : ☐Housing (including bearing outer cylinder) ☐Housing (no cooling of the bearing outer cylinder) ☐Shaft ☐Others ( )
9	Requirements		☐None
			☐Available ☐Service life ☐Max. rotation with no load ☐Machining load: hours ＊For machining load, machining cycle, and other detailed conditions, contact us.
			☐Rigidity ☐Rotational frequency : ☐At mounting ☐ At ( ) min^{-1} ☐Spindle orientation : ☐Horizontal ☐Vertical downward ☐Vertical downward ☐Bearing stiffness ＊Contact us for single row or total value specifications. ☐Single row ☐Total value ☐Shaft head rigidity ＊Contact us for specific loads.
			☐Axial rigidity: N/μm (When the Axial load = N) ☐Ra rigidity : N/μm (When the Ra load = N)
			☐Tool unclamp force (when using a machining center) kN
10	Examination item		
11	Remarks ＊Other requests or comments		

MEMO

MEMO

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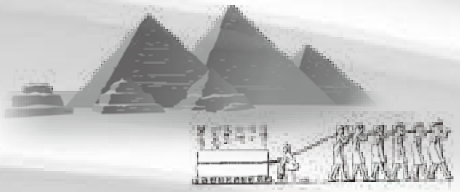
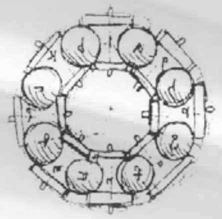
Low-Friction Torque Bearing

LFT-Series

CAT.NO.B1023E





The Evolution of Rolling Bearings

The technology of “moving” and “rolling”
with as little resistance as possible
has evolved since ancient times as an eternal theme,
blossomed as bearing technology and continued to evolve.

Bearings are essential to all industries.
Therefore, reduction of energy loss (torque loss) in bearings through size / weight reduction,
efficiency enhancement, etc. helps reduce CO_2 emissions
across all industries and ultimately
contributes to the prevention of global warming,
which is a reflection of the ancient Japanese saying
“Constant dripping wears away a stone”.

For the future of our planet environment

LFT-Series

Low-Friction Torque

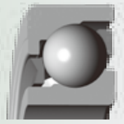
LFT-Series

JTEKT, since its time as Koyo Seiko, has constantly focused on friction and lubrication in efforts to reduce bearing torque and, in the 1980s, successfully developed the world’s first low-torque tapered roller bearing, the LFT. New generations emerged as the product evolved - LFT-II, III and IV, and these have helped to improve the fuel efficiency of automobiles.

Currently, JTEKT applies low-torque technology to other bearing types such as ball bearings and hub units, and offers an extensive LFT bearing lineup.

JTEKT’s LFT-Series of low-torque bearings will continue evolving hereon into the future.

* LFT is an abbreviation for Low-Friction Torque and JTEKT’s registered trademark.

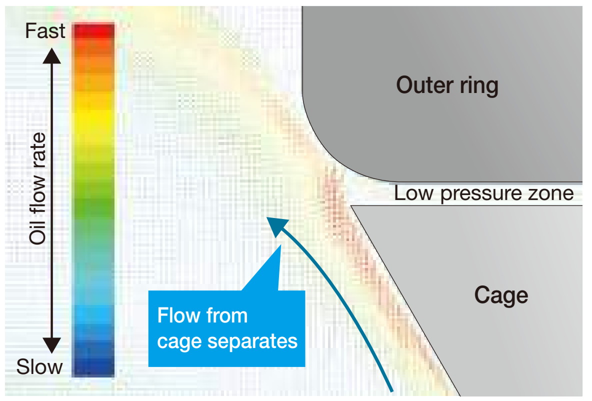
LFT-Series incorporated technologies	TRB-LFT 	BB-LFT 	HUB-LFT 	NRB-LFT 
Lubricant Reduced agitating resistance	○	○	○	○
Reduced in viscous rolling resistance (Bearing ring-rolling element)	○	○	○	○
Reduced sliding friction resistance (Roller-inner ring rib)	○	—	—	—
Reduced sliding friction resistance (Roller-cage)	—	—	—	○
Seal Reduced friction resistance	╲	╲	○	╲

Super-Low Friction Torque Tapered Roller Bearing (LFT-IV)

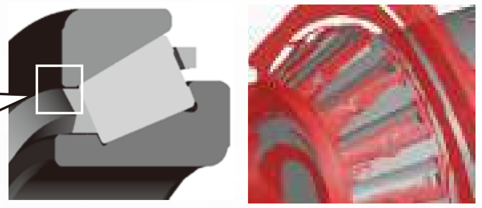
TRB-LFT

Features

In order to optimally control the amount of lubricant that flows through the bearing, this bearing uses resin with a high degree of design freedom for its cage material and has reduced lubricant mixing resistance. Bearing life in contaminated oil has also been improved

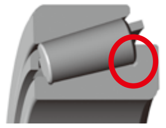
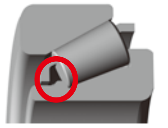


Speed vector diagram



<Mechanisms for reducing oil inflow>

- Flow of lubricant in proximity of cage end face separates from cage
- A low pressure zone is generated at lubricant entry point, reducing flow

	LFT-Ⅰ	LFT-Ⅱ	LFT-Ⅲ	LFT-Ⅳ
Evolution of TRB-LFT				
Features	Optimization of shape and roughness at contact portion of rib and roller	Special crowning of inner / outer ring raceways	Controlled volume of oil flow / Optimized internal	Optimal control of oil inflow with a resin cage
Friction torque reduction effect (compared to standard models)	-10% →	-20% →	-50% →	-65%

Major Fields of Application and Effects

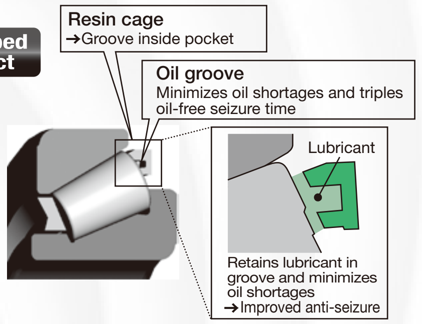
- Used on the pinion support of differential units to improve vehicle fuel efficiency by **2.5**%

Next-generation high performance product

High performance tapered roller bearing with resin cage (improved anti-seizure)

In addition to low-loss through high degree of design freedom using a resin cage and longer life in contaminated oil (LFT-IV), this bearing offers extended oil-free seizure time

Developed product



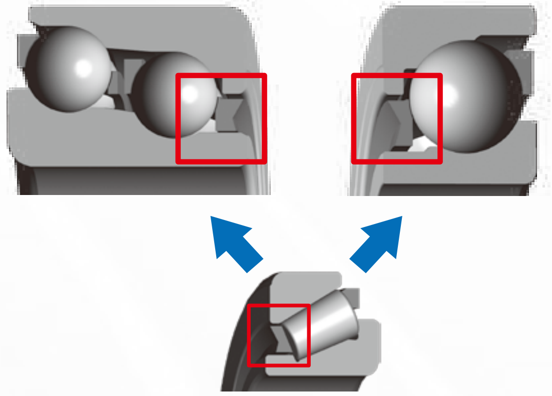
Low-Friction Torque Ball Bearing

BB-LFT

Features

- Horizontal deployment of structure used on super-low friction torque tapered roller bearing to control oil inflow
- By optimizing cage and inner / outer ring shape, oil flow to bearing is restricted and mixing loss is reduced by up to 30% compared to conventional angular contact ball bearings
- Reduced amount of contaminants infiltrating the bearing and improved durability in contaminated oil by 1.5 times

Double row low-friction torque ball bearing for differential pinions



Structure of ultra-low torque tapered roller bearing (LFT-IV) to control oil inflow

Single row low-friction torque ball bearing for differential pinions

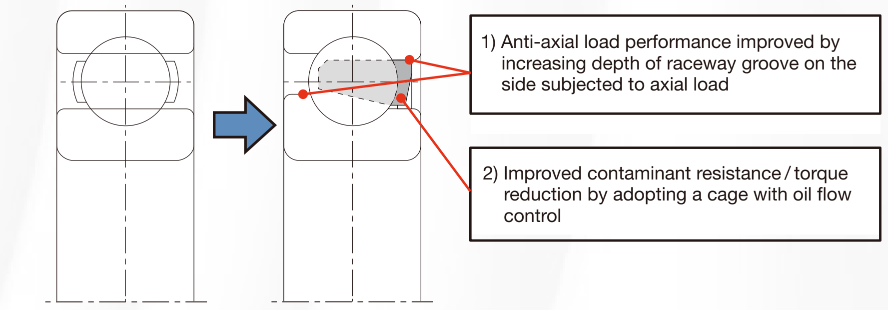
Major Fields of Application and Effects

- Used on the pinion support of differential units to improve vehicle fuel efficiency by **1**%

Next-generation high performance product

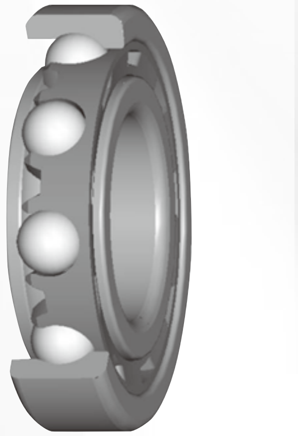
Low-Friction Torque Deep Groove Ball Bearing Supporting High Axial Loads

- 10% smaller outer diameter than conventional deep groove ball bearings and improved anti-axial load
- Compared to tapered roller bearings with equivalent load allowance (JTEKT's LFT-II), torque loss reduced by up to 50%



Current product (standard deep groove ball bearing)

Developed product

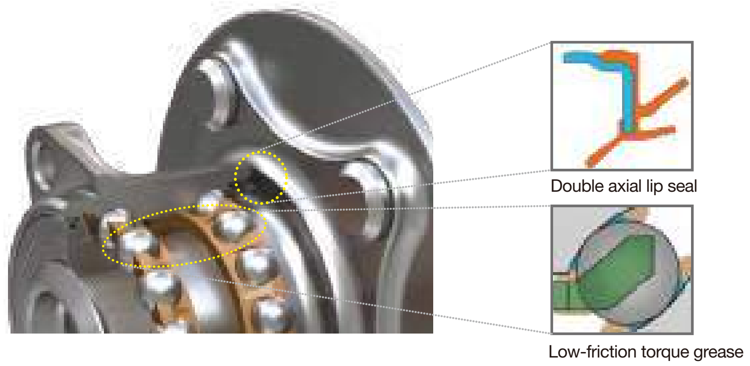


Low-Friction Torque Hub Unit

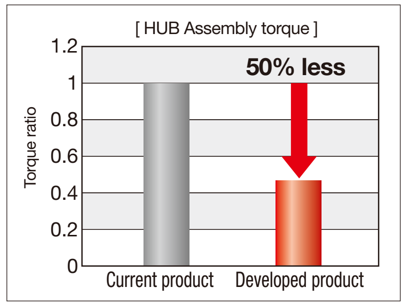
HUB-LFT

Features

- Optimization of thickener, base oil and additive for hub operating environment, developed new grease achieving the trade-off features of improved bearing life and reduced friction torque
- Adopted a double axial lip seal achieving low-friction torque without adversely affecting sealing performance


Double axial lip seal

Low-friction torque grease



Major Fields of Application and Effects

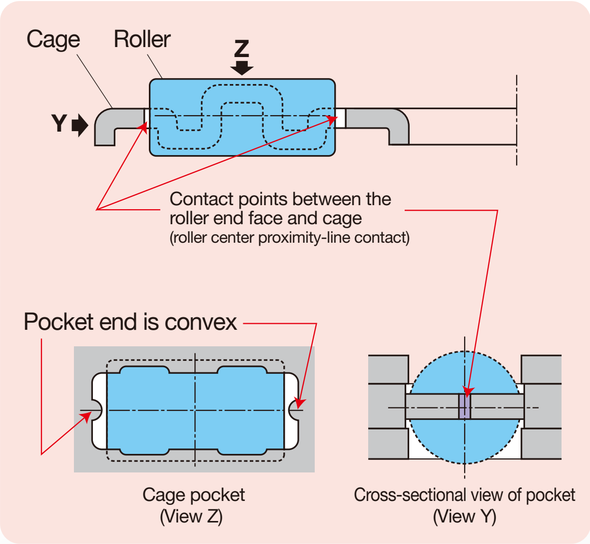
- Used on 4W of vehicles to improve vehicle fuel efficiency by **0.5**%

Low-Friction Torque Needle Roller Thrust Bearing

NRB-LFT

Features

- Reduced sliding resistance between roller end face and cage by optimizing cage shape

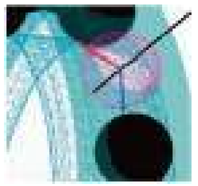


Major Fields of Application and Effects

- Improved vehicle fuel efficiency through adoption on transmission unit (independent friction torque reduction of 50 to 60% depending on conditions)

Base Technology Supporting the LFT-Series

Mechanism analysis

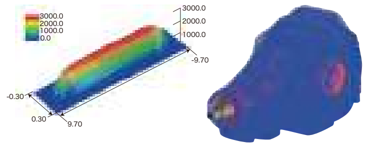


Calculates precise torque by dynamic analysis utilizing a program developed by JTEKT and accounting for ball sliding behavior

Fluid analysis

Analyzes lubricant flow, reduce agitating resistance and reflects results in optimal design

Analysis of axle system



Investigates axis support rigidity, bearing life, surface pressure, etc. for the overall unit then proposes optimal bearings

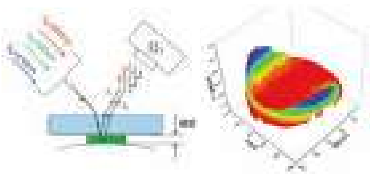
Visualization of oil flow

Simulates lubricant flow under actual operating conditions then proposes low-friction torque bearings

Measuring loss on an actual unit

Evaluation technology that enables accurate detection of torque loss

Oil membrane measurement



Ensure required oil membrane by visualizing oil-membrane state at time of low-friction torque grease and poor lubrication

Actual vehicle evaluation technology

Proving Ground Enables Testing / Evaluations Simulating Roads Worldwide

Fully utilizing our knowledge as a world-leading systems supplier, JTEKT conducts driving evaluations and analyses of products installed in vehicles. We exhaustively pursue the highest standards in product safety and operation on a test course capable of simulating various road and weather conditions of regions around the world. As a total systems supplier, our highest value is to provide our customers with products that deliver outstanding performance and the best quality that help to make automobiles that are more than just fun to drive.

■ Iga Proving Ground

- Site area: 500,000m²
- Course area: 170,000m²
- Combined circuit length: 2,200m
- Dynamics pad area: 54,000m²

- Straight-line track
- Winding track
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VEGETABLE OIL INK

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Koyo®

High Wing Series Drive Shafts

JTEKT

JTEKT CORPORATION

JTEKT
Koyo TOYODA

CAT.NO.B2022E

High wing series drive shafts that handle all kinds of environment with proven results, technology, research and development

In order to improve the reliability of our drive shafts under severe conditions, JTEKT has been continuously committed to research and development of technologies, built upon a wealth of results and experiences achieved with our customers over many years.
Our products also have high compatibility through adoption of standard mounting dimensions.
This catalogue includes dimension tables for respective model numbers, technical data, handling and failure cases, which we believe will surely help with design of construction machinery and railway rolling stocks.
We thank you in advance for your support.

CONTENTS

- Introduction to drive shaft

- Efforts to improve reliability

- Technical data

JTEKT products supporting construction machinery and railway rolling stocks

JTEKT deals with severe conditions with its No.1 & Only One technologies.

Our drive shafts for construction machinery and railway rolling stocks to meet your needs

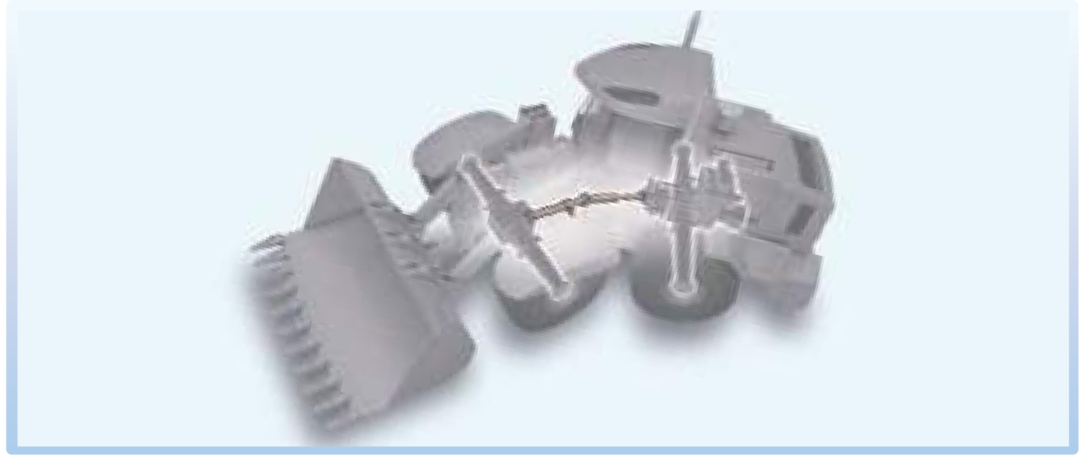
Introduction to drive shafts

Functions

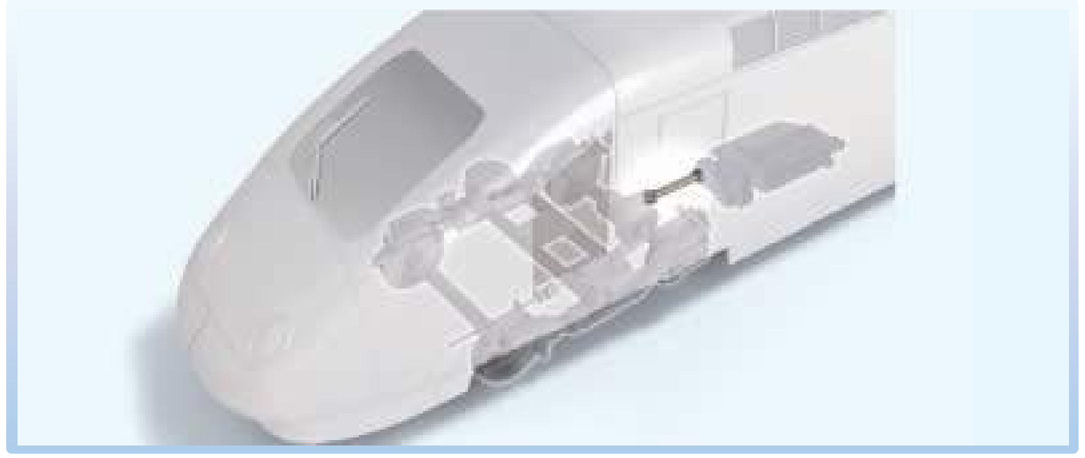
A drive shaft is a device to smoothly transmit rotation torque by connecting a driving shaft and a driven shaft that are not aligned on the same axis. Since it has two universal joints on one shaft, it can connect the driving shaft and the driven shaft flexibly.
In addition, one universal joint has four rolling bearings (cross & bearing) that can minimize torque loss with low friction.

Representative applications of drive shaft

●For wheel loaders

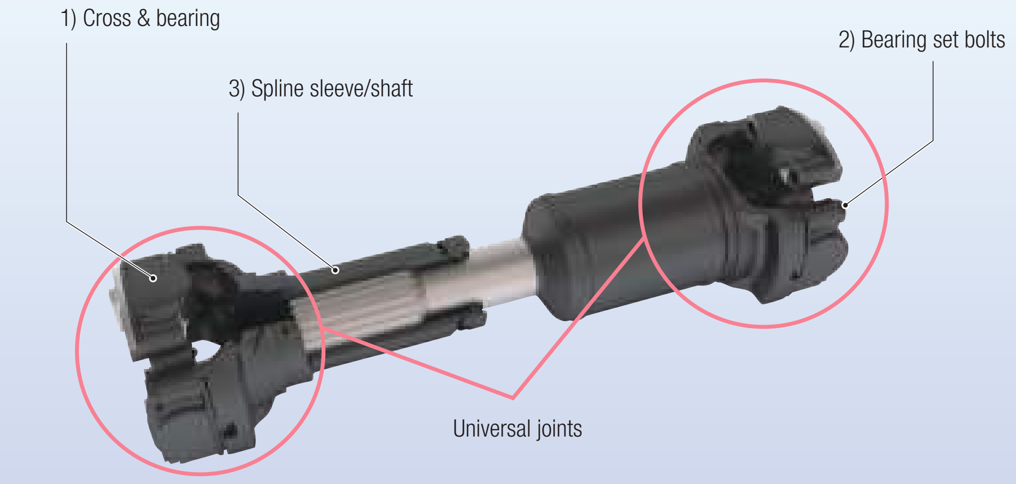


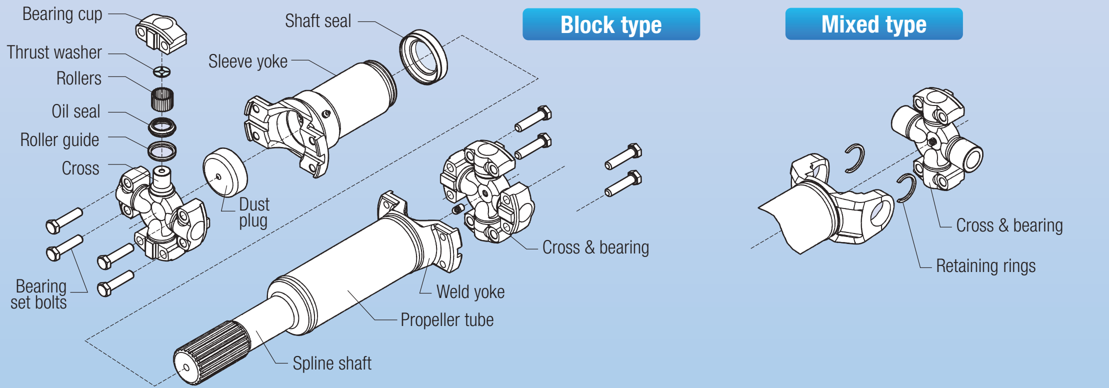
●For diesel locomotives



Appearance and configuration of drive shafts

【The appearance and component configuration of a representative drive shaft】





1) Cross & bearing

The cross & bearings are the most critical components of a drive shaft.
A cross & bearing has a cross-shaped shaft and four rolling bearings that individually support each end of the shaft.

2) Bearing set bolt

The bearing set bolt is used to connect the cross & bearing and its mating part (a retaining ring is used for mixed type).

3) Spline sleeve/shaft

The spline sleeve has a spline bore and shaft, which realize a variable drive shaft installing length.

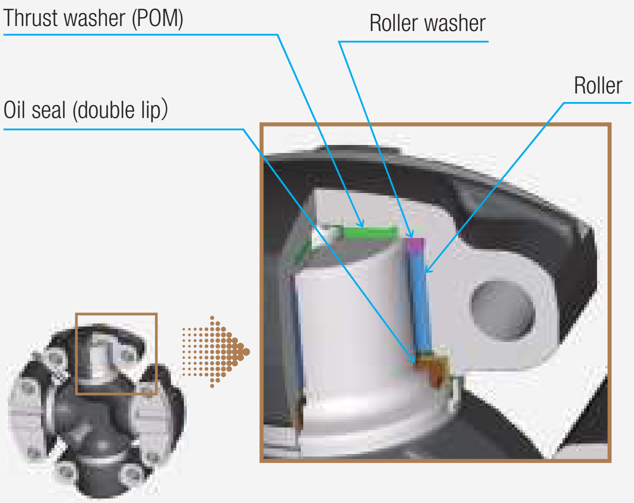
Efforts to improve reliability

1. Long-interval greasing cross & bearing

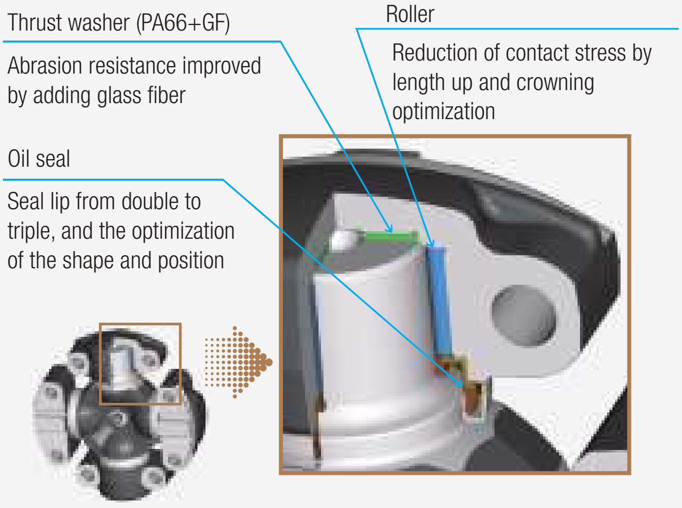
Features

(1) Oil seal lip from double to triple, and the optimization of shape and position.
(2) Reduction of roller contact stress with torque load by length up and crowning optimization
(3) Abrasion resistance improved by adding glass fiber to thrust washer
(4) Bearing cup shape reviewed and cost reduced by abolishing the roller washer

Cross & bearing structure



Conventional product: Greasing interval of 250 hours

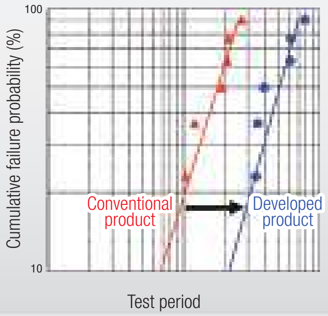


Product with long-interval greasing:
Greasing interval of 2000 - 4000 hours

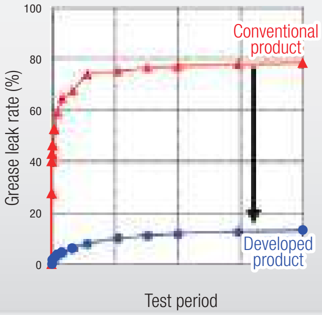
Evaluation results

Greasing interval extended 10 times or more

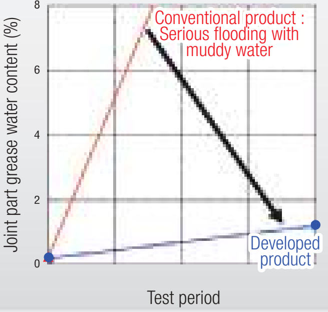
■ Cross & bearing life test result



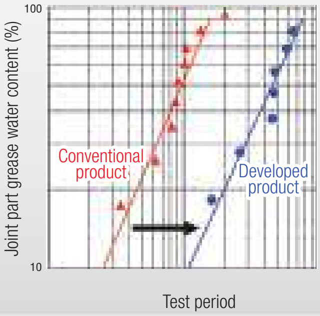
■ Grease leakage test result



■ Cross & bearing muddy water resistance test result



■ Dust resistance test result



2. Spline seal structure of muddy water resistance improvement

Features

Since the cover tube type spline seal has a structure that seals the sleeve (female spline) outer diameter part,

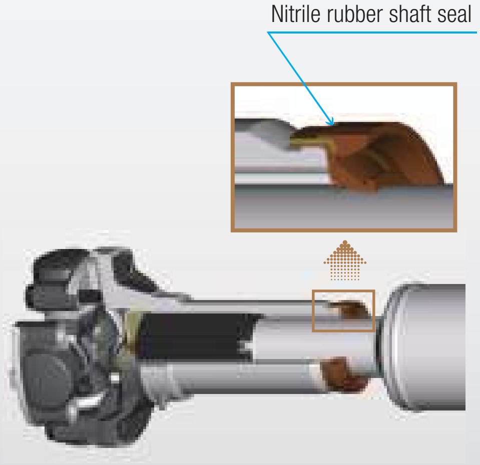
(1) It is not necessary to surpass the male spline major diameter by deforming the seal lip at the time of assembly, so a urethane rubber seal with high rigidity can be used.

(2) The distance from the seal to the spline is long, so muddy water does not reach the spline easily.

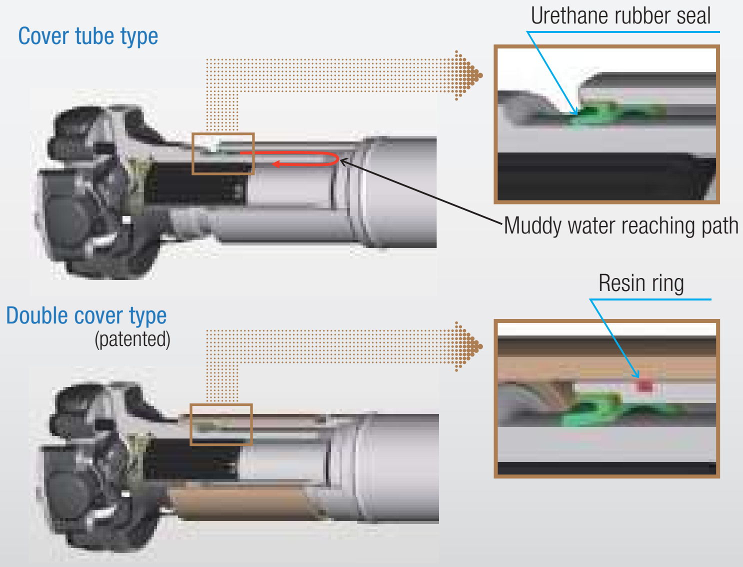
(3) A double cover has been added to protect the seal part, improving endurance further.

Spline seal configuration

【Standard product】

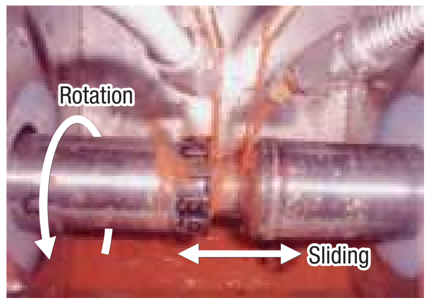


【Countermeasure product】

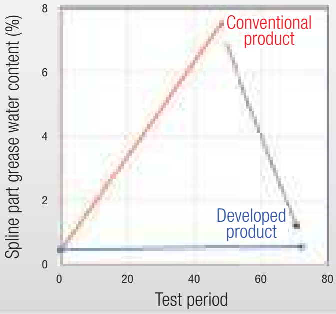


Evaluation result of spline muddy water endurance test

Muddy water resistant performance **greatly** improved



■ Spline muddy water endurance test result

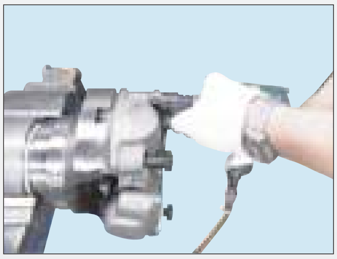


Handling explanation

High wing series features safe and secure torque transmission by a parallel key, and high torque capacity.
The following are the handling method and caution points to ensure that the drive shaft delivers its expected performance.

Handling of drive shaft

Caution points for handling



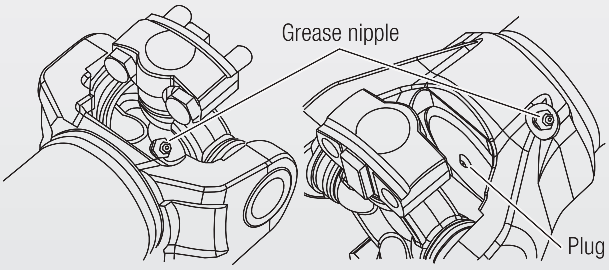
(1) Do not hit the cross & bearing part with hard metal so that a shock should be avoided. If it is necessary at the time of assembling, hit it lightly with a non-ferrous metal (copper, etc.) or plastic hammer.

(2) Tighten the fixing bolts of the bearing cups by setting the bearing cups in the proper positions in the yoke to form an X shape.
If you fit the bearing cups with the tightening force of bolts or fix only one bearing cup with the bolt and then set the other, it may cause troubles such as scars on the spigot joint part and attaching surface, and attachment of bearing cups at a slant.

(3) Never conduct welding between the bolts and the bearing cups and between the yoke and the bearing cups.

(4) Do not disassemble the cross & bearings unless absolutely necessary.

About lubrication



(1) Greasing interval
It is recommended to apply grease every 2000 - 4000 hours, though it depends on the usage environment.
(2) Grease to be used
Lithium grease with extreme-pressure additive
(3) Greasing of cross & bearings
Apply grease until it overflows from all of the four shafts of the cross. Wipe off the overflowing grease because dirt may adhere to it.

(4) Greasing of spline part
To apply grease an onboard drive shaft, move the vehicle body so that the spline should be compressed to the minimum. When grease leaks out of the center of the plug attached to the sleeve yoke, greasing is complete.
If the drive shaft is removed from the vehicle because of overhaul, etc., apply grease with the spline compressed to the minimum.

About cross & bearing attaching bolt

(1) Bolt
Use the attached bolt or part for repair specified by JTEKT.
(2) Torque wrench
Use a calibrated torque wrench.
(3) Specified tightening torque
Tighten with the specified torque.

Cases of failures

Flaking

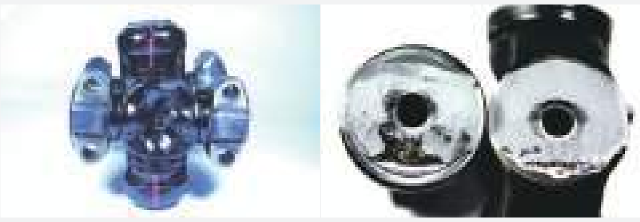
Failures example Flaking has occurred in the raceway surface of rolling contact surface of the cross and cup.

Measure Compare the calculated life and the required life and increase the size as necessary

Breakage

Failures example Breakage is caused from the fillet radius part of the neck of the cross and the fracture surface has no beach mark

Cause Brittle fracture due to excessive load



Measures Check the usage conditions
Increase the size as necessary

Failures example Breakage is caused from the fillet radius part of the neck of the cross, and the fracture surface has a beach mark

Cause Fatigue fracture caused by excessive load applied repeatedly

Measures Check the usage conditions
Increase the size as necessary

Failures example The tube has a crack near the border of the tube and weld bead

Cause Fatigue fracture caused by excessive load applied repeatedly

Measures Check the usage conditions
Increase the size as necessary

Failures example The bearing set bolts are broken near the yoke interface

Cause Bolt fatigue fracture caused by looseness of the bolts

Measure Check that the tightening torque has the specified value

Failures example Bending near the center of the drive shaft

Cause Brittle fracture caused by use around the dangerous rotational speed

Measures Decrease the maximum rotational speed. If it is impossible, reduce the length or increase the tube size

General characteristics of universal joint

Single universal joints

The driving shaft and driven shaft intermediated by a universal joint has the following relationship between their rotational angles:

$$\tan\phi_2 = \cos\theta \cdot \tan\phi_1 \quad \cdots(1)$$

where ϕ_1 : Rotational angle of driving shaft
ϕ_2 : Rotational angle of driven shaft
θ : Shaft operating angle (**Fig. 1**)

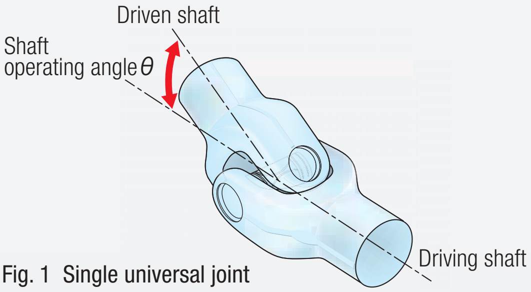
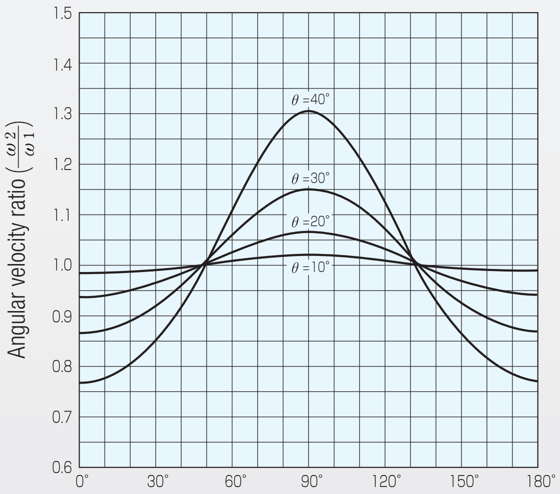


Fig. 1 Single universal joint

This means that, even if the rotational speed and torque of the driving shaft are constant, the driven shaft is subject to fluctuation in rotational speed and torque.
The speed ratio between the driving shaft and driven shaft can be obtained by differentiating equation (1) with respect to time (t), where ϕ_1 is by $\omega_1 \cdot t$ and ϕ_2 by $\omega_2 \cdot t$:

$$\frac{\omega_2}{\omega_1} = \frac{\cos\theta}{1-\sin^2\phi_1 \cdot \sin^2\theta} \quad \cdots(2)$$

where ω_1 : Rotational angular velocity of driving shaft (rad/s)
ω_2 : Rotational angular velocity of driven shaft (rad/s)
ω_2/ω_1 : Angular velocity ratio



Rotation angle of driving shaft ϕ_1
Fig. 2 Angular velocity fluctuation

Equation (2) can be expressed in diagram form as shown in **Fig. 2**. The maximum value and minimum value of the angular velocity ratio can be expressed as follows:

$$(\omega_2/\omega_1)\ \text{max.} = 1/\cos\theta \quad \cdots\cdots \quad \phi_1 = 90°$$
$$(\omega_2/\omega_1)\ \text{min.} = \cos\theta \quad \cdots\cdots \quad \phi_1 = 0°$$

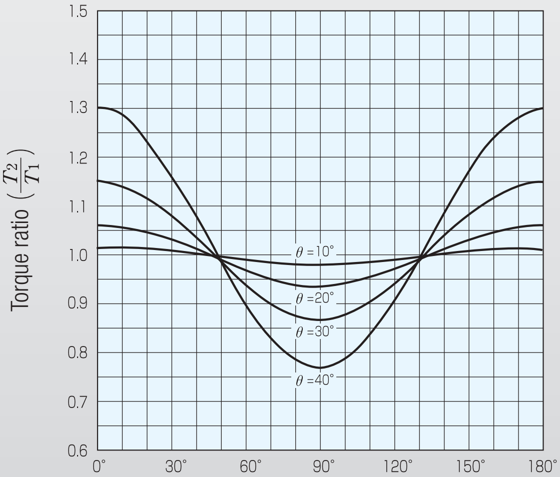
The maximum fluctuation rate of angular velocity in a universal joint can be expressed by the following equation:

$$\frac{(\omega_2\,\text{max.} - \omega_2\,\text{min.})}{\omega_1} = \frac{1}{\cos\theta} - \cos\theta$$

The torque ratio between input and output can be expressed by the diagram shown in **Fig. 3**. The maximum value and minimum value can be obtained as shown below, respectively:

$$(T_2/T_1)\ \text{max.} = 1/\cos\theta \quad \cdots\cdots \quad \phi_1 = 0°$$
$$(T_2/T_1)\ \text{min.} = \cos\theta \quad \cdots\cdots \quad \phi_1 = 90°$$

where T_1 : Input torque
T_2 : Output torque
T_2/T_1: Torque ratio



Rotation angle of driving shaft ϕ_1
Fig. 3 Torque fluctuation

Double universal joints

Universal joints are usually installed in pairs. When assembled as shown in **Fig. 4**, that is,

(1) With equal operating angles in both joints

(2) Yokes connected to the same shaft in line

(3) Central lines of all three shafts (driving shaft, intermediate shaft, and driven shaft) in the same plane, the driven shaft rotates exactly in the same way as the driving shaft.

Therefore, they should be attached as shown in the figure on the right as far as possible.

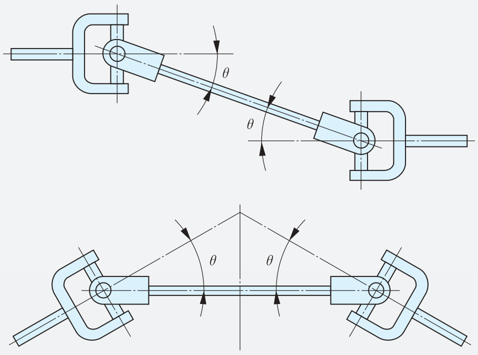


Fig. 4 Installation of double universal joints

Secondary couple

It is often necessary to consider the secondary couples imposed by universal joints operating at an angle; especially under high angle or large torque. These couples must be taken into account in designing the shafts and supporting bearings.

The secondary couples in the universal joints are in the planes of the yoke. These couples are about the intersection of the shaft axis. They impose a load on the bearings and a bending stress in the shaft connecting the joints, and they fluctuate from maximum to zero every 90° of shaft revolution. The broken lines in **Fig. 5** indicate the effect of these secondary couples on the shafts and bearings.

The equation for maximum secondary couple is as follows:

M_1 max. $= T \tan\theta$ (for driving shaft)

M_2 max. $= T \sin\theta$ (for driven shaft)

where M_1: Secondary couple on driving shaft $(\mathrm{N\cdot m})$

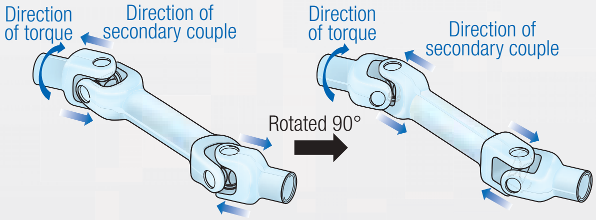
M_2: Secondary couple on driven shaft $(\mathrm{N\cdot m})$

T : Driving torque $(\mathrm{N\cdot m})$

θ : Shaft operating angle

The ratio of the secondary couple to the driving torque is shown in **Fig. 6**.

The secondary couple M_1 and M_2 can be obtained by multiplying M_1/T or M_2/T by the driving torque T.



(Maximum secondary couple is produced on the driving side yoke and the driven side yoke alternately at every rotation of 90°)

Fig. 5 Effect of secondary couple

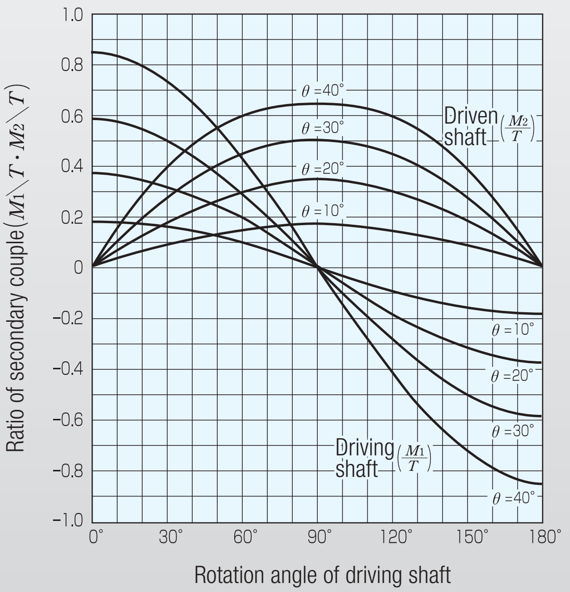


Fig. 6 Fluctuation of secondary couple to driving torque

Drive shaft selection

A drive shaft should be selected so as to satisfy the required strength, service life, operating angle and dimensions necessitated by its purpose. Especially, a drive shaft can be selected if it meets conditions of both strength and life of the universal joint, except for special cases.

Load torque of drive shaft

To decide the size of the drive shaft, it is necessary to grasp the load torque first.

A maximum torque including an impact torque and a mean torque should be known, and it is essential for selecting an appropriate drive shaft to understand the correct maximum torque and mean torque.

Maximum torque:
Value to determine if the strength of each part is sufficient.
Mean torque:
Value necessary to calculate the service life

Mean torque

It is apparent that all kinds of machines are not operating thoroughly by their maximum torque. Therefore, if a drive shaft is selected according to a service life calculated from the maximum torque, it results in being uneconomically larger than necessary.

So, it is reasonable to set up a longer expected service life, if the application condition are severe; and shorter, if the conditions are easy.

If, for instance, a job is expressed as in the table below,

Drive stage	1	2	3 · · · · · Z
Torque $(\mathrm{N \cdot m})$	T_1	T_2	$T_3 \cdot\cdot\cdot\cdot\cdot T_Z$
Rotational speed $(\mathrm{min^{-1}})$	n_1	n_2	$n_3 \cdot\cdot\cdot\cdot\cdot n_Z$
Time ratio $(\%)$	t_1	t_2	$t_3 \cdot\cdot\cdot\cdot\cdot t_Z$

the cube root of mean torque (T_m) and the arithmetical mean of rotational speed (n_m) are yielded from the following equations.

$$T_m = \sqrt[3]{\frac{(T_1^3 \cdot n_1 \cdot t_1 + \cdots\cdots\cdots T_Z^3 \cdot n_Z \cdot t_Z)}{(n_1 \cdot t_1 + \cdots\cdots\cdots + n_Z \cdot t_Z)}}$$

$$n_m = \frac{(n_1 \cdot t_1 + \cdots\cdots\cdots + n_Z \cdot t_Z)}{(t_1 + \cdots\cdots\cdots + t_Z)}$$

Strength of drive shaft

A drive shaft should be selected so that the normal maximum torque shall not exceed the “T_D torque." However, it is difficult to determine the true maximum torque, and the engine capacity or motor capacity is used as the maximum torque in many cases, so the safety factor (f_S) of no less than 1.0 should be considered as the most desirable.

$f_S = T_D$ /maximum torque under normal operating conditions > 1.0

The maximum torque that may occur in an emergency should be determined using "T_S torque." The safety factor (f_S) of no less than 1.5 should be considered as desirable in this case as well.

$f_S = T_S$ /breaking torque under emergency conditions > 1.5

To select a drive shaft based on a safety factor of 1.5 or less, consult JTEKT as close examination is required in consideration of previous performance records.

Life of drive shaft

There is no worldwide standard for service life calculation of universal joint bearings (cross & bearings) and the service life is calculated according to the unique method developed by each manufacturer.

JTEKT employs the following empirical equation based on extensive experimentation (conforming to SAE).

The service life L_h is defined as the expected number of operating hours before a flaking occurs on the rolling contact surface of the bearing. The use of the bearings over the service life L_h may be practical on a low speed machine.

$$L_h = 3000\ K_e \left(\frac{T_R \cdot K_n \cdot K_\theta}{T_m} \right)^{2.907}$$

Where, L_h: Average calculated bearing life (h)
K_e : Experimental correction coefficient (=2)
T_R: Rated torque $(\mathrm{N \cdot m})$
T_m: Mean torque $(\mathrm{N \cdot m})$
K_n: Speed factor = $10.2/n^{0.336}$
K_θ: Angle factor = $1.46/\theta^{0.344}$
n : Rotational speed = $(\mathrm{min^{-1}})$
θ : Shaft operating angle (°)

Note) A drive shaft should be selected by considering the type of the machine, peripheral equipment, particular operating conditions, and other factors. The method outlined in this catalog is a common rough guide. It is recommended to consult JTEKT for details.

Balance quality of drive shaft

If a rotating drive shaft is unbalanced, it may adversely influence the equipment and ambient conditions, thus posing a problem. JTEKT designs and manufactures drive shafts to satisfy the balance quality requirements specified in JIS B 0905.

Expression of balance quality

The balance quality is expressed by the following equation:

Balance quality $= e\omega$

or

Balance quality $= en/9.55$

where e: Amount of specific unbalance (mm)

This amount is the quotient of the static unbalance of a rigid rotor by the rotor mass. The amount is equal to the deviation of the center of the rotor mass from the center line of the shaft.

ω : Maximum service angular velocity of the rotor (rad/s)

n : Rotational speed (min^{-1})

Balance quality grades

The JIS specifies the balance quality grades from G0.4 to G4000. Generally, the three grades described in Table 1 below are commonly used.

Correction of the unbalance of drive shafts

JTEKT corrects the unbalance of drive shafts to the optimal value by the two plane balancing method, using the latest balance system.
To correct the balance of a drive shaft, it is critical to correct the balance between two planes each near the two individual universal joints, instead of by the one plane balancing as used to balance car wheels.
Especially in the case of a long drive shaft, this two plane balancing method is the only way to acquire good results.

Table 1 Recommended balance quality grades (excerpt from JIS B 0905)

Balance quality grade	Upper limit value of balance quality ($e\omega$)	Recommended applicable machines
G40	40	Car wheels, wheel rims, wheel sets and drive shafts Crankshaft systems of elastically mounted high speed four stroke engines (gasoline or diesel) with six or more cylinders Crankshaft systems of the engines of automobiles, trucks and rolling stock
G16	16	Drive shafts with special requirements (propeller shafts and diesel shafts) Components of crushing machines Components of agricultural machines Components of the engines of automobiles, trucks and rolling stock (gasoline or diesel) Crankshaft systems with six or more cylinders with special requirements
G 6.3	6.3	Devices of processing plants Ship engine turbine gears (for merchant ships) Centrifugal drums Papermaking rolls and printing rolls Fans Assembled aerial gas turbine rollers Flywheels Pump impellers Components of machine tools and general industrial machines Medium or large electric armatures (of electric motors having at least 80 mm in the shaft center height) without special requirements Small electric armatures used in vibration insensitive applications and/or provided with vibration insulation (mainly mass produced models) Components of engines with special requirements

Composition of identification numbers

Drive shaft

2 A 70 Z 000 065 1 ☐

Identification code: Given in alphabetic order if design is changed
Configuration code: Refer to pages 15 - 27.
Length code: The distance between centers of the cross & bearings is rounded off to cm (Example) 652 mm→ 065, 657 mm→ 066
Serial number: Given by JTEKT
Z is given to the mixed types of #5 and #6, and no code is given for others
Size code: Represented in two digits

Model No.	Size code
#4 - #9	Size x 10
#10, #12	The size is used as it is

Type code

Type code	Type
A	Block (smaller than #10)
Z	Block (#10 or larger)
M	Mixed

Quantity of cross & bearings

Drive shaft service parts

*Confirm with JTEKT about correspondence to each drive shaft.

(1) Cross & bearing

BA M 070 0 5 1 B W

Thrust washer code: Given if a washer is used
Grease nipple code: Given by JTEKT according to the type of grease nipple
Bearing cup mounting hole shape: Given by JTEKT
Cross female screw code: Given by JTEKT
Identification code: Given in alphanumeric characters
Size code: Represented in three digits Size x 10
Bolt code

M	For metric screw thread
U	For unified screw thread

Type code

Type code	Type
BA	Block
BM	Mixed

(2) Sleeve shaft assembly

SPA 070 000 ☐

Identification code: Given in alphabetical order if design is changed
Serial number: The number same as that of the parent drive shaft is given
Size code: Represented in three digits Size x 10

Type code

Type code	Type
SPA	Block
SPR	Mixed

(3) Bearing fixing bolt

MM 12 X 53 X 1.25 ☐

Identification code: Given in alphabetical order if design is changed
Pitch
Shank length
Nominal diameter
Screw type

MM	For metric screw thread
NF	For unified screw thread

The model numbers of standard bolts are as follows.

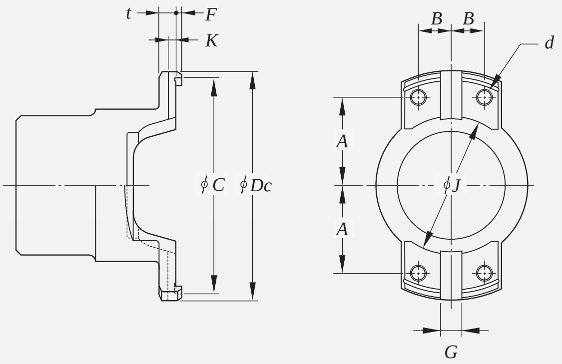
Size	Screw type	Nominal No.
#4	Metric screw thread	MM8 X 38 X 1.25
	Unified screw thread	NF5/16 X 38 X 24
#5, #6	Metric screw thread	MM10 X 45 X 1.25Z
	Unified screw thread	NF3/8 X 044 X 24
#7, #8	Metric screw thread	MM12 X 53 X 1.25
	Unified screw thread	NF1/2 X 51 X 20
#8.5, #9	Metric screw thread	MM12 X 60 X 1.25
	Unified screw thread	NF1/2 X 60 X 20
#10, #12	Metric screw thread	MM14 X 080 X 1.5
	Unified screw thread	—

Specifications

Torque capacity

Model No.	Torque capacity (N·m)			Model No.	Torque capacity (N·m)		
	Rated T_R	Normal maximum T_D	Emergency maximum T_S		Rated T_R	Normal maximum T_D	Emergency maximum T_S
4	466	1 280	3 310	8.5	2 570	7 520	13 500
5	851	1 770	4 470	9	3 450	9 980	18 900
6	1 090	2 240	6 400	10	5 580	13 600	38 900
7	1 650	3 760	9 190	12	8 060	19 300	47 400
8	2 200	5 380	12 200	—	—	—	—

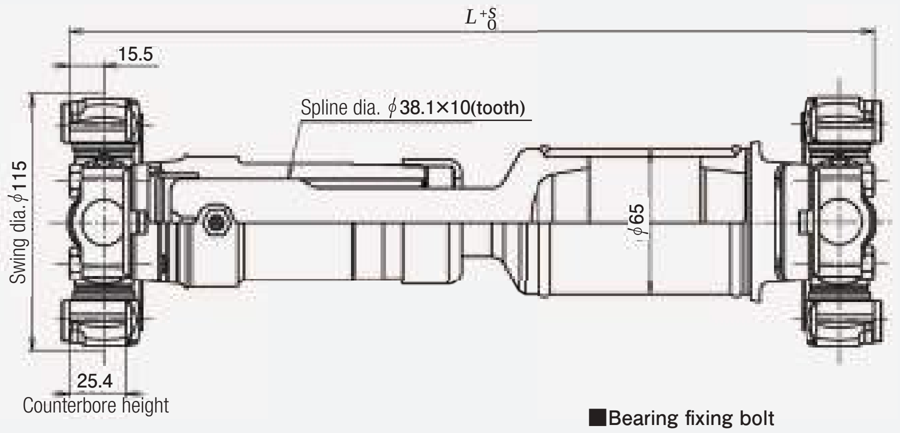
Recommended dimensions of coupling yokes



Model No.	Boundary dimensions (mm)										
	Dc	C	J	F	G	K	A	B	t	Bolt holes d	
										Metric screw thread	Unified screw thread
4	114.3	$107.93^{+0.05}_{0}$	70	3.2	$9.5^{+0.05}_{0}$	$3.5^{+0.5}_{0}$	43.63	18.24	11.8	M 8×1.25	5/16-24UNF
5	121.4	$115.06^{+0.05}_{0}$	70	4	$14.26^{+0.05}_{0}$	$4.9^{+0.5}_{0}$	44.45	21.43	12.6	M10×1.25	3/8-24UNF
6	148.4	$140.46^{+0.05}_{0}$	90	4	$14.26^{+0.05}_{0}$	$4.9^{+0.5}_{0}$	57.15	21.43	12.6		
7	158	$148.38^{+0.05}_{0}$	92	4.8	$15.85^{+0.05}_{0}$	$5.7^{+0.5}_{0}$	58.73	24.61	15.8	M12×1.25	1/2-20UNF
8	215.9	$206.32^{+0.05}_{0}$	150	4.8	$15.85^{+0.05}_{0}$	$5.7^{+0.5}_{0}$	87.3	24.61	17.4		
8.5	174.6	$165.07^{+0.05}_{0}$	96	4.8	$15.85^{+0.05}_{0}$	$5.7^{+0.5}_{0}$	61.91	35.72	19		
9	219.1	$209.52^{+0.05}_{0}$	135	4.8	$15.85^{+0.05}_{0}$	$5.7^{+0.5}_{0}$	84.14	35.72	19		
10	225.4	$212.699^{+0.051}_{0}$	141	6.4	$25.35^{+0.07}_{0}$	$9.3^{+0.5}_{0}$	82.55	46.05	30	M14×1.5	—
12	301.6	$288.90^{+0.1}_{0}$	205	6.4	$25.35^{+0.07}_{0}$	$9.3^{+0.5}_{0}$	120.65	46.05	30		

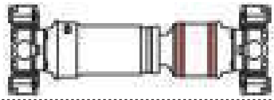
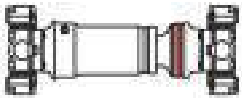
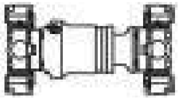
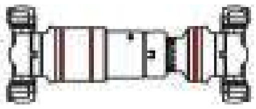
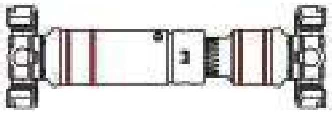
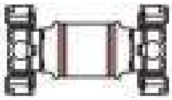
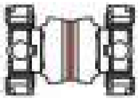
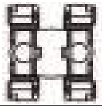
Specifications

Model No. 4 Block type



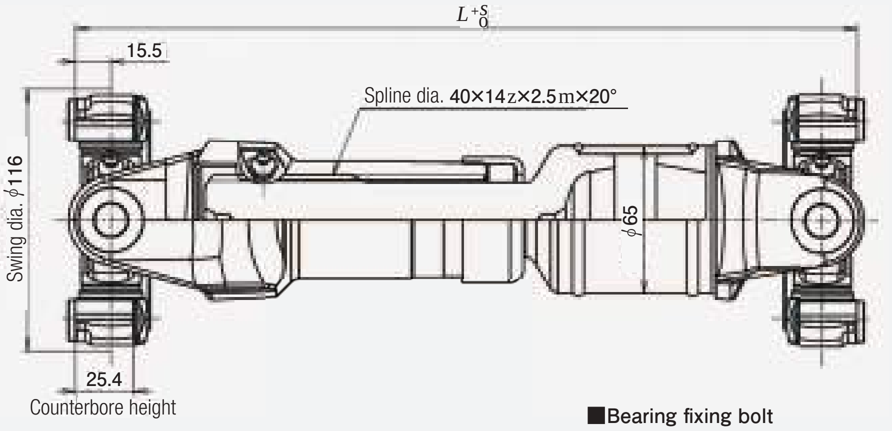
■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M8×1.25	36 - 40
Unified screw thread	5/16-24UNF	30 - 36

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		327 (min.)	45	25	Telescoping type (with tube)
		277			Telescoping type (without tube)
2		*	*	*	Telescoping type (integrated structure on shaft side)
3	 	*	*	25	Long telescoping type
5		176 (min.)	—	25	Fixed type (with tube)
		144			Fixed type (without tube)
6		98.4 104.8	—	10	Fixed type (integrated structure)

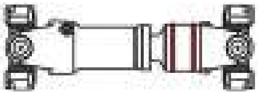
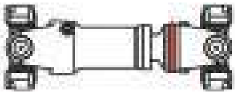
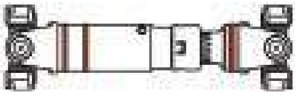
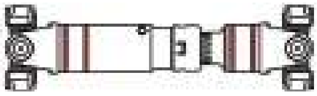
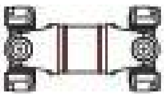
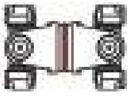
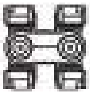
Remark Check with us about *parts as they are designed individually.

Model No. 4 Mixed type



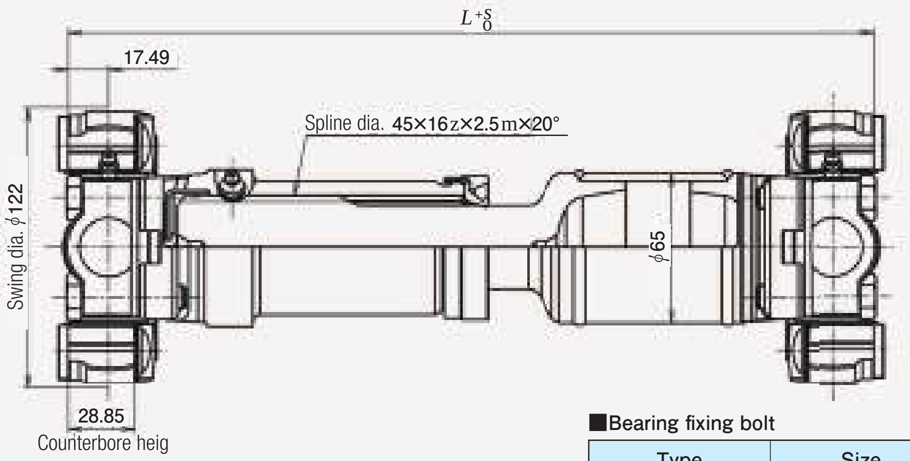
■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M8×1.25	36 - 40
Unified screw thread	5/16-24UNF	30 - 36

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		344 (min.)	45	25	Telescoping type (with tube)
		294			Telescoping type (without tube)
3	 	573	240	25	Long telescoping type
5		195 (min.)	—	25	Fixed type (with tube)
		145			Fixed type (without tube)
6		97	—	12	Fixed type (integrated structure)
		100		15	
		108.5			

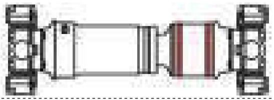
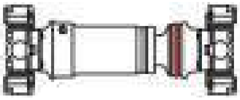
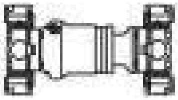
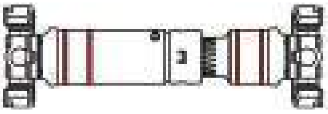
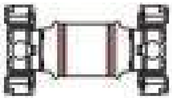
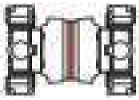
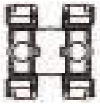
Specifications

Model No. 5 Block type



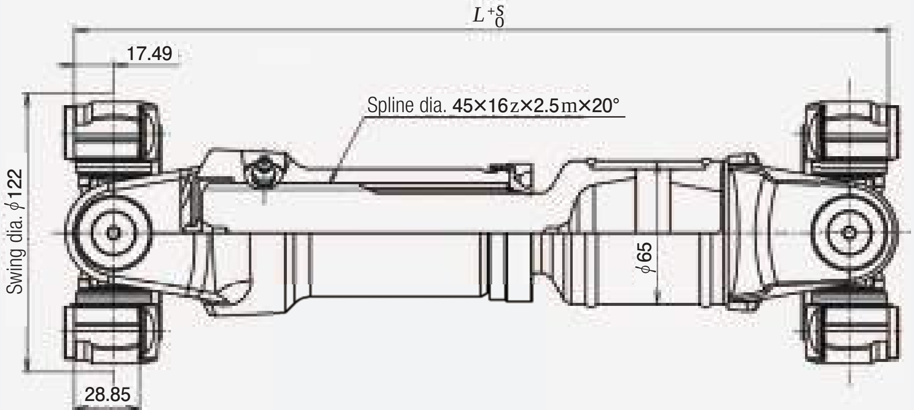
■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M10×1.25	71 - 77
Unified screw thread	3/8-24UNF	50 - 60

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		336 (min.)	42	10	Telescoping type (with tube)
		288			Telescoping type (without tube)
2		263	42	10	Telescoping type (integrated structure on shaft side)
3	 	＊	＊	10	Long telescoping type
5		178 (min.)	—	10	Fixed type (with tube)
		129.56			Fixed type (without tube)
6		112	—	7	Fixed type (integrated structure)

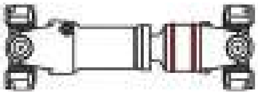
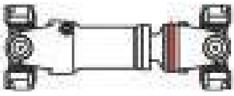
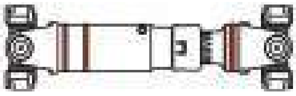
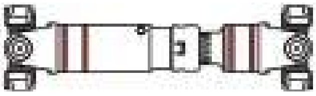
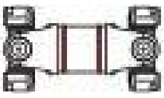
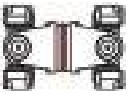
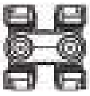
Remark Check with us about ＊parts as they are designed individually.

Model No. 5 Mixed type



■Bearing fixing bolt

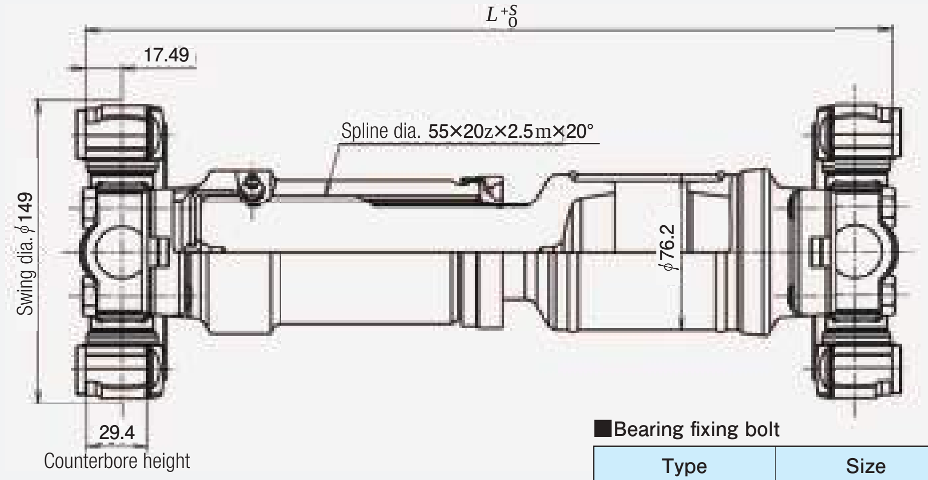
Type	Size	Tightening torque N·m
Metric screw thread	M10×1.25	71 - 77
Unified screw thread	3/8-24UNF	50 - 66

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		364 (min.)	54	25	Telescoping type (with tube)
		314			Telescoping type (without tube)
3	 	*	*	25	Long telescoping type
5		213 (min.)	—	25	Fixed type (with tube)
		160 164			Fixed type (without tube)
6		105 150	—	10	Fixed type (integrated structure)

Remark Check with us about *parts as they are designed individually.

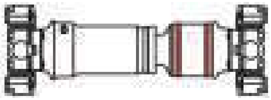
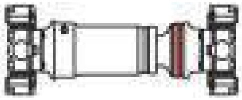
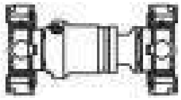
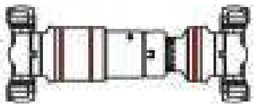
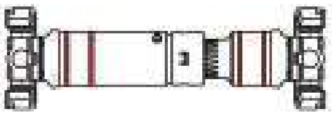
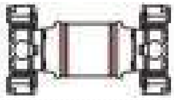
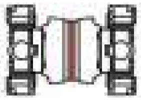
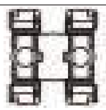
Specifications

Model No. 6 Block type

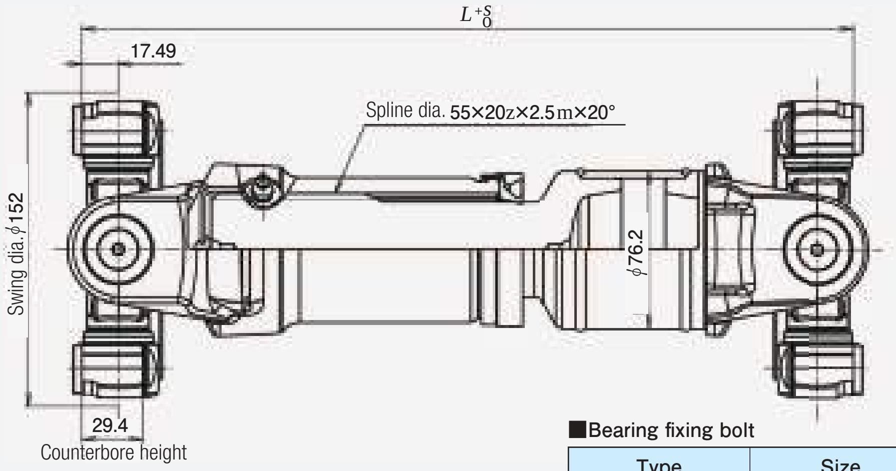


■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M10×1.25	71 - 77
Unified screw thread	3/8-24UNF	50 - 66

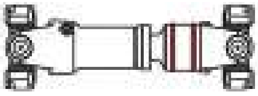
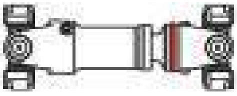
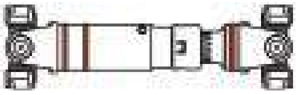
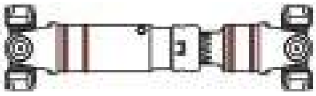
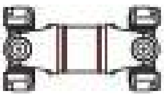
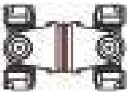
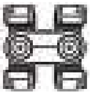
Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		369 (min.)	47	25	Telescoping type (with tube)
		319			Telescoping type (without tube)
2		211 273	15 35	20	Telescoping type (integrated structure on shaft side)
3	 	610 (min.)	259	25	Long telescoping type
5		216 (min.)	—	25	Fixed type (with tube)
		165.96			Fixed type (without tube)
6		113 117.1 120	—	5 10	Fixed type (integrated structure)

Model No. 6 Mixed type



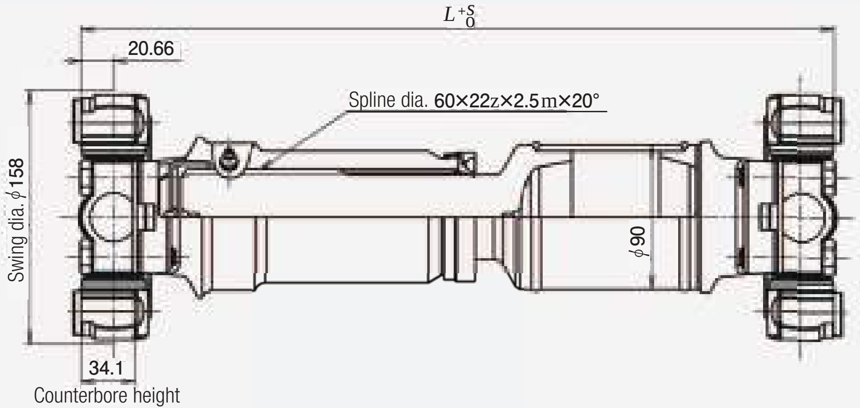
■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M10×1.25	71 - 77
Unified screw thread	3/8-24UNF	50 - 66

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		381 (min.)	52	25	Telescoping type (with tube)
		413 (min.)	85		
		289	16		Telescoping type (without tube)
		332	52		
		363	85		
3	 	615 (min.)	265	25	Long telescoping type
5		227 (min.)	—	25	Fixed type (with tube)
		176.98			Fixed type (without tube)
6		103.88	—	10	Fixed type (integrated structure)
		187.98			

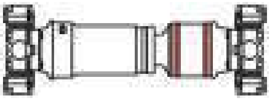
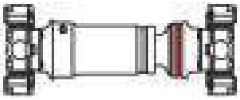
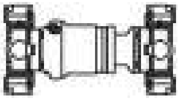
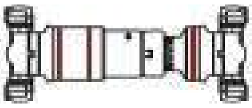
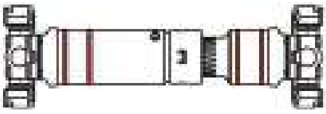
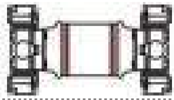
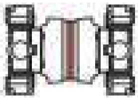
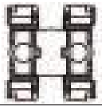
Specifications

Model No. 7 Block type

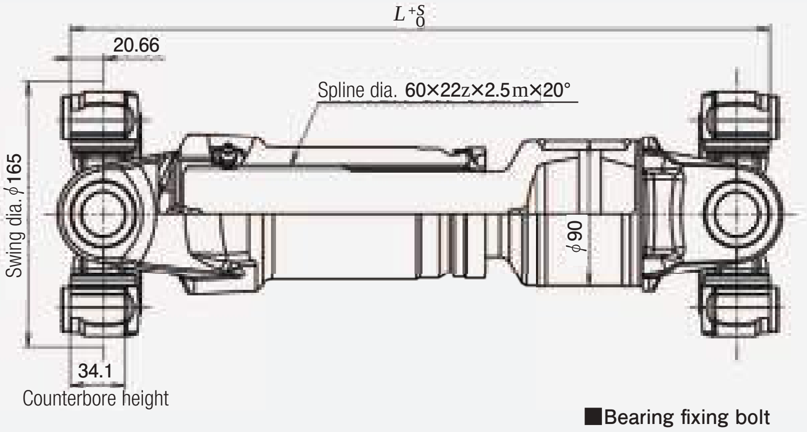


■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M12×1.25	132 - 155
Unified screw thread	1/2-20UNF	95 - 108

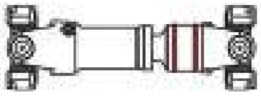
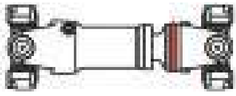
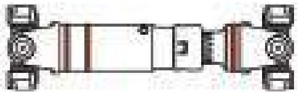
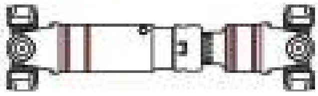
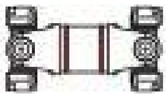
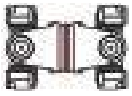
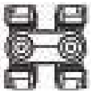
Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		435 (min.)	65	20	Telescoping type (with tube)
		409	47		
		385	65		Telescoping type (without tube)
		359	47		
2		276	21	18	Telescoping type (integrated structure on shaft side)
		290	27		
3	 	528 (min.)	160	20	Long telescoping type
5		241 (min.)	—	20	Fixed type (with tube)
		187.5		15	Fixed type (without tube)
		195		20	
		212			
6		123.8	—	5	Fixed type (integrated structure)

Model No. 7 Mixed type



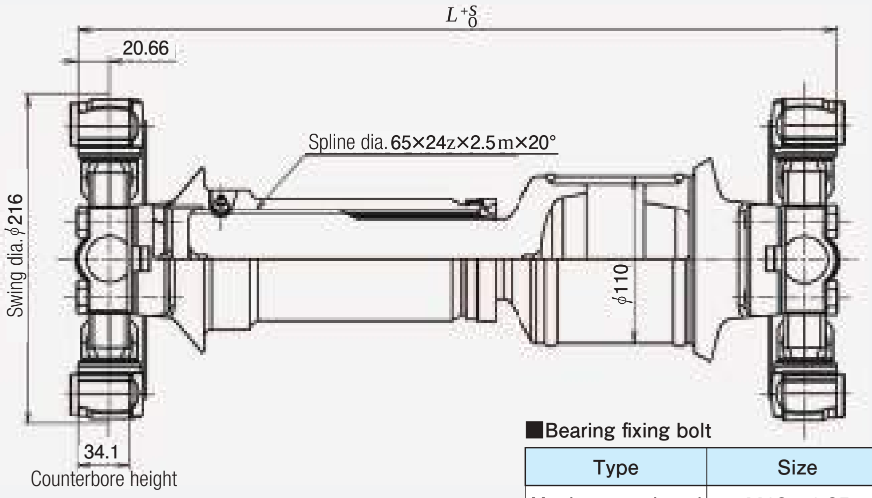
■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M12×1.25	132 - 155
Unified screw thread	1/2-20UNF	95 - 108

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		439 (min.)	65	25	Telescoping type (with tube)
		389			Telescoping type (without tube)
		365	35		
3	 	520 (min.)	160	25	Long telescoping type
5		230 (min.)	—	25	Fixed type (with tube)
		179.32			Fixed type (without tube)
6		140	—	10	Fixed type (integrated structure)
		200			

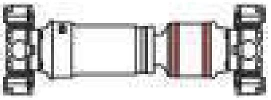
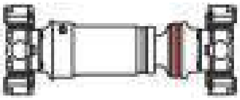
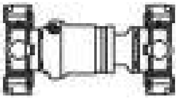
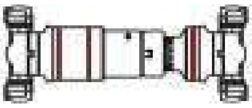
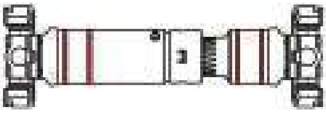
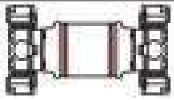
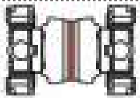
Specifications

Model No. 8 Block type



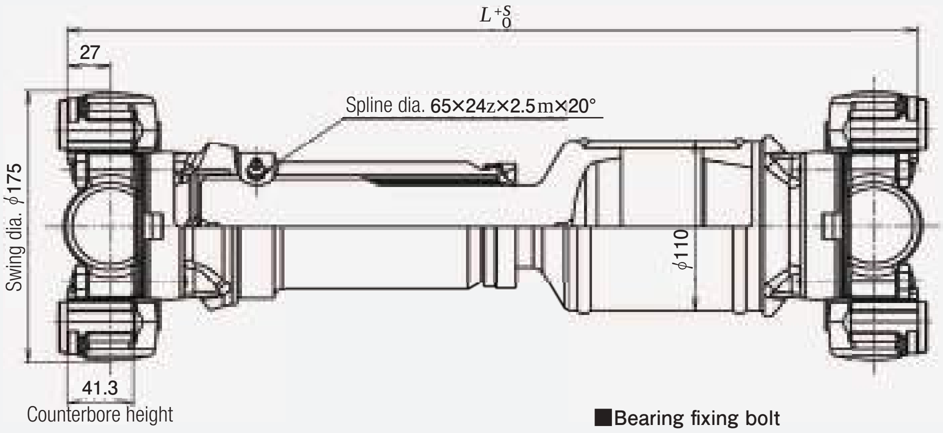
■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M12×1.25	132 - 155
Unified screw thread	1/2-20UNF	95 - 108

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		475 (min.)	76	25	Telescoping type (with tube)
		415			Telescoping type (without tube)
2		＊	＊	＊	Telescoping type (integrated structure on shaft side)
3	 	600 (min.)	190	25	Long telescoping type
5		267 (min.)	—	25	Fixed type (with tube)
		210 206.64			Fixed type (without tube)

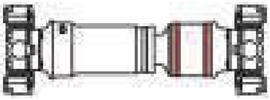
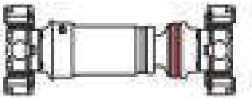
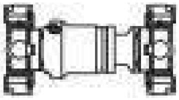
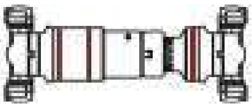
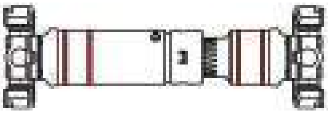
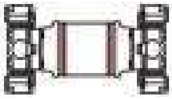
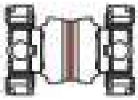
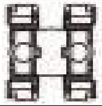
Remark Check with us about ＊parts as they are designed individually.

Model No. 8.5 Block type



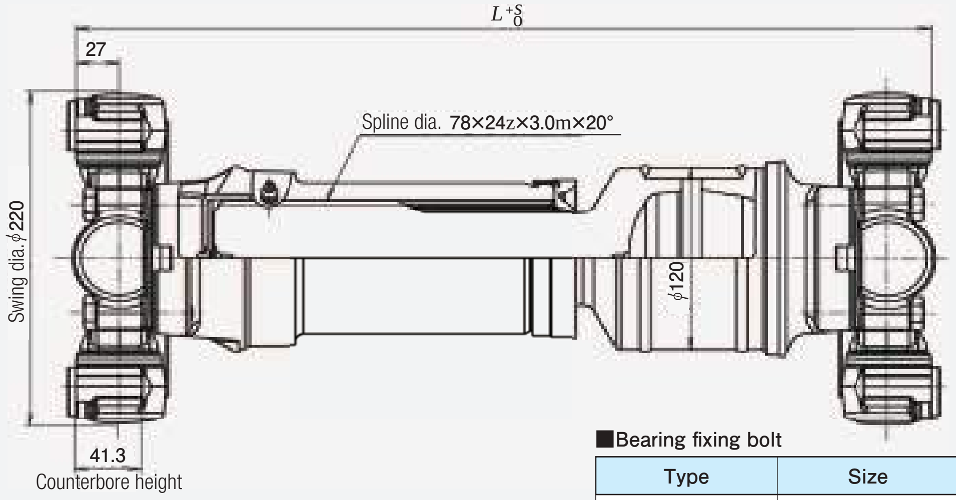
■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M12×1.25	132 - 155
Unified screw thread	1/2-20UNF	149 - 162

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		494 (min.) 512 (min.)	70 85	25	Telescoping type (with tube)
		436	70		Telescoping type (without tube)
2		305 361	20 40	17	Telescoping type (integrated structure on shaft side)
3	 	610 (min.)	190	25	Long telescoping type
5		282 (min.)	—	25	Fixed type (with tube)
		241.5		17	Fixed type (without tube)
		231			
		224		25	
6		158.8 164 172	—	10	Fixed type (integrated structure)

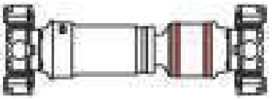
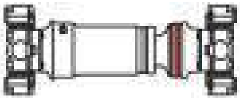
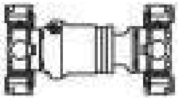
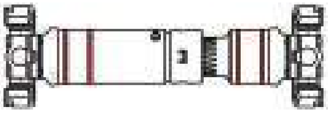
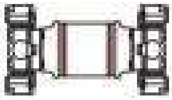
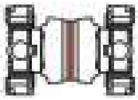
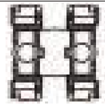
Specifications

Model No. 9 Block type

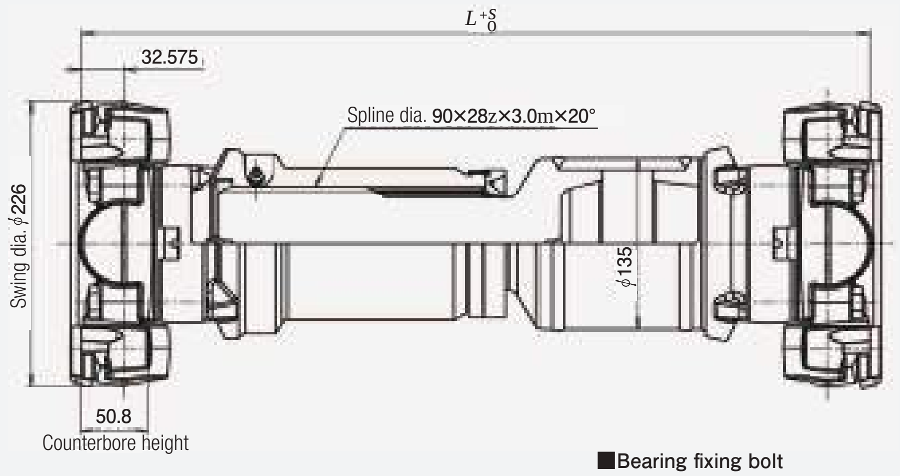


■**Bearing fixing bolt**

Type	Size	Tightening torque N·m
Metric screw thread	M12×1.25	132 - 155
Unified screw thread	1/2-20UNF	149 - 162

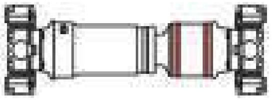
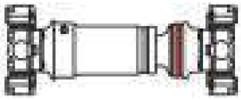
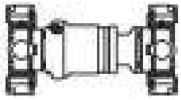
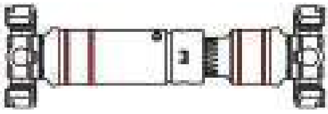
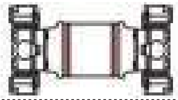
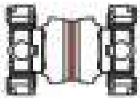
Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		543 (min.)	78	25	Telescoping type (with tube)
		483			Telescoping type (without tube)
2		398	56	25	Telescoping type (integrated structure on shaft side)
3	 	638 (min.)	180	25	Long telescoping type
5		295 (min.)	—	25	Fixed type (with tube)
		235			Fixed type (without tube)
6		158.8	—	25	Fixed type (integrated structure)

Model No. 10 Block type



■Bearing fixing bolt

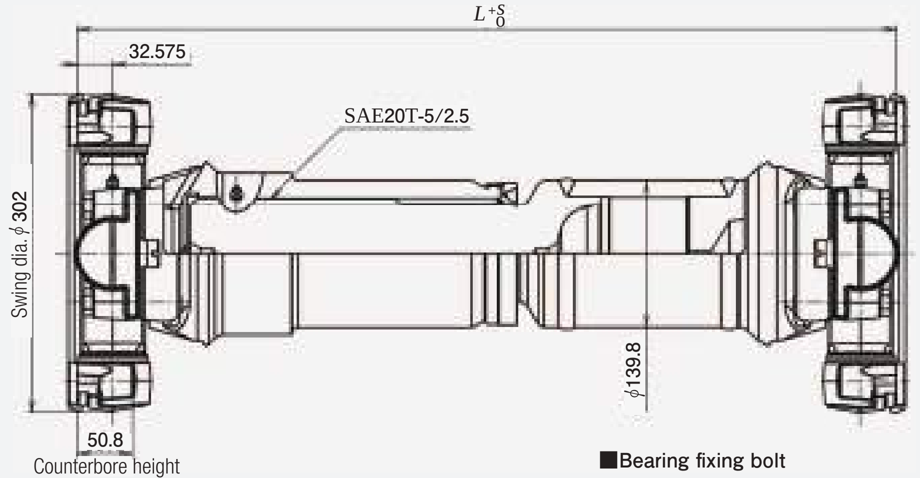
Type	Size	Tightening torque N·m
Metric screw thread	M14×1.5	206 - 220

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		579 (min.)	70	25	Telescoping type (with tube)
		509			Telescoping type (without tube)
2		489	70	25	Telescoping type (integrated structure on shaft side)
3	 	＊	＊	25	Long telescoping type
5		353 (min.)	—	25	Fixed type (with tube)
		280			Fixed type (without tube)
		269			

Remark Check with us about ＊parts as they are designed individually.

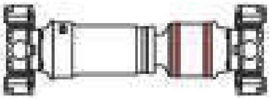
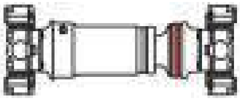
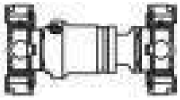
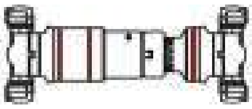
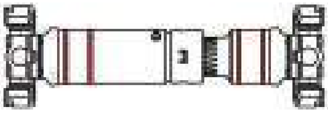
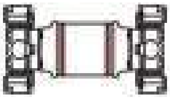
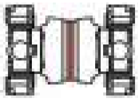
Specifications

Model No. 12 Block type



■Bearing fixing bolt

Type	Size	Tightening torque N·m
Metric screw thread	M14×1.5	206 - 220

Structure code	Structure sketch (The red lines indicate welding parts.)	Length between attaching surfaces L (mm)	Allowable telescoping stroke S (mm)	Max operating angle (°)	Features
1		676 (min.)	82	25	Telescoping type (with tube)
		606			Telescoping type (without tube)
2		∗	∗	∗	Telescoping type (integrated structure on shaft side)
3	 	∗	∗	∗	Long telescoping type
5		369 (min.)	—	25	Fixed type (with tube)
		306.3			Fixed type (without tube)

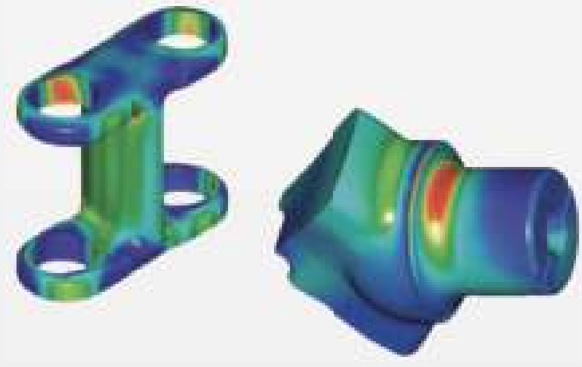
Remark Check with us about ∗parts as they are designed individually.

Analysis/evaluation equipment

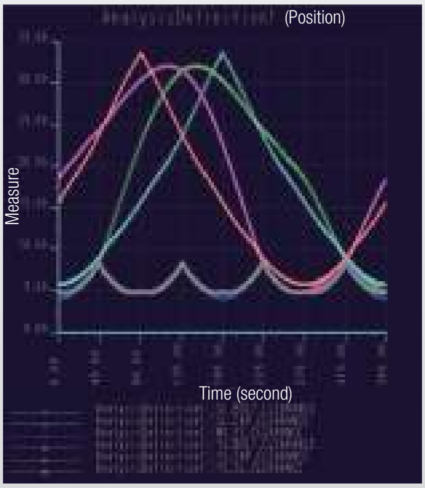
With improvement with FEM using a 3D model and review of the allowable differential angle based on our achievement in the market over more than 40 years, JTEKT proposes optimal design and products suitable for applications.
We also implement evaluation with actual products as necessary.

Large-sized torsion testing machine

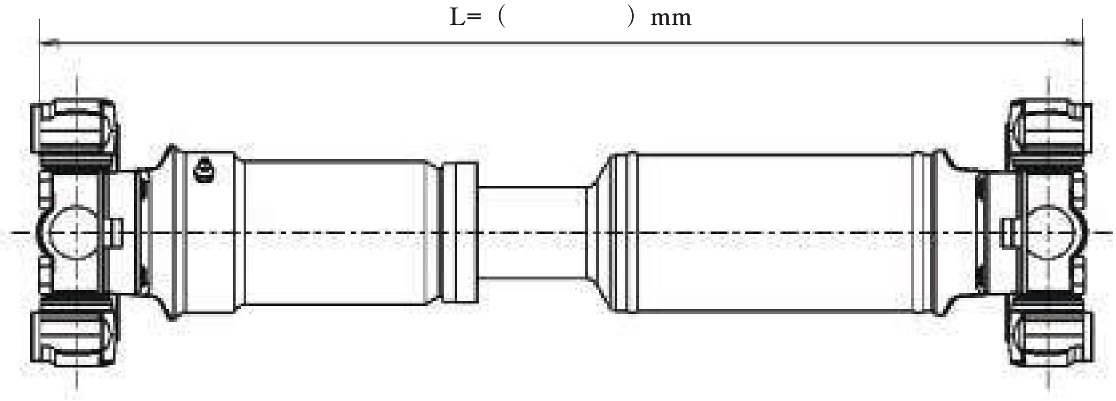
Example of FEM analysis



Example of review of allowable differential angle



Drive shaft selection sheet

Item			Necessity	Description			Remarks
Name of the machine			◎				
Location of installation			◎				
(1)	Size/type		○				
(2)	Torque transmission	(N·m)	◎	Normal	Max.	Emergency max.	
(3)	Rotational speed	(min^{-1})	◎	Normal	Max.		
(4)	Operating angle	(deg)	◎	Normal	Max.		
(5)	Required telescoping	(mm)	◎				
(6)	Limited swing diameter	(mm)	△				
(7)	Paint color		△				Black if not specified
(8)	Ambient temperature	(℃)	△				
(9)	Special environmental conditions		△				
(10)	Service life requirement	(h)	○				
(11)	Attaching dimension 						

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Koyo®

High Wing Series Drive Shafts

JTEKT

CAT.NO.B2022E
Printed in Japan '16.01-1CM

Koyo®

Product Information for Agricultural and Construction Equipment

JTEKT

JTEKT CORPORATION

For superior strength and durability in all environments

Heavy machinery in the agriculture and construction supports economic growth and infrastructure, and is indispensable in daily life. JTEKT's highly functional products contribute to ensuring long service life in severe conditions and improving reliability.

JTEKT products supporting heavy machinery in agriculture and construction

Under such severe conditions, JTEKT responds with No.1 & Only One technologies.

Responding to Needs with
No.1 & Only One Technologies

With a manufacturing history of more than 90 years,
JTEKT clearly understands the needs of its customers,
promptly delivers the reliability and product competitiveness required,
and backs it up with a global support system.

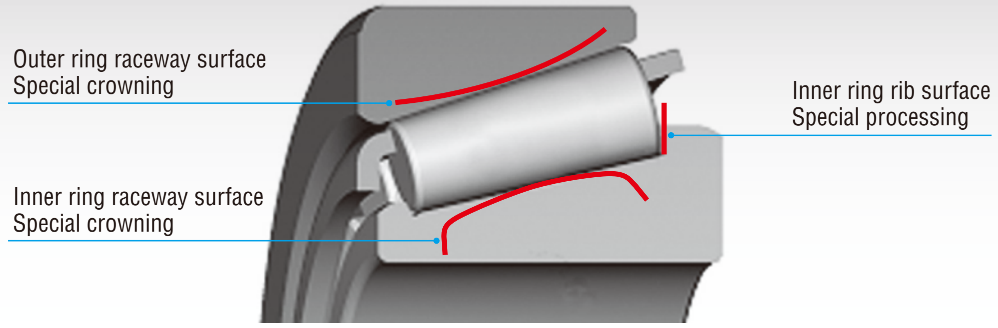
Needs to Agriculture/Construction Heavy Machinery	Bearing Feature	
Improved Durability	Improved load performance Better misalignment endurance	1
	Improved life in contaminated oil	2
	Improved lubricating technologies	3
Global Environmental Preservation	Low friction torque	4
	Lightweight	5
	Extending maintenance cycle Reusable	6

JTEKT Technology Responding to Needs		
Optimum design technologies	1 4 3	・Inner specification optimization ・Crowning optimization ・Low temperature rise design
Material/heat treatment technologies	1 5 2 6	・KE heat treatment: case-hardened steel ・SH heat treatment: bearing steel
Analysis technologies	1 3 2	・Shaft System Analysis Program (SSAP) ・CAE analysis (static analysis/dynamic analysis) ・Benchmark evaluation tests ・X-ray/ultrasound analysis
Surface reforming technologies	3 6	・Special coating process ・Surface roughness optimization

JTEKT products responding to agricultural / construction machinery needs ❶

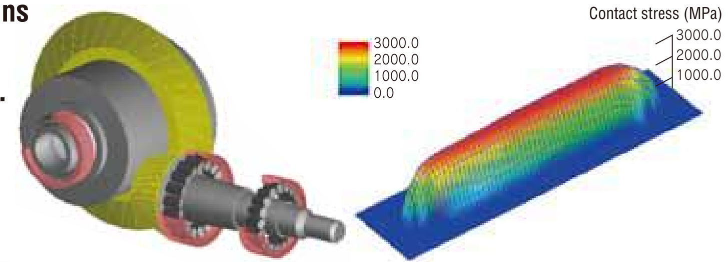
Optimum design technologies

High performance tapered roller bearing

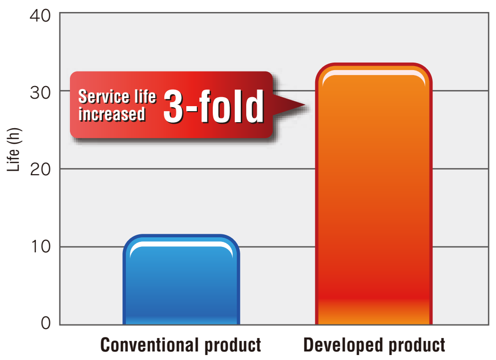


Improved durability (edge stress mitigated by misalignment shaft and low temperature rise)

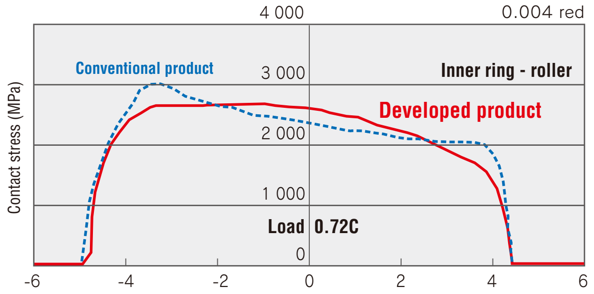
- **Due to optimization of inner specifications and special crowning of bearing ring, bearing force improved by misalignment.**



■ Misalignment durability life evaluation results

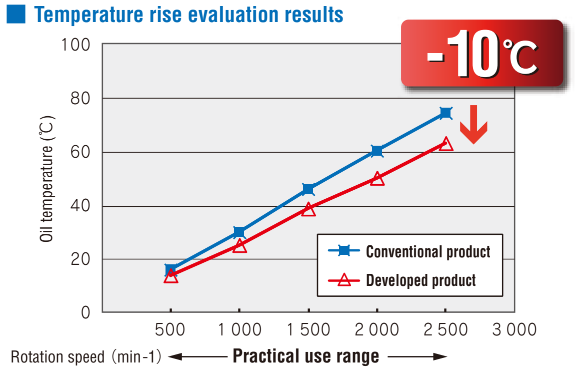


■ Contact stress calculation results



- **Due to special processing of inner ring rib and special crowning of bearing ring, low temperature rise is achieved. Bearing endurance also improved by oil film formation**

■ Temperature rise evaluation results



Material/heat treatment technologies

KE heat treatment

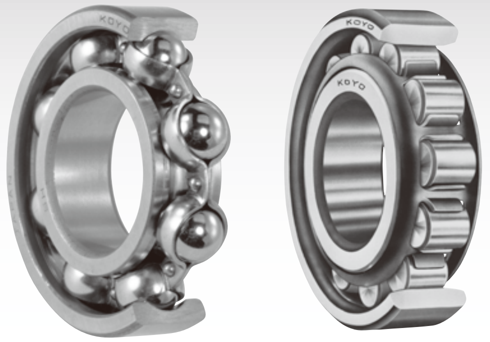
(KE:Koyo Extra-life Bearing)

- **Apply to case-hardened steel**

SH heat treatment

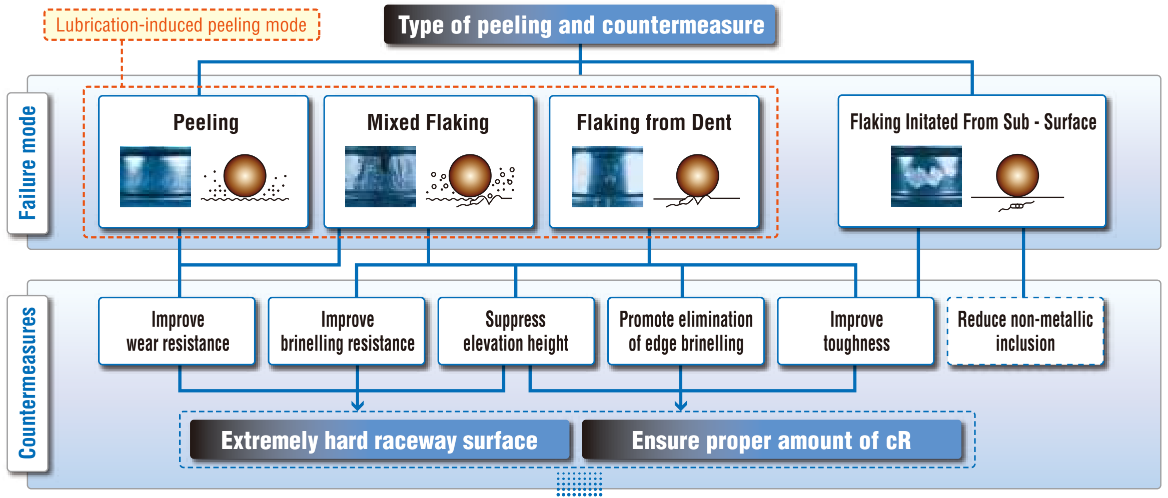
(SH:Special Heat Bearing)

- **Apply to bearing steel**



KE heat treatment/SH heat treatment

- **Special heat treatment realizes extremely hard raceway surface and optimization of residual austenite achieves long life. Especially, superior performance in contaminated oil.**



Lubrication-induced peeling mode

Type of peeling and countermeasure

Failure mode

- Peeling
- Mixed Flaking
- Flaking from Dent
- Flaking Initated From Sub - Surface

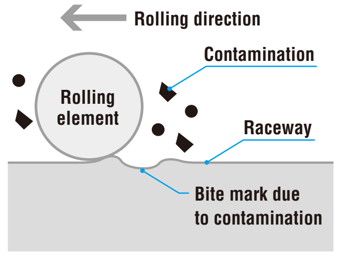
Countermeasures

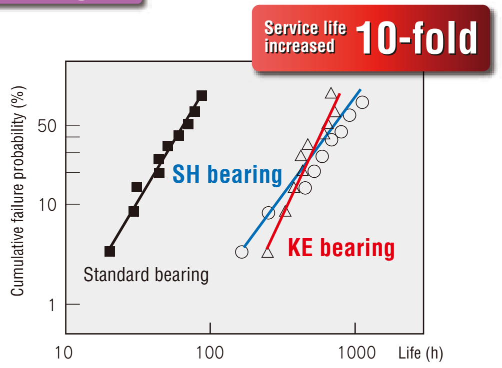
- Improve wear resistance
- Improve brinelling resistance
- Suppress elevation height
- Promote elimination of edge brinelling
- Improve toughness
- Reduce non-metallic inclusion

Extremely hard raceway surface

Ensure proper amount of cR

KE bearing / SH bearing





KE:Koyo Extra-life Bearing SH:Special Heat Bearing

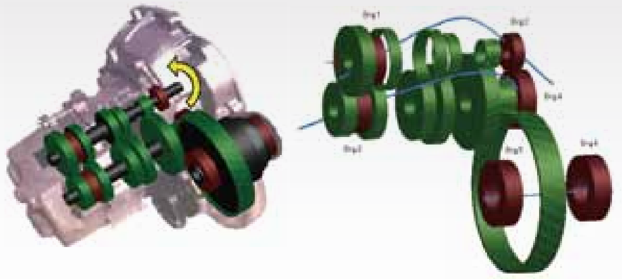
JTEKT products responding to agricultural/ construction machinery needs ❷

Analysis technologies

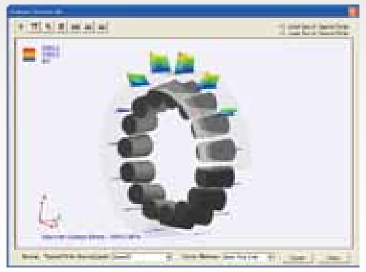
Verify validity of optimum design

- Fully utilizing the Shaft System Analysis Program (SSAP) developed by JTEKT and CAE analysis, an optimum design that gives peripheral components additional rigidity has been achieved. Validity is verified through benchmark evaluation tests (including simulation), and X-ray and ultrasound analysis.

【Shaft system rigidity analysis】

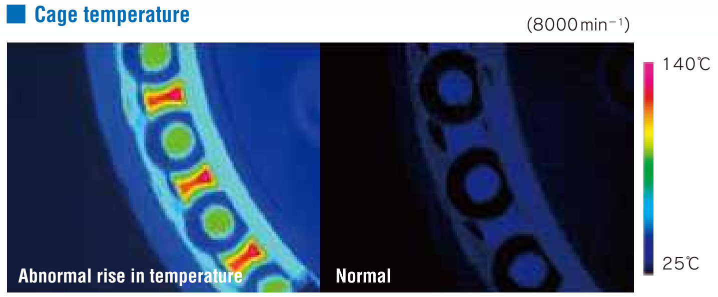


【Contact stress analysis】



【Inner temperature measurement results】

■ Cage temperature



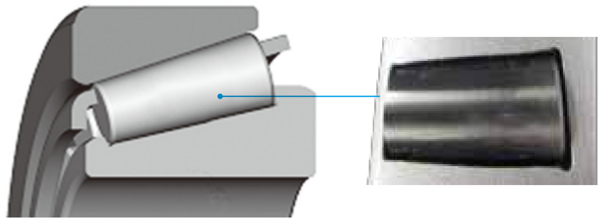
Large-sized Bearing Technology Development Center

- JTEKT has established and started operation of the Large-size Bearing Technology Development Center, where large-sized bearings used in industrial machinery are evaluated and analyzed. Until now, large bearings were manually inspected and then put into the actual machinery for basic evaluations. However, the newly established development center enables more detailed evaluation by reproducing environments close to those of actual use inside the company.

Surface reforming technology

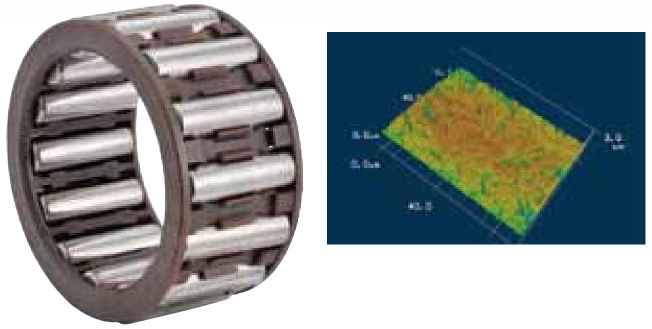
Special coating process

- Durability 3-fold that of non-coated product



Cage and roller (C&R) in response to poor lubrication

- Roller surface roughness optimized for improved oil film retention



JHS Series Spherical Roller Bearings

（JHS : JTEKT Hyper Strong）

JHS Series Spherical Roller Bearings are satisfy the demanding needs of our customers. Manufactured using innovative materials, an optimal internal design and a standardized dimension stabilizing treatment, these bearings have a longer service life, faster rotation speed, enhanced axial load performance and can be used in high-temperature applications.

Innovative materials/Optimal internal design/High-temperature applications supported

Outer ring

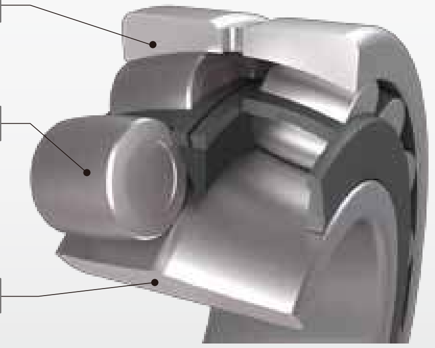
・JTEKT specification steel

Roller

・Roller maximized
・Number of rollers increased
・Roller position stabilized

Inner ring

・JTEKT specification steel



Bearing composition diagram

Longer service life
Max. 4-fold
compared to our existing products

Axial load performance
Max. 20%UP
compared to our existing products

Speed increased
Permissible rotation speed
Max. 25%UP
compared to our existing products

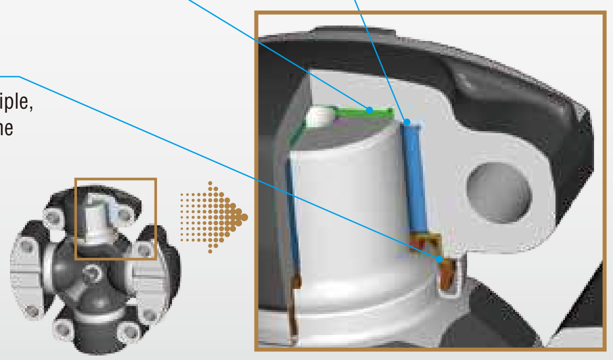
High-temp use
up to 200°C

Propeller shaft for construction machinery

Maintenance hours reduced by
improving cross bearing life and seal performance.

Long-interval greasing cross bearing

Greasing interval increased 10-fold



Thrust washer (PA66+GF)

Abrasion resistance improved by adding glass fiber

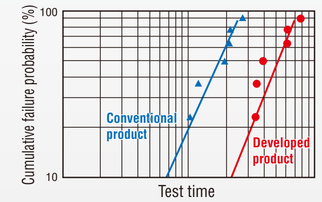
Oil seal

Seal lip from double to triple, and the optimization of the shape and position

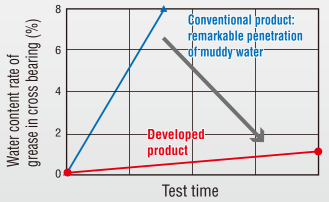
Roller

Reduction of contact stress by length up and crowning optimization

■ Cross bearing life test results

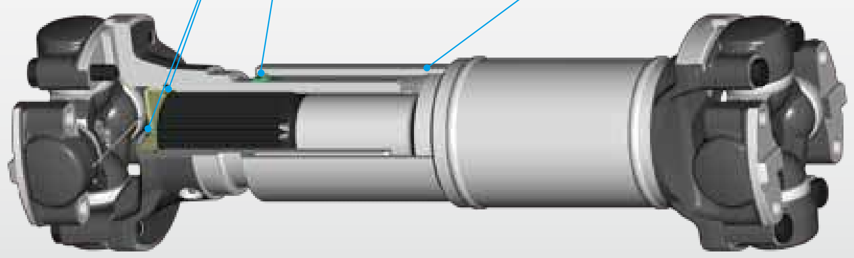


■ Cross bearing muddy water resistance test results



Spline seal structure of muddy water resistance improvement

Muddy water resistance improved 5-fold



Vent (dedicated to exhaust)/O ring

Prevent suction of muddy water when spline sliding

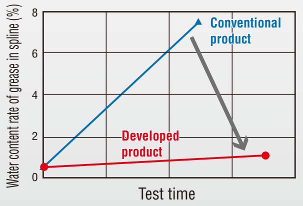
Oil seal

Rigidity of seal lip increased by changing material, from NBR to polyurethane rubber

Cover tube

Function of labyrinth achieved by extending the distance between seal and spline

■ Spline muddy water resistance test results



Oil seal

Seal technologies responding customers' needs for a variety of applications.

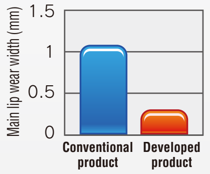
Muddy water resistance technology

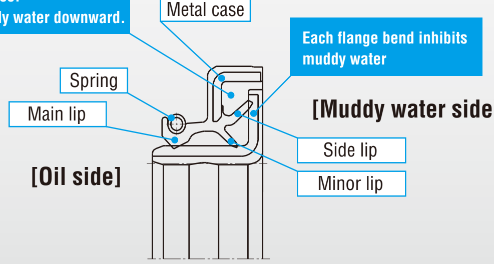
Lip wear width reduced 60%

Features

Side lip added to axle oil seal, creating multi-structured lip that prevents muddy water inclusion/oil leakage when traveling.

■ Muddy water resistance performance results using actual car





Tub formed using side lip and metal case. Directs muddy water downward.

Metal case

Each flange bend inhibits muddy water

Spring

Main lip

[Muddy water side]

[Oil side]

Side lip

Minor lip

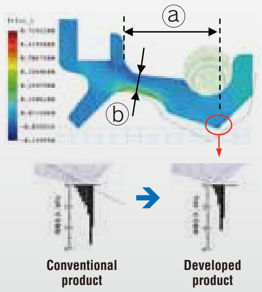
Low-torque technology

Rotating torque reduced 30%

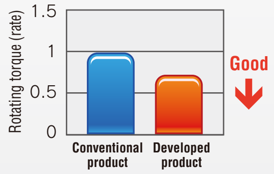
Features

Low-torque oil seal for engine/transmission contributes to reducing fuel consumption

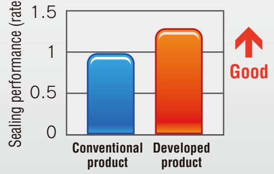
Lip length ⓐ and hip thickness ⓑ optimized, lowering strain force and abrasiveness



Reduced 30%



Lowering torque reduced abrasive effect 1.3-fold



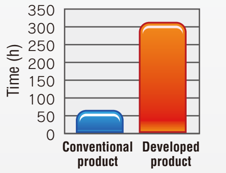
Sealing performance improvement technology

Service life increased 5-fold

Features

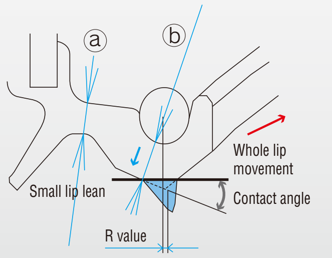
Stable sealing performance maintained by optimizing design optimized and changing the rubber material that inhibits lip torsion caused by sudden servo motor acceleration/deceleration.

Service life increased



Design optimization

Composition ratio (b/a): Large
Contact angle, R value: Standard



Low temperature technology

Low temperature performance improved 2-fold

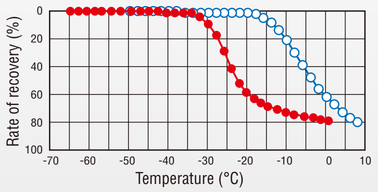
Features

Sealing performance of hydraulic pump and other parts improved by enhancing low-temperature daynamic run out followability.

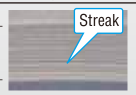
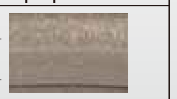
Low-temperature environment

-15℃
↓
-30℃

■ 10% recovery temperature at time of 50% extension rate

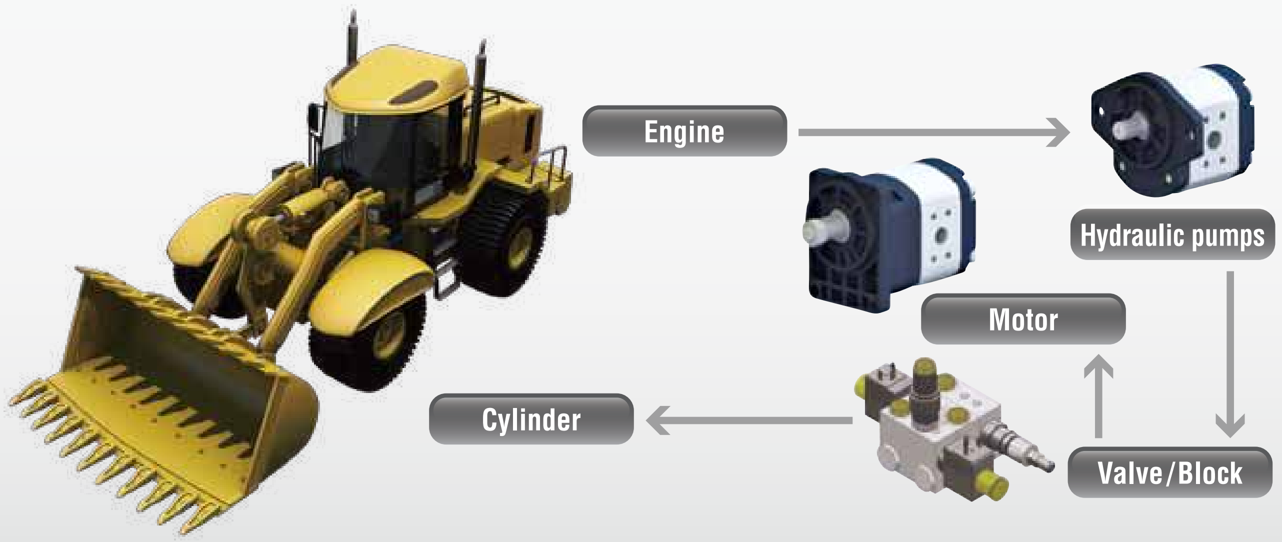


■ Rubber material abrasion characteristics Lip sliding part after abrasion (dry) test

Conventional product	Developed product
Wear width  Streak	Wear width 

Hydraulic Components

With a standard lineup by highly efficient external gear pump technologies,
JTEKT hydraulic systems are built to respond to customer's requirements and specific needs.



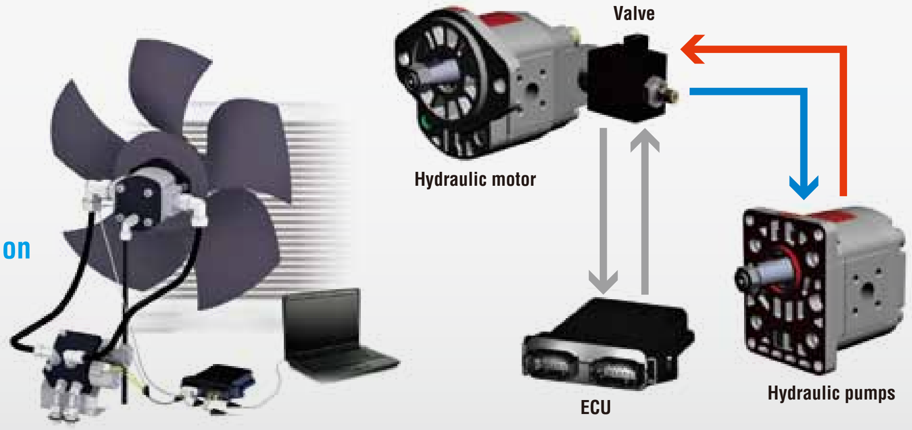
Cooling fan system with hydraulic motor control (HMC)

(HMC system)

Hydraulic control of fan speed ensures optimized cooling conditions for the engine and radiator.

Features

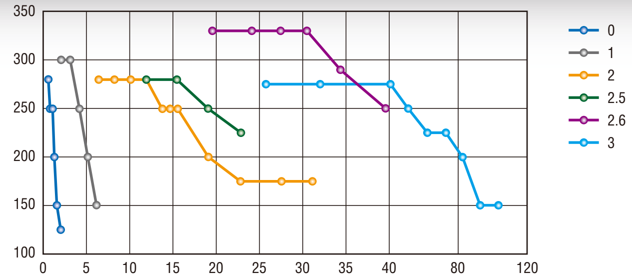
- Fuel consumption reduced
- Low noise
- On-demand cooling possible by setting various parameters
- Downsizing and Weight reduction
- Fan-stop and Reverse function



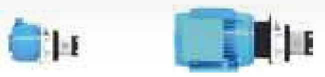
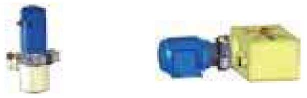
Hydraulic (external gear) pump/motor lineup

	Model	Basic Displacement	Max. Pressure	
Hydraulic (external gear) pumps	6 series 43 models	0.25-100cc/rew	33Mp	 Series 0 Series 1 Series 2 & 2,5 Series 2,6 Series 3
Hydraulic (external gear) motors	4 series 29 models	0.25-100cc/rew	25Mp	 Series 0 Series 1 Series 2 & 2,5 Series 3

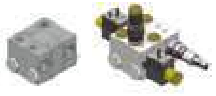
With a basic displacement of 0.25-100cc/rev and maximum operating pressure of up to 33MPa, wide-range products can be provided to customer's needs.



Electric pump set/power pack lineup

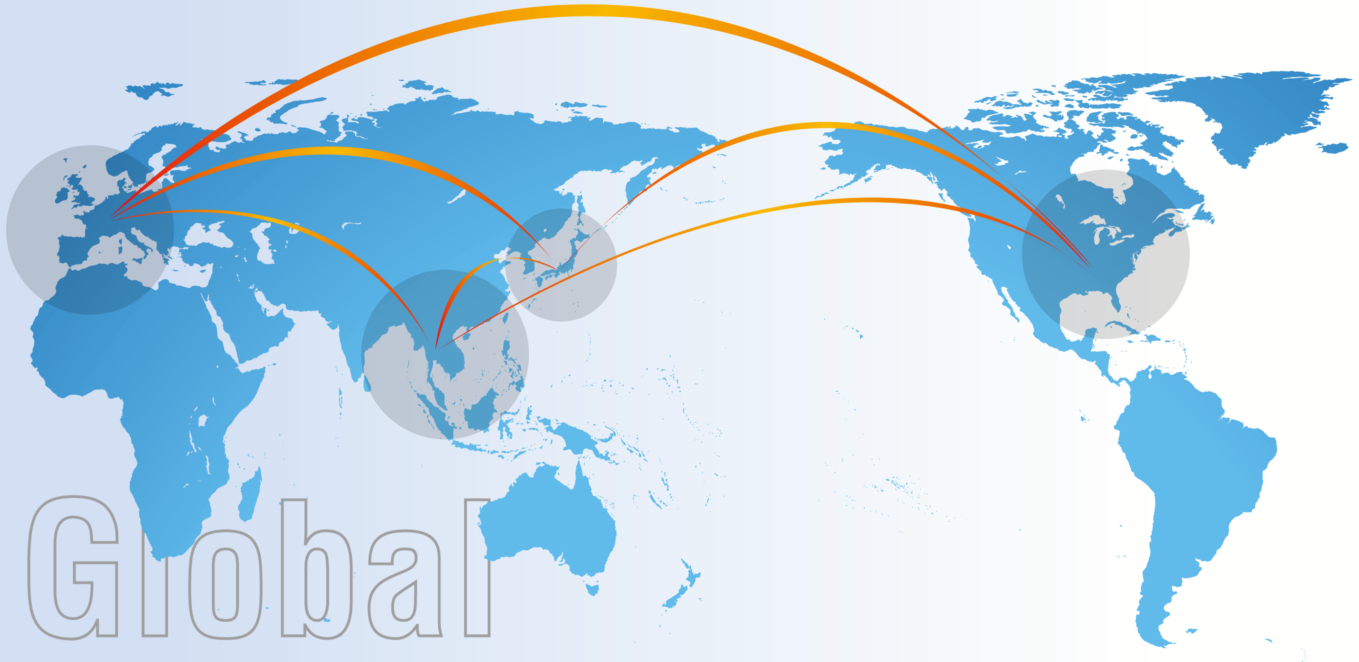
	Model	Flow Rate	Output Power	
Electric pump set (Micro/Mini)	DC Type	0.4-25 L/min	400-4000 W	
	AC Type	1-25 L/min	550-4000 W	
Power pack (Micro/Mini)	DC Type	0.4-25 L/min	400-4000 W	
	AC Type	0.4-25 L/min	550-4000 W	

Valve/Block lineup

Valve	Pilot poppet Solenoide valves		Spool solenoide valves	
Block	**BAF** Assocative Function Blocks for in-Line mounfing		**MBS** Modular Block System	

Global Technical Support (Bearing Development Bases)

Technical centers located around the world ensure quick response and technical support for customers' needs.



Global Technical support

Europe (5 bases)

China / Southeast Asia (2 bases)

Japan (4 bases)

Americas (2 bases)

■ European Region

- The Netherlands (Almere)
- Germany (Munich)
- Germany (Künsebeck)
- France (Colmar)
- The Czech (Brno)

■ ASEAN Region

- China (WUXI)
- Thailand (Bangkok)

■ JAPAN Region

- W-TEC (Osaka)
- C-TEC (Aichi)
- T-TEC (Kanagawa)
- R&D (Nara)

■ North America Region

- U.S.A. (Michigan)
- U.S.A. (South Carolina)

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Products for Steel Production Equipment

Koyo®

Roll neck bearings for rolling mill

JTEKT

JTEKT CORPORATION

JTEKT

Koyo TOYODA

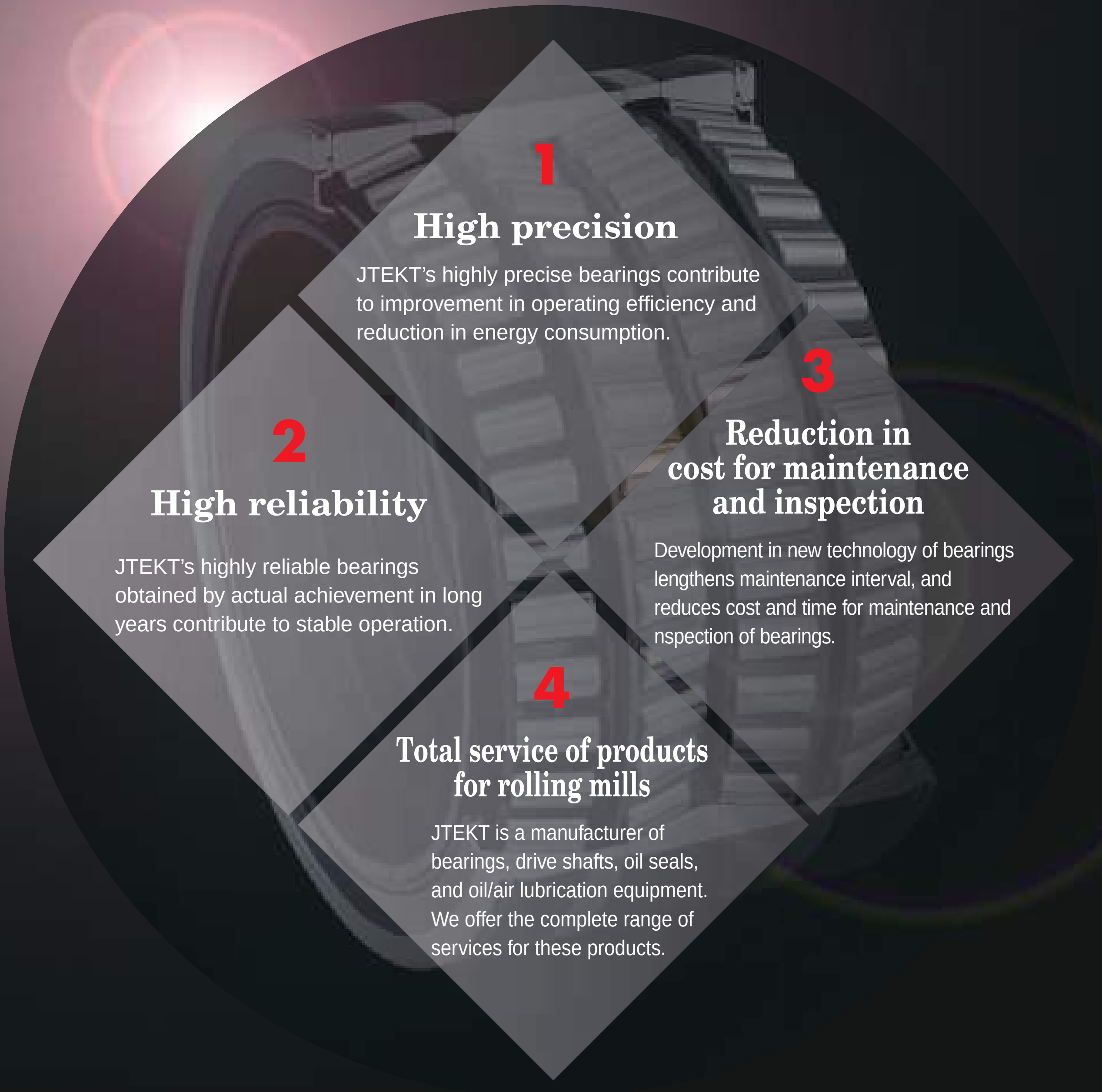
CAT. NO. B2013E-1

Preface

In 1943, JTEKT became the first successful domestic manufacturer of four-row tapered roller bearings for rolling mills in Japan. Since then, we have cultivated advanced technology and technical know-how to serve our customers. To meet with customers' requests, JTEKT strives for development of more highly precise and reliable bearings for rolling mills while using experience and actual achievement for technical development and research.

JTEKT will do a service by customer-oriented “monozukuri” (Japanese way of manufacturing) in the future.

Features of JTEKT products



1

High precision

JTEKT's highly precise bearings contribute to improvement in operating efficiency and reduction in energy consumption.

2

High reliability

JTEKT's highly reliable bearings obtained by actual achievement in long years contribute to stable operation.

3

Reduction in cost for maintenance and inspection

Development in new technology of bearings lengthens maintenance interval, and reduces cost and time for maintenance and nspection of bearings.

4

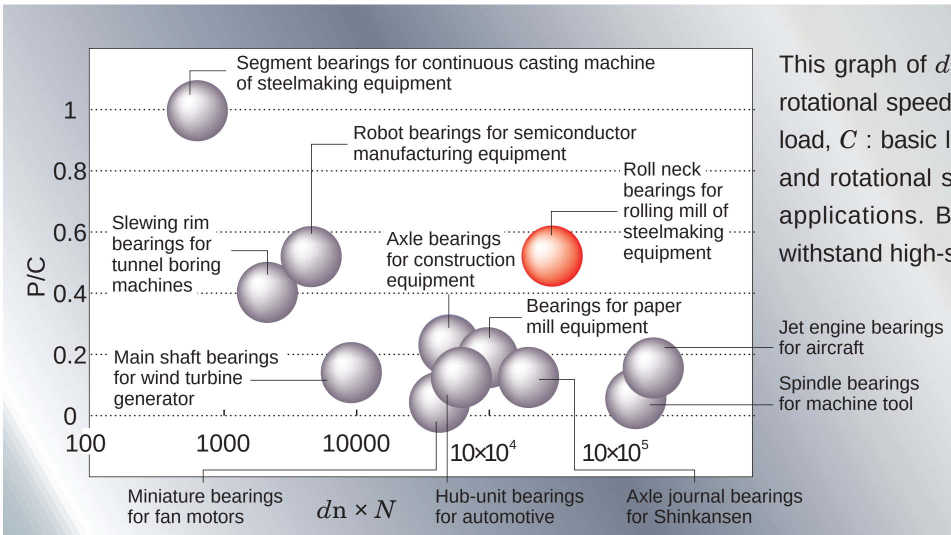
Total service of products for rolling mills

JTEKT is a manufacturer of bearings, drive shafts, oil seals, and oil/air lubrication equipment. We offer the complete range of services for these products.

Operating environment of bearings for rolling mill

Bearings in every industry are used under various kinds of severe conditions. For instance, bearings used in automobiles, railway stocks, and aircrafts are required to have ultimate reliability, as due to safety reasons, they are never allowed to fail during operation. While bearings used in machine tool spindles are required to have ultra-high rotational speed performance and high running accuracy. Bearings for rolling mills must withstand heavy loads and high-speed rotations as well as very severe operating environments. In various industries, they are used under severe conditions in every respects.

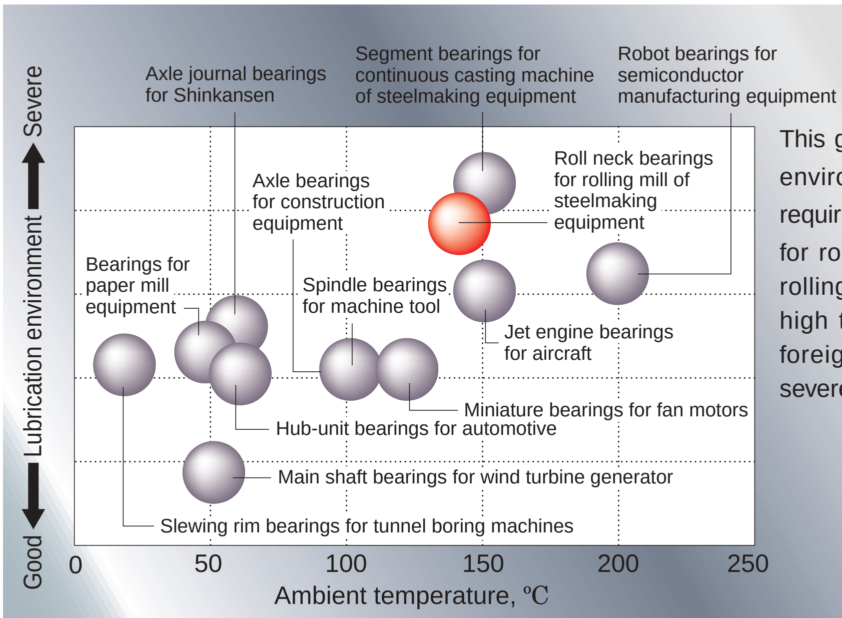
Load and rotational speed of bearings



Bearing load ratings and rotational speeds

This graph of $dn \times N$ (dn : bearing bore dia., N : rotational speed) and P/C (P : dynamic equivalent load, C : basic load rating) shows the bearing load and rotational speed required for various bearing applications. Bearings for rolling mills need to withstand high-speed rotation and heavy load.

Operating environment



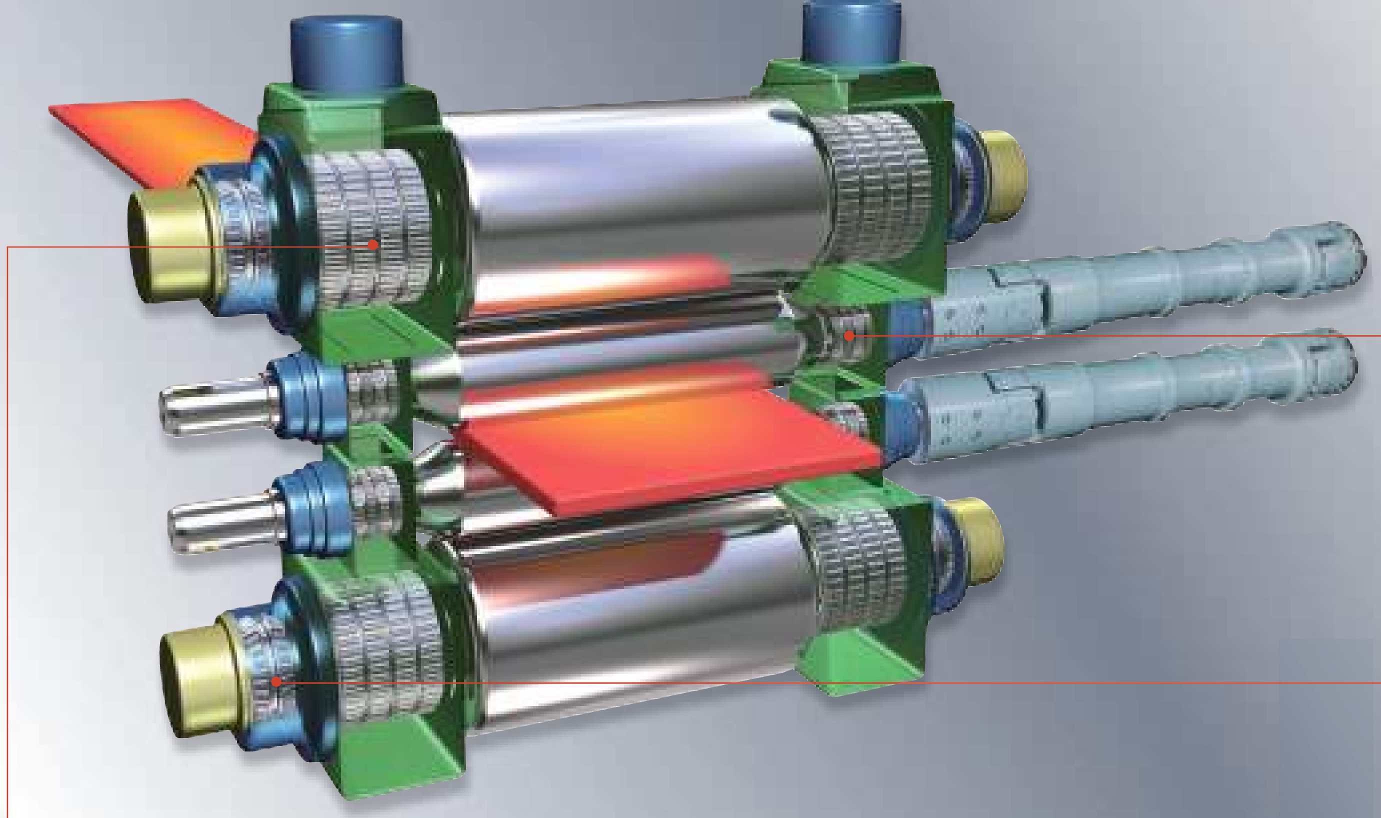
Bearing ambient temperature and lubrication conditions

This graph of ambient temperature and lubrication environment shows the operating environments required for various bearing applications. Bearings for rolling mills, especially in the process of hot rolling, are often used under severe conditions, high temperature and possibility of intrusion of foreign matters. Thus, they must endure these severe conditions.

Roll neck bearings for rolling mill

* For information on bearings not listed here, consult with JTEKT.

Hot / cold strip mill



Sealed type four-row tapered roller bearings

These bearings are mainly used for the work rolls and intermediate rolls of cold strip mills.

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Mass (kg)
Bore diameter	Outside diameter	Cones overall width	Cups overall width	C_r	C_{0r}	C_u		
220	295	315	315	1 930	3 910	429	47TS443032	53
240	338	340	340	2 960	5 360	580	47TS483434	88
245	345	310	310	3 150	6 020	631	47TS493531	90
260	370	354	354	3 880	7 410	778	47TS523735	120
279.4	393.7	320	320	3 610	6 900	702	47TS563932	120
280	380	340	340	3 520	6 940	710	47TS563834	106
310	430	350	350	4 110	7 870	777	47TS624335A	146
343.052	457.098	254	254	3 590	7 030	695	47TS694625D	110
482.6	615.95	330.2	330.2	5 660	12 400	1 130	4TRS19D	239
711.2	914.4	420	420	9 870	22 200	1 840	4TRS711L	678

Four-row tapered roller bearing (Open type)

These bearings are mainly used for the work rolls and intermediate rolls of hot strip mills and cold strip mills.

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Mass (kg)
Bore diameter	Outside diameter	Cones overall width	Cups overall width	C_r	C_{0r}	C_u		
343.052	457.098	254	254	3 560	6 950	680	47T694625	111
400	530	370	370	6 150	12 900	1 200	45D805337	208
482.6	615.95	330.2	330.2	6 540	15 000	1 330	4TR19D	241
509.948	654.924	379	379	7 260	16 700	1 460	4TR510A	316
609.6	787.4	361.95	361.95	8 520	19 900	1 680	EE649241D/310/311D	461
711.2	914.4	317.5	317.5	8 550	18 800	1 580	4TR711	531

Four-row cylindrical roller bearing

These bearings are mainly used for the back-up rolls of cold strip mills.

Boundary dimensions (mm)					Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Mass (kg)
Bore diameter	Outside diameter	Inner rings overall width	Outer rings overall width	Raceway contact diameter of inner ring	C_r	C_{0r}	C_u		
690	980	750	750	766	24 100	52 300	4 240	138FC98750	1 830
755	1 070	750	750	837	28 000	60 300	4 740	151FC107750A	2 220
770	1 075	770	770	847	29 000	63 500	4 950	154FC108770A	2 230
820	1 130	800	800	903	29 300	66 900	5 110	164FC113800	2 520
850	1 180	850	850	940	31 800	72 700	5 610	170FC118850	2 910
900	1 220	840	840	989	34 600	83 300	6 240	180FC122840A	2 990

Double-row tapered roller bearing

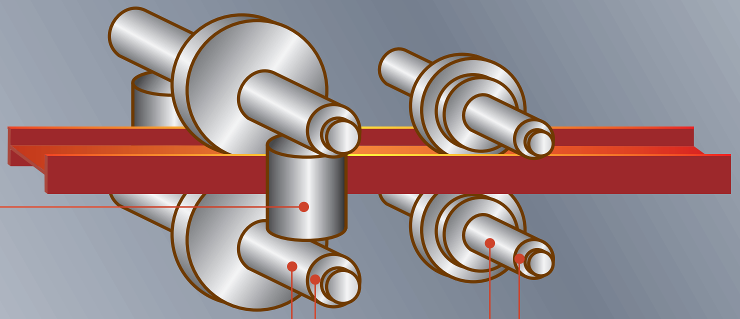
These bearings are mainly used for the roll neck thrust bearings of hot strip mills and cold strip mills.

Boundary dimensions (mm)				Basic load ratings (kN)		Fatigue load limit (kN)	Bearing No.	Mass (kg)	(Reference) Cup preload (kN)
Bore diameter	Outside diameter	Cones width	Cups overall width	C_a	C_{0a}	C_u			
305	500	200	200	2 220	5 490	533	45T615020	148	3.5
400	650	240	240	4 070	11 000	965	2TR400L	299	6.5
509.998	733.5	200.02	200.02	3 270	9 880	859	2TR510L	263	5.2

Roll neck bearings for rolling mill

* For information on bearings not listed here, consult with JTEKT.

Shaped-steel rolling mill



Double-row tapered roller bearing

These bearings are mainly used in the V rolls of shaped-steel rolling mills.

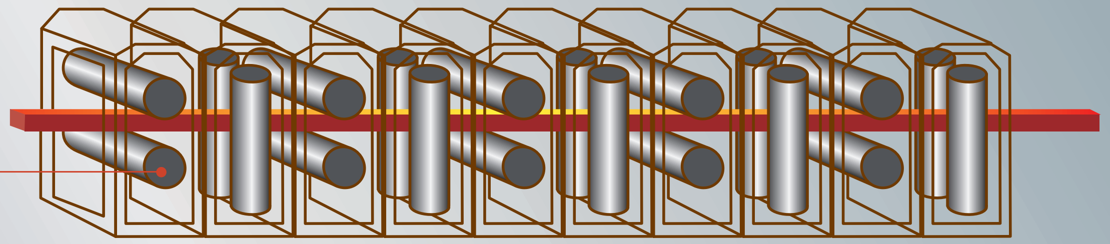
Boundary dimensions (mm) Bore diameter	Outside diameter	Cones overall width	Cups overall width	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Bearing No.	Mass (kg)
240	440	274	224	4 210	6 850	665	46T484427	180
247.65	406	247.65	203	3 520	6 110	603	46CTR504112A	120
255	500	350	285	6 360	10 300	939	46CTR515018	304
260	480	282	220	4 740	7 670	730	46CTR524814A	210

Four-row tapered roller bearing

These bearings are mainly used in the V rolls of shaped-steel rolling mills.

Boundary dimensions (mm) Bore diameter	Outside diameter	Cones overall width	Cups overall width	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Bearing No.	Mass (kg)
450	595	390	352	6 970	15 600	1 410	48T906039A	289

Rod / wire rod rolling mills

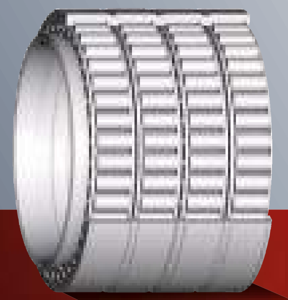


Spherical thrust roller bearing (combination of two single-row bearings)

These bearings are mainly used for the roll neck thrust bearings of shaped-steel rolling mills.

Boundary dimensions (mm) Bore diameter	Outside diameter	Cone width	Cup width	Assembling width	Basic load ratings (kN) C_a	C_{0a}	Fatigue load limit (kN) C_u	Bearing No.	Mass (kg)
180	360	69.5	52	109	2 650	6 890	426	29436B	48
200	340	53.5	41	85	1 940	5 390	328	29340B	30
260	480	83	64	132	4 250	11 900	524	29452B	95

* The values in the above table are those for single-row bearings.



Four-row cylindrical roller bearing

These bearings are mainly used for the roll neck bearings of shaped-steel rolling mills and rod rolling mills.

Boundary dimensions (mm) Bore diameter	Outside diameter	Inner rings overall width	Outer rings overall width	Raceway contact diameter of inner ring	Basic load ratings (kN) C_r	C_{0r}	Fatigue load limit (kN) C_u	Bearing No.	Mass (kg)
200	280	200	200	222	1 820	3 090	365	313893-1	38
200	290	192	192	226	1 840	3 030	350	313811	42
220	310	192	192	247	1 910	3 270	369	313837-1	46
240	330	220	220	264	2 300	4 120	462	48FC33220	54
260	370	220	220	292	2 500	4 330	476	313823	76
280	390	240	240	312	3 070	5 620	608	56FC39240	88
300	420	300	300	331	4 280	7 750	805	60FC42300DW	127
300	420	335	300	332	4 700	8 690	896	60FC42300L	134
320	450	240	240	355	3 990	5 730	604	64FC45240	117
340	480	385	350	378	5 990	11 500	1 150	68FC48350N	212
360	500	250	250	394	4 390	7 340	756	72FC50250	145
380	540	400	380	422	7 530	14 300	1 400	76FC54380	288
440	620	485	450	487	9 900	20 000	1 840	88FC62450A	457

Roll neck bearings

These bearings are required to withstand heavy loads and high-speed rotations in severe environments.
At JTEKT, we strive every day to develop bearing materials and technology that minimizes temperature increases and to improve the sealing performance of bearing seals and other similar items in order to meet these needs.

Issues and required performance

- 🟥🟩 Improvement of durability and service life to withstand heavy loads and high-speed rotations
- 🟦 Prevention of the intrusion of water and mill scale

Improvement of durability and service life to withstand heavy loads and high-speed rotations

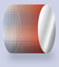
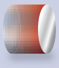
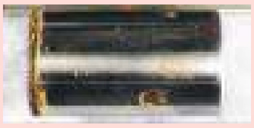
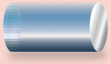
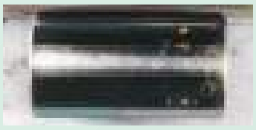
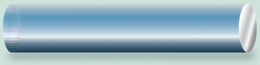
Long-life / high corrosion-resistant carburized steel

JHS520
JTEKT HYPER STRONG

◆ **Standard**
By using our newly developed case-hardening steel in the bearing rings, we have greatly improved the rolling life, toughness, and corrosion resistance compared to our conventional products.

◆ **Premium**
By using our newly developed case-hardening steel and by applying special heat treatment, we have provided the premium specification with further improved rolling fatigue life and corrosion resistance.

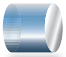
Features
① Long-life and high corrosion-resistant steel with optimized content of chromium and molybdenum
② Original carbonitriding heat treatment improves corrosion-resistance and wear-resistance qualities.

	Results of evaluations of bearings in an environment prone to rust (filled with water-mixed grease)		Results of evaluations of bearings in clean oil
	Rust resistance comparison	Life (JTEKT bench test)	
Conventional product			
Developed steel, carburized product ① (JHS520 standard)		 Approx. 2.2 x	 Approx. 4 x
Developed steel, special heat treated product ①+② (JHS520 premium)		 Approx. 3.8 x	 Approx. 7 x
Test conditions	Humidity cabinet test conditions Test temperature: 49°C ± 1°C Relative humidity: 95% or more Test period: 96 hours	Sample: Tapered roller bearing Main dimensions: ø50 × ø120 ×30 Lubrication: Grease (water content ratio, 30%)	Test piece form: 20 mm dia., 32 mm length Maximum contact stress: 5 800 MPa Loading cycle frequency: 285 Hz Lubricating oil: Turbine oil (ISO #VG68) Oil supply: 2 L/min (room temperature) * Test was stopped after 50 × 10^7 times.

Examples of actual use

Cold strip mill work roll (open type) ① [JHS520 standard]

Conventional type



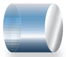
Used approximately 4 million tons (under DS)

Approx. 5 x

No flaking

Cold strip mill work roll (sealed type) ①+② [JHS520 premium]

Conventional type



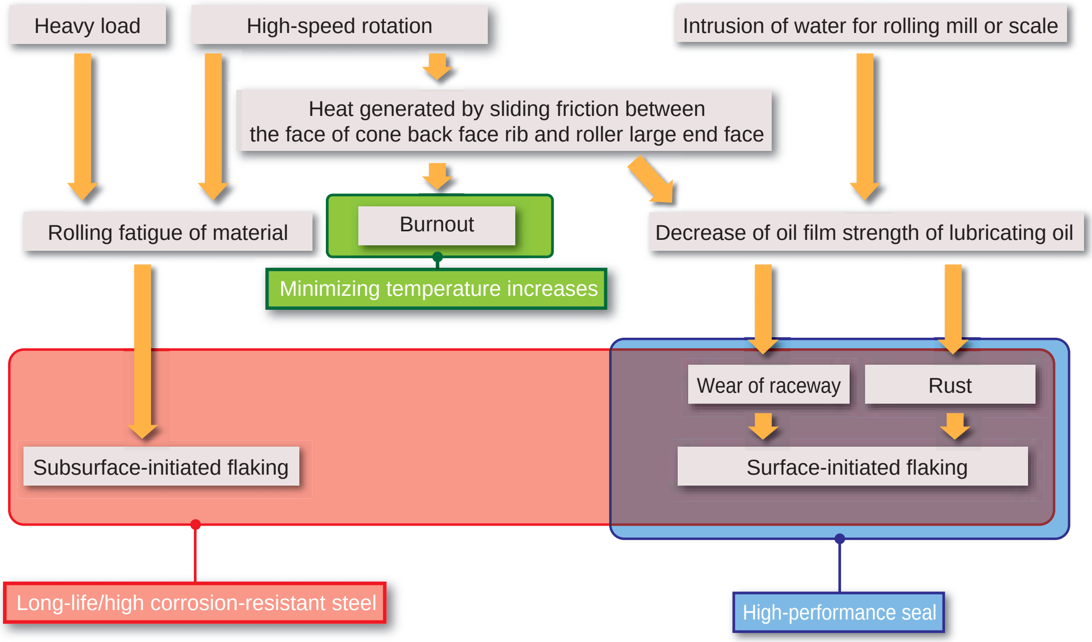
Used for approximately 24 months (under OP)

Approx. 4.8 x

Hardly any indication of rust

Long-life, highly corrosion-resistant JHS is driving innovations in steel production equipment.

Iron manufacturing and rolling mill lines must operate continuously while maintaining high reliability in severe production environments. Answering these needs through the realization of epoch-making long-life and high corrosion resistance is JTEKT Hyper Strong (JHS). By adopting newly developed materials and processes for bearing steel, seal materials and other components, we have realized a 2-to-4-fold increase in bearing service life compared to previously used bearings. Continuing on from JHS520 for rolling mill roll necks and JHS210 for Sendzimir rolling mill backup rolls, we are steadily expanding the bearing series according to each application. The JHS bearing series offers total support for achieving maximum performance and durability in the ever-evolving field of steel equipment. Please keep your expectations high. We won't let you down.


Heavy load

High-speed rotation

Intrusion of water for rolling mill or scale

Heat generated by sliding friction between the face of cone back face rib and roller large end face

Rolling fatigue of material

Burnout

Minimizing temperature increases

Decrease of oil film strength of lubricating oil

Wear of raceway

Rust

Subsurface-initiated flaking

Surface-initiated flaking

Long-life/high corrosion-resistant steel

High-performance seal

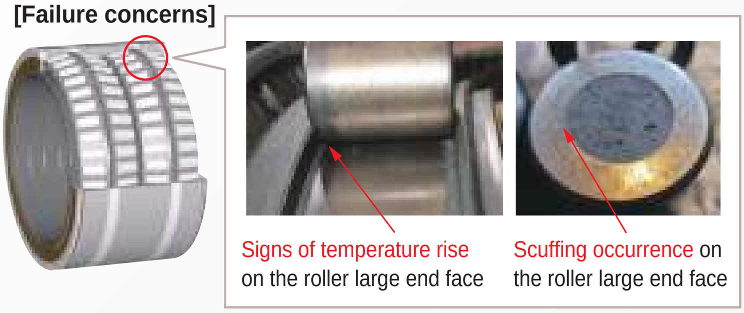
Improvement of durability and service life to withstand heavy loads and high-speed rotations

Technology for minimizing temperature increases

Features

- On the basis of the EHL theory, improvement of the lubrication of the rolling part between the roller large end face and the face of cone back face rib
- Optimization of the shapes and suppression of temperature rising for the rolling part between the roller large end face and the face of cone back face rib

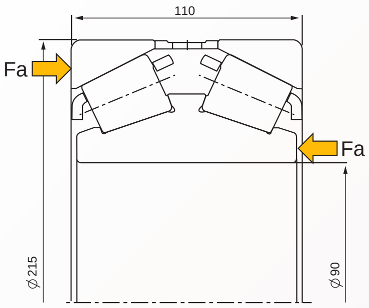
[Failure concerns]


Signs of temperature rise on the roller large end face

Scuffing occurrence on the roller large end face

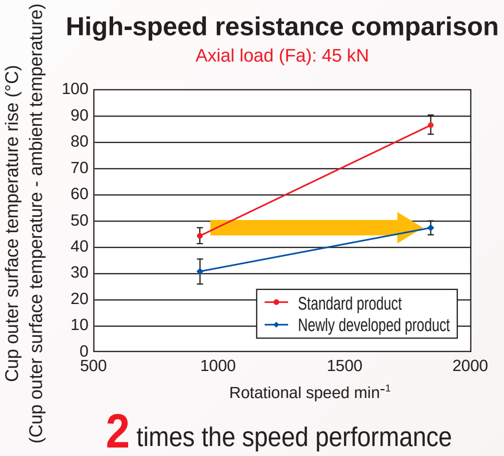
Test bearing

Bearing No.: 45T182211
Main dimensions: ø90 × ø215 ×110 mm
Ca: 228 kN
Lubrication: Grease (Palmax RBG)



High-speed resistance comparison

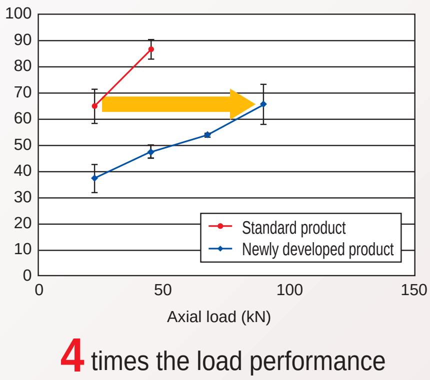
Axial load (Fa): 45 kN



2 times the speed performance
(at the same temperature rise)

Load resistance comparison

Rotational speed: 1840 min⁻¹

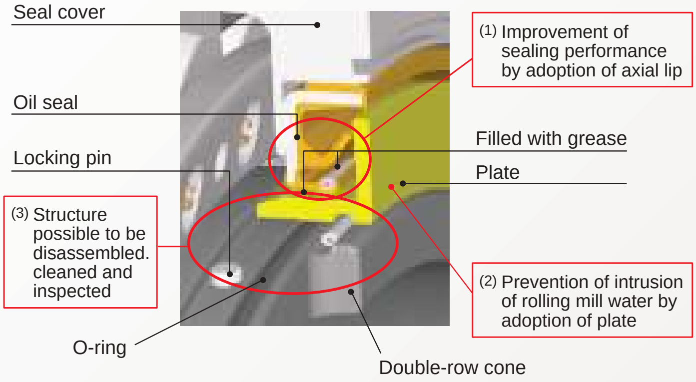


4 times the load performance
(at the same temperature rise)

Prevention of the intrusion of water and scale

High-performance seal

JTEKT dramatically extended bearing life by completely preventing the intrusion of rolling mill water and/or scale into the bearing, which is the major cause of failure through the use of enhanced seals. Moreover, maintenance interval has been also lengthened by maintaining high sealing performance. This product was developed by collaboration of JTEKT and Koyo Sealing Techno Co.,Ltd. in JTEKT group.



The tables below show the appearance status and application history of bearing with high-performance seal adopted. Low water content in the grease and little to no rust generation is proof of excellent sealing performance.

	Before cleaning of grease	After cleaning of grease
Cup		
Cone assembly		

Post-use appearance of bearing with high-performance seal

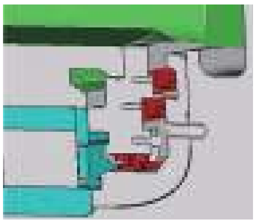
Application	Hot strip mill work roll
Service period	1 486 h (Without any maintenance or re-greasing)
Bearing appearance	Good, no flaking and slight wear
Grease penetration	About 280 (New : 300)
Water content in grease	About 1%

Application history of bearing with high-performance seal

Oil Seal

JTEKT can supply oil seals for various purposes for rolling mills or feeding tables.

Features of Koyo oil seal



1. Lightweight, compact, and energy-saving

- Koyo oil seals offer high sealing performance, while being compact with reduced seal width.

2. High sealing performance by optimum lip design

- Koyo oil seals adopt a linear-contact lip, which provides proper radial lip load.
- The lip design ensures excellent sealing performance, low torque, proper flexibility and high allowability for eccentricity.

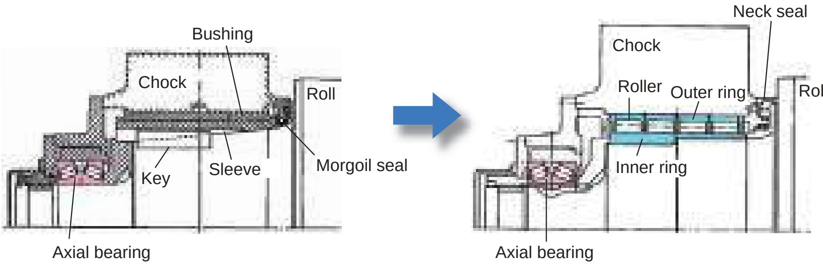
3. Low heat generation and long service life by highly self-lubricating rubber materials

- These products show limited chemical changes such as hardening, softening, and aging.
- These materials, having excellent durability, can offer long service life with less heat generation even under high-lip speed.

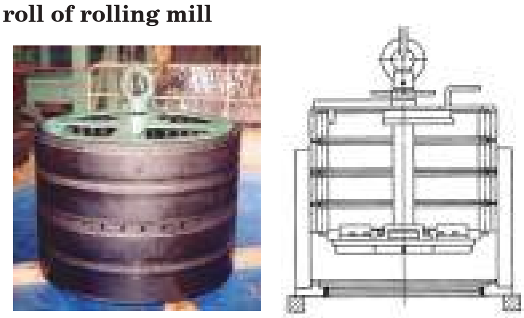
For details of oil seals, see CAT.NO.R2001E.

Replacing oil film bearing with rolling bearing

In 1972, JTEKT adopted four-row cylindrical roller bearings for new cold tandem mill tandem back-up rolls (BUR) at first in Japan. Since then, JTEKT has supplied bearings for BUR to many steel manufacturers all over the world. Since JTEKT carried out the modification design and delivered rolling bearings for the modification of the plate mill by replacing the oil film bearing of the back-up roll with the rolling bearing in 1984, JTEKT has completed about twenty-seven projects (maximum record in Japan) until 2014 and has contributed to offer highly-precise products for rolling mills.



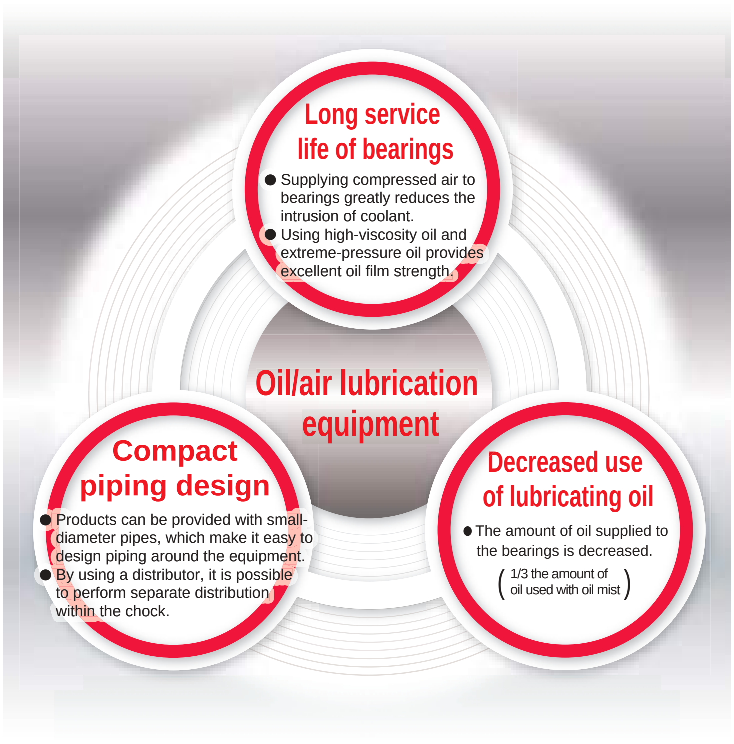
Replacement of oil film bearing with rolling bearing for back-up roll of rolling mill



Lifting tool for rolling bearing assembly

Oil / air lubrication for steelmaking equipment

By improving the lubrication of bearings used in severe environments such as rolling mills and continuous casting machines, JTEKT provides support for these environments.



Long service life of bearings

- Supplying compressed air to bearings greatly reduces the intrusion of coolant.
- Using high-viscosity oil and extreme-pressure oil provides excellent oil film strength.

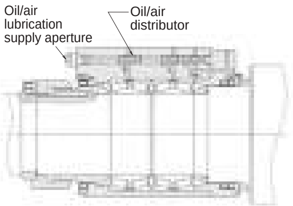
Oil/air lubrication equipment

Compact piping design

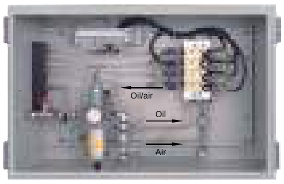
- Products can be provided with small-diameter pipes, which make it easy to design piping around the equipment.
- By using a distributor, it is possible to perform separate distribution within the chock.

Decreased use of lubricating oil

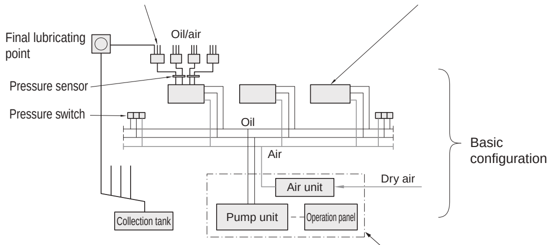
- The amount of oil supplied to the bearings is decreased.
  (1/3 the amount of oil used with oil mist)



Oil/air distributor



Mixing panel



Lubricated object	Rolling mill roll neck bearing Rolling mill auxiliary roll bearing Continuous casting machine guide roll bearing Feed roll bearing, etc.
Tank capacity	From 250 to 2 000 L
Number of lubricating points	1 000 points or more are available
Alarm unit	Respective sections in main unit End of oil and air piping
Lubricated oil q'ty	$Q = 0.085 \cdot d \cdot R / A$ Q : Lubricated oil q'ty cm^3/hour d : Bearing bore diameter mm R : Bearing row number A : Speed coefficient (normally $A = 5$)

Main unit

Handling bearings

This section provides an overview of how to overhaul, assemble, and inspect bearings. We hope this information will be of use to you in maintaining your bearings.

Precautions before opening the package and installing bearings

(1) Do not open the bearing packaging or wrapping until right before you install the bearing.

(2) Make the work area where you will install the bearing as clean as possible, and prevent foreign materials such as trash, dust, and iron powder from adhering to the bearing.

(3) When removing a sealed type bearing from its wooden box, exercise sufficient caution to prevent the oil seal attached to the seal cover from being damaged.

(4) Handle the bearing gently and do not subject it to impacts or shocks.

(5) Thoroughly clean the roll neck and the chock to ensure that no trash or other foreign material is affixed to them.

(6) Sufficiently check that the roll neck diameter and chock inner diameter dimensions are within the permissible tolerances or that the chamfer dimensions of the roll neck diameter and chock inner diameter are the prescribed dimensions before beginning work.

(7) For sealed type bearings that have been stored for a long period of time (3 years or longer), we recommend that you replace the grease with new one.

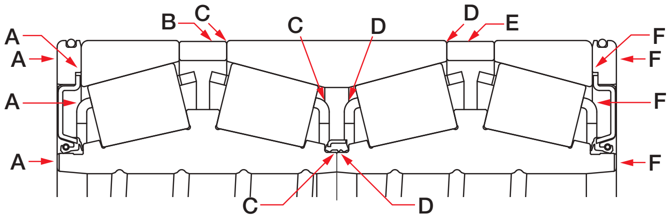
Required tools

Lifting tool	• A tool for lifting the entire bearing assembly • Use this tool when installing the bearing into a chock or when removing the bearing from a chock.
Timber	• Use this tool when putting down the bearing. • This tool can also be used to create a space in which to insert the claws of the lifting tool under the base of the bearing.
Gauge	Use this tool to accurately measure the amount of lubricant to enclose inside a sealed type bearing.
Brass rod	• Use this tool when lightly striking the bearing such as when installing the bearing into a chock or when removing the bearing from a chock. • You can use a plastic hammer or a similar tool as a replacement so long as this tool is soft.

Bearing symbols

In addition to the bearing number, the bearing serial number (combination number) and the row number are also displayed on the bearing.

Assemble the bearing according to these numbers. Mistaking these numbers and assembling the bearing may lead to bearing failure.



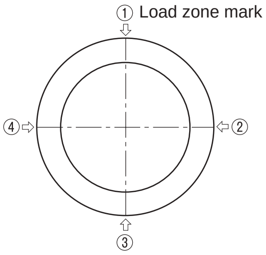
Example VG-10-1

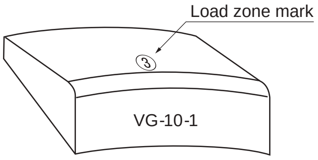
Serial number — Row number

Display position	Number displayed (example)
A	VG-10-1
B	VG-10-1~2
C	VG-10-2
D	VG-10-3
E	VG-10-3~4
F	VG-10-4

Serial number and row number display positions

Load zone marks are displayed on the bearing outside surface. If you change the load zone (the cup loading range) each time that you recombine the bearing after overhauling and cleaning it, you will be able to use the bearing for a longer length of time.





Bearing installation and removal

(1) Open the bearing packaging, and then align the marking-off line displayed on the outside surface of the bearing or the load zone mark with each row.
(2) Check that the oil seal and O-ring are in the correct states.
(3) Fix the bearing in place with a bearing lifting tool like that shown in the figure on the right.
For sealed type bearings, we recommend that you use a lifting tool that makes it easy to install the bearing into a chock.
(4) Apply grease to the bore surface of the chock to enable smooth installation of the bearing.
(5) Check the load zone (first, align load zone No.① [see the figure on the right] with the top of the loading range), and then use the lifting tool and wires along with a hoist or a similar tool to install the bearing into the chock. If the bearing is slanted and can no longer move during the installation, lightly strike the bearing with a brass rod or a similar tool to correct the bearing's orientation. In this situation, be careful to prevent the oil seal from being damaged.
(6) Confirm that the bearing has been installed in the prescribed position, and then remove the lifting tool.
(7) Attach the chock cover to the chock in the same manner as conventional method.
(8) Before mounting the chock, in which the bearing has been installed, into the roll neck, apply a sufficient amount of grease (or a similar lubricant) with molybdenum disulfide to the cone bore and roll neck surfaces.
(9) To remove the bearing, attach the lifting tool to the bearing, and then pull the bearing out from the chock.

Bearing overhaul and inspection interval

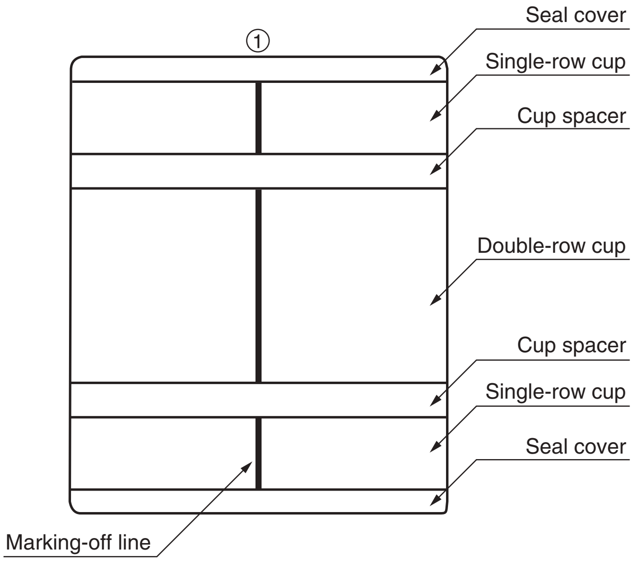
For sealed type bearings, the operating environment varies depending on the type of the rolling mill used and on the stand. It is not possible to determine a uniform interval for the overhaul and inspection (overhaul → cleaning → assembly) of the bearing.

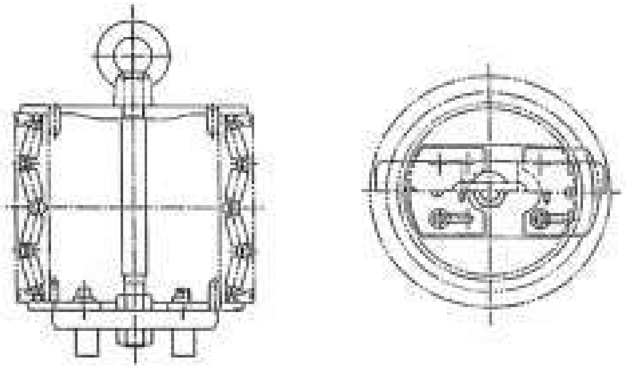
Therefore, in order to determine the period of continuous use, it is necessary to inspect the internal status of the bearing by first setting a short overhaul and inspection interval, and then gradually increasing this interval.

Routine inspections are also necessary.

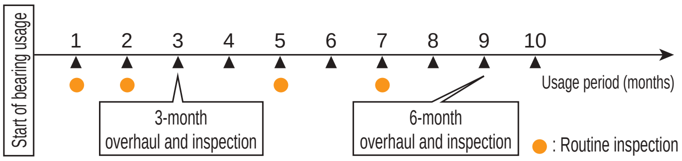
Gradually increase the usage period by changing the overhaul and inspection interval to 3 months and then to 6 months.

After the 6-month overhaul and inspection interval, determine the period of continuous use while observing the status of the bearing.





Bearing lifting tool



Routine inspection

Until the period of continuous use of the bearing is determined, inspect the inside of the bearing by removing the chock cover and just the seal cover and the first row of the cup. Perform this routine inspection between the overhaul and inspection operations. If there are no problems, reassemble the bearing and continue operations. If you find a failure, perform an overhaul and inspection.

Cleaning the bearing

The main points when cleaning the bearing during an overhaul and inspection are shown below.

(1) Before washing the bearing, use your hands or a spatula to remove as much of the grease that has affixed to the bearing as possible.
(2) Separate the washing into two steps: rough washing and finishing washing.

Handling bearings

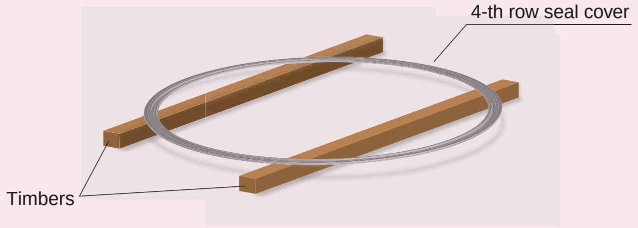
This section provides an overview of how to overhaul, assemble, and inspect bearings.
We hope this information will be of use to you in maintaining your bearings.

Bearing assembly (1)

This section provides the procedure to follow to assemble the bearing after overhauling and cleaning it.

(1) Use an air blower to dry off the washing oil that has affixed to the bearing, and then wipe down the bearing with a rag or similar object.

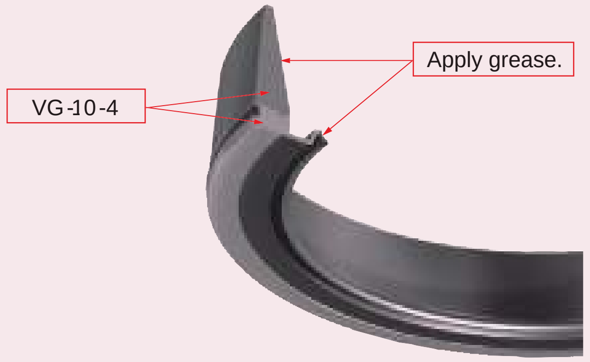
(2) Place the 4th-row seal cover onto two timbers.



(3) Attach the prescribed O-ring to the outside groove of the seal cover.

(4) Place the 4th-row single cup onto the 4th-row seal cover.

(5) Apply bearing sealing grease to the oil seal lip embedded in the seal cover. (For the brand of the grease, see the provided figure.)

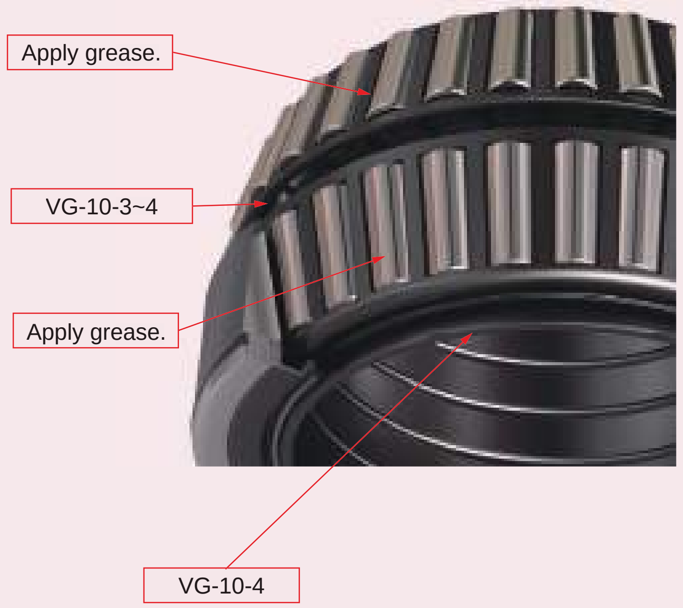


(6) Apply a light layer of bearing sealing grease to the raceway surface of the 4th-row single cup.

(7) Apply approximately 1/3 of the grease for the entire bearing in the space between rollers, the cage, the cone raceway and rib of the cone assembly of the 3rd and 4th rows.
Apply the grease while rotating the rollers and the cage.

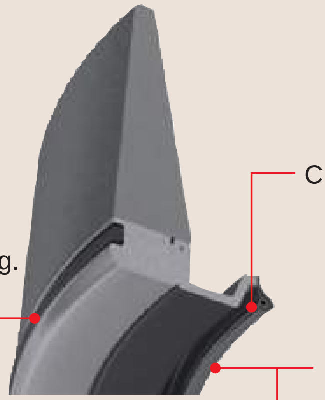
(8) Orient the part so that the 4th row is on the bottom, and then place the cone assembly on top of the 4th-row single cup. In this situation, be careful to prevent the oil seal lip attached to the seal cover from being damaged while you assemble the parts.

(9) Place the 3rd to 4th-row cup spacer on top of the 4th-row single cup. The cup spacer does not have a top or bottom.

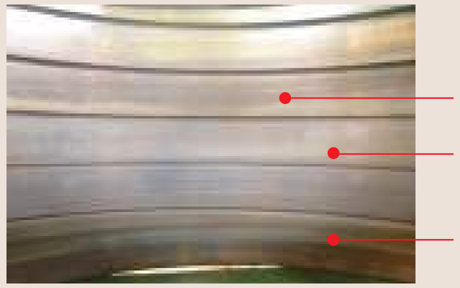


Key points for inspecting parts (1)

Oil seal, O-ring


Check for breaking of the seal lip spring.
Check for breaking of the O-ring.
Check for wear and hardening of the seal lip.
Check for cracking and chipping of the seal lip.

Cone, rollers


Check the degree of wear on the cone bore surface.
Check for rust.
Check for cracking or chipping.


Check for discoloration caused by heat.


Check for scuffing on the roller end faces.

Check the degree of wear on the end face of cone.
Check for heat cracks.

Handling bearings

**This section provides an overview of how to overhaul, assemble, and inspect bearings.
We hope this information will be of use to you in maintaining your bearings.**

Bearing assembly (2)

(10) Apply a light layer of grease to the raceway of the double cup in the 2nd- and 3rd-row.

(11) Orient the part so that the 3rd row of the double cup is on the bottom, and then place this on the cone assembly. Ensure that the load zone marks of the double cup and of the single cup in the 4th-row are aligned.

(12) Attach the oil seal between the cones. Apply bearing sealing grease to the oil seal before attaching it.

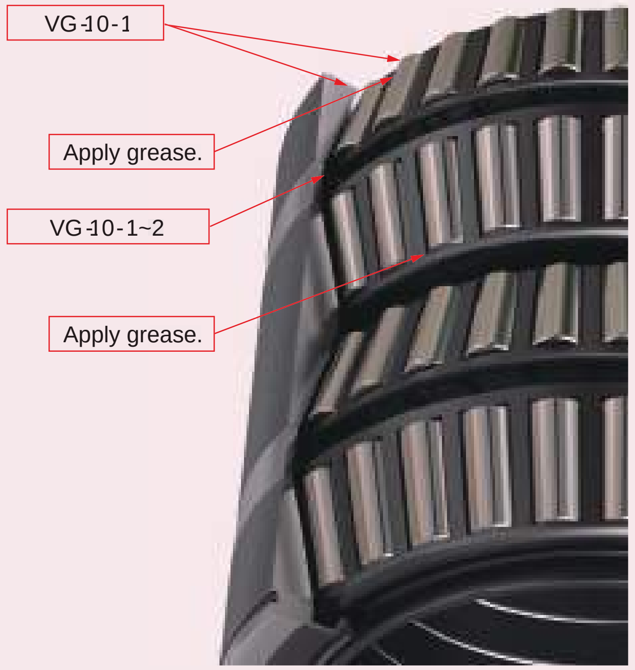
(13) In the same manner as the cone assembly of the 3rd and 4th rows, apply approximately 1/3 of the grease for the entire bearing in the space between rollers, the cage, the cone raceway and rib of the cone assembly of the 1st and 2nd rows. Apply the grease while rotating the rollers and the cage.

(14) Orient the part so that the 2nd row is on the bottom, and then place it on top of the other cone assemblies. Check that the cones are stacked so that there is no space between them.

(15) Place the 1st to 2nd-row cup spacer on top of the assembled parts on the side of the 2nd-row single cup. The cup spacer does not have a top or bottom.

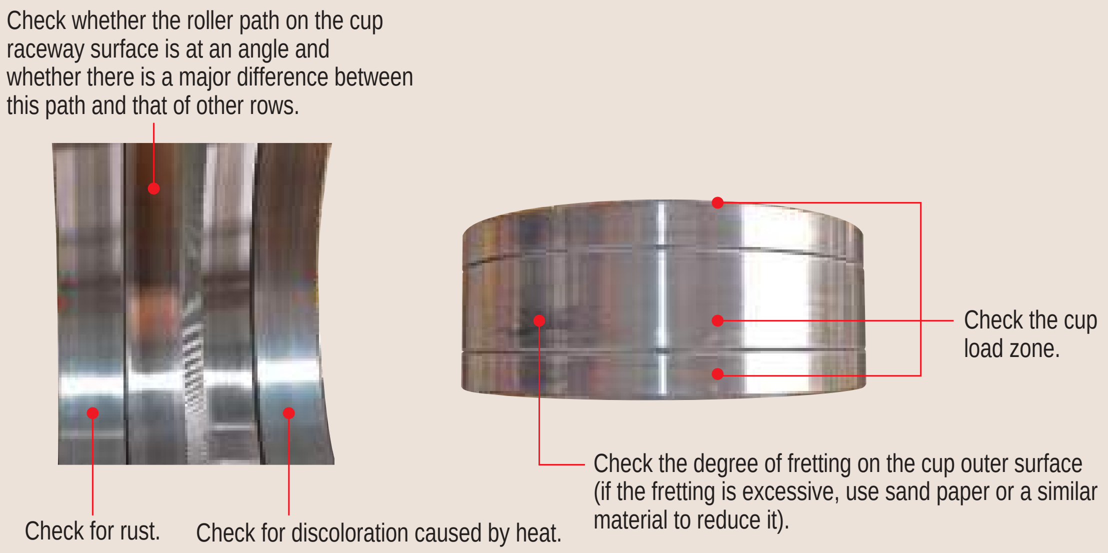
(16) Apply a light layer of grease to the raceway of the single cup in the 1st-row.

(17) Place the 1st-row single cup on top of the 1st to 2nd-row cup spacer. Ensure that the outside surface load zone mark is aligned with the same position of the three other rows.

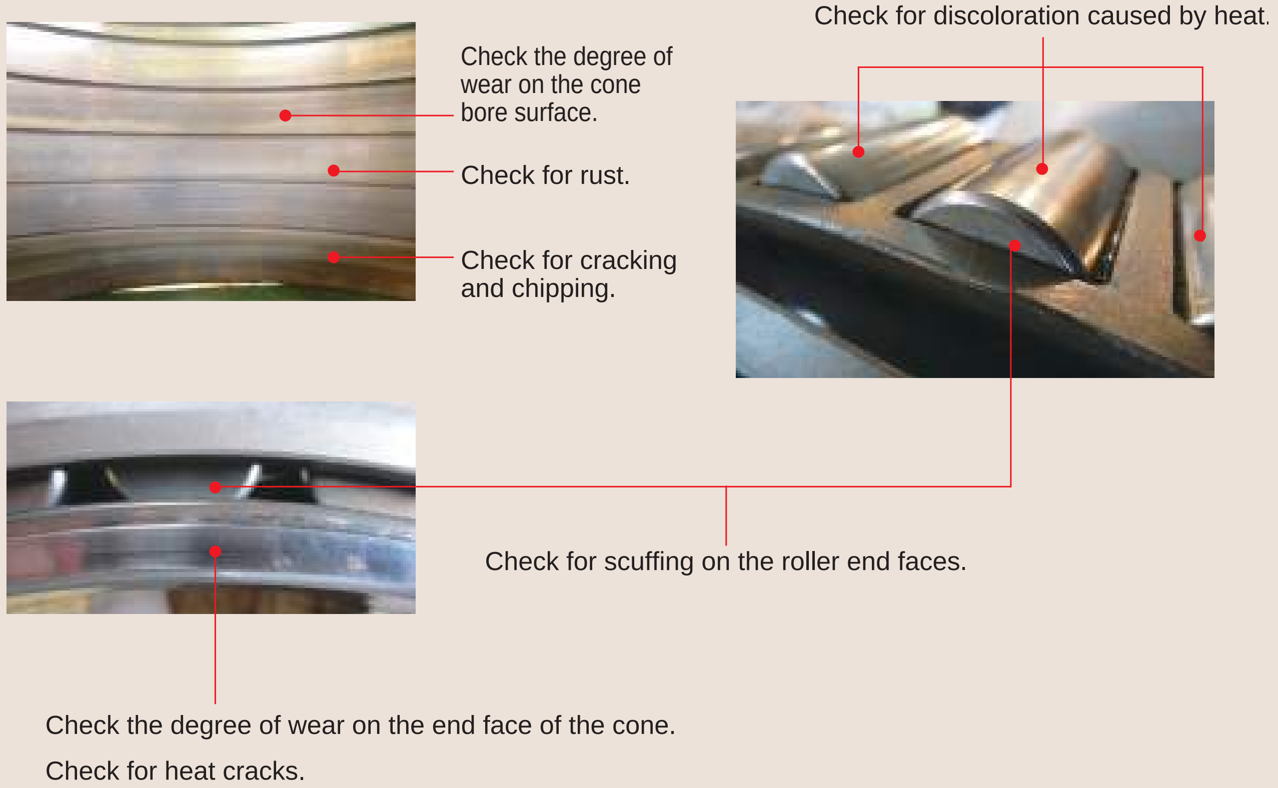


Key points for inspecting parts (2)

Cup



Cone, rollers



Handling bearings

**This section provides an overview of how to overhaul, assemble, and inspect bearings.
We hope this information will be of use to you in maintaining your bearings.**

Bearing assembly (3)

(18) Apply grease to the oil seal lip embedded in the seal cover of the 1st row.

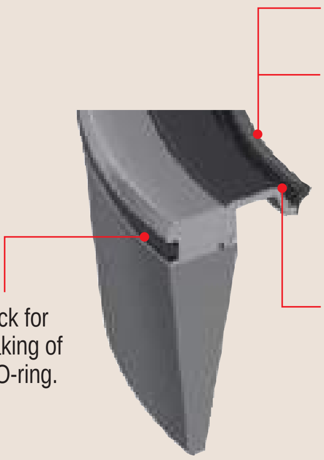
(19) Attach the 1st-row seal cover onto the top of the 1st-row single cup.

(20) Attach the prescribed O-ring to the outside groove of the 1st-row seal cover.

(21) To overhaul the bearing, perform this procedure in the reverse order.

Key points for inspecting parts (3)

Oil seal, O-ring



Check for wear and hardening of the seal lip.

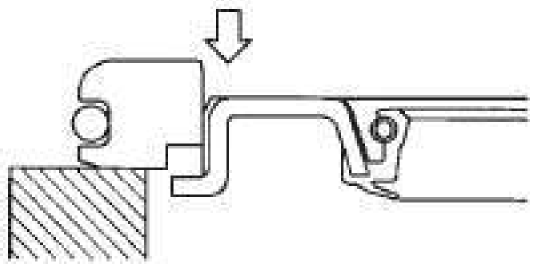
Check for cracking and chipping of the seal lip.

Check for breaking of the O-ring.

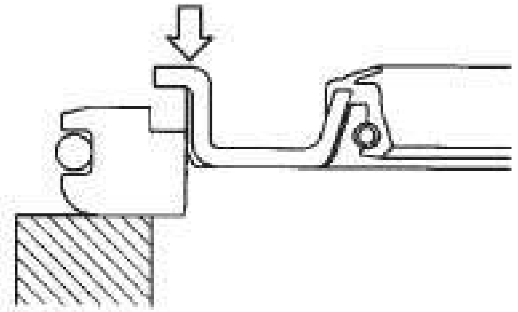
Check for breaking of the seal lip spring.

Attaching and removing the oil seal

(1) To remove the oil seal, strike the side of the oil seal with a hammer or a similar tool.



(2) To attach a new oil seal, apply grease to the outside surface of the oil seal, and then use a support ring or a similar tool to evenly push the oil seal into the seal cover.
Exercise caution when handling the oil seal at this time, as striking it with too much force may lead to deformations.



Bearing failures, causes and countermeasures

Failures | **Characteristics**

1

Flaking

Flaking caused by excessive axial load

(Cones of four-row tapered roller bearing)

Damages

Flaking on bearing raceway surface generated on only rows receiving axial load

Causes

1) Crossed work rolls causing excessive axial load
   - · Roll neck diameter is smaller than the standard one.
   - · Chock side liner is worn.
   - · Inaccuracy of mill stand.
   - · Rigidity of the chock is poor.
   - · Corrosion on liner or clearance generated between the liner and the chock.
   - · Failure of the keeper plate.

Countermeasures

1) Keep the correct locations of the chock and work roll.

(Cup raceway of four-row tapered roller bearing)

Damages

Flaking generated and developed from raceway end face

Causes

1) Looseness of chock cover/excessive axial clearance.
   (As the axial clearance is increased, the loading range becomes narrower, partial load acts, and edge load is generated on the cup raceway.)
2) Excessive axial clearance is generated because of the mixed use of other bearing spacer or cup.

Countermeasures

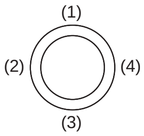
1) Adjust shims, select thickness of shims, measure a gap, and tighten bolts correctly.
2) Use parts of the same number.

Flaking caused by improper mounting

Load zone (1) Load zone (2)

Load zone (3) Load zone (4)

(Cup raceway of four-row tapered roller bearing)



Damages

Flaking on raceway surface with slanted contact

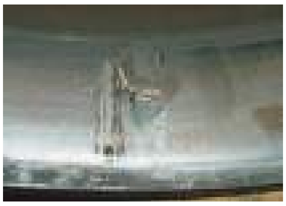
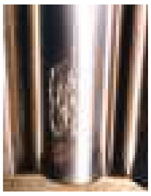
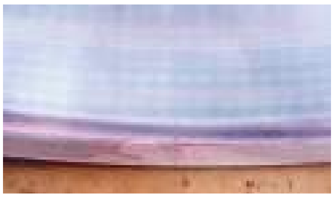
Causes

1) It occurs when the chock is fixed inappropriately and slantingly.
   - · Failure of keeper plate
     Removal, looseness, damage, deformation, bend, unequal tightening, unequal wear, improper parallelism.
   - · Damaged, deformed, or bent chock flange.

Countermeasures

1) Find the cause of damage by periodic inspection of the chock and stand.

Bearing failures, causes and countermeasures

Failures	Characteristics		
1 **Flaking**	**Flaking at corroded start point**  (Cup raceway of four-row tapered roller bearing)	**Damages**	Flaking on raceway surface started from corroded (rusted) portion
		Causes	1) After the bearing was used, it has been left for a long period with moisture mixed in grease. 2) Improper rust preventive treatment after the bearing was washed. 3) Worn or damaged seal lips. 4) Corrosion on the raceway is generated due to the clearance between the roll neck and the sleeve, and flaking occurs with rust.
		Countermeasures	1) Improve seal maintenance and sealing method. Periodically check for wear or damage on the seal lips. 2) Fit the “O” ring between the roll neck and the sleeve. 3) Immediately after the bearing is removed from the chock, change grease. 4) After washing the bearing, remove kerosene and water completely.
	Flaking on nicks (scratch) start point  (Rolling contact surface of four-row cylindrical roller bearing)	**Damages**	Flaking on rolling contact surface with nicks start point
		Causes	1) Inappropriate handling · Mounting / dismounting bearing to / from chock. · Replacing roll.
		Countermeasures	1) Proper handling jig (use of a copper hammer). 2) Prevention of impact load when replacing roll (use of soft material). 3) Improvement in mounting method. 4) Change in raceway chamfering.
	 (Inner ring raceway of double-row cylindrical roller bearing)	**Damages**	Flaking on raceway surface
		Causes	1) Low viscosity oil lubrication (improper lubrication). 2) Ingress of dusts and foreign matters.
		Countermeasures	1) Improvement in viscosity of oil and oil type. 2) Improvement in seal maintenance and sealing method. Periodic check of wear or damage of seal lip. 3) Check of oil filter.
2 **Cracking** **Chipping**	 (Cone side face of four-row tapered roller bearing)	**Damages**	Minute crack on cone side face
		Causes	1) Fix the cone and the roll with a fillet ring (thrust collar). 2) Clearance between the fillet ring (thrust collar) and the cone is excessively small. 3) Area of the side face of nut/slinger contacting the cone side face is too small, the side face is worn due to cone creep, causing heat.
		Countermeasures	1) Keep the clearance between the cone and the fillet ring (thrust collar) (from 0.5 mm to 1.5 mm). 2) Keep the area of the side of fillet ring (thrust collar) (to reduce pressure on the side face). 3) Apply and supply grease of adequate amount.

Failures | **Characteristics**

2

Cracking Chipping

(Rolling contact surface of four-row cylindrical roller bearing)

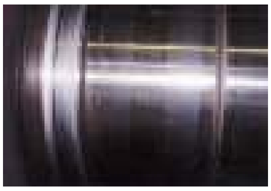
Damages Cracking on rolling elements

Causes

1) Application of load greater than bearing load rating (Load resistance of roller by use of pin type cage)
2) Secondary factor in case of damaged pin of cage (For a reversible mill, pins are broken due to fatigue caused by rapid acceleration and deceleration)
3) Other factors
   - · Ingress of water due to faulty sealing.
   - · Increase of axial clearance of bearing, causing application of partial and excessive load.

Countermeasures

1) Optimal design of bearing considering load and operating conditions (Examination of optimal cage type)
2) Reviewing sealing method and design of strength of cover.



(Inner ring raceway of four-row cylindrical roller bearing)

(Inner ring raceway of four-row cylindrical roller bearing)

Damages Grinding burn or crack on inner ring raceway surface

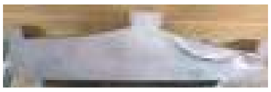
Causes

1) After fitting an inner ring into the roll neck, grinding burn occurs during grinding with the inner ring and the roll.
2) Crack occurs because rollers rolling on the raceway surface of which strength (hardness) is decreased due to grinding burn.

Countermeasures

1) Reviewing grinding conditions Grain size of grinding stone, grinding stone cutting amount, cutting pressure, grinding fluid amount, etc.

(Inner ring of spherical roller bearing)



(Fractured section of inner ring)

Damages Axial crack occurs on bore surface of inner ring and raceway surface.

Causes

1) Excessive interference between inner ring and shaft.
2) Great fit stress due to excessive difference in temperature of inner ring and that of shaft.

Countermeasures

1) Appropriate fit conditions of inner ring and shaft.
2) Appropriate difference in temperature by checking load, rotation, and temperature conditions. (appropriate fit)

(Cone bore surface of four-row tapered roller bearing)

Damages Circumferential crack occurs on bore surface and raceway surface of cone.

Causes

1) Step wear occurs on the shaft (roll neck), and the cone overrides the shaft, causing great bore surface stress.

Countermeasures

1) Provide circumferential groove for the roll neck.
2) When using a bearing with different chamfers for a roll, make the chamfers identical.

Bearing failures, causes and countermeasures

Failures **Characteristics**

2

Cracking Chipping


(Cup raceway of double-row tapered roller bearing)


(Fractured section of cup)

Damages
Axial crack occurs on outside surface and raceway surface of cup.

Causes
1) Excessive axial load.
2) Axial clearance between the bearing and roll is great, and excessive axial load is applied.

Countermeasures
1) Check for axial load.
2) Check the wear condition of counterpart components.
3) Reviewing thickness of the cup


(Shaft race raceway of spherical thrust roller bearing)


(Assembly of spherical thrust roller bearing)

Damages
Crack occurs on shaft race back face rib.

Causes
1) Excessive axial load.
2) Low holding shoulder diameter on the shaft race back face rib.

Countermeasures
1) Reviewing operating conditions.
2) Reviewing dimensions of counterpart collar. (Dimensions allowing backup of shaft race back face rib)

3

Brinelling Nicks


(Double cup raceway surface of four-row tapered roller bearing)


(Rolling contact surface of four-row cylindrical roller bearing)

Damages
1) Brinelling (Nicks) on raceway and rolling contact surfaces (scratch).
2) Brinelling on raceway surface at the same interval as rolling element spacing.

Causes
1) Nicks occur on the raceway and rollers because of improper handling.
   - · Mounting / dismounting bearing to / from chock
   - · Replacing roll
2) Great bending load is applied to the roll neck. (Especially, when faulty rolling occurs)

Countermeasures
1) Proper handling jig (use of a copper hammer).
2) Application of grease to raceway surface of inner and outer rings (cones and cups). (Apply oil if the bearing is the oil lubricated type)
3) Prevention of impact load when replacing roll. (Use of soft material)
4) Roll bending compared to bearing static load rating.
5) Improvement in mounting method.
6) Check for excessive load on the slant chamfer of the raceway surface.

4

Scratch Scuffing


(Roller end face of double-row cylindrical roller bearing)

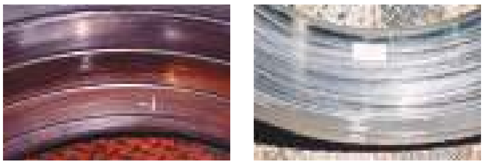

(Outer ring rib of double-row cylindrical roller bearing)


(Roller large end face of double-row tapered roller bearing)

Damages
Scuffing on roller end face, rib of the raceway

Causes
1) Improper lubrication, ingress of foreign matters.
2) Abnormal axial load caused by improper mounting or control of bearing overall thickness.
3) Excessive axial load.
4) Excessive preload.

Countermeasures
1) Selection of appropriate oil type and supply of adequate lubricant.
2) Reviewing bearing mounting location.
3) Reviewing bearing overall thickness control.
4) Reviewing operating conditions.
5) Checking preload.

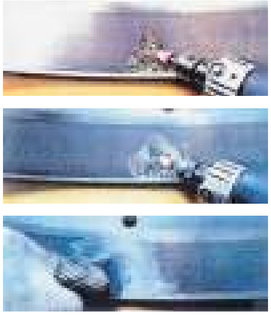
Failures	Characteristics		
5 **Smearing**	 (Cup raceway surface of four-row tapered roller bearing)  (Outer ring raceway surface of spherical roller bearing)  (Outer ring raceway surface of spherical roller bearing)  (Rolling element surface of spherical roller bearing)	**Damages**	Smearing on raceway or rolling contact surface
		Causes	1) Improper lubrication 2) Slip of rolling elements (high speed, light load) 3) Ingress of foreign matters during maintenance
		Countermeasures	1) Selection of appropriate oil type and supply of adequate lubricant 2) Setup of appropriate preload 3) Prevention of ingress of foreign matters
6 **Rust Corrosion**	**Corrosion**  (Cup of four-row tapered roller bearing)  (Cup of four-row tapered roller bearing)	**Damages**	Rust, corrosion on the raceway surface at the same interval as rolling element spacing
		Causes	1) Worn or damaged seal lips 2) Ingress of water or corrosive materials into clearance between roll neck and sleeve
		Countermeasures	1) Improve seal maintenance and sealing method. Periodically check for wear or damage on the seal lips. 2) Fit the "O" ring between the roll neck and the sleeve.
	Rust  (Cup of four-row tapered roller bearing)	**Damages**	Rust on partial or entire surface of bearing
		Causes	1) After the bearing was used, it has been left for a long period with moisture mixed in grease. 2) Improper rust preventive treatment after the bearing was washed.
		Countermeasures	1) Immediately after the bearing is removed from the chock, change grease. 2) After washing the bearing, remove kerosene and water completely.
7 **Creeping**	 (Scuffing on rolling mill roll neck)  (Cone bore surface of four-row tapered roller bearing)	**Damages**	Wear, discoloration, and scuffing due to slip of fitting surface
		Causes	1) Insufficient grease or oil between the cone bore surface and the roll neck outside surface (When creep occurs between the cone and the roll neck, because of loose fit of them.)
		Countermeasures	1) Provide the spiral groove for bore surface of cone 2) When mounting the bearing, apply grease with molybdenum disulfide or EP grease. (Apply oil if the bearing is the oil lubricated type)

Bearing failures, causes and countermeasures

Failures	Characteristics		
8 **Seizure**	 (Rolling contact surface of double-row tapered roller bearing)  (Roller large end face of double-row tapered roller bearing)  (Cone of double-row tapered roller bearing)	**Damages**	Discoloration, deformation, and melting caused by heating in bearing
		Causes	1) Improper lubrication (insufficient or degraded lubricant) 2) Ingress of water due to faulty sealing 3) Excessive axial load 4) Heat generated by creep of cone 5) Ingress of dusts or foreign matters 6) Excessively small bearing internal clearance
		Countermeasures	1) Reviewing sealing type and conditions 2) Reviewing lubricating method and lubricant, and checking lubricated condition 3) Check for axial load 4) Reviewing bearing (type, size, etc.) 5) Reviewing clearance 6) Confirming operating conditions
9 **Failure in lubrication**	 (Cone assembly of four-row tapered roller bearing)	**Damages**	Grease including large quantity of water mixed in
		Causes	1) Operated at high temperature ⇒ Grease is carbonized. 2) Ingress of water due to improper sealing or wear or damage of seal lip (In this example, 20% or more of water is mixed in grease.)
		Countermeasures	1) Find the cause of high temperature. (If the temperature cannot be lowered, review the possibility of change to high temperature grease.) 2) Checking wear or damage of seal lip. Find the cause of and countermeasure against the improper sealing.
	 (Cone assembly of double-row tapered roller bearing)  (Cup of double-row tapered roller bearing)	**Damages**	Foreign matter attachment and corrosion occur because of ingress of a great deal of foreign matters (scale and water for rolling).
		Causes	1) Ingress of water due to improper sealing or wear or damage of seal lip
		Countermeasures	1) Checking wear or damage of seal lip. Find the cause of and countermeasure against the improper sealing.
	 (Four-row tapered roller bearing)	**Damages**	Seizure and adhesion of raceway, roller, and cage
		Causes	1) Varied factors including improper lubrication, improper operation, and ingress of foreign matters occur, causing damages.
		Countermeasures	1) Checking improper operation 2) Checking lubricating conditions 3) Checking degradation of peripheral parts
	 (Outer ring assembly of four-row cylindrical roller bearing)  (Outer ring assembly of four-row cylindrical roller bearing)	**Damages**	Looseness and breaking of pin
		Causes	1) Abnormal load due to vibration occurs. 2) End of cage's service life because of use for a long period
		Countermeasures	1) Checking abnormal vibration 2) Replace if it has been used for a long period.

[Reference]

Repair to portion flaking occurred



❶ **Remove the edges of the portion flaking occurred (with a polishing grinder).**

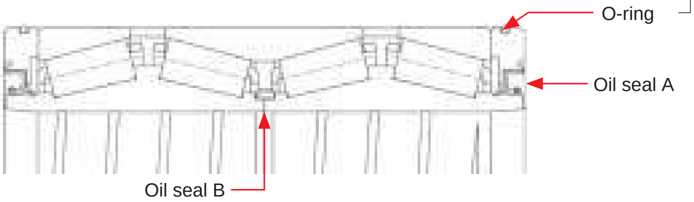
❷ **Finish of the surface of the portion flaking occurred.**

❸ **Finish the surface by lapping the modified portion.**

Modification may not be able to be done depending on the status of the portion flaking occurred. Consult with JTEKT.

Particular cases and damages for sealed type bearing

Checking oil seals and O-rings



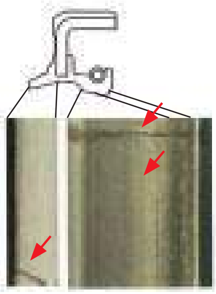
Cut, tearing, and permanent set of O-ring for seal cover

Remedy Replace with new O-rings.

Hardening of oil seal A

Remedy Replacement is recommended.

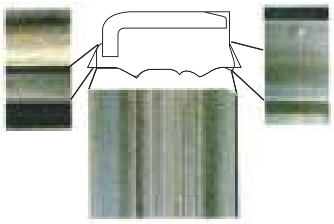
Crack, blister of oil seal A



Remedy ① Replace the oil seal.
(The figure on the left side shows cracks on the sealing lip and minor lip).
② If they occurred in a short period, reviewing operating conditions or examination of change of oil seal material are required.

Abnormal wear to lip of oil seal A

Remedy ① If the interference is restricted, replacement is required.
② When fitting new oil seals, apply grease to the lips generously.



Abnormal wear to side and bore surfaces of oil seal B

Remedy ① If the interference is restricted, replacement is required.
② When fitting new oil seals, apply grease to the side and bore surfaces generously.

Oil seals and O-rings

① Oil seals and O-rings are very important parts to prevent intrusion of water into bearings. Periodic replacement is required, since they are consumables.
② When attaching the oil seal after overhaul and cleaning, be sure to apply grease to the oil seal lips generously.
Service life of seals depends on the grease status.

Technical data

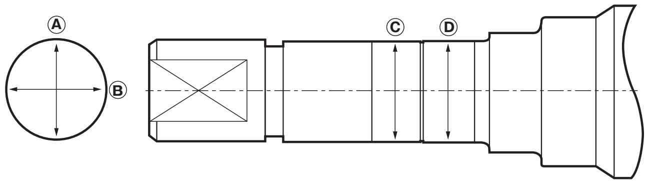
1. Recommended fits for rolling mill roll neck bearing

A roll neck bearing is subject to inner ring rotating load. Its inner ring receives the load on its entire circumference, and the load is applied to the outer ring at only one location.

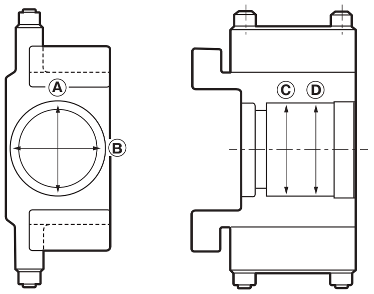
Thus, interference fit is required for the inner ring to prevent any creep, and clearance fit should be used for the outer ring, in principle. For easy attachment, clearance fit has been used for roll neck bearings (because recombination and replacement must be frequently done for roll grinding).

Clearance fit is used for the inner rings of deep groove ball bearings and angular ball bearings used as bearings receiving axial load. Between the outer ring and the chock, adequate clearance should be provided in order to prevent any radial load applied to the outer ring.

Tables 1-1 through 1-4 show the recommended fits for roll neck bearings.



Roll neck



Chock

* For Ⓒ and Ⓓ, measure the dimensions in the Ⓐ and Ⓑ directions.

Table 1-1 Recommended fits for roll neck metric series four-row tapered roller bearing

Double cone and roll neck (shaft)							Cup and chock (housing)							
Nominal bore diameter d mm		Single plane mean bore diameter deviation Δ_{dmp} μm		Roll neck diameter deviation μm		Minimum allowable roll neck diameter wear μm	Nominal outside diameter D mm		Single plane mean outside diameter deviation Δ_{Dmp} μm		Chock bore diameter deviation μm		Maximum allowable chock bore (wear) μm	Maximum roundness μm
over	up to	upper	lower	upper	lower		over	up to	upper	lower	upper	lower		
80	**120**	0	– 20	–120	–150	–300	**120**	**150**	0	– 20	+ 57	+ 25	+150	75
120	**180**	0	– 25	–150	–175	–350	**150**	**180**	0	– 25	+100	+ 50	+250	100
180	**250**	0	– 30	–175	–200	–400	**180**	**250**	0	– 30	+120	+ 50	+300	150
250	**315**	0	– 35	–210	–250	–500	**250**	**315**	0	– 35	+115	+ 50	+300	150
315	**400**	0	– 40	–240	–300	–600	**315**	**400**	0	– 40	+110	+ 50	+300	150
400	**500**	0	– 45	–245	–300	–600	**400**	**500**	0	– 45	+105	+ 50	+300	150
500	**630**	0	– 50	–250	–300	–600	**500**	**630**	0	– 50	+100	+ 50	+300	150
630	**800**	0	– 75	–325	–400	–800	**630**	**800**	0	– 75	+150	+ 75	+450	200
800	**1 000**	0	–100	–350	–425	–900	**800**	**1 000**	0	–100	+150	+ 75	+500	250
1 000	**1 250**	0	–125	–425	–500	–900	**1 000**	**1 250**	0	–125	+175	+100	+600	300
1 250	**1 600**	0	–160	–510	–600	–900	**1 250**	**1 600**	0	–160	+215	+125	+750	350
							1 600	**2 000**	0	–200	+250	+150	+750	350

Table 1-2 Recommended fits for roll neck inch series four-row tapered roller bearing

Double cone and roll neck (shaft)							Cup and chock (housing)							
Nominal bore diameter *d* mm (1/25.4)		Single bore diameter deviation Δ_{ds} μm		Roll neck diameter deviation μm		Minimum allowable roll neck diameter wear μm	Nominal outside diameter *D* mm (1/25.4)		Single outside diameter deviation Δ_{Ds} μm		Chock bore diameter deviation μm		Maximum allowable chock bore (wear) μm	Maximum roundness μm
over	up to	upper	lower	upper	lower		over	up to	upper	lower	upper	lower		
76.2 (3.0)	**101.6** (4.0)	+ 25	0	− 75	−100	−250	–	**304.8** (12.0)	+ 25	0	+ 75	+ 50	+150	150
101.6 (4.0)	**127.0** (5.0)	+ 25	0	−100	−125	−300	**304.8** (12.0)	**609.6** (24.0)	+ 51	0	+150	+100	+300	150
127.0 (5.0)	**152.4** (6.0)	+ 25	0	−125	−150	−350	**609.6** (24.0)	**914.4** (36.0)	+ 76	0	+225	+150	+450	150
152.4 (6.0)	**203.2** (8.0)	+ 25	0	−150	−175	−400	**914.4** (36.0)	**1 219.2** (48.0)	+102	0	+300	+200	+600	300
203.2 (8.0)	**304.8** (12.0)	+ 25	0	−175	−200	−450	**1 219.2** (48.0)	**1 524.0** (60.0)	+127	0	+375	+250	+750	350
304.8 (12.0)	**609.6** (24.0)	+ 51	0	−200	−250	−600	**1 524.0** (60.0)		+127	0	+450	+300	+750	350
609.6 (24.0)	**914.4** (36.0)	+ 76	0	−250	−325	−800								
914.4 (36.0)	**1 219.2** (48.0)	+102	0	−300	−400	−800								
1 219.2 (48.0)		+127	0	−375	−475	−800								

Table 1-3 Recommended fits for roll neck four-row cylindrical roller bearing (inner ring interference fit)

Inner ring and roll neck (shaft)						Outer ring and chock (housing)					
Nominal bore diameter *d* mm		Single plane mean bore diameter deviation Δ_{ds} μm		Roll neck diameter deviation μm		Nominal outside diameter *D* mm		Single plane mean outside diameter deviation Δ_{Ds} μm		Chock bore diameter deviation μm	
over	up to	upper	lower	upper	lower	over	up to	upper	lower	upper	lower
80	**120**	0	− 20	+ 59	+ 37 (p6)	**120**	**150**	0	− 18	+ 40	0 (H7)
120	**180**	0	− 25	+ 68	+ 43 (p6)	**150**	**180**	0	− 25	+ 40	0 (H7)
180	**250**	0	− 30	+ 79	+ 50 (p6)	**180**	**250**	0	− 30	+ 46	0 (H7)
250	**280**	0	− 35	+126	+ 94 (r6)	**250**	**315**	0	− 35	+ 52	0 (H7)
280	**315**	0	− 35	+130	+ 98 (r6)						
315	**355**	0	− 40	+144	+108 (r6)	**315**	**400**	0	− 40	+ 75	+ 18 (G7)
355	**400**	0	− 40	+150	+114 (r6)						
400	**450**	0	− 45	+166	+126 (r6)	**400**	**500**	0	− 45	+ 83	+ 20 (G7)
450	**500**	0	− 45	+172	+132 (r6)						
500	**560**	0	− 50	+194	+150 (r6)	**500**	**630**	0	− 50	+ 92	+ 22 (G7)
560	**630**	0	− 50	+354	+310 (s6)						
630	**710**	0	− 75	+390	+340 (s6)	**630**	**800**	0	− 75	+160	+ 80 (F7)
710	**800**	0	− 75	+430	+380 (s6)						
800	**900**	0	−100	+486	+430 (s6)	**800**	**1 000**	0	−100	+176	+ 86 (F7)
900	**1 000**	0	−100	+526	+470 (s6)						
1 000	**1 120**	0	−125	+588	+520 (s6)	**1 000**	**1 250**	0	−125	+203	+ 98 (F7)
1 120	**1 250**	0	−125	+646	+580 (s6)						
						1 250	**1 400**	0	−160	+235	+110 (F7)
						1 400	**1 600**	0	−160	+345	+220 (E7)

[Remark] The table above shows general values. JTEKT determines recommended fit on a case by case basis according to bearing materials and operating conditions to prevent the inner ring from creeping. Consult with JTEKT when referring to this table.

Table 1-4 Recommended fits of bearing types for support of axial loading

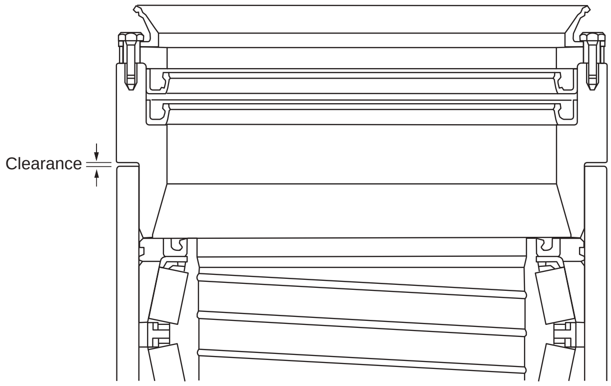
Bearing type	Inner ring and roll neck (shaft)	Outer ring and chock (housing)	
	Shaft tolerance range class	Mounted to chock	Mounted to sleeve
		Chock bore tolerance range class	Sleeve bore tolerance range class
Double row tapered roller bearing (bearings for support of axial loading) ··· TDIS type	e6 or f6	Nominal chock bore (mm) = Outer ring outer dia. + [0.5 to 1.0] H8	G7

[Remarks] 1) When installing a sleeve, clearance of 0.5 mm or more should be provided between the outer diameter of the sleeve and the bore of the chock.

2) When using an oil film bearing with a radial bearing, the information shown here does not cover all cases.

Technical data

1-1. Cork shim selection table and bolt tightening torque (reference)



Cork shim

Table 1-5 Cork shim selection table (reference)

Unit : mm

Measured clearance		Shim thickness	Shim combination
over	up to		
	0.95	1.0	1.0
0.95	1.25	1.5	1.5
1.25	1.65	2.0	2.0
1.65	2.0	2.5	1.0 + 1.5
2.0	2.4	3.0	1.0 + 2.0
2.4	2.8	3.5	1.5 + 2.0
2.8	3.2	4.0	2.0 + 2.0
3.2	3.6	4.5	1.0 + 1.5 + 2.0
3.6	4.0	5.0	1.0 + 2.0 + 2.0
4.0	4.5	5.5	1.5 + 2.0 + 2.0

Table 1-6 Bolt tightening torque (reference)

Bolt size	Interval mm	Tightening torque1)	
		kgf·m	N·m
M24	3	84 ± 5	825 ± 50
M27	3	125 ± 7	1230 ± 70
M30	3.5	170 ± 10	1670 ± 100
M33	3.5	230 ± 15	2260 ± 150
M36	4	290 ± 15	2840 ± 150
M39	4	380 ± 20	3730 ± 200
M42	4.5	470 ± 30	4610 ± 300
M45	4.5	590 ± 30	5790 ± 300
M48	5	710 ± 40	6960 ± 400
M52	5	920 ± 50	9020 ± 500

[Note] 1) The values shown are those when using bolts with JIS strength classification 10.9.

2. Tolerances

2-1. Four-row cylindrical roller bearings

[Applicable tolerance for cylindrical roller bearings]

Type of cylindrical roller bearings	Applicable tolerance
Four-row cylindrical bore bearings	Class 0, class 6, class 5 of JIS B 1514
Four-row tapered bore bearings	Class 0, class 6 of JIS B 1514 (Refer to Table 2-2)

Table 2-1 Tolerances of roller set bore diameter and roller set outside diameter of interchangeable bearings

Unit : µm

Nominal bore diameter d(mm)		Roller set bore diameter deviation Δ_{Fw}		Roller set outside diameter deviation Δ_{Ew}	
over	up to	upper	lower	upper	lower
50	**120**	+ 20	0	0	− 20
120	**200**	+ 25	0	0	− 25
200	**250**	+ 30	0	0	− 30
250	**315**	+ 35	0	0	− 35
315	**400**	+ 40	0	0	− 40
400	**500**	+ 45	0	0	− 45
500	**600**	+ 50	0	0	− 50
600	**700**	+ 55	0	0	− 55
700	**800**	+ 60	0	0	− 60
800	**900**	+ 70	0	0	− 70
900	**1 000**	+ 80	0	0	− 80
1 000	**1 250**	+ 90	0	0	− 90
1 250	**1 600**	+100	0	0	−100
1 600	**2 000**	+120	0	0	−120
2 000	**2 500**	+150	0	0	−150

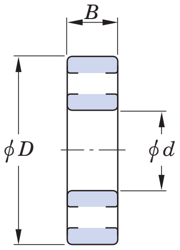
[Remark] Interchangeable bearings have an inner ring with rollers that can be matched with the outer ring, or an outer ring with rollers that can be matched with the inner ring, without affecting performance in the bearing that has the same bearing number in one category.

Table 2-2 (1) Radial bearing tolerances (tapered roller bearings excluded) = JIS B 1514-1 =

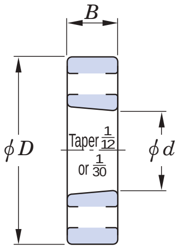
(1) Inner ring (bore diameter)

Unit : μm

Nominal bore diameter d mm		Single plane mean bore diameter deviation $\Delta_{d\mathrm{mp}}$						Single plane bore diameter variation $V_{d\mathrm{sp}}$						Mean bore diameter variation $V_{d\mathrm{mp}}$		
								Diameter series 0, 1			Diameter series 2, 3, 4					
		class 0		class 6		class 5		class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 5
over	up to	upper	lower	upper	lower	upper	lower	max.			max.			max.		
120	**150**	0	– 25	0	–18	0	–13	31	23	10	19	14	10	19	14	7
150	**180**	0	– 25	0	–18	0	–13	31	23	10	19	14	10	19	14	7
180	**250**	0	– 30	0	–22	0	–15	38	28	12	23	17	12	23	17	8
250	**315**	0	– 35	0	–25	0	–18	44	31	14	26	19	14	26	19	9
315	**400**	0	– 40	0	–30	0	–23	50	38	18	30	23	18	30	23	12
400	**500**	0	– 45	0	–35	*0*	*–28*	56	44	21	34	26	*21*	34	26	*14*
500	**630**	0	– 50	0	–40	*0*	*–35*	63	50	*26*	38	30	*26*	38	30	*18*
630	**800**	0	– 75	*0*	*–50*	*0*	*–45*	*94*	*63*	*34*	*56*	*38*	*34*	*56*	*38*	*23*
800	**1 000**	0	–100	*0*	*–60*	*0*	*–60*	*125*	*75*	*45*	*75*	*45*	*45*	*75*	*45*	*30*
1 000	**1 250**	0	–125	*0*	*–75*	*0*	*–75*	*156*	*94*	*56*	*94*	*56*	*56*	*94*	*56*	*38*
1 250	**1 600**	0	–160	–	–	–	–	*200*	–	–	*120*	–	–	*120*	–	–
1 600	**2 000**	0	–200	–	–	–	–	*250*	–	–	*150*	–	–	*150*	–	–



Cylindrical bore



Tapered bore

(2) Inner ring (running accuracy and width)

Unit : μm

Nominal bore diameter d mm		Radial runout of assembled bearing inner ring K_{ia}			S_{d}	Single inner ring width deviation $\Delta_{B\mathrm{s}}$						Single inner ring width deviation $\Delta_{B\mathrm{s}}$[1]						Inner ring width variation $V_{B\mathrm{s}}$		
		class 0	class 6	class 5	class 5	class 0		class 6		class 5		class 0 [2]		class 6 [2]		class 5 [2]		class 0	class 6	class 5
over	up to	max.			max.	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.		
120	**150**	30	18	8	10	0	– 250	0	– 250	0	– 250	0	–500	0	–500	0	–380	30	30	8
150	**180**	30	18	8	10	0	– 250	0	– 250	0	– 250	0	–500	0	–500	0	–380	30	30	8
180	**250**	40	20	10	11	0	– 300	0	– 300	0	– 300	0	–500	0	–500	0	–500	30	30	10
250	**315**	50	25	13	13	0	– 350	0	– 350	0	– 350	0	–500	0	–500	0	–500	35	35	13
315	**400**	60	30	15	15	0	– 400	0	– 400	0	– 400	0	–630	0	–630	0	–630	40	40	15
400	**500**	65	35	*20*	*18*	0	– 450	0	– 450	*0*	*– 450*	–	–	–	–	–	–	50	45	*18*
500	**630**	70	40	*25*	*25*	0	– 500	0	– 500	*0*	*– 500*	–	–	–	–	–	–	60	50	*20*
630	**800**	80	*50*	*30*	*30*	0	– 750	*0*	*– 750*	*0*	*– 750*	–	–	–	–	–	–	70	*60*	*23*
800	**1 000**	90	*60*	*40*	*40*	0	–1 000	*0*	*–1 000*	*0*	*–1 000*	–	–	–	–	–	–	80	*60*	*35*
1 000	**1 250**	100	*70*	*50*	*50*	0	–1 250	*0*	*–1 250*	*0*	*–1 250*	–	–	–	–	–	–	100	*60*	*45*
1 250	**1 600**	120	–	–	–	0	–1 600	–	–	–	–	–	–	–	–	–	–	120	–	–
1 600	**2 000**	140	–	–	–	0	–2 000	–	–	–	–	–	–	–	–	–	–	140	–	–

S_{d} : perpendicularity of inner ring face with respect to the bore

[Notes] 1) These shall be appplied to individual bearing rings manufactured for matched pair or stack bearings.
2) Also applicable to the inner ring with tapered bore of $d \geqq 50$ mm.

[Remark] Values in Italics are prescribed in JTEKT standards.

Table 2-2 (2) Radial bearing tolerances (tapered roller bearings excluded)

(3) Outer ring (outside diameter)

Unit : μm

Nominal outside dia. D mm		Single plane mean outside diameter deviation Δ_{Dmp}						Single plane outside diameter variation V_{Dsp}						Mean outside diameter variation V_{Dmp}		
								Diameter series 0, 1			Diameter series 2, 3, 4					
		class 0		class 6		class 5		class 0 1)	class 6 1)	class 5	class 0 1)	class 6 1)	class 5	class 0 1)	class 6 1)	class 5
over	up to	upper	lower	upper	lower	upper	lower	max.			max.			max.		
150	**180**	0	– 25	0	– 18	0	–13	31	23	10	19	14	10	19	14	7
180	**250**	0	– 30	0	– 20	0	–15	38	25	11	23	15	11	23	15	8
250	**315**	0	– 35	0	– 25	0	–18	44	31	14	26	19	14	26	19	9
315	**400**	0	– 40	0	– 28	0	–20	50	35	15	30	21	15	30	21	10
400	**500**	0	– 45	0	– 33	0	–23	56	41	17	34	25	17	34	25	12
500	**630**	0	– 50	0	– 38	0	–28	63	48	21	38	29	21	38	29	14
630	**800**	0	– 75	0	– 45	0	–35	94	56	26	55	34	26	55	34	18
800	**1 000**	0	–100	0	– 60	*0*	*–50*	125	75	*38*	75	45	*38*	75	45	*25*
1 000	**1 250**	0	–125	*0*	*– 75*	*0*	*–63*	*156*	*94*	*47*	*94*	*56*	*47*	*94*	*56*	*31*
1 250	**1 600**	0	–160	*0*	*– 90*	*0*	*–80*	*200*	*113*	*60*	*120*	*68*	*60*	*120*	*68*	*40*
1 600	**2 000**	0	–200	*0*	*–120*	–	–	*250*	*150*	–	*150*	*90*	–	*150*	*90*	–
2 000	**2 500**	0	–250	–	–	–	–	*313*	–	–	*188*	–	–	*188*	–	–

(4) Outer ring (running accuracy and width)

Unit : μm

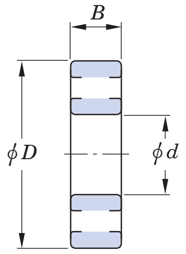
Nominal outside dia. D mm		Radial runout of assembled bearing outer ring K_{ea}			S_D 2)	S_{ea} 2)
		class 0	class 6	class 5	class 5	class 5
over	up to	max.			max.	max.
150	**180**	45	23	13	10	14
180	**250**	50	25	15	11	15
250	**315**	60	30	18	13	18
315	**400**	70	35	20	13	20
400	**500**	80	40	23	15	23
500	**630**	100	50	25	18	25
630	**800**	120	60	30	20	30
800	**1 000**	140	75	*40*	*23*	*40*
1 000	**1 250**	160	*85*	*45*	*30*	*45*
1 250	**1 600**	190	*95*	*60*	*45*	*60*
1 600	**2 000**	220	*110*	–	–	–
2 000	**2 500**	250	–	–	–	–

S_D : perpendicularity of outer ring outside surface with respect to the face
S_{ea} : axial runout of assembled bearing outer ring

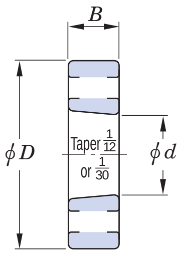
[Notes]

1) Shall be applied when locating snap ring is not fitted.
2) These shall not be applied to flanged bearings.

[Remark]
Values in Italics are prescribed in JTEKT standards.



Cylindrical bore



Tapered bore

d : nominal bore diameter
D : nominal outside diameter
B : nominal assembled bearing width

2-2. Tapered roller bearings

[Applicable tolerance for tapered roller bearings]

Type of tapered roller bearings			Applicable tolerance[1]
Double-row · Four-row	Metric series	45200, 45300, 46200 (A), 46300 (A) 46T30200JR, 46T32200JR, 46T30300JR, 46T32300JR 37200, 47200, 47300	Class 0 of BAS 1002 (Refer to Table 2-3 on page 30)
	Inch series	LM377449D/LM377410, 67388/67322D EE127094D/127138/127139D etc.	Class 4 of ABMA 19 (Refer to Table 2-4 on page 31)
	The others	45T···, 46T···, 47T···, 2TR···, 4TR···	Special tolerances for required are used in many cases. Consult with JTEKT.

[Note] 1) Consult with JTEKT if a higher tolerance class than that shown in this table is necessary.

Table 2-3 Tolerances for metric series double-row and four-row tapered roller bearings (class 0)

= BAS 1002 =

(1) Cone, cup width and overall width

Unit : μm

Nominal bore diameter d mm		Single plane mean bore diameter deviation Δ_{dmp}		Single plane bore diameter variation V_{dsp}	Mean bore diameter variation V_{dmp}	K_{ia}	Single cup or cone width deviation Δ_{Bs}, Δ_{Cs}		Actual overall cones/cups width deviation Double-row Δ_{Ts}		Actual overall cones/cups width deviation Four-row Δ_{Ts}, Δ_{Ws}	
over	up to	upper	lower	max.	max.	max.	upper	lower	upper	lower	upper	lower
120	**180**	0	– 25	25	19	35	0	– 250	+ 500	– 500	+ 600	– 600
180	**250**	0	– 30	30	23	50	0	– 300	+ 600	– 600	+ 750	– 750
250	**315**	0	– 35	35	26	60	0	– 350	+ 700	– 700	+ 900	– 900
315	**400**	0	– 40	40	30	70	0	– 400	+ 800	– 800	+1 000	–1 000
400	**500**	0	– 45	45	34	80	0	– 450	+ 900	– 900	+1 200	–1 200
500	**630**	0	– 60	60	40	90	0	– 500	+1 000	–1 000	+1 200	–1 200
630	**800**	0	– 75	75	45	100	0	– 750	+1 500	–1 500	–	–
800	**1 000**	0	–100	100	55	115	0	–1 000	+1 500	–1 500	–	–

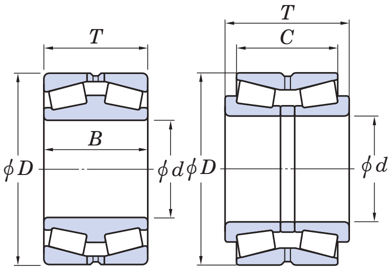
K_{ia} : radial runout of assembled bearing cone

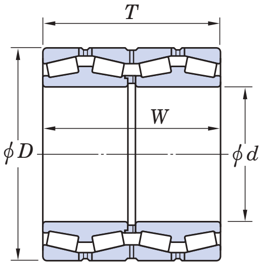
(2) Cup

Unit : μm

Nominal outside diameter D mm		Single plane mean outside diameter deviation Δ_{Dmp}		Single plane outside diameter variation V_{Dsp}	Mean outside diameter variation V_{Dmp}	K_{ea}
over	up to	upper	lower	max.	max.	max.
150	**180**	0	– 25	25	19	45
180	**250**	0	– 30	30	23	50
250	**315**	0	– 35	35	26	60
315	**400**	0	– 40	40	30	70
400	**500**	0	– 45	45	34	80
500	**630**	0	– 50	60	38	100
630	**800**	0	– 75	80	55	120
800	**1 000**	0	–100	100	75	140
1 000	**1 250**	0	–125	130	90	160
1 250	**1 600**	0	–160	170	100	180

K_{ea} : radial runout of assembled bearing cup





d : nominal bore diameter
D : nominal outside diameter
B : nominal double cone width
C : nominal double cup width
T, W : nominal overall width of cups (cones)

Table 2-4 Tolerances and permissible values for inch series tapered roller bearings = ABMA 19 =

(1) Cone

Unit : μm

Applied bearing type	Nominal bore diameter d, mm **(1/25.4)**		Deviation of a single bore diameter Δ_{ds}							
			Class 4		**Class 2**		**Class 3**		**Class 0**	
	over	up to	upper	lower	upper	lower	upper	lower	upper	lower
All types	–	**76.2** (3.0)	+13	0	+13	0	+13	0	+13	0
	76.2 (3.0)	**266.7** (10.5)	+25	0	+25	0	+13	0	+13	0
	266.7 (10.5)	**304.8** (12.0)	+25	0	+25	0	+13	0	+13	0
	304.8 (12.0)	**609.6** (24.0)	+51	0	+51	0	+25	0	–	–
	609.6 (24.0)	**914.4** (36.0)	+76	0	–	–	+38	0	–	–
	914.4 (36.0)	**1 219.2** (48.0)	+102	0	–	–	+51	0	–	–
	1 219.2 (48.0)	–	+127	0	–	–	+76	0	–	–

(2) Cup

Unit : μm

Applied bearing type	Nominal outside diameter D, mm **(1/25.4)**		Deviation of a single outside diameter Δ_{Ds}							
			Class 4		**Class 2**		**Class 3**		**Class 0**	
	over	up to	upper	lower	upper	lower	upper	lower	upper	lower
All types	–	**266.7** (10.5)	+25	0	+25	0	+13	0	+13	0
	266.7 (10.5)	**304.8** (12.0)	+25	0	+25	0	+13	0	+13	0
	304.8 (12.0)	**609.6** (24.0)	+51	0	+51	0	+25	0	–	–
	609.6 (24.0)	**914.4** (36.0)	+76	0	+76	0	+38	0	–	–
	914.4 (36.0)	**1 219.2** (48.0)	+102	0	–	–	+51	0	–	–
	1 219.2 (48.0)	–	+127	0	–	–	+76	0	–	–

(3) Radial runout of assembled bearing cone/cup

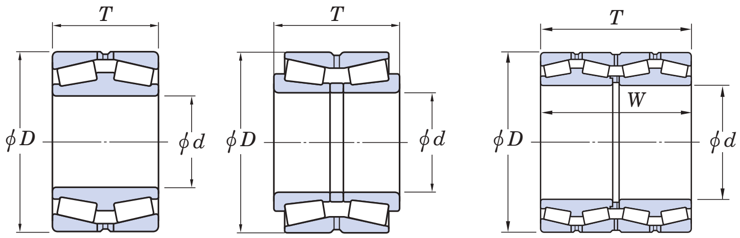
Unit : μm

Applied bearing type	Nominal outside diameter D, mm **(1/25.4)**		Radial runout of cone/cup K_{ia} , K_{ea}			
			Class 4	**Class 2**	**Class 3**	**Class 0**
	over	up to	max.	max.	max.	max.
All types	–	**266.7** (10.5)	51	38	8	4
	266.7 (10.5)	**304.8** (12.0)	51	38	8	4
	304.8 (12.0)	**609.6** (24.0)	51	38	18	–
	609.6 (24.0)	**914.4** (36.0)	76	51	51	–
	914.4 (36.0)	**1 219.2** (48.0)	76	–	76	–
	1 219.2 (48.0)	–	76	–	76	–

(4) Assembled bearing width and overall width

Unit : μm

Applied bearing type	Nominal bore diameter d, mm **(1/25.4)**		Nominal outside diameter D, mm **(1/25.4)**		Deviation of the actual bearing width and overall width of cones/cups Δ_{Ts}, Δ_{Ws}							
					Class 4		Class 2		Class 3		Class 0	
	over	up to	over	up to	upper	lower	upper	lower	upper	lower	upper	lower
Double-row	–	**101.6** (4.0)	–	–	+ 406	0	+ 406	0	+ 406	– 406	+ 406	– 406
	101.6 (4.0)	**266.7** (10.5)	–	–	+ 711	– 508	+ 406	– 203	+ 406	– 406	+ 406	– 406
	266.7 (10.5)	**304.8** (12.0)	–	–	+ 711	– 508	+ 406	– 203	+ 406	– 406	+ 406	– 406
	304.8 (12.0)	**609.6** (24.0)	–	**508.0** (20.0)	–	–	+ 762	– 762	+ 406	– 406	–	–
	304.8 (12.0)	**609.6** (24.0)	**508.0** (20.0)	–	–	–	+ 762	– 762	+ 762	– 762	–	–
	609.6 (24.0)		–	–	+ 762	– 762	–	–	+ 762	– 762	–	–
Double-row (TNA type)	–	**127.0** (5.0)	–	–	–	–	+ 254	0	+ 254	0	–	–
	127.0 (5.0)		–	–	–	–	+ 762	0	+ 762	0	–	–
Four-row	Total dimensional range		–	–	+1 524	–1 524	+1 524	–1 524	+1 524	–1 524	+1 524	–1 524



d : nominal bore diameter
D : nominal outside diameter
T, W : nominal assembled bearing width and nominal overall width of cups (cones)

Large size bearing technology development center

At JTEKT, we continue to develop our operations as a global system supplier that can solve the problems of our customers and that can provide our customers with new products based on our accumulated knowledge and having high added value.

Regarding large bearings used in the field of industrial machinery, up to now it was common to perform theoretical examinations, to perform basic evaluations, and to have these bearings evaluated by our customers with using the bearings on actual equipment. As a result, issues such as unexpected problems and extended development time occurred.

At JTEKT, we have established the Large Size Bearing Technology Development Center and we have begun work at this center, which enables us to perform evaluations in which the environments closely resemble those of the actual machines.

The data that we accumulate here will be put to use in improving the accuracy of our CAE analysis (simulation analysis), in greatly reducing the development time of future products, and in developing new products with high added value.

■ Test devices for bearings used in steelmaking equipment

In order to closely approximate the use conditions of actual machinery, this test equipment enables evaluations with spraying water for rolling and under high temperatures. This enables us to proceed with the development of new products having even higher reliability by giving consideration to bearings and oil seals as a complete package.

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Koyo®

Drive shafts for steel production/ industrial equipment

CAT.NO.UA002EN-0MY

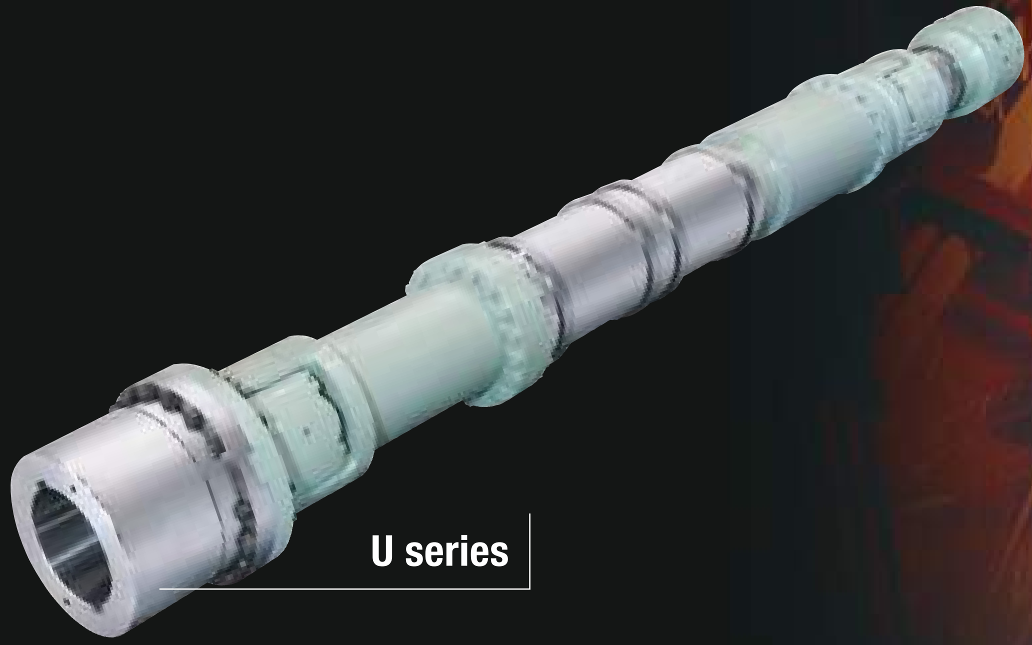
Drive shafts for steel production/ industrial equipment

Preface

Throughout the manufacturing industry the pursuit of greater power output at higher efficiency is a priority. Under such circumstances, highly sophisticated and economical drive shafts that fit in a limited space are in great demand for use in various equipment and machines.

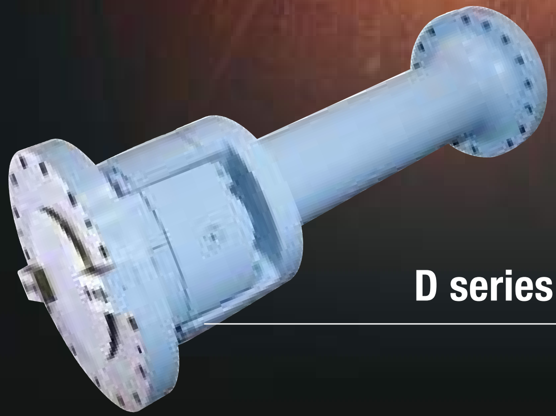
Drive shaft lineup is certain to satisfy your requirements in various applications, including iron manufacturing machines, rolling mills, construction machines, and rolling stock.

We thank you in advance for your support of our drive shafts.



U series

EZ series



D series

CONTENTS

- Introduction to drive shafts

- Measures to improve service life and strength

- Technical data

- Specifications

- Product introduction

- Attached tables

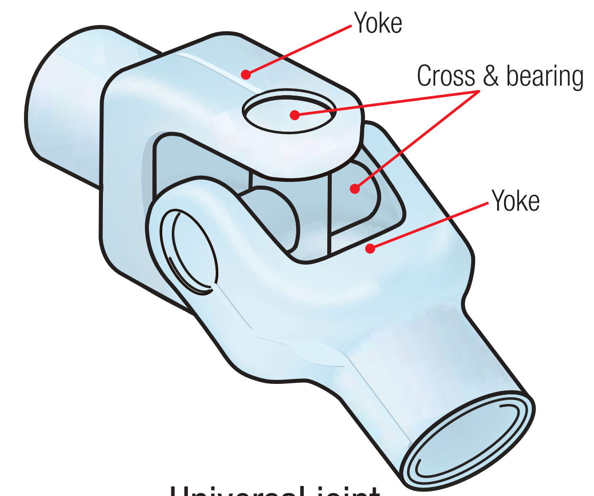
T series

KF series

Introduction to drive shafts

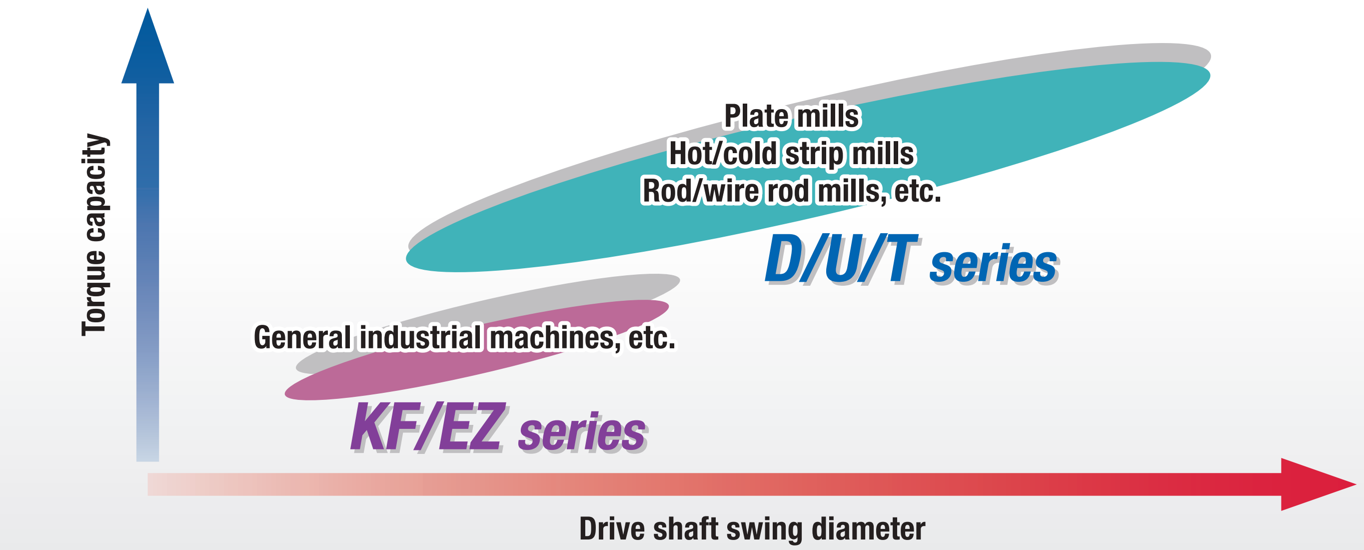
Functions

A drive shaft is a revolving shaft used to transmit the power of a motor to a machine.
Since it is installed in a limited space, the axes are seldom aligned.
However, by using a universal joint, the input axis and the output axis can be flexibly connected even in a limited space, enabling smooth torque transmission.
Each universal joint has four rolling bearings (cross & bearing), realizing low friction and minimizing torque losses.



Universal joint
(Cross-type universal joint)

Position of each series of drive shafts



Configuration of parts

1) Cross & bearings
The cross & bearings are the most critical components of a drive shaft.
A cross & bearing has a cross-shaped shaft and four rolling bearings that individually support each end of the shaft.

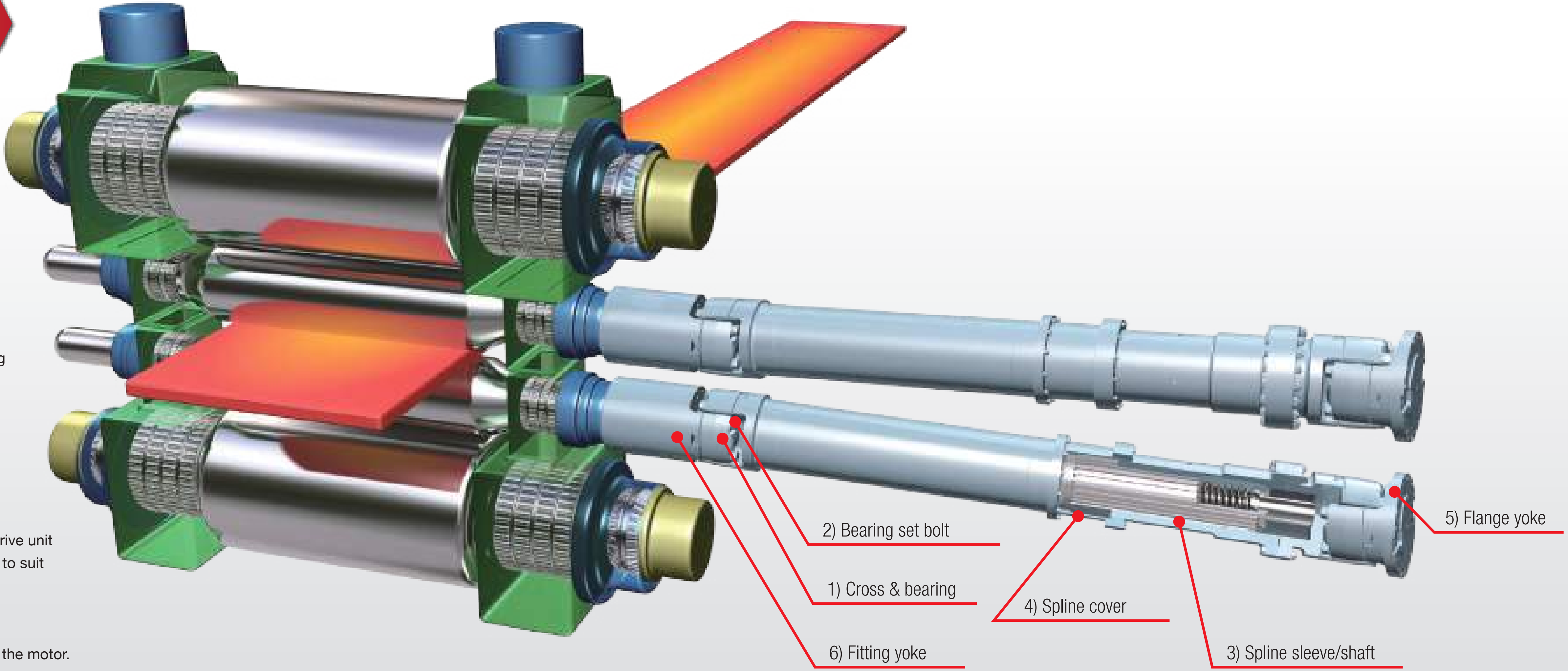
2) Bearing set bolt
Used to connect the cross bearing and its mating part.

3) Spline sleeve/shaft
There are a spline hole and shaft and the attaching length is adjustable.

4) Spline cover
Used to improve the dustproof and waterproof properties if the ambient environment is not good.

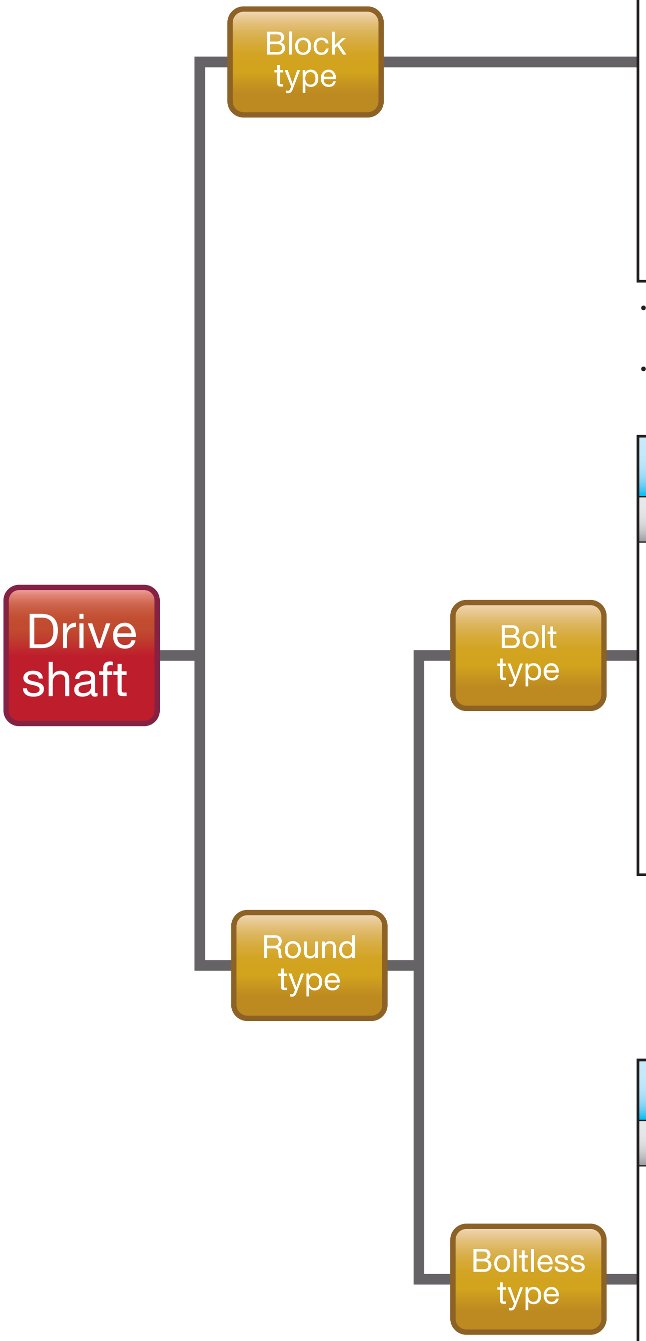
5) Flange yoke
The flange yoke is commonly used to connect a drive unit (such as a motor). A variety of joints are available to suit specifically desired applications.

6) Fitting yoke
Used mainly for connection with the machine and the motor.
Various types of coupling arrangements are provided according to the application.



Configurations of drive shafts

Drive shafts are classified into two types: block drive shafts and round drive shafts according to the structure of the cross & bearings used for the universal joint. Features and representative structures of each type are shown below.



D/U/T series

Features	Characteristics
(1) These series are intended for use in extremely heavy duty applications. (2) High dust resistance makes these series optimal for use under severe operating conditions such as in rolling mills.	(1) Swing diameter (mm) : ϕ160 - 1230
	(2) Torque T_D(kN·m) : 10.9 - 8970
	(3) Torque T_S(kN·m) : 34.1 - 18800
	(4) Maximum operating angle (°) : 4 - 10

- T_D indicates the judgment standard torque for the maximum torque (maximum under normal conditions).
- T_S indicates the judgment standard torque for the breakaway torque (maximum under abnormal conditions).

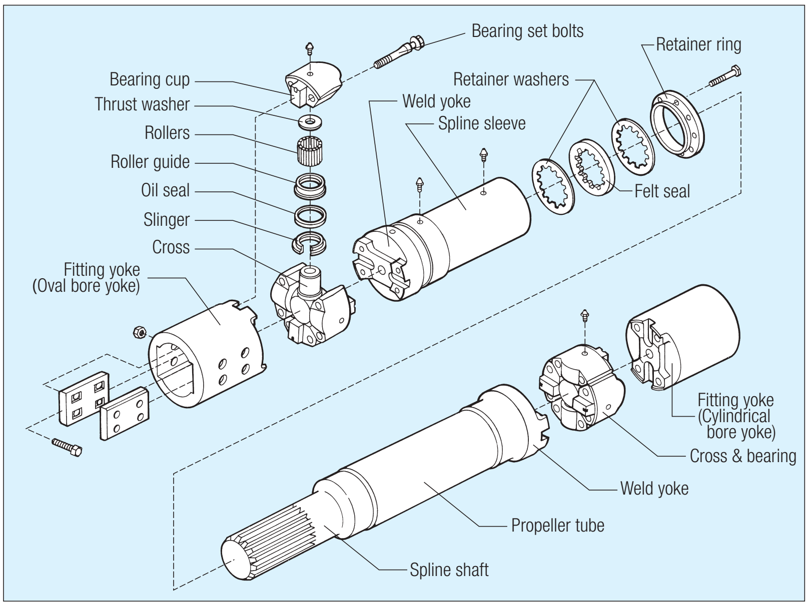
EZ series

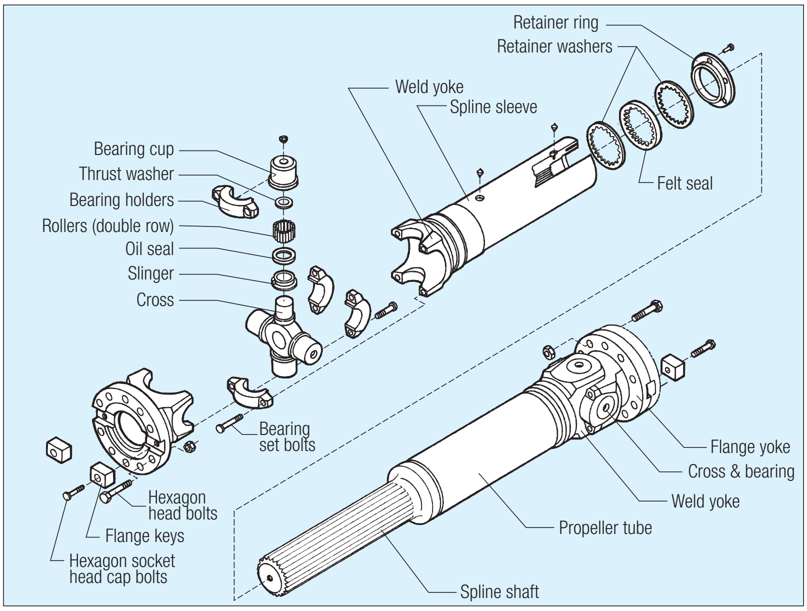
Features	Characteristics
Series for heavy load with excellent balance between performance and price	(1) Swing diameter (mm) : ϕ225 - 435
	(2) Torque T_D(kN·m) : 19.5 - 149.2
	(3) Torque T_S(kN·m) : 71.4 - 546
	(4) Maximum operating angle (°) : 15

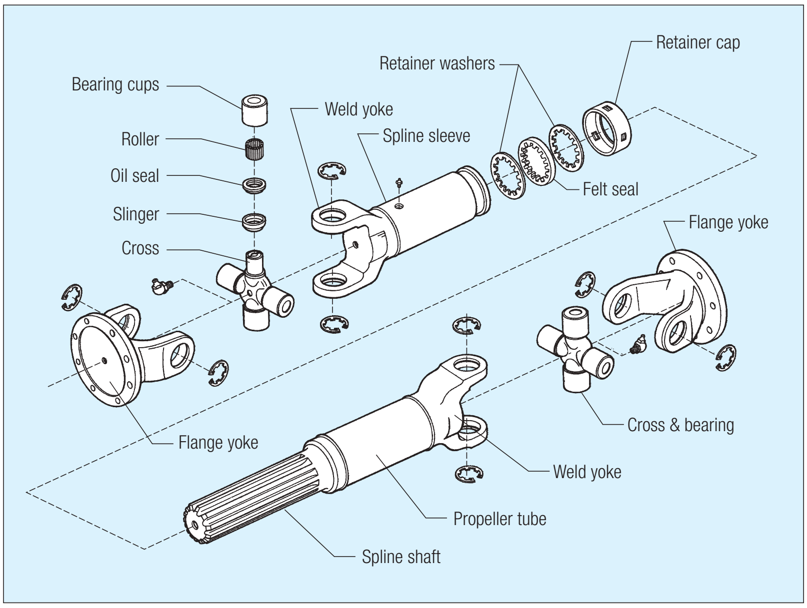
KF series

Features	Characteristics
This cost efficient series is intended for light to medium duty applications.	(1) Swing diameter (mm) : ϕ105 - 180
	(2) Torque T_D(kN·m) : 1.56 - 9.89
	(3) Torque T_S(kN·m) : 4.13 - 36.2
	(4) Maximum operating angle (°) : 18 - 30

Representative configuration







Structural features

With the cross & bearings fixed by bearing set bolts to the yokes, block type drive shafts transfer torque reliably through the key. The rollers, crosses, and bearing set bolts can be greater in size than those of the round type drive shafts, realizing high strength.

Compared with the block type, this type of drive shaft has cross & bearings of simpler construction and is more economical.

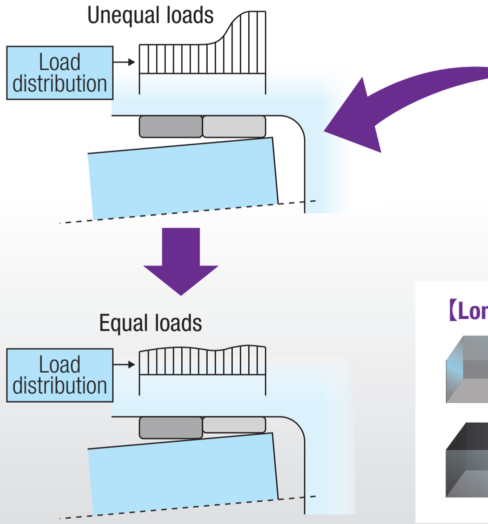
These drive shafts are connected to machines via a flange, enabling easy connection to a variety of machines.

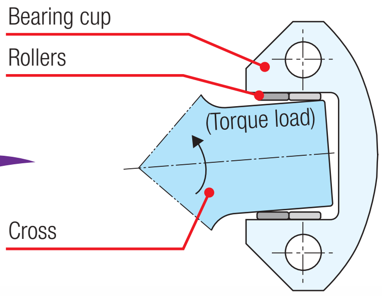
Measures to improve service life and strength

Below are optional specifications for use under severe conditions in which further strength and/or longer life are required.

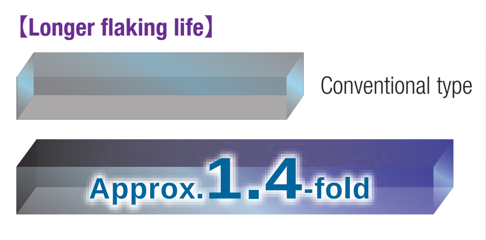
Application of different diameter rollers for cross & bearing

Because the cross is an elastic cantilever beam and the bearing has some radial clearance, the load on the cross generally becomes heavier toward to the end of the cross.
In order to improve this phenomenon, load on the roller is made uniform by designing the roller to have a minutely smaller diameter at the very close end, which would improve flaking life. (figure on the right).
It is required that the detailed investigation takes into account multitude of JTEKT records and the technology of theoretical analysis by FEM, when this would be applied.
(Rollers with different diameters can be used in a three-row structure.)





Effect of rollers different in diameter

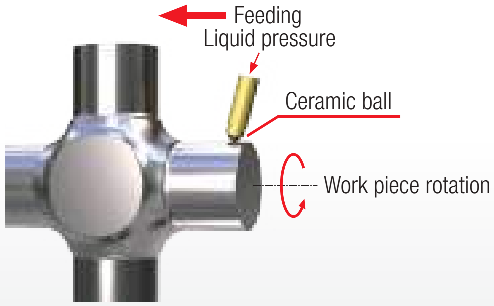


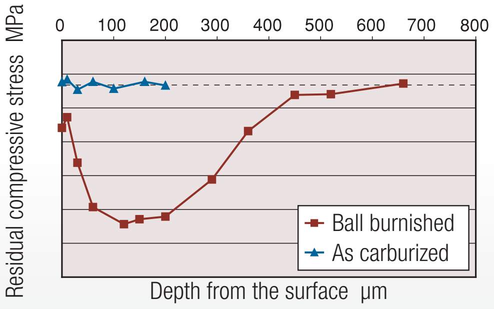
Ball burnishing on cross shaft

The flaking life can be improved by the ball burnishing on cross raceway. This process is a type of plastic working process, which is applied by rolling contact of super-hard ball backed up hydraulically on the cross raceway surface.

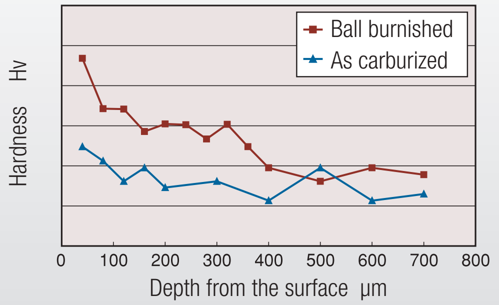
Features

(1) The hardness of the surface becomes higher than that of the carburized original material.
(2) Residual compressive stress at subsurface is larger than in the case of carburizing, and it can be applied deeply.
(3) Raceway roughness of the machined surface is improved. And no further finishing process is required after ball burnishing process.
(4) As the ball burnishing fixture can be used by attaching to lathe or other machine, there is actually no limitation in size of workpieces.





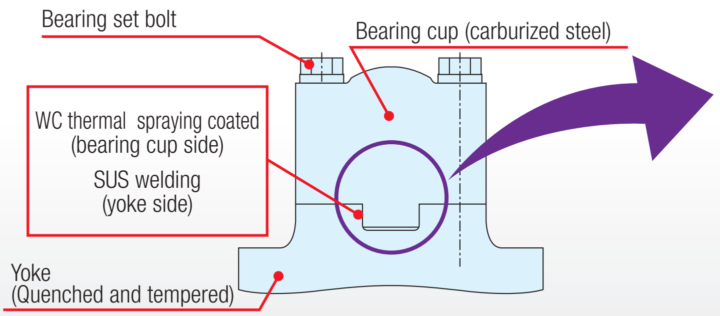
Measurement result of residual compressive stress

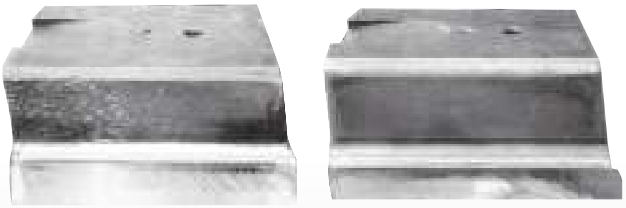


Measurement result of hardness

Thermal spraying coat of tungsten carbide (WC) on bearing cup key

To avoid corrosion on the side face of bearing cup key applying carburizing heat treatment, one possible method is to apply thermal spraying coat of tungsten carbide (WC) on these surfaces.





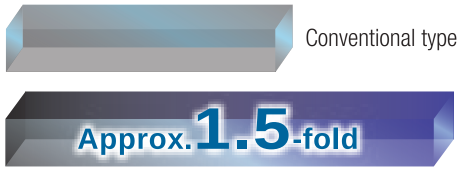
Effect of thermal spraying coat of tungsten carbide (WC)

Effects The following effects are expected in case the generation of clearance due to corrosion at the key area is restrained.

(1) The bending stress of bolt can be alleviated, which leads to the restraint of strength reduction.

(2) The heavier load on raceways at the end of the cross can be restrained, which expects longer fatigue life for cross & bearing.

【Improved corrosion resistance】

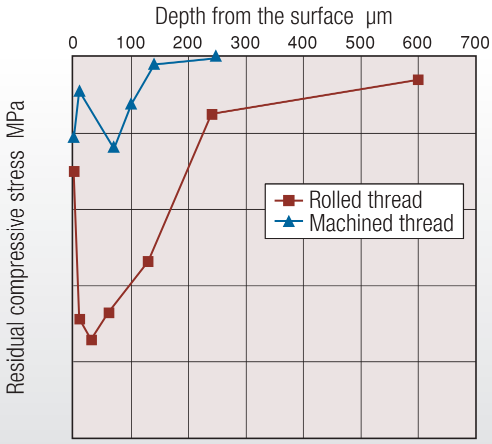


Application of form rolling to bearing set bolt

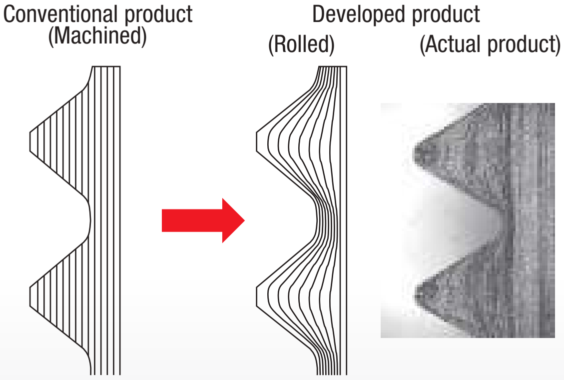
The thread of the bearing set bolt has conventionally been machined after heat treatment. However, by switching this process to form rolling, allowable fatigue stress at the bottom radii of the thread increases significantly.

Features (1) Fiber flow is formed along the shape of the thread. (figure on the right)

(2) Residual compressive stress at subsurface beneath the bottom radius of the thread increases. (figure below)



Residual compressive stress distribution of rolled thread



Fiber flow of rolled thread

【Improved fatigue strength】

Maintenance and inspection method of drive shaft

To use drive shafts safely for a long time, periodic inspection is required. Below is the periodic inspection procedure.
We accept servicing of drive shafts.
We can repair JTEKT products with a swing diameter of 500 mm or more as a guide. Please do not hesitate to contact JTEKT if you need more information.

<Examples of repair>

- Repair by grinding of raceway surfaces of cross, bearing cup
- Repair by build-up welding of yoke key grooves and oval bores
- Repair of slight wear and removal of rust

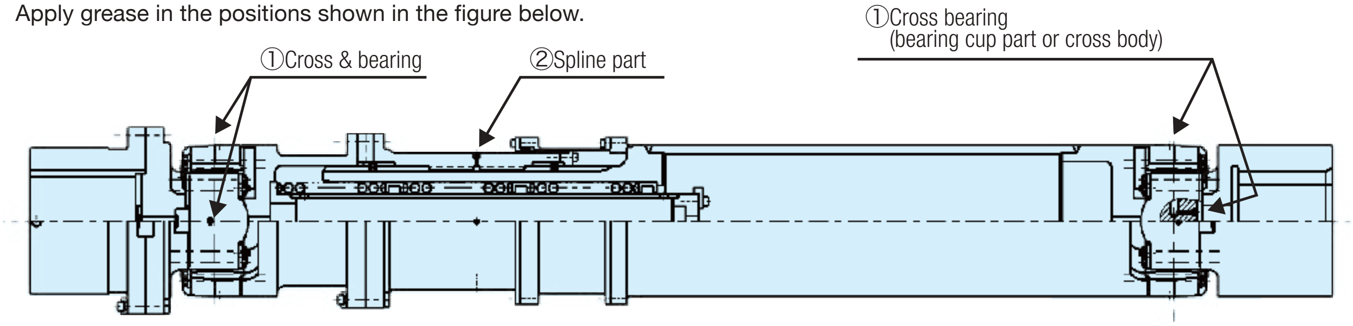
Periodic inspection

(1) Greasing

The greasing amount varies depending on the sizes of the cross & bearing and spline part.
Apply the amount of grease specified by JTEKT.

■ Greasing positions

Apply grease in the positions shown in the figure below.



■ Cycles of periodic greasing

- Hot strip mills: Once a month
- Cold strip mills: Every 3 months
- Others: Every 3 months

＊Be sure to apply grease with correct intervals and amount.
The grease to be applied should be the one specified in the drawing.
Use of insufficient or different grease may lead to early damage.

(2) Tightening torque of bolts

The tightening torque of bolts is set according to the bolt size.
If the bolts are not tightened with the proper tightening torque, it may lead to their early damage.
Refer to the tightening torque of the bolts specified in the drawing.
In addition, a dimension table of torque wrenches is provided on page 28.

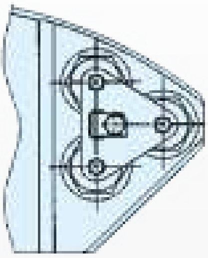
■ Periodic inspection of bolts

Conduct initial inspection of the bolts one week and one month after operation.
After that, conduct periodic inspection every six months.

Inspection of the bolts includes the following.

- Check for looseness or damage of the whirl-stop
- Check the elongation by hammering or looking

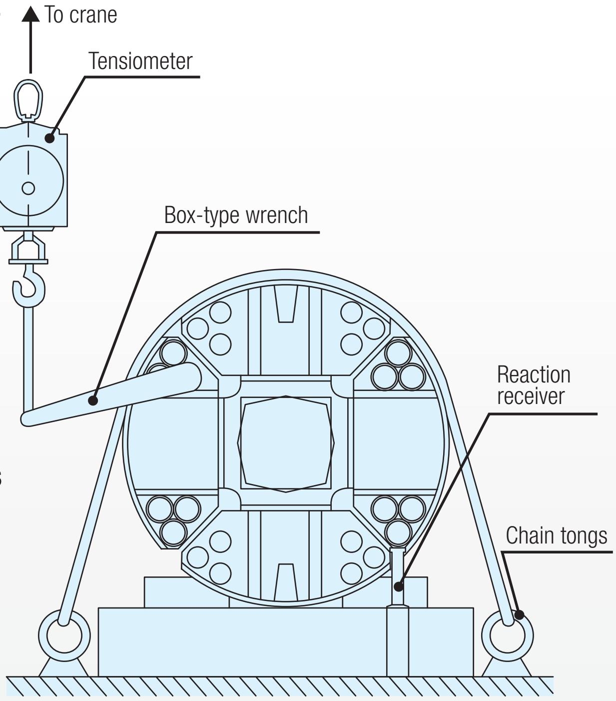
Whirl-stop with one bolt



Whirl-stop with three bolts

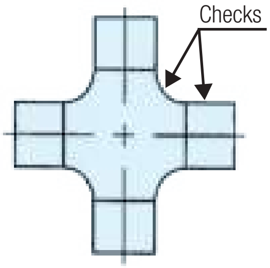
■ How to loosen/tighten the bolts of the cross & bearing

(1) As shown in the figure on the right, tighten the drive shaft with a jig such as chain tongs.
(2) Before tightening, apply a small amount of grease to the thread section and the head seat of the bolt.
(3) Tighten to the specified torque by using a wrench, tensiometer, etc.

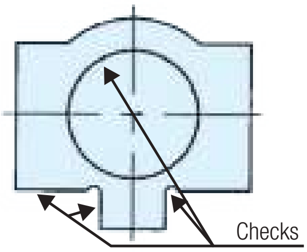


Overhaul

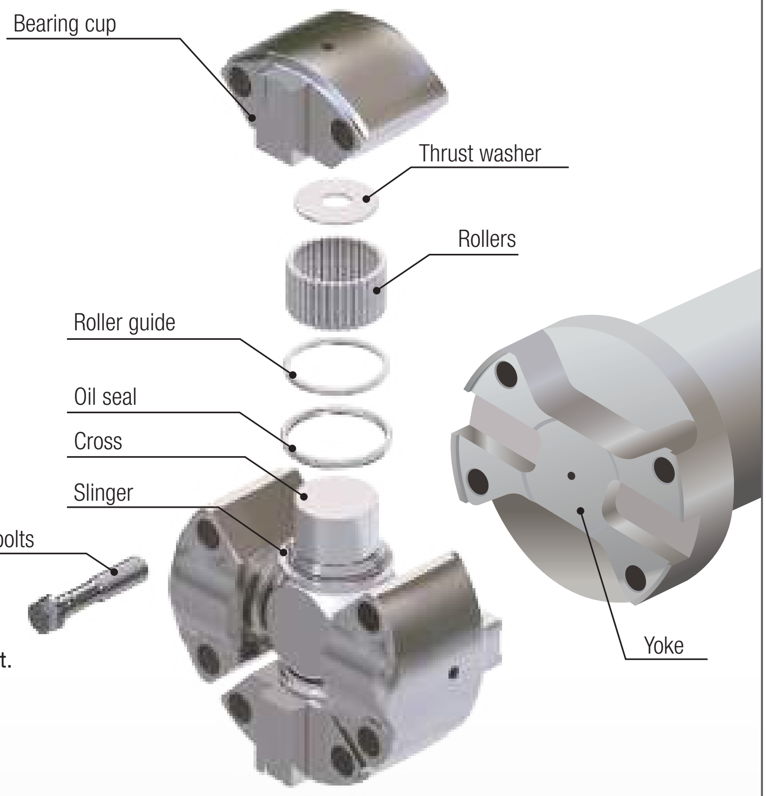
- As a rule, conduct overhaul of the major parts every year after the start of operation.
- Cross & bearing
  - Check for brinelling, wear, flaking, seizure, cracks, nicks, or rusting, etc. of the cross and bearing cup.



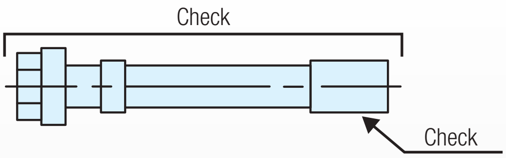
Cross



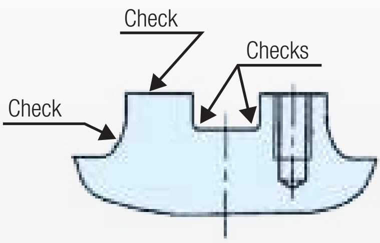
Bearing cup



- Bearing set bolt
  - Check for bending, looseness, cracks, or rusting of the bolt.



- Yoke
  - Check for cracks, nicks, or rusting, etc. of each part.
  - Especially, check the cross & bearing attaching part and the flange attaching part for signs of the above.
- Others
  - Check for wear, scuffing, or cracking, etc. of the oval bore and spline.



∗Consult with JTEKT about the inspection result.

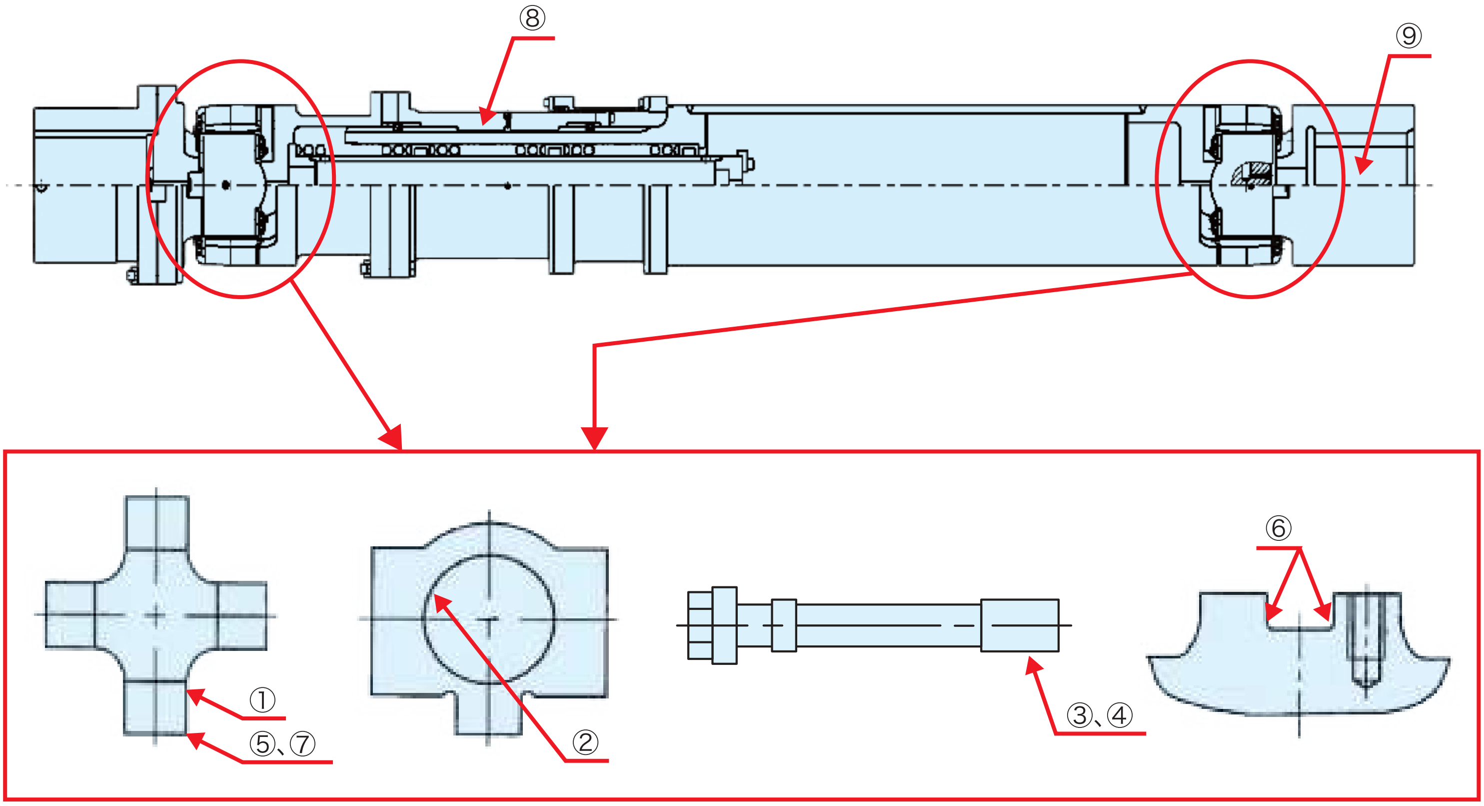
∗The next page shows some examples of failures of each part.

Management/storage

- When storing the product for a long period of time, take measures to prevent rusting.
- Before using a product stored for a long period of time, reapply grease to the cross & bearing, spline, etc.

Cases of failures

Here are some examples of failure cases of drive shaft parts.



(1) Insufficient greasing

① Flaking of cross raceway surface

<Part>
Cross

<Cause>
- Flaking occurred at the bottom of the cross due to insufficient lubrication

<Measure>
- Periodic greasing

<Treatment>
- Repair by re-grinding

② Flaking of bearing cup raceway surface

<Part>
Bearing cup

<Cause>
- Flaking occurred on the bearing cup inlet side due to insufficient lubrication

<Measure>
- Periodic greasing

<Treatment>
- Repair by re-grinding

(2) Insufficient tightening torque

③ Breakage of bolt

<Part>
Bearing set bolt

<Cause>
- Flat fracture shape because the axial force did not act on the bolt

<Measures>
- Tighten with the proper tightening torque
- Maintenance of the attaching surfaces of the cup and yoke

<Treatment>
- Replace with a new part

(3) Excessive load

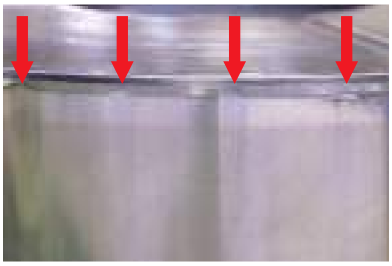
④ Breakage of bolt

<Part>
Bearing set bolt
<Cause>
- An excessive bending stress acted on the bolt

<Measures>
- Review the usage conditions
- Apply an appropriate load
- Reduce the bending stress acting on the bolt

<Treatment>
- Replace with a new part

⑤ Brinelling on raceway surface



<Part>
Cross
<Cause>
- An excessive load acted on the raceway surface

<Measures>
- Review the usage conditions
- Apply an appropriate load

<Treatment>
- Repair by re-grinding

⑥ Dent deformation of key

<Part>
Yoke key way
<Cause>
- An excessive load acted on the key way

<Measures>
- Review the usage conditions
- Apply an appropriate load

<Treatment>
- Repair by weld overlaying

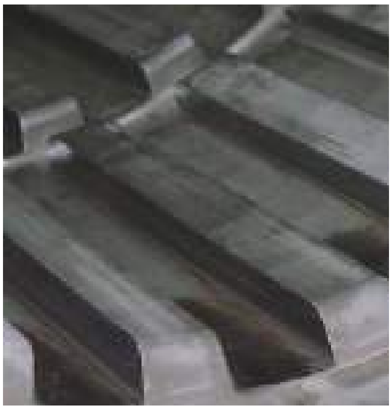
(4) Life

⑦ Flaking of raceway surface

<Part>
Cross
<Cause>
- Flaking occurred at the cross end due to long-term use

<Treatment>
- Repair by re-grinding
- Replace with a new part

⑧ Spline wear



<Part>
Spline sleeve
<Cause>
- Wear of the torque transmission surface due to long-term use

<Treatment>
- Reusable in the case of slight wear
- Replace with a new part in the case of serious wear
(Repair by weld overlaying is impossible)

⑨ Oval bore wear

<Part>
Oval bore yoke
<Causes>
- Doglegged surface pressure
- Clearance of the torque transmission surface
- Wear of the torque transmission surface due to long-term use

<Treatment>
-Repair by weld overlaying

General characteristics of universal joint (Cross-type universal joint)

Single universal joints

The driving shaft and driven shaft intermediated by a universal joint has the following relationship between their rotational angles:

$$\tan \phi_2 = \cos\theta \cdot \tan \phi_1 \quad \cdots(1)$$

where ϕ_1 : Rotational angle of driving shaft

ϕ_2 : Rotational angle of driven shaft

θ : Shaft operating angle (**Fig. 1**)

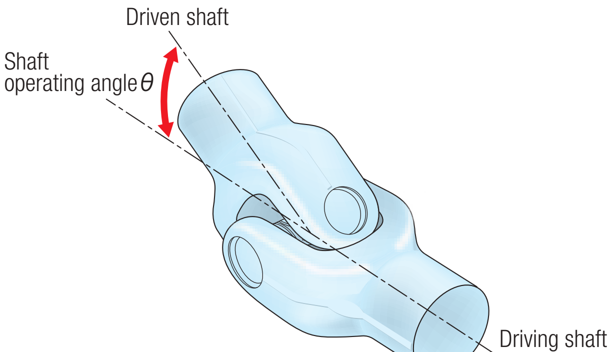


Fig. 1 Single universal joint

This means that, even if the rotational speed and torque of the driving shaft are constant, the driven shaft is subject to fluctuation in rotational speed and torque.
The speed ratio between the driving shaft and driven shaft can be obtained by differentiating equation (1) with respect to time (t), where ϕ_1 is by $\omega_1 \cdot t$ and ϕ_2 by $\omega_2 \cdot t$:

$$\frac{\omega_2}{\omega_1} = \frac{\cos\theta}{1\text{-}\sin^2\phi_1 \cdot \sin^2\theta} \quad \cdots(2)$$

where ω_1 : Rotational angular velocity of driving shaft (rad/s)

ω_2 : Rotational angular velocity of driven shaft (rad/s)

ω_2/ω_1 : Angular velocity ratio

Equation (2) can be expressed in diagram form as shown in **Fig. 2**. The maximum value and minimum value of the angular velocity ratio can be expressed as follows:

$$(\omega_2/\omega_1)\ \text{max.} = 1/\cos\theta \cdots\cdots \phi_1 = 90°$$
$$(\omega_2/\omega_1)\ \text{min.} = \cos\theta \cdots\cdots \phi_1 = 0°$$

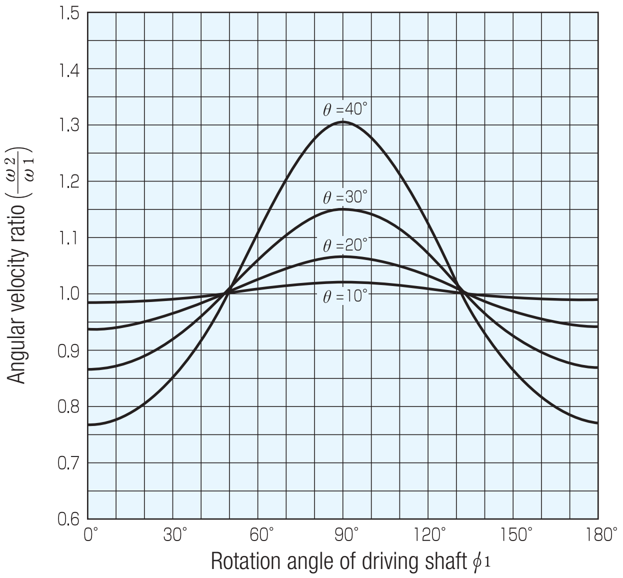


Fig. 2 Angular velocity fluctuation

The maximum fluctuation rate of angular velocity in a universal joint can be expressed by the following equation:

$$\frac{(\omega_2\,\text{max.} - \omega_2\,\text{min.})}{\omega_1} = \frac{1}{\cos\theta} - \cos\theta$$

The torque ratio between input and output can be expressed by the diagram shown in **Fig. 3**. The maximum value and minimum value can be obtained as shown below, respectively:

$$(T_2/T_1)\ \text{max.} = 1/\cos\theta \cdots\cdots \phi_1 = 0°$$
$$(T_2/T_1)\ \text{min.} = \cos\theta \cdots\cdots \phi_1 = 90°$$

where T_1 : Input torque

T_2 : Output torque

T_2/T_1: Torque ratio

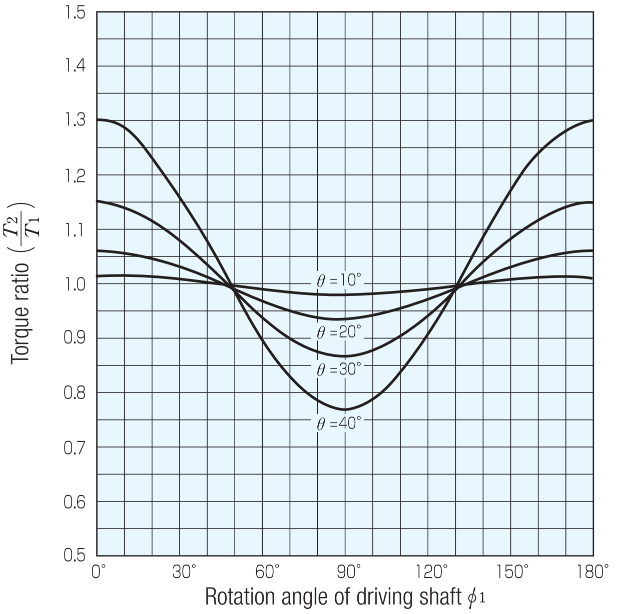


Fig. 3 Torque fluctuation

Double universal joints

Universal joints are usually installed in pairs. When assembled as shown in **Fig. 4**, that is,

(1) With equal operating angles in both joints

(2) Yokes connected to the same shaft in line

(3) Central lines of all three shafts (driving shaft, intermediate shaft, and driven shaft) in the same plane, the driven shaft rotates exactly in the same way as the driving shaft.

Therefore, they should be attached as shown in the figure on the right as far as possible.

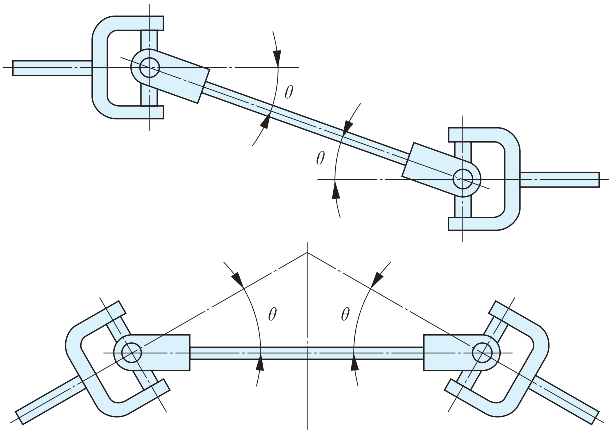


Fig. 4 Installation of double universal joints

Secondary couple

It is often necessary to consider the secondary couples imposed by universal joints operating at an angle; especially under high angle or large torque. These couples must be taken into account in designing the shafts and supporting bearings.

The secondary couples in the universal joints are in the planes of the yoke. These couples are about the intersection of the shaft axis. They impose a load on the bearings and a bending stress in the shaft connecting the joints, and they fluctuate from maximum to zero every 90° of shaft revolution. The broken lines in **Fig. 5** indicate the effect of these secondary couples on the shafts and bearings.

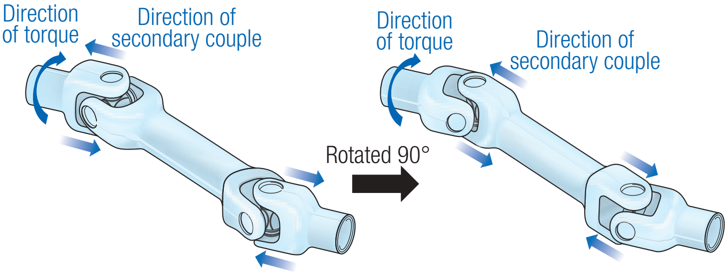
The equation for maximum secondary couple is as follows:

$$M_1 \text{ max.} = T \tan\theta \quad \text{(for driving shaft)}$$
$$M_2 \text{ max.} = T \sin\theta \quad \text{(for driven shaft)}$$

where M_1: Secondary couple on driving shaft $(\mathrm{N\cdot m})$
M_2: Secondary couple on driven shaft $(\mathrm{N\cdot m})$
T : Driving torque $(\mathrm{N\cdot m})$
θ : Shaft operating angle

The ratio of the secondary couple to the driving torque is shown in **Fig. 6**.

The secondary couple M_1 and M_2 can be obtained by multiplying M_1/T or M_2/T by the driving torque T.



(Maximum secondary couple is produced on the driving side yoke and the driven side yoke alternately at every rotation of 90°)

Fig. 5 Effect of secondary couple

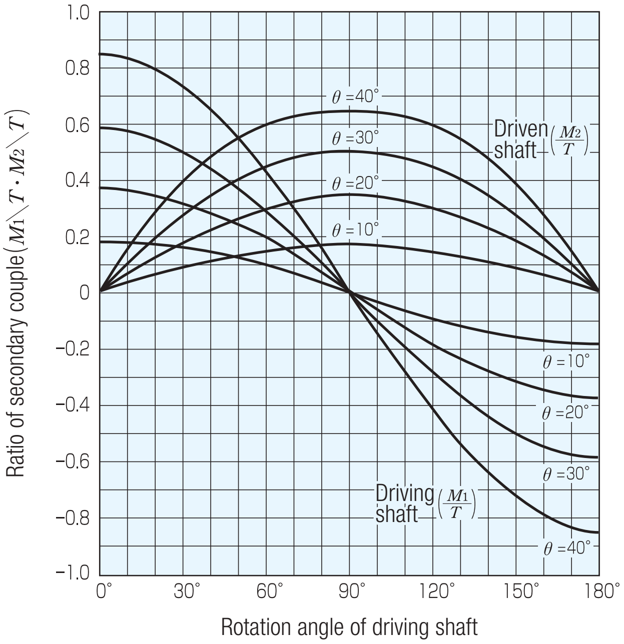


Fig. 6 Fluctuation of secondary couple to driving torque

Technical data (2)

Drive shaft selection

A drive shaft should be selected so as to satisfy the required strength, service life, operating angle and dimensions necessitated by its purpose. Especially, a drive shaft can be selected if it meets conditions of both strength and life of cross & bearings, except for special cases.

Load torque of drive shaft

To decide the size of the drive shaft, it is necessary to grasp the load torque first.

A maximum torque including an impact torque and a mean torque should be known, and it is essential for selecting an appropriate drive shaft to understand the correct maximum torque and mean torque.

Maximum torque:
Value to determine if the strength of each part is sufficient.
Mean torque:
Value necessary to calculate the service life

Mean torque

It is apparent that all kinds of machines are not operating thoroughly by their maximum torque. Therefore, if a drive shaft is selected according to a service life calculated from the maximum torque, it results in being uneconomically larger than necessary.

So, it is reasonable to set up a longer expected service life, if the application condition are severe; and shorter, if the conditions are easy.

If, for instance, a job is expressed as in the table below,

Drive stage	1	2	3·····Z
Torque (N·m)	T_1	T_2	$T_3\cdots\cdots T_Z$
Rotational speed (min^{-1})	n_1	n_2	$n_3\cdots\cdots n_Z$
Time ratio (%)	t_1	t_2	$t_3\cdots\cdots t_Z$

the cube root of mean torque (T_m) and the arithmetical mean of rotational speed (n_m) are yielded from the following equations.

$$T_m = \sqrt[3]{\frac{(T_1^3 \cdot n_1 \cdot t_1 + \cdots\cdots\cdots T_Z^3 \cdot n_Z \cdot t_Z)}{(n_1 \cdot t_1 + \cdots\cdots\cdots + n_Z \cdot t_Z)}}$$

$$n_m = \frac{(n_1 \cdot t_1 + \cdots\cdots\cdots + n_Z \cdot t_Z)}{(t_1 + \cdots\cdots\cdots + t_Z)}$$

Strength of drive shaft

A drive shaft should be selected so that the normal maximum torque shall not exceed the " T_D torque." However, it is difficult to determine the true maximum torque, and the engine capacity or motor capacity is used as the maximum torque in many cases. In consideration of the torque amplification factor (TAF) of the drive shaft and various imponderables, the safety factor (f_S) of no less than 1.5 should be considered as the most desirable.

$f_D = T_D$ /maximum torque under normal operating conditions > 1.5

The maximum torque that may occur in an emergency should be determined using " T_S torque." The safety factor (f_S) of no less than 1.5 should be considered as desirable in this case as well.

$f_S = T_S$ /breaking torque under emergency conditions > 1.5

To select a drive shaft based on a safety factor of 1.5 or less, consult JTEKT as close examination is required in consideration of previous performance records.

Life of drive shaft

There is no global standard for the method of calculating the service life of cross & bearings, and this method is based on the results of research performed by each manufacturer.

JTEKT employs the following empirical equation based on extensive experimentation (conforming to SAE).

The service life L_h is defined as the expected number of operating hours before a flaking occurs on the rolling contact surface of the bearing. The use of the bearings over the service life L_h may be practical on a low speed machine such as a rolling mill.

$$L_h = 3000\, K_m \left(\frac{T_R \cdot K_n \cdot K_\theta}{T_m} \right)^{2.907}$$

Where, L_h: Average calculated bearing life (h)
K_m: Material factor = 1 to 3
T_R: Rated torque (N·m)
T_m: Mean torque (N·m)
K_n: Speed factor = $10.2/n^{0.336}$
K_θ: Angle factor = $1.46/\theta^{0.344}$
n : Rotational speed = (min^{-1})
θ : Shaft operating angle (°)

Note) A drive shaft should be selected by considering the type of the machine, peripheral equipment, particular operating conditions, and other factors. The method outlined in this catalog is a common rough guide. It is recommended to consult JTEKT for details.

Critical number of rotation

When the rotation speed approaches the critical number of rotations of a drive shaft (bending natural frequency), the powertrain may be affected by resonance, and thus when a drive shaft is designed, the rotational flexural rigidity of the drive shaft needs to be considered.

If you need to increase the rotation speed through equipment alteration etc., please contact JTEKT.

Torque calculation from motor output

To obtain the load torque of a drive shaft, there is a method to calculate the torque from the motor output. The following is the calculation equation.

Horsepower → Torque $(\mathrm{N \cdot m})$

$$T = \frac{HP}{N} \cdot 7122 \quad (\mathrm{N \cdot m}) \quad \cdots\cdots(1)$$

However, in the case of PS (CV in French) horsepower, the following equation is applied.

$$T = \frac{PS}{N} \cdot 7024 \quad (\mathrm{N \cdot m}) \quad \cdots\cdots(2)$$

Note) Check if the horsepower specified in the drawing provided means HP horsepower or PS horsepower.

kW → Torque $(\mathrm{N \cdot m})$

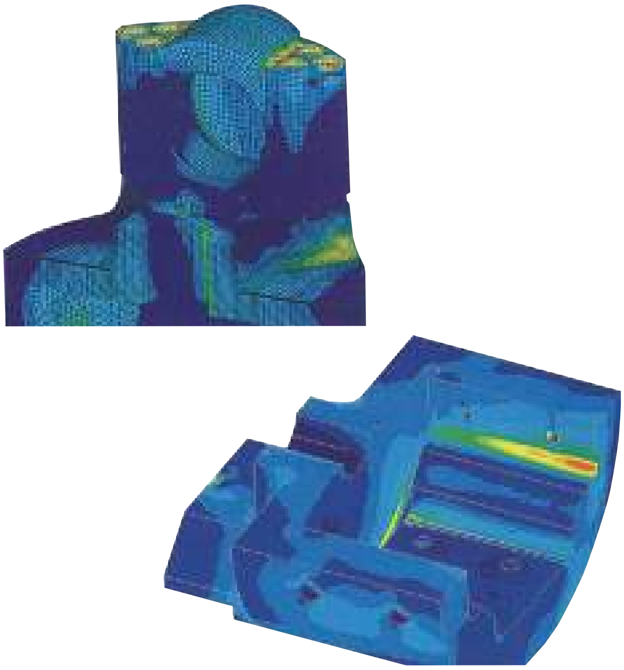
$$T = \frac{kW}{N} \cdot 9552 \quad (\mathrm{N \cdot m}) \quad \cdots\cdots(3)$$

In equations (1) to (3) above,

T : Torque $(\mathrm{N \cdot m})$
N : Rotational speed (min^{-1})
HP : Horsepower (English horsepower)
PS : Horsepower (French horse power)
kW: Kilowatt

Evaluation/analysis

JTEKT conducts FEM analysis as one of the evaluation/analysis approaches to utilize for selection of a drive shaft.



Example of FEM analysis

Balance quality of drive shaft

If a rotating drive shaft is unbalanced, it may adversely influence the equipment and ambient conditions, thus posing a problem. JTEKT designs and manufactures drive shafts to satisfy the balance quality requirements specified in JIS B 0905.

Expression of balance quality

The balance quality is expressed by the following equation:

Balance quality = $e\omega$

or

Balance quality = en /9.55

where e: Amount of specific unbalance (mm)
This amount is the quotient of the static unbalance of a rigid rotor by the rotor mass. The amount is equal to the deviation of the center of the rotor mass from the center line of the shaft.
ω : Maximum service angular velocity of the rotor (rad/s)
n : Rotational speed (min^{-1})

Balance quality grades

The JIS specifies the balance quality grades from G0.4 to G4000. Generally, the three grades described in Table 1 below are commonly used.
We apply grade G16 to high speed drive shafts unless otherwise specified.

Correction of the unbalance of drive shafts

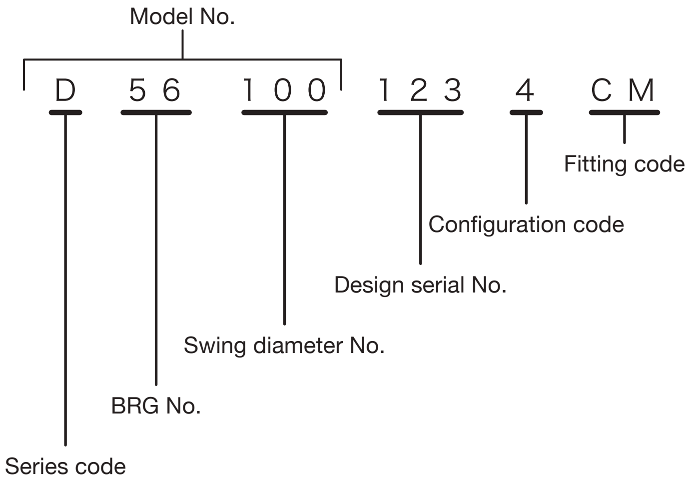
JTEKT corrects the unbalance of drive shafts to the optimal value by the two plane balancing method, using the latest balance system.
To correct the balance of a drive shaft, it is critical to correct the balance between two planes each near the two individual universal joints, instead of by the one plane balancing as used to balance car wheels.
Especially in the case of a long drive shaft, this two plane balancing method is the only way to acquire good results.

Table 1 Recommended balance quality grades (excerpt from JIS B 0905)

Balance quality grade	Upper limit value of balance quality ($e\omega$)	Recommended applicable machines
G40	40	Car wheels, wheel rims, wheel sets and drive shafts Crankshaft systems of elastically mounted high speed four stroke engines (gasoline or diesel) with six or more cylinders Crankshaft systems of the engines of automobiles, trucks and rolling stock
G16	16	Drive shafts with special requirements (propeller shafts and diesel shafts) Components of crushing machines Components of agricultural machines Components of the engines of automobiles, trucks and rolling stock (gasoline or diesel) Crankshaft systems with six or more cylinders with special requirements
G 6.3	6.3	Devices of processing plants Ship engine turbine gears (for merchant ships) Centrifugal drums Papermaking rolls and printing rolls Fans Assembled aerial gas turbine rollers Flywheels Pump impellers Components of machine tools and general industrial machines Medium or large electric armatures (of electric motors having at least 80 mm in the shaft center height) without special requirements Small electric armatures used in vibration insensitive applications and/or provided with vibration insulation (mainly mass produced models) Components of engines with special requirements

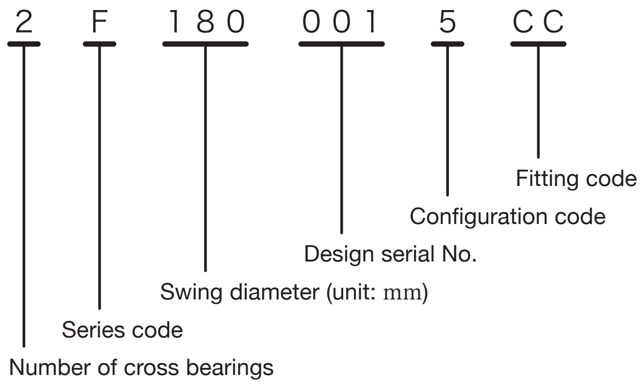
Composition of drive shaft numbers

(1) Block type

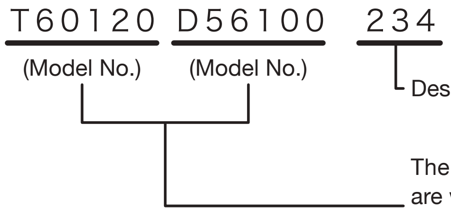


(2) Round type

① KF series

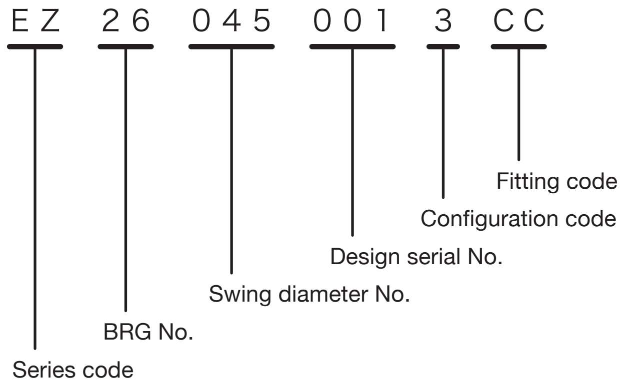


(3) Type with different model numbers on the right and left



The two model numbers are written side by side
If the rotation diameters are the same, the model numbers are written in order of T, D, and U
If the rotation diameters are different, the model number with larger rotation diameter is written first

② EZ series



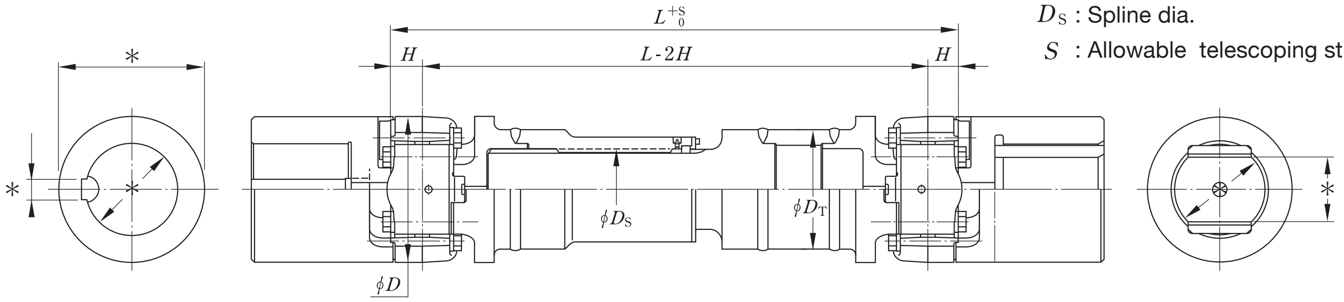
Supplementary explanation of items

- **Series code** D : D series U : U series T : T series F(Z) : KF series EZ : EZ series
- **BRG. No. :** The raceway diameters of the cross are represented in two digits in order of size (e.g.: 56, 63)
- **Swing diameter No. :** The value is swing diameter of cross & bearing /5 and is represented in three digits (e.g.: ϕ450 mm → 090, ϕ900 mm → 180)
- **Design serial No. :** Represented in three digits for each model number (001 - 999)
- **Configuration code :** Decided according to the configuration of the drive shaft
- **Fitting code :** The following shape codes are added to the left, then to the right, according to the shape of the attaching parts at both ends.
  - B : Cross & bearing
  - C : Cylindrical bore
  - F : Flange
  - M : Oval bore
  - T : Tapered bore

D series

Telescoping type (with propeller tube)

D_T : Propeller tube dia.
D_S : Spline dia.
S : Allowable telescoping stroke



Dimensions marked with an asterisk (∗) need to be determined to suit existing equipment.
Please provide the specifications of your equipment when placing an inquiry.

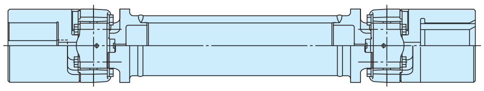
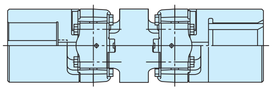
Model No.	Swing dia. (mm) D	Torque capacity (kN·m)			Max. operating angle (°)	Boundary dimensions (mm)					Bearing set bolts					Recommended wrench set 7) (bearing set bolt)
		T_R 1)	T_D 2)	T_S 3)		L 4) (min.)	H	D_T	D_S 5)	S	Nominal thread size	Width across flats	Tightening torque (N·m)	Q'ty 6)	Type	Torque Wrench No. Socket No. Tensiometer No. Wrench No.
D22032	160	2.83	10.9	34.1	9	585	30	139.8	101.6	80	M16×1.5	17	185± 20	8	A	TW4200 HR17×4200
D26038	190	5.33	22.5	54.7	9.5	677	38	159	114.3 (95)	95	M18×1.5	19	285± 20	8	A	TW4200 HR19×4200
D30044	220	8.54	35.3	73.1	10	760	45	177.8	127 (120)	110	M20× 2	22	370± 20	8	A	TW4200 HR22×4200
D34052	260	15.1	56.2	140	7.5	873	52	216.3	152.4 (140)	125	M24× 2	27	645± 30	8	A	TW8500 HR27×8500
D38060	300	22.7	89.9	260	8	965	60	244.5	177.8 (160)	135	M30× 2	32	1 180± 50	8	C	TM500 WR32×500
D44070	350	38.3	144	384	9	1080	70	298.5	203.2 (180)	155	M33× 2	36	1 720± 70	8	C	TM500 WR36×500
D48080	400	54.9	213	560	8	1220	80	339.7	225 (200)	175	M39× 3	50	3 040±200	8	C	TM1000 WR50×500
D50085	425	66.9	264	708	8	1284	86	355.6	250	185	M42× 3	50	4 020±200	8	C	TM1000 WR50×500
D54090	450	80.4	333	739	8	1348	92	381	250	195	M42× 3	50	4 020±200	8	C	TM1000 WR50×500
D56100	500	107	500	1 060	8	1503	107	410	275	205	M48× 3	60	5 980±300	8	C	TM2000 WR60×500
D58110	550	146	747	1 460	6	1604	116	450	300	220	M52× 3	65	7 650±300	8	C	TM2000 WR65×800
D60120	600	195	962	2 040	6	1730	125	490	325	235	M58× 3	70	10 300±300	8	C	TM2000 WR70×800
D62130	650	249	1140	2 520	6	1849	136	530	350	250	M62× 3	75	12 700±300	8	C	TM2000 WR75×800
D64140	700	293	1510	3 370	6	1949	146	580	375	265	M68× 3	85	17 100±500	8	C	TM3000 WR85×800

■ Features

This series is suitable for use under severe conditions, such as in driving rolling mill rolls.
Based on standardized cross & bearings, this series can be designed to suit a wide range of dimensions and a wide variety of fitting configurations.

■ Designs available to order

The fixed type can be designed to order, assembling components shown on the right.
For more details on these designs, consult JTEKT.

With propeller tube	
With coupling yoke	

Model No.	Swing dia. (mm) D	Torque capacity (kN·m)			Max. operating angle (°)	Boundary dimensions (mm)					Bearing set bolts				Recommended wrench set[7] (bearing set bolt)	
		T_R[1]	T_D[2]	T_S[3]		L[4] (min.)	H	D_T	D_S[5]	S	Nominal thread size	Width across flats	Tightening torque (N·m)	Q'ty[6]	Type	Torque Wrench No. Socket No. Tensiometer No. Wrench No.
D66150	750	371	1 730	3 870	6	2 090	155	620	400	290	M72×4	90	20 400±500	8	C	TM3000 WR90×800
D68160	800	449	2 090	4 600	6	2 225	170	670	450	300	M76×4	95	24 500±500	8	C	TM3000 WR95×1000
D71170	850	497	3 720	6 200	7	2 337	178	710	500	320	M48×2	50	5 590±200	24	D	TM2000 WB50×500
D72180	900	591	4 070	6 610	7	2 445	190	750	500	335	M48×2	50	5 590±200	24	D	TM2000 WB50×500
D7E184	920	621	4 360	8 050	7	2 495	190	780	550	340	M52×2	50	7 350±300	24	D	TM2000 WB50×500
D74190	950	654	3 900	9 250	7	2 564	196	810	550	350	M56×3	60	9 120±300	24	D	TM2000 WB60×800
D75194	970	697	4 600	10 400	7	2 594	196	830	550	370	M56×3	60	9 120±300	24	D	TM2000 WB60×800
D76204	1 020	924	4 540	8 050	7	2 654	211	850	550	385	M52×3	55	7 650±300	24	D	TM2000 WB55×500
D7J214	1 070	1 040	6 780	13 500	6	2 900	230	890	600*	400*	M64×3	65	14 200±300	24	D	TM2000 WB65×800
D81220	1 100	1 100	7 970	13 300	6	2 970	250	920	600*	415*	M64×3	65	14 200±300	24	D	TM2000 WB65×800
D8B226	1 130	1 210	7 550	15 200	6	3 070	260	950	650*	430*	M68×3	70	17 100±500	24	D	TM3000 WB70×800
D8E246	1 230	1 540	8 970	18 800	6	3 165	260	1 030	650*	450*	M72×4	75	20 400±500	24	D	TM3000 WB75×800

[Notes] 1) T_R refers to the rated torque used for service life calculation (refer to page 15). The material factor K_m is supposed to be 3 in this calculation.
2) T_D refers to the reference torque used as the criterion for evaluation of resistance to the maximum torque under normal operating conditions.
T_D divided by the maximum torque should preferably be greater than 1.5.
3) T_S refers to the reference torque used as the criterion for evaluation of resistance to the breaking torque under emergency conditions.
T_S divided by the breaking torque should preferably be greater than 1.5.
4) L refers to the minimum dimension when the shaft has neither propeller tube nor welded connection.
5) The parenthesized values refer to the involute spline diameter.
6) Represents the voltage used for one kit of cross & bearing.
7) The types of wrench set are as follows. For details, refer to "Torque wrench set for bolt tightening" on page 28.

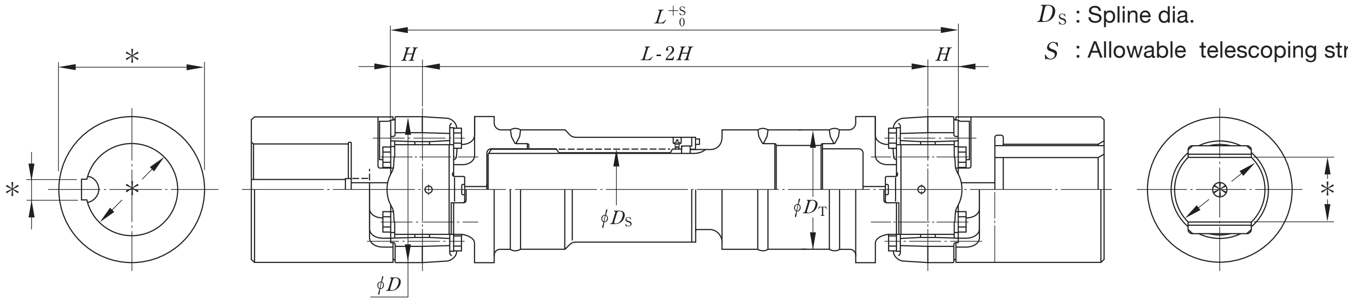
Type A: Torque wrench + Ring head	Type C: Tensiometer + Ring wrench
Type B: Torque wrench + Hexagonal bar wrench	Type D: Tensiometer + Socket wrench

[Remarks] 1) The values with * mark are reference values.
2) The T_D values in the table are the values with alternating load. For the values with pulsating load, contact JTEKT.

U series

Telescoping type (with propeller tube)

D_T : Propeller tube dia.
D_S : Spline dia.
S : Allowable telescoping stroke



Dimensions marked with an asterisk (∗) need to be determined to suit existing equipment.
Please provide the specifications of your equipment when placing an inquiry.

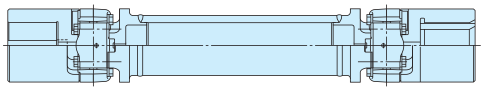
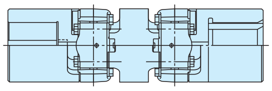
Model No.	Swing dia. (mm) D	Torque capacity (kN·m)			Max. operating angle (°)	Boundary dimensions (mm)					Bearing set bolts					Recommended wrench set 7) (bearing set bolt)
		T_R 1)	T_D 2)	T_S 3)		L 4) (min.)	H	D_T	D_S 5)	S	Nominal thread size	Width across flats	Tightening torque (N·m)	Q'ty 6)	Type	Torque Wrench No. Socket No. Tensiometer No. Wrench No.
U45073	365	45.5	284	497	4	1 185	75	339.7	225 (200)	170	M39×2	41	2 840±150	8	C	TM1000 WR41×500
U4H078	390	53.3	313	745	4	1 240	80	355.6	250	180	M42×2	46	3 820±200	8	C	TM1000 WR46×500
U49084	420	62.7	414	725	4	1 309	86	381	250	190	M45×2	50	4 900±200	8	C	TM2000 WR50×500A
U53088	440	77.1	504	855	4	1 388	92	406.4	275	205	M45×2	55	5 050±200	8	C	TM2000 WR55×500
U5E095	475	94.1	650	1 170	4	1 465	100	420	275	210	M48×2	55	5 880±200	8	C	TM2000 WR55×500A
U55098	490	108	755	1 252	4	1 503	107	440	275	215	M52×2	60	7 350±300	8	C	TM2000 WR60×800A
U5G105	525	127	859	1 410	4	1 630	110	470	325	220	M52×3	65	7 650±300	8	C	TM2000 WR65×800
U57108	540	140	1 160	1 780	4	1 674	116	485	350	230	M56×2	60	9 120±300	8	C	TM2000 WR60×800A
U59118	590	180	1 500	2 270	4	1 775	125	530	375	250	M36×2	36	2 350±100	24	D	TM1000 WB36×500
U63128	640	229	2 120	2 920	4	1 899	136	580	400	265	M39×2	36	2 940±150	24	D	TM1000 WB36×500
U6S132	660	255	2 230	3 030	4	1 963	142	600	400	275	M39×2	36	2 940±150	24	D	TM1000 WB36×500
U6D138	690	285	2 660	3 710	4	2 049	146	620	450	285	M42×2	41	4 270±200	24	D	TM1000 WB41×500

■ Features

The U Series is mainly intended for non reversing mills, such as the finishing stand of a hot strip mill.

■ Designs available to order

The fixed type can be designed to order, assembling components are shown on the right.
For more details on these designs, consult JTEKT.

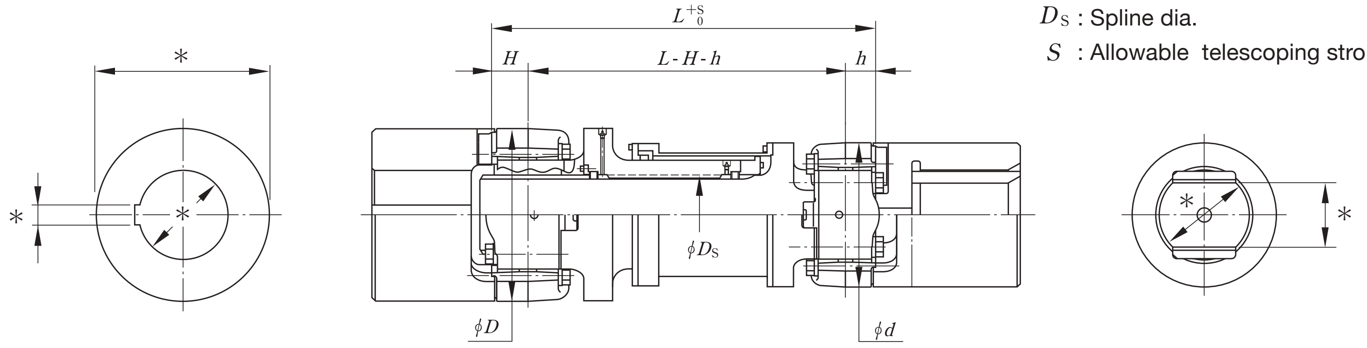
With propeller tube	
With coupling yoke	

Model No.	Swing dia. (mm) D	Torque capacity (kN·m)			Max. operating angle (°)	Boundary dimensions (mm)					Bearing set bolts				Recommended wrench set (bearing set bolt) 7)	
		T_R 1)	T_D 2)	T_S 3)		L 4) (min.)	H	D_T	D_S 5)	S	Nominal thread size	Width across flats	Tightening torque (N·m)	Q'ty 6)	Type	Torque Wrench No. Socket No. Tensiometer No. Wrench No.
U65148	740	360	2 990	4 770	4	2 160	155	670	450	305	M45×2	46	4 900±200	24	D	TM2000 WB46×500
U67152	760	398	3 440	4 840	4	2 195	160	685	450	310	M45×2	46	4 900±200	24	D	TM2000 WB46×500
U6J156	780	416	3 770	5 700	4	2 235	165	705	500	315	M48×2	50	5 590±200	24	D	TM2000 WB50×500
U69168	840	491	4 360	6 650	4	2 357	178	760	500	325	M52×2	55	7 650±300	24	D	TM2000 WB55×500

[Notes] 1) T_R refers to the rated torque used for service life calculation (refer to page 15). The material factor K_m is supposed to be 3 in this calculation.
2) T_D refers to the reference torque used as the criterion for evaluation of resistance to the maximum torque under normal operating conditions.
T_D divided by the maximum torque should preferably be greater than 1.5.
3) T_S refers to the reference torque used as the criterion for evaluation of resistance to the breaking torque under emergency conditions.
T_S divided by the breaking torque should preferably be greater than 1.5.
4) L refers to the minimum dimension when the shaft has neither propeller tube nor welded connection.
5) The value within parentheses indicates the spline diameter of the involute splines.
6) Represents the voltage used for one kit of cross & bearing.
7) The types of wrench set are as follows. For details, refer to “Torque wrench set for bolt tightening” on page 28.
Type A: Torque wrench + Ring head
Type B: Torque wrench + Hexagonal bar wrench
Type C: Tensiometer + Ring wrench
Type D: Tensiometer + Socket wrench

[Remarks] 1) The T_D values in the table are values with pulsating load.
2) If you require U series with swing diameter of ϕ285 to ϕ345, contact JTEKT.

T series



D_S : Spline dia.
S : Allowable telescoping stroke

Dimensions marked with an asterisk (∗) need to be determined to suit existing equipment.
Please provide the specifications of your equipment when placing an inquiry.

■ Features

The T Series is intended for such applications where telescoping function is required in a small space. Because one of the cross & bearings needs to be hollow to enable the required stroke, this series is applicable in such cases where the swing diameter has a given allowance on either the driving side or driven side.

Model No.	Swing dia. (mm) D (d)	Torque capacity(kN・m)			Max. operating angle (°)	Boundary dimensions (mm)			
		T_R 1)	T_D 2)	T_S 3)		L 4) (min.)	H (h)	D_S	S
T42065 (D30044)	325 (220)	16.9	35.3	73.1	10	699	67 (45)	127	180
T48080 (D38060)	400 (300)	30.8	89.9	260	8	870	80 (60)	177.8	210
T54090 (D44070)	450 (350)	45.0	144	384	9	969	92 (70)	203.2	250
TZ56100 (D48080)	500 (400)	74.1	213	560	8	1 080	107 (80)	225	280
T58110 (D54090)	550 (450)	82.5	333	739	8	1 196	116 (92)	250	305
T60120 (D56100)	600 (500)	111	500	1 060	8	1 319	125 (107)	275	335
T62130 (D58110)	650 (550)	142	747	1 460	6	1 414	136 (116)	300	355
T66150 (D62130)	750 (650)	212	1 140	2 520	6	1 617	155 (136)	350	415

Bearing set bolts				Recommended wrench set 6) (bearing set bolt)	
Nominal thread size	Width across flats	Tightening torque (N・m)	Quantity 5)	Type	Torque Wrench No. Socket No. Tensiometer No. Wrench No.
M24×2	27	645± 30	8	A	TM500 HR27×8500
M30×2	32	1 180± 50	8	C	TM500 WR32×500
M33×2	36	1 720± 70	8	C	TM500 WR36×500
M39×3	50	3 030±200	8	C	TM1000 WR50×500
M42×3	50	4 020±200	8	C	TM1000 WR50×500
M48×3	60	5 980±300	8	C	TM2000 WR60×500
M52×3	65	7 650±300	8	C	TM2000 WR65×800
M62×3	75	12 700±300	8	C	TM2000 WR75×800

[Notes] 1) T_R refers to the rated torque used for service life calculation (refer to page 15). The material factor K_m is supposed to be 3 in this calculation.
2) T_D refers to the reference torque used as the criterion for evaluation of resistance to the maximum torque under normal operating conditions.
T_D divided by the maximum torque should preferably be greater than 1.5.
3) T_S refers to the reference torque used as the criterion for evaluation of resistance to the breaking torque under emergency conditions.
T_S divided by the breaking torque should preferably be greater than 1.5.
4) L refers to the minimum dimension when the shaft has neither propeller tube nor welded connection.
5) Represents the voltage used for one kit of cross & bearing.
6) The types of wrench set are as follows. For details, refer to “Torque wrench set for bolt tightening” on page 28.
Type A: Torque wrench + Ring head
Type B: Torque wrench + Hexagonal bar wrench
Type C: Tensiometer + Ring wrench
Type D: Tensiometer + Socket wrench

[Remarks] 1) The T_D values in the table are the values with alternating load. For the values with pulsating load, contact JTEKT.
2) Specifications in parentheses are recommended model numbers and dimensions for combination.

KF/EZ series

Telescoping type (with propeller tube)

D_T : Propeller tube dia.
D_S : Spline dia.
S : Allowable telescoping stroke

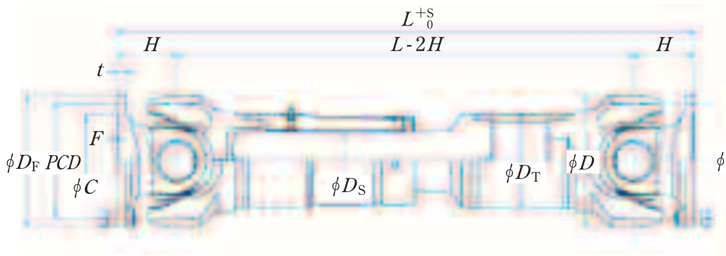


Fig. 1

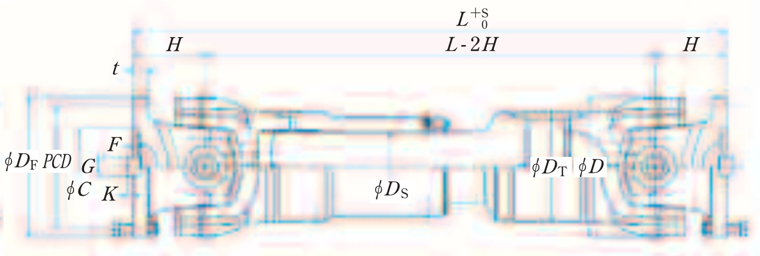


Fig. 2

Model No.	Fig.	Swing dia. (mm) D	Torque capacity (N·m)			Max. operating angle (°)	Boundary dimensions (mm)						
									Telescoping type				Fixed type with propeller tube
			T_R 1)	T_D 2)	T_S 3)		H	D_T	Propeller tube dia. L 4)	With propeller tube L (min.) 4)	S	D_S	L (min.) 4)
KFZ100	1	105	735	1 560	4 130	30	70 —	73	510 —	550 —	60	45	320 —
KF120	1	120	882	2 870	10 500	20	60 62	89.1	495 499	535 539	70	58	310 314
KF150	1	150	1 860	5 890	21 600	20	72 74	114.3	577 581	617 621	70	70	354 358
KF180	1	180	3 280	9 890	36 200	18	82 90	127	664 680	714 730	90	82	404 420
EZ26045	2	225	6 370	19 500	71 400	15	123 128	165.2	862 872	912 922	90	105	536 546
EZ28050	2	250	8 820	32 900	115 000	15	128 130	203	939 943	999 1 003	110	120	586 590
EZ32057	2	285	13 700	41 400	152 000	15	143 148	216.3	1 042 1 052	1 102 1 112	110	140	666 676
EZ34063	2	315	18 900	54 300	199 000	15	163 166	244.5	1 159 1 165	1 229 1 235	135	160	726 732
KFZ350	2	350	25 500	77 200	283 000	15	175 180	244.5	1 231 1 241	1 301 1 311	135	180	780 790
KFZ390	2	390	32 300	107 000	390 000	15	195 —	273.1	1 369 1 399	1 459 1 489	140	200	880 —
KFZ435	2	435	51 000	149 200	546 000	15	220 —	318.5	1 604 1 614	1 704 1 714	140	200	1 010 —

[Notes]
1) T_R refers to the rated torque used for service life calculation (refer to page 15). The material factor K_m is supposed to be 1 for the drive shafts whose swing diameter is 180 mm or less, and to be 3 for those whose swing diameter is between 225 mm and 435 mm in this calculation.
2) T_D refers to the reference torque used as the criterion for evaluation of resistance to the maximum torque under normal operating conditions. T_D divided by the maximum torque should preferably be greater than 1.5.
3) T_S refers to the reference torque used as the criterion for evaluation of resistance to the breaking torque under emergency conditions. T_S divided by the breaking torque should preferably be greater than 1.5.
4) L refers to the minimum dimension when the shaft has neither propeller tube nor welded connection.

[Remarks] 1) The T_D values in the table are the values with alternating load. For the values with pulsating load, contact JTEKT.

Fixed type (with propeller tube)

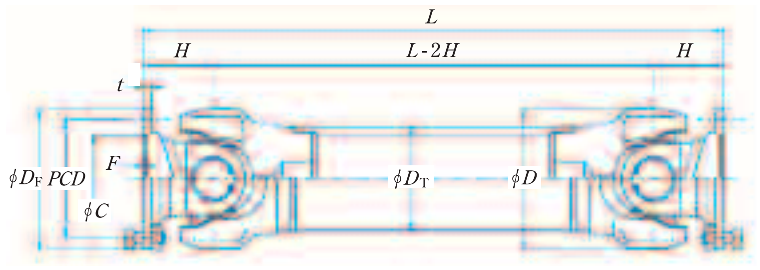


Fig. 1

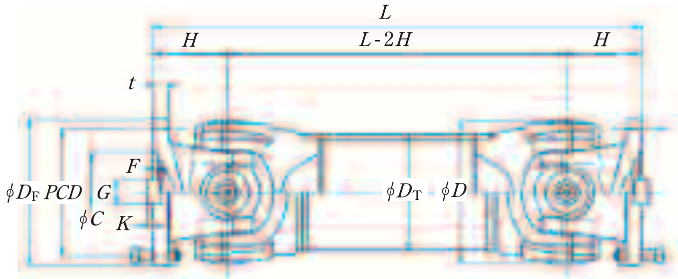


Fig. 2

Bearing set bolts			Flange outside dia. (mm)
Nominal thread size	Width across flats	Tightening torque (N·m)	
—	—	—	120 —
—	—	—	120 150
—	—	—	150 180
—	—	—	180 225
M16×1.5	14	185±10	225 250
M18×2	14	240±20	250 285
M18×2	14	240±20	285 315
M20×2	17	360±20	315 350
M22×1.5	17	745±40	350 390
M27×1.5	19	1 460±80	390 —
M27×1.5	19	1 460±80	435 —

Fixed type (with double flange)

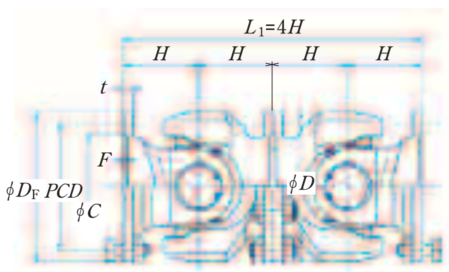


Fig. 1

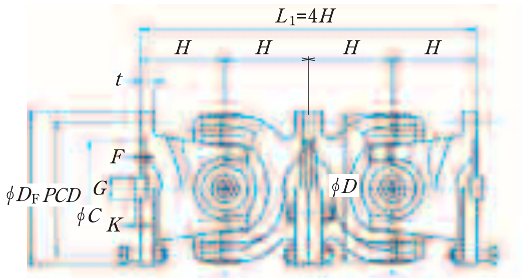


Fig. 2

For the flange dimensions (PCD, C, F, G, K and t) that suit the individual flange outside diameter (D_F) and for the flange bolt hole details, refer to KF/EZ series flange coupling with cylindrical bore on page 27.

■ Features

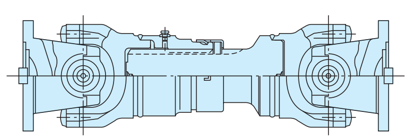
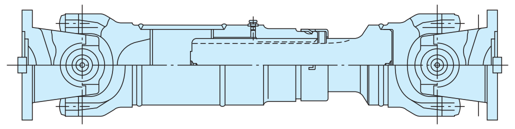
The KF/EZ Series products have the following features depending on the swing diameter.

● Swing diameter: 180 mm or less
The products are suitable for applications where the maximum operating angle is between 18° to 30°. They are suited to light load applications.These products are compatible with a wide variety of equipment. In addition they are economical, with the yokes being integrated.

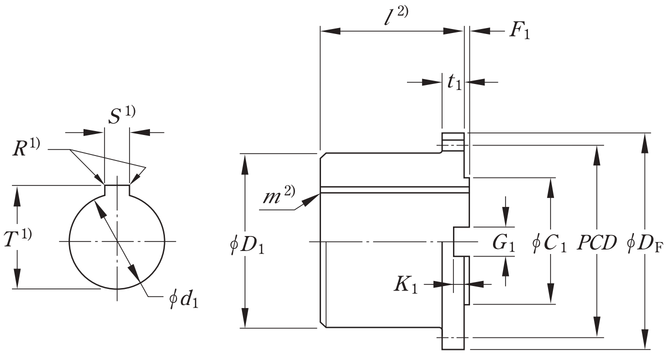
● Swing diameter: 225 to 435 mm
The products are suitable for applications where the maximum operating angle is no more than 15°. They are suited to medium load applications.
Their yokes can be disassembled, so that their cross bearings can be replaced easily.

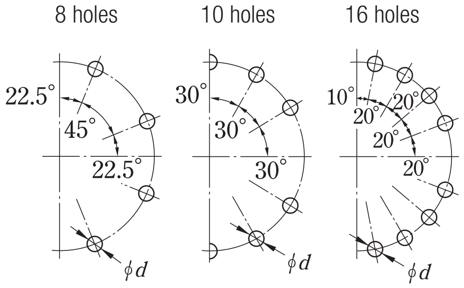
■ Designs available to order

When installation space is limited or when a stroke needs to be long, this series can be designed to order. Assembling components are shown below.
For more details on these designs, consult JTEKT.

Telescoping type without propeller tube	
Long telescoping type	

KF/EZ series flange coupling with cylindrical bore





(Arrangement of bolt holes on the flange)

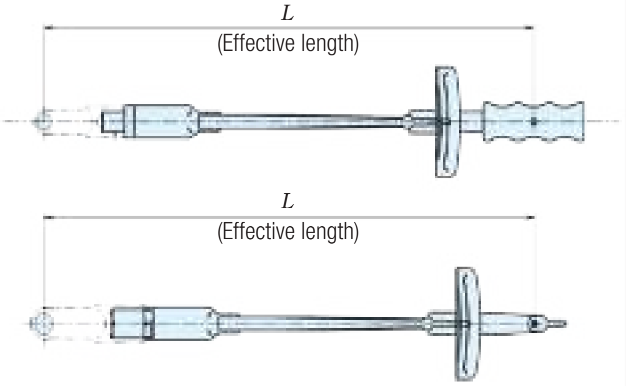
Flange outside dia. D_F (mm)	Boundary dimensions 3)(mm)							Flange bolt holes			Flange set bolts	
	D_1 (max.)	d_1 4) (max.)	C C_1	F F_1	G(e9) G_1(JS9)	K K_1	t t_1	PCD (mm) ±0.1	Dia. d (mm)	Number	Nominal thread size	Tightening torque (N·m)
120	84	52	75 H7/h7	2.5 2	—	—	8	101.5	10 (C12)	8	M10×1.25	64± 5
150	110.5	69	90 H7/h7	2.5 2	—	—	10	130	12 (C12)	8	M12×1.25	105± 5
180	133	83	110 H7/h7	2.5 2	—	—	12	155.5	14 (C12)	8	M14×1.5	175± 10
200	150	94	140 H7/f8	5 4.5	32	9	18	172	15 (drilled)	8	M14×1.5	175± 10
225	172	107	140 H7/f8	5 4.5	32	9	20	196	17 (drilled)	8	M16×1.5	265± 20
250	191	119	140 H7/f8	6 5	40	12.5	25	218	19 (drilled)	8	M18×2.0	360± 20
285	215	134	175 H7/f8	7 6	40	15	27	245	21 (drilled)	8	M20×2.0	500± 30
315	248	155	175 H7/f8	8 7	40	15	32	280	23 (drilled)	10	M22×2.0	675± 40
350	278	173	220 H7/f8	8 7	50	16	35	310	23 (drilled)	10	M22×2.0	675± 40
390	309	193	250 H7/f8	8 7	70	18	40	345	25 (drilled)	10	M24×2.0	900± 50
435	344	215	250 H7/f8	10 9	80	20	42	385	28 (drilled)	16	M27×2.0	1 320± 70
480	379	235	250 H7/f8	12 11	90	22.5	47	425	31 (drilled)	16	M30×2.0	1 810±100
550	446	278	295 H7/f8	12 11	100	22.5	50	492	31 (drilled)	16	M30×2.0	1 810±100

[Notes]
1) The keyway dimensions (S, T and R) shall be determined in conformity with JIS B 1301.
2) The dimensions l and m are determined according to customer specifications. (When not specified, l is recommended to be d_1 multiplied by between 1.2 and 1.5 and m to be d_1 multiplied by about 0.02.)
3) The upper line value in each cell is a dimension for the drive shaft end and the lower line value is a dimension for the cylindrical bore flange coupling end.
4) The d_1 max. dimensions are approximately D_1 divided by 1.6.

Torque wrench set for bolt tightening

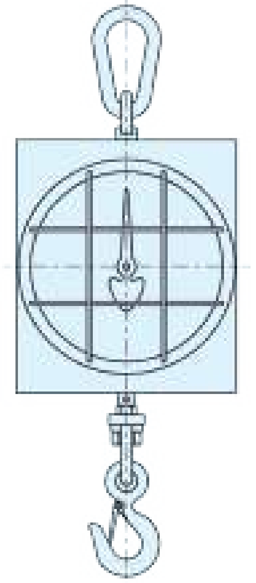
JTEKT provides torque wrench sets suitable for bolt tightening of the drive shaft.
The following are torque wrenches and related tools and their specifications. For details, contact JTEKT.

Torque wrench



No.	*L* (mm)	Scale range (same on the right and left) (N·m)	Minimum scale (N·m)
TW4200	750	70～420	10
TW8500	1310	100～850	20
TW28000	1240	300～2800	50
TW42000	1400	400～4200	100

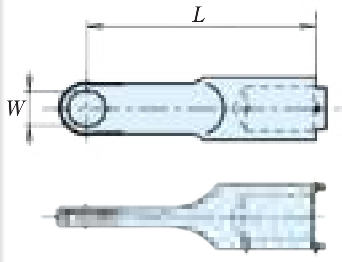
Tensiometer



No.	Weighing (kN)
TM500	5
TM1000	10
TM2000	20
TM3000	30

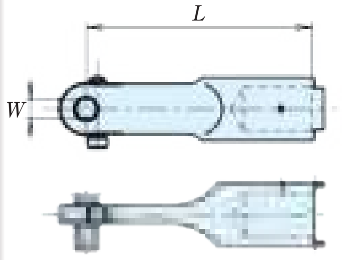
Sockets

(1) Ring head



No.	*L* (mm)	Width across flat *W* (mm)
HR17X4200	100	17
HR19X4200	100	19
HR22X4200	100	22
HR24X8500	160	24
HR27X8500	160	27
HR30X8500	160	30
HR32X8500	160	32
HR36X8500	160	36
HR41X8500	160	41

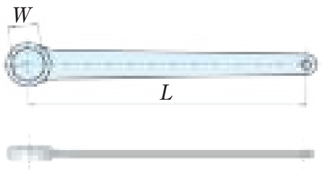
(2) Hexagonal bar head



No.	*L* (mm)	Width across flat *W* (mm)
HH12X8500	160	12
HH14X8500	160	14
HH17X8500	160	17
HH19X8500	160	19

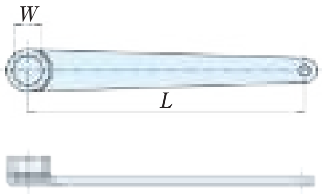
Wrenches

(1) Ring wrench



No.	*L* (mm)	Width across flat *W* (mm)
WR32X500	500	32
WR36X500	500	36
WR41X500	500	41
WR46X500	500	46
WR50X500	500	50
WR50X500A	500	50
WR55X500	500	55
WR55X500A	500	55
WR60X500	500	60
WR60X800A	800	60
WR65X800	800	65
WR70X800	800	70
WR75X800	800	75
WR80X800	800	80
WR85X800	800	85
WR90X800	800	90
WR95X1000	1000	95

(2) Socket wrench

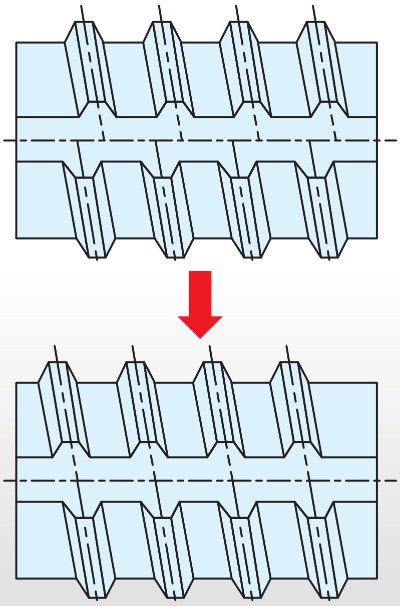


No.	*L* (mm)	Width across flat *W* (mm)
WB36X500	500	36
WB41X500	500	41
WB46X500	500	46
WB50X500	500	50
WB55X500	500	55
WB60X800	800	60
WB65X800	800	65
WB70X800	800	70
WB75X800	800	75

Product introduction

Drive shaft with roll phase adjustment device for bar and rod mill

Applications



Used to adjust the rotation direction phase of the upper and lower rolling mill rolls arbitrarily when forming a continuous thread shape in manufacturing of bar and rod steel for building material (screw reinforcing bar) in bar and rod mills.

Reasons for increase of needs of screw reinforcing bar

(1) To simplify operations, the connection method of bar steel was increasingly changed from previous "welding method" to "screw connection method."

(2) By forming continuous convex in the periphery of bar steel, adhesion with concrete is increased.

Necessity of phase adjustment of rotation direction of rolls

For roll forming of continuous convex screw thread on the surface of bar steel, the rotation direction phase of the upper and lower rolls with concavity spiral groove formed should be adjusted to an arbitrary position.

Features

(1) The rotation phase can be adjusted almost steplessly, which improves the accuracy of products.

(2) The phase can be adjusted in a short time, which improves the efficiency of the work.

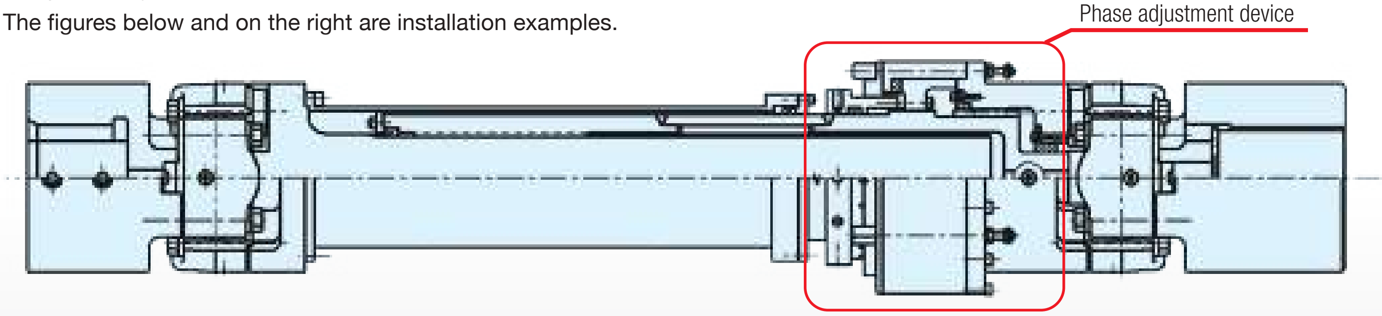
(3) With its unique configuration, the space can be saved in the directions of diameter and shaft.

(4) The lineup of equipment has been enriched to suit most of the bar steel sizes.

(5) On-line work can be conducted without removing the drive shaft.

Installation examples

The phase adjustment device can be attached to both horizontal stand and vertical stand.
The figures below and on the right are installation examples.



For vertical stand

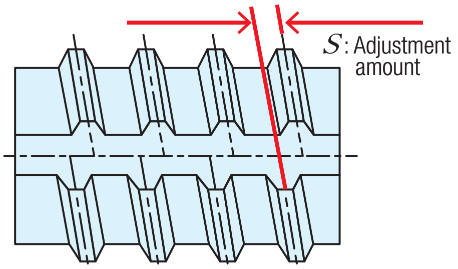
Work procedure

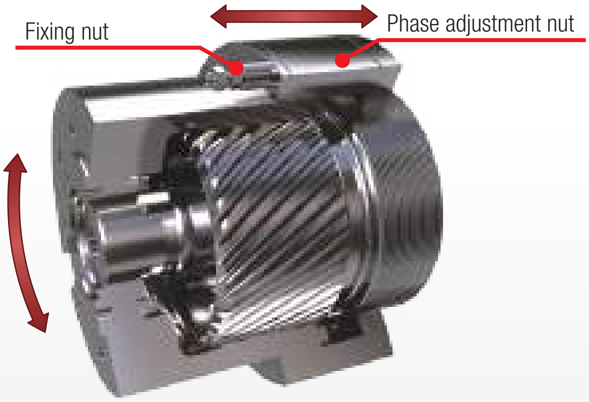
(1) Phase adjustment work should be conducted with the rolls of the rolling mill inserted to the drive shaft. First, measure the adjustment amount.

(2) Decide the number of adjustment scales from the following equation.

$$N = \frac{18 \cdot P \cdot S}{D \cdot L \cdot \tan\theta}$$

N : Number of adjustment scales
P : Helical spline PCD*
S : Adjustment amount (mm) (Measure the dimension in the figure on the right)
D : Roll diameter (mm) (customer dimension)
L : Adjustment nut pitch*
θ : Helical spline helix angle*
For items with *, contact JTEKT.





(3) Loosen the fixing nuts in three positions so that the adjustment nut should be able to rotate.

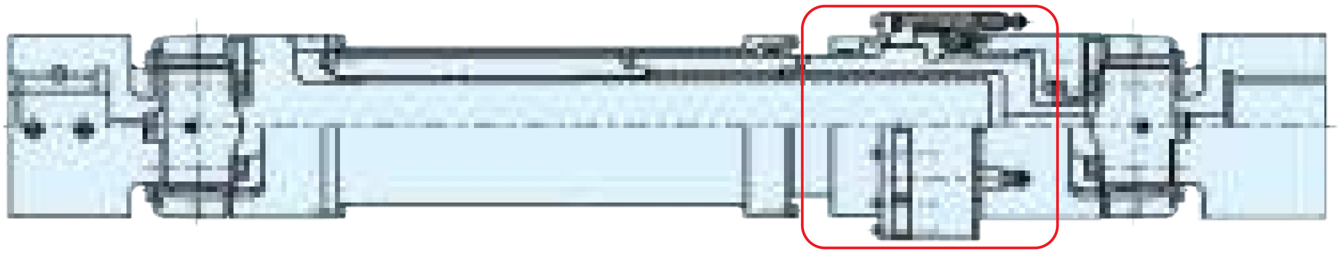
(4) Proceed with adjustment by rotating the phase adjustment nut. When the adjustment nut is rotated, the helical spline slides. With sliding of the helical spline, the rolls rotate slightly. Adjust them to an arbitrary phase.

(5) When the work is complete, tighten the fixing nuts for whirl-stop so that the adjustment unit should not move. It is fixed to this phase.

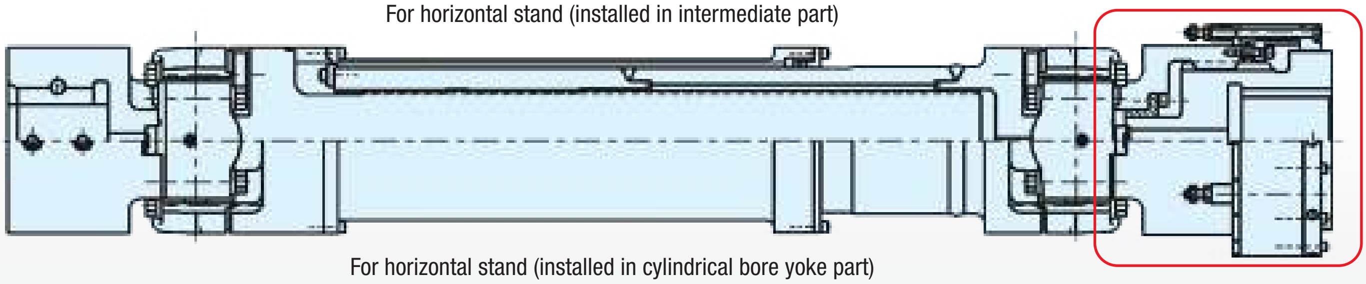
For design of phase adjustment device

Provide JTEKT with the following information for design of the optimal phase adjustment device.
Provide them along with the selection sheet of the drive shaft.

- Stand status (horizontal stand or vertical stand)
- Roll rotation direction (seen from the pinion stand)
- Roll diameter (disposal diameter)
- Pinion PCD
- Pitch in the case of screw reinforcing bar and intercalary dimension in the case of bar steel with different diameters



For horizontal stand (installed in intermediate part)



For horizontal stand (installed in cylindrical bore yoke part)

Product introduction

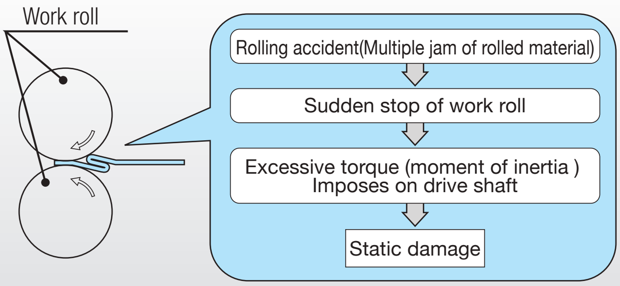
Hyper coupling (1)

Applications

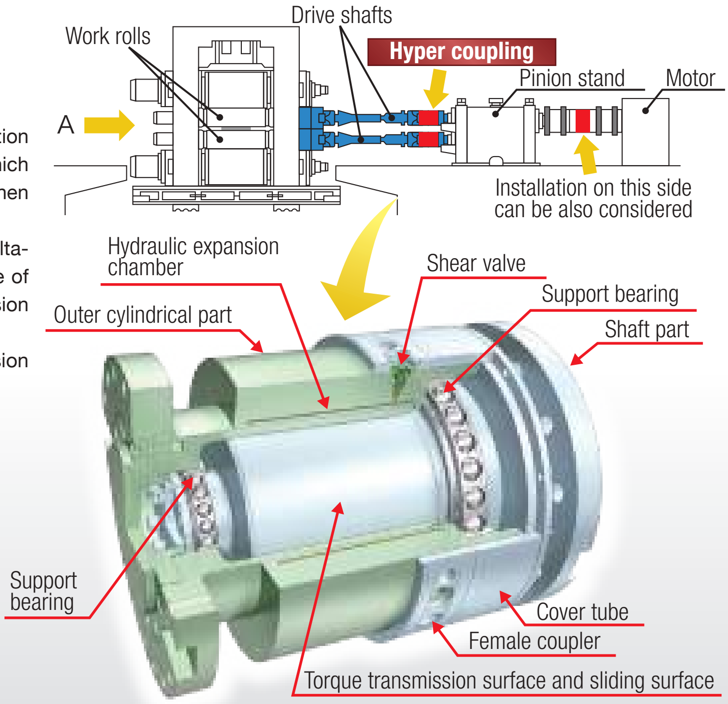
Used to protect peripheral devices of rolling mills against excessive torque.

Structure and working principle

The hydraulic expansion type torque limiter transmits torque by the friction between the shaft components and the welded coupling assemble, which is generated by the bore shrinkage of the welded coupling assemble when oil is filled and pressurized in the hydraulic expansion chamber.
The torque can be set in proportion to hydraulic pressure, which is simultaneously released by the decompression of oil, thanks to the breakage of the shear valve coming concurrently with slipping of torque transmission surface, if the excessive torque beyond set value is generated.
The following illustration shows an example of the hydraulic expansion type torque limiter applied to a rolling mill.



View A (Example of abnormal rolling)



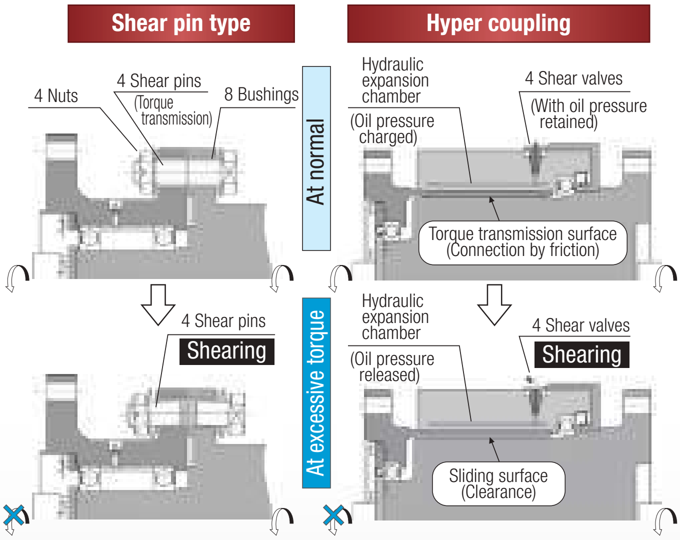
Installation position and structure of hyper coupling

Comparison of Conventional Product

The shear pin type torque limiter has been used as the implement to release torque, however, the maintenance of surrounding parts of the shear pin is required in case the shear pin is broken, which leads to a lot of time consuming for replacement. Furthermore, the pin needs to be periodically replaced in the overhaul in order to prevent the accumulated metal fatigue of the pin. Compared with the share pin type torque limiter, the hydraulic expansion type torque limiter requires only share valve replacement for repair. Since it is not required to replace the shear valves during periodical inspection, it will improve the overhaul time.

		Shear pin type	Hyper coupling
At the time of recovery	Replacement part	◆Shear pin : 4 pieces ◆Nut : 4 pieces ◆Bushe : 8 pieces	◆Shear valves : 4 pieces
	Ratio of required man-hours for part replacement	1	1/4
At the regular inspection time		Periodic replacement of shear pins is required due to accumulated fatigue	Periodic replacement of shear valves is not required

Merits of hyper coupling



Features

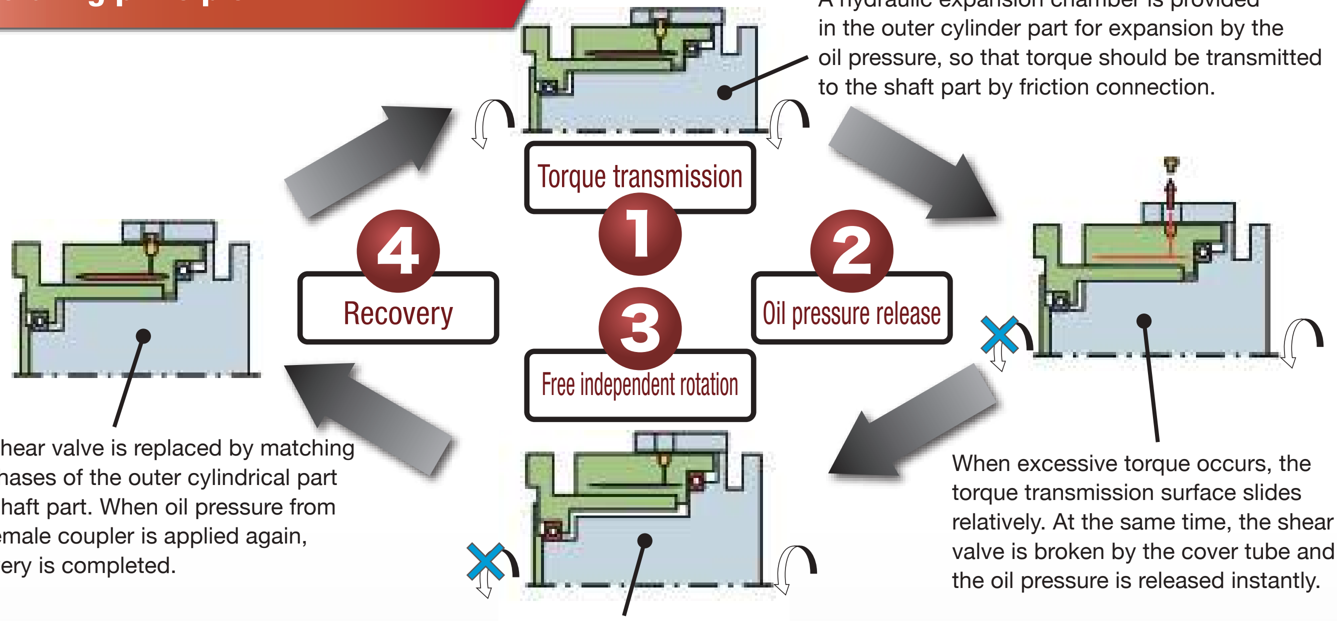
(1) The recovery time after operation (oil pressure release) is significantly shortened.

(2) High operation accuracy.
  - The operation torque accuracy is high. The variation of the operation torque is within ±10 %.
  - The operation torque is validated by using a large-sized torsion testing machine to improve reliability.

(3) The operation torque can be easily set.

(4) High durability performance.
  - A high degree of free independen rotation performance after the release of the oil pressure is secured by utilizing our know-how as a bearing manufacturer.
  - Special surface treatment is applied to the operating surface to improve durability.
  - The oil pressure release-performance is improved by establishing an analysis method of the oil pressure release time.

Operating principle



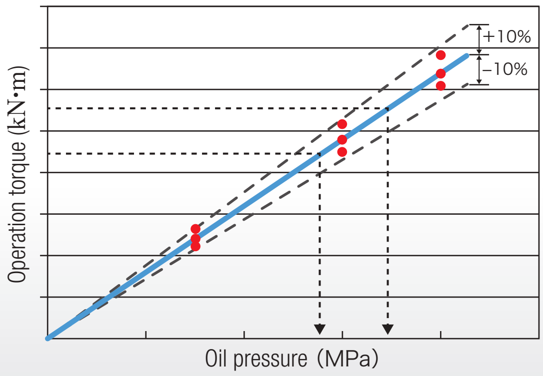
A hydraulic expansion chamber is provided in the outer cylinder part for expansion by the oil pressure, so that torque should be transmitted to the shaft part by friction connection.

When excessive torque occurs, the torque transmission surface slides relatively. At the same time, the shear valve is broken by the cover tube and the oil pressure is released instantly.

The outer cylindrical part and the shaft part are free to rotate independently and smoothly on the bearings that support both ends of the torque transmission surface.

The shear valve is replaced by matching the phases of the outer cylindrical part and shaft part. When oil pressure from the female coupler is applied again, recovery is completed.

Operation torque



Oil pressure-operation torque diagram (image)

The setting of operation torque can be changed easily by adjusting the oil pressure value.

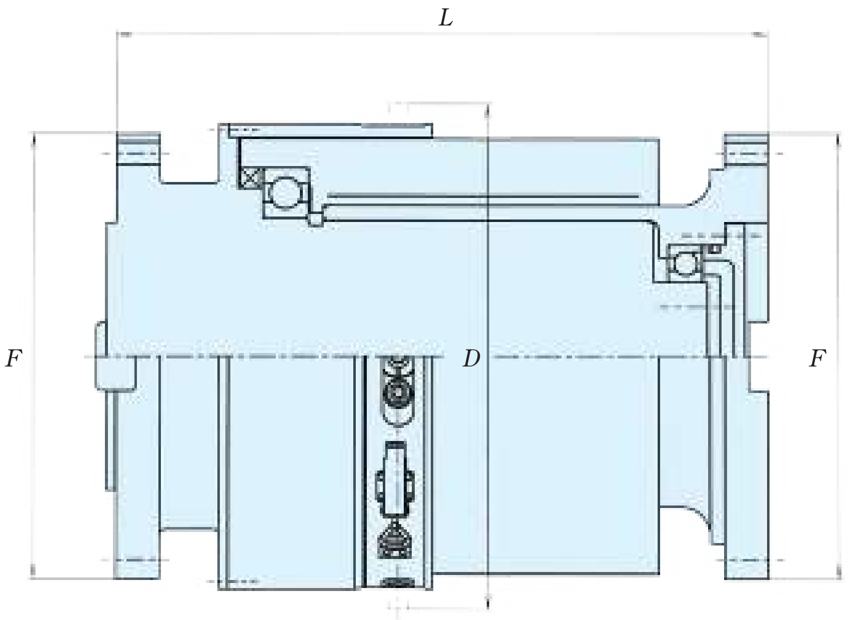
Before shipping, a large-sized torsion testing machine is used with the actual machine to calculate the relationship between each oil pressure and operation torque.
We set the oil pressure value for the requested operation torque.
The accuracy of the operation torque with each oil pressure value is high: within ±10 %.

Large-sized torsion testing machine

Product introduction

Hyper coupling (2)

Dimension tables

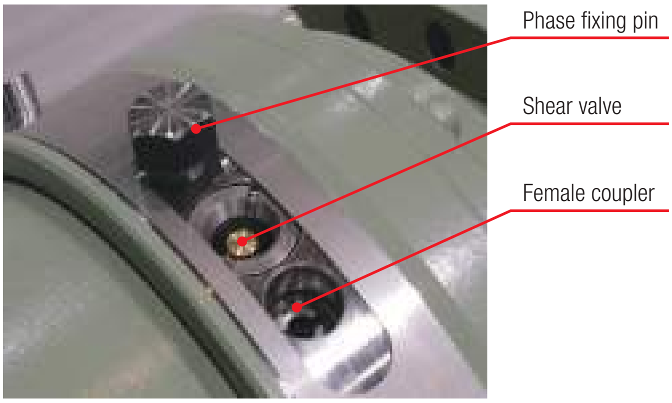


Highper coupling No.	Operation torque (kN·m)	Full length *L* (mm)	Outside diameter *D* (mm)	Flange outside dia. *F* (mm)	Corresponding model No.	
					D series	U series
TL070	80～150	550	420	330	D34052	—
TL088	160～280	650	510	430	D44070	—
TL104	200～510	750	590	525	D50085	U49084
TL120	400～800	850	670	610	D56100	U53088
TL134	600～110	950	740	675	D58110	U5G105
TL148	800～1300	1000	810	735	D60120	U57108
TL160	1000～1800	1100	870	800	D62130	U59118
TL176	1400～2300	1200	950	860	D64140	U6S132
TL188	2100～2900	1300	1010	920	D66150	U6D138
TL204	2500～3600	1400	1090	980	D68160	U67152
TL218	3200～4300	1500	1160	1050	D71170	U69168

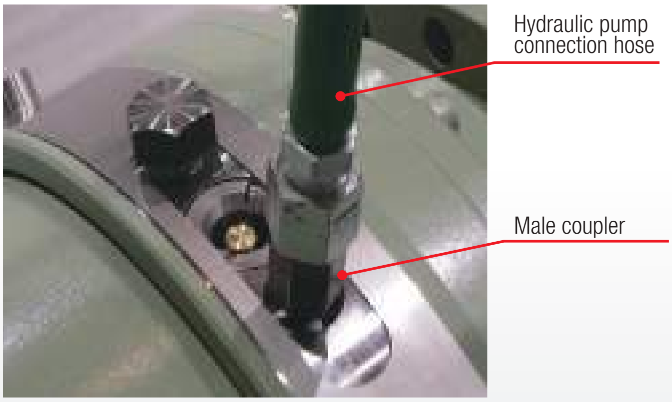
Recovery method after operation

(1) After the drive system (drive shaft) is stopped completely, clean its surroundings.

(2) Match the phases of the outer cylinder part and shaft part and fix the cover tube and the outer cylinder part by using the phase fixing pin.
Remove the shear valve that has been cut off and replace with a new shear valve after cleaning.
(figure on the upper right)



(3) Insert the connection hose of the hydraulic pump with a male coupler to the female coupler and fill the hydraulic expansion chamber with oil and pressurize to the set pressure. (figure on the middle right)

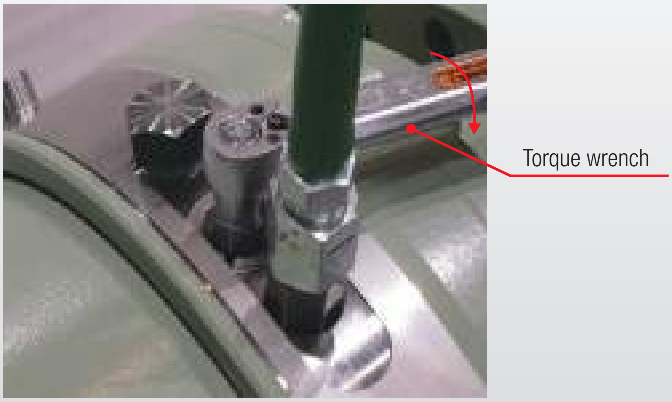


(4) The oil pressure is retained by tightening the shear valve with specified torque. (figure on the lower right)

(5) Check for oil leakage of the shear valve.

(6) After removing the residual pressure of the hydraulic pump, remove the connection hose. The recovery is completed.

For details, refer to the operation manual attached to the product to conduct work.



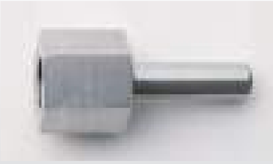
Examples of main tools (attached)

(1) Hydraulic pump
Used to fill the hydraulic expansion chamber with oil and pressurize.

(2) Torque wrench
Used to attach and remove the shear valve assembly, coupler assembly, and phase fixing pin.

(3) Phase fixing pin
Used for whirl-stop at the time of recovery of the hyper coupling.

(4) Male coupler
Attached to the end of the hose attached to the hydraulic pump.
It is inserted to the female coupler of the hyper coupling to pressurize and depressurize the hydraulic expansion chamber.



Recommended tightening torque for flange bolts

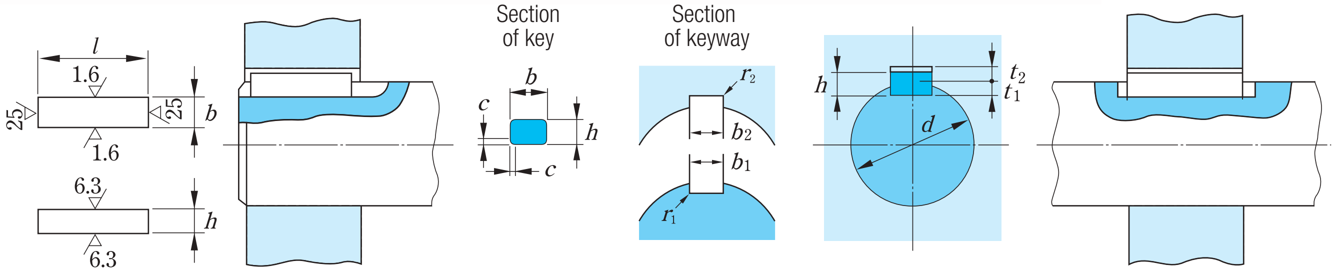
	Designation	Pitch (mm)	Width across flats (mm)	Tightening torque (N・m)	Tightening force (N)
Coarse screw thread	M 6	1	10	12±1	11 500
	M 8	1.25	13	29±2	21 100
	M10	1.5	17	59±5	33 500
	M12	1.75	19	98±5	47 400
	M14	2	22	155±10	65 400
	M16	2	24	245±20	91 800
	M18	2.5	27	345±20	114 000
	M20	2.5	30	480±30	144 000
	M22	2.5	32	645±40	179 000
	M24	3	36	825±50	207 000
	M27	3	41	1 230±70	276 000
	M30	3.5	46	1 670±100	334 000
	M33	3.5	50	2 260±150	417 000
	M36	4	55	2 840±150	479 000
	M39	4	60	3 730±200	582 000
	M42	4.5	65	4 610±300	665 000
	M45	4.5	70	5 790±300	783 000
	M48	5	75	6 960±400	876 000
	M52	5	80	9 020±500	1 060 000
	M56	5.5	85	11 300±600	1 240 000
	M60	5.5	90	13 700±700	1 410 000
	M64	6	95	16 700±900	1 610 000
	M68	6	100	20 100±1000	1 840 000

	Designation	Pitch (mm)	Width across flats (mm)	Tightening torque (N・m)	Tightening force (N)
Fine screw thread	M 6	0.75	10	14±1	12 900
	M 8	1	13	31±2	23 000
	M10	1.25	17	64±5	37 200
	M12	1.25	19	105±5	54 400
	M12	1.5	19	105±5	52 800
	M14	1.5	22	175±10	75 400
	M16	1.5	24	265±20	102 000
	M18	2	27	360±20	123 000
	M20	2	30	500±30	153 000
	M22	2	32	675±40	191 000
	M24	2	36	900±50	233 000
	M27	2	41	1 320±70	305 000
	M30	2	46	1 810±100	378 000
	M33	2	50	2 450±150	468 000
	M36	3	55	3 040±150	523 000
	M39	3	60	3 920±200	624 000
	M42	3	65	5 000±300	740 000
	M45	3	70	6 180±300	855 000
	M48	3	75	7 550±400	979 000
	M52	3	80	9 610±500	1 160 000
	M56	3	85	12 300±700	1 380 000
	M60	3	90	14 700±800	1 560 000
	M64	3	95	18 100±1000	1 810 000
	M68	3	100	21 600±1000	2 040 000

[Remarks] 1) The recommended values are applicable to the following bolts.
Hexagon head bolts of JIS strength class 10.9 (bolt holes is JIS class 1)
Non treated (including blackening), grease lubrication (μ = 0.125 to 0.14)

2) The values are also applicable to class 2 bolt holes and reamer bolt holes as well as hexagon socket head cap screws as far as the designation and pitch are identical.

Shape and dimensions of parallel key and keyway (JIS B 1301)



unit : mm

Nominal size of key $b \times h$	Dimension of key							Dimension of keyway								Informative note
	b		h			c	l 1)	Basic dimension of b_1 and b_2	Close grade	Normal grade		r_1 and r_2	Basic dimension of t_1	Basic dimension of t_2	Tolerance of t_1 and t_2	Applicable shaft dia. d 2)
	Basic dimension	Tolerance (h9)	Basic dimension	Tolerance					b_1 and b_2 Tolerance (P9)	b_1 Tolerance (N9)	b_2 Tolerance (JS9)					
2× 2	2	0 −0.025	2	0 −0.025	h9	0.16 ~0.25	6~ 20	2	−0.006 −0.031	−0.004 −0.029	±0.0125	0.08 ~0.16	1.2	1.0	+0.1 0	6~ 8
3× 3	3		3				6~ 36	3					1.8	1.4		8~ 10
4× 4	4	0 −0.030	4	0 −0.030			8~ 45	4	−0.012 −0.042	0 −0.030	±0.0150		2.5	1.8		10~ 12
5× 5	5		5			0.25 ~0.40	10~ 56	5				0.16 ~0.25	3.0	2.3		12~ 17
6× 6	6		6				14~ 70	6					3.5	2.8		17~ 22
(7× 7)	7	0 −0.036	7	0 −0.036			16~ 80	7	−0.015 −0.051	0 −0.036	±0.0180		4.0	3.0	+0.2 0	20~ 25
8× 7	8		7	0 −0.090	h11		18~ 90	8					4.0	3.3		22~ 30
10× 8	10		8			0.40 ~0.60	22~110	10				0.25 ~0.40	5.0	3.3		30~ 38
12× 8	12	0 −0.043	8				28~140	12	−0.018 −0.061	0 −0.043	±0.0215		5.0	3.3		38~ 44
14× 9	14		9				36~160	14					5.5	3.8		44~ 50
(15×10)	15		10				40~180	15					5.0	5.0		50~ 55
16×10	16		10				45~180	16					6.0	4.3		50~ 58
18×11	18		11	0 −0.110			50~200	18					7.0	4.4		58~ 65
20×12	20	0 −0.052	12			0.60 ~0.80	56~220	20	−0.022 −0.074	0 −0.052	±0.0260	0.40 ~0.60	7.5	4.9		65~ 75
22×14	22		14				63~250	22					9.0	5.4		75~ 85
(24×16)	24		16				70~280	24					8.0	8.0		80~ 90
25×14	25		14				70~280	25					9.0	5.4		85~ 95
28×16	28		16				80~320	28					10.0	6.4		95~110
32×18	32	0 −0.062	18				99~360	32	−0.026 −0.088	0 −0.062	±0.0310		11.0	7.4		110~130
(35×22)	35		22	0 −0.130		1.00 ~1.20	100~400	35				0.70 ~1.00	11.0	11.0	+0.3 0	125~140
36×20	36		20				—	36					12.0	8.4		130~150
(38×24)	38		24				—	38					12.0	12.0		140~160
40×22	40		22				—	40					13.0	9.4		150~170
(42×26)	42		26				—	42					13.0	13.0		160~180
45×25	45		25				—	45					15.0	10.4		170~200
50×28	50		28				—	50					17.0	11.4		200~230
56×32	56	0 −0.074	32	0 −0.160		1.60 ~2.00	—	56	−0.032 −0.106	0 −0.074	±0.0370	1.20 ~1.60	20.0	12.4		230~260
63×32	63		32				—	63					20.0	12.4		260~290
70×36	70		36				—	70					22.0	14.4		290~330
80×40	80		40			2.50 ~3.00	—	80				2.00 ~2.50	25.0	15.4		330~380
90×45	90	0 −0.087	45				—	90	−0.037 −0.124	0 −0.087	±0.0435		28.0	17.4		380~440
100×50	100		50				—	100					31.0	19.5		440~500

[Notes] 1) Dimension l shall be selected among the following within the range given in Table.
The dimensional tolerance on l shall be generally h12 in JIS B0401.
6 , 8 , 10 , 12 , 14 , 16 , 18 , 20 , 22 , 25 , 28 , 32 , 36 , 40 , 45 , 50 , 56 , 63 , 70 , 80 , 90 , 100 , 110 , 125 , 140 , 160 , 180 , 200 , 220 , 250 , 280 , 320 , 360 , 400
2) The applicable shaft diameter is appropriate to the torque corresponding to the strength of the key.

[Remark] The nominal sizes given in parentheses should be avoided from use, as possible.

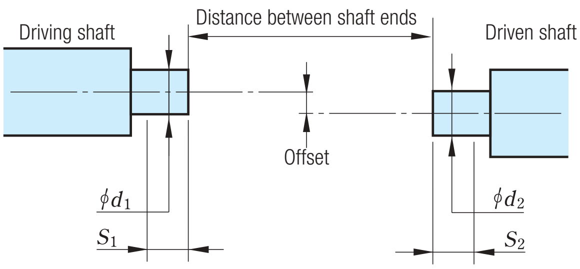
[Reference] Where the key of the smaller tolerance than that specified in this standard is needed, the tolerance on width b of the key shall be h7. In this case, the tolerance on height h shall be h7 for the key 7× 7 or less in nominal size and h11 for the key of 8 × 7 or more.

Drive shaft selection sheet

Item	Necessity	Description	Remarks
Name of the machine			
Location of installation			
(1) Rated motor output (kW)	○		
(2) Motor speed (min^{-1})	○	Min. Max.	
(3) Reduction ratio	○		
Drive shaft			
(4) Number of drive shafts per motor	○		
(5) Torque transmission (kN·m)	○	Normal Normal max. Emergency max.	
(6) Rotational speed (min^{-1})	○	Min. Max.	Unnecessary if (2) and (3) are filled in
(7) Direction(s) of rotation (Circle one of the two listed on the right.)	○	Non reversing Reversing	
(8) Limit swing dia. (mm)	△		
(9) Required stroke (mm)	○		
(10) Pinion PCD (mm)	△		Enter when the shaft is used for reduction rolls as an example.
(11) Roll minimum dia. (mm)	△		
(12) Paint color	△		Black if not specified
(13) Ambient temperature (℃)	△		
(14) Special environmental conditions	△		Water, steam, etc.

(15) Installation dimensions (Must be filled out.)

○ : Must be filled in.
△ : Should be filled in as appropriate.



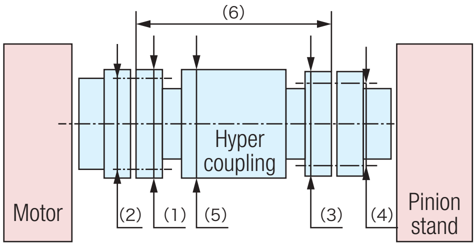
Distance between shaft ends (mm)		
Offset		
	Horizontal (mm)	
	Vertical (mm)	
Fit		
Driving shaft	ϕd_1 (mm)	
	S_1 (mm)	
Driven shaft	ϕd_2 (mm)	
	S_2 (mm)	

Hyper coupling selection sheet

Item	Necessity	Description	Remarks
Name of the machine			
Location of installation	○		
(1) Rated motor output (kW)	○		
(2) Motor speed	○		
(3) Reduction ratio	○		
Existing overload prevention device		Yes No	
If "Yes"			
(4) Installation position (refer to (11))	○	A B	
(5) Type		Shear pin Hydraulic Others	
Installation position (refer to (11))			
(6) (1) - (7) in the figure below	○		
Transmission torque (kN·m)			
(7) Normal	○		
(8) Max.	○		
(9) Emergency max.	○		
(10) Operation torque	○		
Rotational speed (min^{-1})	○		
Paint color			
Ambient temperature (℃)	△		
Special environmental conditions	△		

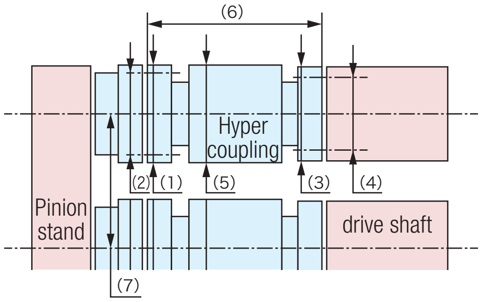
(11) Installation dimensions (Must be filled out.)

○ : Must be filled in.
△ : Should be filled in as appropriate.



A. When installed between the motor and the pinion stand

(1) Flange outside diameter	
(2) Mounting hole PCD x quantity	
(3) Flange outside diameter	
(4) Mounting hole PCD x quantity	
(5) Hyper coupling outside diameter	
(6) Full length	



B. When installed between the pinion stand and the drive shaft

(1) Flange outside diameter	
(2) Mounting hole PCD x quantity	
(3) Flange outside diameter	
(4) Mounting hole PCD x quantity	
(5) Hyper coupling outside diameter	
(6) Full length	
(7) Pinion PCD	

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CAT.NO.UA002EN-0MY

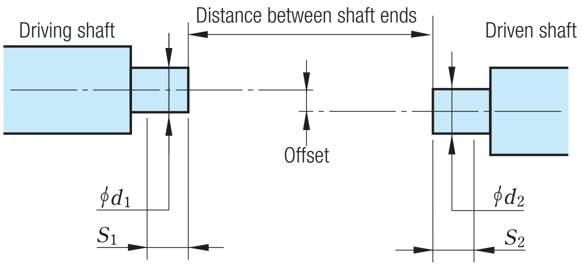
Printed in Japan '20.03('16.1)

Drive shaft selection sheet

Item	Necessity	Description	Remarks
Name of the machine			
Location of installation			
(1) Rated motor output (kW)	○		
(2) Motor speed (min^{-1})	○	Min. Max.	
(3) Reduction ratio	○		
Drive shaft			
(4) Number of drive shafts per motor	○		
(5) Torque transmission (kN·m)	○	Normal Normal max. Emergency max.	
(6) Rotational speed (min^{-1})	○	Min. Max.	Unnecessary if (2) and (3) are filled in
(7) Direction(s) of rotation (Circle one of the two listed on the right.)	○	Non reversing Reversing	
(8) Limit swing dia. (mm)	△		
(9) Required stroke (mm)	○		
(10) Pinion PCD (mm)	△		Enter when the shaft is used for reduction rolls as an example.
(11) Roll minimum dia. (mm)	△		
(12) Paint color	△		Black if not specified
(13) Ambient temperature (℃)	△		
(14) Special environmental conditions	△		Water, steam, etc.

(15) Installation dimensions (Must be filled out.)

○ : Must be filled in.
△ : Should be filled in as appropriate.



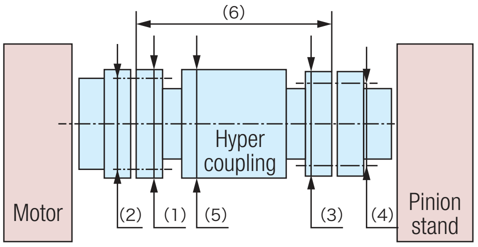
Distance between shaft ends (mm)		
Offset		
	Horizontal (mm)	
	Vertical (mm)	
Fit		
Driving shaft	ϕd_1 (mm)	
	S_1 (mm)	
Driven shaft	ϕd_2 (mm)	
	S_2 (mm)	

Hyper coupling selection sheet

Item	Necessity	Description	Remarks
Name of the machine			
Location of installation	○		
(1) Rated motor output (kW)	○		
(2) Motor speed	○		
(3) Reduction ratio	○		
Existing overload prevention device		Yes No	
If "Yes"			
(4) Installation position (refer to (11))	○	A B	
(5) Type		Shear pin Hydraulic Others	
Installation position (refer to (11))			
(6) (1) - (7) in the figure below	○		
Transmission torque (kN·m)			
(7) Normal	○		
(8) Max.	○		
(9) Emergency max.	○		
(10) Operation torque	○		
Rotational speed (min^{-1})	○		
Paint color			
Ambient temperature (℃)	△		
Special environmental conditions	△		

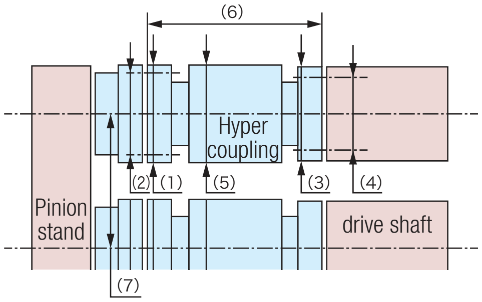
(11) Installation dimensions (Must be filled out.)

○ : Must be filled in.
△ : Should be filled in as appropriate.



A. When installed between the motor and the pinion stand

(1) Flange outside diameter	
(2) Mounting hole PCD x quantity	
(3) Flange outside diameter	
(4) Mounting hole PCD x quantity	
(5) Hyper coupling outside diameter	
(6) Full length	



B. When installed between the pinion stand and the drive shaft

(1) Flange outside diameter	
(2) Mounting hole PCD x quantity	
(3) Flange outside diameter	
(4) Mounting hole PCD x quantity	
(5) Hyper coupling outside diameter	
(6) Full length	
(7) Pinion PCD	

Cylindrical Roller Bearings for Multi-roll Mill Backup Rolls

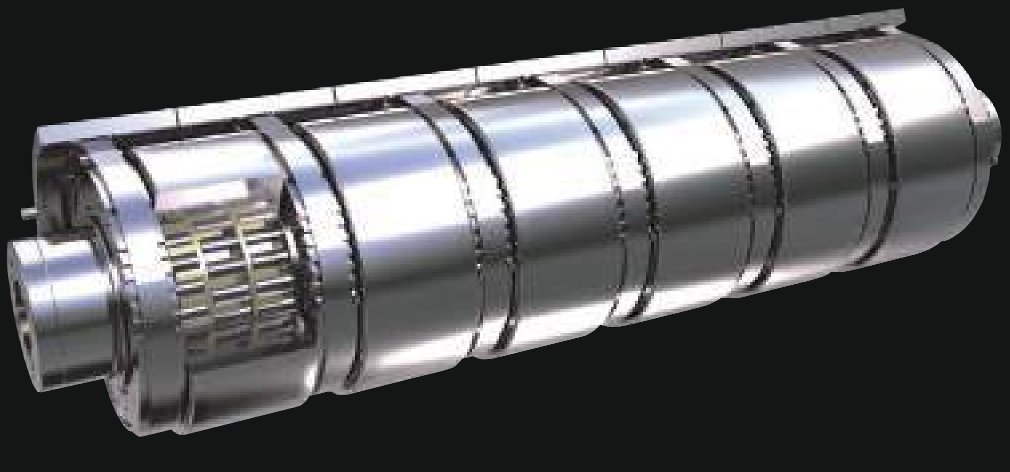
CAT.NO.BA015EN-0MY

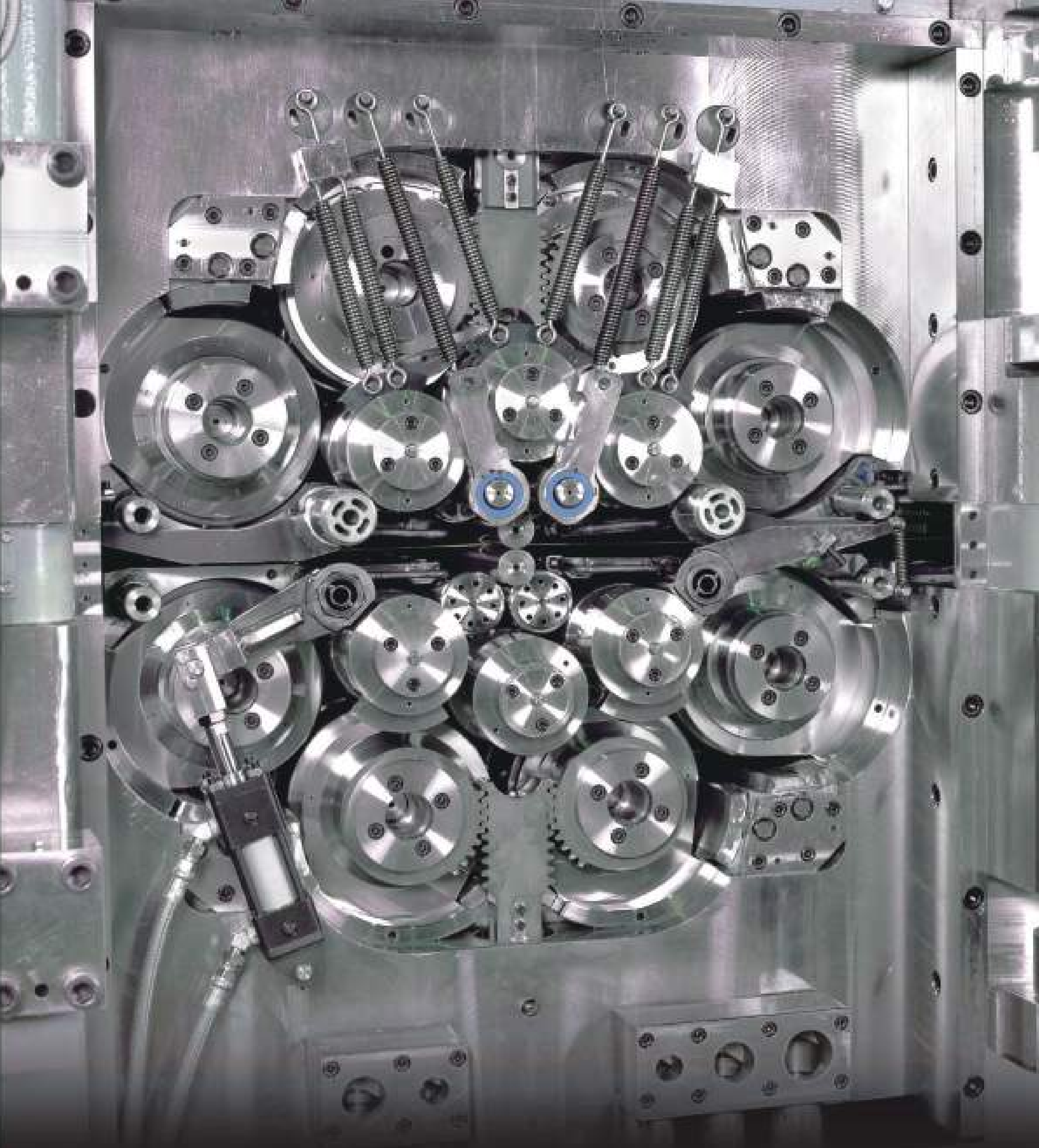
JTEKT started producing cylindrical roller bearings for backup rolls for Sendzimir mills in the 1950s and has continued to provide superior products for customers around the world.

As regards to the backup rolls assembling products, which is the Key component of the Sendzimir mill, we concluded a production agreement for licensing with SENDZIMIR JAPAN, LTD. in 1970 and now supply over 100 products for Sendzimir mills around the world.

We support our customer's operations stability not only with cylindrical roller bearings for backup rolls, but with cylindrical roller thrust bearings for work rolls , bearing-regrinding jigs, measurement of the bearing's section height with equipment developed at JTEKT and our technical know-how and experience.

JTEKT has a long history of providing high quality products and the experience to offer products with high durability and reliability.





Multi-roll mills enable our customers to utilize extremely small diameter work rolls with a choice of 12 or 20 rolls. Thereby, we are now capable of rolling hard materials such as stainless steel sheets and electrical steel sheets as well as rolling ultrathin copper. Cylindrical roller bearings for backup rolls play a significant role in obtaining this high level of efficiency.

Photo by: SENDZIMIR JAPAN, LTD.

Cylindrical roller bearings for multi-roll mill backup rolls

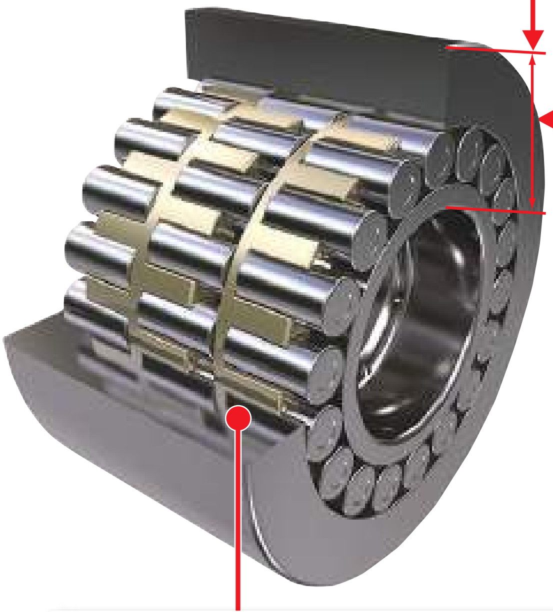
JTEKT has provided Cylindrical roller bearings for backup rolls with high durability and precision, contributing to the utmost performance in multi-roll mills.

Required performance and issues

- 🟪 **Seal structure that maintains a favorable lubricated state**
- 🟩 **Longer inner ring rolling fatigue service life**
- 🟥 **Improving outer ring durability**
- 🟦 **Improving outer ring rotational accuracy**
- 🟧 **Improving ease of outer ring regrinding work (P15-16)**

Bearing configuration and features

The bearings which are used for multi-roll mill backup rolls are attached to the rolls on 1 shaft and the bearings outer diameter are fit closely to the intermediate roll which rotates while loading the rolling component force. Therefore, the outer ring must be fabricated having sufficient rigidity and fatigue strength as well as high precision. At JTEKT, we assemble the bearings in a specially controlled clean working environment.



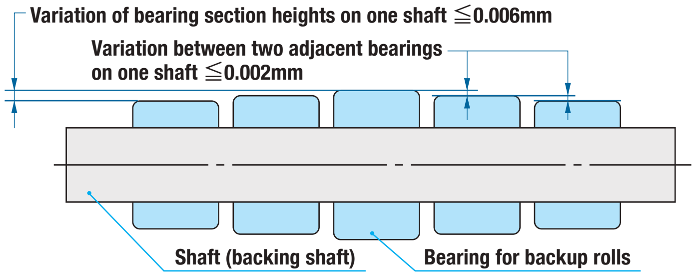
- **The outer surface of the bearing is manufactured through crowning, which accounts for the contact stress distribution to prevent damage to the intermediate roll due to edge load.**

Uncrowned outside surface **Crowned outside surface**

Typical contact stress distribution of the outer-ring's outside surface

(Refer to P16 for the dimensions of the outer ring crowning)

- **By ensuring that high precision in both the variation of the bearing's section heights and high rotation accuracy is achived for optimum distribution of the bearing loads and supporting the development in rolling precision and the quality of the coils.**



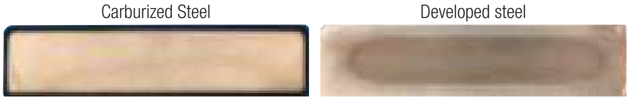
Cored hardening

Surface-hardened layer improved approximately 3-fold

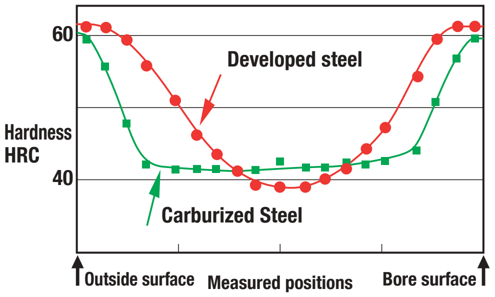
- **Outer ring is fabricated by JTEKT original developed steel and cored hardening.**

※**Cored hardening is applied to bearings of over 130mm inner diameter.**

【Macroscopic structure】



【Surface-hardened layer】



Typical hardness distribution of cored hardening outer ring

Long life, highly corrosion-resistant JHS is driving innovations in steel production equipment.

Iron manufacturing and rolling mill lines must operate continuously while maintaining high reliability in severe production environments. Answering these needs through the realization of epoch-making long-life and high corrosion resistance is JTEKT Hyper Strong (JHS). By adopting newly developed materials and processes for bearing steel, seal materials and other components, we have realized a 2-to-4-fold increase in bearing service life compared to previously used bearings. Continuing on from JHS520 for rolling mill roll necks and JHS210 for Sendzimir rolling mill backup rolls, we are steadily expanding the bearing series according to each application. The JHS bearing series offers total support for achieving maximum performance and durability in the ever-evolving field of steel equipment. Please keep your expectations high. We won't let you down.

🟪 Seal structure that maintains a favorable lubricated state 🟩 Longer inner ring rolling fatigue service life 🟥 Improving outer ring durability 🟦 Improving outer ring rotational accuracy

Bearing for oil mist lubrication

Advantages

- **Improving bearing service life (2-fold/4-fold compared to conventional types)**
- **High sealing performance**
- **Oil seal's Space-saving size for simple installation/ removal**

【Service life】

Conventional type

Approx.2-fold JHS210 (standard specification)

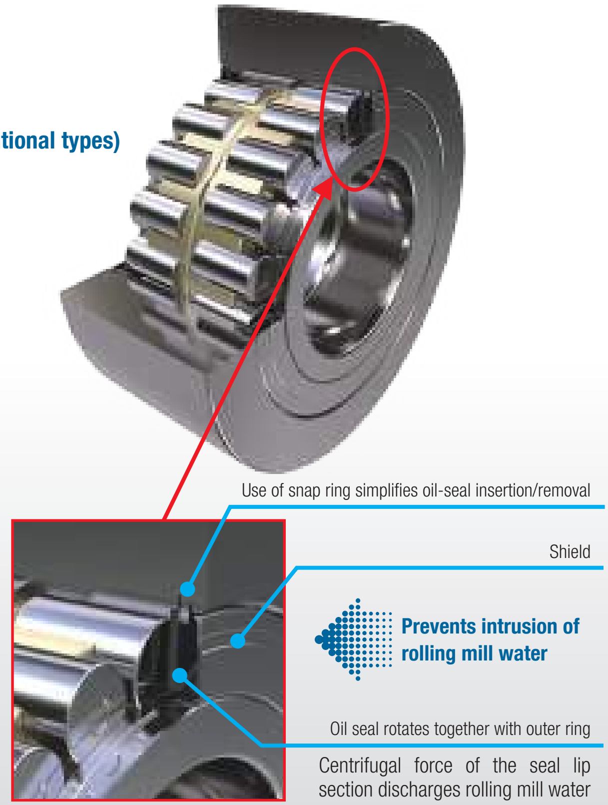
Approx.4-fold

JHS210 (premium specification)

Premium specifications

JHS 210 JTEKT HYPER STRONG

Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication. Bearing service life is approx. 4-fold compared to the conventional type.



Centrifugal force of the seal lip section discharges rolling mill water that has infiltrated to the outside

🟩 Longer inner ring rolling fatigue service life 🟥 Improving outer ring durability 🟦 Improving outer ring rotational accuracy

Bearing for forced oil lubrication

Advantages

- **Outer ring with both high rigidity and durability realized**
- **High resistance to fatigue realized owing to superior materials composition**
- **Design optimized to match surrounding structure**

【Service life】

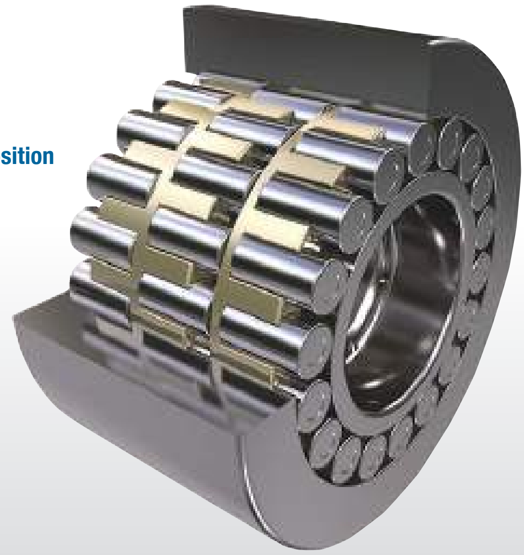
Conventional type

Approx.1.5~3-fold JHS210 (premium specification)

Premium specifications

JHS 210 JTEKT HYPER STRONG

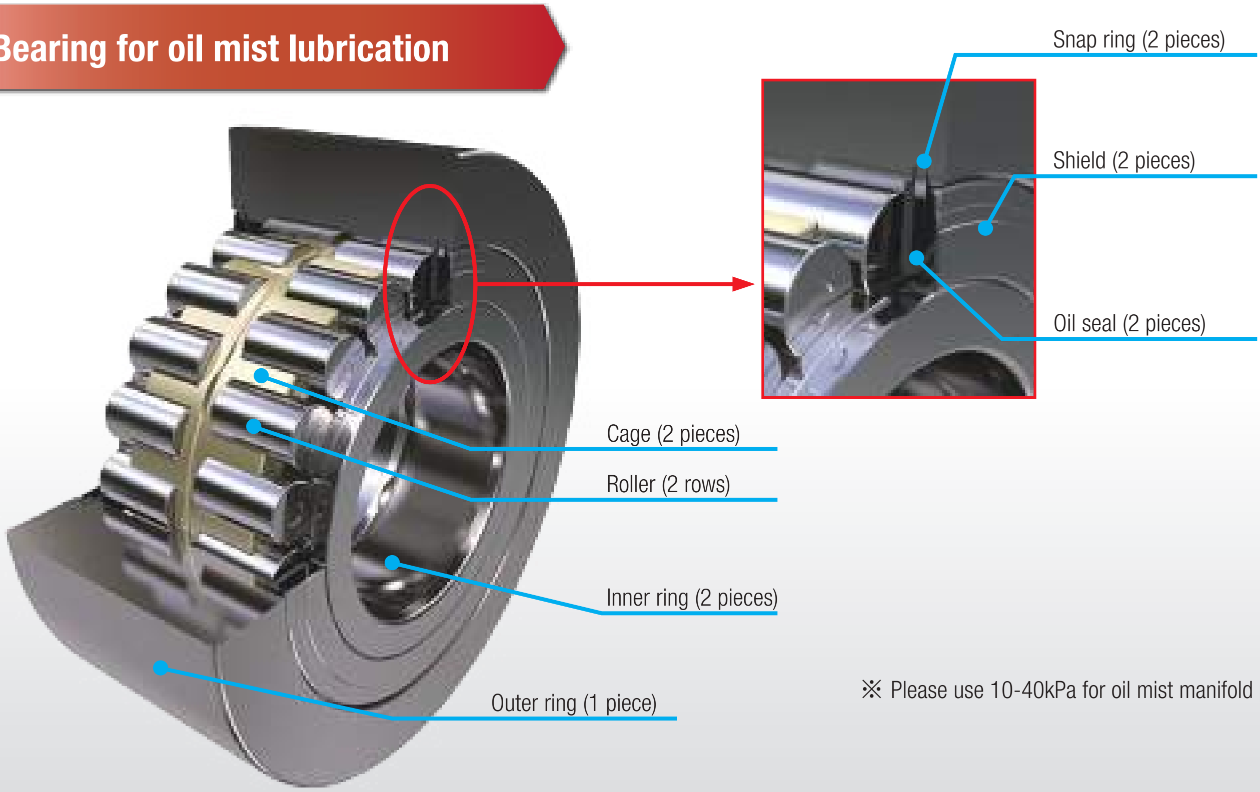
Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication. Bearing service life is approx. 1.5~3-fold compared to the conventional type.



Bearing instruction

Here is an illustration of how we disassemble, assemble and inspect the bearings. Please follow this for bearing maintenance.

Bearing for oil mist lubrication



※ Please use 10-40kPa for oil mist manifold pressure.

Inner ring disassembling points

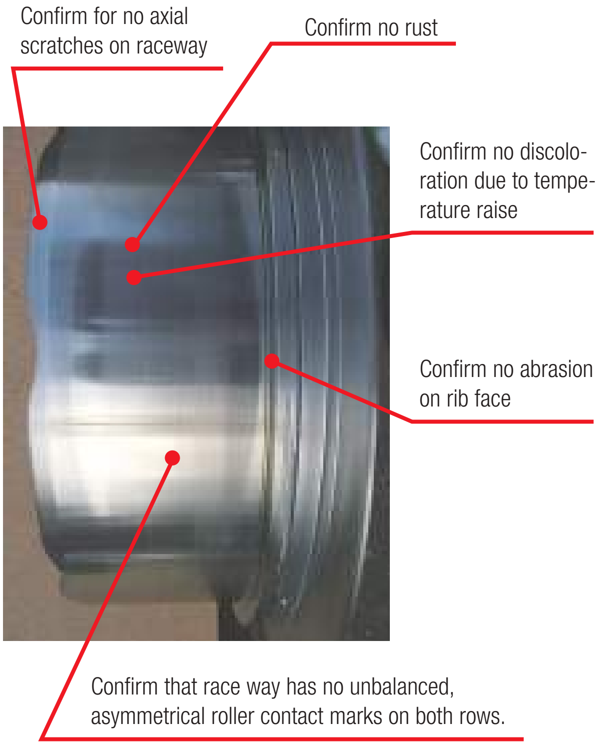
(1) Remove inner rings (both rings)

Shield will be removed with inner rings due to the press-fitting of the inner ring.

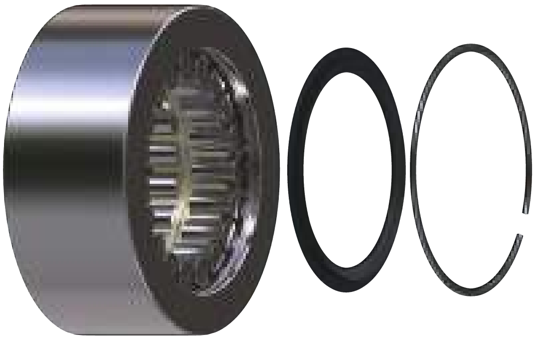
【!】Caution

Be careful when handling the shield. Any damage to shield may affect the performance of the bearing’s sealing.

Inner ring inspection points



Oil seal disassembling points



(2) Remove snap ring (both pieces)

(3) Remove oil seals (both pieces)

【!】Caution

Be careful to not scratch the oil seal when removing the snap ring and oil seal.

Oil seal inspection points

Confirm no cracking or chipping on seal lip part

【!】Caution

In case of cleaning the oil seal with cleaning oil, please wipe off the cleaning oil immediately.

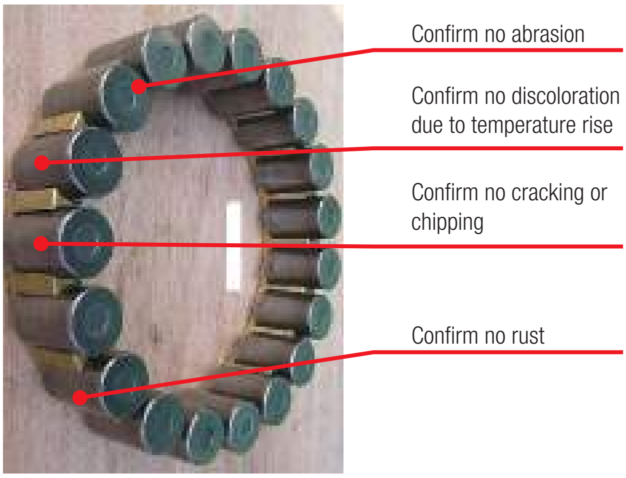
Roller・Cage disassembling points

(4) Hold the cage and remove it with the roller (both rows)

【!】Caution

Be sure to keep all rollers and other parts separate from other bearing parts and manage each bearing independently.

Roller inspection points



Confirm no abrasion

Confirm no discoloration due to temperature rise

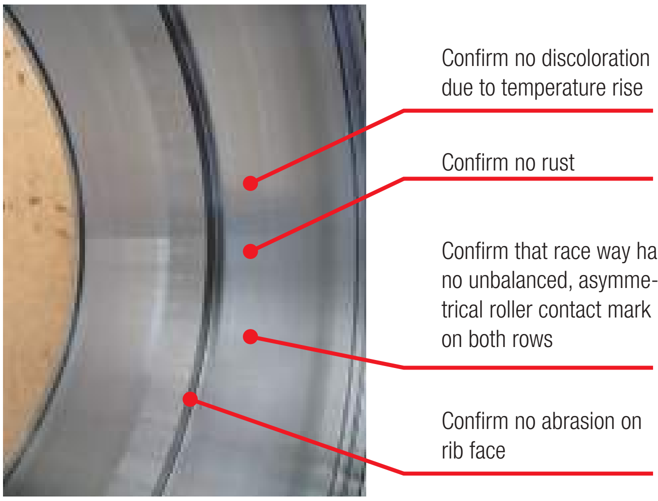
Confirm no cracking or chipping

Confirm no rust

Outer ring inspection points

Confirm no cracking or chipping

Confirm no slipping scratches or brinelling



Confirm no discoloration due to temperature rise

Confirm no rust

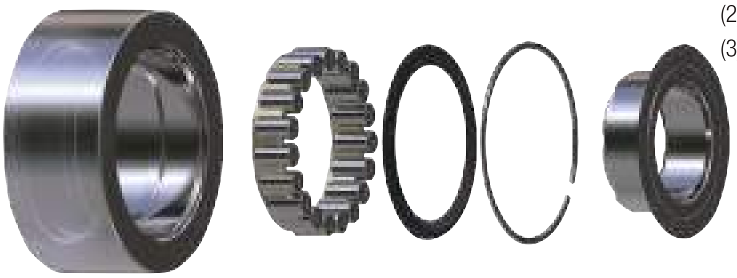
Confirm that race way has no unbalanced, asymmetrical roller contact mark on both rows

Confirm no abrasion on rib face

Bearing instruction

Here is an illustration of how we disassemble, assemble and inspect the bearings. Please follow this for bearing maintenance.

Assembling cylindrical roller bearings for backup rolls

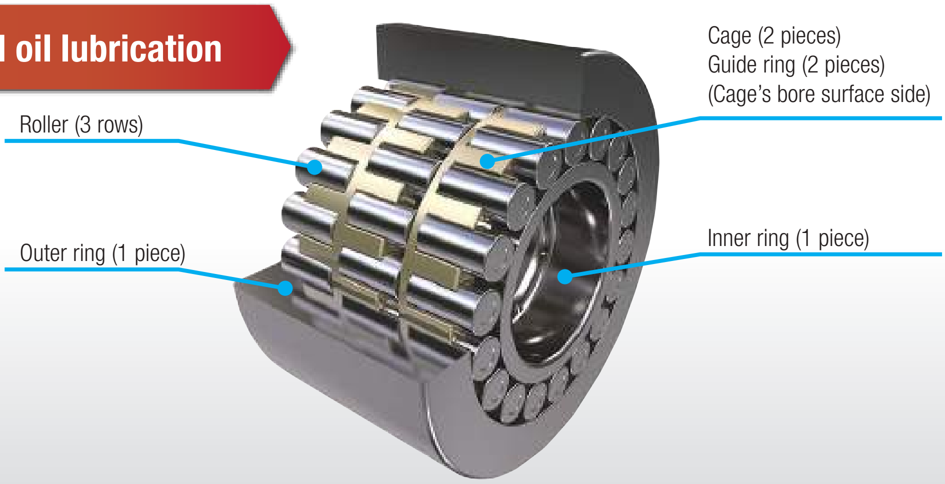


(1) Complete cleaning of each part before re-assembling.
(2) Assemble the bearings in the reverse order of disassembling.
(3) Before inserting the inner ring (with shield), supply the initial lubricate oil (mist oil) into the bearing.

【!】Caution

- Be careful to insert only appropriate bearing parts. There are no compatible parts with other products.
- During re-assembly, be careful not to contaminate the bearing with any foreign matter. Please handle with care so as not to scratch any surfaces of the bearing.

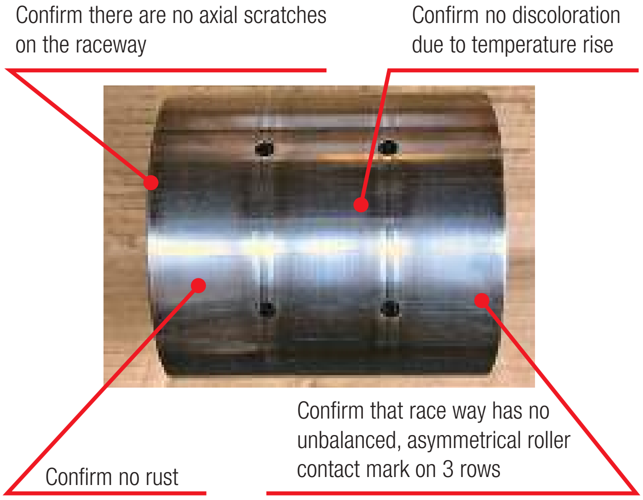
Bearings for forced oil lubrication



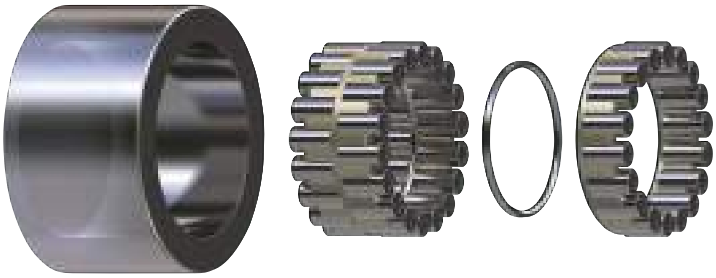
Inner ring disassembling points

(1) Remove inner ring (1 piece)

Inner ring inspection points



Roller ·Cage disassembling points



(2) Hold the cage and remove it with roller (2 rows and 1 row)

【!】Caution

Be sure to keep all rollers and other parts separate from other bearing parts and manage each bearing independently.

Roller inspection points

Outer ring inspection points

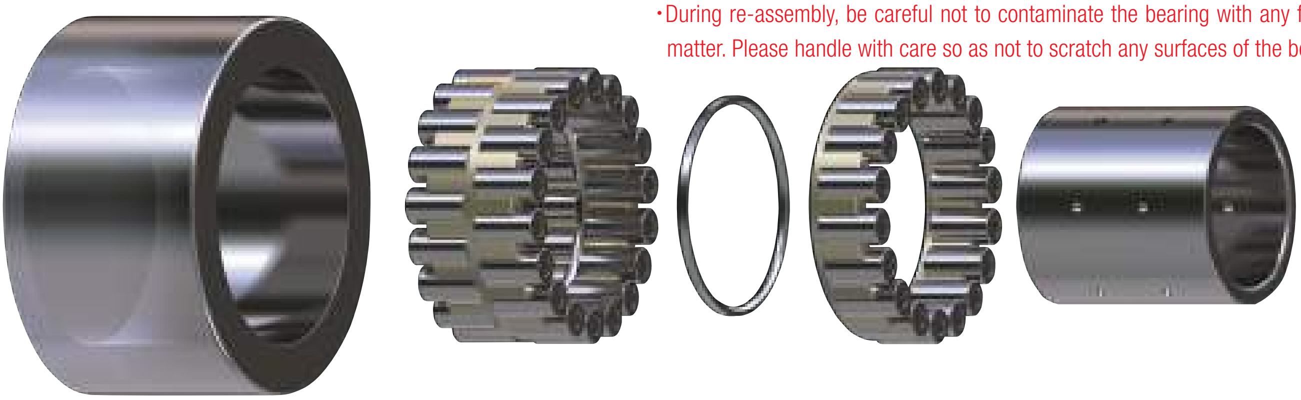
Assembling cylindrical roller bearings for backup rolls

(1) Complete cleaning of each part before re-assembling

(2) Assemble the bearings in the reverse order of disassembling

【!】Caution

- Be careful to insert only appropriate bearing parts. There are no compatible parts with other products.
- During re-assembly, be careful not to contaminate the bearing with any foreign matter. Please handle with care so as not to scratch any surfaces of the bearing.



Examples of bearing failures and countermeasures

JTEKT's countermeasures for various failures. Please follow this bearing maintenance program for optimum performance.

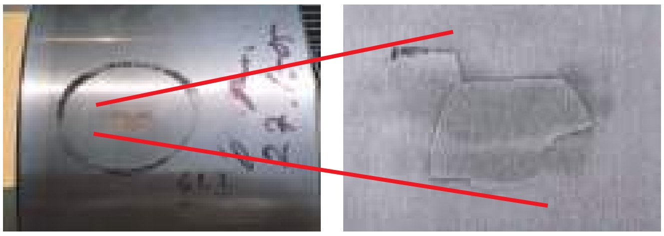
Outside surface of outer ring's slipping scratches and grinding burn

Outside of outer ring's slipping scratches

<Probable causes>
- Slip with the intermediate roll (Sheet jam, involution and so on)

<Countermeasures>
- Review operating conditions

<Countermeasures>
- After removing the slipping scratches on outer surface of the outer ring, a minimum of 0.5mm re-grinding on outer ring diameter needs to be done.



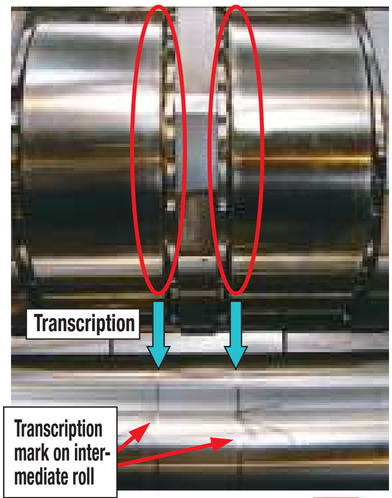
Outside of outer ring's grinding burn

<Probable causes>
- Improper regrinding of outer ring (Heavy grinding, lack of grinding fluid, clogged grinding stone, etc.)

<Countermeasures>
- Optimizing the grinding conditions, improving grinding stone

<Countermeasures>
- dispose

Transcription mark on intermediate roll



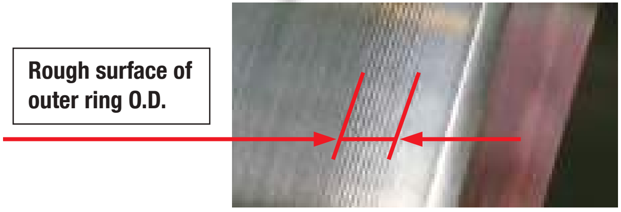
Outside of outer ring's slipping scratches

<Probable causes>
- Improper regrinding of outer ring(Clogged grinding stone) →rough outside surface (include scratches and foreign matter) →occurrence of transcription mark on intermediate roll

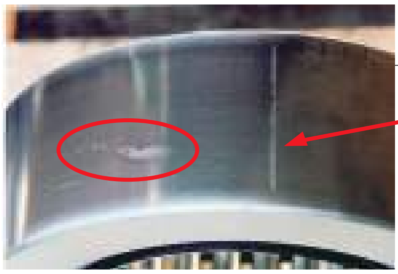
<Countermeasures>
- Optimizing grinding conditions, improving grinding stone and cleaning outside surface and shaft

<Countermeasures>
- Reusable by grinding outside surface
- Reusable by grinding intermediate roll

Expansion of crowning part on outer ring O.D.



Brinelling on raceway



Brinelling on outer ring O.D.

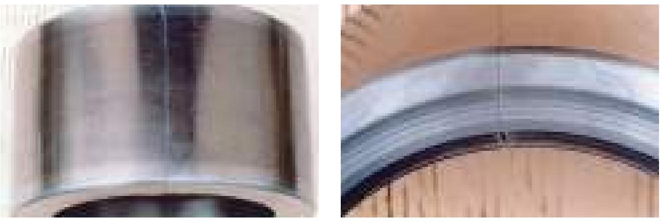
Brinelling on raceway surface of outer ring

<Probable causes>
- Foreign matter jam (rolling material's fragmentation, etc.)

<Countermeasures>
- Rolling oil cleaning

<Countermeasures>
- Reusable by regrinding outside surface. Reusable by lapping raceway surface. However, if damage is too severe, dispose

Raceway ring's cracking



Outer ring cracking

<Probable causes>
- Outside surface damage progresses from slipping scratches.
- Side surface damage progresses from heat cracks (due to slipping with thrust washer.)

<Countermeasures>
- Remove the slipping scratch by regrinding the outer ring O.D.
- Proper management of thrust washers

<Countermeasures>
- dispose

Inner ring cracking

<Probable causes>
- Excessive axial load due to misaligned roll or irregular section height of bearings in one shaft.

<Countermeasures>
- Restraining misalligned roll
- Control of section height of bearings in one shaft

<Countermeasures>
- dispose

Raceway・roller flaking

Raceway flaking

Roller flaking

<Probable causes>

- Rolling fatigue service life, excessive loading, improper lubrication

<Countermeasures>

- Review operating conditions
- Review viscosity of oil lubrication

<Countermeasures>

- dispose

However, in the case of minimal flaking of the inner ring, it's reusable by removing the flaking and setting in an unloading position

Rust・scratches

Rust

<Probable causes>

- After use, equipment has been left for a long period without disassembling
- Improper storage condition
- Intrusion of mill water

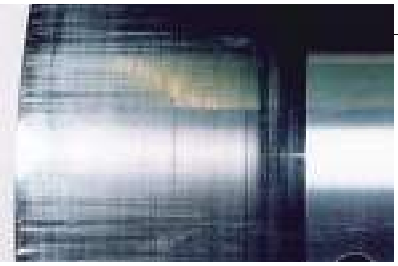
<Countermeasures>

- After use, disassemble and clean as soon as possible
- perform rust prevention maintenance
- confirm the seals condition

<Countermeasures>

- Reusable by lapping using oil grinding stone or sandpaper
- In case of severe condition, dispose

Scratches



<Probable causes>

- Scratches during bearing's disassembling or re-assembling

<Countermeasures>

- Appropriate caution during bearing's disassembling and re-assembling

<Countermeasures>

- Reusable by lapping using oil grinding stone or sandpaper
- In case of severe condition, dispose

Smearing or abrasions

Roller Smearing

<Probable causes>

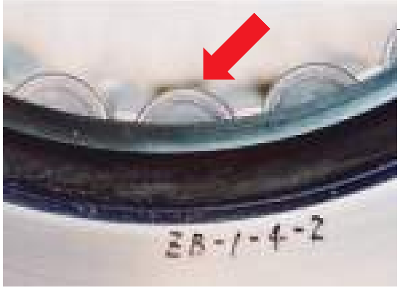
- Minimal loading
- improper lubrication

<Countermeasures>

- proper loading
- review lubricant condition

<Countermeasures>

- Reusable by lapping using In case of severe condition, dispose (when picture's state, dispose)



Roller abrasion

<Probable causes>

- Bearing misalignment
- improper lubrication
- Foreign matter jam

<Countermeasures>

- Maintaining alignment of the bearing
- review lubricant condition

<Countermeasures>

- usually disposal

Raceway wear

Raceway wear

<Probable causes>

- Excessive loading
- improper lubrication

<Countermeasures>

- proper loading
- review lubricant condition

<Countermeasures>

- Usually disposal

Fretting on bore surface of inner ring

<Probable causes>

- Loose fitting between shaft and inner ring

<Countermeasures>

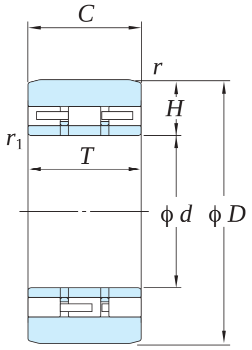
- (It is not possible to change the shaft and inner ring fit independently)
- Apply lubricant into the fitting surface of the shaft and inner ring Appropriate operating period

<Countermeasures>

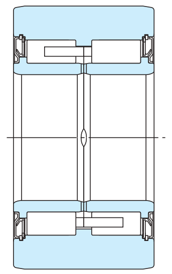
- Reusable by lapping using oil grinding stone or sandpaper

Bearing dimensions table

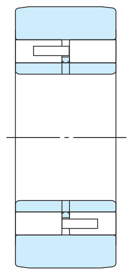
A list of available bearings can be found in the following dimensions table. For any dimensions which are not on the table, please consult **JTEKT**.



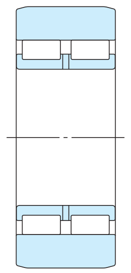
Design 1



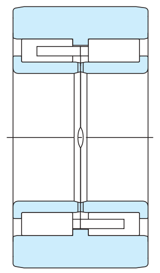
Design 2



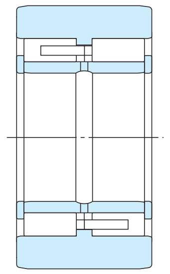
Design 3



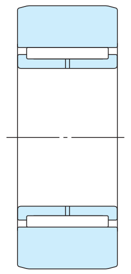
Design 4



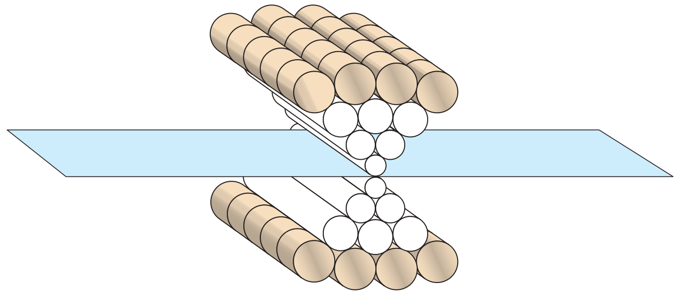
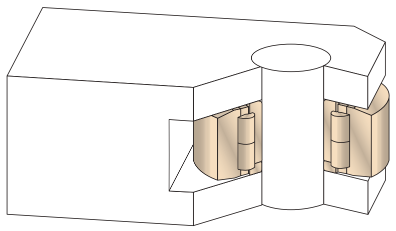
Design 5



Design 6



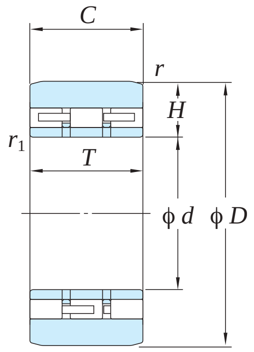
Design 7

Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue limit load (kN)	Bearing No.		Design	Bearing section height when manufactured (mm)	Mass (kg)	Amount of bearings required per mill 1)	Applicable multi-roll mill type	Applicable multi-roll mill rolls arrangement
$d(F_W)$	D	T	C	r	r_1	Cr	Cor	Cu				H				
31.75	76.2	46.23	45.85	0.8	1.5	121	183	31.5	06DC0846A		4	22.200	1.27	40	ZR34	
54.999	120	25.999	25.999	1.6	1.6	99.3	138	18.8	11N1226V		7	32.4672	1.69	24,56	ZR24	
55	120	52.197	52	1.6	1.6	254	341	45.9	11DC1252		4	32.483	3.27	40	ZR24	
70	160	90	90	1.5	1.5	434	546	81.2	14DC1690LDS-1		5	44.977	10.1	40	ZR33	
70	160.07	90	90	1.5	1.5	475	667	101	14DC1690ADS		1	45.000	10.5	32,48,72	ZR33	
90	190	100	100	3	3	593	770	109	18DC19100NDS		5	49.980	14.7	48	ZR25	
100	225.021	80	80	1.5	1.5	759	991	136	20DC23080DS		3	62.474	18.2	12（36）	ZR23	
100	225.021	120	120	1.5	1.5	1020	1440	199	20DC23120MDS		1	62.474	27.2	32	ZR23	
100	225	100	100	3	1.5	683	838	114	20DC23100NDS-1		5	62.480	21.7	40	ZR23	
99.995	225	120	120	1.5	1.5	780	995	135	20DC23120KDS-2		2	62.474	26.0	32,40,48	ZR23	
130	300	160	159.5	4	3.5	1660	2340	297	26DC30160DS		1	84.9617	64.8	40,48	ZR22	
130	300	172.644	172.644	4	3.5	1950	2900	363	26DC30170MDS		1	84.955	72.6	40,48	ZR22	 Cylindrical roller bearings for work roll thrust
130	300	172.644	172.644	4	3.5	1650	2210	275	26DC30170KDS-3		2	84.955	70	40,48	ZR22	
180	406.42	171.04	171.04	4	4	2580	3810	450	36DC41171DS		1	113.155	130	48,56	ZR21	
180	406.42	171.04	171.04	4	1	2390	3340	389	36DC41171ADS		6	113.155	124	48,56	ZR21	
180	406.42	171.04	171.04	4	3	2090	2960	346	36DC41171KDS		2	113.155	125	48	ZR21	
179.984	406.43	223.96	217	4	0.5	2940	4500	515	36DC41217DS+DP		1	113.155	161	40,48	ZR21	
179.984	406.43	224.25	220	4	3	2430	3530	405	36DC41224KDS		2	113.181	160	32,48	ZR21	
180	406.42	224.25	224	4	3	2860	4230	480	36DC41224QDS		5	113.155	162	40,48	ZR21	
50	110	44.4	44.4	1.1	1.1	158	167	24.5	10NUP1144		–	–	2.33	–	ZR22,ZR21	
50	125	48	46	2.0	1.1	202	213	28.0	10NUP1346/48		–	–	3.39	–	ZR21	
50	125	52	52	5.0	1.1	226	256	35.0	10NUP1352		–	–	3.8	–	ZR21	

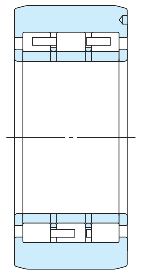
Note 1) The numbers in parentheses, show necessary bearing quantities per mill. Differences in numbers in parentheses mean it is necessary to use other bearings as well.

Bearing dimensions table

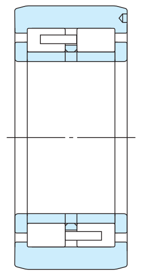
A list of available bearings can be found in the following dimensions table. For any dimensions which are not on the table, please consult **JTEKT**.



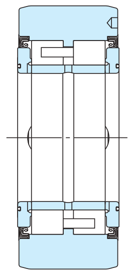
Dimensions mark design



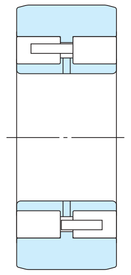
Design 8



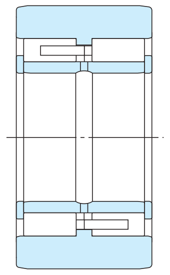
Design 9



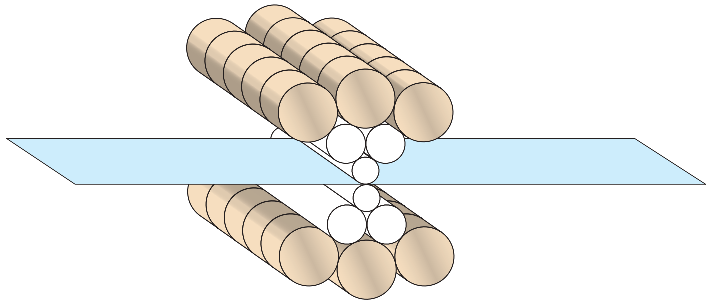
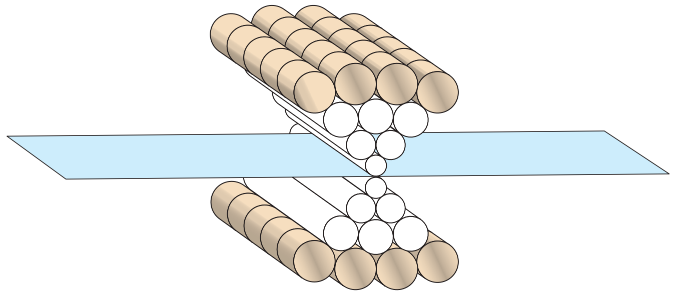
Design 10



Design 11



Design 12

Boundary dimensions (mm)						Basic load ratings (kN)		Fatigue limit load (kN)	Bearing No.		Design	Bearing section height when manufactured (mm)	Mass (kg)	Amount of bearings required per mill 1)	Applicable multi-roll mill type	Applicable multi-roll mill rolls arrangement
$d(F_W)$	D	T	C	r	r_1	C_r	C_{0r}	C_u				H				
50	120	80	80	1.5	1.5	335	379	56.4	10DC1280DS		9	34.976	5.15	32	12HI	
50	120	85	85	1.5	1.5	379	427	63.2	10DC1285DS		9	34.984	5.40	32		
60	160	95	95	1.5	2	498	589	88.3	12DC1695DS		9	46.484	11.5	20 (32)		
65	170	100	100	2	2	498	597	89.6	13DC17100DS		9	52.480	13.5	10 (34)		
90	230	100	100	2	3	802	982	133	18DC23100DS		9	69.980	24.2	24 (34)		
100	260	95	95	2	2	871	1060	143	20DC2695DS		9	79.970	30.2	32		
100	260	105	105	2	2	975	787	161	20DC26105DS		9	79.970	33.5	32		
90	260	125	125	2	2	1150	1520	197	18DC26125DS		9	84.970	41.3	34		
100	260	130	130	2	2	1190	1580	204	20DC26130DS		9	79.970	41.5	32		
110	280	165	165	2	2	1390	1880	250	22DC28165DS		8	84.965	60.2	10 (34)		
120	280	165	165	2	3	1380	1940	244	24DC28165DS		9	79.965	57.7	14 (38)		
120	350	165	165	2	3	1710	2220	273	24DC35165ADS		12	114.965	98.3	24 (34)		
130	350	175	175	2	3	1750	2300	281	26DC35175DS		12	109.965	101	24 (38)		
62	155	90	90	1	2	445	529	78.3	12DC1690DS		9	46.484	9.97	8 (44)	20HI	
62	155	110	110	1	2	505	622	95.6	12DC16110DS		8	46.484	12.2	36 (44)		
90	220	95	95	2	2	664	795	112	18DC2295DS		9	64.982	20.9	40		
90	220	130	130	2	2	873	1130	158	18DC22130ADS		8	64.982	28.7	32,40		
115	260	140	140	3	2	1220	1690	225	23DC26140DS		8	72.470	41.9	40		
65	165	70	70	1.5	2	531	586	90.1	13DC1770DS		11	49.982	8.83	40		
90	220	94	94	2	1.5	860	997	138	18DC2294DS		11	64.976	21.2	40		
90	220	96	94	3	3	618	700	101	18DC2294/96DS		10	65.000	21.0	64		
130	300.02	130	129	2	3	1300	1740	215	26DC30130DS		9	85.010	52.2	56		
130	300.02	130	129	4	3.5	1340	1620	206	26DC30130BDS		10	85.010	51.8	–		
130	300.02	132	129	2	3	1430	1830	231	26DC30132ADS		9	85.010	53.8	72		

Note 1) The numbers in parentheses, show necessary bearing quantities per mill. Differences in numbers in parentheses mean it is necessary to use other bearings as well.

Improving ease of outer ring regrinding work

We provide regrinding jigs which are capable of grinding the outer ring outside diameter of the bearing with high accuracy.

Bearing-regrinding Jigs

Required performance and issues

🟧 **Improving ease of outer ring regrinding work**

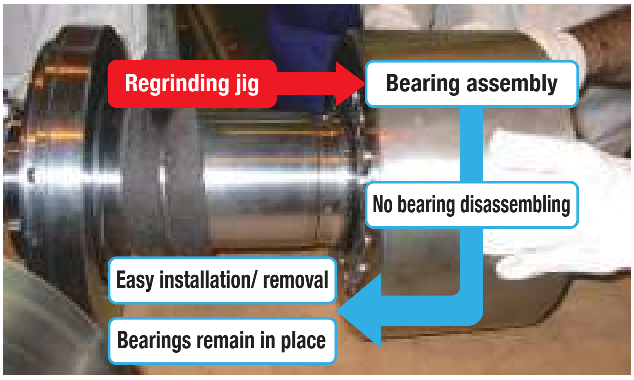
Advantages

- **The jigs minimize the radial run out of the bearings after regrinding.**

Once the bearing is installed into the jig, the jig completely nullifies any clearance on the fitting surface between the jig and bearing and the Internal clearance of the bearing, eliminating play in the radial direction. The jig grinds the outside diameter surface while turning the outer ring and retaining the inner ring as stationary, enabling grinding under the same conditions as when in operation. Grinding of the bearings radial run-out can be performed with a high level of accuracy.

- **The jigs improve efficient installation and removal**

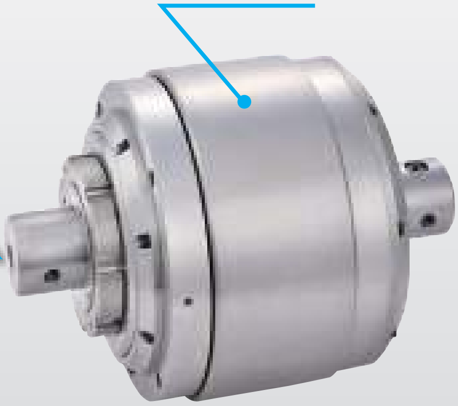
Bearings can be installed on and removed from the jig easily without the need of disassembling the inner ring and outer ring. There is no possibility that rollers will come off.



Overview

The outer surfaces of the bearings used on the backing shafts of multi-roll mills should be ground periodically to retain precise bearing performance, thus ensuring the quality of rolled products. **JTEKT** supplies the jigs that grind bearing's outside diameter surface with high precision.

Regrinding jig



Bearing assembly

Cylindrical grinder for outer ring-regrinding

JTEKT provides the GE series which is capable of processing both roll grinding and outer ring-regrinding with high accuracy using cylindrical grinders. (TOYODA brand)

Mounting the regrinding jig and
bearing assembly to the cylindrical grinder

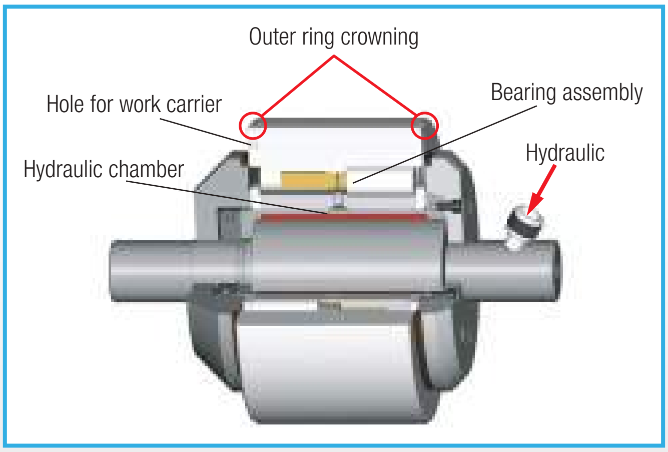
cylindrical grinder（GE6i-PRO）

Jig type and constructions

The jigs come in two types, which should be selected according to the dimensions and types of backing-shaft bearings. Please specify the type suitable to your needs.

Type 1

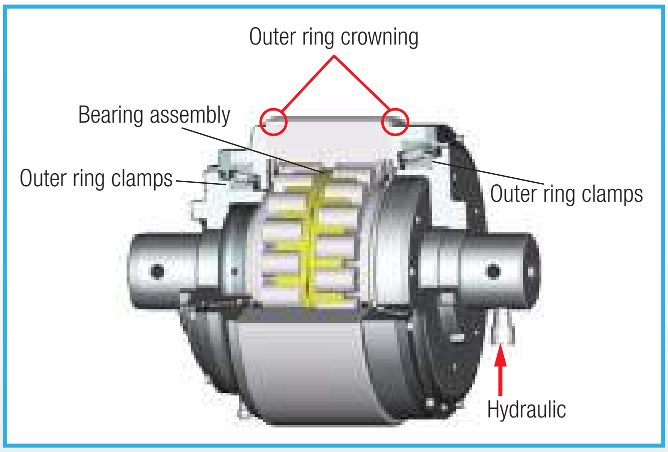
This type of jig is suitable for bearings over 70mm bore with an outer ring rib.
This jig requires a hole for the work carrier on the side face of outer ring.



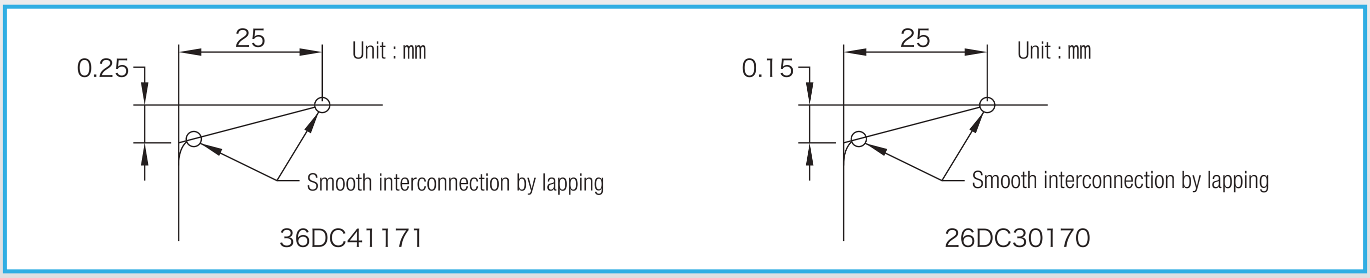
Typical installation of suitable bearing on jig Type 1

Type 2

This type of jig is suitable for both bearings with and without outer ring rib.
It is used on the Sendzimir Rolling Mills ZR21 and ZR22.



Typical installation of suitable bearing on jig Type 2



Example of Outer ring crowning dimensions

Measurement for bearing section height

Advantages

- possible to measure to 1/1000mm
- possible to measure bearings radial run-out
- easy bearing installation / removal

Overview

When the outer surface of a bearing is ground, it is critical to accurately control the variation of bearing's section heights of all the bearings installed on the backing shaft. **JTEKT** supplies Measurement for bearing section height that suit the individual bearings listed on the dimensional table.

Large size bearing technology development center

JTEKT's accumulated knowledge and experience helps our customers solve problems. We provide new high value-added products and processes for businesses by having developed a global supply system to meet those demands.

JTEKT established a large size bearing technology development center to evaluate and analyze large size bearing uses in the industrial machinery field.

Until now, with regards to large size bearings used in the industrial machinery field, investment was made in the actual machines before accurate modeling was done resulting in customer dissatisfaction. As a result, development time took too long due to the problems that arose.

Now, we are able to simulate and evaluate production conditions close to the real machines in our large size bearing technology developing center.

The accumulated data for bearing testing equipment for steel production equipment introduced has allowed us to improve the accuracy of CAE analysis (simulation analysis) which gives us a significant reduction for the products developmental period and in the development of new high value-added products for the future.

Bearing testing equipment for steel production equipment

Our testing equipment is able to evaluate the scattering rolling mill water under a high temperature environment to recreate close to actual conditions.

In this way, we can deliver bearings and oil seal components with excellent performance.

JTEKT

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JTEKT CORPORATION

www.jtekt.co.jp

CAT.NO.BA015EN-0MY
Printed in Japan '19.06（'04.07）

High-performance Product Series

for Steel Production / Rolling Equipment

CAT.NO. BA010EN-0CH

JTEKT...
Utilizing comprehensive strengths to manufacture products that respond to steel production equipment needs and support stable operations.

Steel production equipment are operated in extremely harsh environments, where machinery is exposed to high temperatures, water and mill scale. The bearings used in this equipment must continually withstand heavy loads and high-speed rotation. These conditions test not only each bearing, but also the overall strengths of peripheral parts and the integration thereof. As a general manufacturer of bearings, drive shafts and oil seals, JTEKT is a full- service provider for a wide range of products.

Only One Partner

Photo courtesy of Nippon Steel & Sumitomo Metal Corporation

JHS
JTEKT HYPER STRONG

JHS (JTEKT Hyper Strong) is a product series incorporating designs to meet the requirements of various industrial machinery.
In order to achieve high-durability of ever-evolving steel production equipment, JHS is evolving daily together with JTEKT customers and provides total support for bearings, drive shafts and oil seals.

JHS Series

Bearings

- **RZ-type Spherical Roller Bearings** (CAT.NO.B2023E)
- **Bearings for multi-roll mill backup rolls** (CAT.NO.B2012E)

JHS 210
Case-hardened steel is used on the inner ring to improve rolling life in low-viscosity lubrication.

- **Bearings for roll necks** (CAT.NO.B2013E)

JHS 520

Standard
By using our newly developed case-hardening steel in the bearing rings, we have improved the rolling life, toughness, and corrosion resistance.

Premium
A special heat treatment is applied to the newly developed hardened steel to further improve rolling life and corrosion resistance.

- **Bearings for sintering machine pallet car**

Drive shafts

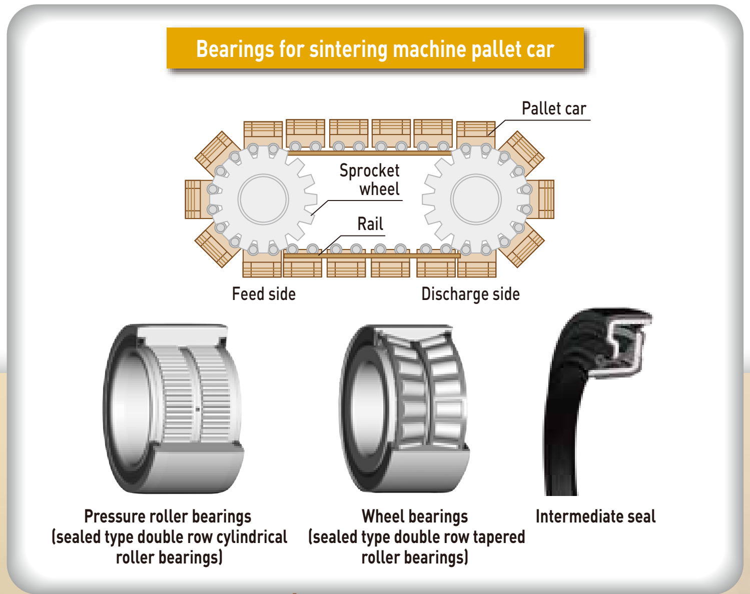
- **Drive shaft for roll drives** (CAT.NO.B2021E)
- **Hyper coupling** (CAT.NO.B1010E)

We will continue our efforts to enrich the JHS series.

History of JTEKT products for steel production equipment

Year	Social conditions /events	Steel manufacturer trends		(□ Bearings 🟧 Drive shafts)
1940	WWII Post-WWII	Catch-up with industry overseas	Domestic production of bearings for rolling mills	• Developed four-row tapered roller bearings for hot-strip mill work rolls Japan 1st • Developed tapered roller bearings for hot-strip mill backup rolls Japan 1st
1950	High growth period			
1960		Mass production; increase productivity; high-load/ high-speed/continuous	Development of high-performance bearings (longer service life, high-speed compatibility) Introduction of overseas Drive shafts technologies; domestic production	• Developed three-row cylindrical roller bearings with cage for Sendzimir mills • First delivery of drive shafts for wire-rod mills Japan 1st
1970	Stable growth period			• Entered agreement with Sendzimir Japan, Ltd. to manufacture backup roll assemblies • Started production of Sendzimir mill backup roll assemblies Unique to Japan • Adopted roller bearings for 1,680m/min cold-strip mill backup rolls Japan 1st • First delivery of drive shafts for cold-strip mills Japan 1st • First delivery of drive shafts for hot-strip mills Japan 1st
1975				• Received award from the Japan Society of Mechanical Engineers for hot-strip mill drive shaft • Developed sealed cylindrical roller bearings for Sendzimir mills
1980		Large-variety, low-volume production; improve thickness accuracy; reduce maintenance cost	Development of bearings/drive shafts compatible with shape-controlled rolling mills Longer-life bearings/drive shafts and extended maintenance interval	• Developed (sealed) roll neck bearings for 6HI work roll shift mills • Improved bearings for backup rolls from oil-film bearings to roller bearings Japan 1st • Developed split bearing units (spherical Roller bearings)
1985	Bubble economy			• Developed CR mill backup roll assemblies • First delivery of drive shafts for hot-strip WR shift mills Japan 1st • Developed fastening-ring split bearing units with fastening-ring • Developed cylindrical roller bearings with self-aligning ring
1990	Burst of bubble / Economic stagnation			• Developed oil/air lubrication system • Developed long-life Cross & Bearing with different diameter rollers • First delivery of drive shafts for pair cross mills • Developed carburized steel (CH213) for large bearings
1995				• Developed HSC split bearing units • First delivery of drive shafts for Plate mills World 1st
2000	Economic expansion	Pursue higher functionality/better quality		• Developed new material for core hardening • Developed sealed cylindrical roller bearings for new Sendzimir mill producing magnetic steel sheets • Developed long-life Cross & Bearing with cross burnishing process
2005	Period of economic change			• Fiest delivery of hyper coupling • Adopted newly developed material and carbonitriding process (premium) for JHS520 highly corrosion-resistant long-life bearings
2010				• Developed JHS210 high-performance backup roll bearings for new Sendzimir mill producing magnetic steel sheets • Developed a long-life, high-speed JHS Series spherical roller bearings • Commenced full-scale operation of the Large Bearing Technical Development Center
2015				• Developed an oil seal for sealed-type, four-row tapered roller bearings, for roll neck • Developed an oil seal for drive shaft cross bearings

Introduction to products for steel production equipment

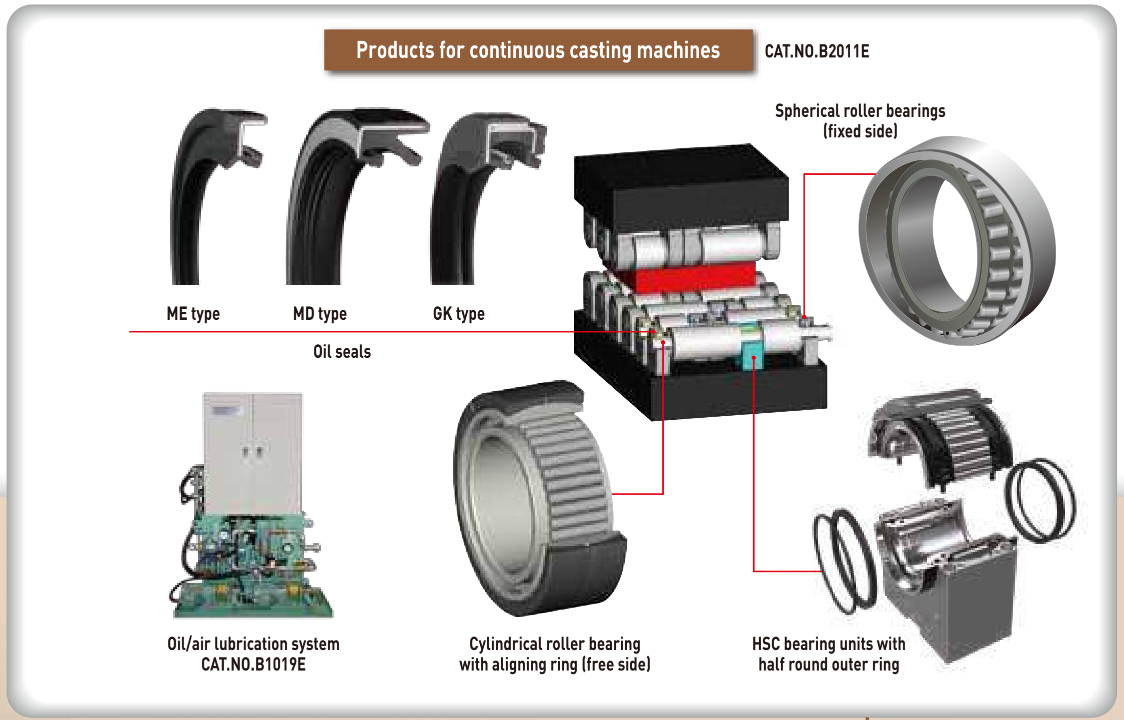


Bearings for sintering machine pallet car

Pressure roller bearings (sealed type double row cylindrical roller bearings)

Wheel bearings (sealed type double row tapered roller bearings)

Intermediate seal



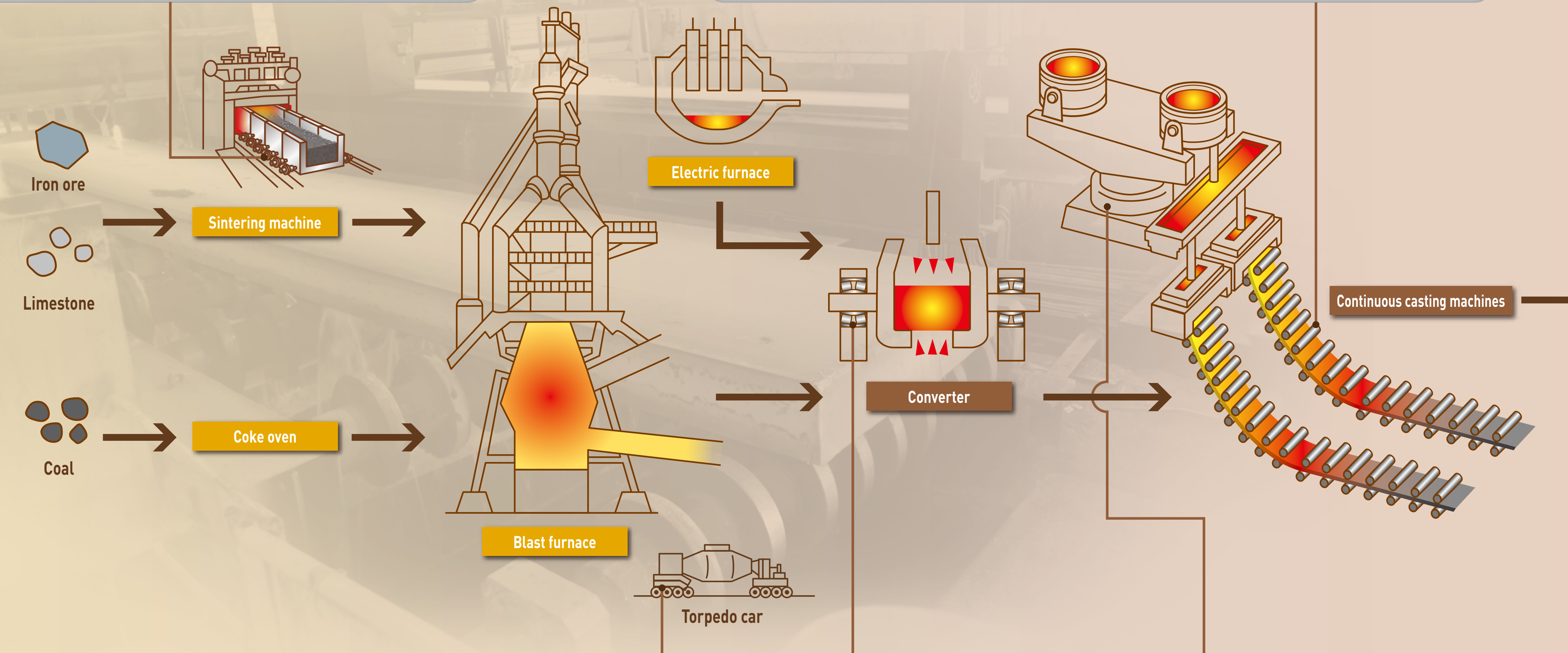
Products for continuous casting machines

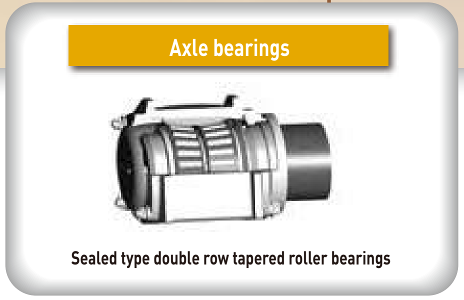
CAT.NO.B2011E

Oil/air lubrication system CAT.NO.B1019E

Cylindrical roller bearing with aligning ring (free side)

HSC bearing units with half round outer ring





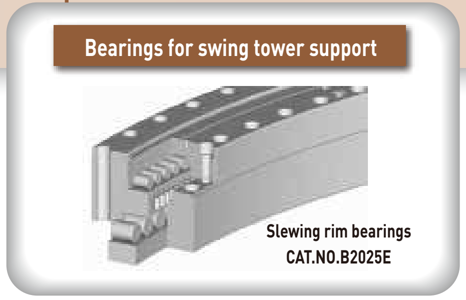
Axle bearings

Sealed type double row tapered roller bearings

Bearings for converter

Large seal (MS)

Large spherical roller bearings

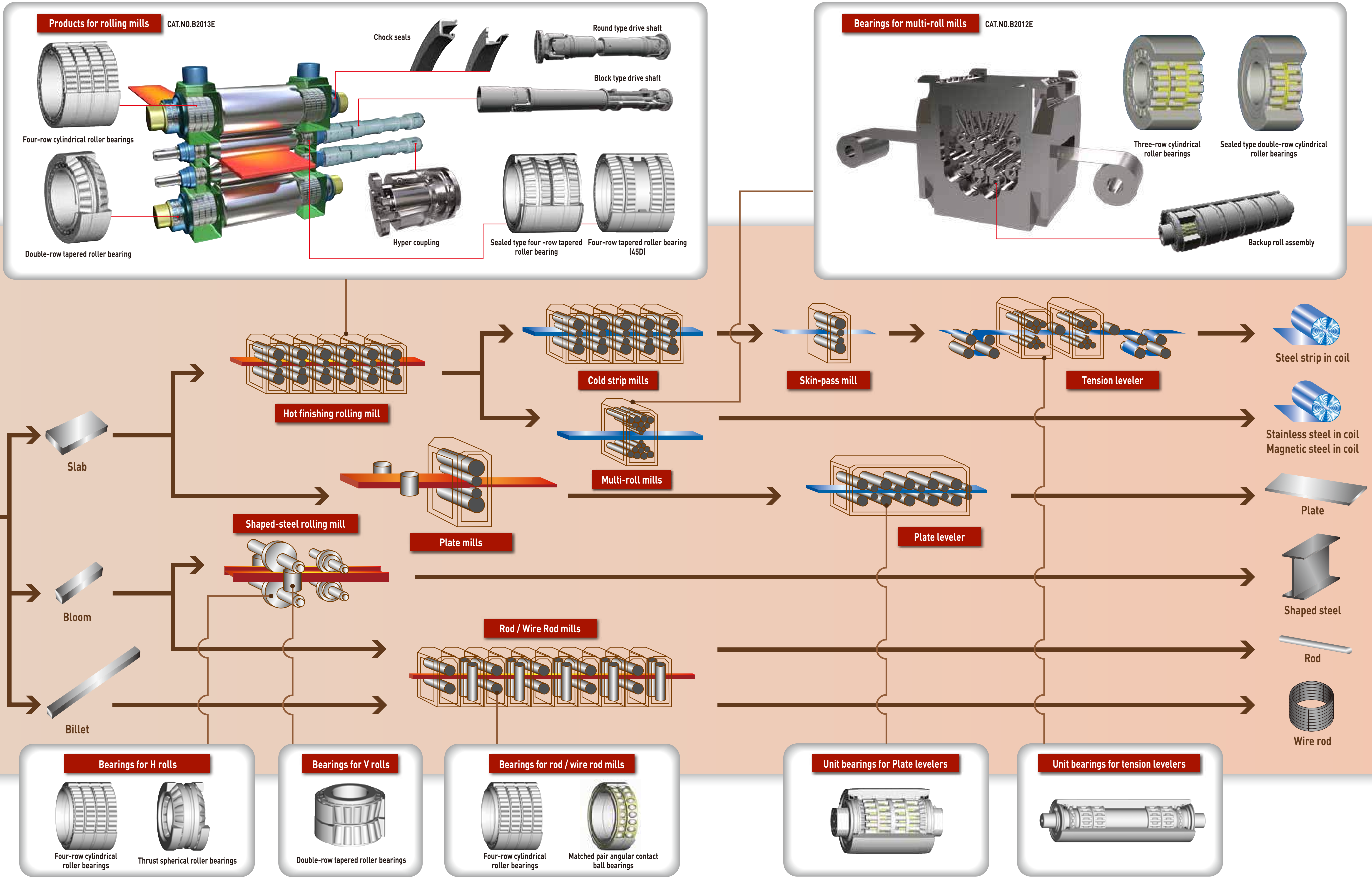


Bearings for swing tower support

Slewing rim bearings CAT.NO.B2025E

Ironmaking

Steelmaking



Products for rolling mills CAT.NO.B2013E

Four-row cylindrical roller bearings

Double-row tapered roller bearing

Chock seals

Round type drive shaft

Block type drive shaft

Hyper coupling

Sealed type four -row tapered roller bearing

Four-row tapered roller bearing (45D)

Bearings for multi-roll mills CAT.NO.B2012E

Three-row cylindrical roller bearings

Sealed type double-row cylindrical roller bearings

Backup roll assembly

Slab

Bloom

Billet

Hot finishing rolling mill

Cold strip mills

Skin-pass mill

Tension leveler

Multi-roll mills

Plate mills

Plate leveler

Shaped-steel rolling mill

Rod / Wire Rod mills

Steel strip in coil

Stainless steel in coil
Magnetic steel in coil

Plate

Shaped steel

Rod

Wire rod

Bearings for H rolls

Four-row cylindrical roller bearings

Thrust spherical roller bearings

Bearings for V rolls

Double-row tapered roller bearings

Bearings for rod / wire rod mills

Four-row cylindrical roller bearings

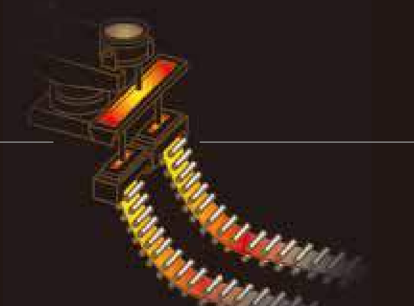
Matched pair angular contact ball bearings

Unit bearings for Plate levelers

Unit bearings for tension levelers

Rolling

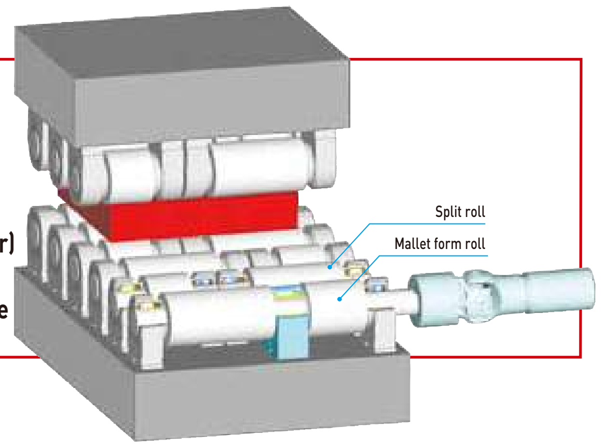
Products for continuous casting machines



Offering long-life bearings for systems, we manufacture bearings for continuous casting equipment, bearing housing units, oil/air lubrication devices, oil seals and other products.

Required performance and issues

- 🟩 Measures for high contact stress/roll deflection under heavy load
- 🟥 Measures for roll elongation under high temperature
- 🟦 Measures for corrosion / lubrication failure due to the infiltration of steam (water)
- 🟧 Measures for surface roughness / indentations due to the intrusion of mill scale

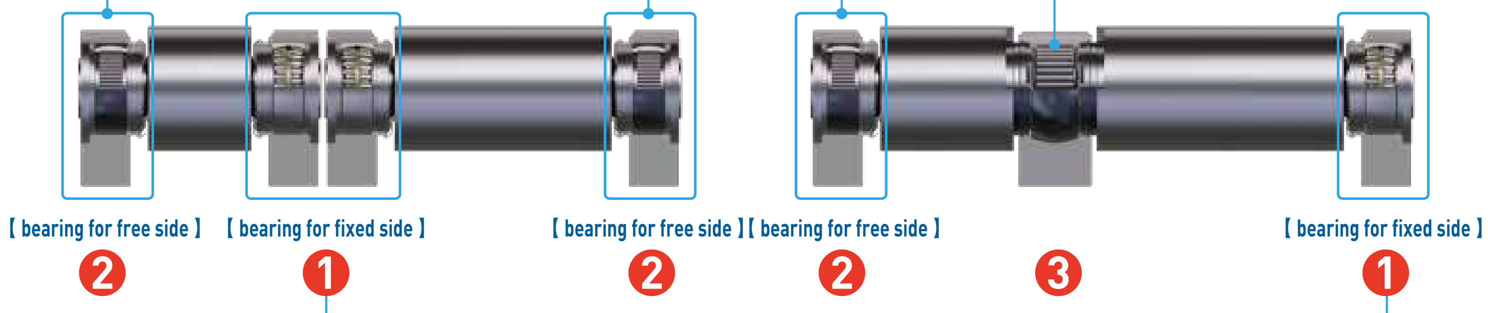


Roll configuration example 1 (single and split rolls)

Optimal configuration for roll elongation absorption using single and split rolls

Roll configuration example 2 (pestle-shaped roll)

Optimal configuration for roll elongation absorption using pestle-shaped roll

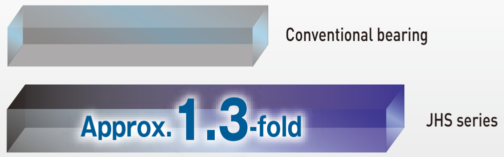


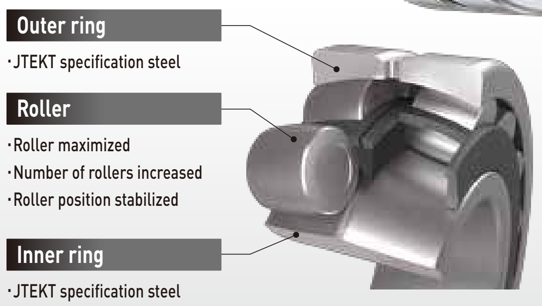
🟩🟥 Measures for heavy load / high temperature

① RZ-type Spherical Roller Bearings

Features
- Designed for maximum load rating; internal design reduces contact stress
- Designed to stabilize roll position
- Resistant to high temperature for use in various environments

[Service life]





Outer ring
- JTEKT specification steel

Roller
- Roller maximized
- Number of rollers increased
- Roller position stabilized

Inner ring
- JTEKT specification steel

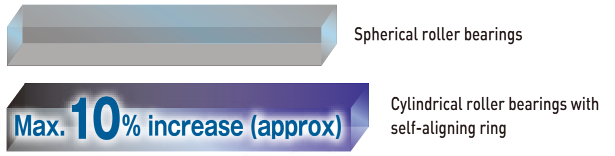
Bearing composition diagram

🟩🟥 Measures for heavy load / high temperature

② Cylindrical roller bearings with self-aligning ring

Features
- Smooth absorption of roll movement in the axial direction
- Absorption of roll deflection and misalignment

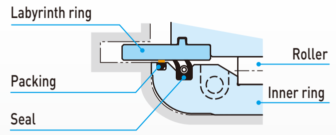
[Static load rating]



③ HSC bearing units with half round outer ring

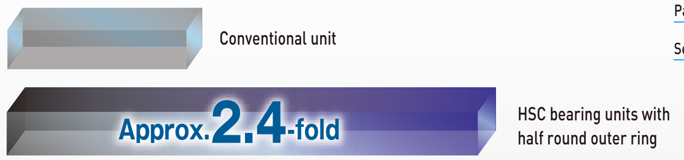
Features
- Heavy load type using a compact sealing structure
- Water-cooled structure with high cooling efficiency

[Compact sealing structure]

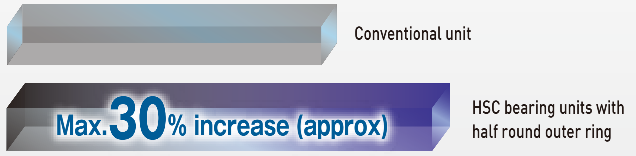


[Cooling structure]

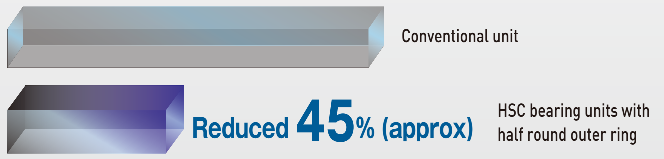
[Service life]



[Rated static load]



[Flow consumption]



🟦🟧 Measures for intrusion of water / mill scale

Oil seals

Features
- Superior sealing performance
- Lip contact stress dispersed
- Materials used are hydrogenated nitrile rubber (HNBR) and fluoro rubber (FKM)

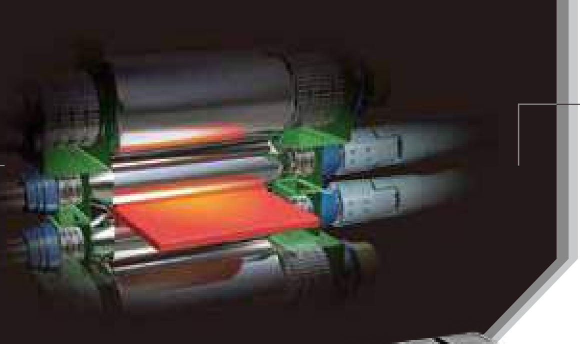
End side
ME type

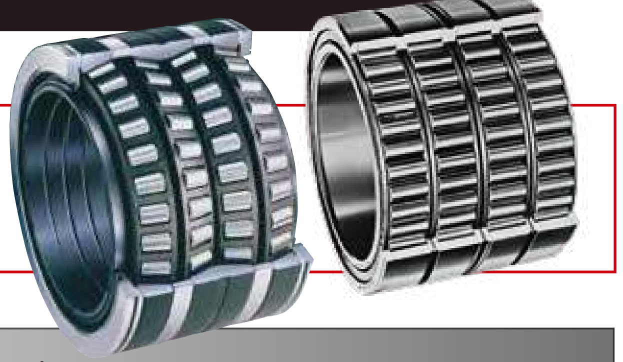
Roll side
MD type

Roll side
GK type

Bearings for roll necks

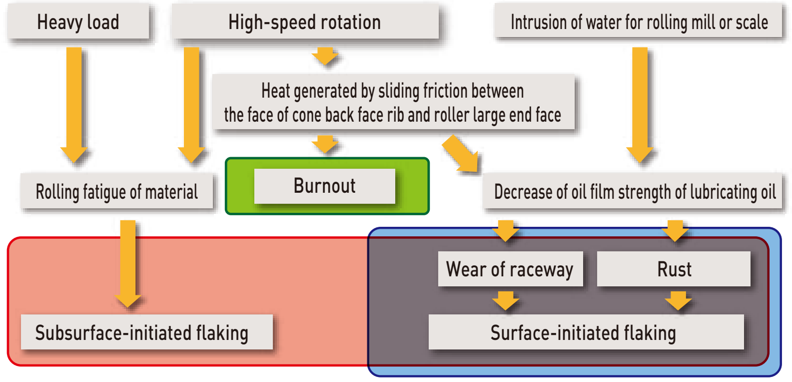
Bearings used to steel mill roll necks must cope with heavy loads and high-speed rotation in severe environments. In order to respond to these needs, JTEKT works daily to resolve related issues such as developing bearing materials and improving bearing seal performance.





Required performance and issues

- 🟥🟩 Enhancing durability and service life under heavy load / high-speed rotation
- 🟦 Preventing the intrusion of water / mill scale



(Countermeasure technologies)

- 🟥 Long-life/high corrosion-resistant steel
- 🟩 Minimizing temperature increases
- 🟦 High-performance seal

🟥 Improvement of durability and service life to withstand heavy loads and high-speed rotations

Long-life / high corrosion-resistant carburized steel

JHS 520
JTEKT HYPER STRONG

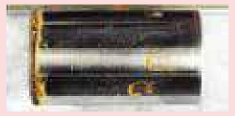
◆ **Standard**
By using our newly developed case-hardening steel in the bearing rings, we have greatly improved the rolling life, toughness, and corrosion resistance compared to our conventional products.

◆ **Premium**
By using our newly developed case-hardening steel and by applying special heat treatment, we have provided the premium specification with further improved rolling fatigue life and corrosion resistance.

Features

① Long-life and high corrosion-resistant steel with optimized content of chromium and molybdenum

② Original carbonitriding heat treatment improves corrosion-resistance and wear-resistance qualities

	Results of evaluations of bearings in an environment prone to rust (filled with water-mixed grease)		Results of evaluations of bearings in clean oil
	Rust resistance comparison	Rust resistance comparison Life (JTEKT bench test)	
Conventional product			
Developed steel, carburized product ① (JHS520 standard)		Approx.2.2-fold	Approx.4-fold
Developed steel, special heat treated product ①+② (JHS520 premium)		Approx.3.8-fold	Approx.7-fold
Test conditions	Humidity cabinet test conditions Test temperature: 49°C ± 1°C Relative humidity: 95% or more Test period: 96 hours	Sample: Tapered roller bearing Main dimensions: ø50 × ø120 ×30 Lubrication: Grease (water content ratio, 30%)	Test piece form: 20 mm dia., 32 mm length Maximum contact stress: 5 800 MPa Loading cycle frequency: 285 Hz Lubricating oil: Turbine oil (ISO #VG68) Oil supply: 2 L/min (room temperature) * Test was stopped after 50 × 107 times.

Examples of actual use

Cold strip mill work roll (open type) ① [JHS520 standard]

Conventional type

Used approximately 4 million tons (under DS)

Approx.5-fold

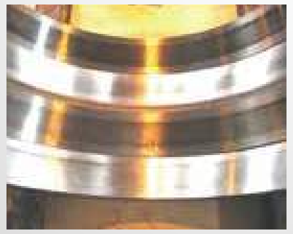
No flaking

Cold strip mill work roll (sealed type) ①+② [JHS520 premium]

Conventional type

Used for approximately 24 mont (under OP)

Approx.4.8-fold



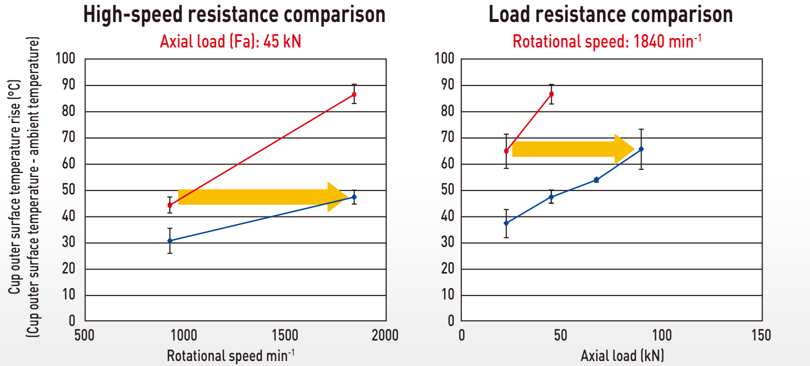
Hardly any indication of rust

🟩 Improvement of durability and service life to withstand heavy loads and high-speed rotations

Technology for minimizing temperature increases

Features

- On the basis of the EHL theory, improvement of the lubrication of the rolling part between the roller large end face and the face of cone back face rib
- Optimization of the shapes and suppression of temperature rising for the rolling part between the roller large end face and the face of cone back face rib



2 times the speed performance (at the same temperature rise)

4 times the load performance (at the same temperature rise)

🟦 Preventing intrusion of water / mill scale

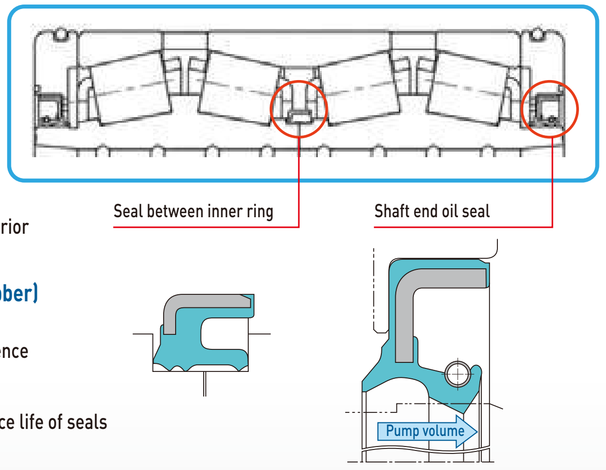
High sealing property oil seal for sealed-type, four-row tapered roller bearings

Features

① **Greater robustness due to improved sealing property**
- Optimization of seal lip shape
- Maximized pump volume and reduced the amount of water infiltration into the interior of the bearing by **70% or more compared to conventional**

② **Expanded application range of the conventional material (NBR: nitrile rubber)**
- Reduced seal lip temperature by **30% compared to conventional**
- Expanded the application range of common and low-cost NBR to improve convenience

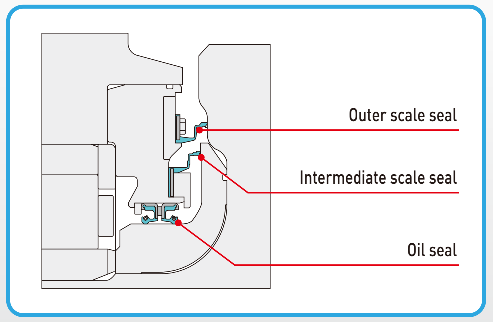
③ **Reduced maintenance costs**
- Contributed to reduction of customers' maintenance costs through extended service life of seals



Chock seals

Features

- Original design realizes an optimal lip structure that demonstrates excellent sealing performance



For more information, please refer to catalog No. B2013E and No.B2002E.

Bearings for multi-roll mill backup rolls

We provide high-precision bearings with excellent durability based on long years of experience and achievements.

Required performance and issues

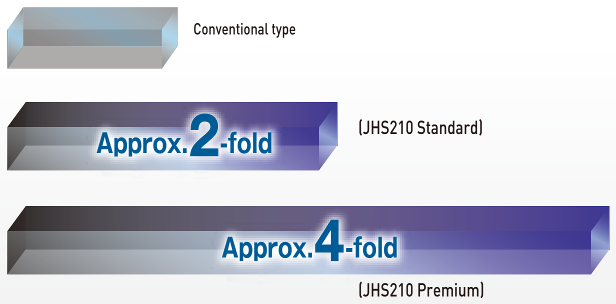
- 🟪 Seal structure that maintains a favorable lubricated state
- 🟩 Longer inner ring rolling fatigue service life
- 🟥 Improving outer ring durability
- 🟦 Improving outer ring rotational accuracy
- 🟧 Improving ease of outer ring regrinding work

🟪 Seal structure that maintains a favorable lubricated state 🟩 Longer inner ring rolling fatigue service life 🟥 Improving outer ring durability
🟦 Improving outer ring rotational accuracy

Bearings for oil mist lubrication

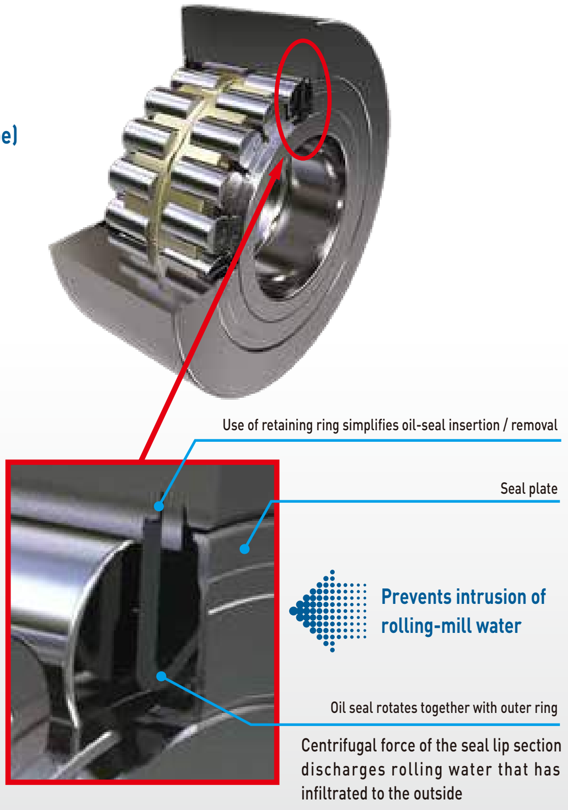
Features
- Improved bearing service life (2-fold/4-fold compared to the conventional type)
- High sealing performance
- Space-saving size for simple installation / removal

[Service life]



Premium specifications
JHS210 JTEKT HYPER STRONG

Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication. For oil-seal materials, fluoro rubber is used, improving sealing performance and realizing an increase in bearing service life of approximately four-fold compared to the conventional type.



Centrifugal force of the seal lip section discharges rolling water that has infiltrated to the outside

---

🟩 Longer inner ring rolling fatigue service life 🟥 Improving outer ring durability 🟦 Improving outer ring rotational accuracy

Bearings for forced oil lubrication

Features
- Outer ring with both high rigidity and durability realized
- High resistance to fatigue realized owing to superior materials composition
- Design optimized to match surrounding structure

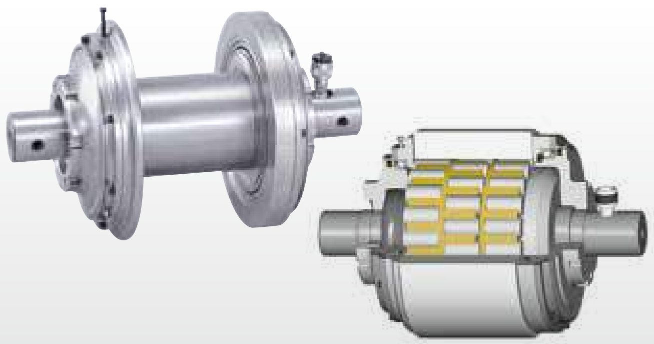
Premium specifications
JHS210 JTEKT HYPER STRONG

Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication.
Bearing service life is approx. 1.5~3-fold that of conventional products.

🟧 Improving ease of outer ring regrinding work

Bearings-regrinding Jigs

Features
- Bearing radial runout minimized
- Installation / removal work simplified
- Reproduction of radial runout accuracy equivalent to that when product is new



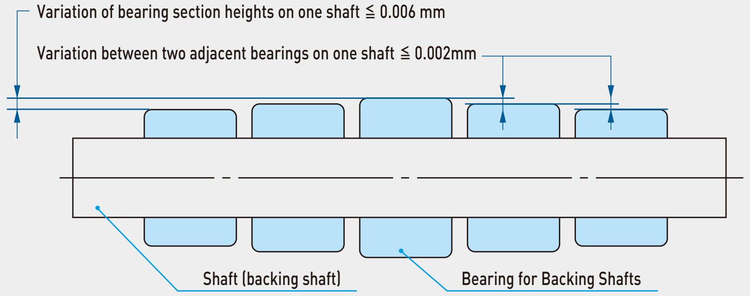
🟧 Improving ease of outer ring regrinding work

Measurement for Bearing Section Height

Features
- High rigidity, possible to make extremely accurate measurements
- Possible to measure outer ring rotational accuracy
- Adoption of mandrel shape realizes easy bearing insertion / removal

Optimized load distribution

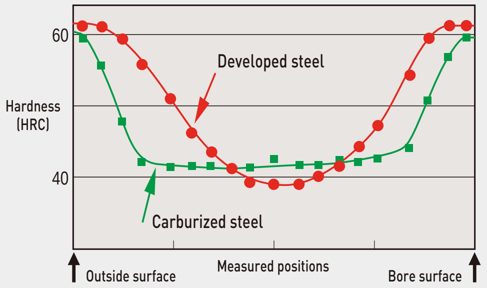
Contributes to rolled coil quality / precision



Core hardening

Surface-hardened layer improved approximately 3-fold

[Surface-hardened layer]



【 typical hardness distribution of cored hardening outer ring 】

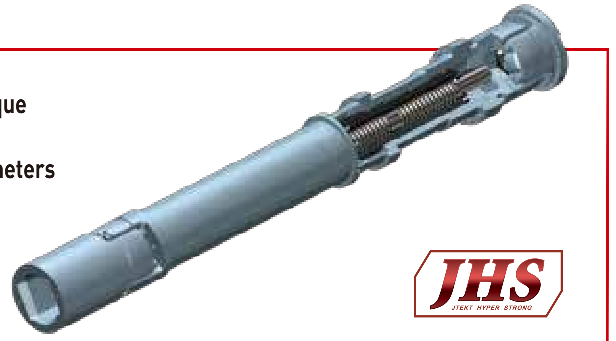
For more information, please refer to catalog No. B2012E.

Drive shafts for rolling mills

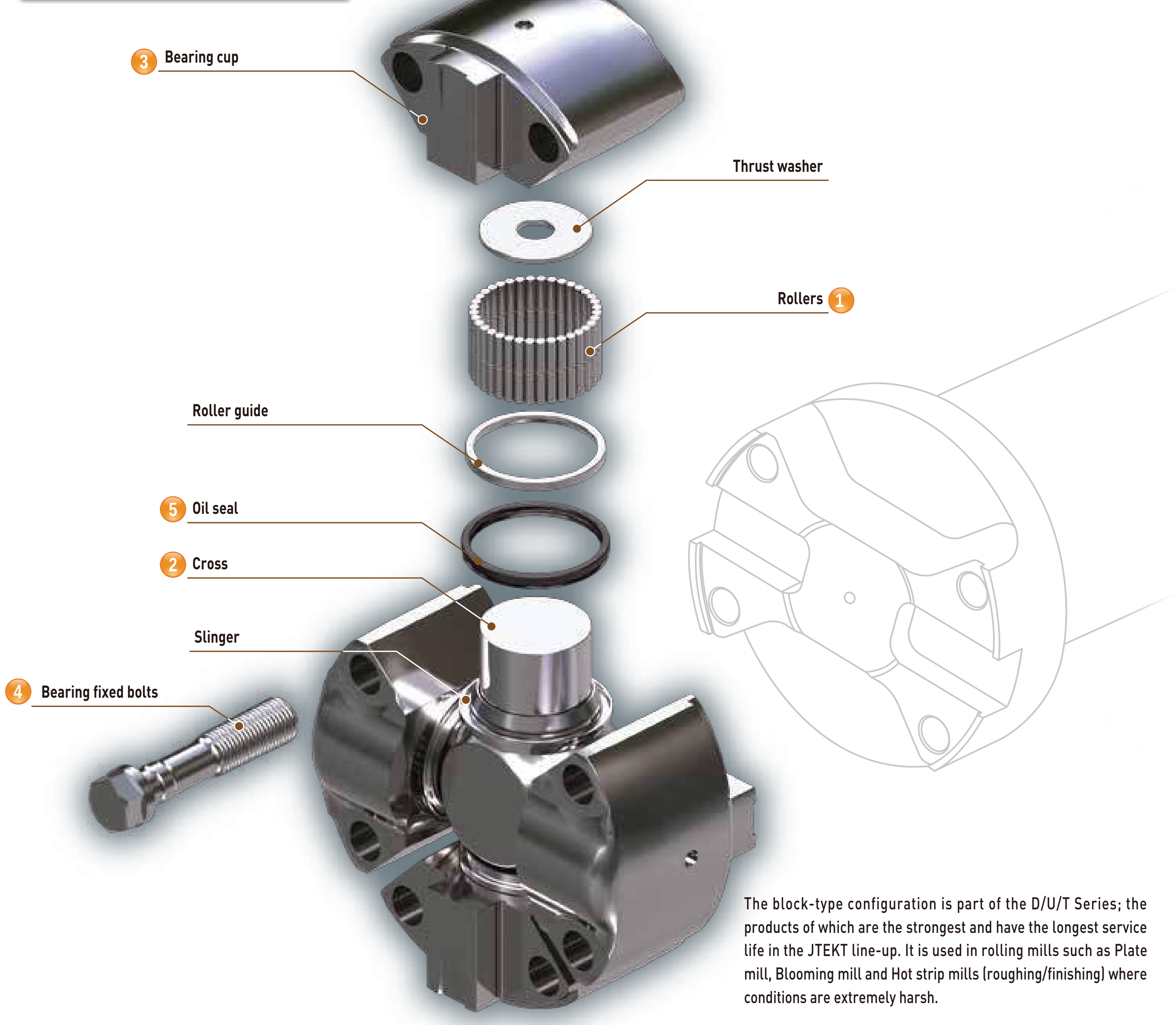
We provide high-strength, long-life drive shafts that have good torque transfer efficiency under severe environments.

Required performance and issues

- 🟪 Stronger, longer-life drive shafts capable of handling increased rolling torque
- 🟩 Stronger, longer-life drive shafts for use with smaller rolling-mill roll diameters
- 🟥 Protecting rolling-mill drive systems from excessive torque
- 🟦 Ability to randomly adjustment the roll rotational phase



Example of block-type configuration



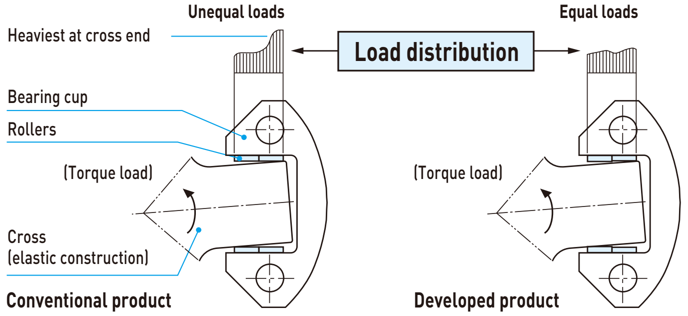
The block-type configuration is part of the D/U/T Series; the products of which are the strongest and have the longest service life in the JTEKT line-up. It is used in rolling mills such as Plate mill, Blooming mill and Hot strip mills (roughing/finishing) where conditions are extremely harsh.

🟪🟩 Contributing to stronger, longer-life drive shafts

① Application of different diameter rollers for cross & bearing

Features Roller diameter at the end of the cross reduced slightly
➡ Uniform multi-row roller load

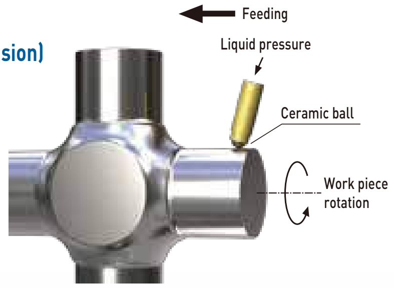
[Longer service life]

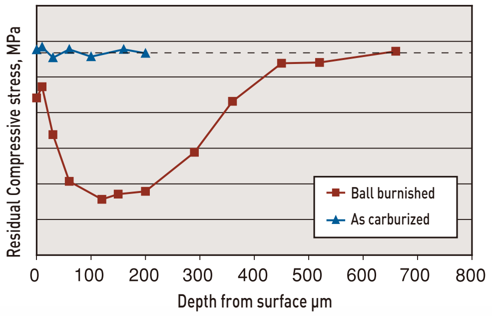


② Ball burnishing on cross shaft

Features
- Increasing of residual compressive stress at subsurface
- Increasing of surface hardness
- Fine surface roughness (Removal protrusion)

[Longer service life]

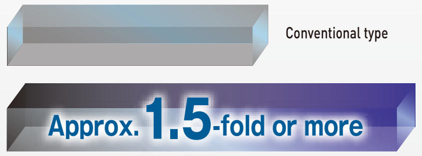


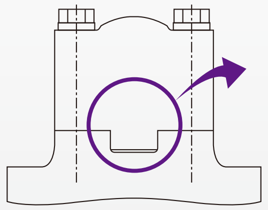


③ Thermal spraying coat of tungsten carbide (WC) on bearing cup key

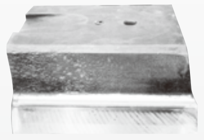
Features Restraining of clearance between key and key way due to corrosion wear
➡ Alleviating bending stress of bolt ··· Restraint of Strength reduction
➡ Minimizing heavy load at cross end ··· Longer service life

[Improved corrosion resistance]



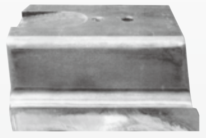


13 months



Without WC coat (corrosion)

20 months

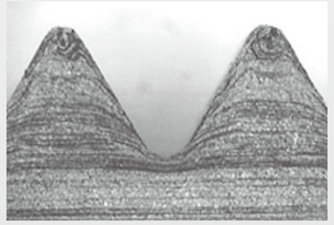


WC coated product (no corrosion)

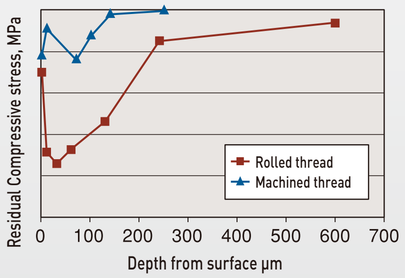
④ Application of form rolling to bearing set Bolt

Features
- Thread section processing changed from machining to form after heat treatment
- Fiber flow is formed along the shape of the thread
- Residual compressive stress at subsurface beneath the bottom radius of the thread increases

[Improved fatigue strength]



【 Fiber flow of rolled thread 】

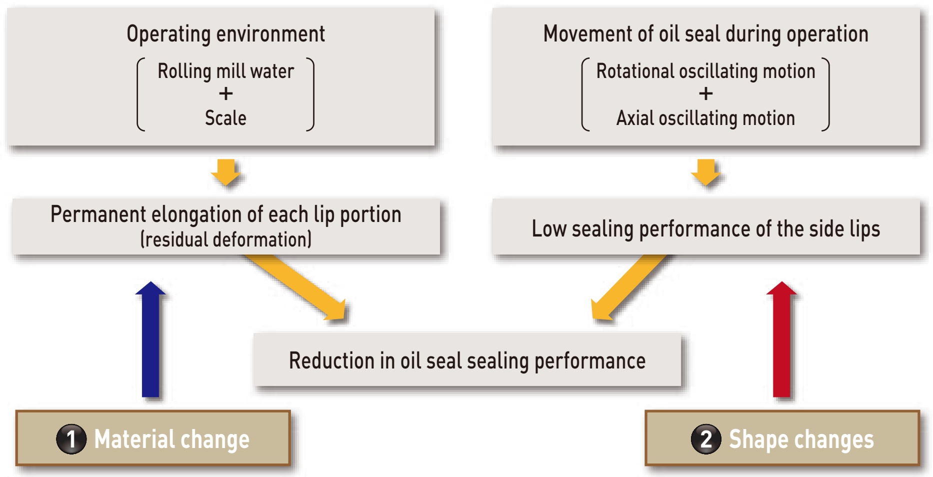


【 Residual compressive stress distribution of rolled thread 】

For more information, please refer to catalog No. B2021E.

Improved service life of oil seals and cross bearings

5 Development of a high-sealing oil seal



Operating environment
Rolling mill water
+
Scale

Movement of oil seal during operation
Rotational oscillating motion
+
Axial oscillating motion

Permanent elongation of each lip portion
(residual deformation)

Low sealing performance of the side lips

Reduction in oil seal sealing performance

❶ Material change

❷ Shape changes

Features

❶ **Improved sealing performance through material change**

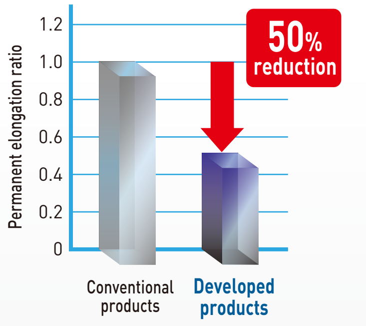
- Reduction of permanent elongation under rolling mill water and high temperature (90°C) environment by 50% compared to conventional

❷ **Improved sealing performance through shape change**

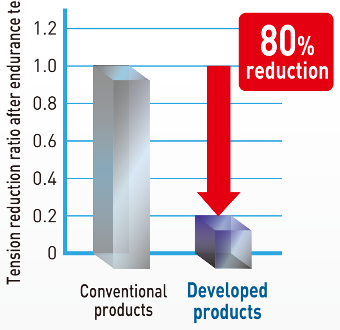
- By changing from side lip seal thrust contact to radial contact, sealing performance relative to axial oscillating motion has improved
- Reduced decline in lip tension by 80% compared to conventional

These changes suppress sudden damage to the cross bearing caused by deterioration in lubricating ability, thus contributing to reduced maintenance costs and improved productivity for customers.

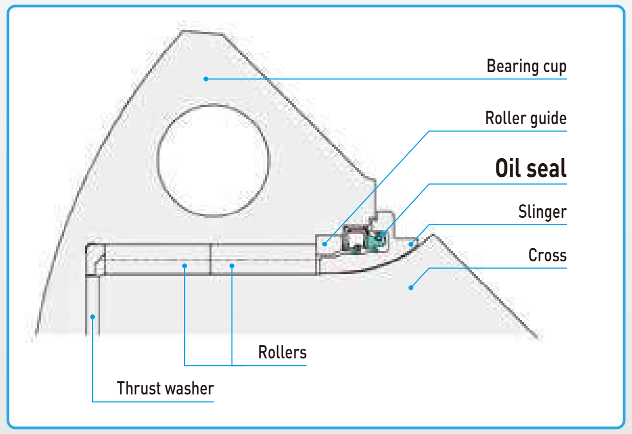
❶ [Confirmation of permanent elongation]



❷ [Confirmation of lip tension]



Conventional product: NBR (nitrile rubber)
Developed product: NBR (high nitrile rubber)



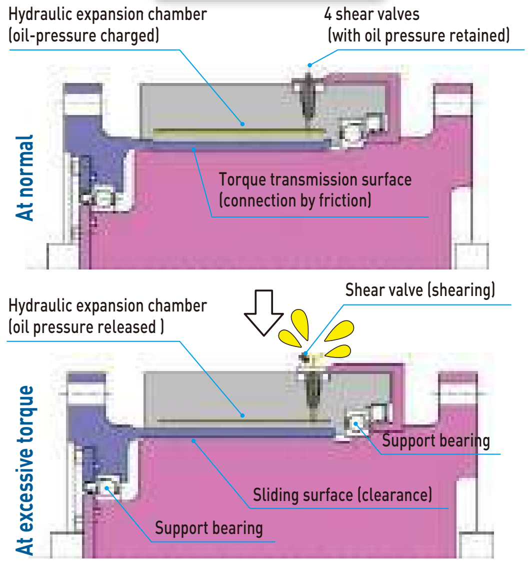
Optional mechanisms supporting drive shafts for rolling mill

Hyper coupling (torque limiter)

Features

- Device for protecting rolling mill drive system from excessive torque
- Significantly improved operating precision and durability
- Easy to set operating torque
- Significant reduced recovery time after finishing operation

Operating principle



Recovery work process (required time: 30min)

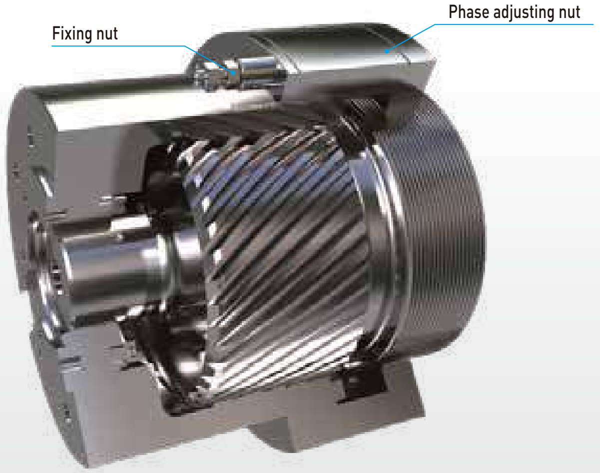
1. Phase alignment
2. Shear valve replacement (x4)
3. Re-pressurizing hydraulic expansion chamber

Optional mechanisms supporting drive shafts for rolling mill

Roll phase adjustment device (for bar & rod mill)

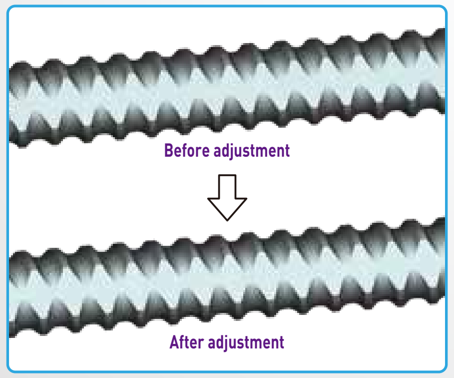
Features

- Device enables the rotational phase of rolls to be randomly adjusted when producing screw reinforcing bar and deformed steel bar used for construction.
- Phase can be adjusted almost seamlessly in a short time, improving product accuracy.
- Operation being possible without dismounting the drive shafts.



Product example

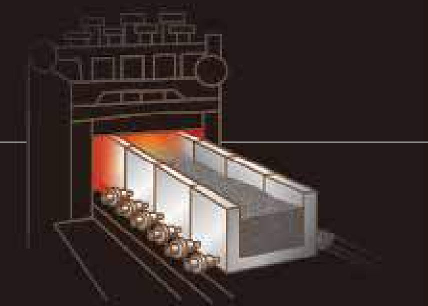
Screw reinforcing bar



Adjustment work process (online work)

1. Measure misalignment of workpiece
2. Set adjustment angle
3. Loosen the fixing nut
4. Turn the adjusting nut the required amount
5. Tighten the fixing nut

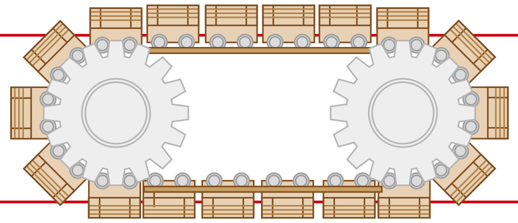
Bearings for sintering machine pallet car



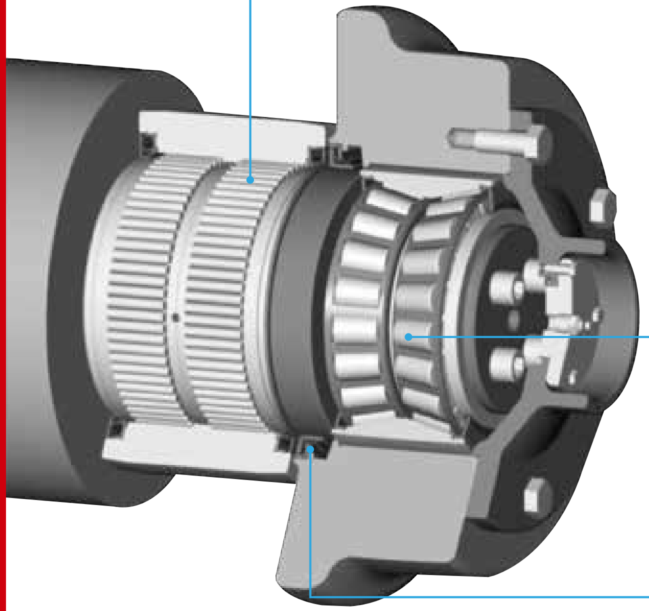
Sintering machines are used in harsh environments where high temperatures and large amounts of dust are generated. We provide sealed bearings and mill-scale seals capable of withstanding these kinds of environments.

Required performance and issues

- 🟥 Measures for heavy load / shock load
- 🟦 Preventing intrusion of dust



JHS JTEKT HYPER STRONG



Pressure roller bearings
(sealed type double row cylindrical roller bearings)

Features

Optimized outer ring thickness and carburized steel adopted
➡ Capable of withstanding heavy loads/impact loads

Sealing structure using special seal
➡ Prevents the intrusion of dust

Full roller shape adopted
➡ High load capacity realized

Wheel bearings
(sealed type double row tapered roller bearings)

Features

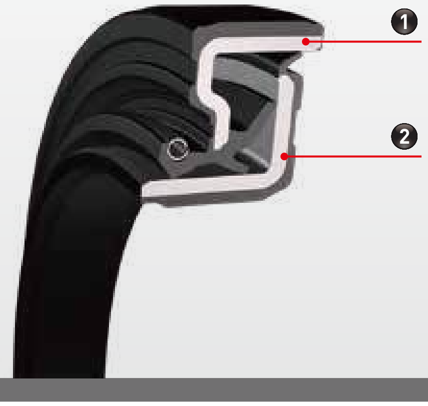
Integrated seal structure offers both high load capacity and excellent sealing performance
➡ Can withstand heavy loads and prevents the intrusion of dust

Intermediate seal

Features

Structure combining two parts (❶ and ❷)
➡ No damage to peripheral parts

High sealing performance owing to multilayer lip structure
➡ Prevents the intrusion of dust



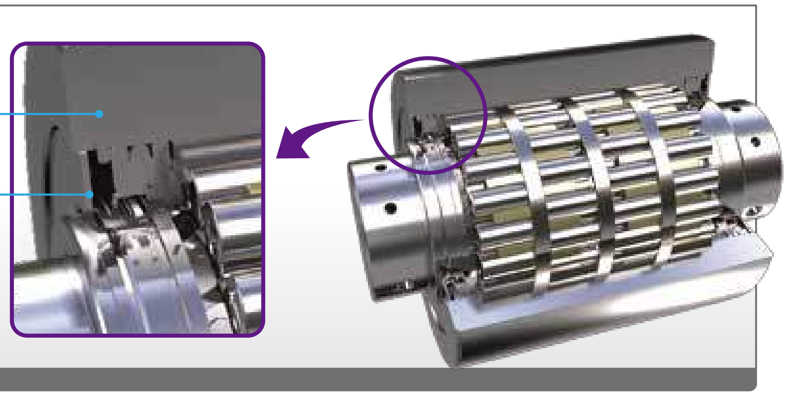
Bearing units for plate levelers

We provide plate leveler units to cope with severe usage environments such as heavy loads, rust and the intrusion of water / foreign matter.

Required performance and issues

🟥 Stable operation under heavy load 🟦 High corrosion resistance 🟩 Prevent the intrusion of water / foreign matter

- 🟥 Roll strength and bearing load rating improved as the result of integrating the roll and outer ring structure
- 🟦 Special stainless steel for rolls developed
- 🟩 Seal and shield are combined to form a labyrinth structure that has excellent sealing performance



Bearing units for tension levelers

We provide optimal tension leveler units that are compatible for high-speed rotation, wet / dry environments and low torque.

Required performance and issues

🟥 Low torque 🟩 Tightly sealed structure 🟦 High section height accuracy

- 🟥🟩 Wet-specification unit has an oil seal that forms a tightly sealed structure and also realizes lower torque
- 🟥 Dry-specification unit has a labyrinth seal structure that realizes the lowest possible torque
- 🟦 Addition of a suitable, uniform corrective force by controlling bearing section height (H) dimensional accuracy

Large Size Bearing Technology Development Center

JTEKT's accumulated knowledge and experience helps our customers solve problems. We provide new, high- value-added products and processes for businesses with a global supply system developed to meet those demands.

Regarding large bearings used in the industrial machinery field, there have been many cases in the past where customers evaluate by using actual machines after conducting desk review and basic evaluation. As a result, development took too long due to unforeseen problems that arose.

At the Large Size Bearing Technology Development Center which was established and launched operations, evaluation tests in environments close to actual machines are now possible within JTEKT. The accumulated data will be used to raise the accuracy of CAE analysis (simulation analysis) which will result in significant reduction of the product developmental period as well as the development of new, high-value-added products.

Bearing testing equipment for steel production equipment

Our testing equipment is able to evaluate the scattering rolling mill water in high-temperature environments to recreate close to actual conditions.

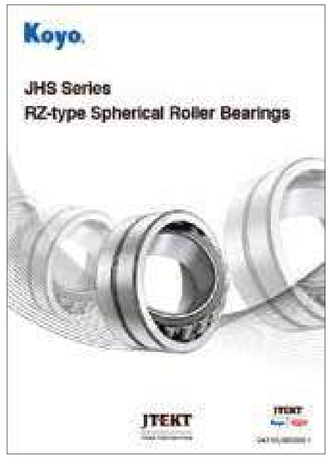
In this way, we can deliver bearings and oil seal components with excellent performance.

Catalog Series for JTEKT Steel Production Equipment Products

Please contact JTEKT to request a catalog or for advice regarding other technical issues or concerns.

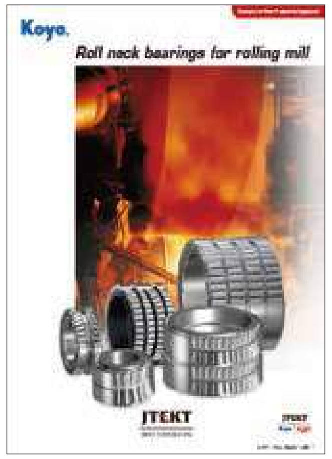
JHS Series RZ-type Spherical Roller Bearings

CAT.NO.B2023E



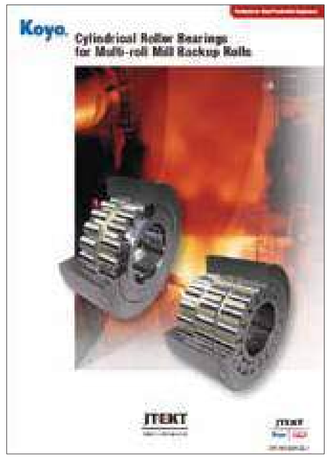
Roll neck bearings for rolling mill

CAT.NO.B2013E



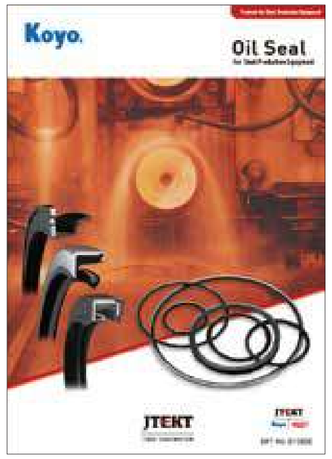
Cylindrical Roller Bearings for Multi-roll Mill Backup Rolls

CAT.NO.B2012E



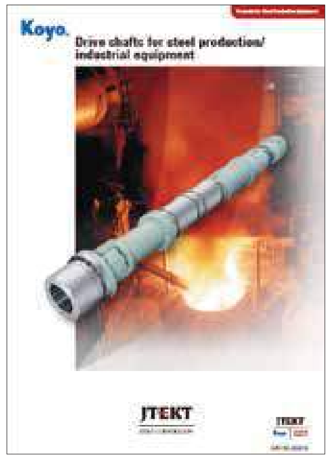
Oil Seal For Steel Production Equipment

CAT.NO.B1020E



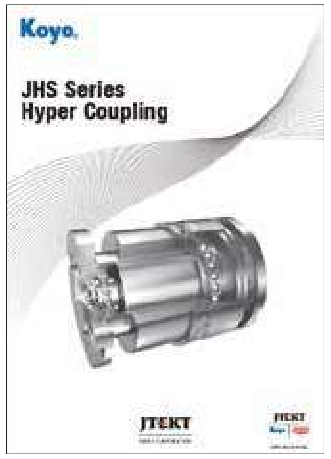
Drive shafts for steel production /industrial equipment

CAT.NO.B2021E



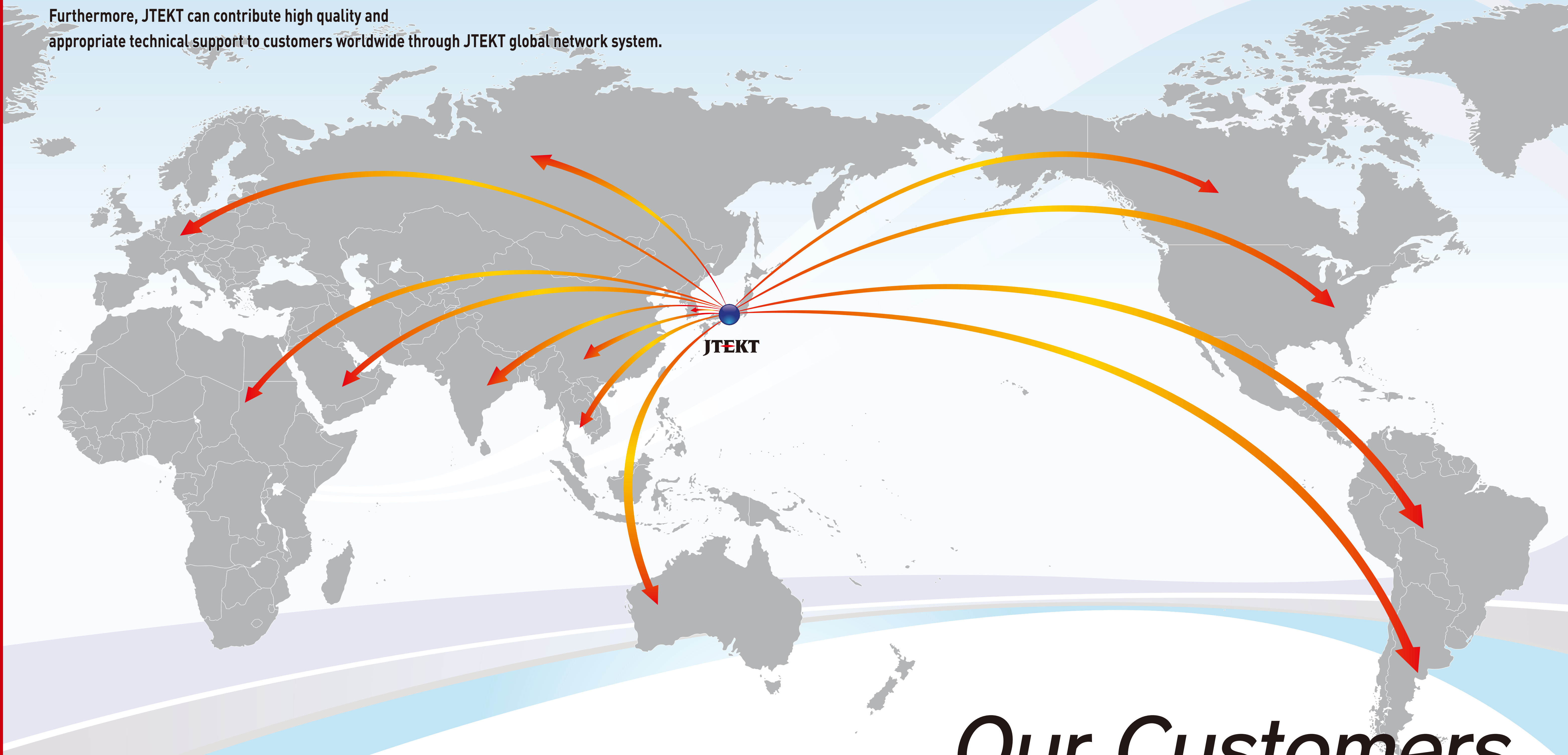
JHS Series Hyper Coupling

CAT.NO.B1010E



Providing high quality and cutting- edge technology for the world

Manufacturing in Japan enables JTEKT state- of- the- art material and technology to be implemented to JTEKT products, which leads to delivering top quality and excellent performance. Furthermore, JTEKT can contribute high quality and appropriate technical support to customers worldwide through JTEKT global network system.



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JTEKT Technologies and Quality from Japan

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CAT.NO. BA010EN-0CH
Printed in Japan '18.05-5BCH

Oil Seal

For Steel Production Equipment

JTEKT CORPORATION

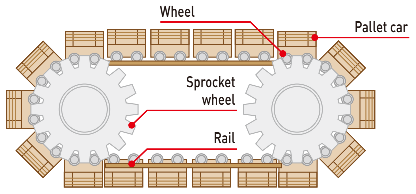
CAT. NO. B1020E

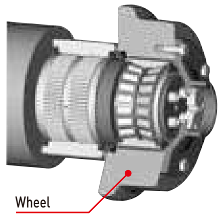
Oil Seal Lineup for Steel Production Equipment

Only One ***Partner***

Steel production equipment operates in high-temperature environments where a large amount of water is used.
In order to secure the stable operation of steel production equipment, JTEKT produces optimal oil seals that contribute to ensuring a favorable working environment where the equipment demonstrate its true potential.
We offer a complete range of sealing technology services, including oil seals and surrounding structures such as bearings, drive shafts and other key components.

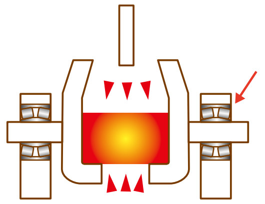
Sintering Machine Pallet Cars





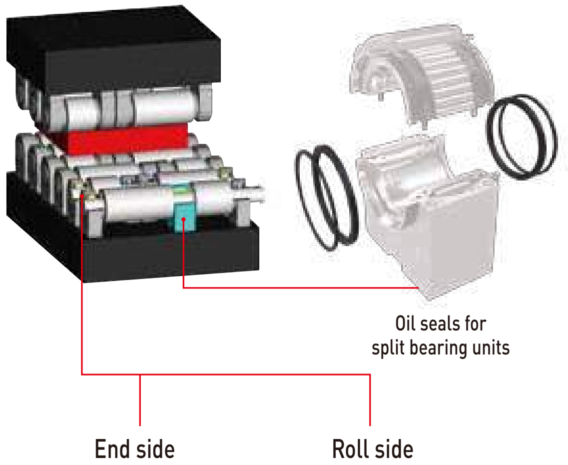

Intermediate seal

Converter Furnaces




Large seal (MS)

Continuous Casting Machines

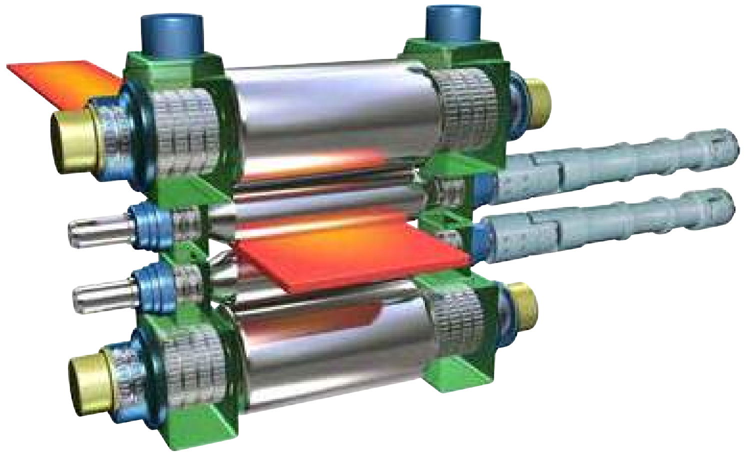



ME type


MD type


GK type

Rolling Mill




Scale seal (WR)

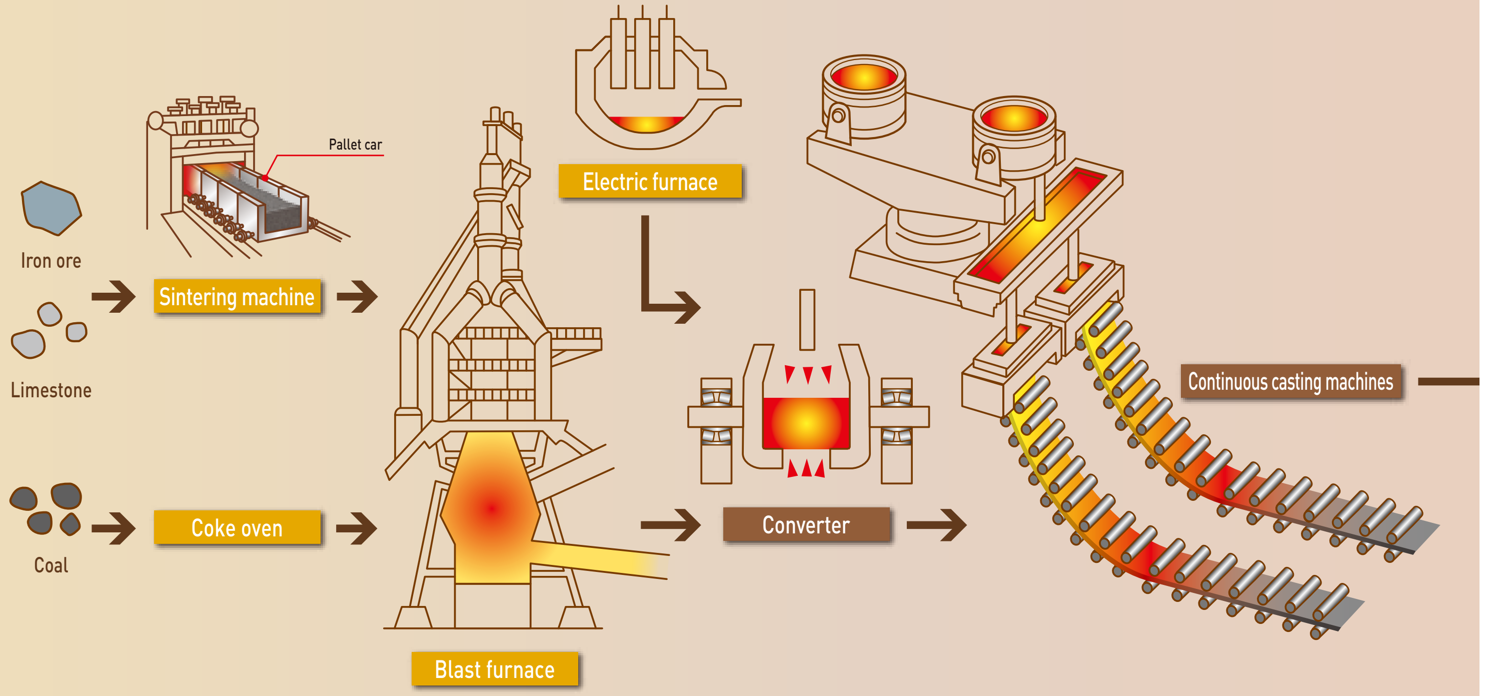

Scale seal (WR-J)

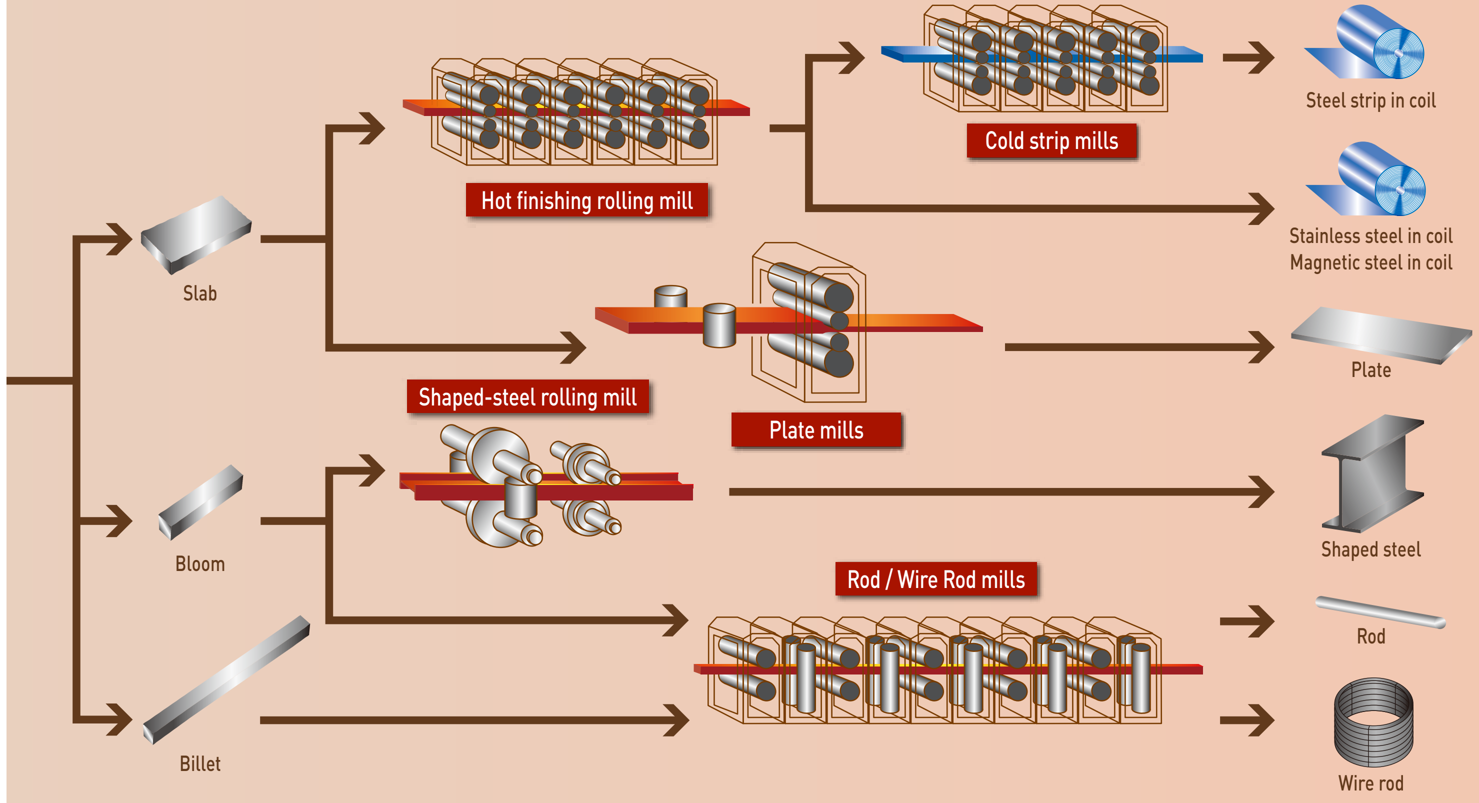

Oil seal (YS)


Oil seal (YSN)


Oil seal (HMSH-J)


Mogoil seal (MS-NJ)


Iron ore
Limestone
Coal
Sintering machine
Pallet car
Coke oven
Blast furnace
Electric furnace
Converter
Continuous casting machines

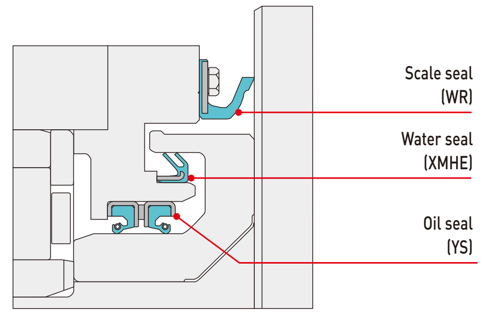

Slab
Bloom
Billet
Hot finishing rolling mill
Cold strip mills
Plate mills
Shaped-steel rolling mill
Rod / Wire Rod mills
Steel strip in coil
Stainless steel in coil
Magnetic steel in coil
Plate
Shaped steel
Rod
Wire rod

Oil Seals for Rolling Mill Roll Necks

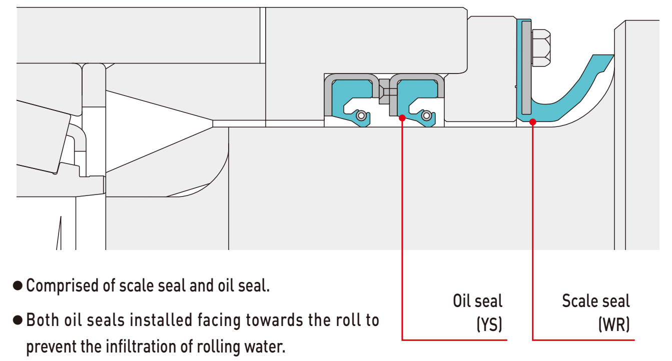
Examples of Oil Seal Applications

Cold Rolling Mill Backup Rolls

- The WR seal is often used as a scale seal owing to it featuring a side lip that gives it superior ability to shake off rolling water.
- Oil seals are attached back-to-back and play an important role in preventing bearing oil leaks.



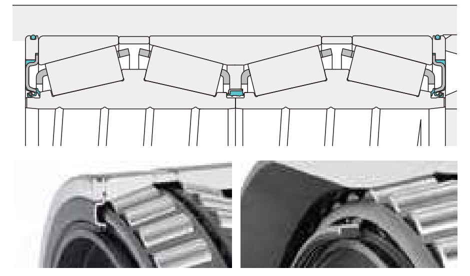
Rolling Mill Work Rolls

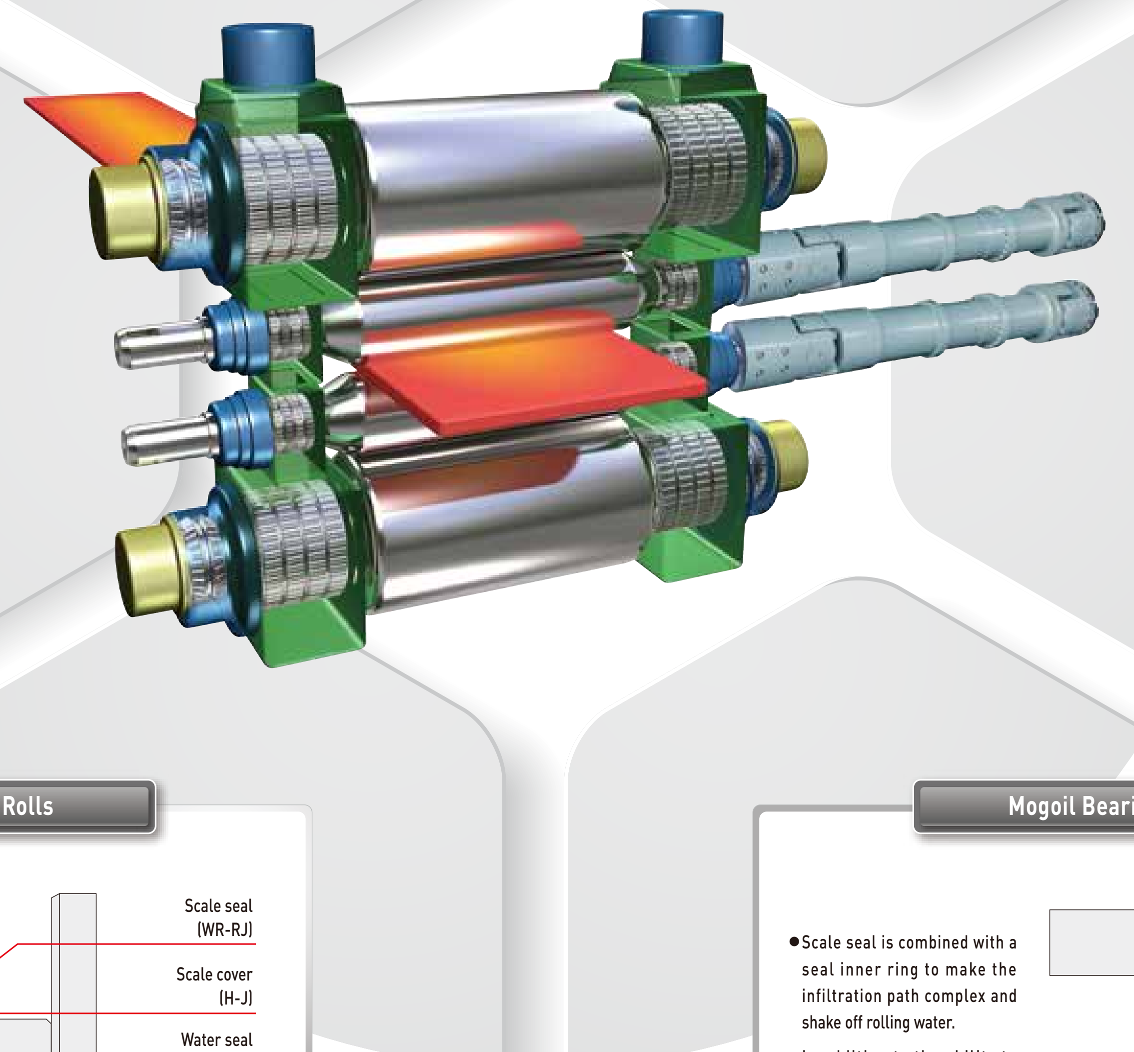


- Comprised of scale seal and oil seal.
- Both oil seals installed facing towards the roll to prevent the infiltration of rolling water.

■Sealed type four -row tapered roller bearings

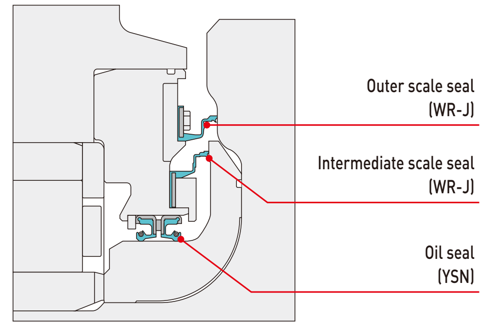
- Holds grease in the bearing and prevents the infiltration of rolling water and scale from outside.





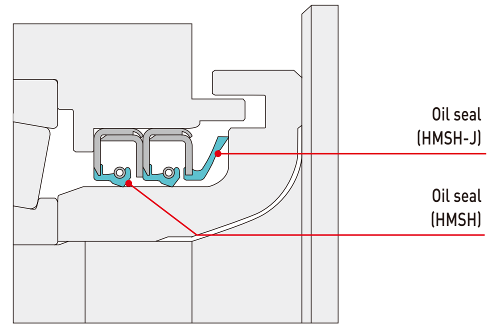
High-speed Cold Rolling Mill Backup Rolls

- If the roll rotation speed exceeds 1,800min^{-1}, the durability of the scale seal is improved thanks to its low heat generation specification.
- Infiltration of rolling water is prevented by using two scale seals.
- Oil seals for low-heat generating specifications.



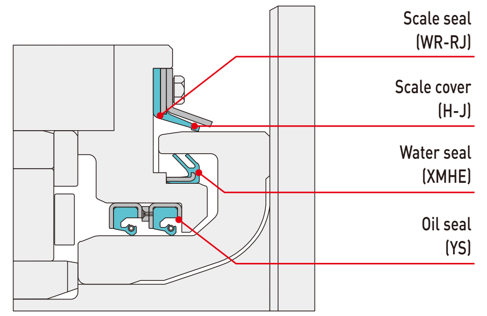
Shaped-steel Rolling Mill

- A HMSH-J oil seal with scale seal function added is used on the roll side to prevent the infiltration of scale.



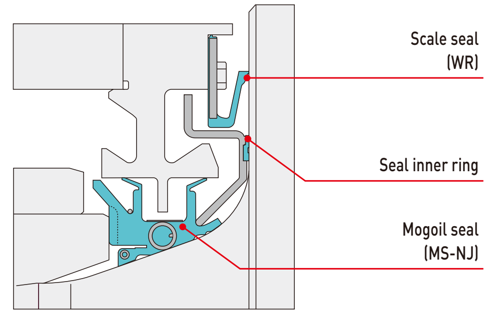
Hot Rolling Mill Backup Rolls

- The WR-RJ scale seal with a radial lip for superior following of axial displacement and the H-J scale cover can also be used.
- Two oil seals installed facing towards the roll play an important part in preventing water infiltration.

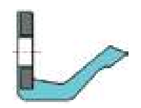
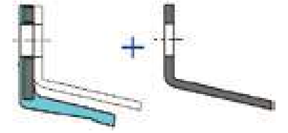
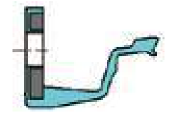
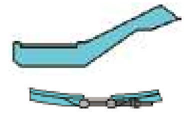


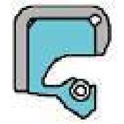
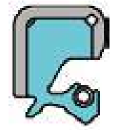
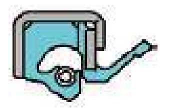
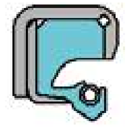
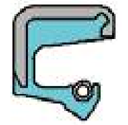
Mogoil Bearing (Slide Bearing)

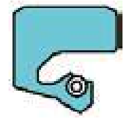
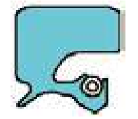
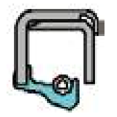
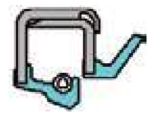
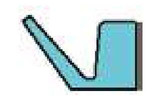
- Scale seal is combined with a seal inner ring to make the infiltration path complex and shake off rolling water.
- In addition to the ability to shake off water, the Mogoil seal increases sealability using a seal lip.

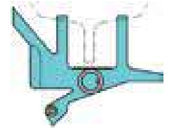
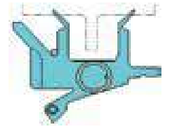
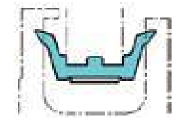
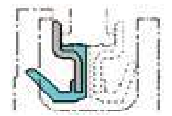


Features of Each Oil Seal

Category	Scale Seal			
Type	WR	WR-RJ + H-J	WR-J	WR-BJ
Shape				
Features	● Standard scale seal product ● Side lip has superior ability to prevent rolling water/scale infiltration	● Used when there is frequent movement in the axial direction ● Scale cover (H-J) is used if rolling water come in direct contact with the seal	● Low torque specifications ● Appropriate for high-speed cold rolling, dry milling and other specifications where heat generation and lubrication are difficult	● Used if there is no space to install in the radial direction ● Tightened and secured with a steel band

Category	Oil Seal				
Type	YS	YSA	YS-J	YS-P	YSN
Shape					
Features	● Standard oil seal product Superior installation ability owing to use of robust steel band ● Spring less likely to come out as rubber covers more than 75% of the bearing	● YS oil seal with an additional auxiliary lip to prevent the infiltration of dust	● YS oil seal with scale seal modification added for when there is insufficient space to install a scale seal	● YS with pressure-resistant specification ● Additional backup ring on the lip prevents lip from turning due to pressure, reduces lip temperature by providing support	● Often used for low-torque YS specifications but can be used with general specifications

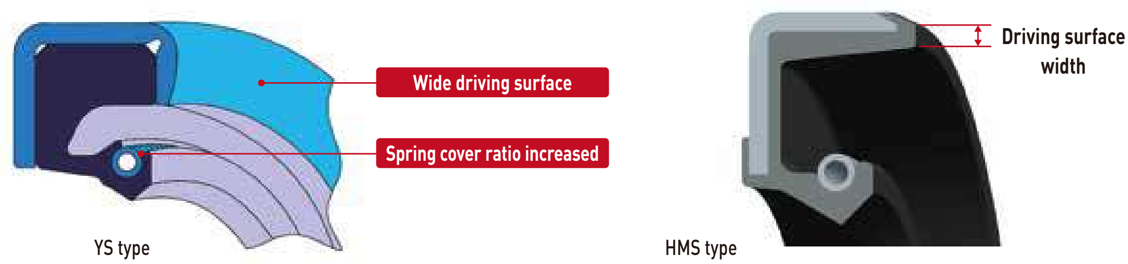
Category	Oil Seal				Water Seal	V ring
Type	MS	MSA	HMSH	HMSH-J	XMHE	MV-A
Shape						
Features	● Easy-to-install oil seal comprised of rubber and hook-type spring ● If shaft cannot be removed, a one cut-type oil seal (MS-C) is used	● MS oil seal with an auxiliary lip added to prevent the infiltration of dust	● Small-diameter oil seal (outer diameter 300mm or less)	● HMSH oil seal with scale seal modification added for when there is insufficient space to install a scale seal	● Seal lip is installed facing outward, with the two spaces functioning as a conduit to direct rolling water from the top to the bottom and prevent infiltration of rolling water and scale	● A seal made of only rubber stretched and attached to the shaft ● Used as an alternative to a scale seal

Category	Mogoil Seal		Block Mill Seal	
Type	MS-J	MS-NJ	M-BNJ	WR-J
Shape				
Features	● Standard Mogoil seal product ● East-to-install seal that prevents the infiltration of oil and water ● Rotates due to being secured to the roll neck, and therefore has superior shake off performance	● Lip contact is stable owing to the different shapes of the lip and end-plate, thereby achieving superior sealability performance compared to the MS-J	● Standard block mill seal product ● Prevents infiltration of oil and water at ultrahigh-speed rotation of 100 m/s	● Improved product durability with superior detachability ● Uses two seals, one each for oil and water, for tough specification conditions, with seal on water side only easy to replace

Oil Seal (YS) Features

Features

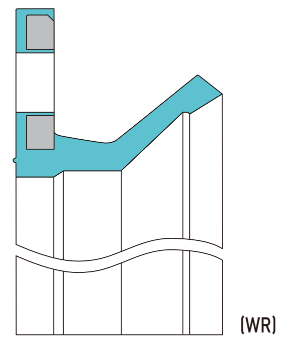
- Wider driving surface when assembling seal on the choke prevents seal distortion, and steel band made of enhanced high-strength material is used
- Spring cover ratio increased to prevent spring from coming off when inserting into roll



Scale Seal (WR & WR-J) Features

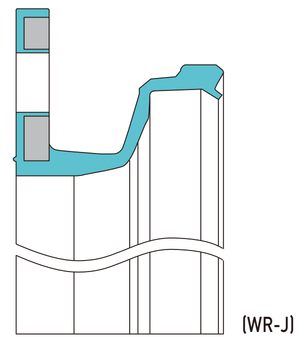
(Standard products)

- Used in locations exposed to large volumes of water, such as hot rolling mills, owing to superior ability to prevent water and scale infiltration

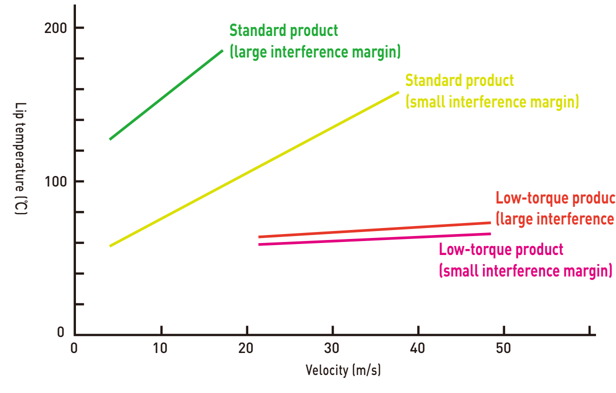


(Low-torque products)

- Used for high-speed cold rolling owing to the ability to suppress rising lip temperature



- Lip temperature on actual machine measured and reflected in design



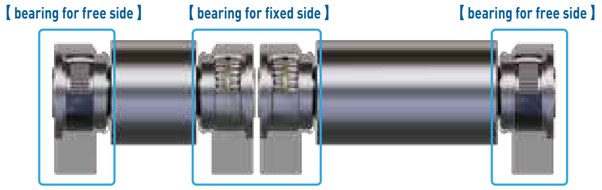
Velocity and lip temperature (bench test)

Oil Seals for Continuous Casting Machines

Types of Rolls

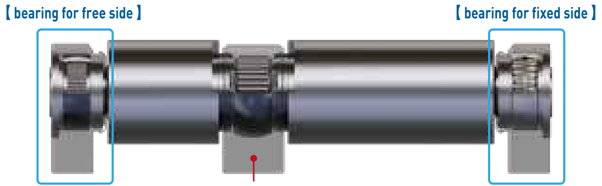
Roll configuration example 1 (single and split rolls)

Optimal configuration for roll elongation absorption using single and split rolls



Roll configuration example 2 (pestle-shaped roll)

Optimal configuration for roll elongation absorption using pestle-shaped roll



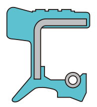
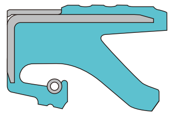
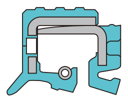
(See next page for oil seal for split bearing units)

Oil Seals for Free Side/Fixed Side Bearing Housing Units

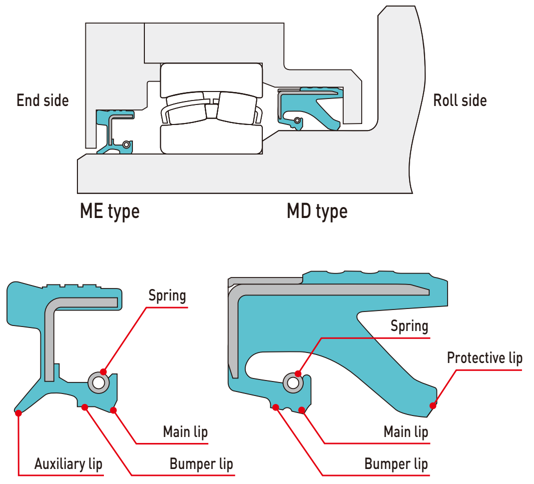
Features

- Bumper lip shape for main lip alleviates shaft wear
- Protective lip suppresses water/scale infiltration
- Hydrogenated nitrile rubber (HNBR) used as standard rubber material, featuring superior heat resistance that ensures more stable use when exposed to water vapor

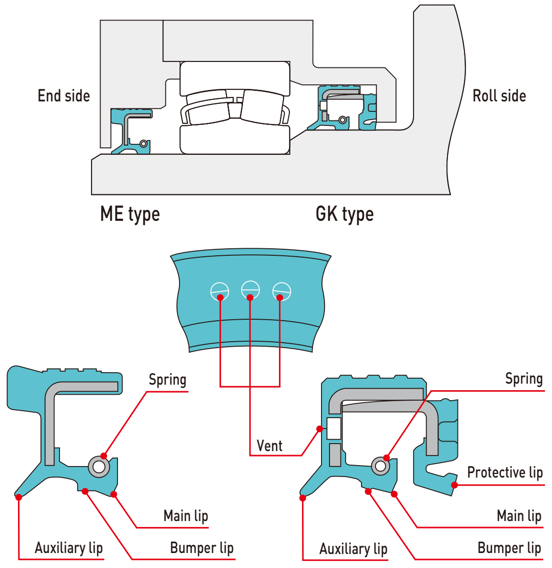
■ Discharge and recovery methods for bearing house grease and oil/air

		End side	Roll side	
		ME type	MD type	GK type
Shape				
Characteristic		Standard end-side product	Improved sealability with protective lip	Vent for improved lubrication and suppressing wear on shaft and lip
Grease	Discharge method	○	○	—
	Recovery method	○	—	○
Oil/Air	Discharge method	○	○	—
	Recovery method	○	○	—

Bearing Housing Grease discharge method
Oil/Air discharge method
Oil/Air recovery method



Bearing Housing Grease recovery method

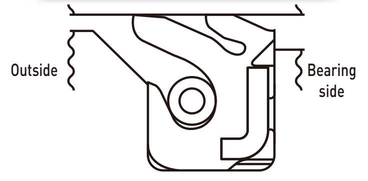


Oil Seals for Split Bearing Units

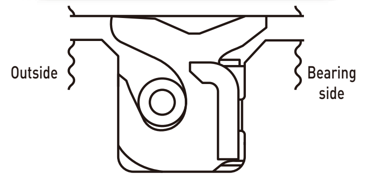
Features

- Follow roll deflection
- Suppress water and scale infiltration
- Hold grease between lips

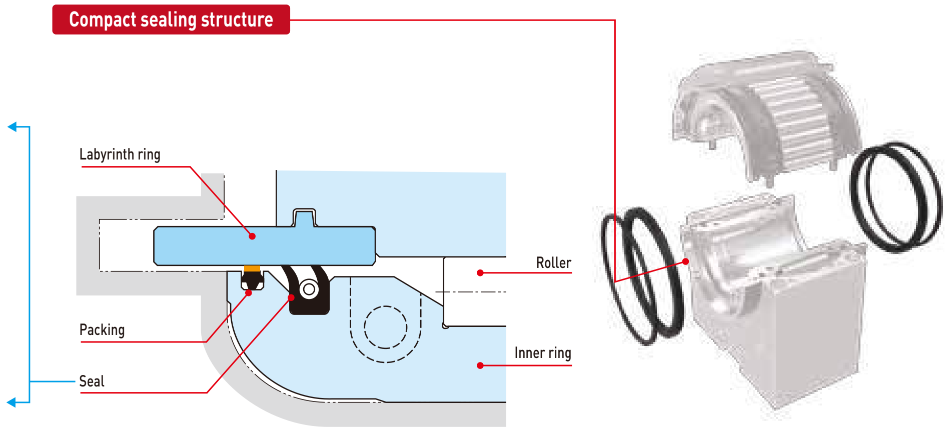
Grease discharge method



Grease Recovery Method



Please consult with JTEKT regarding oil seals for oil/air lubrication.



Oil Seal Rubber Material Used for Continuous Casting Machines

Features

- Compared to fluoro rubber (FKM), hydrogenated nitrile rubber (HNBR) has superior water vapor resistance and grease resistance (urea-based), thereby providing better performance than FKM in cases of continuous use.

■ Rubber material resistance comparison

	Hydrogenated nitrile rubber (HNBR)	Fluoro rubber (FKM)	Nitrile butadiene rubber (NBR)
Heat resistance	○	○	△
Urea grease resistance	○	△	○
Water vapor resistance	○	×	△
Water resistance	○	○	○
Wear resistance	○	○	○

○:Has resistance (excluding specific cases) △:No resistance (excluding specific cases) ×:No resistance

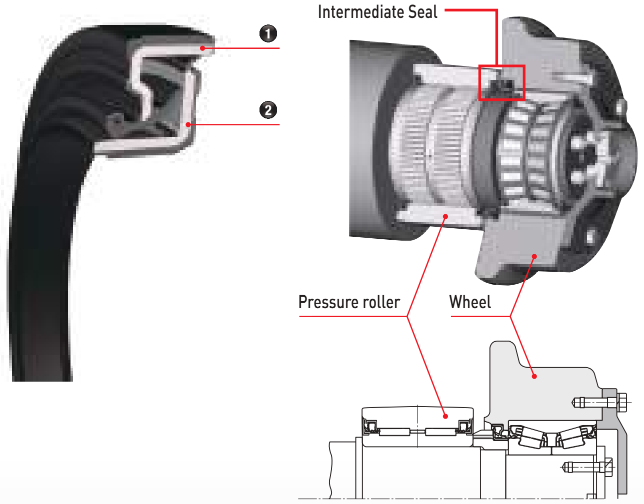
Note: Judgment of heat resistance and water vapor resistance assumed a working condition of 100℃

Oil Seals for Sintering Machine Pallet Cars

Intermediate seal

Features

- No damage to peripheral parts owing to two-component (❶and❷) combined structure
- Prevents dust infiltration owing to high sealing performance provided by multilayer lip structure



Sealed Bearing Seals

Bearing seal for pressure rollers

●Special seal shape with integrated sleeve prevents dust infiltration

Bearing seals for wheels

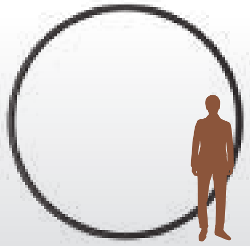
●Compact seal shape with improved sealing performance prevents dust infiltration

Oil Seals for Converter Furnaces

Large Seals

Features

- MS-type oil seals can be cut in one location to enable easy installation on long or complex-shaped shafts



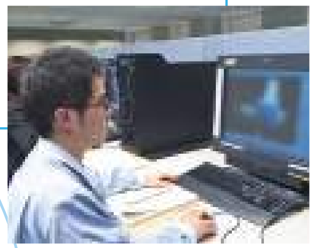
Converter trunnion split bearing

MS-type oil seal cut in one location

Technology Management

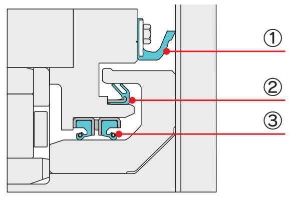
Oil seal FEM analysis

Scale seal FEM analysis



Analysis example

Basic design concept



① Scale seal
…Prevents infiltration of/shakes off cooling water

② Water seal
…Prevents infiltration of cooling water

③ Oil seal
…Prevents leakage of bearing lubricant

Example rolling bearing sealers for backup rolls

- Optimal rubber composition as sealing material
- Well-balanced design adaptable to location of use

Material Design Analysis

Technology Management

Production Inspection

- Stable quality by vacuum vulcanization molding
- Integrated production of seals including rubber and metal ring

Large turning machine

Inspection data CPU

Evaluation

- Evaluation can be performed in a simulated environment closely resembling actual machine operation

Bearing tester
for steel production equipment

Koyo® Oil Seal For Steel Production Equipment

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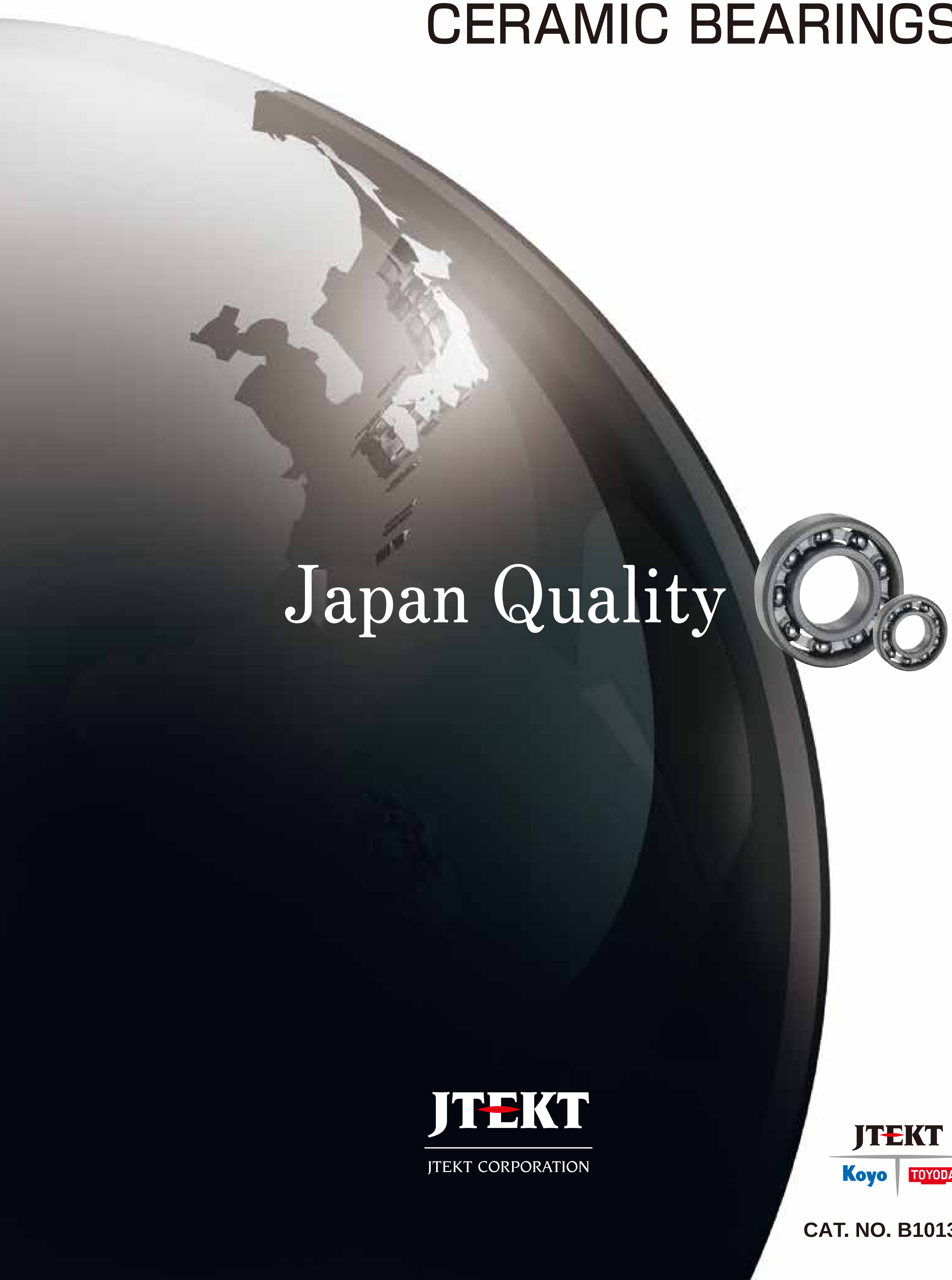
EXSEV

FOR EXTREME SPECIAL ENVIRONMENTS

CERAMIC BEARINGS



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Koyo TOYODA

CAT. NO. B1013E

World’s first successful practical application of ceramic bearings

“Aren’t there any bearings that can be used in seawater?”

…One of our customers asked this question,
triggering our efforts to develop the ceramic bearing.

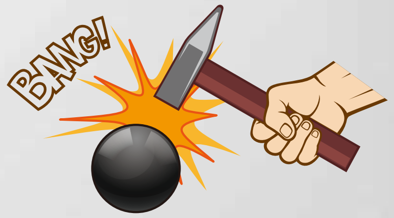
Initially, we attempted to use alumina as the raw material,
but **it split quickly and cracks developed…**

Following this, research stalled and ended after approximately five years.

Research resumed again in 1978;
this time with the development team consisting of five members.

Additionally, **a material manufacturer known for leading ceramics research was invited to join the effort.**

Starting with silicon nitride as the raw material,
strength was reinforced using a sintering additive and
a hot pressing process eliminated cracking.
As a result, the first ceramic bearings were commercialized in 1984.



Some of our customers had doubts about strength in the beginning,
stating “If ceramic cracks, it will surely split in two!”

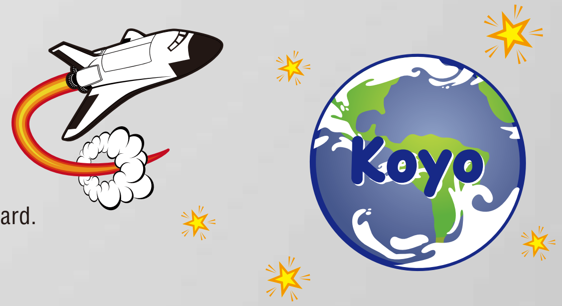
At that time, **customers would hit the bearings with a hammer to test their strength.**

Doing this, **the concrete below the bearing was the only thing that cracked!**

Finding practical applications was initially difficult,
but **their strength and high-speed performance were gradually recognized,** and
ceramic bearings began to be utilized for the main spindles of machine tools.

Next, **they began receiving attention from semiconductor manufacturers owing to the characteristics of not using oil and not producing waste.**

Ceramic bearings were then **utilized in a section of experimental equipment on the space shuttle Colombia,** expanding their range of applications.



As productivity improved, ceramic bearings began being used in the
mass production of computer HDDs and automobile engines.

Their excellent performance has been recognized and
applications have received various awards, such as the Japan Fine Ceramics Award.

And now…

“For ceramic bearings, the answer is KOYO”

Introduction to Application Examples

Features

Properties of ceramic materials

Production Process

Ceramics Production Process

Product Details

Ceramic Bearing Product Details

Performance

Ceramic Bearing Capacities

Product Introduction

1 Machine tools

CERAMIC BEARINGS

1 Spindle (Angular Contact Ball Bearing)

Product : Hybrid Ceramic Bearings

Machine tool spindle bearings are required to have superior rotational performance at extremely high speeds, quick acceleration/ deceleration, high rigidity, and reduced temperature rises.
Hybrid Ceramic Bearings, which satisfy these requirements, are widely used in this application.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- 20% to 30% reduction in temperature rise
- Upper limit of rotational speed range is 1.2-1.5 times higher (compared to Koyo steel bearings)

Use Conditions

Rotational speed: 25 000 min^{-1}
($d_m n = 2.75 \times 10^6$)
Lubrication: Oil or Grease
Spindle power: 75 kW

High Ability

2 Spindle (Cylindrical Roller Bearing)

Product : Hybrid Ceramic Bearings

Seizure resistance performance under unbalanced load conditions due to misalignment improved at the Vertical Spindle Machining Center.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- 20% to 30% reduction in temperature rise
- Upper limit of rotational speed range is 1.2-1.5 times higher (compared to Koyo steel bearings)

Use Conditions

Rotational speed: 12 000 min^{-1}
Lubrication: Grease

High Ability

2 Film manufacturing equipment

CERAMIC BEARINGS

1 Liquid Crystal Polarizing Film Manufacturing Equipment

Product : Corrosion Resistant Hybrid Ceramic Bearings

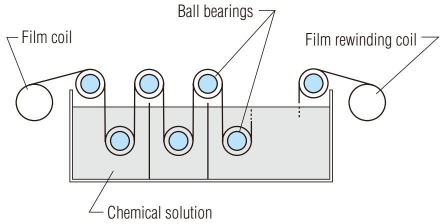
Liquid crystal polarizing film manufacturing equipment use acid solution, alkaline solution, dying solution, distilled water, and other solutions.
In such corrosive environments, Corrosion Resistant Hybrid Ceramic Bearings are widely used.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	**Abrasion resistance**	Low torque

- Corrosion resistance to solutions such as acid solution, alkaline solution, dying solution, and distilled water

Use Conditions

Rotational speed: 80 min^{-1}
Temperature: Room temp. to 80°C
Lubrication: Chemical solution



2 Photographic Film Manufacturing Equipment

Product: Hybrid Ceramic Bearings (with special features)

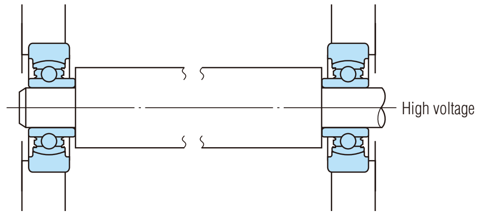
A photographic film production line treats film surfaces by applying a high voltage.
Hybrid Ceramic Bearings are widely used in such environments, because the ceramic inner ring and balls serve as insulators.

Vacuum	Clean	High temperature
Corrosive	**Electric field**	Magnetic field
High speed	Abrasion resistance	Low torque

- Insulation under high voltage environments

Use Conditions

Rotational speed: 200 min^{-1}
Temperature: Room temp.
Lubrication: Grease



3 Power generation equipment

CERAMIC BEARINGS

1 Wind Turbine Generator

Product: Hybrid Ceramic Bearings

Wind Turbine Generator are strongly required to operate for extensive periods of time without the need of maintenance.
However, bearings used in generators are subject to electrical pitting, which may cause the bearings to break down.
Hybrid Ceramic Bearings, which have superior durability and reliability, are widely used in such aerogenerators.

Vacuum	Clean	High temperature
Corrosive	**Electric field**	Magnetic field
High speed	Abrasion resistance	Low torque

- Prevention of electrical pitting
- Extension of grease service life (three times longer than Koyo steel bearings)

Use Conditions

Rotational speed: 2700 min^{-1}
Temperature: Below freezing point to approx. 60°C
Lubrication: Grease

2 Micro Gas Turbine Generator

Product: Hybrid Ceramic Bearings

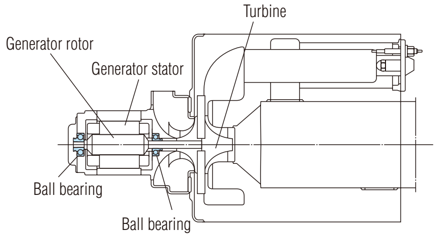
The world's smallest gas turbine generators emit clean exhaust emissions and hence are friendly to the environment.
Hybrid Ceramic Bearings are used in these generators because they are low in vibration and noise generation, and have excellent high speed performance.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Improved reliability in high speed rotation

Use Conditions

Rotational speed: 10 000 min^{-1}
($d_m n = 2.22 \times 10^5$)
Temperature: 200°C
Lubrication: Oil



4 Industrial furnaces

CERAMIC BEARINGS

1 Liquid Crystal Panel Bonding and LC Sealing Furnace

Product : Hybrid Ceramic Linear Motion Ball Bearings

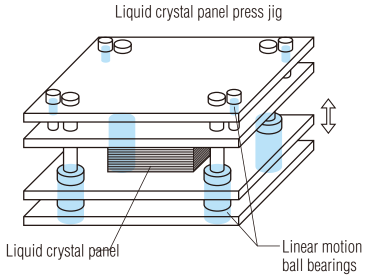
Substrate bonding press jigs for use in furnaces must be low in particle emissions and have a long service life under high temperature conditions.
The Clean Pro Hybrid Ceramic Linear Motion Ball Bearings are widely used for such jigs.

Vacuum	**Clean**	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Suitable for clean environments thanks to low particle emissions

Use Conditions

Stroke speed: 5 mm/s
Temperature: 200°C
Ambient pressure: Normal pressure
Lubrication: Clean pro coating



2 Furnaces Cars

Product: High Temperature Hybrid Ceramic Bearings

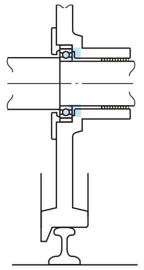
The bogies, conveyers and other carrier systems used in furnaces are exposed to high temperatures.
Because of their high heat resistance, High Temperature Hybrid Ceramic Bearings are used in such applications.

Vacuum	Clean	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Applicable to high temperature environments

Use Conditions

Rotational speed: 10 to 500 min^{-1}
Temperature: 500°C
Lubrication: Graphite



3 Baking Furnace Cars

Product: High Temperature Hybrid Ceramic Bearings

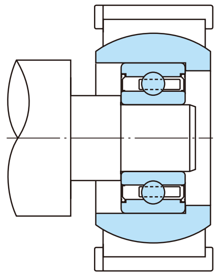
In the kiln that bakes fluorine resin onto the heat rollers of copying machines, conveyor bearings must be low in particle emissions under high temperatures. Because it is structurally difficult to mount bearings accurately, High temperature Hybrid Ceramic Bearings are used for this application, along with aligning rings.

Vacuum	Clean	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Compatible with high temperature environments

Use Conditions

Rotational speed: 3 to 10 min^{-1}
Temperature: 400 to 500°C
Lubrication: Graphite



4 Tube Annealing Furnace Guide Rolls

Product: Hybrid Ceramic Bearings

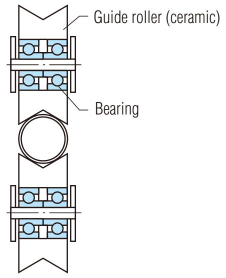
The guide roll bearings installed inside tube annealing furnaces are used under high temperatures without lubrication.
Hybrid Ceramic Bearings are suitable for such applications.

Vacuum	Clean	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Compatible with high temperature environments

Use Conditions

Rotational speed: 300 min^{-1}
Temperature: 300°C



5 Diffusion Furnace Dolly

Product: Full-complement Ceramic Ball Bearings

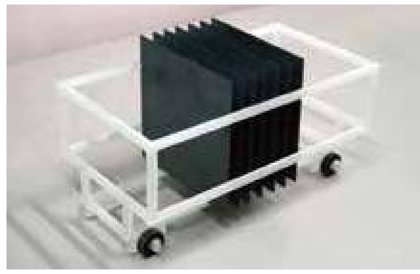
Conditions in a diffusion furnace are harsh, including not only high temperature, but also corrosive gas.
Incorporating a rolling mechanism for the conveyor dolly in the furnace enables smooth conveyance to be obtained, thereby leading to improvements in product quality and productivity.

Vacuum	Clean	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Compatible with high-temperature environments
- Corrosion-resistant against corrosive gases
- Contributes to improved productivity

Use Conditions

Temperature: 800°C or higher
Ambient pressure: Corrosive gas atmosphere
Load: 5N



5 Production equipment

CERAMIC BEARINGS

1 Aluminum Electrolytic Capacitor Manufacturing Equipment

Product: High Corrosion Resistant Ceramic Bearings

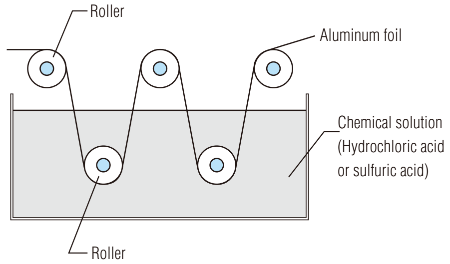
In an aluminum foil electrolytic capacitor manufacturing equipment, a strong acid solution is used to treat the aluminum foils. High Corrosion Resistant Ceramic Bearings are widely used in such highly corrosive environments.

Vacuum	Clean	High temperature
[✓ Corrosive]	Electric field	Magnetic field
High speed	[✓ Abrasion resistance]	Low torque

- Corrosion resistance to strong acid solution

Use Conditions

Rotational speed: 50 min⁻¹
Temperature: 90°C
Lubrication: Chemical solution
(hydrochloric acid and sulfuric acid)



2 Synthetic Fiber Manufacturing Equipment

Product: Corrosion Resistant Hybrid Ceramic Bearings

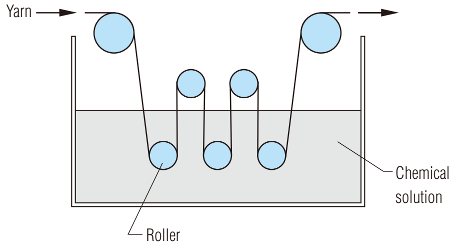
Acid solution, alkaline solution, water, and other liquids are used in synthetic fiber yarn reinforcing processes. Corrosion Resistant Hybrid Ceramic Bearings are applied in such corrosive environments.

Vacuum	Clean	High temperature
[✓ Corrosive]	Electric field	Magnetic field
High speed	[✓ Abrasion resistance]	Low torque

- Corrosion resistance under acid solution, alkaline solution and water

Use Conditions

Rotational speed: 20 to 100 min⁻¹
Temperature: Room temp. to 90°C
Lubrication: Chemical solution



3 DVD Sputtering Equipment

Product: Hybrid Ceramic Bearings

To improve reliability further, Hybrid Ceramic Bearings are used.

Vacuum	Clean	High temperature
Corrosive	[✓ Electric field]	Magnetic field
High speed	Abrasion resistance	Low torque

- Insulation

Use Conditions

Rotational speed: 300 min⁻¹
Temperature: Room temp.
Lubrication: Grease

4 Steel Wire Stranding Machine

Product: Hybrid Ceramic Bearings

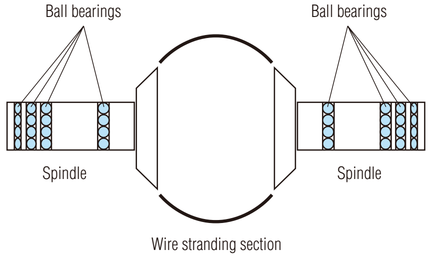
Steel wires for radial tires are produced by stranding steel wires to attain the required strength. In steel wire stranding machines, which involve high speed rotation, Hybrid Ceramic Bearings are used for improved service life and stability.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
[✓ High speed]	Abrasion resistance	Low torque

- Reduced temperature rises
- Reliable durability

Use Conditions

Rotational speed: 6 000 min⁻¹ or higher
Lubrication: Grease



5 Jet Electrostatic Coating Machine

Product: Hybrid Ceramic Bearings

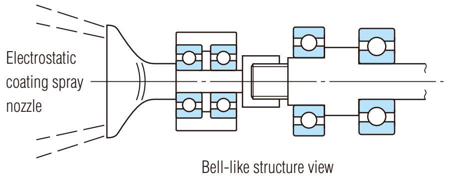
In a jet electrostatic coating machine, grease may escape from the spray nozzle due to the air motor, affecting the quality of the paint to be coated.
To resolve this problem, Hybrid Ceramic Bearings that do not use grease are used.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
[✓ High speed]	Abrasion resistance	Low torque

- Prevention of grease scattering
- Prevention of paint contamination

Use Conditions

Rotational speed: 20 000 min⁻¹
Lubrication: Fluorine polyme



6 Blister Packaging Equipment

Product: High-temperature Hybrid Ceramic Bearings

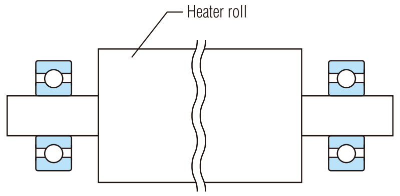
As heater roll bearings used in processing reach high temperatures during operation, conventional bearings are quickly damaged.
Incorporating high-temperature ceramic bearings extends the bearing replacement cycle and improves productivity.

Vacuum	Clean	[✓ High temperature]
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Applicable to high-temperature environments
- Contributes to improved productivity

Use Conditions

Temperature: 250°C
Load: 900N
Lubrication: Grease



6 Semiconductor manufacturing equipment

1 Transfer Robot for Semiconductor and LCD Manufacturing Equipment

Product: K Series Full-Complement Hybrid Ceramic Ball Bearings

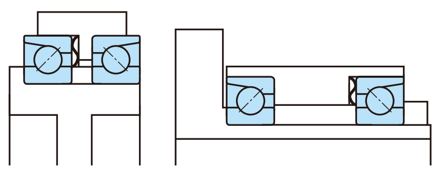
For application in transfer robots for semiconductor and liquid crystal manufacturing equipment, bearings are required to be low in particle emissions and have a long service life.
Bearings may be delivered incorporated in arm units for improved assemblability and maintainability.

Vacuum	**Clean**	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	**Low torque**

- Applicable to vacuum environments and clean environments
- Optimal for machine size reduction

Use Conditions

Temperature: Room temp. to 200°C
Ambient pressure: 10^{-3} Pa
Lubrication: Grease or clean pro coating



Bearing unit for application to transfer robots

2 Electron Beam Lithography

Product: Non-magnetic Hybrid Ceramic Bearings

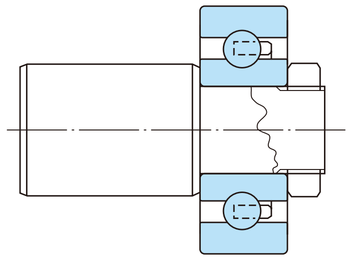
The bearings in semiconductor production electron beam lithography are exposed to strong magnetic fields.
Because of their non-magnetic characteristics, Hybrid Ceramic Bearings are used in such machines.

Vacuum	Clean	High temperature
Corrosive	Electric field	**Magnetic field**
High speed	Abrasion resistance	Low torque

- Compatible with vacuum, strong magnetic field environments

Use Conditions

Rotational speed: 100 min^{-1}
Temperature: Room temp.
Ambient pressure: 10^{-5} Pa
Lubrication: Grease



3 Gates in Chemical Vapor Deposition Equipment

Product: Hybrid Ceramic Ball Bearing Clean Pro Linear Motion Ball Bearings

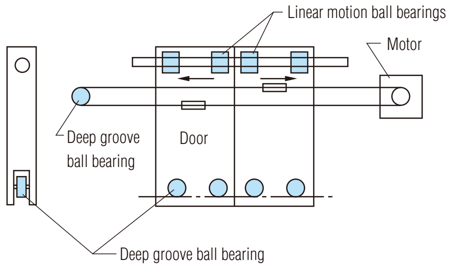
Hybrid Ceramic Ball Bearings and Clean Pro Linear Motion Ball Bearings are widely used for the doors of the chemical vapor deposition (CVD) equipment.

Vacuum	**Clean**	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Applicable to high temperature, vacuum and clean environments

Use Conditions

Rotational speed: 10 to 200 min^{-1}
Temperature: 200°C
Ambient pressure: Normal to 10^{-4} Pa
Lubrication: Clean pro coating



4 Etching Equipment

Product: Hybrid Ceramic Bearings (with special features)

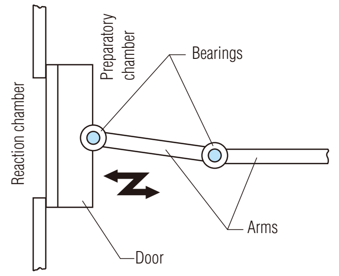
Bearings used in etching machines must be resistant to halogen, hydrofluoric acid, and other corrosive gasses, as well as low in particle emissions. To meet these requirements, PTFE coated Hybrid Ceramic Bearings are used.

Vacuum	**Clean**	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Resistant to corrosive ambient gases such as halogen and hydrofluoric acid
- Suitable for clean environments thanks to low particle emissions

Use Conditions

Temperature: Room temp. to 60°C
Ambient pressure: Normal to 10^{-2} Pa
Load: Radial load of 10 N
Lubrication: PTFE coating



5 Vacuum Evaporator

Product: High Temperature Hybrid Ceramic Bearings (with special features)

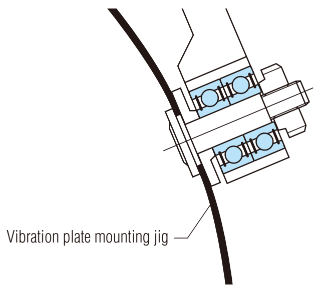
Bearings used in the planetary section of vacuum evaporator are required to be high in durability under high temperatures, high load (moment) conditions. To ensure a long bearing life under high temperature conditions, High temperature Hybrid Ceramic Bearings with special features are used.

Vacuum	Clean	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Improved reliability in vacuum and high temperature environments

Use Conditions

Rotational speed: 1 to 30 min^{-1}
Temperature: 200 to 400°C
Ambient pressure: 10^{-6} to 10^{-8} Pa
Lubrication: Molybdenum disulfide or silver



6 Spin-dryer for Wafer Cleaning Equipment

Product: Corrosion Resistant Hybrid Ceramic Bearings

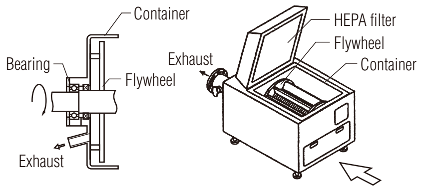
In semiconductor wafer cleaning processes, wafers are cleaned in cleansing chemicals, rinsing liquids, distilled water, and other liquids before drying.
Because of their high corrosion resistance, Corrosion Resistant Hybrid Ceramic Bearings are widely used in wafer cleaners.

Vacuum	**Clean**	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	**Low torque**

- Corrosion resistance to solutions such as cleaning chemicals, rinsing liquids, and distilled water

Use Conditions

Rotational speed: 2 000 to 3 000 min^{-1}
Temperature: Room temp.
Lubrication: Grease



6 Semiconductor manufacturing equipment

CERAMIC BEARINGS

7 Wafer Transfer Equipment

Product: Hybrid Ceramic Linear Way Bearing Units (with special features)

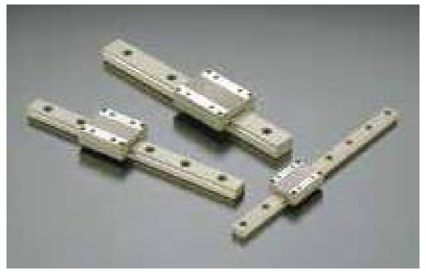
For application in wafer transfer equipment, low particle emissions performance is required.
For such devices, Clean Pro Hybrid Ceramic Linear Way Bearing Units are widely used.

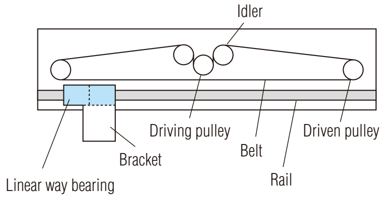
Vacuum	**Clean**	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Suitable for clean environments thanks to low particle emissions
- Corrosion resistant to cleaning agent splashes

Use Conditions

Stroke speed: 350 mm/s
Temperature: Room temp.
Ambient pressure: Normal pressure
Lubrication: Clean pro coating





8 Wafer Cleaning Equipment for Chemical Mechanical Polishing System

Product: Corrosion Resistant Ceramic Bearings

In the semiconductor multilayer production process, each wafer surface should be treated to maintain evenness. This process uses chemical mechanical polishing equipment, and the cleaner attached to the equipment uses Corrosion Resistant Ceramic Bearings.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	**Abrasion resistance**	Low torque

- Corrosion resistance to corrosive solutions

Use Conditions

Rotational speed: 100 min^{-1}
Temperature: Room temp.
Lubrication: Fluorine polymer

9 Turbo Molecular Pump

Product: Full-Complement Hybrid Ceramic Ball Bearings (with special features)

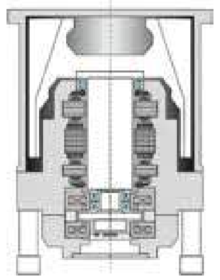
Magnetic bearings are used in turbo molecular pumps driven at extremely high speeds. To protect the blades from fracture in case of a power failure or magnetic failure, touchdown bearing units are used. As touchdown bearings, Full-Complement Hybrid Ceramic Ball Bearings are used to increase the service life of the touchdown bearings under severe hostile conditions.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	**Abrasion resistance**	Low torque

- Improved reliability in vacuum environments

Use Conditions

Rotational speed: 20 000 to 60 000 min^{-1}
Ambient pressure: 1 Pa
Lubrication: Molybdenum disulfide or silver



7 Motor, Industrial machinery

CERAMIC BEARINGS

1 Polygon Scanner Motor

Product: Hybrid Ceramic Bearings

Hybrid Ceramic Bearings, which exhibit superior high speed performance, are widely used in high speed polygon scanner motors.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Excellent reliability in high speed rotation

Use Conditions

Rotational speed: 26 000 min^{-1} or higher
Lubrication: Grease

2 Ultrasonic Motor in Magnetic Resonance Imagers

Product: Ceramic Bearings

The motors installed in magnetic resonance imagers (MRI) use magnetism insensitive Ceramic Bearings.

Vacuum	Clean	High temperature
Corrosive	Electric field	**Magnetic field**
High speed	Abrasion resistance	Low torque

- Compatible with strong magnetic field environments

Use Conditions

Rotational speed: 500 min^{-1}
Temperature: Room temp.
Lubrication: Grease

3 Switched Reluctance Motor

Product: Hybrid Ceramic Bearings

For high speed, high efficiency switched reluctance (SR) motors, which do not use coils or permanent magnets, Hybrid Ceramic Bearings are applied.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Excellent reliability in high speed rotation

Use Conditions

Rotational speed: 30 000 min^{-1}
Lubrication: Grease

8 Medical equipment

CERAMIC BEARINGS

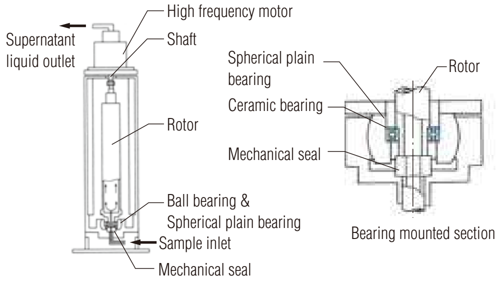
1 Blood Centrifuge

Product: Hybrid Ceramic Bearings (with special coating)

Corrosion resistance is required of bearings to be used in blood centrifuge especially to physiological saline.
Hybrid Ceramic Bearings with bearing rings coated with a corrosion resistant film are suitable for such corrosive environments.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

● **Corrosion resistance to physiological saline**



Use Conditions

Rotational speed: 20 000 min^{-1}
Temperature: –10 to 10°C
Lubrication: Grease

2 Ultrasonic Motor in Magnetic Resonance Imagers

Product: Ceramic Bearings

The motors installed in magnetic resonance imagers (MRI) use magnetism insensitive Ceramic Bearings.

Vacuum	Clean	High temperature
Corrosive	Electric field	**Magnetic field**
High speed	Abrasion resistance	Low torque

● **Compatible with strong magnetic field environments**

Use Conditions

Rotational speed: 500 min^{-1}
Temperature: Room temp.
Lubrication: Grease

9 Home electrical appliances

CERAMIC BEARINGS

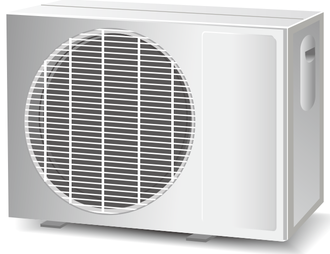
1 Air-conditioner motors

Product : Hybrid Ceramic Bearings

When using motors equipped with inverter control such as air-conditioner motors, there is a possibility of electric pitting defects occurring on motor bearings.
Using a ceramic — which is an insulator — as the rolling elements eliminates electric pitting.

Vacuum	Clean	High temperature
Corrosive	**Electric field**	Magnetic field
High speed	Abrasion resistance	Low torque

● **CElectric pitting prevent through insulation performance**



Use Conditions

Rotational speed: 3 000 min^{-1}
Load (preload): 1.5% C
Lubrication: Grease

2 Fan Motor

Product : Hybrid Ceramic Bearings

Bearing defects occur due to electric pitting in various motors.
Hybrid ceramic bearings are utilized as a measure against electric pitting.

Vacuum	Clean	High temperature
Corrosive	**Electric field**	Magnetic field
High speed	Abrasion resistance	Low torque

● **Prevention of electrical pitting**

Use Conditions

Rotational speed: 5 000 min^{-1}
Temperature: –10 to 120°C
Lubrication: Grease

10 Outer space, Leisure

CERAMIC BEARINGS

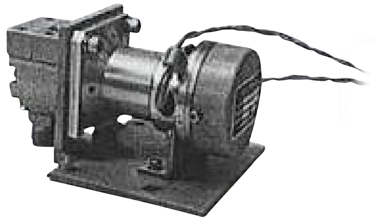
1 Outer Space Experimentation Equipment

Product: Ceramic Bearings

Utilized in experimental equipment on a space shuttle.
Stainless-steel bearings using fresh water as the lubricant experience abrasion and do not reach the required service life.
Using general ceramic bearings enables the required service life to be attained.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	**Abrasion resistance**	Low torque

● **Long Service Life under Freshwater Lubricating Conditions**



Use Conditions

Rotational speed: 10 000 min^{-1}
Temperature: 30°C
Load: Radial 5N, Axial 10N
Lubrication: Fresh water

2 Inline Skates

Product : Hybrid Ceramic Bearings

Because of their low running torque and high durability, Hybrid Ceramic Bearings are widely used in speed skates.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	**Low torque**

● **Low torque and improved durability**

Use Conditions

Rotational speed: 10 000 min^{-1}
Lubrication: Oil or grease

11 Automobiles, Motorcycles

CERAMIC BEARINGS

1 Turbocharger

Product: Hybrid Ceramic Bearings

Bearings supporting the main shaft of the turbocharger are responsive during acceleration and durable when using low-viscosity, dirty oil.
Hybrid ceramic bearings with superior reliability are utilized.

Vacuum	Clean	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	Low torque

- Service life three times longer than that of ordinary bearings
- Acceleration response improved 20%
- Oil quantity reduced 80%

Use Conditions

Rotational speed: 180 000 to 210 000 min^{-1}
Temperature: 350°C
Lubrication: Oil

2 Fuel Injection System Control Valve

Product: Ceramic Ball

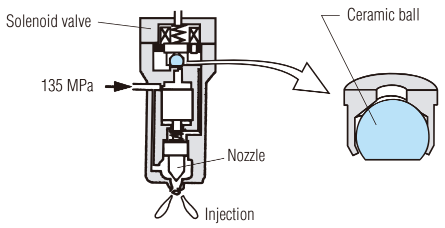
The common rail system (fuel injection system), which enables diesel engines to feature high power, good fuel economy and low emissions, is equipped with Ceramic Balls in the control valves.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	**Abrasion resistance**	Low torque

- Compatible with high pressure fuel injection thanks to improved wear resistance and seizure resistance

Use Conditions

Maximum pressure: 135 MPa



3 Wheel Bearings for Solar Cars

Product: Hybrid Ceramic Bearings

Stable operation of the motor section under severe open conditions of running eight hours or more per day. Improvements in weight reduction, durability and reliability.
Suppressing spinning resistance and efficiently transferring the driving force to the wheels contributes to saving power.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	Abrasion resistance	**Low torque**

- Australia: Covered over 3,000km vertically
- South Africa: Covered over 4,000km

Use Conditions

Rotational speed: 1 000 min^{-1}
Lubrication: Grease

Photo: Courtesy of Tokai University

4 Rally Car Hub Units

Product: Hybrid Ceramic Bearings

Excellent abrasion resistance even under severe environmental conditions has improved durability and reliability.

Vacuum	Clean	High temperature
Corrosive	Electric field	Magnetic field
High speed	**Abrasion resistance**	Low torque

- Utilized in the car entered in the Paris-Dakar Rally in 1997 and 1998
- Rigidity improved
- Unsprung weight reduced

Photos: Courtesy of Mitsubishi Motors Corporation

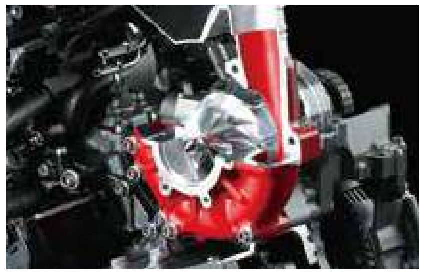
5 Motorcycle Superchargers

Product: Hybrid Ceramic Bearings

The new superchargers for large motorcycles utilize lightweight, high-strength ceramic balls capable of high-speed rotation. The incorporation of ceramic balls has achieved bearings with excellent high-speed performance, heat resistance and abrasion resistance. Additionally, when using hybrid ceramic bearings, high output is achieved even for race-specification motors operating under harsh conditions.

Vacuum	Clean	**High temperature**
Corrosive	Electric field	Magnetic field
High speed	**Abrasion resistance**	**Low torque**

- High-speed performance, heat resistance and abrasion resistance improved
- Contributes to achieving high output supporting race specifications



Photos: Courtesy of Kawasaki Heavy Industries, Ltd.

Properties of ceramic materials

CERAMIC BEARINGS

1 Material characteristics

Table 1 below lists the mechanical and physical properties of major ceramic materials used as bearing materials. Table 2 compares silicon nitride and high carbon chromium bearing steel.

Table 1 Mechanical and physical properties of ceramic materials used as bearing materials

Property	Unit / Ceramic Material	Silicon Nitride Si_3N_4	Zirconia ZrO_2	Silicon Carbide SiC
Density	g/cm^3	3.2	6.0	3.1
Linear expansion coefficient	K^{-1}	3.2×10^{-6}	10.5×10^{-6}	3.9×10^{-6}
Vickers hardness	HV	1 500	1 200	2 200
Module of longitudinal elasticity	GPa	320	220	380
Poisson's ratio		0.29	0.31	0.16
Three point bending strength	MPa	1 100	1 400	500
Fracture toughness	MPa·m$^{1/2}$	6	5	4
Heat resistance (in atmospheric air)	℃	800	200	1 000 or higher
Thermal shock resistance	℃	750 or higher	350	350
Coefficient of thermal conductivity	W/(m·K)	20	3	70
Specific heat	J/(kg·K)	680	460	670

Table 2 Comparison of characteristics of silicon nitride and high carbon chromium bearing steel

Property	Unit	Silicon Nitride Si_3N_4	High Carbon Chromium Bearing Steel SUJ2	Advantages of Ceramic Bearings
Density	g/cm^3	3.2	7.8	Decrease in centrifugal force induced by rolling elements (balls or rollers) → Longer service life and reduced bearing temperature rises
Linear expansion coefficient	K^{-1}	3.2×10^{-6}	12.5×10^{-6}	Decreased internal clearance change due to reduced bearing temperature rises → Lowered vibration and reduced preload changes
Vickers hardness	HV	1 500	750	Less deformation in rolling contact areas → Higher rigidity
Module of longitudinal elasticity	GPa	320	208	
Poisson's ratio		0.29	0.3	
Heat resistance	℃	800	180	Retention of superior load carrying characteristics under high temperature
Corrosion resistance		High	Low	Useful in acid or alkaline solutions
Magnetism		Non-magnetic	Ferromagnetic	Decreased rotational fluctuation in ferromagnetic field due to non-magnetization
Conductivity		insulator	conductor	Prevents electrical pitting
Bond		Covalent bond	Metallic bond	Decrease in adhesion (or material transfer) due to oil film thinning in rolling contact areas

2 Rolling fatigue of ceramic materials

The individual ceramic materials were tested for rolling fatigue under oil lubrication and under water lubrication, to evaluate their applicability as bearing material. Figs. 1 and 2 show the results of the tests.
The figures indicate that each ceramic material has a certain level of rolling fatigue strength and that silicon nitride has the highest fatigue strength among the ceramic materials tested.

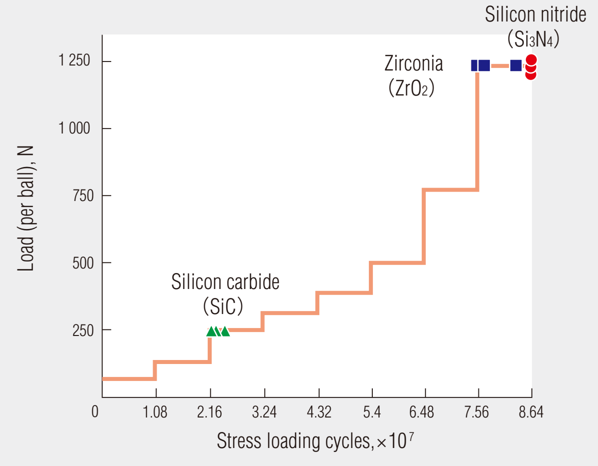


Fig. 1 Comparison in rolling fatigue life under oil lubrication

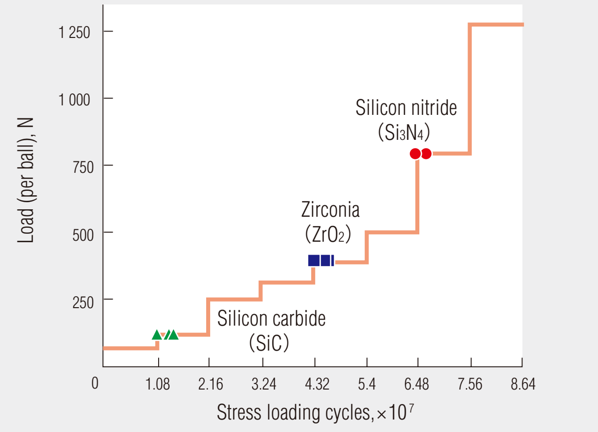
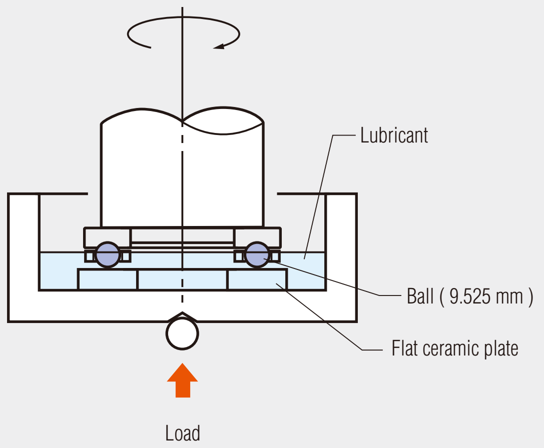


Fig. 2 Comparison in rolling fatigue life under water lubrication

Test conditions

	Oil lubrication	Water lubrication
Lubricant	Spindle oil	City water
Ball	Bearing steel	Ceramic
Load	Increased in stages at every 1.08×10^7 cycles	
Rotational speed	1 200 min^{-1}	

Test equipment



Test equipment appearance

Fig. 3 Rolling fatigue life test conditions and test equipment

3 Ceramic materials suitable for rolling bearings

Table 3 shows the results of evaluating the ceramic materials in terms of their characteristics and the rolling fatigue strength. Among the ceramic materials tested, silicon nitride is the most suitable as rolling bearing material.
JTEKT uses the silicon nitride produced by the hot isostatic pressing (HIP) method as the standard ceramic material for bearings.

Table 3 Ratings of ceramic materials as rolling bearing materials

	Application to rolling bearings		
	Rating	Performance and use	Characteristics
Silicon nitride Si_3N_4	◎	･Comparable to bearing steel in load carrying capability and service life ･Suitable for high performance applications	･High speed ･High vacuum ･Corrosion resistant ･Heat resistant ･Non-magnetic ･High rigidity
Zirconia ZrO_2	○	･Useful under a limited load ･Applicable in highly corrosive chemicals	･Highly corrosion resistant
Silicon carbide SiC	○	･Useful under a limited load ･Applicable in highly corrosive chemicals	･Highly corrosion resistant ･Highly heat resistant

4 Composition of ceramic bearings

Koyo ceramic bearings are divided into Full Ceramic Bearings (with all components, namely, the outer ring, inner ring and rolling elements, made of ceramic) and Hybrid Ceramic Bearings (with only the rolling elements made of ceramic). The outer ring and inner ring of the Hybrid Ceramic Bearings are made from special steel, including high carbon chromium bearing steel. The cage may be made of a metallic material, resin, or composite material, depending on the intended operating conditions of the bearing.

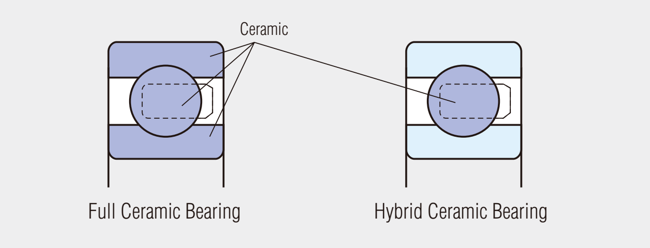


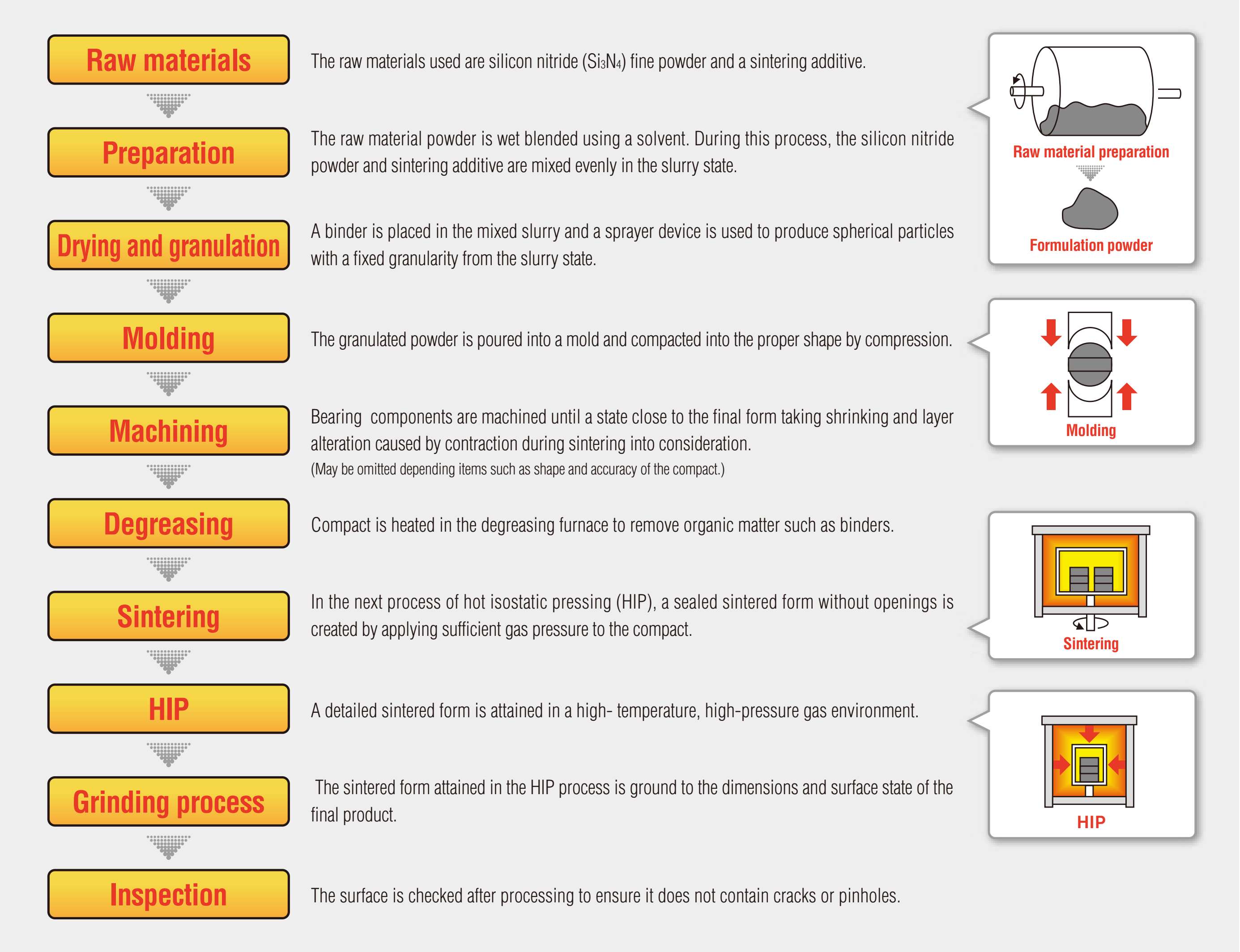
Fig. 4 Composition of ceramic bearings

Ceramics Production Processes

CERAMIC BEARINGS

1 Production processes

With silicon nitride, characteristics such as density and strength can vary greatly depending on the manufacturing method and manufacturing conditions. Therefore, it is necessary to strictly control items such as shape, sintering and other processes when manufacturing silicon nitride for ball and roller bearings. The general manufacturing process is shown in Fig. 5.



Raw materials The raw materials used are silicon nitride (Si_3N_4) fine powder and a sintering additive.

Preparation The raw material powder is wet blended using a solvent. During this process, the silicon nitride powder and sintering additive are mixed evenly in the slurry state.

Drying and granulation A binder is placed in the mixed slurry and a sprayer device is used to produce spherical particles with a fixed granularity from the slurry state.

Molding The granulated powder is poured into a mold and compacted into the proper shape by compression.

Machining Bearing components are machined until a state close to the final form taking shrinking and layer alteration caused by contraction during sintering into consideration.
(May be omitted depending items such as shape and accuracy of the compact.)

Degreasing Compact is heated in the degreasing furnace to remove organic matter such as binders.

Sintering In the next process of hot isostatic pressing (HIP), a sealed sintered form without openings is created by applying sufficient gas pressure to the compact.

HIP A detailed sintered form is attained in a high- temperature, high-pressure gas environment.

Grinding process The sintered form attained in the HIP process is ground to the dimensions and surface state of the final product.

Inspection The surface is checked after processing to ensure it does not contain cracks or pinholes.

Fig. 5 Ball and roller Bearing Silicon Nitride Manufacturing Process

Ceramic Bearing Product Details

CERAMIC BEARINGS

Silicon nitride, a ceramic material, is more rigid than high carbon chromium bearing steel; therefore, a bearing including silicon nitride components is subject to a higher contact stress on the area of contact between bearing raceways and rolling elements. Accordingly, to estimate the service life of ceramic bearings, whether the rolling bearing theory is applicable or not is critical.

Basic dynamic load rating

The ISO standard defines the basic dynamic load rating as the pure radial load (for radial bearings), constant in magnitude and direction, under which the basic rating life of 1 million revolutions can be obtained, when the inner ring rotates while the outer ring is stationary or vice versa. The basic dynamic load rating represents the resistance of a bearing against rolling fatigue.

Basic static load rating

The basic static load rating is defined as the static load which corresponds to the calculated contact stress shown below, at the center of the most heavily loaded raceway/rolling elements.

Self-aligning ball bearings : 4 600 MPa
Other ball bearings : 4 200 MPa
Roller bearings : 4 000 MPa

JTEKT defines the dynamic load rating and static load rating of ceramic bearings based on the results of their service life tests, the maximum allowable static load of the ceramic materials, the elastic deformation test results of high carbon chromium bearing steel, and other related data, as shown in Table 4.

Table 4 Load ratings of ceramic bearings

	Full Ceramic Bearing	Hybrid Ceramic Bearing
Dynamic load rating C_r	Comparable to steel bearings	Comparable to steel bearings
Static load rating C_{0r}	Comparable to steel bearings	85% that of steel bearings

Note) The steel bearings here refer to bearings consisting of rings and rolling elements both made of high carbon chromium bearing steel.

1 Rolling fatigue life of ceramic bearings

A typical service life test for Ceramic Bearings and steel bearings was performed under the conditions specified in Fig. 7.

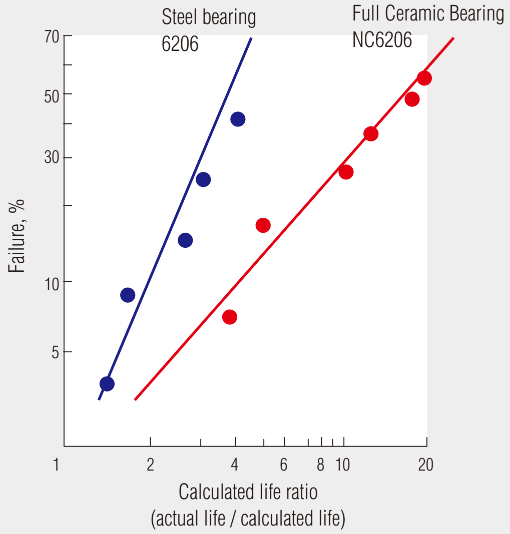
The test results showed that the service life of Ceramic Bearings was equal to or longer than that of steel bearings, exceeding the calculated life.

The Ceramic Bearings were found to exhibit flaking (Fig. 6) when their service life terminated. The same phenomenon was observed on the steel bearings whose service life terminated.

Based on these findings, as the dynamic load rating of a Ceramic Bearing, that of a steel bearing of the same dimensions can be used.


Ceramic ball
Ceramic inner ring

Fig. 6 Flaking on ceramic ball and inner ring



Rolling fatigue test conditions

Bearing number	Material (outer/inner rings and balls)	Dimensions, mm
NC6206	Silicon nitride (Si_3N_4)	30 × 62 × 16 (bore × outside dia. × width)
6206	Bearing steel (SUJ2)	

Specification	Condition
Load	5 800 N
Rotational speed	8 000 min^{-1}
Lubrication oil	AeroShell Turbine Oil 500
Temperature	70 ± 2 ℃

Fig. 7 Rolling fatigue life of Full ceramic bearings and steel bearings

2 Static load rating of ceramic bearings

The basic static load rating of a steel bearing represents a load that produces a localized permanent deformation in the rolling element/raceway contact area, impeding smooth rotation.

However, ceramic materials, which are highly rigid, produce little permanent deformation. Therefore, the theory of the basic static load rating for steel bearings is not applicable to ceramic bearings.

Static load rating of Full Ceramic Bearings

When exposed to continuous excessive loads, ceramic materials may break down; however, before breakdown occurs, the materials develop cracking.

Fig. 8 compares the load measurements at which ceramic balls developed cracking with the basic static load ratings of steel bearings. Fig. 9 shows the measurement system.

As these results show, the loads at which cracks develop on the Full Ceramic Bearing are far higher than that of the basic static load rating of steel bearings. This means that the basic load ratings specified in the ISO standard can be used as the allowable static loads of the Full Ceramic Bearing.

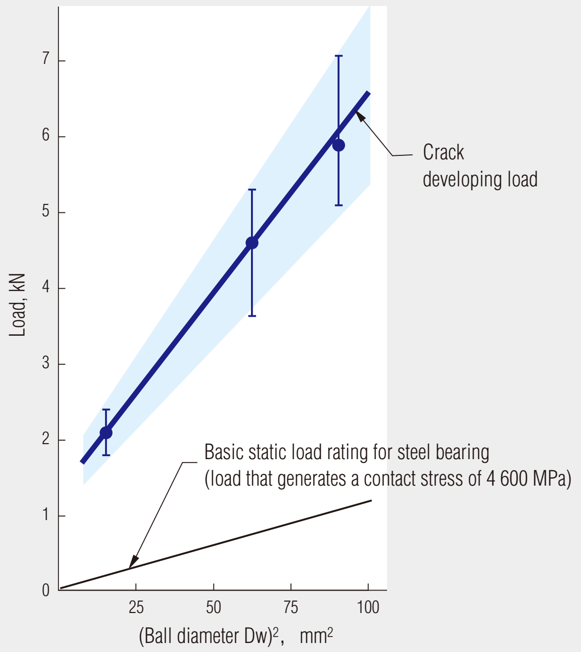


Fig. 8 Crack developing loads for Full Ceramic Bearings

Static load rating of Hybrid Ceramic Bearings

The theory of the static load rating for steel bearings is applicable to Hybrid Ceramic Bearings because their outer and inner rings are made of steel and accordingly any deformation is permanent.

Table 5 shows the results of a test for which a high carbon chromium bearing steel ball and ceramic ball were pressed against a flat plate of high carbon chromium bearing steel and the resulting permanent deformations (indentation depths) on the flat plate and balls were measured.

Table 5 Measurements of permanent deformation produced on flat steel plate and balls

Load kN		Permanent deformation (average), mm		Permanent deformation (sum of averages), mm
		Flat plate (bearing steel)	Ball	
Ceramic ball	0.65	0.5	—	0.5
	1.3	1.9	—	1.9
	2.6	5.2	—	5.2
	3.9	9.3	—	9.3
Steel ball	0.65	0.4	—	0.4
	1.3	1.3	0.11	1.41
	2.6	4.0	0.41	4.41
	3.9	6.8	1.18	7.98

These results indicate that ceramic balls do not suffer permanent deformation and that the permanent deformation produced on the flat steel plate by the ceramic balls is approximately 1.2 times the sum of the deformation produced on the flat plate by steel ball and the deformation that the steel ball undergo.

Accordingly, the static load rating of Hybrid Ceramic Bearings can be determined based on the permanent deformation of their bearing steel rings. JTEKT uses the load equal to 85% of the static load rating of steel bearings as the static load rating of the Hybrid Ceramic Bearings.

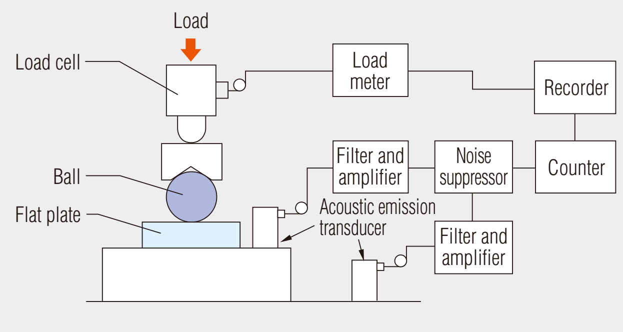


Fig. 9 Crack generating load measurement system

3 Impact strength of ceramic bearings

To evaluate the impact strength of ceramic bearings, ceramic balls were crushed by two methods: by a static load and an impact load. The test results are shown in Fig. 10. Fig. 11 shows the testing methods.

This figure shows that the impact strength of the ceramic bearings is almost equal to the static load strength, which means the bearings possess sufficient impact strength.

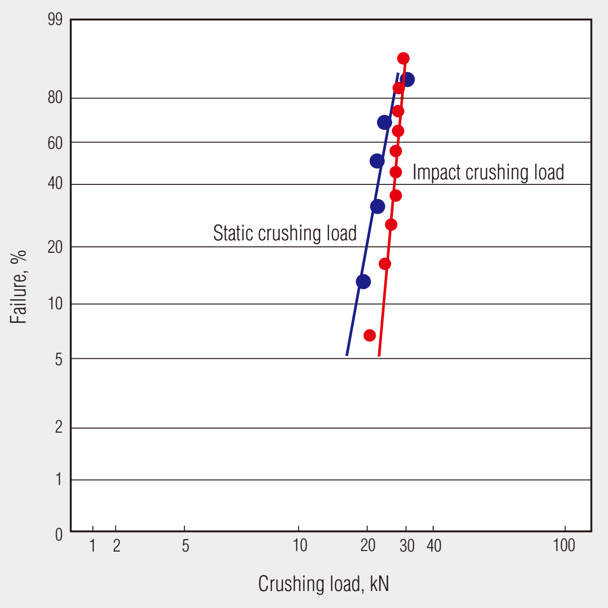
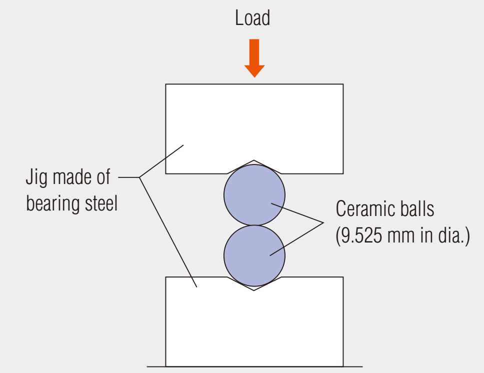


Fig. 10 Comparison of static load and impact load that crush ceramic balls

○ Static crushing test



○ Impact crushing test

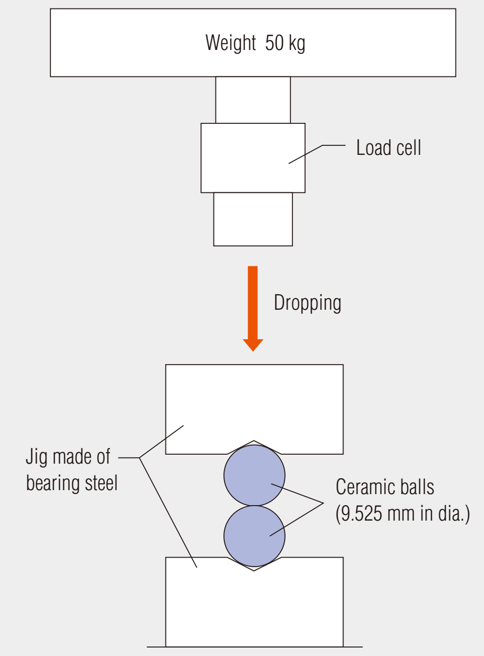


Fig. 11 Ceramic ball crushing test method

4 Fitting of ceramic bearings

When using ceramic bearings, it should be noted that ceramic materials are largely different from steel materials in the coefficient of linear expansion. Attention should therefore be paid to fitting stresses and temperature rises. The following are the results of evaluating the fitting of a Ceramic Bearing on a stainless steel shaft.

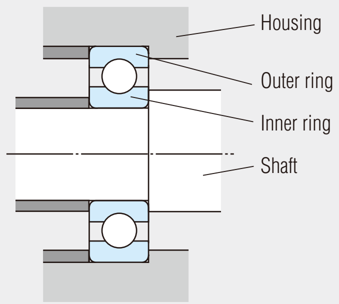


Fig. 12 Bearing fitting

Maximum stress produced by fitting

Table 6 shows the results of a static strength test conducted on a ceramic ring fitted on a stainless steel shaft. Table 7 shows the results of a dynamic strength test (running test) conducted on a ceramic ring fitted on a stainless steel shaft.

Based on the results of these tests, JTEKT makes it a rule for the maximum stress produced by interference to be no greater than 150 MPa when a ceramic inner ring is fitted on a stainless steel shaft.

Consult JTEKT for applications requiring tighter fitting.

○ Table 6 Typical results of static strength test on ceramic bearing shaft fitting

	Interference, L_{10} µm	Ring's fracture stress MPa
Solid shaft	50	399
Hollow shaft	68	332

○ Table 7 Typical results of dynamic strength test on ceramic bearing shaft fitting

	Max. allowable interference µm	Max. allowable stress for ring MPa
Solid shaft	31	243
Hollow shaft	43	204

Fig. 13 Ceramic inner ring damaged by dynamic strength test

Influence of temperature

During operation, bearing temperature exceeds the ambient temperature. When a ceramic bearing is operated on a stainless steel shaft or in a stainless steel housing, the interference with the shaft increases due to the difference in linear expansion coefficient while the interference with the housing decreases. (When the outer ring is loose-fitted, the clearance increases.)

To determine the class of fit for a ceramic bearing, the maximum temperature during operation should be assessed carefully.

■ The maximum stress generated on the inner ring due to the interference with the shaft can be determined from the following equation:

$$\sigma = P_m \cdot \frac{D_i^2 + d^2}{D_i^2 - d^2}$$

$$P_m = \varDelta_{deff} \left[\frac{d}{E_B} \left(\frac{D_i^2 + d^2}{D_i^2 - d^2} + \nu_B \right) + \frac{d}{E_S} \left(\frac{d^2 + d_0^2}{d^2 - d_0^2} - \nu_S \right) \right]^{-1}$$

σ : Maximum circumferential stress to interference (MPa)
P_m : Pressure of contact on fitting surface (MPa)
d , D_i : Inner ring bore diameter and outside diameter (mm)
$\varDelta_{deff}$: Effective interference of inner ring (mm)
d_0 : Bore diameter of hollow shaft (mm)
E_B , ν_B : Bearing's modulus of longitudinal elasticity and Poisson's ratio (MPa)
E_S , ν_S : Shaft's modulus of longitudinal elasticity and Poisson's ratio (MPa)

Ceramic Bearing Capacities

CERAMIC BEARINGS

1 Corrosion resistance

Table 8 shows the corrosion resistance of ceramic materials. Silicon nitride, which is used as the standard material of the ceramic bearings, is excellent in corrosion resistance. However, it may develop corrosion in a highly corrosive chemical, a high temperature, or other highly corrosive ambient condition.

Table 8 Corrosion resistance of ceramic materials

◎ : Fully resistant ○ : Almost resistant △ : Slightly susceptible × : Susceptible

Corrosive solutions \ Ceramic materials	Silicon nitride (standard) Si_3N_4	Corrosion resistant silicon nitride Si_3N_4	Zirconia ZrO_2	Silicon Carbide SiC
Hydrochloric acid	△	○	○	◎
Nitric acid	△	○	○	◎
Sulfuric acid	△	○	○	◎
Phosphoric acid	○	○	○	◎
Fluorine acid	△	△	×	◎
Sodium hydroxide	△	△	○	△
Potassium hydroxide	△	△	△	△
Sodium carbonate	△	△	△	△
Sodium nitrate	△	△	△	△
Water and saltwater	◎	◎	◎	◎

Note) The corrosive natures of individual solutions differ largely depending on the concentration and temperature. Note that mixing two or more chemicals may increase the corrosivity.

There are two types of ceramic corrosion: One is the corrosion of the alumina-yttria system sintering aid (Al_2O_3-Y_2O_3), which is used to bake ceramic materials. To avoid this type of corrosion, corrosion resistant silicon nitride treated with a spinel sintering aid ($MgAl_2O_4$) should be used. Fig. 14 shows the mass reduction and bending strength deterioration of corrosion resistant silicon nitride dipped in an acid or alkaline solution for a given period of time.

The other type of corrosion is the corrosion of the silicon nitride itself. For use in a highly corrosive solution, bearings made of zirconia (ZrO_2) or silicon carbide (SiC) may be effective.

To select a ceramic bearing for use in a highly corrosive environment, its corrosion resistance to the specific condition should be carefully examined.

Service life of corrosion resistant bearings

Table 9 lists the bearings suitable for applications requiring corrosion resistance, along with their major applications.

Table 9 Typical corrosion resistant Ceramic Bearings

	Applications	Bearing Materials	
		Bearing Rings	Balls
Corrosion Resistant Hybrid Ceramic Bearing	In water, alkaline environment and reactive gas	SUS630	Silicon nitride
Ceramic Bearing	In a slightly acidic environment, alkaline environment and reactive gas	Silicon nitride	Silicon nitride
Corrosion Resistant Ceramic Bearing	In a strongly acidic environment, strongly alkaline environment and reactive gas	Corrosion resistant silicon nitride	Corrosion resistant silicon nitride
High Corrosion Resistant Ceramic Bearing	In a strongly acidic environment, strongly alkaline environment and corrosive gas	Silicon carbide	Silicon carbide

When Ceramic Bearings are operated in a solution, the solution serves as a lubricant. This means the solution is closely associated with the service life of the bearings. Fig. 15 shows the service life evaluation results for three types of Ceramic Bearings under water.

The Ceramic Bearings terminate their service life due to the flaking on the bearing ring or ball surfaces.

In case of the Hybrid Ceramic Bearings, ceramic balls do not develop flaking or wear. Their service life ends due to wear attributed to the minute corrosion of stainless steel bearing rings.

When bearings are used in a solution whose lubrication performance is not enough, such as in water, it is important to evaluate in advance the susceptibility of the bearings to corrosion and the relationship between the bearing load and wear in the solution.

SUS440C has a longer service life than SUS630; however, the former steel is not suitable for use in water because it may rust and cause contamination.

Ceramic Bearings may develop wear at an early stage of use depending on the characteristics of the solution, temperature, and load. Please contact JTEKT before using Ceramic Bearings in solutions.

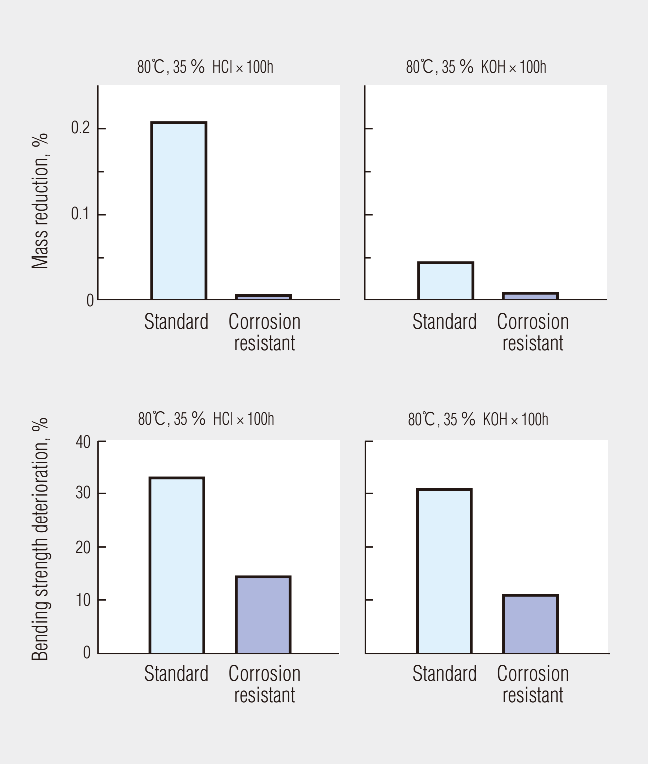
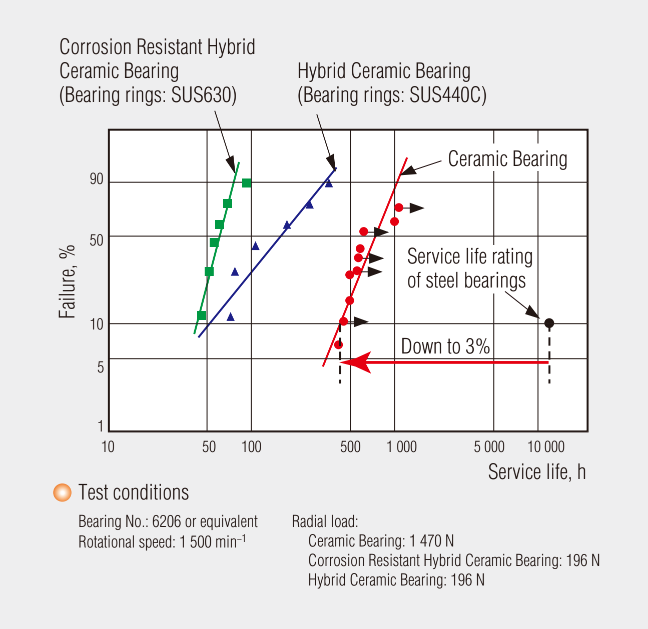


Fig. 14 Anticorrosive performance of corrosion resistant silicon nitride



Test conditions

Bearing No.: 6206 or equivalent
Rotational speed: 1 500 min^{-1}

Radial load:
Ceramic Bearing: 1 470 N
Corrosion Resistant Hybrid Ceramic Bearing: 196 N
Hybrid Ceramic Bearing: 196 N

Fig. 15 Comparison in underwater service life of Ceramic Bearings

2 Non-magnetic performance

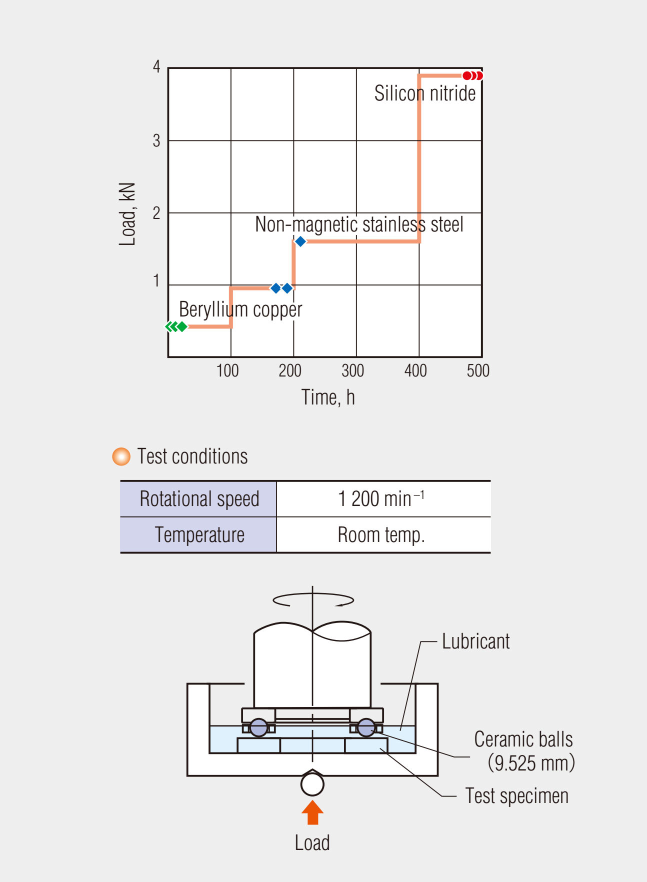
Bearings may be exposed to magnetic fields in some applications, including equipment associated with super conductivity, semiconductor production facilities and medical examination facilities. If steel bearings are used for such applications, the running torque may fluctuate or the magnetic field may be disturbed . Non-magnetic bearings should be used for such applications. As a non-magnetic material for such bearings, beryllium copper has conventionally been used. However the use of beryllium copper should be avoided since it contains beryllium, a substance of environmental concern.

For such applications, JTEKT supplies Hybrid Ceramic Bearings, whose rings are made of non-magnetic stainless steel and rolling elements are made of a ceramic material, or the full ceramic bearings.

Table 10 Non-magnetic bearings and relative permeability

	Relative permeability
Non-magnetic Hybrid Ceramic Bearings	1.01 or lower
Ceramic Bearing	1.001 or lower
(Ref.) Beryllium copper	1.001 or lower

Fig. 16 shows a rolling fatigue strength evaluation result for various non-magnetic materials. As can be seen from the figure, non-magnetic stainless steel is superior to beryllium copper in rolling fatigue strength.



Test conditions

Rotational speed	1 200 min^{-1}
Temperature	Room temp.

Fig. 16 Comparison of non-magnetic materials in rolling fatigue strength

3 Insulation

A cause of bearing failure in motors or generators is electric pitting. Electric pitting occurs when a surface in rolling contact is locally molten due to sparks produced over the very thin lubricating oil film on the surface when electricity passes through the bearing in operation.

Electric pitting appears as a series of pits or a series of ridges on the surface in rolling contact, which is shown in Fig. 17 and Fig. 18.

An estimation of the mechanism that causes electric pitting on a bearing is shown in Fig. 19.

Fig. 17
Electric pitting generated on general purpose bearings (pits)

Fig. 18
Electric pitting generated on general purpose bearings (ridges)

To avoid such pitting, a bypass is provided to ensure that no electric current passes through the bearing. Another method is to use an insulating bearing that can block electric current.

Since ceramic materials exhibit an excellent insulation performance, Hybrid Ceramic Bearings consisting of ceramic rolling elements can be used as insulating bearings.

Hybrid Ceramic Bearings prevent electric pitting, also reduce bearing temperature rise, and lengthen grease service life. For these reasons, Hybrid Ceramic Bearings assure long term maintenance free operation and high speed equipment operation.

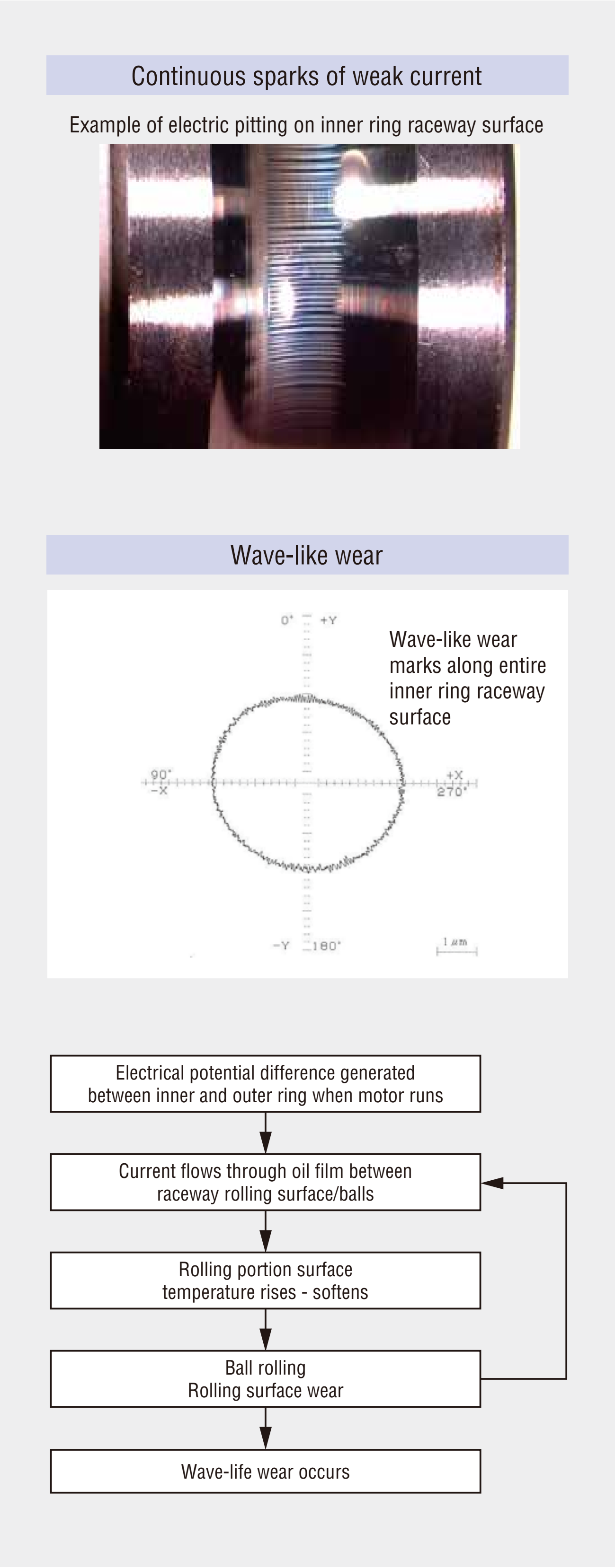


Fig. 19 Estimation of electric pitting (wave-like wear) occurrence mechanism

4 High-speed performance

Hybrid Ceramic Bearings, whose rolling elements are made of a ceramic material with a density lower than that of bearing steel, are most suitable for high speed applications. This is because reduced mass of rolling elements suppresses the centrifugal force of the rolling elements, as well as slippage attributable to the gyro-moment, when the bearings are in operation.

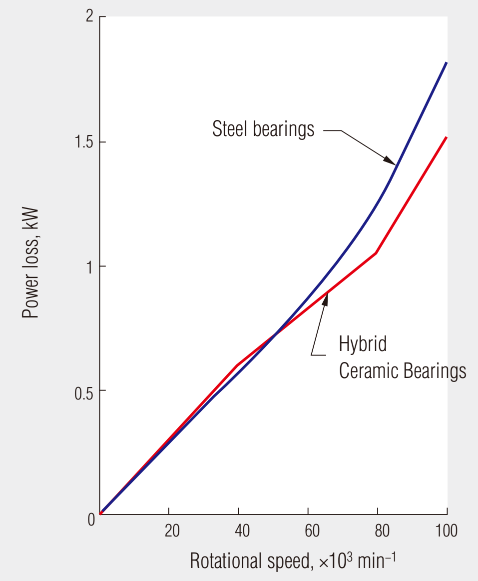
Thanks to their superior high speed performance, Hybrid Ceramic Bearings are used in turbochargers and on machine tool spindles.

Power losses at high speed

Fig. 20 compares power losses between the Hybrid Ceramic Bearings and steel bearings.

When compared to steel bearings, the Hybrid Ceramic Bearings lose smaller power during high speed operation. The power loss decreases with increasing rotational speed.

The Hybrid Ceramic Bearings also have superior antiseizure characteristics, which means that they consume smaller amount of lubrication oil and thereby reduce rolling resistance (power loss).



		Hybrid Ceramic Bearings	Steel bearings
Bearing rings		High speed tool steel (M50)	
Balls	Material	Ceramic (Si_3N_4)	High speed tool steel (M50)
	Dia.	6.35 mm	
	Number of balls	9	
Cage		Polyimide resin	

Condition	Specification
Axial load	200 N
Rotational speed (max.)	100 000 min^{-1}
Lubricating oil	AeroShell Turbine Oil 500
Ambient temperature	Room temp.

Fig. 20 Comparison in power loss between Hybrid Ceramic Bearings and steel bearings

Seizure limit at high speed

Fig. 21 shows the seizure limits of Hybrid Ceramic Bearings and steel bearings. The limits were measured by gradually reducing lubricating oil feed rate.

Compared with general purpose steel bearings, Hybrid Ceramic Bearings consume smaller amount of lubricating oil under the same speed condition, while they can run at a higher speed under the same luburicating oil feed rate condition.

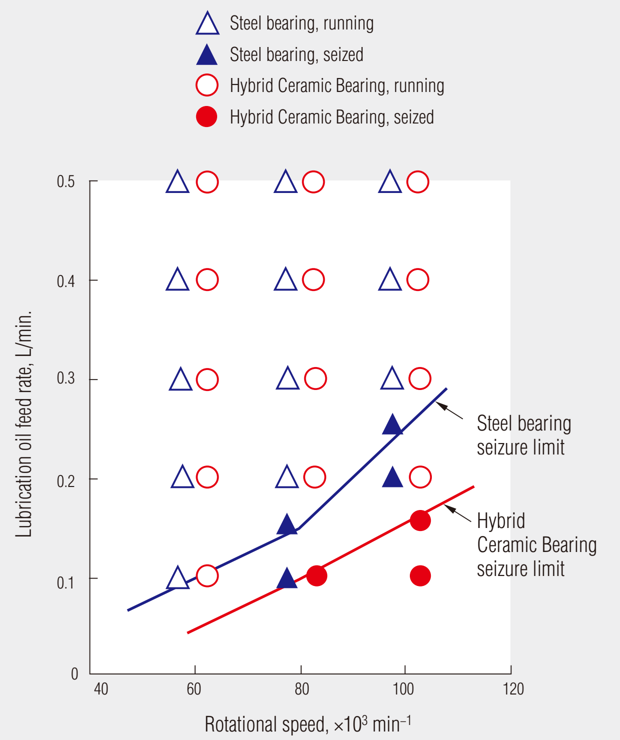


Fig. 21 Comparison between Hybrid Ceramic Bearings and steel bearings in seizure limit

1 Ceramic balls

JTEKT also supplies Ceramic Balls (silicon nitride), which have excellent resistance to wear and seizure, and are usable in corrosive environments and ultrahigh vacuums. Other major features of these balls are excellent heat resistance (up to 800°C), high rigidity, lightweight (40% compared to bearing steel), non-magnetic, and have insulating characteristics.

The Ceramic Balls are useful in many applications such as jigs, tools, gauges, solenoid valves, check valves, other valve varieties, high grade bicycle parts, automotive parts, and machine components.

Table of Dimensions and Masses

Nominal dimension		Nominal outside diameter mm	Precision grade [1]	Mass [2] (per piece)
mm	inch			
0.8		0.800 00	3 and 5	0.866 mg
1.0		1.000 00		1.691 mg
1.2		1.200 00		2.922 mg
	1/16	1.587 50		6.766 mg
2.0		2.000 00		13.530 mg
	3/32	2.381 25		22.836 mg
	7/64	2.778 12		36.262 mg
	1/8	3.175 00		54.129 mg
3.5		3.500 00		72.511 mg
	5/32	3.968 75		0.105 7 g
	3/16	4.762 50		0.182 7 g
	7/32	5.556 25		0.290 1 g
	15/64	5.953 12		0.356 8 g
	1/4	6.350 00		0.433 0 g
	17/64	6.746 88	5	0.519 4 g
	9/32	7.143 75		0.616 6 g
	5/16	7.937 50		0.845 8 g
	11/32	8.731 25		1.125 7 g
	3/8	9.525 00		1.461 5 g
	13/32	10.318 75		1.858 2 g
	7/16	11.112 75	5 and 10	2.320 8 g
	15/32	11.906 25		2.854 5 g
	1/2	12.700 00		3.46 g
	17/32	13.493 75		4.2 g
	9/16	14.287 50	40	4.9 g
	19/32	15.081 25		5.8 g
	5/8	15.875 00		6.8 g
	3/4	19.050 00		11.7 g
	13/16	20.637 50		14.9 g
	7/8	22.225 00		18.6 g
	15/16	23.812 50		22.8 g
	1	25.400 00		27.7 g
	1 1/8	28.575 00		39.5 g
	1 3/16	30.162 50		46.4 g
	1 1/4	31.750 00	60	54.1 g
	1 5/16	33.337 50		62.7 g
	1 1/2	38.100 00		93.5 g

Notes 1) For the grades, those specified in JIS B 1501 shall apply.
2) The masses are calculated on the basis of 3.23 g/cm^3 in density.

Numbering System

5/32 G5 NCR

NCR — Material code: silicon nitride ceramic
G5 — Precision grade code
5/32 — Nominal dimension

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Tapered Roller Bearings

for axle drive pinions

JTEKT

JTEKT CORPORATION

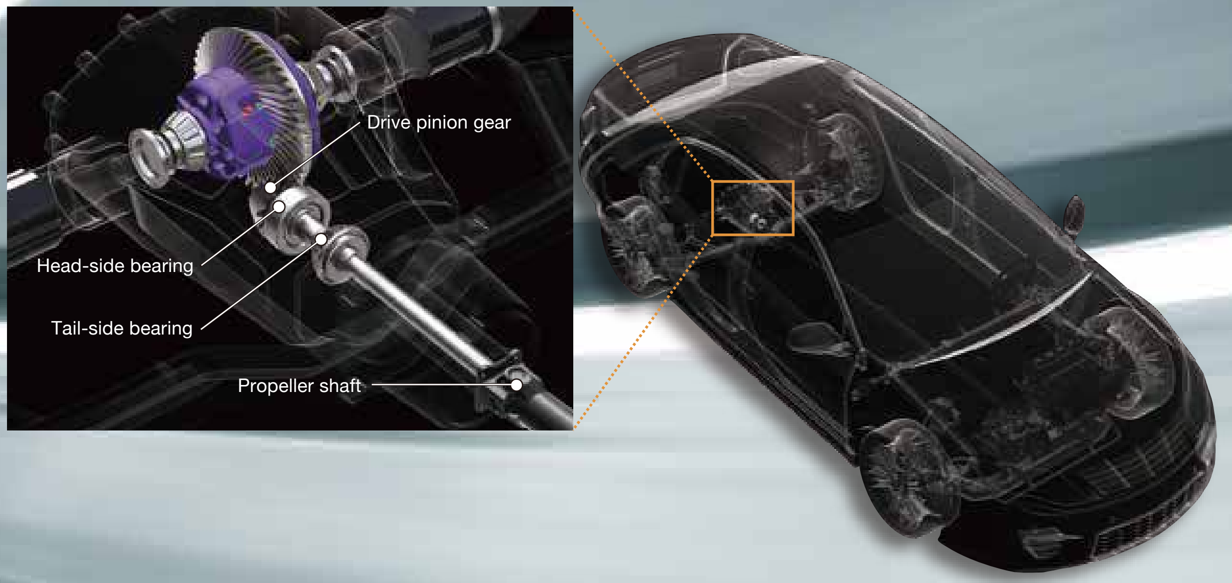
CAT.NO.B1006E-1

Compact & Lightweight, Low-torque, High-capacity & High-durability. JTEKT's TRBs support enhancement of vehicle's environmental performance.

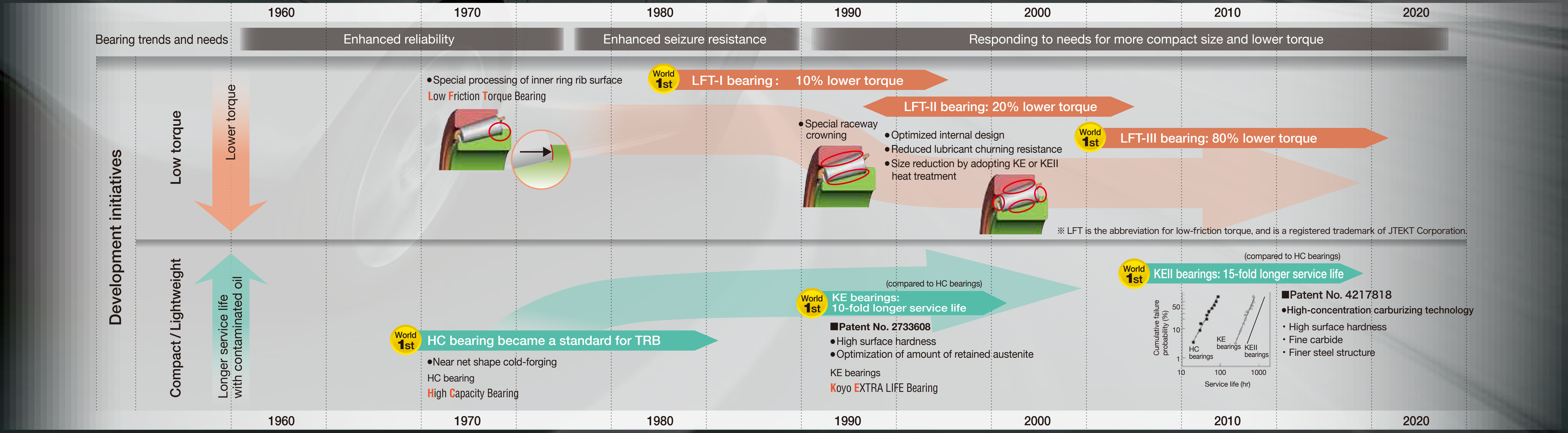
In automobile axles, various stresses are caused by acceleration, deceleration, and cornering forces in a complex manner from all directions.
They're truly a key mechanical part of every vehicle. In response to the demand for ever more advanced bearings that support drive pinions, JTEKT goes one step beyond making proposals. Every elemental technology imaginable is rethought from scratch to ensure products with unequalled levels of low friction loss and high capacity.

Tapered roller bearings for axle drive pinions

Drive pinion bearings support the drive pinion gear shaft of the hypoid gear,
which facilitates a 90° directional change of the driving force transmitted from the propeller shaft.
This bearing is used in pairs to simultaneously ensure smooth rotation and the rigidity of gear meshing points.



Tapered roller bearing development timeline (for automobile drivelines)



- Special processing of inner ring rib surface

Low Friction Torque Bearing

World 1st LFT-I bearing : 10% lower torque

LFT-II bearing: 20% lower torque

- Special raceway crowning

- Optimized internal design
- Reduced lubricant churning resistance
- Size reduction by adopting KE or KEII heat treatment

World 1st LFT-III bearing: 80% lower torque

※ LFT is the abbreviation for low-friction torque, and is a registered trademark of JTEKT Corporation.

World 1st HC bearing became a standard for TRB

- Near net shape cold-forging

HC bearing
High Capacity Bearing

(compared to HC bearings)
World 1st KE bearings: 10-fold longer service life

■Patent No. 2733608
- High surface hardness
- Optimization of amount of retained austenite

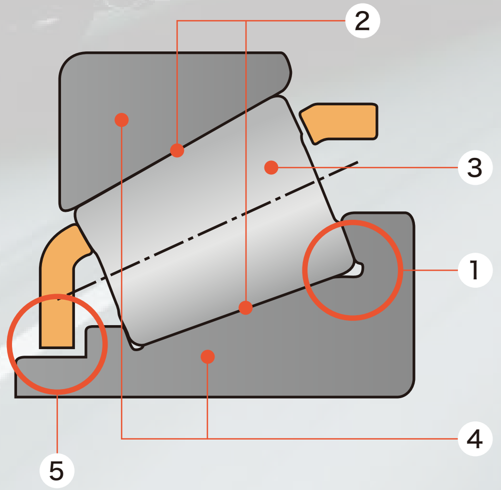
KE bearings
Koyo EXTRA LIFE Bearing

(compared to HC bearings)
World 1st KEII bearings: 15-fold longer service life

■Patent No. 4217818
- High-concentration carburizing technology
  - High surface hardness
  - Fine carbide
  - Finer steel structure

Tapered Roller Bearings **Torque reduction technologies LFT**

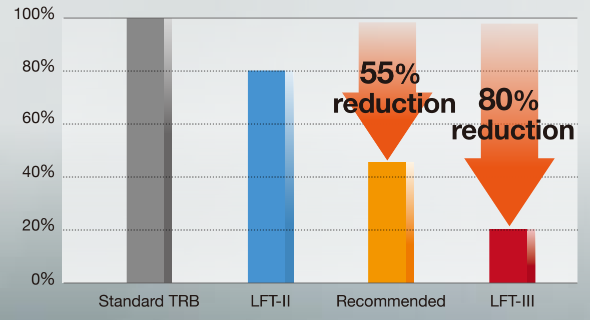
Target To reduce bearing rotational torque by focusing on friction loss caused by sliding, rolling and lubricant churning.



Applied technologies	LFT-II	Recommended	LFT-III
① Optimized surface roughness and shape of sliding parts	▮	▮	▮
② Optimized raceway crowning profile	▮	▮	▮
③ Optimized internal design		▮	▮
④ Size reduction enabled by excellent heat-treatment technologies		▮	▮
⑤ Control of lubricating oil flow			▮

Performance “Recommended” models significantly contribute to torque reduction compared to standard TRBs.

For axle drive pinion application, we are pleased to propose a model specially designed for that purpose as a recommended model. In addition, we can offer LFT-III as its option since LFT-III has a premium specification including the control of lubricating oil flow.



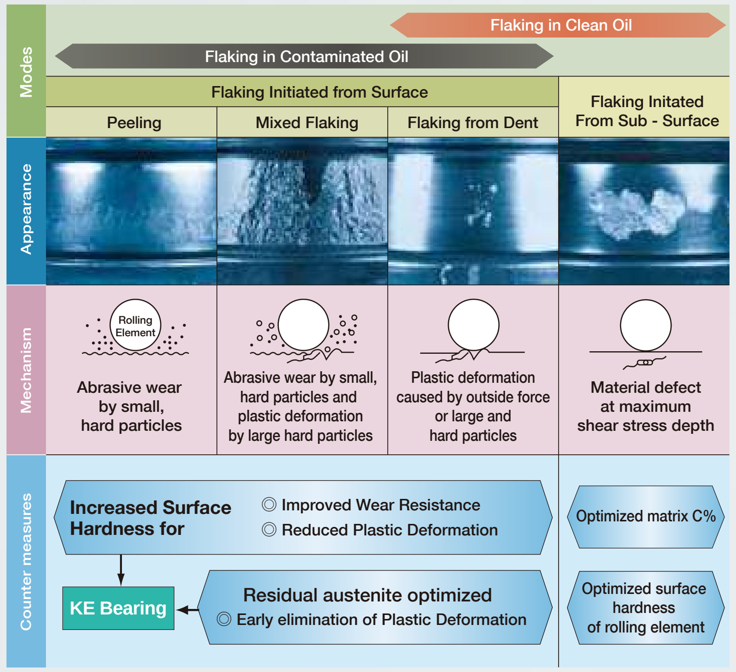
Tapered Roller Bearings
KE Bearing—Embodiment of Size/Weight Reduction Technologies

Target Significant extension of service life with contaminated oil by adopting JTEKT’s own heat treatment technologies.

1. Increase bearing surface hardness
2. Optimize the amount of retained austenite

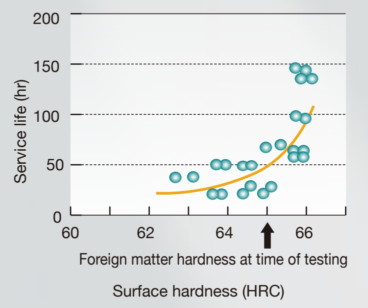
Effective to surface originated flaking which occurs when lubricated by contaminated oil

Bearing flaking mode

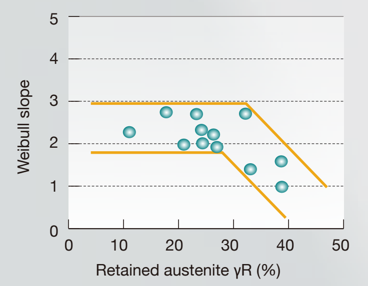


Modes	Flaking in Contaminated Oil Flaking Initiated from Surface Peeling	Flaking in Contaminated Oil Flaking Initiated from Surface Mixed Flaking	Flaking in Contaminated Oil / Flaking in Clean Oil Flaking Initiated from Surface Flaking from Dent	Flaking in Clean Oil Flaking Initated From Sub - Surface
Appearance				
Mechanism	Rolling Element Abrasive wear by small, hard particles	Abrasive wear by small, hard particles and plastic deformation by large hard particles	Plastic deformation caused by outside force or large and hard particles	Material defect at maximum shear stress depth
Counter measures	Increased Surface Hardness for ◎ Improved Wear Resistance ◎ Reduced Plastic Deformation Residual austenite optimized ◎ Early elimination of Plastic Deformation KE Bearing			Optimized matrix C% Optimized surface hardness of rolling element

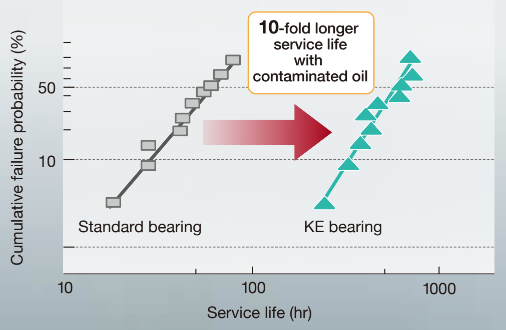
■Relationship between bearing surface hardness and service life with contaminated oil



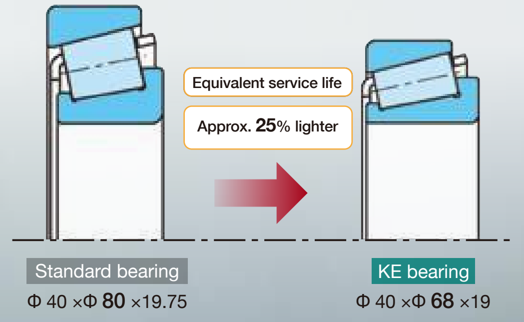
■Relationship between the amount of retained austenite and Weibull slope with contaminated oil



Performance Longer service life with contaminated oil



Size/ Weight reductions Contribution to fuel economy enhancement

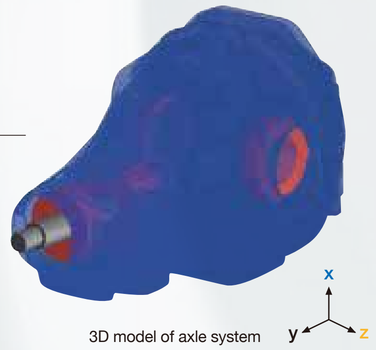


Example Technology Review

CAE analysis

JTEKT's design and development are conducted utilizing the latest equipment in an advanced CAE environment.

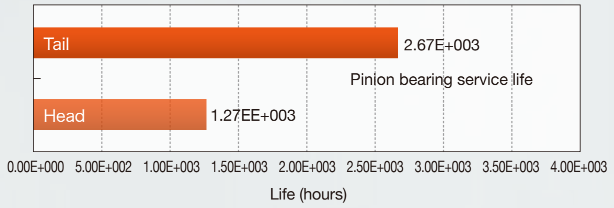
As JTEKT developed its own high-precision tapered roller bearing's torque calculation formula based on accumulated data, research and analysis, rotational torque can be easily obtained and used for examination.
JTEKT considers the rigidity of whole axle system, which supports the axle, bearing service life, contact stress, etc. and propose the best TRBs for your applications.



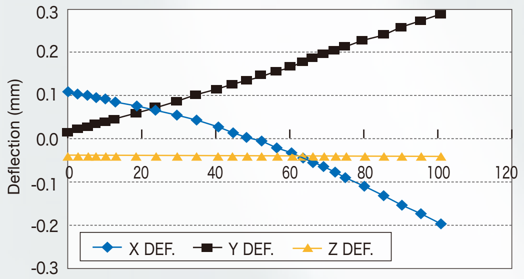
3D model of axle system

Calculation is possible as axle system.

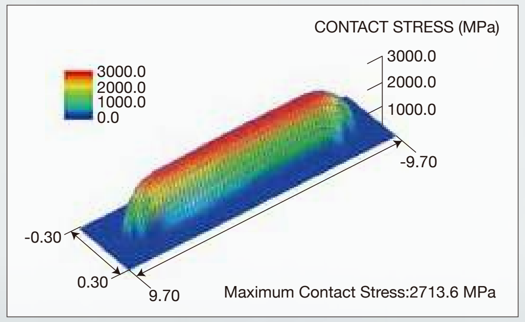
Service life calculation

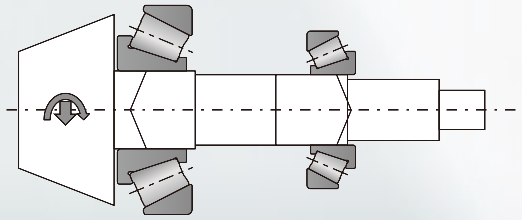


Deflection of pinion gear's meshing point



Surface pressure calculation





Simulation test equipment

In response to customers' requests, we conduct evaluations utilizing various vehicle driving conditions.

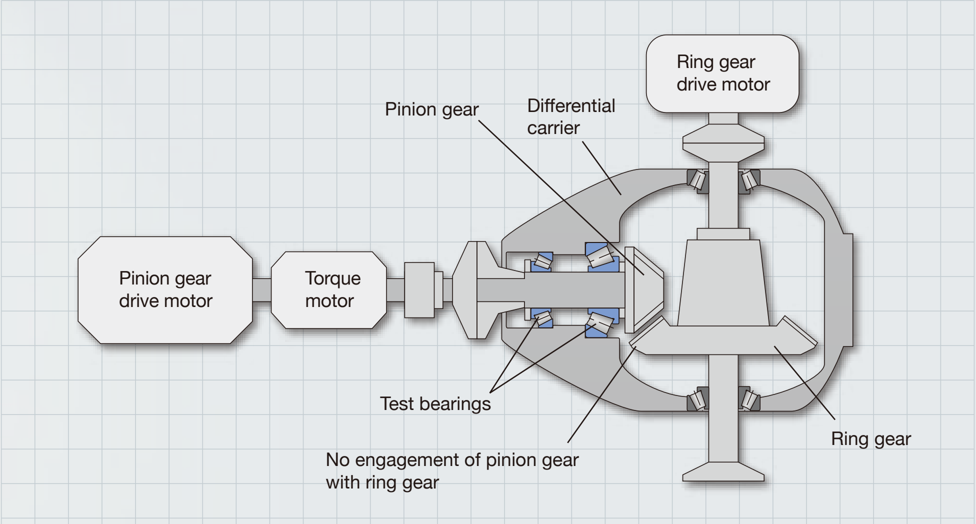
At JTEKT, prior to evaluations in actual vehicles, evaluations simulating various driving conditions are possible (such as oil flow check and torque loss measurement), which enables the reduction of development and evaluation periods.

Simulation of mountain road driving, high-speed cornering, driving in urban areas, etc.

Nose angle | Turning angle | Longitudinal G force | Lateral G force | Load
Rotational speed | Temp

Example Evaluation

CAE analysis result is verified by using an actual final reduction gear unit with an actual drive pinion.



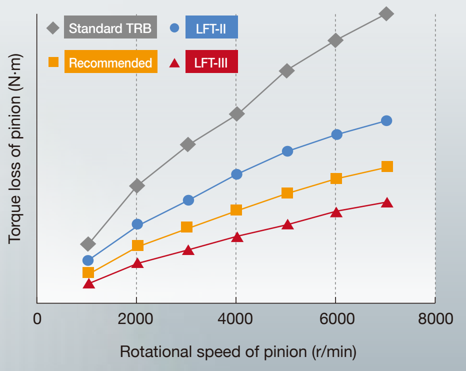
Schematic diagram of test equipment

Pinion bearing torque measurement results

Recommended ▶Max.55%torque reduction

LFT-III ▶Max.80%torque reduction

※ Compared to Standard TRB

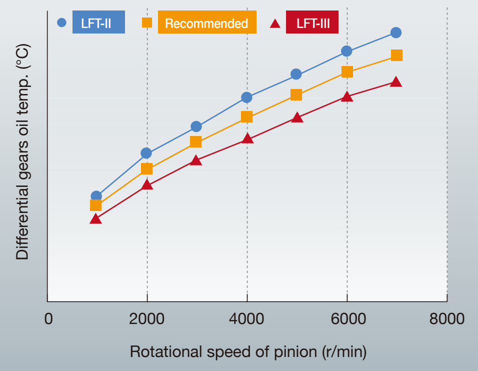


Oil temperature measurement results of differential gears

Recommended ▶Max. temp. rise controlled to 11℃

LFT-III ▶Max. temp. rise controlled to 20℃

※ Compared to LFT-II



Testing methods:
"Pinion bearing torque measurement results" for torque reduction and
"Oil temperature measurement results of differential gears"for temperature rise.

Global Technical Support (Bearing Development Bases)

Technical centers located around the world ensure quick response and technical support for customers' needs.

Iga Proving Ground Enables Testing / Evaluations Simulating Roads Worldwide

Fully utilizing our knowledge as a world-leading systems supplier, JTEKT conducts driving evaluations and analyses of products installed in vehicles. We exhaustively pursue the highest standards in product safety and operation on a test course capable of simulating various road and weather conditions around the world. As a total systems supplier, our highest value is to provide our customers with products that deliver outstanding performance and the best quality that help to make automobiles that are more than just fun to drive.

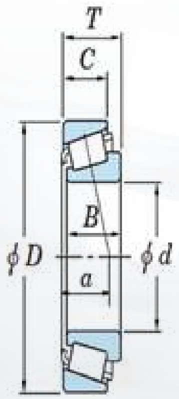
■ JTEKT Iga Proving Ground

- Site area: 500,000m²
- Course area: 170,000m²
- Combined circuit length: 2,200m
- Dynamics pad area: 54,000m²

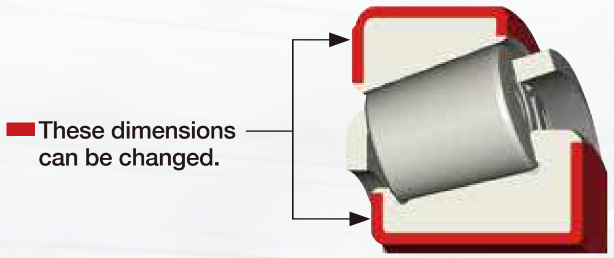
Recommended Series Bearing Numbers

Please select from the recommended bearing numbers when considering axle drive pinion bearings.

Boundary dimensions (mm)						Basic load rating (kN)		Fatigue load limit (kN)	bearing number	ABMA bearing number	Load center position (mm)	Constant	Axial load factor		(Reference) Mass (kg)
No.	d	D	T	B	C	C_r	C_{0r}	C_u			a	e	Y1	Y0	
1	30	72	20.750	19	14	71.2	55.6	8.10	KEST3072CLFT	---	18.6	0.55	1.10	0.60	0.381
2	33.338	68.263	22.225	22.225	15.25	66.1	62.2	8.70	KESTD3368LFT	M88048/10	21.8	0.70	0.86	0.47	0.361
3	34.925	72.233	23.579	23.106	15.463	78.8	75.0	10.6	KESTR3572LFTYR1	HM88649/10	22.0	0.70	0.86	0.47	0.428
4	35	80	29.000	27.2	20	100	96.4	13.8	KESTN3580LFT	---	24.8	0.50	1.20	0.66	0.694
5	36.513	79.375	29.370	27.2	20.4	100	96.4	13.8	KESTA3779LFT	HM89249/10	25.6	0.67	0.90	0.49	0.664
6	40	90	26.500	26	18.5	110	106	15.7	KESTJ4090LFT	---	25.4	0.62	0.97	0.53	0.806
7	41.275	82.550	26.543	25.654	18	85.8	75.3	11.0	KEST4183YR1LFT	M802048/11	27.3	0.72	0.84	0.46	0.601
8	41.275	90.000	30.006	30.006	21	112	112	16.2	KEST4190LFTUR4	HM803146/10	29.0	0.70	0.86	0.47	0.866
9	45	100	38.000	36.5	27.5	164	183	25.6	KETRD091004UR4	---	34.5	0.76	0.79	0.43	1.46
10	47.625	95.250	30.162	29.37	20.5	127	133	19.4	KESTA4895-1LFTUR4	HM804846/10	29.2	0.70	0.86	0.47	0.945
11	50.800	104.775	36.512	34	25.5	171	177	26.1	KETRD101004UR4	HM807046/10	33.1	0.67	0.90	0.49	1.41



Boundary dimensions can be changed upon request.
For details, please contact the nearest JTEKT sales office.



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The 3rd generation

BALL HUB UNITS

JTEKT

JTEKT CORPORATION

CAT.NO.B1004E-1

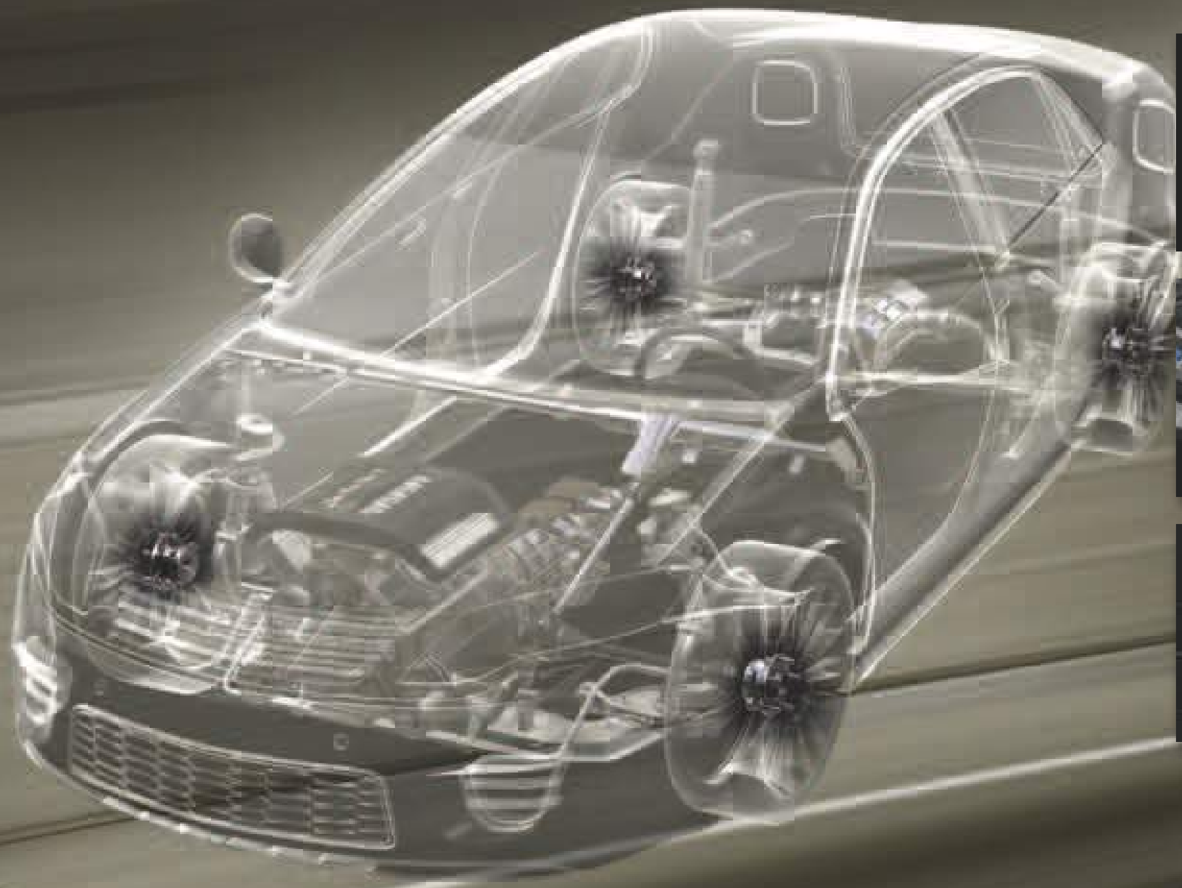
Refined Technologies and Products for Roads Worldwide Market leading and environment-friendly hub units contributing to vehicle performance and safety on roads worldwide

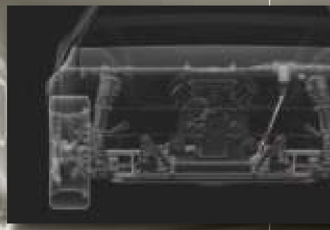
Hub Units - What they are and how they work

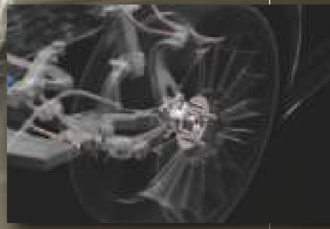
Hub units are wheel bearings combined with various peripheral parts, which in a single component play a vital role in supporting vehicle motion. JTEKT produces two types, both of which feature high precision and durability: one supports vehicle weight while delivering smooth rotation, and the other does that as well as assisting in the transmission of the driving force from the engine to the wheel. Beginning with the consideration of the car's overall construction to the environmental impact of our manufacturing techniques, JTEKT hub units are built to be lightweight with low rotating friction to enhance fuel efficiency, while maintaining the strength and rigidity that ensures optimal driving performance.

The 3rd generation

BALL HUB UNITS

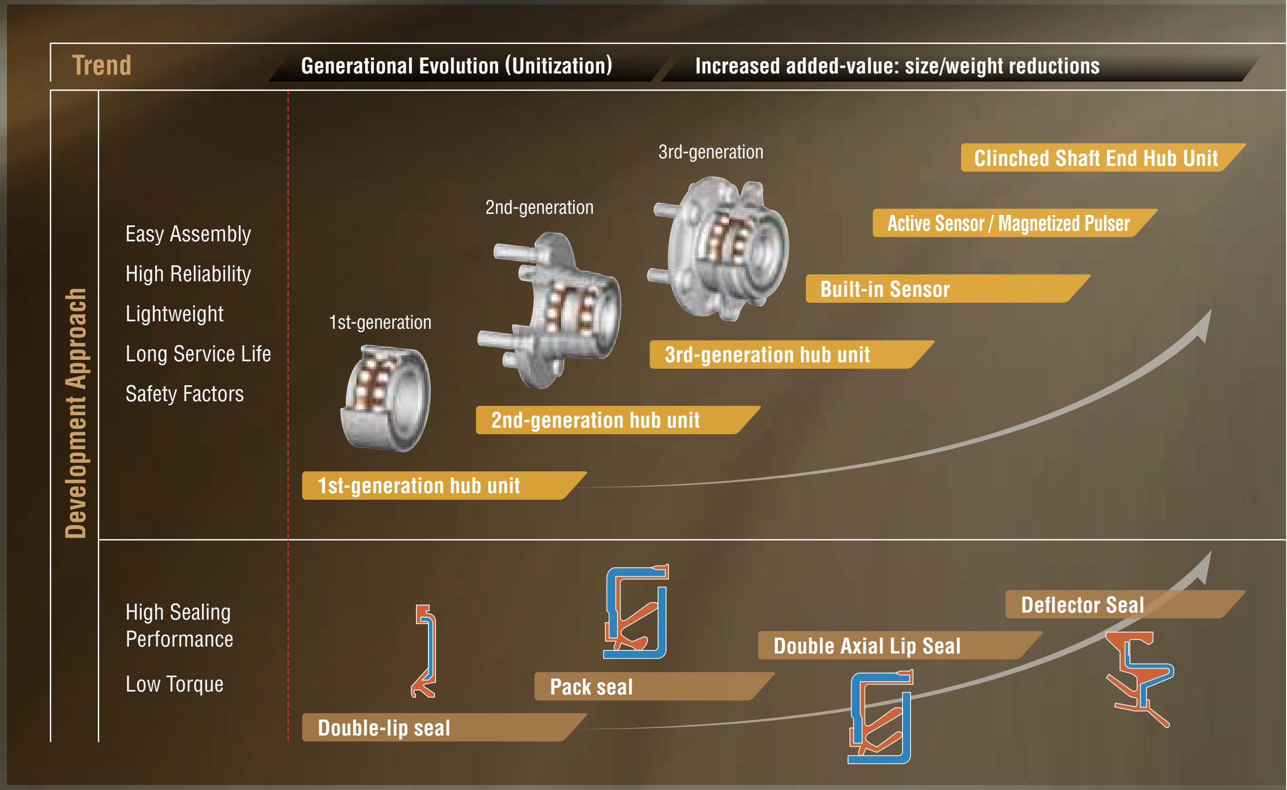






JTEKT hub units have evolved from the conventional 1st-generation design to the current advanced 3rd-generation configuration, which we most recommend to customers, by integrating flanges that facilitate their installation to vehicles.

1st-generation: Two single rows integrated into a double-row unit 2nd-generation: Integrated one flange on outer ring 3rd-generation: Also inner ring integrated with flange



Trend

Generational Evolution (Unitization)

Increased added-value: size/weight reductions

Development Approach

Easy Assembly

High Reliability

Lightweight

Long Service Life

Safety Factors

1st-generation

2nd-generation

3rd-generation

1st-generation hub unit

2nd-generation hub unit

3rd-generation hub unit

Built-in Sensor

Active Sensor / Magnetized Pulser

Clinched Shaft End Hub Unit

High Sealing Performance

Low Torque

Double-lip seal

Pack seal

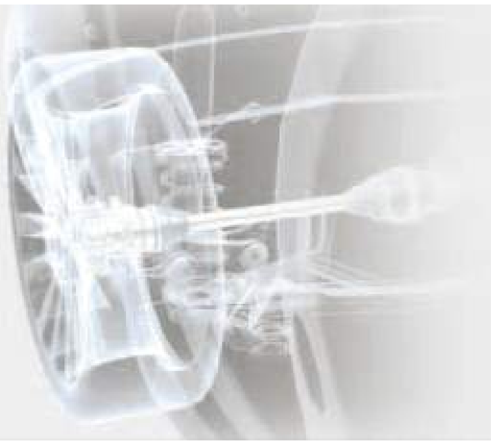
Double Axial Lip Seal

Deflector Seal

In parallel with the evolution of automobiles, JTEKT hub units have been widely adopted by not only automotive manufacturers in Japan, but manufacturers around the world.

JTEKT Hub Units Support Vehicles on Every Road around the World

Eco-friendly measures taken at all stages
— from initial design to manufacturing to daily driving

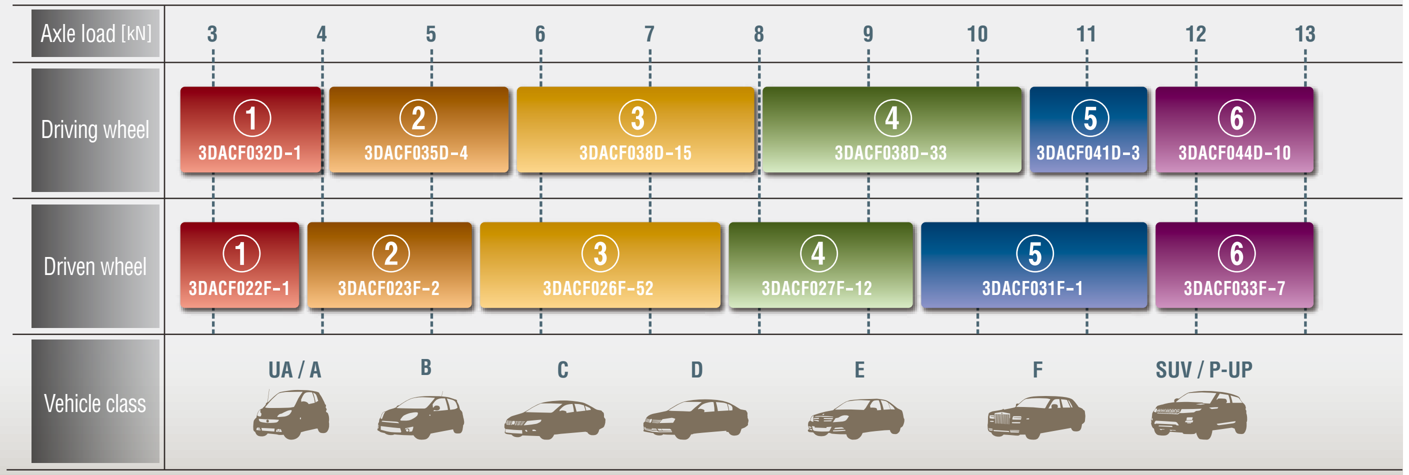


Hub Unit Recommendations

Features / Selection

Fuel Efficiency / Performance	Simultaneous achievement of weight reduction (= fuel efficiency) and increased strength/rigidity (= driving performance) at a high level
High Reliability	High reliability ensured, even in severe environments such as driving on muddy roads
High Capacity	High-capacity bearing design enabled by maximizing the use of allowable space
Recommended set-up	Recommended specifications are set according to vehicle segment (axle load)

Recommended hub units according to axle load



Axle load [kN]	3	4	5	6	7	8	9	10	11	12	13

	①	②	③	④	⑤	⑥
Driving wheel	3DACF032D-1	3DACF035D-4	3DACF038D-15	3DACF038D-33	3DACF041D-3	3DACF044D-10
Driven wheel	3DACF022F-1	3DACF023F-2	3DACF026F-52	3DACF027F-12	3DACF031F-1	3DACF033F-7

Vehicle class	UA / A	B	C	D	E	F	SUV / P-UP

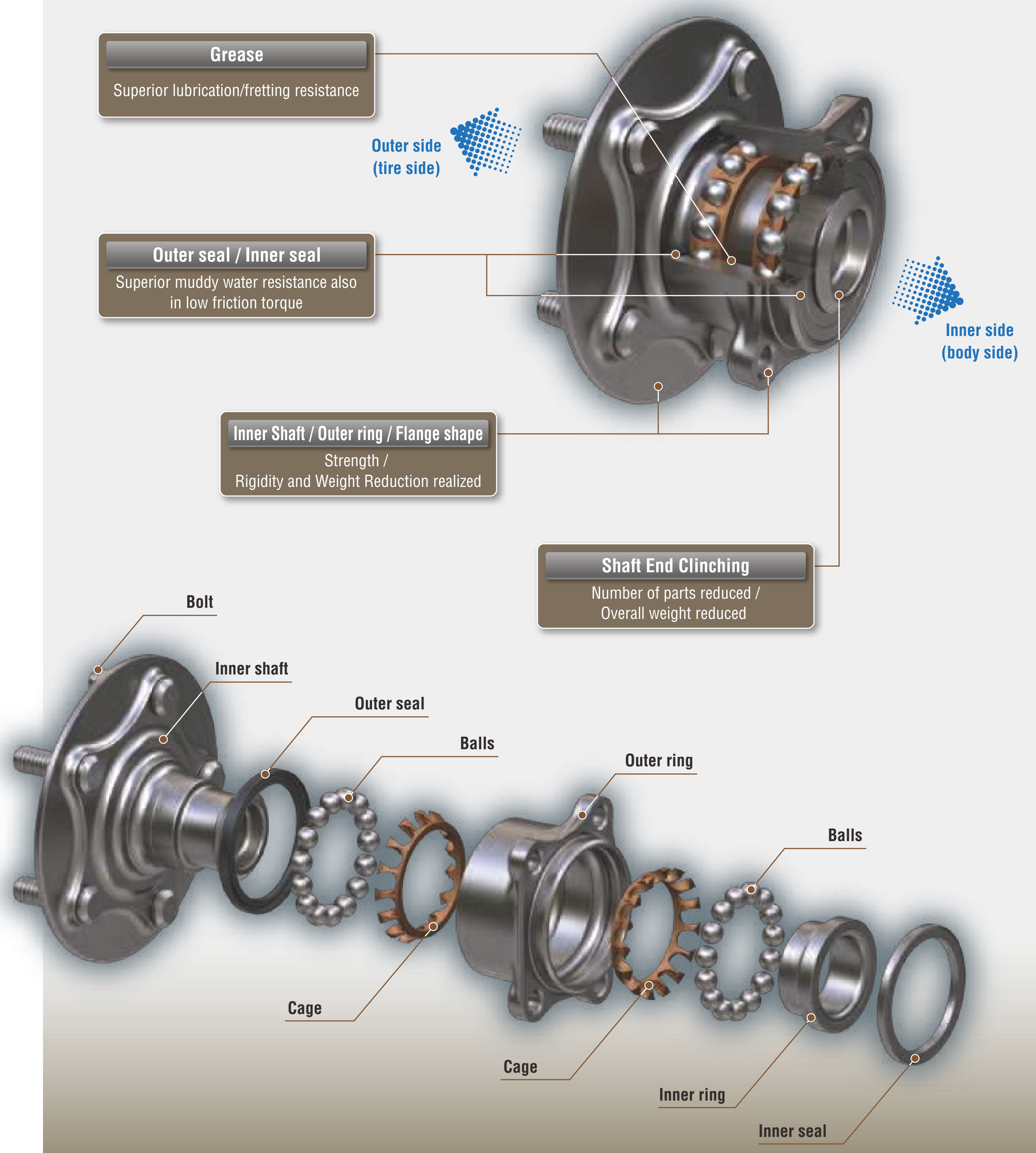
*Please use this table together with “Recommended hub unit numbers” on pages 9 and 10.

Modifications	The flange design can be modified to suit installations to customer’s vehicles

3rd-generation evolution

Structure

*Example: Hub unit for driving wheel



Grease
Superior lubrication/fretting resistance

Outer seal / Inner seal
Superior muddy water resistance also in low friction torque

Inner Shaft / Outer ring / Flange shape
Strength /
Rigidity and Weight Reduction realized

Shaft End Clinching
Number of parts reduced /
Overall weight reduced

Answering bearing performance / reliability needs

Materials Selection

Properties required for bearing ring / ball materials

High Reliability | **Excellent rolling fatigue life** | **High Abrasion Resistance**

JTEKT Hub Unit Materials

Use for hub unit bearings/structural parts ●: Yes - -: No

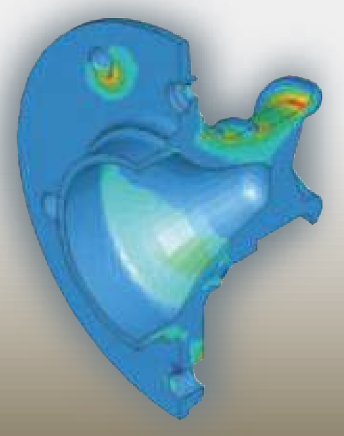
	Outer ring	Inner ring	Inner shaft	Ball	
Carbon steels for machine structural use	●	- -	●	- -	Carbon steel with good forging performance and high-frequency quenching of races. High-quality material with low non-metallic inclusions and superior characteristics not only in rolling fatigue service life, but also rotation bend fatigue strength and impact resistance.
High carbon chromium bearing steels	1st generation ●	●	- -	●	Most commonly used material for standard bearings; high quality with low non-metallic inclusions.

Simultaneous achievement of strength / rigidity and weight reduction

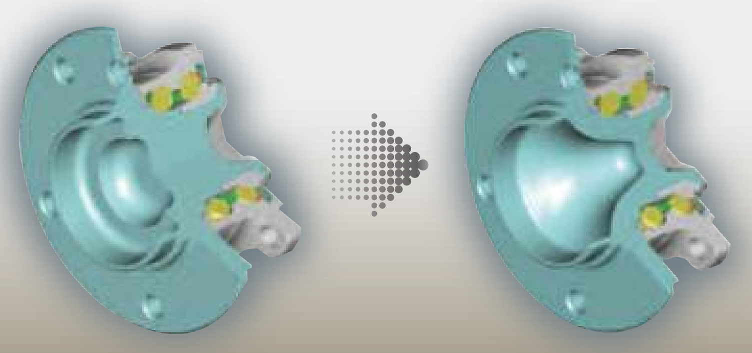
Inner Shaft / Outer Ring / Flange Shape

CAE analysis is used to obtain a design that achieves both of the seemingly contradictory goals of increased strength / rigidity and reduced weight.
Theoretical results are then verified with actual use on an original and rigorous test course developed by JTEKT.

[Example of inner shaft analysis]



[Example of assembled unit weight reduction]



Superior Lubrication / Fretting Resistance

Grease

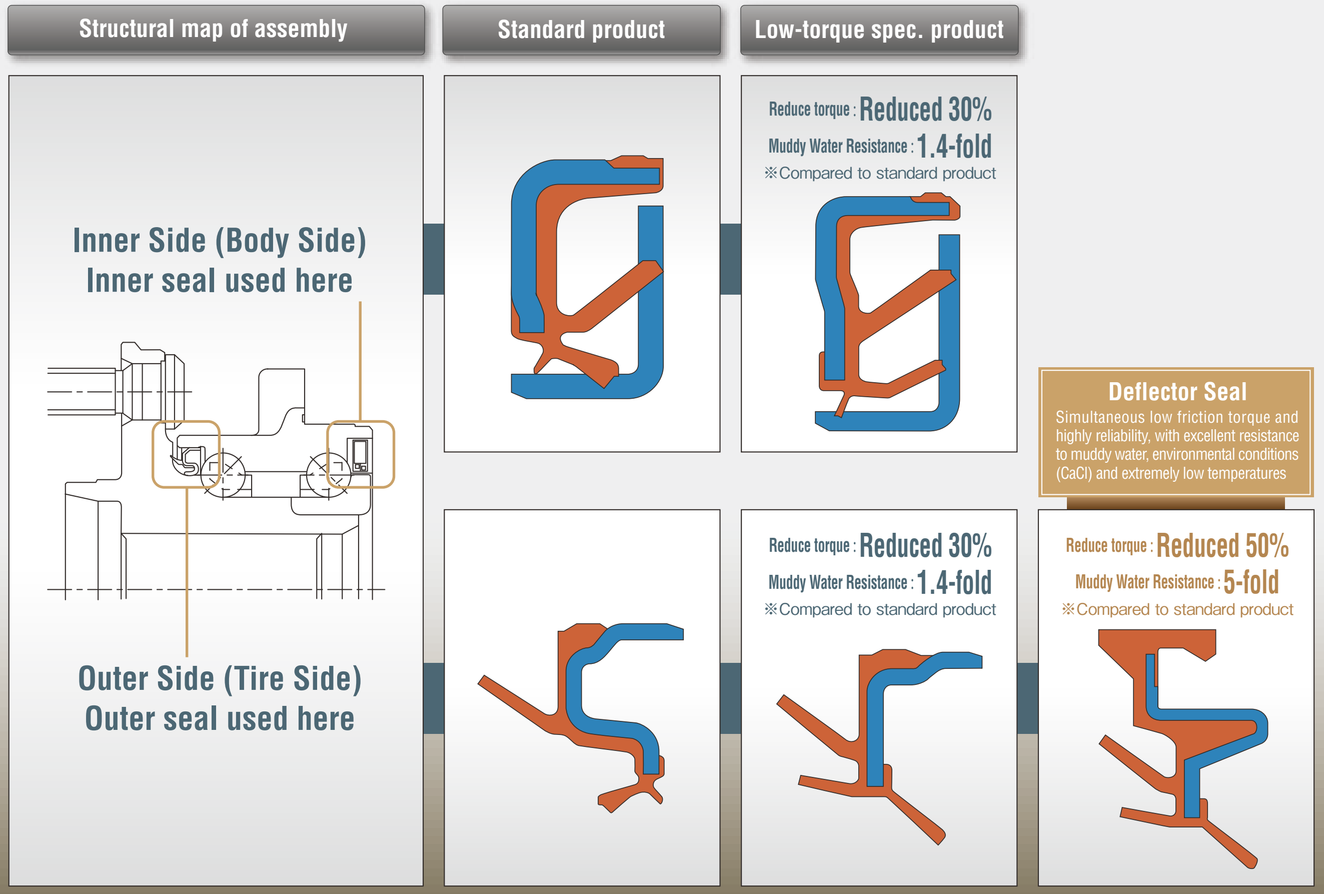
Grease is injected into the hub unit as a lubricant to maintain bearing function.
As standard, JTEKT uses grease with superior quick-acting lubricating performance and superior fretting resistance.

	Grease Service Life	Fretting Resistance	Seizure Resistance	Low friction torque	Operating Temperature Range
Conventional Product	★	★	★	★	0～150℃
Mineral-oil Urea Grease (standard)	★★★	★★★	★★★	★★★	-30～150℃

Superior muddy water resistance also in low friction torque

Outer Seal / Inner Seal

The seals are among the most important components supporting hub unit functions and their technical performance continues to increase in keeping with the evolution of the hub unit.
JTEKT seals ensure low friction torque and superior muddy water resistance.



Deflector Seal
Simultaneous low friction torque and highly reliability, with excellent resistance to muddy water, environmental conditions (CaCl) and extremely low temperatures

Number of Parts Reduced / Weight Reduced

Shaft End Clinching

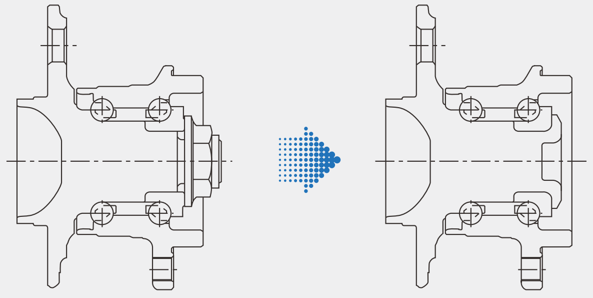
Fixed inner ring configuration proposed for 3rd-generation hub unit.

Hub Unit for Non-Driven Wheel

➔ Compared to the conventional nut fastening method, clinching the shaft end provides weight- and space-saving benefits.

Hub unit for Driven Wheel

➔ In addition to weight- and space-saving benefits, the need for torque management (axial force) of nut fastening at the time of installing unit in the vehicle is eliminated, thereby simplifying assembly.



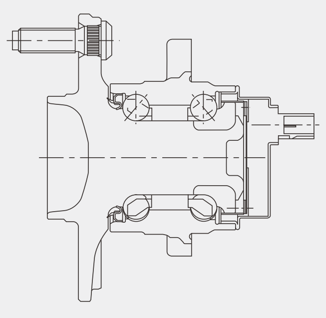
[Nut fastening] [Shaft End Clinching]

Assembly work simplified

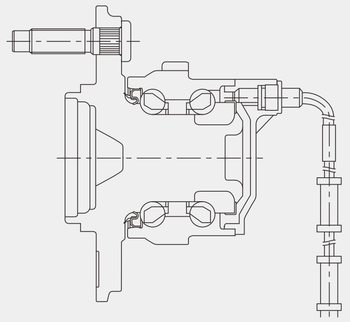
ABS Sensor (option)

JTEKT 3rd-generation hub units with built-in ABS sensor and magnetized pulser provide the following benefits.

- Space savings
- Controlled air gap for magnetized pulser and sensor
- Adhesion of foreign substances prevented; high ABS signal reliability



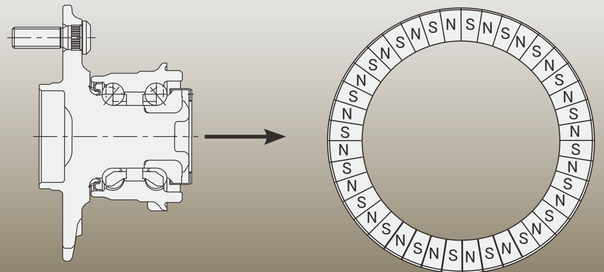
[Integrated sensor cover]



[Built-in stick-type sensor]

Magnetized pulser Changes in magnetic flux density accompanying wheel rotation are detected by a sensor and converted to wheel rpm.

The magnetized pulser is a multipolar magnet applied to a pulser ring: a rubber composite is filled with magnetic material and then segments are alternately magnetized with North and South poles, taking the bearing rotation shaft as the point of origin. Using the magnetized pulser enables more reliable detection of wheel speed.

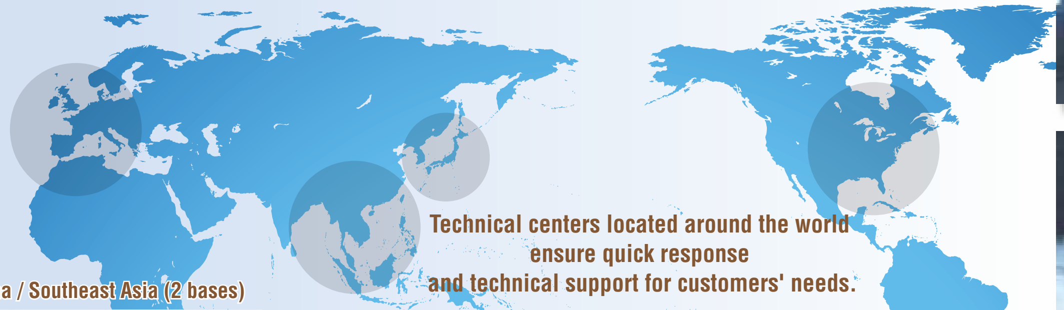


Global Technical Support (Bearing Development Bases)

Europe (5 bases)

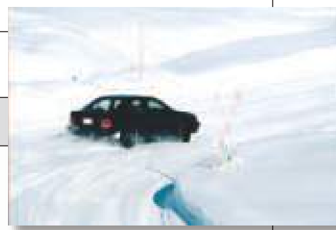
Japan (4 bases)

America (2 bases)



Technical centers located around the world ensure quick response and technical support for customers' needs.

China / Southeast Asia (2 bases)



Iga Proving Ground Enables Testing / Evaluations Simulating Roads Worldwide

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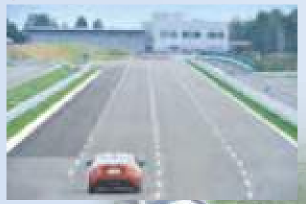
A Straight-line Course

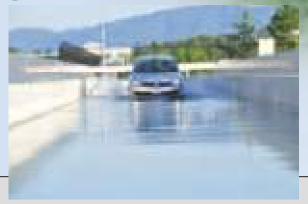


B Winding Course

■ **JTEKT Iga Proving Ground**

- Site area: 500,000m²
- Course area: 170,000m²
- Combined circuit length: 2,200m
- Dynamics pad area: 54,000m²

D Fording Course



E Dynamics Pad

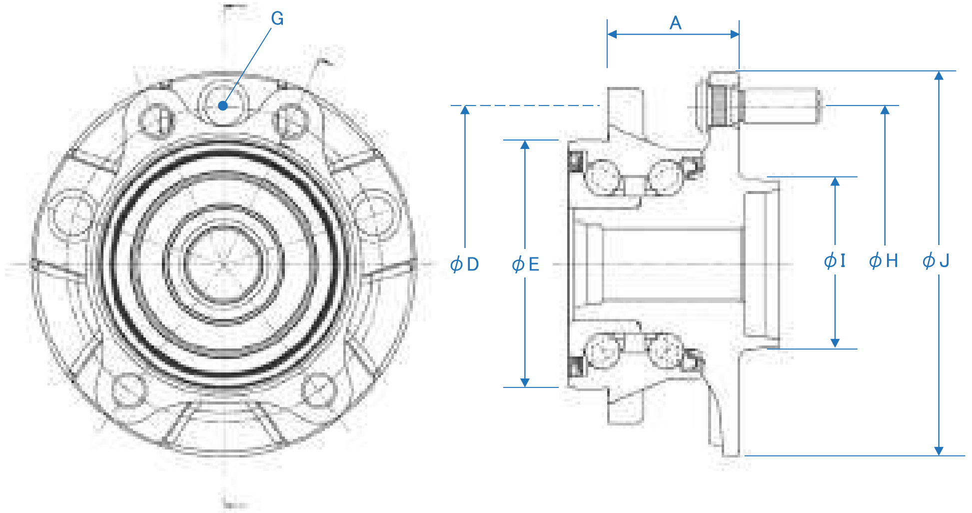
F Noise Evaluation Course

C Administration / Maintenance Building

Recommended hub unit Numbers

Hub Unit List

For Driving Wheel



Recommended hub unit Numbers

Type	JTEKT Recommended model	Basic hub unit No.	Basic Installation Specifications						
			A: Unit Width	Vehicle-side Installation Dimensions		Wheel-side Installation Dimensions			
				D: Installation Hole P.C.D.	E: Spigot Outer Diameter	G: No. of bolts	H: Hub Bolt P.C.D.	I: Spigot Outer Diameter	J: Flange Outer Diameter
Driving Wheel	①	3DACF032D-1	59.4	92	63	4	100	61	136
	②	3DACF035D-4	38.4	93	70	4	100	60	120
		3DACF037D-14	60	95	74	5	100	55	135
		3DACF037D-2	72	110	84	5	114.3	62	152
		3DACF037D-4	60	95	74	4	100	55	135
		3DACF037D-8	69	110	84	5	114.3	62	152
		3DACF037D-9	66	95	74	5	100	55	135
		3DACF038D-1	69	106	84	5	114.3	62	152
	③	3DACF038D-15	47	109	84	5	100	55	125
	④	3DACF038D-33	43.2	115.5	79.4	5	100	55	125
		3DACF038DB-2	42	103	78	5	100	55	125
	⑤	3DACF041D-3	47.5	114	90	5	114.3	62	139
		3DACF041D-6	65	110	87	5	114.3	62	152
	⑥	3DACF044D-10	47.5	114	90	5	114.3	62	139
		3DACF044D-14	68.9	112.5	87.4	5	120	62	158
		3DACF044D-16	67.5	109.8	84	5	114.3	62	154
		3DACF044D-9	67.5	109.8	84	5	114.3	62	154
		3DACF044DC	67.5	112	84	5	114.3	62	154

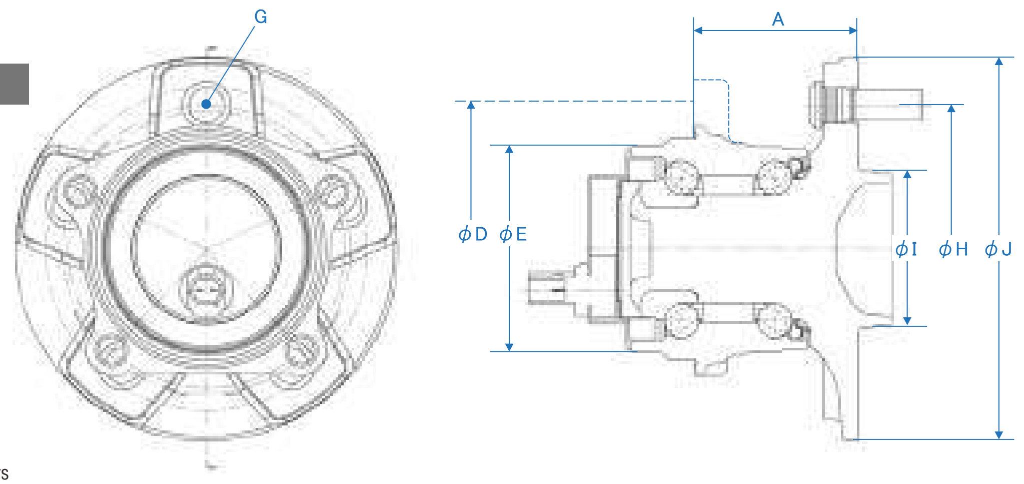
※ For dimensions not listed, please contact us.

The 3rd generation

BALL HUB UNITS

Hub Unit List

For Driven Wheel



Recommended hub unit Numbers

Type	JTEKT Recommended model	Basic hub unit No.	Basic Installation Specifications						
			A: Unit Width	Vehicle-side Installation Dimensions		Wheel-side Installation Dimensions			
				D: Installation Hole P.C.D.	E: Spigot Outer Diameter	G: No. of bolts	H: Hub Bolt P.C.D.	I: Spigot Outer Diameter	J: Flange Outer Diameter
Driven Wheel	①	3 DACF 022 F-1	52.5	82	56	4	100	55	133
	②	3 DACF 023 F-2	55.5	92	67	4	100	55	135
		3 DACF 026 F-15	74.5	99	74	5	114.3	62	152
		3 DACF 026 F-16	74.5	99	74	5	114.3	62	152
		3 DACF 026 F-17	69	106	84	5	114.3	62	152
		3 DACF 026 F-20	54.5	93	74	4	100	55	135
		3 DACF 026 F-23	54.5	92	67	4	100	55	135
		3 DACF 026 F-23	54.5	92	67	4	100	55	135
		3 DACF 026 F-24	60	95	74	4	100	55	135
		3 DACF 026 F-37	60	95	74	5	100	55	135
		3 DACF 026 F-39	60	95	74	4	100	55	135
		3 DACF 026 F-47	60	95	74	5	100	55	135
	③	3 DACF 026 F-52	60	95	74	4	100	55	135
		3 DACF 026 F-6	55.5	92	67	4	100	55	125
		3 DACF 026 F-7	54.5	93	74	4	100	55	135
		3 DACF 027 F-10	54.5	93	74	5	100	55	135
		3 DACF 027 F-11	60	95	74	5	114.3	62	152
	④	3 DACF 027 F-12	60	97	76	5	114.3	62	152
		3 DACF 027 F-13	60	99	74	5	100	55	135
		3 DACF 027 F-14	65	112	74	5	114.3	62	150
		3 DACF 027 F-15	65	112	74	5	114.3	62	150
		3 DACF 027 F-19	64	95	74	5	114.3	62	152
		3 DACF 027 F-26	57	102	74	5	114.3	62	140
		3 DACF 027 F-28	60	97	76	5	100	55	135
		3 DACF 027 F-29	74.5	99	74	5	114.3	62	152
		3 DACF 027 F-30	67.5	99	74	5	114.3	62	152
		3 DACF 027 F-8	55	112	74	5	114.3	62	140
	⑤	3 DACF 031 F-1	42	110	78	5	120	62	158
	⑥	3 DACF 033 F-7	65	110	87	5	114.3	62	152

※ For dimensions not listed, please contact us.

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Errata - Grease Table pg. 6

Superior Lubrication / Fretting Resistance

Grease

Grease is injected into the hub unit as a lubricant to maintain bearing function.

In addition to standard grease, JTEKT has a lineup of low-torque specification grease that contributes to improving fuel efficiency.

	Grease Service Life	Fretting Resistance	Seizure Resistance	Low friction torque	Operating Temperature Range
Mineral-oil Urea Grease (standard)	★	★	★	★	-30～150℃
Synthetic-oil Urea Grease (low-torque specification)	★★	★★	★★★	★★	-40～150℃

Koyo®

航空・宇宙用軸受

Bearings for Aerospace Applications

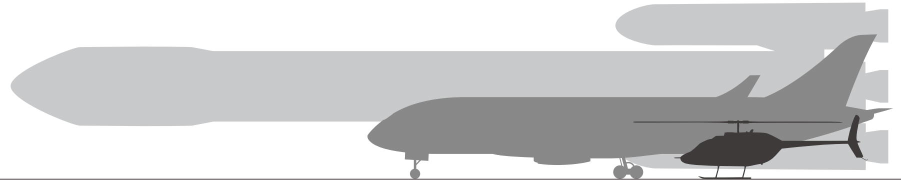
JTEKT
株式会社ジェイテクト

JTEKT
Koyo TOYODA

CAT.NO.B1003JE-1

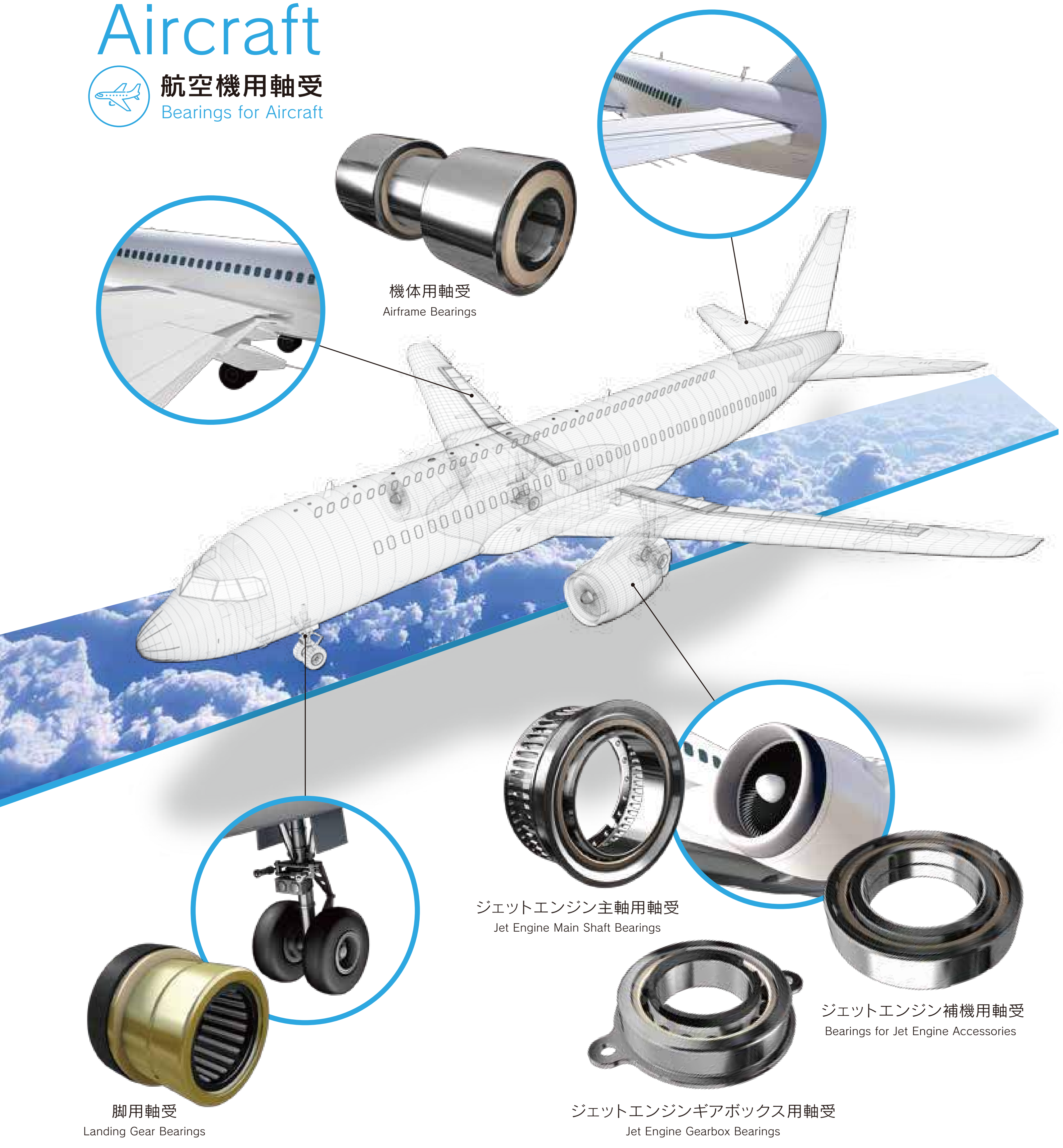
航空機やヘリコプタで使用される軸受には、高い信頼性とともに長寿命化、及び軽量化等、
最新の技術が必要とされる中、KOYOブランドの軸受は多くのアプリケーションで貢献しています。

Bearings for aircraft and helicopter applications require the latest technologies to ensure high reliability, long life, and light weight.
This is why KOYO brand bearings are used for numerous applications.



Aircraft

航空機用軸受
Bearings for Aircraft

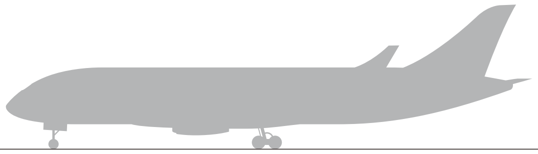


Helicopter

ヘリコプタ用軸受
Bearings for Helicopters

Aircraft

航空機用軸受
Bearings for Aircraft



ジェットエンジン主軸用軸受
Jet Engine Main Shaft Bearings

ジェットエンジン主軸用軸受は、航空機の心臓部を支える重要な機械部品です。
絶対的な信頼性を確保するため、厳重な工程管理の下で製造されています。

The main shaft bearings of a jet engine are critical mechanical components supporting the aircraft' s engine, essentially the heart of the aircraft.
In order to secure absolute reliability, these bearings are manufactured according to strict process control.

特長 Features

高温用特殊鋼 Special steel for high-temperature use	優れた耐熱性を有し、高温下でも高硬度 With excellent heat resistance and high hardness even under high temperatures
真空再溶解鋼(VIM-VAR) Vacuum arc re-melted steel (VIM-VAR)	材料の清浄度向上により長寿命・高信頼性を実現 Realization of long service life and high reliability by improving cleanliness of material
浸炭処理による表面硬化 Surface hardened using carburizing process	異物混入時の耐久性向上 Improved contamination resistance
スクイズフィルムダンパーやビームを持つ With squeeze film damper and beam	軸の振動を軽減 Reduction of shaft oscillation

ジェットエンジンギアボックス用軸受
Jet Engine Gearbox Bearings

スタータやポンプなど様々なアクセサリーが取り付くギアボックスには
高温高速条件下で長期間安定した性能を維持する軸受が求められています。

Gearboxes mounted with various accessories such as starters and pumps require bearings capable of maintaining stable performance for long periods of time at high temperatures and high speeds.

特長 Features

フランジ付外輪 Outer ring with flange	位置決め容易、組込性向上、軽量化 Easy positioning, simple installation, compact
内輪と外輪の差幅管理 Inner- and outer-ring width difference control	ギアの歯当り調整の簡素化 Simplification of gear tooth contact adjustment
真空再溶解鋼(VIM-VAR) Vacuum arc re-melted steel (VIM-VAR)	材料の清浄度向上により長寿命・高信頼性を実現 Realization of long service life and high reliability by improving cleanliness of material

ジェットエンジン補機用軸受
Bearings for Jet Engine Accessories

エンジン後方のアフタバーナ部や、エンジン主軸とギアボックスを繋ぐPTOやRDS等、
主軸やギアボックス以外の回転部にも軸受が使われています。(PTO:Power Take Off／RDS:Radial Drive Shaft)

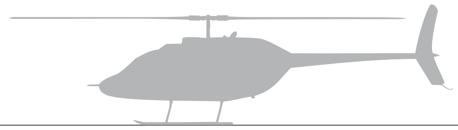
Bearings are used for rotating parts other than the main shaft and gearbox.
Some examples include the afterburner at the rear of the engine,
the PTO and RDS that connect the engine' s main shaft and gearbox, etc. (PTO:Power Take Off／RDS:Radial Drive Shaft)

特長 Features

内輪と外輪の差幅管理 Inner- and outer-ring width difference control	ギアの歯当り調整の簡素化 Simplification of gear tooth contact adjustment
真空再溶解鋼(VIM-VAR) Vacuum arc re-melted steel (VIM-VAR)	材料の清浄度向上により長寿命・高信頼性を実現 Realization of long service life and high reliability by improving cleanliness of material
特殊合金 Special alloy	高温環境下で無潤滑でも使用可能 Able to be used even without lubricant at high temperatures
特殊表面処理 Special surface treatment	金属表面の硬度向上により耐久性向上 Improved durability due to higher metal surface hardness

Helicopter

ヘリコプタ用軸受
Bearings for Helicopters



ヘリコプタ トランスミッション用軸受
Helicopter Transmission Bearings

トランスミッション用軸受は、エンジンからの動力を各部に伝達するための
ギアの支持に使用されています。ヘリコプタの核となる部位を支持するため
高い信頼性を有しています。

Transmission bearings are used to support gears that transmit power from the engine to various areas.
They must be highly reliable as they support the core operations of the helicopter.

特長 Features

ドライラン性能 Dry-run performance	オイル遮断後も長時間の運転可能 Can be operated for a long time even after oil supply is isolated
油穴付内輪 Inner ring with oil hole	アンダーレース潤滑により軸を冷やし、すきま詰まりを抑制 Cools shaft using under-race lubrication and minimizes gap blockage
内輪と外輪の差幅管理 Inner- and outer-ring width difference control	ギアの歯当り調整の簡素化 Simplification of gear tooth contact adjustment
真空再溶解鋼(VIM-VAR) Vacuum arc re-melted steel (VIM-VAR)	材料の清浄度向上により長寿命・高信頼性を実現 Realization of long service life and high reliability by improving cleanliness of material

ヘリコプタ スワッシュプレート用軸受
Helicopter Swash Plate Bearings

操縦桿からの指示によりブレードのピッチ角をコントロールし、浮力調整や
水平移動等ヘリコプタの動きを司る部分に使用されるスワッシュプレート用軸受は、
コンパクトかつ高容量の軸受です。

According to commands from the control stick, the swash plate controls blade pitch angle and movement of the helicopter, such as buoyancy adjustment and horizontal movement.
The bearings used in swash plates are compact, yet have high capacity.

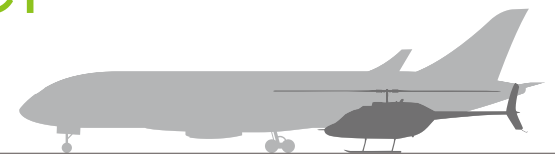
特長 Features

大径かつ薄肉 Large diameter but thin	軽量化を実現 Realizing lighter weight
ワイヤ保持器を採用 Wire cage used	玉数を増やし負荷容量向上 Load capacity increases when using more balls.
グリース潤滑品 Grease lubricated product	環境にも優しく、外輪に設けた穴から容易に給脂可能 Environment-friendly operation by easily supplying oil through a hole in the outer ring

Aircraft Helicopter

航空機用軸受
Bearings for Aircraft

ヘリコプタ用軸受
Bearings for Helicopters



機体用軸受
Airframe Bearings

ビジネスジェットや商用機などの多岐にわたる用途をカバーし、フラップ＆スラット用（トラックローラ）、可動式水平尾翼アクチュエータ用（スラスト軸受）、昇操舵（自動調心軸受）、乗客ドアロック用（トラックローラ）、エアコン（コンバインド軸受）など、豊富なラインナップを有しています。

Covering a broad range of uses including private jets and commercial airliners,
JTEKT has a large lineup of bearings, such as those for flaps and struts (track rollers), movable horizontal tail actuators (thrust bearings), elevating steering (self-aligning bearings), passenger door locks (track rollers), and air conditioning (combined bearings).

特長 Features

総玉･総ころ軸受の採用 → 高負荷容量への対応
Full complement type ball/ Full complement type roller bearings incorporated → Supports high-load capacity

高性能浸炭ステンレス鋼の採用 → 高強度、高耐食性
High-performance, carburized stainless steel incorporated → High strength, high corrosion resistance

軌道輪への特殊なめっき処理 → 耐食性の向上
Special plating for bearing rings → Improved corrosion resistance

テフロン樹脂性シール採用 → 広範囲な温度領域で使用可能
Adoption of a Teflon resin seal → Able to be used over a wide temperature range

脚用軸受
Landing Gear Bearings

航空機の脚用軸受は、急加速、衝撃荷重など厳しい条件下で使用されています。

Aircraft landing gear bearings are under severe conditions such as sudden acceleration when taking off and impact load when landing.

特長 Features

内外輪で互換性を有する → メンテナンスが容易
Inner-/Outer-ring compatibility → Simple maintenance

はだ焼鋼の採用 → 高強度、衝撃に強い
Case-hardened steel incorporated → High strength, strong against impact

高清浄度鋼の採用 → 材料の清浄度向上により長寿命・高信頼性を実現
Extremely-clean steal incorporated → Realization of long service life and high reliability by improving cleanliness of material

Outer Space

宇宙機器用軸受
Bearings for Devices Used in Outer Space

宇宙機器用軸受
Bearings for Devices Used in Outer Space

高真空、広範囲な温度領域、放射線環境など地上とは異なる厳しい環境である宇宙で使用出来る特殊な材料技術、トライボロジー技術を組み合わせた軸受を提供致します。

In the field of space development, JTEKT offers bearings manufactured by combining special materials technologies and tribology technology to make them appropriate for use in space where the harsh environment differs from that on Earth, including factors such as a high vacuum, wide temperature variations and high radiation.

特長 Features

高耐食鋼 → 地上での長期保管可能
High corrosion-resistant steel → Suited for long-term, terrestrial storage

真空用特殊グリース → 高真空、高速環境でも使用可能
Special vacuum grease → Able to be used in high-vacuum, high-speed environments

固体潤滑剤 → 広範囲な温度領域で使用可能
Solid lubricant → Able to be used in wide temperature ranges

Aerospace

テクノロジーマネジメント
Technology Management

航空機のための、究極の安心・信頼をお届けすることが、私たちのミッションです。
設計・解析から生産・加工、検査・測定、評価までをトータルマネジメントすることにより、
航空機用軸受の技術・品質を日々向上させています。

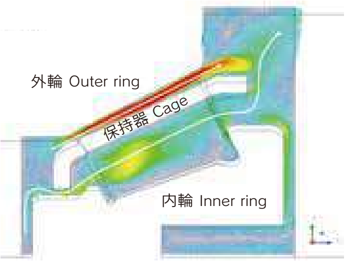
Delivering superior reassurance and reliability for aircraft is our mission.
To improve the manufacturing techniques and quality of aircraft bearings, we use total management, from design and analysis to production, processing, inspection, measurement and evaluation.

設計・解析
Design and Analysis

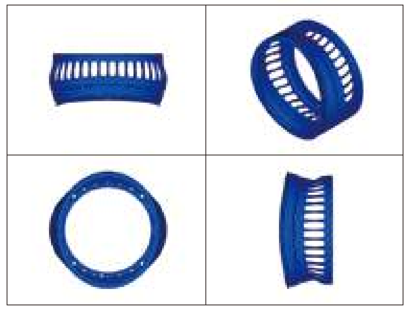
高度な流体解析や、振動モード解析、応力解析による結果を設計にフィードバックし、高性能を実現します。実際の運転状態を再現する解析プログラムを活用し、短期間で精度の高い設計を実現します。

High performance achieved by feeding back the results obtained from sophisticated fluid analysis, vibration mode analysis and stress analysis during design.
Utilizing an analysis program that recreates actual operating conditions, highly accurate design is realized in a short time.

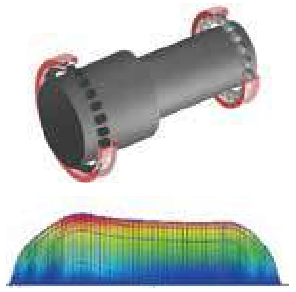
流体解析
Fluid analysis



振動モード解析
Vibration mode analysis



軸系解析プログラムによるモデル
Model from a shaft system analysis program



生産・加工
Production and Machining

複雑な形状の多品種な製品を、高精度かつ強靭に加工します。

We perform machining that ensures high accuracy and durability for a large variety of products with complex shapes.

【 研削工程 】
Grinding process

複雑な形状を高精度に加工する研削工程
A grinding process for machining highly accurate complex shapes

【 熱処理設備 】
Heat treatment equipment

金属を強靭に変化させる熱処理設備
Heat treatment equipment to make metal stronger

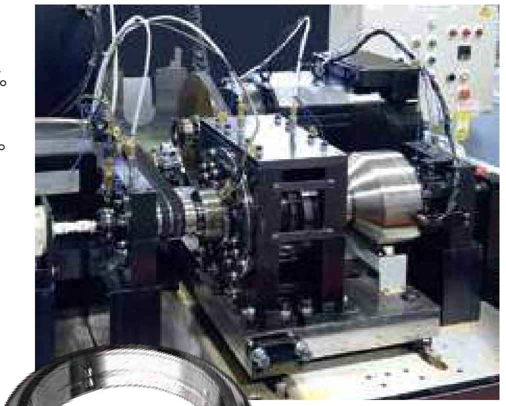
評価
Evaluation

信頼性の高い製品開発と航空機の安全を支えるために、実際の使用条件を再現した評価で、製品の性能を十分に確認します。

内輪も外輪も回転するのが差動ベアリング。超高速で回転する2つの異なる動きからさまざまなデータを測定するために、その試験設備は極めて複雑なものとなり、その開発には高度な技術が求められます。ジェイテクトはこの差動ベアリング試験設備を自社開発。試験結果から得られるデータを、より高次元の開発や改善へとつなげています。

To support highly reliable product development and aircraft safety, actual use conditions are reproduced to thoroughly check and evaluate product performance.

Both the inner and outer rings of differential-motion bearings rotate. In order to measure the different data from the two rings, which both rotate at ultrahigh speeds, an extremely complex testing apparatus is required. Using highly advanced technologies, JTEKT Corporation has succeeded in developing such an apparatus, enabling the company to use data from test results to enhance bearing development and make ongoing improvements.



差動ベアリング試験設備
Test apparatus for differential-motion bearings

差動ベアリング
Differential-motion bearing

検査・測定
Inspection and Measurement

最新の技術を取り入れた非破壊検査設備と超精密測定機を用いて、製品の信頼性を確実なものにします。

We ensure product reliability using non-destructive inspection equipment that incorporates cutting-edge technologies and ultra-precise measuring devices.

【 渦流探傷検査設備 】
Eddy current flaw inspection equipment

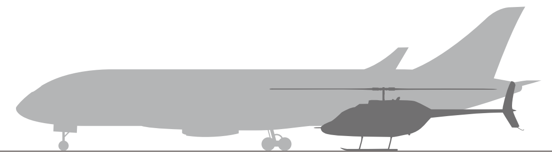
電磁誘導を利用して傷を測定・評価する渦流探傷検査装置
Equipment for detecting eddy current by measuring and evaluating flaws utilizing electromagnetic induction

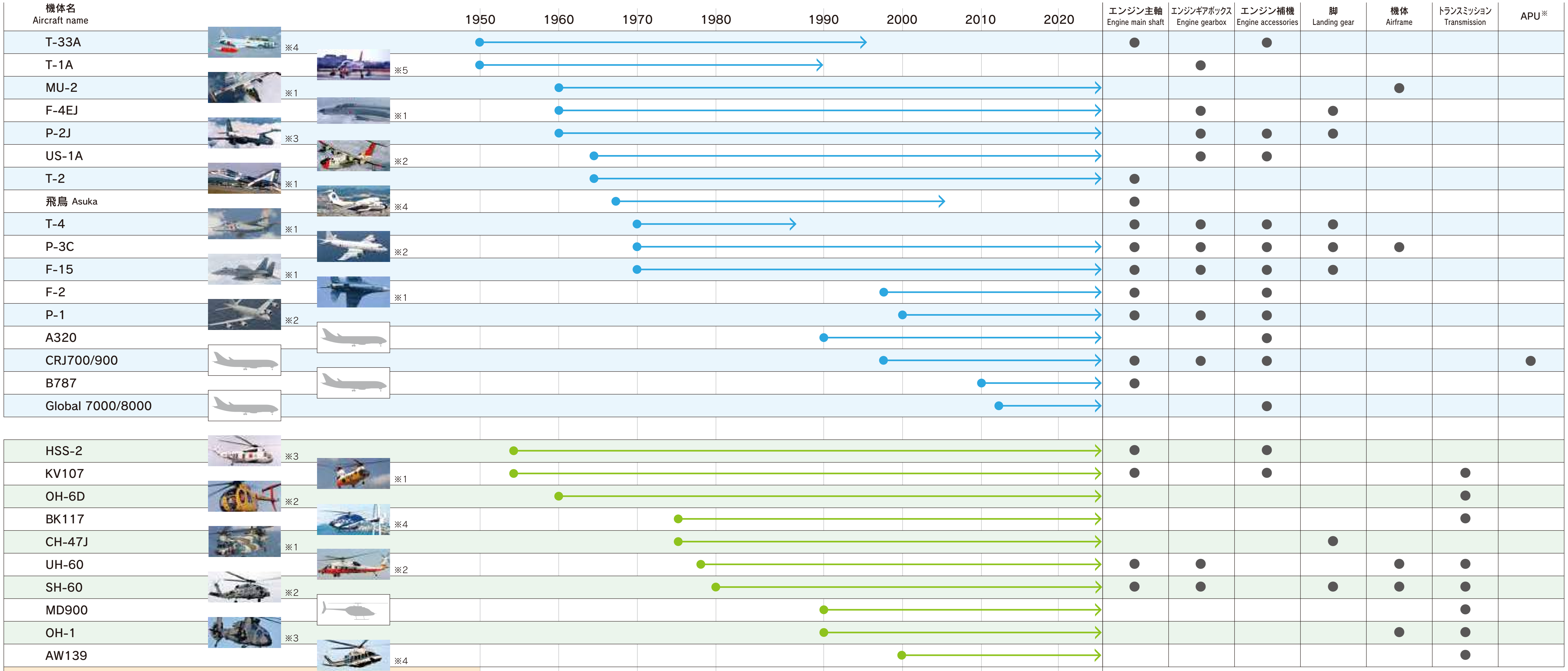
【 3次元測定機 】
3D coordinate measuring machine (CMM)

複雑な形状の加工精度を測定する検査装置
Inspection device for measuring the machining accuracy of complex-shaped workpieces

Aircraft Helicopter

航空機関連エンジニアリングの展開
Deployment of aircraft-related engineering

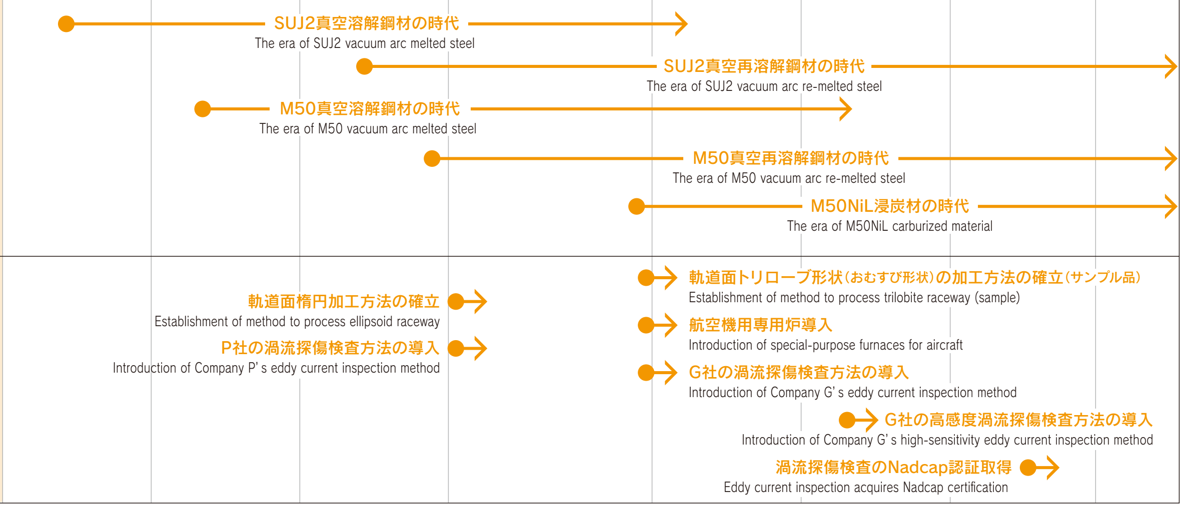




機体名 Aircraft name		エンジン主軸 Engine main shaft	エンジンギアボックス Engine gearbox	エンジン補機 Engine accessories	脚 Landing gear	機体 Airframe	トランスミッション Transmission	APU※
T-33A	※4	●		●				
T-1A	※5		●					
MU-2	※1					●		
F-4EJ	※1		●		●			
P-2J	※3		●	●	●			
US-1A	※2		●	●				
T-2	※1	●						
飛鳥 Asuka	※4	●						
T-4	※1	●	●	●	●			
P-3C	※2	●	●	●	●	●		
F-15	※1	●	●	●	●			
F-2	※1	●		●				
P-1	※2	●	●	●				
A320				●				
CRJ700/900		●	●	●				●
B787		●						
Global 7000/8000				●				
HSS-2	※3	●		●				
KV107	※1	●		●			●	
OH-6D	※2						●	
BK117	※4						●	
CH-47J	※1				●			
UH-60	※2	●	●			●	●	
SH-60	※2	●	●		●	●	●	
MD900							●	
OH-1	※3					●	●	
AW139	※4						●	

※APU（Auxiliary Power Unit）補助動力装置

使用材料の変遷
History of bearing materials



SUJ2真空溶解鋼材の時代
The era of SUJ2 vacuum arc melted steel

SUJ2真空再溶解鋼材の時代
The era of SUJ2 vacuum arc re-melted steel

M50真空溶解鋼材の時代
The era of M50 vacuum arc melted steel

M50真空再溶解鋼材の時代
The era of M50 vacuum arc re-melted steel

M50NiL浸炭材の時代
The era of M50NiL carburized material

加工技術
Machining technology

設備導入
Introduction of equipment

特殊工程
Special processes

軌道面楕円加工方法の確立
Establishment of method to process ellipsoid raceway

P社の渦流探傷検査方法の導入
Introduction of Company P's eddy current inspection method

軌道面トリローブ形状（おむすび形状）の加工方法の確立（サンプル品）
Establishment of method to process trilobite raceway (sample)

航空機専用炉導入
Introduction of special-purpose furnaces for aircraft

G社の渦流探傷検査方法の導入
Introduction of Company G's eddy current inspection method

G社の高感度渦流探傷検査方法の導入
Introduction of Company G's high-sensitivity eddy current inspection method

渦流探傷検査のNadcap認証取得
Eddy current inspection acquires Nadcap certification

写真提供：※1 航空自衛隊　※2 海上自衛隊　※3 陸上自衛隊　※4 川崎重工業株式会社　※5 富士重工業株式会社　Photos provided by: *1 Japan Air Self-Defense Force *2 Japan Maritime Self-Defense Force *3 Japan Ground Self-Defense Force *4 Kawasaki Heavy Industries, Ltd. *5 Fuji Heavy Industries Ltd.

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Global Technical Support (bearing development base)




欧州〔4拠点〕 European Region (4 bases)	中国・アセアン〔2拠点〕 ASEAN Region (2 bases)	日本〔4拠点〕 JAPAN Region (4 bases)	米州〔2拠点〕 North America Region (2 bases)
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Koyo®

Products for Wind Turbine Generators

JTEKT

JTEKT CORPORATION

JTEKT
Koyo TOYODA

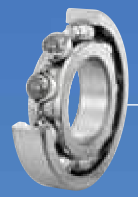
CAT. NO. B1002E-4

For the Environment…

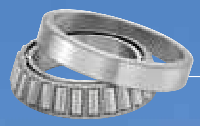
Wind turbine generators efficiently turn one of the elemental forces of Nature into a stable supply of electric power. JTEKT has used their 90+ years of friction management experience to developing world leading bearing, sealing and other technologies to the rapidly advancing field of renewable power generation thus enabling Wind Turbines to achieve an operation life of 25 years or more.

Main shaft bearings

Gearbox bearings



Generator bearings



Products for
peripheral equipment

Main shaft bearings

Main shaft bearings of various types and sizes are required to support the diverse wind turbine designs and the ever increasing size of both onshore and offshore wind turbines.
JTEKT is committed to answering the needs of its customers through high reliability and speedy development.

(Main shaft: An important component that supports the wind load applied by the blades and transfers the rotational torque to the gearbox.)

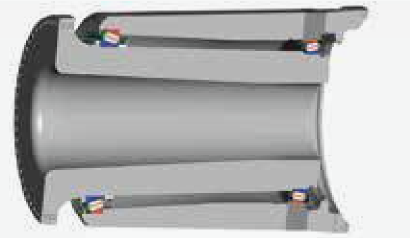

Tapered roller bearings

Supporting market demands for smaller, lighter and more reliable bearings, JTEKT is leveraging new technologies to develop and mass produce industry leading tapered roller bearings.

- **Utilizing advanced roller movement stabilizing technology in our spherical roller bearings and low-torque design technology of tapered roller bearings JTEKT has extended the service life of the main shaft bearing grease by reducing bearing temperature increases.**


Spherical roller bearings


FEM analysis model


Main shaft configuration

At JTEKT' s Kokubu Large-Size Bearing Engineering Development Center, we have validated our FEM analysis results with full size test equipment. This allows us to confidently optimize the internal and external geometry of the bearings based on the mathematical analyses of the entire Wind Turbine drivetrain and structure.

Certified by DNV-GL*

The high quality of JTEKT bearing materials has been evaluated and consequently received certified approval from DNV-GL to increase our published load ratings by 25%. This allows for more accurate life predictions and the confidence to use optimally sizes bearings.

* Certification acquired November 2015

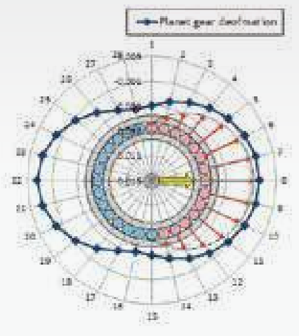
Large-Size Bearing Engineering Development Center

A new testing facility has been installed in our Large-Size Bearing Engineering Development Center to evaluate actual wind turbine drivetrains allowing for higher reliability and shorter customer development periods.

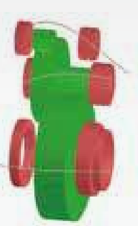
JTEKT' s proprietary Shaft System Analysis Program

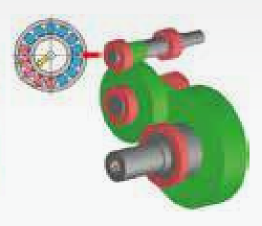
In addition to analytical techniques such as FEM, JTEKT has developed a bearing analysis system that enables detailed calculations of bearing life considering rigidity of peripheral components and lubrication conditions during operation. With this system, reliable and speedy technical verification is possible, thereby ensuring optimal bearing selection.

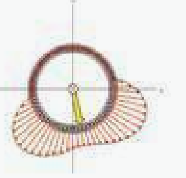

Shaft System Analysis
Program model of a wind turbine drivetrain.

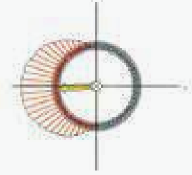


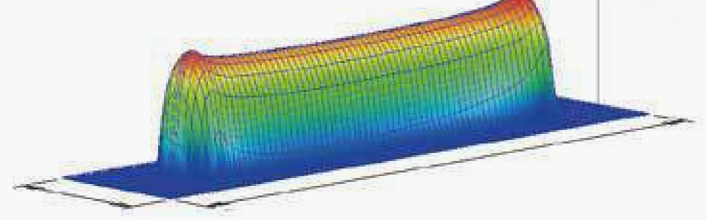
Planetary gear bore deformation and load distribution


Shaft deflection


Rolling element load distribution


Main shaft bearing
rolling element load distribution
(front)


Main shaft bearing
rolling element load distribution
(rear)


Contact stress distribution between roller and raceway

Gearbox bearings

Gearbox bearings vary greatly in regards to type, load capacity and rotational speed depending on where they are used in the gear train.
JTEKT responds to diversified customer requests by ensuring optimal designs based on strict calculations.

(Gearbox: Mechanism that increases the rotational speed transmitted via the main shaft up to a speed where electric power can be generated.)

Responding to market needs, JTEKT uses special carburized steel and surface treatments help us to achieve higher reliability under severe lubrication conditions and high-rotational speed variations.


double-row cylindrical roller bearing for planetary gear


double row tapered roller bearing with integrated planet gear


Bearing with special surface treatment minimize roller slippage and improves lubricity

Generator bearings

Electric pitting is a common cause of bearing failures in wind turbine generators due to stray electrical currents.
Insulated ceramic bearings eliminate electrolytic corrosion (commonly called fluting)and extend bearing life.

(Generator: The device that converts rotational energy into electrical energy.)

Insulated (hybrid) ceramic bearing

Rolling elements in insulated ceramic bearings are made from silicon nitride ceramic (Si_3N_4)
JTEKT was the first company in the world to develop and install insulated hybrid ceramic bearings in Wind Turbines.
The use of hybrid ceramic bearings contributes to the reduction of maintenance costs and improves operating efficiency.

Characteristic		Silicon nitride	High carbon chromium (bearing steel)
Heat resistance	℃	800	180
Density	g/cm³	3.2	7.8
Coefficient of linear expansion	1/℃	3.2×10^{-6}	12.5×10^{-6}
Vicker's hardness	Hv	1300 to 2000	700 to 800
Young' s modulus	GPa	310	210
Poisson's ratio		0.29	0.3
Magnetic property		Nonmagnetic	Magnetic
Electrical Conductivity		Insulator	Conductor
Material type		Covalent bond	Metallic bond

Comparison of ceramics and bearing steel properties

Eliminates electric corrosion and extends grease life

Compared to bearings with ceramic coated outer rings, hybrid ceramic bearings are not susceptible to insulation degradation due to handling damage. Additionally, ceramic balls lower the operating temperature of the bearings; extending both grease and bearing life.

All steel bearing with electric corrosion
Steel bearing inner ring with fluting damage

Products for peripheral equipment

Bearings for yaw-drives

JTEKT supplies optimally designed tapered roller bearings and needle roller bearings that simultaneously provide high reliability and rigidity needed to withstand extreme wind gusts.

Technology to improve bearing robustness	
Larger rolling element design (R-type design)	Rated capacity improved **1.1 to 1.2 times**
Special heat treatment (KE treatment, SH treatment)	Fatigue life more than **doubled**
Optimized crowning	**Improved life under misalignment conditions**

Main Shaft Oil Seals

Full rubber seals (MS-type and MSA-type)

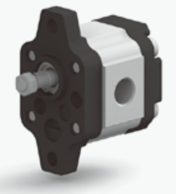
- Full rubber material makes installation easy
- Split MS-type seals also available as replacement
- MSA-type with dust lip available for environments with excessive dust

HPI Hydraulic Pumps

HPI hydraulic pumps are highly efficient, lightweight and compact.
They also have a long life and high reliability.

Hydraulic pump for pitch brakes

Used for pitch brake hydraulic power units.
The hydraulic power unit reduces the rotor speed using a disc similar to the way disc brakes are used to slow down an automobile.



Series 0

Model	Capacity (cc/rev)	Peak pressure (MPa)
0025	0.25	28.0
0050	0.5	28.0
0075	0.75	25.0
0100	1	25.0
0125	1.25	20.0
0150	1.5	15.0
0200	2	12.5

Hydraulic pump for pitch controllers

Hydraulic power is used to change blade pitch angle to insure operation at the turbine's rated speed.

Series 1

Model	Capacity (cc/rev)	Peak pressure (MPa)
1001	1.02	30.0
1002	2.05	30.0
1003	3.07	30.0
1004	4.09	25.0
1005	5.12	20.0
1006	6.14	15.0

Note: The body is made of aluminum alloy.
The photographs are for reference only.

Machine Tools

JTEKT also manufactures high performance Toyoda machining centers for the production gear boxes and other large wind power components.
Large, Fast and Strong – Top of the class in all three areas
Optimal horizontal machining center for large-size parts machining

FH1250SX
Large horizontal machining center

Quick rapid feed rate of 42m/min, fastest in its class

Max. workpiece range: Φ 2,400 x 1,800mm
Pallet load capacity: 5,000kg
Pallet size: 1,250 x 1,250mm
Large-torque spindle: 8,000min⁻¹
Max. spindle torque: 1,009N·m

FH1600SW5i
Large horizontal machining center

Equipped with TOYOPUC-Touch, a new CNC incorporating smartphone-inspired operability

Max. workpiece range: Φ 3,200 x 2,200mm
High-rigidity quill spindle: Φ 150mm quill, Φ 200mm high-rigidity bearing

Koyo® Products for Wind Turbine Generators

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VEGETABLE OIL INK

JTEKT

CAT. NO. B1002E-4
Printed in Japan '16.11-5BCH ('08.07)

Koyo®

Miniature One-way Clutch

JTEKT
JTEKT CORPORATION

JTEKT
Koyo TOYODA

CAT.NO.B2024E

Miniature One-way Clutch

We can provide you with various types of miniature one-way clutches, both high- and low-load types with shaft diameters between 4 mm and 12 mm, based on our highly advanced technical know-how and abundant experience.

Features

- Creation of detent protrusions over the surface of the outer-race diameter prevents creeping without strict setting of dimensional tolerance over the engaged surfaces.
- Prefilled optimal grease eliminates replenishment of oil and grease in normal operating conditions.
- Preassembled integrated modules made of synthetic-resin housing and one-way clutch are available. Custom design for various items such as gears, timing pulleys, cams, and rubber rollers are also available. Please contact JTEKT.

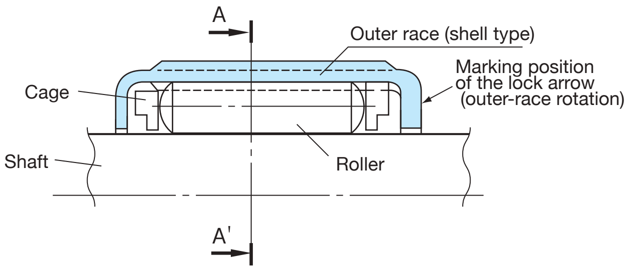
Structure and principles

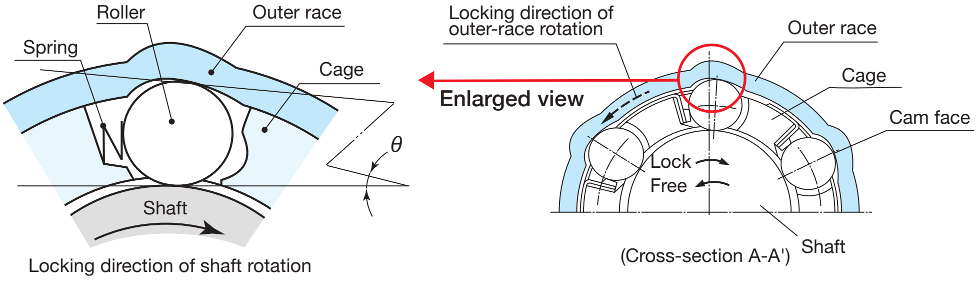
Clutch engagement

Clockwise shaft rotation at the cross-section A-A' presses the roller on the cam surface of the outer race, locking the cam surface and the shaft by wedge action and driving the outer race.

Clutch disengagement

Counterclockwise shaft rotation at the cross-section A-A' detaches the roller from the cam surface of the outer race and allows rotation of the shaft without driving the outer race.



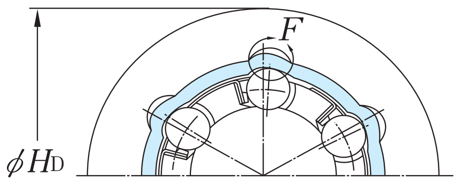


Types and characteristics

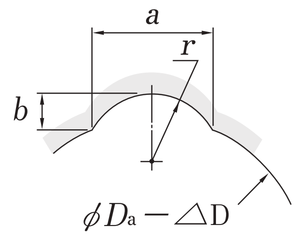
	EWC series (with synthetic resin spring)		1WC series (with metal spring)
	High-load type	Low-load type	Torque capacity
	EWC･･･C	EWC･･･A	1WC
Torque capacity	High load	Low load	High load
Operating temperature range	−10～+70℃		−10～+90℃
Lock life	More than 1 million lock times (subject to torque capacity not exceeding the one described in the specifications and dimensions)		
Insert molding	Not available		Available

Housing dimensions and accuracy

Tolerances of housing dimensions and accuracy depend on the materials and wall thickness. So, please consult JTEKT.
The following table shows the interference for polyacetal housing and steel housing (⊿D). The recommended plane roughness for steel housing inside diameter is 6S.



Housing shape



Enlarged section F

Shaft dimensional tolerances and accuracy

In general, an inner race is not used; instead, the shaft functions as a bearing ring. Therefore, to fully demonstrate the clutch functions, the following dimensional tolerances and accuracies must be satisfied.

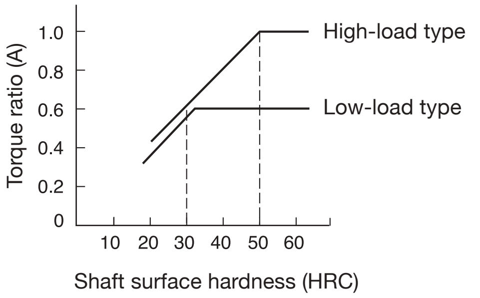
	High-load type (EWC･･･C, 1WC･･･)	Low-load type (EWC･･･A)
Shaft tolerance zone class	h8	
Surface hardness	50 HRC or more	30 HRC or more
Surface roughness (Ra)	0.3a or less	0.8a or less
Circularity and cylindricity	0.005 mm or less	

1) Shaft diameter dimensional tolerance in case clutch engagement accuracy is not required or no radial load and moment are applied:
- Shaft diameter 6 mm or less and EWC0809: 0 to 0.040 mm
- Shaft diameter 8 mm or more (except EWC0809): h10

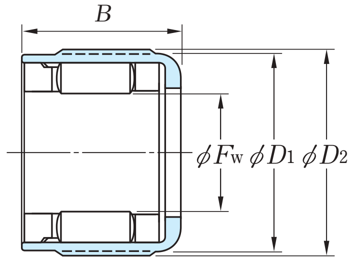
2) Surface hardness in case that load torque is smaller than torque capacity.
- The chart to the right shows the target value of shaft surface hardness against torque ratio (A).

Where:

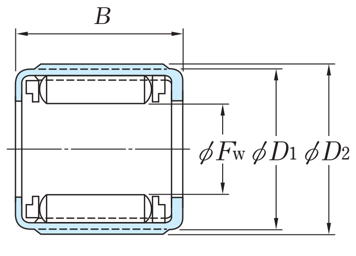
$$\text{Torque ratio (A)} = \frac{\text{load torque}}{\text{torque capacity of high-load type}}$$



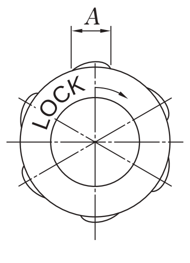
Model series and dimensions



EWC series (with resin spring)



1WC series (with metal spring)



Shaft diameter	F_W	D_1	D_2	B	A	Torque capacity	Designation		Number of protrusions on outer race (equal intervals)	Housing recommended dimensions (polyacetal resin)						Housing recommended dimensions (steel)						(Reference) weight	
							EWC series (with resin spring)	1WC series (with metal spring)		H_D	a	b	r	Da	⊿D	H_D	a	b	r	Da	⊿D	EWC	1WC
mm in	mm in	mm in	mm in	mm in	mm in	N-m				mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	g	g
4	4	8	8.4	6	2.6	0.08	EWC0406A	—	4	12	2.65	0.50	2	8	0.06	10	2.9	0.65	2	8	0.03	1	—
	4	8	8.4	6	2.6	0.15	EWC0406C	—	4	12	2.65	0.50	2	8	0.06	10	2.9	0.65	2	8	0.03	1	—
6	6	10	10.4	6	2.8	0.19	EWC0606XC	—	6	14	2.8	0.57	2	10	0.08	12.5	3.1	0.85	2	10	0.03	1.4	—
	6	10	10.4	7.5	2.8	0.25	EWC0608XA	—	6	14	2.8	0.57	2	10	0.08	12.5	3.1	0.85	2	10	0.03	1.7	—
	6	10	10.4	7.5	2.8	0.44	EWC0608XC	—	6	14	2.8	0.57	2	10	0.08	12.5	3.1	0.85	2	10	0.03	1.7	—
	6	10	10.4	8	2.8	0.25	EWC0608A	—	6	14	2.8	0.57	2	10	0.08	12.5	3.1	0.85	2	10	0.03	1.7	—
	6	10	10.4	8	2.8	0.44	EWC0608C	—	6	14	2.8	0.57	2	10	0.08	12.5	3.1	0.85	2	10	0.03	1.7	—
	6	10	10.4	8	2.8	0.44	—	1WC0608	6	14	2.8	0.57	2	10	0.08	12.5	3.1	0.85	2	10	0.03	—	2
	6	10	10.4	12	2.8	0.88	—	1WC0612	6	14	2.8	0.57	2	10	0.08	12.5	3.1	0.85	2	10	0.03	—	3
8	8	12	12.4	9	2.6	0.49	EWC0809A	—	6	16	2.6	0.48	2	12	0.1	14	3	0.7	2	12	0.035	2.4	—
	8	12	12.4	9	2.6	0.88	EWC0809C	—	6	16	2.6	0.48	2	12	0.1	14	3	0.7	2	12	0.035	2.4	—
	8	14.2	15	12	3.6	1.18	EWC0812A	—	6	18.5	3.6	0.87	2.3	14.2	0.11	17.5	3.9	1.15	2.3	14.2	0.035	5.8	—
	8	14.2	15	12	3.6	1.96	EWC0812C	—	6	18.5	3.6	0.87	2.3	14.2	0.11	17.5	3.9	1.15	2.3	14.2	0.035	5.8	—
	8	14.2	15	12	3.6	1.96	—	1WC0812	6	18.5	3.6	0.87	2.3	14.2	0.11	17.5	3.9	1.15	2.3	14.2	0.035	—	7
	8	14.2	15	14.5	3.6	2.65	—	1WC0815	6	18.5	3.6	0.87	2.3	14.2	0.11	17.5	3.9	1.15	2.3	14.2	0.035	—	8
10	10	16	17	10	5	1.18	EWC1010A	—	6	21	5	1.2	3.2	16	0.13	19	5.3	1.4	3.2	16	0.035	6	—
	10	16	17	10	5	1.96	EWC1010C	—	6	21	5	1.2	3.2	16	0.13	19	5.3	1.4	3.2	16	0.035	6	—
	10	16	17	12	5	1.37	EWC1012A	—	6	21	5	1.2	3.2	16	0.13	19	5.3	1.4	3.2	16	0.035	6.8	—
	10	16	17	12	5	2.35	EWC1012C	—	6	21	5	1.2	3.2	16	0.13	19	5.3	1.4	3.2	16	0.035	6.8	—
	10	16	17	12	5	2.35	—	1WC1012	6	21	5	1.2	3.2	16	0.13	19	5.3	1.4	3.2	16	0.035	—	8
12	12	18	19	16	5.1	6.28	—	1WC1216	8	23	5.1	1.2	3.3	18	0.14	21	5.4	1.4	3.3	18	0.035	—	12

Multi-function devices

Automatic teller machines
(ATMs)

Applications of miniature one-way clutch

This product has gained a high reputation for use in clutch systems in a rariety of equipment and derices throughout a variety of fields,such as office automation equipment,including paper copiers and printers.

Various types of
ticket vending machines

Fishing tackle (reels)

Koyo Miniature One-way Clutch

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CAT.NO.B2024E
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Koyo®

New Development / New Product

New Ceramic Ball Bearings for Electric Motors

EXSEV

Our newly developed, first in Japan ceramic material makes ceramic bearings available for more applications.

Ceramic rolling elements prevent electrical pitting in bearings for electric motors

- Our newly developed ceramic has only a slight difference in linear expansion coefficient(※) from the inner and outer ring material (bearing steel SUJ2), thus creating minimal internal clearances due to temperature change, allowing ceramic bearing use in an environment with a wide range of temperatures.

※Change in a material's length in response to a change in temperature of 1 degree Celsius.

- Our newly developed ceramic has similar insulation properties, strength, and durability (little change in acoustic value) with conventional silicon nitride material (Si_3N_4). (See the table below for details.)

■ Material properties

	New ceramic	Bearing steel (SUJ2)	Standard ceramic (Si_3N_4)
Density (g/cm^3)	6	7.8	3.2
Linear expansion coefficient (1/°C)	10.5×10^{-6}	12.5×10^{-6}	3.2×10^{-6}
Vickers hardness (HV)	1280	750	1500
Module of longitudinal elasticity (GPa)	210	208	320
Poisson's ratio	0.31	0.30	0.29
3-point bending strength (MPa)	1200	–	1100
Fracture toughness ($MPa\cdot m^{1/2}$)	5～6	–	6
Conductivity	Insulator	Conductor	Insulator

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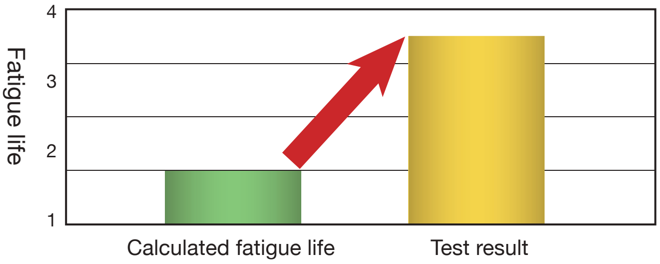
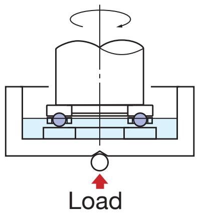
JTEKT Koyo TOYODA

Rolling fatigue life evaluation results

More than 3 times longer than calculated fatigue life



Test equipment

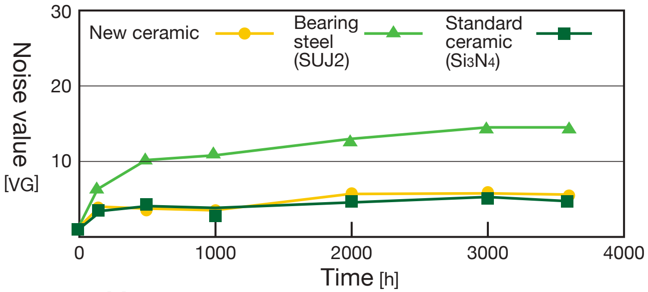


Test conditions

Contact stress	4.2 GPa
Lubrication	Oil bath

High-temperature Noise comparison test results

Noise comparison test results (150°C)

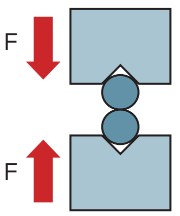


Test conditions

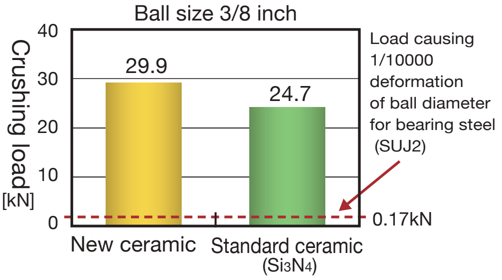
Lubrication	KVC (urea-based grease)
Ambient temperature	Outer ring temperature 150°C
Load	Fa=0.16kN
Rotational speed	3000 min^{-1}
Calculated grease life	3600 h
Test duration	3600 h

No significant deterioration of the acoustic value of our new ceramic after 3600 hours

Crushing load test



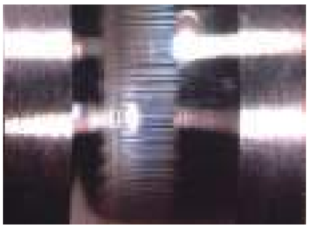
Schematic of crushing load test

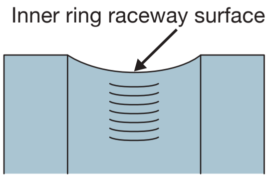


Crushing load test results

This new ceramic has strength equivalent to conventional silicon nitride ceramic (Si_3N_4).

Wave-like wear by electrical pitting





【Electrical pitting】

Due to the nature of electric motors, harmful voltage is generated by high-frequency current during operation, and above a certain voltage can produce arcing between the bearing raceway surface and rolling elements. Electrical pitting occurs when a surface in rolling contact is locally melted due to the arcing, reducing bearing service life. To avoid such pitting, using an insulating ceramic rolling element is one of the most reliable solutions. Our newly developed ceramic has insulation properties equivalent to those of conventional silicon nitride ceramic (Si_3N_4).

Applications

- Inverter motors
- Fan motors

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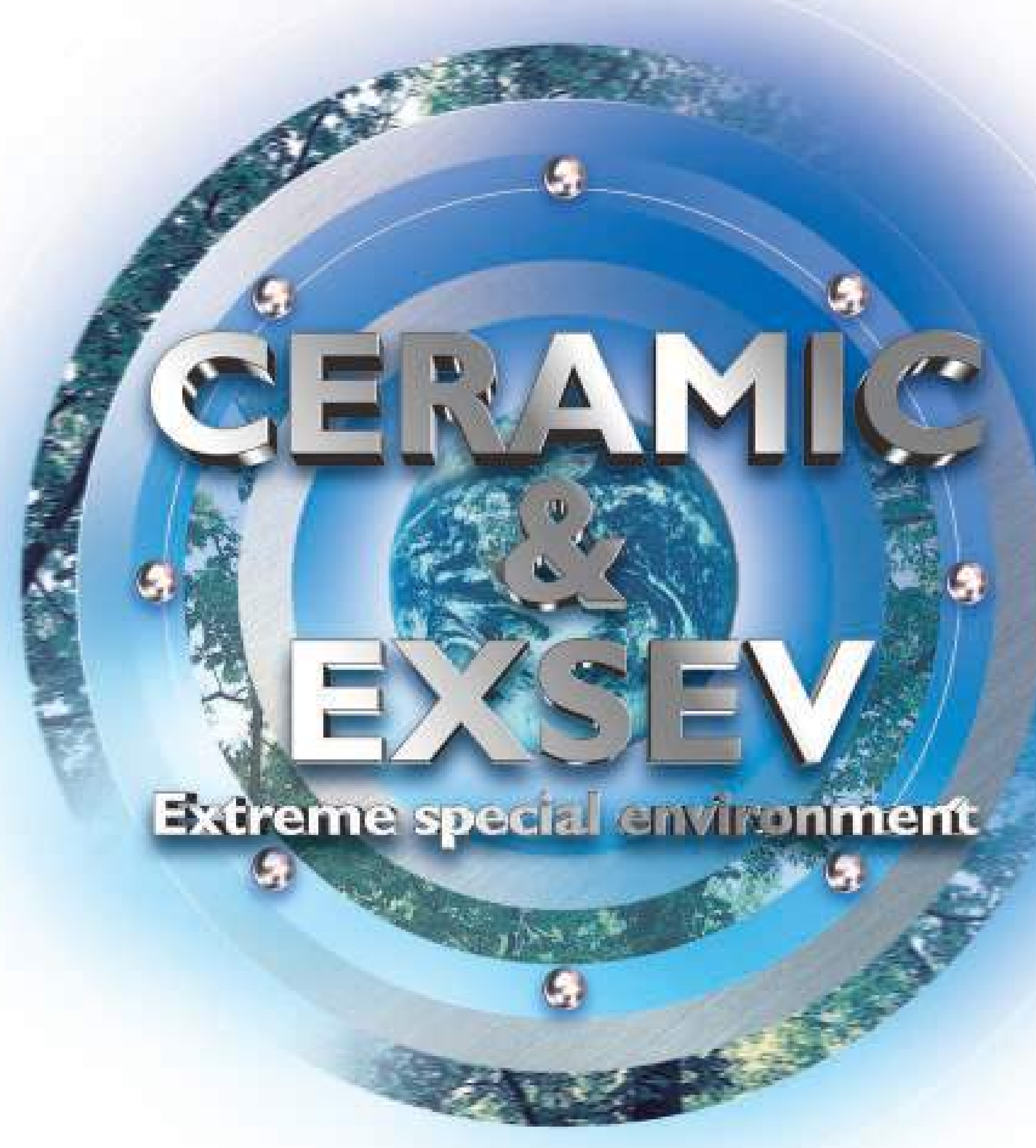
Koyo®

EXSEV Bearings and CERAMIC Bearings for Extreme Special Environments



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Koyo®

EXSEV BEARINGS AND CERAMIC BEARINGS

FOR EXTREME SPECIAL ENVIRONMENTS

Koyo *EXSEV* BEARINGS AND CERAMIC BEARINGS
FOR EXTREME SPECIAL ENVIRONMENTS

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4 Supplementary Tables

Specifications Sheet

EXSEV
BEARING SERIES
Products and Applications

Koyo *EXSEV* Bearings and Ceramic Bearings for Extreme Special Environments are used for a wide range of the state of the art technologies.

New Clean Pro Bearing-PR

Clean

- New Clean Pro Bearing-PR
- Clean Pro Bearing-RZ
- Clean Pro Bearing-RB
- EXSEV®-EX
- EXSEV®-FA
- K series Full Complement Hybrid Ceramic Ball Bearings

X-ray Tube Units

Vacuum

- New Clean Pro Bearing-PR
- Clean Pro Bearing-RZ
- Clean Pro Bearing-RB
- EXSEV®-EX
- EXSEV®-FA
- EXSEV®-XT
- EXSEV®-WS
- EXSEV®-MG
- EXSEV®-PN
- EXSEV®-MO
- K series Full Complement Hybrid Ceramic Ball Bearings

Corrosion Guard Pro Bearing-SN

Corrosive

- Corrosion Guard Pro Bearing-SC
- Corrosion Guard Pro Bearing-SN
- Ceramic Bearings
- Corrosion Guard Pro Bearing-ZO
- Corrosion Guard Pro Bearing-MD
- EXSEV®-SK

Full Complement Ceramic Ball Bearings

High temperature

- Clean Pro Bearing-RB
- Full Complement Ceramic Ball Bearings
- EXSEV®-XT
- EXSEV®-WS
- EXSEV®-MG
- EXSEV®-PN
- EXSEV®-MO

Non-magnetic Hybrid Ceramic Bearing

Magnetic field

- Ceramic Bearings
- Non-magnetic Hybrid Ceramic Bearings

Hybrid Ceramic Bearings

Electric field

- Ceramic Bearings
- Hybrid Ceramic Bearings

Hybrid Ceramic Bearings

High Speed

- Hybrid Ceramic Bearings
- High Ability Angular Contact Ball Bearings

Grease-filled Bearings for Food Machinery

Hygiene

- Grease-filled Bearings for Food Machinery

Development and Manufacturing Facilities

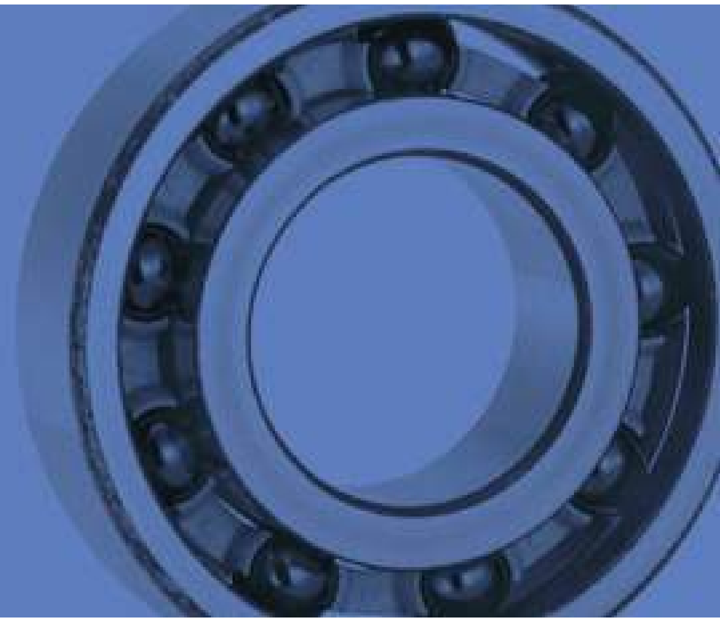
By continuously incorporating new improvements, Koyo *EXSEV* Bearings and Ceramic Bearings are applicable in more technologies than ever.

Technologies are advancing rapidly and bearings are required to satisfy more complicated and varied requirements under increasingly hostile operating conditions.

In response to such needs, JTEKT is committed to the development and manufacture of the EXSEV Bearing Series using the latest research / development and manufacturing facilities.

JTEKT intends to supply products that live up to customers' expectations, while contributing to environmental conservation and energy saving through streamlined manufacturing.

❶ Assembly in a clean room
❷ Corrosion-resistant bearing evaluation equipment
❸ Vacuum bearing evaluation equipment



❹ Ion plating facility
❺ High temperature bearing evaluation equipment
❻ Ceramic ball manufacturing line

Bearing Operations Headquarters

Shikoku Plant

RESEARCH AND DEVELOPMENT

1 EXSEV Bearings: Composition and Selection

Conventional bearings, made from bearing steel, and lubricants such as oil and grease, may not be applicable in an extreme special environment such as a clean room, vacuum, high temperature application or corrosive environment, or when special characteristics are required, such as being non-magnetic, or insulating, or having superior high speed performance.
Koyo EXSEV Bearings are a special bearing series, developed specifically to address such needs.
Please consult JTEKT when using bearings in a new, unprecedented environment, or when bearings with special characteristics are required.

1 Ceramic Bearings and Special Steel Bearings

2 Lubricants for EXSEV Bearings

3 How to Select EXSEV Bearings

4 EXSEV Bearings with Special Characteristics

1 Ceramic Bearings and Special Steel Bearings

The EXSEV Bearing Series has been developed for use in special applications where conventional bearings are not practical.

The EXSEV Bearings incorporate components made from special material and use special lubricants, to be applicable in extreme special environments such as a clean room, vacuum, high temperature application, or corrosive condition, and to realize special characteristics, such as being non-magnetic, or insulating, or having superior high speed performance.

The EXSEV Bearing series consist of Ceramic Bearings and Special Steel Bearings, depending on the specific materials of the components.

1-1 Ceramic Bearings

Ceramic Bearings, including components made from ceramic, have the special properties that steel bearings do not have, such as being non-magnetic or insulating. They can be used in new applications where conventional bearings have not been practical.

Ceramic Bearings are highly heat resistant, enabling a rolling bearing to be practical in a high temperature environment. The low density of ceramic decreases the centrifugal force induced by rolling elements (balls or rollers), contributing to an increased speed of the apparatus.

Properties of ceramic materials

1) Material characteristics

Table 1-1 below lists the mechanical and physical properties of major ceramic materials used as bearing materials. Table 1-2 compares silicon nitride and high carbon chromium bearing steel.

Table 1-1 Mechanical and physical properties of ceramic materials used as bearing materials

Ceramic Material		Silicon Nitride Si_3N_4	Zirconia ZrO_2	Silicon Carbide SiC
Property	**Unit**			
Density	g/cm^3	3.2	6.0	3.1
Linear expansion coefficient	K^{-1}	3.2×10^{-6}	10.5×10^{-6}	3.9×10^{-6}
Vickers hardness	HV	1 500	1 200	2 200
Module of longitudinal elasticity	GPa	320	220	380
Poisson's ratio		0.29	0.31	0.16
Three point bending strength	MPa	1 100	1 400	500
Fracture toughness	MPa · m$^{1/2}$	6	5	4
Heat resistance (in atmospheric air)	˚C	800	200	1 000 or higher
Thermal shock resistance	˚C	750 or higher	350	350
Coefficient of thermal conductivity	W/(m · K)	20	3	70
Specific heat	J/(kg · K)	680	460	670

Table 1-2 Comparison of characteristics of silicon nitride and high carbon chromium bearing steel

Property	Unit	Silicon Nitride Si_3N_4	High Carbon Chromium Bearing Steel SUJ2	Advantages of Ceramic Bearings
Density	g/cm^3	3.2	7.8	Decrease in centrifugal force induced by rolling elements (balls or rollers) ➔ Longer service life and reduced bearing temperature rises
Linear expansion coefficient	K^{-1}	3.2×10^{-6}	12.5×10^{-6}	Decreased internal clearance change due to reduced bearing temperature rises ➔ Lowered vibration and reduced preload changes
Vickers hardness	HV	1 500	750	Less deformation in rolling contact areas ➔ Higher rigidity
Module of longitudinal elasticity	GPa	320	208	
Poisson's ratio		0.29	0.3	
Heat resistance	˚C	800	180	Retention of superior load carrying characteristics under high temperature
Corrosion resistance		High	Low	Useful in acid or alkaline solutions
Magnetism		Non-magnetic	Ferromagnetic	Decreased rotational fluctuation in ferromagnetic field due to non-magnetization
Conductivity		Insulator	Conductor	Prevents electrical pitting
Bond		Covalent bond	Metallic bond	Decrease in adhesion (or material transfer) due to oil film thinning in rolling contact areas

2) Rolling fatigue of ceramic materials

The individual ceramic materials were tested for rolling fatigue under oil lubrication and under water lubrication, to evaluate their applicability as bearing material. Figs. 1-1 and 1-2 show the results of the tests.

The figures indicate that each ceramic material has a certain level of rolling fatigue strength and that silicon nitride has the highest fatigue strength among the ceramic materials tested.

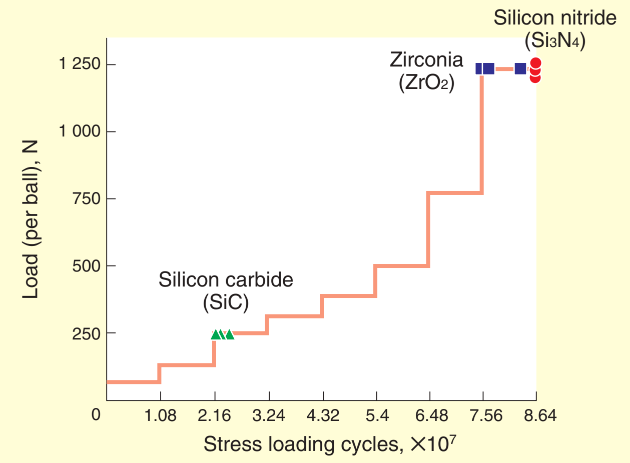


Fig. 1-1 Comparison in rolling fatigue life under oil lubrication

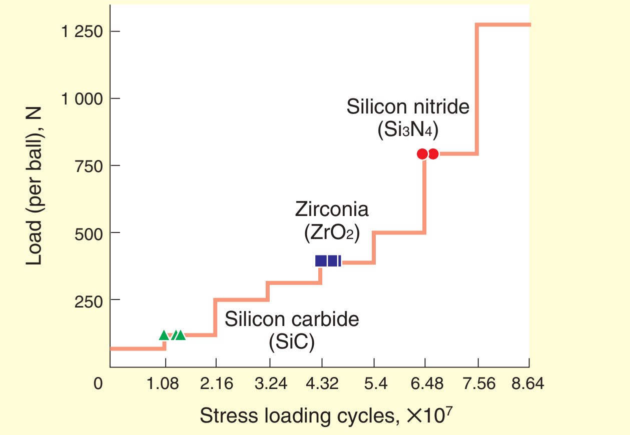
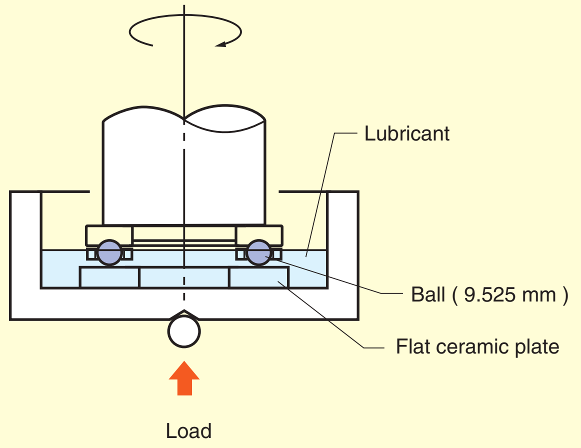


Fig. 1-2 Comparison in rolling fatigue life under water lubrication

Test conditions

	Oil lubrication	Water lubrication
Lubricant	Spindle oil	City water
Ball	Bearing steel	Ceramic
Load	Increased in stages at every 1.08 × 10^7 cycles	
Rotational speed	1 200 min^{-1}	

Evaluation equipment



Evaluation equipment appearance

Fig. 1-3 Rolling fatigue life test conditions and evaluation equipment

3) Ceramic materials suitable for rolling bearings

Table 1-3 shows the results of evaluating the ceramic materials in terms of their characteristics and the rolling fatigue strength. Among the ceramic materials tested, silicon nitride is the most suitable as rolling bearing material.

JTEKT uses the silicon nitride produced by the hot isostatic pressing (HIP) method as the standard ceramic material for bearings.

4) Composition of ceramic bearings

Koyo ceramic bearings are divided into Full Ceramic Bearings (with all components, namely, the outer ring, inner ring and rolling elements, made of ceramic) and Hybrid Ceramic Bearings (with only the rolling elements made of ceramic). The outer ring and inner ring of the Hybrid Ceramic Bearings are made from special steel, including high carbon chromium bearing steel. The cage may be made of a metallic material, resin, or composite material, depending on the intended operating conditions of the bearing.

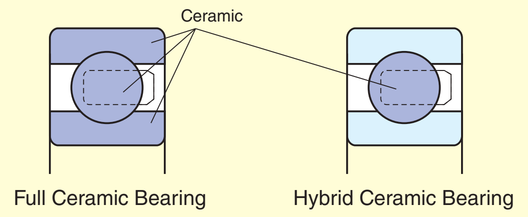


Fig. 1-4 Composition of ceramic bearings

● **Table 1-3 Ratings of ceramic materials as rolling bearing materials**

	Application to rolling bearings		
	Rating	Performance and use	Characteristics
Silicon nitride Si_3N_4	◎	· Comparable to bearing steel in load carrying capability and service life · Suitable for high performance applications	· High speed · High vacuum · Corrosion resistant · Heat resistant · Non-magnetic · High rigidity
Zirconia ZrO_2	○	· Useful under a limited load · Applicable in highly corrosive chemicals	· Highly corrosion resistant
Silicon carbide SiC	○	· Useful under a limited load · Applicable in highly corrosive chemicals	· Highly corrosion resistant · Highly heat resistant

Load ratings and service life of ceramic bearings

Silicon nitride, a ceramic material, is more rigid than high carbon chromium bearing steel; therefore, a bearing including silicon nitride components is subject to a higher contact stress on the area of contact between bearing raceways and rolling elements. Accordingly, to estimate the service life of ceramic bearings, whether the rolling bearing theory is applicable or not is critical.

Basic dynamic load rating

The ISO standard defines the basic dynamic load rating as the pure radial load (for radial bearings), constant in magnitude and direction, under which the basic rating life of 1 million revolutions can be obtained, when the inner ring rotates while the outer ring is stationary or vice versa. The basic dynamic load rating represents the resistance of a bearing against rolling fatigue.

Basic static load rating

The basic static load rating is defined as the static load which corresponds to the calculated contact stress shown below, at the center of the most heavily loaded raceway/rolling elements.

Self-aligning ball bearings : 4 600 MPa
Other ball bearings : 4 200 MPa
Roller bearings : 4 000 MPa

JTEKT defines the dynamic load rating and static load rating of ceramic bearings based on the results of their service life tests, the maximum allowable static load of the ceramic materials, the elastic deformation test results of high carbon chromium bearing steel, and other related data, as shown in Table 1-4.

● **Table 1-4 Load ratings of ceramic bearings**

	Full Ceramic Bearing	Hybrid Ceramic Bearing
Dynamic load rating C_r	Comparable to steel bearings	Comparable to steel bearings
Static load rating C_{0r}	Comparable to steel bearings	85% that of steel bearings

The steel bearings here refer to bearings consisting of rings and rolling elements both made of high carbon chromium bearing steel.

1) Rolling fatigue life of ceramic bearings

A typical service life test for Ceramic Bearings and steel bearings was performed under the conditions specified in Fig. 1-6.

The test results showed that the service life of Ceramic Bearings was equal to or longer than that of steel bearings, exceeding the calculated life.

The Ceramic Bearings were found to exhibit flaking (Fig. 1-5) when their service life terminated. The same phenomenon was observed on the steel bearings whose service life terminated.

Based on these findings, as the dynamic load rating of a Ceramic Bearing, that of a steel bearing of the same dimensions can be used.

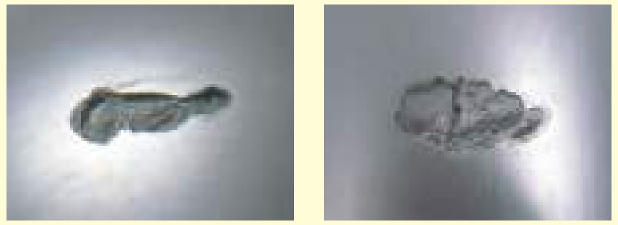
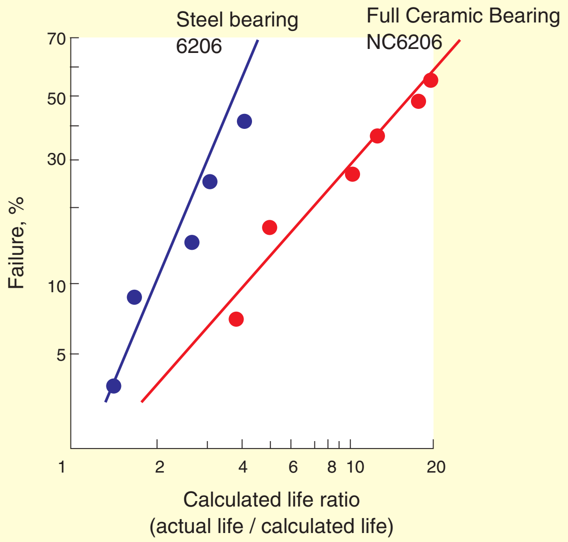

Ceramic ball
Ceramic inner ring

Fig. 1-5 Flaking on ceramic ball and inner ring



● **Rolling fatigue test conditions**

Bearing number	Material (outer/inner rings and balls)	Dimensions, mm
NC6206	Silicon nitride(Si_3N_4)	30×62×16 (bore × outside dia. × width)
6206	Bearing steel(SUJ2)	

Specification	Condition
Load	5 800 N
Rotational speed	8 000 min^{-1}
Lubrication oil	AeroShell Turbine Oil 500
Temperature	70 ± 2˚C

Fig. 1-6 Rolling fatigue life of Full ceramic bearings and steel bearings

2) Static load rating of ceramic bearings

The basic static load rating of a steel bearing represents a load that produces a localized permanent deformation in the rolling element/raceway contact area, impeding smooth rotation.

However, ceramic materials, which are highly rigid, produce little permanent deformation. Therefore, the theory of the basic static load rating for steel bearings is not applicable to ceramic bearings.

• Static load rating of Full Ceramic Bearings

When exposed to continuous excessive loads, ceramic materials may break down; however, before breakdown occurs, the materials develop cracking.

Fig. 1-7 compares the load measurements at which ceramic balls developed cracking with the basic static load ratings of steel bearings. Fig. 1-8 shows the measurement system.

As these results show, the loads at which cracks develop on the Full Ceramic Bearing are far higher than that of the basic static load rating of steel bearings. This means that the basic load ratings specified in the ISO standard can be used as the allowable static loads of the Full Ceramic Bearing.

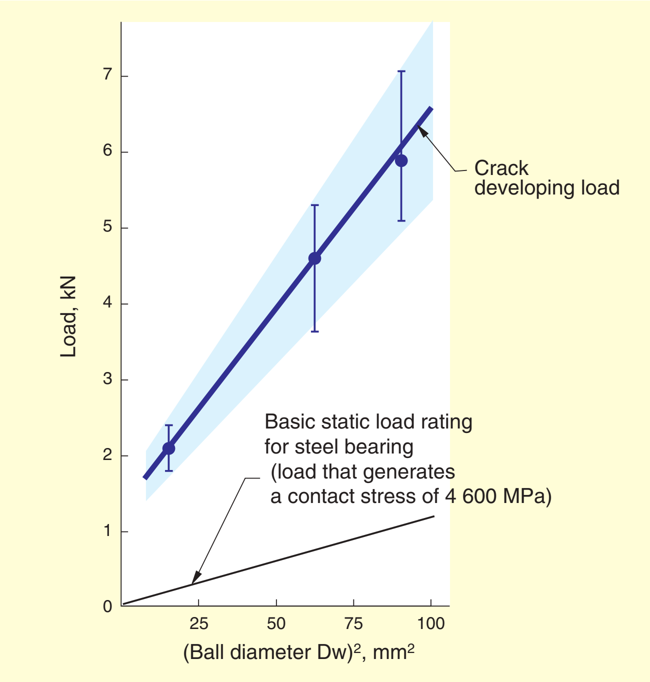


Fig. 1-7 Crack developing loads for Full Ceramic Bearings

• Static load rating of Hybrid Ceramic Bearings

The theory of the static load rating for steel bearings is applicable to Hybrid Ceramic Bearings because their outer and inner rings are made of steel and accordingly any deformation is permanent.

Table 1-5 shows the results of a test for which a high carbon chromium bearing steel ball and ceramic ball were pressed against a flat plate of high carbon chromium bearing steel and the resulting permanent deformations (indentation depths) on the flat plate and balls were measured.

● Table 1-5 Measurements of permanent deformation produced on flat steel plate and balls

	Load kN	Permanent deformation (average), mm		Permanent deformation (sum of averages), mm
		Flat plate (bearing steel)	Ball	
Ceramic ball	0.65	0.5	—	0.5
	1.3	1.9	—	1.9
	2.6	5.2	—	5.2
	3.9	9.3	—	9.3
Steel ball	0.65	0.4	—	0.4
	1.3	1.3	0.11	1.41
	2.6	4.0	0.41	4.41
	3.9	6.8	1.18	7.98

These results indicate that ceramic balls do not suffer permanent deformation and that the permanent deformation produced on the flat steel plate by the ceramic balls is approximately 1.2 times the sum of the deformation produced on the flat plate by steel ball and the deformation that the steel ball undergo.

Accordingly, the static load rating of Hybrid Ceramic Bearings can be determined based on the permanent deformation of their bearing steel rings. JTEKT uses the load equal to 85% of the static load rating of steel bearings as the static load rating of the Hybrid Ceramic Bearings.

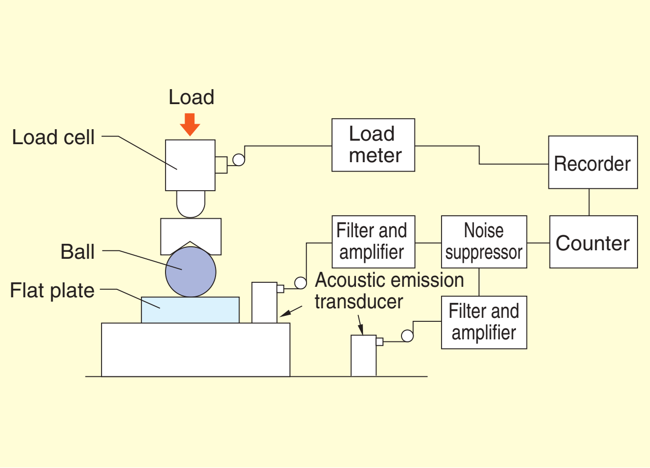


Fig. 1-8 Crack generating load measurement system

3) Impact strength of ceramic bearings

To evaluate the impact strength of ceramic bearings, ceramic balls were crushed by two methods: by a static load and an impact load. The test results are shown in Fig. 1-9. Fig. 1-10 shows the testing methods.

This figure shows that the impact strength of the ceramic bearings is almost equal to the static load strength, which means the bearings possess sufficient impact strength.

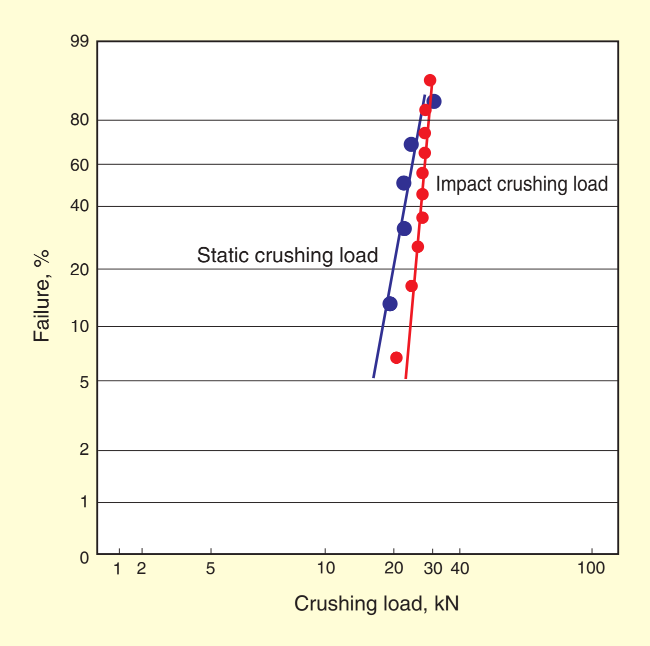


Fig. 1-9 Comparison of static load and impact load that crush ceramic balls

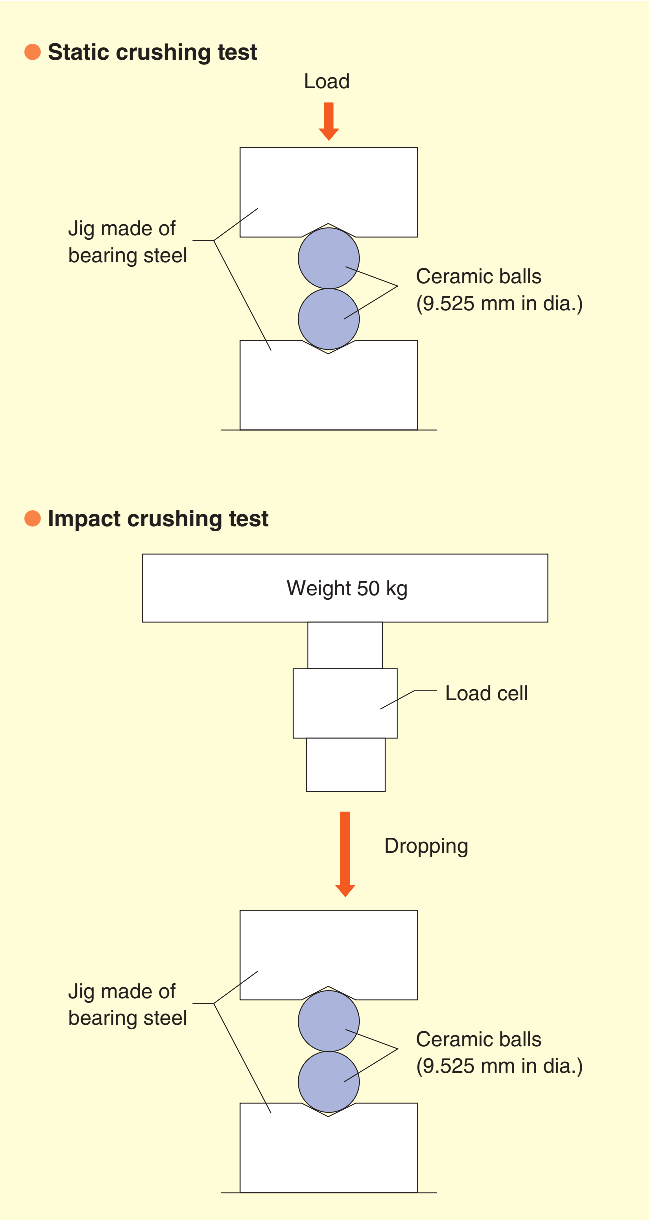


Fig. 1-10 Ceramic ball crushing test method

4) Fitting of ceramic bearings

When using ceramic bearings, it should be noted that ceramic materials are largely different from steel materials in the coefficient of linear expansion. Attention should therefore be paid to fitting stresses and temperature rises.

The following are the results of evaluating the fitting of a Ceramic Bearing on a stainless steel shaft.

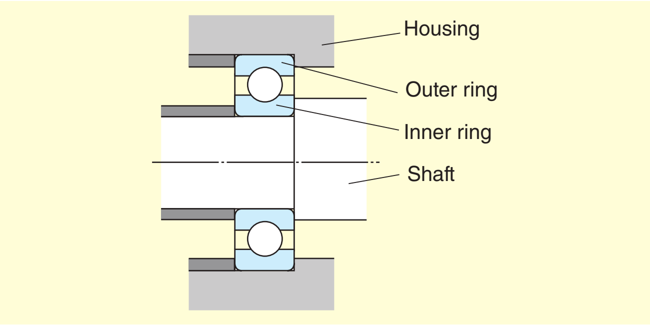


Fig. 1-11 Bearing fitting

• Maximum stress produced by fitting

Table 1-6 shows the results of a static strength test conducted on a ceramic ring fitted on a stainless steel shaft. Table 1-7 shows the results of a dynamic strength test (running test) conducted on a ceramic ring fitted on a stainless steel shaft.

Based on the results of these tests, JTEKT makes it a rule for the maximum stress produced by interference to be no greater than 150 MPa when a ceramic inner ring is fitted on a stainless steel shaft.

Consult JTEKT for applications requiring tighter fitting.

● Table 1-6 Typical results of static strength test on ceramic bearing shaft fitting

	Interference, L_{10} μm	Ring's fracture stress MPa
Solid shaft	50	399
Hollow shaft	68	332

● Table 1-7 Typical results of dynamic strength test on ceramic bearing shaft fitting

	Max. allowable interference μm	Max. allowable stress for ring MPa
Solid shaft	31	243
Hollow shaft	43	204

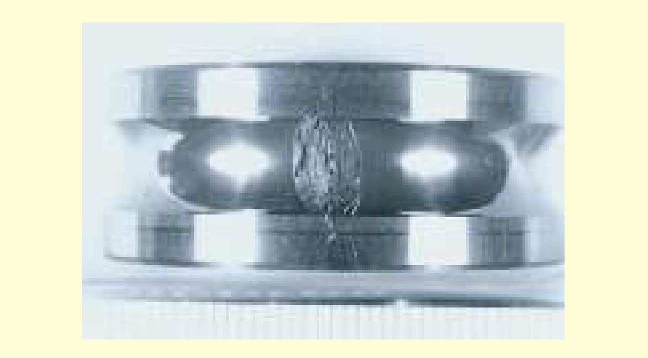


Fig. 1-12 Ceramic inner ring damaged by dynamic strength test

• Influence of temperature

During operation, bearing temperature exceeds the ambient temperature. When a ceramic bearing is operated on a stainless steel shaft or in a stainless steel housing, the interference with the shaft increases due to the difference in linear expansion coefficient while the interference with the housing decreases. (When the outer ring is loose-fitted, the clearance increases.)

To determine the class of fit for a ceramic bearing, the maximum temperature during operation should be assessed carefully.

■ The maximum stress generated on the inner ring due to the interference with the shaft can be determined from the following equation:

$$\sigma = P_m \cdot \frac{D_i^2 + d^2}{D_i^2 - d^2}$$

$$P_m = \varDelta_{deff}\left[\frac{d}{E_B}\left(\frac{D_i^2 + d^2}{D_i^2 - d^2} + \nu_B\right) + \frac{d}{E_S}\left(\frac{d^2 + d_0^2}{d^2 - d_0^2} - \nu_S\right)\right]^{-1}$$

σ :Maximum circumferential stress to interference (MPa)
P_m :Pressure of contact on fitting surface (MPa)
d, D_i :Inner ring bore diameter and outside diameter (mm)
$\varDelta_{deff}$:Effective interference of inner ring (mm)
d_0 :Bore diameter of hollow shaft (mm)
E_B, ν_B :Bearing's modulus of longitudinal elasticity and Poisson's ratio (MPa)
E_S, ν_S :Shaft's modulus of longitudinal elasticity and Poisson's ratio (MPa)

1-2 Special Steel Bearings

Table 1-8 lists the typical special steels used to produce the bearing rings and rolling elements of EXSEV Bearings.

● Table 1-8 Characteristics of the typical special steels used for EXSEV Bearings

◎ : Superior, ○ : Good

	Hardness HRC	Modulus of longitudinal elasticity GPa	Coefficient of linear expansion $\times 10^{-6}$K^{-1}	Load carrying capability	Applications
High carbon chromium bearing steel SUJ2	61	208	12.5	◎	Hybrid Ceramic Bearings for insulation, etc.
Martensitic stainless steel SUS440C	60	208	10.5	◎	Clean environments and vacuum environments
Precipitation hardening stainless steel SUS630	40	196	11.0	○	Corrosive environments
High speed tool steel M50	61	207	10.6	◎	High temperature environments
High speed tool steel SKH4	64	207	12.0	◎	High temperature environments
Non-magnetic stainless steel	43	200	18.0	○	Magnetic field environments

1) Bearings for use in clean and/or vacuum environments

The rings and rolling elements of conventional bearings are made of high carbon chromium bearing steel (JIS SUJ2), which is resistant to rolling fatigue. However, due to a relatively low corrosion resistance, this steel requires application of anticorrosive oil or other suitable rust preventive measure.

Applying anticorrosive oil to bearings is not favorable for use in a clean and / or vacuum environment, due to the possibility of contamination. Accordingly, EXSEV Bearings use martensitic stainless steel (JIS SUS440C), which is highly corrosion resistant, as a standard material for use in a clean environment.

2) Bearings for use in corrosive environments

For a highly corrosive environment where the SUS440C is not enough to prevent corrosion, precipitation hardening stainless steel (JIS SUS630) is used. However, SUS630 has a hardness of 40 HRC, which is inferior to other materials in load carrying capability and rolling fatigue strength.

3) Bearings for use in high temperature environments

Fig. 1-13 shows the high temperature hardness of various materials. SUS440C has a hardness of 55 HRC at 300˚C, which means it can be used in a high temperature environment of up to approximately 300˚C. In an environment heated in excess of 300˚C, high speed tool steel (JIS SKH4, AISI M50, etc.) should be used.

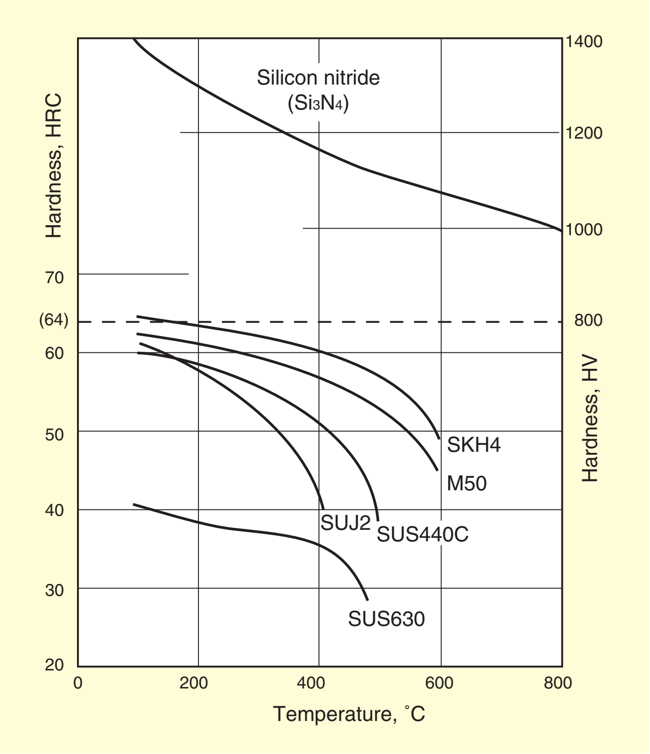


Fig. 1-13 High temperature hardness of various bearing materials

2 Lubricants for EXSEV Bearings

Bearing performance depends on lubrication; it is no exaggeration to say that lubrication determines the service life of bearings. Grease or a solid lubricant is properly used to lubricate the EXSEV bearings.

Compared with solid lubricants, grease is superior for the high speed performance, load carrying capability, and service life of bearings. Therefore, it is recommended to use grease as much as possible.

Grease cannot be used for some application in an ultrahigh vacuum, high temperature, or clean environment. In an application where oil evaporation from grease is unacceptable, solid lubricants should be used.

2-1 Grease

1) High temperature, vacuum or clean environments

Fluorinated greases are known as useful for high temperature applications. Its base oil is perfluoropolyether (PFPE) and its thickener is polytetrafluoroethylene (PTFE).

Fluorinated grease has a low evaporation pressure, and can be used in a vacuum environment of approximately 10^{-5} Pa at room temperature. Another advantage of this grease is low particle emissions, and is applicable in a clean environment. Owing to these excellent characteristics, fluorinated grease is used as the standard grease for the EXSEV Bearings.

2) High vacuum environments

Fluorinated greases are classified according to whether the base oil includes an acetal bond ($-O-CF_2-O-$) and whether side chains are included (Table 2-1).

Note that when a fluorinated grease is used in a vacuum, these differences in molecular structure may cause the molecular chains to be disconnected and decompose, resulting in a difference in the amount of gas emissions in the vacuum.

For the PFPE of the three greases listed in Table 2-1, Fig. 2-1 shows the results of gas emissions evaluation, using four ball type vacuum test equipment.

As can be seen Fig. 2-1, oil A, which originally has the acetal structure, apparently emits a great amount of oxide components, such as CF_2O^+, $C_2F_3O^+$ and $C_2F_5O^+$, which are attributed to the decomposition of the acetal structure. It emits a greater amount of gas than other oils.

As the standard grease for the EXSEV Bearings, JTEKT uses fluorinated grease containing oil B or PFPE, whose molecular chains are not easily torn off.

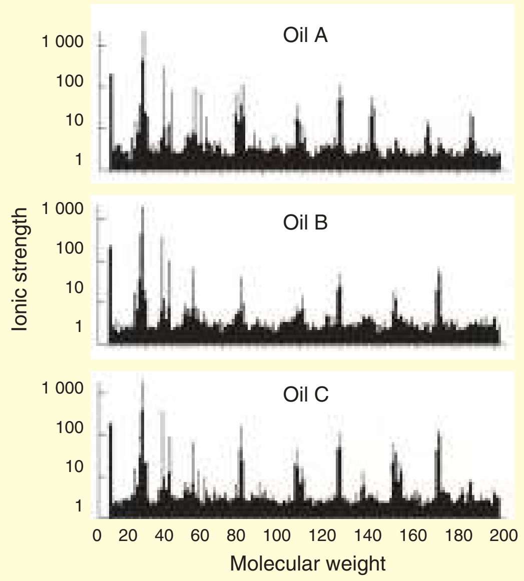
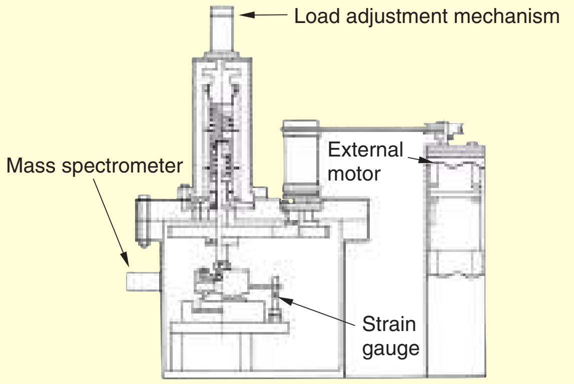


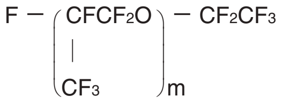
Fig. 2-1 Differences in gas emissions from PFPE



Exhaust system : Turbo molecular pump & rotary pump
(exhaust possible up to 10^{-7} Pa)

Fig. 2-2 Four ball type vacuum test equipment

Table 2-1 Tested PFPEs and their characteristics

Oil	Molecular structure	Viscosity, 20°C mm²/s	Mean molecular weight	Vapor pressure, 20°C Pa
A	$CF_3-(OCF_2CF_2)_p-(OCF_2)_q-OCF_3$	255	9 500	4×10^{-10}
B	$F-(CF_2CF_2CF_2O)_n-CF_2CF_3$	500	8 400	7×10^{-9}
C	 $F-\left(\begin{array}{c}CFCF_2O\\ \vert\\ CF_3\end{array}\right)_m-CF_2CF_3$	2 700	11 000	4×10^{-12}

2-2 Solid Lubricants

In an environment where oil and grease cannot be used, a solid lubricant is used to lubricate bearings.

Solid lubricants can roughly be classified into soft metals, layer lattice materials, and polymeric materials.

Table 2-2 shows the characteristics of major solid lubricants used for the EXSEV Bearings, along with the major applications where the individual solid lubricants are used.

1) Soft metals

Soft metals, such as silver (Ag) and lead (Pb), are coated on balls by the ion plating method (refer to Fig. 2-3). These lubricants are effective for use in ultrahigh vacuum environments where gas emissions from bearings should be avoided.

Silver coated components require careful handling because silver is susceptible to oxidization and durability deteriorates rapidly once oxidized. Lead is seldom used as a lubricant because it is hostile to the environment.

2) Layer lattice materials

Among layer lattice materials, molybdenum disulfide (MoS_2) is coated to the cage and bearing rings, or is used as an additive for composite materials, while tungsten disulfide (WS_2) is not used as a coating material but used only as an additive for composite materials (refer to Fig. 2-4).

These lubricants are superior to polymeric materials in heat resistance and load carrying capability, and are used for high temperature applications or applications where a large load carrying capability is required.

Layer lattice materials should not be used in a clean environment because they emit an excessive amount of particles.

3) Polymeric materials

Polymeric materials are coated to the cage and/or bearing rings. They are also used to make cages (refer to Fig. 2-5).

Polymeric materials are suitable for applications where cleanliness is critical or the environment is corrosive. Because they are relatively independent of ambient conditions, they are suitable for applications where bearings are repeatedly exposed to atmospheric air and a vacuum.

Fig. 2-3 Balls coated with silver ion plating

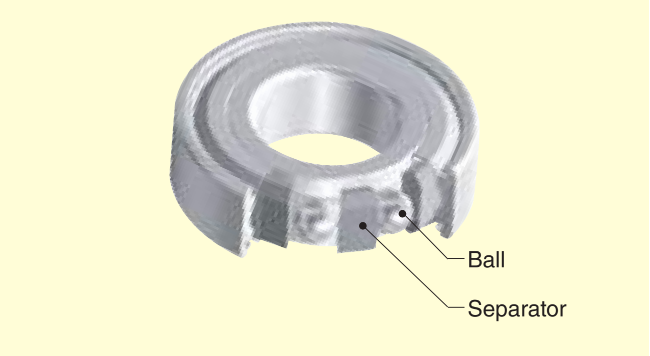


Fig. 2-4 Separator including tungsten disulfide

Fig. 2-5 Cage made from fluorocarbon resin

Table 2-2 Characteristics of major solid lubricants used for EXSEV Bearings

◎ : Superior, ○ : Good, △ : Acceptable

Solid lubricant		Thermalstability, °C		Coefficient of friction		Load capacity MPa	Particle emissions	Gas emissions	Applications
		Atmospheric air	Vacuum	Atmospheric air	Vacuum				
Soft metals	Silver (Ag)	–	600 or higher	–	0.2 to 0.3	2 500 max.	△	◎	Ultrahigh vacuum environments
	Lead (Pb)	–	300 or higher	0.05 to 0.5	0.1 to 0.15	2 500 max.	△	◎	
Layer lattice materials	Molybdenum disulfide (MoS_2)	350	1 350	0.01 to 0.25	0.001 to 0.25	2 000 max.	△	○	Vacuum environments, High temperature environments
	Tungsten disulfide (WS_2)	425	1 350	0.05 to 0.28	0.01 to 0.2	2 500 max.	△	○	
	Graphite (C)	500	–	0.05 to 0.3	0.4 to 1.0	2 000 max.	△	○	
Polymeric materials	Polytetrafluoroethylene (PTFE)	260	260	0.04 to 0.2	0.04 to 0.2	1 000 max.	◎	△	Clean, vacuum, and/or corrosive environments
	Polyimide (PI)	300	300	0.05 to 0.6	0.05 to 0.6	1 000 max.	○	△	

4) Service life of solid lubricants

Bearings lubricated with a solid lubricant can provide stable running performance as long as the lubricant is supplied continuously. When the lubricant is used up, the metal components become in contact with each other, rapidly increasing running torque and reducing the service life of the bearing. The service life of bearings is greatly influenced by the operating conditions. As a consequence, it is not always possible to accurately estimate the service life of bearings lubricated with solid lubricant because of the variations in operating conditions.

When a solid lubricant is used to lubricate a bearing, the bearing is generally used under a relatively light load, such as 5% or less of the basic dynamic load rating. Based on the results of various experiments under the above mentioned operating conditions, JTEKT provides the following experimental equation to enable an estimation of the service life of a deep groove ball bearing lubricated with a solid lubricant. For details, refer to the following product pages.

• Polymeric materials

The average service life of clean pro coated bearings can be estimated by the following equation:

$$L_{av} = b_2 \cdot \left(\frac{C_r \times 0.85}{P_r}\right)^q \times 0.016667/n$$

Where,

L_{av} : Average life, h
b_2 : Lubrication factor
$b_2 = 420$ (New Clean Pro Bearing-PR, Clean Pro Bearing-RZ)
C_r : Basic dynamic load rating, N
P_r : Dynamic equivalent radial load, N
q : Exponential coefficient, $q = 3$
n : Rotational speed, min^{-1}

Clean Pro Bearing-RZ .... Page 31
New Clean Pro Bearing-PR .... Page 35

• Layer lattice materials

The average service life of the EXSEV Bearings whose cage is coated with molybdenum disulfide (EXSEV®-MO) can also be estimated by the above equation, supposing that b_2 equals to 6.

EXSEV®-MO .... Page 63

• Soft metal materials

The average service life of the EXSEV Bearing whose balls are silver ion plated (EXSEV®-MG) can be estimated using the following equation:

$$L_{vh} = b_1 \cdot b_2 \cdot b_3 \left(\frac{C_r}{13 \times P_r}\right)^q \times 16\,667/n$$

Where,

L_{vh} : 90% reliability service life, h
C_r : Basic dynamic load rating, N
P_r : Dynamic equivalent radial load, N
q : Exponential coefficient, $q = 1$
n : Rotational speed, min^{-1} ($10 \leq n \leq 10\,000$)
b_1 : Speed factor
$b_1 = 1.5 \times 10^{-3}\, n + 1$
b_2 : Lubrication factor
$b_2 = 1$
b_3 : Ambient pressure/temperature factor
$b_3 = 1$(at 10^{-3} Pa and room temperature)

EXSEV®-MG .... Page 59

The basic dynamic load ratings and the permissible radial loads listed in this catalog are as follows.

Basic dynamic load rating: Strength against bearing rolling fatigue
Permissible radial load: They can be regarded as the maximum loads applicable to individual bearings. When an axial load is applied to the bearing, convert this axial load to a dynamic equivalent radial load, and then compare this value to the permissible radial load.

✻ Bearings lubricated with a solid lubricant are generally damaged by friction and not by rolling fatigue. For this reason, the permissible radial load is listed on each page for bearings lubricated with a solid lubricant.

3 How to Select EXSEV Bearings

3-1 Clean Environments

In a clean environment, bearings made of high carbon chromium bearing steel applied with rust preventive oil cannot be used. Accordingly, stainless steel bearings are used without applying rust preventive oil. A low particle emission type lubricant should be used for these bearings.

Fig. 3-1 shows an EXSEV Bearing selection chart on the basis of the cleanliness class and temperature of the environment. In this chart, each numerical value has a margin.

The amounts of particle emissions from bearings differ depending on operating conditions such as temperature, load and rotational speed. Please consult JTEKT for applications who's operating conditions are near the bearing applicability divisions specified in Fig. 3-1.

Table 3-1 compares the particle emissions of various lubricants provided for major EXSEV Bearings.

For an unlubricated EXSEV Bearing, more than 3 million particles are found for every 20 hours. When silver or molybdenum disulfide is used as a lubricant, 10 000 or more particles are emitted, indicating that neither is suitable for clean environments.

Bearings using a fluorine polymer are low in particle emissions and suitable for use in clean environments.

Bearings lubricated with a New Clean Pro Bearing-PR coating or fluorinated grease are also useful in clean environments because they are low in particle emissions.

Fluorinated grease is superior to solid lubricants in load carrying capability and high speed operation. This grease can be used in applications where a slight amount of scattering of fluorinated oil is acceptable.

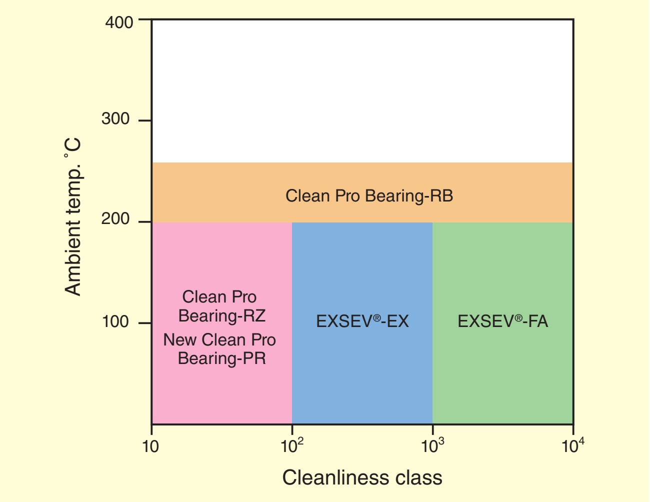
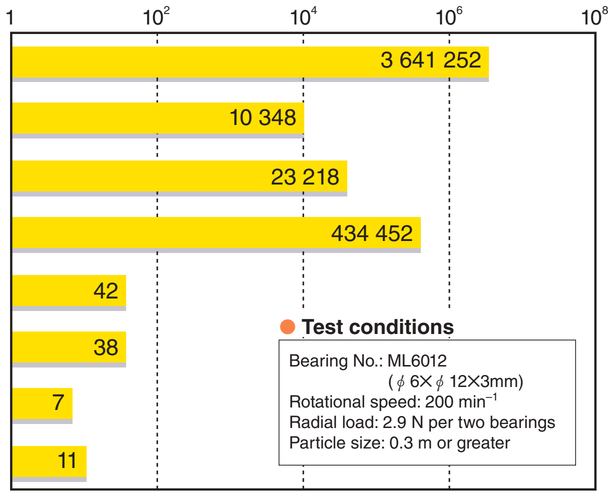


Fig. 3-1 EXSEV Bearings suitable for clean environments

● Table 3-1 Particle emissions from major EXSEV Bearings

Bearing material composition			Lubrication		Number of emitted particles during 20-hour test duration
Bearing rings	Balls	Cage	Lubricated component	Lubricant	
SUS440C	SUS440C	SUS304	—	(None)	3 641 252
	Silicon nitride	SUS304			10 348
	SUS440C	SUS304	Balls	Silver ion plating	23 218
			Cage	Baking of molybdenum disulfide	434 452
			Cage	Baking of PTFE	42
		Fluorocarbon resin (FA)	Cage	Fluorine polymer	38
		SUS304	Whole component surfaces	New Clean Pro Bearing-PR coating	7
			—	Fluorinated grease	11



● Test conditions
Bearing No.: ML6012
(ϕ 6×ϕ 12×3mm)
Rotational speed: 200 min^{-1}
Radial load: 2.9 N per two bearings
Particle size: 0.3 m or greater

For the properties of the EXSEV Bearings shown in Fig. 3-1, refer to the pages listed below.

Fluorinated grease

EXSEV®-EX 37

Polymeric materials

Clean Pro Bearing-RZ 31
Clean Pro Bearing-RB 33
New Clean Pro Bearing-PR 35
EXSEV®-FA 39

3-2 Vacuum Environments

• Bearing materials

Outer/inner rings and balls of the bearings for use in a vacuum environment are usually made of martensitic stainless steel (SUS440C). For the bearings requiring corrosion resistance, precipitation hardening stainless steel (SUS630) is used. When high temperature resistance is required, high speed tool steel (SKH4, M50, etc.) can be used. For a special operating condition, ceramic having excellent heat/corrosion resistance may be used.

• Lubricants

A bearing used in an ordinary vacuum chamber is repeatedly exposed to atmospheric air and vacuum. There is no rolling bearing lubricant that is effective for use under such a wide pressure range. The lubricant should optimally be selected in consideration of principal ambient pressure and temperature as well as required cleanliness and corrosion resistance when necessary.

1) When cleanliness is not critical:

Fig. 3-2 shows the EXSEV Bearings that are suitable for vacuum applications that do not require cleanliness.

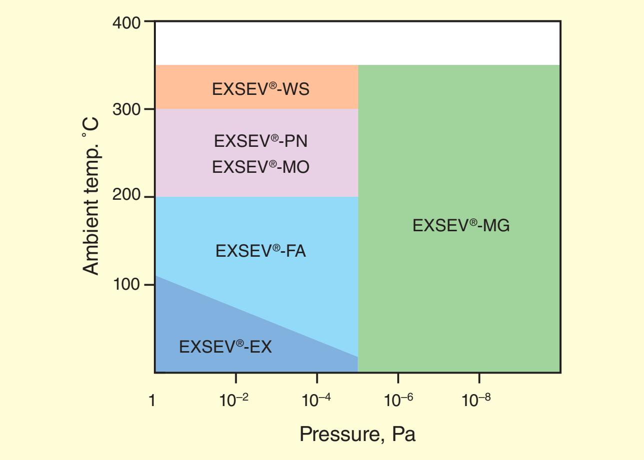


Fig. 3-2 EXSEV Bearings useful for vacuum applications where cleanliness is not critical

When the ambient temperature is near normal room temperature and vacuum is 10^{-5} Pa or less, fluorinated grease is used for lubrication. However, since the fluorinated oil contained in the grease gradually begins to evaporates, a solid lubricant should be used in applications where oil scattering should not occur.

In an ultrahigh vacuum environment with pressure lower than 10^{-5} Pa, gas emissions from bearings may pose a problem. For this pressure range, EXSEV®-MG lubricated with silver, a soft metal lubricant, should be used.

2) When cleanliness is critical:

When bearings should be clean, solid lubricants such as soft metal materials and layer lattice materials cannot be used because of excessive particle emissions. In such a case, a polymeric material or fluorinated grease is used.

Figs. 3-3 and 3-4 show the EXSEV Bearings applicable for vacuum environments with cleanliness classes 100 and 10, respectively.

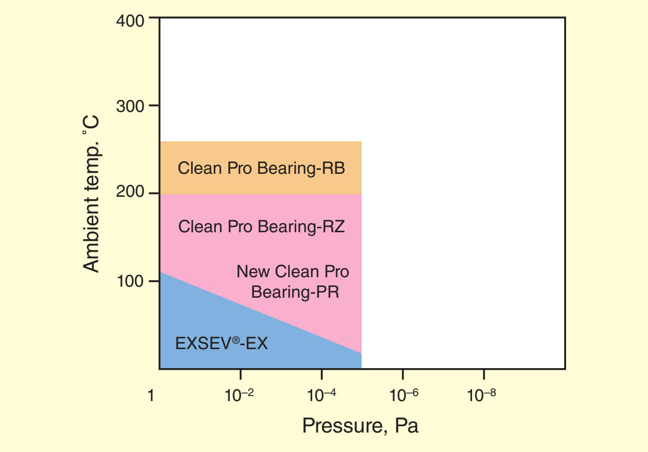


Fig. 3-3 EXSEV Bearings applicable for cleanliness class 100

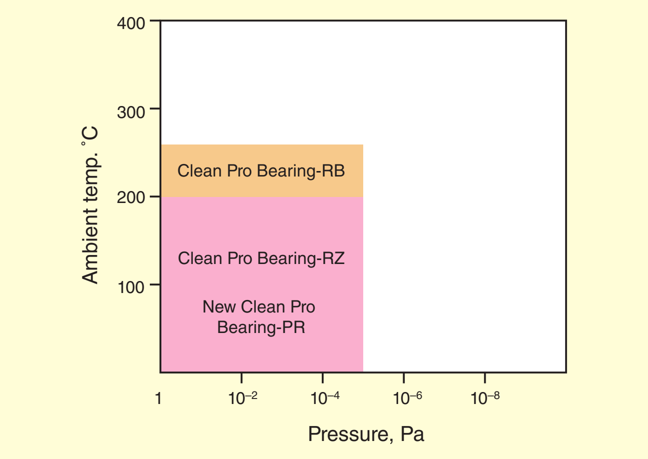


Fig. 3-4 EXSEV Bearings applicable for cleanliness class 10

3-3 High Temperature Environments

• Bearing materials

Fig. 3-5 shows bearing materials for high temperature applications.

SUS440C can withstand temperatures up to approximately 300˚C.

In the range from 300˚C to approximately 500˚C, High Temperature Hybrid Ceramic Bearings, whose bearing rings are made of highly heat resistant high speed tool steel (SKH4 or M50) and rolling elements made of ceramic, should be used.

In a high temperature environment in excess of 500˚C, full ceramic bearings should be used.

• Lubricants

Fig. 3-5 shows lubricants for high temperature applications. In a temperature range of up to approximately 200˚C, fluorinated grease can be used. At temperatures over 200˚C, a layer lattice material should be used.

Because all layer lattice materials emit a large amount of particles, they are not suitable for applications where cleanliness is required. Graphite cannot be used in a vacuum environment because it does not serve as a lubricant in a vacuum.

In a high temperature environment over 500˚C, there is no lubricant that can work perfectly. Unlubricated full ceramic bearings are used for such a high temperature application.

Fig. 3-6 shows the EXSEV Bearings useful for high temperature applications.

The temperatures shown in the figure are approximate. When the operating temperature of your application is near a temperature division specified in this figure, consult JTEKT.

If a bearing is exposed to a high temperature in a clean or vacuum environment, please refer to the sections entitled "Clean Environments" or "Vacuum Environments".

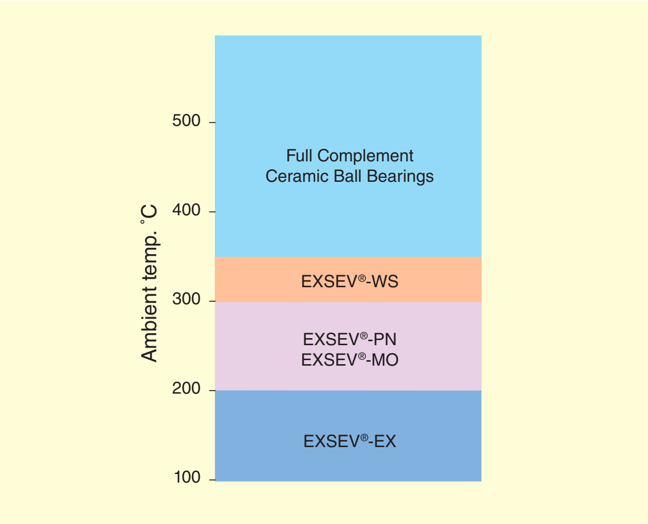


Fig. 3-6 EXSEV Bearing applicable for high temperature environments

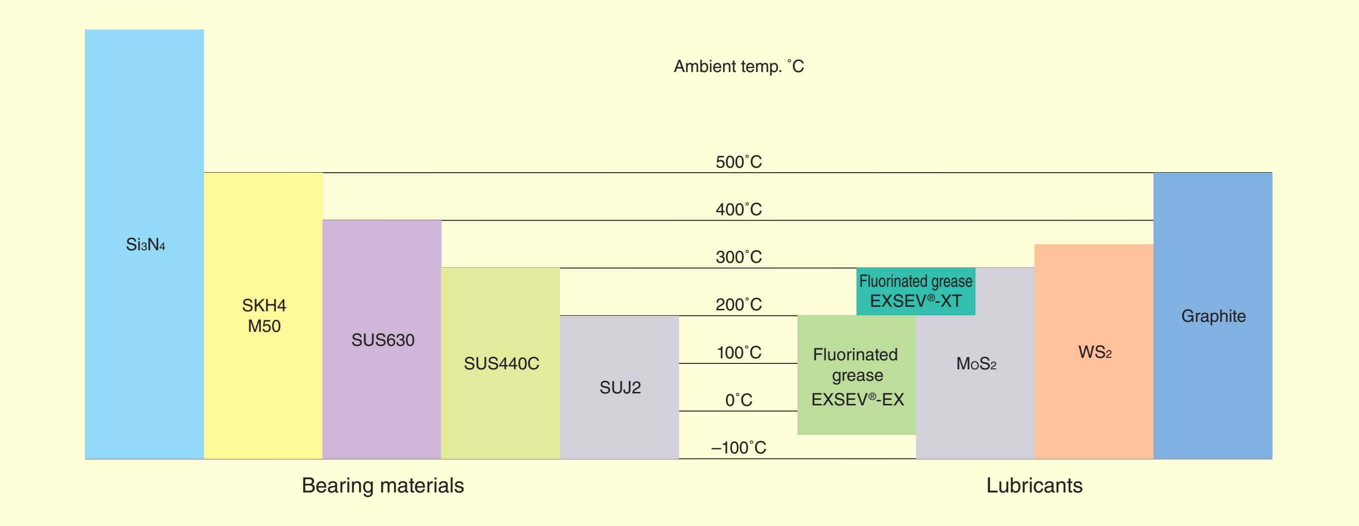


Fig. 3-5 Bearing materials and lubricants for high temperature applications

For the properties of the individual EXSEV Bearings shown in the figures, refer to the applicable pages shown below:

Fluorinated grease

EXSEV®-EX 37
EXSEV®-XT 55

Polymeric materials

Clean Pro Bearing-RZ 31
Clean Pro Bearing-RB 33
New Clean Pro Bearing-PR 35
EXSEV®-FA 39

Layer lattice materials

EXSEV®-WS 57
EXSEV®-PN 61
EXSEV®-MO 63

Soft metal materials

EXSEV®-MG 59

No lubrication

Full Complement Ceramic Ball Bearings 53

3-4 Corrosive Environments

1) Corrosion resistance of special steels

Table 3-2 shows the corrosion resistance of the special steels used for the EXSEV Bearings to major corrosive solutions.

In stainless steels, SUS630 is superior to SUS440C in corrosion resistance. However, in such a highly corrosive solution as an acid or alkaline solution, or if the solution must be kept free from rust, these special steels cannot be used.

2) Corrosion resistance of ceramic materials

Table 3-3 shows the corrosion resistance of ceramic materials. Silicon nitride, which is used as the standard material of the ceramic bearings, is excellent in corrosion resistance. However, it may develop corrosion in a highly corrosive chemical, a high temperature, or other highly corrosive ambient condition.

There are two types of ceramic corrosion: One is the corrosion of the alumina-yttria system sintering aid ($Al_2O_3 - Y_2O_3$), which is used to bake ceramic materials. To avoid this type of corrosion, corrosion resistant silicon nitride treated with a spinel sintering aid ($MgAl_2O_4$) should be used. Fig. 3-7 shows the mass reduction and bending strength deterioration of corrosion resistant silicon nitride dipped in an acid or alkaline solution for a given period of time.

The other type of corrosion is the corrosion of the silicon nitride itself. For use in a highly corrosive solution, bearings made of zirconia (ZrO_2) or silicon carbide (SiC) may be effective.

To select a ceramic bearing for use in a highly corrosive environment, its corrosion resistance to the specific condition should be carefully examined.

Table 3-2 Corrosion resistance of special steels and materials for cages

Solution	Concentration	Steels				Concentration	Materials for cages	
		Martensitic stainless steel SUS 440C	Precipitation hardening stainless steel SUS 630	Austenitic stainless steel SUS 304	High carbon chromium bearing steel SUJ 2		Fluorocarbon resin FA	PEEK resin PN
Water	–	◎	◎	◎	×	–	Good	Good
Hydrochloric acid	1%	△	○	○	×	5%	Good	Good
	10%	×	×	×	×			
Sulfuric acid	1%	○	◎	◎	×	5%	Good	Good
	10%	△	○	○	×			
Nitric acid	20%	○	◎	◎	×	25%	Good	–
Caustic soda	5%	○	○	○	△	5%	Good	Good
Seawater	–	○	◎	◎	×	–	Good	Good

Temperature 25˚C　Corrosion rate ◎ : Up to 0.125 mm/year　○ : Over 0.125 to 0.5 mm/year　△ : Over 0.5 to 1.25 mm/year　× : Over 1.25 mm/year

Table 3-3 Corrosion resistance of ceramic materials

◎ : Fully resistant　○ : Almost resistant
△ : Slightly susceptible　×: Susceptible

Corrosive solutions \ Ceramic materials	Silicon nitride (standard) Si_3N_4	Corrosion resistant silicon nitride Si_3N_4	Zirconia ZrO_2	Silicon Carbide SiC
Hydrochloric acid	△	○	○	◎
Nitric acid	△	○	○	◎
Sulfuric acid	△	○	○	◎
Phosphoric acid	○	○	○	◎
Fluorine acid	△	△	×	◎
Sodium hydroxide	△	△	○	△
Potassium hydroxide	△	△	△	△
Sodium carbonate	△	△	△	△
Sodium nitrate	△	△	△	△
Water and saltwater	◎	◎	◎	◎

Note) The corrosive natures of individual solutions differ largely depending on the concentration and temperature. Note that mixing two or more chemicals may increase the corrosivity.

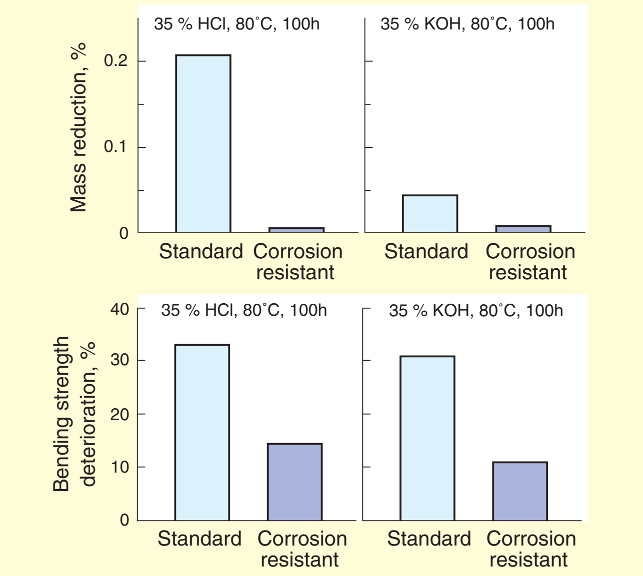


Fig. 3-7 Anticorrosive performance of corrosion resistant silicon nitride

3) Service life of corrosion resistant bearings

Table 3-4 lists the bearings suitable for applications requiring corrosion resistance, along with their major applications.

Table 3-4 Typical corrosion resistant EXSEV Bearings

	Applications	Bearing Materials		Page
		Bearing Rings	Balls	
Corrosion Guard Pro Bearing-SC	In a strongly acidic environment, strongly alkaline environment and corrosive gas	Silicon carbide	Silicon carbide	41
Corrosion Guard Pro Bearing-SN	In a strongly acidic environment, strongly alkaline environment and reactive gas	Corrosion resistant silicon nitride	Corrosion resistant silicon nitride	43
Ceramic Bearings	In a slightly acidic environment, alkaline environment and reactive gas	Silicon nitride	Silicon nitride	45
Corrosion Guard Pro Bearing-ZO	In saltwater, a slightly acidic environment and alkaline environment	Zirconia	Zirconia	47
Corrosion Guard Pro Bearing-MD	In water, alkaline environment and reactive gas	SUS630	Silicon nitride	49

When EXSEV Bearings are operated in a solution, the solution serves as a lubricant. This means the solution is closely associated with the service life of the bearings. Fig. 3-8 shows the service life evaluation results for three types of EXSEV Bearings under water.

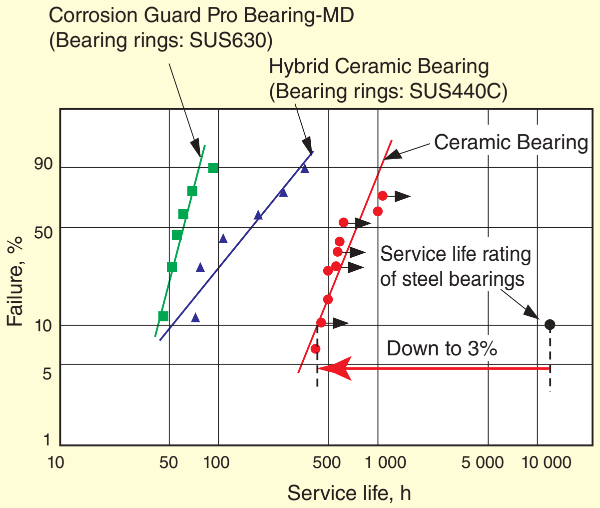
The Ceramic Bearings terminate their service life due to the flaking on the bearing ring or ball surfaces.

In case of the Hybrid Ceramic Bearings, ceramic balls do not develop flaking or wear. Their service life ends due to wear attributed to the minute corrosion of stainless steel bearing rings.

When bearings are used in a solution whose lubrication performance is not enough, such as in water, it is important to evaluate in advance the susceptibility of the bearings to corrosion and the relationship between the bearing load and wear in the solution.

SUS440C has a longer service life than SUS630; however, the former steel is not suitable for use in water because it may rust and cause contamination.

Ceramic Bearings may develop wear at an early stage of use depending on the characteristics of the solution, temperature, and load. Please contact JTEKT before using Ceramic Bearings in solutions.



Test conditions

Bearing No.: 6206 or equivalent
Rotational speed: 1 500 min^{-1}
Radial load:
Ceramic Bearing: 1 470 N
Corrosion Guard Pro Bearing-MD: 196 N
Hybrid Ceramic Bearing: 196 N

Fig. 3-8 Comparison in underwater service life of EXSEV Bearings

4 EXSEV Bearings with Special Characteristics

4-1 Non-magnetic Bearings

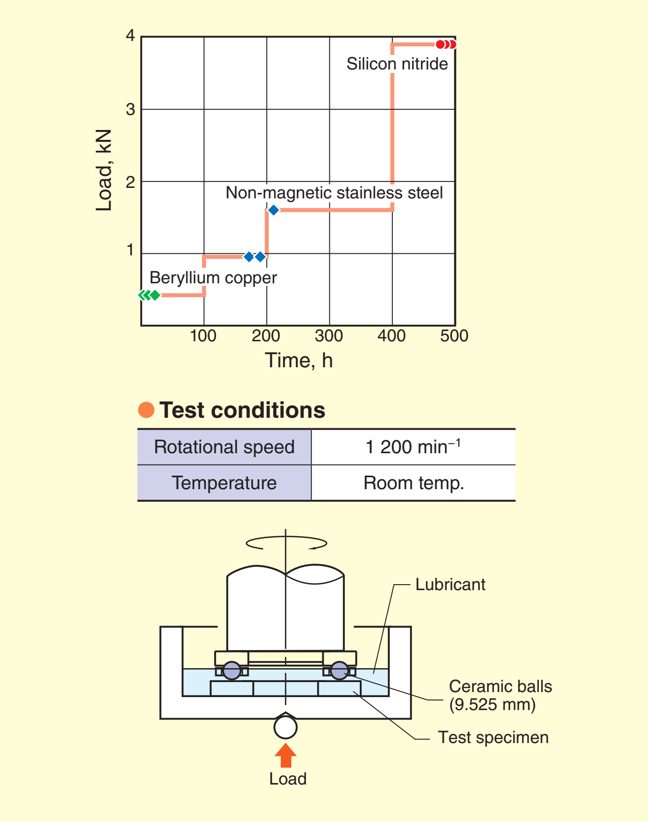
Bearings may be exposed to magnetic fields in some applications, including equipment associated with super conductivity, semiconductor production facilities and medical examination facilities. If steel bearings are used for such applications, the running torque may fluctuate or the magnetic field may be disturbed. Non-magnetic bearings should be used for such applications. As a non-magnetic material for such bearings, beryllium copper has conventionally been used. However the use of beryllium copper should be avoided since it contains beryllium, a substance of environmental concern.

For such applications, JTEKT supplies Hybrid Ceramic Bearings, whose rings are made of non-magnetic stainless steel and rolling elements are made of a ceramic material, or the full ceramic bearings.

● **Table 4-1 Non-magnetic bearings and relative permeability**

	Relative permeability	Page
Non-magnetic Hybrid Ceramic Bearings	1.01 or lower	65
Ceramic Bearings	1.001 or lower	45
(Ref.) Beryllium copper	1.001 or lower	—

Fig. 4-1 shows a rolling fatigue strength evaluation result for various non-magnetic materials. As can be seen from the figure, non-magnetic stainless steel is superior to beryllium copper in rolling fatigue strength.



● **Test conditions**

Rotational speed	1 200 min^{-1}
Temperature	Room temp.

Fig. 4-1 Comparison of non-magnetic materials in rolling fatigue strength

4-2 Insulating Bearings

A cause of bearing failure in motors or generators is electric pitting. Electric pitting occurs when a surface in rolling contact is locally molten due to sparks produced over the very thin lubricating oil film on the surface when electricity passes through the bearing in operation.

Electric pitting appears as a series of pits or a series of ridges on the surface in rolling contact, which is shown in Fig. 4-2 and Fig. 4-3.

An estimation of the mechanism that causes electric pitting on a bearing is shown in Fig. 4-4.

Fig. 4-2 Electric pitting generated on general purpose bearings (pits)

Fig. 4-3 Electric pitting generated on general purpose bearings (ridges)

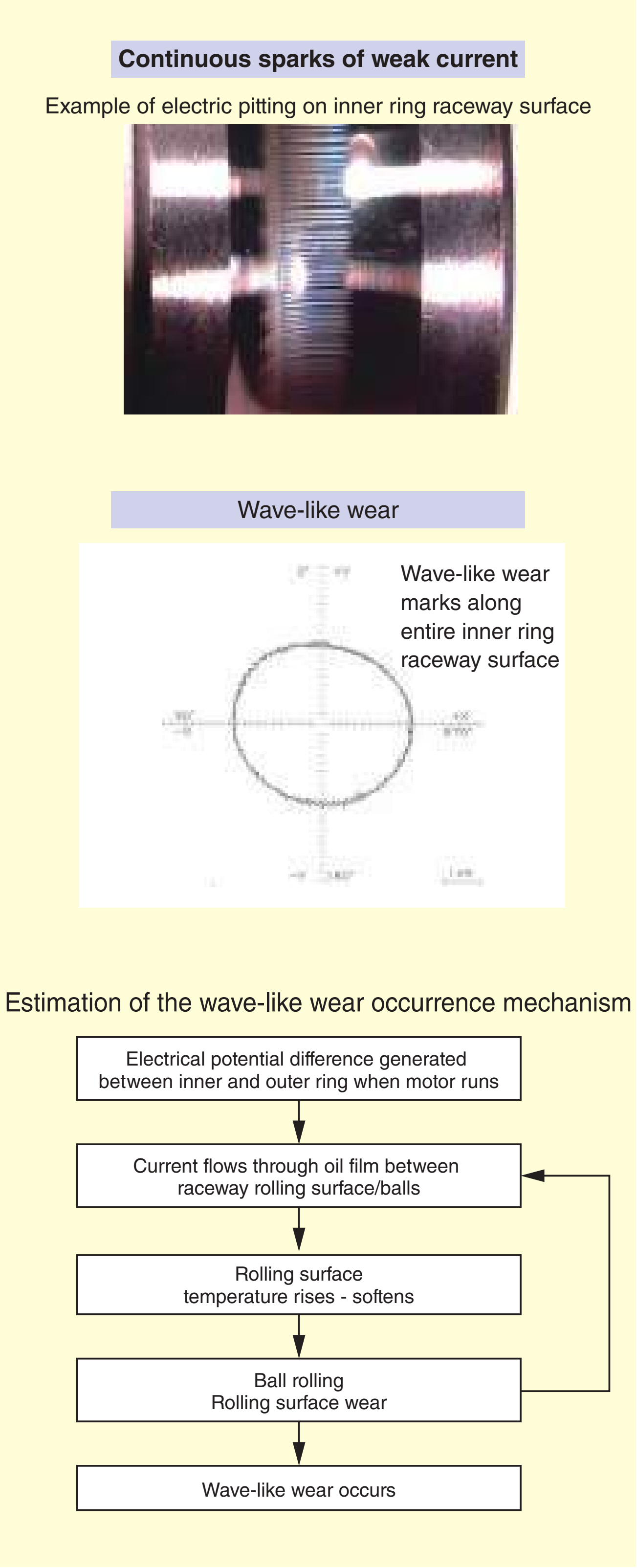


Fig. 4-4 Estimation of electric pitting (wave-like wear) occurrence mechanism

To avoid such pitting, a bypass is provided to ensure that no electric current passes through the bearing. Another method is to use an insulating bearing that can block electric current.

Since ceramic materials exhibit an excellent insulation performance, Hybrid Ceramic Bearings consisting of ceramic rolling elements can be used as insulating bearings. (Fig.4-5)

Hybrid Ceramic Bearings prevent electric pitting, also reduce bearing temperature rise, and lengthen grease service life. For these reasons, Hybrid Ceramic Bearings assure long term maintenance free operation and high speed equipment operation.

Fig. 4-5 Insulating bearings (Hybrid Ceramic Bearings)

Also, ceramic materials have the same insulation performance as silicon nitride. In addition, we can now support Hybrid Ceramic Bearings that use oxide ceramics, which have the characteristic of having a coefficient of linear expansion that is close to that of the metal used in the inner and outer rings material, for their rolling elements. This has enabled us to reduce fluctuations in the clearances between the balls and the inner and outer rings due to temperature fluctuations to a higher level than was possible with conventional bearings. This makes it possible to use these bearings in environments spanning an even larger range of temperatures.

Fig. 4-6 Insulating bearings (oxide ceramic balls)

4-3 High Speed Bearings

Hybrid Ceramic Bearings, whose rolling elements are made of a ceramic material with a density lower than that of bearing steel, are most suitable for high speed applications. This is because reduced mass of rolling elements suppresses the centrifugal force of the rolling elements, as well as slippage attributable to the gyro-moment, when the bearings are in operation.

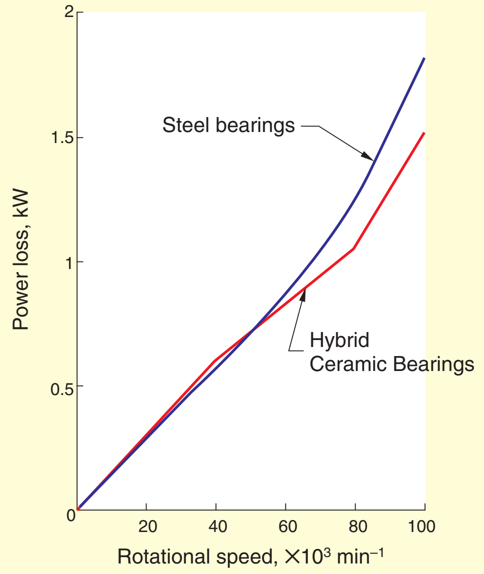
Thanks to their superior high speed performance, Hybrid Ceramic Bearings are used in turbochargers and on machine tool spindles.

• Power losses at high speed

Fig. 4-7 compares power losses between the Hybrid Ceramic Bearings and steel bearings.

When compared to steel bearings, the Hybrid Ceramic Bearings lose smaller power during high speed operation. The power loss decreases with increasing rotational speed.

The Hybrid Ceramic Bearings also have superior antiseizure characteristics, which means that they consume smaller amount of lubrication oil and thereby reduce rolling resistance (power loss).



		Hybrid Ceramic Bearings	Steel bearings
Bearing rings		High speed tool steel (M50)	
Balls	Material	Ceramic (Si_3N_4)	High speed tool steel (M50)
	Dia.	6.35 mm	
	Number of balls	9	
Cage		Polyimide resin	

Condition	Specification
Axial load	200 N
Rotational speed (max.)	100 000 min^{-1}
Lubricating oil	AeroShell Turbine Oil 500
Ambient temperature	Room temp.

Fig. 4-7 Comparison in power loss between Hybrid Ceramic Bearings and steel bearings

• Seizure limit at high speed

Fig. 4-8 shows the seizure limits of Hybrid Ceramic Bearings and steel bearings. The limits were measured by gradually reducing lubricating oil feed rate.

Compared with general purpose steel bearings, Hybrid Ceramic Bearings consume smaller amount of lubricating oil under the same speed condition, while they can run at a higher speed under the same luburicating oil feed rate condition.

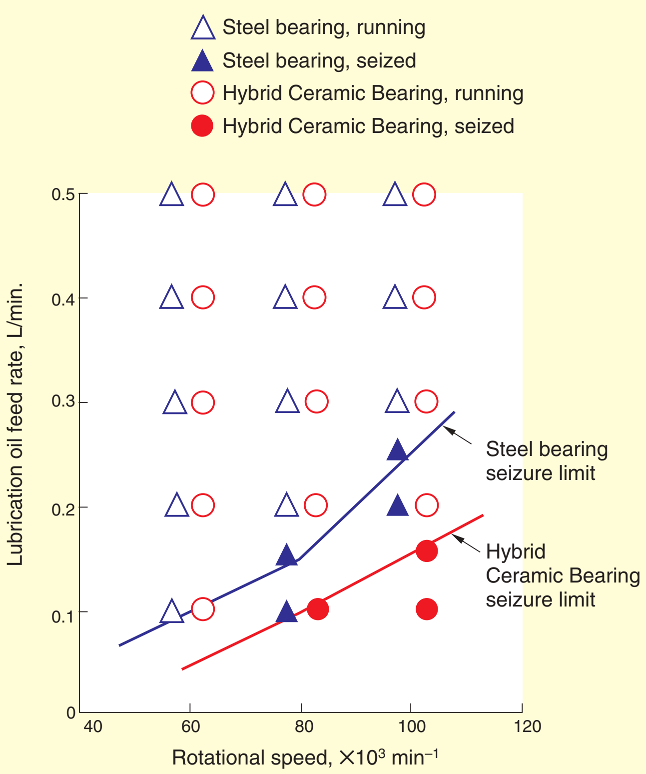


Fig. 4-8 Comparison between Hybrid Ceramic Bearings and steel bearings in seizure limit

2 EXSEV Bearings and Other EXSEV Products

For the use of bearings in an extreme, special environment, identifying the best combination of bearing materials and lubricants according to specific conditions is critical.
This chapter describes the component compositions and features of major EXSEV Bearing varieties.
For other EXSEV Bearings suited to more specialized applications, please consult JTEKT.

3 Radial Ball Bearings

5 Linear Motion Bearings

10 Tolerance and Internal Clearance of EXSEV Bearings and Ceramic Bearings

1 EXSEV Bearings and Ceramic Bearings: Table of Specifications

Products		Clean Pro Bearing-RZ	Clean Pro Bearing-RB	New Clean Pro Bearing-PR	EXSEV®-EX	EXSEV®-FA	Corrosion Guard Pro Bearing-SC	Corrosion Guard Pro Bearing-SN	Ceramic Bearing	Corrosion Guard Pro Bearing-ZO	Corrosion Guard Pro Bearing-MD	EXSEV®-SK	Full Complement Ceramic Ball Bearing (angular contact ball bearing)	EXSEV®-XT	EXSEV®-WS	EXSEV®-MG	EXSEV®-PN	EXSEV®-MO	Non-magnetic Hybrid Ceramic Bearing	Hybrid Ceramic Bearing	K Series Full Complement Hybrid Ceramic Ball Bearing	Grease-filled Bearing for Food Machinery
Page		p. 31	p. 33	p. 35	p. 37	p. 39	p. 41	p. 43	p. 45	p. 47	p. 49	p. 51	p. 53	p. 55	p. 57	p. 59	p.61	p. 63	p. 65	p. 67	p. 69	p. 94
Bearing No.	Prefix	SE	SE	SE	SV	SE	NCZ	NCT	NC	NCB	3NC	SK	NC	SV	SE	SE	SE	SE	3NC	3NC	3NC	(None)
	Suffix	ZZSTPRZ	ZZSTPRB	ZZSTPR	ZZST	ZZST	(None)	(None)	(None)	(None)	ZZMD4	ZZ (2RS) ST	V	ZZST	ZZST	ZZSTMG3	ZZST	ZZSTMSA7	YH4	ZZ	VST-1	ZZ
	Cage code	YS	YS	YS	YS	FA	FA	FA	FA	PN	FA	YS	(No cage)	YS	WS	YS	PN	YS	FA	FG	(No cage)	FG
Outer ring		Martensitic stainless steel					Silicon carbide ceramic	Silicon nitride ceramic (corrosion resistant)	Silicon nitride ceramic (standard)	Zirconia	Precipitation hardening stainless steel	Martensitic stainless steel	Silicon nitride ceramic (standard)	Martensitic stainless steel					Non-magnetic stainless steel	High carbon chromium bearing steel	Martensitic stainless steel	High carbon chromium bearing steel
Inner ring		Martensitic stainless steel					Silicon carbide ceramic	Silicon nitride ceramic (corrosion resistant)	Silicon nitride ceramic (standard)	Zirconia	Precipitation hardening stainless steel	Martensitic stainless steel	Silicon nitride ceramic (standard)	Martensitic stainless steel					Non-magnetic stainless steel	High carbon chromium bearing steel	Martensitic stainless steel	High carbon chromium bearing steel
Rolling elements		Martensitic stainless steel					Silicon carbide ceramic	Silicon nitride ceramic (corrosion resistant)	Silicon nitride ceramic (standard)	Zirconia	Silicon nitride ceramic (standard)	Martensitic stainless steel	Silicon nitride ceramic (standard)	Martensitic stainless steel					Silicon nitride ceramic (standard)			High carbon chromium bearing steel
Cage or separator		Austenitic stainless steel				Fluorocarbon resin				PEEK resin	Fluorocarbon resin	Austenitic stainless steel	(None)	Austenitic stainless steel	(separator) Composite material including tungsten disulfide	Austenitic stainless steel	PEEK resin	Austenitic stainless steel	Fluorocarbon resin	Reinforced polyamide resin	(separators) Martensitic stainless steel	Reinforced polyamide resin
Shield		Austenitic stainless steel					(None)				Austenitic stainless steel	Austenitic stainless steel (rubber seal)	(None)	Austenitic stainless steel					(None)	Carbon steel	(None)	Carbon steel
Lubrication	Lubricant	Clean Pro Bearing-RZ coating	Clean Pro Bearing-RB coating	New Clean Pro Bearing-PR coating	EXSEV®-EX (Grease)	Fluorocarbon polymer				Molybdenum disulfide, etc.	Fluorocarbon polymer	EXSEV®-KHD (Grease)	(None)	EXSEV®-XT (Grease)	Tungsten disulfide	Silver	Molybdenum disulfide, etc.	Molybdenum disulfide	Fluorocarbon polymer	Grease or oil	EXSEV®-EX (Grease)	Grease for food machinery
	Component coated with or including lubricant	Raceways and balls		Entire surface of all components		Cage									Separators	Balls	Cage					
Applicable environments		Vacuum environments											Vacuum environments								Vacuum environments	
		Clean environments									Clean environments								Clean environments		Clean environments	
							Corrosive environments					Corrosive environments							Corrosive environments			
			High temperature environments		High temperature environments								High temperature environments									
							Magnetic field environments						Magnetic field environments						Magnetic field environments			
							Electric field environments						Electric field environments						Electric field environments			
																				High speed applications		
																						Hygiene

2 EXSEV Bearings and Ceramic Bearings: Table of Characteristics (1)

Major Uses		Products	Applicable Environments																	Bearing Number 3)	(Cage Code)	Corresponding Catalog Pages	Has Sizes Available from Stock
			Limiting Speeds		Operating Temp. (˚C)									Vacuum (Pa)			Cleanliness (class) 2)						
			dn value 1)	Max. (min^{-1})	< 120	< 200	< 260	< 300	< 350	< 400	< 500	< 800		Atmospheric air	10^{-5}	10^{-10}	1000	100	10				
Clean environment	Vacuum environment	Clean Pro Bearing-RZ	< 10 000	1 000	→	→								→	→				●	SE □□□□ ZZSTPRZ	(YS)	31-32	○
		Clean Pro Bearing-RB	< 10 000	1 000	→	→	→							→	→				●	SE □□□□ ZZSTPRB	(YS)	33-34	
		New Clean Pro Bearing-PR	< 10 000	1 000	→	→								→	→				●	SE □□□□ ZZSTPR	(YS)	35-36	
		EXSEV®-EX	< 40 000	–	→	→	→							→	→			●		SV □□□□ ZZST	(YS) EX	37-38	
		EXSEV®-FA	< 10 000	1 000	→	→								→	→		●			SE □□□□ ZZST	(FA)	39-40	○
		Ceramic Bearing, Corrosion Guard Pro Bearing-SC, SN	< 10 000	1 000	→	→								→	→		●			(NCZ, NCT) NC □□□□	(FA)	41-46	○
		Corrosion Guard Pro Bearing-ZO	< 10 000	1 000	→	→								→	→		●			NCB □□□□	(PN)	47-48	
		Corrosion Guard Pro Bearing-MD	< 10 000	1 000	→	→								→	→		●			3NC □□□□ ZZMD4	(FA)	49-50	○
		Non-magnetic Hybrid Ceramic Bearing	< 10 000	1 000	→	→								→	→		●			3NC □□□□ YH4	(FA)	65-66	
	Corrosive environment	Corrosion Guard Pro Bearing-SC	< 10 000	1 000	→	→								→	→		●			NCZ □□□□	(FA)	41-42	
		Corrosion Guard Pro Bearing-SN	< 10 000	1 000	→	→								→	→		●			NCT □□□□	(FA)	43-44	○
		Ceramic Bearing	< 10 000	1 000	→	→								→	→		●			NC □□□□	(FA)	45-46	○
		Corrosion Guard Pro Bearing-MD	< 10 000	1 000	→	→								→	→		●			3NC □□□□ ZZMD4	(FA)	49-50	○
	High temperature environment	Clean Pro Bearing-RB	< 10 000	1 000	→	→	→							→	→				●	SE □□□□ ZZSTPRB	(YS)	33-34	
	Magnetic field environment	Non-magnetic Hybrid Ceramic Bearing	< 10 000	1 000	→	→								→	→		●			3NC □□□□ YH4	(FA)	65-66	
		Ceramic Bearing, Corrosion Guard Pro Bearing-SC, SN	< 10 000	1 000	→	→								→	→		●			(NCZ, NCT) NC □□□□	(FA)	41-46	○
		Corrosion Guard Pro Bearing-ZO	< 10 000	1 000	→	→								→	→		●			NCB □□□□	(PN)	47-48	
	Electric field environment	Corrosion Guard Pro Bearing-MD	< 10 000	1 000	→	→								→	→		●			3NC □□□□ ZZMD4	(FA)	49-50	○
		Non-magnetic Hybrid Ceramic Bearing	< 10 000	1 000	→	→								→	→		●			3NC □□□□ YH4	(FA)	65-66	
		Ceramic Bearing, Corrosion Guard Pro Bearing-SC, SN	< 10 000	1 000	→	→								→	→		●			(NCZ, NCT) NC □□□□	(FA)	41-46	○
Vacuum environment		Clean Pro Bearing-RZ	< 10 000	1 000	→	→								→	→				●	SE □□□□ ZZSTPRZ	(YS)	31-32	○
		Clean Pro Bearing-RB	< 10 000	1 000	→	→	→							→	→				●	SE □□□□ ZZSTPRB	(YS)	33-34	
		New Clean Pro Bearing-PR	< 10 000	1 000	→	→								→	→				●	SE □□□□ ZZSTPR	(YS)	35-36	
		EXSEV®-EX	< 40 000	—	→	→	→							→	→			●		SV □□□□ ZZST	(YS) EX	37-38	
		EXSEV®-FA	< 10 000	1 000	→	→								→	→		●			SE □□□□ ZZST	(FA)	39-40	○
		Corrosion Guard Pro Bearing-SC, SN	< 10 000	1 000	→	→								→	→		●			(NCZ, NCT) NC □□□□	(FA)	41-46	○
		Corrosion Guard Pro Bearing-ZO	< 10 000	1 000	→	→								→	→		●			NCB □□□□	(PN)	47-48	
		Corrosion Guard Pro Bearing-MD	< 10 000	1 000	→	→								→	→		●			3NC □□□□ ZZMD4	(FA)	49-50	○
		Full Complement Ceramic Ball Bearing	< 4 000	500	→	→	→	→	→	→	→	→			→	→				NC □□□□ V	(—)	53-54	
		EXSEV®-WS	< 4 000	500	→	→	→	→	→					→	→					SE □□□□ ZZST	(WS)	57-58	○
		EXSEV®-MG	< 10 000	1 000	→	→	→	→	→					Cannot be used under the atmosphere.	→	→				SE □□□□ ZZSTMG3	(YS)	59-60	○
		EXSEV®-PN	< 10 000	1 000	→	→	→	→						→	→					SE □□□□ ZZST	(PN)	61-62	○
		EXSEV®-MO	< 10 000	1 000	→	→	→	→						→	→					SE □□□□ ZZSTMSA7	(YS)	63-64	
		Non-magnetic Hybrid Ceramic Bearing	< 10 000	1 000	→	→								→	→		●			3NC □□□□ YH4	(FA)	65-66	

1) *dn* value: Bearing bore diameter (mm) × Rotational speed (min^{-1})

2) The cleanliness classes may vary depending on operating conditions.

3) The four blank boxes represent the basic number of the bearing. A basic number consists of three or four alphanumeric characters. A bearing number may be used as a convenience in the case of any queries to JTEKT.

EXSEV Bearings and Ceramic Bearings: Table of Characteristics (2)

Major Uses	Products	Applicable Environments																	Bearing Number [3]	(Cage Code)	Corresponding Catalog Pages	Has Sizes Available from Stock
		Limiting Speeds		Operating Temp. (˚C)									Vacuum (Pa)			Cleanliness (class) [2]						
		dn value [1]	Max. (min^{-1})	< 120	< 200	< 260	< 300	< 350	< 400	< 500	< 800		Atmospheric air	10^{-5}	10^{-10}	1000	100	10				
Corrosive environment	Corrosion Guard Pro Bearing-SC	< 10 000	1 000	→	→								→	→		●			NCZ □□□□	(FA)	41-42	
	Corrosion Guard Pro Bearing-SN	< 10 000	1 000	→	→								→	→		●			NCT □□□□	(FA)	43-44	○
	Ceramic Bearing	< 10 000	1 000	→	→								→	→		●			NC □□□□	(FA)	45-46	○
	Corrosion Guard Pro Bearing-ZO	< 10 000	1 000	→	→								→	→		●			NCB □□□□	(PN)	47-48	
	Corrosion Guard Pro Bearing-MD	< 10 000	1 000	→	→								→	→		●			3NC □□□□ ZZMD4	(FA)	49-50	○
	EXSEV®-SK	Equal to the *dn* value of standard bearings		→									→						SK □□□□ ZZ (2RS) ST	(YS) HX	51-52	○
	Full Complement Ceramic Ball Bearing	< 4 000	500	→	→	→	→	→	→	→	→			→	→				NC □□□□ V	(—)	53-54	
High temperature environment	Clean Pro Bearing-RB	< 10 000	1 000	→	→	→							→	→				●	SE □□□□ ZZSTPRB	(YS)	33-34	
	EXSEV®-EX	< 40 000	–	→	→	→							→	→			●		SV □□□□ ZZST	(YS) EX	37-38	
	Full Complement Ceramic Ball Bearing	< 4 000	500	→	→	→	→	→	→	→	→			→	→				NC □□□□ V	(—)	53-54	
	EXSEV®-XT	< 40 000	–			→	→	→					→	→					SV □□□□ ZZST	(YS) XT	55-56	
	EXSEV®-WS	< 4 000	500	→	→	→	→	→					→	→					SE □□□□ ZZST	(WS)	57-58	○
	EXSEV®-MG	< 10 000	1 000	→	→	→	→	→						→	→				SE □□□□ ZZSTMG3	(YS)	59-60	○
	EXSEV®-PN	< 10 000	1 000	→	→	→	→						→	→					SE □□□□ ZZST	(PN)	61-62	○
	EXSEV®-MO	< 10 000	1 000	→	→	→	→						→	→					SE □□□□ ZZSTMSA7	(YS)	63-64	
Magnetic field environment	Ceramic Bearing, Corrosion Guard Pro Bearing-SC, SN	< 10 000	1 000	→	→								→	→		●			(NCZ, NCT) NC □□□□	(FA)	41-46	○
	Full Complement Ceramic Ball Bearing	< 4 000	500	→	→	→	→	→	→	→	→			→	→				NC □□□□ V	(—)	53-54	
	Non-magnetic Hybrid Ceramic Bearing	< 10 000	1 000	→	→								→	→		●			3NC □□□□ YH4	(FA)	65-66	
Electric field environment	Ceramic Bearing, Corrosion Guard Pro Bearing-SC, SN	< 10 000	1 000	→	→								→	→		●			(NCZ, NCT) NC □□□□	(FA)	41-46	○
	Corrosion Guard Pro Bearing-ZO	< 10 000	1 000	→	→								→	→		●			NCB □□□□	(PN)	47-48	
	Corrosion Guard Pro Bearing-MD	< 10 000	1 000	→	→								→	→		●			3NC □□□□ ZZMD4	(FA)	49-50	○
	Full Complement Ceramic Ball Bearing	< 4 000	500	→	→	→	→	→	→	→	→			→	→				NC □□□□ V	(—)	53-54	
	Non-magnetic Hybrid Ceramic Bearing	< 10 000	1 000	→	→								→	→		●			3NC □□□□ YH4	(FA)	65-66	
	Hybrid Ceramic Bearing	No less than 1.2 times that of steel bearings		→									→						3NC □□□□ ZZ	(FG)	67-68	○
High speed application	Hybrid Ceramic Bearing	No less than 1.2 times that of steel bearings		→									→						3NC □□□□ ZZ	(FG)	67-68	○
Hygiene	Grease-filled Bearing for Food Machinery	Equal to the *dn* value of standard bearings		→ →	(General purpose) →	(High temperature)							→						The same as standard bearings [4]			

1) *dn* value: Bearing bore diameter (mm) × Rotational speed (min^{-1})

2) The cleanliness classes may vary depending on operating conditions.

3) The four blank boxes represent the basic number of the bearing. A basic number consists of three or four alphanumeric characters. A bearing number may be used as a convenience in the case of any queries to JTEKT.

4) Specify the bearing as a (general purpose or high temperature) grease-filled bearing for food machinery.

3 Radial Ball Bearings

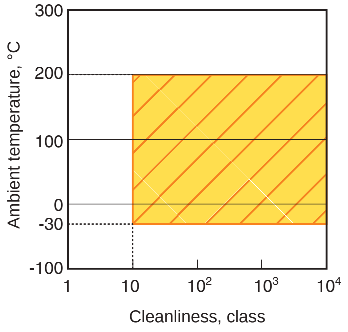
3-1 Clean Pro Bearing-RZ

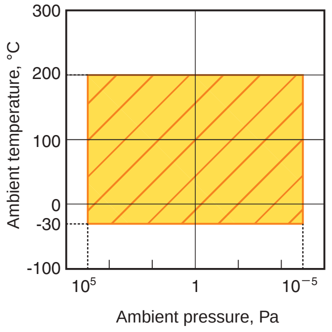
Clean Pro Bearing Series
Long-Service-Life Type

This bearing has a fluoropolymer gel coating on its rolling surfaces as the lubricant.

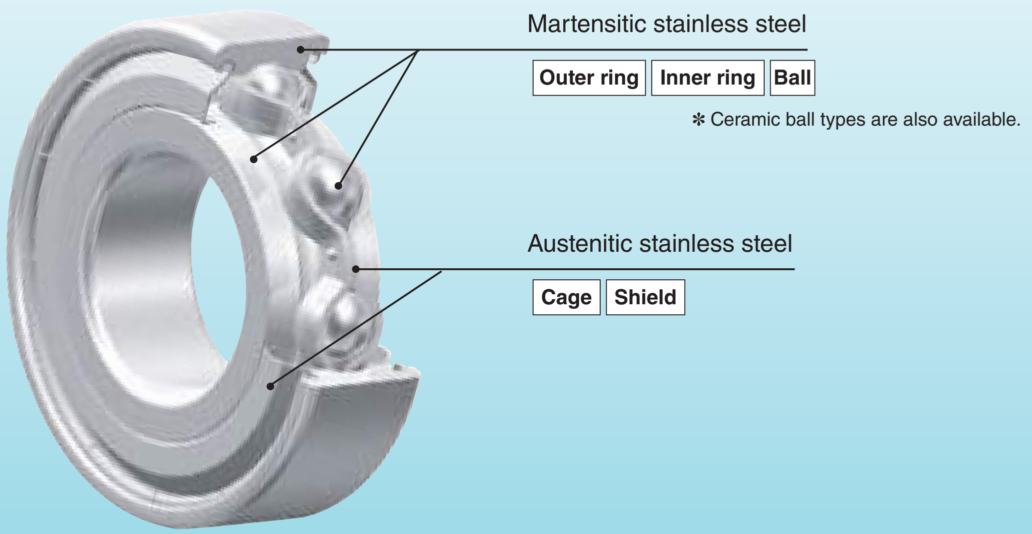
Applicable Environments

- **Clean**
- **Vacuum**
- High speed
- Corrosive
- Magnetic field
- Electric field
- High temperature
- Hygiene





Product Specifications



✻ Ceramic ball types are also available.

Bearing Numbering System

SE | Basic bearing number | ZZST**PRZ** YS

SE: Solid lubricant

PRZ: Clean Pro Bearing-RZ

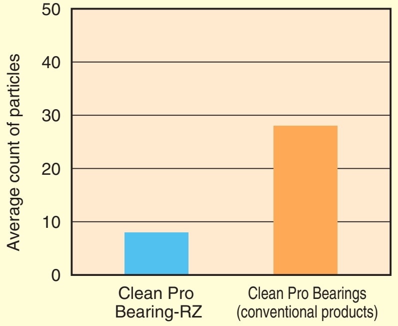
Applications

- Semiconductor manufacturing equipment
- Transfer systems
- Lithography equipment
- Vacuum motors
- Vacuum equipment

Performance

- Clean Pro Bearing-RZ has better characteristics in low particle emissions than Clean Pro Bearings (conventional products).

Comparison of particle emissions
(Particles 0.1μm or greater in diameter)

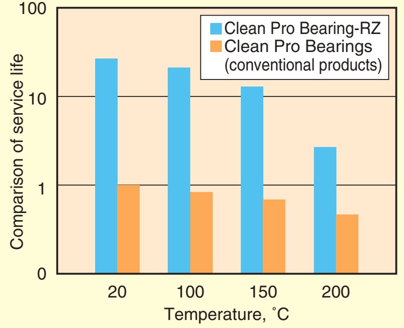


Test conditions

Bearing No.: 6000
Temperature: Atmosphere / room temperature
Rotational speed: 200min^{-1}, Load: Axial 30 N

- Clean Pro Bearing-RZ has longer service life than Clean Pro Bearings (conventional products).

Comparison of service life



Test conditions

Bearing No.: 6000, Rotational speed: 1200min^{-1}
Load: Axial 147 N, Atmosphere pressure: 10^{-3} Pa

- Clean Pro Bearing-RZ has better characteristics in low gas emission than Clean Pro Bearings (conventional products).

Lubricant service life expectancy equation

The average service life of Clean Pro Bearing-RZ can be estimated with the following equation.

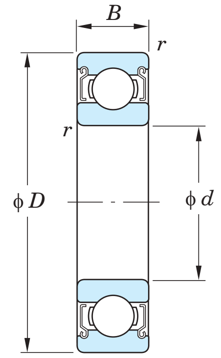
$$L_{av} = b_2 \cdot \left(\frac{C_r \times 0.85}{P_r}\right)^q \times 0.016667/n$$

Where,

L_{av} : Average life, h
b_2 : Lubrication factor
$b_2 = 420$
C_r : Basic dynamic load rating, N
P_r : Dynamic equivalent radial load, N
q : Exponential coefficient, $q = 3$
n : Rotational speed, min^{-1}

For the service life of solid lubricants, refer to page 13.

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Boundary dimensions mm				Bearing No.	Basic load ratings [1] kN		Factor	Permissible radial load [2]	Limiting speed
d	D	B	r (min.)		C_r	C_{0r}	f_0	N	min^{-1}
5	14	5	0.2	**SE605ZZSTPRZM5 YS**	1.30	0.49	12.3	50	1 000
	16	5	0.3	**SE625-5ZZSTPRZM5 YS**	1.75	0.67	12.4	90	1 000
6	17	6	0.3	**SE606ZZSTPRZM5 YS**	1.95	0.74	12.2	100	1 000
	19	6	0.3	**SE626ZZSTPRZM5 YS**	2.60	1.05	12.3	130	1 000
7	19	6	0.3	**SE607ZZSTPRZM5 YS**	2.60	1.05	12.3	130	1 000
	22	7	0.3	**SE627ZZSTPRZM5 YS**	3.30	1.35	12.4	165	1 000
8	22	7	0.3	**SE608ZZSTPRZM5 YS**	3.30	1.35	12.4	165	1 000
	24	8	0.3	**SE628ZZSTPRZM5 YS**	3.35	1.40	12.8	170	1 000
9	24	7	0.3	**SE609ZZSTPRZM5 YS**	3.35	1.40	12.8	170	1 000
	26	8	0.6	**SE629ZZSTPRZM5 YS**	4.55	1.95	12.4	230	970
9.525	22.225	7.142	0.5	**SEEE3SZZSTPRZM5 YS**	3.35	1.40	12.8	170	1 000
10	26	8	0.3	**SE6000ZZSTPRZC3 YS**	4.55	1.95	12.3	230	1 000
	30	9	0.6	**SE6200ZZSTPRZC3 YS**	5.10	2.40	13.2	255	860
12	28	8	0.3	**SE6001ZZSTPRZC3 YS**	5.10	2.40	13.2	255	830
	32	10	0.6	**SE6201ZZSTPRZC3 YS**	6.80	3.05	12.3	340	770
15	32	9	0.3	**SE6002ZZSTPRZC3 YS**	5.60	2.85	13.9	280	660
	35	11	0.6	**SE6202ZZSTPRZC3 YS**	7.65	3.75	13.2	385	610
17	35	10	0.3	**SE6003ZZSTPRZC3 YS**	6.00	3.25	14.4	300	580
	40	12	0.6	**SE6203ZZSTPRZC3 YS**	9.55	4.80	13.2	480	530
20	42	12	0.6	**SE6004ZZSTPRZC3 YS**	9.40	5.05	13.9	470	500
	47	14	1	**SE6204ZZSTPRZC3 YS**	12.8	6.65	13.2	640	450
25	47	12	0.6	**SE6005ZZSTPRZC3 YS**	10.1	5.85	14.5	505	400
	52	15	1	**SE6205ZZSTPRZC3 YS**	14.0	7.85	13.9	700	360
30	55	13	1	**SE6006ZZSTPRZC3 YS**	13.2	8.25	14.7	660	330
	62	16	1	**SE6206ZZSTPRZC3 YS**	19.5	11.3	13.9	975	300
35	62	14	1	**SE6007ZZSTPRZC3 YS**	15.9	10.3	14.9	795	280
	72	17	1.1	**SE6207ZZSTPRZC3 YS**	25.7	15.4	13.9	1285	250
40	68	15	1	**SE6008ZZSTPRZC3 YS**	16.7	11.5	15.2	835	250
	80	18	1.1	**SE6208ZZSTPRZC3 YS**	29.1	17.8	14.0	1455	220

Notes 1) The basic load ratings are those of standard bearing (used to calculate lubrication life).
2) The permissible radial loads can be regarded as the maximum loads applicable to individual bearings. When an axial load is applied to the bearing, convert this axial load to a dynamic equivalent radial load, and then compare this value to the permissible radial load.

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

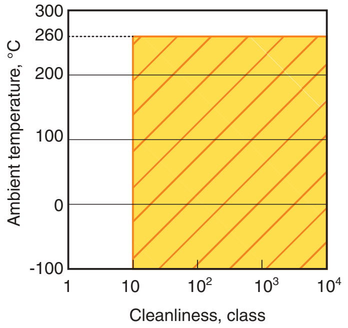
3-2 Clean Pro Bearing-RB

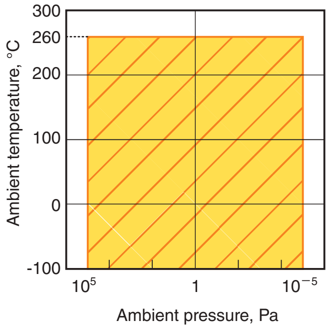
Supports 260˚C Clean, Vacuum Environments

This bearing has a fluoropolymer coating on its rolling surface as the lubricant.

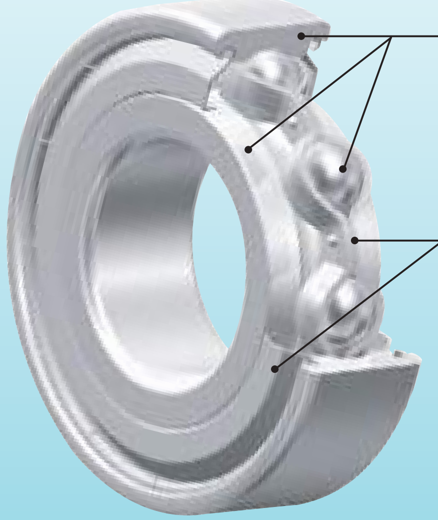
Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	**High temperature**
Corrosive	Hygiene





Product Specifications



Martensitic stainless steel

Outer ring **Inner ring** **Ball**

✻ Ceramic ball types are also available.

Austenitic stainless steel

Cage **Shield**

Bearing Numbering System

SE Basic bearing number ZZST**PRB** YS

Solid lubricant

Clean Pro Bearing-RB

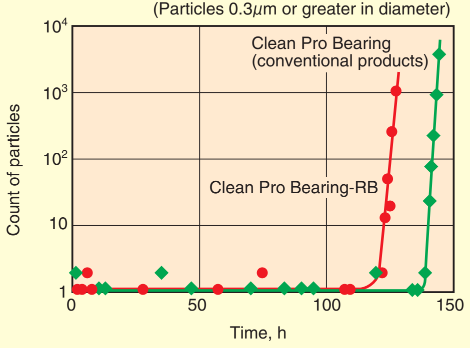
Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer systems
- Vacuum equipment
- Sputtering equipment

Performance

- Comparable to the Clean Pro Bearing (conventional products) in low particle emissions.

Comparison of particle emissions
(Particles 0.3μm or greater in diameter)

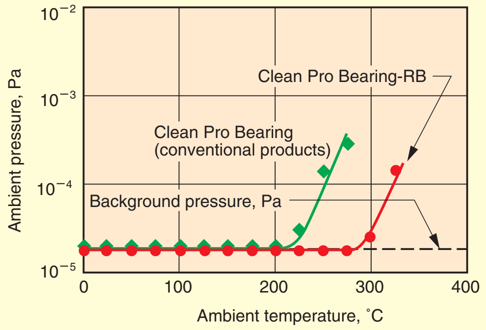


- **Test conditions**

Bearing No.: 608
Temperature: Atmosphere / room temperature
Rotational speed: 200min^{-1}, Load: Axial 100 N

- Compatible with temperatures of up to 260˚C in a vacuum.

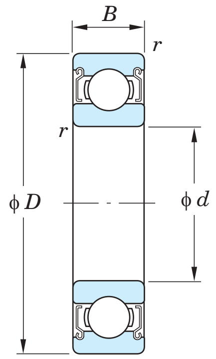
Gas emission characteristics



- **Test conditions**

Bearing No.: 608

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load 2)	Limiting speed
d	D	B	r (min.)		f_0	N	min^{-1}
4	12	4	0.2	**SE604ZZSTPRBM5 YS**	12.4	30	1 000
	13	5	0.2	**SE624ZZSTPRBM5 YS**	12.3	40	1 000
5	14	5	0.2	**SE605ZZSTPRBM5 YS**	12.3	40	1 000
	16	5	0.3	**SE625-5ZZSTPRBM5 YS**	12.4	55	1 000
6	17	6	0.3	**SE606ZZSTPRBM5 YS**	12.2	60	1 000
	19	6	0.3	**SE626ZZSTPRBM5 YS**	12.3	80	1 000
7	19	6	0.3	**SE607ZZSTPRBM5 YS**	12.3	80	1 000
	22	7	0.3	**SE627ZZSTPRBM5 YS**	12.4	100	1 000
8	22	7	0.3	**SE608ZZSTPRBM5 YS**	12.4	100	1 000
	24	8	0.3	**SE628ZZSTPRBM5 YS**	12.8	100	1 000
9	24	7	0.3	**SE609ZZSTPRBM5 YS**	12.8	100	1 000
	26	8	0.6	**SE629ZZSTPRBM5 YS**	12.4	135	970
9.525	22.225	7.142	0.5	**SEEE3SZZSTPRBM5 YS**	12.8	100	1 000
10	26	8	0.3	**SE6000ZZSTPRBC3 YS**	12.3	135	1 000
	30	9	0.6	**SE6200ZZSTPRBC3 YS**	13.2	155	860
12	28	8	0.3	**SE6001ZZSTPRBC3 YS**	13.2	155	830
	32	10	0.6	**SE6201ZZSTPRBC3 YS**	12.3	205	770
15	32	9	0.3	**SE6002ZZSTPRBC3 YS**	13.9	170	660
	35	11	0.6	**SE6202ZZSTPRBC3 YS**	13.2	230	610
17	35	10	0.3	**SE6003ZZSTPRBC3 YS**	14.4	180	580
	40	12	0.6	**SE6203ZZSTPRBC3 YS**	13.2	285	530
20	42	12	0.6	**SE6004ZZSTPRBC3 YS**	13.9	280	500
	47	14	1	**SE6204ZZSTPRBC3 YS**	13.2	385	450
25	47	12	0.6	**SE6005ZZSTPRBC3 YS**	14.5	305	400
	52	15	1	**SE6205ZZSTPRBC3 YS**	13.9	420	360
30	55	13	1	**SE6006ZZSTPRBC3 YS**	14.7	395	330
	62	16	1	**SE6206ZZSTPRBC3 YS**	13.9	585	300
35	62	14	1	**SE6007ZZSTPRBC3 YS**	14.9	475	280
	72	17	1.1	**SE6207ZZSTPRBC3 YS**	13.9	770	250
40	68	15	1	**SE6008ZZSTPRBC3 YS**	15.2	500	250
	80	18	1.1	**SE6208ZZSTPRBC3 YS**	14.0	875	220

[Remarks] 1) Bearings with a radial internal clearance of C4 are also available.
2) Sizes other than those listed in this table are also available. Contact JTEKT for details.
3) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

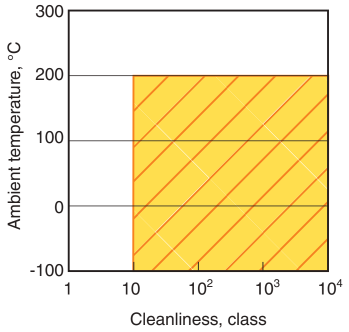
3-3 New Clean Pro Bearing-PR

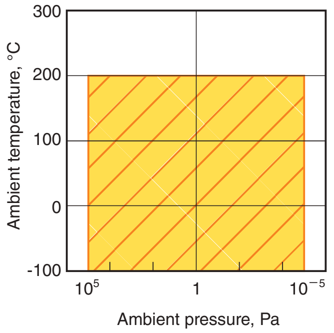
For Clean Rooms, Vacuum Equipment

This bearing is lubricated with a fluoropolymer coating over the entire surface of all bearing components.

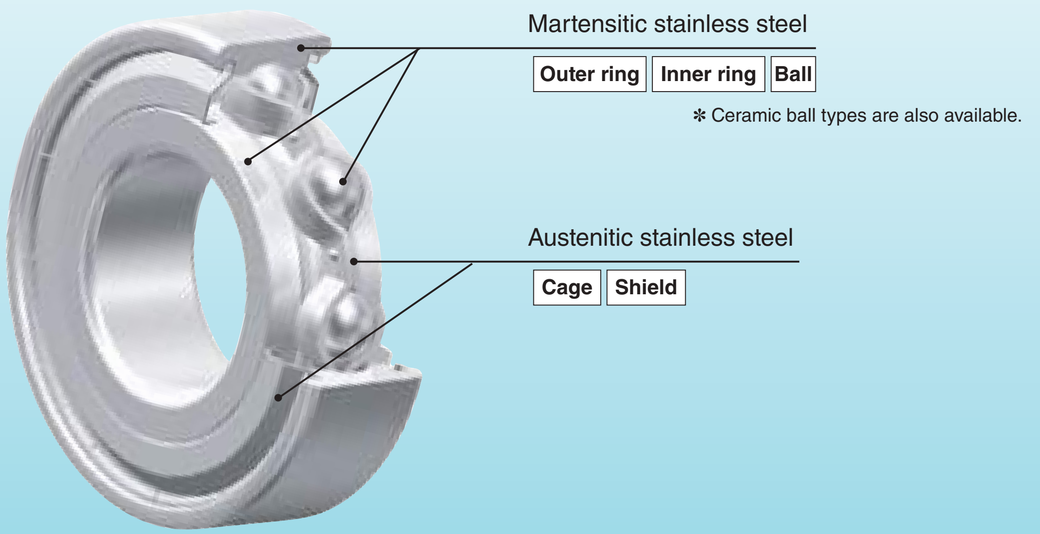
Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	High temperature
Corrosive	Hygiene





Product Specifications



✻ Ceramic ball types are also available.

Bearing Numbering System

SE Basic bearing number ZZST**PR** YS

SE: Solid lubricant

PR: New Clean Pro Bearing-PR

Applications

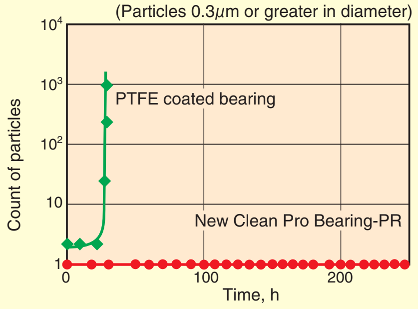
- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum equipment
- Lithography equipment
- Sputtering equipment
- Vacuum motors

Performance

- Suitable for use in clean environments due to low particle emissions.

Comparison of particle emissions

(Particles 0.3μm or greater in diameter)

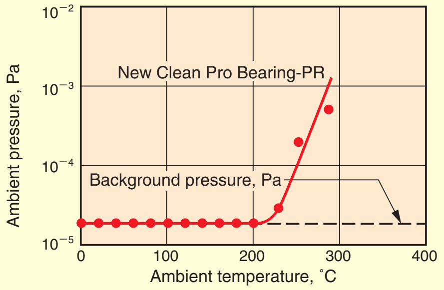


Test conditions

Bearing No.: 608
Temperature: Atmosphere / room temperature
Rotational speed: 200min^{-1}, Load: Axial 20 N

- Stable performance up to 200°C in a vacuum.

Gas emission characteristics



Test conditions

Bearing No.: 608

Lubricant service life expectancy equation

The average service life of New Clean Pro Bearing-PR can be estimated by the following equation:

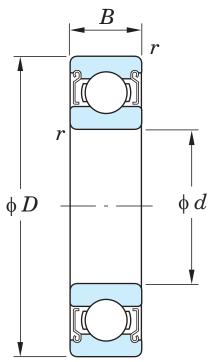
$$L_{av} = b_2 \cdot \left(\frac{C_r \times 0.85}{P_r}\right)^q \times 0.016667/n$$

Where,

L_{av} : Average life, h
b_2 : Lubrication factor
$b_2 = 420$
C_r : Basic dynamic load rating, N
P_r : Dynamic equivalent radial load, N
q : Exponential coefficient, $q = 3$
n : Rotational speed, min^{-1}

For the service life of solid lubricants, refer to page 13.

Dimensions Table



Dynamic equivalent load
$P_r = XF_r + YF_a$
(X and Y are as shown below.)
Static equivalent load
$P_{0r} = 0.6F_r + 0.5F_a$
When P_{0r} is smaller than F_r .
$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Boundary dimensions mm				Bearing No.	Basic load ratings [1] kN		Factor	Permissible radial load [2]	Limiting speed
d	D	B	r (min.)		C_r	C_{0r}	f_0	N	min^{-1}
4	12	4	0.2	**SE604ZZSTPRM5 YS**	0.97	0.36	12.4	30	1 000
	13	5	0.2	**SE624ZZSTPRM5 YS**	1.30	0.49	12.3	40	1 000
5	14	5	0.2	**SE605ZZSTPRM5 YS**	1.30	0.49	12.3	40	1 000
	16	5	0.3	**SE625-5ZZSTPRM5 YS**	1.75	0.67	12.4	55	1 000
6	17	6	0.3	**SE606ZZSTPRM5 YS**	1.95	0.74	12.2	60	1 000
	19	6	0.3	**SE626ZZSTPRM5 YS**	2.60	1.05	12.3	80	1 000
7	19	6	0.3	**SE607ZZSTPRM5 YS**	2.60	1.05	12.3	80	1 000
	22	7	0.3	**SE627ZZSTPRM5 YS**	3.30	1.35	12.4	100	1 000
8	22	7	0.3	**SE608ZZSTPRM5 YS**	3.30	1.35	12.4	100	1 000
	24	8	0.3	**SE628ZZSTPRM5 YS**	3.35	1.40	12.8	100	1 000
9	24	7	0.3	**SE609ZZSTPRM5 YS**	3.35	1.40	12.8	100	1 000
	26	8	0.6	**SE629ZZSTPRM5 YS**	4.55	1.95	12.4	135	970
9.525	22.225	7.142	0.5	**SEEE3SZZSTPRM5 YS**	3.35	1.40	12.8	100	1 000
10	26	8	0.3	**SE6000ZZSTPRC3 YS**	4.55	1.95	12.3	135	1 000
	30	9	0.6	**SE6200ZZSTPRC3 YS**	5.10	2.40	13.2	155	860
12	28	8	0.3	**SE6001ZZSTPRC3 YS**	5.10	2.40	13.2	155	830
	32	10	0.6	**SE6201ZZSTPRC3 YS**	6.80	3.05	12.3	205	770
15	32	9	0.3	**SE6002ZZSTPRC3 YS**	5.60	2.85	13.9	170	660
	35	11	0.6	**SE6202ZZSTPRC3 YS**	7.65	3.75	13.2	230	610
17	35	10	0.3	**SE6003ZZSTPRC3 YS**	6.00	3.25	14.4	180	580
	40	12	0.6	**SE6203ZZSTPRC3 YS**	9.55	4.80	13.2	285	530
20	42	12	0.6	**SE6004ZZSTPRC3 YS**	9.40	5.05	13.9	280	500
	47	14	1	**SE6204ZZSTPRC3 YS**	12.8	6.65	13.2	385	450
25	47	12	0.6	**SE6005ZZSTPRC3 YS**	10.1	5.85	14.5	305	400
	52	15	1	**SE6205ZZSTPRC3 YS**	14.0	7.85	13.9	420	360
30	55	13	1	**SE6006ZZSTPRC3 YS**	13.2	8.25	14.7	395	330
	62	16	1	**SE6206ZZSTPRC3 YS**	19.5	11.3	13.9	585	300
35	62	14	1	**SE6007ZZSTPRC3 YS**	15.9	10.3	14.9	475	280
	72	17	1.1	**SE6207ZZSTPRC3 YS**	25.7	15.4	13.9	770	250
40	68	15	1	**SE6008ZZSTPRC3 YS**	16.7	11.5	15.2	500	250
	80	18	1.1	**SE6208ZZSTPRC3 YS**	29.1	17.8	14.0	875	220

Notes 1) The basic load ratings are those of standard bearing (used to calculate lubrication life).
2) The permissible radial loads can be regarded as the maximum loads applicable to individual bearings. When an axial load is applied to the bearing, convert this axial load to a dynamic equivalent radial load, and then compare this value to the permissible radial load.

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

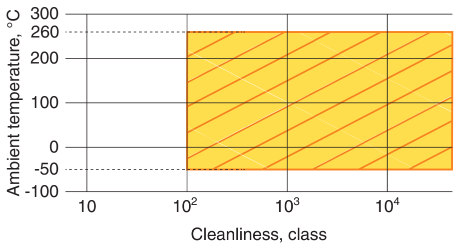
3-4 EXSEV®-EX

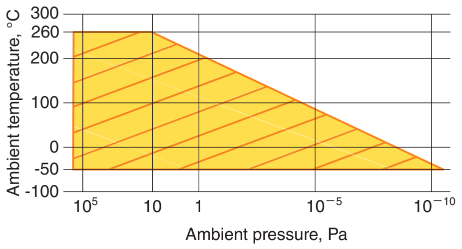
The Lubricating Properties of Grease in Clean / Vacuum Applications

This bearing is lubricated with the packed fluorinated EXSEV®-EX (Grease), which is suitable for use in clean environments and vacuum environments.
Compliant with environmental regulations (does not contain PFOA)

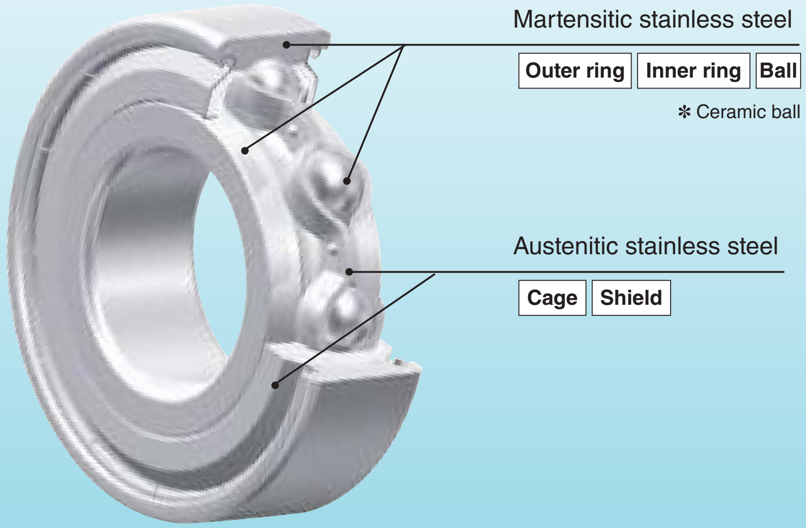
Applicable Environments

Clean Magnetic field
Vacuum Electric field
High speed **High temperature**
Corrosive Hygiene





Product Specifications



✻ Ceramic ball types are also available.

Bearing Numbering System

SV | Basic bearing number | ZZST YS EX

Solid lubricant

✻ For details on EXSEV®-EX (grease), refer to page 94.

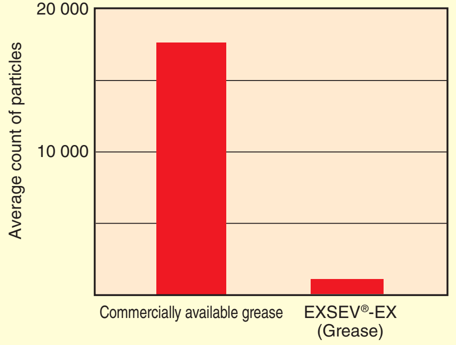
Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer robots
- Vacuum pumps

Performance

- Suitable for clean and vacuum applications thanks to low particle emissions.

Comparison of particle emissions
(Particles 0.1 μm or greater in diameter)



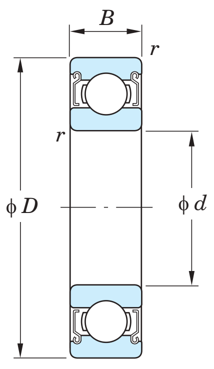
- **Test conditions**

Bearing No.: 6000
Temperature: Atmosphere / room temperature
Rotational speed: 450min^{-1}
Load: Radial 10 N
Filled amount: 25%

Grease properties

Name	EXSEV®-EX (Grease)
Thickener	PTFE
Base oil	PFPE
Dropping point	None
Evaporation (99°C×24h)	0.1wt%max.
Oil separation (100°C×24h)	2wt%max.
Operating temperature range	–50 to 260°C

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Boundary dimensions mm				Bearing No.	Basic load ratings [1] kN		Factor	Limiting [2] speed
d	D	B	r (min.)		C_r	C_{0r}	f_0	min^{-1}
4	12	4	0.2	**SV604ZZSTM5 YS EX**	0.80	0.30	12.4	10 000
	13	5	0.2	**SV624ZZSTM5 YS EX**	1.10	0.40	12.3	9 000
5	14	5	0.2	**SV605ZZSTM5 YS EX**	1.10	0.40	12.3	8 000
	16	5	0.3	**SV625-5ZZSTM5 YS EX**	1.45	0.55	12.4	6 700
6	17	6	0.3	**SV606ZZSTM5 YS EX**	1.65	0.60	12.2	6 600
	19	6	0.3	**SV626ZZSTM5 YS EX**	2.20	0.85	12.3	5 900
7	19	6	0.3	**SV607ZZSTM5 YS EX**	2.20	0.85	12.3	5 700
	22	7	0.3	**SV627ZZSTM5 YS EX**	2.80	1.10	12.4	4 900
8	22	7	0.3	**SV608ZZSTM5 YS EX**	2.80	1.10	12.4	5 000
	24	8	0.3	**SV628ZZSTM5 YS EX**	2.85	1.10	12.8	4 700
9	24	7	0.3	**SV609ZZSTM5 YS EX**	2.85	1.10	12.8	4 400
	26	8	0.6	**SV629ZZSTM5 YS EX**	3.90	1.55	12.4	3 900
9.525	22.225	7.142	0.5	**SVEE3SZZSTM5 YS EX**	2.85	1.10	12.8	5 600
10	26	8	0.3	**SV6000ZZSTC3 YS EX**	3.85	1.55	12.3	4 000
	30	9	0.6	**SV6200ZZSTC3 YS EX**	4.35	1.90	13.2	3 400
12	28	8	0.3	**SV6001ZZSTC3 YS EX**	4.35	1.90	13.2	3 300
	32	10	0.6	**SV6201ZZSTC3 YS EX**	5.75	2.45	12.3	3 100
15	32	9	0.3	**SV6002ZZSTC3 YS EX**	4.75	2.25	13.9	2 600
	35	11	0.6	**SV6202ZZSTC3 YS EX**	6.50	3.00	13.2	2 400
17	35	10	0.3	**SV6003ZZSTC3 YS EX**	5.10	2.60	14.4	2 300
	40	12	0.6	**SV6203ZZSTC3 YS EX**	8.15	3.85	13.2	2 100
20	42	12	0.6	**SV6004ZZSTC3 YS EX**	8.00	4.05	13.9	2 000
	47	14	1	**SV6204ZZSTC3 YS EX**	10.9	5.35	13.2	1 800
25	47	12	0.6	**SV6005ZZSTC3 YS EX**	8.55	4.65	14.5	1 600
	52	15	1	**SV6205ZZSTC3 YS EX**	11.9	6.30	13.9	1 400
30	55	13	1	**SV6006ZZSTC3 YS EX**	11.2	6.60	14.7	1 300
	62	16	1	**SV6206ZZSTC3 YS EX**	16.5	9.05	13.9	1 200
35	62	14	1	**SV6007ZZSTC3 YS EX**	13.5	8.25	14.9	1 100
	72	17	1.1	**SV6207ZZSTC3 YS EX**	21.8	12.3	13.9	1 000
40	68	15	1	**SV6008ZZSTC3 YS EX**	14.2	9.20	15.2	1 000
	80	18	1.1	**SV6208ZZSTC3 YS EX**	24.8	14.3	14.0	900

Notes 1) The basic load ratings are those of bearing made from SUS440C.
To calculate dynamic equivalent radial loads, multiply the C_{0r} value in this table by 1.25.
2) The limiting speed is that determined based on the condition that the cleanliness requirement is class 100.
[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

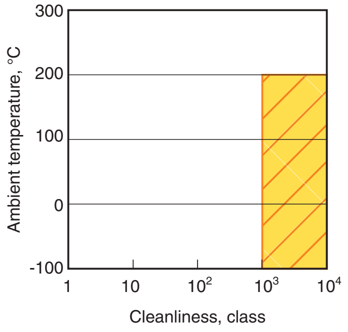
Basic Specification for Supporting Clean, Vacuum Environments

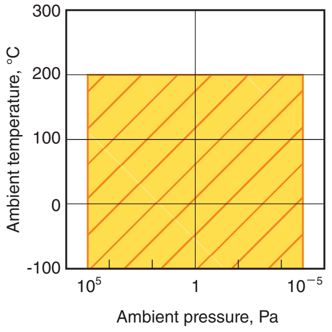
3-5 EXSEV®-FA

This bearing is lubricated with a solid fluoropolymer lubricant,which offers superior lubrication performance. The cage is made from a low-particle-emission fluorocarbon resin.

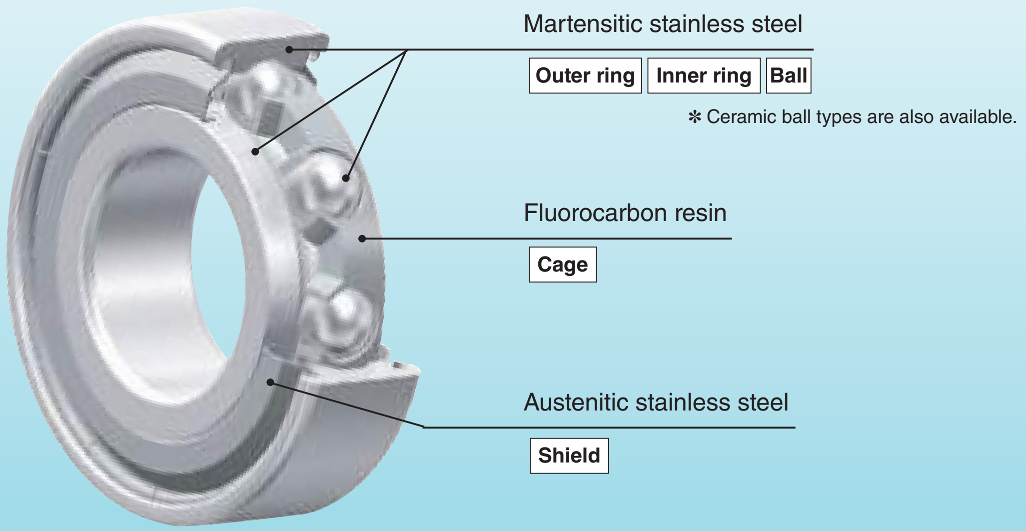
Applicable Environments

- **Clean**
- Magnetic field
- **Vacuum**
- Electric field
- High speed
- High temperature
- Corrosive
- Hygiene





Product Specifications



＊Ceramic ball types are also available.

Bearing Numbering System

SE Basic bearing number ZZST **FA**

SE: Solid lubricant

FA: Molded fluorocarbon resin cage

Applications

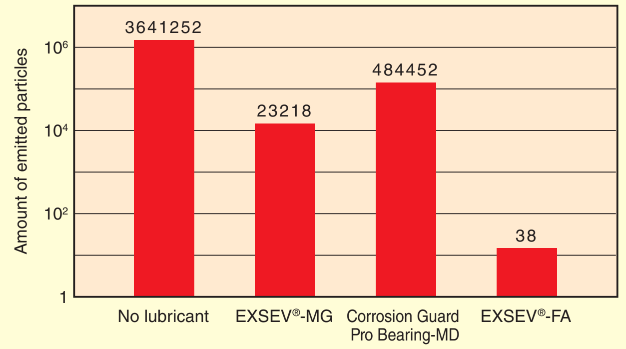
- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer systems
- Inspection systems

Performance

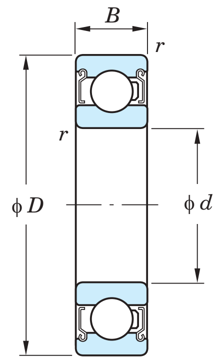
Test conditions

Tested bearing	ML6012 equivalent (ϕ6×12×3)
Rotational speed	200min^{-1}
Radial load	2.9 N/2 bearings
Ambience	In Class 10 clean bench, room temperature
Test time	20h
Measured particle size	Particle size 0.3μm or larger

Comparison of total emitted particles during a 20-hour test



Dimensions Table



Dynamic equivalent load

$$P_r = XF_r + YF_a$$

(X and Y are as shown below.)

Static equivalent load

$$P_{0r} = 0.6F_r + 0.5F_a$$

When P_{0r} is smaller than F_r .

$$P_{0r} = F_r$$

$\dfrac{f_0F_a}{C_{0r}}$	e	$\dfrac{F_a}{F_r} \leqq e$		$\dfrac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		f_0	N	min^{-1}
4	12	4	0.2	**SE604ZZST FA**	12.4	7.5	1 000
	13	5	0.2	**SE624ZZST FA**	12.3	10	1 000
5	14	5	0.2	**SE605ZZST FA**	12.3	10	1 000
	16	5	0.3	**SE625-5ZZST FA**	12.4	15	1 000
6	17	6	0.3	**SE606ZZST FA**	12.2	15	1 000
	19	6	0.3	**SE626ZZST FA**	12.3	20	1 000
7	19	6	0.3	**SE607ZZST FA**	12.3	20	1 000
	22	7	0.3	**SE627ZZST FA**	12.4	25	1 000
8	22	7	0.3	**SE608ZZSTM5 FA**	12.4	25	1 000
	24	8	0.3	**SE628ZZST FA**	12.8	25	1 000
9	24	7	0.3	**SE609ZZST FA**	12.8	25	1 000
	26	8	0.6	**SE629ZZST FA**	12.4	35	970
9.525	22.225	7.142	0.5	**SEEE3SZZST FA**	12.8	25	1 000
10	26	8	0.3	**SE6000ZZST FA**	12.3	35	1 000
	30	9	0.6	**SE6200ZZST FA**	13.2	50	860
12	28	8	0.3	**SE6001ZZST FA**	13.2	40	830
	32	10	0.6	**SE6201ZZST FA**	12.3	70	770
15	32	9	0.3	**SE6002ZZST FA**	13.9	45	660
	35	11	0.6	**SE6202ZZST FA**	13.2	75	610
17	35	10	0.3	**SE6003ZZST FA**	14.4	50	580
	40	12	0.6	**SE6203ZZST FA**	13.2	95	530
20	42	12	0.6	**SE6004ZZST FA**	13.9	70	500
	47	14	1	**SE6204ZZST FA**	13.2	130	450
25	47	12	0.6	**SE6005ZZST FA**	14.5	75	400
	52	15	1	**SE6205ZZST FA**	13.9	140	360
30	55	13	1	**SE6006ZZSTC3 FA**	14.7	95	330
	62	16	1	**SE6206ZZST FA**	13.9	195	300
35	62	14	1	**SE6007ZZST FA**	14.9	110	280
	72	17	1.1	**SE6207ZZST FA**	13.9	210	250
40	68	15	1	**SE6008ZZST FA**	15.2	135	250
	80	18	1.1	**SE6208ZZST FA**	14.0	230	220

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

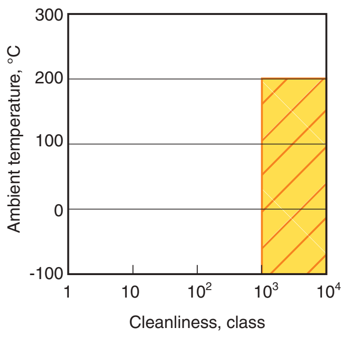
3-6 Corrosion Guard Pro Bearing-SC

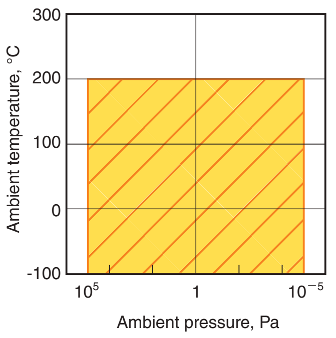
For Extreme Corrosive Environments

This bearing uses a silicon carbide ceramic material, which is resistant to strong acids and alkalis.

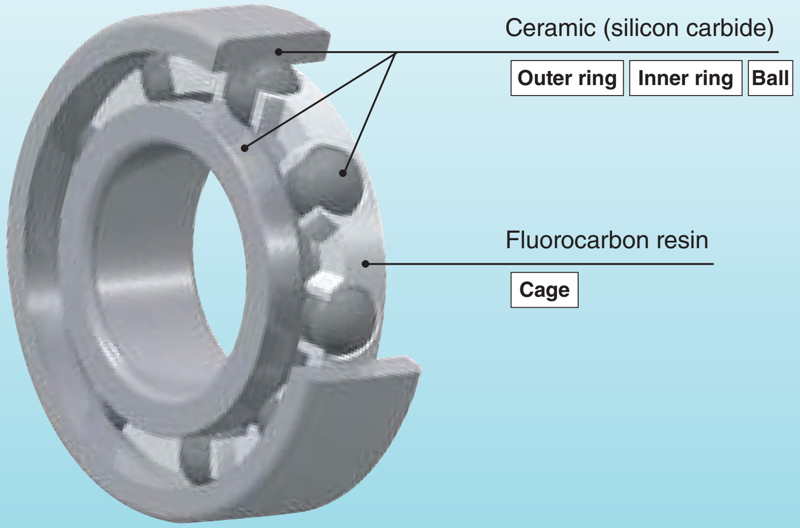
Applicable Environments

Clean **Magnetic field**
Vacuum **Electric field**
High speed High temperature
Corrosive Hygiene





Product Specifications



Bearing Numbering System

NCZ Basic bearing number **FA**

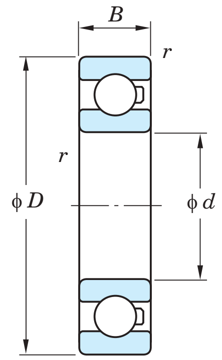
Corrosion Guard Pro Bearing-SC

Molded fluorocarbon resin cage

Applications

- Aluminum electrolytic capacitor manufacturing equipment

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		f_0	N	min^{-1}
4	12	4	0.2	**NCZ604 FA**	12.4	7.5	1 000
	13	5	0.2	**NCZ624 FA**	12.3	10	1 000
5	14	5	0.2	**NCZ605 FA**	12.3	10	1 000
	16	5	0.2	**NCZ625 FA**	12.4	15	1 000
6	17	6	0.3	**NCZ606 FA**	12.2	15	1 000
	19	6	0.3	**NCZ626 FA**	12.3	20	1 000
7	19	6	0.3	**NCZ607 FA**	12.3	20	1 000
	22	7	0.3	**NCZ627 FA**	12.4	25	1 000
8	22	7	0.3	**NCZ608 FA**	12.4	25	1 000
	24	8	0.3	**NCZ628 FA**	12.8	25	1 000
9	24	7	0.3	**NCZ609 FA**	12.8	25	1 000
	26	8	0.6	**NCZ629 FA**	12.4	35	970
9.525	22.225	7.142	0.5	**NCZEE3S FA**	12.8	25	1 000
10	26	8	0.3	**NCZ6000 FA**	12.3	35	1 000
	30	9	0.6	**NCZ6200 FA**	13.2	50	860
12	28	8	0.3	**NCZ6001 FA**	13.2	40	830
	32	10	0.6	**NCZ6201 FA**	12.3	70	770
15	32	9	0.3	**NCZ6002 FA**	13.9	45	660
	35	11	0.6	**NCZ6202 FA**	13.2	75	610
17	35	10	0.3	**NCZ6003 FA**	14.4	50	580
	40	12	0.6	**NCZ6203 FA**	13.2	95	530
20	42	12	1	**NCZ6004 FA**	13.9	70	500
	47	14	0.6	**NCZ6204 FA**	13.2	130	450
25	47	12	1	**NCZ6005 FA**	14.5	75	400
	52	15	1	**NCZ6205 FA**	13.9	140	360
30	55	13	1	**NCZ6006 FA**	14.7	95	330
	62	16	1	**NCZ6206 FA**	13.9	195	300
35	62	14	1	**NCZ6007 FA**	14.9	110	280
	72	17	1.1	**NCZ6207 FA**	13.9	210	250
40	68	15	1	**NCZ6008 FA**	15.2	135	250
	80	18	1.1	**NCZ6208 FA**	14.0	230	220

[Remarks] 1) Products manufactured using zirconia are also available. Contact JTEKT for details.
2) Sizes other than those listed in this table are also available. Contact JTEKT for details.
3) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

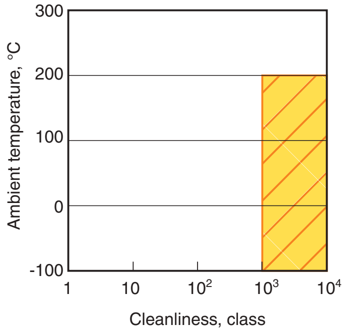
3-7 Corrosion Guard Pro Bearing-SN

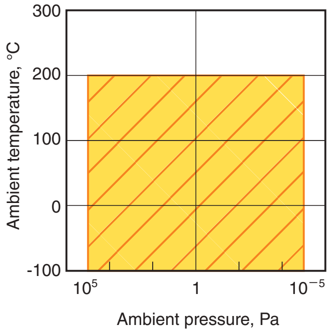
Silicon Nitride with Increased Corrosion Resistance

This bearing has its components made of corrosion resistant silicon nitride and is lubricated with fluoropolymer. This bearing can be used even in a highly corrosive solution.

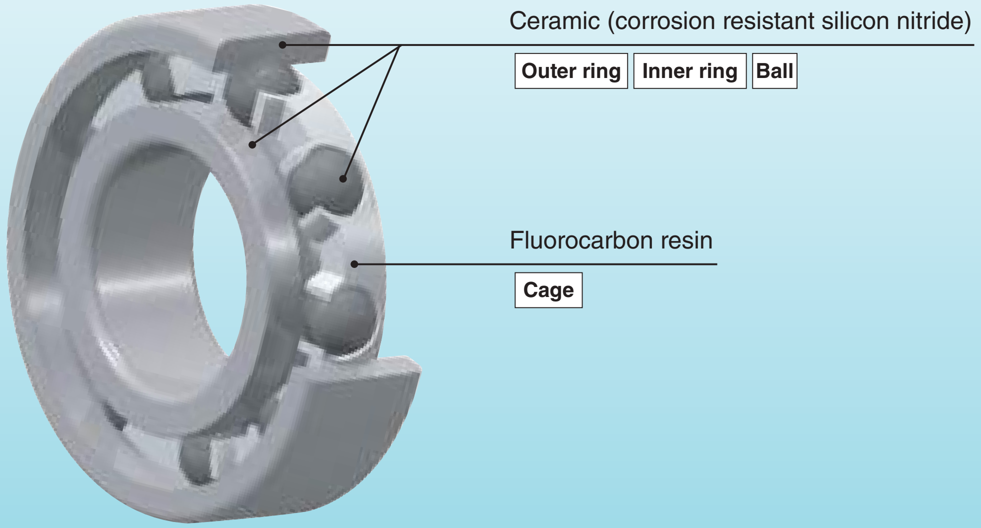
Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	High temperature
Corrosive	Hygiene





Product Specifications



Bearing Numbering System

NCT Basic bearing number **FA**

NCT: Corrosion Guard Pro Bearing-SN

FA: Molded fluorocarbon resin cage

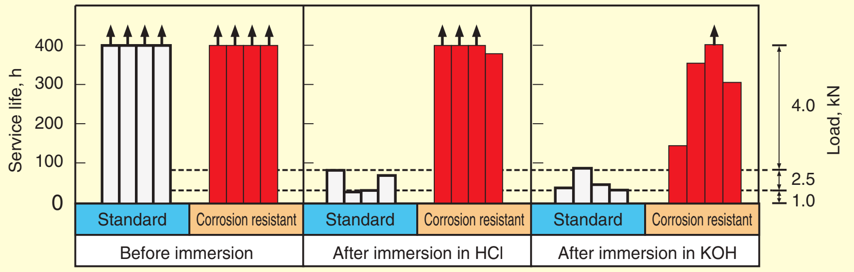
Applications

- Liquid crystal film manufacturing equipment
- Aluminum electrolytic capacitor manufacturing equipment
- Plating equipment
- Synthetic fiber manufacturing equipment
- Food container washing machine

Performance

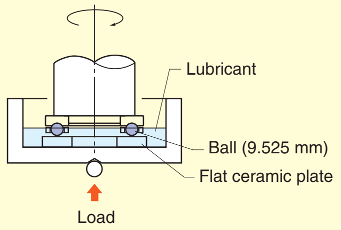
- In an acid or alkaline solution, this bearing has a longer service life than bearings made from standard silicone nitride.

Comparison in service life after immersion in acid or alkaline solutions

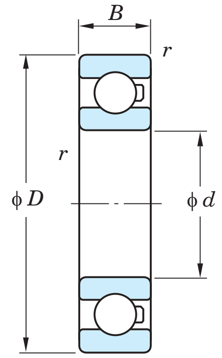


- **Test conditions**
  Lubricant : Spindle oil
  Ball : Bearing steel
  Load : Increased in stages at every 1.08×10^7 cycles
  Rotational speed : 1 200 min^{-1}

- **Evaluate equipment**



Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		f_0	N	min^{-1}
4	12	4	0.2	**NCT604 FA**	12.4	7.5	1 000
	13	5	0.2	**NCT624 FA**	12.3	10	1 000
5	14	5	0.2	**NCT605 FA**	12.3	10	1 000
	16	5	0.3	**NCT625-5 FA**	12.4	15	1 000
6	17	6	0.3	**NCT606 FA**	12.2	15	1 000
	19	6	0.3	**NCT626 FA**	12.3	20	1 000
7	19	6	0.3	**NCT607 FA**	12.3	20	1 000
	22	7	0.3	**NCT627 FA**	12.4	25	1 000
8	22	7	0.3	**NCT608 FA**	12.4	25	1 000
	24	8	0.3	**NCT628 FA**	12.8	25	1 000
9	24	7	0.3	**NCT609 FA**	12.8	25	1 000
	26	8	0.6	**NCT629 FA**	12.4	35	970
9.525	22.225	7.142	0.5	**NCTEE3S FA**	12.8	25	1 000
10	26	8	0.3	**NCT6000 FA**	12.3	35	1 000
	30	9	0.6	**NCT6200 FA**	13.2	50	860
12	28	8	0.3	**NCT6001 FA**	13.2	40	830
	32	10	0.6	**NCT6201 FA**	12.3	70	770
15	32	9	0.3	**NCT6002 FA**	13.9	45	660
	35	11	0.6	**NCT6202 FA**	13.2	75	610
17	35	10	0.3	**NCT6003 FA**	14.4	50	580
	40	12	0.6	**NCT6203 FA**	13.2	95	530
20	42	12	0.6	**NCT6004 FA**	13.9	70	500
	47	14	1	**NCT6204 FA**	13.2	130	450
25	47	12	0.6	**NCT6005 FA**	14.5	75	400
	52	15	1	**NCT6205 FA**	13.9	140	360
30	55	13	1	**NCT6006 FA**	14.7	95	330
	62	16	1	**NCT6206 FA**	13.9	195	300
35	62	14	1	**NCT6007 FA**	14.9	110	280
	72	17	1.1	**NCT6207 FA**	13.9	210	250
40	68	15	1	**NCT6008 FA**	15.2	135	250
	80	18	1.1	**NCT6208 FA**	14.0	230	220

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

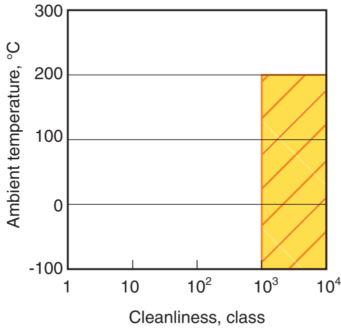
Using Ceramics for Various Applications

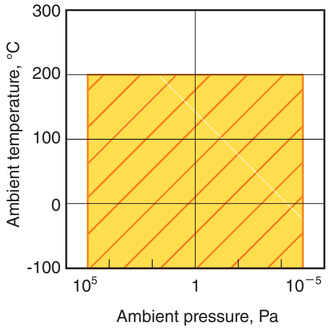
3-8 Ceramic Bearings

This bearing has its components made of silicon nitride ceramic and uses fluoropolymer as the lubricant. It is typically used in vacuum and corrosive environments.

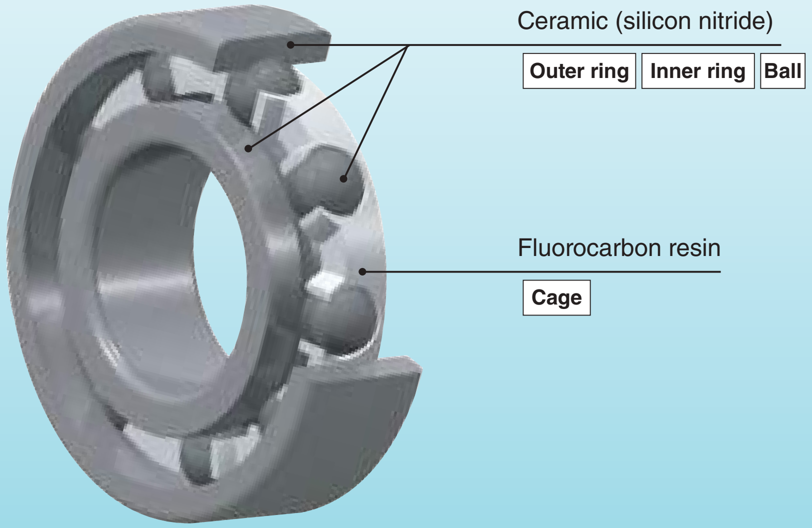
Applicable Environments

Clean
Magnetic field
Vacuum
Electric field
High speed
High temperature
Corrosive
Hygiene





Product Specifications



Bearing Numbering System

NC | Basic bearing number | **FA**

Ceramic bearing
Molded fluorocarbon resin cage

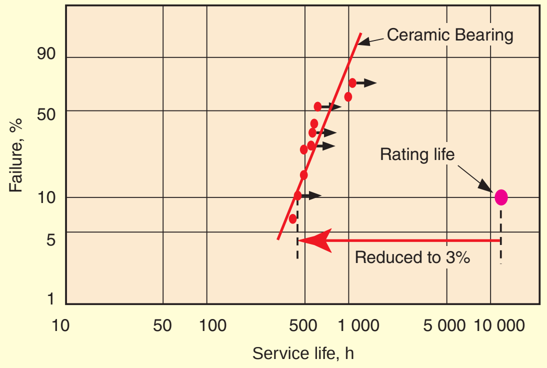
Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Semiconductor inspection equipment
- Synthetic fiber manufacturing equipment
- Canning machinery
- Ultrasonic motors

Performance

- This Ceramic Bearing can be used under water; however, when used in a liquid with poor lubrication characteristics, the load exerted on the bearing should be no higher than 10% of the bearing's basic dynamic load rating. Also note that the fatigue life of the bearing is 3% of its rating life under water.
- When this Ceramic Bearing is not used under water, select one based on the permissible radial load and limiting speed specified in the Dimensions Table.

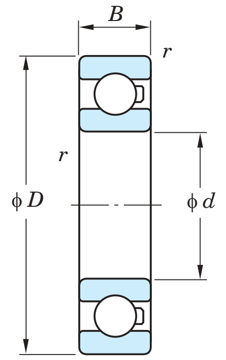
Water resistance



Test conditions

Bearing No.: 6206 equivalent
Rotational speed: 1500min^{-1}
Load: Radial 1470 N

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Boundary dimensions mm				Bearing No.	Basic load ratings kN		Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		C_r	C_{0r}	f_0	N	min^{-1}
4	12	4	0.2	**NC604 FA**	0.97	0.36	12.4	7.5	1 000
	13	5	0.2	**NC624 FA**	1.30	0.49	12.3	10	1 000
5	14	5	0.2	**NC605 FA**	1.30	0.49	12.3	10	1 000
	16	5	0.3	**NC625-5 FA**	1.75	0.67	12.4	15	1 000
6	17	6	0.3	**NC606 FA**	1.95	0.74	12.2	15	1 000
	19	6	0.3	**NC626 FA**	2.60	1.05	12.3	20	1 000
7	19	6	0.3	**NC607 FA**	2.60	1.05	12.3	20	1 000
	22	7	0.3	**NC627 FA**	3.30	1.35	12.4	25	1 000
8	22	7	0.3	**NC608 FA**	3.30	1.35	12.4	25	1 000
	24	8	0.3	**NC628 FA**	3.35	1.40	12.8	25	1 000
9	24	7	0.3	**NC609 FA**	3.35	1.40	12.8	25	1 000
	26	8	0.6	**NC629 FA**	4.55	1.95	12.4	35	970
9.525	22.225	7.142	0.5	**NCEE3S FA**	3.35	1.40	12.8	25	1 000
10	26	8	0.3	**NC6000 FA**	4.55	1.95	12.3	35	1 000
	30	9	0.6	**NC6200 FA**	5.10	2.40	13.2	50	860
12	28	8	0.3	**NC6001 FA**	5.10	2.40	13.2	40	830
	32	10	0.6	**NC6201 FA**	6.80	3.05	12.3	70	770
15	32	9	0.3	**NC6002 FA**	5.60	2.85	13.9	45	660
	35	11	0.6	**NC6202 FA**	7.65	3.75	13.2	75	610
17	35	10	0.3	**NC6003 FA**	6.00	3.25	14.4	50	580
	40	12	0.6	**NC6203 FA**	9.55	4.80	13.2	95	530
20	42	12	0.6	**NC6004 FA**	9.40	5.05	13.9	70	500
	47	14	1	**NC6204 FA**	12.8	6.65	13.2	130	450
25	47	12	0.6	**NC6005 FA**	10.1	5.85	14.5	75	400
	52	15	1	**NC6205 FA**	14.0	7.85	13.9	140	360
30	55	13	1	**NC6006 FA**	13.2	8.25	14.7	95	330
	62	16	1	**NC6206 FA**	19.5	11.3	13.9	195	300
35	62	14	1	**NC6007 FA**	15.9	10.3	14.9	110	280
	72	17	1.1	**NC6207 FA**	25.7	15.4	13.9	210	250
40	68	15	1	**NC6008 FA**	16.7	11.5	15.2	135	250
	80	18	1.1	**NC6208 FA**	29.1	17.8	14.0	230	220

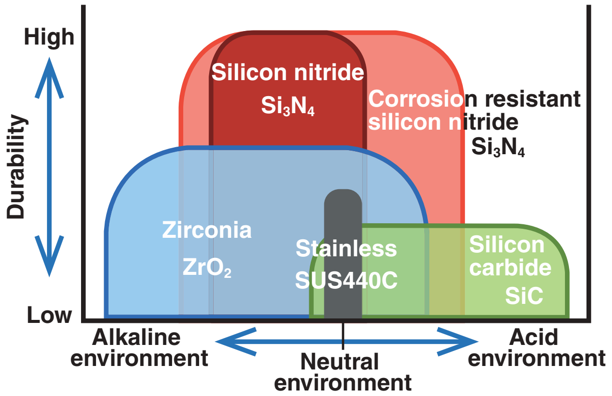
[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

3-9 Corrosion Guard Pro Bearing-ZO

This bearing uses ceramic (zirconia) for its material and is lubricated with the solid lubricant of the molded PEEK resin cage. It can be used in corrosive liquids or water and also has excellent impact resistance.

Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	High temperature
Corrosive	Hygiene



Product Specifications

＊A type with an aligning ring is also available as an option.

Bearing Numbering System

NCB Basic bearing number **PN**

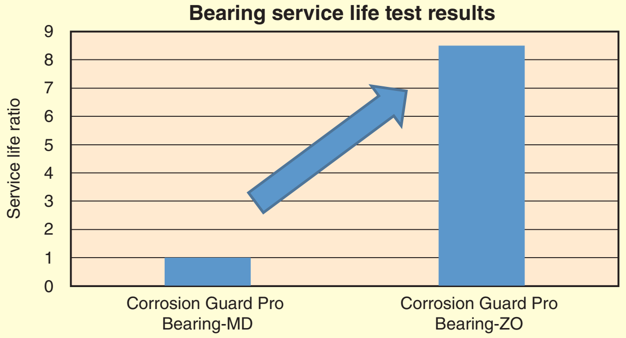
Corrosion Guard Pro Bearing-ZO

Molded PEEK resin cage

Applications

- High-performance film manufacturing equipment
- Cleaning equipment

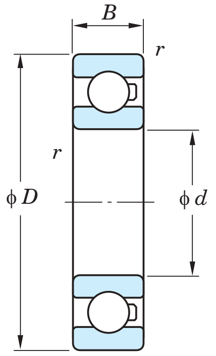
Performance



Test conditions

Bearing No.	6205
Load	250N (Radial)
Rotational speed	20min⁻¹
Ambience	Submerged in solution
Temperature	60 to 80˚C

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		f_0	N	min⁻¹
4	12	4	0.2	**NCB604 PN**	12.4	7.5	1 000
	13	5	0.2	**NCB624 PN**	12.3	10	1 000
5	14	5	0.2	**NCB605 PN**	12.3	10	1 000
	16	5	0.3	**NCB625 PN**	12.4	15	1 000
6	17	6	0.3	**NCB606 PN**	12.2	15	1 000
	19	6	0.3	**NCB626 PN**	12.3	20	1 000
7	19	6	0.3	**NCB607 PN**	12.3	20	1 000
	22	7	0.3	**NCB627 PN**	12.4	25	1 000
8	22	7	0.3	**NCB608 PN**	12.4	25	1 000
	24	8	0.3	**NCB628 PN**	12.8	25	1 000
9	24	7	0.3	**NCB609 PN**	12.8	25	1 000
	26	8	0.6	**NCB629 PN**	12.4	35	970
9.525	22.225	7.142	0.5	**NCBEE3S PN**	12.8	25	1 000
10	26	8	0.3	**NCB6000 PN**	12.3	35	1 000
	30	9	0.6	**NCB6200 PN**	13.2	50	860
12	28	8	0.3	**NCB6001 PN**	13.2	40	830
	32	10	0.6	**NCB6201 PN**	12.3	70	770
15	32	9	0.3	**NCB6002 PN**	13.9	45	660
	35	11	0.6	**NCB6202 PN**	13.2	75	610
17	35	10	0.3	**NCB6003 PN**	14.4	50	580
	40	12	0.6	**NCB6203 PN**	13.2	95	530
20	42	12	0.6	**NCB6004 PN**	13.9	70	500
	47	14	1	**NCB6204 PN**	13.2	130	450
25	47	12	0.6	**NCB6005 PN**	14.5	75	400
	52	15	1	**NCB6205 PN**	13.9	140	360
30	55	13	1	**NCB6006 PN**	14.7	95	330
	62	16	1	**NCB6206 PN**	13.9	195	300
35	62	14	1	**NCB6007 PN**	14.9	110	280
	72	17	1.1	**NCB6207 PN**	13.9	210	250
40	68	15	1	**NCB6008 PN**	15.2	135	250
	80	18	1.1	**NCB6208 PN**	14.0	230	220

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

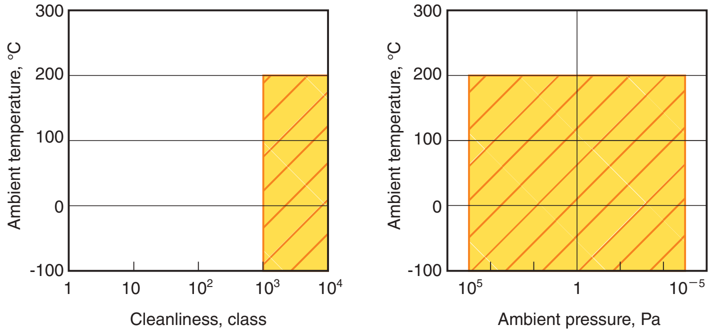
3-10 Corrosion Guard Pro Bearing-MD

For Salt Water and Chemical Environments

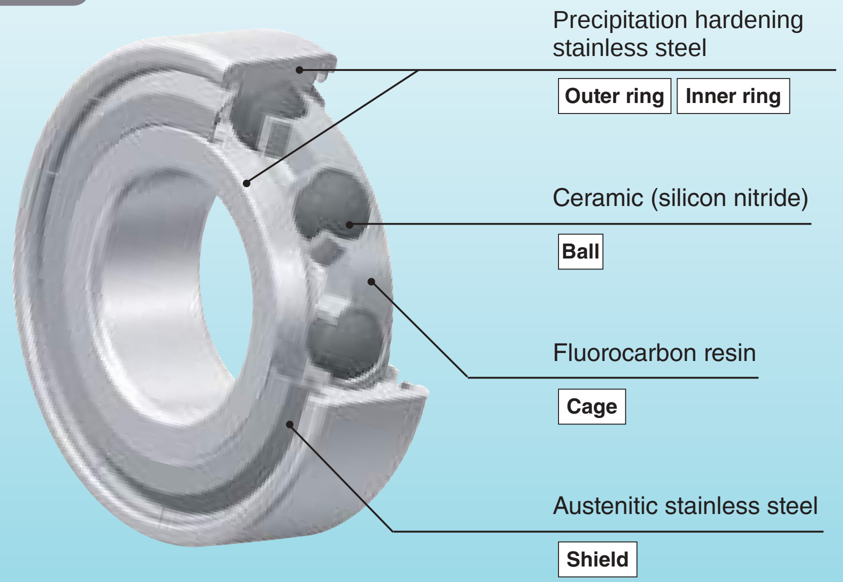
This bearing uses a stainless steel variety that has excellent corrosion resistance. As the lubricant, fluoropolymer is used. It is compatible with underwater use.

Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	High temperature
Corrosive	Hygiene



Product Specifications



Bearing Numbering System

3NC Basic bearing number ZZ**MD4** **FA**

Hybrid ceramic bearing

Molded fluorocarbon resin cage

Corrosion Guard Pro Bearing-MD

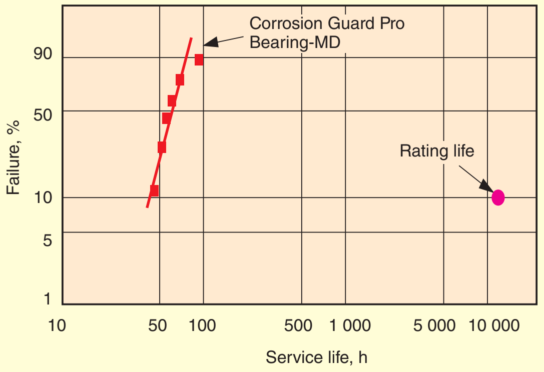
Applications

- Semiconductor manufacturing equipment
- Chemical manufacturing equipment
- Food machinery
- Cleaning equipment

Performance

- When this Corrosion Guard Pro Bearing-MD is used under water, its service life is determined depending on the rust and/or wear of bearing rings. The service life cannot be estimated correctly from the rating life.
- When this Corrosion Guard Pro Bearing-MD is not used under water, select one based on the allowable radial load and limiting speed specified in the Dimensions Table.

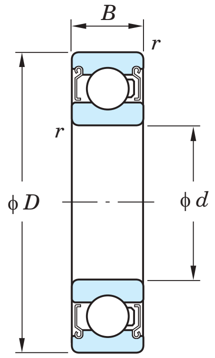
Water resistance



Test conditions

Bearing No.: 6206 equivalent
Rotational speed: 1500min⁻¹
Load: Radial 196 N

Dimensions Table



Dynamic equivalent load

$$P_r = XF_r + YF_a$$

(X and Y are as shown below.)

Static equivalent load

$$P_{0r} = 0.6F_r + 0.5F_a$$

When P_{0r} is smaller than F_r .

$$P_{0r} = F_r$$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		f_0	N	min⁻¹
4	12	4	0.2	**3NC604ZZMD4 FA**	12.4	7.5	1 000
	13	5	0.2	**3NC624ZZMD4 FA**	12.3	10	1 000
5	14	5	0.2	**3NC605ZZMD4 FA**	12.3	10	1 000
	16	5	0.3	**3NC625-5ZZMD4 FA**	12.4	15	1 000
6	17	6	0.3	**3NC606ZZMD4 FA**	12.2	15	1 000
	19	6	0.3	**3NC626ZZMD4 FA**	12.3	20	1 000
7	19	6	0.3	**3NC607ZZMD4 FA**	12.3	20	1 000
	22	7	0.3	**3NC627ZZMD4 FA**	12.4	25	1 000
8	22	7	0.3	**3NC608ZZMD4M5 FA**	12.4	25	1 000
	24	8	0.3	**3NC628ZZMD4 FA**	12.8	25	1 000
9	24	7	0.3	**3NC609ZZMD4 FA**	12.8	25	1 000
	26	8	0.6	**3NC629ZZMD4 FA**	12.4	35	970
9.525	22.225	7.142	0.5	**3NCEE3SZZMD4 FA**	12.8	25	1 000
10	26	8	0.3	**3NC6000ZZMD4 FA**	12.3	35	1 000
	30	9	0.6	**3NC6200ZZMD4 FA**	13.2	50	860
12	28	8	0.3	**3NC6001ZZMD4 FA**	13.2	40	830
	32	10	0.6	**3NC6201ZZMD4 FA**	12.3	70	770
15	32	9	0.3	**3NC6002ZZMD4 FA**	13.9	45	660
	35	11	0.6	**3NC6202ZZMD4 FA**	13.2	75	610
17	35	10	0.3	**3NC6003ZZMD4 FA**	14.4	50	580
	40	12	0.6	**3NC6203ZZMD4 FA**	13.2	95	530
20	42	12	0.6	**3NC6004ZZMD4 FA**	13.9	70	500
	47	14	1	**3NC6204ZZMD4 FA**	13.2	130	450
25	47	12	0.6	**3NC6005ZZMD4 FA**	14.5	75	400
	52	15	1	**3NC6205ZZMD4 FA**	13.9	140	360
30	55	13	1	**3NC6006ZZMD4C3 FA**	14.7	95	330
	62	16	1	**3NC6206ZZMD4 FA**	13.9	195	300
35	62	14	1	**3NC6007ZZMD4 FA**	14.9	110	280
	72	17	1.1	**3NC6207ZZMD4 FA**	13.9	210	250
40	68	15	1	**3NC6008ZZMD4 FA**	15.2	135	250
	80	18	1.1	**3NC6208ZZMD4 FA**	14.0	230	220

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

3-11 EXSEV®-SK

The Standard for Stainless Steel Bearings

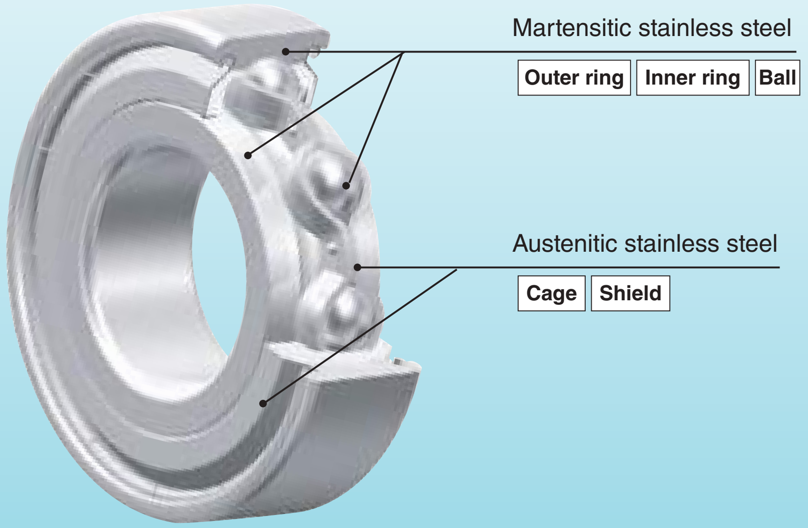
This bearing has its components made of stainless steel, and is lubricated with lithium containing EXSEV®-KHD (Grease), which is packed in adequate amounts. This bearing is suitable for use in slightly corrosive environments.

Applicable Environments

Clean
Magnetic field
Vacuum
Electric field
High speed
High temperature
Corrosive
Hygiene

- Temperature: – 30 to 120˚C
- Ambient pressure: Atmospheric pressure
- Unsuitable for clean environments due to anticorrosive treatment.

Product Specifications



Bearing Numbering System

SK | Basic bearing number | ZZ (2RS) ST YS HX

EXSEV®-SK

Applications

- Chemical equipment
- Transfer systems

Grease Properties

Grease properties

Name	EXSEV®-KHD (Grease)
Thickener	Lithium soap
Base oil	Poly α olefin
Dropping point	203˚C
Evaporation (99˚C × 22h)	0.14wt%
Oil separation (100˚C × 24 h)	0.1wt%
Operating temperature range	–30 to 120˚C

Grease life can be estimated by the following equation.

$$\log L = 6.10 - 4.40 \times 10^{-6} d_m n - 2.50 \left(\frac{P_r}{C_r} - 0.05\right) - (0.021 - 1.80 \times 10^{-8} d_m n)\, T$$

where :

L : grease life, h

$d_m = \frac{D + d}{2}$ (D : outside diameter, d : bore diameter), mm

n : rotational speed, min^{-1}

P_r : dynamic equivalent radial load, N

C_r : basic dynamic radial load rating, N

T : operating temperature of bearing, ˚C

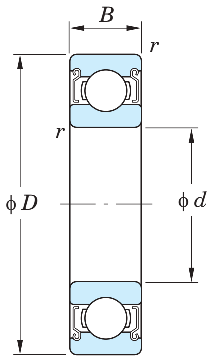
The conditions for applying equation are as follows :

a) Operating temperature of bearing : T ˚C
Applicable when $T \leqq 120$
〔when $T < 50$, $T = 50$〕
When $T > 120$, please contact with JTEKT.

b) Value of $d_m n$
Applicable when $d_m n \leqq 500 \times 10^3$
〔when $d_m n < 125 \times 10^3$, $d_m n = 125 \times 10^3$〕
When $d_m n > 500 \times 10^3$, please contact with JTEKT.

c) Load condition : $\frac{P_r}{C_r}$
Applicable when $\frac{P_r}{C_r} \leqq 0.2$
〔when $\frac{P_r}{C_r} < 0.05$, $\frac{P_r}{C_r} = 0.05$〕
When $\frac{P_r}{C_r} > 0.2$, please contact with JTEKT.

Dimensions Table



Dynamic equivalent load
$P_r = XF_r + YF_a$
(X and Y are as shown below.)
Static equivalent load
$P_{0r} = 0.6F_r + 0.5F_a$
When P_{0r} is smaller than F_r .
$P_{0r} = F_r$

$\frac{f_0 F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Boundary dimensions mm				Bearing No.		Basic load ratings [1] kN		Factor	Limiting speeds min^{-1}	
d	D	B	r (min.)	ZZ (Shielded type)	2RS (Contact seal type)	C_r	C_{0r}	f_0	ZZ	2RS
10	22	6	0.3	**SK6900ZZST YS HX**	**SK69002RSST YS HX**	2.30	1.00	14.0	34 000	21 000
	26	8	0.3	**SK6000ZZST YS HX**	**SK60002RSST YS HX**	3.85	1.55	12.3	31 000	19 000
	30	9	0.6	**SK6200ZZST YS HX**	**SK62002RSST YS HX**	4.35	1.90	13.2	24 000	16 000
12	24	6	0.3	**SK6901ZZST YS HX**	**SK69012RSST YS HX**	2.45	1.15	14.5	31 000	18 000
	28	8	0.3	**SK6001ZZST YS HX**	**SK60012RSST YS HX**	4.35	1.90	13.2	27 000	17 000
	32	10	0.6	**SK6201ZZST YS HX**	**SK62012RSST YS HX**	5.75	2.45	12.3	22 000	15 000
15	28	7	0.3	**SK6902ZZST YS HX**	**SK69022RSST YS HX**	3.65	1.80	14.3	26 000	15 000
	32	9	0.3	**SK6002ZZST YS HX**	**SK60022RSST YS HX**	4.75	2.25	13.9	23 000	14 000
	35	11	0.6	**SK6202ZZST YS HX**	**SK62022RSST YS HX**	6.50	3.00	13.2	20 000	13 000
17	30	7	0.3	**SK6903ZZST YS HX**	**SK69032RSSTC3 YS HX**	3.90	2.05	14.7	23 000	13 000
	35	10	0.3	**SK6003ZZST YS HX**	**SK60032RSST YS HX**	5.10	2.60	14.4	21 000	12 000
	40	12	0.6	**SK6203ZZST YS HX**	————	8.15	3.85	13.2	17 000	12 000
20	37	9	0.3	**SK6904ZZST YS HX**	**SK69042RSST YS HX**	5.40	2.95	14.7	19 000	11 000
	42	12	0.6	**SK6004ZZST YS HX**	**SK60042RSST YS HX**	8.00	4.05	13.9	17 000	10 000
	47	14	1	**SK6204ZZST YS HX**	**SK62042RSST YS HX**	10.9	5.35	13.2	15 000	9 700
25	42	9	0.3	**SK6905ZZST YS HX**	**SK69052RSST YS HX**	5.95	3.65	15.4	16 000	9 300
	47	12	0.6	**SK6005ZZST YS HX**	**SK60052RSST YS HX**	8.55	4.65	14.5	15 000	9 000
	52	15	1	**SK6205ZZST YS HX**	**SK62052RSST YS HX**	11.9	6.30	13.9	13 000	8 400
30	47	9	0.3	**SK6906ZZSTC3 YS HX**	————	6.15	4.00	15.8	14 000	8 200
	55	13	1	**SK6006ZZST YS HX**	**SK60062RSST YS HX**	11.2	6.60	14.7	13 000	7 500
	62	16	1	**SK6206ZZST YS HX**	**SK62062RSST YS HX**	16.5	9.05	13.9	11 000	7 000
35	55	10	0.6	**SK6907ZZSTC3 YS HX**	**SK69072RSST YS HX**	9.25	6.20	15.7	12 000	6 800
	62	14	1	**SK6007ZZSTC3 YS HX**	**SK60072RSST YS HX**	13.5	8.25	14.9	11 000	6 500
	72	17	1.1	**SK6207ZZSTC3 YS HX**	**SK62072RSSTC3 YS HX**	21.8	12.3	13.9	9 200	6 000
40	68	15	1	**SK6008ZZSTC3 YS HX**	**SK60082RSSTC3 YS HX**	14.2	9.20	15.2	10 000	5 800
	80	18	1.1	**SK6208ZZSTC3 YS HX**	**SK62082RSSTC3 YS HX**	24.8	14.3	14.0	8 300	5 400

Note 1) The basic load ratings are those of bearing made from SUS440C.
To calculate the dynamic equivalent radial loads, multiply the C_{0r} value in this table by 1.25.

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

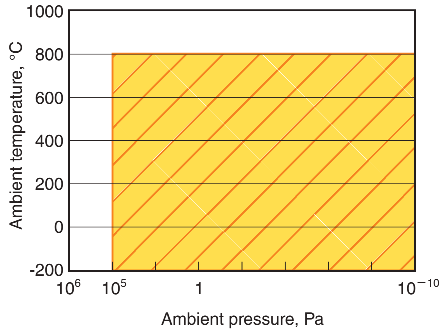
3-12 Full Complement Ceramic Ball Bearings

Ultra-high Temperature 800˚C

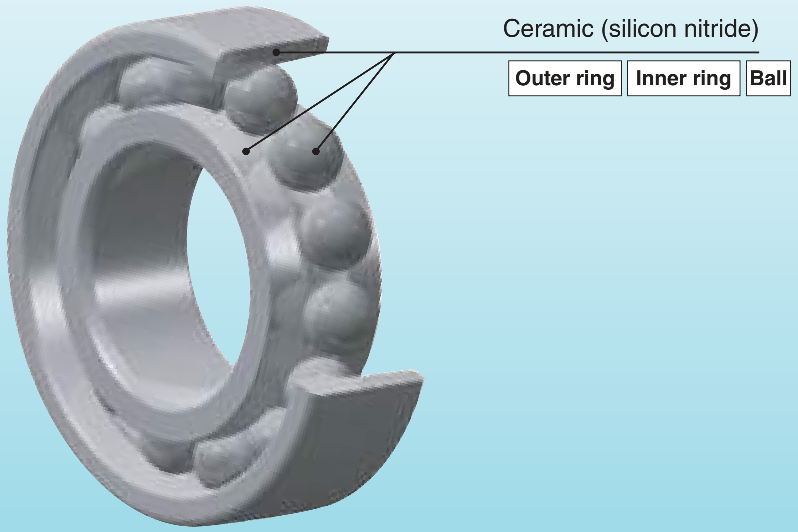
This bearing has all components made of ceramic for use in an ultrahigh temperature environments. No cage is provided. Being an angular contact ball bearing, this bearing is normally used in pairs.

Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	High temperature
Corrosive	Hygiene



Product Specifications



Bearing Numbering System

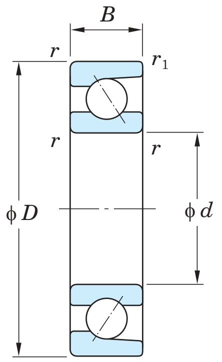
NC Basic bearing number **V**

Ceramic bearing
Full complement ball bearing

Applications

- Baking furnace cars
- Fans in furnaces

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

Contact angle	e	Single row or tandem mounting				Back to back or face to face			
		$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$		$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y	X	Y	X	Y
30°	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

* In the case of back-to-back duplex bearings and face-to-face duplex bearings, apply 2 to i. As for single row bearings and tandem duplex bearings, apply 1 to i.

Contact angle	Single row or tandem mounting		Back to back or face to face	
	X_0	Y_0	X_0	Y_0
30°	0.5	0.33	1	0.66

Boundary dimensions mm					Bearing No.	Permissible radial load	Limiting speed
d	D	B	r (min.)	r_1 (min.)		N	min⁻¹
4	12	4	0.2	0.1	**NC704V**	10	500
	13	5	0.2	0.1	**NC724V**	15	500
5	14	5	0.2	0.1	**NC705V**	15	500
	16	5	0.2	0.1	**NC725V**	25	500
6	17	6	0.3	0.15	**NC706V**	20	500
	19	6	0.3	0.15	**NC726V**	35	500
7	19	6	0.3	0.15	**NC707V**	30	500
	22	7	0.3	0.15	**NC727V**	40	490
8	22	7	0.3	0.15	**NC708V**	40	500
	24	8	0.3	0.15	**NC728V**	40	470
9	24	7	0.3	0.15	**NC709V**	40	440
	26	8	0.3	0.15	**NC729V**	50	390
10	26	8	0.3	0.15	**NC7000V**	55	400
	30	9	0.6	0.3	**NC7200V**	60	340
12	28	8	0.3	0.15	**NC7001V**	60	330
	32	10	0.6	0.3	**NC7201V**	85	310
15	32	9	0.3	0.15	**NC7002V**	70	260
	35	11	0.6	0.3	**NC7202V**	90	240
17	35	10	0.3	0.15	**NC7003V**	75	230
	40	12	0.6	0.3	**NC7203V**	115	210
20	42	12	0.6	0.3	**NC7004V**	115	200
	47	14	1	0.6	**NC7204V**	160	180
25	47	12	1	0.6	**NC7005V**	125	160
	52	15	1	0.6	**NC7205V**	170	140
30	55	13	1	0.6	**NC7006V**	160	130
	62	16	1	0.6	**NC7206V**	235	120
35	62	14	1	0.6	**NC7007V**	195	110
	72	17	1.1	0.6	**NC7207V**	310	100
40	68	15	1	0.6	**NC7008V**	195	100
	80	18	1.1	0.6	**NC7208V**	370	90

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

3-13 EXSEV®-XT

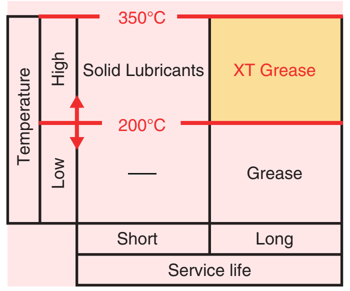
Long service life with grease lubrication even at 350˚C

The bearings are filled with fluorinated grease capable of handling high temperatures even up to 350˚C.

Applicable Environments

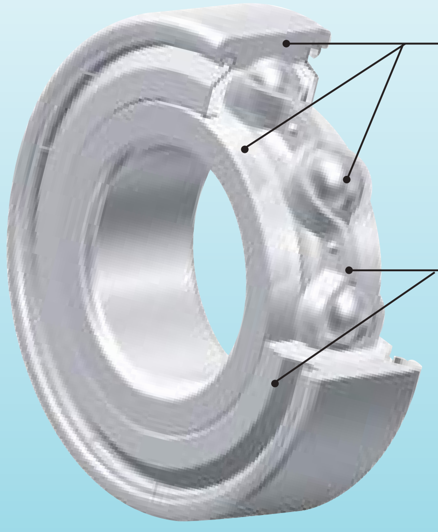
- Clean
- Magnetic field
- [✓ Vacuum]
- Electric field
- High speed
- [✓ High temperature]
- Corrosive
- Hygiene

Operating range



Temperature			
	High	Solid Lubricants	XT Grease
	Low	—	Grease
		Short	Long
		Service life	

Product Specifications



Martensitic stainless steel

Outer ring **Inner ring** **Ball**

✻ Ceramic ball types are also available.

Austenitic stainless steel

Cage **Shield**

Bearing Numbering System

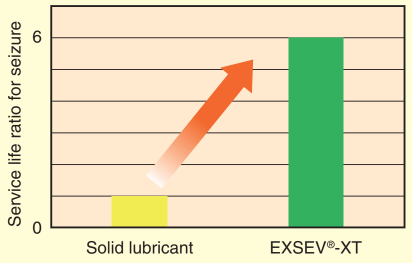
SV | Basic bearing number | ZZST YS XT

Solid lubricant

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer robots
- Vacuum pumps

Performance



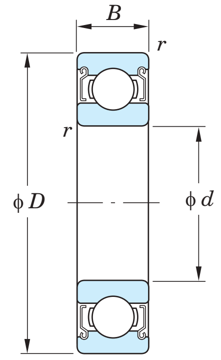
Test conditions

Bearing No. (bore dia. × outside dia. × width)	6000 ϕ10×ϕ26×8mm
Temperature	300°C
Ambience	Air
Rotational speed	500min^{-1}
Axial load	175N

Grease properties

Name		EXSEV®-XT (Grease)
Base oil		PFPE
Dropping point		None
Evaporation (200˚C×22h)		0.1wt%max.
Oil separation (100˚C×24h)		2wt%max.
Operating temperature range	In atmospheric air	MAX350˚C

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Boundary dimensions mm				Bearing No.	Basic load ratings [1] kN		Factor	Limiting speed [2]
d	D	B	r (min.)		C_r	C_{0r}	f_0	min^{-1}
4	12	4	0.2	**SV604ZZSTM6 YS XT**	0.80	0.30	12.4	10 000
	13	5	0.2	**SV624ZZSTM6 YS XT**	1.10	0.40	12.3	9 000
5	14	5	0.2	**SV605ZZSTM6 YS XT**	1.10	0.40	12.3	8 000
	16	5	0.3	**SV625-5ZZSTM6 YS XT**	1.45	0.55	12.4	6 700
6	17	6	0.3	**SV606ZZSTM6 YS XT**	1.65	0.60	12.2	6 600
	19	6	0.3	**SV626ZZSTM6 YS XT**	2.20	0.85	12.3	5 900
7	19	6	0.3	**SV607ZZSTM6 YS XT**	2.20	0.85	12.3	5 700
	22	7	0.3	**SV627ZZSTM6 YS XT**	2.80	1.10	12.4	4 900
8	22	7	0.3	**SV608ZZSTM6 YS XT**	2.80	1.10	12.4	5 000
	24	8	0.3	**SV628ZZSTM6 YS XT**	2.85	1.10	12.8	4 700
9	24	7	0.3	**SV609ZZSTM6 YS XT**	2.85	1.10	12.8	4 400
	26	8	0.6	**SV629ZZSTM6 YS XT**	3.90	1.55	12.4	3 900
9.525	22.225	7.142	0.5	**SVEE3SZZSTM6 YS XT**	2.85	1.10	12.8	5 600
10	26	8	0.3	**SV6000ZZSTC4 YS XT**	3.85	1.55	12.3	4 000
	30	9	0.6	**SV6200ZZSTC4 YS XT**	4.35	1.90	13.2	3 400
12	28	8	0.3	**SV6001ZZSTC4 YS XT**	4.35	1.90	13.2	3 300
	32	10	0.6	**SV6201ZZSTC4 YS XT**	5.75	2.45	12.3	3 100
15	32	9	0.3	**SV6002ZZSTC4 YS XT**	4.75	2.25	13.9	2 600
	35	11	0.6	**SV6202ZZSTC4 YS XT**	6.50	3.00	13.2	2 400
17	35	10	0.3	**SV6003ZZSTC4 YS XT**	5.10	2.60	14.4	2 300
	40	12	0.6	**SV6203ZZSTC4 YS XT**	8.15	3.85	13.2	2 100
20	42	12	0.6	**SV6004ZZSTC4 YS XT**	8.00	4.05	13.9	2 000
	47	14	1	**SV6204ZZSTC4 YS XT**	10.9	5.35	13.2	1 800
25	47	12	0.6	**SV6005ZZSTC4 YS XT**	8.55	4.65	14.5	1 600
	52	15	1	**SV6205ZZSTC4 YS XT**	11.9	6.30	13.9	1 400
30	55	13	1	**SV6006ZZSTC4 YS XT**	11.2	6.60	14.7	1 300
	62	16	1	**SV6206ZZSTC4 YS XT**	16.5	9.05	13.9	1 200
35	62	14	1	**SV6007ZZSTC4 YS XT**	13.5	8.25	14.9	1 100
	72	17	1.1	**SV6207ZZSTC4 YS XT**	21.8	12.3	13.9	1 000
40	68	15	1	**SV6008ZZSTC4 YS XT**	14.2	9.20	15.2	1 000
	80	18	1.1	**SV6208ZZSTC4 YS XT**	24.8	14.3	14.0	900

Note 1) The basic load ratings are those of bearing made from SUS440C.
To calculate dynamic equivalent radial loads, multiply the C_{0r} value in this table by 1.25.

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

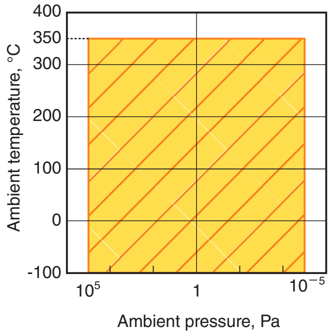
3-14 EXSEV®-WS

Combines 350˚C Heat Resistance and Load Carrying Capability

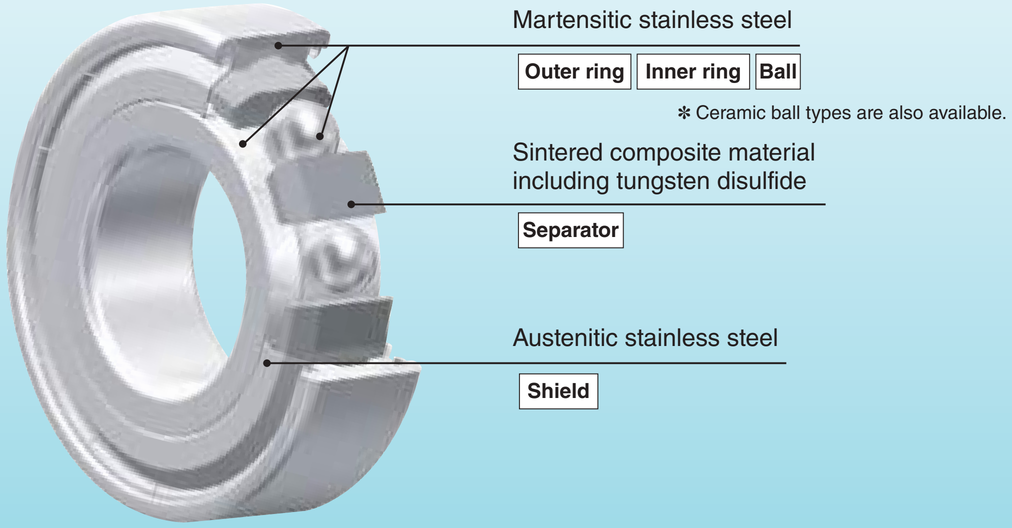
This bearing has extremely heat resistant tungsten disulfide included in the separator material as the lubricant.

Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	**High temperature**
Corrosive	Hygiene



Product Specifications



✻ Ceramic ball types are also available.

Bearing Numbering System

SE Basic bearing number ZZST **WS**

SE: Solid lubricant

WS: Separators including tungsten disulfide

Applications

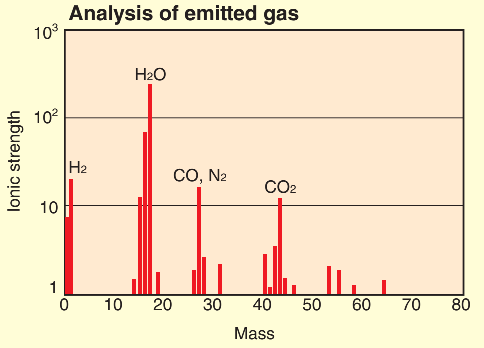
- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporatior
- Plasma display panel manufacturing equipment

✻ We recommend that this bearing is used with horizontal axes. For information on using this bearing with items other than horizontal axes, consult JTEKT.

Performance

- Free from problematic gas emissions under the conditions of up to 10^{-5} Pa and up to 350˚C.

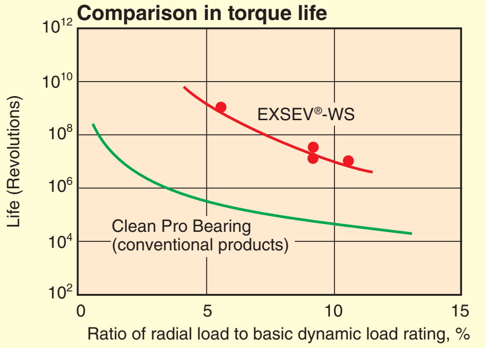
Analysis of emitted gas



- **Test conditions**
  Bearing No.: 608

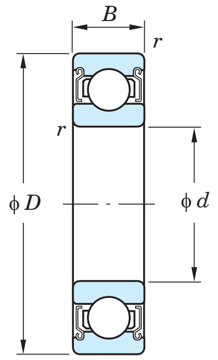
- Highly heat resistant and superior to the Clean Pro Bearing (conventional products) in lubrication life.

Comparison in torque life



- **Test conditions**
  Bearing No.: 608, Rotational speed: 500min^{-1}
  Atmosphere pressure: 10^{-3} Pa

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0 F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		f_0	N	min^{-1}
6	17	6	0.3	**SE606ZZSTM6 WS**	12.2	100	500
	19	6	0.3	**SE626ZZSTM6 WS**	12.3	130	500
7	19	6	0.3	**SE607ZZSTM6 WS**	12.3	130	500
	22	7	0.3	**SE627ZZSTM6 WS**	12.4	165	490
8	22	7	0.3	**SE608ZZSTM6 WS**	12.4	165	500
	24	8	0.3	**SE628ZZSTM6 WS**	12.8	170	470
9	24	7	0.3	**SE609ZZSTM6 WS**	12.8	170	440
	26	8	0.6	**SE629ZZSTM6 WS**	12.4	230	390
9.525	22.225	7.142	0.5	**SEEE3SZZSTM6 WS**	12.8	170	410
10	26	8	0.3	**SE6000ZZSTC4 WS**	12.3	230	400
	30	9	0.6	**SE6200ZZSTC4 WS**	13.2	255	340
12	28	8	0.3	**SE6001ZZSTC4 WS**	13.2	255	330
	32	10	0.6	**SE6201ZZSTC4 WS**	12.3	340	310
15	32	9	0.3	**SE6002ZZSTC4 WS**	13.9	280	260
	35	11	0.6	**SE6202ZZSTC4 WS**	13.2	385	240
17	35	10	0.3	**SE6003ZZSTC4 WS**	14.4	300	230
	40	12	0.6	**SE6203ZZSTC4 WS**	13.2	480	210
20	42	12	0.6	**SE6004ZZSTC4 WS**	13.9	470	200
	47	14	1	**SE6204ZZSTC4 WS**	13.2	640	180
25	47	12	0.6	**SE6005ZZSTC4 WS**	14.5	505	160
	52	15	1	**SE6205ZZSTC4 WS**	13.9	700	140
30	55	13	1	**SE6006ZZSTC4 WS**	14.7	660	130
	62	16	1	**SE6206ZZSTC4 WS**	13.9	975	120
35	62	14	1	**SE6007ZZSTC4 WS**	14.9	795	110
	72	17	1.1	**SE6207ZZSTC4 WS**	13.9	1 285	100
40	68	15	1	**SE6008ZZSTC4 WS**	15.2	835	100
	80	18	1.1	**SE6208ZZSTC4 WS**	14.0	1 455	90

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

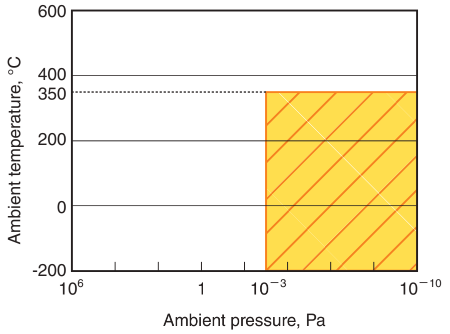
3-15 EXSEV®-MG

Supports Ultra-high Temperature Vacuums

This bearing has silver ion plated on the stainless steel balls, as the lubricant.

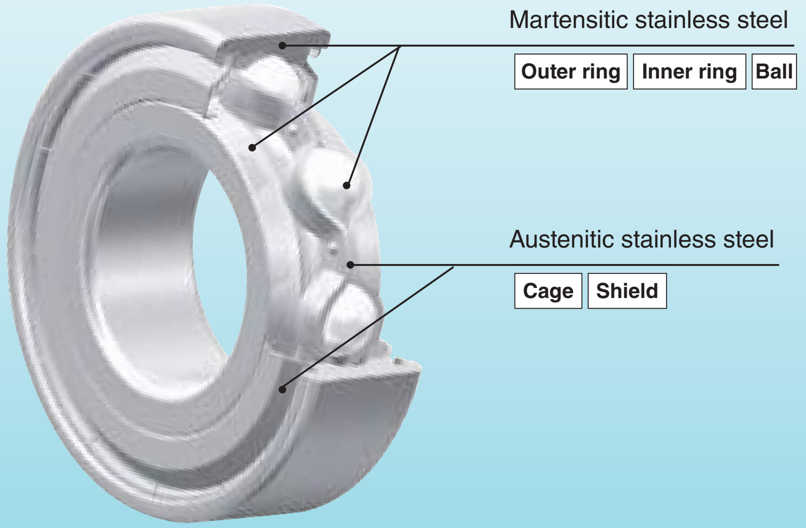
Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	**High temperature**
Corrosive	Hygiene



* As much as possible, avoid bringing these bearings in contact with the atmosphere.

Product Specifications



Bearing Numbering System

SE Basic bearing number ZZST **MG3** YS

Solid lubricant (SE)

Silver ion plated balls (MG3)

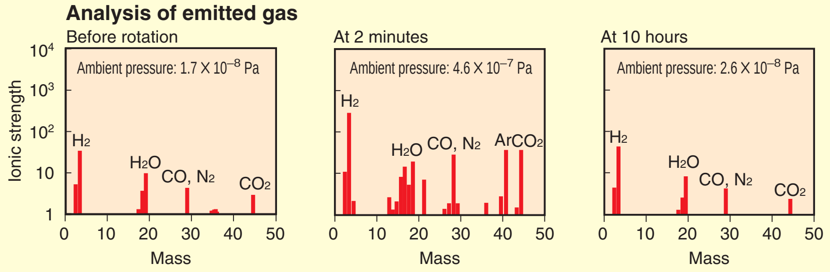
Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporator
- Medical equipment
- Vacuum motors

Performance

- Useful in an ultrahigh vacuum environment of 10^{-10} Pa thanks to low gas emissions in an ultrahigh vacuum.

Analysis of emitted gas



- **Test conditions**

  Temperature: Atmosphere / room temperature, Load: Radial 3 N · Axial 98 N
  Ambient pressure: 1.3 × 10^{-8} Pa (1.0 × 10^{-10} Torr), Rotational speed: 140min^{-1}

Lubricant service life expectancy equation

The average service life of bearings with silver ion-plated balls (EXSEV®-MG) can be estimated with the following equation.

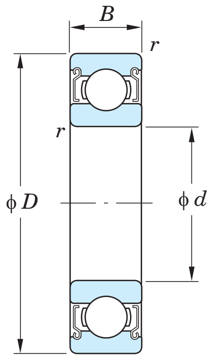
$$L_{vh} = b_1 \cdot b_2 \cdot b_3 \left(\frac{C_r}{13 \times P_r}\right)^q \times 16\,667/n$$

Where,

L_{vh} : 90% confidence service life, h
C_r : Basic dynamic load rating, N
P_r : Dynamic equivalent radial load, N
q : Exponential coefficient, $q = 1$
n : Rotational speed, min^{-1} However, $10 \leqq n \leqq 10\,000$
b_1 : Speed factor
$b_1 = 1.5 \times 10^{-3} n + 1$
b_2 : Lubrication factor
$b_2 = 1$
b_3 : Atmosphere pressure/temperature dependency coefficient
$b_3 = 1$ (when 10^{-3} Pa, room temperature)

For the service life of solid lubricants, refer to page 13.

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0 F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Boundary dimensions mm				Bearing No.	Basic load ratings [1) kN		Factor	Permissible radial load [2)	Limiting speed
d	D	B	r (min.)		C_r	C_{0r}	f_0	N	min^{-1}
4	12	4	0.2	**SE604ZZSTMG3M6 YS**	0.97	0.36	12.4	30	1 000
	13	5	0.2	**SE624ZZSTMG3M6 YS**	1.30	0.49	12.3	40	1 000
5	14	5	0.2	**SE605ZZSTMG3M6 YS**	1.30	0.49	12.3	40	1 000
	16	5	0.3	**SE625-5ZZSTMG3M6 YS**	1.75	0.67	12.4	55	1 000
6	17	6	0.3	**SE606ZZSTMG3M6 YS**	1.95	0.74	12.2	60	1 000
	19	6	0.3	**SE626ZZSTMG3M6 YS**	2.60	1.05	12.3	80	1 000
7	19	6	0.3	**SE607ZZSTMG3M6 YS**	2.60	1.05	12.3	80	1 000
	22	7	0.3	**SE627ZZSTMG3M6 YS**	3.30	1.35	12.4	100	1 000
8	22	7	0.3	**SE608ZZSTMG3M6 YS**	3.30	1.35	12.4	100	1 000
	24	8	0.3	**SE628ZZSTMG3M6 YS**	3.35	1.40	12.8	100	1 000
9	24	7	0.3	**SE609ZZSTMG3M6 YS**	3.35	1.40	12.8	100	1 000
	26	8	0.6	**SE629ZZSTMG3M6 YS**	4.55	1.95	12.4	135	970
9.525	22.225	7.142	0.5	**SEEE3SZZSTMG3M6 YS**	3.35	1.40	12.8	100	1 000
10	26	8	0.3	**SE6000ZZSTMG3C4 YS**	4.55	1.95	12.3	135	1 000
	30	9	0.6	**SE6200ZZSTMG3C4 YS**	5.10	2.40	13.2	155	860
12	28	8	0.3	**SE6001ZZSTMG3C4 YS**	5.10	2.40	13.2	155	830
	32	10	0.6	**SE6201ZZSTMG3C4 YS**	6.80	3.05	12.3	205	770
15	32	9	0.3	**SE6002ZZSTMG3C4 YS**	5.60	2.85	13.9	170	660
	35	11	0.6	**SE6202ZZSTMG3C4 YS**	7.65	3.75	13.2	230	610
17	35	10	0.3	**SE6003ZZSTMG3C4 YS**	6.00	3.25	14.4	180	580
	40	12	0.6	**SE6203ZZSTMG3C4 YS**	9.55	4.80	13.2	285	530
20	42	12	0.6	**SE6004ZZSTMG3C4 YS**	9.40	5.05	13.9	280	500
	47	14	1	**SE6204ZZSTMG3C4 YS**	12.8	6.65	13.2	385	450
25	47	12	0.6	**SE6005ZZSTMG3C4 YS**	10.1	5.85	14.5	305	400
	52	15	1	**SE6205ZZSTMG3C4 YS**	14.0	7.85	13.9	420	360
30	55	13	1	**SE6006ZZSTMG3C4 YS**	13.2	8.25	14.7	395	330
	62	16	1	**SE6206ZZSTMG3C4 YS**	19.5	11.3	13.9	585	300
35	62	14	1	**SE6007ZZSTMG3C4 YS**	15.9	10.3	14.9	475	280
	72	17	1.1	**SE6207ZZSTMG3C4 YS**	25.7	15.4	13.9	770	250
40	68	15	1	**SE6008ZZSTMG3C4 YS**	16.7	11.5	15.2	500	250
	80	18	1.1	**SE6208ZZSTMG3C4 YS**	29.1	17.8	14.0	875	220

Notes 1) The basic load ratings are those of standard bearing (used to calculate lubrication life).
2) The permissible radial loads can be regarded as the maximum loads applicable to individual bearings. When an axial load is applied to the bearing, convert this axial load to a dynamic equivalent radial load, and then compare this value to the permissible radial load.

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

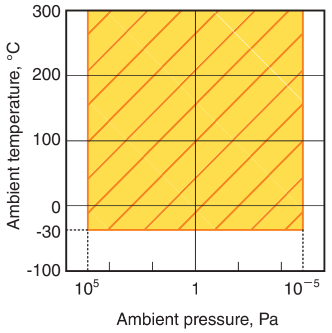
3-16 EXSEV®-PN

Superior Heat Resistance Supporting 300˚C

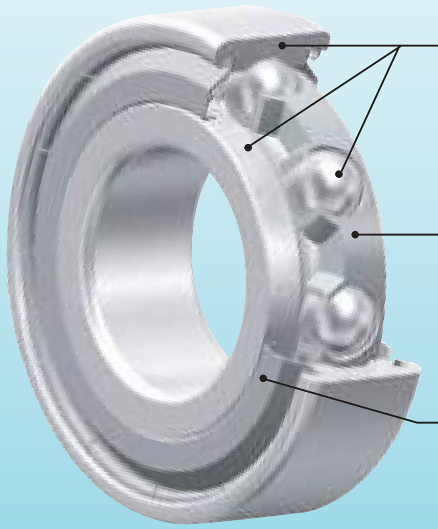
This bearing has a highly heat resistant solid lubricant, such as molybdenum disulfide included in the cage material.

Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	**High temperature**
Corrosive	Hygiene



Product Specifications



Martensitic stainless steel

Outer ring | Inner ring | Ball

✻ Ceramic ball types are also available.

PEEK resin

Cage

Austenitic stainless steel

Shield

Bearing Numbering System

SE | Basic bearing number | ZZST **PN**

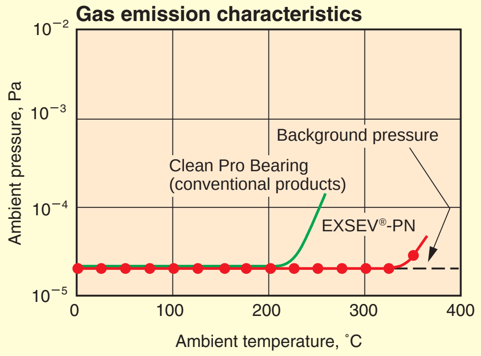
Solid lubricant — Molded PEEK resin cage

Applications

- Carton manufacturing equipment
- LCD cleaning equipment

Performance

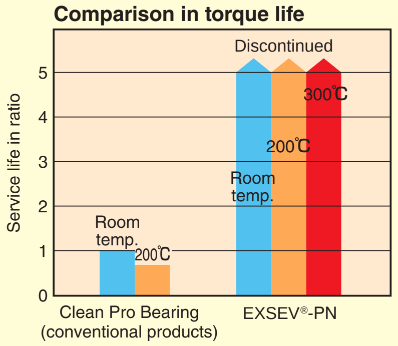
- Useful up to 300˚C in a vacuum.



- **Test conditions**

Bearing No.: 608

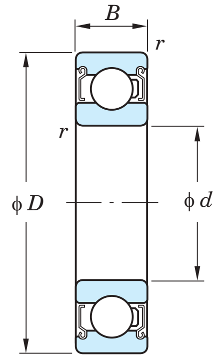
- Excellent in lubricant service life in temperatures from room temp. to 300˚C.



- **Test conditions**

Bearing No.: 608
Rotational speed: 200min-1, Load: Axial 100 N

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		f_0	N	min⁻¹
4	12	4	0.2	**SE604ZZSTM5 PN**	12.4	30	1 000
	13	5	0.2	**SE624ZZSTM5 PN**	12.3	40	1 000
5	14	5	0.2	**SE605ZZSTM5 PN**	12.3	40	1 000
	16	5	0.3	**SE625-5ZZSTM5 PN**	12.4	55	1 000
6	17	6	0.3	**SE606ZZSTM5 PN**	12.2	60	1 000
	19	6	0.3	**SE626ZZSTM5 PN**	12.3	80	1 000
7	19	6	0.3	**SE607ZZSTM5 PN**	12.3	80	1 000
	22	7	0.3	**SE627ZZSTM5 PN**	12.4	100	1 000
8	22	7	0.3	**SE608ZZSTM5 PN**	12.4	100	1 000
	24	8	0.3	**SE628ZZSTM5 PN**	12.8	100	1 000
9	24	7	0.3	**SE609ZZSTM5 PN**	12.8	100	1 000
	26	8	0.6	**SE629ZZSTM5 PN**	12.4	135	970
9.525	22.225	7.142	0.5	**SEEE3SZZSTM5 PN**	12.8	100	1 000
10	26	8	0.3	**SE6000ZZSTC3 PN**	12.3	135	1 000
	30	9	0.6	**SE6200ZZSTC3 PN**	13.2	155	860
12	28	8	0.3	**SE6001ZZSTC3 PN**	13.2	155	830
	32	10	0.6	**SE6201ZZSTC3 PN**	12.3	205	770
15	32	9	0.3	**SE6002ZZSTC3 PN**	13.9	170	660
	35	11	0.6	**SE6202ZZSTC3 PN**	13.2	230	610
17	35	10	0.3	**SE6003ZZSTC3 PN**	14.4	180	580
	40	12	0.6	**SE6203ZZSTC3 PN**	13.2	285	530
20	42	12	0.6	**SE6004ZZSTC3 PN**	13.9	280	500
	47	14	1	**SE6204ZZSTC3 PN**	13.2	385	450
25	47	12	0.6	**SE6005ZZSTC3 PN**	14.5	305	400
	52	15	1	**SE6205ZZSTC3 PN**	13.9	420	360
30	55	13	1	**SE6006ZZSTC3 PN**	14.7	395	330
	62	16	1	**SE6206ZZSTC3 PN**	13.9	585	300
35	62	14	1	**SE6007ZZSTC3 PN**	14.9	475	280
	72	17	1.1	**SE6207ZZSTC3 PN**	13.9	770	250
40	68	15	1	**SE6008ZZSTC3 PN**	15.2	500	250
	80	18	1.1	**SE6208ZZSTC3 PN**	14.0	875	220

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

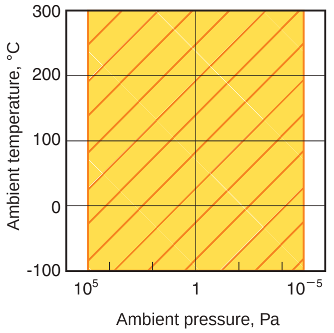
3-17 EXSEV®-MO

Basic Specification for 300˚C Support

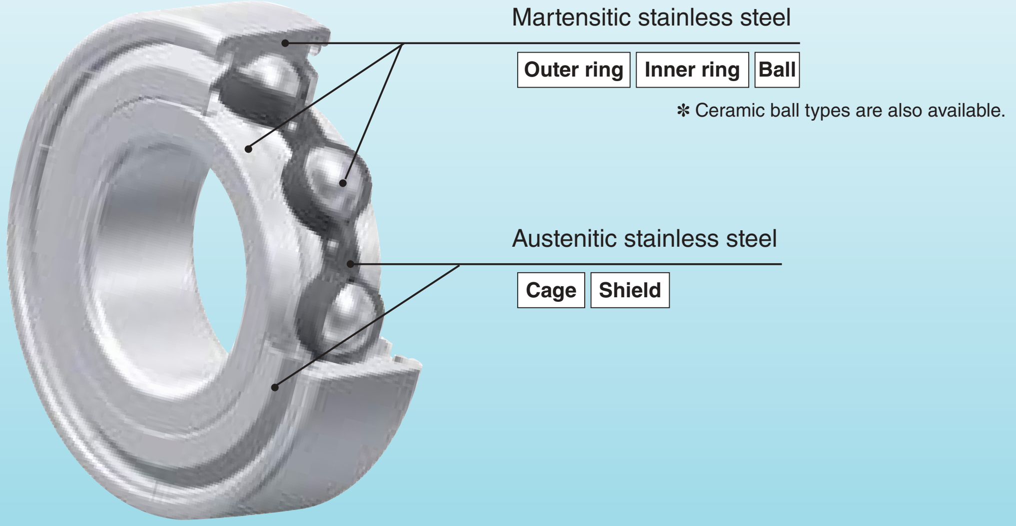
This bearing has molybdenum disulfide baked on the surface of the stainless steel cage, as the lubricant.

Applicable Environments

Clean
Magnetic field
Vacuum
Electric field
High speed
High temperature
Corrosive
Hygiene



Product Specifications



✻ Ceramic ball types are also available.

Bearing Numbering System

SE Basic bearing number ZZST **MSA7** YS

Solid lubricant

Molybdenum disulfide baked stainless steel cage

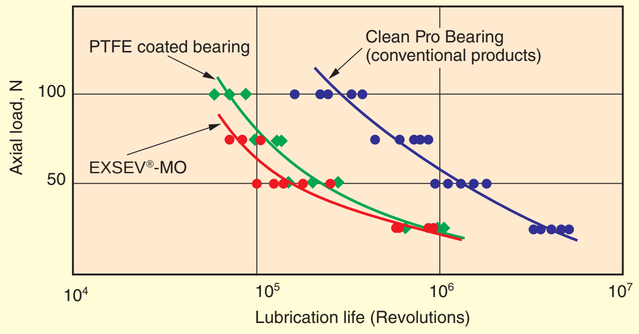
Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporator
- Turbo molecular pump
- Rotary furnaces

Performance

- Molybdenum disulfide compares to the common PTFE coating in lubrication life but is superior in heat resistance.

Comparison in lubrication life



- **Test conditions**
  Bearing No.: 608

Lubricant service life expectancy equation

The average service life of EXSEV bearings with the cage coated with molybdenum disulfide (EXSEV®-MO) can be estimated with the following equation.

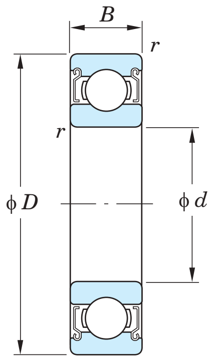
$$L_{av} = b_2 \cdot \left(\frac{C_r \times 0.85}{P_r}\right)^q \times 0.016667/n$$

Where,

L_{av} : Average life, h
b_2 : Lubrication factor
$b_2 = 6$
C_r : Basic dynamic load rating, N
P_r : Dynamic equivalent radial load, N
q : Exponential coefficient, $q = 3$
n : Rotational speed, min^{-1}

For the service life of solid lubricants, refer to page 13.

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0 F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172 0.345 0.689 1.03 1.38 2.07 3.45 5.17 6.89	0.19 0.22 0.26 0.28 0.30 0.34 0.38 0.42 0.44	1	0	0.56	2.30 1.99 1.71 1.55 1.45 1.31 1.15 1.04 1.00

Boundary dimensions mm				Bearing No.	Basic load ratings [1) kN		Factor	Permissible radial load [2)	Limiting speed
d	D	B	r (min.)		C_r	C_{0r}	f_0	N	min^{-1}
4	12	4	0.2	**SE604ZZSTMSA7M5 YS**	0.97	0.36	12.4	30	1 000
	13	5	0.2	**SE624ZZSTMSA7M5 YS**	1.30	0.49	12.3	40	1 000
5	14	5	0.2	**SE605ZZSTMSA7M5 YS**	1.30	0.49	12.3	40	1 000
	16	5	0.3	**SE625-5ZZSTMSA7M5 YS**	1.75	0.67	12.4	55	1 000
6	17	6	0.3	**SE606ZZSTMSA7M5 YS**	1.95	0.74	12.2	60	1 000
	19	6	0.3	**SE626ZZSTMSA7M5 YS**	2.60	1.05	12.3	80	1 000
7	19	6	0.3	**SE607ZZSTMSA7M5 YS**	2.60	1.05	12.3	80	1 000
	22	7	0.3	**SE627ZZSTMSA7M5 YS**	3.30	1.35	12.4	100	1 000
8	22	7	0.3	**SE608ZZSTMSA7M5 YS**	3.30	1.35	12.4	100	1 000
	24	8	0.3	**SE628ZZSTMSA7M5 YS**	3.35	1.40	12.8	100	1 000
9	24	7	0.3	**SE609ZZSTMSA7M5 YS**	3.35	1.40	12.8	100	1 000
	26	8	0.6	**SE629ZZSTMSA7M5 YS**	4.55	1.95	12.4	135	970
9.525	22.225	7.142	0.5	**SEEE3SZZSTMSA7M5 YS**	3.35	1.40	12.8	100	1 000
10	26	8	0.3	**SE6000ZZSTMSA7C3 YS**	4.55	1.95	12.3	135	1 000
	30	9	0.6	**SE6200ZZSTMSA7C3 YS**	5.10	2.40	13.2	155	860
12	28	8	0.3	**SE6001ZZSTMSA7C3 YS**	5.10	2.40	13.2	155	830
	32	10	0.6	**SE6201ZZSTMSA7C3 YS**	6.80	3.05	12.3	205	770
15	32	9	0.3	**SE6002ZZSTMSA7C3 YS**	5.60	2.85	13.9	170	660
	35	11	0.6	**SE6202ZZSTMSA7C3 YS**	7.65	3.75	13.2	230	610
17	35	10	0.3	**SE6003ZZSTMSA7C3 YS**	6.00	3.25	14.4	180	580
	40	12	0.6	**SE6203ZZSTMSA7C3 YS**	9.55	4.80	13.2	285	530
20	42	12	0.6	**SE6004ZZSTMSA7C3 YS**	9.40	5.05	13.9	280	500
	47	14	1	**SE6204ZZSTMSA7C3 YS**	12.8	6.65	13.2	385	450
25	47	12	0.6	**SE6005ZZSTMSA7C3 YS**	10.1	5.85	14.5	305	400
	52	15	1	**SE6205ZZSTMSA7C3 YS**	14.0	7.85	13.9	420	360
30	55	13	1	**SE6006ZZSTMSA7C3 YS**	13.2	8.25	14.7	395	330
	62	16	1	**SE6206ZZSTMSA7C3 YS**	19.5	11.3	13.9	585	300
35	62	14	1	**SE6007ZZSTMSA7C3 YS**	15.9	10.3	14.9	475	280
	72	17	1.1	**SE6207ZZSTMSA7C3 YS**	25.7	15.4	13.9	770	250
40	68	15	1	**SE6008ZZSTMSA7C3 YS**	16.7	11.5	15.2	500	250
	80	18	1.1	**SE6208ZZSTMSA7C3 YS**	29.1	17.8	14.0	875	220

Notes 1) The basic load ratings are those of standard bearing (used to calculate lubrication life).
2) The permissible radial loads can be regarded as the maximum loads applicable to individual bearings. When an axial load is applied to the bearing, convert this axial load to a dynamic equivalent radial load, and then compare this value to the permissible radial load.

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

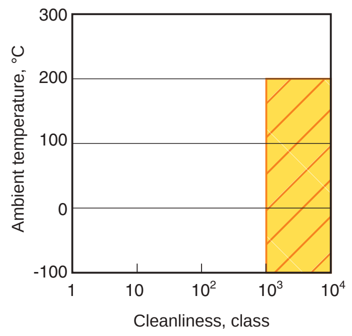
3-18 Non-magnetic Hybrid Ceramic Bearings

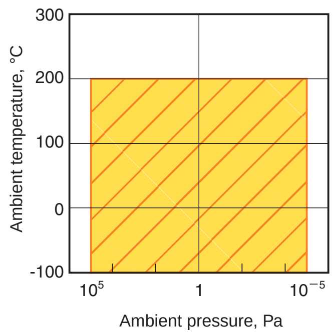
Non-magnetic Support in Stainless Steel

This bearing uses non-magnetic stainless steel. It includes fluoropolymer as the lubricant. This bearing can be used in a vacuum environment.

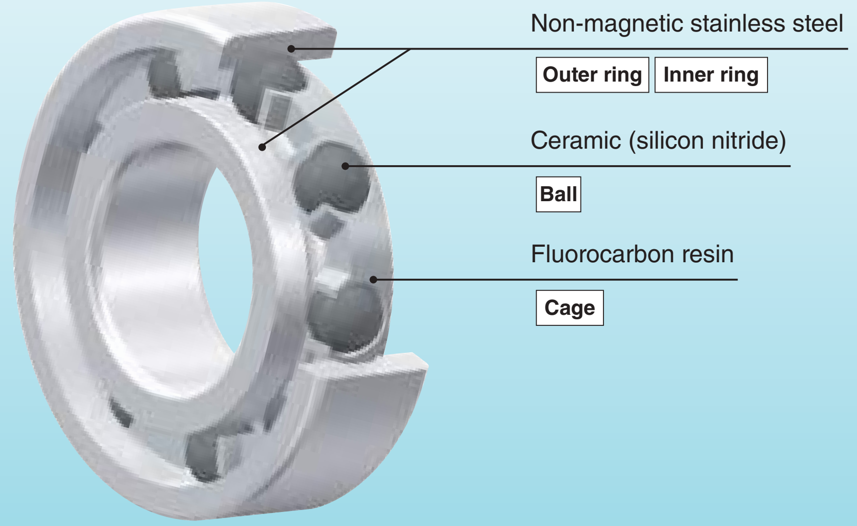
Applicable Environments

- Clean
- Magnetic field
- Vacuum
- Electric field
- High speed
- High temperature
- Corrosive
- Hygiene





Product Specifications



Bearing Numbering System

3NC Basic bearing number **YH4** **FA**

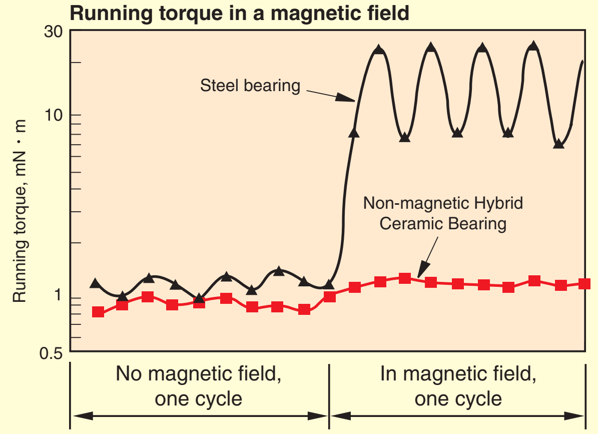
3NC: Hybrid ceramic bearing
YH4: Non-magnetic stainless steel
FA: Molded fluorocarbon resin cage

Applications

- Semiconductor manufacturing equipment
- Semiconductor inspection equipment
- Canning machinery
- Superconductivity-related equipment
- Welder

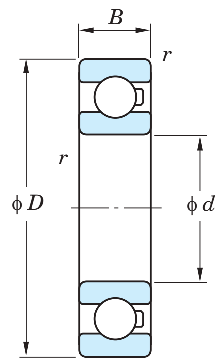
Performance

- While steel bearings experience fluctuating running torque, caused by magnetic fields, this bearing rotates at a stable torque.



- **Test conditions**
  Bearing No.: 6206

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

The static lsod ratings are those of standard bearing.

Boundary dimensions mm				Bearing No.	Factor	Permissible radial load	Limiting speed
d	D	B	r (min.)		f_0	N	min⁻¹
4	12	4	0.2	**3NC604YH4 FA**	12.4	7.5	1 000
	13	5	0.2	**3NC624YH4 FA**	12.3	10	1 000
5	14	5	0.2	**3NC605YH4 FA**	12.3	10	1 000
	16	5	0.3	**3NC625-5YH4 FA**	12.4	15	1 000
6	17	6	0.3	**3NC606YH4 FA**	12.2	15	1 000
	19	6	0.3	**3NC626YH4 FA**	12.3	20	1 000
7	19	6	0.3	**3NC607YH4 FA**	12.3	20	1 000
	22	7	0.3	**3NC627YH4 FA**	12.4	25	1 000
8	22	7	0.3	**3NC608YH4 FA**	12.4	25	1 000
	24	8	0.3	**3NC628YH4 FA**	12.8	25	1 000
9	24	7	0.3	**3NC609YH4 FA**	12.8	25	1 000
	26	8	0.6	**3NC629YH4 FA**	12.4	35	970
9.525	22.225	7.142	0.5	**3NCEE3SYH4 FA**	12.8	25	1 000
10	26	8	0.3	**3NC6000YH4 FA**	12.3	35	1 000
	30	9	0.6	**3NC6200YH4 FA**	13.2	50	860
12	28	8	0.3	**3NC6001YH4 FA**	13.2	40	830
	32	10	0.6	**3NC6201YH4 FA**	12.3	70	770
15	32	9	0.3	**3NC6002YH4 FA**	13.9	45	660
	35	11	0.6	**3NC6202YH4 FA**	13.2	75	610
17	35	10	0.3	**3NC6003YH4 FA**	14.4	50	580
	40	12	0.6	**3NC6203YH4 FA**	13.2	95	530
20	42	12	0.6	**3NC6004YH4 FA**	13.9	70	500
	47	14	1	**3NC6204YH4 FA**	13.2	130	450
25	47	12	0.6	**3NC6005YH4 FA**	14.5	75	400
	52	15	1	**3NC6205YH4 FA**	13.9	140	360
30	55	13	1	**3NC6006YH4 FA**	14.7	95	330
	62	16	1	**3NC6206YH4 FA**	13.9	195	300
35	62	14	1	**3NC6007YH4 FA**	14.9	110	280
	72	17	1.1	**3NC6207YH4 FA**	13.9	210	250
40	68	15	1	**3NC6008YH4 FA**	15.2	135	250
	80	18	1.1	**3NC6208YH4 FA**	14.0	230	220

[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

3-19 Hybrid Ceramic Bearings

For Insulation and High-speed Applications

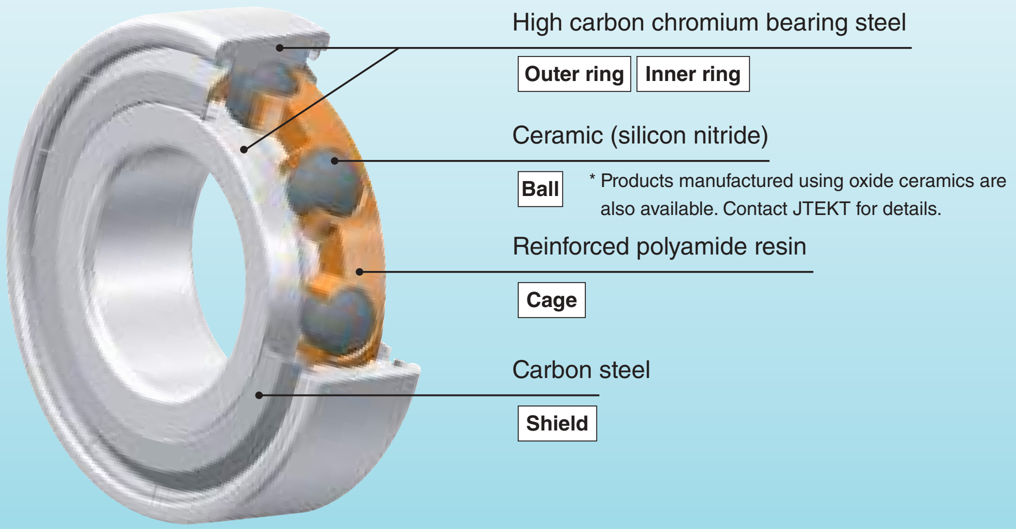
This bearing is a standard hybrid ceramic bearing. Lubricated with grease or oil, it can be used as an insulating bearing or high speed bearing.

Applicable Environments

Clean	Magnetic field
Vacuum	**Electric field**
High speed	High temperature
Corrosive	Hygiene

- Temperature: – 30 to 120˚C
- Ambient pressure: Atmospheric pressure

Product Specifications



* Products manufactured using oxide ceramics are also available. Contact JTEKT for details.

Bearing Numbering System

3NC | Basic bearing number | ZZ FG

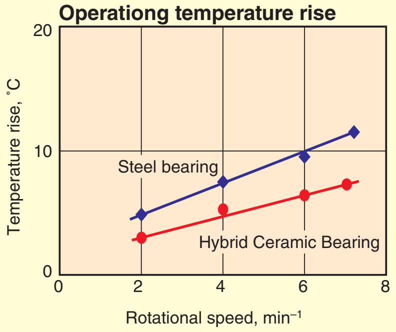
Hybrid ceramic bearing

Applications

- High speed stranding machine guide rollers
- Motors
- Generators

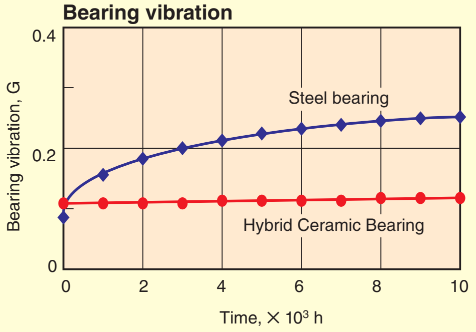
Performance

- Reduced temperature rises.



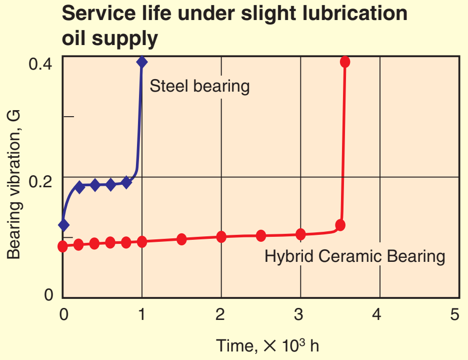
Test conditions
Bearing No.: 6312
Rotational speed: 2000 ～ 7000 min^{-1}
Load: Radial 2.94 kN

- Reduced bearing vibration.



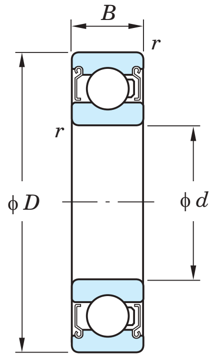
Test conditions
Bearing No.: 696 Temperature: 70˚C
Rotational speed: 15000 min^{-1}
Load (Preload) : 14.2 N (Position preloading)

- Good antiseizure characteristics.



Test conditions
Bearing No.: 695 Temperature: 70˚C
Rotational speed: 7200 min^{-1}
Load (Preload) : 14.7 N (Constant pressure preloading)

Dimensions Table



Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Boundary dimensions mm				Bearing No.	Basic load ratings [1] kN		Factor	Limiting speed min^{-1}	
d	D	B	r (min.)		C_r	C_{0r}	f_0	Grease lubrication	Oil lubrication
4	12	4	0.2	**3NC604ZZM5 FG**	0.97	0.30	12.4	63 000	75 000
	13	5	0.2	**3NC624ZZM5 FG**	1.30	0.40	12.3	52 000	64 000
5	14	5	0.2	**3NC605ZZM5 FG**	1.30	0.40	12.3	60 000	72 000
	16	5	0.3	**3NC625-5ZZM5 FG**	1.75	0.55	12.4	48 000	58 000
6	17	6	0.3	**3NC606ZZM5 FG**	1.95	0.60	12.2	51 000	61 000
	19	6	0.3	**3NC626ZZM5 FG**	2.60	0.90	12.3	42 000	51 000
7	19	6	0.3	**3NC607ZZM5 FG**	2.60	0.90	12.3	48 000	56 000
	22	7	0.3	**3NC627ZZM5 FG**	3.30	1.15	12.4	37 000	44 000
8	22	7	0.3	**3NC608ZZM5 FG**	3.30	1.15	12.4	40 000	49 000
	24	8	0.3	**3NC628ZZM5 FG**	3.35	1.20	12.8	33 000	42 000
9	24	7	0.3	**3NC609ZZM5 FG**	3.35	1.20	12.8	39 000	48 000
	26	8	0.6	**3NC629ZZM5 FG**	4.55	1.65	12.4	32 000	39 000
9.525	22.225	7.142	0.5	**3NCEE3SZZM5 FG**	3.35	1.20	12.8	39 000	48 000
10	26	8	0.3	**3NC6000ZZC3 FG**	4.55	1.65	12.3	37 000	43 000
	30	9	0.6	**3NC6200ZZC3 FG**	5.10	2.05	13.2	28 000	34 000
12	28	8	0.3	**3NC6001ZZC3 FG**	5.10	2.05	13.2	32 000	38 000
	32	10	0.6	**3NC6201ZZC3 FG**	6.80	2.60	12.3	26 000	32 000
15	32	9	0.3	**3NC6002ZZC3 FG**	5.60	2.40	13.9	27 000	32 000
	35	11	0.6	**3NC6202ZZC3 FG**	7.65	3.15	13.2	24 000	28 000
17	35	10	0.3	**3NC6003ZZC3 FG**	6.00	2.75	14.4	25 000	30 000
	40	12	0.6	**3NC6203ZZC3 FG**	9.55	4.10	13.2	20 000	25 000
20	42	12	0.6	**3NC6004ZZC3 FG**	9.40	4.30	13.9	20 000	25 000
	47	14	1	**3NC6204ZZC3 FG**	12.8	5.65	13.2	18 000	20 000
25	47	12	0.6	**3NC6005ZZC3 FG**	10.1	4.95	14.5	18 000	21 000
	52	15	1	**3NC6205ZZC3 FG**	14.0	6.70	13.9	15 000	18 000
30	55	13	1	**3NC6006ZZC3 FG**	13.2	7.00	14.7	15 000	18 000
	62	16	1	**3NC6206ZZC3 FG**	19.5	9.60	13.9	13 000	15 000
35	62	14	1	**3NC6007ZZC3 FG**	15.9	8.75	14.9	13 000	15 000
	72	17	1.1	**3NC6207ZZC3 FG**	25.7	13.1	13.9	11 000	13 000
40	68	15	1	**3NC6008ZZC3 FG**	16.7	9.80	15.2	12 000	14 000
	80	18	1.1	**3NC6208ZZC3 FG**	29.1	15.2	14.0	9 900	12 000

Note 1) The basic load ratings are those of the Hybrid Ceramic Bearing.
To calculate its dynamic equivalent radial load, multiply the C0r values in this table by 1.176.
[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.
2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

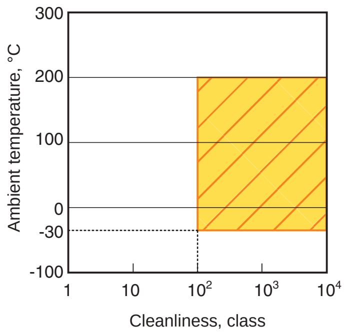
4 K Series Full Complement Hybrid Ceramic Ball Bearings

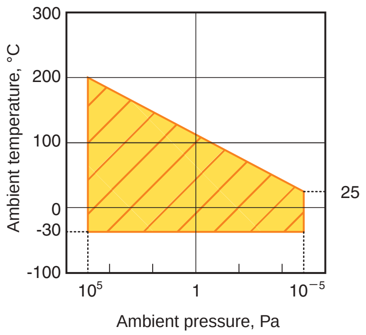
Clean Specification for Super Thin Section Ball Bearings

This bearing is based on the K series super thin section ball bearing, which is widely used in industrial robots. Provided with some adaptations, this bearing is compatible with clean or vacuum environments. It uses fluorinated EXSEV®-EX (Grease) as the standard lubricant. However, please consult with us regarding New Clean Pro Bearing-PR and other solid lubricants.

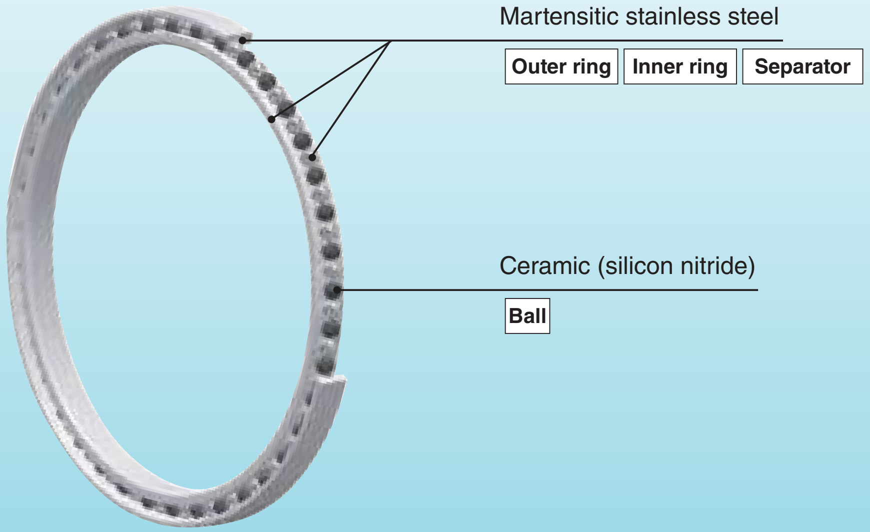
Applicable Environments

Clean	Magnetic field
Vacuum	Electric field
High speed	High temperature
Corrosive	Hygiene





Product Specifications



Bearing Numbering System

3NC Basic bearing number **VST-1**

Hybrid ceramic bearing — Full complement type

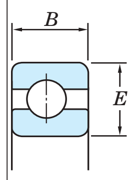
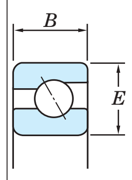
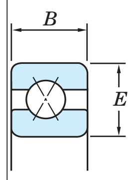
Applications

- Wafer transfer robot
- Semiconductor manufacturing equipment
- LCD manufacturing equipment

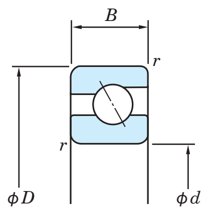
Types and Dimension Series

- The K series super thin section ball bearing is available in three types: deep groove type, angular contact type and four point contact type.
- The cross section can be selected from among three sizes: 4.762, 6.35 and 7.938 (mm).
- For use in a clean or vacuum environment, the angular contact type, which has stainless steel balls and ceramic balls alternately, is available in series.

  Products not listed in the Dimensions Table are available to order. Please consult JTEKT.

Dimension series code	Cross sectional dimension $B = E$ mm	Bearing type code C (Deep groove type)	 A (Angular contact type)	 X (4 point contact type)	Bore dia. mm
					
T	4.762	KTC	KTA	KTX	25.4, 38.1
A	6.35	KAC	KAA	KAX	50.8 ⟆ 88.9
B	7.938	KBC	KBA	KBX	

Dimensions Table



Angular contact type

Dynamic equivalent load

$P_r = XF_r + YF_a$

(X and Y are as shown below.)

Static equivalent load

$P_{0r} = 0.6F_r + 0.5F_a$

When P_{0r} is smaller than F_r .

$P_{0r} = F_r$

Contact angle	e	Single row or tandem mounting $\frac{F_a}{F_r} \leqq e$ X	 Y	 $\frac{F_a}{F_r} > e$ X	 Y	Back to back or face to face $\frac{F_a}{F_r} \leqq e$ X	 Y	 $\frac{F_a}{F_r} > e$ X	 Y
30°	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24

Contact angle	Single row or tandem mounting X_0	 Y_0	Back to back or face to face X_0	 Y_0
30°	0.5	0.33	1	0.66

Boundary dimensions mm d	 D	 B	 r (min.)	Bearing No.	Basic load ratings [1] kN C_r	 C_{0r}
25.4	34.925	4.762	0.4	**3NCKTA010VST-1**	2.05	1.20
38.1	47.625	4.762	0.4	**3NCKTA015VST-1**	2.35	1.65
50.8	63.5	6.35	0.6	**3NCKAA020VST-1**	3.90	2.95
	66.675	7.938	1	**3NCKBA020VST-1**	5.40	3.80
63.5	76.2	6.35	0.6	**3NCKAA025VST-1**	4.20	3.55
	79.375	7.938	1	**3NCKBA025VST-1**	5.85	4.60
76.2	88.9	6.35	0.6	**3NCKAA030VST-1**	4.50	4.20
	92.075	7.938	1	**3NCKBA030VST-1**	6.25	5.45
88.9	101.6	6.35	0.6	**3NCKAA035VST-1**	4.80	4.90
	104.775	7.938	1	**3NCKBA035VST-1**	6.60	6.25

Note 1) The basic load ratings are those of bearing made from SUS440C.

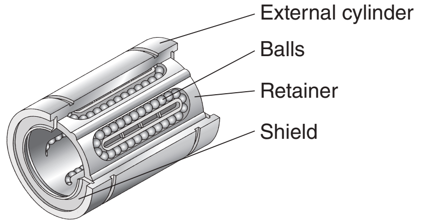
[Remarks] 1) Sizes other than those listed in this table are also available. Contact JTEKT for details.

2) Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

5 Linear Motion Bearings

5-1 Linear Motion Ball Bearings for Use in Extreme Special Environments

The linear motion ball bearings are a high precision product that moves linearly in axial directions while having rolling contact with the shaft. Having balls, retainer and shields housed in an external cylinder, this compact bearing moves linearly without limit to the stroke distance.



Bearing Types

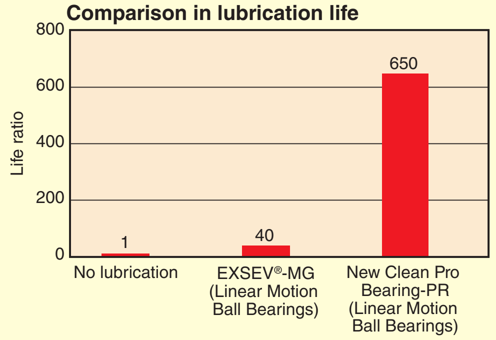
		EXSEV®-EX (Linear Motion Ball Bearings)	New Clean Pro Bearing-PR (Linear Motion Ball Bearings)	EXSEV®-MG (Linear Motion Ball Bearings)	EXSEV®-MO (Linear Motion Ball Bearings)	Hybrid Ceramic Linear [1)] Motion Ball Bearing
Material	External cylinder	Martensitic stainless steel				Martensitic stainless steel
	Balls					Silicon nitride
	Retainer	Austenitic stainless steel				Austenitic stainless steel
	Shields	Precipitation hardened stainless steel				Precipitation hardened stainless steel
Lubricant		EXSEV®-EX (Grease) [2)]	New Clean Pro Bearing-PR coating over the entire surface of all components	Silver ion plated balls	Molybdenum disulfide coated on the retainer surface	(Remark)

Notes 1) Hybrid Ceramic Linear Motion Ball Bearings with grease lubrication or with New Clean Pro Bearing-PR are also available. Consult JTEKT regarding the applications of these bearings.
2) For details on EXSEV®-EX (grease), refer to page 94.

Applicable Environments

	EXSEV®-EX (Linear Motion Ball Bearings)	New Clean Pro Bearing-PR (Linear Motion Ball Bearings)	EXSEV®-MG (Linear Motion Ball Bearings)	EXSEV®-MO (Linear Motion Ball Bearings)	Hybrid Ceramic Linear Motion Ball Bearing
Cleanliness	Class 100	Class 10	–	–	–
Temperature ˚C	– 50 to 260	– 100 to 200	– 200 to 300	– 100 to 300	– 30 to 200
Ambient pressure Pa (Room temperature)	Atomospheric air to 10^{-7}	Atomospheric air to 10^{-5}	10^{-3} to 10^{-10}	Atomospheric air to 10^{-5}	Atomospheric air to 10^{-10}

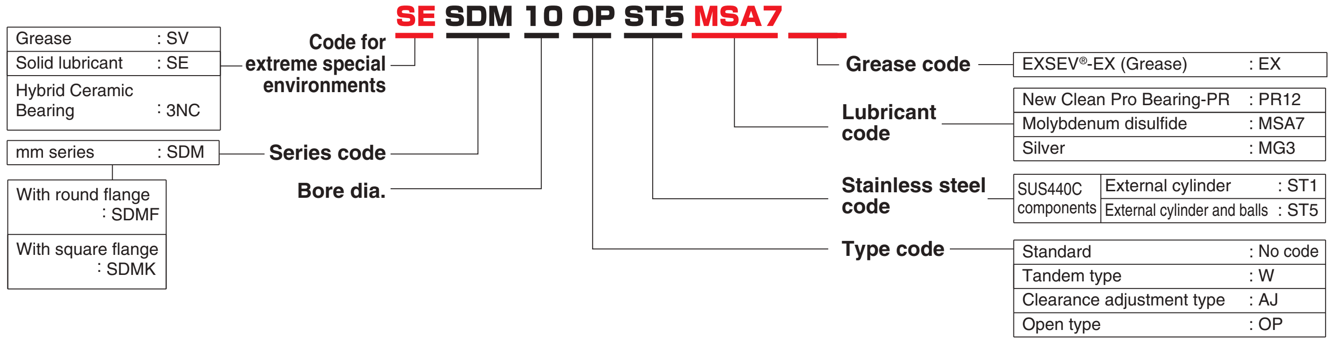
Performance


Comparison in lubrication life

Test conditions

Tested bearing	ϕ 10 × ϕ 19 × 29mm (bore dia. X outside dia. X width)
Ambience	Atmospheric air, class 10
Temperature	Room temp.
Load	50N
Speed	30mm/s

Bearing Numbering System


SE SDM 10 OP ST5 MSA7

Code for extreme special environments
- Grease : SV
- Solid lubricant : SE
- Hybrid Ceramic Bearing : 3NC

Series code
- mm series : SDM
  - With round flange : SDMF
  - With square flange : SDMK

Bore dia.

Grease code
- EXSEV®-EX (Grease) : EX

Lubricant code
- New Clean Pro Bearing-PR : PR12
- Molybdenum disulfide : MSA7
- Silver : MG3

Stainless steel code
- SUS440C components
  - External cylinder : ST1
  - External cylinder and balls : ST5

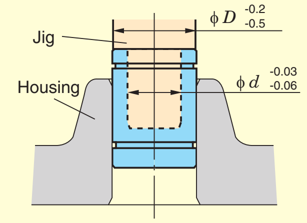
Type code
- Standard : No code
- Tandem type : W
- Clearance adjustment type : AJ
- Open type : OP

Notes 1) This catalogue does not contain the dimensions tables of mm-series linear motion ball bearings (for Europe). Contact JTEKT for the dimensions.
2) The clearance adjustment type (AJ) and open type (OP) are not compatible with tandem type and flanged type.

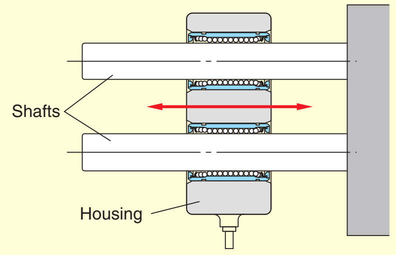
Bearing Mounting

1) Linear motion ball bearings are constructed not to allow rotary motion but allow linear motion only.
These bearings should carry loads evenly throughout their entire stroke; therefore, when the bearing is subjected to bending loads, mount two bearings at a distance on a shaft, or use a tandem type linear motion ball bearing.
2) When installing a linear motion ball bearings in a housing, press one end face of the external cylinder into the housing, taking care not to push or hit the shield, or insert the bearing softly using a jig as shown in the figure at right. When inserting a shaft, check the shaft for burrs or indentations in advance and insert it slowly so as not to deform the shaft. Chamfer the shaft end faces.
3) To support linear motion ball bearings built in a single housing on a set of two or more shafts, adjust the parallelism of the shafts while checking the smooth motion of the bearings. Imperfectly paralleled shafts may disturb smooth motion of the bearings or shorten their service life.

Jig for bearing installation in housing

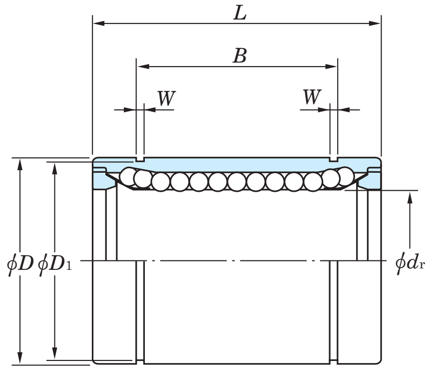


Typical use on two shafts

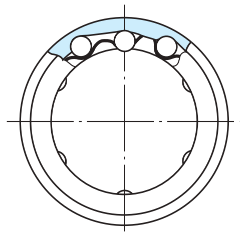


Dimensions Table

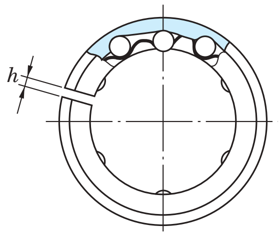
SDM Series



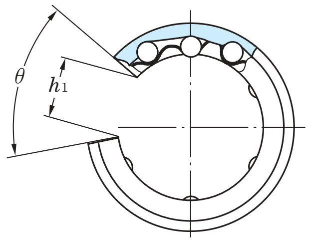
Standard
SDM



Clearance adjustment type
SDM..AJ



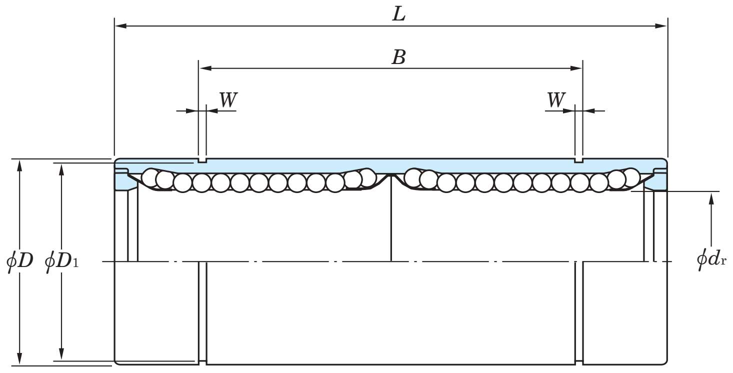
Open type
SDM..OP

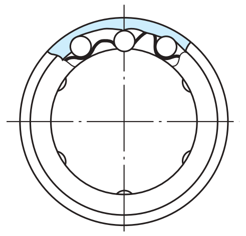


Shaft dia. d_r mm	Standard			Clearance adjustment type (AJ)			Open type (OP)			Boundary dimensions, mm													Basic load rating	
	Basic bearing No.	No. of ball rows	Mass g	Basic bearing No.	No. of ball rows	Mass g	Basic bearing No.	No. of ball rows	Mass g	d_r	Tolerance µm	D	Tolerance µm	L	Tolerance µm	B	Tolerance µm	W	D_1	h	h_1	θ (degree)	C N	C_0 N
3	SDM 3	4	1.4	—	—	—	—	—	—	3	0 − 8	7	0 − 9	10	0 − 120	—	—	—	—	—	—	—	69	105
4	SDM 4		2	—	—	—	—	—	—	4		8		12		—	—	—	—	—	—	—	88	127
5	SDM 5		4	—	—	—	—	—	—	5		10		15		10.2	0 − 200	1.1	9.6	—	—	—	167	206
6	SDM 6		8.5	—	—	—	—	—	—	6	0 − 9	12	0 − 11	19	0 − 200	13.5		1.1	11.5	—	—	—	206	265
8	SDM 8S		11	—	—	—	—	—	—	8		15		17		11.5		1.1	14.3	—	—	—	176	216
8	SDM 8		17	—	—	—	—	—	—	8		15		24		17.5		1.1	14.3	—	—	—	274	392
10	SDM10		36	—	—	—	—	—	—	10		19	0 − 13	29		22		1.3	18	—	—	—	372	549
12	SDM12		42	SDM12 AJ	4	41	SDM12 OP	3	32	12		21		30		23		1.3	20	1.5	8	80	510	784
13	SDM13		49	SDM13 AJ		48	SDM13 OP		37	13		23		32		23		1.3	22	1.5	9	80	510	784
16	SDM16		76	SDM16 AJ		75	SDM16 OP		58	16		28		37		26.5		1.6	27	1.5	11	80	774	1 180
20	SDM20	5	100	SDM20 AJ	5	98	SDM20 OP	4	79	20	0 − 10	32	0 − 16	42		30.5		1.6	30.5	1.5	11	60	882	1 370
25	SDM25	6	240	SDM25 AJ	6	237	SDM25 OP	5	203	25		40		59	0 − 300	41	0 − 300	1.85	38	2	12	50	980	1 570
30	SDM30		270	SDM30 AJ		262	SDM30 OP		228	30		45		64		44.5		1.85	43	2.5	15	50	1 570	2 740
35	SDM35		425	SDM35 AJ		420	SDM35 OP		355	35	0 − 12	52	0 − 19	70		49.5		2.1	49	2.5	17	50	1 670	3 140
40	SDM40		654	SDM40 AJ		640	SDM40 OP		546	40		60		80		60.5		2.1	57	3	20	50	2 160	4 020
50	SDM50		1 700	SDM50 AJ		1 680	SDM50 OP		1 420	50		80		100		74		2.6	76.5	3	25	50	3 820	7 940
60	SDM60		2 000	SDM60 AJ		1 980	SDM60 OP		1 650	60	0 − 15	90	0 − 22	110		85		3.15	86.5	3	30	50	4 700	10 000

[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

SDM..W series (Tandem type)

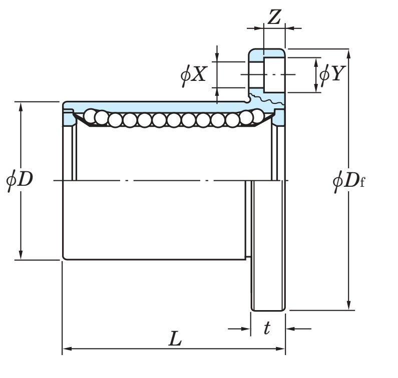




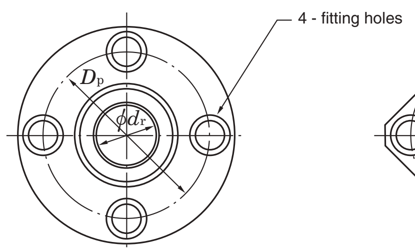
Shaft dia. d_r mm	Basic bearing No.	Mass g	Boundary dimensions, mm										Basic load rating	
			d_r	Tolerance µm	D	Tolerance µm	L	Tolerance µm	B	Tolerance µm	W	D_1	C N	C_0 N
5	SDM 5W	11	5	0 − 10	10	0 − 11	28	0 − 300	20.4	0 − 300	1.1	9.6	265	412
6	SDM 6W	16	6		12	0 − 13	35		27		1.1	11.5	323	530
8	SDM 8W	31	8		15		45		35		1.1	14.3	431	784
10	SDM10W	62	10		19	0 − 16	55		44		1.3	18	588	1 100
12	SDM12W	80	12		21		57		46		1.3	20	813	1 570
13	SDM13W	90	13		23		61		46		1.3	22	813	1 570
16	SDM16W	145	16		28		70		53		1.6	27	1 230	2 350
20	SDM20W	180	20	0 − 12	32	0 − 19	80		61		1.6	30.5	1 400	2 740
25	SDM25W	440	25		40		112	0 − 400	82	0 − 400	1.85	38	1 560	3 140
30	SDM30W	480	30		45		123		89		1.85	43	2 490	5 490
35	SDM35W	795	35	0 − 15	52	0 − 22	135		99		2.1	49	2 650	6 270
40	SDM40W	1 170	40		60		151		121		2.1	57	3 430	8 040
50	SDM50W	3 100	50		80		192		148		2.6	76.5	6 080	15 900
60	SDM60W	3 500	60	0 − 20	90	0 − 25	209		170		3.15	86.5	7 550	20 000

[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

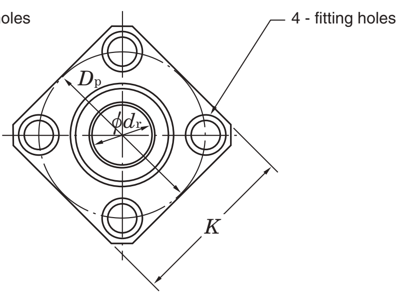
SDMF series (with round flange)
SDMK series (with square flange)



With round flange
SDMF



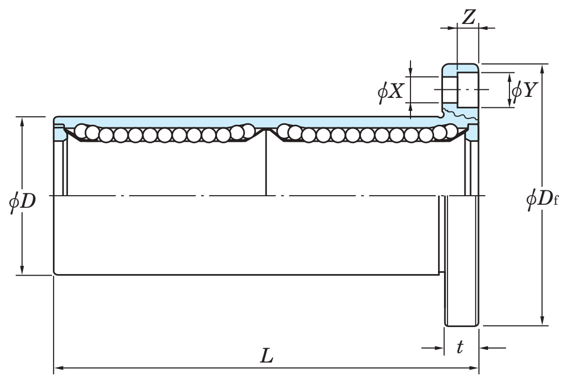
With square flange
SDMK



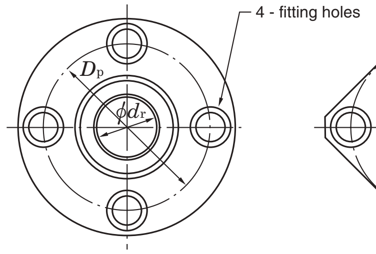
Shaft dia. d_r mm	Basic bearing No.	Mass g	Boundary dimensions, mm													Eccen-tricity (max.) μm	Square-ness (max.) μm	Basic load rating	
			d_r	Tolerance μm	D	Tolerance μm	L	Tolerance μm	D_f	K	t	D_p	X	Y	Z			C N	C_0 N
6	SDMF 6 SDMK 6	24 18	6	0 − 9	12	0 − 13	19	± 300	28	22	5	20	3.5	6	3.1	12	12	206	265
8	SDMF 8S SDMK 8S	32 24	8		15		17		32	25	5	24	3.5	6	3.1			176	216
8	SDMF 8 SDMK 8	37 29	8		15		24		32	25	5	24	3.5	6	3.1			274	392
10	SDMF10 SDMK10	72 52	10		19	0 − 16	29		40	30	6	29	4.5	7.5	4.1			372	549
12	SDMF12 SDMK12	76 57	12		21		30		42	32	6	32	4.5	7.5	4.1			510	784
13	SDMF13 SDMK13	88 72	13		23		32		43	34	6	33	4.5	7.5	4.1			510	784
16	SDMF16 SDMK16	120 104	16		28		37		48	37	6	38	4.5	7.5	4.1			774	1 180
20	SDMF20 SDMK20	180 145	20	0 − 10	32	0 − 19	42		54	42	8	43	5.5	9	5.1	15	15	882	1 370
25	SDMF25 SDMK25	340 300	25		40		59		62	50	8	51	5.5	9	5.1			980	1 570
30	SDMF30 SDMK30	470 375	30		45		64		74	58	10	60	6.6	11	6.1			1 570	2 740
35	SDMF35 SDMK35	650 560	35	0 − 12	52	0 − 22	70		82	64	10	67	6.6	11	6.1	20	20	1 670	3 140
40	SDMF40 SDMK40	1 060 880	40		60		80		96	75	13	78	9	14	8.1			2 160	4 020
50	SDMF50 SDMK50	2 200 2 000	50		80		100		116	92	13	98	9	14	8.1			3 820	7 940
60	SDMF60 SDMK60	3 000 2 560	60	0 − 15	90	0 − 25	110		134	106	18	112	11	17	11.1	25	25	4 700	10 000

[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

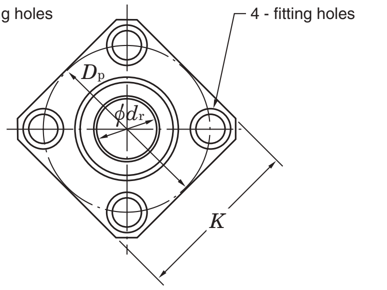
SDMF..W series (tandem type, with round flange)
SDMK..W series (tandem type, with square flange)



With round flange
SDMF..W



With square flange
SDMK..W

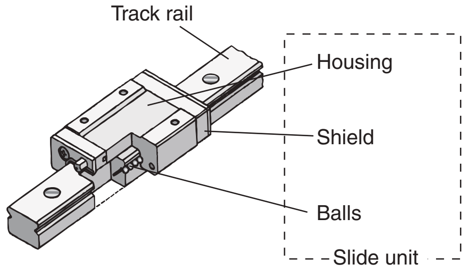


Shaft dia. d_r mm	Basic bearing No.	Mass g	Boundary dimensions, mm													Eccen-tricity (max.) μm	Square-ness (max.) μm	Basic load rating	
			d_r	Tolerance μm	D	Tolerance μm	L	Tolerance μm	D_f	K	t	D_p	X	Y	Z			C N	C_0 N
6	SDMF 6W SDMK 6W	31 25	6	0 − 10	12	0 − 13	35	± 300	28	22	5	20	3.5	6	3.1	15	15	323	530
8	SDMF 8W SDMK 8W	51 43	8		15		45		32	25	5	24	3.5	6	3.1			431	784
10	SDMF10W SDMK10W	98 78	10		19	0 − 16	55		40	30	6	29	4.5	7.5	4.1			588	1 100
12	SDMF12W SDMK12W	110 90	12		21		57		42	32	6	32	4.5	7.5	4.1			813	1 570
13	SDMF13W SDMK13W	130 108	13		23		61		43	34	6	33	4.5	7.5	4.1			813	1 570
16	SDMF16W SDMK16W	190 165	16		28		70		48	37	6	38	4.5	7.5	4.1			1 230	2 350
20	SDMF20W SDMK20W	260 225	20	0 − 12	32	0 − 19	80		54	42	8	43	5.5	9	5.1	20	20	1 400	2 740
25	SDMF25W SDMK25W	540 500	25		40		112		62	50	8	51	5.5	9	5.1			1 560	3 140
30	SDMF30W SDMK30W	680 590	30		45		123		74	58	10	60	6.6	11	6.1			2 490	5 490
35	SDMF35W SDMK35W	1 020 930	35	0 − 15	52	0 − 22	135		82	64	10	67	6.6	11	6.1	25	25	2 650	6 270
40	SDMF40W SDMK40W	1 570 1 380	40		60		151		96	75	13	78	9	14	8.1			3 430	8 040
50	SDMF50W SDMK50W	3 600 3 400	50		80		192		116	92	13	98	9	14	8.1			6 080	15 900
60	SDMF60W SDMK60W	4 500 4 060	60	0 − 20	90	0 − 25	209		134	106	18	112	11.0	17.0	11.1	30	30	7 550	20 000

[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

5-2 Linear Way Bearing Units for Use in Extreme Special Environments

The Linear Way Bearing Units have a slide unit in which balls circulate, allowing the slide unit to move linearly on the track rail without limit. High precision linear motion can be obtained easily by fixing the slide unit and track rail with bolts.



Bearing Types

		EXSEV®-EX (Linear Way Bearing Unit)	New Clean Pro Bearing-PR (Linear Way Bearing Unit)	Hybrid Ceramic Linear Way Bearing Unit [1]
Material	Housing	Martensitic stainless steel		Martensitic stainless steel
	Track rail			
	Balls			Silicon nitride
	Shields	Austenitic stainless steel		Austenitic stainless steel
Lubricant		EXSEV®-EX (Grease) [2]	New Clean Pro Bearing-PR coating over the entire surface of all components	(Remark)

Notes 1) Hybrid Ceramic Linear Way Bearing Unit with grease lubrication or with New Clean Pro Bearing-PR are also available.
Consult JTEKT regarding the use of these bearings.
2) For details on EXSEV®-EX (grease), refer to page 94.

Applicable Environments

	EXSEV®-EX (Linear Way Bearing Unit)	New Clean Pro Bearing-PR (Linear Way Bearing Unit)	Hybrid Ceramic Linear Way Bearing Unit
Cleanliness	Class 100	Class 10	–
Temperature ˚C	– 50 to 260	– 100 to 200	– 30 to 200
Ambient pressure Pa (Room temperature)	Atomospheric air to 10^{-7}	Atomospheric air to 10^{-5}	Atomospheric air to 10^{-10}

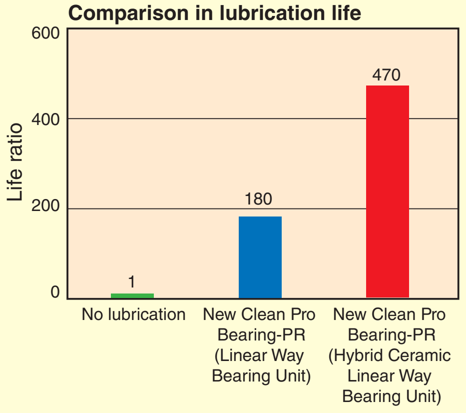
Performance

Test conditions

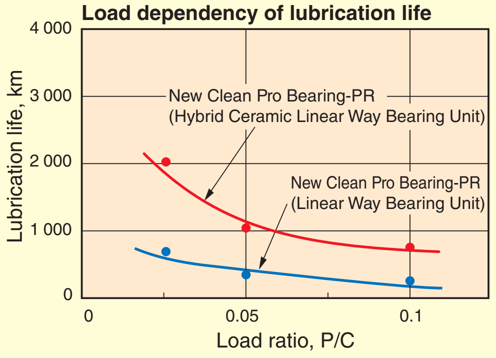
Bearing number	LWL9
Ambience	Class10, Room temp.
Average movement speed mm/s	250
Acceleration mm/s²	500
Stroke mm	250
Load N	80 (Radial)

The end of the service life is defined as the point in time when the number of emitted particles (having a particle diameter of 0.1 µm or more) is greater than or equal to 1000 particles per 2.83 × 10^{-3} m³ (0.1 ft³).

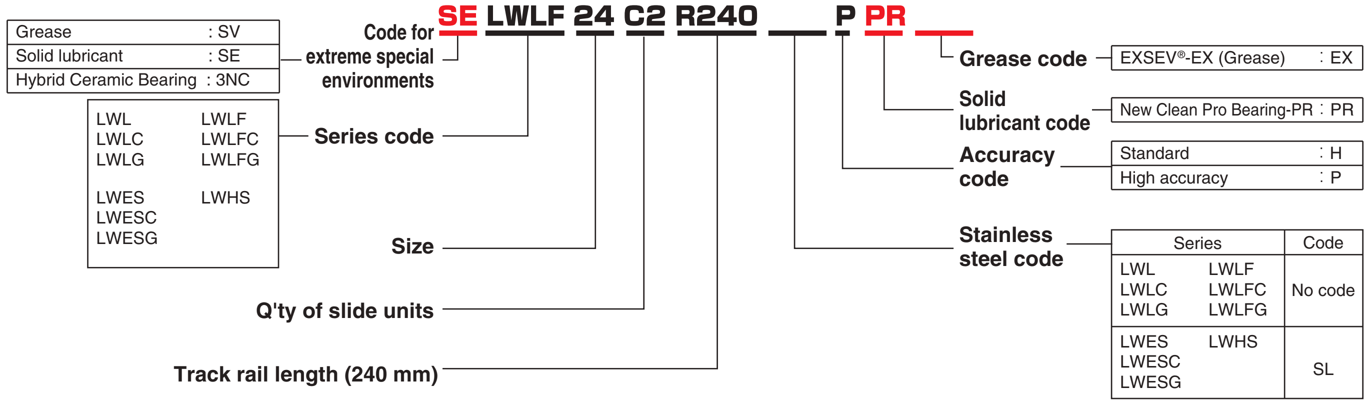
Comparison in lubrication life



Load dependency of lubrication life



Bearing Numbering System



Grease : SV
Solid lubricant : SE
Hybrid Ceramic Bearing : 3NC

LWL
LWLC
LWLG
LWES
LWESC
LWESG
LWLF
LWLFC
LWLFG
LWHS

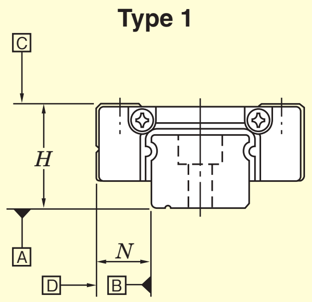
EXSEV®-EX (Grease) : EX

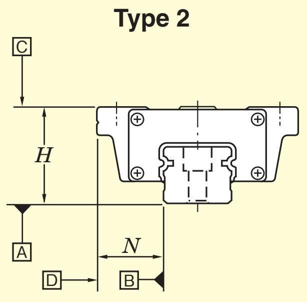
New Clean Pro Bearing-PR : PR

Standard : H
High accuracy : P

Series	Code
LWL LWLF LWLC LWLFC LWLG LWLFG	No code
LWES LWHS LWESC LWESG	SL

Tolerance (before surface treatment)





Unit: mm

Item	LWL LWLF LWLC LWLFC LWLG LWLFG (Type 1)	LWES LWHS LWESC LWESG (Type 2)
Tolerance of *H*	± 0.020	± 0.040
Variation of *H* 1)	0.015 max.	0.015 max.
Tolerance of *N*	± 0.025	± 0.050
Variation of *N* 1)	0.020 max.	最大 0.020 max.
Degree of running parallelism of plane *C* to plane *A* Degree of running parallelism of plane *D* to plane *B*	Fig. 5-1	Fig. 5-2

Note 1) The variation refers to the dimensional difference between the slide units built into the same track rail.

Remark) The preload is null or negligible.

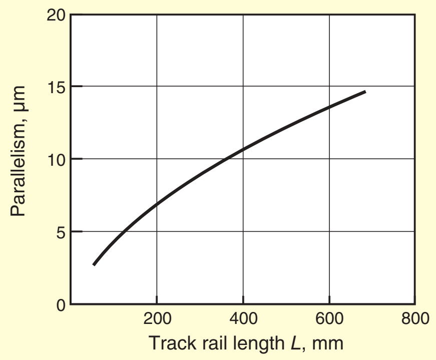


Fig. 5-1 Running parallelism of Linear Way Bearing Unit (Type 1)

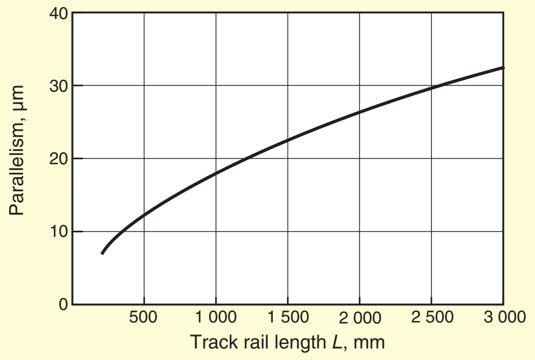


Fig. 5-2 Running parallelism of Linear Way Bearing Unit (Type 2)

Bearing Mounting

1) Do not change the factory assembled combination of the slide units and track rail.
Handle the linear way bearing units carefully to keep them out of oil stains and dust.

2) Before installing a linear way bearing unit in a machine or equipment, remove burrs and indentations from the contact surface of both the machine and bearing unit. Also remove dust, contamination and oil stains. Clean the recesses of the mounting surface (Fig. 5-3).

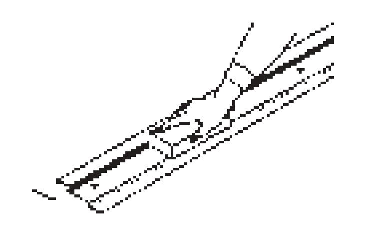


Fig. 5-3 Cleaning of the mounting surface

3) After positioning the mounting reference plane of the track rail correctly to the mounting reference plane of the bed, temporarily fasten the track to the bed (Fig. 5-4). Then bring the two planes into close contact, using a small vice or other suitable tool. Tighten the bolts one by one to securely fasten the drive side track rail to the bed (Fig. 5-5). The driven side track rail of the Linear Way Bearing Unit should be kept temporarily fastened.

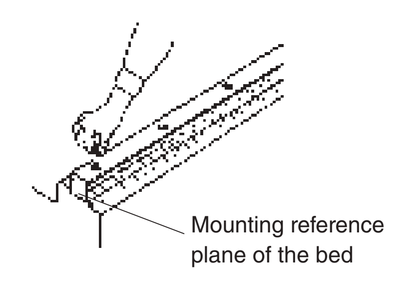


Fig. 5-4 Temporary fastening of the track rail

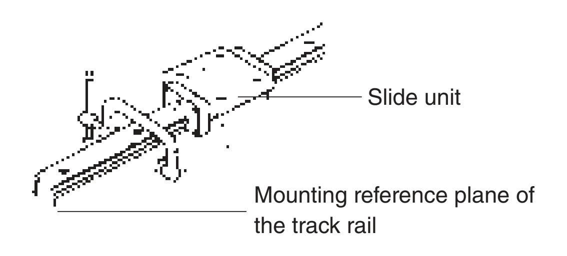


Fig. 5-5 Fastening of the drive side track rail

4) After positioning the slide units of the linear way bearing unit to the table, place the table carefully on the slide units and then temporarily fasten them together. Then align the mounting reference plane of the drive side slide units correctly with that of the table and fasten them together. With one of the driven side slide units positioned and fixed with respect to the moving direction, leave the other slide unit loosely tightened (Fig. 5-6).

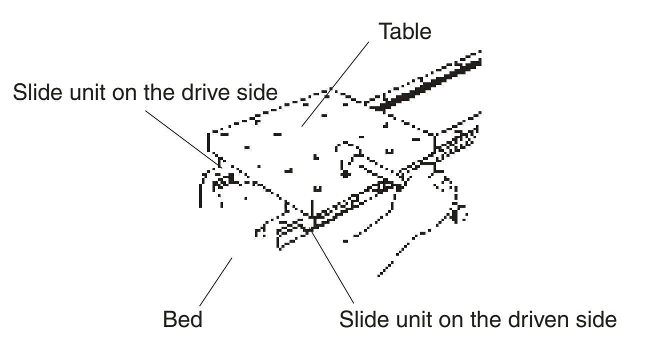


Fig. 5-6 Fastening of the slide unit

5) Before securely fastening the temporarily fastened track rail on the driven side, move the table and check that the motion is smooth. Tighten the fastening bolt that has just been passed over by the slide unit, thus fastening the track rail to the bed in a step-by-step manner (Fig. 5-7).
Securely fasten the slide unit to the table, which has been kept temporarily fastened.

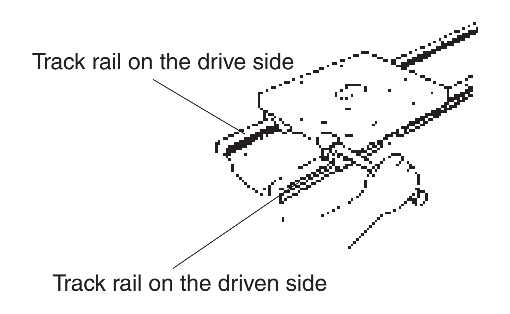
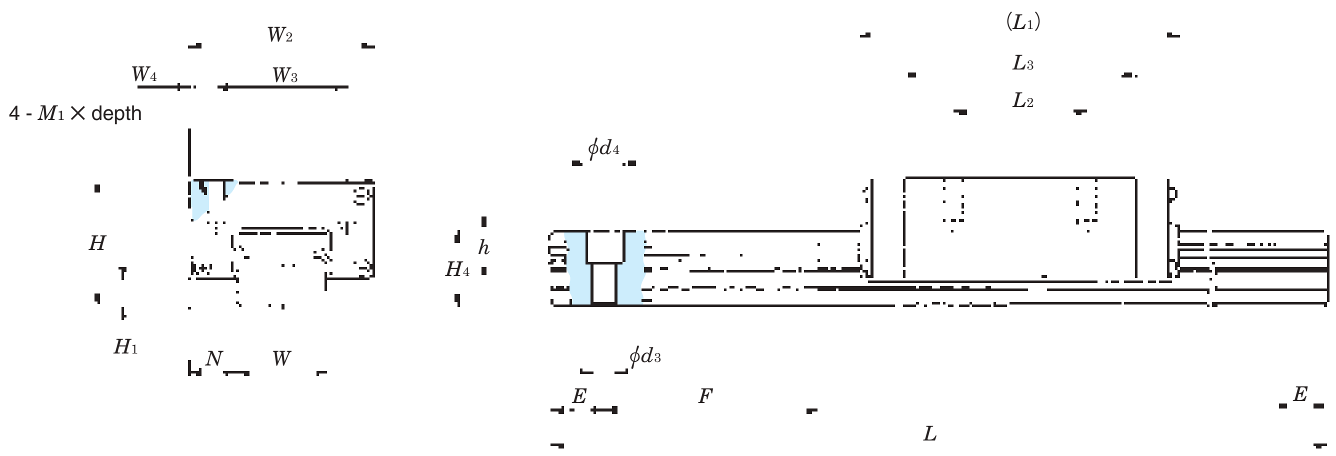


Fig. 5-7 Fastening of the driven side track rail

Dimensions Table

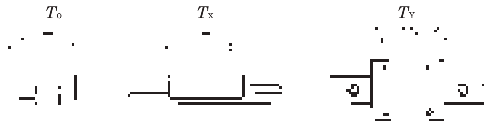
LWHS series



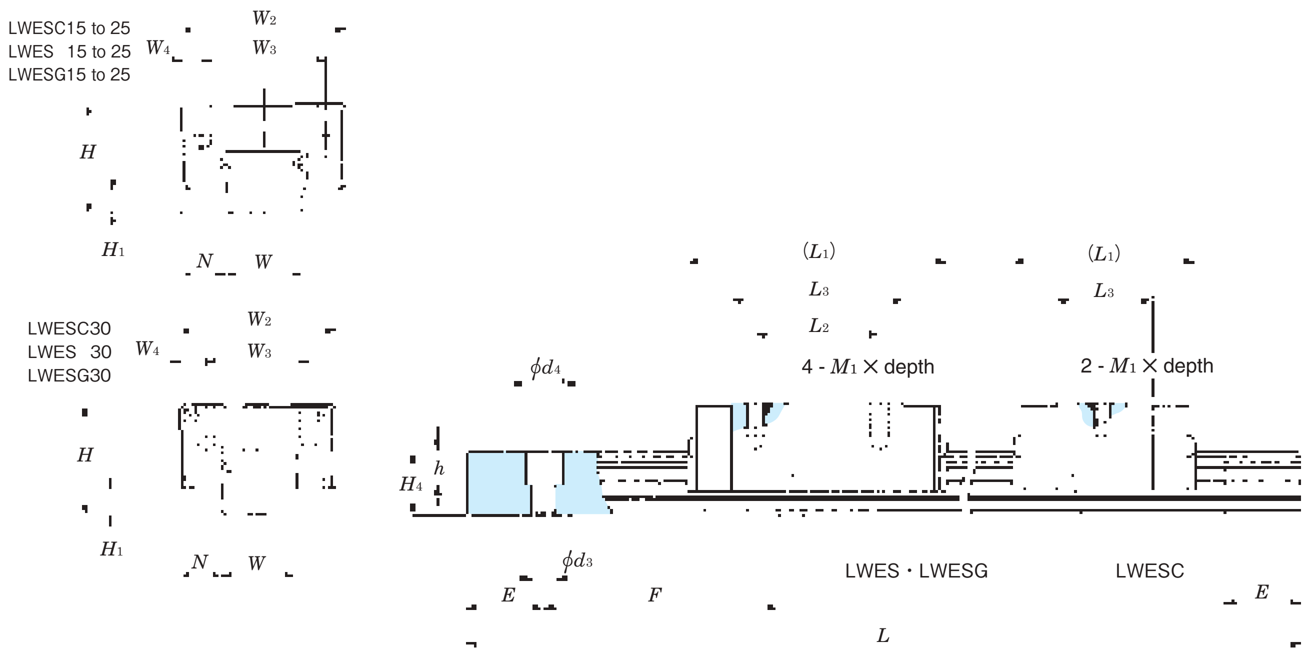
Basic No.	Mass (refer.)		Dimensions of assembly mm			Rail width mm	Dimensions of slide unit mm							Dimensions of track rail mm						Track rail fastening bolt mm (nominal) ×ℓ	Max. track rail length L mm	Basic load rating		Static bending moment rating 1)		
	Slide unit kg	Track rail kg / m	H	H_1	N	W	W_2	W_3	W_4	L_1	L_2	L_3	M_1× depth	H_4	d_3	d_4	h	E	F			C N	C_0 N	T_0 N·m	T_X N·m	T_Y N·m
LWHS 15	0.18	1.47	24	4.5	9.5	15	34	26	4	66	26	44.6	M4× 8	15	4.5	8	6	30	60	M4×16	600	11 600	13 400	112	95.6 556	95.6 556
LWHS 20	0.36	2.56	30	5	12	20	44	32	6	83	36	57.2	M5×10	18	6	9.5	8.5	30	60	M5×18	600	18 100	21 100	232	195 1 090	195 1 090
LWHS 25	0.55	3.50	36	6.5	12.5	23	48	35	6.5	95	35	64.7	M6×12	22	7	11.0	9	30	60	M6×22	600	25 200	28 800	362	309 1 690	309 1 690
LWHS 30	1.00	4.82	42	7	16	28	60	40	10	113	40	80.6	M8×16	25	9	14	12	40	80	M8×28	600	35 400	40 700	623	536 2 820	536 2 820

Note 1) The illustrations at right show the directions of the static bending moment ratings T_O, T_X, and T_Y.
Each of the upper values in the T_X and T_Y columns shows the bending moment for a single slide unit, and the lower value shows the bending moment for two slide units kept in close contact.

[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.



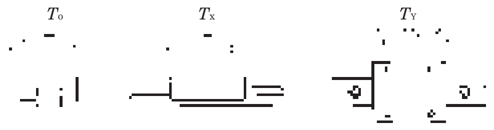
LWES series



Basic No.	Mass (refer.)		Dimensions of assembly mm			Rail width mm	Dimensions of slide unit mm							Dimensions of track rail mm						Track rail fastening bolt mm (nominal) ×ℓ	Max. track rail length L mm	Basic load rating		Static bending moment rating 1)		
	Slide unit kg	Track rail kg / m	H	H_1	N	W	W_2	W_3	W_4	L_1	L_2	L_3	M_1× depth	H_4	d_3	d_4	h	E	F			C N	C_0 N	T_0 N·m	T_X N·m	T_Y N·m
LWESC15	0.09	1.57	24	5.8	9.5	15	34	26	4	41	—	22.4	M4 × 7	14.5	3.6	6.5	4.5	20	60	M3 × 16	600	5 240	5 480	43.8	21.3 149	21.3 149
LWES 15	0.14									57	26	38.4									600	7 640	9 390	75.1	57.6 333	57.6 333
LWESG15	0.18									70	36	51.1									600	9 340	12 500	100	99.5 533	99.5 533
LWESC20	0.15	2.28	28	6	11	20	42	32	5	47	—	24.5	M5 × 8	16	6	9.5	8.5	20	60	M5 × 16	600	7 570	7 340	78.9	31.5 235	31.5 235
LWES 20	0.25									67	32	44									600	11 600	13 400	145	95.6 566	95.6 566
LWESG20	0.33									83	45	59.9									600	14 400	18 300	197	172 930	172 930
LWESC25	0.26	3.09	33	7	12.5	23	48	35	6.5	59	—	32	M6 × 9	19	7	11	9	20	60	M6 × 20	600	12 400	12 300	153	71.8 480	71.8 480
LWES 25	0.43									83	35	56									600	18 100	21 100	262	195 1 090	195 1 090
LWESG25	0.55									102	50	75									600	22 200	28 200	349	336 1 740	336 1 740
LWESC30	0.46	5.09	42	10	16	28	60	40	10	68	—	36	M8 × 12	25	7	11	9	20	80	M6 × 25	600	20 600	18 800	287	129 855	129 855
LWES 30	0.78									97	40	64.8									600	29 500	31 300	479	328 1 920	328 1 920
LWESG30	1.13									129	60	96.5									600	39 200	47 000	718	704 3 690	704 3 690

Note 1) The illustrations at right show the directions of the static bending moment ratings T_O, T_X, and T_Y.
Each of the upper values in the T_X and T_Y columns shows the bending moment for a single slide unit, and the lower value shows the bending moment for two slide units kept in close contact.

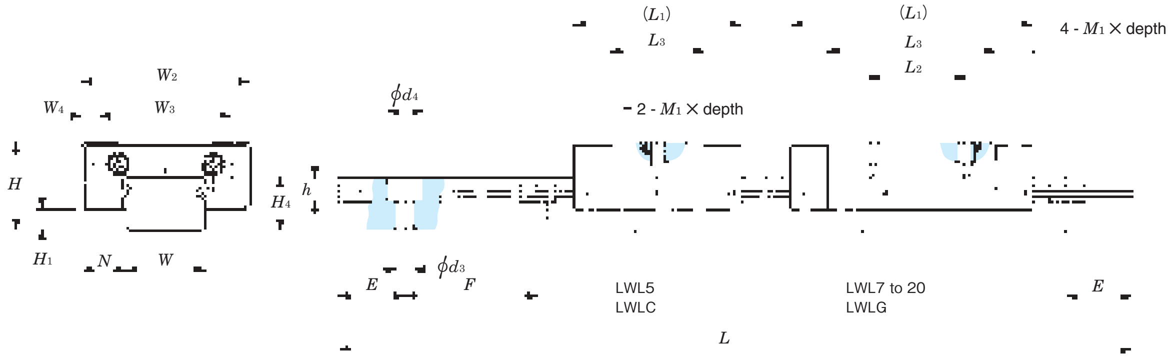
[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.



2

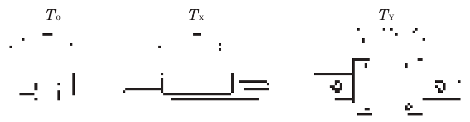
EXSEV Bearings and Other EXSEV Products

LWL series



Basic No.	Mass (refer.)		Dimensions of assembly mm			Rail width mm	Dimensions of slide unit mm							Dimensions of track rail mm						Track rail fastening bolt mm (nominal) × ℓ	Max. track rail length L mm	Basic load rating		Static bending moment rating 1)		
	Slide unit g	Track rail g/100mm	H	H_1	N	W	W_2	W_3	W_4	L_1	L_2	L_3	M_1 × depth	H_4	d_3	d_4	h	E	F			C N	C_0 N	T_0 N·m	T_X N·m	T_Y N·m
LWLC 5	3.4	12	6	1	3.5	5	12	8	2	16	—	9.6	M2 × 1.5	3.7	2.4	3.6	0.8	7.5	15	Cross recessed round head screw M2 × 6	210	562	841	2.2	1.4 8.5	1.2 7.2
LWL 5	4.4									19	—	12.6										676	1 090	2.9	2.3 12.8	1.9 10.8
LWLC 7	7.1	22	8	1.5	5	7	17	12	2.5	19	—	9.6	M2 × 2.5	5	2.4	4.2	2.3	7.5	15	Hexagon socket head cap bolt M2 × 6	300	937	1 140	4.1	1.8 14.9	1.5 12.9
LWL 7	10									23.5	8	14.3										1 330	1 890	6.9	4.7 28.2	3.9 23.6
LWLG 7	14									31	12	21.6										1 690	2 650	9.7	8.8 50.7	7.4 42.5
LWLC 9	11	35	10	2	5.5	9	20	15	2.5	21.5	—	11.9	M3 × 3	6	3.5	6	3.5	10	20	Hexagon socket head cap bolt M3 × 8	600	1 180	1 480	6.9	2.9 21.4	2.4 18.0
LWL 9	19									30	10	20.8										1 810	2 760	12.8	9.1 51.1	7.6 42.9
LWLG 9	28									40.5	15	30.9										2 370	4 030	18.7	18.7 98.3	15.7 82.5
LWLC12	22	65	13	3	7.5	12	27	20	3.5	25	—	13	M3 × 3.5	8	3.5	6.5	4.5	12.5	25	Hexagon socket head cap bolt M3 × 8	600	2 210	2 380	14.8	5.3 41.7	4.5 35.0
LWL 12	35									34	15	21.6										3 330	4 290	26.6	15.4 93.1	12.9 78.2
LWLG12	51									44	20	32										4 310	6 200	38.4	30.6 168	25.7 141
LWLC15	42	107	16	4	8.5	15	32	25	3.5	32	—	17.7	M3 × 4	10	3.5	6.5	4.5	20	40	Hexagon socket head cap bolt M3 × 10	600	3 490	3 890	30.0	11.7 84.5	9.8 70.9
LWL 15	64									42	20	27.8										4 980	6 490	50.0	29.7 172	24.9 144
LWLG15	95									57	25	42.7										6 620	9 740	75.0	63.9 338	53.6 284
LWLC20	89	156	20	5	10	20	40	30	5	38	—	22.3	M4 × 6	11	6	9.5	5.5	30	60	Hexagon socket head cap bolt M5 × 14	600	4 580	5 300	54.0	19.4 134	16.3 112
LWL 20	133									50	25	34.6										6 650	9 080	92.6	52.7 280	44.2 235
LWLG20	196									68	30	52.3										8 510	12 900	131	102 529	85.7 444

Note 1) The illustrations at right show the directions of the static bending moment ratings T_O, T_X, and T_Y.
Each of the upper values in the T_X and T_Y columns shows the bending moment for a single slide unit, and the lower value shows the bending moment for two slide units kept in close contact.



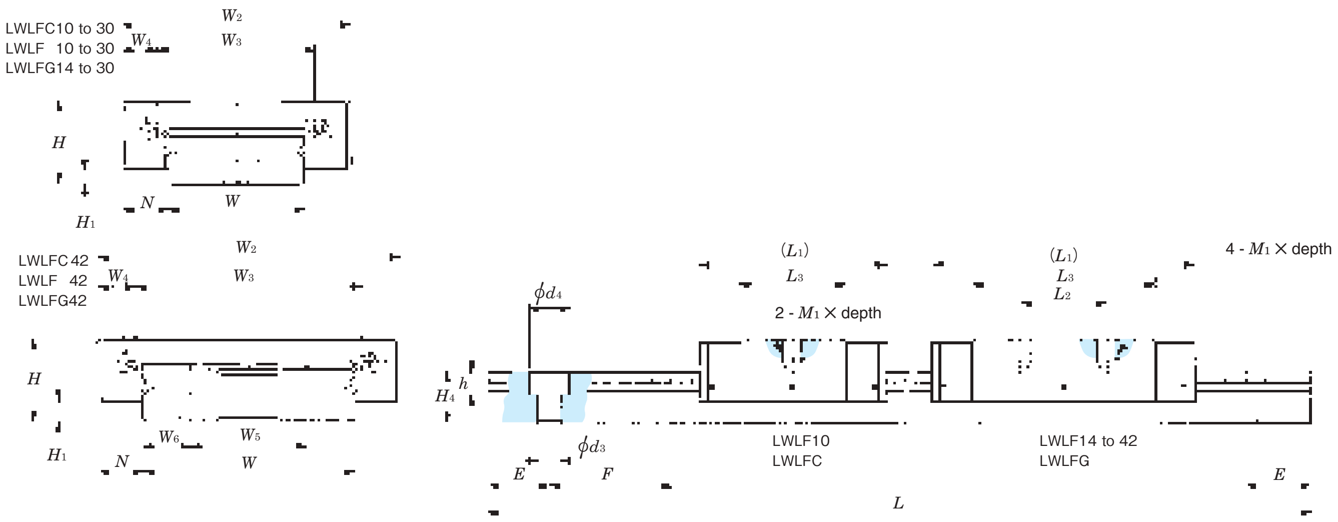
[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

2

5

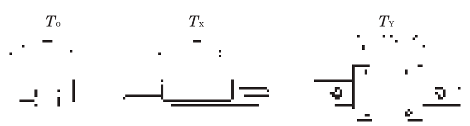
Linear Motion Bearings

LWLF series



Basic No.	Mass (refer.)		Dimensions of assembly mm			Rail width mm	Dimensions of slide unit mm							Dimensions of track rail mm								Track rail fastening bolt mm (nominal) × ℓ	Max. track rail length L mm	Basic load rating		Static bending moment rating 1)		
	Slide unit g	Track rail g/100mm	H	H_1	N	W	W_2	W_3	W_4	L_1	L_2	L_3	M_1 × depth	H_4	W_5	W_6	d_3	d_4	h	E	F			C N	C_0 N	T_0 N·m	T_X N·m	T_Y N·m
LWLFC10	5.9	28	6.5	1.5	3.5	10	17	13	2	20.5	—	13.6	M2.5×1.5	4	—	—	2.9	4.8	1.6	10	20	Cross recessed round head screw M2.5 × 7	300	712	1 180	6.1	2.6 14.9	2.2 12.5
LWLF 10	7.5									24.5	—	17.6												849	1 510	7.8	4.2 22.4	3.5 18.8
LWLFC14	13	54	9	2	5.5	14	25	19	3	22.5	—	13	M3×3	5.5	—	—	3.5	6	3.2	15	30	Hexagon socket head cap bolt M3 × 8	300	1 240	1 700	12.2	3.8 24.6	3.2 20.7
LWLF 14	21									31.5	10	22												1 770	2 840	20.3	10.1 54.7	8.4 45.9
LWLFG14	31									42	19	32.5												2 320	4 160	29.8	21.0 104	17.6 87.6
LWLFC18	26	90	12	3	6	18	30	21	4.5	26.5	—	16.6	M3×3	7	—	—	3.5	6.5	4.5	15	30	Hexagon socket head cap bolt M3 × 8	600	1 510	2 120	19.4	5.5 35.9	4.7 30.1
LWLF 18	44									38.5	12	28.6												2 280	3 810	34.9	16.9 88.8	14.2 74.5
LWLFG18	61							23	3.5	50.5	24	40.4												2 870	5 300	48.5	31.9 159	26.7 134
LWLFC24	45	139	14	3	8	24	40	28	6	30.5	—	17.7	M3×3.5	8	—	—	4.5	8	4.5	20	40	Hexagon socket head cap bolt M4 × 10	600	2 800	3 340	40.7	9.7 67.6	8.2 56.8
LWLF 24	76									44	15	31												4 310	6 200	75.6	30.6 168	25.7 141
LWLFG24	111									59	28	46.3												5 620	9 060	111	63.3 321	53.1 270
LWLFC30	70	198	15	3	10	30	50	35	7.5	35.5	—	20.5	M4×4.5	9	—	—	4.5	8	4.5	20	40	Hexagon socket head cap bolt M4 × 12	600	3 890	4 540	69.1	15.4 107	13.0 89.9
LWLF 30	112									49.5	18	34.8												5 970	8 440	128	48.7 256	40.8 215
LWLFG30	170									68.5	35	53.8												7 810	12 300	187	100 508	84.3 426
LWLFC42	95	294	16	4	9	42	60	45	7.5	41.5	—	25.3	M4×4.5	10	23	9.5	4.5	8	4.5	20	40	Hexagon socket head cap bolt M4 × 12	600	5 030	6 050	128	24.8 164	20.8 137
LWLF 42	140									55	20	39												7 050	9 840	209	61.3 333	51.4 280
LWLFG42	204									74.5	35	58.3												9 200	14 400	305	126 644	106 541

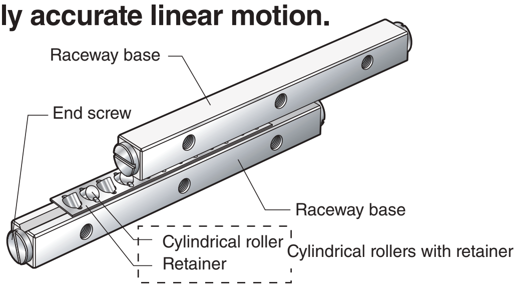
Note 1) The illustrations at right show the directions of the static bending moment ratings T_O, T_X, and T_Y.
Each of the upper values in the T_X and T_Y columns shows the bending moment for a single slide unit, and the lower value shows the bending moment for two slide units kept in close contact.



[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

5-3 Cross Roller Way Bearing Units for Use in Extreme Special Environments

The Cross Roller Way Bearing Unit is a linear motion bearing unit consisting of two raceway bases. Each base has one longitudinal plane cut into a V shape, which serves as the rolling surface. Two bases are in contact on each of the other's V-cut surface, and cylindrical rollers with a retainer are placed between the surfaces. Any pair of adjacent cylindrical rollers is directed at right angles to each other, thus enabling smooth and extremely accurate linear motion.



Bearing Types

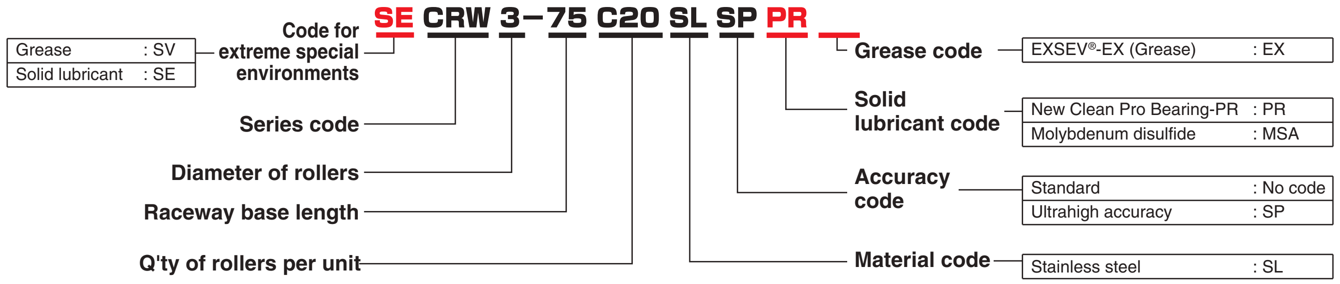
		EXSEV®-EX (Cross Roller Way Bearing Unit)	New Clean Pro Bearing-PR (Cross Roller Way Bearing Unit)	EXSEV®-MO (Cross Roller Way Bearing Unit)
Material	Raceway base	Martensitic stainless steel		
	Cylindrical rollers			
	Retainer	Austenitic stainless steel		
	End screw			
Lubricant		EXSEV®-EX (Grease) [1]	New Clean Pro Bearing-PR coating over the entire surface of all components	Molybdenum disulfide coating on the raceway bases

Note 1) For details on EXSEV®-EX (grease), refer to page 94.

Applicable Environments

	EXSEV®-EX (Cross Roller Way Bearing Unit)	New Clean Pro Bearing-PR (Cross Roller Way Bearing Unit)	EXSEV®-MO (Cross Roller Way Bearing Unit)
Cleanliness	Class 100	Class 10	–
Temperature ˚C	– 50 to 260	– 100 to 200	– 100 to 300
Ambient pressure Pa (Room temperature)	Atmospheric air to 10^{-7}	Atmospheric air to 10^{-5}	Atmospheric air to 10^{-5}

Bearing Numbering System



SE CRW 3–75 C20 SL SP PR

Grease	: SV
Solid lubricant	: SE

Code for extreme special environments

Series code

Diameter of rollers

Raceway base length

Q'ty of rollers per unit

Grease code

EXSEV®-EX (Grease)	: EX

Solid lubricant code

New Clean Pro Bearing-PR	: PR
Molybdenum disulfide	: MSA

Accuracy code

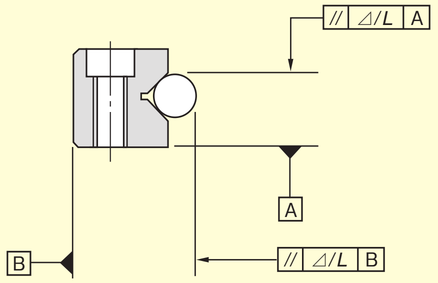
Standard	: No code
Ultrahigh accuracy	: SP

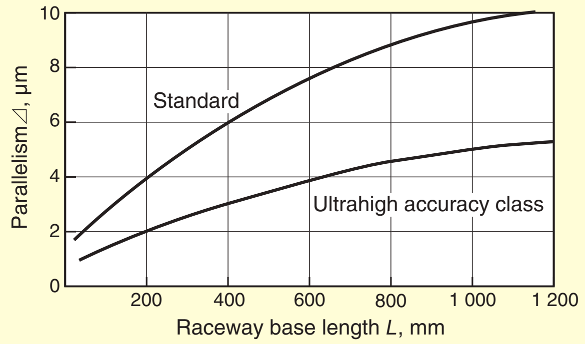
Material code

Stainless steel	: SL

Note) This bearing number represents four raceway bases and two sets cylindrical rollers with retainer.

Tolerance (before surface treatment)





Bearing Mounting

Fig. 5-8 shows a typical mounting construction of the Cross Roller Way Bearing Unit. Mounting procedures are described on the following page.

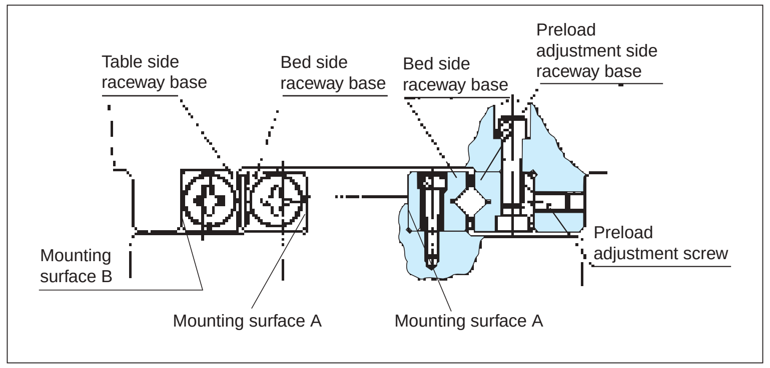


Fig. 5-8 Typical mounting of Cross Roller Way Bearing Unit

1) One package includes an entire set of the components of a cross roller way bearing unit (four raceway bases and two sets of cylindrical rollers with retainer). Take care not to mix the components of a set not compatible with those of another set. Treat cross roller way bearing units with extra care to keep them free from oil stains or contamination.

2) Remove burrs, indentations and other irregularities from the machine surface on which the cross roller way bearing unit is to be mounted. Also clean off dust, contamination and oil stains. Clean the recesses of the mounting surface as well.

3) Place the bed side raceway base and table side raceway base correctly on the each mounting surface, and fasten the bases temporarily by tightening the screws evenly.
While keeping the bed side raceway base in close contact with surface A and the table side raceway base with surface B, tighten the screws permanently to a specified torque (Fig. 5-9).
Table 5-1 shows the tightening torque for individual regular screw sizes.

Table 5-1 Screw tightening torque

Nominal screw size	Tightening torque N · m
M2×0.4	0.23
M3×0.5	1.4
M4×0.7	3.2
M5×0.8	6.3
M6×1	10.7

Remark) When screws of different sizes are used for on the table side and bed side, tighten them by applying the torque for the smaller screws.

4) Retract the preload adjustment screw in advance. Place the preload adjustment side raceway base into close contact with the mounting surface, and tighten the screws temporarily by applying light, even torque.

5) To assemble the table and bed, insert cylindrical rollers with retainer carefully into the space between the table side raceway base and bed side raceway base such that the rollers will be located at the center of the raceway base length. Take care not to deform the cage.
Fasten the end screws and end plates of the raceway bases, press the entire table toward the preload adjustment screw side, and tighten the screw for temporary adjustment until the clearance of the raceways is almost entirely eliminated.
Slowly move the table for one entire stroke and adjust the position of the cylindrical rollers with retainer to the center.

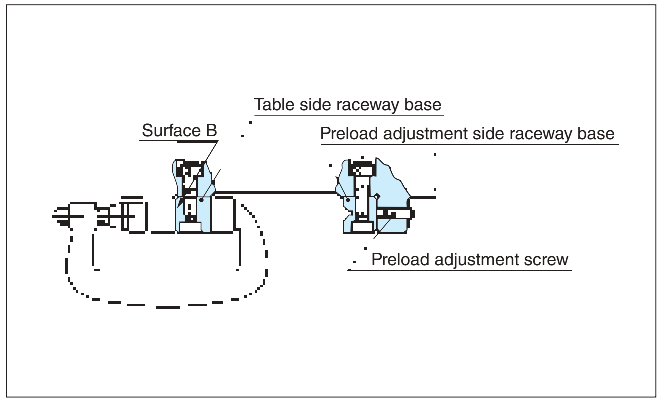


Fig. 5-9 Mounting of table side raceway base

6) Adjust the preload with the preload adjustment side raceway base fastened temporarily.
Firstly adjust the preload adjustment screw at the center of the raceway base length, and adjust the preload adjustment screws on the lengths to both ends alternately. Adjust the clearance on the side face of the table, and tighten the preload adjustment screws one by one until the dial gauge indication becomes stable (Fig. 5-10).
When the indication is stable, determine and record the tightening torque of the preload adjustment screws. To adjust the preload adjustment screws near both ends, stroke the table slowly to check that cylindrical rollers are located at the preload adjustment screw.
After these adjustments, the clearance will be entirely or almost eliminated. However, at this point the preload is not yet even. By repeating the same procedure, re-adjust all the preload adjustment screws by applying the torque recorded.

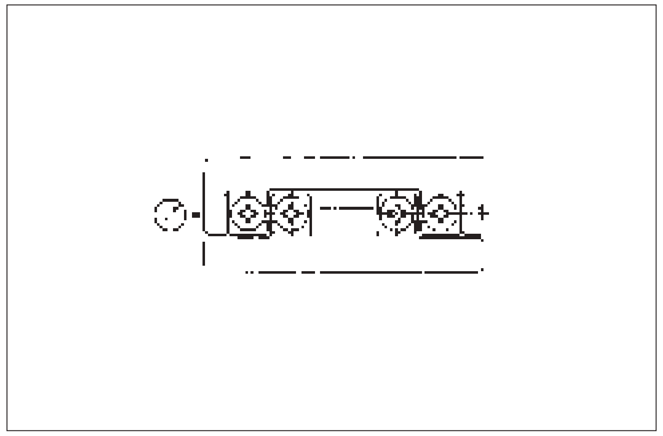


Fig. 5-10 Typical preload adjustment procedure

7) When permanently fastening the preload adjustment side raceway base, make sure the screws have already been lightly tightened to even torque.
In the same manner as the preload adjustment screws were tightened, firstly adjust the preload adjustment screw at the center of the raceway base length, and adjust the preload adjustment screws on the lengths to both ends alternately by applying torque close to the specified torque.
To tighten the fastening screws near the ends, stroke the table slowly to check that the cylindrical rollers are located at the tightened screw position.
In the end, tighten all screws evenly and permanently by applying specified torque. Move the table slowly through the entire stroke and check that it moves smoothly without producing noise.
Check the table upper surface and side faces with a dial gauge to check running accuracy.

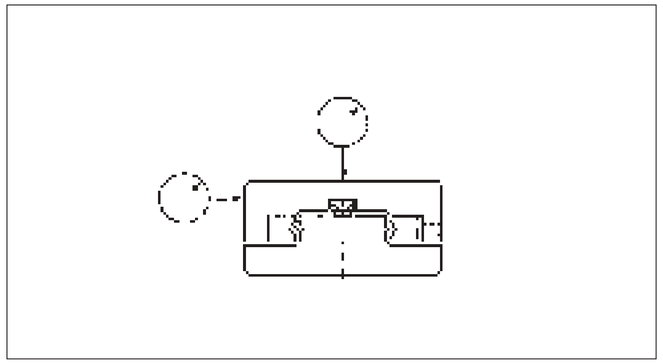
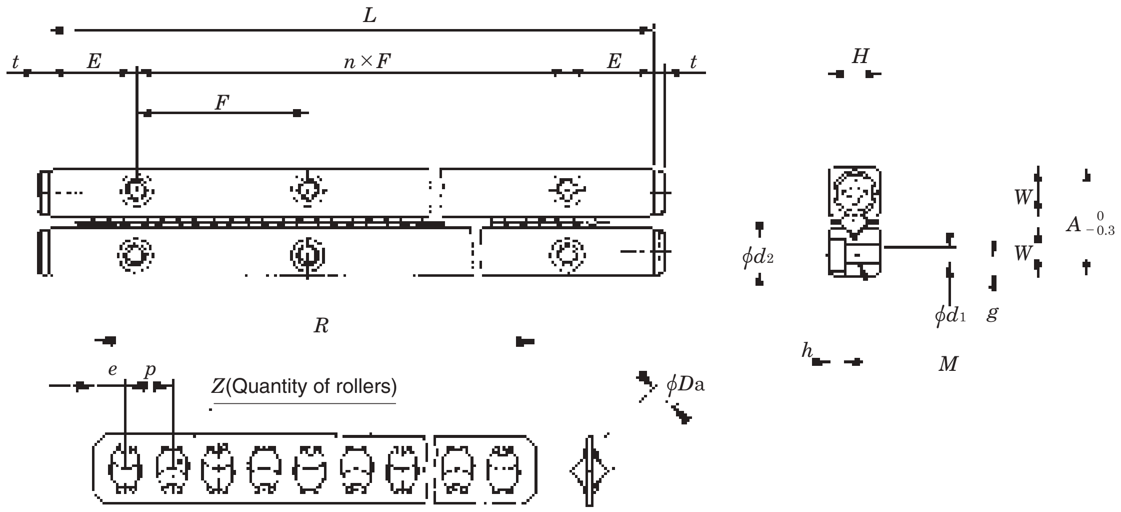


Fig. 5-11 Accuracy check after assembly

Dimensions Table

CRW series



Basic No.	Mass (refer.)		Boundary dimensions mm				Dimensions of cylindrical rollers with retainer mm					Mounting dimensions mm							Basic load rating		Allowable load
	Raceway base 1) kg / m	Cylindrical rollers with retainer 2) g	*A*	*H*	*L* (*n* × *F*)	*E*	D_a	*R*	*Z*	*p*	*e*	*W*	*g*	*M*	d_1	d_2	*h*	*t*	*Cu* 3) N	C_{0u} 3) N	*Fu* 3) N
CRW1 — 20	0.12	0.38	8.5	4	20 (1 × 10)	5	1.5	16.5	5	3	2.25	3.9	1.8	M2	1.65	3	1.4	1.7	131	119	39.4
— 30					30 (2 × 10)			25.5	8												
— 40					40 (3 × 10)			31.5	10												
— 50					50 (4 × 10)			37.5	12												
— 60					60 (5 × 10)			43.5	14												
— 70					70 (6 × 10)			52.5	17												
— 80					80 (7 × 10)			61.5	20												
CRW2 — 30	0.24	0.98	12	6	30 (1 × 15)	7.5	2	29.6	7	4	2.8	5.5	2.5	M3	2.55	4.4	2	1.5	305	292	97.3
— 45					45 (2 × 15)			41.6	10												
— 60					60 (3 × 15)			53.6	13												
— 75					75 (4 × 15)			65.6	16												
— 90					90 (5 × 15)			77.6	19												
— 105					105 (6 × 15)			89.6	22												
— 120					120 (7 × 15)			101.6	25												
— 135					135 (8 × 15)			113.6	28												
— 150					150 (9 × 15)			125.6	31												
— 165					165 (10 × 15)			137.6	34												
— 180					180 (11 × 15)			149.6	37												
CRW3 — 50	0.50	2.96	18	8	50 (1 × 25)	12.5	3	42	8	5	3.5	8.3	3.5	M4	3.3	6	3.1	2	664	606	202
— 75					75 (2 × 25)			62	12												
— 100					100 (3 × 25)			82	16												
— 125					125 (4 × 25)			102	20												
— 150					150 (5 × 25)			122	24												
— 175					175 (6 × 25)			142	28												
— 200					200 (7 × 25)			162	32												
— 225					225 (8 × 25)			182	36												
— 250					250 (9 × 25)			202	40												
— 275					275 (10 × 25)			222	44												
— 300					300 (11 × 25)			242	48												

Notes 1) Mass per meter of raceway base length
2) Mass of an assembly of a cage and ten cylindrical rollers
3) Load per cylindrical roller
[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

Basic No.	Mass (refer.)		Boundary dimensions mm				Dimensions of cylindrical rollers with retainer mm					Mounting dimensions mm							Basic load rating		Allowable load
	Raceway base 1) kg / m	Cylindrical rollers with retainer 2) g	*A*	*H*	*L* (*n* × *F*)	*E*	D_a	*R*	*Z*	*p*	*e*	*W*	*g*	*M*	d_1	d_2	*h*	*t*	*Cu* 3) N	C_{0u} 3) N	*Fu* 3) N
CRW4 — 80	0.82	6.91	22	11	80 (1 × 40)	20	4	73	10	7	5	10	4.5	M5	4.3	7.5	4.1	2	1 290	1 170	389
— 120					120 (2 × 40)			101	14												
— 160					160 (3 × 40)			136	19												
— 200					200 (4 × 40)			164	23												
— 240					240 (5 × 40)			199	28												
— 280					280 (6 × 40)			227	32												
— 320					320 (7 × 40)			262	37												
— 360					360 (8 × 40)			297	42												
— 400					400 (9 × 40)			325	46												
— 440					440 (10 × 40)			360	51												
— 480					480 (11 × 40)			388	55												
CRW6 — 100	1.57	20.3	31	15	100 (1 × 50)	25	6	84	9	9	6	14	6	M6	5.3	9.5	5.2	3	2 680	2 290	764
— 150					150 (2 × 50)			129	14												
— 200					200 (3 × 50)			165	18												
— 250					250 (4 × 50)			210	23												
— 300					300 (5 × 50)			246	27												
— 350					350 (6 × 50)			282	31												
— 400					400 (7 × 50)			327	36												
— 450					450 (8 × 50)			363	40												
— 500					500 (9 × 50)			408	45												
— 550					550 (10 × 50)			444	49												
— 600					600 (11 × 50)			489	54												

Notes 1) Mass per meter of raceway base length
2) Mass of an assembly of a cage and ten cylindrical rollers
3) Load per cylindrical roller
[Remark] Please note that you may be asked to provide information on applications and usage conditions when requesting an estimate.

6 High Ability Angular Contact Ball Bearings

The High Ability Angular Contact Ball Bearings are optimized for the spindle of machine tools. They have superior high speed performance and rapid acceleration/deceleration, and are especially excellent at ultrahigh speeds under oil/air lubrication. They are superior in high speed performance to conventional products under grease lubrication as well.

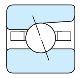
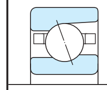
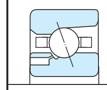
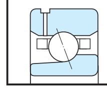
For practical use of this type of bearings, refer to JTEKT Catalogue "Precision Ball and Roller Bearings for Machine Tools" for High Ability Angular Contact Ball Bearings.

Types and Applications

The High Ability Angular Contact Ball Bearings are classified as shown in Table 6-1, according to bearing construction and rolling element material.

Select the optimal type best suited for your application needs.

Table 6-1 Classification of High Ability Angular Contact Ball Bearings

Type	Specifications			Application
	Bearing dimension series No.	Contact angle	Rolling element material	
Type R 	10 19	15° 20° 30°	Steel or ceramic	High speed, high rigidity type
Type C 	10 19	15° 20°	Ceramic	High speed, high load rating type
Type D 	10	20°	Ceramic	Ultrahigh speed, low noise type For oil/air lubrication
Type X 	10 19	20°	Ceramic	Ultrahigh speed type For oil/air lubrication

Features

- **20 to 30% reduction in temperature increase**

(compared with JTEKT's conventional products)

JTEKT has conducted various tests and analyses and developed elaborate machining techniques to improve the performance of bearings used with machining tool spindles. The result is a substantial reduction in frictional heat generated in bearings rotating at a high speed.

- **1.2- to 1.5- fold increases in speed limits**

(compared with JTEKT's conventional products)

Speed limits have been extended through re-designing for high-speed rotation and heat reduction. Use of ceramic balls as rolling elements enables additional high-speed rotation.

- **Improved high speed performance achieved by position preloading**

Low increases in temperature during operation ensure reduced changes in preload. Preload can be given by position preloading even at high speeds, which has been hitherto unavailable with conventional systems. The result is high-precision machining with stability.

- **Conventional bearings easily replaced**

Dimensions of High Ability bearings conform to ISO standards. Replacement of conventional bearings with High Ability bearings requires minimal geometry changes of the present spindle or housing.

Bearing Numbering System

3NC HA C 0 13 CA -5 DB CS5

Clearance code
CY: Preload (negative clearance)
CS: Clearance
5 : Clearance mean dimension in the unit of μm (5 μm)

Code of combination type

Typical codes

Cage guiding code
–5 : Ball guide type
No code : Outer ring guide type

Code of contact angle
C : 15°
CA : 20°
No code : 30°

Bore dia. number 13 : 5 mm × 13 = 65 mm (bearing bore diameter)

Dimension series code
9 : Dimension series19
0 : Dimension series10

Type Codes R, C, D, or F: Please refer to the above table.

High Ability Angular Contact Ball Bearing Series

Hybrid Ceramic Bearing

Performance

High Ability Bearings demonstrate their utmost performance when two or more units are used together and a preload is provided by the position preloading method. The following are the performance of these bearings preloaded by the position preloading method.

- **High speed performance of Type R and Type C High Ability Bearings**

Fig. 6-1 shows the relationship between rotational speed and bearing temperature rises of High Ability Bearings, in comparison with conventional high precision bearings.

In either grease lubrication or oil/air lubrication, the High Ability Bearings are superior to conventional bearings, with lower temperature rise and higher rotational speed limit.

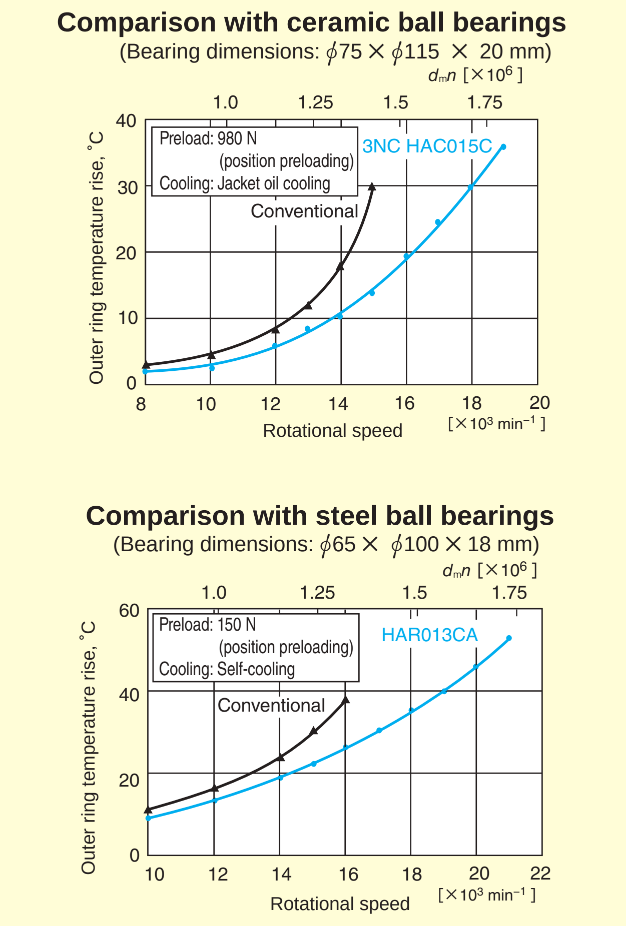


Fig. 6-1 Comparison in bearing temperature rises under oil air lubrication

By using High Ability Bearings, it is possible to switch the spindle, which had been running with oil/air lubrication up until now, to grease lubrication.

Fig. 6-2 shows evaluation examples of this.

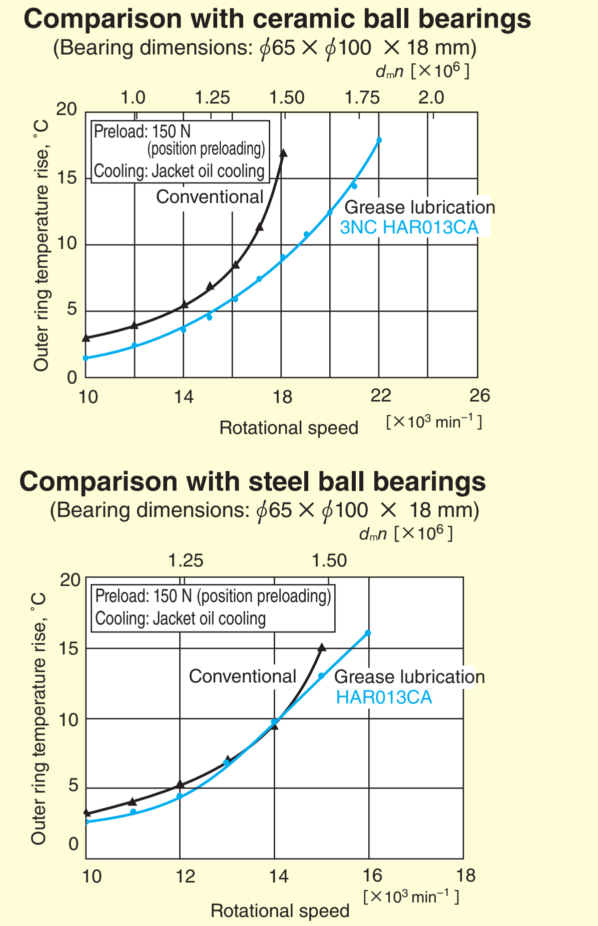


Fig. 6-2 Comparison in high speed performance under grease lubrication

The Type R using ceramic balls, in grease lubrication, improves on high-speed performance over conventional bearings with oil/air lubrication.

The high-speed performance of the Type R using steel balls, in grease lubrication, is the same as or better than that of conventional bearings with oil/air lubrication.

Fig. 6-3 shows the result of the comparison between ceramic balls and bearing steel balls.

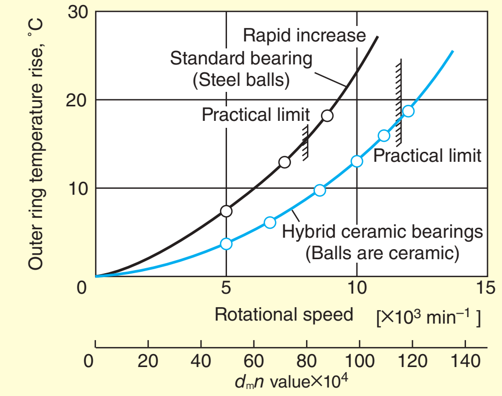


Fig. 6-3 Comparison of temperature rise characteristics between hybrid ceramic bearings and standard bearings

7 Ceramic Balls

JTEKT also supplies Ceramic Balls (silicon nitride), which have excellent resistance to wear and seizure, and are usable in corrosive environments and ultrahigh vacuums. Other major features of these balls are excellent heat resistance (up to 800˚C), high rigidity, lightweight (40% compared to bearing steel), non-magnetic, and have insulating characteristics.

The Ceramic Balls are useful in many applications such as jigs, tools, gauges, solenoid valves, check valves, other valve varieties, high grade bicycle parts, automotive parts, and machine components.

Table of Dimensions and Masses

Nominal dimension mm	Nominal dimension inch	Nominal outside diameter mm	Precision grade [1]	Mass [2] (per piece)
0.8		0.800 00	3 and 5	0.866 mg
1.0		1.000 00		1.691 mg
1.2		1.200 00		2.922 mg
	1/16	1.587 50		6.766 mg
2.0		2.000 00		13.530 mg
	3/32	2.381 25		22.836 mg
	7/64	2.778 12		36.262 mg
	1/8	3.175 00		54.129 mg
3.5		3.500 00		72.511 mg
	5/32	3.968 75		0.105 7 g
	3/16	4.762 50		0.182 7 g
	7/32	5.556 25		0.290 1 g
	15/64	5.953 12		0.356 8 g
	1/4	6.350 00		0.433 0 g
	17/64	6.746 88	5	0.519 4 g
	9/32	7.143 75		0.616 6 g
	5/16	7.937 50		0.845 8 g
	11/32	8.731 25		1.125 7 g
	3/8	9.525 00		1.461 5 g
	13/32	10.318 75		1.858 2 g
	7/16	11.112 75	5 and 10	2.320 8 g
	15/32	11.906 25		2.854 5 g
	1/2	12.700 00		3.46 g
	17/32	13.493 75		4.2 g
	9/16	14.287 50	40	4.9 g
	19/32	15.081 25		5.8 g
	5/8	15.875 00		6.8 g
	3/4	19.050 00		11.7 g
	13/16	20.637 50		14.9 g
	7/8	22.225 00		18.6 g
	15/16	23.812 50		22.8 g
	1	25.400 00		27.7 g
	1 1/8	28.575 00		39.5 g
	1 3/16	30.162 50		46.4 g
	1 1/4	31.750 00	60	54.1 g
	1 5/16	33.337 50		62.7 g
	1 1/2	38.100 00		93.5 g

For other outside diameters, please consult JTEKT.

Notes 1) For the grades, those specified in JIS B 1501 shall apply.
2) The masses are calculated on the basis of 3.23 g/cm³ in density.

Numbering System

5/32 G5 NCR

- **Material code: silicon nitride ceramic** (NCR)
- **Precision grade code** (G5)
- **Nominal dimension** (5/32)

8 EXSEV®-EX (Grease)

This fluorinated grease is designed for vacuum environments with low particle generation. It is also compliant with environmental regulations (does not contain PFOA).

EXSEV®-EX offers superior performance for rolling bearings, linear motion bearings, and ball screws. JTEKT also handles requests for grease only. Contact us for more information.

	Grease No.
75 g tube	SVEX0.075KG //P0/98
750 g cartridge	SVEX0.75KG //P0/98
1 kg can	SVEX1KG //P0/98

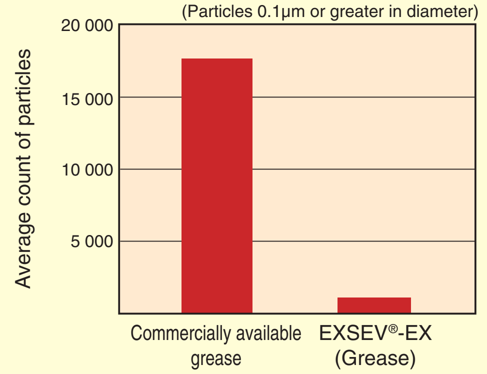
Properties

Thickener	PTFE
Base oil	PFPE
Dropping point	None
Evaporation (99˚C×24h)	0.1wt%max.
Oil separation (100˚C×24h)	2wt%max.
Operating temperature range	–50 to 260˚C

- The grease can be used under atmospheric pressures of up to 10^{-7} Pa at 20°C, but consult JTEKT for use in high-temperature, high-vacuum combinations.

Performance

Particle emission characteristics when used as ball and roller bearing lubrication
(Particles per 2.83 × 10^{-3} m³ (0.1 ft³))



9 Grease-filled Bearings for Food Machinery

These are bearings that are filled with grease for food machinery.

They can be used in hygienic environments such as food machinery or cosmetic/pharmaceutical production machinery.

Grease Properties

	Standard	Long service life
Operating temperature range	-30 to 120°C	-40 to 150°C
Thickener	Aluminum complex soap	Silicate
Base oil	Synthetic oil	Synthetic oil
Kinematic viscosity (mm²/s, at 40°C)	150	65
Worked penetration	275	280
NSF category*	H1	H1

* NSF category:
This is a standard certified by NSF International (National Sanitation Foundation International).
"H1" indicates a lubricant that can be used in locations that may accidentally come into contact with food.

Bearing Specifications

Type	Inner and outer rings, balls	Packing specifications
A	Martensitic stainless steel	Anticorrosive oil applied + standard packing
B	Martensitic stainless steel	Degreasing + clean packing
C	High carbon chromium bearing steel	Anticorrosive oil applied + standard packing

Bearing Numbering System

In addition to the same bearing number of the general bearing having the same size, specify that the bearing is filled with grease (standard or long service life grease) for food machinery. The basic bearing specifications are type A, but types B and C can also be supported according to customer request.

10 Tolerance and Internal Clearance of EXSEV Bearings and Ceramic Bearings

10-1 Tolerance of Radial Ball Bearings

Table 10-1(1) Inner ring (bore diameter)

Unit: μm

Nominal bore diameter d mm		Single plane mean bore diameter deviation Δ_{dmp}						Single radial plane bore diameter variation V_{dsp}									Mean bore diameter variation V_{dmp}		
								Diameter series 7, 8, 9			Diameter series 0, 1			Diameter series 2, 3, 4					
		class 0		class 6		class 5		class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 5
over	up to	upper	lower	upper	lower	upper	lower	max.			max.			max.			max.		
0.6[1)]	2.5	0	−8	0	−7	0	−5	10	9	5	8	7	4	6	5	4	6	5	3
2.5	10	0	−8	0	−7	0	−5	10	9	5	8	7	4	6	5	4	6	5	3
10	18	0	−8	0	−7	0	−5	10	9	5	8	7	4	6	5	4	6	5	3
18	30	0	−10	0	−8	0	−6	13	10	6	10	8	5	8	6	5	8	6	3
30	50	0	−12	0	−10	0	−8	15	13	8	12	10	6	9	8	6	9	8	4

Note 1) Dimension 0.6 mm is included in this category.

Table 10-1(2) Inner ring (running tolerance and width)

Unit: μm

Nominal bore diameter d mm		Radial runout of assembled bearing inner ring K_{ia}			S_d	S_{ia}[2)]	Single inner ring width deviation Δ_{Bs}						Single inner ring width deviation Δ_{Bs}[3)]						Inner ring width variation V_{Bs}		
		class 0	class 6	class 5	class 5	class 5	class 0		class 6		class 5		class 0		class 6		class 5		class 0	class 6	class 5
over	up to	max.			max.	max.	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	max.		
0.6[1)]	2.5	10	5	4	7	7	0	−40	0	−40	—	−40	—	—	—	—	0	−250	12	12	5
2.5	10	10	6	4	7	7	0	−120	0	−120	0	−40	0	−250	0	−250	0	−250	15	15	5
10	18	10	7	4	7	7	0	−120	0	−120	0	−80	0	−250	0	−250	0	−250	20	20	5
18	30	13	8	4	8	8	0	−120	0	−120	0	−120	0	−250	0	−250	0	−250	20	20	5
30	50	15	10	5	8	8	0	−120	0	−120	0	−120	0	−250	0	−250	0	−250	20	20	5

S_d: perpendicularity of inner ring face with respect to the bore S_{ia}: axial runout of assembled bearing inner ring

Notes 1) Dimension 0.6 mm is included in this category.
2) Applicable to deep groove ball bearings and angular contact ball bearings.
3) Applicable to bearing rings made for matched bearings.

Table 10-2(1) Outer ring (outside diameter)

Unit: μm

Nominal outside diameterr D mm		Single plane mean outside diameter deviation Δ_{Dmp}						Single plane outside diameter variation V_{Dsp}											Mean outside diameter variation V_{Dmp}		
																	Shielded/sealed type				
								Diameter series 7, 8, 9			Diameter series 0, 1			Diameter series 2, 3, 4			Diameter series 2, 3, 4	Diameter series 0, 1, 2, 3, 4			
		class 0		class 6		class 5		class 0[2)]	class 6[2)]	class 5	class 0[2)]	class 6[2)]	class 5	class 0[2)]	class 6[2)]	class 5	class 0[2)]	class 6[2)]	class 0[2)]	class 6[2)]	class 5
over	up to	upper	lower	upper	lower	upper	lower	max.			max.			max.			max.		max.		
2.5[1)]	6	0	−8	0	−7	0	−5	10	9	5	8	7	4	6	5	4	10	9	6	5	3
6	18	0	−8	0	−7	0	−5	10	9	5	8	7	4	6	5	4	10	9	6	5	3
18	30	0	−9	0	−8	0	−6	12	10	6	9	8	5	7	6	5	12	10	7	6	3
30	50	0	−11	0	−9	0	−7	14	11	7	11	9	5	8	7	5	16	13	8	7	4
50	80	0	−13	0	−11	0	−9	16	14	9	13	11	7	10	8	7	20	16	10	8	5

Notes 1) Dimension 2.5 mm is included in this category.
2) Applicable when no snap ring is fitted.

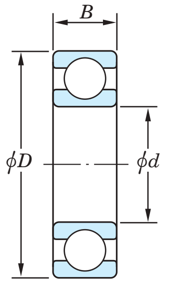
Table 10-2(2) Outer ring (running tolerance and width)

Unit: μm

Nominal outside diameter D mm		Radial runout of assembled bearing outer ring K_{ea}			S_D	S_{ea}[2)]	Deviation of a single outer ring widht Δ_{Cs}		Ring width variation V_{Cs}	
		class 0	class 6	class 5	class 5	class 5	classes 0, 6 & 5		classes 0 & 6	class 5
over	up to	max.			max.	max.	upper	lower	max.	
2.5[1)]	6	15	8	5	8	8	Same as the tolerance of Δ_{Bs} for d of the same bearing		Same as the allowable value of V_{Bs} for d of the same bearing	5
6	18	15	8	5	8	8				5
18	30	15	9	6	8	8				5
30	50	20	10	7	8	8				5
50	80	25	13	8	8	10				6

S_D: perpendicularity of outer ring outside surface with respect to the face S_{ea}: axaial runout of assembled bearing outer ring

Notes 1) Dimension 2.5 mm is included in this category.
2) Applicable to deep groove ball bearings and angular contact ball bearings.



d : Nominal bore diameter
D : Nominal outside diameter
B : Nominal assembled bearing width

10-2 Clearance of Radial Ball Bearings

Table 10-3 Radial internal clearance of deep groove ball bearings (cylindrical bore)

Unit: μm

Nominal bore diameter d, mm		Radial internal clearance							
		CN		C3		C4		C5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.
2.5	6	2	13	8	23	14	29	20	37
6	10	2	13	8	23	14	29	20	37
10	18	3	18	11	25	18	33	25	45
18	24	5	20	13	28	20	36	28	48
24	30	5	20	13	28	23	41	30	53
30	40	6	20	15	33	28	46	40	64
40	50	6	23	18	36	30	51	45	73

Remark) When the above values are used as clearance measurements, the values should be corrected by adding the increase of the radial internal clearances caused by the measuring load. The values to be added are shown below.

Unit: μm

Nominal bore diameter d, mm		Measuring load N	Amounts of clearance correction			
over	up to		CN	C3	C4	C5
2.5	18	24.5	4	4	4	4
18	50	49	5	6	6	6

Table 10-4 Radial internal clearance of extra small/miniature ball bearings

Unit: μm

Clearance code	M3		M4		M5		M6	
	min.	max.	min.	max.	min.	max.	min.	max.
Clearance	5	10	8	13	13	20	20	28

Remark) When the above values are used as clearance measurements, the values should be corrected by adding the increase of the radial internal clearances caused by the measuring load.

Unit: μm

measuring load N	Amounts of clearance correction			
	M3	M4	M5	M6
2.3	1	1	1	1

Remark) Miniature ball bearings: bearing with an outside diameter of less than 9 mm
Small size ball bearings: bearings with an outside diameter of 9 mm or over and a bore diameter of less than 10 mm

Remark) Consult JTEKT regarding the tolerance and internal clearance of inch series bearings (bearing basic number EE3S).

10-3 Tolerance and Internal Clearance of K Series Full Complement Hybrid Ceramic Ball Bearings

Table 10-5 Tolerance and internal clearance of K Series Full Complement Hybrid Ceramic Ball Bearings

Unit: μm

Bore diameter No.	Single plane mean bore diameter deviation Δ_{dmp}		Single plane mean outside diameter deviation Δ_{Dmp}		Single inner or outer ring width deviation Δ_{Bs}, Δ_{Cs}	Radial runout of assembled bearing, max.				S_{ia}, S_{ea}		Radial internal clearance		Bore diameter No.
						Inner ring, K_{ia}		Outer ring, K_{ea}		Inner ring	Outer ring			
	class K0		class K0		class K0	class K0		class K0		class K0	class K0	class K0		
	category Ⅰ	category Ⅱ	category Ⅰ	category Ⅱ		category Ⅰ	category Ⅱ	category Ⅰ	category Ⅱ			Deep groove type	Four point contact type	
010	0 −10		0 −13		0 −127	13	8	20	10	Same as the tolerance for the radial runout of the inner ring	Same as the tolerance for the radial runout of the outer ring	25 to 41	25 to 38	010
015	0 −13					15	10					30 to 46	30 to 43	015
020	0 −15					20	13	25	13			30 to 61	30 to 56	020
025														025
030			0 −15				15		15					030
035	0 −20					25		30				41 to 71	41 to 66	035

S_{ia}, S_{ea}: axial runout of assembled bearing inner or outer ring, max.

[Notes] Category Ⅰ specifications are applied to deep groove ball bearings.
Category Ⅱ specifications are applied to angular contact bearings and four point contact ball bearings.

3 Application Examples

1 Clean Environments

1-1 Transfer Robot

Product: K Series Full Complement Hybrid Ceramic Ball Bearing

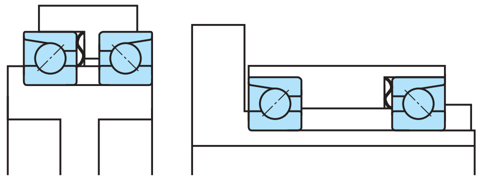
For application in transfer robots for semiconductor and liquid crystal manufacturing equipment, bearings are required to be low in particle emissions and have a long service life.

Bearings may be delivered incorporated in arm units for improved assemblability and maintainability.

- Applicable to vacuum environments and clean environments
- Optimal for machine size reduction

Use conditions

Temperature: Room temp. to 200˚C
Ambient pressure: 10^{-3} Pa
Lubrication: Grease or
New Clean Pro Bearing-PR coating



Bearing unit for application to transfer robots

1-2 Conveyor for Sputtering Equipment

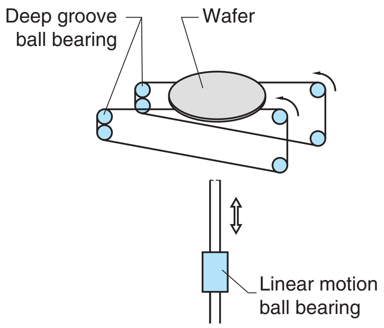
Product: New Clean Pro Bearing-PR (Linear Motion Ball Bearings)

New Clean Pro Bearing-PR Linear Motion Ball Bearings are widely used for the conveyers in sputtering equipment.

- Applicable to vacuum environments and clean environments

Use conditions

Stroke: 20 mm
Speed: 10 mm/s
Temperature: 200˚C
Ambient pressure: Atomospheric air to 10^{-5} Pa
Lubrication: New Clean Pro Bearing-PR coating



1-3 Gates in Chemical Vapor Deposition Equipment

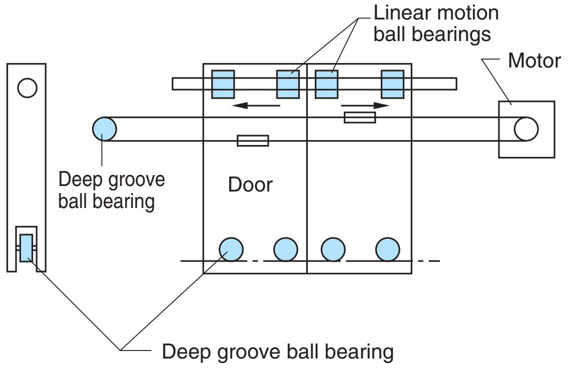
Product: Hybrid Ceramic Ball Bearing New Clean Pro Bearing-PR (Linear Motion Ball Bearings)

Hybrid Ceramic Bearings and New Clean Pro Bearing-PR Linear Motion Ball Bearings are widely used for the doors of the chemical vapor deposition (CVD) equipment.

- Applicable to high temperature, vacuum and clean environments

Use conditions

Rotational speed: 10 to 200 min^{-1}
Temperature: 200˚C
Ambient pressure: Atomospheric air to 10^{-4} Pa
Lubrication: New Clean Pro Bearing-PR coating



1-4 Chemical Vapor Deposition Machine

Product: New Clean Pro Bearing-PR (Cross Roller Way Bearing Unit)

New Clean Pro Bearing-PR Cross Roller Way Bearings are widely used in CVD machines due to their low gas and particle emissions.

- Applicable to vacuum environments and clean environments

Use conditions

Stroke: 100 mm
Temperature: 200˚C
Ambient pressure: Atomospheric air to 10^{-3} Pa
Lubrication: New Clean Pro Bearing-PR coating

1-5 Etching Equipment

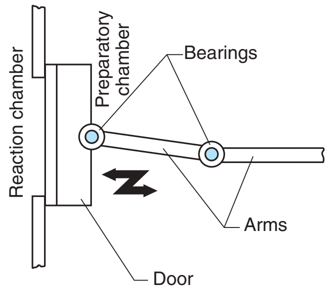
Product: Hybrid Ceramic Bearing (with special features)

Bearings used in etching machines must be resistant to halogen, hydrogen fluoride, and other corrosive gasses, as well as low in particle emissions. To meet these requirements, PTFE coated Hybrid Ceramic Bearings are used.

- Resistant to corrosive ambient gases such as halogen and hydrogen fluoride
- Suitable for clean environments thanks to low particle emissions

Use conditions

Temperature: Room temp. to 60˚C
Ambient pressure: Atomospheric air to 10^{-2} Pa
Load: Radial load of 10 N
Lubrication: PTFE coating



1-6 Sputtering Equipment

Product: Clean Pro Bearing-RB

Sputtering systems have a high temperature vacuum conveyor, in which Clean Pro Bearing-RB are used.

- Applicable to a clean environment under high temperature and vacuum conditions

Use conditions

Rotational speed: 60 min^{-1}
Temperature: Room temp. to 260˚C
Ambient pressure: 10^{-5} Pa
Load: Radial load of 100 to 150 N
Lubrication: Clean Pro Bearing-RB coating

1 Clean Environments

1-7 Liquid Crystal Panel Bonding and LC Sealing Furnace

Product: Hybrid Ceramic Linear Motion Ball Bearing

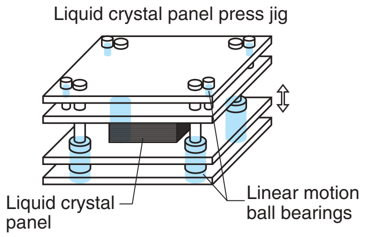
Substrate bonding press jigs for use in furnaces must be low in particle emissions and have a long service life under high temperature conditions.

The New Clean Pro Bearing-PR Hybrid Ceramic Linear Motion Ball Bearings are widely used for such jigs.

- **Suitable for clean environments thanks to low particle emissions**

Use conditions

Stroke speed: 5 mm/s
Temperature: 200˚C
Ambient pressure: Atomospheric air
Lubrication: New Clean Pro Bearing-PR coating



1-8 Wafer Transfer Equipment

Product: Hybrid Ceramic Linear Way Bearing Unit (with special features)

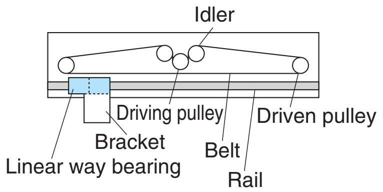
For application in wafer transfer equipment, low particle emissions performance is required.

The New Clean Pro Bearing-PR Hybrid Ceramic Linear Way Bearing Unit are widely used for such jigs.

- **Suitable for clean environments thanks to low particle emissions**
- **Corrosion resistant to cleaning agent splashes**

Use conditions

Stroke speed: 350 mm/s
Temperature: Room temp.
Ambient pressure: Atomospheric air
Lubrication: New Clean Pro Bearing-PR coating



2 Vacuum Environments

2-1 Vacuum Evaporator

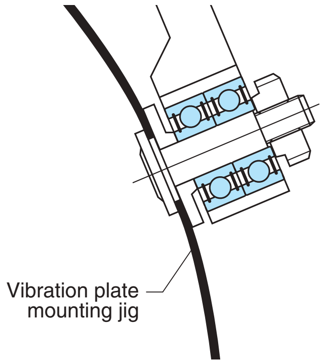
Product: High Temperature Hybrid Ceramic Bearing (with special features)

Bearings used in the planetary section of vacuum evaporator are required to be high in durability under high temperatures, high load (moment) conditions. To ensure a long bearing life under high temperature conditions, High temperature Hybrid Ceramic Bearings with special features are used.

- **Improved reliability in vacuum and high temperature environments**

Use conditions

Rotational speed: 1 to 30 min^{-1}
Temperature: 200 to 400˚C
Ambient pressure: 10^{-6} to 10^{-8} Pa
Lubrication: Molybdenum disulfide or silver



2-2 Turbo Molecular Pump

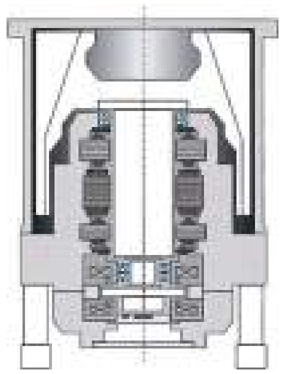
Product: Full Complement Hybrid Ceramic Ball Bearing (with special features)

Magnetic bearings are used in turbo molecular pumps driven at extremely high speeds. To protect the blades from fracture in case of a power failure or magnetic failure, touchdown bearing units are used. As touchdown bearings, Full Complement Hybrid Ceramic Ball Bearings are used to increase the service life of the touchdown bearings under severe hostile conditions.

- **Improved reliability in vacuum environments**

Use conditions

Rotational speed: 20 000 to 60 000 min^{-1}
Ambient pressure: 10^{-7} Pa
Lubrication: Molybdenum disulfide or silver



2-3 X-ray Tube

Product: Full Complement Ball Bearing Unit

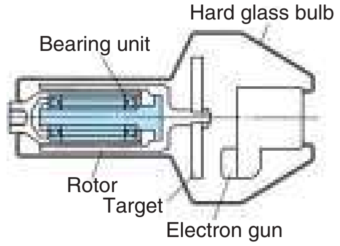
For rotational anode X-ray tubes, Full Complement Ball Bearing Units, which integrate the flange and shaft.

These bearing units are required to be resistant to vacuum, good high speed performance, heat resistant, and load capacity.

- **Improved reliability in vacuum and high temperature environments**

Use conditions

Rotational speed: 3 000 to 10 000 min^{-1}
Temperature: 250 to 500˚C
Ambient pressure: 10^{-6} Pa
Lubrication: Silver



3 Corrosive Environments

3-1 Synthetic Fiber Manufacturing Equipment

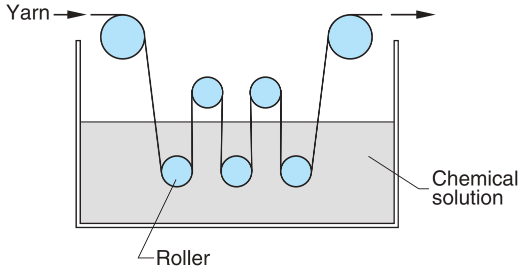
Product: Corrosion Guard Pro Bearing-MD

Acid solution, alkaline solution, water, and other liquids are used in synthetic fiber yarn reinforcing processes. In such corrosive environments, Corrosion Guard Pro Bearing-MD Bearings are widely used for their superior corrosion resistance.

- **Corrosion resistance under acid solution, alkaline solution and water**

Use conditions

Rotational speed: 20 to 100 min^{-1}
Temperature: Room temp. to 90˚C
Lubrication: Chemical solution



3-2 Blood product centrifuge

Product: Hybrid Ceramic Bearing (with special coating)

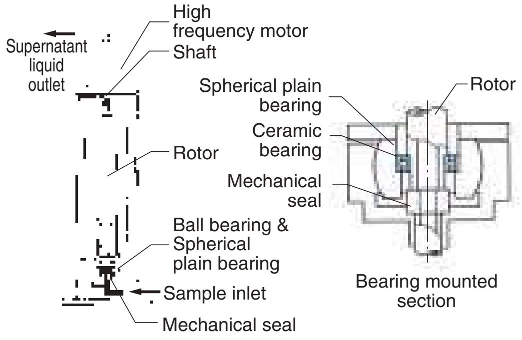
Corrosion resistance is required of bearings to be used in blood product centrifuge especially to physiological saline.

Hybrid Ceramic Bearings with bearing rings coated with a corrosion resistant film are suitable for such corrosive environments.

- **Corrosion resistance to physiological saline**

Use conditions

Rotational speed: 20 000 min^{-1}
Temperature: –10 to 10˚C
Lubrication: Grease



3-3 Aluminum Electrolytic Capacitor Manufacturing Equipment

Product: Corrosion Guard Pro Bearing-SC

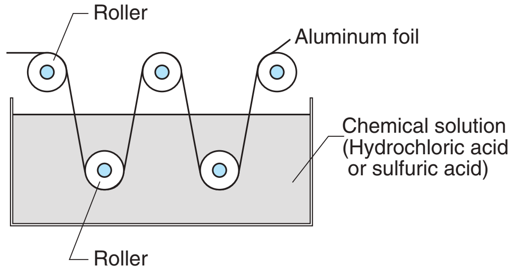
In an aluminum foil electrolytic capacitor manufacturing equipment, a strong acid solution is used to treat the aluminum foils.

In such highly corrosive environments, Corrosion Guard Pro Bearing-SC Bearings are widely used.

- **Corrosion resistance to strong acid solution**

Use conditions

Rotational speed: 50 min^{-1}
Temperature: 90˚C
Lubrication: Chemical solution
(hydrochloric acid and sulfuric acid)



3-4 High-performance Film Manufacturing

**Product: Corrosion Guard Pro Bearing-ZO
Corrosion Guard Pro Bearing-MD**

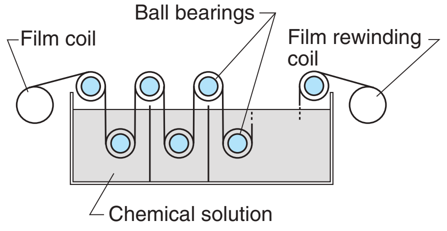
A variety of solutions—such as acid solutions, alkaline solutions, dyeing solutions, and distilled water—are used in the manufacturing lines of high-performance film.

In such corrosive environments, Corrosion Guard Pro Bearing-ZO and Corrosion Guard Pro Bearing-MD Bearings are widely used.

- **Corrosion resistance to solutions such as acid solution, alkaline solution, dyeing solution, and distilled water**

Use conditions

Rotational speed: 10 to 100 min^{-1}
Temperature: Room temp. to 80˚C
Lubrication: Chemical solution



3-5 Spin-dryer for Wafer Cleaning Equipment

Product: Corrosion Guard Pro Bearing-MD

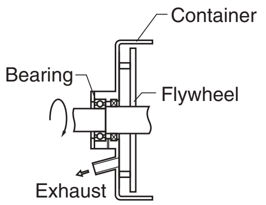
In semiconductor wafer cleaning processes, wafers are cleaned in cleansing chemicals, rinsing liquids, distilled water, and other liquids before drying.

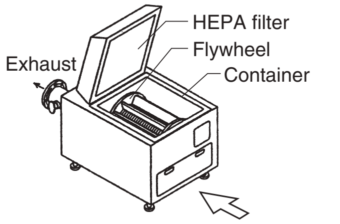
In such cleaning equipment, Corrosion Guard Pro Bearing-MD Bearings are widely used for their superior corrosion resistance.

- **Corrosion resistance to solutions such as cleaning chemicals, rinsing liquids, and distilled water**

Use conditions

Rotational speed: 2 000 to 3 000 min^{-1}
Temperature: Room temp.
Lubrication: Grease





3 Corrosive Environments

3-6 Chemical Mechanical Polishing System

Product: Corrosion Guard Pro Bearing-SC

In the semiconductor multilayer production process, each wafer surface should be treated to maintain evenness. This process uses chemical mechanical polishing equipment, and the cleaner attached to the equipment uses Corrosion Guard Pro Bearing-SC Bearings.

- **Corrosion resistance to corrosive solutions**

Use conditions

Rotational speed: 100 min^{-1}
Temperature: Room temp.
Lubrication: Cleaning agent

3-7 Outer Space Experimentation Equipment

Product: Ceramic Bearings

Utilized in experimental equipment on a space shuttle.

Stainless-steel bearings using fresh water as the lubricant experience abrasion and do not reach the required service life.

Using general ceramic bearings enables the required service life to be attained.

- **Long Service Life under Freshwater Lubricating Conditions**

Use conditions

Rotational speed: 10 000 min^{-1}
Temperature: 30˚C
Load: Radial 5 N, Axial 9 N
Lubrication: Fresh water

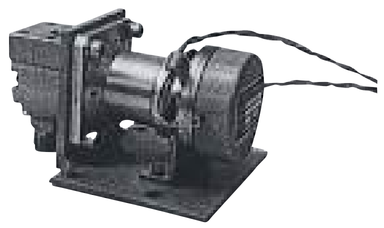


Photo: From the presentation materials for the 8th lecture on space stations

4 High Temperature Environments

4-1 Heating furnace

Product: High Temperature Hybrid Ceramic Bearing

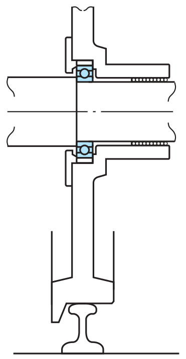
The bogies, conveyers and other carrier systems used in heating furnaces are exposed to high temperatures.

Because of their high heat resistance, High Temperature Hybrid Ceramic Bearings are used in such applications.

- **Applicable to high temperature environments**

Use conditions

Rotational speed: 10 to 500 min^{-1}
Temperature: 500˚C
Lubrication: Graphite



4-2 Carton Manufacturing Equipment

Product: EXSEV®-PN

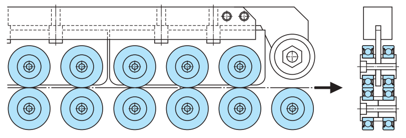
In carton manufacturing equipment, polyethylene film, which is attached to carton board in advance, is heat bonded by a gas burner in the high temperature gas burner bonding process.

The EXSEV®-PN which have superior heat resistance, are used to support the guide rollers of the belt that carries carton board in this process, thus avoiding contaminating the carton board with grease.

- **Prevention of grease scattering**
- **Improved durability and reliability under high temperatures**

Use conditions

Rotational speed: 3 000 to 4 000 min^{-1}
Temperature: 220˚C
Lubrication: Molybdenum disulfide and other means



4-3 Baking Furnace

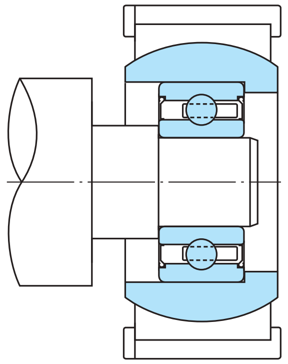
Product: High Temperature Hybrid Ceramic Bearing

In the kiln that bakes fluorine resin onto the heat rollers of copying machines, conveyor bearings must be low in particle emissions under high temperatures. Because it is structurally difficult to mount bearings accurately, High temperature Hybrid Ceramic Bearings are used for this application, along with aligning rings.

- **Compatible with high temperature environments**

Use conditions

Rotational speed: 3 to 10 min^{-1}
Temperature: 400 to 500˚C
Lubrication: Graphite



4 High Temperature Environments

4-4 Tube Annealing Furnace Guide Rolls

Product: Hybrid Ceramic Bearing

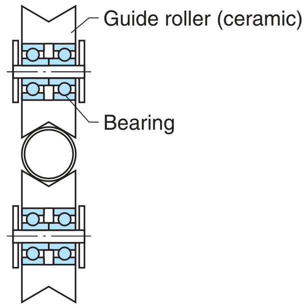
The guide roll bearings installed inside tube annealing furnaces are used under high temperatures without lubrication.

Hybrid Ceramic Bearings are suitable for such applications.

- Compatible with high temperature environments

Use conditions

Rotational speed: 300 min^{-1}
Temperature: 300°C



4-5 Diffusion Furnace Dolly

Product: Full-complement Ceramic Ball Bearings

Conditions in a diffusion furnace are harsh, including not only high temperature, but also corrosive gas.

Incorporating a rolling mechanism for the conveyor dolly in the furnace enables smooth conveyance to be obtained, thereby leading to improvements in product quality and productivity.

- Compatible with high-temperature environments
- Corrosion-resistant against corrosive gases
- Contributes to improved productivity

Use conditions

Temperature: 800°C or higher
Ambient pressure: Corrosive gas atmosphere
Load: 5 N

4-6 Blister Packaging Equipment

Product: High-temperature Hybrid Ceramic Bearings

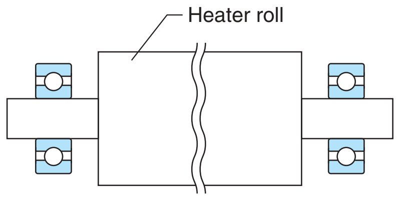
As heater roll bearings used in processing reach high temperatures during operation, conventional bearings are quickly damaged.

Incorporating high-temperature ceramic bearings extends the bearing replacement cycle and improves productivity.

- Applicable to high-temperature environments
- Contributes to improved productivity

Use conditions

Temperature: 250°C
Load: 900 N
Lubrication: Grease



5 Magnetic Field Environments

5-1 Electron Beam Lithography

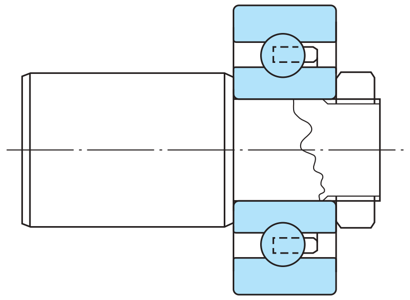
Product: Non-magnetic Hybrid Ceramic Bearing

The bearings in semiconductor production electron beam lithography are exposed to strong magnetic fields. Because of their non-magnetic characteristics, Hybrid Ceramic Bearings are used in such machines.

- Compatible with vacuum, strong magnetic field environments

Use conditions

Rotational speed: 100 min^{-1}
Temperature: Room temp.
Ambient pressure: 10^{-5} Pa
Lubrication: Grease



5-2 Magnetic Resonance Imagers

Product: Ceramic Bearing

The motors installed in magnetic resonance imagers (MRI) use magnetism insensitive Ceramic Bearings.

- Compatible with strong magnetic field environments

Use conditions

Rotational speed: 500 min^{-1}
Temperature: Room temp.
Lubrication: Grease

6 Electric Field Environments

6-1 Wind Turbine Generator

Product: Hybrid Ceramic Bearing

Wind Turbine Generator are strongly required to operate for extensive periods of time without the need of maintenance. However, bearings used in generators are subject to electrical pitting, which may cause the bearings to break down.

Hybrid Ceramic Bearings, which have superior durability and reliability, are widely used in such aerogenerators.

- Prevention of electrical pitting
- Extension of grease service life (three times longer than Koyo steel bearings)

Use conditions

Rotational speed: 2 700 min^{-1}
Temperature: Below freezing point to approx. 60˚C
Lubrication: Grease

6-2 DVD Sputtering Equipment

Product: Hybrid Ceramic Bearing

To improve reliability further, Hybrid Ceramic Bearings are used.

- Insulation

Use conditions

Rotational speed: 300 min^{-1}
Temperature: Room temp.
Lubrication: Grease

6-3 Fan Motor

Product: Hybrid Ceramic Bearing

Bearings used in motors are susceptible to electrical pitting. Hybrid Ceramic Bearings are widely used to prevent such pitting.

- Prevention of electrical pitting

Use conditions

Rotational speed: 5 000 min^{-1}
Temperature: –10 to 120˚C
Lubrication: Grease

6-4 Photographic Film Manufaturing Equipment

Product: Hybrid Ceramic Bearing (with special features)

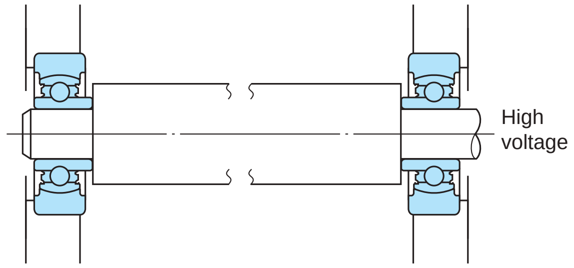
A photographic film production line treats film surfaces by applying a high voltage.

Hybrid Ceramic Bearings are widely used in such environments, because the ceramic inner ring and balls serve as insulators.

- Insulation under high voltage environments

Use conditions

Rotational speed: 200 min^{-1}
Temperature: Room temp.
Lubrication: Grease



6-5 Air-conditioner motors

Product : Hybrid Ceramic Bearings

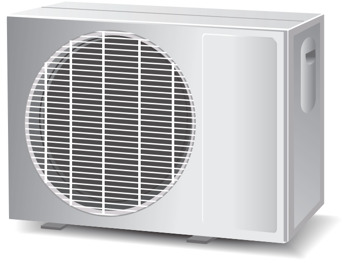
When using motors equipped with inverter control such as air-conditioner motors, there is a possibility of electric pitting defects occurring on motor bearings.

Using a ceramic — which is an insulator — as the rolling elements eliminates electric pitting.

- Electric pitting prevent through insulation performance

Use conditions

Rotational speed: 3 000 min^{-1}
Load (preload): 1.5% C
Lubrication: Grease



7 High Speed Applications

7-1 Turbocharger

Product: Hybrid Ceramic Bearing

Bearings that support the spindle of turbochargers should have good acceleration response characteristics and high durability under low viscosity, contaminated oil.

Because of their high reliability in these respects, Hybrid Ceramic Bearings are widely used for this application.

- **Three times longer service life than that of steel bearings**
- **Acceleration response up 20%**
- **An 80% reduction in oil supply**

Use conditions

Rotational speed: 180 000 to 210 000 min^{-1}
Temperature: 350°C
Lubrication: Oil

7-2 Spindle for Machine Tool (Angular Contact Ball Bearing)

Product: Hybrid Ceramic Bearing

Machine tool spindle bearings are required to have superior rotational performance at extremely high speeds, quick acceleration/ deceleration, high rigidity, and reduced temperature rises.

Hybrid Ceramic Bearings, which satisfy these requirements, are widely used in this application.

- **20% to 30% reduction in temperature rises**
- **The upper limit of the rotational speed range is 1.2 to 1.5 times higher (compared with Koyo steel bearings).**

Use conditions

Rotational speed: 25 000 min^{-1}
($d_m n = 2.75 \times 10^6$)
Spindle power: 75 kW
Lubrication: Oil or grease

7-3 Spindle for Machine Tool (Cylindrical Roller Bearing)

Product : Hybrid Ceramic Bearings

Seizure resistance performance under unbalanced load conditions due to misalignment improved at the Vertical Spindle Machining Center.

- **20% to 30% reduction in temperature rise**
- **Upper limit of rotational speed range is 1.2-1.5 times higher (compared to Koyo steel bearings)**

Use conditions

Rotational speed: 12 000 min^{-1}
Lubrication: Grease

7-4 Polygon Scanner Motor

Product: Hybrid Ceramic Bearing

Hybrid Ceramic Bearings, which exhibit superior high speed performance, are widely used in high speed polygon scanner motors.

- **Excellent reliability in high speed rotation**

Use conditions

Rotational speed: 26 000 min^{-1} or higher
Lubrication: Grease

7-5 Switched Reluctance Motor

Product: Hybrid Ceramic Bearing

For high speed, high efficiency switched reluctance (SR) motors, which do not use coils or permanent magnets, Hybrid Ceramic Bearings are applied.

- **Excellent reliability in high speed rotation**

Use conditions

Rotational speed: 30 000 min^{-1}
Lubrication: Grease

7-6 Steel Wire Stranding Machine

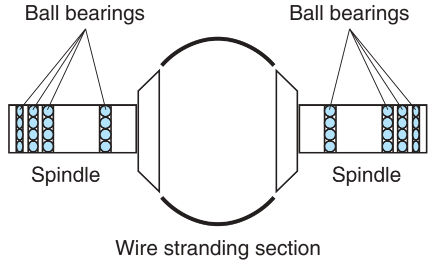
Product: Hybrid Ceramic Bearing

Steel wires for radial tires are produced by stranding steel wires to attain the required strength. In steel wire stranding machines, which involve high speed rotation, Hybrid Ceramic Bearings are used for improved service life and stability.

- **Reduced temperature rises**
- **Reliable durability**

Use conditions

Rotational speed: 6 000 min^{-1} or higher
Lubrication: Grease



7 High Speed Applications

7-7 Jet Electrostatic Coating Machine

Product: Hybrid Ceramic Bearing

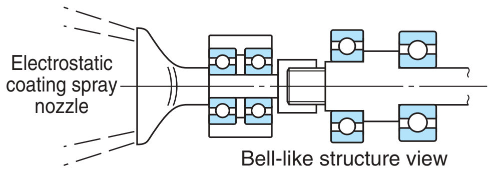
In a jet electrostatic coating machine, grease may escape from the spray nozzle due to the air motor, affecting the quality of the paint to be coated.

To resolve this problem, Hybrid Ceramic Bearings that do not use grease are used.

- **Prevention of grease scattering**
- **Prevention of paint contamination**

Use conditions

Rotational speed: 20 000 min^{-1}
Lubrication: Fluorine polymer



Bell-like structure view

7-8 Micro Gas Turbine Generator

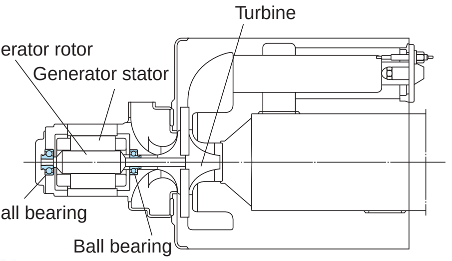
Product: Hybrid Ceramic Bearing

The world's smallest gas turbine generators emit clean exhaust emissions and hence are friendly to the environment. Hybrid Ceramic Bearings are used in these generators because they are low in vibration and noise generation, and have excellent high speed performance.

- **Improved reliability in high speed rotation**

Use conditions

Rotational speed: 100 000 min^{-1}
($d_m n = 2.22 \times 10^6$)
Temperature: 200˚C
Lubrication: Oil



7-9 Motorcycle Superchargers

Product: Hybrid Ceramic Bearings

The new superchargers for large motorcycles utilize lightweight, high-strength ceramic balls capable of high-speed rotation. The incorporation of ceramic balls has achieved bearings with excellent high-speed performance, heat resistance and abrasion resistance. Additionally, when using hybrid ceramic bearings, high output is achieved even for race-specification motors operating under harsh conditions.

- **High-speed performance, heat resistance and abrasion resistance improved**
- **Contributes to achieving high output supporting race specifications**

Photos: Courtesy of Kawasaki Heavy Industries, Ltd.

8 Abrasion Resistance

8-1 Fuel Injection System Control Valve

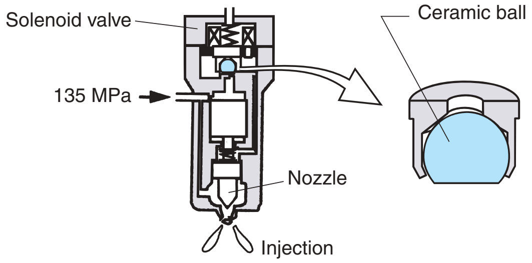
Product: Ceramic Ball

The common rail system (fuel injection system), which enables diesel engines to feature high power, good fuel economy and low emissions, is equipped with Ceramic Balls in the control valves.

- **Compatible with high pressure fuel injection thanks to improved wear resistance and seizure resistance**

Use conditions

Maximum pressure: 135 MPa



8-2 Rally Car Hub Units

Product: Hybrid Ceramic Bearings

Excellent abrasion resistance even under severe environmental conditions has improved durability and reliability.

- **Utilized in the car entered in the Paris-Dakar Rally in 1997 and 1998**
- **Rigidity improved**
- **Unsprung weight reduced**

Photos: Courtesy of Mitsubishi Motors Corporation

9 Low Torque

9-1 Inline Skates

Product: Hybrid Ceramic Bearing

Because of their low running torque and high durability, Hybrid Ceramic Bearings are widely used in speed skates.

- **Low torque and improved durability**

Use conditions

Rotational speed: 10 000 min^{-1}
Lubrication: Oil or grease

9-2 Wheel Bearings for Solar Cars

Product: Hybrid Ceramic Bearings

Stable operation of the motor section under severe open conditions of running eight hours or more per day. Improvements in weight reduction, durability and reliability.

Suppressing spinning resistance and efficiently transferring the driving force to the wheels contributes to saving power.

- **Australia: Covered over 3 000km vertically**
- **South Africa: Covered over 4 000km**

Use conditions

Rotational speed: 1 000 min^{-1}
Lubrication: Grease

Photo: Courtesy of Tokai University

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4 Supplementary Tables

Supplementary table 1 Shaft tolerances (deviation from nominal dimensions)

Unit: µm (Refer.)

Nominal shaft diameter (mm)		Deviation classes of shaft diameter																											Nominal shaft diameter (mm)		Δ_{dmp} 1) of bearing (class 0)
over	up to	d6	e6	f6	g5	g6	h5	h6	h7	h8	h9	h10	js5	js6	js7	j5	j6	k5	k6	k7	m5	m6	m7	n5	n6	p6	r6	r7	over	up to	
3	6	−30 −38	−20 −28	−10 −18	−4 −9	−4 −12	0 −5	0 −8	0 −12	0 −18	0 −30	0 −48	±2.5	±4	±6	+3 −2	+6 −2	+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+16 +4	+13 +8	+16 +8	+20 +12	+23 +15	+27 +15	3	6	0 −8
6	10	−40 −49	−25 −34	−13 −22	−5 −11	−5 −14	0 −6	0 −9	0 −15	0 −22	0 −36	0 −58	±3	±4.5	±7.5	+4 −2	+7 −2	+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+21 +6	+16 +10	+19 +10	+24 +15	+28 +19	+34 +19	6	10	0 −8
10	18	−50 −61	−32 −43	−16 −27	−6 −14	−6 −17	0 −8	0 −11	0 −18	0 −27	0 −43	0 −70	±4	±5.5	±9	+5 −3	+8 −3	+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+25 +7	+20 +12	+23 +12	+29 +18	+34 +23	+41 +23	10	18	0 −8
18	30	−65 −78	−40 −53	−20 −33	−7 −16	−7 −20	0 −9	0 −13	0 −21	0 −33	0 −52	0 −84	±4.5	±6.5	±10.5	+5 −4	+9 −4	+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+29 +8	+24 +15	+28 +15	+35 +22	+41 +28	+49 +28	18	30	0 −10
30	50	−80 −96	−50 −66	−25 −41	−9 −20	−9 −25	0 −11	0 −16	0 −25	0 −39	0 −62	0 −100	±5.5	±8	±12.5	+6 −5	+11 −5	+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+34 +9	+28 +17	+33 +17	+42 +26	+50 +34	+59 +34	30	50	0 −12
50	80	−100 −119	−60 −79	−30 −49	−10 −23	−10 −29	0 −13	0 −19	0 −30	0 −46	0 −74	0 −120	±6.5	±9.5	±15	+6 −7	+12 −7	+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+41 +11	+33 +20	+39 +20	+51 +32	+60 +41	+71 +41	50	65	0 −15
																											+62 +43	+73 +43	65	80	
80	120	−120 −142	−72 −94	−36 −58	−12 −27	−12 −34	0 −15	0 −22	0 −35	0 −54	0 −87	0 −140	±7.5	±11	±17.5	+6 −9	+13 −9	+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+48 +13	+38 +23	+45 +23	+59 +37	+73 +51	+86 +51	80	100	0 −20
																											+76 +54	+89 +54	100	120	
120	180	−145 −170	−85 −110	−43 −68	−14 −32	−14 −39	0 −18	0 −25	0 −40	0 −63	0 −100	0 −160	±9	±12.5	±20	+7 −11	+14 −11	+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+55 +15	+45 +27	+52 +27	+68 +43	+88 +63	+103 +63	120	140	0 −25
																											+90 +65	+105 +65	140	160	
																											+93 +68	+108 +68	160	180	
180	250	−170 −199	−100 −129	−50 −79	−15 −35	−15 −44	0 −20	0 −29	0 −46	0 −72	0 −115	0 −185	±10	±14.5	±23	+7 −13	+16 −13	+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+63 +17	+51 +31	+60 +31	+79 +50	+106 +77	+123 +77	180	200	0 −30
																											+109 +80	+126 +80	200	225	
																											+113 +84	+130 +84	225	250	
250	315	−190 −222	−110 −142	−56 −88	−17 −40	−17 −49	0 −23	0 −32	0 −52	0 −81	0 −130	0 −210	±11.5	±16	±26	+7 −16	±16	+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+72 +20	+57 +34	+66 +34	+88 +56	+126 +94	+146 +94	250	280	0 −35
																											+130 +98	+150 +98	280	315	
315	400	−210 −246	−125 −161	−62 −98	−18 −43	−18 −54	0 −25	0 −36	0 −57	0 −89	0 −140	0 −230	±12.5	±18	±28.5	+7 −18	±18	+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+78 +21	+62 +37	+73 +37	+98 +62	+144 +108	+165 +108	315	355	0 −40
																											+150 +114	+171 +114	355	400	
400	500	−230 −270	−135 −175	−68 −108	−20 −47	−20 −60	0 −27	0 −40	0 −63	0 −97	0 −155	0 −250	±13.5	±20	±31.5	+7 −20	±20	+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+86 +23	+67 +40	+80 +40	+108 +68	+166 +126	+189 +126	400	450	0 −45
																											+172 +132	+195 +132	450	500	
500	630	−260 −304	−145 −189	−76 −120	−22 −54	−22 −66	0 −32	0 −44	0 −70	0 −110	0 −175	0 −280	±16	±22	±35	—	—	+32 0	+44 0	+70 0	+58 +26	+70 +26	+96 +26	+76 +44	+88 +44	+122 +78	+194 +150	+220 +150	500	560	0 −50
																											+199 +155	+225 +155	560	630	
630	800	−290 −340	−160 −210	−80 −130	−24 −60	−24 −74	0 −36	0 −50	0 −80	0 −125	0 −200	0 −320	±18	±25	±40	—	—	+36 0	+50 0	+80 0	+66 +30	+80 +30	+110 +30	+86 +50	+100 +50	+138 +88	+225 +175	+255 +175	630	710	0 −75
																											+235 +185	+265 +185	710	800	
800	1 000	−320 −376	−170 −226	−86 −142	−26 −66	−26 −82	0 −40	0 −56	0 −90	0 −140	0 −230	0 −360	±20	±28	±45	—	—	+40 0	+56 0	+90 0	+74 +34	+90 +34	+124 +34	+96 +56	+112 +56	+156 +100	+266 +210	+300 +210	800	900	0 −100
																											+276 +220	+310 +220	900	1 000	

Note 1) Δ_{dmp} : single plane mean bore diameter deviation

Supplementary table 2　Housing bore tolerances (deviation from nominal dimensions)

Unit: μm

Nominal shaft diameter (mm)		Deviation classes of housing bore diameter														
over	up to	E6	F6	F7	G6	G7	H6	H7	H8	H9	H10	JS5	JS6	JS7	J6	J7
10	18	+43 +32	+27 +16	+34 +16	+17 +6	+24 +6	+11 0	+18 0	+27 0	+43 0	+70 0	±4	±5.5	±9	+6 −5	+10 −8
18	30	+53 +40	+33 +20	+41 +20	+20 +7	+28 +7	+13 0	+21 0	+33 0	+52 0	+84 0	±4.5	±6.5	±10.5	+8 −5	+12 −9
30	50	+66 +50	+41 +25	+50 +25	+25 +9	+34 +9	+16 0	+25 0	+39 0	+62 0	+100 0	±5.5	±8	±12.5	+10 −6	+14 −11
50	80	+79 +60	+49 +30	+60 +30	+29 +10	+40 +10	+19 0	+30 0	+46 0	+74 0	+120 0	±6.5	±9.5	±15	+13 −6	+18 −12
80	120	+94 +72	+58 +36	+71 +36	+34 +12	+47 +12	+22 0	+35 0	+54 0	+87 0	+140 0	±7.5	±11	±17.5	+16 −6	+22 −13
120	180	+110 +85	+68 +43	+83 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+100 0	+160 0	±9	±12.5	±20	+18 −7	+26 −14
180	250	+129 +100	+79 +50	+96 +50	+44 +15	+61 +15	+29 0	+46 0	+72 0	+115 0	+185 0	±10	±14.5	±23	+22 −7	+30 −16
250	315	+142 +110	+88 +56	+108 +56	+49 +17	+69 +17	+32 0	+52 0	+81 0	+130 0	+210 0	±11.5	±16	±26	+25 −7	+36 −16
315	400	+161 +125	+98 +62	+119 +62	+54 +18	+75 +18	+36 0	+57 0	+89 0	+140 0	+230 0	±12.5	±18	±28.5	+29 −7	+39 −18
400	500	+175 +135	+108 +68	+131 +68	+60 +20	+83 +20	+40 0	+63 0	+97 0	+155 0	+250 0	±13.5	±20	±31.5	+33 −7	+43 −20
500	630	+189 +145	+120 +76	+146 +76	+66 +22	+92 +22	+44 0	+70 0	+110 0	+175 0	+280 0	±16	±22	±35	—	—
630	800	+210 +160	+130 +80	+160 +80	+74 +24	+104 +24	+50 0	+80 0	+125 0	+200 0	+320 0	±18	±25	±40	—	—
800	1 000	+226 +170	+142 +86	+176 +86	+82 +26	+116 +26	+56 0	+90 0	+140 0	+230 0	+360 0	±20	±28	±45	—	—
1 000	1 250	+261 +195	+164 +98	+203 +98	+94 +28	+133 +28	+66 0	+105 0	+165 0	+260 0	+420 0	±23.5	±33	±52.5	—	—

(Refer.)

K5	K6	K7	M5	M6	M7	N5	N6	N7	P6	P7	R7	Nominal shaft diameter (mm) over	up to	$\varDelta_{Dmp}$ of bearing (class 0)
+2 −6	+2 −9	+6 −12	−4 −12	−4 −15	0 −18	−9 −17	−9 −20	−5 −23	−15 −26	−11 −29	−16 −34	10	18	0 −8
+1 −8	+2 −11	+6 −15	−5 −14	−4 −17	0 −21	−12 −21	−11 −24	−7 −28	−18 −31	−14 −35	−20 −41	18	30	0 −9
+2 −9	+3 −13	+7 −18	−5 −16	−4 −20	0 −25	−13 −24	−12 −28	−8 −33	−21 −37	−17 −42	−25 −50	30	50	0 −11
+3 −10	+4 −15	+9 −21	−6 −19	−5 −24	0 −30	−15 −28	−14 −33	−9 −39	−26 −45	−21 −51	−30 −60	50	65	0 −13
											−32 −62	65	80	
+2 −13	+4 −18	+10 −25	−8 −23	−6 −28	0 −35	−18 −33	−16 −38	−10 −45	−30 −52	−24 −59	−38 −73	80	100	0 −15
											−41 −76	100	120	
+3 −15	+4 −21	+12 −28	−9 −27	−8 −33	0 −40	−21 −39	−20 −45	−12 −52	−36 −61	−28 −68	−48 −88	120	140	(up to150) 0 −18 (over 150) 0 −25
											−50 −90	140	160	
											−53 −93	160	180	
+2 −18	+5 −24	+13 −33	−11 −31	−8 −37	0 −46	−25 −45	−22 −51	−14 −60	−41 −70	−33 −79	−60 −106	180	200	0 −30
											−63 −109	200	225	
											−67 −113	225	250	
+3 −20	+5 −27	+16 −36	−13 −36	−9 −41	0 −52	−27 −50	−25 −57	−14 −66	−47 −79	−36 −88	−74 −126	250	280	0 −35
											−78 −130	280	315	
+3 −22	+7 −29	+17 −40	−14 −39	−10 −46	0 −57	−30 −55	−26 −62	−16 −73	−51 −87	−41 −98	−87 −144	315	355	0 −40
											−93 −150	355	400	
+2 −25	+8 −32	+18 −45	−16 −43	−10 −50	0 −63	−33 −60	−27 −67	−17 −80	−55 −95	−45 −108	−103 −166	400	450	0 −45
											−109 −172	450	500	
0 −32	0 −44	0 −70	−26 −58	−26 −70	−26 −96	−44 −76	−44 −88	−44 −114	−78 −122	−78 −148	−150 −220	500	560	0 −50
											−155 −225	560	630	
0 −36	0 −50	0 −80	−30 −66	−30 −80	−30 −110	−50 −86	−50 −100	−50 −130	−88 −138	−88 −168	−175 −255	630	710	0 −75
											−185 −265	710	800	
0 −40	0 −56	0 −90	−34 −74	−34 −90	−34 −124	−56 −96	−56 −112	−56 −146	−100 −156	−100 −190	−210 −300	800	900	0 −100
											−220 −310	900	1 000	
0 −47	0 −66	0 −105	−40 −87	−40 −106	−40 −145	−66 −113	−66 −132	−66 −171	−120 −186	−120 −225	−250 −355	1 000	1 120	0 −125
											−260 −365	1 120	1 250	

Note 1) $\varDelta_{Dmp}$: single plane mean bore diameter deviation

Supplementary table 3 Numerical values for standard tolerance grades IT

Basic size (mm)		**Standard tolerance grades (IT)**																	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14 1)**	**15 1)**	**16 1)**	**17 1)**	**18 1)**
over	up to	Tolerances (μm)											Tolerances (mm)						
—	**3**	0.8	1.2	2	3	4	6	10	14	25	40	60	0.10	0.14	0.26	0.40	0.60	1.00	1.40
3	**6**	1	1.5	2.5	4	5	8	12	18	30	48	75	0.12	0.18	0.30	0.48	0.75	1.20	1.80
6	**10**	1	1.5	2.5	4	6	9	15	22	36	58	90	0.15	0.22	0.36	0.58	0.90	1.50	2.20
10	**18**	1.2	2	3	5	8	11	18	27	43	70	110	0.18	0.27	0.43	0.70	1.10	1.80	2.70
18	**30**	1.5	2.5	4	6	9	13	21	33	52	84	130	0.21	0.33	0.52	0.84	1.30	2.10	3.30
30	**50**	1.5	2.5	4	7	11	16	25	39	62	100	160	0.25	0.39	0.62	1.00	1.60	2.50	3.90
50	**80**	2	3	5	8	13	19	30	46	74	120	190	0.30	0.46	0.74	1.20	1.90	3.00	4.60
80	**120**	2.5	4	6	10	15	22	35	54	87	140	220	0.35	0.54	0.87	1.40	2.20	3.50	5.40
120	**180**	3.5	5	8	12	18	25	40	63	100	160	250	0.40	0.63	1.00	1.60	2.50	4.00	6.30
180	**250**	4.5	7	10	14	20	29	46	72	115	185	290	0.46	0.72	1.15	1.85	2.90	4.60	7.20
250	**315**	6	8	12	16	23	32	52	81	130	210	320	0.52	0.81	1.30	2.10	3.20	5.20	8.10
315	**400**	7	9	13	18	25	36	57	89	140	230	360	0.57	0.89	1.40	2.30	3.60	5.70	8.90
400	**500**	8	10	15	20	27	40	63	97	155	250	400	0.63	0.97	1.55	2.50	4.00	6.30	9.70
500	**630**	—	—	—	—	—	44	70	110	175	280	440	0.70	1.10	1.75	2.80	4.40	7.00	11.00
630	**800**	—	—	—	—	—	50	80	125	200	320	500	0.80	1.25	2.00	3.20	5.00	8.00	12.50
800	**1 000**	—	—	—	—	—	56	90	140	230	360	560	0.90	1.40	2.30	3.60	5.60	9.00	14.00
1 000	**1 250**	—	—	—	—	—	66	105	165	260	420	660	1.05	1.65	2.60	4.20	6.60	10.50	16.50
1 250	**1 600**	—	—	—	—	—	78	125	195	310	500	780	1.25	1.95	3.10	5.00	7.80	12.50	19.50
1 600	**2 000**	—	—	—	—	—	92	150	230	370	600	920	1.50	2.30	3.70	6.00	9.20	15.00	23.00
2 000	**2 500**	—	—	—	—	—	110	175	280	440	700	1 100	1.75	2.80	4.40	7.00	11.00	17.50	28.00
2 500	**3 150**	—	—	—	—	—	135	210	330	540	860	1 350	2.10	3.30	5.40	8.60	13.50	21.00	33.00

Note 1) Standard tolerance grades IT 14 to IT 18 (incl.) shall not be used for basic sizes less than or equal to 1 mm.

Supplementary table 4 Steel hardness conversion

Rockwell	**Vicker's**	**Brinell**		**Rockwell**		**Shore**
C-scale 1471.0 N		**Standard ball**	**Tungsten carbide ball**	**A-scale** 588.4 N	**B-scale** 980.7 N	
68	940			85.6		97
67	900			85.0		95
66	865			84.5		92
65	832		739	83.9		91
64	800		722	83.4		88
63	772		705	82.8		87
62	746		688	82.3		85
61	720		670	81.8		83
60	697		654	81.2		81
59	674		634	80.7		80
58	653		615	80.1		78
57	633		595	79.6		76
56	613		577	79.0		75
55	595	—	560	78.5		74
54	577	—	543	78.0		72
53	560	—	525	77.4		71
52	544	500	512	76.8		69
51	528	487	496	76.3		68
50	513	475	481	75.9		67
49	498	464	469	75.2		66
48	484	451	455	74.7		64
47	471	442	443	74.1		63
46	458	432	432	73.6		62
45	446	421		73.1		60
44	434	409		72.5		58
43	423	400		72.0		57
42	412	390		71.5		56
41	402	381		70.9		55
40	392	371		70.4	—	54
39	382	362		69.9	—	52
38	372	353		69.4	—	51
37	363	344		68.9	—	50
36	354	336		68.4	(109.0)	49
35	345	327		67.9	(108.5)	48
34	336	319		67.4	(108.0)	47
33	327	311		66.8	(107.5)	46
32	318	301		66.3	(107.0)	44
31	310	294		65.8	(106.0)	43
30	302	286		65.3	(105.5)	42
29	294	279		64.7	(104.5)	41
28	286	271		64.3	(104.0)	41
27	279	264		63.8	(103.0)	40
26	272	258		63.3	(102.5)	38
25	266	253		62.8	(101.5)	38
24	260	247		62.4	(101.0)	37
23	254	243		62.0	100.0	36
22	248	237		61.5	99.0	35
21	243	231		61.0	98.5	35
20	238	226		60.5	97.8	34
(18)	230	219		—	96.7	33
(16)	222	212		—	95.5	32
(14)	213	203		—	93.9	31
(12)	204	194		—	92.3	29
(10)	196	187			90.7	28
(8)	188	179			89.5	27
(6)	180	171			87.1	26
(4)	173	165			85.5	25
(2)	166	158			83.5	24
(0)	160	152			81.7	24

Supplementary table 5(1) SI units and conversion factors

Mass	SI units	Other Units [1]	Conversion into SI units	Conversion from SI units
Angle	rad [radian(s)]	° [degree(s)] ✻	1° =π/180 rad	1 rad=57.295 78°
		′ [minute(s)] ✻	1′ =π/10 800 rad	
		″ [second(s)] ✻	1″ =π/648 000 rad	
Length	m [meter(s)]	Å [Angstrom unit]	1 Å=10^{-10} m=0.1 nm=100pm	1 m=10^{10} Å
		µ [micron(s)]	1 µ =1 µm	
		in [inch(es)]	1 in=25.4 mm	1 m=39.37 in
		ft [foot(feet)]	1 ft=12 in=0.304 8 m	1 m=3.280 8 ft
		yd [yard(s)]	1 yd=3 ft=0.914 4 m	1 m=1.093 6 yd
		mile [mile(s)]	1 mile=5 280 ft=1 609.344 m	1 km=0.621 4 mile
Area	m^2	a [are(s)]	1 a=100m^2	
		ha [hectare(s)]	1 ha=10^4 m^2	
		acre [acre(s)]	1 acre=4 840 yd^2=4 046.86 m^2	1 km^2=247.1 acre
Volume	m^3	ℓ, L [liter(s)] ✻	1 ℓ =1 dm^3=10^{-3} m^3	1 m^3=10^3 ℓ
		cc [cubic centimeters]	1 cc=1 cm^3=10^{-6} m^3	1 m^3=10^6 cc
		gal (US) [gallon(s)]	1 gal (US)=231 in^3=3.785 41 dm^3	1 m^3=264.17 gal
		floz (US) [fluid ounce(s)]	1 floz (US)=29.573 5 cm^3	1 m^3=33 814 floz
		barrel (US) [barrels(US)]	1 barrel (US)=158.987 dm^3	1 m^3=6.289 8 barrel
Time	s [second(s)]	min [minute(s)] ✻		
		h [hour(s)] ✻		
		d [day(s)] ✻		
Angular velocity	rad/s			
Velocity	m/s	kn [knot(s)]	1 kn=1 852 m/h	1 km/h=0.539 96 kn
		m/h ✻		
Acceleration	m/s^2	G	1 G=9.806 65 m/s^2	1 m/s^2=0.101 97 G
Frequency	Hz [hertz]	c/s [cycle(s)/second]	1 c/s=1 s^{-1}=1 Hz	
Rotation frequency	s^{-1}	rpm [revolutions per minute]	1 rpm=1/60 s^{-1}	1 s^{-1}=60 rpm
		min^{-1} ✻		
		r/min		
Mass	kg [kilogram(s)]	t [ton(s)] ✻	1 t=10^3 kg	
		lb [pound(s)]	1 lb=0.453 592 37 kg	1kg=2.204 6 lb
		gr [grain(s)]	1 gr=64.798 91 mg	1 g=15.432 4 gr
		oz [ounce(s)]	1 oz=1/16 lb=28.349 5 g	1kg=35.274 0 oz
		ton (UK) [ton(s) (UK)]	1 ton (UK)=1 016.05 kg	1 t=0.9842 ton (UK)
		ton (US) [ton(s) (US)]	1 ton (US)=907.185 kg	1 t=1.102 3 ton (US)
		car [carat(s)]	1 car=200 mg	1 g=5 car

Note 1) ✻ : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 5(2) SI units and conversion factors

Mass	SI units	Other Units [1]	Conversion into SI units	Conversion from SI units
Density	kg/m^3			
Linear density	kg/m			
Momentum	kg・m/s			
Moment of momentum, angular momentum	kg・m^2/s			
Moment of inertia	kg・m^2			
Force	N [newton(s)]	dyn [dyne(s)]	1 dyn=10^{-5} N	1 N=10^5 dyn
		kgf [kilogram-force]	1 kgf=9.806 65 N	1 N=0.101 97 kgf
		gf [gram-force]	1 gf=9.806 65×10^{-3} N	
		tf [ton-force]	1 tf=9.806 65×10^3 N	
		lbf [pound-force]	1 lbf=4.448 22 N	1 N=0.224 809 lbf
Moment of force	N・m [Newton meter(s)]	gf・cm	1 gf・cm=9.806 65×10^{-5} N・m	
		kgf・cm	1 kgf・cm=9.806 65×10^{-2} N・m	
		kgf・m	1 kgf・m=9.806 65 N・m	1 N・m=0.101 97 kgf・m
		tf・m	1 tf・m=9.806 65×10^3 N・m	
		lbf・ft	1 lbf・ft=1.355 82 N・m	1 N・m=0.737 56 lbf・ft
Pressure, Normal stress	Pa [Pascal(s)] or N/m^2 {1 Pa=1 N/m^2}	gf/ cm^2	1 gf/ cm^2=9.806 65×10 Pa	
		kgf/mm^2	1 kgf/mm^2=9.806 65×10^6 Pa	1 MPa=0.101 97 kgf/mm^2
		kgf/m^2	1 kgf/m^2=9.806 65 Pa	1 Pa=0.101 97 kgf/m^2
		lbf/in^2	1 lbf/in^2=6 894.76 Pa	1 Pa=0.145×10^{-3} lbf/in^2
		bar [bar(s)]	1 bar=10^5 Pa	1 Pa=10^{-2} mbar
		at [engineering air pressure]	1 at=1 kgf/cm^2=9.806 65×10^4 Pa	
		mH_2O, mAq [meter water column]	1 mH_2O=9.806 65×10^3 Pa	
		atm [atmosphere]	1 atm=101 325 Pa	
		mHg [meter mercury column]	1 mHg=$\frac{101\ 325}{0.76}$ Pa	
		Torr [torr]	1 Torr=1 mmHg=133.322 Pa	1 Pa=7.500 6×10^{-3} Torr
Viscosity	Pa・s [pascal second]	P [poise]	10^{-2} P=1 cP=1 mPa・s	
		kgf・s/m^2	1 kgf・s/m^2=9.806 65 Pa・s	1 Pa・s=0.101 97 kgf・s/m^2
Kinematic viscosity	m^2/s	St [stokes]	10^{-2} St=1 cSt=1 mm^2/s	
Surface tension	N/m			

Supplementary table 5(3) SI units and conversion factors

Mass	SI units	Other Units [1]	Conversion into SI units	Conversion from SI units
Work, energy	J [joule(s)] {1 J=1 N・m}	eV [electron volt(s)] ✻ erg [erg(s)] kgf・m lbf・ft	1 eV=(1.602 189 2± 0.000 004 6)×10^{-19} J 1 erg=10^{-7} J 1 kgf・m=9.806 65 J 1 lbf・ft=1.355 82 J	1 J=10^{7} erg 1 J=0.101 97 kgf・m 1 J=0.737 56 lbf・ft
Power	W [watt(s)]	erg/s [ergs per second] kgf・m/s PS [French horse-power] HP [horse-power (British)] lbf・ft/s	1 erg/s=10^{-7} W 1 kgf・m/s=9.806 65 W 1 PS=75 kgf・m/s=735.5 W 1 HP=550 lbf・ft/s=745.7 W 1 lbf・ft/s=1.355 82 W	1 W=0.101 97 kgf・m/s 1 W=0.001 36 PS 1 W=0.001 34 HP
Thermo-dynamic temperature	K [kelvin(s)]			
Celsius temperature	℃ [Celsius(s)] {t℃=(t+273.15)K}	℉ [degree(s) Fahrenheit]	t℉=$\frac{5}{9}$(t−32)℃	t℃=($\frac{9}{5}$t+32)℉
Linear expansiona coefficient	K^{-1}	$℃^{-1}$ [per degree]		
Heat	J [joule(s)] {1 J=1 N・m}	erg [erg(s)] kgf・m cal IT [I. T. calories]	1 erg=10^{-7} J 1 cal IT=4.186 8 J 1 Mcal IT=1.163 kW・h	1 J=10^{7} erg 1 J=0.238 85 cal IT 1 kW・h=0.86×10^{6} cal IT
Thermal conductivity	W/(m・K)	W/(m・℃) cal/(s・m・℃)	1 W/(m・℃)=1 W/(m・K) 1 cal/(s・m・℃)= 4.186 05 W/(m・K)	
Coeffcient of heat transfer	W/(m^2・K)	W/(m^2・℃) cal/(s・m^2・℃)	1 W/(m^2・℃)=1 W/(m^2・K) 1 cal/(s・m^2・℃)= 4.186 05 W/(m^2・K)	
Heat capacity	J/K	J/℃	1 J/℃=1 J/K	
Massic heat capacity	J/(kg・K)	J/(kg・℃)		

Note 1) ✻ : Unit can be used as an SI unit.
No asterisk : Unit cannot be used.

Supplementary table 5(4) SI units and conversion factors

Mass	SI units	Other Units [1]	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge, quantity of electricity	C [coulomb(s)] {1 C=1 A・s}	A・h ✻	1 A・h=3.6 kC	
Tension, electric potential	V [volt(s)] {1 V=1 W/A}			
Capacitance	F [farad(s)] {1 F=1 C/V}			
Magnetic field strength	A/m	Oe [oersted(s)]	1 Oe=$\frac{10^3}{4\pi}$ A/m	1 A/m=4π×10^{-3} Oe
Magnetic flux density	T [tesla(s)] {1 T=1 N/(A・m) =1 Wb/m^2 =1 V・s/m^2}	Gs [gauss(es)] γ [gamma(s)]	1 Gs=10^{-4} T 1 γ=10^{-9} T	1 T=10^{4} Gs 1 T=10^{9} γ
Magnetic flux	Wb [weber(s)] {1 Wb=1 V・s}	Mx [maxwell(s)]	1 Mx=10^{-8} Wb	1 Wb=10^{8} Mx
Self inductance	H [henry (– ries)] {1 H=1 Wb/A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω=1 V/A}			
Conductance (to direct current)	S [siemens] {1 S=1 A/V}			
Active power	W {1 W=1 J/s =1 A・V}			

Supplementary table 6 Inch / millimeter conversion

inch		inches										
		0	1	2	3	4	5	6	7	8	9	10
		mm										
0	0	**0**	**25.4000**	**50.8000**	**76.2000**	**101.6000**	**127.0000**	**152.4000**	**177.8000**	**203.2000**	**228.6000**	**254.0000**
1/64	0.015625	0.3969	25.7969	51.1969	76.5969	101.9969	127.3969	152.7969	178.1969	203.5969	228.9969	254.3969
1/32	0.03125	0.7938	26.1938	51.5938	76.9938	102.3938	127.7938	153.1938	178.5938	203.9938	229.3938	254.7938
3/64	0.046875	1.1906	26.5906	51.9906	77.3906	102.7906	128.1906	153.5906	178.9906	204.3906	229.7906	255.1906
1/16	0.0625	1.5875	26.9875	52.3875	77.7875	103.1875	128.5875	153.9875	179.3875	204.7875	230.1875	255.5875
5/64	0.078125	1.9844	27.3844	52.7844	78.1844	103.5844	128.9844	154.3844	179.7844	205.1844	230.5844	255.9844
3/32	0.09375	2.3812	27.7812	53.1812	78.5812	103.9812	129.3812	154.7812	180.1812	205.5812	230.9812	256.3812
7/64	0.109375	2.7781	28.1781	53.5781	78.9781	104.3781	129.7781	155.1781	180.5781	205.9781	231.3781	256.7781
1/8	0.125	**3.1750**	**28.5750**	**53.9750**	**79.3750**	**104.7750**	**130.1750**	**155.5750**	**180.9750**	**206.3750**	**231.7750**	**257.1750**
9/64	0.140625	3.5719	28.9719	54.3719	79.7719	105.1719	130.5719	155.9719	181.3719	206.7719	232.1719	257.5719
5/32	0.15625	3.9688	29.3688	54.7688	80.1688	105.5688	130.9688	156.3688	181.7688	207.1688	232.5688	257.9688
11/64	0.171875	4.3656	29.7656	55.1656	80.5656	105.9656	131.3656	156.7656	182.1656	207.5656	232.9656	258.3656
3/16	0.1875	4.7625	30.1625	55.5625	80.9625	106.3625	131.7625	157.1625	182.5625	207.9625	233.3625	258.7625
13/64	0.203125	5.1594	30.5594	55.9594	81.3594	106.7594	132.1594	157.5594	182.9594	208.3594	233.7594	259.1594
7/32	0.21875	5.5562	30.9562	56.3562	81.7562	107.1562	132.5562	157.9562	183.3562	208.7562	234.1562	259.5562
15/64	0.234375	5.9531	31.3531	56.7531	82.1531	107.5531	132.9531	158.3531	183.7531	209.1531	234.5531	259.9531
1/4	0.25	**6.3500**	**31.7500**	**57.1500**	**82.5500**	**107.9500**	**133.3500**	**158.7500**	**184.1500**	**209.5500**	**234.9500**	**260.3500**
17/64	0.265625	6.7469	32.1469	57.5469	82.9469	108.3469	133.7469	159.1469	184.5469	209.9469	235.3469	260.7469
9/32	0.28125	7.1438	32.5438	57.9438	83.3438	108.7438	134.1438	159.5438	184.9438	210.3438	235.7438	261.1438
19/64	0.296875	7.5406	32.9406	58.3406	83.7406	109.1406	134.5406	159.9406	185.3406	210.7406	236.1406	261.5406
5/16	0.3125	7.9375	33.3375	58.7375	84.1375	109.5375	134.9375	160.3375	185.7375	211.1375	236.5375	261.9375
21/64	0.328125	8.3344	33.7344	59.1344	84.5344	109.9344	135.3344	160.7344	186.1344	211.5344	236.9344	262.3344
11/32	0.34375	8.7312	34.1312	59.5312	84.9312	110.3312	135.7312	161.1312	186.5312	211.9312	237.3312	262.7312
23/64	0.359375	9.1281	34.5281	59.9281	85.3281	110.7281	136.1281	161.5281	186.9281	212.3281	237.7281	263.1281
3/8	0.375	**9.5250**	**34.9250**	**60.3250**	**85.7250**	**111.1250**	**136.5250**	**161.9250**	**187.3250**	**212.7250**	**238.1250**	**263.5250**
25/64	0.390625	9.9219	35.3219	60.7219	86.1219	111.5219	136.9219	162.3219	187.7219	213.1219	238.5219	263.9219
13/32	0.40625	10.3188	35.7188	61.1188	86.5188	111.9188	137.3188	162.7188	188.1188	213.5188	238.9188	264.3188
27/64	0.421875	10.7156	36.1156	61.5156	86.9156	112.3156	137.7156	163.1156	188.5156	213.9156	239.3156	264.7156
7/16	0.4375	11.1125	36.5125	61.9125	87.3125	112.7125	138.1125	163.5125	188.9125	214.3125	239.7125	265.1125
29/64	0.453125	11.5094	36.9094	62.3094	87.7094	113.1094	138.5094	163.9094	189.3094	214.7094	240.1094	265.5094
15/32	0.46875	11.9062	37.3062	62.7062	88.1062	113.5062	138.9062	164.3062	189.7062	215.1062	240.5062	265.9062
31/64	0.484375	12.3031	37.7031	63.1031	88.5031	113.9031	139.3031	164.7031	190.1031	215.5031	240.9031	266.3031
1/2	0.5	**12.7000**	**38.1000**	**63.5000**	**88.9000**	**114.3000**	**139.7000**	**165.1000**	**190.5000**	**215.9000**	**241.3000**	**266.7000**
33/64	0.515625	13.0969	38.4969	63.8969	89.2969	114.6969	140.0969	165.4969	190.8969	216.2969	241.6969	267.0969
17/32	0.53125	13.4938	38.8938	64.2938	89.6938	115.0938	140.4938	165.8938	191.2938	216.6938	242.0938	267.4938
35/64	0.546875	13.8906	39.2906	64.6906	90.0906	115.4906	140.8906	166.2906	191.6906	217.0906	242.4906	267.8906
9/16	0.5625	14.2875	39.6875	65.0875	90.4875	115.8875	141.2875	166.6875	192.0875	217.4875	242.8875	268.2875
37/64	0.578125	14.6844	40.0844	65.4844	90.8844	116.2844	141.6844	167.0844	192.4844	217.8844	243.2844	268.6844
19/32	0.59375	15.0812	40.4812	65.8812	91.2812	116.6812	142.0812	167.4812	192.8812	218.2812	243.6812	269.0812
39/64	0.609375	15.4781	40.8781	66.2781	91.6781	117.0781	142.4781	167.8781	193.2781	218.6781	244.0781	269.4781
5/8	0.625	**15.8750**	**41.2750**	**66.6750**	**92.0750**	**117.4750**	**142.8750**	**168.2750**	**193.6750**	**219.0750**	**244.4750**	**269.8750**
41/64	0.640625	16.2719	41.6719	67.0719	92.4719	117.8719	143.2719	168.6719	194.0719	219.4719	244.8719	270.2719
21/32	0.65625	16.6688	42.0688	67.4688	92.8688	118.2688	143.6688	169.0688	194.4688	219.8688	245.2688	270.6688
43/64	0.671875	17.0656	42.4656	67.8656	93.2656	118.6656	144.0656	169.4656	194.8656	220.2656	245.6656	271.0656
11/16	0.6875	17.4625	42.8625	68.2625	93.6625	119.0625	144.4625	169.8625	195.2625	220.6625	246.0625	271.4625
45/64	0.703125	17.8594	43.2594	68.6594	94.0594	119.4594	144.8594	170.2594	195.6594	221.0594	246.4594	271.8594
23/32	0.71875	18.2562	43.6562	69.0562	94.4562	119.8562	145.2562	170.6562	196.0562	221.4562	246.8562	272.2562
47/64	0.734375	18.6531	44.0531	69.4531	94.8531	120.2531	145.6531	171.0531	196.4531	221.8531	247.2531	272.6531
3/4	0.75	**19.0500**	**44.4500**	**69.8500**	**95.2500**	**120.6500**	**146.0500**	**171.4500**	**196.8500**	**222.2500**	**247.6500**	**273.0500**
49/64	0.765625	19.4469	44.8469	70.2469	95.6469	121.0469	146.4469	171.8469	197.2469	222.6469	248.0469	273.4469
25/32	0.78125	19.8438	45.2438	70.6438	96.0438	121.4438	146.8438	172.2438	197.6438	223.0438	248.4438	273.8438
51/64	0.796875	20.2406	45.6406	71.0406	96.4406	121.8406	147.2406	172.6406	198.0406	223.4406	248.8406	274.2406
13/16	0.8125	20.6375	46.0375	71.4375	96.8375	122.2375	147.6375	173.0375	198.4375	223.8375	249.2375	274.6375
53/64	0.828125	21.0344	46.4344	71.8344	97.2344	122.6344	148.0344	173.4344	198.8344	224.2344	249.6344	275.0344
27/32	0.84375	21.4312	46.8312	72.2312	97.6312	123.0312	148.4312	173.8312	199.2312	224.6312	250.0312	275.4312
55/64	0.859375	21.8281	47.2281	72.6281	98.0281	123.4281	148.8281	174.2281	199.6281	225.0281	250.4281	275.8281
7/8	0.875	**22.2250**	**47.6250**	**73.0250**	**98.4250**	**123.8250**	**149.2250**	**174.6250**	**200.0250**	**225.4250**	**250.8250**	**276.2250**
57/64	0.890625	22.6219	48.0219	73.4219	98.8219	124.2219	149.6219	175.0219	200.4219	225.8219	251.2219	276.6219
29/32	0.90625	23.0188	48.4188	73.8188	99.2188	124.6188	150.0188	175.4188	200.8188	226.2188	251.6188	277.0188
59/64	0.921875	23.4156	48.8156	74.2156	99.6156	125.0156	150.4156	175.8156	201.2156	226.6156	252.0156	277.4156
15/16	0.9375	23.8125	49.2125	74.6125	100.0125	125.4125	150.8125	176.2125	201.6125	227.0125	252.4125	277.8125
61/64	0.953125	24.2094	49.6094	75.0094	100.4094	125.8094	151.2094	176.6094	202.0094	227.4094	252.8094	278.2094
31/32	0.96875	24.6062	50.0062	75.4062	100.8062	126.2062	151.6062	177.0062	202.4062	227.8062	253.2062	278.6062
63/64	0.984375	25.0031	50.4031	75.8031	101.2031	126.6031	152.0031	177.4031	202.8031	228.2031	253.6031	279.0031

Supplementary table 7 Cleanliness classes

JIS B9920/ISO14644-1 Upper limit to the concentration of individual cleanliness classes (particle count/m^3)
(Comparison with the U.S. federal standards)

	Cleanliness class								
FED 209D (particle count/ft^3)	—	—	class 1	class 10	class 100	class 1 000	class 1 000	class 100 000	—
JIS/ISO Particulate diameter (μm)	class 1	class 2	class 3	class 4	class 5	class 6	class 7	class 8	class 9
0.1	10	100	1 000	10 000	100 000	1 000 000	—	—	—
0.2	2	24	237	2 370	23 700	237 000	—	—	—
0.3	—	10	102	1 020	10 200	102 000	—	—	—
0.5	—	4	35	352	3 520	35 200	352 000	3 520 000	35 200 000
1.0	—	—	8	83	832	8 320	83 200	832 000	8 320 000
5.0	—	—	—	—	29	293	2 930	29 300	293 000
Particle diameter range	0.1 to 0.2	0.1 to 0.5	0.1 to 1.0		0.1 to 5.0		0.5 to 5.0		

Remarks
1) The U.S. Federal Standards are no longer in effect; however, in Japan and in the U.S., the old Federal Standard (FED-STD-209D) is commonly referred to.
2) The FED-STD-209D specifies that Class 100 limits the count of particles 0.5 μm or greater in diameter) to 100 (3 520 per cubic meter). This corresponds to Class 5 in the Japanese Industrial Standard and ISO Standard. (1 m^3 = 35.3 ft^3)

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Koyo Extreme Special Environment Specification Sheet for EXSEV Bearings and/or Ceramic Bearings

Note: For the selection of the most suitable bearing, this sheet must be completed in as much detail as possible. Date

Bearing Dimensions	Bearing number		(If unknown) Bore dia.	× Outside dia.	× Width	(mm)
Application			Usage location :			
	○ For new design	○ For repair (replacement)	○ For repair (redesign)			
Special environment (required performance)	☐ Clean ☐ Vacuum ☐ Corrosion resistance ☐ High temperature	☐ Non-magnetism ☐ Insulation ☐ High speed	☐ Others ( )			
Operating condition	Operation	○ Dual-directional ○ Continuous ○ Intermittent		Running time	○ 24 h/day ○ h/day ○ Other ( )	
	Rotation speed	○ Inner ring rotating ○ Outer ring rotating				
		min.	(min⁻¹)		<Target service life> ○ Less than 1 year ○ 1 to 3 years ○ 3 to 5 years ○ More than 5 years	
		max.	(min⁻¹)			
		Normal	(min⁻¹)			
	Load	Radial	(N)	Fitting		Material | Tolerance | Surface roughness
		Axial	(N)		Shaft	
		Moment	(N)		Housing	
	Environment	Temperature (°C)	Normal min. max.	Humidity (%)		Cleanliness (Class)
		Pressure (Pa)	×10	○ Atmospheric ○ Atmospheric ⇔ Vacuum ○ Vacuum ○ Other ( )		
		Corrosive atmosphere	○ Present ○ Not present (If you selected "present" Gas :	Liquid :)		
		Usage of grease or oil	○ Possible ○ Not possible ○ Possible but not desirable			
	Other					
Quantity		/unit (line)	Required quantity from this order			
Present condition	Bearing material					
	Lubrication		Lubricant			
	Bearing replacement frequency					
	Failure mode(s)					
Cross sectional sketch of application and additional comments						

● With this sheet, the EXSEV and/or ceramic bearings most suitable for the operating conditions can be selected.

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Koyo Extreme Special Environment Specification Sheet for Linear Motion Bearings

Note: For the selection of the most suitable bearing, this sheet must be completed in as much detail as possible. Date

Bearing Dimensions	Bearing number					
Application			Usage location :			
	○ For new design	○ For repair (replacement)	○ For repair (redesign)			
Special environment (required performance)	☐ Clean ☐ Vacuum ☐ Corrosion resistance ☐ High temperature	☐ Non-magnetism ☐ Insulation ☐ High speed	☐ Others ( )			
Operating condition	Linear motion speed	min.	(mm/s)	Running time	○ 24 h/day ○ h/day ○ Other ( )	
		max.	(mm/s)			
		Normal	(mm/s)		<Target service life> ○ Less than 1 year ○ 1 to 3 years ○ 3 to 5 years ○ More than 5 years	
		Start-up time				
	Movement distance		(mm)	Drive system		
	Load	Bearing loaded (N)				
		Moment (N)				
		Other				
	Environment	Temperature (°C)	Normal min. max.	Humidity (%)		Cleanliness (Class)
		Pressure (Pa)	×10	○ Atmospheric ○ Atmospheric ⇔ Vacuum ○ Vacuum ○ Other ( )		
		Corrosive atmosphere:	○ Present ○ Not present (If you selected "present" Gas	Liquid :)		
		Usage of grease or oil	○ Possible ○ Not possible ○ Possible but not desirable			
	Other					
Quantity		/unit (line)	Required quantity from this order			
Present condition	Bearing material					
	Lubrication		Lubricant			
	Bearing replacement frequency					
	Failure mode(s)					
Cross sectional sketch of application and additional comments						

● With this sheet, the linear motion bearings most suitable for the operating conditions can be selected.

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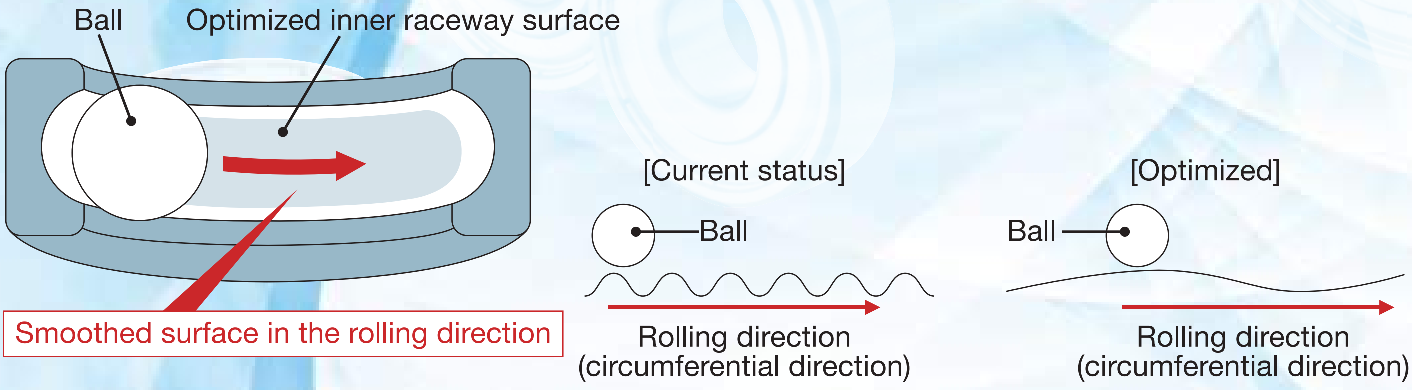

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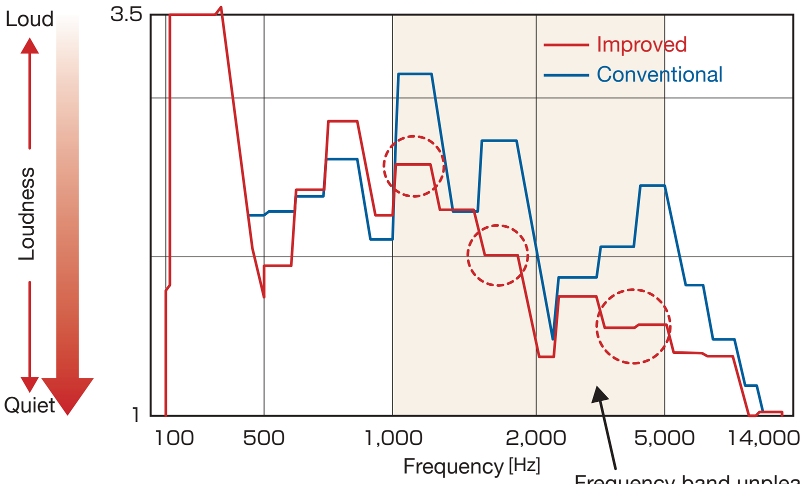
Measured example



Reduced loudness in the 1,000–5,000 Hz frequency band

Frequency band unpleasant to the human ear

Product lineup

Bearing series	Inner dia. No.	Inner dia. (mm)	Outer dia. (mm)	Width (mm)	Basic rated load (kN)		Permissible rotational speed (min^{-1})	
					Cr	Cor	Grease lubrication	Oil lubrication
60	00	10	26	8	5.70	1.95	31,000	36,000
	01	12	28	8	6.40	2.40	27,000	32,000
	02	15	32	9	7.00	2.85	23,000	27,000
62	00	10	30	9	6.40	2.40	24,000	29,000
	01	12	32	10	8.50	3.05	22,000	27,000
	02	15	35	11	9.55	3.75	20,000	24,000
	03	17	40	12	12.0	4.80	17,000	21,000
	04	20	47	14	16.0	6.65	15,000	17,000
	05	25	52	15	17.5	7.85	13,000	15,000
	06	30	62	16	24.3	11.3	11,000	13,000
	07	35	72	17	32.1	15.4	9,200	11,000
	08	40	80	18	36.4	17.8	8,300	10,000
	09	45	85	19	40.9	20.3	7,700	9,200
	10	50	90	20	43.9	23.3	7,100	8,500
63	00	10	35	11	10.1	3.45	22,000	27,000
	01	12	37	12	12.1	4.20	20,000	25,000
	02	15	42	13	14.3	5.45	17,000	20,000
	03	17	47	14	17.0	6.65	15,000	18,000
	04	20	52	52	19.9	7.85	14,000	17,000
	05	25	62	17	25.7	11.3	11,000	13,000
	06	30	72	19	33.3	15.0	9,600	12,000
	07	35	80	21	41.7	19.3	8,500	10,000
	08	40	90	23	50.9	24.0	7,700	9,200
	09	45	100	25	61.1	29.5	6,800	8,100
	10	50	110	27	77.5	38.3	6,100	7,300
69	01	12	24	6	3.60	1.45	31,000	36,000
	02	15	28	7	5.40	2.25	26,000	30,000

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CAT.NO.B1005E-1

EXSEV Bearing Series
Product Guidebook

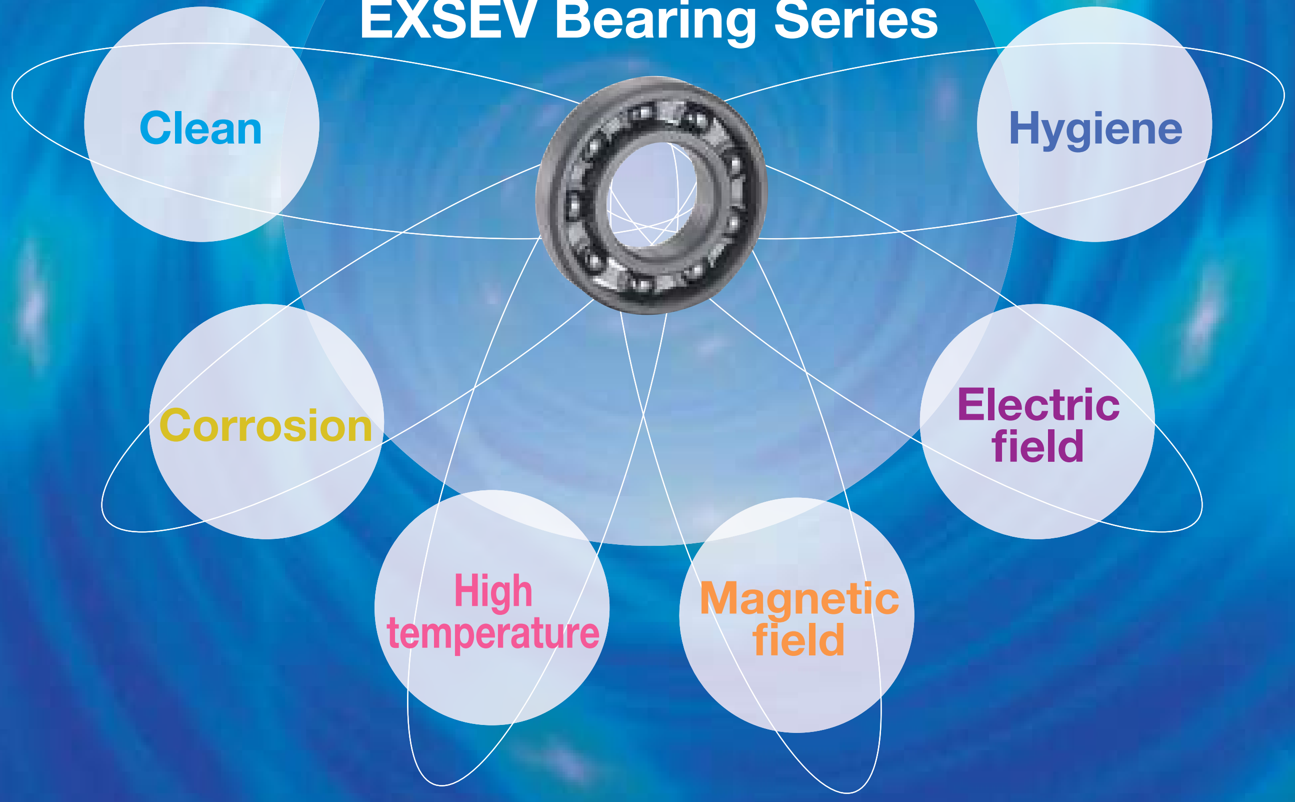
The Koyo EXSEV Bearing Series is a collection of high-performance bearings compatible with special operating environments and conditions, where conventional bearings are not applicable.

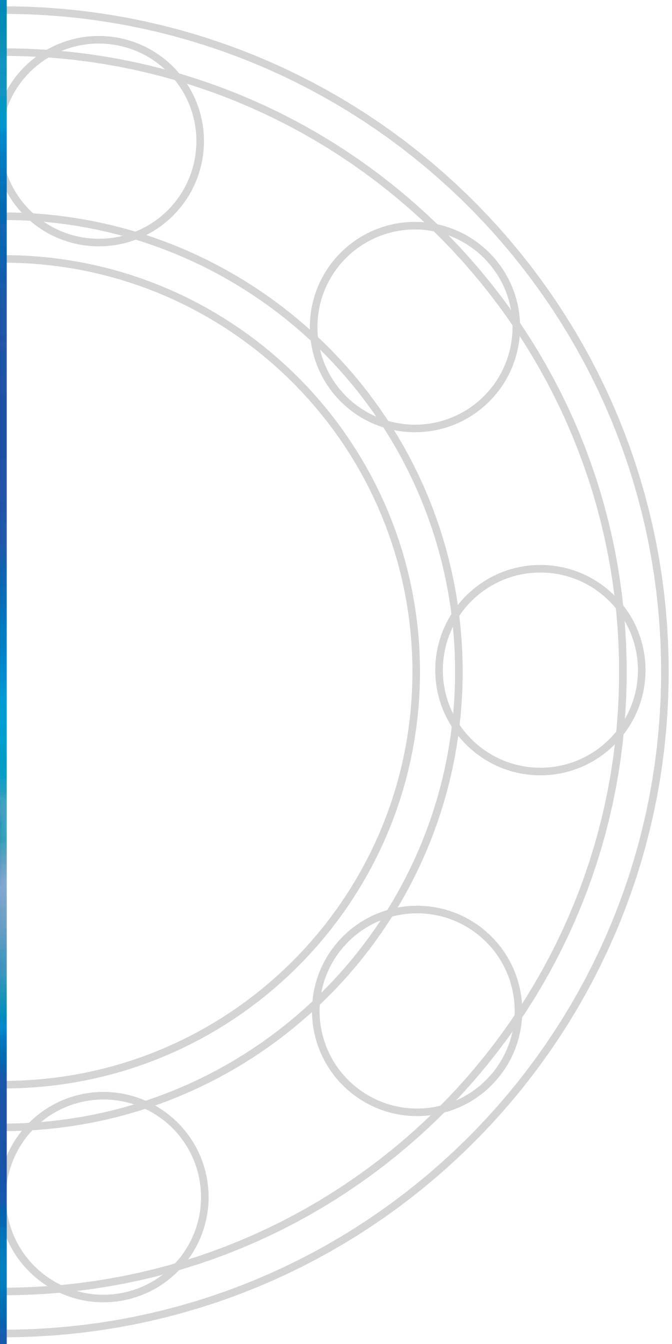
From among our varied collection of EXSEV Series bearings, this Guidebook includes products that are especially contributory to the semiconductor industry, such as in clean-room or vacuum-chamber applications.

Koyo is certain that the high-performance EXSEV Bearing Series, which is the materialization of new values, will assist the many engineers working not only in the semiconductor industry but in a variety of fields.

For your needs in varied extreme special environments

EXSEV Bearing Series





Contents

Clean environment

Corrosive environment

High temperature environment

Magnetic field environment

Electric field environment

Hygiene

EXSEV bearings in daily life and at the cutting edge of technology

Electric field Prevents damage from electric pitting to enable extended operation.

- Hybrid Ceramic Bearing

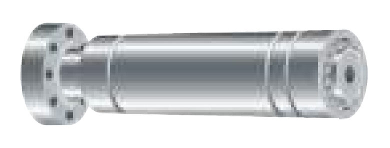
High temperature Compatible with the high temperature environments of the surface treatment used in the solar cell manufacturing process.

- WS Bearing
- PN Bearing
- Full Complement Ceramic Ball Bearing

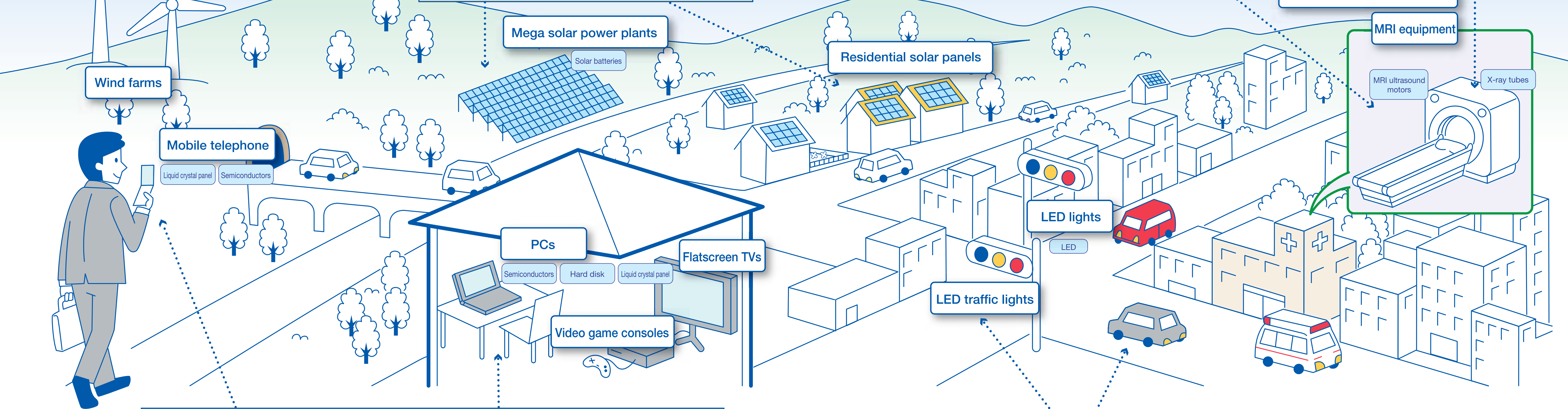
Magnetic field Rotates smoothly even in magnetic fields.

- Non-magnetic Hybrid Ceramic Bearing
- Ceramic Bearing

High temperature **Vacuum** **High Speed** Compatible with the harsh environment needed to generate X-rays.



- Spindle Unit for X-ray Tube



Corrosion Can be used in the corrosive acid/alkaline environments needed for LC panel manufacturing.

- Corrosion Resistant Hybrid Ceramic Bearing
- Corrosion Resistant Bearing Unit with Aligning Ring
- Ceramic Bearing
- Corrosion Guard Pro Bearing

Clean **Vacuum** Helps restrain gas and dust generation to maintain a clean semiconductor manufacturing environment.

- Clean Pro Bearing
- Clean Pro PRZ Bearing
- Touchdown Bearings for Turbo Molecular Pump
- MO Bearing
- MG Bearing
- PN Bearing

High temperature Can be used in the harsh environment needed to manufacture LEDs.

- WS Bearing
- PN Bearing
- Full Complement Ceramic Ball Bearing

🟩	EXSEV bearings are used in the product itself.
🟨	EXSEV bearings are used during manufacturing.

EXSEV Bearings: Table of Characteristics

Major Uses	Products	Applicable Environments 1)																Performance and functions	Bearing Number 4) (Cage Code)	Page
		Limiting Speeds		Permissible radial load	Operating Temp. (℃)							Vacuum (Pa)			Cleanliness (class) 3)					
		dn value 2)	Max.(min^{-1})		~120	~200	~260	~300	~350	~800		Atmosphere	10^{-5}	10^{-10}	1000	100	10			
Clean environment	Clean Pro PRZ Bearing	<10 000	1 000	Approximately 5% of Cr or less	→	→						→	→		→	→	→	High	SE□□□□ZZSTPRZ (YS)	Page 7
	High Temperature Clean Pro Bearing	<10 000	1 000	Approximately 3% of Cr or less	→	→	→					→	→		→	→	→		SE□□□□ZZSTPRB (YS)	Page 7
	Clean Pro Bearing	<10 000	1 000	Approximately 3% of Cr or less	→	→						→	→		→	→	→		SE□□□□ZZSTPR (YS)	Page 8
	DL Bearing	<40 000	—	—	→	→						→	→		→	→			SV□□□□ZZST (YS)	Page 8
	FA Bearing	<10 000	1 000	Approximately 1% of Cr or less	→	→						→	→		→			Low	SE□□□□ZZST (FA)	Page 9
Corrosive environment	High Corrosion Resistant Ceramic Bearing	<10 000	1 000	Approximately 1% of Cr or less	→	→						→	→		→			High	NCZ□□□□ (FA)	Page 9
	Corrosion Resistant Ceramic Bearing	<10 000	1 000	Approximately 1% of Cr or less	→	→						→	→		→				NCT□□□□ (FA)	Page 10
	Ceramic Bearing	<10 000	1 000	Approximately 1% of Cr or less	→	→						→	→		→				NC□□□□ (FA)	Page 10
	Corrosion Guard Pro Bearing	<10 000	1 000	Approximately 3% of Cr or less	→	→	→	→				→	→						3NCT□□□□UN4 (PN)	Page 11
	Corrosion Resistant Hybrid Ceramic Bearing	<10 000	1 000	Approximately 1% of Cr or less	→	→						→	→		→				3NC□□□□ZZMD4 (FA)	Page 11
	SK Bearing	Equal to the *dn* value of normal bearings	—	—	→							→			→			Low	SK□□□□ZZST (YS)	Page 12
High temperature environment	Full Complement Ceramic Ball Bearing	<4 000	1 000	Approximately 1% of Cr or less	→	→	→	→	→	→		→	→	→				High	NC□□□□V (—)	Page 12
	WS Bearing	<4 000	500	Approximately 5% of Cr or less	→	→	→	→	→			→	→						SE□□□□ZZST (WS)	Page 13
	MG Bearing	<10 000	500	Approximately 3% of Cr or less	→	→	→	→	→			Cannot be used under the atmosphere.	→	→					SE□□□□ZZSTMG3 (YS)	Page 13
	PN Bearing	<10 000	1 000	Approximately 3% of Cr or less	→	→	→	→				→	→						SE□□□□ZZST (PN)	Page 14
	MO Bearing	<10 000	1 000	Approximately 3% of Cr or less	→	→	→	→				→	→					Low	SE□□□□ZZSTMSA7 (YS)	Page 14
Magnetic field environment	Non-magnetic Hybrid Ceramic Bearing	<10 000	1 000	Approximately 1% of Cr or less	→	→						→	→						3NC□□□□YH4 (FA)	Page 15
Electric field environment	Hybrid Ceramic Bearing	No less than 1.2 times that of steel bearings	—	—	→							→							3NC□□□□ZZ (FG)	Page 15
Hygiene	Grease-filled Bearing for Food Machinery	Equal to the *dn* value of normal bearings	—	—	General purpose → High temperature →	High temperature →						→							□□□□ZZ (FG)	Page 16

1) Solid lubricants are used in the majority of applicable environments.
2) *dn* value: Bearing bore diameter (mm) × Rotational speed (min^{-1})
3) The cleanliness classes may vary depending on operating conditions.

4) The four blank boxes(□□□□) represent the basic number of the bearing. A basic number consists of three or four alphanumeric characters.
A bearing number may be used as a convenience in the case of any queries to JTEKT.

EXSEV Bearing : Table of standard delivery times

*As situations may charge, contact JTEKT regarding details such as the period for delivery.

🟥 Available as a finished product in stock 🟩 Available as parts in stock, and assembled as ordered 🟪 Produced upon the receipt of an order

Boundary dimensions (mm)			Basic load ratings 1) (kN)		Series / Bearing number	Clean Pro PRZ Bearing	High Temperature Clean Pro Bearing	Clean Pro Bearing	DL Bearing	FA Bearing	High Corrosion Resistant Ceramic Bearing	Corrosion Resistant Ceramic Bearing		Ceramic Bearing	Corrosion Guard Pro Bearing	Corrosion Resistant Hybrid Ceramic Bearing	SK Bearing	SK Bearing (Seal)	Full Complement Ceramic Ball Bearing	WS Bearing	MG Bearing	PN Bearing	MO Bearing	Non-magnetic Hybrid Ceramic Bearing	Hybrid Ceramic Bearing
Bore dia.	Outside dia.	Width	C_r	C_{0r}	Basic number / Prefix Suffix Cage code	SE ZZSTPRZ YS	SE ZZSTPRB YS	SE ZZSTPR YS	SV ZZST YS	SE ZZST FA	NCZ FA	NCT FA		NC FA	3NCT UN4 PN	3NC ZZMD4 FA	SK ZZST YS	SK 2RSST YS	NC V (No cage)	SE ZZST WS	SE ZZSTMG3 YS	SE ZZST PN	SE ZZSTMSA7 YS	3NC YH4 FA	3NC ZZ FG
4	12	4	0.97	0.36	604		🟩	🟩	🟩	🟩	🟪	🟪		🟥		🟪			🟪		🟥	🟪	🟩	🟪	🟩
	13	5	1.30	0.49	624		🟩	🟩	🟩	🟥	🟪	🟪		🟥		🟪			🟪		🟥	🟥	🟩	🟪	🟩
5	14	5	1.30	0.49	605	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟪		🟪			🟪		🟪	🟪	🟪	🟪	🟩
	16	5	1.75	0.67	625	🟪	🟩	🟩	🟩	🟩	🟪	🟪		🟥		🟪			🟪		🟥	🟪	🟩	🟪	🟩
6	17	6	1.95	0.74	606	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟥		🟪			🟪	🟪	🟪	🟪	🟪	🟪	🟩
	19	6	2.60	1.05	626	🟩	🟩	🟩	🟩	🟥	🟪	🟥		🟥		🟪			🟪	🟥	🟥	🟥	🟩	🟪	🟩
7	19	6	2.60	1.05	607	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟥		🟪			🟪	🟪	🟪	🟪	🟪	🟪	🟩
	22	7	3.30	1.35	627	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟪		🟪			🟪	🟪	🟪	🟪	🟪	🟪	🟩
8	22	7	3.30	1.35	608	🟩	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟥	🟥 *			🟪	🟥	🟥	🟥	🟩	🟪	🟩
	24	8	3.35	1.40	628	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟪	🟪	🟪			🟪	🟪	🟪	🟪	🟪	🟪	🟩
9	24	7	3.35	1.40	609	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟪	🟪	🟪			🟪	🟪	🟪	🟪	🟪	🟪	🟩
	26	8	4.55	1.95	629	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟪	🟪	🟪			🟪	🟪	🟪	🟪	🟪	🟪	🟩
9.525	22.225	7.142	2.83	1.13	EE3S	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟪	🟪	🟪				🟩	🟥	🟪	🟩	🟪	🟩
10	22	6	2.30	1.00	6900												🟥	🟥							
	26	8	4.55	1.95	6000	🟥	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟥	🟥	🟥	🟥	🟪	🟥	🟥	🟥	🟩	🟪	🟩
	30	9	5.10	2.40	6200	🟥	🟩	🟩	🟩	🟥	🟪	🟪		🟥	🟥	🟪	🟥	🟥	🟪	🟥	🟪	🟥	🟩	🟪	🟩
12	24	6	2.45	1.15	6901												🟥	🟥							
	28	8	5.10	2.40	6001	🟥	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟥	🟥	🟥	🟥	🟪	🟥	🟥	🟥	🟩	🟪	🟩
	32	10	6.80	3.05	6201	🟥	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟪	🟪	🟥	🟥	🟪	🟥	🟪	🟥	🟩	🟪	🟥
15	28	7	3.65	1.80	6902												🟥	🟥							
	32	9	5.60	2.85	6002	🟥	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟥	🟥	🟥	🟥	🟪	🟥	🟥	🟥	🟩	🟪	🟩
	35	11	7.65	3.75	6202	🟥	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟥	🟪	🟥	🟥	🟪	🟥	🟪	🟥	🟩	🟪	🟥
17	30	7	3.90	2.05	6903												🟥	🟥 *							
	35	10	6.00	3.25	6003	🟩	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟥	🟥	🟥	🟥	🟪	🟥	🟥	🟥	🟩	🟪	🟩
	40	12	9.55	4.80	6203	🟩	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟪	🟪	🟥	🟪	🟪	🟥	🟪	🟥	🟩	🟪	🟥
20	37	9	5.40	2.95	6904												🟥	🟥							
	42	12	9.40	5.05	6004	🟥	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟥	🟥	🟥	🟥	🟪	🟥	🟥	🟥	🟩	🟪	🟩
	47	14	12.8	6.65	6204	🟥	🟩	🟩	🟩	🟩	🟪	🟥		🟥	🟥	🟥	🟥	🟥	🟪	🟥	🟪	🟥	🟩	🟪	🟥
25	42	9	5.95	3.65	6905												🟥	🟥							
	47	12	10.1	5.85	6005	🟩	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟥	🟥	🟥	🟥	🟪	🟥	🟥	🟥	🟩	🟪	🟩
	52	15	14.0	7.85	6205	🟩	🟩	🟩	🟩	🟩	🟪	🟥		🟥	🟥	🟥	🟥	🟥	🟪	🟥	🟪	🟥	🟩	🟪	🟪
30	47	9	6.15	4.00	6906												🟥 *	🟪							
	55	13	13.2	8.25	6006	🟩	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟪	🟥 *	🟥	🟥	🟪	🟥	🟥	🟥	🟩	🟪	🟩
	62	16	19.5	11.3	6206	🟩	🟩	🟩	🟩	🟥	🟪	🟥		🟥	🟪	🟥	🟥	🟥	🟪	🟥	🟪	🟥	🟩	🟪	🟪
35	55	10	9.25	6.20	6907												🟥 *	🟥							
	62	14	15.9	10.3	6007	🟪	🟪	🟪	🟪	🟥	🟪	🟪		🟥	🟪	🟪	🟥 *	🟥	🟪	🟪	🟪	🟪	🟪	🟪	🟩
	72	17	25.7	15.4	6207	🟪	🟪	🟪	🟪	🟪	🟪	🟥		🟥	🟪	🟪	🟥 *	🟥 *	🟪	🟪	🟪	🟪	🟪	🟪	🟪
40	68	15	16.7	11.5	6008	🟪	🟪	🟪	🟪	🟪	🟪	🟥		🟥	🟪	🟪	🟥 *	🟥	🟪	🟪	🟪	🟪	🟪	🟪	🟩
	80	18	29.1	17.8	6208	🟪	🟪	🟪	🟪	🟪	🟪	🟪		🟥	🟪	🟪	🟪	🟥	🟪	🟪	🟪	🟪	🟪	🟪	🟪
Note) As a general rule, the internal clearance of bearings is as shown on the right.						C3	C3	C3	C3 Packed with KDL grease	C3	CN	CN		CN	CN	CN 2)	CN 2) Packed with KHD grease.	CN 2) Packed with KHD grease.	— 3)	C4	C4	C3	C3	CN	C3

1) The basic load rating (C_r) indicates the value for high-carbon steel chrome bearings. These values are used in the calculation of the permissible radial load.
1) The basic load rating (C_r) of each bearing may differ from the values shown in this table.

2) The bearing number marked with an asterisk have a C3 clearance.
3) Because the configuration of these bearings is that of angular contact ball bearings, their basic bearing number and basic load ratings differ from those shown in this table.

Clean Pro PRZ Bearing

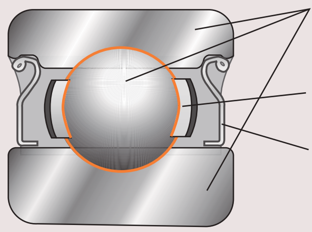
Typical bearing number

SE□□□□ZZSTPRZ (YS)

Advantages

This bearing has a fluoropolymer gel coating on its rolling surfaces as the lubricant.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
＊Ceramic ball types are also available.

Cage
Austenitic stainless steel

Shield
Austenitic stainless steel

Lubrication
Clean pro PRZ coating

Performance

Cleanliness : Class 10[1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −30 to 200 ℃
Limiting speed : $dn < 10\ 000$[2]
1 000 min^{-1} max.
Permissible radial load : ≦ 5% of the basic dynamic load rating[3]

Applications

- Semiconductor manufacturing equipment
- Lithography equipment
- Transfer systems
- Vacuum motors
- Vacuum equipment

High Temperature Clean Pro Bearing

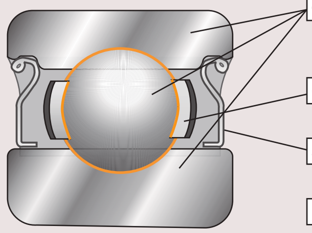
Typical bearing number

SE□□□□ZZSTPRB (YS)

Advantages

This bearing has a fluoropolymer coating on its rolling surface as the lubricant.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
＊Ceramic ball types are also available.

Cage
Austenitic stainless steel

Shield
Austenitic stainless steel

Lubrication
High temperature clean pro coating

Performance

Cleanliness : Class 10[1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 260 ℃
Limiting speed : $dn < 10\ 000$[2]
1 000 min^{-1} max.
Permissible radial load : ≦ 3% of the basic dynamic load rating[3]

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer systems
- Vacuum equipment
- Sputtering equipment

Clean Pro Bearing

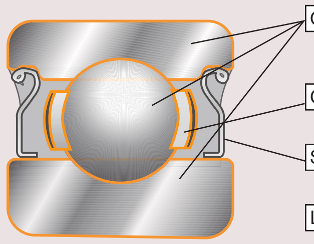
Typical bearing number

SE□□□□ZZSTPR (YS)

Advantages

This bearing is lubricated with a fluoropolymer coating over the entire surface of all bearing components.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
＊Ceramic ball types are also available.

Cage
Austenitic stainless steel

Shield
Austenitic stainless steel

Lubrication
Clean pro coating

Performance

Cleanliness : Class 10[1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 200 ℃
Limiting speed : $dn < 10\ 000$[2]
1 000 min^{-1} max.
Permissible radial load : ≦ 3% of the basic dynamic load rating[3]

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum equipment
- Lithography equipment
- Sputtering equipment
- Vacuum motors

DL Bearing

Typical bearing number

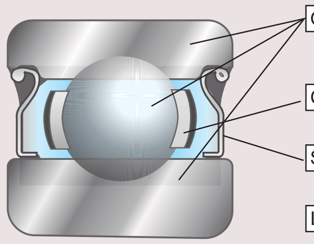
SV□□□□ZZST (YS)

Advantages

This bearing is lubricated with the packed fluorinated KDL grease, which is suitable for use in clean environments and vacuum environments.

* KDL grease can also be sold as a standalone product. For details, see page 19.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
＊Ceramic ball types are also available.

Cage
Austenitic stainless steel

Shield
Austenitic stainless steel

Lubrication
KDL grease

Performance

Cleanliness : Class 100[1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −30 to 200 ℃
Limiting speed : $dn < 40\ 000$[2]

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer robots
- Vacuum pumps

1) The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.
2) When used in an environment where cleanliness is not a significant factor, the product can be used at higher speed, reaching the same limiting speed as that of standard products.

3) The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to page 5 for each product's basic dynamic load rating (*Cr*).

FA Bearing

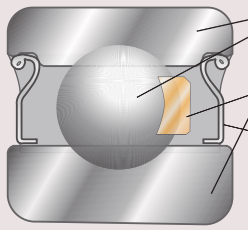
Typical bearing number

SE□□□□ZZST (FA)

Advantages

This bearing is lubricated with a solid fluoropolymer lubricant, which offers superior lubrication performance.
The cage is made from a low-particle-emission fluorocarbon resin.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
＊Ceramic ball types are also available.

Cage
Fluorocarbon resin

Shield
Austenitic stainless steel

Lubrication
Fluorine polymer (solid lubricant)

Performance

Cleanliness : Class 1 000 [1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 200 ℃
Limiting speed : $dn < 10\ 000$ [2]
1 000 min^{-1} max.
Permissible radial load : ≦ 1% of the basic dynamic load rating [3]

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer systems
- Inspection systems

High Corrosion Resistant Ceramic Bearing

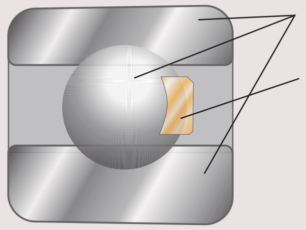
Typical bearing number

NCZ□□□□ (FA)

Advantages

This bearing uses a silicon carbide ceramic material, which is resistant to strong acids and alkalis.

Specifications



Outer/inner rings and balls
Ceramic (silicon cabide)

Cage
Fluorocarbon resin

Lubrication
Fluorine polymer (solid lubricant)

Performance

Cleanliness : Class 1 000 [1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 200 ℃
Limiting speed : $dn < 10\ 000$
1 000 min^{-1} max.
Permissible radial load : ≦ 1% of the basic dynamic load rating [3]

Applications

- Aluminum electrolytic capacitor manufacturing equipment

Corrosion Resistant Ceramic Bearing

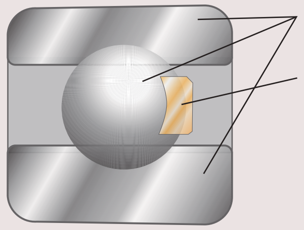
Typical bearing number

NCT□□□□ (FA)

Advantages

This bearing has its components made of corrosion resistant silicon nitride and is lubricated with fluoropolymer. This bearing can be used even in a highly corrosive solution.

Specifications



Outer/inner rings and balls
Ceramic (corrosion resistant silicon nitride)

Cage
Fluorocarbon resin

Lubrication
Fluorine polymer (solid lubricant)

Performance

Cleanliness : Class 1 000 [1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 200 ℃
Limiting speed : $dn < 10\ 000$
1 000 min^{-1} max.
Permissible radial load : ≦ 1% of the basic dynamic load rating [3]

Applications

- Liquid crystal film manufacturing equipment
- Aluminum electrolytic capacitor manufacturing equipment
- Plating equipment
- Synthetic fiber manufacturing equipment
- Food container washing machine

Ceramic Bearing

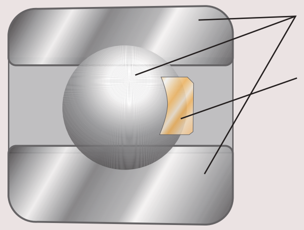
Typical bearing number

NC□□□□ (FA)

Advantages

This bearing has its components made of silicon nitride ceramic and uses fluoropolymer as the lubricant. It is typically used in vacuum and corrosive environments.

Specifications



Outer/inner rings and balls
Ceramic (silicon nitride)

Cage
Fluorocarbon resin

Lubrication
Fluorine polymer (solid lubricant)

Performance

Cleanliness : Class 1 000 [1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 200 ℃
Limiting speed : $dn < 10\ 000$
1 000 min^{-1} max.
Permissible radial load : ≦ 1% of the basic dynamic load rating [3]

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Semiconductor inspection equipment
- Synthetic fiber manufacturing equipment
- Canning machinery
- Ultrasonic motors

---

1) The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.
2) When used in an environment where cleanliness is not a significant factor, the product can be used at higher speed, reaching the same limiting speed as that of standard products.
3) The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to page 5 for each product's basic dynamic load rating (Cr).

Corrosion Guard Pro Bearing

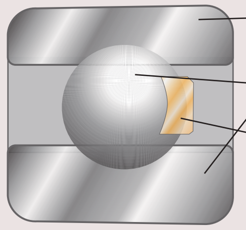
Typical bearing number

3NCT□□□□UN4 (PN)

Advantages

This bearing is harder than normal corrosion-resistant steel, which gives it a long service life and excellent load carrying capability. It is lubricated with the solid lubricant of the molded PEEK resin cage and can be used in corrosive liquids or water.

Specifications



Outer/inner rings
High-hardness and corrosion-resistant stainless steel

Balls
Ceramic (silicon nitride)

Cage
PEEK resin

Performance

Cleanliness : -
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −30 to 300 ℃
Limiting speed : dn < 10 000
1 000 min^{-1} max.
Permissible radial load : ≦ 3% of the basic dynamic load rating [2]

Applications

- High-performance film manufacturing equipment
- Cleaning equipment

Corrosion Resistant Hybrid Ceramic Bearing

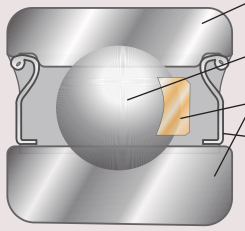
Typical bearing number

3NC□□□□ZZMD4 (FA)

Advantages

This bearing uses a stainless steel variety that has excellent corrosion resistance. As the lubricant, fluoropolymer is used. It is compatible with underwater use.

Specifications



Outer/inner rings
Precipitation hardening stainless steel

Balls
Ceramic (silicon nitride)

Cage
Fluorocarbon resin

Shield
Austenitic stainless steel

Lubrication
Fluorine polymer (solid lubricant)

Performance

Cleanliness : Class 1 000 [1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 200 ℃
Limiting speed : dn < 10 000
1 000 min^{-1} max.
Permissible radial load : ≦ 1% of the basic dynamic load rating [2]

Applications

- Semiconductor manufacturing equipment
- Chemical manufacturing equipment
- Food machinery
- Cleaning equipment

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[1] The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.

SK Bearing

Typical bearing number

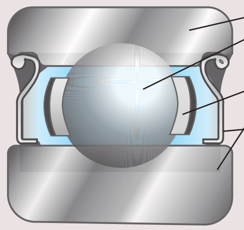
SK□□□□ZZST (YS)

Advantages

This bearing has its components made of stainless steel, and is lubricated with lithium containing KHD grease, which is packed in adequate amounts. This bearing is suitable for use in slightly corrosive environments.

＊Unsuitable for clean environments due to anticorrosive treatment.

Specifications



Outer/inner rings and balls
Martensitic stainless steel

Cage
Austenitic stainless steel

Shield
Austenitic stainless steel

Lubrication
KHD grease

Performance

Cleanliness : -
Ambient pressure : Atmospheric pressure
Temperature : −30 to 120 ℃
Limiting speed : Equal to the dn value of normal bearings

Applications

- Chemical equipment
- Transfer systems

Full Complement Ceramic Ball Bearing

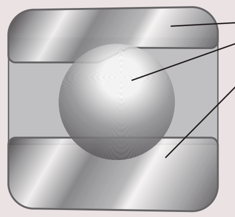
Typical bearing number

NC□□□□V (−)

Advantages

This bearing has all components made of ceramic for use in an ultrahigh temperature environments. No cage is provided. Being an angular contact ball bearing, this bearing is normally used in pairs.

Specifications



Outer/inner rings and balls
Ceramic (silicon nitride)

Cage
Not provided

Lubrication
Not provided

Performance

Cleanliness : -
Ambient pressure : Atmospheric pressure to 10^{-10} Pa
Temperature : −200 to 800 ℃
Limiting speed : dn < 4 000
500 min^{-1} max.
Permissible radial load : ≦ 1% of the basic dynamic load rating [2]

Applications

- Baking furnace cars
- Fans in furnaces

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[2] The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to page 5 for each product's basic dynamic load rating (Cr).

WS Bearing

Typical bearing number

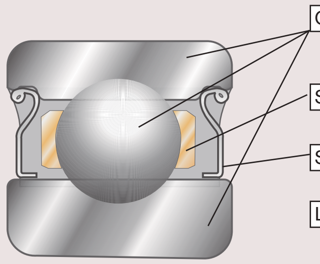
SE□□□□ZZST (WS)

Advantages

This bearing has extremely heat resistant tungsten disulfide included in the separator material as the lubricant.

＊We recommend that this bearing is used with horizontal axes. For information on using this bearing with items other than horizontal axes, consult JTEKT.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
＊Ceramic ball types are also available.
Separator
Sintered composite material including tungsten disulfide
Shield
Austenitic stainless steel
Lubrication
Solid lubricant including tungsten disulfide

Performance

Cleanliness : -
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 350 ℃
Limiting speed : $dn < 4\ 000$
500 min^{-1} max.
Permissible radial load : ≦ 5% of the basic dynamic load rating 1)

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporatior
- Plasma display panel manufacturing equipment

MG Bearing

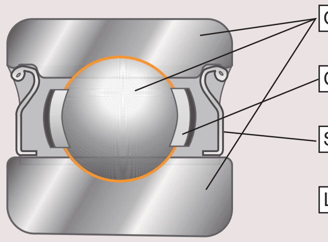
Typical bearing number

SE□□□□ZZSTMG3 (YS)

Advantages

This bearing has silver ion plated on the stainless steel balls, as the lubricant.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
Cage
Austenitic stainless steel
Shield
Austenitic stainless steel
Lubrication
Silver ion plating

Performance

Cleanliness : -
Ambient pressure : 10^{-3} to 10^{-10} Pa
Temperature : −250 to 350 ℃
Limiting speed : $dn < 10\ 000$
1 000 min^{-1} max.
Permissible radial load : ≦ 3% of the basic dynamic load rating 1)

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporatior
- Medical equipment
- Vacuum motors

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1) The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to page 5 for each product's basic dynamic load rating (Cr).

PN Bearing

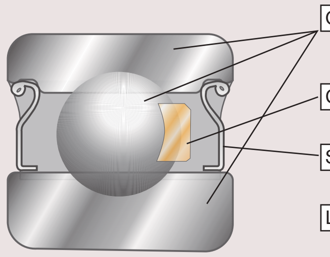
Typical bearing number

SE□□□□ZZST (PN)

Advantages

This bearing has a highly heat resistant solid lubricant, such as molybdenum disulfide included in the cage material.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
＊Ceramic ball types are also available.
Cage
PEEK resin
Shield
Austenitic stainless steel
Lubrication
Solid lubricant including molybdenum disulfide

Performance

Cleanliness : -
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −30 to 300 ℃
Limiting speed : $dn < 10\ 000$
1 000 min^{-1} max.
Permissible radial load : ≦ 3% of the basic dynamic load rating 1)

Applications

- Carton manufacturing equipment
- LCD cleaning equipment

MO Bearing

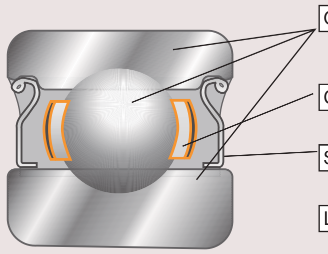
Typical bearing number

SE□□□□ZZSTMSA7 (YS)

Advantages

This bearing has molybdenum disulfide baked on the surface of the stainless steel cage, as the lubricant.

Specifications



Outer/inner rings and balls
Martensitic stainless steel
＊Ceramic ball types are also available.
Cage
Austenitic stainless steel
Shield
Austenitic stainless steel
Lubrication
Molybdenum disulfide

Performance

Cleanliness : -
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 300 ℃
Limiting speed : $dn < 10\ 000$
1 000 min^{-1} max.
Permissible radial load : ≦ 3% of the basic dynamic load rating 1)

Applications

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporator
- Turbo molecular pump
- Rotary furnaces

Magnetic field environment

Non-magnetic Hybrid Ceramic Bearing

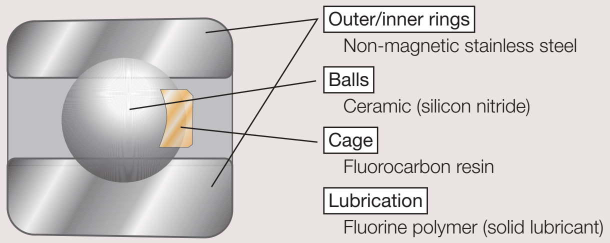
Typical bearing number

3NC□□□□YH4 (FA)

Advantages

This bearing uses non-magnetic stainless steel. It includes fluoropolymer as the lubricant. This bearing can be used in a vacuum environment.

Specifications



Performance

Cleanliness : Class 1 000 [1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −100 to 200 ℃
Limiting speed : $dn < 10\ 000$ [2]
1 000 min^{-1} max.
Permissible radial load : ≦ 1% of the basic dynamic load rating [3]

Applications

- Semiconductor manufacturing equipment
- Semiconductor inspection equipment
- Canning machinery
- Superconductivity-related equipment
- Welder

Electric field environment

Hybrid Ceramic Bearing

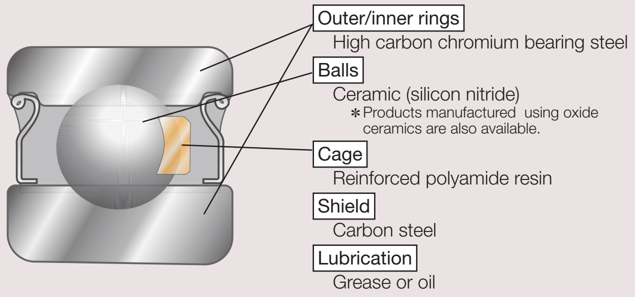
Typical bearing number

3NC□□□□ZZ (FG)

Advantages

This bearing is a standard hybrid ceramic bearing. Lubricated with grease or oil, it can be used as an insulating bearing or high speed bearing.

Specifications



Performance

Cleanliness : -
Ambient pressure : Atmospheric pressure
Temperature : −30 to 120 ℃
Limiting speed : Equal to or higher than 1.2 times the limiting speed of steel bearings

Applications

- High speed stranding machine guide rollers
- Motors
- Generators

Hygiene

Grease-filled Bearing for Food Machinery

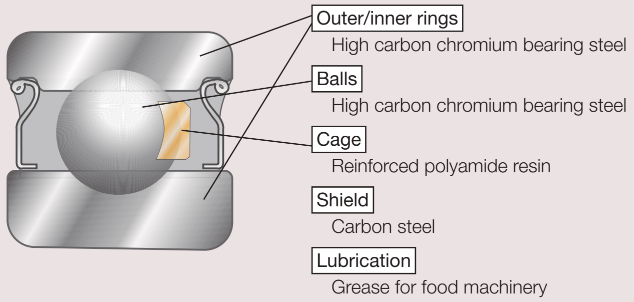
Typical bearing number

□□□□ZZ (FG)

Advantages

This bearing is filled with grease for food machinery. It can be used in hygienic environments such as food machinery or cosmetic/pharmaceutical production machinery.

Specifications



Performance

Cleanliness : -
Ambient pressure : Atmospheric pressure
Temperature : −30 to 120 ℃
Limiting speed : Equal to or higher than 1.2 times the limiting speed of steel bearings

Applications

- Food machinery
- Chemical manufacturing equipment

K Series Full Complement Hybrid Ceramic Ball Bearing

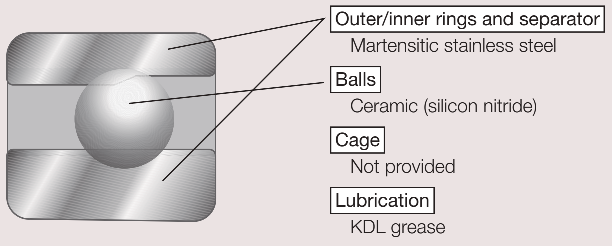
Typical bearing number

3NC□□□□VST-1

Advantages

This bearing is based on the K series super thin section ball bearing, which is widely used in industrial robots. Provided with some adaptations, this bearing is compatible with clean or vacuum environments. It uses fluorinated KDL grease as the standard lubricant. However, it can also be used with other solid greases such as Clean Pro.

Specifications



Performance

Cleanliness : Class 100 [1]
Ambient pressure : Atmospheric pressure to 10^{-5} Pa
Temperature : −30 to 200 ℃

Applications

- Wafer transfer robot
- LCD manufacturing equipment
- Semiconductor manufacturing equipment

Remark

For details, please refer to the EXSEV BEARINGS AND CERAMIC BEARINGS catalog (CAT.NO.B2004E) or consult JTEKT.

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1) The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.

2) When used in an environment where cleanliness is not a significant factor, the product can be used at higher speed, reaching the same limiting speed as that of standard products.

3) The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to page 5 for each product's basic dynamic load rating (Cr).

Linear Motion Ball Bearings

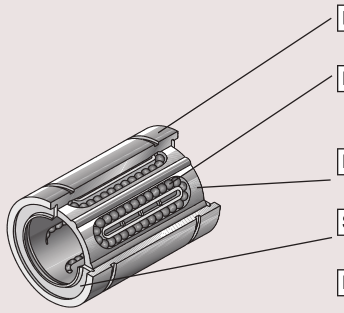
Typical bearing number

○○SDM□□ST△△

Advantages

The linear motion ball bearings are a high precision product that moves linearly in axial directions while having rolling contact with the shaft. Having balls, retainer and shields housed in an external cylinder, this compact bearing moves linearly without limit to the stroke distance.

Specifications



External cylinder
Martensitic stainless steel

Balls
Martensitic stainless steel or ceramics (silicone nitride)

Retainer
Austenitic stainless steel

Shields
Precipitation hardened stainless steel

Lubrication
KDL grease (Standard specification)
Clean pro coating (Clean specification)

Performance

Lubrication specification	Performance		
	Cleanliness	Temperature	Ambient pressure
KDL	Class 100	−30 to 200 ℃	Atmospheric pressure to 10^{-5} Pa
Clean Pro	Class 10	−100 to 200 ℃	

Remark

Symbols determined according to factors such as the type, size, and material are entered in place of ○, □, and △.
For more information, including details of factors other than those mentioned above, please refer to the EXSEV BEARINGS AND CERAMIC BEARINGS catalog (CAT.NO.B2004E) or consult JTEKT.

Linear Way Bearing Units

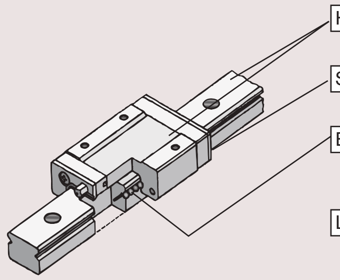
Typical bearing number

○○LW□□□□△△

Advantages

The Linear Way Bearing Units have a slide unit in which balls circulate, allowing the slide unit to move linearly on the track rail without limit. High precision linear motion can be obtained easily by fixing the slide unit and track rail with bolts.

Specifications



Housing and track rail
Martensitic stainless steel

Shields
Austenitic stainless steel

Balls
Martensitic stainless steel or ceramics (silicone nitride)

Lubrication
KDL grease (Standard specification)
Clean pro coating (Clean specification)

Performance

Lubrication specification	Performance		
	Cleanliness	Temperature	Ambient pressure
KDL	Class 100	−30 to 200 ℃	Atmospheric pressure to 10^{-5} Pa
Clean Pro	Class 10	−100 to 200 ℃	

Remark

Symbols determined according to factors such as the type, size, and material are entered in place of ○, □, and △.
For more information, including details of factors other than those mentioned above, please refer to the EXSEV BEARINGS AND CERAMIC BEARINGS catalog (CAT.NO.B2004E) or consult JTEKT.

Ceramic Balls

Advantages

JTEKT also supplies Ceramic Balls (silicon nitride), which have excellent resistance to wear and seizure, and are usable in corrosive environments and ultrahigh vacuums. Other major features of these balls are excellent heat resistance (up to 800℃), high rigidity, lightweight (40% compared to bearing steel), non-magnetic, and have insulating characteristics.
The Ceramic Balls are useful in many applications such as jigs, tools, gauges, solenoid valves, check valves, other valve varieties, high grade bicycle parts, automotive parts, and machine components.

Table of Dimensions and Masses

Nominal dimension		Nominal outside diameter mm	Precision grade [1]	Mass [2] (per piece)
mm	inch			
0.8		0.800 00	3 and 5	0.866 mg
1.0		1.000 00		1.691 mg
1.2		1.200 00		2.922 mg
	1/16	1.587 50		6.766 mg
2.0		2.000 00		13.530 mg
	3/32	2.381 25		22.836 mg
	7/64	2.778 12		36.262 mg
	1/8	3.175 00		54.129 mg
3.5		3.500 00		72.511 mg
	5/32	3.968 75		0.105 7g
	3/16	4.762 50		0.182 7g
	7/32	5.556 25		0.290 1g
	15/64	5.953 12		0.356 8g
	1/4	6.350 00		0.433 0g
	17/64	6.746 88	5	0.519 4g
	9/32	7.143 75		0.616 6g
	5/16	7.937 50		0.845 8g
	11/32	8.731 25		1.125 7g
	3/8	9.525 00		1.461 5g
	13/32	10.318 75		1.858 2g

Notes 1) For the grades, those specified in JIS B 1501 shall apply.
2) The masses are calculated on the basis of 3.23 g/cm³ in density.

Nominal dimension		Nominal outside diameter mm	Precision grade [1]	Mass [2] (per piece)
mm	inch			
	7/16	11.112 75	5 and 10	2.320 8g
	15/32	11.906 25		2.854 5g
	1/2	12.700 00		3.46 g
	17/32	13.493 75		4.2g
	9/16	14.287 50	40	4.9g
	19/32	15.081 25		5.8g
	5/8	15.875 00		6.8g
	3/4	19.050 00		11.7g
	13/16	20.637 50		14.9g
	7/8	22.225 00		18.6g
	15/16	23.812 50		22.8g
	1	25.400 00		27.7g
	1 1/8	28.575 00		39.5g
	1 3/16	30.162 50		46.4g
	1 1/4	31.75000	60	54.1g
	1 5/16	33.337 50		62.7g
	1 1/2	38.100 00		93.5g

Numbering System

5/32 G5 NCR

NCR — Material code : Silicon nitride ceramic
G5 — Precision grade code
5/32 — Nominal dimension

KDL Grease

Advantages

This is low-particle-emission fluorocarbon grease for use in vacuum environments.

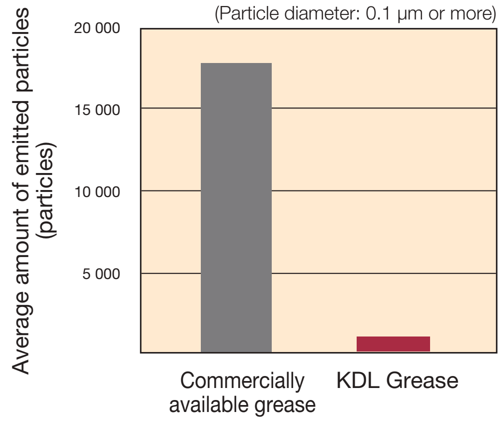
- KDL grease expresses its high properties when used with rolling bearings, linear-motion bearings, and ball screws.
- JTEKT also respond to requests only for grease, so consult JTEKT with such requests.
- This grease can be used up to an atmospheric pressure of 10^{-5} Pa, but consult JTEKT for information on using this grease under conditions combining high temperature and high vacuum.

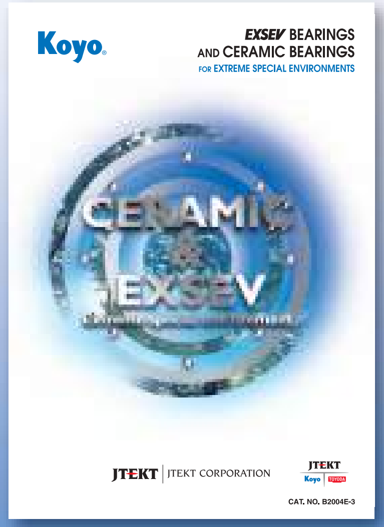
Performance

Characteristics

Thickener		Fluorocarbon resin
Base oil		Fluorocarbon oil
Dropping point		None
Evaporation amount (200 ℃ for 22 h)		0.1 wt% or less
Degree of oil separation (100 ℃ for 24 h)		2 wt% or less
Operating temperature range	Atmosphere	−30 to 200 ℃
	Vacuum	−30 to 100 ℃

Particle-emission characteristic when used to lubricate a rolling bearing
(number of particles per 2.83 × 10^{-3} m^3 [0.1 ft^3])





For details on EXSEV products, please refer to the EXSEV BEARINGS AND CERAMIC BEARINGS FOR EXTREME SPECIAL ENVIRONMENTS catalog (CAT.NO.B2004E).

GLOBAL NETWORK
BEARING BUSINESS OPERATIONS

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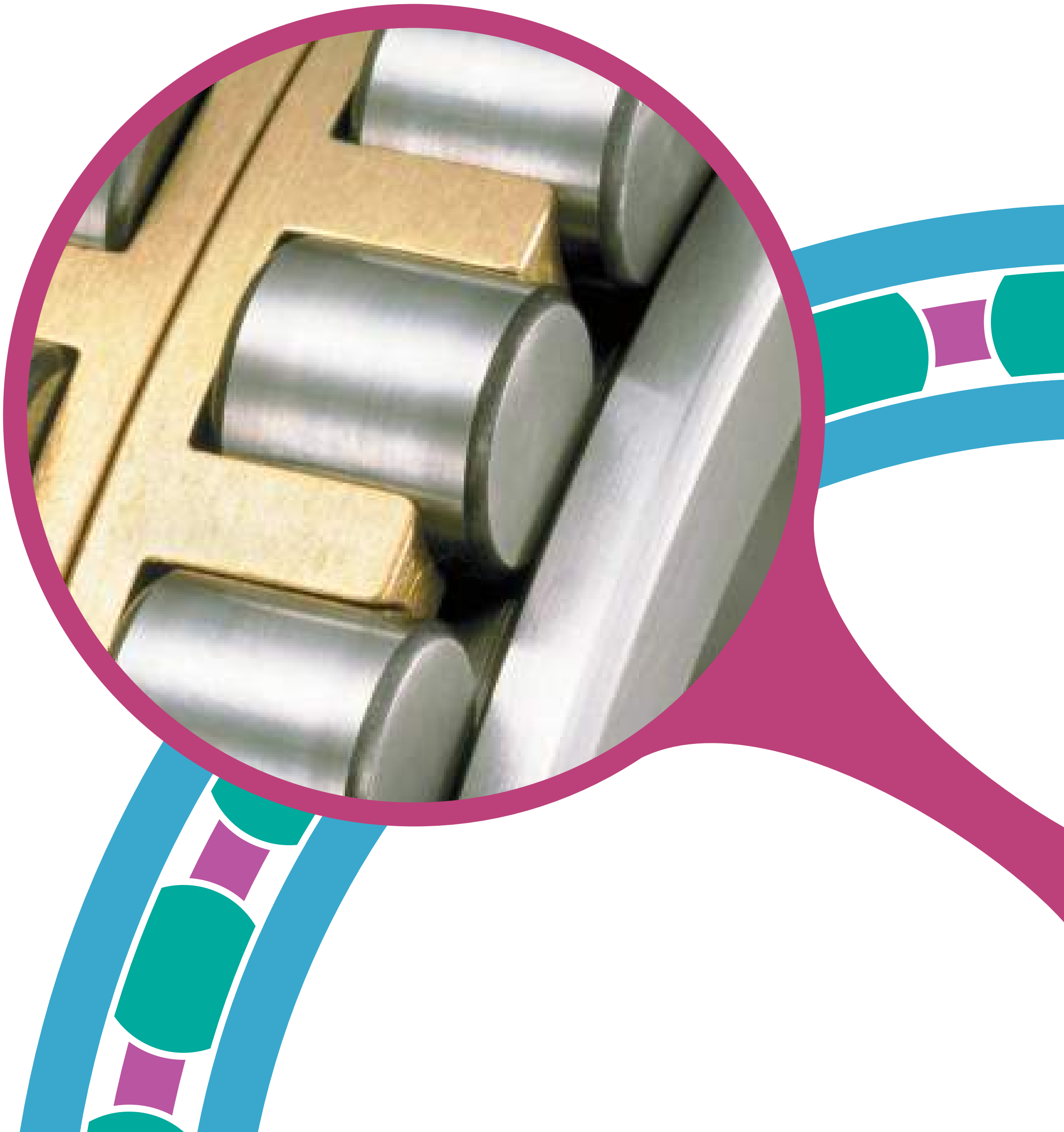
Ball & Roller Bearings:

Failures, Causes and Countermeasures



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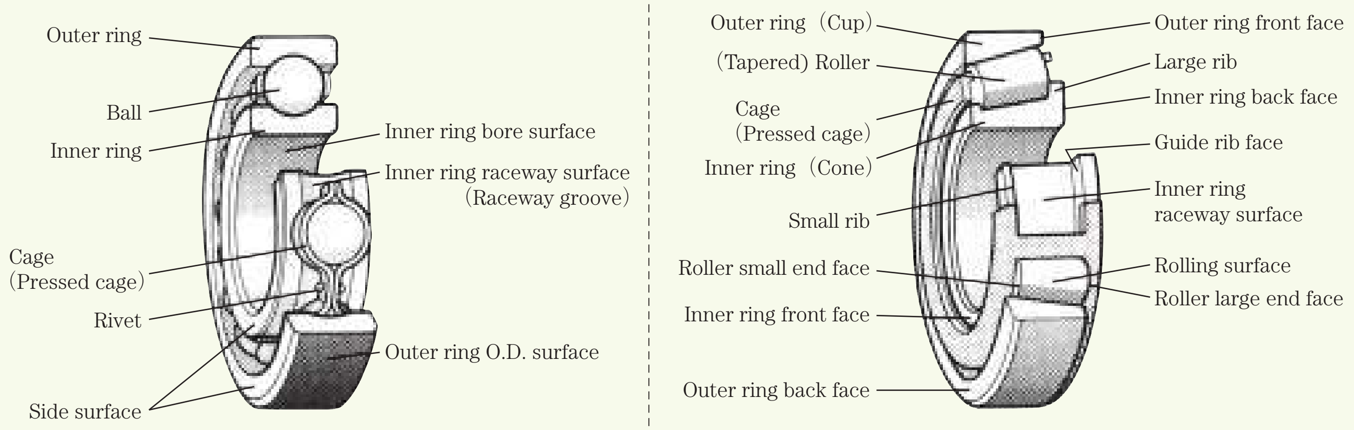
Ball & Roller Bearings: Failures, Causes and Countermeasures

Ⅰ. Bearing Fracture

Ⅱ. Bearing Failure

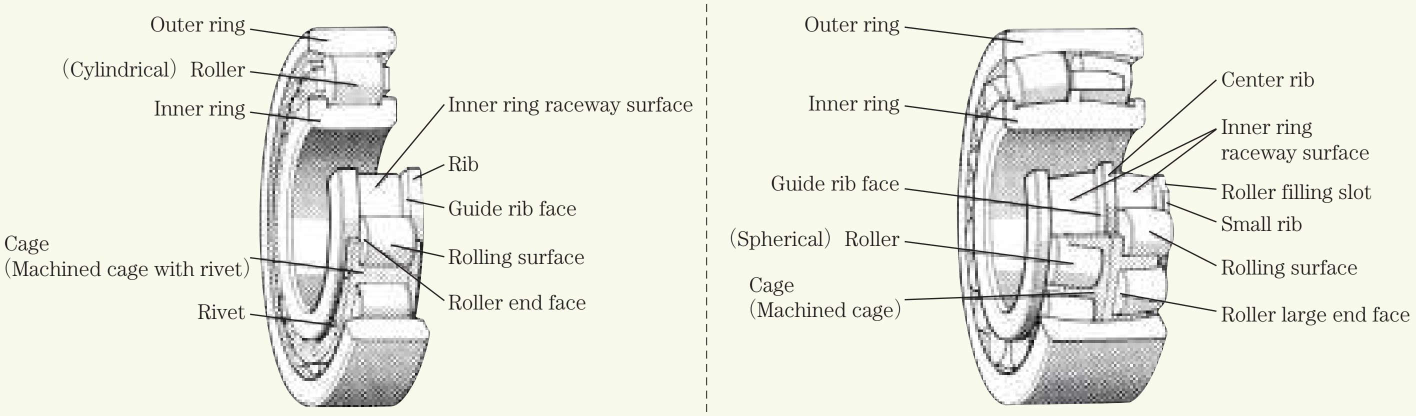
Ⅲ. Failures, Causes and Countermeasures

– Rolling bearing: Description of each part –



(a) Deep groove ball bearing

(c) Tapered roller bearing



(b) Cylindrical roller bearing

(d) Spherical roller bearing

Introduction

Even when bearings are being used under ideal conditions, failures of bearings are caused by deterioration of the material due to rolling fatigue. Generally, the service life of bearings is expressed either as a period of time or as the total number of rotations before the occurrence of failures in the inner ring, outer ring or rolling element because of rolling fatigue, due to repeated stress.

Rolling bearings sometimes fracture earlier than expected. The following causes should be considered;

① Inappropriate use of bearings
② Faulty installation or improper processing
③ Improper lubricant, lubrication method or sealing device
④ Inappropriate speed and operating temperature
⑤ Contamination by foreign matter during installation
⑥ Abnormally heavy load

When bearing failure is found, even if it is insignificant, it is important to investigate the phenomenon to determine the causes. At this time, not only the bearing but also the shaft, housing, and lubricant used with the bearing should be comprehensively investigated, together with the bearing.

To judge the causes of failure, sufficient knowledge and experience in bearings and lubricants and a good understanding of the characteristics of the equipment are necessary. In addition, consideration of the installation conditions and operational process of the bearing is required.

〔Reference〕 Rated service life of rolling bearing

$$L = \left(\frac{C_r}{P}\right)^p$$

$$L_h = \frac{10^6}{60n}\left(\frac{C_r}{P}\right)^p$$

L : Rated service life, 10^6 rotations
L_h : Rated service life, h
C_r : Basic dynamic load rating, N
P : Dynamic equivalent load rating, N
n : Rotational speed, min^{-1}
p : 3 ……Ball bearing,
10/3 …Roller bearing

Ⅰ. Bearing Fracture

1. Time of fracture occurrence and causes

For failure analysis, it is important to accurately determine the time a fracture occurs, because the possible causes of failure can be limited in according to the time of fracture occurrence.

For reference, time of fracture occurrence and related causes are categorized and listed in Table 1–1.

Table 1–1 Time of Breakage Occurrence and Causes

Causes / Time of fracture occurrence	Inappropriate use of bearings	Faulty design of shaft, housing or other installation aspects or improper processing	Improper lubricant, lubrication method or sealing device	Defect in bearings	Mis-mounting of bearings	Defect in sealing device, contamination of water, dust or other foreign matters, or shortage of lubricant
(1) Fracture occurring immediately after bearings were mounted or within a short time after mounting	○	○	○	○	○	
(2) Fracture occurring immediately after overhaul			○		○	
(3) Fracture occurring immediately after lubricant was supplied			○			
(4) Fracture occurring immediately after repair or removal of shaft, housing or other parts		○	○		○	
(5) Fracture occurring during normal operation			○		○	○

2. Abnormal operations, their causes and countermeasures

Causes and countermeasures of abnormal operations are categorized and listed in Table 1–2.

Table 1–2 Abnormal Operations, their Causes and Countermeasures

Abnormal operation		Causes	Countermeasures (supplementary countermeasures)
Increase in temperature		1. Excessively tight bearing internal clearance	Replace with a new bearing.（Correct bearing internal clearance and interference.）
		2. Creep on bearing ring	Replace with a new bearing.（Correct interference.）
		3. Excessively heavy load	Remounting（Correct load by adjusting housing.）
		4. Improper centering in mounting	Remounting（Correct centering, or widen mounting clearance.）
		5. Defect in bearing	Replace with a new bearing.（Take proper countermeasures, after inspecting the causes.）
		6. Improper volume of lubricant	Correct lubricant volume.
		7. Improper lubricant	Change to proper lubricant.
		8. Improper lubrication method	Correct lubrication method by remounting or replacement with new parts.
		9. Oil seal – Excessive interference – Shortage of lubricant – Improper oil seal	Correct interference by installing new seal or changing seal type. Supply lubricant. Correct oil seal type or sealing method.
		10. Abnormal contact with labyrinth seal or other parts	Remounting or modify parts.
Excessively loud noise or foreign noise	Noise at uniform intervals	1. Flaws including scratches, brinelling, etc.	Repair bearings or replace with new ones.（Care should be taken in handling bearings.）
		2. Electric pitting	Repair bearings or replace with new ones.（Prevent electricity from passing through bearings by modifying their design.）
		3. Cracking of inner or outer ring（s）	Replace with a new bearing.
		4. Flaking of raceway surface	Replace with a new bearing.
		5. Receway surface roughened by foreign matter（s）	Repair bearings or replace with new ones.
	High-pitched metallic noise	1. Excessively narrow internal clearance	Replace with a new bearing or widen internal clearance.
		2. Shortage of lubricant	Supply lubricant.
		3. Sliding of rolling element	Change to proper lubricant or decrease operational clearance.
	Noise at nonuniform intervals	1. Contamination by foreign matter（s）	Change to proper lubricant.
		2. Contact with another rolling part	Remounting or modify parts.
		3. Flaw or flaking on rolling element	Replace with a new bearing.
		4. Wear of cage	Replace with a new bearing.
Excessively high vibration		1. Contamination by foreign matter（s）	Change to proper lubricant.
		2. Excessively wide clearance	Remounting bearing or replace with a new one.
		3. Flaw on raceway surface or rolling contact surface	Replace with a new bearing.
Excessively large rotational torque		1. Improper mounting	Remounting（Widen internal clearance. Care should be taken with centering.）
		2. Improper sealing device	Remounting（Reduce interference of oil seal.）
		3. Improper lubricant	Decrease lubricant volume.（Care should be taken not to supply an excessive amount of lubricant.）

Ⅱ. Bearing Failure

1. Types of failure

Defects in the appearance of bearings are referred to as bearing failures. Table 2–1 describes bearing failures, first assigning a general term to each type of failure, then adding more detailed classifications.

Table 2–1 Bearing Failure

Bearing failures		Main cause (reference)
Failures	Failure details	
Rolling fatigue	Flaking, Pitting	Unavoidable
Wear	Wear, Fretting	
Fracture	Cracks, Chips	Improper handling
Flaw	Brinelling, Nicks, Scratches, Scuffing	
Rust	Rust, Corrosion	
Seizure	Seizure, Discoloration, Smearing	Improper lubrication
Creep	Creep	Improper fitting
Electric pitting	Electric pitting	Passage of electricity

2. Types of failure and parts in which they occur

Table 2–2 describes bearing failures, parts where they occur, and standards for judging the failures.

Table 2–2 Bearing Failures, Parts in which they Occur, and Standards for Judging Failures

Bearing failure	Bearing ring, Rolling element			Bearing ring	Cage	
	· Raceway surface · Rolling surface	· Roller guide surface · Cage guide surface · Roller end face	· Others	· Fitting surface	· Pocket surface · Guide surface	· Rivet
Flaking, Pitting	×	—	—	—	—	—
Wear	○	○	○	○	○	×
Fretting	○	—	—	○	—	—
Cracks	×	×	×	×	×	×
Chips	×	×	○	×	×	×
Brinelling	○	○	○	○	—	—
Nicks	○	○	○	○	○	○
Scratches	○	○	○	○	○	○
Scuffing	○	○	○	○	—	—
Rust	○	○	○	○	○	○
Corrosion	○	○	○	○	○	○
Pear skin	○	—	—	—	—	—
Discoloration	○	○	○	○	—	—
Smearing	○	○	—	—	—	—
Creep	—	—	—	○	—	—
Electric pitting	○	○	—	—	○	—
Seizure	×	×	×	×	×	—
Failure of cage	—	—	—	—	○	×

Notes） × : In principle, not reusable.
○ : Reusable in accordance with seriousnes of failure, by repairing or meeting required conditions.
— : No failure of this part.

3. Failures and causes

Table 2–3 describes failures and causes. For further detail, refer to Section "Ⅲ. Failures, Causes and Countermeasures".

Table 2–3 Failures and Causes

	Failure	Cause
Flaking	Circumference on one side (Fig. 1)	Excessive axial load
	Symmetrical flaking on each side (Fig. 2)	Inclined mounting, or shaft or housing not in the shape of a circle
	Flaking on one side or flaking in the form of an oblique line on raceway surface of bearing ring on fixed side (Fig. 3)	Distortion of shaft, insufficient centering, bearings not installed on shaft at the correct angle
	Partial flaking on thrust bearing	Eccentric mounting
	Flaking found on part only	Contamination by foreign matter(s), flaws, initial stage of flaking
Scratches, Scuffing	Scuffing on roller end face and guide rib face (Fig. 4)	Excessive axial load, improper lubrication
	Scraches on raceway surface	Grease of too high viscosity, excessive acceleration in starting
	Scratches on raceway surface oh thrust bearing	Sliding of rolling element caused by centrifugal force during rotation
Cracks, Chips	Cracks or chips of rolling element (Fig. 5)	Improper bearing material, excessive impact too wide internal clearance of cylindrical roller bearing
	Cracks or chips of inner ring or outer ring (Fig. 5)	Advanced stage of flaking, improper bearing material, interference too large, housing of inaccurate design
	Cracks, chips of rib (Fig. 5)	Impact in mounting, axial impact, load too heavy
	Cracks, chips of cage	Improper lubricant or lubrication method, high speed operation, vibration impact too strong, advanced stage of wear
Creep	Creep on inner/outer rings	Insufficient interference
Wear	Wear on inner/outer rings	Sliding abrasion, bearing of insufficient hardness, contamination by foreign matter(s), shortage of lubricant, improper lubrication
	Wear caused by creep	Creep
	Wear on cage	Contamination by foreign matter(s), improper lubrication, inclined bearing
Rust, Corrosion	Rust on inner ring bore surface or outer ring O.D. surface	Fretting, water, humidity
	Rust covering whole bearing surface, corrosion	Defective washing oil or lubricant, water, humidity
Others	False brinelling (Fig. 6)	Progressing stage of flaws caused by load from vibration when machine is not running.
	Fluting on raceway surface or roller rolling surface (Fig. 7)	Passage of electricity
	Discoloration	Heat generation, chemical action

Sketches of failures

Fig.1 Flaking along circumference on one side. (Deep Groove Ball Bearing)

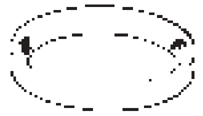


Fig.2 Symmetrical flaking on each side. (Tapered Roller Bearing)

Fig.3 Flaking in the form of an oblique line. (Deep Groove Ball Bearing)

Fig.4 Scuffing on roller end face and guide rib face. (Cylindrical Roller Bearing)

Fig.5 Cracks and/or chips on inner ring or roller. (Spherical Roller Bearing)

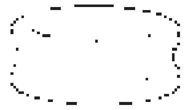


Fig.6 False brinelling on inner ring. (Deep Groove Ball Bearing)

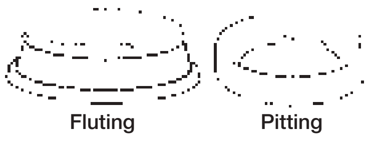


Fig.7 Type of Electric pitting.

Ⅲ. Failures, Causes and Countermeasures

1 Flaking, Pitting

Phenomena, causes and countermeasures

Phenomena

- ■ Flaking is a phenomena in which the bearing surface turns scaly and peels off due to contact load repeatedly received on the raceway and rolling surface during rotation.

  Occurrence of flaking indicates that the end of a bearing's service life is near.

- ● Pitting is a phenomena in which small holes 0.1 mm in depth are generated on the raceway surface by rolling fatigue.

※Flaking and pitting are often found at an early stage. In this case, countermeasures should be taken, after examining the causes.

Causes

Flaking and pitting occur early in a bearing's service life under the following conditions:

1) During operation, bearing internal clearance becomes narrower than specified.
2) Bearing ring is mounted at an inclination by mistake.
3) Flaw is created during mounting, or brinelling, nicks, rust, etc. occur on the raceway surface or rolling surface.
4) Inaccurate shape of shaft or housing (imperfect circle, depressions on surface.)

Countermeasures

■ Flaking

a) Use a bearing with heavier rated load.
b) Check if abnormal load is being generated.
c) Improve lubrication method to ensure better formation of lubricant film, by increasing the viscosity.
d) When a failure is discovered at an early stage, the countermeasures described above should be taken, after investigating the causes.

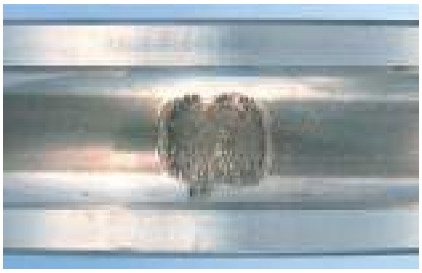
● Pitting

a) Increase viscosity of lubricant to ensure better formation of lubricant film.

(Care should be taken because foreign matters appear similar to holes caused by brinelling or corrosion.)

Examples of failures

■ Flaking on inner ring of Deep Groove Ball Bearing



(A-6977)

■ Flaking on inner ring of Cylindrical Roller Bearing

(A-7024)

■ Flaking on outer ring of Double-Row Cylindrical Roller Bearing

(A-6466, 6473)

■ Flaking on inner ring of Tapered Roller Bearing

(A-6644, 6645)

■ Flaking on inner ring of Spherical Roller Bearing

(A-6476)

2 Wear and Fretting

Phenomena, causes and countermeasures

Phenomena

■ Wear is caused mainly by sliding abrasion on parts including the roller end face and rib, cage pocket surface, cage, and the guide surface of the bearing ring.
Wear due to contamination by foreign matter and corrosion occurs not only to the sliding surface but also to the rolling surface.

● Fretting is a phenomena which occurs when slight sliding is repeatedly caused on the contact surface.
On the fitting surface, fretting corrosion occurs, generating a rust like powder.

▲ If bearings receive a vibration load when they stop or operate, slight sliding occurs in the section between the rolling element and bearing ring due to elastic distortion.
False brinelling, a flaw similar to brinelling, is generated by this condition.

Causes

■ Wear
1) Improper lubricant or shortage of lubricant.
2) Contamination by foreign matter(s).

● Fretting
1) Vibration load.
2) Slight vibration on fitting surface caused by load.

Countermeasures

■ Wear
a) Review and improvement of lubricant and lubrication method.
b) Filtering of oil.
c) Improvement of sealing.

● Fretting
a) Investigation and countermeasures for the source of vibration.
b) Investigation and increase of interference.
c) Enhancement of shaft rigidity.

Examples of failures

■ Wear on roller and face of Cylindrical Roller Bearing

(A-4718)

■ Wear on outer ring raceway surface of Double-Row Cylindrical Roller Bearing

(A-6714)

● Fretting on inner ring bore surface of Tapered Roller Bearing

(A-6649)

● Fretting on outer ring O.D. surface of Deep Groove Ball Bearing
Vertical fretting at symmetric positions 180° apart.

(A-6735)

▲ False brinelling on inner ring raceway surface of Deep Groove Ball Bearing

(A-7278)

3 Cracks and Chips

Phenomena, causes and countermeasures

Phenomena

■ Cracks include slight cracks, splitting and fracture.

● Chips are a type of failure occurring at a certain part of a bearing ring rib or corner of a roller.

Causes

■ Cracks

1) Heavy load.
2) Excessively heavy internal load caused by improper installation.
3) Excessive interference at fitting, or shaft and housing of improper shape.
4) Instantaneous heat generation of bearing caused by sudden sliding at rolling surface, sliding surface or fitting surface.
5) Abnormal heat is generated due to shortage of lubricant.

● Chips

1) Abnormally heavy axial load or impact load.
2) Partial impact of hammer or other tool used when bearing is mounting or dismounting.

Countermeasures

■ Cracks

a) Investigation followed by countermeasures for excessively heavy load.
b) Removal of thermal impact.
c) Improvement of interference (decrease of interference.)

● Chips

a) Improvement of mounting and dismounting procedures.
b) Improvement of handling method.
c) Investigation followed by countermeasures for excessively heavy load.

Examples of failures

■ Crack and chip in a Spherical Roller Bearing

(A-6395)

■ Crack on outer ring of Four-Point Contact Ball Bearing

Crack starting from key groove on O.D. surface.

(A-6625)

■ Crack in outer ring of Double-Row Cylindrical Roller Bearing

(A-6626)

● Chip in outer ring rib of Cylindrical Roller Bearing

(A-6555)

● Chip in outer ring rib of Cylindrical Roller Bearing

(A-6658)

4 Brinelling and Nicks

	Phenomena, causes and countermeasures	Examples of failures
Phenomena	■ Brinelling is depressions created on the part of the raceway surface which comes into contact with the rolling element, and is due to plastic deformation. Brinelling is also small depressions on the rolling surface caused by contamination by solid foreign matters. ● Nicks are a flaw caused by the direct impact received when bearings are hit by a hammer or other solid tool.	■ Brinelling on outer ring raceway surface of Deep Groove Ball Bearing  (A-6474) ■ Brinelling on inner ring raceway surface of Tapered Roller Bearing  (A-6617)
Causes	■ Brinelling 1） Extremely heavy load （static load, impact load） applied to bearing. 2） Solid foreign matter caught in bearing parts. ● Nicks 1） Faulty bearing mounting or dismounting. 2） Mis-handling of bearings.	
Countermeasures	■ Brinelling a） Investigation followed by countermeasures for excessively heavy load or impact. b） Enhancement of sealing capability. c） Careful washing of shaft and housing to remove foreign matter. d） Filtering of oil. e） Investigation of flaking in target bearing together with other bearings. ● Nicks a） Improvement of bearing mounting and dismounting. b） Improvement of bearing handling.	

5 Scratches and Scuffing

Phenomena, causes and countermeasures

Phenomena

■ A scratch is a relatively shallow flaw caused by sliding contact.

● Scuffing is a flaw caused by high contact pressure and heat on the rolling surface.

In general, more serious scratches are regarded as scuffing.

1) Flaw in the axial direction (flaw occurring in mounting)
   In the mounting of bearings whose outer rings and inner rings are separable, a flaw in the axial direction is sometimes caused by contact with the edge of rollers or raceway surfaces.
   These are referred to as flaws in the axial direction.

2) Scuffing on roller end face and rib face
   Cycloidal flaws can occur on the roller end or rib face of the bearing ring, which guides rollers.
   Flaws such as scratches, which occur on these parts are called scuffing.

Causes

(1) Flaw generated during mounting.
  1) Careless handling in mounting or dismounting.

(2) Scuffing on roller end face and rib face.
  1) Improper lubrication at contact face.
  2) Excessive preload.
  3) Intrusion of foreign matter.
  4) Abnormal axial load.

(3) Scratches and scuffing on raceway surface and rolling surface.
  1) Improper rotation of rolling element.
  2) Improper lubrication.
  3) Intrusion of foreign matter.

Countermeasures

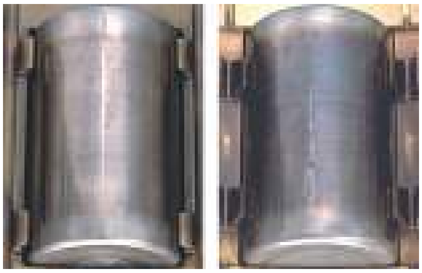
(1) Flaw generated during mounting.
  a) Improvement in operations involved in mounting and dismounting.
     (Implementation of accurate center adjustment.)

(2) Scuffing on roller end face and rib face.
  a) Review and improvement of lubricant and lubrication method.
  b) Inspection and countermeasures for abnormal load.
  c) Enhancement of sealing capability.

(3) Scratches and scuffing on raceway surface and rolling surface.
  a) Review and improvement of lubricant and lubrication method.
  b) Enhancement of sealing capability.
  c) Sufficient cleaning of shaft and housing.

Examples of failures

■ Scratch on roller rolling surface of Cylindrical Roller Bearing



(A-6451, 6453)

■ Scratch on roller rolling surface of Cylindrical Roller Bearing

Scratch occurring in circumference direction.

(A-6452)

■ Scratch on outer ring raceway surface of Double-Row Cylindrical Roller Bearing

Roller which slides when running.

(A-6470)

● Scuffing on inner ring bore surface of Tapered Roller Bearing

(A-6736)

● Scuffing on inner ring rib face and roller and face of Cylindrical Roller Bearing with rib

(A-6669)

6 Rust and Corrosion

Phenomena, causes and countermeasures

Phenomena

■ Rust is a film of oxide, hydroxide, or carbonate produced on a metallic surface by chemical action.

● Corrosion is the phenomena of oxidation or dissolution occurring on the surface and is produced by chemical action (electric chemical action including combination or cell restructuring) with acid or alkali.

Causes

■ Rust

1) When equipment is stopped and its temperature decreases to the dew point, humidity in the housing turns into drops of water. The water drops often contaminate the lubricant. As a result, rust is generated on the bearing surface.

2) When bearings are stored in a humid place for a long time, rust is generated on the raceway surface at intervals equal to the rolling elements spacing.

● Corrosion

1) Corrosion occurs when a sulfur or chlorine compound contained in lubricant additives decomposes under high temperature.

2) Corrosion occurs when water gets inside bearings.

Countermeasures

■ Rust ● Corrosion

a) Enhancement of sealing capability.

b) Periodic inspection of lubricant.

c) Provision for adequate rust prevention during storage of bearings.

Examples of failures

■ **Rust on outer ring raceway surface of Double-Row Angular Ball Bearing**

Rust on raceway surface of one row.

(A-6494)

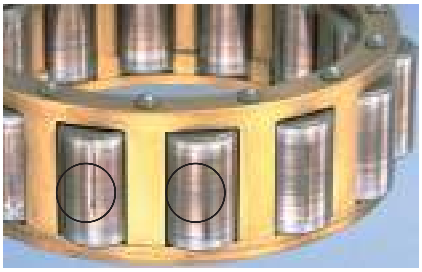
■ **Rust on outer ring raceway surface of Double-Row Cylindrical Roller Bearing**

Rust on roller pitch.

(A-6472)

■ **Rust on roller rolling surface of Cylindrical Roller Bearing**

Rust at one position the rollers.



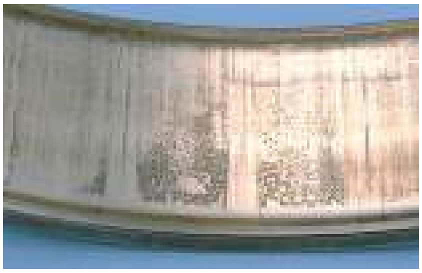
(A-6479)

■ **Rust on inner and outer rings and on roller of Tapered Roller Bearing**

Rust on roller pitch of one row.

(A-7130)

■ **Rust on outer ring raceway surface of Tapered Roller Bearing**



(A-7051)

7 Pear skin, Discoloration

Phenomena, causes and countermeasures

Phenomena

■ Pear skin is a condition of the rolling surface where small depressions are created entirely as a result of many foreign matters being caught between parts.

A rolling surface suffering from pear skin appears dim and is rough in texture. In the worst case, the surface is discolored by heat.

● Discoloration is a phenomena in which the bearing surface is discolored by staining or heat generated during operation.

Causes

■ Pear skin

Since pear skin is mainly caused by contamination by foreign matter or lack of lubricant, these two points should be inspected most carefully.

● Discoloration

1) Discoloration (staining) is caused by deterioration of the lubricant or adhesion of colored substances to the bearing surface.
Some of these substances can be removed by scrubbing or wiping with a solvent.

2) A brown discoloration of the rolling or sliding surface is caused by adhesion of acidic powders generated by abrasion during operation.
In general, these powders adhere uniformly to the bearing circumference.

Countermeasures

■ Pear skin

a) Careful washing of shaft and housing.
b) Enhancement of sealing capability.
c) Filtering of oil.
d) Review of lubricant and lubrication method.

● Discoloration

Discoloration can be classified as follows: staining, electric pitting, rust, corrosion, and temper color. Stains can be removed by wiping with an organic solvent (aceton). When observed by microscope, electric pitting is small depressions caused by electric discharge. If unevenness remains on the surface after wiping with sand paper, the phenomena are judged to be rust and corrosion. If unevenness is completely removed, the phenomena is judged to be temper color caused by heat.

a) Improvement of heat dissipation from bearings.
b) Improvement of lubrication.
c) Review followed by countermeasures for bearing operating conditions.

Examples of failures

■ Pear skin on inner ring raceway surface of Double-Row Cylindrical Roller Bearing

(A-6556)

■ Pear skin on inner ring raceway surface of Deep Groove Ball Bearing

(A-6960)

● Discoloration on ball surface of Deep Groove Ball Bearing

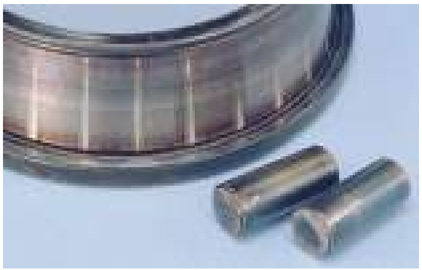
(A-6639)

● Discoloration on raceway surface, roller rolling surface of Cylindrical Roller Bearing

(A-6725)

● Discoloration on inner ring and roller of Tapered Roller Bearing

Staining



(A-6982)

Ⅲ. Failures, Causes and Countermeasures

8 Smearing

	Phenomena, causes and countermeasures
Phenomena	■ Smearing is a phenomena where minute seizure is concentrated on the rolling surface. In smearing, the surface is partially melted by heat of high temperature generated by friction; and on some parts, the surface damaged becomes significantly rough.
Causes	1) Smearing occurs if the oil film disappears as rolling elements stop rotating due to inappropriate use or improper lubrication, and then start to slide on the raceway surface. 2) In ball bearings, smearing is caused by sliding or spinning of balls; and, in roller bearings, smearing tends to occur when the roller enters into on from the load zone.
Countermeasures	a) Review followed by countermeasures to improve the formation of oil film. b) Provision for extreme-pressure lubricant. c) Adoption of countermeasures to prevent sliding. (by diminishing mounting clearance.)

Examples of failures

■ Smearing on inner ring raceway surface of Deep Groove Ball Bearing

(A-6640)

■ Smearing on ball surface

(A-6641)

■ Smearing on inner ring raceway surface of Angular Ball Bearing

(A-6642)

■ Smearing on outer ring raceway surface of Cylindrical Roller Bearing

(A-7435)

■ Smearing on roller rolling surface of Cylindrical Roller Bearing

(A-6480)

9 Creep

	Phenomena, causes and countermeasures	Examples of failures
Phenomena	■ Creep is the displacement during operation of a bearing ring, relative to the shaft or housing.	■ Creep of Deep Groove Ball Bearing inner ring  (A-6726) ■ Creep of Deep Groove Ball Bearing outer ring  (A-6957) ■ Creep of Double-Row Cylindrical Roller Bearing inner ring  (A-6647) ■ Creep of Tapered Roller Bearing inner ring  (A-6616)
Causes	Creep occurs when interference is too small in relation to the heat or load generated during operation.	
Countermeasures	Review of interference between inner ring and shaft and between outer ring and housing.（Increase of interference.）	

10 Electric pitting

	Phenomena, causes and countermeasures	Examples of failures
Phenomena	■ Electric pitting is a phenomena in which the bearing surface is partially melted by sparks generated when electric current enters the bearing and passes through an extremely thin oil film at the rolling contact point. Electric pitting can be classified into pitting or ridge marks, which the rolling contact surface propagates. Depressions like craters can be observed when pitting is magnified, indicating that the surface has been melted by sparks. ・Significant electric pitting causes flaking. In addition, since the hardness of the rolling contact surface deteriorates, the surface tends to be easily worn. ・If a fluting surface is found by manual inspection, or pitting is observed by normal visual inspection, the bearing cannot be re-used.	■ Electric pitting on Deep Groove Ball Bearing Fluting on inner ring raceway surface.  (A-6652) ■ Electric pitting on Cylindrical Roller Bearing  (A-6653) ■ Electric pitting on Cylindrical Roller Bearing inner ring  (A-5180) ■ Fluting on Cylindrical Roller Bearing inner ring  (A-6651) ■ Fluting on Spherical Roller Rolling surface  (A-6409, 6650)
Causes	Bearing surface is partially melted by electric current passing through the bearing.	
Countermeasures	a) Improvement of grounding or improvement of grounding maintenance. b) Provision of insulation for bearings or for the section near bearings.	

11 Seizure

Phenomena, causes and countermeasures

Phenomena

- Although scuffing and smearing can be categorized as seizure, scuffing is generally regarded as a more serious type of failure. The seizure described in this section is the kind in which bearing parts are melted and adhere to one another due to abnormal heat or the rolling surface becoming rough; as a result, the bearing can no longer rotate.

· Once seizure occurs, the bearing cannot be used again because the hardness has deteriorated and smooth rotation is impossible on the rough surface.

Causes

Seizure results from abnormal heat generated by improper lubrication, excessive preload, or improper contact of rolling elements with the raceway surface, which cannot be compensated for by the cooling method or lubrication employed in the bearings.

Countermeasures

Causes should be investigated; and appropriate countermeasures corresponding to the results should be taken.

Examples of failures

■ Seizure of Cylindrical Roller Bearing

Rollers are removed because pocket surface of cage has become worn.

(A-6457)

■ Seizure of Cylindrical Roller Bearing with rib

(A-6464)

■ Seizure of Tapered Roller Bearing

Heat is generated on roller end face and inner ring rib face.

(A-6679)

12 Failure of Cage

Phenomena, causes and countermeasures

Phenomena

1) Cracks and Chips
If a seriously cracked bearing is used under heavy operating conditions, it will fail.

2) Flaw and Distortion
- Since cages are made from soft material, they tend to be damaged or become distorted by external forces or from contact with other parts.
- Since cages with a serious flaw also have distortion, their accuracy may decrease.
And the motion of the rolling element is consequently affected; therefore, especially the size and location of the flaw should be checked with care.

3) Rust and Corrosion
If rust or corrosion is found on cages, it can be assumed that it is also occurring on the bearing ring and rolling element.

4) Wear
As described in Section 2, cages under the following conditions can no longer be used because proper rotation of the rolling element is hindered: cages whose pocket surface has been worn down in the shape of the rolling elements; cages which cannot maintain the rolling elements, and cages whose guide surface for the bearing ring has been eccentrically or severely worn.

5) Looseness and Improper Riveting
Looseness of the rivet is caused by an error in bearing mounting, moment load, variable load, vibration, etc.
If a bearing is operated with improper riveting, the bearing cannot be returned to service because the rivets may break.

Causes and countermeasures

1) Cracks and Chips
   a) Careless handling.
   b) Abnormal load, Vibration impact.
2) Flaw, Distortion
   a) Careless handling.
3) Rust, Corrosion
   a) Improvement of sealing capability.
      Periodic inspection of lubricant.
   b) Provision of adequate rust prevention during storage of bearings
4) Wear
   a) Improper lubricant or shortage of lubricant ... Investigation followed by countermeasures involving lubricant and lubrication method.
   b) Contamination by foreign matter ... Improvement of sealing capability.
5) Looseness and Cut-Off of Rivet
   a) Improper bearing mounting ... Reduction of bearing inclination.
   b) Severe load or vibration ... Consultation with Koyo.

Examples of failures

● Crack of Deep Groove Ball Bearing cage

(A-6455)

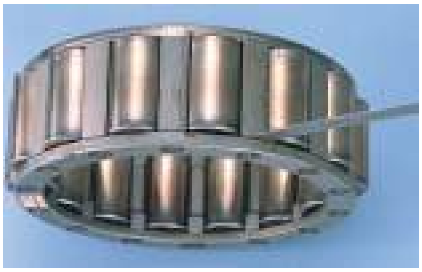
● Crack of Tapered Roller Bearing cage

(A-6670)

● Distortion of Cylindrical Roller Bearing cage

(A-7026)

● Looseness of Cylindrical Roller Bearing cage rivet



(A-6481)

● Rust on Tapered Roller bearing cage

(A-7131)

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Koyo® Ball & Roller Bearings: Failures, Causes and Countermeasures

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FSC® C018104
FSC
www.fsc.org

VEGETABLE OIL INK

CAT.NO.B3001E
Printed in Japan '21.6-DS（'92.4）

New Development / New Product

Slim Bearing

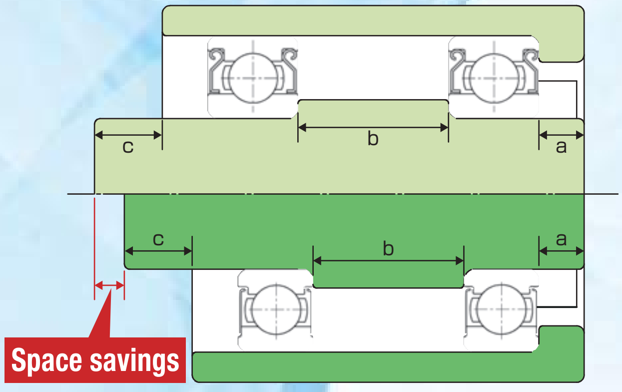
Narrowed width contributes to space and weight savings.

— Standard bearing —

— Slim Bearing —

Compact body but equivalent load capacity.

With standard bearing



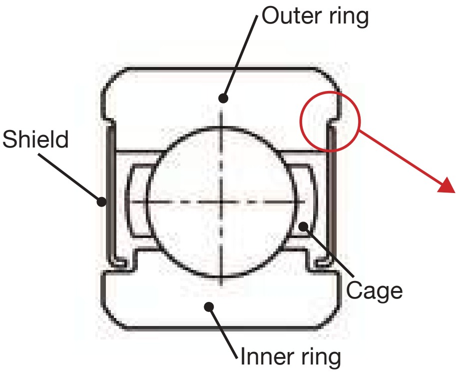
With slim bearing

Equivalent load capacity
Narrowed width (–6 mm) and
reduced weight (–17%)

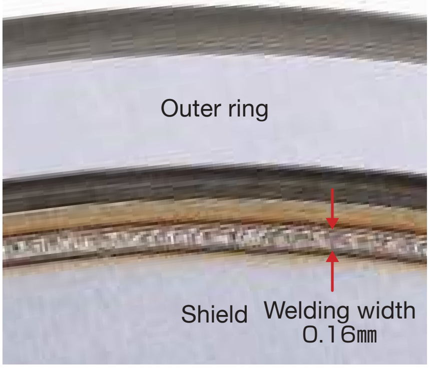
		Standard bearing 6008ZZ	Slim Bearing JS6008ZZW
Dimensions	Inner dia.	ϕ 40 ㎜	ϕ 40 ㎜
	Outer dia.	ϕ 68 ㎜	ϕ 68 ㎜
	Width	15 ㎜	12 ㎜
Rated load	Cr	20.9 kN	20.9 kN
	Cor	11.5 kN	11.5 kN

JTEKT CORPORATION

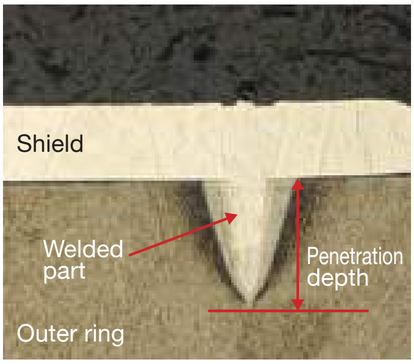
Outer shield is fully sealed by precision laser welding.



Enlarged view of welded part

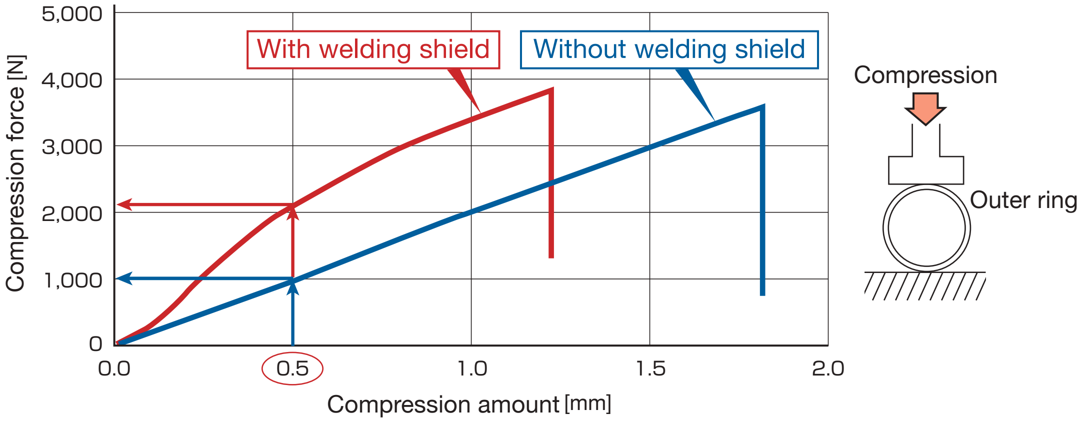


Cross-sectional view of welded part



＊The shallow weld penetration eliminates any adverse influences on bearing strength and performance.

Outer ring stiffness is improved by an integrated shield.



The compression force required to depress by 0.5 mm is increased by over 100%.

Expanded lineup

Bearing No.	Slim bearing dimensions (㎜)			Reduced width from standard bearing (㎜)	Rated load (kN)	
	Inner dia.	Outer dia.	Width		Cr	Cor
JS6005ZZW	25	47	10	−2	12.6	5.85
JS6204ZZW	20	47	12.5	−1.5	16.0	6.65
JS6205ZZW	25	52	12	−3	17.5	7.80
JS6008ZZW	40	68	12	−3	20.9	11.5
JS6010ZZW	50	80	13	−3	27.3	16.6

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CAT.NO.B1021E
Printed in Japan '17.07-1CM

High speed ball bearing for EV motors

Supports "high temperature" and "high speed" required for EV motors

Features

① Adoption of JTEKT's original shape cage with excellent high speed Supports $d_{m}n$(※) 1.5 million

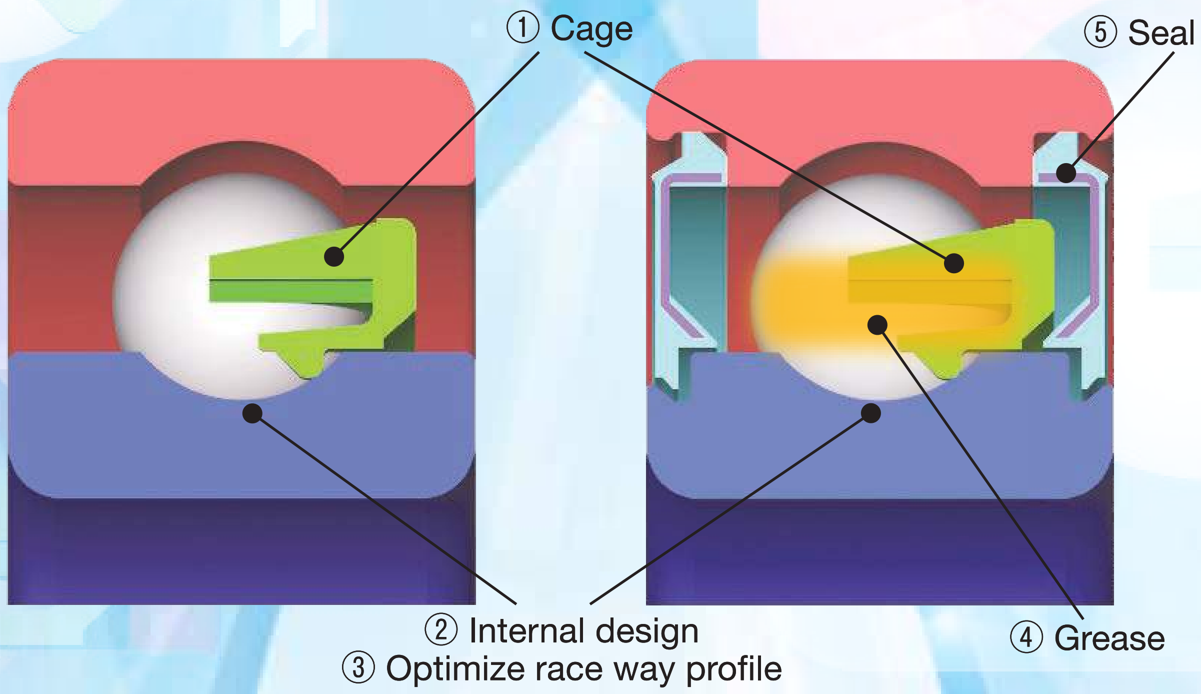
② Internal design with excellent high temperature and high speed

③ Improvement of quietness by optimizing the raceway surface properties and improving accuracy

④ Adoption of JTEKT's original grease that supports high temperature and high speed

⑤ Lineup of open type and sealed type according to the usage environment

(※) $d_{m}n$: A value that expresses the rotational performance of a bearing
Pitch circle diameter (mm) x rotation speed (min^{-1})



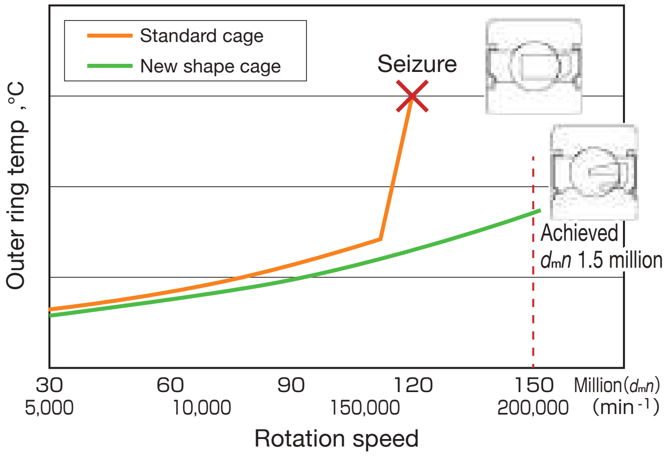
Open Type **Sealed Type**

CAT.NO.BA019EN-0MY

Performance

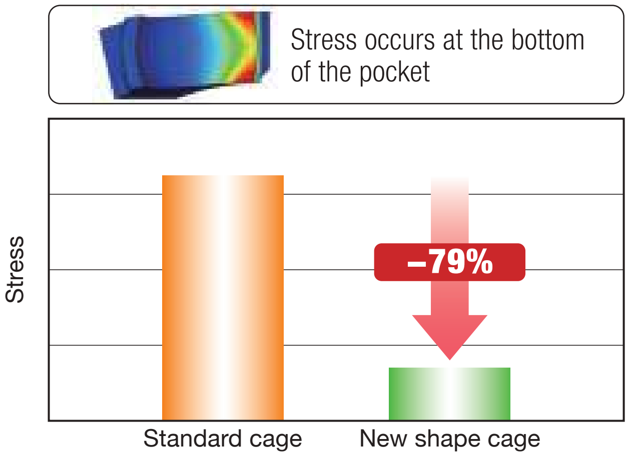
Temperature rise suppression

Reduced temperature rise under high speed rotation by optimizing the internal design



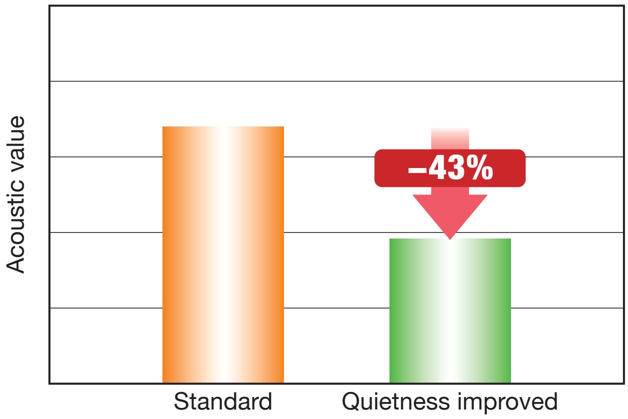
Cage strength

Significantly reduces the stress generated by centrifugal force



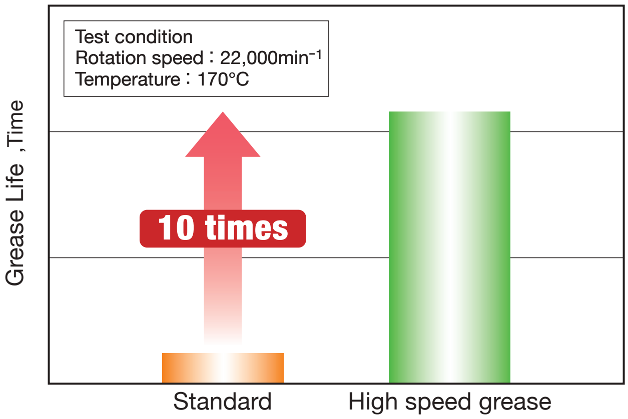
Silence

Reduced acoustic level by the raceway surface properties and accuracy



High temperature and high speed grease

Improved life at high temperature and high speed compared to standard grease



Bearing lineup for high-speed EV

Basic Model number	Boundary dimensions (mm)			Basic load rating (kN)		Limiting speeds (min^{-1})
	d	*D*	*B*	C_r	C_{0r}	
6007	35	62	14	15.9	10.3	30,000
6008	40	68	15	16.7	11.5	27,000

※ Please contact JTEKT as the internal clearance of the bearing is important when using it in other sizes or at high speed rotation.

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